

INFO
ONLY

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9.1.15 SHIPMENT OF RADIOACTIVE MATERIAL

1.0 DISCUSSION

Radioactive material shipments by any of the normal modes of transportation are subject to controls listed in various sections of the Code of Federal Regulations. Maine Yankee is responsible for the safe packaging and labeling of all radioactive material leaving the plant site. Before a shipment of radioactive material is made, a Radiological Controls supervisor will be notified. Should the shipment consist of any special nuclear materials the Reactor Engineering and Radiological Control Supervisors will also be notified. To insure safe radiation levels, a Radiological Controls representative will perform a radiation and contamination survey of the material to be shipped. A Radiological Controls Supervisor will calculate the activity of the shipment and assure that DOT and NRC requirements are complied with. Authorization to ship any radioactive material from the plant site will be made by a Radiological Controls Supervisor. Due to rapidly changing burial site criteria and State and DOT regulations, it may become necessary to deviate from this procedure in order to meet current requirements.

2.0 OBJECTIVE

Establish a procedure for shipping radioactive material from Maine Yankee.

3.0 REFERENCES

- 3.1 49 CFR, Parts 170-189.
- 3.2 10 CFR, Parts 20, 30, 40, 61, 70, 71.
- 3.3 Waste Disposal Site criteria (latest edition).
- 3.4 H.P. Procedure 9.1.17 Health Physics Requirements For Radioactive Waste Processing And Shipping.
- 3.5 AIF NESP Methodologies for Classification of LLW from Nuclear Power Plants, November 1983.
- 3.6 Latest scaling factors from Science Applications, Inc.

4.0 PRECAUTIONS

- 4.1 All of the general packaging requirements of 49 CFR 173.411 or 10 CFR 71.43, unless otherwise specified, must be met.

- 4.2 If the shipment is overweight notify the shipment contractor to obtain an "overweight permit" for the vehicle.
- 4.3 Transportation of radioactive material on the Maine Turnpike is allowed only during daylight hours (sunrise to sunset). Do not allow any vehicle carrying radioactive waste material that requires placarding of the vehicle to leave the Maine Yankee site property without sufficient time to comply with the daylight travel only regulations of the Maine Turnpike Authority.
- 4.4 Assure that radiation levels do not exceed the specified limits.
- 4.5 Assure that the radiation levels on items loaded into shipping casks do not exceed the limits in Attachment A.
- 4.6 Assure that liquid wastes are adequately mixed prior to sampling to insure that a representative isotopic analysis is performed before determining the disposal method. This is especially critical with oil and water mixtures. [I.E. notice 83-33]
- 4.7 If the shipment contains transuranic elements, the radioactive shipping contractor and the burial site must be notified before the shipment leaves Maine Yankee.
- 4.8 Shipments requiring labels or placards must have the appropriate label or placard attached before leaving the plant site. Special precautions must be taken when applying labels or placards during inclement weather conditions to prevent them from falling off during transit.

5.0 PREREQUISITES

- 5.1 Unless exempt by 173.421 (limited Quantities of Radioactive Materials and Radioactive Devices) or 173.425 (Low Specific Activity), only approved containers will be used for shipment of radioactive material.
- 5.2 Before Radioactive material is transferred to another licensee, verification of their license to receive, the type, form and quantity of radioactive material must be checked by Maine Yankee. A copy of their license should be on file at Maine Yankee.
- 5.3 All placarded shipments of radioactive material through the State of Massachusetts require notification of the Massachusetts Department of Public Health. Notification is to be made by telephone. Form No. 9-1-15-HP-3 Massachusetts Department of Health Notification Form, lists the data required and the notification procedure. This form must be filled in for each such notification.

- 5.4 Shipments of fissile nuclear materials, both entering and leaving the state of Maine, require written notification of the following Maine State Agencies:
- 1) Maine Turnpike Authority (must be informed three days in advance of shipment).
 - 2) Maine Bureau of Civil Emergency Preparedness.
 - 3) Maine Department of Environmental Protection, Bureau of Oil & Hazardous Material.
 - 4) Maine State Police.

- 5.5 All shipments of radioactive material that require placarding of the vehicle, will require notification of the following Maine State Agencies by telephone prior to leaving the site.

- 1) Maine Turnpike Authority.
- 2) Maine Department of Environmental Protection, Bureau of Oil & Hazardous Material.
- 3) Maine State Police. (Also requires not less than 24 hour advance notification of any LLW shipment Form No. 9-1-15-HP-8).

Date, time and person contacted for such notification, made pursuant to this paragraph, must be recorded on Maine Yankee State Agency Notification Form. Form No. 9-1-15-HP-4.

- 5.6 Shipments of spent reactor fuel leaving the Maine Yankee site must be escorted by one individual from the Health Physics Department until the shipment leaves the State of Maine. Additional requirements, see Section 6.5.3.
- 5.7 Low Specific Activity (L.S.A.) shipments that contain greater than Type A quantities of radioactive material must be packaged in a container that meets the requirements of 10 CFR 71.52.
- 5.8 Prior to each shipment of fissile radioactive material, Type B or highway route controlled quantity of radioactive materials (see 6.1.5 + 6.5.3) the consignee must be notified of the shipping dates and expected time of arrival. The consignee must also be notified of any special loading/unloading instructions.
- 5.9 Shipments of radioactive material that require placarding through the State of Connecticut, New Jersey and Rhode Island require a permit unless the material is exempted by the individual state. The carrier is responsible for obtaining the above permits.

- 5.9.1 Normally a Radiological Controls Supervisor will have the Connecticut application for a Radioactive Permit telecopied to Connecticut as soon as the driver signs it. The permit should come back to Maine Yankee and be part of the driver's paperwork.
- 5.9.2 Massachusetts Department of Public Health is to be notified of all shipments of radioactive material requiring placarding entering the State (Form No. 9-1-15-R-3).
- 5.10 The Radioactive Quality Assurance Record (Form No. 9-1-15-HP-1) must be completed for all shipments of radioactive material.
- 5.11 Prior to the first use of a package for which a license or certificate of compliance is required the Director of Nuclear Material Safety and Safeguards must be notified in writing of Maine Yankee's intent to use the package.
- 5.12 A broker must be obtained for shipments to Nevada or Washington if a third party is involved.
- 5.13 A determination of the type, form, classification, and whether any exemption to the transportation regulations apply has been made for each package.
- 5.14 A determination of whether each radioactive waste container is Class A, B or C has been made (see Section 6.6 and 6.8.4).
- 5.15 On a case by case basis as specified in 10 CFR 20.302 very low level radioactive waste may be disposed of in a manner not otherwise authorized in the regulations. [IE Notice 83-05]

6.0 PROCEDURE

6.1 Preshipment Requirements

- 6.1.1 Arrange with carrier for type of vehicle or cask required.

Chem Nuclear: 1-803-259-1781
Hittman: 1-301-964-5047

- 6.1.2 Chem Nuclear at Barnwell, South Carolina.

- 6.1.2.1 Call Chem Nuclear by at least the fifth of the month to schedule a shipment(s) for that month.

NOTE: Maine Yankee has been allotted 506 cubic feet per month.

- 6.1.2.2 Send prior notification form (DHEC 802) to South Carolina so that it is received no less than 3 days or nor more than 30 days prior to arrival.

Bureau of Radiological Health
Radioactive Waste Management Section
S.C. Dept. of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Telecopier: 1-803-799-6726

Change or add information to PNP form: 1-803-758-7806.

- 6.1.2.3 Send copy of PNP form to Chem Nuclear at the same time.

Chem Nuclear Systems, Inc.
P.O. Box 726
Barnwell, South Carolina 29812
Attention: Scheduling

Change or add information to PNP form: 1-803-259-1781

- 6.1.3 U.S. Ecology, Inc. at Richland, Washington.

- 6.1.3.1 After arranging for carrier, notify U.S. Ecology of the intended shipment and approximate arrival date.

Phone: 1-509-377-2411

NOTE: Carrier has to notify Washington State a minimum of four (4) hours prior to entering State.

- 6.1.4 Chief of Maine State Police.

- 6.1.4.1 At least 24 hour advance notification of any shipment of low-level waste is required. Fill out Form No. 9-1-15-HP-8 and call in available information.

- 6.1.5 If a "HIGHWAY ROUTE CONTROLLED QUANTITY" (49 CFR 173.403(1)) is to be shipped, there are special requirements that must be adhered to. See Section 6.5.3.

- 6.1.5.1 Definition: A quantity within a single package which exceeds:

- (1) 3000 times the A₁ value
- (2) 3000 times the A₂ value
- (3) 30,000 Curies, whichever is least

6.1.5.2 10CFR71.97(3) also has special requirements if a shipment contains:

- (1) Greater than 20 curies of other than special form for which A_2 is less than or equal to 4 curies.
- (2) Greater than 200 curies of other than special form for which A_2 is greater than 4 curies.

6.2 Initial Survey of Empty Transport Vehicle (Exclusive Use)

6.2.1 Upon arrival, the transport vehicle will be detained outside the plant protected area by Security personnel until authorized to enter the plant by a Radiological Controls Supervisor.

