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Standard Guide for Design of Equipment for Processing Nuclear and Radioactive Materials[1]

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1. Scope

1.1 *Intent:*

1.1.1 This guide covers equipment used in shielded cell or canyon facilities for the processing of nuclear and radioactive materials. It is the intent of this guide to set down the conditions and practices that have been found necessary to ensure against or to minimize the failures and outages of equipment used under the subject circumstances.

1.1.2 It is intended that this guide record the principles and caveats that experience has shown to be essential to the design, fabrication, and installation of equipment capable of meeting the stringent demands of operating, dependably and safely, in a nuclear processing environment that operators can neither see nor reach directly.

1.1.3 This guide sets forth generalized criteria and guidelines for the design, fabrication, and installation of equipment used in this service. *This service* includes the processing of radioactive wastes. Equipment is placed behind radiation shield walls and cannot be directly accessed by the operators or by maintenance personnel because of the radiation exposure hazards. In the type of shielded cell or canyon facility of interest to users of this guide, either the background radiation level remains high at all times or it is impractical to remove the process sources of radiation to facilitate in situ repairs or carry out maintenance procedures on equipment. The equipment is operated remotely, either with or without visual access to the equipment.

1.2 *Applicability:*

1.2.1 This guide is intended to be applicable to equipment used under one or more of the following conditions:

1.2.1.1 The materials handled or processed constitute a significant radiation hazard to man or to the environment.

1.2.1.2 The equipment will generally be used over a long-term life cycle (for example, in excess of two years), but equipment intended for use over a shorter life cycle is not excluded.

1.2.1.3 The material handled or processed must be retained, contained, and confined within known bounds for reasons of accountability or to minimize the spread of radioactive contamination.

1.2.1.4 The materials handled or processed must be kept and maintained within one or more of the following conditions:

(1) In a specific geometric array or configuration, and

(2) Within a range of conditions that have been determined to be a critically safe set of conditions for that piece of equipment, that is, *1*) in a given and specified operational position where adjacent nuclear criticality interaction conditions are known and unchanging, *2*) for a given and specified set or range of operating conditions, and *3*) for a given and specified process.

1.2.1.5 The equipment can neither be accessed directly for purposes of operation or maintenance, nor can the equipment be viewed directly, for example, without intervening shielded viewing windows, periscopes, or a television monitoring system.

1.2.2 This guide is intended to be applicable to the design of equipment for the processing of materials containing uranium and transuranium elements in any physical form under the following conditions:

1.2.2.1 Such materials constitute an unacceptable radiation hazard to the operators and maintenance personnel,

1.2.2.2 The need exists for the confinement of the in-process material, of dusts and particulates, or of vapors and gases arising or resulting from the handling and processing of such materials, and

1.2.2.3 Any of the conditions cited in 1.2.1 apply.

1.2.3 This guide is intended to apply to the design, fabrication, and installation of ancillary and support services equipment under the following conditions:

1.2.3.1 Such equipment is installed in shielded cell or canyon environments, or

1.2.3.2 Such equipment is an integral part of an in-cell processing equipment configuration, or an auxiliary component or system thereof, even though an equipment item or system may not directly hold or contain nuclear or radioactive materials under normal processing conditions.

[1] This guide is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.09 on Nuclear Processing.

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