

Leaflet 40

Contingency Plans

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- C Guidance on the handling and disposal of a broken GTLS, GTLD, radioactive valve or luminised article

Scope

1 A contingency plan sets out an organised, planned, and coordinated course of action to be followed in case of a fire, explosion, flood, accident, or incident that gives rise to a risk to human health or the environment. The need for contingency planning in relation to radiological accidents and incidents, and the requirements for content and implementation of contingency plans, are detailed in this Leaflet.

Statutory Requirements and Parallel Arrangements

2 In addition to the general requirements of the Health and Safety at Work etc Act 1974, the following specific legislation applies directly or is applied indirectly through parallel arrangements designed to achieve equivalent standards:

- Management of Health and Safety at Work Regulations 1999 (MHSWR 99) (applies directly);
- Ionising Radiations Regulations 1999 (IRR99) (applies directly);
- The Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPPIR) (applies directly);
- The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended) (applies directly)

Commanding Officer

3 The CO/HoE is the responsible person for the health and safety of all persons, including the general public, who may be exposed to ionising radiations as a result of any work carried out at the ship or establishment. This responsibility includes contingency planning for radiological accidents and incidents. Authority (but not responsibility) for radiation safety management arrangements may be delegated to appropriate personnel, such as a Radiation Safety Officer (RSO).

Radiation Safety Officer (RSO)

4 The Radiation Safety Officer (RSO) is to ensure that:

- The measures detailed in this Leaflet are considered in the context of the work undertaken, taking advice from the RPA as necessary.
- Contingency plans, where appropriate, are documented and promulgated.
- Staff and other persons are provided with appropriate local training and information so that they understand and comply with contingency plans.
- Contingency plans are subject to periodic review and, where appropriate, rehearsal.

Radiation Protection Supervisor (RPS)

5 Where sites and establishments have controlled areas and/or supervised areas, an RPS must be appointed for each such designated area (see Leaflet 4). The prime duty of the RPS is to ensure compliance with the IRR99 in respect of work carried out in the designated area. In practice, the RPS will achieve this by ensuring that work is carried out in accordance with local orders and local rules (see Leaflet 16) for radiation safety. An essential component of such documentation is the identification or summary of any contingency arrangements including details of the accidents or occurrences to which they relate.

Workplace Supervisor (Radioactive Materials) (WPS) (RAM)

6 In cases where work with radioactive material is carried out but where the risk assessment shows that designated areas are not required, a WPS (RAM) should be appointed with duties to ensure that the work with radioactive material is carried out safely in accordance with the local orders for radiation safety. Such local orders are to identify or summarise any relevant contingency arrangements and detail the accidents or occurrences to which they relate.

Employees

7 It is the responsibility of all employees to ensure that they are familiar with the contingency plans that apply to the workplace and to the work in which they are involved. Employees must also bring to the attention of the appropriate supervisor or manager any shortcomings in contingency plans that they identify, regardless of whether they would be directly affected by such shortcomings.

Requirement for Contingency Planning

8 In relation to work with ionising radiation, the employer must conduct a risk assessment to demonstrate that all hazards arising from that work with the potential to cause a 'radiation accident' have been identified. A 'radiation accident' is an accident or incident where immediate action would be required to prevent or reduce the radiation exposure to employees or any other persons to ionising radiation. In the risk assessment, the nature and magnitude of the risks to employees and other persons arising from those hazards are to be evaluated. The requirements for risk assessments are described in detail in Leaflet 2.

9 Ships, units or establishments must take all reasonably practicable steps to prevent, or limit the consequences of, radiation accidents, and must prepare a contingency plan in the event that a radiation accident remains reasonably foreseeable having regard to those steps taken to reduce the risks and consequences.

