

## **U.S. Department of Energy/Argonne National Laboratory Training Courses for Packaging, Transportation, and Storage of Radioactive Material-17269**

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### **ABSTRACT**

The U.S. Department of Energy (DOE) Packaging Certification Program (PCP), Office of Packaging and Transportation, Office of Environmental Management, has sponsored a suite of training courses that have been conducted since the early 1990s. Of these training courses, Argonne National Laboratory (Argonne) conducts three courses: (1) Quality Assurance (QA) for Radioactive Material Packaging, (2) American Society for Mechanical Engineers (ASME) Pressure Vessel Code for Nuclear Transport and Storage, and (3) Nuclear and Other Radioactive Materials Transport Security.

Argonne has been working with the University of Nevada, Reno, to develop an accredited graduate-level program in nuclear packaging. The Graduate Certificate in Nuclear Packaging (GCNP) program provides an applied knowledge-based curriculum in packaging for nuclear and radioactive materials that complements other graduate programs at the University (for additional information, see <https://www.unr.edu/degrees/nuclear-packaging/certificate>).

### **INTRODUCTION**

In support of the DOE PCP, Argonne conducts three training courses annually. Each course is one week in duration and includes lectures, in-class exercises and discussions, homework assignments, and a final exam.

The objective of the "Quality Assurance (QA) for Radioactive Material Packaging" training course is to help participants gain a working knowledge of the QA principles and methods for satisfying those federal regulatory safety requirements for packagings and casks used in the transportation and storage of radioactive material, including spent nuclear fuel and high-level waste.

The objective of the "American Society for Mechanical Engineers (ASME) Pressure Vessel Code for Nuclear Transport and Storage" training course is to help participants gain an understanding of the regulatory basis, current design practice, and engineering rationale for applying the ASME Boiler & Pressure Vessel Code to the packaging and transportation of radioactive material and the storage of spent nuclear fuel and high-level waste.

The objective of the “Nuclear and Other Radioactive Materials Transport Security” training course is to help participants gain an understanding of (1) the requirements for security during the transport of nuclear and other radioactive materials and (2) the methodologies that can be used to satisfy U.S. domestic regulatory requirements and international standards and recommendations.

## **DESCRIPTION**

### **Quality Assurance for Radioactive Material Packaging**

The QA training course is designed for personnel who are responsible for designing, fabricating, or evaluating radioactive material transportation packagings and spent fuel dry storage casks, as well as for those who are preparing or reviewing the associated safety analysis reports. The course includes in-class exercises, a mock-loading exercise, and a final exam.

Course highlights include:

- An overview of federal regulations that govern packaging and transportation of radioactive material and dry cask storage systems for spent nuclear fuel, including test requirements from 10 CFR Parts 71 and 72
- DOE Orders and NRC guidance documents, including Regulatory Guides, NRC Regulation (NUREG) reports, and Standard Review Plans
- ASME NOA-1 [1] requirements for creating a QA program, including the requirements for the organization, the quality assurance program, design control, inspection, test control, corrective action, nonconformances, and audits
- Best practices in Type B packaging testing
- Applicability of commercial-grade dedication of items
- Application of the graded approach to establish QA requirements for components important to safety
- Software quality assurance
- Lessons learned from QA audits and inspections at facilities using packagings and casks
- DOE PCP Quality Assurance Approval Program (QAAP) for transportation packagings
- DOE PCP packaging certification process

## **American Society for Mechanical Engineers Pressure Vessel Code for Nuclear Transport and Storage**

The ASME training course is designed for personnel who are responsible for designing, fabricating, or evaluating Type B and fissile material transportation packages and spent fuel storage casks, as well as for those who are preparing or reviewing the associated safety analysis reports.

Course highlights include:

- Overview of federal regulations that govern packaging and transportation of radioactive material and dry cask storage systems for spent nuclear fuel
- DOE Orders and U.S. Nuclear Regulatory Commission (NRC) guidance documents, including standard review plans, regulatory guides, and NUREG reports
- DOE/NRC lessons learned from certifying transportation packages and licensing dry cask storage systems
- Discussion of the ASME Code [2], with emphasis on Section III, Division 3, *Containments for Transportation and Storage of Spent Nuclear Fuel and High Level Radioactive Material and Waste*, and discussion of Section III, Division 1; Section VIII, Division 1; and Sections II, IX, and XI
- Code and non-code materials, design considerations with emphasis on design-by-analysis rules, and design qualification by physical testing
- QA, fabrication, welding, examination, containment/confinement requirements
- ANSI N14.5 leakage rate testing [3]
- Renewal of license for Independent Spent Fuel Storage Installations and Certificate of Compliance for Dry Cask Storage Systems and extended storage
- Aging effects and mechanisms, aging management programs, and time-limited aging analyses
- Structural, thermal, containment/confinement analysis considerations
- Shielding and criticality safety analysis considerations
- Long-term storage of DOE materials
- DOE PCP Certification Process

## **Nuclear and Other Radioactive Materials Transport Security**

The transport security training course is designed for personnel who are responsible for ensuring the security of nuclear and other radioactive material during transport within the United States and around the world. Professionals who benefit from the course include shippers, carriers, and receivers; public relations personnel; logistics planners and brokers; federal and state regulators and inspectors; and guard, escort, and emergency response personnel.

Course highlights include:

- Need for transport security, fundamental security principles, and definitions
- Overview of international and U.S. domestic transport security requirements and recommendations and guidance from international and U.S. governmental organizations
- How to develop transport security systems by following a graded approach
- How to establish the rules of engagement for escort, guard force, and emergency response force personnel
- How to communicate with the public during emergencies
- How to develop transport security plans (TSPs) that satisfy regulatory security requirements
- Hands-on exercises involving TSPs, readiness review, and corrective actions
- Field exercises using the ARG-US remote monitoring system [4, 5] to track a mock shipment with “staged incidents”

## **CONCLUSIONS**

The three training courses presented by Argonne provide personnel with knowledge in the areas of quality assurance, ASME pressure vessel code information, and transport security. The training courses are an integral part of the Packaging Certification Program implemented by the DOE Office of Packaging and Transportation, Office of Environmental Management. These courses also provide credits toward the Graduate Certificate in Nuclear Packaging Program from the University of Nevada, Reno.

## **ACKNOWLEDGEMENTS**

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## **REFERENCES**

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