

## **Type B Packaging Maintenance At Nuclear Waste Management Division**

David Witzke  
Senior Technical Engineer, Radioactive Material Transportation  
Nuclear Waste Management Division  
Ontario Power Generation

### **Abstract**

The Nuclear Waste Management Division of Ontario Power Generation completes about 300 shipments annually with its fleet of 12 Type B Packagings. All Type B packagings owned by Ontario Power Generation undergo an Inspection and Maintenance program at Nuclear Waste Management's Western Waste Management Facility located at Tiverton, Ontario. This paper describes the elements of the Inspection and Maintenance Program.

### **Introduction:**

The Nuclear Waste Management Division (NWMD) of Ontario Power Generation completes about 300 [1] shipments annually requiring a Type B Packaging. These shipments are made in Nuclear Waste Management's fleet of 12 Type B Packagings. The fleet is comprised of 6 Type B Liquid Packagings; namely the Tritiated Heavy Water Transportation Packagings and 6 Type B solid packagings. The 6 Type B solid packagings are 3 Radioactive Filter Transportation Package with a payload of In-Station Flasks, 2 Trillium Transportation Packagings used for Bulk Resin shipments and high activity solid waste and 1 Roadrunner Transportation Packaging used for reactor core components such as Flux Detectors and Pressure and Calandria tubes.

There are a number of other Type B packagings used by Nuclear Waste Management Division, but are operated under a lease agreement (Irradiated Material Transportation Packaging, Radiography exposure devices, tritium containers etc.). These Type B packagings are not maintained by Nuclear Waste Management and are not discussed in this paper.

The 12 Type B transportation packagings undergo an annual Inspection and Maintenance program at Nuclear Waste Management's Western Waste Management Facility located at Tiverton, Ontario. This paper describes the various elements of the Inspection and Maintenance Program.

### Quality Assurance:

NWMD assures that all activities affecting the quality of the Type B packagings are accomplished under suitably controlled conditions. The Radioactive Material Transportation organization addresses the requirements of the International Atomic Energy Agency Safety Series 113 [2] and TS-R-1 paragraph 310 [3] under the following elements.

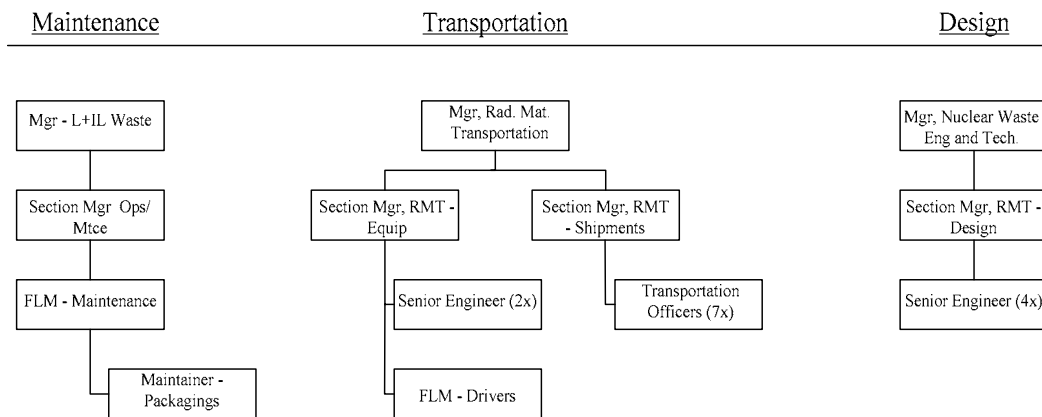
### Radioactive Material Transportation Organization:

The Radioactive Material Transportation organization consists of the Shipments and Equipment sections reporting to the Radioactive Material Transportation Manager. Transportation Package maintenance comprises two senior engineers reporting to the Section Manager of the Equipment Section.

Maintenance support is provided to Radioactive Material Transportation through the operations side of Nuclear Waste Management. Operations perform Type B Packaging maintenance using a crew of 5 Mechanical Maintainers under the supervision of one First Line Manager Assistant and one First Line Manager. Maintenance personnel are a resource shared with other work areas at the Western Waste Management Facility.

Design Engineering support for Radioactive Material Transportation is provided by Nuclear Waste Engineering and Technology. Nuclear Waste Engineering and Technology is responsible for the design of Type B, Type A, Industrial Type 2 and 3 transportation packagings and overpacks. They provide engineering support for the design and modification of transportation packagings and support equipment, maintain Canadian Nuclear Safety Commission certificates for Transportation packagings and maintain the licensed packaging Safety Analysis Reports and compliance reports.

