10 CFR 50.59

SAFETY ANALYSIS REVIEW

OPERATION OF THE SUPER COMPACTOR

BY

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR STATION

CODE OF FEDERAL REGULATIONS 10 CFR 50.59

This section of the Code of Federal Regulations contains the following requirement:

"The licensee shall maintain records of changes in the facility and of changes in procedures made pursuant to this section, to the extent that these changes constitute changes in the facility as described in the safety analysis report or to the extent that they constitute changes in procedures as described in the safety analysis report. The licensee shall also maintain records of test and experiments carried out pursuant to paragraph (a) of this section. These record must include a written safety evaluation which provides the bases for the determination that the change, test, or experiment does not involve an unreviewed safety question."

SUPERPACK SYSTEM DESCRIPTION

The Superpack unit is an ultra high pressure super compaction system designed for the processing of nuclear power plant low-level dry active wastes. This unit is capable of significantly reducing the volume of such waste material through compaction thereby reducing the final disposal volume by a factor in excess of 3 for normal waste material, when compared to present plant methods. This methodology, therefore, benefits the company's operational expenses associated with waste disposal and reduces the final national disposal volume which would have to be committed to this low-level waste material.

The Superpack system is designed as two distinct and separable components. A Hydraulic Press which can develop a compressive force of 2200 tons and a Hydraulic/Control Module which houses the hydraulic motive system and the operational control console. During normal operations the Hydraulic/Control Module is mounted directly to the rear of the Press compartment on the lowboy. Transportation is conducted with the units separated and individually moved by their own tractor. This arrangement provides a compressive machine with the maximum force, yet allows the unit to be transportable.

The Super Compactor is a vertical stroke hydraulically driven press. The Northern States Power (NSP) machine is designed to process 52 and 55 gallon drums of precompacted dry active waste material. Input drums are placed on a motor drive conveyor system by means of a jib crane provided with the unit. At this point the operator verifies that the system is ready for processing and visually inspects the press area through the viewing window in the operating compartment. The operator then initiates the compression process by:

- Opening the press mold (clamshells);
- Opening the air lock doors;
- Energizing the conveyor motors to deliver a drum to the center of the press;
- Closes the press mold;
- Closes the air lock doors;
- Initiates the compression stroke.

This process is reversed to extract the crushed drum from the press. It should be pointed out that the press is designed with a dual speed compression stroke. The initial movement is rapid and it continues until a set compressive resistance is reached. At this point, the hydraulic system automatically shifts to a slower high pressure stroke. This compression stroke continues until the maximum force of 2200 tons is reached.

After the operator removes the pellet from the press via the exit conveyor it is placed into a 55 gallon overpack drum. Once the drum is filled with such pellets, 3 to 5 under normal conditions, the drum is sealed and placed in storage awaiting final shipment and disposal.

The Superpack is equipped with two important auxiliary systems to protect against the spread of contamination. The first is a HEPA Filtration System. This system is required to be fully operational whenever the press is in operation. This system maintains a slight negative pressure within the press compartment throughout the operating cycle. Air is withdrawn from the annular space immediately above the clamshell mold. The air is delivered to a roughing filter and then to a final HEPA filter prior to being discharged to the outside environment. The positioning of the suction piping and sizing of the fan assures proper control over the spread of airborne contamination.

The second contamination control system provided with the Superpack is the Liquid Drainage System. Although normal material being processed through this unit will be dry by definition, there does exist a possibility of liquids being present within the input drums. The drainage system collects liquid pressed from these drums and delivers it to a temporary holding tank.

SAFETY ANALYSIS

The Superpack system is specifically designed for the processing of dry low-level radioactive waste materials. The following codes and standards were adhered to in the fabrication and assembly of the NPS unit:

- NFP (A) Hydraulic Standard - National Fluid Power Assc.;
- National Electrical Code - 1984 - National Fire Protection Assc. No. 70-1984;
- AWS D1.1-80 American Welding Society Structural Welding Code;
- NEMA MG1 - 1978 - Motors and Generators

In performing this analysis the following failures were examined to determine if an unreviewed safety question was created by the operation of the Supercompactor system. Included in this review were the following:

- Failure of the HEPA Filtration System;
- Failure of the Liquid Drainage System;
- Hydraulic and Electrical Fire Potential.

