

Basic Health Physics Course

The System of Control of Radiological Hazards at Harwell

1. An analysis of recent incidents indicate that at some stage the individual concerned is responsible in some small or large degree for failure to observe either common sense precautions or laid down regulations.
2. It is the individual regardless of grade who is responsible for safety.
3. When an individual is responsible for other people he is also responsible for the safety of the operations which his people carry out. In this way there is a natural chain of responsibility through to the Division Head who carries ultimate responsibility for safety in his own division.
4. The Division Head has set up a safety committee to advise him on all aspects of safety in the Division. In addition the Director has laid down various regulations which must be obeyed by all staff. (Harwell Notices).
5. Each Group in the Division is represented on the Safety Committees by some responsible person who is usually an Area Supervisor. There are also representatives of Safety Section and Health Physics and Medical Division on this committee.
6. An individual, regardless of rank, who needs advice on safety matters can (a) approach his representatives on the Safety Committee or (b) approach one of the specialist organisations set up by the Director to provide this advice.
7. The Specialist Organisations are:-
 - 7.1 Safety Section - deal with all aspects of General Safety.
 - 7.2 Health Physics Operations Group - deal with all aspects of Radiological Safety. A Team consisting of an Area Health Physicist, a Non-Tech. II Foreman and several Health Monitors is responsible for each area of the Site. The Area Health Physicist or members of his team are always available for consultation or advice. Their duties include:-
 - (a) Provision of Health Physics advisory service and specialist support.
 - (b) Routine monitoring to prove that control of experiments and work is adequate.
 - (c) Provision of monitoring instruments.
 - (d) Provision of emergency services.
 - 7.3 The Harwell Criticality Committee (see H.N.16) offers advice to persons handling fissile materials in quantities greater than 100g. (Fissile materials are defined as > 1% enriched Uranium, ^{235}U , ^{233}U , ^{239}Pu and ^{241}Pu .) It is emphasised that staff who are handling fissile materials are personally responsible for the safety of all operations.

8. In order to avoid confusion about the person who is responsible in a particular area for all matters affecting radiological safety a person called the Area Supervisor is nominated for each controlled area. His duties are to see that all staff in a particular area are aware of and follow all local recommendations for safe practice and that they are aware of and obey all establishment rules. He must see that staff obtain the best advice that is available and that interaction does not occur with other Areas.
9. The appointment of Area Supervisors is covered by Harwell Notice No. 63 and H.P. Gen 27 (Notes for the Guidance of Area Supervisors) is a useful aide memoire for area supervisors; it includes a list of all relevant Harwell Notices.
10. The following is a list of Harwell Notices which are of immediate importance to all staff.

10.1 H.N.19 Authority Health and Safety Codes

All staff must comply with the provisions of these codes. The principle codes to date are:-

- (a) AH & S E.1.1 Maximum Permissible Doses from External Radiation.
- (b) AH & S E.1.2 Maximum Permissible Doses from Internal and Ingested Radioactive Materials.
- (c) AH & S A.1.1 The transport of Radioactive material.
- (d) AH & S E.3.2 The withdrawal of Radioactive material from shielding.
- (e) AH & S D.3.2 The Handling of Beryllium and its compounds.

10.2 H.N. 35 Radiological Safety of Contractors Employed at A.E.R.E.

Area Supervisors are responsible for the safety of contractors staff whilst they are in his area. A work permit must be raised when a contractor is to work in any controlled area. Incidents to contractors staff must be reported (Para's 5.4, 5.5 and 5.6.).

10.3 H.N. 36 Classification of Controlled Areas

	Contamination	Radiation
White	Negligible risk of Contam.	Radiation exposure < 1.5 R/year
Blue	Surface contam. of such a low order that special precautions to control hazard are not necessary.	Radiation exposure > 1.5 R/year but < 5 R/year.
Red	Special precautions are necessary to control contamination hazard	Special precautions are necessary to keep radiation exposures below 5 R/year.
Purple	No access without special protective clothing.	Special precautions and restrictions are necessary to prevent exposure above maximum permissible levels.

