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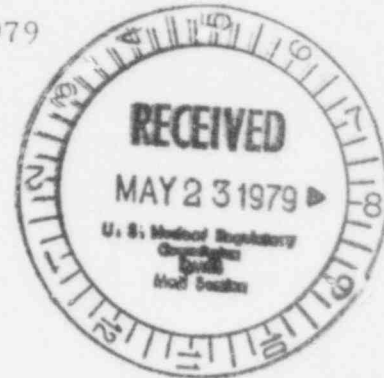


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May 18, 1979



Director
Office of Nuclear Material Safety
and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

Re: FR#23391, April 19, 1979

The Committee on Mining and Milling of the Atomic Industrial Forum has reviewed the draft document "Review and Assessment of Package Requirements (Yellowcake) and Emergency Response to Transportation Accidents", NUREG-0535, which was prepared by the U. S. Nuclear Regulatory Commission and the U. S. Department of Transportation. The authors of the report are to be commended for the study and the thoughtful work that went into the recommendations. The Committee wholeheartedly endorses them.

While yellowcake is of low specific activity and relatively easy to clean up completely if spilled, the Committee agrees that emergency response plans are necessary to assure expeditious handling of spills and to maintain favorable public reaction. Experience with the few accidents that have been reported has been shown this to be the case in each instance. The potential adverse impact of any mishap in the nuclear industry is frequently exaggerated by the media; hence, the better control we have over such situations and the faster spills are cleaned up, the better it will be for the entire industry.

A Working Group of this Committee has prepared an emergency response plan that has been informally submitted to the NRC. A copy is enclosed. It has been widely adopted by the industry and adequately meets the recommendations set forth in the NRC draft document, NUREG-0535.

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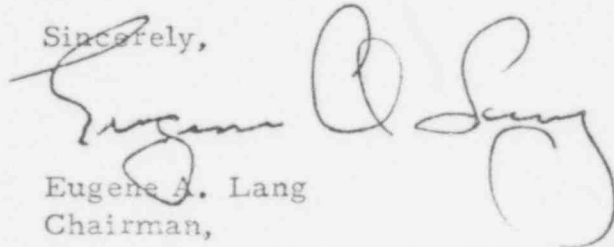
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Director
Office of Nuclear Material Safety
May 18, 1979
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We believe that the procedures established therein are acceptable to the shippers, the carriers, and the general public. We intend to distribute our emergency response plan and these comments to the states in which yellowcake is transported.

Sincerely,



Eugene A. Lang
Chairman,
Committee on Mining & Milling
Atomic Industrial Forum, Inc.

cc: E. Gordon, Secretary-AIF

Respond to: Mr. Eugene A. Lang
Senior Vice President
Rocky Mountain Energy Company
4704 Harlan Street
Denver, Colorado 80212

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July 26, 1978

URANIUM ORE CONCENTRATE SHIPPERS & TRANSPORTERS
RECOMMENDED TRANSPORTATION ACCIDENT RESPONSE GUIDE*

1.0 INTRODUCTION

Transportation accidents during the shipment of uranium ore concentrates infrequently occur on public highways and at trucking terminals. Leakage or spillage of ore concentrate from its container can be a potential health hazard to persons if they inhale or ingest the material. The health hazard, even with an acute exposure, is usually small and is primarily because of chemical toxicity to the kidneys. Radioactivity is a much lesser health hazard.

The purpose of this procedure is to provide guidance for persons responding to a shipping accident involving uranium ore concentrate, particularly when the concentrate has leaked or is spilled from its containers. Leakage or spillage can range in severity from a small leak in a single container to a truck load of ruptured drums dumped outside of the vehicle. Although this guide addresses the worst-case situation, it intends lesser response activity for less severe accidents.

The guide provides instructions to the truck driver or to other person(s) who are the first to arrive at the accident scene. These instructions request notifications be made to the shipper and the carrier. If warranted, the shipper is to dispatch an initial response team to investigate the accident. He also alerts a clean-up crew for possible duty. Guidance is also given for securing pre-arranged clean-up equipment and services. Clean-up methods, monitoring, sampling, release levels, and concluding activities are also described. Each shipper and carrier should provide implementing procedures to accomplish the tasks which are specifically described in this guide, as well as the tasks which are only generally described.

Preparation and training will greatly aid proper judgmental decision making and prompt application of adaptive measures to an accident situation with a minimum of "time without control". Achievement of this goal is the reason for which this response guide is prepared.

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*Prepared by AIF Ad Hoc Working Group on Transportation Accident Plan
June 1978.