FAILURE OF THE HEPA FILTRATION SYSTEM (WHILE AT SPC)

The air collection and filtration system is required to operate whenever the press is in service. Loss of the HEPA filtration pressure upon the HEPA filtration media will automatically shut down the hydraulic system through control system interlocks.

The most creditable HEPA system failure involving the release of radioactivity is based upon rupture of the HEPA filtration media. The nuclides present in the low level uranium waste contained in the drums to be compacted are those commensurate with low enriched fuel fabrication; i.e. ^{238}U, ^{235}U, and ^{234}U. We assumed that the HEPA filter failed over one compaction cycle of 60 seconds and that 1% of the allowed 100 g ^{235}U of 3% enriched UO_2 contents of one drum was released. Therefore:

1 g ^{235}U at 3% enrichment = 33 gU
33 gU at 3% enrichment = 69 μCi

Assuming the release takes place 200 m from the plant boundary and that a person lived and produced his vegetables, meat, and milk at the boundary, the dose he would receive is 0.4 mrem/yr. This dose was calculated using COMPLY.

Such a dose is 0.4% of the 10 CFR 20 limit. Failure of the HEPA filter system will, therefore, not produce airborne uranium concentrations which would result in exceeding dose limits.

FAILURE OF THE LIQUID COLLECTION SYSTEM

Dry active waste material by definition contains only a small fraction of liquid waste. It is estimated that the maximum volume of liquid which could be expected in a input drum is approximately 5 gallons of such material. Failure of drainage system would result in the overflowing of the collection channel. This liquid would proceed to the air lock door area and possibly a small quantity could flow from the lowboy under such a failure condition. Such a failure would be immediately detected by the operating crew due to the close proximity to the flow path, the press operator has direct visual contact to the press area and waste drum handlers are located at the input and exit doors of the press compartment for material movement. It is not creditable that the failure of the liquid drainage system could create a site boundary problem or an unreviewed safety question.

HYDRAULICAL AND ELECTRICAL FIRES

The Superpack system like any hydraulic unit has principally two sources of combustible materials, the hydraulic fluid and the electrical cable and plastic components. There are several design features that reduce the potential for such fires to an extremely low level. First, the hydraulic fluid is maintained at all time below 150° F by means of an air/hydraulic fluid heat exchanger. This important parameter is continuously monitored and is interlocked to the control system for immediate system shutdown should this value be exceeded. Additionally, two leak detection switches are positioned to immediately detect hydraulic fluid leakage. And finally, the hydraulic pumping system is physically separated from the waste processing area of the press. This separation provides additional time to bring any such fire under control without exposing the contaminated area to the fire.

Electrical fire rated extinguishers are provided in the main control area adjacent to the main electrical cabinet. Operating personnel are instructed to immediately notify the Control Room upon the detection of any fire.

CONCLUSION

A safety analysis performed related to the operation of the Superpack compaction system concludes that this equipment and its operation does not constitute an unreviewed safety question to Northern States Power Co. in the operation of its Prairie Island Nuclear Station.

