2. FACILITY DESCRIPTION

2.1 Introduction

The information presented in this chapter is of sufficient depth and breadth to allow an independent reader to develop an understanding of the structure and operation of the Radioactive Waste Management Complex (RWMC). This information does not establish or present functional requirements or performance criteria. Where applicable, functional requirements and performance criteria are established in other chapters.

Information presented in this chapter includes the following:

- A brief overview of the facility, including its mission and history
- A description of the facility structure and design basis
- A description of the facility processes, systems, equipment, instrumentation, and controls
- A description of facility confinement systems
- A description of facility safety-support systems
- A description of facility auxiliary systems and support facilities.

NOTE: *More detailed and current information should be obtained from RWMC System Descriptions and Procedures.*

As established in Chapter 3, there are no safety class structures, systems, or components (SSCs) at the RWMC.

2.2 Requirements

2.2.1 Federal Requirements

U.S. Department of Energy (DOE) Order 420.1, "*Facility Safety*," October 1996.

2.2.2 State and Local Requirements

Final HWMA Storage Permit for the Radioactive Waste Management Complex on the Idaho National Engineering Laboratory, EPA-ID No. 4890008952, September 1996.

2.2.3 Design Codes, Standards, and Regulations

As discussed later in this Chapter, some RWMC facilities have been in existence for over 40 years. The codes, standards, and regulations utilized as design criteria have changed significantly during this period. The basic design documents implemented for new SSCs are listed in Table 2-1. Because some of the buildings and structures at RWMC were built before the development of DOE Order 420.1, it may not be sufficient to reference the design criteria and construction specifications used to build the facilities.

The design and construction dates for all major structural features at the RWMC have been located. Knowledge of the design date makes it possible to determine the edition of codes and/or standards used during design and construction.

Each building at the RWMC was designed and constructed in accordance with the applicable codes and standards in effect at the time. Changes to codes and standards and changes of management direction relating to the design and construction of the major features of the RWMC are summarized in Figure 2-1. Specific design criteria for the major structures are summarized in Table 2-2.

Figure 2-1 shows the history of three Federal agencies that have been responsible for Idaho National Engineering and Environmental Laboratory (INEEL) operations over the years: the Atomic Energy Commission (AEC) from 1949 until January 19, 1975; the Energy Research and Development Administration from January 19, 1975, until October 1, 1977; and the DOE from October 1, 1977, to the present.

Codes and standards used for the design of RWMC buildings are also shown in Figure 2-1. There were two revisions of the AEC Manual Appendix 6301, *General Design Criteria - Engineering Handbook*: one dated May 8, 1963, and the other dated November 20, 1972. Additionally, several sections, dated December 23, 1965; August 7, 1967; and January 16, 1968, were added to Appendix 6301 of the original AEC Manual. They were also reprinted on December 6, 1968. ERDA Manual Appendix 6301 was issued March 25, 1977. A draft of DOE Order 6430, *General Design Criteria Manual*, was issued June 6, 1981, and the final version, DOE Order 6430.1, *General Design Criteria Manual*, was issued December 12, 1983. A draft of DOE Order 6430.1A, *General Design Criteria*, was issued December 25, 1987, and the final version was issued April 6, 1989. In October 1995, DOE Order 420.1, *Facility Safety*, canceled Division 13 of DOE Order 6430.1A.

Six contractors have operated the RWMC facilities; Phillips Petroleum from 1953 to 1967, Idaho Nuclear from 1967 to 1972, Aerojet Nuclear from 1972 to 1976, EG&G Idaho from 1976 to 1994, Lockheed Martin Idaho Technologies Company (LMITCO) from 1994 to 1999, and Bechtel BWXT, LLC (BBWI) from 1999 to the present.

2.3 Facility Overview

The RWMC is located in the southwest corner of the INEEL (see Chapter 1). It is a (165-acre) controlled-access area with facilities and equipment to manage low-level radioactive waste (LLW), transuranic (TRU) waste, and mixed solid radioactive waste generated by INEEL operations and other offsite DOE operations. An 8-ft high chain link fence, with three barbed wire strands on top completely encloses the RWMC.

Table 2-1. Basic design documents for structures, systems, and components.

Applicable Code, Standard, Order, Reference	Architectural and Structural	Heating, Ventilation, and Air Conditioning	Cranes and Hoists	Mechanical Equipment and Piping Systems	Electrical Systems	Instrumentation	Communications and Alarms
DOE Order 420.1	X	X	X	X	X	X	X
University of California Research Laboratories-15910	X	-					
Uniform Building Code	X	-		X			
American Concrete Institute	X	-					
National Fire Protection Association	X	X		X	X	X	X
DOE Hoisting and Rigging Handbook	-		X				
INEEL Welding Manual	X			X			
Institute of Electrical and Electronic Engineers	-				X	X	
American Society of Heating, Refrigeration, and Air Conditioning Engineers	-	X					
DOE-ID[a] Architectural Engineering Standards	X	X	X	X	X	X	X
UL Standards	-			X	X		X
Instrument Society of America Standards	-			X	X	X	
National Electrical Code	-			X	X	X	X

a. ID and DOE-ID refer to the DOE Idaho Operations Office.

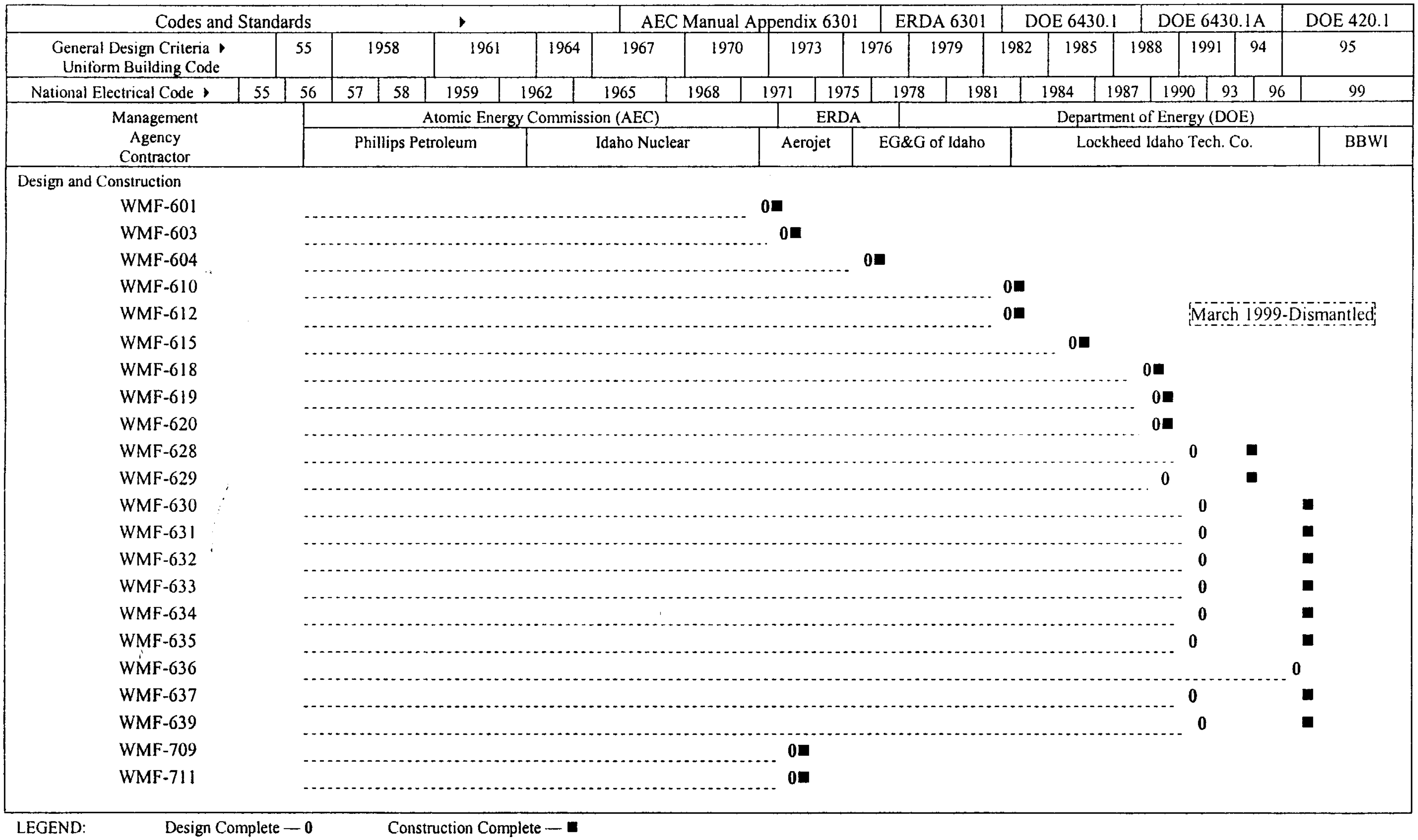

Figure 2-1. RWMC history.

'able 2-2. Wind and earthquake design criteria for major structures at RWMC.

	WMF-601	WMF-603	WMF-604	WMF-610	WMF-612	WMF-615	WMF-618	WMF-619	WMF-620
Design release date	11-72(A)	5-74(A)	7-77(E)	11-83(A)	9-83(A)	4-86(A)	5-88(A)	8-88(A)	12-88(A)
Construction completion date	1973(P)	1974 (P)	11-77(E)	1984(P)	1984(P)	9-86(H)	1988(P)	1989(P)	1-89(H)
University of California Research Laboratories 15910 criteria (5)(N)	2	1	1	1	3	3	1	1	1
Uniform Building Code edition	1970(F)	1973(F)	1976(E)	MBMA	1982(F)	1982(I)	1985(F)	1988(F)	1988(F)
Earthquake									
Original criteria									
Seismic zone	3(G)	3(G)	3(E)	2(I)	2(G)	2(I)	3(I)	2B(G)	2B(G)
1991 UBC									
Seismic zone	2B	2B	2B	2B	2B	2B	2B	2B	2B
Wind									
Original criteria	108 mph(E)	(Q)	88 mph(E)	88 mph(K)	(Q)	80 mph(I)	80 mph(I)	(Q)	88 mph(J)
UCRL 15910 criteria	84 mph(L)	84 mph(L)	84 mph(L)	84 mph(L)	95 mph(L)	95 mph(L)	84 mph(L)	84 mph(L)	88 mph(M)

