



THE SOCIETY FOR
RADIOLOGICAL PROTECTION

MANAGING INDUSTRIAL SITE RADIOGRAPHY WORK



What is Site Radiography?

Industrial radiography involves the use of industrial X-ray sets and/or high-activity gamma radiation sources to carry out non-destructive testing (NDT) of welds or for determining structural or pressure-retaining integrity. The high-intensity radiation sources used can pose a significant risk to those carrying out the work as well as others who may be in the vicinity.

HSE's expectation is that industrial radiography will be carried out in a properly designed shielded enclosure, fitted with appropriate safety systems to restrict radiation exposures. However, there will be occasions where items are too large to be transported into an enclosure or *in-situ* components such as pipework, spools and so on need to be radiographed. On these occasions the radioactive source and/or X-ray set must be taken to the site for the testing to be carried out, a practice known as "site radiography".

This leaflet has been produced by the Non Nuclear Sectorial Committee of The Society for Radiological Protection (SRP).

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www.bindt.org

While care has been taken to provide accurate and helpful information in this booklet, the SRP and those responsible for producing this booklet do not accept responsibility for any errors or omissions therein. Readers are expected to seek professional advice as appropriate in specific circumstances.

This information sheet is intended to assist companies carrying out site radiography, and also clients who engage such companies, to comply with the law. Clients, main contractors and site radiography companies are all employers and have clear responsibilities under health and safety legislation (Ionising Radiations Regulations 1999, Health and Safety at Work etc. Act 1974 and Management of Health and Safety at Work Regulations 1999).

Site radiography companies using gamma radiation sources must also comply with the specific conditions contained in their radioactive substances permit issued under the Environmental Permitting Regulations 2010 (by the Environment Agency or Natural Resources Wales) or their certificate of registration issued under the Radioactive Substances Act 1993 (by the Scottish Environment Protection Agency or the Northern Ireland Environment Agency).

Checklists

This leaflet provides a short summary of the main radiation protection requirements to ensure that site radiography is carried out safely, and consists of two checklists:

- one for site radiography companies
- one for their clients

These checklists are not intended to be exhaustive; rather they represent the minimum standards in terms of radiation protection arrangements.

Note: It is not addressed in this leaflet, but the transport of gamma radiography sources to/from site must also comply with the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations. A suitable Dangerous Goods Safety Adviser (DGSA) will be able to provide advice on compliance with these regulations.



Checklist for Site Radiography Companies

1. Site Radiography Equipment

Many accidents have been caused by faulty site radiography equipment. It is essential that all equipment used to control the exposure of the radiation source is fit for purpose, properly inspected on a regular basis (normally each working day), and maintained in accordance with the manufacturer's instructions. This includes:

- Gamma source containers (projection and non-projection types): these should comply with ISO 3999: 2004.
- Wind-out equipment, projection guide tubes and collimators.
- Mobile X-ray equipment (mains and battery operated), including the tube-head, cables and control box.

Records of inspection and servicing of equipment should be kept.

2. Personnel: Training, Supervision and Expert Advice

All radiography staff should receive training in radiation protection and the requirements of the local rules. This training should be kept up to date (refresher training).

One or more Radiation Protection Supervisors should be appointed in writing, and receive additional training. An RPS must always be present on site when radiography is being undertaken, to ensure it is carried out in accordance with the local rules.

All radiography companies are required to appoint a Radiation Protection Adviser (RPA); normally an external body or individual with appropriate RPA certification and knowledge of industrial radiography safety.



3. **Planning the Work**

As well as initially notifying HSE of the intention to use mobile radiography sources, each site radiography job must be notified to HSE at least 7 days in advance.

A suitable prior radiation risk assessment should be prepared, and this should cover both normal operations and reasonably foreseeable accidents. See paragraphs 44 and 45 of the Approved Code of Practice to the Ionising Radiations Regulations 1999 for more guidance.

Key considerations are:

- Using the most appropriate NDT technique (ie which may not involve radiation at all).
- Minimising the size of the radiography controlled area, for example by using lower output sources and/or appropriate source exposure systems, where practical.
- Minimising the likelihood of accidents, for example by using non-projection gamma exposure systems.

Other planning issues include access/egress arrangements, site inductions, permit to work requirements and emergency arrangements. Other workplace risks, such as work at height or confined spaces, should also be assessed.

4. **Control of Radioactive Sources**

Special precautions are needed to ensure the safety and security of gamma radiography sources. Radiography companies must have a Radioactive Substances Permit (or Certificate of Registration), and must comply with the conditions and limitations.

Gamma sources must be kept under continuous surveillance when in use, and kept in secure storage when not. If sources are to be stored on site, the storage arrangements (including site security) should be discussed and agreed with the client.

The suitable and secure storage of X-ray sets should also be considered.

5. Safe Working Procedures

Written safe working procedures (local rules) must be followed to ensure that the exposure of radiographers and other persons are properly restricted. These should take account of the site working conditions, and be discussed with the client in advance.