6.2.2 Radiological Controls personnel will survey the transport vehicle for contamination and radiation. They will complete Survey Form MY-HP-102-79.

6.3 Preparation for Shipment

6.3.1 All radioactive material shipping containers must have:

- a contact and three foot radiation reading
- the contamination level on the outside of the container
- a determination of isotopic content of the material
- a determination of total curie content of container
- labels as per Section 6.8
- markings as per Section 6.7 or 6.5.4.1 or 6.5.4.2

6.4 Specific Details

6.4.1 Debris

6.4.1.1 Fifty-Five Gallon Drums

6.4.1.1.1 Isotopic content can be determined from evaporator bottoms isotopic analysis which should be representative of contamination.

6.4.1.1.2 Curie content estimated using the following formula:

$$\text{Millicuries} = \text{MR/HR at } 3' \times 4$$

6.4.1.1.3 Normally shipped on exclusive use vehicle as RADIOACTIVE LSA, see Section 6.5.4.2, 6.9.1 and 6.10.2

NOTE: Gross weight limit of DOT 17H drums is 840 lbs. and DOT 6J is 560 lbs.

6.4.1.2 L.S.A. Boxes

6.4.1.2.1 Isotopic content determined as in 6.4.1.1.1.

6.4.1.2.2 Curie content estimated using the following formula:

$$\text{Millicuries} = \text{MR/HR at 3' x 6.85.}$$

NOTE: Ensure that box lids are banded (for waste containers).

6.4.1.2.3 Normally shipped on exclusive use vehicle as RADIOACTIVE LSA, see section 6.5.4.2, 6.9.1 and 6.10.2.

6.4.2 Laundry

6.4.2.1 Normally shipped in LSA boxes, see Section 6.4.1.2.

6.4.3 Disposable Waste Liners

6.4.3.1 Isotopic content determined from an isotopic analysis of the material put into the liner.

$$\text{Curies} = \text{curies/gm or ml} \times \text{volume in gms or mls}$$

NOTE: If the material cannot be sampled, a Chemistry or Radiological Controls Supervisor will calculate the activity of the material.

NOTE: Spent Resin

Barnwell, S.C. - shipped either solidified in cement or dewatered in a High Integrity Container (HIC). A qualitative and quantitative (isotopic) analysis of all nuclides contained in the resin expressed in uci/cc is required. A summation of the activity of nuclide with half-lives greater than five years is required.

Richland, Washington - The same analysis information is required. If the summation of nuclide activities with half-lives greater than five years is less than 1.0 uci/cc, the resin can be shipped dewatered. If this sum is greater than 1.0 uci/cc, the resin must be solidified in cement.

- 6.4.3.2 Quality Control personnel must inspect all dewatered or solidified containers to insure that there is not detectable free standing liquid.

Barnwell, S.C. - Less than 0.5% by waste volume in a steel container.

Barnwell, S.C. - Less than 1.0% by waste volume in a High Integrity Container (HIC)

Richland, W.A. - Less than 0.5% or one gallon per container, whichever is less.

- 6.4.3.3 Normally shipped on exclusive use vehicle as RADIOACTIVE LSA, see Section 6.5.4.2 an 6.9.1 and 6.10.2

- 6.4.3.4 See Section 6.5 for package requirements.

6.4.4 Spent Liquid Filtration Filters

- 6.4.4.1 Isotopic content determined by isotopically analyzing a sample of the material deposited on the filters.

- 6.4.4.2 Curie content is determined by estimating the total amount of material deposited on the filters and using the following formula:

$$\text{Curies} = \text{curies/gm} \times \text{weight of material in gms}$$

NOTE: If the material cannot be sampled, a Chemistry or Radiological Controls Supervisor will calculate the activity of the material.

- 6.4.4.3 Analysis requirements are the same as in Section 6.4.3.1 for spent resin.

- 6.4.4.4 Free standing water requirements as in 6.4.3.2.

- 6.4.4.5 Normally shipped on exclusive use vehicle as RADIOACTIVE LSA, see Section 6.5.4.2, 6.9.1 and 6.10.2

6.4.5 Samples for Analysis

6.4.5.1 Liquid

- 6.4.5.1.1 Isotopic content determined from isotopic analysis of each sample to be shipped.

- 6.4.5.1.2 Curie content of the package is determined using the following formula:

$$\text{Curies} = \text{curies/ml} \times \text{volume in mls}$$

- 6.4.5.1.3 Mixed cargo is normally shipped as LIMITED QUANTITY, see Section 6.5.4.1 and 6.10.1.

NOTE: Shipping container must contain enough absorbent material to absorb at least twice the volume of the liquid being shipped. (49CFR173.412(n)(2) and (3))

- 6.4.5.1.4 See Section 6.5.4.1 for package requirements.

6.4.5.2 Solids

- 6.4.5.2.1 Isotopic content determined by isotopically analyzing a representative smear(s) from item(s) being shipped.

- 6.4.5.2.2 Curie content estimated by calculating the surface area of the item(s) and using the following formula:

$$\text{Curies} = \text{area in cm}^2 \times \text{curies/cm}^2$$

- 6.4.5.2.3 Mixed cargo is normally shipped as LIMITED QUANTITY, see Section 6.5.4.1 and 6.10.1.

- 6.4.5.2.4 See Section 6.5.4.1 for package requirements.

6.4.6 Equipment

- 6.4.6.1 Proceed as in Section 6.4.5.2 (Solid Samples).

6.5 Determination of Type Package

- 6.5.1 Determine the total curie content of the material by A_1 or A_2 values as listed in 49CFR173.435 or 49CFR173.433 if not listed. See Attachment C for A_1 and A_2 values.

- 6.5.1.1 A_1 values are for special form material like sealed sources. See 49CFR173.403Z, 469 and 476.

NOTE: Documentation of special form material must be obtained if shipments are made in this category.
[IE notice 83-47]

- 6.5.1.2 A_2 values are for normal form material. Normally shipments are in this category.

6.5.2 Determine if values obtained are greater than or less than the A₁ or A₂ values listed as appropriate.

6.5.2.1 Type A packages are required if the contents do not exceed the A₁ or A₂ values (49CFR173.415).

6.5.2.1.1 A Demonstration of Compliance is required when a TYPE A package is required (49CFR173.461) [IE notice 83-47].

NOTE: See Section 6.5.4 for exemptions.

6.5.2.2 Type B packages are required if the contents exceed the A₁ or A₂ values (49CFR173.416).

6.5.2.3 If a TYPE B package is used, be sure that the Certificate of Compliance (C of C) is onsite and that all of its requirements are fulfilled.

NOTE: No changes can be made to the package as described in the C of C [IE notice 83-10].

6.5.2.4 If a TYPE B package is required assure that the heat generated by the material will not exceed the shipping cask thermal watt limitation as specified by the Certificate of Compliance (C of C). C of C's are located in the Casks Books in the Radwaste Office. Calculation is as follows for each isotope:

$$\text{WATTS} = (e) (Ci) (5.93 \text{ E-3})$$

e = total energy per disintegration (beta energy to be
1/3 max energy + total energy of all gammas)

Ci = total curies of isotope

6.5.3 If it is determined that a "highway route controlled quantity" is to be shipped, special requirements and pre-notifications are required: (49CFR177.825b)

6.5.3.1 Prenotification as described in 10CFR71.97 for waste and 10CFR73.37 for spent fuel.

6.5.3.2 Special placards (49CFR172.527).

6.5.3.3 Special reporting requirements (49CFR173.22).

6.5.3.4 Always requires a RADIOACTIVE YELLOW III label (49CFR172.403c).

6.5.3.5 Each shipping paper related to the shipment must bear the package identification marking indicated in the USNRC approval (49CFR173.471c)

TABLE 7

ACTIVITY LIMITS FOR LIMITED QUANTITIES, INSTRUMENTS, AND ARTICLES

Nature of Contents	Instruments & Devices		Materials
	Instrument & Article Limits ¹	Package Limits	Package Limits
Solids:			
Special form	10 ⁻² A ₁	A ₁	10 ⁻³ A ₁
Other form	10 ⁻² A ₂	A ₂	10 ⁻³ A ₂
Liquids:			
Tritiated water:			
less than 0.1 Ci/liter			1000 Curies
0.1 Ci to 1.0 Ci/l			100 Curies
greater than 1.0 Ci/liter			1 Curie
Other liquids	10 ⁻³ A ₂	10 ⁻¹ A ₂	10 ⁻⁴ A ₂
Gases:			
Tritium ²	20 Curies	200 Curies	20 Curies
Special Form	10 ⁻³ A ₁	10 ⁻² A ₁	10 ⁻³ A ₁
Other Forms	10 ³ A ₂	10 ⁻² A ₂	10 ⁻³ A ₂

¹ For mixture of radionuclides see §173.433 (b).

² These values also apply to tritium in activated luminous paint and tritium absorbed on solid carriers.

Mixtures of Radionuclides

Ratio₁ + Ratio₂ + Ratio_n (must not be greater than unity to qualify as limited quantity.)

Ratio = $\frac{\text{Total Activity of Isotope in Shipment}}{\text{A}_1 \text{ or } 2 \text{ Value from Table in Attachment C}}$

Multiplied times package limit or compared to value in Table 7 as appropriate.