	WMF-628	WMF-629	WMF-630	WMF-631	WMF-632	WMF-633	WMF-635	WMF-637
Design release date	4-92(A)	7-91(A)	7-93(A)	7-93(A)	7-93(A)	11-93	5-92	6-92
Construction Completion Date	4-94(P)	4-94(P)	9-95(H)	9-95(P)	9-95(I)	9-95	8-95	3-95
UCRL 15910 Criteria	1	1	1	1	1	1	1	1
UBC Edition	1991(F)	1991(F)	1991(F)	1991(F)	1991(F)	1991(F)	1991(F)	1991(F)
Earthquake								
Original Criteria								
Seismic Zone	2(G)	2(G)	2(G)	2(G)	2(G)	2(G)	2(G)	2(G)
1991 UBC								
Seismic Zone	2B	2B	2B	2B	2B	2B	2B	2B
Wind								
Original criteria	84 mph	84 mph	84 mph	84 mph	84 mph	84 mph	84 mph	84 mph
UCRL 15910 criteria	84 mph	84 mph	84 mph	84 mph	84 mph	84 mph	84 mph	84 mph

	WMF-639	WMF-709	WMF-711	WMF-727	WMF-636
Design release date	1993	2-75(A)	3-75(A)	1993	1993
Construction completion date	1995	75(P)	1975(I)	1995	1997
UCRL 15910 criteria (5)(N)	1	1	1	1	1
UBC edition	1991	NFPA(E)	1973(F)	1991	1991(F)
Earthquake					
Original criteria					
Seismic zone	2	3(E)	D	2	2(G)

	WMF-639	WMF-709	WMF-711	WMF-727	WMF-636
1991 UBC					
Seismic zone	2B	2B	D	2B	2B
Wind					
Original criteria	84 mph	108 mph(E)	80 mph(I)	84 mph	84 mph
UCRL 15910 criteria	84 mph	84 mph(L)	84 mph(L)	84 mph	84 mph

1 = 10^{-3} annual Hazard Exceedence Probability

2 = 5×10^{-4} annual Hazard Exceedence Probability

3 = 10^{-4} annual Hazard Exceedence Probability

A. Date shown is "issued for construction" date recorded on facility drawings.
B. Not used.
C. Information found in Functional and Operational Requirements document.
D. Air support structure. Earthquake criteria do not apply.
E. Information taken from the RWMC Facility Design description.
F. Date based on design release date.
G. Value based on uniform building code criteria.
H. Information obtained from subcontract documents.
I. Information obtained from A-E Construction Specification, Section III. Documents located in Subcontract or RWMC Project Files.
J. Information obtained from RWMC Project files.
K. Value based on MBMA "Design Practices Manual."
L. June 1990 version, Table 5-1, exposure C.
M. Information obtained from INEEL architectural and engineering (A&E) Specification, Appendix K.
N. September 1992 Draft Version, Rev. 2.
O. Estimate, based on Design Release date.
P. Information not available.

The primary mission of RWMC is to safely dispose of INEEL-generated LLW and to temporarily store TRU waste, which will be shipped to the Waste Isolation Pilot Plant (WIPP) at Carlsbad, New Mexico, or other designated storage facilities. To fulfill this mission, the RWMC maintains several types of facilities, administrative areas, storage areas, and disposal areas. An overall map of the RWMC is presented in Figure 2-2.

Before startup of the first nuclear reactors at the INEEL (formerly called the National Reactor Testing Station) in 1951, the need was recognized for disposing of solid radioactive waste originating with Atomic Energy Commission (AEC) operations.

Because the geology and hydrology of a site have important effects on the condition and containment of disposed waste at that site, the United States Geological Survey (USGS) was consulted in selecting the disposal site. The USGS recommended an area of greater than 90-acres in the southwestern corner of the INEEL as a suitable site for disposal operations. A 12-acre tract at this site was selected as the National Reactor Testing Station Burial Ground. Disposal of solid radioactive waste began in 1952. During 1957, the disposal area was expanded to its present size, approximately 96.8 acres, by enclosing an adjacent site.

In 1953, the AEC decided that solid radioactive waste from its fabrication Rocky Flats Plant near Golden, Colorado, would be sent to the INEEL for disposal. The first shipment of boxes and drums was received from Rocky Flats in 1954. The waste, which contains TRU nuclides (principally plutonium), was stacked in pits and covered with earth. Between 1963 and 1969, the waste was dumped at random into pits and trenches to reduce both labor problems and the risk of injury to the personnel who handled heavy waste containers.

In 1960, the INEEL was designated as one of two national interim burial grounds for disposal of radioactive waste from any source. Although waste was received from many sources, most of the TRU waste received at the INEEL was from Rocky Flats. The "national" designation of the operations was discontinued in 1963 when commercial disposal facilities for radioactive waste became available.

In 1962, technical operation of the RWMC was transferred from the Idaho Operations Office of the AEC to the major operating contractor at the INEEL, Phillips Petroleum Company. In 1966, Idaho Nuclear Corporation assumed responsibility for technical operation of the RWMC. In 1971, that responsibility was transferred to Aerojet Nuclear Company.

In 1970 the AEC directed that all waste contaminated with TRU isotopes be segregated from other types of radioactive waste because of the radiotoxicity and long half-lives of the TRU material. The TRU waste was to be stored in a readily retrievable manner, during an interim storage period of 20 years. When a federal repository became available, this waste was to be retrieved and sent for long-term isolation. Several methods of providing interim TRU waste storage were considered feasible for compliance with the new AEC regulations. An abovegrade (aboveground) storage method was adopted.

The Transuranic Storage Area (TSA) was located adjacent to the 96.8-acre disposal tract in an area where the shallow depth of the soil above the basalt precluded efficient use of the area for burial operations. The 57.5-acre TSA contains asphalt pads used to store TRU contact-handled waste aboveground. The Intermediate Level Transuranic Storage Facility (ILTSF) was built within the TSA in 1976 to store remote-handled TRU waste.

In 1974, a railroad spur to the TSA was completed to permit direct shipment of waste to the RWMC. In 1975, the Energy Research and Development Administration, which replaced the AEC, assumed responsibility for managing radioactive waste at the INEEL. In 1976, EG&G Idaho, Inc., assumed responsibility for technical operation of the RWMC. In 1977, the DOE replaced the Energy Research and Development Administration as the organization responsible for managing radioactive waste at the INEEL. In 1994, Lockheed Idaho Technologies Company assumed responsibility for technical operation of RWMC. In 1999, Bechtel BWXT, LLC (BBWI) assumed responsibility for technical operation of RWMC.

Processes and operations addressed in this Safety Analysis Report include the following:

- Waste receiving
- Waste monitoring
- Waste shipping
- Waste disposal
- Waste storage
- Waste drum venting
- Waste examination and certification
- Waste overpacking
- Waste loading and unloading
- Environmental radiological monitoring
- Shielded cask operations.

2.4 Facility Structure

Facilities located at the RWMC include the following:

- The Subsurface Disposal Area (SDA[a]) used for permanent disposal of LLW (TRU waste received before 1970 was also buried in the SDA)
- The TSA used for TRU waste examination, segregation, certification, interim storage, and retrieval activities
- The Administrative Area
- The Operations Area.

The layout of the RWMC and its facilities is shown in Figure 2-2; the areas and facilities are described in the following paragraphs. A floor plan, including the location of constant air monitors (CAMs) and remote area monitors (RAMs), used for monitoring radioactivity, is provided for each major structure.

2.4.1 Subsurface Disposal Area (SDA)

The SDA is a 96.8-acre tract of land located in the western portion of the RWMC. The purpose of the SDA is to provide permanent disposal of solid LLW generated at the INEEL. The area includes Pad A (formerly the Transuranic Disposal Area), trenches, soil vaults, and pits used for disposal of LLW. Dikes and drainage channels are appropriately located to protect the SDA from flooding in the event of heavy rainfall or snowmelt. Figure 2-3 shows the SDA and relevant soil vaults, pits, and trenches. The trenches are approximately 2-m (6.5-ft) wide, 275-m (902-ft) long, and an average of 4-m (13-ft) deep. The pits are 30-m (98.5-ft) wide, 4-m (13-ft) to 10-m (32-ft) deep, and vary in length from 60 m (197 ft) to 360 m (1,181 ft).

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[a] RWMC operations/facilities do not include the Pit 9 project.

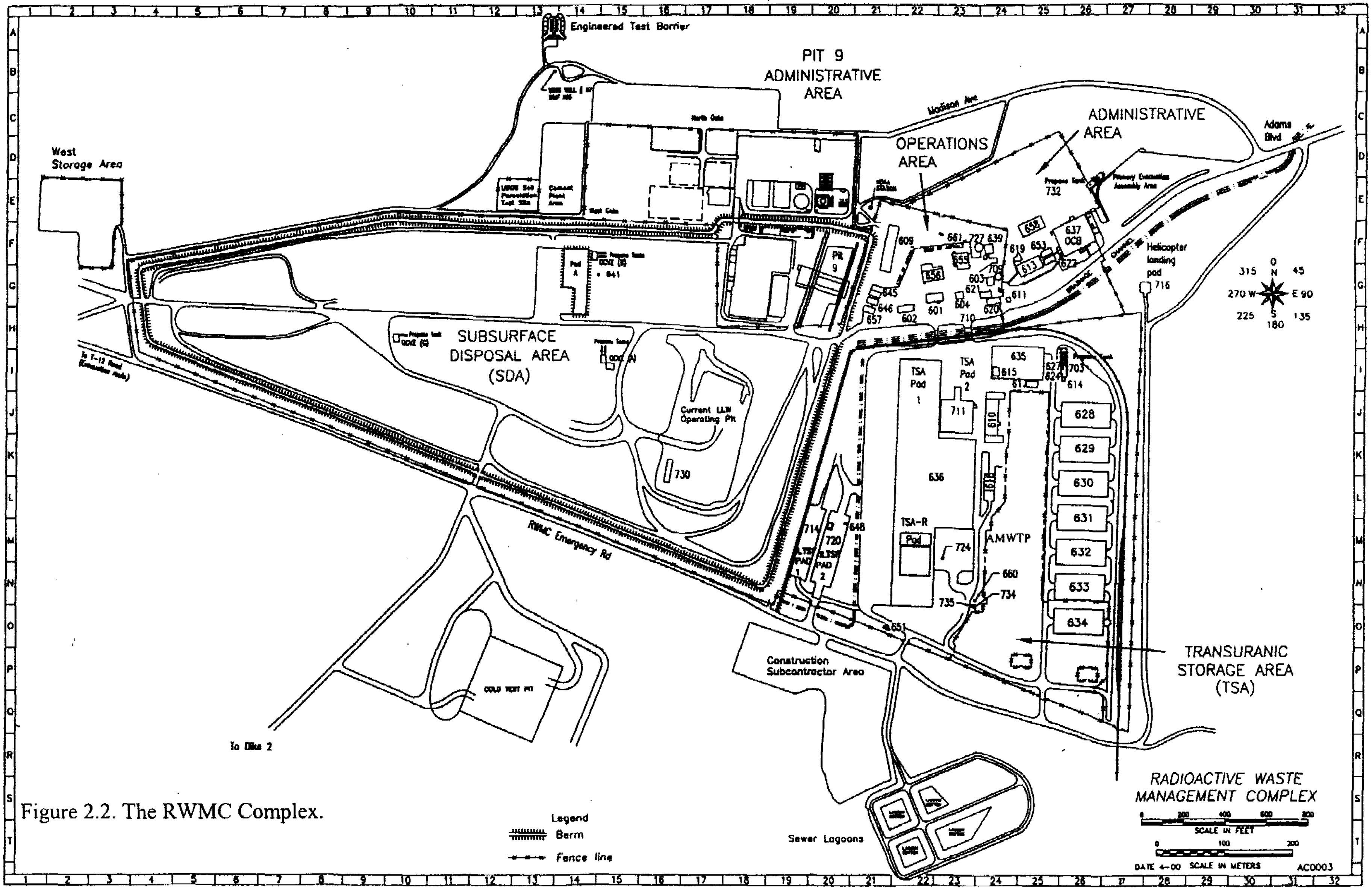


Figure 2.2. The RWMC Complex.

