

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
WASHINGTON, D.C. 20555

May 4, 1990

NRC INFORMATION NOTICE NO. 90-31: UPDATE ON WASTE FORM AND HIGH INTEGRITY CONTAINER TOPICAL REPORT REVIEW STATUS, IDENTIFICATION OF PROBLEMS WITH CEMENT SOLIDIFICATION, AND REPORTING OF WASTE MISHAPS

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors, fuel cycle licenses, and certain byproduct materials licenses.

Purpose:

This information notice is being provided to inform addressees of recent developments concerning the stability of waste forms that contain Class B or Class C low-level waste. The developments pertain to: the status of reviews of topical reports (TRs) on waste stabilization media and high integrity containers; the results of the Workshop on Cement Stabilization of Low-Level Waste held in Gaithersburg, Maryland, on May 31 to June 2, 1989; the identification of constituents that create problems with cement solidification of low-level wastes; and the notification to the U.S. Nuclear Regulatory Commission (NRC) of mishaps with waste stabilization.

It is expected that addressees will review the information for applicability to their facilities and consider actions, as appropriate, to avoid problems in solidification of wastes in cement and in disposing of certain waste streams. Addressees are encouraged to distribute the notice to responsible radiological staff and waste handling personnel. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Discussion:

Update on Waste Form and High Integrity Container TR Review Status -

In Information Notice No. 89-27, "Limitations on the Use of Waste Forms and High Integrity Containers for the Disposal of Low-Level Radioactive Waste," March 8, 1989, it is pointed out that waste generators are required, under 10 CFR 20.311, to certify that any Class B or C wastes that they send for disposal are structurally stable, in accordance with 10 CFR Part 61. The information notice goes on to describe the NRC review of TRs on waste solidification media and high integrity containers for the disposal of Class B or Class C wastes. The status of these NRC TR reviews is summarized. A

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description is provided on how the Agreement State authorities that host the three operating low-level waste disposal facilities have implemented NRC decisions on the TRs. The information notice states that the status of approved waste stabilization media and high integrity containers will change periodically as TR reviews are completed, and as new TRs are submitted for review. The information notice states that NRC will periodically issue updates of the status of topical report reviews, to keep licensees fully informed of approved solidification media and high integrity containers for disposal of Class B and C wastes. Attachment 1 provides the status of NRC topical report reviews as of April 1, 1990. Licensees are directed to Information Notice 89-27 for further information that applies to disposal of Class B and C wastes. Waste generators are urged to contact the disposal facility operators for additional information and procedural details before pursuing disposal options for Class B and C wastes.

#### Cement Solidification Workshop -

Information Notice 89-27 pointed out that NRC had not approved any topical reports describing commercial cement stabilization of low-level wastes. This situation still exists (see Attachment 1). To gather information that would provide an improved understanding of the complex technical concerns regarding the use of cement for waste stabilization and that would lead to both short-term and long-term regulatory resolution of TR reviews on cement stabilization media, NRC hosted the Workshop on Cement Stabilization of Low-Level Radioactive Waste on May 31 - June 2, 1989. During the workshop, the following topics were discussed: lessons learned from small- and full-scale waste forms and observations at nuclear power plants; implications of laboratory test experience with cement solidification and the application to problem waste streams; stabilized waste form testing guidance (including NRC's 1983 "Technical Position on Waste Form"), and process control programs and waste characterization. The results of the workshop have been published as an NRC Conference Proceedings report, NUREG/CP-0103. Licensees are encouraged to obtain a copy of this report and determine if any topics discussed will potentially improve their application of waste solidification processes.

#### Waste Constituents That Create Problems with Cement Solidification -

One important item that licensees should be fully aware of, which was discussed in detail during the workshop, is continuing concerns with deleterious chemical reactions during waste solidification using cement. This subject was first brought to the attention of licensees by Information Notice No. 88-08, March 14, 1988, "Chemical Reactions with Radioactive Waste Solidification Agents." As a result of the continuing concerns with this subject, NRC has developed the list in Attachment 2 of waste constituents that could cause problems with solidification campaigns, particularly at nuclear power plants. The first part of the list identifies "problem" constituents of wastes that are expected ingredients in certain waste streams. Licensees should ensure that proper formulations are being used for these types of wastes, especially if the wastes require structural stability. The second part of the list covers "problem" constituents of waste streams that are not expected ingredients in

the wastes, and may cause a problem with cement solidification if they accidentally get into a waste stream, especially since the waste-processing vendor may not necessarily be using a formulation that would successfully treat the waste stream. Some of these constituents may be a problem for successful cement solidification, even at parts per million concentrations, depending on the waste stream they are in and the synergistic effects that could arise. NRC has identified these as waste constituents that could be controlled and possibly prevented from entering waste streams with good house-keeping, inventory control, use limits, or pretreatment, thereby minimizing the potential to affect cement solidification. NRC encourages licensees to determine if they are using any of these items, and if they are, to determine if housekeeping, inventory, or use controls are adequate to prevent these "problem" constituents from entering waste streams that are to be solidified; especially waste streams that require structural stability. Licensees who are aware of having small concentrations of these "problem" constituents in their waste streams, and are using a proper solidification formula to treat the wastes, should be aware that changes in concentrations of these constituents may result in a problem. Licensees are also encouraged to evaluate the use of alternative products or chemical constituents, in order to reduce or eliminate the possibility of "problem" constituents entering the waste stream. Licensees should inform solidification vendors of circumstances that may result in waste constituent changes, so that the vendor may determine the correct formula to use in solidification. This will help in avoiding problems such as those reported in Information Notice No. 88-08.

