RELATED TERMS

- Cesium-137 Release
- Goiânia, Brazil
- Recovery

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LESSON LEARNED

PRIMARY DISCIPLINES

- Emergency Management
- Hazardous Materials
- Environmental Protection

Radiological Incident Response: Establishing a Temporary Storage Site for Contaminated Material

SUMMARY

In September 1987, an accidental release of Cesium-137 (Cs-137) in Goiânia, Brazil, caused the second largest nuclear accident after Chernobyl. Goiânia's decontamination created approximately 40 tons of radioactive waste material. Brazilian authorities had to establish a temporary storage site for radiologically contaminated materials from the beginning of incident response.

DESCRIPTION

On September 13, 1987, two men stole an orphaned radiotherapy unit source from an abandoned clinic in downtown Goiânia, Brazil. The unit consisted of approximately 20 grams (1,375 curies) of Cs-137 in the form of cesium chloride salt. The men were not familiar with the international radiation symbol and did not know that the source was radioactive. They dismantled the unit and sold it to a junkyard as scrap metal. In the process, they ruptured the container and released the cesium, contaminating themselves, family members, and the environment. A number of people became fascinated by the radioactive powder that glowed blue and rubbed it on their skin.

Goiânia is the capital of the Brazilian state of Goias. The city is located 1,000 miles from Rio de Janeiro and 600 miles from Sao Paulo. It had approximately 1 million inhabitants at the time of the incident. The incident occurred in one of the poorest sections of the city, where adult literacy was limited.

On September 29th, the junkyard owner's wife grew concerned about her sick relatives and took a bag of the powder to the local hospital by bus, contaminating additional people and facilities in the process. A local physician recognized the symptoms of acute radiation syndrome and alerted the Comissão Nacional de Energia Nuclear (National Nuclear Energy Commission), or CNEN. After realizing the severity of the incident, CNEN requested help from the International Atomic Energy Agency (IAEA).

Contaminated items included 50,000 toilet paper rolls and gift wrap, banknotes, typewriters, bicycles, tires, sanitation systems, hospital materials, city busses, and more than fifty private cars. A number of contaminated pets and pigs had to be put down.

Goiânia's decontamination created 3,500 cubic meters (approximately 40 tons) of radioactive waste materials. A health physics team was selected to supervise the disposal of radioactive waste from the beginning of incident response. The team was charged with recording information such as the waste's origin, physical form, combustibility, external dose rates, etc.

Goiânia's radioactive materials were sealed into a total of 3800 drums, 1400 boxes, 10 metal containers, and six cylindrical containers with 200 mm reinforced concrete walls. The containers were transferred to a site located 20 km from Goiânia in convoys escorted by the police. Health physicists trained to manage radiological emergencies accompanied each shipment. The dose rate from each package was measured before shipment to verify that it was free of contamination. The trucks employed were also monitored at the end of each trip to ensure that there was no residual contamination.

The selected waste site was meant to store the radioactive materials for up to two years, while a permanent repository was prepared. Armed guards patrolled the premises around the clock. Emergency response organizations built six semi-absorbent concrete platforms to accommodate the waste containers and retain contamination spills. The most radioactive packages were placed in the center of each platform to minimize dose rates in the access corridors and at the security fence. The containers were covered with plastic sheets to protect them from rainfall. Each receptacle was numbered and its content described on an inventory card.

Boxes and Drums of Waste Stacked and Covered at the Temporary Storage Site
(From: IAEA Report, *The Radiological Accident in Goiânia*. 16 Sep 1988.)

A monitoring system was created to screen workers, soil, vegetation, surface water, sediments, and air at all times. Thermoluminescent dosimeters were employed at the security fence. A sampling system was also set up to monitor water dripping from the platforms during thunderstorms. Several barriers and a small embankment were built to slow the draining water flow and increase the absorption of Cs-137 within the depository area.

Temporary Storage Site: Showing Concrete Bases with Runoff Sampling Channels.
(From: IAEA Report, *The Radiological Accident in Goiânia*. 16 Sep 1988.)

CITATION

International Atomic Energy Agency. *The Radiological Accident in Goiânia*. 16 Sep 1988. https://www.llis.gov/member/secure/detail.cfm?content_id=12310

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