Pad A is an aboveground pad, approximately 243-ft wide x 328-ft long, constructed of a 3-in. thick asphalt surface over a 4-in. gravel base. The waste on Pad A has been completely covered; the pad is no longer used for aboveground disposal.

Several Environmental Restoration activities are underway in the SDA. These activities are discussed in Section 2.9.3.

2.4.1.1 Contact-Handled Low-Level Waste (CH LLW). Solid low-level, beta-gamma-contaminated wastes with radiation levels below 500 mR/h at 1 m from the waste package surface are buried in Pits 17 through 20. The package typically used for CH LLW disposal is a plywood box, 4 x 4 x 8 ft. Larger bulky items may simply be wrapped in heavy gauge, 0.15-mm polyethylene sheets.

In general, CH LLW arrives by unshielded truck/trailer from other INEEL operating areas or from offsite. The shipments are received, visually inspected, and transported to the disposal pit within the SDA. The CH LLW packages are transferred from the truck/trailer to the waste stack using forklifts and similar types of equipment. On occasion, waste packages of unusual size or shape are received and disposed of using special procedures. Personnel exposures are minimized because personnel remain at an optimal distance from the packages and time is reduced to the minimum required.

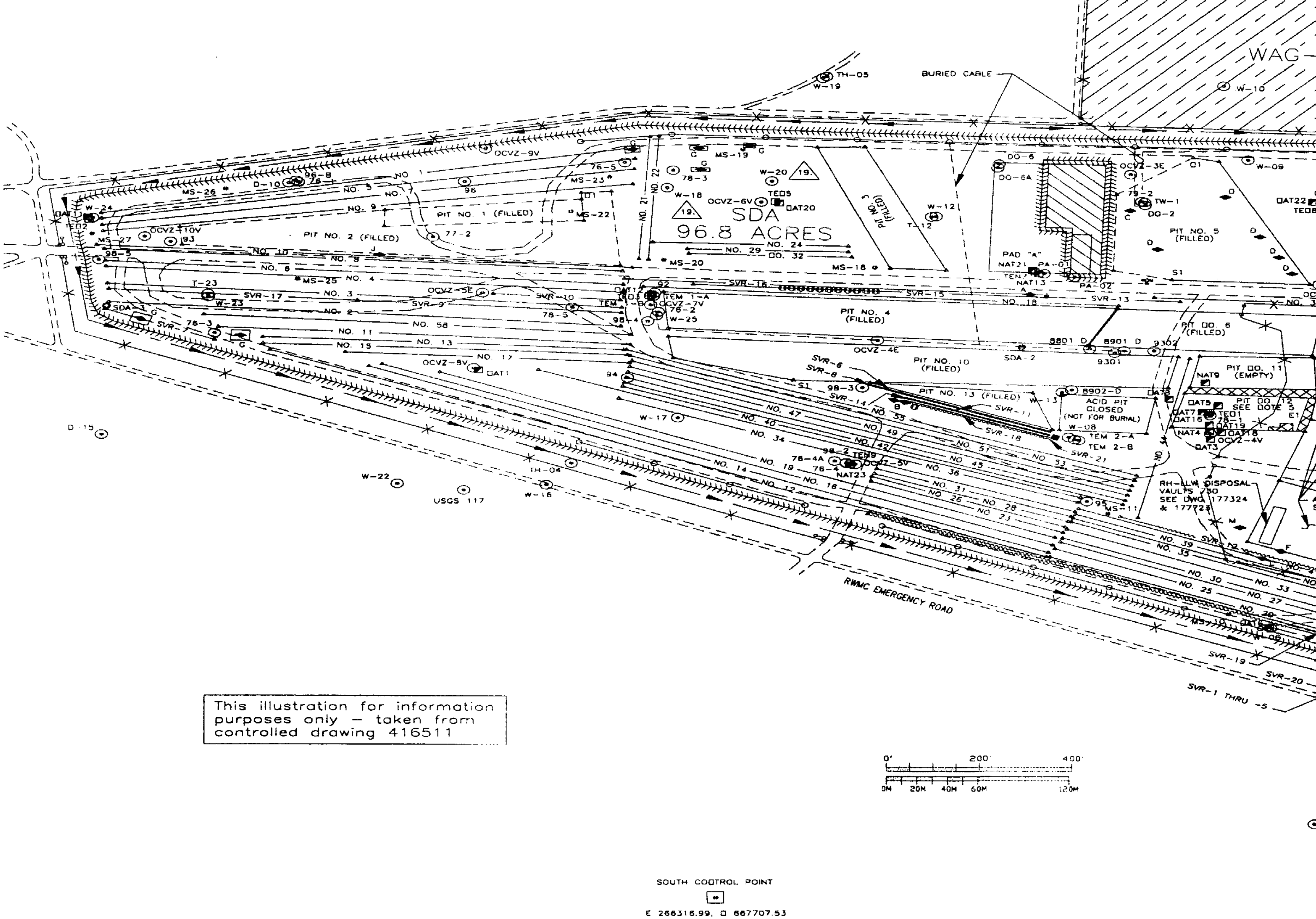
2.4.1.2 Remote-Handled Low-Level Waste. Remote-handled (RH) LLW is solid radioactive waste with dose rates higher than 500 mR/h at 1 m. This waste is typically placed in a steel container for disposal. From shortly after the RWMC first opened in 1952, RH LLW has been disposed of by remote transfer of the waste container from a specially designed bottom-discharge shipping cask to a soil or concrete vault in the SDA. The soil vaults are unlined holes bored to bedrock. The holes are then backfilled with 2 ft of soil (the soil is for filtration). Soil vaults are drilled to a depth that provides a minimum of 3 ft of soil over the last waste container. The amount of soil cover required is calculated and compared to available soil vault depth before each discharge. These minimum depths limit the available soil vault area within the SDA.

To optimize the available disposal area for the RH LLW, concrete vaults are used in addition to soil vaults. The concrete vaults are located in the southwest corner of Pit 20 in the SDA. This is part of an area from which the basalt rock was excavated in 1983 and 1984. The approximate dimensions and orientation of Pit 20 are 61 m (200 ft) N-S x 104 m (340 ft) E-W. The bottom of the pit is about 10 m (32 ft) below ground level on the west side of the pit. Rock begins about 3.6 m (12 ft) below the ground level on the west side of the pit and is lower on the south side. The concrete vaults are precast, reinforced-concrete sections resting on an integral base plate capped with a concrete plug. These vaults are configured in honeycomb arrays when installed. The void spaces between vaults (created by three concrete vaults touching at their outer walls) are filled with sand. The perimeter of each array is surrounded with soil that provides seismic stability and serves as a radiation shielding material. The concrete vaults are designed to accommodate up to two waste containers of the same design as those disposed of in soil vaults and to support the weight of a crane, the bearing pad, the 55-ton cask, and the RH-LLW during transfer to the vaults.

Seismic design requirements to prevent vault overturn during an earthquake are found in an EDF (Reference 2-1). This EDF determined that embankment height and soil backfill provide lateral stability for the vaults. The calculations indicate that the minimum backfill requirement against the side of the vaults is a height of 23 ft, with a slope of 1.5:1. At this backfill level, vault overturn does not occur during a "Low Hazard" seismic event per the University of California Research Laboratories (UCRL) 15910 report (Reference 2-2).

EDF RWMC-580 provides the shielding analysis for the concrete vaults (Reference 2-3). The conclusion of this EDF is that the 4-ft thick concrete plug is adequate to ensure that the design basis dose rate of 1 mR/h at the surface is not exceeded.

The concrete vaults are designed and positioned to protect against ground freeze-thaw cycles and other environmental factors for a minimum of 50 years.



igure 2-3. The subsurface disposal area.

LEGEND

- FENCE
- ROAD
- FILLED TRENCH
- UNFILLED PORTION OF SOIL VAULT ROW (AS OF 31 JULY 1995)
- DISPOSAL BOUNDARY MONUMENT
- MONITORING STATION
- MONITORING WELL U.N.O.
- NEUTRON MOISTURE PROBE HOLE
- TENSIOMETER PROBE HOLE
- SDA CONTROL MONUMENT
- RAILROAD
- DIKE OR BERM
- POWER LINE
- DRAINAGE DITCH SHOWING FLOW PATH
- FIRE HYDRANT
- SUMP
- SHALLOW SOIL <12'
- MASTODON/CAMEL BONE ENCOUNTERED DURING EXCAVATION
- UNRECORDED WASTE

- RADIOACTIVE (LLW & TRU)
- MIXED RADIOACTIVE & ORGANICS
- TRANSURANIC WASTE ONLY
- LOW LEVEL WASTE ONLY
- TRANSURANIC & ORGANICS
- AS YET UNDETERMINED
- TRANSURANIC CONTAMINATED LOW LEVEL WASTE

TRENCH 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 55, 56, 57 & 58	TRANSURANIC & ORGANICS
ALL OTHER TRENCHES NOT LISTED ABOVE	TRANSURANIC CONTAMINATED LOW LEVEL WASTE
SVRs	LOW LEVEL WASTE (HIGH RADIATION LEVELS)
PIT 7	LOW LEVEL WASTE ONLY

INFORMATION ON UNRECORDED WASTE (REFERENCE FOR "A" THRU "K" IS 416511-M)

