

# STATE OF COLORADO

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Colorado Department  
of Public Health  
and Environment

May 31, 2006

Amory Quinn, President  
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Subject: **Notice of Violation**

This letter is a Notice of Violation of certain requirements of Title 25, Article 11, CRS, Colorado Radioactive Materials License Number 369-01, and the State of Colorado *Rules and Regulations Pertaining to Radiation Control* (the Regulations).

On March 2, 2006, at approximately 0015 hours, a worker attempted to relieve pressure from a drum of yellowcake that exhibited bulging. The incident occurred in the calciner enclosure, which is a posted airborne area, and has an aggressive ventilation system. The worker was in PPE assigned for the calciner, which included Tyveks and respiratory protection. The respiratory protection device was a 3M brand positive displacement hood with an assigned protection factor of 1,000, and a faceplate with neck seal, rubber gloves and steel-toed rubber boots. The yellowcake product is from peroxide extraction and low-fired calcining, which yields a soluble yellowcake.

It is known that the peroxide extraction method generates O<sub>2</sub> gas. Standard practice is to wait 3 hours prior to capping a drum to allow the chemical reaction to finish, and for heat to dissipate. According to the information provided by the worker, the drum was filled at about 1400 hours, capped at 1700, put back into the calciner and the lid removed at about 2400 (sic).

When the worker loosened the tightening bolt and nut on the sealing ring, an exothermic release occurred, resulting in the lid to fly up in the air, striking the operator on the respirator helmet on the way down. About one half of the drum contents were released to the air. The force of the release defeated the flexible neck shroud used for sealing purposes on the respirator, and as such, his face, ears, eyes, and hair were covered in yellowcake. The worker exited the calciner enclosure, held his breath and ran to an area where he was able to get assistance. He tried to not breath or swallow, and rinsed his mouth out at the first opportunity. The pressure in the yellowcake enclosure forced the gas/yellowcake mixture through the barreling doors and under the entry door. The suspension of yellowcake in the air outside

the yellowcake enclosure resulted in intakes of soluble uranium less than the regulatory limit of 10 milligrams per week by another operator and the personnel engaged in cleanup activities in response to the incident.

Cotter immediately started enhanced bioassay on the affected workers. In addition to urinalysis, an in vivo chest scan at the CDPHE lab facility was done for the affected worker.

Based on the results of the bioassay, the material is soluble. Most likely the worker inhaled about 85% and ingested about 15% of what was in the uptake, based on best fit of the data. Based on current intake retention factors from Potter (2002), the worker did not exceed the weekly limit of 10 mg soluble uranium. The lung scan did not indicate that there was insoluble yellowcake involved.

The root cause type analysis identified less than adequate procedures related to the barrel being capped too soon and the barrel being capped before cool enough (even though they meet the suggested times in Information Notice 99-03). A contributing cause was a less than adequate procedure on zero energy. With respect to the excursion of yellowcake outside the enclosure, contributing causes were sloping floor, wall penetrations not sealed (less than adequate management of change), and a less than adequate design on the barrel swinging doors not being airtight. The containment works adequately under normal operating conditions.

Cotter has identified an issue for future consideration. The chemical reaction may result in a situation where the air is enriched in oxygen. Cotter has installed monitors in the enclosure to ensure that workers not be exposed to an enriched oxygen atmosphere.

As a result of this incident, the following items of noncompliance were identified:

1. License Condition 13.1 of the Order on Consent states that written operating procedures shall be maintained for all routine operations and shall incorporate at a minimum, responsibilities, operating instructions and safety precautions. These include, at a minimum, Cotter's *Radiation Protection Program Procedures*, *Site Safety Manual*, *Site Security Manual*, *Laboratory Procedures Manual*, *Site Liquids and Solid Materials Management Plan*, and the *Quality Assurance Program Plan*.