6.5.3.6 Special routing requirements (49CFR177.825c).

6.5.4 Exemptions

6.5.4.1 Limited Quantity (49CFR173.421)

- 6.5.4.1.1 Package contact dose rate cannot exceed 0.5 mrem/hr.
- 6.5.4.1.2 Isotopic content of material must be within the limits as listed in table 7.
- 6.5.4.1.3 Package only required to be a STRONG TIGHT container.
- 6.5.4.1.4 A seal is not required on the package.
- 6.5.4.1.5 The outside of the inner package must be marked RADIOACTIVE.
- 6.5.4.1.6 Certification statement (Form No. 9-1-15-HP-9) must accompany the shipment. (49CFR173.421-1(a))

6.5.4.2 RADIOACTIVE LSA (49CFR173.425)

6.5.4.2.1 Material in which the radioactivity is essentially uniformly distributed and in which the estimated average concentration of contents does not exceed: (49CFR173.403n)

1. 0.0001 millicurie per gram of radionuclides for which the A_2 quantity is not more than 0.05 curie.
2. 0.005 millicurie per gram of radionuclides for which the A_2 quantity is more than 0.05 curie, but not more than 1 curie; or
3. 0.3 millicurie per gram of radionuclide for which the A_2 quantity is more than 1 curie.

NOTE: This includes, but is not limited to, materials such as residues or solutions from chemical processing, waste such as building rubble, metal, wood and fabric, glassware, paper and cardboard; solid or liquid plant wastes, sludges and ashes.

6.5.4.2.2 Packages only required to be a STRONG TIGHT container up through A_2 quantity if shipped in exclusive use vehicle.

CAUTION: Shipments that contain greater than an A_2 quantity must be packaged in a DOT specification container. (10CFR71.52)

- 6.5.4.2.3 There must always be two (2) markings of RADIOACTIVE LSA on each package 180° apart.

NOTE: Markings must be at least 1/2" high.

- 6.5.4.2.4 A seal is not required on the package.

6.6 Determination of Waste Burial Class A, B or C; (10CFR61.55)

- 6.6.1 Determine the amount of activity, if any, of the isotopes listed in Table 1 or 2, found in Attachment D, are contained in the waste.

NOTE: Use Form No. 9-1-15-HP-10 as a worksheet.

- 6.6.1.1 Non-gamma emitters required to be reported will be reported using scaling factors, where applicable. These scaling factors will be based upon a data base developed under a cooperative program with the NRC and SAI and modified as the data base expands. These scaling factors are given in Attachment E.

NOTE: One sample, typical of each waste stream, will be fully analyzed annually until it is demonstrated to be unnecessary, to ensure the validity of the factors being utilized.

NOTE: Gross changes in waste stream radionuclide concentrations or ratios will require a reevaluation of the classification methods and will be addressed as the situation arises.

- 6.6.1.2 Radioisotopes requiring reporting, not easily measured or correlatable, will be reported based upon the methods described in the AIF NESP Report, "Methodologies for Classification of LLW from Nuclear Power Plants", November 1983. (Report maintained in Radwaste Office.)

NOTE: A nuclide is considered to be "significant for purposes of classification" if its concentration is greater than 0.01 times the concentration listed in Table 1, Column 1 or 0.01 times the smallest concentration listed in Table 2. This does not include isotopes identified in Table 2 as having half-lives less than 5 years. An isotope (other than Cm-242) having a half-life less than 5 years is considered significant if it is contained in the waste in concentrations greater than 7 uci/cc (0.01 times the Table 2, Column 1 value).

6.6.2 Determination of Waste Class from Table 1

- 6.6.2.1 If the concentration of the nuclide does not exceed the value in Column 2, the waste is Class A.

- 6.6.2.2 If the concentration of the nuclide does exceed the value in Column 2, but does not exceed the value listed in Column 1, the waste is Class C.
- 6.6.2.3 If the concentration of the nuclide exceeds the value in Column 1, the waste is not generally acceptable for near surface disposal.

6.6.2.3.1 Proposals for disposal of waste in this category may be submitted to the NRC for approval under 10CFR61.58.

- 6.6.2.4 For wastes containing a mixture of nuclides listed in Table 1, the class is determined by the sum of the fractions rule as follows:

CAUTION: All values must be taken from the same column in the same table.

Nuclide 1 uci/cc -----	+	Nuclide 2 uci/cc -----	+	+	Nuclide n uci/cc -----	= less than 1
Value in Column		Value in Column				Value in Column	

NOTE: If the answer is less than 1, the class of waste is determined by the column used.

6.6.3 Determination of Waste Class from Table 2

- 6.6.3.1 If the concentration of the nuclide does not exceed the value in Column 1, the waste is Class A.
- 6.6.3.2 If the concentration of the nuclide exceeds the value in Column 1, but does not exceed the value in Column 2, the waste is Class B.
- 6.6.3.3 If the concentration of the nuclide exceeds the value in Column 2, but does not exceed the value in Column 3, the waste is Class C.
- 6.6.3.4 If the concentration of the nuclide exceeds the value listed in Column 3, the waste is not generally acceptable for near surface disposal. See Section 6.6.2.3.1.
- 6.6.3.5 For wastes containing a mixture of nuclides listed in Table 2 proceed as in 6.6.2.4.

- 6.6.4 If the waste does not contain any nuclides listed in Table 1 or 2, the waste is Class A.

6.7 Marking (49CFR172.300)

- 6.7.1 Each package weighing more than 110 pounds must have its gross weight plainly and durably marked on the outside of the package.

6.7.2 Each package which conforms to the requirements for Type A or Type B packaging (see section 6.5) must be plainly and durably marked on the outside of the package in letters at least 1/2" high with the wording "USA DOT 7A TYPE A and Radioactive Material (49 CFR 178.350-3) or the package identification marking indicated in the USNRC approval (49 CFR 173.471b) respectively".

6.7.3 Any markings must be at least 1/2" high.

6.8 Labeling (49CFR172.403)

6.8.1 Radioactive White I

6.8.1.1 Package content dose rate cannot exceed 0.5 mrem/hr.

6.8.1.2 Package cannot contain FISSILE CLASS I or II material.

6.8.1.2.1 Fissile material is (49CFR173.403j):

Plutonium - 238, 239 or 241
Uranium - 233 or 235

6.8.1.3 Package cannot contain a "HIGHWAY ROUTE CONTROLLED QUANTITY" of material. See section 6.1.5

6.8.2 Radioactive Yellow II

6.8.2.1 Packages with contact dose rates exceeding 0.5 mrem/hr, but not greater than 50 mrem/hr and not exceeding 1.0 mrem/hr at one meter (3.3 feet).

6.8.2.2 Must use on FISSILE CLASS II package having a Transport Index (TI) of 1.0 or less.

6.8.2.2.1 TI is the maximum dose rate in mrem/hr at one meter from the package.

6.8.3 Radioactive Yellow III

6.8.3.1 Package contact dose rates exceeding 50 mrem/hr or greater than 1.0 mrem/hr at one meter.

CAUTION: See section 6.10 for maximum package contact dose rates.

6.8.3.2 Must use on FISSILE CLASS III package.

6.8.3.3 Must use on a package containing a "HIGHWAY ROUTE CONTROLLED QUANTITY" of material. See section 6.1.5 and 6.5.3.

6.8.4 Each package of radioactive waste must be labeled as Class A, B or C as per Section 6.6. (10CFR61.57)

- 6.8.5 The contents asked for on Radioactive Yellow II and III labels are the major isotopes contained in the material.
- 6.8.6 There must always be two (2) labels on each package 180° apart.
- 6.8.7 All packages shipped under a label must be at least TYPE A.
- 6.8.8 All packages shipped under a label must incorporate a feature such as a seal on the outside of the package, which is not readily breakable and which, while intact will be evidence that the package has not been illicitly opened. (49CFR173.412b)

6.9 Placarding (49CFR172.500)

- 6.9.1 All RADIOACTIVE LSA shipments sent by exclusive use vehicle must be placarded.
- 6.9.2 Any vehicle which contains a package bearing a RADIOACTIVE YELLOW III label must be placarded.
- 6.9.3 Placards must be on each side and each end of the vehicle.
 - 6.9.3.1 If shipping on a tractor trailer, the placards are put on each end and each side of the trailer or load.

6.10 Method of Shipment

- 6.10.1 Motor Freight (Mixed Cargo) (49CFR173.441a)
 - 6.10.1.1 Packages with contact dose rates up to 200 mrem/hr and a Transport Index of 10 or less.
- 6.10.2 Motor Freight (Exclusive Use Vehicle) (49CFR173.441b)
 - 6.10.2.1 Packages with dose rates that exceed those in Section 6.10.1.1 can be shipped on an exclusive use vehicle.
 - 6.10.2.1.1 Up to 1000 mrem/hr on the external accessible surface of the package (closed transport vehicle only).

NOTE: Vehicle must be equipped with an attached exterior enclosure, which during normal transport, restricts the access of unauthorized persons to the cargo space containing the radioactive material. (49CFR173.403c)

6.10.2.1.2 Up to 200 mrem/hr at any point on the external surface of the car or vehicle (closed transport vehicles only).