10 Contingency planning may be appropriate in relation to a radiation accident arising from:

- Any practice involving work with radioactive substances, including the transport of radioactive material, or the operation of electrical equipment emitting ionising radiation;
- Any work carried out in an atmosphere containing radon-222 gas at concentrations exceeding 400 Bq m⁻³;
- Any work with radioactive substances (other than work with radon-222 as referred to above) containing naturally occurring radionuclides.

11 The purpose of the contingency plan is to secure, as far as is reasonably practicable, the restriction of exposure to ionising radiation and the health and safety of persons who may be affected by the identified radiation accident. In compilation of the contingency plan, consultation is to be undertaken with the RPA.

Contents of Contingency Plans

12 The contingency plan is to contain:

- Actions which should be taken in order to avoid or minimise the effects of the accident or incident including, as appropriate, workplace and personal decontamination following source breakage or spillage, and the treatment of cuts or breaks in the skin;
- Details of any requirement for provision of personal protective equipment (PPE), respiratory protection equipment (RPE), instrumentation, accident dosimeters and other equipment; including where these may be found;
- Contact details for personnel who require to be informed of the incident, including radiation protection/ radioactive material supervisors, other radiation protection specialists, radiation medicine specialists and emergency respondents, as appropriate;
- Details of the steps to be followed to assess the seriousness of the situation; RPA advice should be sought regarding requirements for monitoring and biological sampling, where appropriate, to assess the magnitude of any intake of contamination by personnel;
- The names of persons authorised to take action to implement the plan;
- The provision of information, instruction, and training of personnel in relation to the plan;
- Dose assessment and reconstruction to identify all people affected by the accident (if appropriate).

Implementation of Contingency Plans

13 Contingency arrangements for radiation accidents or incidents in the workplace, including a description of the accidents or occurrences to which they relate, are to be summarised or cited in local orders or local rules as appropriate (see Leaflet 16). Contingency plans are to be brought to the attention of any persons who may be affected by the accidents or occurrences to which they relate, including those persons who may be required to take action in implementing those plans. Such persons are also to be provided with training and instruction appropriate to the actions that they may be required to take.

14 Consignors, carriers and consignees of radioactive material are to establish a radiation protection programme to provide adequate instructions to restrict radiation exposure when transporting radioactive materials. The programme should address the emergency arrangements and contingency plans appropriate to the consignment of radioactive material.

15 The contingency plan is to be rehearsed at suitable intervals, at a frequency determined by the ship, unit or establishment in consultation with the RPA.

Guidance on Contingency Planning for Specific Accidents and Incidents

16 Annexes A to C of this Leaflet provide guidance on contingency planning for a range of radiation accidents and incidents relevant to radioactive sources in widespread use by MOD ships, units and establishments. The guidance provided is not intended to be exhaustive, nor are the contingency plans intended to be necessarily prescriptive. As stated previously, the content of contingency plans appropriate to work carried out by a radiation employer should be determined through the risk assessment process, which should normally be conducted in consultation with the RPA.

Contingency Planning for Flooding

17 Where a unit is situated in an area where there is either a significant or moderate potential for flooding, it is recommended that contingency plans for accidents involving radioactive equipment address what steps will be taken to prevent the loss or damage to this equipment in the event of a flood. In England & Wales more information on flood risk is available on the Environment Agency webpage detailed below:

<http://www.environment-agency.gov.uk/homeandleisure/37837.aspx>

Review of Contingency Plans

18 Contingency plans should be reviewed by a ship, unit or establishment at regular intervals, normally in conjunction with a review of the underpinning risk assessment. Frequency of review should be determined taking into account the degree of risk associated with the identified radiation accident. Additionally, the contingency plan should be reviewed where:

- There is reason to suspect that the contingency plan is no longer valid (e.g. due to equipment or process modifications).
- There has been a significant change in the work to which the contingency plan relates.