A. HIT WASTE AT 3' BELOW SURFACE DURING DRILLING OPERATIONS OF SVR-16 37' WEST OF EAST MONUMENT 3-14-85
B. HIT WASTE AT APPROX 6' BELOW SURFACE DURING DRILLING OPERATIONS OF SVR-11 331', 335' & 343' WEST OF EAST MONUMENT 2-20-84
C. HIT WASTE AT APPROX 5' BELOW SURFACE DURING TEST WELL DRILLING
C & D. IDENTIFIED IN REPORT WMP 77-3 BY D.H. CARD, MARCH 1977
E. ENCOUNTERED SCRAP MATERIAL DURING EXCAVATION OF WHAT IS NOW PIT 17 – NO CONTAMINATION OR RADIATION DETECTED
F. "HOT" SPOT UNCOVERED DURING EXCAVATION OF WHAT IS NOW PIT 20
G. IDENTIFIED AS SHALLOW FILLED PITS, NO SPECIFIC LOCATION GIVEN
H. ENCOUNTERED WASTE DURING DRILLING OF SVR-12, CLOSED VAULT ROW 7-83
J. ENCOUNTERED WASTE DURING EWR PROJECT
K. ENCOUNTERED WASTE DURING DRILLING OF SVR-12 IN 1982, REFER TO EDF RWMC-112
L. ENCOUNTERED WOODEN WASTE BOX AT 9' BELOW SURFACE ON 9-23-92 DURING EXCAVATION FOR INSTALLATION OF LOW LEVEL REMOTE HANDLED STORAGE VAULTS, REFER TO NCR-RWMC-091
M. ENCOUNTERED CONTAMINATED SOIL ON 4-29-93 DURING EXCAVATION FOR INSTALLATION OF CONCRETE VAULT PAD, REFER TO O.R. RWMC-93-9

NOTES:

1. TRENCH WASTE LOCATIONS ARE DETERMINED BY MEASUREMENTS MADE FROM EAST TO WEST AND NORTH TO SOUTH OF MONUMENTS
2. PIT BURIAL LOCATIONS ARE DETERMINED BY REFERENCE TO NORTHEAST CORNER MONUMENTS
3. FEATURES SUCH AS FENCES, BUILDINGS, MONITORING WELLS, DIKES, DITCHES, ROADS & POWER LINES ARE LOCATED PER 1989 & 1990 SURVEYS. MONUMENTS FOR PITS AND TRENCHES ARE LOCATED PER SOURCE INFORMATION ON SHEET 2 OF DRAWING 416511. MONITORING STATIONS & UNNUMBERED PITS ARE LOCATED ACCORDING TO INFORMATION PER 1989 SURVEY AND EG&G DRAWING 416511 REV M
4. INFORMATION ON THIS DRAWING SUPERSEDES THAT OF DRAWING 1230-BGF-101-1 (EG&G DRAWING 152907) & DRAWING 1375-RWMC-135-1 (EG&G DRAWING 154978)
5. WASTE REMOVED FROM PITS 11 AND 12 AS PART OF THE IDR PROJECT EXCEPT FOR PORTIONS OF PIT 12 WHERE SOME BOXED WASTE REMAINS. THE BOXED WASTE WILL BE REMOVED PER ANOTHER PROJECT AT A LATER DATE
6. MOISTURE EXCLUSION COMPLETE ON PITS 1, 2, 3, 4, 5, 6, 9 AND 10
7. MOISTURE PROBES ARE MISSING ON 8, 12, 13, 14 AND 17 1990 SURVEYS.
8. FIRE MAIN WITHIN THE SDA IS A DRY SYSTEM
9. SVR CLOSURE DATES BASED ON LAST RECORDED ENTRY IN WMIS
10. TRENCH 55 WAS ADMINISTRATIVELY CLOSED 3-12-82 DUE TO THE UNKNOWN CONDITIONS OF THE EAST END OF THE TRENCH
11. SDA = 96.8 ACRES
12. COORDINATES SHOWN ARE LISTED IN RWMC PROJECT PLANE COORDINATES WHICH HAVE BEEN MEASURED WITH A GPS FIRST LEVEL CONTROL. THIS GPS INFORMATION IS BASED ON THE 1991 GPS.

Figure 2-3. (continued).

2.4.2 Transuranic Storage Area

The TSA (Figure 2-4) is a 57.5-acre tract of land located in the southeast portion of RWMC. The primary purpose of the TSA is examination, segregation, certification, and interim storage of solid TRU waste. The TSA consists of Waste Storage Facilities (WSFs), the ILTSF, the Stored Waste Examination Pilot Plant (SWEPP), Transuranic Storage Area - Retrieval Enclosure (TSA-RE), Advanced Mixed Waste Treatment Project (AMWTP), and support facilities, described in the following subsections.

Over 100,000 waste containers are stored in the WSF, 90% of them are 55-gal steel drums. The remaining containers are 4- x 5- x 6-ft steel bins; 83- and 30-gal steel drums; plywood- and fiberglass-reinforced plywood boxes or modular steel boxes measuring approximately 4 x 4 x 7 ft and 2 x 4 x 7 ft; and some oversized containers.

2.4.2.1 Transuranic Storage Area Pads. TSA pads were developed to provide retrievable interim (20-year) storage for contact-handled transuranic (CH TRU) waste and isolation from the environment.

The TSA was originally used for TRU waste with greater than 10 nCi/g of transuranic activity. This limit has been redefined as waste containing >100 nCi/g of alpha-emitting transuranic radionuclides. Radiation levels found around the TSA pads are generally <1 mR/h. The exception is the Transuranic Storage Area Retrieval (TSA-R) pad, where radiation levels range from 1 to 70 mR/h.

The TSA has the following specialized storage locations:

- TSA-1 and TSA-2 asphalt surface, earthen-covered storage pads
- TSA-3 asphalt surface (WMF-711), air-supported building storage pad has been vacated (it will no longer be used for storage)
- TSA-3 asphalt surface storage pad
- TSA-RE (WMF-636), a weather resistant enclosure over TSA-1,-2, and -R
- ILTSF with engineered vaults
- Storage cells which are a part of the pads
- Resource Conservation and Recovery Act (RCRA)-regulated Types I and II Storage Modules.

Two asphalt pads (TSA-1 and -2) were constructed to provide 20-year retrievable storage for CH TRU waste. (CH TRU is defined as waste having a container surface radiation level <200 mR/h.) A typical pad is composed of a 2- to 3-in. thick asphalt surface on a compacted gravel base. Each pad slopes laterally across the width, with an approximately 1% slope along the length (that is, a shallow, sloping trough that prevents water accumulation). The slope also allows runoff liquids, if present, to be sampled to determine whether radionuclides are escaping from the stored wastes.

The TSA-1 pad opened in October 1970, was filled to capacity, and then closed in 1975. The first TSA pad was 150-ft wide x 400-ft long and was extended to 730 ft in 1972. The first waste was stored on TSA-1 on November 9, 1970. The pad was originally divided into sections, measuring 40 x 150 ft each, and totaled 15 sections. These sections were later incorporated into eight cells, each cell measuring from approximately 40- to 120-ft long x 150-ft wide.

Drums were originally stacked horizontally, up to nine drums high, in Cells 1, 2, 3, and 4. Beginning in December 1972 in Cell 5, drums were stacked vertically five drums high. Waste boxes were generally used to line the sides of all cells and were sometimes placed down the center line of the cell. In 1984, approximately 2,465 drums and 240 boxes were retrieved from Cell 5 to support the TRU Waste Sampling Program. These wastes are now stored in the Type II Storage Modules.

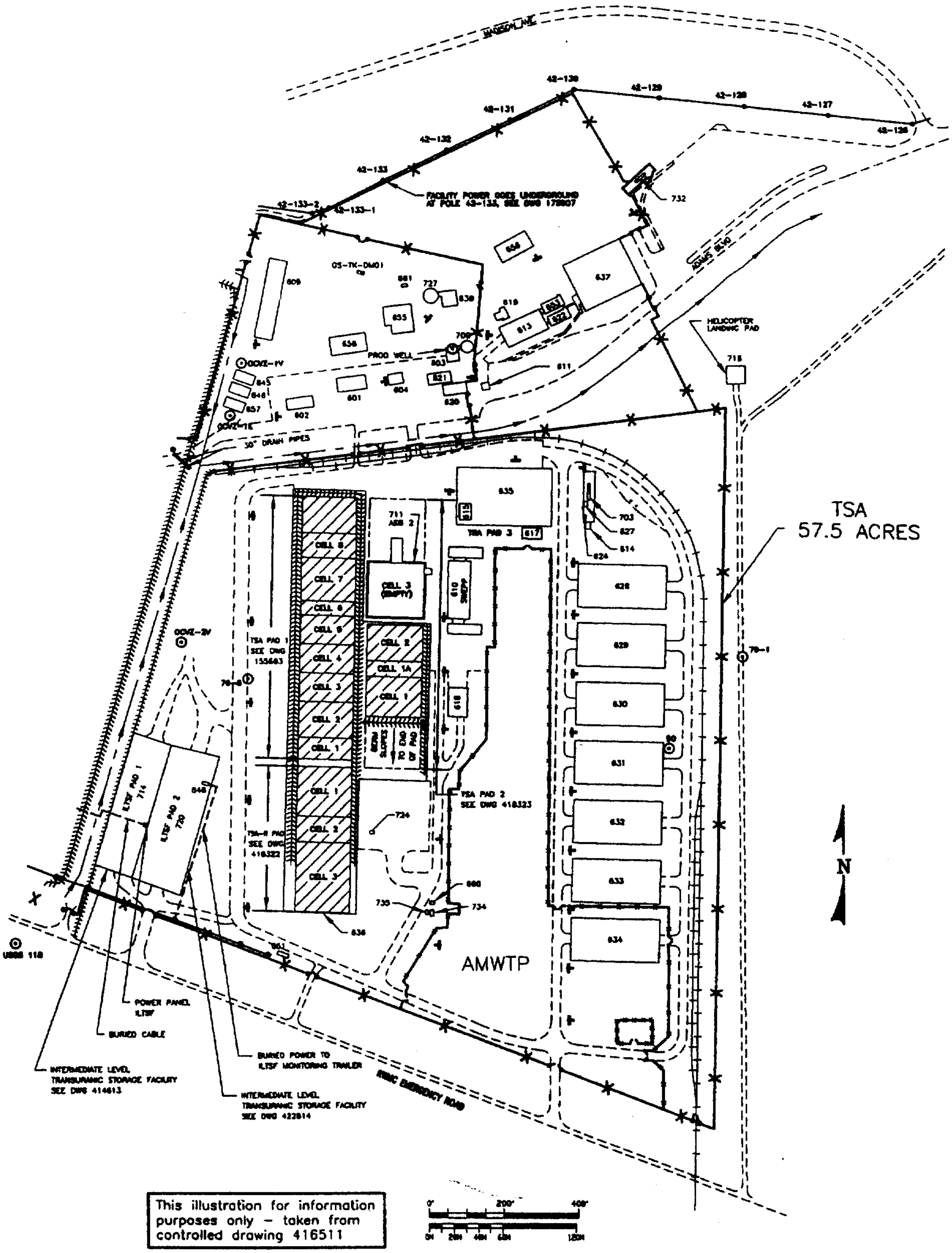


Figure 2-4. Transuranic storage area.