6.10.2.1.2.1 Open vehicle limited to 200 mrem/hr on contact with the package(s).

6.10.2.1.3 Up to 10 mrem/hr at any point 2 meters (6.6 feet) from the vertical planes projected by the outer lateral surfaces of the car or vehicle.

6.10.2.1.4 Up to 2 mrem/hr in any normally occupied position in the car or vehicle except that this provision does not apply to private motor carriers.

6.10.2.2 Specific instructions for maintenance of the exclusive use (sole use) shipment controls must be provided by the shipper to the carrier.

6.10.2.3 Shipment must be loaded by consignor and unloaded by the consignee from the transport vehicle in which originally loaded.

6.11 Loading of the Transport Vehicle

6.11.1 Radioactive Shipment Quality Assurance Record (Form No. 9-1-15-HP-1).

6.11.1.1 Radiological Controls personnel will complete Sections I.

6.11.1.2 Radiological Controls and Quality Control personnel will complete Section II, III, IV and V. Section II to be completed prior to loading any material.

6.11.2 Opening, loading and closure of casks used to transport radioactive material will normally be done in accordance with Equipment Handling Procedures supplied by the radioactive material shipping vendor, Hittman, Chem-Nuclear, etc.).

6.11.3 Radiological Controls personnel will conduct a final survey on all radioactive material being loaded for highest contact and one meter radiation levels.

6.11.4 Radiological Controls personnel will monitor the external radiation levels of the package for compliance with external radiation criteria [200 MR/HR contact, 10 MR/HR at two (2) meters and no greater than 2 MR/HR inside the tractor cab, 173.441(a)(b)] as the truck is being loaded.

6.11.5 Assure that proper labels are placed on containers, see Section 6.8 or 6.5.4.2, and are properly adhered to prevent removal during inclement weather.

6.11.6 Assure that proper markings are placed on containers, see Section 6.7, and are properly adhered to prevent removal during inclement weather.

6.11.7 Assure that all packages have been adequately blocked or braced to prevent load shifting during transportation.

6.12 Closure of the Transport Vehicle

6.12.1 Radiological Controls personnel will verify compliance with external radiation level criteria (see 6.11.4) before final closure of the transport vehicle.

6.13 Final Vehicle Survey

6.13.1 Radiological Controls will survey and record the highest contact, and 2 meter radiation level of the shipping package as per H.P. Procedure 9.1.17.

6.13.2 Radiological Controls will survey the dose rate of the cab at the closest point of the load external of the cab if possible and record the results.

NOTE: If the cab reading is greater than 1.5 mrem/hr, the load should be repackaged.

6.13.3 Radiological Controls will check and record the external surface of the package, transporter and vehicle tires for contamination. Contamination shall be less than 100dpm/100cm² gross activity or less than 1000 dpm/100 cm² beta-gamma and less than 100 dpm/100 cm² alpha. (49 CFR 173.443)

6.13.4 The Final Shipment Radiation Surveys of each package(s) and transport vehicle will be performed by two different individuals using different survey meters. The second complete survey will be performed by a Radiological Controls Supervisor.

6.14 Placarding

6.14.1 Assure that the proper placards are placed on the transport vehicle, see Section 6.9 and 6.5.3, and are properly adhered to prevent removal during inclement weather.

6.15 Shipping Manifest: (49CFR172.200)

RADIOACTIVE WASTE (Also 10CFR20.311)

6.15.1 Radioactive waste is normally manifested on forms provided by the burial site.

6.15.1.1 All required information is requested on these forms.

- 6.15.1.2 The total quantity of the radionuclides H-3, C-14, Tc-99 and I-129 must be shown.
- 6.15.1.2.1 If any of these nuclides are known not to be present, the quantity should be recorded as "not present".
- 6.15.1.2.2 If any of these nuclides is known or suspected to be present but in quantities less than the lower limit of detection (LLD), the quantity should be recorded as less than minimum detectable, with the LLD value listed.
- 6.15.1.3 Other nuclides listed in Table 1 and 2, if significant for purposes of classification, should be listed. See Section 6.6.1.2.
- 6.15.1.4 Other nuclides not listed in Table 1 or 2 should be reported if they are contained in significant quantities (10% or greater of total activity in container).
- 6.15.1.5 The total quantity of source or special nuclear material should be reported, if the waste contains such material.
- 6.15.1.6 Distribute copies of the manifest as indicated on the forms. (10CFR20.311d (5, 6, 7))
- 6.15.1.6.1 Mail copy to burial site at time of shipment.
- 6.15.1.6.2 Include one copy with the shipping papers.
- 6.15.1.6.3 Retain one copy on-site.
- 6.15.1.7 If Maine Yankee has not received a signed copy of the manifest or equivalent documentation, indicating receipt of the shipment from the burial site within 20 days after the shipping date, an investigation must be started to locate the shipment. (10CFR20.311h(1))
- 6.15.1.7.1 The investigation shall include tracing the shipment and filing a written report with the nearest NRC office within 2 weeks of the completion of the investigation. (10CFR20.311h(2))

RADIOACTIVE NON-WASTE

- 6.15.2 Radioactive material that is not waste is normally manifested on Maine Yankee's Radioactive Shipment Record (RSR). (MY-HP-23-72)
- 6.15.2.1 All required information is requested on these forms.
- 6.15.2.2 Radionuclides that attribute 10% or greater to the total activity contained in the shipment should be listed on the RSR form.

6.16 Records

The transportation of radioactive material requires various records and forms to be properly completed before the shipment leaves the plant site. A checklist of required forms and records will be maintained and new forms or records will be added to the list as required (Form No. 9-1-15-HP-5). A Health Physics Supervisor will verify that each item on the list is completed before the shipment leaves the plant site.

7.0 FINAL CONDITIONS

Radioactive material is properly packaged and ready for shipment.

ATTACHMENT A

RADWASTE DOSE RATE LIMITS BY PKG.

CASK MODEL NO.	TYPE	DOSE RATE (R/HR)	PAYLOAD (MAX)	VOLUME ft ³ / # LINER/DRUMS	INNER PKG. SPEC.	SUPPLIER
CNS 8-120	B	200 R	20,000	124 / 8	SEC. CONTAINER	CNSI
CNS 14-195-H	A	15 R	17,700	195 / 14	SEC. CONTAINER	CNSI
CNS 21-300	A	1 R	27,250	300 / 21	SEC. CONTAINER	CNSI
CNS 6-80-2	A	500 R	7,500	80 / 4	SEC. CONTAINER	CNSI
CNS 14-190	B	5 R	10,000	195 / 14	SEC. CONTAINER	CNSI
CNS 4-45	B	10,000 R	10,000	45 / 4	SEC. CONTAINER	CNSI
CNS6-75	A	150 R	10,300	85 / 6	DOT TYPE A	CNSI
4-85	B	50 R	5,700	88 / 4	SEC. CONTAINER DOT TYPE A	CNSI
HN-100 Ser 1	A	5 R	14,500	170 / 14	SEC. CONTAINER	HNDC
HN-100 Ser 2	A	5 R	14,500	170 / 14	SEC. CONTAINER	HNDC
HN-100 Ser 3	A	5 R	17,800	170 / 14	SEC. CONTAINER	HNDC
HN-100 Ser 3 with shield insert	A	50 R	10,400	125 / 14	SEC. CONTAINER	HNDC
HN-100S	A	1 R	17,000	170 / 14	SEC. CONTAINER	HNDC
HN-200	B	600 R	10,675	80 / 3	SEC. CONTAINER DOT SPEC. 17-H	HNDC
HN-300	A	1 R	8,000	- / 12	DOT TYPE A DOT SPEC. 17-H	HNDC
HN-400	A	1 R	12,000	- / 18	DOT TYPE A DOT SPEC. 17-H	HNDC
HN-600	A	50 R	13,000	87 / 7	SEC. CONTAINER	HNDC
DED VANS	N/A	0.5 R	27,000	- 160	N/A	VARIOUS

ATTACHMENT B

GUIDELINES FOR PROPER SIZE WIRE SLINGS & SHACKLES

TABLE I. SAFE WORKING LOADS ON VARIOUS TYPES OF SLINGS



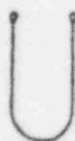




Type of sling	Nominal size, in.					Total load on two-leg slings (For three-leg sling multiply by 1 1/2. For four-leg sling multiply by 2)			Weight per ft (exclusive of hook, ring, thimble, or splice), lb
									