Additional Requirements for Holders of Large Quantities of Radioactive Material

19 Where premises holds large quantities of radioactive material, or where a carrier transports large quantities of radioactive materials by rail or by certain other transport modes, the employer or carrier is to prepare a hazard identification and risk evaluation (HIRE) assessment, or ensure that one is prepared, in accordance with REPPiR. The requirements for such an assessment are broadly similar to those for routine radiological risk assessments as specified in paragraph 8; however, there is a requirement to send the Health and Safety Executive a report of the assessment and, depending on the magnitude of projected doses to members of the public, there may be a requirement for specific contingency plans referred to as the 'operator's emergency plan' and the 'off-site emergency plan'.

20 The required content of the HIRE assessment and the regulatory requirements under REPPiR are described in detail in Leaflet 3. Where REPPiR applies to premises and transport operations, the RPA should be consulted regarding regulatory compliance, preparation of the HIRE assessment and in relation to any subsequent requirement for emergency plans.

Related Leaflets

21 Leaflets referred to within this leaflet are shown in Table 1.

Table 1 Related Leaflets

Leaflet Number	Leaflet Title
2	Risk assessments
3	Introduction and use of radioactive substances and radiation generators
6	Dosimetry and personal dose records, including medical surveillance of classified persons
10	Transport of radioactive materials
12	Accumulation and disposal of radioactive waste
14	Accident and incident investigation and reporting
16	Local orders for radiation safety

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Leaflet 40 Annex A

Fire – Guidance on Elements of a Contingency Plan to Respond to a Fire Affecting Radioactive Material

Fire – Response Actions

1 The primary danger to life is from fire and smoke, not from radioactive material. Thus, initial response actions to evacuate personnel and casualties from the scene are no different to the normal response to a fire or fire alarm. However, there are a number of additional measures which should be taken where radioactive material is involved, where it is safe to do so, as follows:

- Order the immediate evacuation of all personnel and casualties not involved in planned response actions;
- Make safe radioactive sources and materials if it is practicable to achieve this quickly and safely;
- Isolate the affected area, shutting doors, windows, ventilation systems etc where appropriate;
- Notify fire fighters, site emergency staff etc of presence and location of radioactive material including the provision of information on radionuclide(s), activity and physical nature (e.g. special form sealed source, open source etc);
- Take a note of all personnel involved and the circumstances (times and locations);
- Inform CO/HoE and consult the RPA;
- If the spread of contamination either airborne or surface is possible, then the monitoring of personnel and areas may be necessary – procedures for this should be included in the plan;
- If personnel are found to be (or suspected to be) contaminated, then decontamination drills should be followed (see Leaflet 16). RPA advice should be sought regarding procedures to be followed or samples to be taken to assess any possible intake of contamination by personnel;
- When the fire emergency is over, re-entry to the area should be planned carefully taking into account possible release of radioactive contamination and/or damage to radioactive sources, containers and shielding. RPA advice should normally be sought prior to re-entry as to the protection and monitoring requirements;
- Carry out the reporting and notification procedures in Leaflet 14.

2 Planning for additional actions may be required and this should be evident from the risk assessment. Guidance for specific uses of radioactive material may be found in the relevant leaflet.

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Leaflet 40 Annex B

Spills – Guidance on Elements of a Contingency Plan to Respond to Spillage of Radioactive Liquid or Loose Solid Materials

CONTENTS

Paragraph

- 1 Spillage – response actions
- 3 Treatment of cuts or breaks in the skin
- 4 Bodily intake of radioactive materials and skin contamination
- 5 Removal of personal contamination

Spillage – Response Actions

1 In the event of spillage of radioactive substances that are likely to have potential for causing airborne or surface contamination, carry out the following actions:

- By persons in the immediate vicinity of the spill
- Follow immediate action drills to isolate the spillage by applying absorbent material, shutting valves etc;
- Evacuate the immediate area and isolate the area concerned, closing doors, windows and shutting down ventilation.
- Any suspected contamination of personnel or cuts or injuries sustained during the occurrence should be drawn to the immediate attention of supervisors and medical staff;
- By establishment personnel under the supervision of a suitably qualified and experienced person (e.g. a Radiation Protection Supervisor)
- Prevent access to the area suspected of being contaminated (such as by erecting barriers and attaching warning notices).
- Where personnel are suspected of being contaminated, they should firstly be assisted to remove and bag contaminated over garments (lab coats etc), then provided with coveralls and overshoes if they need to be moved to a separate area for decontamination and monitoring.
- Monitor for personal contamination any personnel who were within the area during the spillage.
- Re-enter the area wearing suitable PPE and where necessary RPE, to monitor the extent of the spread of the contamination arising from the spillage.
- Clean up the spillage without undue delay using techniques that do not spread the contamination or create an airborne hazard.

- Treat articles and materials used in cleaning up the spillage as contaminated. Equipment that can be re-used should be decontaminated, but if contamination remains the equipment should be appropriately marked and, if necessary, packaged. Materials and articles should be disposed of as radioactive waste if they are not to be re-used.
- Re-monitor the area to ensure that the levels of contamination are less than the maximum prescribed for normal operations in the area concerned (if no monitoring equipment is available on site, contact the RPA). RPA advice may be necessary as to acceptable levels of residual contamination.
- Seek the advice of the RPA where contamination cannot be reduced to prescribed levels by repeated cleaning.
- When the area has been adequately decontaminated remove the additional barriers and allow return to normal procedures for access to the area.
- Notify the CO/HoE of the occurrence.
- Estimate the total activity of the spillage from data on the source of the spillage and the monitoring results, and enter details into a radiation incident log.
- Notify appropriate authorities in accordance with Leaflet 14.

2 Where the spillage involves very short-lived radionuclides, it may be more appropriate to allow the material to decay naturally; the RPA should be consulted for further advice. Entry to the area is to be restricted until the radionuclide has decayed away.

Treatment of cuts or breaks in the skin

3 When any person who sustains a cut or other break in the skin he should promptly present himself to the RPS to ensure that appropriate first aid treatment is given. Any such injury sustained while working with radioactive materials is to be reported to the medical department and the person sent for treatment. The RPS is to record the injury in the appropriate accident book, and notify the CO/HoE.

Bodily intake of radioactive materials and skin contamination

4 If an intake of radioactive material into the body is known or suspected, or an individual's skin becomes contaminated and cannot be decontaminated by normal washing, the RPS and RPA are to be informed. The person is to be referred to the medical department and the appointed doctor is to be notified. The actions to be taken to assess the radiation dose from radioactive material following an accident are detailed in Leaflet 6.

Removal of personal contamination

5 The following actions should be taken by medical personnel as quickly as possible when a person with skin contamination arrives at the medical department.

- Moist-swab the skin with plain water (soap should not be used initially). When removing contamination from the face, swab away from the mouth, nose, eyes, ears and any wound. Contamination in any orifice may be removed by irrigation with normal saline or similar infusion, or even plain water. Care should be taken to ensure that the skin is not reddened or broken when removing contamination.

- If repeated monitoring indicates that the contamination is being removed the use of plain water should be continued. If not, soap or other detergent may be used.
- If the use of soap fails to reduce the contamination levels below limits recommended by the RPA, the appointed doctor should be consulted.

6 Medical staff should wear an appropriate level of PPE (including RPE) during the removal of contaminated clothing and subsequent decontamination of the skin. It should be ensured that the level of PPE/RPE is not at a level that may unduly alarm the contaminated person. Advice may be sought from the appointed doctor or RPA.

7 All PPE, other clothing, swabs and washings must be treated as potentially contaminated and retained for disposal through an appropriate waste disposal route, as described in Leaflet 12. Advice on disposal may be sought from the RPA.