This notice also lays down procedures in controlled areas of which the most important are as follows:-

- (a) Contact shoes and laboratory coats must be worn in red areas. They may be worn in blue areas, but not in white areas.
- (b) Eating, drinking and smoking in red areas is not allowed.
- (c) Items leaving red areas should have a transfer certificate.
- (d) A work permit must be raised when persons who are not under the direct control of the area supervisor are working in his area.
- (e) Accidents in controlled areas must be reported to the area supervisor. Skin injuries should also be reported to the Health Physics Office.

10.4 H.N. 37 Deals with work in Beryllium Areas

This notice is now a little out of date in that the area health physicist should be approached for advice on the handling of beryllium and its compounds. In general the notice is very similar to H.N. 36; the major difference being that staff employed on beryllium work must be medically examined and declared fit for beryllium work, and listed on the beryllium register.

10.5 H.N. 38 Wearing and Use of Radiation Monitoring Films

1. Films must be worn by everyone entering a red radiation area and by everyone working in a blue radiation area.
2. The film must be worn between the shoulder and the waist, outside the clothing.
3. The film must only be used for measuring one's whole body exposure.
4. It is the responsibility of the wearer to obtain appropriate additional films from the H.P. office.
5. Contaminated or suspect heavily exposed films should be changed at the H.P. office.

10.6 H.N. 39 Waste disposal

Wastes are classified according to their level of radioactivity. Three levels are recognised, inactive, low level and high level. Wastes from White contamination areas, from offices in blue areas and from change rooms are treated as inactive. Wastes from other contamination areas are classified as low or high according to the table on the next page.

Type of Activity	Solid Waste	Liquid Waste
alpha	1 mc	10 mc
Beta/gamma	10 mc	100 mc
if radiation level at surface of container exceeds	100mR/hr.	100mR/hr

Wastes must be disposed of as described below

1. Solid Active waste

- (a) For essentially inactive or minimally active waste, foot operated bins with waxed paper liners.
- (b) For low level waste, waxed paper bags in steel drums. Glassware and other items which may cut the paper should be placed in a fibre board keg in a steel drum.
- (c) For high level alpha waste, fibre board keg in steel drum (e.g. glove box waste - each item sealed in PVC bag before disposal in fibre board keg).
- (d) For high level beta/gamma waste special lead pots (contamination precautions may need to be taken)

2. Liquid Waste

- (a) Essentially inactive waste e.g. (in laboratories connected to the active drainage system),
Second and third washings of active glassware may be discharged down the sinks of blue and red contamination areas. Low level liquid waste in laboratories not connected to the active drainage system should be poured into a carboy.
- (b) For low level liquid waste, carboys in steel containers; organic and aqueous waste should be placed in separate containers.
- (c) High level liquid wastes are best dealt with individually, e.g. small volumes absorbed in vermiculite and sent for immediate disposal. Beta/gamma active waste may require shielding. Large volumes of liquid waste may require special treatment. If in doubt contact Effluent Disposal section for advice.

10.7 H.N. 64 The Control of Radioactive Sources

defines significant sources as

10 μ c alpha emitters

0.1 mc ^{90}Sr , ^{154}Eu , ^{144}Ce

1.0 mc other $\beta\gamma$ emitters,

or >10 mR/hour at 1 foot (unshielded)

Sources must be labelled to indicate the nature of the material. A card index of all sources must be kept using the standard yellow cards. When a source is loaned to another person or area a pink card must be filled in and retained by the owner of the source. The yellow card must accompany the source. (Note: alternative source control systems approved by Health Physics and Medical Division may be used.) Probably the most important requirement of this Harwell Notice is that area supervisors are responsible for carrying out a two monthly check of the records, the sources and their labels.

J. Stephenson

Health Physics and Medical Division,
Building 351.15.

OCT 1964