Local Rules should specify:

- Only using one radiography source at a time in the same area. The minimum source activity or X-ray settings needed to obtain the required image quality should be used.
- Using collimators and local shielding to reduce dose rates outside the main beam.
- Setting up a Controlled Area using temporary barriers and warning signs prior to the exposure. Searching this area (including above and below, where appropriate) and excluding all persons other than the radiographers. The barriers should be monitored and patrolled by radiography staff during exposures.
- Use of separate audible or visual warnings prior to an exposure (pre-warning) and during an exposure.
- The source control point should ideally be outside the Controlled Area. If this is not possible, it should be positioned where the dose rate is as low as practicable.
- Locking off source containers and X-ray control panels between exposures and removing the keys.



6. Radiation Monitoring

All site radiography personnel must be classified persons (IRR99), and be issued with personal dosimeters supplied by an approved dosimetry service. These must be worn at all times during the work.

Site radiography personnel should also wear a personal electronic radiation alarm, which is capable (even on noisy sites, if applicable) of alerting the radiographer to the presence of high dose rates.

Radiographers must also have a suitable radiation survey instrument, which must be used:

- To confirm that the dose rate at the Controlled Area boundary is below 7.5 microsieverts per hour.
- To confirm that the dose rate at the control point is as low as practicable.
- To confirm the gamma source has returned to the shielded container, or that the X-ray exposure has terminated. THIS MUST BE DONE AFTER EVERY EXPOSURE.

Radiation survey instruments and personal electronic alarms must be in good working order and subject to a statutory annual test to ensure they are still giving the correct readings.

7. Dealing with Accidents

If not conducted properly, site radiography can produce serious radiation accidents. Such accidents must be considered at the prior risk assessment stage and, where practicable, steps to prevent such accidents should be taken. In addition:

- Contingency Plans and any emergency equipment required for dealing with site radiography accidents should be prepared. For gamma radiography with projection equipment, this should include the recovery of a detached source, including a suitable shielded container into which it can be placed.
- Training should be provided for radiography staff, including regular rehearsals of the Contingency Plans.
- If an accident does occur, it is likely to require reporting to the HSE and (if it involves a gamma source) to the appropriate environment agency.

Checklist for Site Radiography Clients

1. Selecting a Radiography Company

Site radiography (using gamma or X-ray sources), if not undertaken properly, can give rise to a significant radiation hazard to persons on site. Consequently, when selecting a site radiography company, due consideration should be given to ensuring a high level of radiation safety. For example, you should check that the radiographers will comply with the site radiography checklist, and request copies of documents such as risk assessments, local rules and contingency plans prior to the work commencing.

Site radiography needs planning, and you should not request radiography at short notice, except where there is an urgent need, for example because of unexpected events or emergency situations. Similarly, ensure you allow sufficient time for the radiography to be conducted without rushing.

2. Planning for Safe Radiography

A good site radiography company will want to liaise with you in advance, to ensure that everyone is satisfied with the proposed arrangements. Matters to discuss will include:

- Whether radiography is the most appropriate NDT technique, or is there a non-radiation alternative?
- Whether the radiography could be done in an enclosure, ie is there a need for site radiography?
- Confirmation that the radiography company has notified HSE at least 7 days in advance of the work starting.
- What is the most appropriate radiography source and source exposure system?
- The location, size and duration of the Controlled Area and how access will be restricted prior to and during the work.
- General safe working arrangements for the site, for example adequate lighting, the need for scaffolding, etc and the potential impact on other equipment on site, such as nucleonic gauges.

- Relevant contact details, for example for the Radiation Protection Supervisor and relevant site personnel.
- If applicable, arrangements for the temporary storage of gamma radiography sources and X-ray sets on site, including the security arrangements.
- The implementation of Contingency Plans for site radiography. Also, what the radiographers should do in the event of a site emergency such as a gas release or fire alarm.

3. Safety Audits

You may also wish to conduct your own safety audits of site radiographers. You can use the checklist for radiography companies as a basis for this. In addition:

- You should ensure that your own personnel obey the restrictions on access to the Controlled Area, and follow any safety instructions given by the radiographers.
- If radiography is routinely carried out, you might also consider purchasing your own radiation monitor to do independent measurements (by a suitably trained site employee). You might also consider appointing your own Radiation Protection Adviser to assist with the audit procedure.



Providers of Site Radiography Products and Services

SRP has a number of Affiliate Members who offer products and services relating to Site Radiography.

Please see the SRP Website www.srp-uk.org for further details or email admin@srp-uk.org for an up to date contact list.



Further Details

If you would like any further information on Site Radiography please email SRP's Non Nuclear Sectorial Committee on nnsc@srp-uk.org

Membership of SRP

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The Society for Radiological Protection is the UK Associate Society affiliated to the International Radiation Protection Association. It promotes the science and art of radiation protection and allied fields for the public benefit.



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