101 6 x 19 improved plow steel rope (Federal spec. RR-R-371) Factor of safety = 8 Splice efficiency = 50% Rope diameter →	3/4	1,350	1,010	2,700	2,380	2,330	1,910	1,350	0.23
	7/8	1,840	1,380	3,680	3,220	3,180	2,600	1,840	0.31
	1	2,420	1,815	4,840	4,240	4,180	3,420	2,420	0.40
	1 1/4	2,900	2,175	5,800	5,080	5,000	4,110	2,900	0.51
	1 1/2	3,500	2,550	7,000	6,050	6,070	5,400	3,500	0.63
	1 3/4	5,280	3,940	10,520	9,200	9,100	7,450	5,280	0.90
	2	7,000	5,250	14,000	12,250	12,100	9,900	7,000	1.23
	2 1/4	9,000	6,750	18,000	15,750	15,550	12,750	9,000	1.60
	2 1/2	11,200	8,400	22,400	19,600	19,400	15,900	11,200	2.03
	3	13,800	10,350	27,600	24,200	23,900	19,550	13,800	2.50
Iron crane chain (ASTM spec. A 56-39) Factor of safety = 5 Stock diameter →	3/4	1,710	1,280	3,420	3,000	2,970	2,420	1,710	1.66
	7/8	2,845	2,130	5,690	4,950	4,940	4,030	2,845	2.75
	1	4,380	3,280	8,760	7,680	7,600	6,200	4,380	4.30
	1 1/4	6,415	4,820	12,830	12,200	11,150	9,100	6,415	6.15
	1 1/2	8,850	6,630	17,700	15,500	15,350	12,550	8,850	8.20
	1 3/4	11,750	8,800	23,500	20,600	20,400	16,650	11,750	10.45
	2	15,350	11,500	30,700	26,900	26,650	21,700	15,350	13.10
	2 1/4	19,250	14,400	38,500	33,700	33,500	27,250	19,250	16.60
	2 1/2								
	3								

TABLE IV. SAFE LOADS ON SHACKLES*

Shank, in.	Safe load, lb†	Pin, in.	Inside width, in.	Inside length, in.
3/4	2,530	1 1/4	1 1/4	1 1/4
7/8	3,580	1 1/2	1 1/2	1 1/2
1	4,420	1 3/4	1 3/4	1 3/4
1 1/4	6,360	2	2	2
1 1/2	8,650	2 1/4	2 1/4	2 1/4
1 3/4	11,310	2 1/2	2 1/2	2 1/2
2	13,360	3	3	3
2 1/4	16,500	3 1/4	3 1/4	3 1/4
2 1/2	19,960	3 1/2	3 1/2	3 1/2
3	23,740	4	4	4
3 1/4	27,900	4 1/4	4 1/4	4 1/4
3 1/2	32,320	4 1/2	4 1/2	4 1/2
4	42,220	5	5	5

* U.S. Navy, Bureau of Ships.

† Safety factor = 5.

NOTE: Tables taken from "Handbook of Rigging" by Rossnagel, Third Edition.

ATTACHMENT C

TABLE OF A_1 and A_2 VALUES FOR RADIONUCLIDES

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	A_1 (Ci) (Special Form)	A_2 (Ci) (Normal Form)
ACTINIUM (89)	Ac-227	1000	0.003
	Ac-228	10	4
AMERICIUM (95)	Am-241 ⁵	8	0.008
	Am-243	8	0.008
ANTIMONY (51)	Sb-122	30	30
	Sb-124	5	5
	Sb-125	40	25
ARGON (18)	Ar-37	1000	1000
	Ar-41 ⁸	1	1
	Ar-41(uncompressed)	2 20	20
ARSENIC (33)	As-73	1000	400
	As-74	20	20
	As-76	10	10
	As-77	300	20
ASTATINE (85)	At-211	200	7
BARIUM (56)	Ba-131	40	40
	Ba-133	40	10
	Ba-140	20	20
BERKELIUM (97)	Bk-249	1000	1
BERYLLIUM (4)	Be-7	300	300
BISMUTH (83)	Bi-206	5	5
	Bi-207	10	10
	Bi-210	100	4
	Bi-212	6	6
BROMINE (35)	Br-82	6	6
	Br-77	70	25
CADMIUM (48)	Cd-109	1000	70
	Cd-115 ^m	30	30
	Cd-115	80	20
CALCIUM (20)	Ca-45	1000	25
	Ca-47	20	20

TABLE OF A_1 and A_2 VALUES FOR RADIONUCLIDES (Cont'd)

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	$A_1(Ci)$ (Special Form)	$A_2(Ci)$ (Normal Form)
CALIFORNIUM (98)	Cf-249	2	0.002
	Cf-250	7	0.007
	Cf-25	2	0.009
CARBON (6)	C-11	20	20
	C-14	1000	60
CERIUM (58)	Ce-139	100	100
	Ce-141	300	25
	Ce-143	60	20
	Ce-144	10	7
CESIUM (55)	Cs-129	40	40
	Cs-131	1000	1000
	Cs-134m	1000	10
	Cs-134	10	10
	Cs-135	1000	25
	Cs-136	7	7
	Cs-137	30	10
CHLORINE (17)	Cl-36	300	10
	Cl-38	10	10
CHROMIUM (24)	Cr-51	600	600
COBALT (27)	Co-56	5	5
	Co-57	90	90
	Co-58m	1000	1000
	Co-58	20	20
	Co-60	7	7
COPPER (29)	Cu-64	80	25
	Cu-67	200	25
CURIUM (96)	Cm-242	200	0.2
	Cm-243	9	0.009
	Cm-244	10	0.01
	Cm-245	6	0.006
	Cm-246	6	0.006
DYSPROSIUM (66)	Dy-165	100	20
	Dy-166	1000	200
ERBIUM (68)	Er-169	1000	25
	Er-171	50	20

TABLE OF A_1 and A_2 VALUES FOR RADIONUCLIDES (Cont'd)

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	A_1 (Ci) (Special Form)	A_2 (Ci) (Normal Form)
EUROPIUM (63)	Eu-152m	30	30
	Eu-152	20	10
	Eu-154	10	5
	Eu-155	400	60
FLUORINE (9)	F-18	20	20
GADOLNIUM (64)	Gd-153	300	100
	Gd-159	300	20
GALLIUM (31)	Ga-67	100	100
	Ga-68	20	20
	Ga-72	7	7
GERMANIUM (32)	Ge-68	20	10
	Ge-71	1000	1000
GOLD (79)	Au-193	200	200
	Au-196	30	30
	Au-198	40	20
	Au-199	200	25
HAFNIUM (72)	Hf-181	30	25
HOLMIUM (67)	Ho-166	30	30
HYDROGEN (1)	H-3 (See Tritium)		
INDIUM (49)	In-111	30	25
	In-113m	60	60
	In-114m	30	20
	In-115m	100	20
IODINE (53)	I-123	50	50
	I-125	1000	70
	I-126	40	10
	I-129	1000	2
	I-131	40	10
	I-132	7	7
	I-133	30	10
	I-134	8	8
	I-135	10	10

TABLE OF A_1 and A_2 VALUES FOR RADIONUCLIDES (Cont'd)

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	A_1 (Ci) (Special Form)	A_2 (Ci) (Normal Form)
IRIDIUM (77)	Ir-190	10	10
	Ir-192	20	10
	Ir-194	10	10
IRON (26)	Fe-52	5	5
	Fe-55	1000	1000
	Fe-59	10	10
KRYPTON (36)	Kr-85m ⁸	3	3
	Kr-85m		
	(uncompressed) ²	100	100
	Kr-85 ⁸	5	5
	Kr-85		
	(uncompressed) ²	1000	1000
	Kr-87 ⁸	0.6	0.6
	Kr-87		
	(uncompressed) ²	20	20
LATHANUM (57)	La-140	30	30
LEAD (82)	Pb-201	20	20
	Pb-210	100	0.2
	Pb-212	6	5
LUTECIUM (71)	Lu-177	300	25
MAGNESIUM (12)	Mg-28	6	6
MANGANESE (25)	Mn-52	5	5
	Mn-54	20	20
	Mn-56	5	5
MERCURY (80)	Hg-197m	200	200
	Hg-197	200	200
	Hg-203	80	25
MIXED FISSION PRODUCTS	MF-P	10	0.4
MOLYBDENUM (42)	Mo-99	100	20
NEODYMIUM (60)	Nd-147	100	20
	Nd-149	30	20

TABLE OF A₁ and A₂ VALUES FOR RADIONUCLIDES (Cont'd)

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	A ₁ (Ci) (Special Form)	A ₂ (Ci) (Normal Form)
NEPTUNIUM (93)	Np-237	5	0.005
	Np-239	200	25
NICKEL (28)	Ni-59	1000	900
	Ni-63	1000	100
	Ni-65	10	10
NIOBIUM (41)	Nb-93m	1000	200
	Nb-95	20	20
	Nb-97	20	20
NITROGEN (7)	N-13	20	10
OSMIUM (76)	Os-185	20	20
	Os-191m	200	200
	Os-191	600	200
	Os-193	100	20
PALLADIUM (46)	Pd-103	1000	700
	Pd-109	100	20
PHOSPHORUS (15)	P-32	30	30
PLATINUM (78)	Pt-191	100	100
	Pt-193m	200	200
	Pt-197m	300	20
	Pt-197	300	20
PLUTONIUM (94)	Pu-2384,5	3	0.003
	Pu-2394,5	2	0.002
	Pu-240 ⁵	2	0.002
	Pu-2414,5	1000	0.1
	Pu-242 ⁵	3	0.003
POLONIUM (84)	Po-210	200	0.2
POTASSIUM (19)	K-42	10	10
	K-43	20	10
PRASEODYMIUM (59)	Pr-142	10	10
	Pr-143	300	20