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Leaflet 40 Annex C

Instructions on the Handling and Disposal of a Broken GTLS, GTLD, Radioactive Valve or Luminised Article

CONTENTS

Paragraph

- 1 Hazards
- 4 Breakage kit
- 5 Immediate action following the breakage of a GTLS, GTLD or valve containing gaseous radioactive material
- 6 Decontamination and clean-up
- 7 Disposal of damaged articles and other waste
- 8 GTLSs and GTLDs
- 10 Radioactive valves
- 12 Luminous articles

Hazards

1 A broken GTLS or GTLD is potentially hazardous, principally through inhalation of tritium (H-3) gas and tritium water vapour which may be released. Additionally, there may be a hazard due to ingestion or absorption of radioactive material into the body. The handling of glass or metal fragments of a broken GTLS or GTLD with bare hands must be avoided as such items will be contaminated.

2 A broken radioactive valve is potentially hazardous for the following reasons:

- If the valve contains tritium (may be marked as H-3) or Krypton-85 (may be marked Kr-85), then breakage will result in the release of radioactive gas which could give rise to an internal dose by inhalation. Tritium in the form of tritiated water vapour may also be absorbed through the skin. Although the internal dose from a gaseous release from the breakage of a valve is likely to be very small, it can be avoided by vacating the room or compartment where the breakage has occurred. (Note: a large proportion of radioactive electronic valves now in use in MOD contain tritium).
- Whether or not radioactive gases are involved, there is a potential for an internal dose via contamination - radioactive material can be absorbed into the body through cuts or scratches in the skin. The handling of glass or metal fragments with bare hands must therefore be avoided.

3 Broken luminised equipment containing solid radioactive material is potentially hazardous, principally because the radioactive material released may be ingested or absorbed into the body, for example through cuts or scratches in the skin. The handling of glass or metal fragments with bare hands must be avoided.

Breakage Kit

4 In all locations where GTLSs, GTLDs, radioactive valves and luminous articles are stored or used, clean-up kits are to be readily available. Each kit is to be clearly labelled so as to indicate its purpose and is to contain the following:

- 1 pair of rubber gloves
- 1 pair of tongs or tweezers
- Soft cloths
- 1 roll of adhesive tape
- Disposal container (e.g. paint type tin) with sealable lid
- Safety glasses/goggles
- A container for water (or if there is no access to water outside of the spillage area, a bottle of water (the water should be regularly replaced to avoid any biological contamination such as Legionnaire's Disease))

Immediate Action Following the Breakage of a GTLS, GTLD or Valve Containing Gaseous Radioactive Material

5 In the event of damage or suspected damage to a GTLS, GTLD, or valve containing gaseous radioactive material, for example a valve containing tritium (H-3) or Krypton-85 (Kr-85), immediate actions are appropriate to minimise the inhalation hazard and should be undertaken providing operational circumstances and safety considerations permit. These actions are as follows:

- Evacuate the room or compartment.
- Cordon off.
- Warn against access.
- Ventilate for 1 hour if the breakage occurs in an enclosed space, or 15 minutes if in the open air.
- Collect breakage kit and carry out the actions at paragraph 6 below.
- Note: if it is certain that the GTLS, GTLD or valve article does **not** contain gaseous tritium (H-3), Krypton-85 (Kr-85) or any other radioactive gas, the damaged article may be cleared up immediately using the procedure described in paragraph 6 below.

Decontamination and Clean-Up

6 After completing any immediate actions to minimise the inhalation hazard, decontamination and clean-up is to be conducted as follows:

- Put on rubber gloves and, if appropriate, wear safety glasses.
- Pick up all visible fragments and other items liable to be contaminated, using tongs or tweezers and place them in the disposal container.
- Pick up small particles with adhesive tape, using only light pressure, and place adhesive tape in disposal container.
- Dampen the cloth and wipe the area, using light straight strokes (to avoid rubbing particles into the surface being cleaned) in an inwards direction to the breakage. Fold the cloth in half after each stroke, and keep the clean side out. When the wiping surface of the cloth becomes too small, replace with the other clean dampened cloth. Place the cloth in the disposal container.
- Remove rubber gloves. Place them in the disposal container and seal the lid securely (and remove any radioactive references from the outside of the container).
- Wash hands thoroughly.
- Report any cuts or abrasions to the medical officer and inform him that the cut was sustained whilst clearing up a broken radioactive article and so must be assumed to be contaminated.