LEGEND

- FENCE
- ROAD
- FILLED TRENCH
- UNFILLED PORTION OF SOIL VAULT ROW (AS OF 18 JAN 2000)
- DISPOSAL BOUNDARY MONUMENT
- MONITORING STATION
- MONITORING WELL U.N.O.
- NEUTRON MOISTURE PROBE HOLE
- TENSIOMETER PROBE HOLE
- SDA CONTROL MONUMENT
- RAILROAD
- DIKE OR BERM
- POWER LINE
- DRAINAGE DITCH SHOWING FLOW PATH
- FIRE HYDRANT
- SUMP
- SHALLOW SOIL <12'
- MASTODON/CAMEL BONE ENCOUNTERED DURING EXCAVATION
- UNRECORDED WASTE

- RADIOACTIVE (LLW & TRU)
- MIXED RADIOACTIVE & ORGANICS
- TRANSURANIC WASTE ONLY
- LOW LEVEL WASTE ONLY
- TRANSURANIC & ORGANICS
- AS YET UNDETERMINED
- TRANSURANIC CONTAMINATED LOW LEVEL WASTE

TRENCH 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 55, 56, 57 & 58	TRANSURANIC & ORGANICS
ALL OTHER TRENCHES NOT LISTED ABOVE	TRANSURANIC CONTAMINATED LOW LEVEL WASTE
SVRs	LOW LEVEL WASTE (HIGH RADIATION LEVELS)
PIT 7	LOW LEVEL WASTE ONLY

INFORMATION ON UNRECORDED WASTE (REFERENCE FOR "A" THRU "K" IS 416511-M)

A. HIT WASTE AT 3' BELOW SURFACE DURING DRILLING OPERATIONS OF SVR-16 37' WEST OF EAST MONUMENT 3-14-85

B. HIT WASTE AT APPROX 6' BELOW SURFACE DURING DRILLING OPERATIONS OF SVR-11 331', 335' & 343' WEST OF EAST MONUMENT 2-20-84

C. HIT WASTE AT APPROX 5' BELOW SURFACE DURING TEST WELL DRILLING

C & D. IDENTIFIED IN REPORT WMP 77-3 BY D.H. CARD, MARCH 1977

E. ENCOUNTERED SCRAP MATERIAL DURING EXCAVATION OF WHAT IS NOW PIT 17 – NO CONTAMINATION OR RADIATION DETECTED

F. "HOT" SPOT UNCOVERED DURING EXCAVATION OF WHAT IS NOW PIT 20

G. IDENTIFIED AS SHALLOW FILLED PITS, NO SPECIFIC LOCATION GIVEN

H. ENCOUNTERED WASTE DURING DRILLING OF SVR-12, CLOSED VAULT ROW 7-83

J. ENCOUNTERED WASTE DURING EWR PROJECT

K. ENCOUNTERED WASTE DURING DRILLING OF SVR-12 IN 1982, REFER TO EDF RWMC-112

L. ENCOUNTERED WOODEN WASTE BOX AT 9' BELOW SURFACE ON 9-23-92 DURING EXCAVATION FOR INSTALLATION OF LOW LEVEL REMOTE HANDLED STORAGE VAULTS. REFER TO NCR-RWMC-091

M. ENCOUNTERED CONTAMINATED SOIL ON 4-29-93 DURING EXCAVATION FOR INSTALLATION OF CONCRETE VAULT PAD, REFER TO O.R. RWMC-93-9

NOTES:

1. TRENCH WASTE LOCATIONS ARE DETERMINED BY MEASUREMENTS MADE FROM EAST TO WEST AND NORTH TO SOUTH OF MONUMENTS
2. PIT BURIAL LOCATIONS ARE DETERMINED BY REFERENCE TO NORTHEAST CORNER MONUMENTS
3. FEATURES SUCH AS FENCES, BUILDINGS, MONITORING WELLS, DIKES, DITCHES, ROADS & POWER LINES ARE LOCATED PER 1989 & 1990 SURVEYS. MONUMENTS FOR PITS AND TRENCHES ARE LOCATED PER SOURCE INFORMATION ON SHEET 2 OF THIS DRAWING. MONITORING STATIONS & UNNUMBERED PITS ARE LOCATED ACCORDING TO INFORMATION PER 1989 SURVEY AND EG&G DRAWING 416511 REV M
4. INFORMATION ON THIS DRAWING SUPERSEDES THAT OF DRAWING 1230-BGF-101-1 (EG&G DRAWING 152907)
5. WASTE REMOVED FROM PITS 11 AND 12 AS PART OF THE IDR PROJECT EXCEPT FOR PORTIONS OF PIT 12 WHERE SOME BOXED WASTE REMAINS. THE BOXED WASTE WILL BE REMOVED PER ANOTHER PROJECT AT A LATER DATE
6. MOISTURE EXCLUSION COMPLETE ON PITS 1, 2, 3, 4, 5, 6, 9 AND 10
7. MOISTURE PROBES ARE MISSING ON 8, 12, 13, 14 AND 17
8. FIRE MAIN WITHIN THE SDA IS A DRY SYSTEM
9. SVR CLOSURE DATES BASED ON LAST RECORDED ENTRY IN WMIS
10. TRENCH 55 WAS ADMINISTRATIVELY CLOSED 3-12-82 DUE TO THE UNKNOWN CONDITIONS OF THE EAST END OF THE TRENCH
11. THE INFORMATION ON THIS DRAWING SUPERSEDES THAT OF DRAWING 1375-RWMC-135-1 (EG&G DRAWING 154978)
12. REMOVED
13. THE MONUMENT COORDINATES GIVEN ON SHEET 2 OF THIS DRAWING ARE THE BEST AVAILABLE INFORMATION TAKEN FROM SURVEYS, DRAWINGS & RWMC OPERATIONS AS REFERENCED IN THE SOURCE COLUMN
14. THIS INFORMATION IS DOCUMENTED IN EDF NO. ERP-WAG7-06 REV 2
15. COORDINATES ARE LISTED IN RWMC PROJECT PLANE COORDINATES TO AGREE WITH THE RWMC NORTH AND SOUTH CONTROL POINTS WHICH HAVE BEEN MEASURED WITH A GPS FIRST LEVEL CONTROL. THIS GPS INFORMATION IS BASED ON THE 1991 GPS. CONTACT THE SURVEY DEPARTMENT AT MK-FERGUSON OF IDAHO TO UPDATE THE COORDINATES TO THE CURRENT GPS
16. COORDINATE DATA ON THIS DRAWING SHOULD NOT BE USED FOR ANY INTRUSIVE ACTIVITIES WITHOUT EVALUATING AND COMPARING AVAILABLE GEOPHYSICAL DATA, PERFORMING ADDITIONAL GEOPHYSICAL SURVEYS, PERFORMING ADDITIONAL LOCATION SURVEYS, ETC: COMMENSURATE WITH THE RISK OF THE PROPOSED INTRUSION
17. PIT 9 MONUMENTS DEFINE AND CAPTURE WASTE LOCATIONS BUT DO NOT DEFINE THE BOUNDARIES OF THE PIT
18. CONFIGURATION MANAGEMENT WILL NOT BE MAINTAINED WITHIN THE HATCHED BOUNDARY AND IS THE RESPONSIBILITY OF THE OPERATING CONTRACTOR OPERATING UNDER SUBCONTRACT C91-133136 UNTIL THE COMPLETION AND TURNOVER OF THE PIT 9 PROJECT
19. WELLS W-18 & W-20 ARE ABANDONED IN PLACE AND COVERED WITH OVERBURDEN

Figure 2-4. (Continued).

The TSA-2 pad is constructed like TSA-1 and has the same overall dimensions. A portion of TSA-2 was opened in September 1975; only a portion of it was filled.

The fiberglass-reinforced plywood boxes were placed around the perimeter of an area called a "cell" to serve as a boundary, retaining wall, and load-bearing surface and to add to the stacking integrity of the drums within the perimeter. A cell is typically 100 x 128 ft. Each cell on a pad is isolated from the adjacent cell by a 2- to 4-ft thick earth firewall. The steel drums occupy the space within the cell boundary and are stacked five high (approximately 15 ft high).

The filled cell was covered with plywood; 20-mm thick, nylon-reinforced polyvinyl sheeting; and 2 to 3 ft of soil seeded with sod-building grass to provide surface drainage and prevent excessive erosion. Three storage cells (Cells 1, 1A, and 2) have been filled and closed. Cell-monitoring instruments to measure temperature and humidity have been added. The remainder of TSA, known as Cell-3 has had all the TRU and mixed waste relocated to the WSF.

The TSA-3 pad consists of a 935- x 148-ft asphalt pad completed in 1983. The SWEPP, a 160- x 60-ft metal examination building was erected in 1984 on TSA-3.

The TSA Retrieval (TSA-R) Pad is a 150- x 430-ft asphalt pad used to store TRU waste retrieved during the Initial Drum Retrieval and the Early Waste Retrieval (EWR) projects conducted within the SDA. The TRU waste from the EWR project is contained in Department of Transportation (DOT) 7A steel bins stacked two high to form the Cell-1 boundary. The TRU waste from the Initial Drum Retrieval project is contained in 55-gal and 83-gal steel drums placed in metal cargo carriers and M-III bins and stacked two high within this boundary. The containers are covered with 4-in. x 12-in. x 16-ft long planks, 1/4-in. plywood, polyethylene sheeting, and 2 to 3 ft of soil seeded with a sod-building grass. A second cell was being used to store Rocky Flats Plant (RFP) boxes, Sandia boxes, and M-III bins as they were received.

2.4.2.2 Intermediate-Level Transuranic Storage Facility. The ILTSF is located southwest of the TSA-1 Pad (see Figure 2-4). The vaults are embedded in a compacted earth berm 88-ft wide x 352-ft long. The berm is approximately 5 ft abovegrade, asphalt surfaced on top and sloped to preclude flooding around the vault covers. The ILTSF provides storage of remote-handled TRU (RH TRU) waste. RH TRU is defined as waste containing >100 nCi/g of alpha-emitting TRU radionuclides per gram of waste, and having a container surface radiation level of >200 mR/h.