TABLE OF A₁ and A₂ VALUES FOR RADIONUCLIDES (Cont'd)

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	A ₁ (Ci) (Special Form)	A ₂ (Ci) (Normal Form)
PROMETHIUM (61)	Pm-147	1000	25
	Pm-149	100	20
PROTACTINIUM (91)	Pa-230	20	0.8
	Pa-231	2	0.002
	Pa-233	100	100
RADIUM (88)	Ra-223	50	0.2
	Ra-224	6	0.5
	Ra-226	10	0.05
	Ra-228	10	0.05
RADON (86)	Rn-222	10	2
RHENIUM (75)	Re-186	100	20
	Re-187	Unlimited	Unlimited
	Re-188	10	10
	Re-natural	Unlimited	Unlimited
RHODIUM (45)	Rh-103m	1000	1000
	Rh-105	200	25
RUBIDIUM (37)	Rb-81	30	25
	Rb-86	30	30
	Rb-87	Unlimited	Unlimited
	Rb-natural	Unlimited	Unlimited
RUTHENIUM (44)	Ru-97	80	80
	Ru-103	30	25
	Ru-105	20	20
	Ru-106	10	7
SAMARIUM (62)	Sm-147	Unlimited	Unlimited
	Sm-151	1000	90
	Sm-153	300	20
SCANDIUM (21)	Sc-46	8	8
	Sc-47	200	20
	Sc-48	5	5
SELENIUM (34)	Se-75	40	40
SILICON (14)	Si-31	100	20

TABLE OF A_1 and A_2 VALUES FOR RADIONUCLIDES (Cont'd)

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	A_1 (Ci) (Special Form)	A_2 (Ci) (Normal Form)
SILVER (47)	Ag-105	40	40
	Ag-110m	7	7
	Ag-111	100	20
SODIUM (11)	Na-22	8	8
	Na-24	5	5
STRONTIUM (38)	Sr-85m	80	80
	Sr-85	30	30
	Sr-87m	50	50
	Sr-89	100	10
	Sr-90	10	0.4
	Sr-91	10	10
	Sr-92	10	10
SULPHUR (16)	S-35	1000	60
TANTALUM (73)	Ta-182	20	20
TECHNETIUM (43)	Tc-96m	1000	1000
	Tc-96	6	6
	Tc-97m	1000	200
	Tc-97	1000	400
	Tc-99m	100	100
	Tc-99	1000	25
TELLURIUM (52)	Te-125m	1000	100
	Te-127m	300	20
	Te-127	300	20
	Te-129m	30	10
	Te-129	100	20
	Te-131m	10	10
	Te-132	7	7
TERBIUM (65)	Tb-160	20	10
THALLIUM (81)	Tl-200	20	20
	Tl-201	200	200
	Tl-202	40	40
	Tl-204	300	10

TABLE OF A₁ and A₂ VALUES FOR RADIONUCLIDES (Cont'd)

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	A ₁ (Ci) (Special Form)	A ₂ (Ci) (Normal Form)
THORIUM (90)	Th-227	200	0.2
	Th-228	6	0.008
	Th-230	3	0.003
	Th-231	1000	25
	Th-232	Unlimited	Unlimited
	Th-234	10	10
	Th-natural	Unlimited	Unlimited
	Th-(irradiated) ⁶	---	---
THULLIUM (69)	Tm-170	300	10
	Tm-171	1000	10
TIN (50)	Sn-113	60	60
	Sn-119m	100	100
	Sn-125	10	10
TRITIUM (1)	H-3 (uncompressed) ²		1000
	H-3 (compresses)	1000	1000
	H-3 (activated luminous paint)	1000	1000
	H-3 (absorbed on solid carrier)	1000	1000
	H-3 (tritiated water)	1000	1000
	H-3 (other forms)	20	20
TUNGSTEN (74)	W-181	200	100
	W-185	1000	25
	W-187	40	20
URANIUM (92)	U-230	100	0.1
	U-232	30	0.03
	U-233 ⁴	100	0.1
	U-234	100	0.1
	U-235 ⁴	100	0.2
	U-236	200	0.2
	U-238	Unlimited	Unlimited
	U-natural	Unlimited	Unlimited (See 173.434)
	U-enriched ⁴ less than 20%	Unlimited	Unlimited (See 173.434)
	U-enriched ⁴ greater than 20%	100	Unlimited (See 173.434)
	U-depleted	Unlimited	Unlimited (See 173.434)
	U-irradiated	----	----

TABLE OF A₁ and A₂ VALUES FOR RADIONUCLIDES (Cont'd)

ELEMENT & ATOMIC NUMBER	RADIONUCLIDE ³	A ₁ (Ci) (Special Form)	A ₂ (Ci) (Normal Form)
VANADIUM (23)	V-48	6	6
XENON (54)	Xe-127 ⁸	5	5
	Xe-127 (uncompressed) ²	70	70
	Xe-131m ⁸	10	10
	Xe-131m (uncompressed) ²	100	100
	Xe-133 ⁸	5	5
	Xe-133 (uncompressed) ²	1000	1000
	Xe-135 ⁸	2	2
	Xe-135 (uncompressed) ²	70	70
YTTERBIUM (70)	Yb-169	80	80
	Yb-175	400	25
YTTERIUM (39)	Y-87	20	20
	Y-90	10	10
	Y-91m	30	30
	Y-91	30	30
	Y-92	10	10
	Y-93	10	10
ZINC (30)	Zn-65	30	30
	Zn-69m	40	20
	Zn-69	300	20
ZIRCONIUM 940)	Zr-93	1000	200
	Zr-95	20	20
	Zr-97	20	20

¹Atomic number shown in parentheses.

²Uncompressed means at a pressure not exceeding 14.7 psi (absolute).

³Atomic weight shown after the radionuclide symbol.

⁴Fissile radioactive material.

TABLE OF A_1 and A_2 VALUES FOR RADIONUCLIDES (Cont'd)

⁵For shipments solely within the United States, the A_1 value is 20 curies americium and plutonium contained in Am-Be or Pu-Be neutron sources or in nuclear powered pacemakers.

⁶The values of A_1 and A_2 must be calculated in accordance with the procedure specified in 173.433 of this subchapter, taking into account the activity of the fission products and of the uranium-233 in addition to that of the thorium.

⁷The values of A_1 and A_2 must be calculated in accordance with the procedure specified in 173.433 of this subchapter, taking into account the activity of the fission products and plutonium isotopes in addition to that of the uranium.

⁸Compressed (greater than 14.7 psi (absolute)).

ATTACHMENT D (10CFR61.55)

Table 1

RADIONUCLIDE	CONCENTRATION (uci/cc)	
	Column 1	Column 2
	Class C Limit	Class A Limit
C-14	8	0.8
C-14 in activated metal	80	8
Ni-59 in activated metal	220	22
Nb-94 in activated metal	0.2	0.02
Tc-99	3	0.3
I-129	0.08	0.008
Alpha emitting transuranic nuclides		
with half-lives greater than 5 yrs	*100	*10
Pu-241	*3,500	*350
Cm-242	*20,000	*2,000

*Units are in Nanocuries per gram

Table 2

RADIONUCLIDE	CONCENTRATION (uci/cc)		
	Column 1	Column 2	Column 3
	Class A Limit	Class B Limit	Class C Limit
Total of all nuclides with half-lives less than 5 years	700	No Limit	No Limit
H3	40	No Limit	No Limit
Co-60	700	No Limit	No Limit
Ni-63	3.5	70	700
Ni-63 in activated metal	35	700	7000
Sr-90	0.04	150	7000
Cs-137	1	44	4600

NO LIMIT - Although no limit is specified, practical consideration such as effects of external radiation and internal heat generation on transportation, handling and disposal will limit the concentrations for these wastes. These wastes will be Class B unless the concentrations of other nuclides in Table 2 determine the waste to be Class C independent of these nuclides.

DATE: _____
R.C. SUP. _____

Form No. 9-1-15-HP-10
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Date Revised:
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WORKSHEET FOR DETERMINATION OF WASTE CLASSIFICATION (100FR61.55)

Table 1 Isotopes	Scaling Factor	Scaling Isotope	Scaling Isotope uci/cc	Isotopic Conc. uci/cc	MY LLD uci/cc	Class A		Class B		Class C	
						Limit uci/cc	Ratio ^c	Limit uci/cc	Ratio ^c	Limit uci/cc	Ratio ^c
C-14						8E-01		d	////////	8E00	
Tc-99						3E-01		d	////////	3E00	
I-129						8E-03		d	////////	8E-02	
a TRU						10		d	////////	100	
a Pu-241						350		d	////////	3500	
a Cm-242						2000		d	////////	20000	
RATIOS						////////		////////		////////	
Table 2 Isotopes											
H-3						4E+01		b		b	
Co-60						7E+02		b		b	
Ni-63						3.5E00		7E+01		7E+02	
Sr-90						4E-02		1.5E+02		7E+03	
Cs-137						1E00		4.4E+01		4.6E+03	
with T1/2 less than 5 year						7E+02		b		b	
RATIOS						////////		////////		////////	

a. Units are nanocuries/gram
b. No limit.

c. It is not necessary to list on manifest any nuclide whose ratio is less than 0.01 except C-14, Tc-99, I-129, H3
d. If Class A limit is exceeded the waste is Class C.