Licensees should be aware that several of the waste constituents listed in Attachment 2 may result in a situation that produces mixed hazardous and radioactive waste. The currently operating low-level radioactive waste disposal facilities are not permitted to receive mixed wastes. Licensees should contact the Environmental Protection Agency (EPA) for more information on what constitutes a mixed hazardous and radioactive waste and refer to the joint NRC Environmental Protection Agency (EPA) guidance document entitled, "Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste and Answers to Anticipated Questions."

#### Notification of Waste Stabilization Mishaps -

NRC has become increasingly concerned about mishaps that have occurred during the solidification of low-level radwaste at power plants and other facilities. These mishaps, some of which were described in Information Notice No. 89-27, have included waste forms that have failed to solidify completely and that swelled and/or disintegrated over relatively short times after solidification. These mishaps result in questions as to whether the waste form will satisfy the Part 61 stability requirements. To maintain current information about problems encountered in solidifying wastes and placing wastes in high integrity containers for structural stability, NRC is evaluating mechanisms for obtaining reports of mishaps like the ones described above. Licensees will become involved in the reporting process to the extent that the waste that is involved in mishaps reported to NRC is the ultimate responsibility of the waste generator. Waste mishaps reporting will be addressed in a future information notice.

No specific action or written response is required by this information notice. If you have any questions regarding this information notice, please contact the technical contact listed below or the Regional Administrator of the appropriate regional office.

*Richard L. Bangart*

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Division of Low-Level Waste Management  
and Decommissioning  
Office of Nuclear Material Safety  
and Safeguards

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**Attachments:**

1. Topical Report Review Status Summary: Solidified Waste Forms and High Integrity Containers (HICs)
2. List of Waste Constituents That May Cause Problems with Cement Solidification
3. List of Recently Issued NMSS Information Notices
4. List of Recently Issued NRC Information Notices

TOPICAL REPORT REVIEW STATUS SUMMARY  
SOLIDIFIED WASTE FORMS AND HIGH INTEGRITY CONTAINERS  
 APRIL 1, 1990

Office of Nuclear Material Safety and Safeguards

<u>Vendor</u>	<u>Docket No.</u>	<u>Type</u>	<u>Disposition</u>
Waste Chem	WM-90	Solidification (bitumen)	Approved
General Electric	WM-88	Solidification (polymer)	Approved
DOW	WM-82	Solidification (polymer)	Approved
Chichibu	WM-81 Rev 2.1	HIC (poly impreg/concrete)	Approved
Nuclear Packaging	WM-45	HIC (ferralium/FL-50)	Approved
Nuclear Packaging	WM-85	HIC (ferralium/family)	Approved
LN Technologies	WM-93 Rev 1	HIC (stainless/poly)	Approved
Chem-Nuclear	WM-18	HIC (polyethylene)	Not Approved
Westinghouse	WM-80	HIC (polyethylene)	Not Approved
TFC Nuclear	WM-76	HIC (polyethylene)	Not Approved
U.S. Gypsum	WM-51	Solidification (qypsum.)	Not Approved
U.S. Ecology	WM-91	Solidification (bitumen)	Discontinued
VIKEM	WM-13	Solidification/oil (cement)	Discontinued
Stock	WM-92	Solidification (cement)	Discontinued
Nuclear Packaging	WM-71	Solid/Encap (cement/qypsum)	Withdrawn
Chem-Nuclear	WM-19	Solidification (cement/	Withdrawn
Chem-Nuclear	WM-96	Solidification (cement)	Withdrawn
Westinghouse	WM-79	Solidification (SG-95)	Withdrawn
Nuclear Packaging	WM-87	HIC (316-stainless/SDS)	Withdrawn
LN Technologies	WM-57	HIC (polyethylene)	Withdrawn
Chem-Nuclear	WM-47	HIC (fiberglass/poly)	Withdrawn
Chem-Nuclear	WM-101	Solidification (cement #1)	Under review
Chem-Nuclear	WM-97	Solidification (cement #2)	Under review
Chem-Nuclear	WM-97 Rev 1	Solidification (cement #2)	Under review
Chem-Nuclear	WM-98	Solidification (cement #3)	Under review
LN Technologies	WM-20	Solidification (cement)	Under review
LN Technologies	WM-99	Solidification (cement/decon)	Under review
Westinghouse	WM-46	Solidification (cement)	Under review
U.S. Ecology	WM-100	Solidification (NSI bitumen)	Under review
Bondico	WM-94	HIC (fiberglass/poly)	Under review
Babcock & Wilcox	WM-95	HIC (coated carbon steel)	Under review
U.S. Ecology	WM-102	Solidification (LLW bitumen)	Under review
Pacific Nuclear	WM-103	HIC (enviroglass)	Under review