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2.0 TRANSPORTATION ACCIDENT RESPONSE ORGANIZATION AND DUTIES

2.1 The Shipper

2.1.1 Shippers Management

Each shipper should have one or more individuals assigned to accomplish the following:

- a) Prepare and use the emergency procedures and questionnaire. One copy should be provided to the truck drivers, and one copy should be attached to the rear of each truck. (See Appendix A)
- b) Supply State Police and Health Departments with copies of their emergency response plan.
- c) Notify the appropriate regulatory agencies.
- d) Provide a spill covering kit for each truckload shipment.
- e) Provide a 24-hour per day telephone answering capability, trained to receive emergency calls and notify appropriate individuals.
- f) Provide an initial response team capability.
- g) Provide a spill clean-up capability (crew and equipment).
- h) Provide implementing procedures.
- i) Make cash quickly accessible to the response team and crew.
- j) Train personnel.

2.1.2 Call Receiver

Each shipper shall have persons assigned to receive emergency telephone calls at any time. The person receiving a call indicating an accident shall record and relay this information to those persons assigned to make an evaluation of an accident situation.

2.1.3 Initial Response for Spillage of Uranium Ore Concentrate

An accident involving spillage of ore concentrate shall be promptly investigated by one or more members of the Initial Response Team, who are either:

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- a) A member of the shipper's organization;
- b) By mutual aid, a qualified member of another uranium operator;
- c) A qualified consultant or contractor; or,
- d) A qualified carriers' representative.

The response team member(s) called should be the one(s) who can respond most promptly to the accident scene, with a copy of their response plan, survey instruments, camera, shoe covers, a few sample bottles and other equipment as needed.

2.1.3.1 Duties of the Initial Response Team

The team shall survey the accident site and determine the need for a clean-up crew, its size and equipment. The team shall call and advise the clean-up crew supervisor of those needs. They shall also arrange for additional empty drums and trucks as needed.

The team shall coordinate pre-clean up planning with the governmental officials present at the site. These officials shall be fully appraised of the response plan. News reporters at the sites should be given factual information in lay terms for best understanding of the situation.

Persons who were first upon the accident scene and who were potentially exposed to the spilled ore concentrate should be instructed by the team to give urine samples. (See Section 4.4)

The team may perform other activities such as photographing, surveying and mapping the site, procuring extra needed equipment, arranging for sample analysis, hiring local help, additional spill covering, etc., as needed.

2.1.4 Clean-Up Crew

The clean-up crew and its equipment are further described in Section 3 of this guide. The crew and its supervisor must be trained and experienced in the handling of low specific activity material, such as yellowcake.

2.2 The Carrier (Transporter)

The carrier shall require his drivers to learn and carry the emergency procedures given in Appendix A. The carrier shall have

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persons assigned to receive emergency calls at any time. The person receiving the call will promptly notify company management. A call will be made to the shipper to confirm that appropriate action is being taken. The carrier may have one of its staff and/or insurance agent visit the accident site.

3.0 SPILL CLEAN-UP

3.1 Equipment and Personnel

Equipment and personnel needed for a spill of consequence may consist of part or all of the following:

3.1.1 Equipment

- 10 pair - Disposable rain suits
- 10 pair - Coveralls (2 small, 4 medium, 4 large)
- 10 - Cloth head covers
- 20 pair - Work gloves
- 10 - Dust respirators (4 full-face, 6 half-face)
- 30 - 6 oz. bottles w/caps and labels (sealed in a plastic bag)
- 300 feet - Barricade rope
- 20 - 4-foot metal fence posts
- 4 - Radiation zone and radioactive material signs
- 1,000 sq. ft. - Plastic sheeting
- 20 - Tent stakes
- 5 - Rolls of plastic tape
- 40 - Drum liner bags
- 8 - 55-gallon drums (contains most other items)
- 1 - Vacuum cleaner (to fit on a 55-gallon drum)
- 6 - Shovels
- 4 - Brooms
- 1 - Drum lid closure wrench
- 10 - Washclothes and towels
- 2 - Wash basins
- 6 - Bars of toilet soap
- 1 - Snake bite and small first-aid kit
- 2 - 5-gallon water tanks with spray nozzles on hose
- 1 - Drum of cleaning rags
- 2 - Portable generators (including engine oil)
- 1 - Gasoline can (empty - pack near top of drum)
- 2 - 50-foot extension cords
- 2 - Extension-cord type trouble lights
- 1 - Umbrella tent
- 1 - High-volume air sampler, filter papers and repair kit
- 2 - "Personnel" air samplers

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- 50 - DOT "Radioactive II" labels
- 4 - DOT "Radioactive" placards
- 2 - Clipboards with tablets and pencils
- 1 - Alpha survey meter and check source
- 1 - Micro R meter (or equivalent) and check source

Other equipment as needed should be procured as near the accident site as is most expedient. The above listed equipment (excepting the survey meters) should be packed with or contained in eight 55-gallon drums with lever-lock lids. Each drum should have a label listing its contents. The containers should be stored in a readily accessible location with adequate handling equipment available. The clean-up crew responding to the accident shall bring calibrated survey instruments and their TLD or film badge dosimeters.