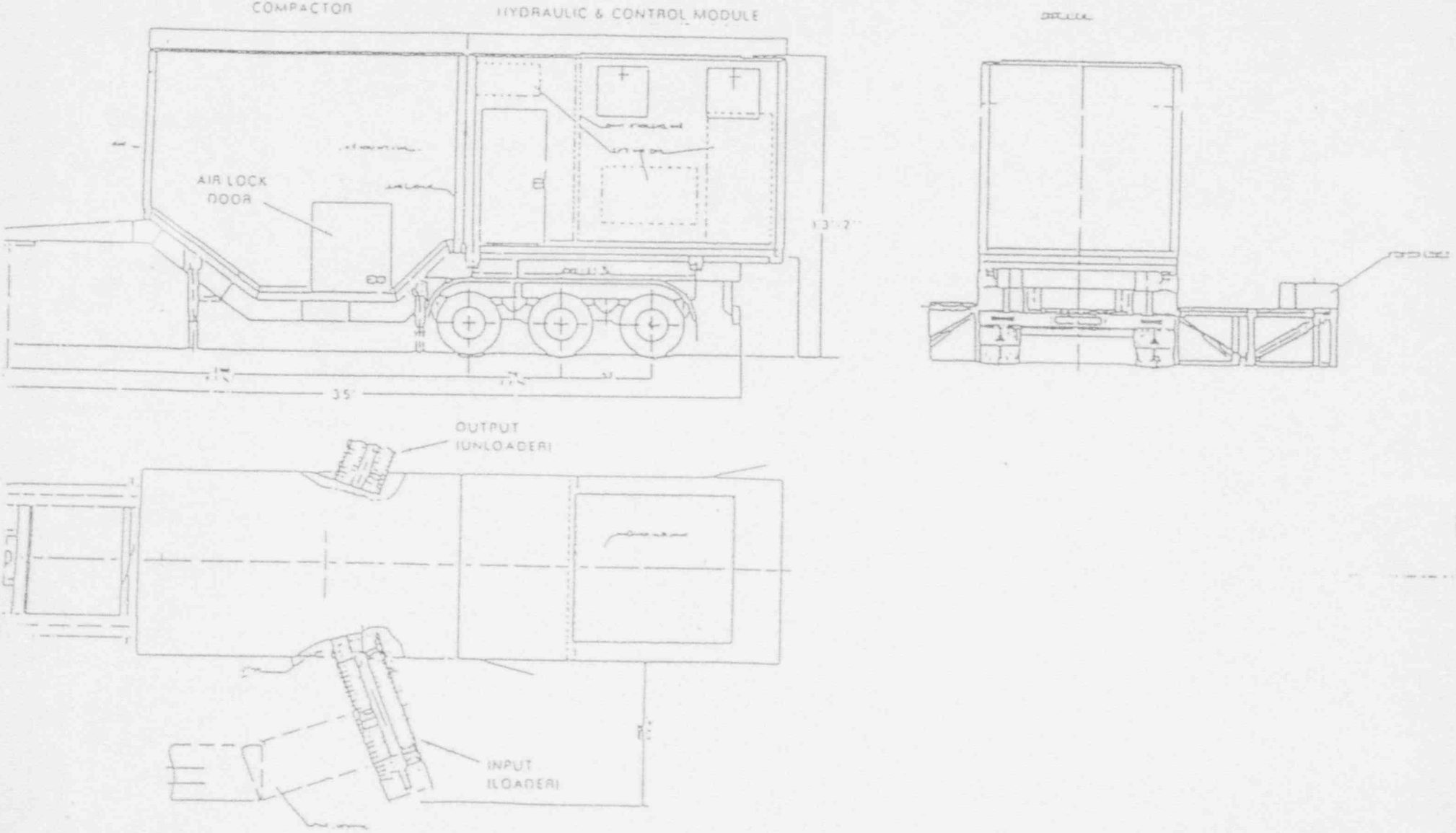