The ILTSF area consists of 16-, 24-, 30-, and 48-in. diameter storage vaults embedded 20 to 30 ft into the ground on two separate asphalt pads. The vaults, constructed of carbon steel pipe, are grouted in concrete and are watertight. A removable concrete shielding plug is provided for each vault. The ILTSF vaults are designed to store TRU waste having radiation levels between 0.2 R/h and 4,500 R/h at the container surface. An asphalt road permits heavy equipment to be used during waste unloading and retrieval operations. The 24-, 30-, and 48-in. diameter vaults are designed to accommodate free-air transfers of wastes having radiation levels up to 30 R/h, as well as shielded transfers of wastes having higher levels. Eighteen of the 2.5-ft vaults are RCRA-approved for storage of hazardous waste and are operated per the Hazardous Waste Storage Permit, issued by the State of Idaho, which governs the operation of the WSF and portions of the ILTSF. The 16-in. diameter vaults match the bottom-discharge Hot Fuel Examination Facility (HFEF)-5 shipping cask, and allow shielded transfers of wastes with surface radiation levels up to 4,500 R/h. Monitoring and sampling provisions are included in the vault designs. The concrete plugs provide shielding to reduce the radiation exposure rate above the filled vault.

The vaults are installed on 8-ft centers by columns and on minimum 6-ft centers by rows. Pad-1 is 30-ft wide x 351-ft long; Pad-2 is 101.7-ft wide x 351-ft long. Each pad is configured with rows of vaults installed symmetrically along either side of a central heavy-equipment lane which provides access for heavy equipment during operations.

Areas in the TSA (including ILTSF) may be used as aboveground storage areas for waste containers. These areas, designated as Radioactive Material Areas (RMAs) are used on a temporary basis until disposition is determined.

2.4.2.2.1 WMF-648 ILTSF Trailer—Waste Management Facility (WMF)-648 houses the equipment used to monitor the condition of waste containers stored in ILTSF vaults and controlled under RCRA. These vaults (16) are located on ILTSF Pad-2 and are equipped with specially designed liners to facilitate RCRA-required monitoring. Power is provided through a transformer and underground cable to the trailer. Heating, ventilating, and air-conditioning (HVAC) are provided by a wall mounted air-to-air heat pump. Neither potable nor industrial water is available in the trailer.

2.4.2.3 WMF-610 Stored Waste Examination Pilot Plant. The SWEPP facility was designed for nondestructive examination of CH-TRU waste containers to ensure that they meet the requirements for permanent offsite disposal.

WMF-610 is a preengineered metal structure, approximately 59 x 161 ft, located adjacent and parallel to the existing TSA pads. (The location of this building is shown in Figure 2-4; the floor plan is shown in Figure 2-5). Painted and insulated metal panels comprise the exterior walls and roof. Interior perimeter walls are finished with painted metal panels manufactured and provided by the building manufacturer. Interior walls are of concrete block and metal stud and wallboard construction.

The floor is a concrete slab on grade, with perimeter spread footings. The building interior is designed to be column free. The total floor area of the SWEPP building is approximately 9,500 ft^2.

In areas of the building where waste is routinely handled, surfaces are painted to permit easy decontamination.

Waste is temporarily stored in the south high bay area to supply process flow through the facility. A secondary spill containment is provided by six-in. high curbing, two ramps that serve as berms, raised steps under personnel doors, and floors are sealed. The floor integrity of the containment meets the requirements of 40 CFR 264.175(b)(1).

Special load ratings are implemented in the X-ray radioscopy module and the Passive-Active Neutron (PAN) fissile material module. The radioscopy module weighs 50,000 lbs and bears over a 10 x 18 ft area. The design allows for supplemental shielding to ensure compliance with applicable DOE guidelines for radiation exposure to occupational workers. The PAN assay module weighs approximately 5,000 lbs and this weight is spread over a 4 x 5 ft area.

There are two gamma ray spectrometer systems installed at SWEPP: The SWEPP Gamma-Ray Spectrometer System (SGRS) and the Waste Assay Gamma Spectrometer System (WAGS). The SGRS unit weighs approximately 18,000 lbs and is spread over a 4 x 6 area. The WAGS is comprised of several components. The weight of the shield with rotator, interior conveyor, and transmission source assembly is approximately 14,550 lbs which is supported on four 6" x 8" support legs with a separation distance of 30" in the x direction and 37.25" in the y direction. The shield interior may also contain a 2,000 lb drum. With the shield sliding door closed the weight is essentially equally distributed to the four support legs or 4,137 lbs per legs. With the sliding door open, an eccentricity exists and one support leg is more heavily loaded or 6,711 lbs. A 14'4" section of the conveyor assembly weighs approximately 3,100 lbs and supports six drums of up to 2,000 lbs each. This weight is distributed to six 5" x 6.625" support legs or 2,517 lbs per leg. The spacing between legs are 36" in the x direction and 84" in the y direction.

The SWEPP building provides the necessary area for required nondestructive examination of TRU waste.

An area located in the SWEPP building is designated as a Criticality Control Area (CCA) to store fissile material reference sources and standards used for calibration of the assay system.

The SWEPP building has alpha and beta-gamma CAMs located in the SWEPP examination area to monitor for alpha and beta-gamma airborne radioactivity. RAMs are also in place to monitor radiation levels around the Real-Time Radioscopy (RTR) when it is operating. One personnel contamination monitor is located near the exit of the examination area.

A 12.5 kV feeder line supplies electrical power to transformer N-XFR-SA02. Transformer N-XFR-SA02, rated at 500 kVA, 12 kV-480/277 V, supplies 480 V to panel N-PP-1001 located in WMF-610. Panel N-PP-1001 supplies power to loads in WMF-610 and -617. During a loss of commercial power, all SWEPP examination operations and support activities stop until commercial power is restored. A 75-kW generator provides standby power to the following system loads:

- All CAMs (beta-gamma and alpha)
- The remote area monitoring system
- Sufficient lighting for safe evacuation of the building
- Exit lighting for the building
- Fire alarm system (battery backup)
- Uninterruptible power system (UPS) [for the TRIPS]
- UPS for Gamma-Ray Spectrometer
- Radiological controls sample counter

Potable water is available in the building. An automatic wet-pipe sprinkler system with a water flow-activated alarm, alarm notification devices, manual fire alarms, fire extinguishers, and a fire department pumper connection are provided. Three fire hydrants are located within 100 m (330 ft) of the building.

Two cranes are in the SWEPP: a five-ton bridge crane and a one-ton monorail crane.

2.4.2.4 WMF-615 Drum Vent Facility. The DVF has been temporarily modified to allow for absorbent addition to sludge drums containing excess water. The safety analysis for absorbent addition operation is documented in Addendum F. The following discussions cover drum-venting operations in the DVF. Some of the descriptive information contained in this section is still applicable to the general layout of the DVF. Addendum F should be referred to for additional information on absorbent addition operations. Specifically, the equipment layouts detailed in the figures have been modified for absorbent addition operations.

The Drum Vent Facility (DVF), WMF-615, is located in the southwest corner, inside the Type I storage module, WMF-635 (see Figures 2-4 and 2-11). The floor plan and section view are shown in Figures 2-6 and 2-7. The building is composed of a preengineered, cylindrical, galvanized-steel silo enclosed within a 30- x 40-ft rectangular, preengineered metal building. The silo functions as the primary containment enclosure for drum venting and filter insertion operations. The outer building provides an area for the entrance and exit conveyors, drum survey station, control room, hydraulic unit, and some headspace sampling and ventilation equipment. The remainder of the headspace sampling equipment, vapor recovery units, fans, vacuum pumps, and conveyors are contained within the Type-I building on the east and north sides of the DVF. An electrically operated rollup door on the north side of the outer building provides access for incoming drums. Two opposing doors on the silo allow drums to be conveyed through the silo; another electrically operated rollup door located on the building's south side is the exit point for the drums. The drum survey station, located between the silo and DVF exit doors, is a glovebox type access for obtaining contamination smears from outgoing vented drums, replacing filters, and sampling drum headspace gas.

The control room is located in the southwest corner of the DVF and houses the system operator, attending radiological control technician (RCT), and the control mechanisms for the DVS and DVF ventilation system. A 2-ft x 2-ft x 1-in. thick blast-resistant window is located on the west side of the silo to allow the operator to observe the control, and monitor operations. An RCT, stationed at the drum survey access area located in the control room (see Figure 2-6), obtains contamination smear surveys for each outgoing vented drum. No personnel are permitted inside the silo while venting and filter insertion operations are in progress.

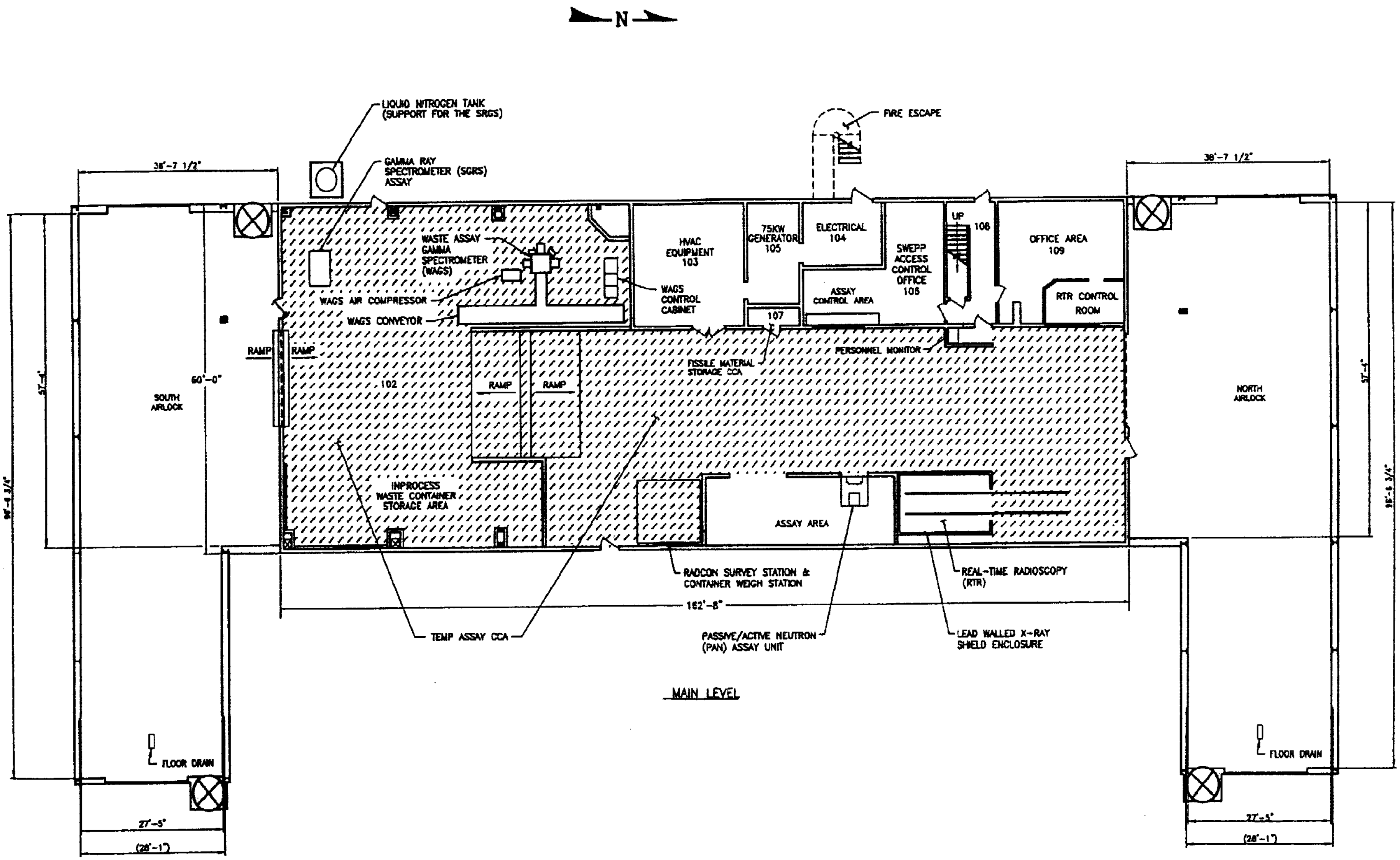


Figure 2-5. Floor plan of SWEPP building (WMF-610).

