

Specification for

Equipment for minehead assay and sorting radioactive ores in containers

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- Association of Consulting Engineers
- British Electrical and Allied Manufacturers' Association (BEAMA)
- British Insurance (Atomic Energy) Committee
- Electricity Supply Industry in England and Wales*
- Health and Safety Executive*
- Lloyd's Register of Shipping
- National Radiological Protection Board*
- Radiochemical Centre*
- Scientific Instrument Manufacturers' Association*
- The Institution of Nuclear Engineers*
- United Kingdom Atomic Energy Authority*
- Water-tube Boilermakers' Association

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- Association of X-ray Equipment Manufacturers
- British Institute of Non-destructive Testing
- British Institute of Radiology
- Clinical Physics and Bioengineering
- Electronic Engineering Association
- Institute of Physics

This British Standard, having been prepared under the direction of the Nuclear Engineering Standards Committee, was published under the authority of the Executive Board and comes into effect on 31 March 1980

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National foreword

This British Standard is identical with IEC Publication 600 “*Equipment for minehead assay and sorting radioactive ores in containers*” published by the International Electrotechnical Commission (IEC).

The standard has been prepared under the direction of the Nuclear Engineering Standards Committee, and the UK took part in the work of IEC Technical Committee 45 that prepared IEC 600.

The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

They have the form of recommendations for international use, and they are accepted by the National Committees in that sense.

Terminology and conventions. The text of the International Standard has been approved as suitable for publication, without deviation, as a British Standard. Some terminology and certain conventions are not identical with those used in British Standards.

Cross-references

International Standard	Corresponding British Standard
IEC 38:1975	BS 77:1958 <i>Voltages for a.c. transmission and distribution systems</i> (Technically equivalent)
IEC 68-2	BS 2011 <i>Basic environmental testing procedures</i> Part 2.1 <i>Tests</i> (Identical)
IEC 278:1968	BS 4308:1968 <i>Documents supplied with electronic measuring instruments</i> (Technically equivalent)
IEC 529:1976	BS 5490:1977 <i>Specification for degrees of protection provided by enclosures</i> (Identical)

The references to IEC 196:1965 and IEC 536:1976, for which there are no corresponding British Standards, contain mandatory requirements, and are therefore reproduced as National appendix A and National appendix B respectively to this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope

This standard is applicable to equipment for grading and sorting radioactive ores in containers at minehead and in open-cast workings, described in Clauses 3 and 4.

2 Object

- a) To lay down mandatory requirements.
- b) To give a list of characteristics which the manufacturer shall specify in the instruction manual supplied with each apparatus (see IEC Publication 278, Documentation to be Supplied with Electronic Measuring Apparatus).

3 General description of operation

3.1 Such equipment, used at the minehead or in open-cast workings and quarries, ensures two functions:

- a) Estimation of the grade of uranium ore, permitting the sampling of exploratory work and the survey of the production output. As the measured gamma radioactivity does not directly represent the content of uranium metal, the processing of the results is made using a statistical method, establishing the correlation between radioactivity and uranium content. This allows account to be taken of the state of the radioactive equilibrium of the ore.
- b) Selection of the quarried products, which enables avoidance of unnecessary freight and processing charges for ore with a uranium content that is too low to be economical to process, and also allows classification of ores into several ranges of uranium contents, so that each grade may be treated appropriately.

3.2 The starting of the measuring cycle is controlled either manually or automatically, by the skip displacement, or by the placing of a truck; a cycle includes, for example:

- a) *Measurement*: determining the product radioactivity by means of a scaler during a predetermined time interval.
- b) *Selection*: at the end of the measurement, the information on the grade of the product (sterile, poor ore, mixed ore, rich ore) is transmitted to the sorting device.
- c) *Recording*: the measurement results are transmitted to a printing or perforating machine the number of the general location, the number of the measurement, the radioactivity, the designation of the special location displayed on landing at the skip terminal, the class of ore, and optionally, the ore mass.
- d) *Verification of the background*: after removal of the product or departure of the truck, a background measurement allows survey of probe operation, product removal and local contamination.

When commissioning the plant, it is necessary to carry out a background measurement replacing the sample material by an equal amount of material with as low a radioactivity as possible, e.g. river sand, to simulate the absorption of background radiation by the mineral.

- e) *Background recording*.
- f) *End of the cycle*.

3.3 According to use at the minehead or in open-cast workings, equipment belongs to two classes:

- a) *Cylinder sorting equipment* used at the minehead. Usually, in order to carry out the measurement in a container easy of access and easily decontaminated, and in order not to hinder mining, each skip tips its load into a cylinder in which measurement is made while the skip performs a new quarrying cycle. Measurement can also be made directly on the skip or on trams previously separated in order to avoid mutual influence.
- b) *Sorting equipment for trucks* used in open-cast workings and quarries. The trucks to be measured and sorted stop under an archway which supports the detector, which is high enough to eliminate geometrical variations and collimated to "see" only ore, excluding ground area which is usually contaminated.