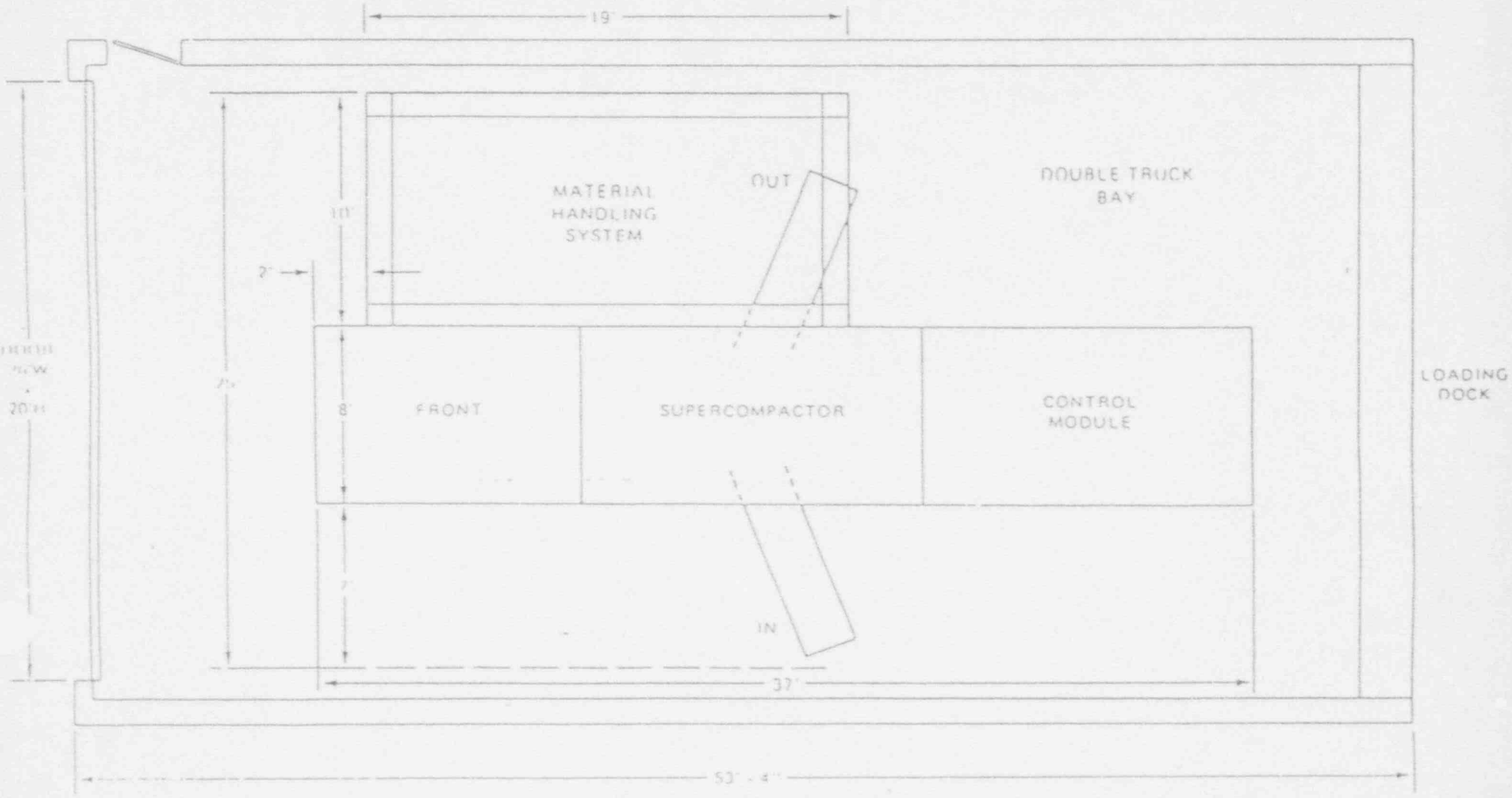