Disposal of Damaged Articles and Other Waste

7 The arrangements for disposal of waste articles and arisings from UK establishments are described in the sub-sections below. For overseas establishments these arrangements do not apply and waste must normally be sent back to the UK for disposal. Further information is available from the RPA/RWA.

Note: These disposal arrangements cover non-routine occurrences and should not be used for situations where a continuous waste stream is being generated. In addition, unless otherwise advised, intact GTLSs should be returned through stores for re-cycling.

8 The disposal of radioactive waste, as detailed in the sub-sections below, are subject to the limits detailed in Table C-1.

Table C-1

Waste category	Radioactive waste	Maximum activity per dustbin load (0.1 m3 of non radioactive waste)	Annual limit
A	Individual sealed source	20 GBq of tritium (H-3) 200kBq of other	10000 GBq of tritium 10 MBq of other

		radionuclides	radionuclides
B	Solid radioactive waste containing tritium & C-14 with no single item >400kBq	4 MBq	2 GBq
	Solid radioactive waste with no single item > 40 kBq	400 kBq for the sum of all radionuclides	200 MBq
C	Luminised article with no single item containing > 80 MBq of Pm-147, or > 4 GBq of tritium	80 MBq of Pm-147, or 4 GBq of tritium	2 GBq of Pm-147, or 100 GBq of tritium

9 There may be other items (damaged or intact) being disposed from an establishment, which are not detailed below, that will contribute to the maximum quantity that can be disposed of for each of the radioactive waste categories in Table C-1. Further guidance is available from the RWA.

GTLSs and GTLDs

10 Within the UK, the disposal of the GTLS fragments and associated waste arisings may be undertaken using the normal refuse route. The disposal container is to be securely sealed and not have any visible markings to indicate the presence of radioactive material. Advice may be sought from the RWA.

11 Disposal of broken GTLSs and GTLDs must comply with waste Category A limits (Table C-1).

12 Details of the broken GTLSs or GTLDs material disposed of and the disposal route should be entered on the radioactive source list and the Dstl Annual Holdings Return.

Radioactive Valves

13 The disposal procedure for radioactive valve fragments and associated waste arisings is to be as follows:

- Broken valves containing tritium (H-3), in a securely sealed container, can be disposed of in substantial quantities of normal refuse subject to waste category A limits (Table C-1).
- Broken valves containing krypton 85 (Kr-85) can be disposed of via normal refuse. This is subject to an annual disposal limit of 200 GBq.
- Valves containing nuclides other than tritium (e.g. caesium-137 (Cs-137), cobalt-60 (Co-60)) can be disposed of in substantial quantities of normal refuse subject to waste category B limits (Table C-1).

- In all cases the disposal container should not be labelled or marked to indicate the presence of radioactive material.
- If the broken valve contained activities exceeding those listed above, then the disposal container should be marked as containing radioactive material and advice obtained on an appropriate disposal route from the RWA.

14 When broken valves are disposed of, details of the articles disposed of and the disposal route are to be entered on the radioactive source list and the Dstl Annual Holdings Return.

Luminous Articles (other than GTLSs and GTLDs)

15 The subsequent disposal of the luminised equipment fragments, cloths and gloves is by the disposal of the container into a normal refuse route, subject to waste category C (Table C-1) limits. The disposal container is to not have any markings to indicate the presence of radioactive material. Advice may be sought from the RWA.

16 When broken luminous articles are disposed of, details of the articles disposed of and the disposal route are to be entered on the radioactive source list and the Dstl Annual Holdings Return.