NOTE: For resin assume 50% of Volume is liquid and use reactor coolant H-3 value to determine the amount of H-3 in shipment.

RADIOACTIVE MATERIAL PACKAGING AND SHIPPING QUALITY ASSURANCE RECORD

SECTION I. SHIPPING INFORMATION (Radiological Controls)

Shipment Number _____

Carrier		Tractor License No.	
Date of Arrival		Trailer License No.	
Time of Arrival		Cask Type	
Driver(s) Name		Cask Serial No.	
		Shipping Contractor	

SECTION II. DOCUMENT VERIFICATION

DATE _____

ITEM	RC		OQAD	
	INITS	TIME	INITS	TIME
1. Initial Radiological Survey Taken (Exclusive use Vehicle)				
2. An updated copy of the consignee license to receive radioactive material is on site				
3. Inspect the transport vehicle (exclusive use only) attach Form No. 9-1-15-HP-10.				
4. Handling equipment to be used to load the radioactive material has been inspected, checked and designed to handle the intended load weight. Attachment B is a guide to insure proper slings and shackles are used.				
5. Certificate of Compliance for the shipping cask is on site				
6. Inspect the cask and tie-down system (chains, cables, binder, etc.) to assure that it has not sustained any damage.				
7. Cask has been receipt inspected per Proc. 0-03-1.				
8. Cask is marked with same ID No. as on C of C and M.Y. is identified as a registered user (10CFR71.85c).				
9. Personnel opening and loading the cask have a working copy of the cask handling procedure.				
10. Inspect the cask interior for defects, obstructions to loading, etc.				

R

RADIOACTIVE MATERIAL PACKAGING & SHIPPING QUALITY ASSURANCE RECORD (Cont'd)

SECTION III. SHIPMENTS WITH ACTIVITY LESS THAN A1 or A2 VALUES (49CFR173.475)

DATE _____		RC		OQAD	
ITEM		INITS	TIME	INITS	TIME
1. The container(s) is proper for the contents to be shipped.					
2. The container(s) is in unimpaired physical condition except for superficial marks.					
3. For fissile material, each moderator and neutron absorber, if required, is present and in proper condition.					
4. Each special instruction for filling, closing, and preparation of the container(s) or shipment has been followed.					
5. Each closure, valve, or other opening of the containment system through which the radioactive content might escape, is properly closed and sealed.					
6. Each closure device of the container(s) including any required gasket, is properly installed, secured, and free of defects.					
7. The internal pressure of the containment system will not exceed the design pressure during transportation.					
8. The case is proper for the contents to be shipped (see C of C).					
9. Inspect the container(s) or cask tiedown system (chains, cables, binders, etc.).					
10. Each cask closure device including any required gasket, is properly installed and secured and free of defects.					
11. The cask has been loaded and closed in accordance with written M.Y. approved procedures and the user check-off sheet has been completed.					
12. All user required conditions listed on the C of C for the cask have been complied with and documented and referenced documents are on site.					
13. Package(s) and vehicle radiation and contamination levels are within the allowable limits specified (see Section 6.11.4 and 6.13.3 and H.P. Procedure 9.1.17).					

R

RADIOACTIVE MATERIAL PACKAGING & SHIPPING QUALITY ASSURANCE RECORD (Cont'd)

SECTION III. (Con't.)

[illegible]

RADIOACTIVE MATERIAL PACKAGING & SHIPPING QUALITY ASSURANCE RECORD (Cont'd)
SECTION IV SHIPMENTS WITH ACTIVITY GREATER THAN A1 or A2 VALUES (10CFR71.87)
NOTE: Section III, Items pertaining to the container(s) must also be completed.

DATE _____		RC		OQAD	
ITEM		INITS	TIME	INITS	TIME
1. The cask is proper for the contents to be shipped. (See C of C)					
2. The cask is in unimpaired physical condition except for superficial defects such as marks or dents.					
3. For fissile material, any moderator or neutron absorber, if required, is present and in proper condition.					
4. Each closure device of the cask, including any required gasket, is properly installed, secured, and free of defects.					
5. Any system for containing liquid is adequately sealed and has adequate space or other specified provision for expansion of the liquid.					
6. Any pressure relief device is operable and set in accordance with written procedures.					
7. Any structural part of the cask which could be used to lift or tiedown the cask during transport is rendered inoperable for that purpose unless it satisfies the design requirements of §71.45.					
8. Accessible cask surface temperatures will not exceed the limits specified (122°F for mixed cargo, 180°F for exclusive use vehicle).					
9. Inspect the cask tiedown system (chains, cables, binders, etc.					
10. The cask has been loaded and closed in accordance with written M.Y. approved procedures and the user check-off sheet has been completed.					
11. All user required conditions listed on the C of C for the cask have been complied with and documented and referenced documents on site.					
12. Package(s) and vehicle radiation and contamination levels are within the allowable limits specified. (See Section 6.11.4 and 6.13.3 and H.P. Procedure 9.1.17).					

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RADIOACTIVE MATERIAL PACKAGING & SHIPPING QUALITY ASSURANCE RECORD (Cont'd)

SECTION V Final Shipment Verification

DATE _____		RC		OQAD	
ITEM		INITS	TIME	INITS	TIME
1. Material to be shipped has a contact and three foot radiation survey taken.					
2. The outside of each container or cask must have a seal that is not easily breakable that will demonstrate that the package has not been illicitly opened. (Not applicable for LSA or exempt shipments).					
3. Final health physics survey of the package and/or transporter is completed as per H.P. Procedure 9.1.17.					
4. Final vehicle survey results have been verified (exclusive use vehicle).					
5. The consignee has been notified if the shipment contains fissile material. Type B or a Highway Route Controlled Quantity.					
6. The State of New Jersey has been notified if the shipment contains greater than 20 curies and will pass through the State of New Jersey.					
7. The routine determination required by 10CFR71.87 and/or 49CFR173.475 have been performed and are acceptable.					
8. Connecticut Radioactive Permit obtained for carrier.					
9. Copy of RSR mailed to Hittman and called prior to shipment leaving.					
10. Reactor Engineering and Health Physics notified if spent fuel & X Core detectors being shipped.					
11. Appropriate markings and labels have been adequately applied to container(s) and cask if applicable (see Section 6.7 & 6.8).					
12. Appropriate placards have been adequately applied. (See Section 6.9).					

DATE _____

ITEM	RC		OQAD	
	INITS	TIME	INITS	TIME
13. Driver satisfied with arrangement of load (driver's initials).				
14. Shipping papers have been completed.(10CFR20.311)				
15. Radiological Control Supervisor final vehicle inspection completed.				
16. Required notifications either by telephone or letter have been made.				
Maine Turnpike				
State Police				
Department of Environmental Protection				
Mass. Dept. of Public Health				
Burial Site Representative				
So. Carolina Dept. of Health if Applicable				
Maine Bureau of Civil Emergency Preparedness				

GUIDELINE FOR EXCLUSIVE USE VEHICLE INSPECTION

Vehicle Identification:

Tractor _____

Trailer _____

Shipment No. _____

Date _____

OQAD Inspector _____

Items to Inspect	SAT	UNSAT
A. <u>Tires:</u> 1. Tread and general condition. 2. Rims and lugs intact.		
B. <u>Brake Tubing and Hose:</u> 1. Long and flexible enough to accommodate, without damage, all normal motion. 2. Suitably secured against chafing, kinking, or other mechanical damage.		
C. <u>Headlights and Reflectors:</u> 1. Headlamps, turnsignals, clearance lamps, and reflectors intact and functional.		
D. <u>Mirrors</u> 1. Two rear vision mirrors - one on each side.		
E. <u>Coupling Device:</u> 1. No cracking, warping or deformation of the frame. 2. Installation includes a device for positive prevention of shifting.		
F. <u>Fire Extinguishers:</u> 1. Properly filled and located so that it is readily accessible.		
G. <u>Brakes:</u> 1. All brakes operative. 2. Low air pressure warning device present. 3. Pressure gauge indicating pressure available.		
H. <u>Windshield Wipers:</u> 1. Equipped with two automatically operating windshield wiper blades.		
I. <u>Tiedown System:</u> 1. Tiedown cables secure and free from interferences. 2. Turnbuckles and clamps free from visual defects.		
J. <u>Frame:</u> 1. Bolted or pinned connections have no loose, missing or bent parts. 2. No signs of cracks, abrasion or corrosion that would reduce thickness significantly. 3. Examination of frame for signs of buckling, twisting or misalignment.		

