

Qualification and Certification of NRC Criticality Safety Inspectors

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Introduction

In order to assure public health and safety, the U.S. Nuclear Regulatory Commission (NRC) performs safety inspections, including criticality safety inspections, at fuel cycle facilities licensed under Title 10 of the Code of Federal Regulations, Part 70 and Part 76 using technical staff from NRC Headquarters and Regional offices. Routine and reactive criticality safety inspections are currently performed at 15 licensed facilities. The NRC hires, trains, and certifies headquarters inspection staff to perform specialized criticality safety inspections at these fuel cycle facilities. In addition to performing focused inspections, NRC criticality safety inspectors also integrate headquarters and regional criticality safety inspection activities, coordinate the NRC response to operational events involving criticality safety at fuel cycle facilities, coordinate enforcement actions involving criticality safety at fuel cycle facilities, and coordinate publication of generic correspondence concerning operational criticality safety. NRC criticality safety inspectors are selected on the basis of operational experience at fuel cycle facilities, prior inspection experience, experience in operational criticality safety, and engineering education. Within two years, newly appointed or assigned inspectors must complete a qualification program leading to certification that includes formal training, inspection accompaniments at licensed facilities, a written examination, and an oral review.

Qualification Requirements

Upon appointment or assignment as an NRC criticality safety inspector, an NRC employee is required to prepare an NRC Inspector Qualification Journal based on NRC Inspection Manual Chapter 1246¹, Appendix B. The qualification journal has 12 specific training areas that must be completed:

- NRC Orientation
- Code of Federal Regulations
- Headquarters and Regional Policies and Procedures
- Regulatory Guidance and Generic Procedures
- NRC Inspection Manual
- Industry Codes and Standards
- Inspection Accompaniments
- NRC Management Directives
- Significant Fuel Cycle Events
- Physical Security
- Safety Analysis
- Formal Training

The prospective inspector will meet with the lead criticality safety inspector and determine the specific requirements to be met in each area based upon the employee's background, experience level, or prior NRC certification. The resulting qualification plan is then reviewed and approved by the supervisor of the inspection section. All areas are self-study reading assignments with the exception of inspection

accompaniments and formal training. The employee is assigned a reference facility to study safety analysis. The employee must satisfactorily complete at least four inspection accompaniments with a certified inspector. The actual number of accompaniments is determined based upon employee needs and normally will greatly exceed four.

Formal Training

All criticality safety inspectors complete formal training which consists, at a minimum of the following courses which are three to five day classroom courses with written final examinations:

- Fundamentals of Inspection
- Inspecting for Performance
- Effective Communication
- Root Cause and Incident Investigation
- OSHA Indoctrination
- Site Access Training
- General Health Physics Practices
- Fuel Cycle Technology
- Fire Protection
- Nuclear Criticality Safety
- Integrated Safety Analyses

All the above training is conducted by the NRC at the headquarters complex in Rockville but may not always be available to the particular employee during a qualification period due to scheduling. In such cases, all but the first three courses may be taken from vendors or through self-study. For example, inspectors may take the University of New Mexico Short Course in Criticality Safety rather than the NRC equivalent course. An individual qualification plan may include additional formal training requirements, for example, criticality safety inspectors normally take the Oakridge KENO course.

Written Examination

The comprehensive written examination is a new requirement that is not yet formally incorporated into the NRC Inspection Manual. The examination is not intended to cover material that would be discussed and tested in the inspectors formal criticality safety course. The examination is designed to build the inspectors confidence in specific inspection areas and to identify remaining gaps in understanding prior to oral review. The question bank for the examination was developed under contract by Battelle Pacific Northwest Laboratories to address the following topics:

- Neutron Physics
- Validation and Statistics
- Analysis and Calculations
- Limits, Controls, and Safety Margin
- NRC Fuel Cycle Program

An examination of 20 questions is assembled by the lead criticality safety inspector with representative questions in each of the five areas based on consideration of the strengths and weaknesses of the individual employee. To date, all exams have included a sample validation problem, and preparation of a KENO input file for a simple geometry. Difficulty with the examination would result in additional training and reexamination.

Oral Board Review and Certification

Upon completion of all qualification requirements contained in the approved qualification plan, the lead criticality safety inspector will recommend to the supervisor of the inspection section that the employee is ready for certification. The supervisor will interview the employee and review the employee's qualification journal which will, by then, contain the completed qualification plan with evidence that all requirements have been fulfilled. When the supervisor is satisfied that the employee is ready for oral review, the supervisor will convene and chair an oral board consisting of, at least, a regional inspection supervisor, the lead criticality safety inspector, and a criticality safety license reviewer. Senior managers of the Fuel Cycle Safety and Safeguards Division are also invited and may choose to participate. Reasonable questions concerning the NRC inspection program, enforcement, allegations, criticality safety, licensed facilities, and risk may be asked. An outline of typical questions is provided to the employee and panel members prior to the review, however, the review is not limited to these questions. At the conclusion of the review, the panel meets in private and discusses the employee's responses. If all panel members are satisfied that the employee is fully capable of performing independently as a certified NRC inspector, the panel will recommend certification to the senior management. If problems are identified by the panel, the employee must develop a training plan to satisfy the deficiencies prior to certification. Occasionally, subsequent to additional training, a second panel is convened and an additional review is conducted to complete certification.

Planned Program Upgrades

The fuel cycle inspection program is presently undergoing modification with the key objectives being better risk focus, strategic plan alignment, and integration of Headquarters and Regional inspection effort. Program modifications are expected to include revision of inspector qualification requirements. Preliminary discussion of qualification program changes revealed a desire to eliminate ambiguity and subjectivity from the program, for example, by developing more structured guidelines for oral review. An additional goal is to limit the duration of inspector qualification by adding requirements for maintenance or recertification.

Summary

The NRC certifies headquarters staff to conduct specialized criticality safety inspections at licensed fuel cycle facilities. Employees appointed or assigned as criticality safety inspectors must complete a rigorous program involving self-study, formal training, inspection accompaniments, written examination, and oral review prior to final NRC certification. The high standard associated with certification as an NRC criticality safety inspector is commensurate with the NRC responsibility to assure the safety of licensed facilities against inadvertent criticality.

References

1. NRC Inspection Manual Chapter 1246, *Formal qualification Programs in the Nuclear Material Safety and Safeguards Program Area*, U.S. Nuclear Regulatory Commission (June 1996).