LIST OF WASTE CONSTITUENTS THAT MAY CAUSE PROBLEMS WITH CEMENT SOLIDIFICATION  
POTENTIAL PROBLEM CONSTITUENTS THAT MAY BE EXPECTED IN THE WASTE STREAM

Inorganic Constituents

Borates [1]  
Phosphates  
Lead salts  
Zinc salts  
Ammonia and ammonium salts  
Ferric salts  
"Oxidizing agents" [1] (often proprietary)  
    Permanganates [1]  
    Chromates [2]  
Nitrates [1]  
Sulfates [1]

Organic Constituents - Aqueous Solutions

Organic acids [1]  
    Formic acid (and formates)  
  
"Chelates" [1],[3]  
    Oxalic acid (and oxalates)  
    Citric acid (and citrates)  
    Picolinic acid (and picolines)  
    EDTA (and its salts)  
    NTA (and its salts)  
  
"Decon solutions" [1]  
    Soaps [1]  
    Detergents [1]

Organic Constituents - Oily Wastes

Benzene [1],[2]  
Toluene [1],[2]  
Hexane [1]  
Miscellaneous hydrocarbons  
Vegetable oil additives

POTENTIAL PROBLEM CONSTITUENTS THAT MAY BE AVOIDED BY HOUSEKEEPING OR PRETREATMENT [4]

Generic Problem Constituents

Oil [1] and grease  
"Aromatic oils" [1]  
"Organic solvents" [1],[2]  
Dry-cleaning solvents [1],[2]  
"Industrial cleaners" [1],[2]  
Paint thinners [1],[2]  
"Decon solutions" [1]  
Soaps [1]  
Detergents [1]

Specific Problem Constituents - Organic [5]

Acetone [1],[2]  
Methyl ethyl ketone [2]  
Trichloroethane [2]  
Trichlorotrifluoroethane [2]  
Xylene [2]  
Dichlorobenzene [2]

Specific Problem Constituents - Inorganic

Sodium hypochlorite [1]

NOTES.

1. These constituents have been specifically identified by vendors as having the potential to cause problems with cement solidification of low-level wastes.
2. The presence of these constituents may result in the generation of mixed wastes. The Environmental Protection Agency should be contacted for more information.
3. All of these chelating agents could also be identified as "organic acids."
4. Good housekeeping and pretreatment could also be effective in preventing problems with cement solidification for many of the constituents listed in the top list.
5. These specific constituents also fall into several of the "generic" problem constituents "categories" listed at the left.

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to:
90-24	Transportation of Model SPEC 2-T Radiographic Exposure Device	04/10/90	All NRC licensees authorized to use, transport, or operate radiographic exposure devices and source changers.
90-20	Personnel Injuries Resulting from Improper Operation of Radwaste Incinerators	03/22/90	All U.S. NRC licensees who process or incinerate radioactive waste
90-16	Compliance with New Decommissioning Rule	03/07/90	All materials licensees
90-15	Reciprocity: Notification of Agreement State Radiation Control Directors before Beginning Work in Agreement States	03/07/90	All holders of NRC materials licenses that authorize use of radioactive material at temporary job sites
90-14	Accidental Disposal of Radioactive Materials	03/06/90	All NRC byproduct materials licensees
90-09	Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees	02/05/90	All holders of NRC materials licenses
90-01*	Importance of Proper Response to Self-Identified Violations by Licensees	01/12/90	All holders of NRC materials licenses

\*Correct Number for 90-01 should be 90010145.

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
90-30	Ultrasonic Inspection Techniques for Dissimilar Metal Welds	5/1/90	All holders of OLs or CPs for nuclear power reactors.
90-29	Cracking of Cladding and Its Heat-Affected Zone in the Base Metal of a Reactor Vessel Head	4/30/90	All holders of OLs or CPs for nuclear power reactors.
90-28	Potential Error in High Steamline Flow Setpoint	4/30/90	All holders of OLs or CPs for BWRs.
90-27	Clarification of the Recent Revisions to the Regulatory Requirements for Packaging of Uranium Hexafluoride (UF <sub>6</sub> ) for Transportation	4/30/90	All uranium fuel fabrication and conversion facilities.
89-70, Supp. 1	Possible Indications of Misrepresented Vendor Products	4/26/90	All holders of OLs or CPs for nuclear power reactors.
90-26	Inadequate Flow of Essential Service Water to Room Coolers and Heat Exchangers for Engineered Safety-Feature Systems	4/24/90	All holders of OLs or CPs for nuclear power reactors.
90-25	Loss of Vital AC Power with Subsequent Reactor Coolant System Heat-Up	4/16/90	All holders of OLs or CPs for nuclear power reactors.
90-24	Transportation of Model Spec 2-T Radiographic Exposure Device	4/10/90	All NRC licensees authorized to use, transport, or operate radiographic exposure devices and source changers.

OL = Operating License  
CP = Construction Permit

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