Figure 1. Supercompactor

TYPICAL LOWBOY ARRANGEMENT OF SUPERPACK™



TYPICAL SETUP IN LOADING DOCK

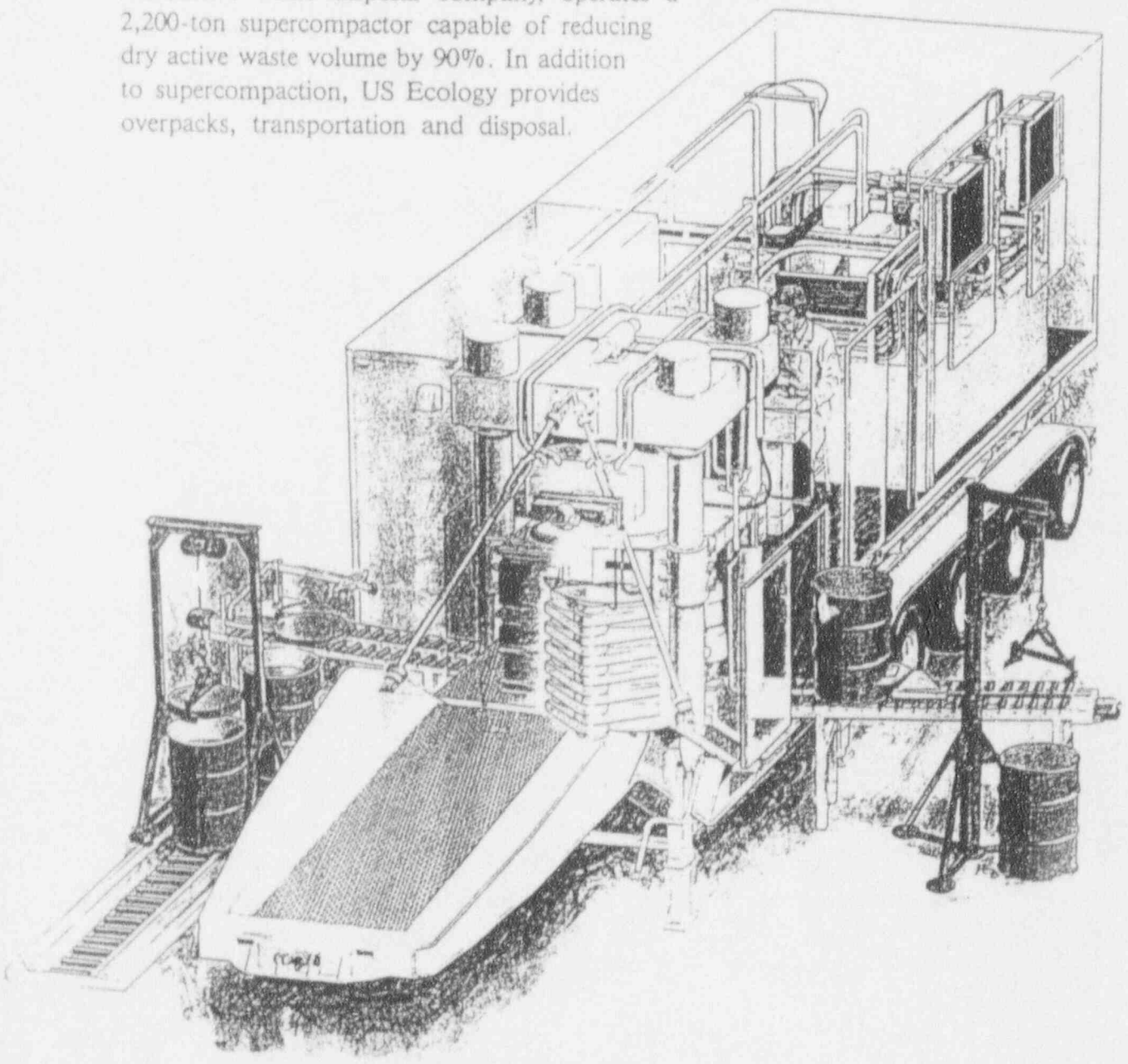
USEcology

an *American Ecology* company

Supercompaction

For Volume Reduction of Dry Active Waste

US Ecology, Inc., a hazardous waste and low-level radioactive waste disposal company, operates a 2,200-ton supercompactor capable of reducing dry active waste volume by 90%. In addition to supercompaction, US Ecology provides overpacks, transportation and disposal.



PART I - LICENSE CONDITIONS

REV.

TABLE I-1.1 Specific Locations of Authorized Activities (Cont.d)

Location	SNM	Authorized Activity
Packaged Waste Storage Areas	Uranium Compounds (up to 19.99 wt% U-235)	Outside storage of contaminated materials (including low level waste and incinerator ash) which are packaged, sealed, labeled and externally free of contamination.
Process Chemical Waste Storage Lagoon System	Uranium Compounds (up to 5 wt% U-235)	Transfer, mixing, sampling, storage and solar evaporation of contaminated liquid wastes.
Retention Tanks	Uranium Compounds (up to 5 wt% U-235)	Interim storage of potentially contaminated liquid wastes.
High Uranium Solids Pond	Uranium Compounds (up to 5 wt% U-235)	Transfer of uranium bearing solids, leaching for uranium recovery.
Solids Trench	Uranium Compounds (up to 5 wt% U-235)	Transfer and storage of contaminated solids awaiting leaching or burial.
Lagoon Uranium Recovery	Uranium Compounds (up to 5 wt% U-235)	Recovery of uranium from waste solutions.
Ammonia Recovery Facility	Uranium Compounds (up to 5 wt% U-235)	Removal and recovery of ammonia from uranium contaminated liquid wastes.
Lagoon 5A IX Process-ARF Bldg.	Uranium Liquid Wastes (up to 5 wt% U-235 and less than 140 gU/ℓ concentrations in filters and resins)	Filtration and ion exchange of uranium liquid wastes.
Any permanent or portable building having HEPA filtration and isokinetic sampling.	Uranium solid waste (up to 5 wt% U-235)	Sorting and compaction.

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