DRIVER INSTRUCTION RECORD

1.0 SHIPMENT INFORMATION

- | | |
|---------------------------------------|-----------------------------|
| 1. Shipment Number _____ | |
| 2. Type of radioactive material _____ | 4. Vehicle radiation levels |
| | 1 - contact _____ mr/hr |
| 3. Transport index _____ | 2 - one meter _____ mr/hr |
| | 3 - two meters _____ mr/hr |
| | 4 - inside cab _____ mr/hr |

2.0 EXCLUSIVE USE (SOLE USE) VEHICLE INSTRUCTION (if applicable)

1. This shipment of radioactive material is being transported in an exclusive use vehicle.
2. The material is to be loaded by the shipper and unloaded at its final destination only.
3. Repositioning or movement of any loaded material without the written permission of the consignor is prohibited.
4. Changing of the tractor is prohibited without the express consent of Maine Yankee.
5. Frequently check to ensure that the four (4) placards are still present.
6. Other _____

3.0 EMERGENCY INSTRUCTIONS

1. In case of an accident, keep all unnecessary personnel clear and call Maine Yankee Atomic Power Company, phone 207-882-6321. Give details of accident.

DAYS - Radwaste Coordinator

NIGHTS - Plant Shift Superintendent

2. Notify State Police in state of accident. Give details of accident.
3. Notify the U.S. Department of Transportation, phone 202-426-1830.

4.0 TRAVEL INSTRUCTIONS IN THE STATE OF MAINE

1. Routing: Depart Maine Yankee via Route 144 to U.S. Route 1 to Interstate 95 and enter the Maine Turnpike at Entrance 9. Remain on the Maine Turnpike throughout until leaving the State of Maine. DO NOT DEVIATE from this route.
2. Hours of Travel: Transportation of radioactive material on the Maine Turnpike is allowed only during daylight hours (sunrise to sunset).

I have read and understand the above.

Driver's Signature: _____

Company: _____ Date: _____

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

NOTIFICATION FORM

The Massachusetts Department of Public Health must be notified of all shipments of radioactive material entering the state. If possible, 24 hour notification is to be given.

Shipment Number _____
Curie Content of Shipment _____

Date Called _____

Time of Call _____

Person Making the call _____

Type of Material

1. Radioactive waste
2. Radioactive laundry
3. Spent fuel
4. New reactor fuel
5. Other _____

Person contacted in Department of
Public Health _____

Time and Date of Shipment _____

Shipping Contractor _____

Vehicle Registration _____

Vehicle Destination _____

Route through Massachusetts _____

During normal work hours the phone numbers for the following are:

1. R. Hallisey (617) 723-6214
2. G. Swibble (617) 727-6248
3. Emergency (617) 729-9710

During off hours, weekends or holidays contact one of the following:

1. R. Hallisey (617) 729-5728
2. G. Swibble (617) 387-7768

In the event contact cannot be made in the above manner, call Massachusetts State Police Headquarters (617) 566-4500, Extension 237 or 238. Ask for Communication Room and explain circumstances.

MAINE STATE AGENCY NOTIFICATION FORM

Shipment Number _____

1.0 SHIPMENTS OF FISSILE NUCLEAR MATERIALS AND/OR RADIOACTIVE WASTE:

For all shipments of Fissile Nuclear Materials and/or Radioactive Waste leaving the plant site, the following State of Maine Agencies must be notified by telephone before the shipment leaves the plant site. Time and content of notification is to be recorded below.

a) Maine Turnpike Authority
Fare Collection:
Phone: 871-7724

Person Notified _____

Date/Time/Notified By:

b) Dept. of Environmental Protection
Bureau of Oil & Hazardous Material
Phone: 289-2651

Person Notified _____

Date/Time/Notified By:

c) Maine State Police
State Officer of the Day
Phone: 289-2155

Person Notified _____

Date/Time/Notified By:

Fissile Nuclear Material Only

d) Maine Bureau of Civil
Emergency Preparedness
Phone: 622-6201

Person Notified _____

Date/Time/Notified By:

The following information has been conveyed to the above named agency as applicable to the shipment concerned:

____ This shipment contains Fissile Nuclear Material requiring prior written
____ notification. The written notification has been mailed on (the date shown
in paragraph 2.0 below).

OR

____ This shipment contains Radioactive Waste only which does not require prior
____ notification in writing.

____ This shipment meets the legal weight limits and does not require
____ an overload permit.

OR

____ This shipment is overweight and requires an overload permit.

MAINE STATE AGENCY NOTIFICATION FORM (CONT.)

2.0 SHIPMENTS OF FISSILE NUCLEAR MATERIALS ONLY:

For all shipments of Fissile Nuclear Materials entering or leaving the State, the agencies listed below must be notified in writing no later than three days prior to the expected shipping or receiving date.

a) Maine Turnpike Authority
Mr. David H. Stevens
17 Bishop Street
Portland, Me 04103

c) Maine State Police
36 Hospital Street
Augusta, Me 04330

b) Dept. of Environmental Protection
Bureau of Oil and Hazzardous Material
Statehouse Station #7
Augusta, Me 04330

d) Director
Maine Bureau of Civil
Emergency Preparedness
State House
Augusta, Me 04330

The written notification required under this paragraph have been mailed
by: _____ on: _____.

MAINE YANKEE ATOMIC POWER COMPANY

RADIOACTIVE MATERIAL RELEASE FORM

Shipment Number _____

Date: _____

Time: _____

NOTE: This form must be completed by a Radwaste Supervisor before plant security will allow any radioactive material to leave the plant site. Plant security will note the date and time of departure and return this form to Radwaste.

Description of Material

Approved for Shipment _____
Radwaste Supervisor

To be completed by Plant Security

Date: _____

Time of Departure: _____

Officer: _____

RADWASTE SHIPMENT ROUTE

Shipment No. _____

Date _____

According to the dispatcher at _____ the truck
routing from Maine Yankee Nuclear Power Station to _____
is as follows:

Driver's Signature

CHIEF OF MAINE STATE POLICE
RADIOACTIVE WASTE SHIPMENT PRENOTIFICATION*
TITLE 25, Section 2109

SHIPMENT NUMBER: _____

SHIPMENT DATE: _____

DATE CALLED: _____

TIME CALLED: _____

CONTACTED: _____ at 289-2155

CONTACTED BY: _____

*A minimum of 24 hour advance notification is required.

SHIPMENT INFORMATION

CARRIER: _____

VEHICLE REGISTRATION:

TRACTOR: _____

TRAILER: _____

ROUTE THRU MAINE: Route 144 to US Route 1 to Interstate 95 and enter the Maine Turnpike at Entrance 9. Remain on Maine Turnpike until leaving the State of Maine at Kittery.

DESTINATION: _____

FACILITY: _____

CONTENTS:

VOLUME: _____

CURIES: _____

TYPE MATERIAL: _____

DATE FORM MAILED: _____

Maine State Police
36 Hospital Street
Augusta, Maine 04330

ATTENTION: Communications

LIMITED QUANTITY CERTIFICATION

49CFR173.421-1(a)

SHIPMENT NO. _____

DATE: _____

Maine Yankee Atomic Power Company certifies that:

"This package conforms to the conditions and limitations specific in:

☐ 49CFR173.421 for excepted radioactive material, limited quantity, n.o.s., UN2910 or

☐ 49CFR173.422 for excepted radioactive material, instruments and articles, UN2911 or

☐ 49CFR173.424 for excepted radioactive material, articles manufactured from natural or depleted uranium or natural thorium, UN2909."

RAD CONTROLS SUPERVISOR

RADIOACTIVE MATERIAL SHIPMENT CHECKLIST

Shipment Number _____

A. The following forms have been completed if applicable:

ITEM	INITIALS
1. Form No. 9-1-15-HP-1 (Radioactive Shipment Quality Assurance Record)	
2. Form No. 9-1-15-HP-2 (Drivers Instruction Record) Original to carrier, retain copy	
3. Form No. 9-1-15-HP-3 (Mass. Dept. of Public Health Notification Form)	
4. Form No. 9-1-15-HP-4 (Maine State Agency Notification Form)	
5. Form No. 9-1-15-HP-5 (Radioactive Material Shipment Checklist)	
6. Form No. 9-1-15-HP-6 (Radioactive Material Release Form)	
7. Form No. 9-1-15-HP-7 (Radioactive Shipment Route) Exclusive use vehicle only Original to carrier, retain copy	
8. Form No. 9-1-15-HP-8 (Chief of the Maine State Police - Radioactive Waste Shipment Prenotification)	
9. Form No. 9-1-15-HP-9 (Limited Quantity Certification) Must accompany a limited quantity shipment.	
10. MY-HP-23-72 (Maine Yankee Radioactive Shipment Record) Completed if consignee does not have one Original to carrier, retain copy	
11. DHEC 802 (South Carolina's Prior Notification and Manifest Form) Original to carrier, retain copy	
12. DHEC 803 (South Carolina's Certification Form) Original to carrier, retain copy	
13. DSHS RHF-31B (Washington State Certification Form) Original to carrier, retain copy	
14. US Ecology (Rad. Waste Shipment & Disposal Form) Retain indicated copy, mail copy to US Ecology, other 2 to carrier.	
15. Chem Nuclear (Rad. Shipment Record Form) Retain indicated copy, mail copy to CNSI, other to carrier.	

RADIOACTIVE MATERIAL SHIPMENT CHECKLIST - CONT'D

16. Maine Yankee straight bill of lading Last copy retained, others to carrier	
17. Acknowledgement of shipment receipt must be received by: DATE DUE _____ DATE RECEIVED _____	