### Organization Charts, Radioactive Materials Transportation



### Document Control

Each unique Type B packaging has a Maintenance Inspection and Testing Procedure associated with it as well as the Design Drawings and Design Specifications. Each maintenance procedure is assigned a unique number with a revision number and indication of the issue status.

All documents are prepared, reviewed and approved in accordance with approved procedures by personnel with the requisite experience and qualifications to ensure incorporation of the appropriate quality and regulatory requirements.

The Maintenance Inspection and Testing procedures are prepared by one of the senior engineers responsible for the packaging. Each new or revised maintenance procedure is reviewed by Operations, Nuclear Waste and Engineering Technology and by the Section Manager for Radioactive Materials Transportation – Equipment. Approval is by the Manager, Radioactive Materials Transportation.

### Design Control

Nuclear Waste Management has a Conduct Of Engineering program that encompasses all changes to Type B transportation packagings. The program ensures changes are controlled, inspected and tested; that designs are developed to meet applicable regulatory requirements and that design activities are carried out in a planned, controlled and orderly manner.

All changes are reviewed by Nuclear Waste Engineering and Technology. Approved changes are managed under the Engineering Change Control process and are assigned a unique tracking number. Appropriate changes are made to governing documentation where required. If the Design Change affects the licensing basis, prior competent authority approval is obtained.

Configuration control is maintained by verifying against approved engineering drawings during every annual maintenance. Any Discrepancies are corrected to the approved design configuration.

All approved changes are field implemented with procurement control, installation and commissioning requirements completed as required.

### Procurement Control

Replacement parts for Type B transportation packagings are purchased through the Ontario Power Generation procurement system from qualified suppliers. A graded approach is used to apply purchasing standards and supplier quality assurance aligned with the requirements for the Packaging.

All parts supporting the containment function of the packaging are purchased with the following controls.

1. Certified Material Test Report
2. Dimensional Report
3. Traceability to Heat or Lot
4. 100% visual inspection
5. Procured to an ASME Section II “SA” Material Standard
6. Procured to a product standard
7. Purchased from companies with a recognized quality program. This is normally ISO 9001, 10CFR50 or CSA Z299.3
8. Shelf life indicators applied where applicable.

#### Material Control

The procurement process used at Nuclear Waste Management ensures that the proper materials and parts are specified and purchased for the maintenance of Type B packagings. In order that assurance is given that proper parts in a non-deteriorated condition are used the following controls are used.

Where parts, such as gaskets and sealants have a defined shelf life, appropriate shelf life indicators are required to be placed on the material at time of manufacture. These indicators are maintained in the material inventory system and parts are disposed of prior to reaching their defined shelf life.

Each Type B packaging has a specific, approved Bill Of Material associated with it and only materials on that Bill Of Material can be obtained for use on the packaging. When material is obtained, an issue slip is generated and subsequently stored with the maintenance record. This ensures tracking of all material associated with each packaging.

#### Process Control

The maintenance of all Type B transportation packagings is governed by a specific, approved facility procedure for each packaging. Where additional special processes are required for packaging repair, such as welding, they are controlled through approved procedures.

#### Inspection and Approved Test Control

The Inspection and Test requirements for each Type B packaging are established in the Safety Analysis Report and Design Specifications for each packaging. When a packaging approaches the end of its defined design life, specific design life extension inspection requirements are determined by Nuclear Waste

Engineering and Technology. Approved Work Order Execution Plans are issued to complete the detailed inspections.

Non Destructive Examination is completed on an annual basis for all fasteners used on the packaging. The inspections are completed by Ontario Power Generation Inspection and Maintenance Services Technicians who are certified to Canadian General Standards Boards (CGSB 48.9712 level 1 or level 2). Approved Inspection and Maintenance Services procedures control the inspection process. Acceptance criteria are defined in the maintenance procedures and are normally those given in American Society of Mechanical Engineers (ASME Section V)

Leak test acceptance criteria are included in the Safety Analysis Report for each packaging and a detailed leak test procedure, including machine calibration and operation, is incorporated in each maintenance procedure. During each annual maintenance evolution, and whenever a containment seal is replaced, a helium leak test is completed on the containment seals of the packaging.

Any deficiencies discovered during the inspection or test phase are recorded on the maintenance inspection sheets and resolved prior to returning the packaging to service.

All inspection and test results from the maintenance on each packaging are reviewed by the engineer responsible for the packaging. A summary report of findings is prepared and approved by the Section Manager for radioactive materials transportation. The summary report is indexed in the records management system and retained for the life of the packaging plus an additional 5 years.