3.1.2 Personnel

The clean-up crew may either be employees of the shipper, carrier, a qualified contractor, or by mutual aid arrangement they may be employees of another mill operator or conversion plant operator. These persons will be assigned tasks commensurate with their training and experience, such as:

- a) Handling and repackaging the spilled yellowcake;
- b) Performing decontamination efforts;
- c) Monitoring, sampling and related exposure evaluation activities;
- d) Providing logistical support for the crew;
- e) Crew supervision; or,
- f) Coordination of activities with civil organizations and governmental agencies.

Non-shipper personnel may be hired locally to handle clean drums, operate tractors, load trucks and other jobs not involving the direct contact with uncontained ore concentrate or contaminated materials.

At any one time, the number of persons recovering the spilled material could be as many as twelve (12) persons, including five persons picking up and redrumming the spilled yellowcake, two individuals monitoring the work activity and the environment and two persons loading clean drums onto another truck. Also included is the crew foreman, the person-in-charge, and a person to do odd jobs. The person-in-charge should be

qualified to direct the health physics type activities and to evaluate the monitoring and sampling data. If the person-in-charge does not have these qualifications, then another person having this experience must also be present. (These latter persons are likely to be the same people who made the shippers initial response and evaluation of the accident.)

3.2 Clean-Up Crew Response

3.2.1 Notification

The person(s) making the initial response will contact their management supervisors and advise them of the needs for cleaning up the spill. Time, being an important factor, should prompt a quick decision as to who will supply the clean-up crew, i.e. (a) the shipper, (b) another mill operator via mutual aid agreement, (c) the conversion plant operator via mutual aid agreement, (d) a contractor organization, (e) the carrier, or (f) a combination of (a) through (e). The shipper shall make the appropriate notifications to accomplish prompt response to the accident scene by a clean-up crew.

3.2.2 Responding to the Scene

The supervisor of the crew responding will promptly gather his personnel. They shall obtain an appropriate amount of money and the necessary survey instruments. They shall also obtain the emergency equipment needed.

Travel to the accident site should be done in the most expeditious manner.

3.3 Pre-Clean-Up Activities

After the clean-up crew arrives at the accident scene and have been briefed by the Initial Response Team, the crew should perform the following tasks as needed and as assigned by the person-in-charge.

- a) Unload equipment.
- b) Correct or mitigate safety hazards which could interfere with the clean-up operation.
- c) Further cover the spill and contaminated items.
- d) Rope off the exclusion area and post signs.
- e) Establish an upwind "hot line" monitoring station at the exclusion area border.

- f) Erect the personnel "decon" tent at the hot line location.
- g) Establish a "command post" location outside of the exclusion area near the hot line.
- h) Set portable toilet near the command post.
- i) Obtain water (use one or more empty drums).
- j) Set wind breaks.
- k) Fuel and oil the generators.
- l) Set the air samplers - downwind.
- m) Mount the vacuum cleaner head on an empty drum.

3.4 Spill Clean-Up Methods

It is desirable to repackage spilled yellowcake into 55-gallon drums. Contaminated debris, snow, ice, soil and "decon" water should be similarly packaged. Where spilled yellowcake is more than 1/4 inch thick, shovel methods are recommended. Where the spill is less than 1/4 inch thick and the material is dry, vacuum sweeping should be successful. Where the spilled material covers soil it is expected that 1-2 inches of soil will be removed. Contamination remaining on pavements and other hard surfaces after vacuuming may need to be cleaned with water and detergent as described later.

3.4.2 Vacuum Cleaning

Vacuum cleaners with efficient exhaust filters are recommended. Vacuum methods are successful where thin layers of yellowcake dust have settled. Care must be taken that the cleaner filter(s) are not punctured. Before removing the cleaner head from its drum collector, be sure that the dust inside the drum has settled (wait 2 minutes after turning the vacuum off).

The operator of the vacuum should be completely attired with coveralls, shoe covers, head cover, respirator and gloves.

