



U.S. NUCLEAR REGULATORY COMMISSION

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 3.45
(Task FP 925-5)**NUCLEAR CRITICALITY SAFETY FOR PIPE INTERSECTIONS CONTAINING
AQUEOUS SOLUTIONS OF ENRICHED URANYL NITRATE****A. INTRODUCTION**

Section 70.22, "Contents of Applications," of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," requires that applications for a specific license to own, acquire, deliver, receive, possess, use, or transfer special nuclear material contain proposed procedures to avoid accidental conditions of criticality. This regulatory guide provides guidance for complying with this portion of the Commission's regulations by describing procedures acceptable to the NRC staff for the prevention of criticality accidents in the storage and processing of aqueous solutions of enriched uranyl nitrate in pipe intersections.

B. DISCUSSION

ANSI/ANS 8.9-1978, "Nuclear Criticality Safety Guide for Pipe Intersections Containing Aqueous Solutions of Enriched Uranyl Nitrate,"¹ was prepared by Subcommittee 8, Fissionable Materials Outside Reactors, of the Standards Committee of the American Nuclear Society. ANSI/ANS 8.9-1978 was approved by the American National Standards Committee N16, Nuclear Criticality Safety, in 1977 and subsequently by the American National Standards Institute (ANSI) on February 15, 1978.

ANSI/ANS 8.9-1978 is applicable only to the storage and processing of homogeneous aqueous solutions of uranyl nitrate containing no more than 93.5 wt-% U-235 in intersecting pipe geometries consisting of single central columns with smaller intersecting arms. The standard presents tabulated maximum safe values, derived from an empirical model based on validated calculations and experimental data, for both the central column diameter and the total area of intersection of the arms with the column for conditions of partial and total reflection. The standard also presents a general procedure to ascertain the safety of specific pipe intersections as well as guidance on model parameters and

limitations. In intersecting pipe geometries where the model does not apply, e.g., multiple columns or columns in the vicinity of other fissionable materials, the standard requires that experimental data or validated computational techniques be used to determine the safe configuration.

C. REGULATORY POSITION

The nuclear criticality safety practices and guidance for calculating safe pipe intersections for enriched uranyl nitrate solutions contained in ANSI/ANS 8.9-1978 provide procedures generally acceptable to the NRC staff for the prevention of criticality accidents in the storage and processing of aqueous solutions of enriched uranyl nitrate in pipe intersections.

Section 6 of ANSI/ANS 8.9-1978 lists additional documents referred to in the standard. The specific applicability or acceptability of two of these listed documents has been addressed in the latest version of the regulatory guides identified below:

Standard ¹	Regulatory Guide
ANSI N16.1-1975	3.4
ANSI N16.9-1975	3.41

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants regarding the NRC staff's plan for using this regulatory guide.

The methods described in this guide were applied in a number of specific cases during reviews and selected licensing actions. These methods reflect the latest general NRC approach to criticality safety in the storage and processing of aqueous solutions of enriched uranyl nitrate in pipe intersections. Therefore, except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used in the evaluation of submittals for license applications submitted pursuant to 10 CFR Part 70.

¹ Copies may be obtained from the American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525.

USNRC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the NRC staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. This guide was revised as a result of substantive comments received from the public and additional staff review.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

The guides are issued in the following ten broad divisions:

- | | |
|-----------------------------------|-----------------------------------|
| 1. Power Reactors | 6. Products |
| 2. Research and Test Reactors | 7. Transportation |
| 3. Fuels and Materials Facilities | 8. Occupational Health |
| 4. Environmental and Siting | 9. Antitrust and Financial Review |
| 5. Materials and Plant Protection | 10. General |

Copies of issued guides may be purchased at the current Government Printing Office price. A subscription service for future guides in specific divisions is available through the Government Printing Office. Information on the subscription service and current GPO prices may be obtained by writing the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Publications Sales Manager.

VALUE/IMPACT STATEMENT*

Regulatory Guide 3.45 (Task FP 925-5) endorses ANSI/ANS 8.9-1978, "Nuclear Criticality Safety Guide for Pipe Intersections Containing Aqueous Solutions of Enriched Uranyl Nitrate," which was approved by the American National Standards Institute on February 15, 1978. The

* A copy of the draft value/impact statement (published with Draft Guide FP 925-5 in January 1980) is available for public inspection at 1717 H Street NW., Washington, D.C.

nuclear criticality safety practices and guidance for calculating safe pipe intersections contained in ANSI/ANS 8.9-1978 are acceptable to the NRC staff and to industry. The guide provides a convenient reference for the licensee or license applicant in designing nuclear criticality safety programs to meet regulatory requirements and standards of good nuclear criticality safety practice. The use of this guide should facilitate the licensing process with minimum impact on the NRC staff and industry.



POSTAGE AND FEES PAID
U.S. NUCLEAR REGULATORY
COMMISSION

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555
OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300

119406002001 1 QAQ3
US NRC REGION I
OFFICE OF INSPECTION & ENFORCE
R J BORES
631 PARK AVENUE
REGION I
KING OF PRUSSIA PA 19406