The silo is designed to dissipate the energy released during a maximum credible explosion (MCE) of a single waste drum by an upward movement of the entire roof assembly. Design calculations demonstrate that the silo side panels, Lexan viewing window, access doors, and roof assembly are sufficient to contain the pressure pulse generated during an MCE (Reference 2-4). The silo is also qualified to Uniform Building Code (UBC) Zone 3 seismic loading criteria. Since a potential for flammable or explosive reactions of hydrogen and oxygen involving TRU waste drums does exist, no combustible materials were used in the construction of the silo, and all exposed surfaces were coated with a high-gloss, epoxy-based paint easy to decontaminate.

Internal silo electrical distribution and lighting systems are designed in accordance with National Fire Protection Association (NFPA) 70, Articles 500 and 501 for a Class I, Division 2 location.

Electrical heaters are used to heat the control and equipment rooms outside the silo. A window type AC unit is used in the control room.

The silo is equipped with ventilation systems to dissipate concentrations of hydrogen to below the lower explosive limit (LEL) during drum venting operations. These systems include a recirculation system to rapidly dilute any hydrogen expelled during the DVS vent cycle to below the flammable concentration limit and an off-gas system to exhaust any vented hydrogen from the silo. The recirculation system uses a sustained flow rate of 500 cfm to provide turbulent mixing used for hydrogen dilution. A Vapor Recovery System (VRS) is designed to pull gas from the drum, dilute it with air, filter it, then discharge it to the exhaust system. The VRS dilutes 1.5 to 3.7 cfm of gas with 20 cfm of clean air before filtering and discharging it. The drum vent exhaust (off-gas) is designed to operate between 600 to 1200 cfm and provide a minimum of four air volume changes per hour and to maintain a negative pressure with respect to the outside atmosphere. This pressure differential is comparable to that used in commercial nuclear power plant containments to reduce out-leakage of residual airborne contamination. Sensors provide an alarm on loss of negative pressure and prevent the initiation of the punch cycle upon a loss of ventilation flow.

All three ventilation systems contain inline high-efficiency particulate air (HEPA) filters to trap any radioactive particulate released during the DVS vent cycle. The HEPA filter for the recirculation system captures virtually all particulates released during normal venting operations. The VRS and offgas system are equipped with HEPA filters that filter before the air is discharged to the atmosphere. Each of the installed HEPA filters provides a 99.95% removal efficiency for particulates greater than or equal to 0.3 microns in diameter. All the HEPA filters are equipped with differential pressure sensors linked to remote instrumentation displays inside the DVS control room. The DVS operator surveys these displays to ensure that the structural integrity and proper flow conditions of the filters are maintained. Gas in the VRS passes through separate carbon beds where the total volatile organic compounds are removed before discharging to the offgas system.

The DVF is equipped with a fire extinguisher discharge system for extinguishing potential fires in the inner silo resulting from a drum explosion during drum venting. The system consists of rack-mounted 17-lb HALON 1211 fire extinguishers piped to a single nozzle in the silo. A pressure switch in the discharge piping automatically disconnects power to both silo ventilation blowers if the system is activated, to prevent loss of HALON through the containment ventilation stack. The system requires manual activation by the DVS operator in the event of a fire. The building and silo are also equipped with wet pipe sprinkler systems, smoke and heat detectors, manual fire alarms, alarm notification devices, and is located within 300 ft of two fire hydrants.

The DVF is equipped with alpha and beta-gamma CAMs for monitoring airborne contamination levels.

2.4.2.5 WMF-618 TRUPACT-II Loading Facility. The Transuranic Package Transporter (TRUPACT-II) Loading Facility (TLF) (Figure 2-8) is an 80- x 50- x 30-ft high preengineered metal building used for loading and unloading TRUPACT-II containers.

The inside floor of the TLF is concrete and has a total area of approximately 4,000 ft^2. The floor can support a live load of 200 lb/ft^2, as required for the 62,000-lb trailer and equipment used in the loading operation. Located adjacent to the north and south ends of the TLF are two 50-ft x 50-ft x 4-in. asphalt pads for vehicle access.

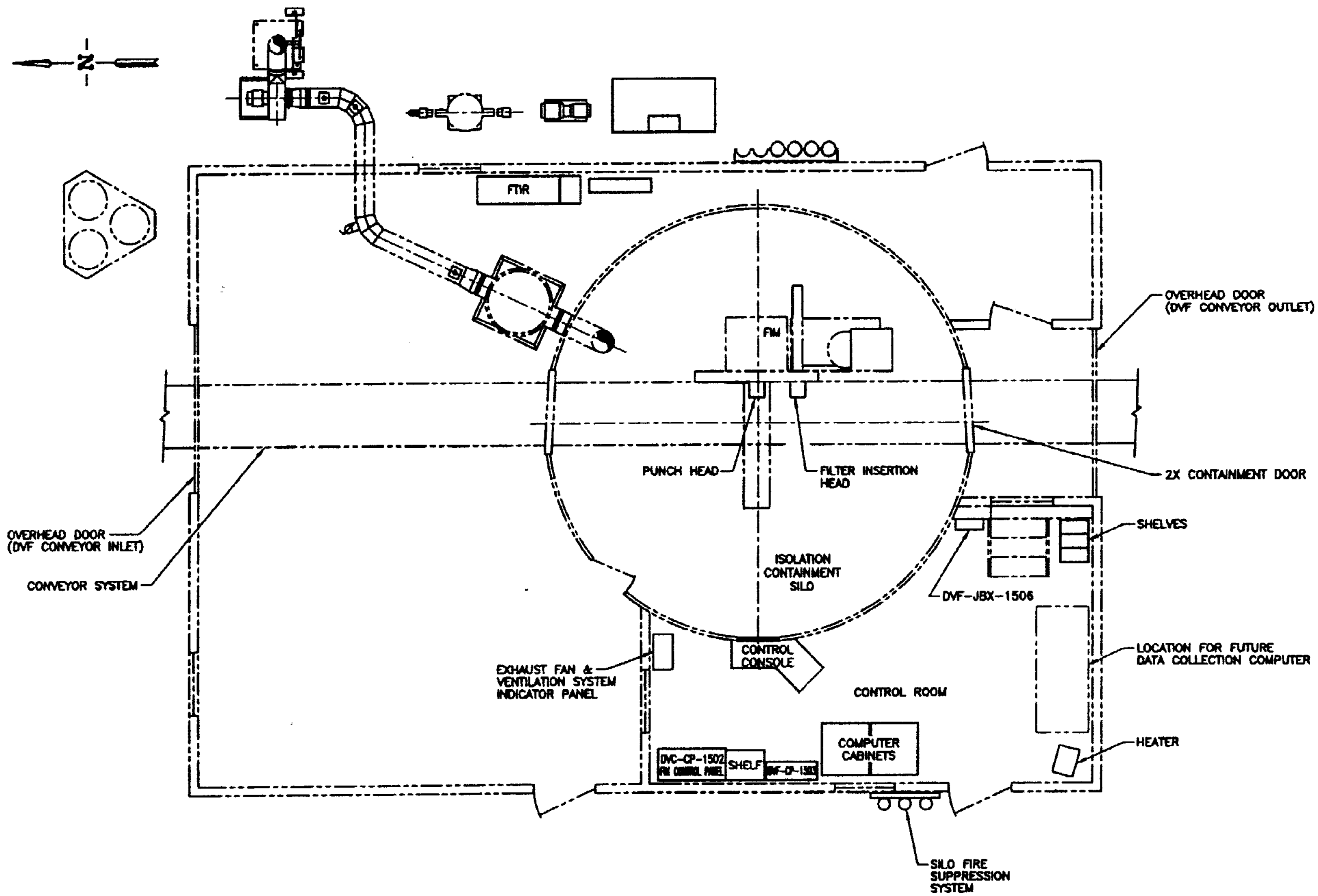


Figure 2-6. Drum vent facility floor plan (WMF-615).