3.4.3 Wet Cleaning Methods

Conventional wet scrubbing with detergent-water solutions using brooms and cleaning rags can reduce surface contamination of pavements and other hard surfaces to acceptable levels. Release limits are given in Table #1.

3.4.4 Other Decontamination Methods

Contaminated soil may be dozed, shoveled or otherwise scooped from the ground and packaged in drums. Items with surface contamination exceeding the limits given in Table #1 should also be packaged.

TABLE #1

Acceptable Surface Contamination Levels

<u>Average</u> ^{ab}	<u>Maximum</u> ^{ac}	<u>Removable</u> ^{ad}
5,000 dpm a/100cm ²	15,000 dpm a/100cm ²	1,000 dpm a/100cm ²

- a. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.
- b. Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.
- c. The maximum contamination level applies to an area of not more than 100 cm².
- d. The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

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4.0 MONITORING AND SAMPLING

4.1 Hot Line Operations

The Hot Line is an established control line separating the spill-contaminated area from the contamination-free area. All personnel and equipment entering and leaving the accident scene are channeled through the Hot Line. The Hot Line is manned by at least one person skilled at monitoring. No person or equipment leaves the contamination area without first being monitored and decontaminated if necessary.

The Hot Line is supplied with clean protective clothing, respirators and tape as well as the washing facility (tent). Drums or plastic bags for "dirty" clothing and waste are also provided at the Hot Line.

4.2 Air Sampling

Personnel air sampling should be considered for the clean-up crew when handling large spills of ore concentrate. This should be done to assure that the respiratory protective equipment used is adequate and to provide data for exposure evaluations.

During clean-up operations, a high-volume air sampler shall be operated about 25-30 yards downwind from the accident. When no operations are being performed, the sampler shall collect a background sample from an area ~ 500 yards upwind of the accident.

An example of an air sample calculation assuming 50% geometry of an alpha detector is as follows:

$$\text{dpm/m}^3 = \frac{\left(\frac{\text{cpm}}{0.5}\right) \left(\frac{\text{AF}}{\text{AC}}\right)}{(\text{m}^3) (\text{E}) (\text{X})}$$

where

$$\text{dpm/m}^3 = \text{Disintegrations per minute found in one cubic meter of air}$$

- cpm = Counts per minute indicated by instrument
- cpm/0.5 = dpm (cpm corrected for instrument geometry)
- A_f = Area of filter paper used (any units)
- A_c = Area of filter paper actually counted by the instrument (same as units A_f)
- X = Alpha absorption factor for paper used (from manufacturer's specifications)
- E = Collection efficiency of paper used (from manufacturer's specifications)
- m^3 = Total volume of sampled air in cubic meters

The background radioactivity should be subtracted from the calculated downwind concentration.

Proper controls are being used during the clean-up if the downwind sampler results (corrected for background) are below 100 dpm/ m^3 .

4.3 Soil and Water Sampling

4.3.1 Soil Sampling

At the upwind air sampler (background) location and other suitable locations, obtain four 2-inch deep 6-inch square samples of soil and place in suitable containers. Identify each container with labels.

Soil samples similarly obtained at the spill site after the final decontamination effort should be collected.

The soil samples should be analyzed for uranium content as promptly as possible. Soil decontamination efforts will be considered successful when the spill site samples show no more than 30 pCi of uranium per gram of soil above the background soil sample.

4.4 Personnel Dosimetry and Bioassay Sampling

4.4.1 Personnel Dosimetry

TLD, film badge, or pencil type dosimeters should be provided the clean-up crew. Frequent recorded beta-gamma surveys near the individual at his work location may be done in lieu of the use of personal dosimeters.

4.4.2 Bioassay Sampling

Inhaled or ingested uranium ore concentrates have enough solubility in body fluids as to make urinalysis an acceptable method to use for evaluating internal exposures. Urine samples should be given by potentially exposed clean-up crew member and other personnel involved. The sampling should be done as directed by the person responsible for supervising the health physics activities. Elaborate precautions will be taken to prevent the sample bottles from becoming contaminated with uranium from external sources. The samples should be analyzed promptly.

Follow-up urine sampling will be considered necessary when any single sample exceeds 20ugU/liter. An exposure evaluation should be made for each potentially exposed individual.

5.0 CONCLUDING ACTIVITIES

5.1 Review of Monitoring and Sampling Data

All monitoring and sampling data including personnel exposure evaluations should be reviewed with the appropriate governmental authorities. Upon securing their approval, the decontamination efforts shall cease.