SH0016 of the Safety Procedures Manual (November 2005) has the following requirements:

"Training programs should be provided as follows:

- Initially when the plan is developed
- For all new employees
- When new equipment, materials, or processes are introduced
- When procedures have been updated or revised
- When experiences/operations show that employee performance must be improved
- At least monthly

Besides the standard training, employees should also be trained in the recognition of hazards. Be able to look at something or someone and know that there is a problem, a list may include:

- Falls from—Floors, Roofs and roof openings, Ladders (Straight and Step), Scaffolds, Wall openings, Tripping, Trenches, Steel Erection, Stairs, Chairs
- Electrical—Appliances, Damaged cords, Outlets, Overloads, Overhead High Voltage, Extension cords, Portable Tools (broken casing or damaged wiring), Grounding, Metal Box's, Switches, Ground fault circuit interrupters(GFCI)
- Housekeeping—Exits, Walkways, Floors, Trash, Storage of Materials (Hazardous and Non-Hazardous), Protruding Nails etc.,
- Fire—Oily-Dirty Rags, Combustibles, Fuel Gas Cylinders, Exits (blocked)
- Trips/Slips—Stairs, Un-even flooring, Electrical cords, icy walkways
- Health—Silicosis, Asbestos, Loss of hearing, Eye injury due to flying objects

Employees trained in the recognition of hazards are less likely to be injured on the job. Overall production will increase, workers compensation insurance will decrease and management/employee relations will be substantially improve.

Training is not just for the worker, but for everyone.”

Contrary to those requirements, and interviews with the shift operator and the worker who opened the drum, bulging was not recognized as a hazard, and was not reported to management. Peroxide extraction is a relatively new process at Cotter, and training must address chemical reactions and exothermic releases. Workers were not adequately trained to recognize that bulging drums could pose a serious hazard. Bulging drums are a well-known hazard, and have been addressed in a variety of documents, including the OSHA Hazardous Waste Response Operations manual (which has a whole chapter on drums), and numerous incidents where DOE has addressed bulging drums.

Cotter shall adequately train workers to be able to reasonably identify potential hazards in the workplace. The Safety Procedures Manual shall be revised to address potential releases of energy from chemical reactions. The Cotter Safety manual has a section on training and recognition of hazards (SU0016), and another section on goals and objectives of training (SU0017). The training shall be improved to include better recognition of hazards in the workplace.

A procedure shall be written that addresses bulging drums.

2. The revised Mill Safety Handbook (November 2005) states:

A most important item of each employee's work is the protection of himself/herself and fellow employees from injury. He/she should at all times consider him/herself a safety inspector and should report immediately to his/her supervisor any dangerous conditions or practices that come to his/her attention. Corrective measures will be taken as rapidly as possible.

“FAMILIARIZE YOURSELF WITH THESE RULES AND OBEY THEM; THE COMPANY WILL NOT RETAIN CARELESS EMPLOYEES, BECAUSE THEY ARE NOT ONLY A HAZARD TO THEMSELVES, BUT ALSO TO THEIR FELLOW EMPLOYEES. THE VIOLATION OF ANY OF THESE RULES IS SUFFICIENT REASON FOR DISCIPLINARY ACTION AND/OR DISCHARGE.”

Mr. Amory Quinn  
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Contrary to this requirement, the worker and shift operator failed to notify management that the drum had bulged, and was being moved back into the calciner enclosure.

Workers shall report any dangerous conditions or practices that come to his/her attention to management so that appropriate evaluations may be made.

The Cotter Safety Handbook states "Each employee must report promptly to his/her supervisor any defective equipment, unsafe condition or act, injury, or accident." Workers shall be retrained on this requirement.

Your written response must be submitted within thirty (30) days of receipt of this letter and must include: (1) a detailed description of the corrective actions which have been taken to achieve compliance; (2) plans to achieve compliance with the requirements which cannot be remedied within thirty (30) days; and (3) other relevant information. Any proposed compliance schedules or plans to achieve full compliance after thirty days must specifically include implementation deadlines for each of the key components of the plan. If these deadlines are not met, this will provide the Division a basis, without further notice, to institute proceedings for suspension, revocation or modification of your license, as provided in RH 3.23 of the Regulations.

As required by RH 10.2 of the Regulations, this notice must be posted so as to permit individuals engaged in licensed activities to observe it on the way to or from any particular licensed activity location to which the document applies. Any acknowledgment to this report by the licensee shall be posted within five (5) working days after dispatched by the licensee. Such documents shall remain posted for a minimum of five (5) working days or until actions correcting the violations have been completed, whichever is later.

If you have any questions concerning this letter, please contact Mr. Phil Egidi of this Division at (970) 248-7162.



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