#### Nonconformance Control and Corrective Action

Nonconforming materials, parts or components and activities that are significant to safe transportation of radioactive materials are identified and dispositioned in accordance with approved Nuclear Waste Management Procedures.

#### Records

The record management system includes the retention of design, fabrication, inspection, and maintenance and operations records essential to demonstrate product quality and program compliance. It provides for the identification of materials and their corresponding manufacturing, installation, test and inspection records and certificates.

Each maintenance event requires that personnel completing the maintenance record completion of specified steps in the procedure. Sign off and dating of the specific steps ensures traceability of completion. At completion, the maintenance

supervisor reviews and signs the maintenance record sheet and forwards it to the technical section for further review. Technical personnel ensure completion of all aspects of the maintenance, ensure there are no outstanding corrective actions to be completed and file the completed maintenance records with the appropriate retention periods.

An in-service report is prepared for each scheduled maintenance. The report is a summary of maintenance completed, significant findings and any required actions. The report is electronically filed for access by any NWMD personnel from their workstation.

Operating records maintained include inspection, test and audit results. Records are maintained in accordance with approved NWMD procedures.

#### Training:

All Nuclear Waste Management Division Mechanical Maintainers working on Type B Packagings are qualified to the Ontario Power Generation Training and Qualification Description for the Mechanical Maintenance position. Further qualification as a Radioactive Material Handler Receiver or Type B Packaging handler is required to satisfy Part 6 of the Transportation Of Dangerous Goods Regulations [4]

Technical personnel with responsibilities for packaging maintenance functions receive specialized training where required. Procurement engineering and root cause evaluation techniques training are normally provided for these personnel.

Specific vendor training is completed where there are specific requirements to do so. Vendor training is normally only required where there is specific test instrumentation required as part of the maintenance.

#### Audits:

Audits are planned, scheduled and performed by qualified personnel to provide comprehensive, independent verification and evaluation of the Radioactive Material Transportation activities. The NWMD Performance Assurance Department provides this service in accordance with approved procedures. The Radioactive Material Transportation Department also performs internal assessments of various aspects of its business.

#### Servicing:

Detailed maintenance procedures for transportation packagings establish the servicing, maintenance and inspection requirements for this equipment. Maintenance and inspection are controlled through approved Corporate, Nuclear and Facility work and control procedures.

## Type B Packagings



**Roadrunner Transportation Package**



**Tritiated Heavy Water Transportation Package**



**Trillium Transportation Package**



**Radioactive Filter Transportation Package**



### Facilities:

Maintenance has historically been completed in an access controlled radiation controlled area, 30 foot x 80 foot single bay area. A maintenance platform designed to accommodate the packagings and elevate personnel to an ergonomic working height enables more efficient work on the packagings.

Currently a purpose built radiation controlled facility with two maintenance bays in a 60 foot x 85 foot bay area is under construction. The two maintenance bays will each have a working platform to accommodate the packagings and elevate personnel to an ergonomic working height.

Maintenance area equipment includes a 40 imperial ton crane, a wet bench for Inspection and Maintenance Services Non Destructive Examination technician use, a power part washer to clean small parts prior to inspection and a fume hood for temporary storage of contaminated parts. Active ventilation is available with flexible, powered elephant trunks extending to each maintenance area.

Attached to the maintenance bays are two workshops for Control and Mechanical Maintenance personnel. Both Control and Mechanical Maintenance personnel are a shared resource with other Nuclear Waste Management Departments and these workshops are used to support these other departments.

### Packaging Maintenance Facility



**Tritiated Heavy Water Transportation Packaging in Maintenance Platform**



**General View Of Transportation Package Maintenance Building**



**NDE Wet Bench and Fume Hood**

### Conclusion:

Establishing a Type B Packaging maintenance program ensures that all Nuclear Waste Management Division Type B Packagings maintain their design basis over the life of the Packaging. The inspection and maintenance program further ensures that degradation never progresses to the point where an impairment of the design function of the packaging occurs.

### References:

- [1] Radioactive Material Transportation Annual Report 2003; TRAN-REP-03450-00015
- [2] International Atomic Energy Agency, Safety Series No. 113; Quality Assurance for the Safe Transport of Radioactive Material.
- [3] International Atomic Energy Agency, Safety Standards Series No. TS-R-1; Regulations for the Safe Transport of Radioactive Material.
- [4] Canadian Transportation Of Dangerous Goods Regulations, Clear Language Edition, Part 6, Training.