

# REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

## REGULATORY GUIDE 3.36

## NONDESTRUCTIVE EXAMINATION OF TUBULAR PRODUCTS FOR USE IN FUEL REPROCESSING PLANTS AND IN PLUTONIUM PROCESSING AND FUEL FABRICATION PLANTS

### A. INTRODUCTION

Section 50.34, "Contents of applications: technical information," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires, among other things, that each application for a construction permit for a fuel reprocessing plant include sufficient information relative to materials of construction to provide reasonable assurance that the final design will conform to the design bases with adequate margin for safety and a discussion of how the applicable requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 will be satisfied. As used in Appendix B, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that safety-related structures, systems, and components will perform satisfactorily in service. Appendix B requires, in part, that measures be established to ensure materials control and control of special processes and to ensure the performance of reliable testing programs.

Paragraph 70.22(f) of 10 CFR Part 70, "Special Nuclear Material," requires, in part, that each application for a license to possess and use special nuclear material in a plutonium processing and fuel fabrication plant contain a description of the quality assurance program to be applied to the design, fabrication, construction, testing, and operation of the structures, systems, and components of the plant and that the description include a discussion of how the criteria of Appendix B of Part 50 will be met. Paragraph 70.23(b) of Part 70 provides that the Commission will approve construction of a plutonium processing and fuel fabrication plant when it has determined that the design bases and the quality assurance program provide reasonable

assurance of protection against natural phenomena and the consequences of potential accidents and notes that the criteria in Appendix B of Part 50 will be used in determining the adequacy of the quality assurance program.

The integrity of tubular products can be an important consideration in safety evaluations. The proper use of nondestructive examination can identify defects that could impair the integrity of these items. Acceptable practices for the nondestructive examination of tubular products can differ significantly. In the interest of standardization, this guide specifies procedures acceptable to the NRC staff for the nondestructive examination of high-integrity tubular products. These procedures, which draw on those used for nuclear power plants, will provide a uniform quality level consistent with the function of high-integrity tubular products for safety-related structures, systems, and components of fuel reprocessing plants and plutonium processing and fuel fabrication plants.

The recommendations of this guide apply to high-integrity tubular products for confinement barriers, for process systems and components, for radioactive waste handling and storage systems. The recommendations also apply to tubular products whose failure may adversely affect the safety of other structures, systems, and components, and to tubular products exposed to corrosive environments and/or high stresses of other safety-related structures, systems, and components of fuel reprocessing plants and plutonium processing and fuel fabrication plants.

### B. DISCUSSION

The maintenance and decontamination of radiochemical structures, systems, and components can be

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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. However, comments on this guide, if received within about two months after its issuance, will be particularly useful in evaluating the need for an early revision.

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both difficult and hazardous. Cracks, crevices, defects, and other discontinuities on the surfaces of such equipment may retain radioactive solutions or particulates. This complicates decontamination for decommissioning or when direct repair, maintenance, or inspection must be made. Cracks and defects can also contribute to the leakage of equipment by initiating accelerated crevice corrosion by either the operation or decontamination environment. Internal cracks and defects may eventually be exposed to the surfaces by normal corrosion and wear of the equipment. Internal defects can therefore be considered as detrimental as surface defects and, for the reasons given above, should be avoided. Therefore, reliable nondestructive examination of the entire volume of metal of tubular products used in safety-related structures, systems, and components of fuel reprocessing plants and of plutonium processing and fuel fabrication plants should be performed.

Subarticle NB-2550 of Section III, Division 1, of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code<sup>3</sup> gives requirements for examination and repair and acceptance criteria for seamless and welded (without filler metal) tubular products and fittings for use in nuclear reactor components. The requirements and criteria of NB-2550 are also acceptable to the NRC staff for the quality control of seamless tubular products for use in fuel reprocessing plants and in plutonium processing and fuel fabrication plants with the following clarifications and additions: (1) all tubular products should be examined for both circumferential and axial defects and (2) when ultrasonic examination is required, the sound should be transmitted in the two directions, i.e., in both circumferential directions or both axial and both circumferential directions, as required. This scanning may be accomplished by separate passes of the pipe through the examination equipment in each direction (back and forth) or by a single pass through equipment containing complete and independent channels of instrumentation for each mode and direction of scanning.

Requirements for the examination and repair and acceptance criteria for welded tubular products (with filler metal added) are given in Subsubarticle NB-2560 of Section III of the ASME code. These requirements are acceptable to the NRC staff with the following addition. When the option for ultrasonic examination of finished welded pipe is invoked as permitted by NB-2560, the ultrasonic examination should meet the requirements of NB-2550 and the recommendations of this guide.

### C. REGULATORY POSITION

Nondestructive examination applied to (1) tubular products used for safety-related process systems and components, (2) tubular products used for radioactive

waste handling and storage systems, and (3) tubular products exposed to corrosive environments and/or high stresses of other safety-related structures, systems, and components of fuel reprocessing plants and of plutonium processing and fuel fabrication plants should be capable of detecting unacceptable defects regardless of defect shape, orientation, or location in the product. Accordingly, to the degree practical, the examinations should include methods that apply to the entire volume of the product and should include techniques designed to locate all types of defects. In particular, procedures for ultrasonic examination of pipe and tubing should provide a sensitivity that will detect randomly oriented defects that occasionally develop in pipe and tubing manufactured by extrusion, swaging, or tube-reducing processes.

To adequately control the quality of tubular products intended for the uses described above, they should be examined and repaired as follows:

1. All tubular products should be examined for both circumferential and axial defects.
2. Wrought seamless tubular products should be examined and repaired in accordance with NB-2550 of the ASME Code using the acceptance criteria given therein with the following addition. When ultrasonic examination is performed, the sound should be transmitted in both directions for each mode of scanning; i.e., when the code requires circumferential scan, the sound should be transmitted in both circumferential directions, and when the code requires circumferential and axial scans, the sound should be transmitted in both circumferential directions and both axial directions.
3. Examination and repair for welded tubular products (with filler metal added) should be in accordance with NB-2560 of the ASME Code. When ultrasonic examination is performed for these products, it should be done in accordance with NB-2550 of the ASME Code and with regulatory positions C.1 and C.2.

### D. IMPLEMENTATION

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

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 or construction permits docketed after December 26, 1975.

If an applicant whose application for license is docketed on or before December 26, 1975, wishes to use this regulatory guide in developing submittals for applications, the pertinent portions of the application will be evaluated on the basis of this guide.

<sup>3</sup>Copies may be obtained from the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017.