5.2 Abandoning the Site

It is desirable to restore an accident site to its pre-accident condition, or better. Arrangements should be made to accomplish this restoration during-or after packing up and leaving the site.

5.3 Cost Accounting

An accurate documentation of losses and costs should be made. The appropriate insurance company(s) should be notified if the accounting shows that losses and costs of more than nominal value have occurred.

5.4 Reports

Reports of the accident will need to be prepared as required by Federal, State or local regulations. For example, the Shipper may need to report in accordance with Title 10 CFR Part 20.403. The Carrier may need to report in accordance with Title 49 CFR Parts 171.15 and 171.16.

APPENDIX A

TO WHOM IT MAY CONCERN:

- a) Rescue and lifesaving may be done with little fear of the hazards from the cargo on this truck. If possible, avoid breathing dust from spilled cargo. DO NOT DELAY RESCUE EFFORTS!
- b) After needed rescue, lifesaving, first aid or firefighting, please read the attached instructions in the event of cargo spillage.
- c) Please note that a box of emergency equipment was the last item loaded onto this truck. It should be accessible through the rear cargo doors.

TO THE DRIVER:

Keep these emergency procedures with your shipping papers.

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EMERGENCY PROCEDURES

This vehicle contains drums of uranium ore concentrate, commonly called yellowcake or U_3O_8 . It is a granular solid material. Its color may be yellow, greenish brown, or black. It cannot burn or explode. In the event of an accident involving spillage of yellowcake from the drums, the following actions are recommended if appropriate:

1. LIFESAVING, RESCUE AND FIREFIGHTING

This may be done with little fear towards the hazards from the yellowcake. If possible, avoid breathing yellowcake dust and avoid swallowing it. Yellowcake on the skin or clothing is relatively harmless and simple washing methods will remove it. If you become contaminated with yellowcake, please wait for advice from health officials. To avoid ingestion of uranium, do not eat, drink or smoke while near the spill.

2. CONTACT THE LOCAL LAW ENFORCEMENT AGENCY

Tell the police of the accident with spillage of "LOW SPECIFIC ACTIVITY" (LSA) radioactive material called uranium ore concentrate - "YELLOWCAKE". Ask them to notify the state health department. Give them the location of the accident site and tell them of any injuries to persons.

3. COVER THE SPILLED URANIUM ORE CONCENTRATE

This vehicle carries a box containing four approved dust respirators, respirator user instructions, 1,000 square feet of plastic sheeting, tent stakes, nails, a hammer and a knife. Don a respirator and then cover the spilled material with the plastic. Secure the edges of the plastic to the ground using the tent stakes or to the vehicle floor, etc., using the nails. Bystanders should be instructed to stand upwind of the spill and 25 feet or more from it. Undamaged containers laying on the road may be moved to the side of the road.

4. FILL OUT QUESTIONNAIR ATTACHED

Please obtain all of the information asked for on the attached form. You will need to relay this information to the carrier and the shipper.

5. TELEPHONE THE CARRIER AND SHIPPER (Call Collect)

a) The Trucking Carrier is _____
and his Telephone No. is _____

b) The Shipper is _____
and his Telephone No. is _____

Read the completed questionnaire to whomever answers your calls. If necessary for complete understanding, read the questionnaire a second time.

6. WHEN HELP ARRIVES

Please cooperate with all Civil Authorities and Carrier's and Shipper's personnel who arrive at the scene. Follow their health-safety instructions for checking possible contamination of your clothing or body.

Please be assured that your exposure to this material will be relatively harmless, particularly if you have followed these instructions. The health-safety personnel who will arrive will be glad to answer any questions you have about this matter.

Thank you very much.

EVALUATION QUESTIONNAIRE

1. Name of Truck Driver _____
2. Name of Trucking Company _____
3. Bill of Lading Number _____
4. Destination of Shipment _____
5. Time of Accident _____
6. Place of Accident _____
7. Name of Police Dept. Notified _____
8. Phone No. of Police Notified _____
9. Is the Driver Injured? _____ Others? _____
10. Is the Truck Roadworthy? _____
11. Are Drums Outside of the Truck? _____ How Many? _____
12. Estimate the Number of Square Feet of Spilled Material _____
13. Has the Spill Been Covered? _____
14. Is the Spill on Ground? _____
15. Is the Spill in Water? _____ Lake? _____ Stream? _____
16. Is Spill Near a Building? _____ Sewer? _____
17. Is the Accident Place Lighted at Night? _____
18. Other Comments _____

19. Where Can You Be Reached by Phone? _____
 - (a) Near the Accident Site _____
 - (b) Home or Business Phone _____

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