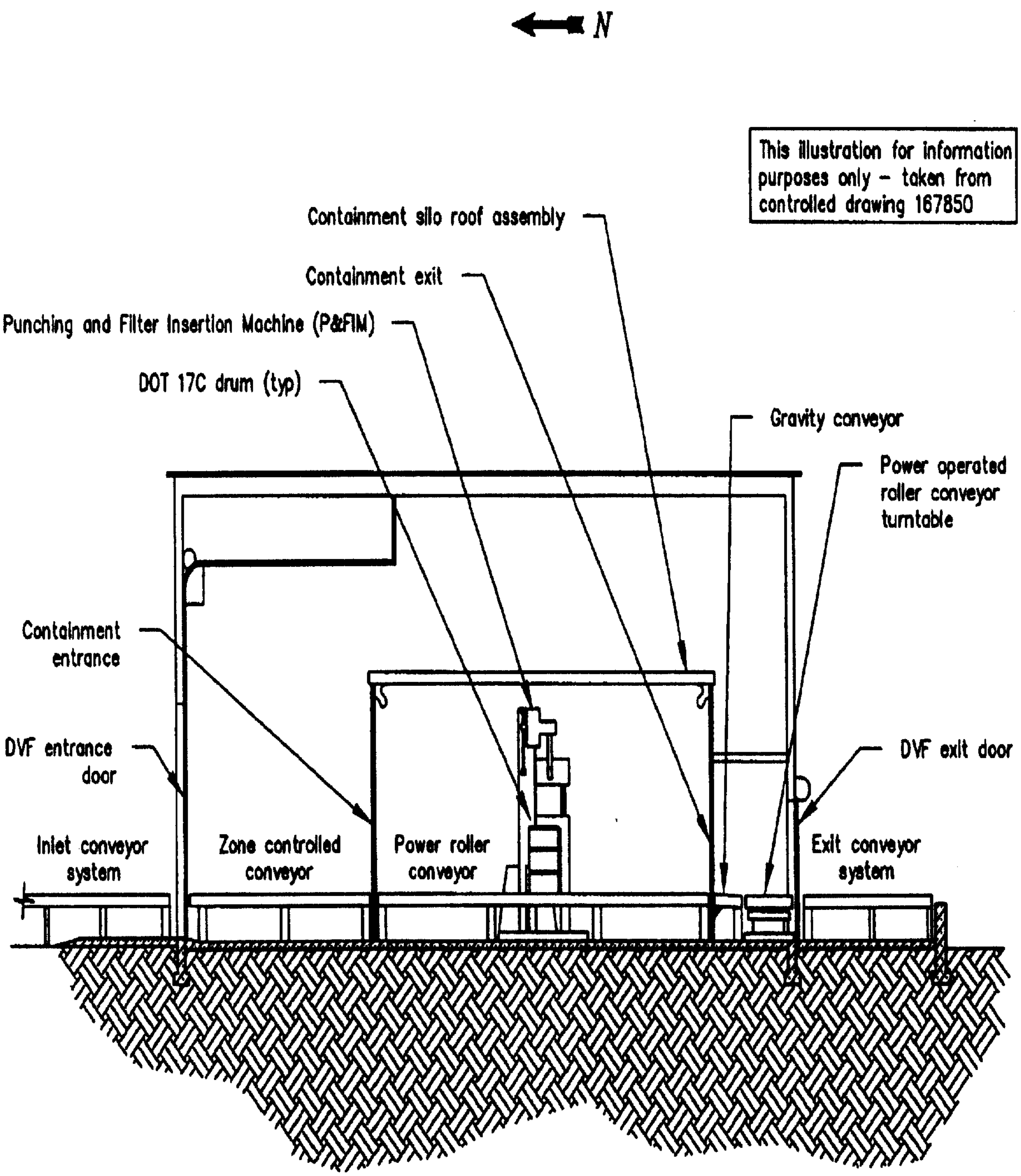


Figure 2-7. Drum vent facility cross section.

The TLF receives CH TRU containers from offsite shipments or from the Waste Storage Buildings, prepares them for loading, and loads them into the TRUPACT-II shipping casks. CH TRU in 55-gal drums is assembled into a stacked array of 14 drums. An adjustable center-of-gravity lift fixture (ACGLF) is attached to the array. The assembly is balanced and then lowered into a TRUPACT-II cask mounted on a transport trailer or into two TRUPACT bins (standard waste boxes). The TLF is also equipped for loading assemblies of Standard Waste Boxes (SWB) that contain 55-gal drums.

A 12.5 kV feeder line supplies electrical power to transformer N-XFR-SA03. Transformer N-XFR-SA03 is rated at 300 kVA, 12 kV-480/277 V, and supplies 480 V to panel N-PP-1801 located in WMF-618.

The TLF is protected by a wet-pipe automatic sprinkler system and waterflow-activated fire alarm. Manual fire alarms, alarm notification devices, fire extinguishers are provided. The building is located within 100 m (328 ft) of two fire hydrants. No potable water is available.

The heating system for the TLF consists of wall-mounted electric resistance heaters with individual thermostats and destratification fans. No air-conditioning is provided in the building.

The TLF is equipped with alpha and beta-gamma CAMs for monitoring airborne radioactivity. A personal contamination monitor (PCM) is located near the exit of the building.

The TLF bridge crane is a Class II with an 8-ton maximum capacity and has a travel range of 64 x 43 ft. DOE has approved this crane for use in handling radioactive waste. The maximum travel distance of the hook is 21 ft vertically and 66 ft horizontally. The rail system for the crane is a self-supporting independent structure mounted to the concrete floor. The power required for the crane is 480 V, 3-phase, 60 Hz. The ACGLF along with the crane is used to facilitate handling 14 pack drums, TRUPACT-II container lids, and SWBs.

WMF-628 through -635 Waste Storage Facilities (WSFs). The Environment Protection Agency (EPA) issued a Notice of Noncompliance to DOE in February 1990, for deficiencies in the configuration of stored waste at the RWMC. Negotiations between the DOE, State of Idaho, and EPA have resulted in the construction of a series of RCRA-approved storage modules and a Hazardous Waste Storage Permit, issued by the State of Idaho which governed the construction of the storage modules at the WSF and the operation of the WSF and the ILTSF.

The RCRA-permitted WSF consists of a series of storage modules located at the east side of the TSA. Two types of modules have been constructed to accommodate various activities supporting waste examination, storage, characterization, and transportation efforts. Figure 2-4 shows the location of WMF-628 through -635. The basic functions of the two types of modules are described in the following paragraphs:

2.4.2.5.1 WMF-628 through -633 Type II Storage Modules—Seven buildings, each approximately 120- x 240-ft (28,800 ft^2), have been constructed. (A typical floor plan is shown in Figure 2-10.) These modules are not heated and are used for interim storage of waste before shipment offsite for disposal or further processing. These modules are equipped with a central aisle that runs the length of the building. This aisle allows easy access to all storage cells and facilitates unloading and loading truck transported waste.

2.4.2.5.2 WMF-635 Type I Storage Module—The building encloses the existing DVF and is approximately 160- x 255-ft (40,800 ft^2). The module is heated and insulated to thaw waste before examination at the SWEPP. This building also provides facilities for Payload Assembly and Gas Generation Testing and a waste characterization area.

2.4.2.5.3 Type I and Type II Storage Modules Fire Protection—Each Type I and Type II storage module is clad in ribbed metal siding with standing seam metal roofing and is constructed above an impervious, curbed concrete slab designed to provide a basin for liquid waste containment. Forklifts and trucks are used to transport waste containers to, from, and within the storage modules.

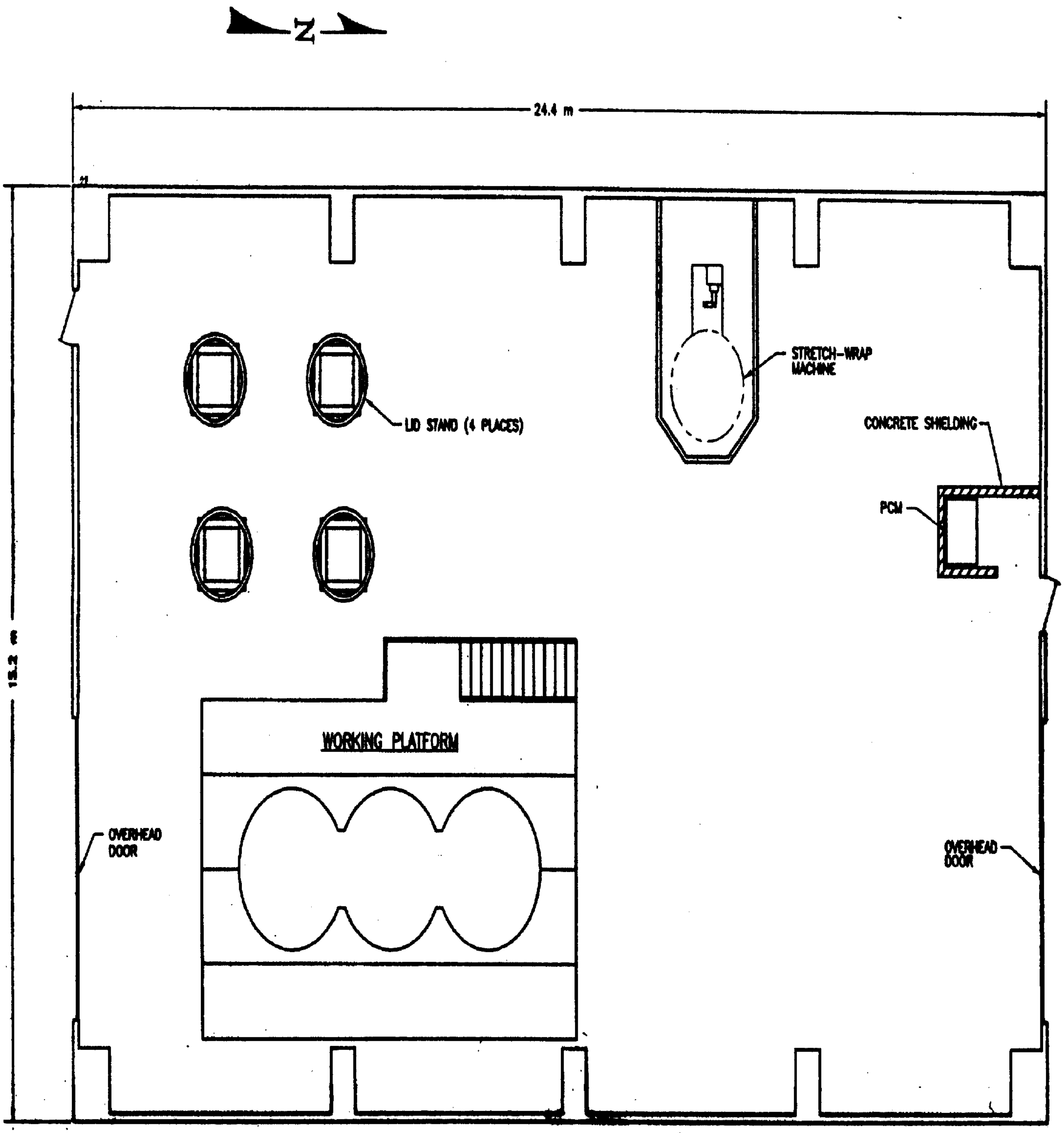


Figure 2-8. Floor plan of TRUPACT-II loading station.

Fire protection for the WSF is provided in both the Type I and Type II modules by a combination of smoke detectors, local and remote alarms, automatic sprinkler systems, and fire extinguishers. Fire hydrants are located near each module. The purpose of the system is to minimize fire damage and provide the level of protection required by DOE Order 420.1, Facility Safety.

Fire suppression is accomplished by automatic sprinkler systems that provide 100% area coverage in each module. The Type I module is provided with two wet pipe sprinkler systems. Water is always available at each sprinkler head in the building. The heat from a fire melts the fusible link of the sprinkler head(s) and allows water to flow, which sounds local and remote alarms, shuts down the ventilation system and suppresses the fire. The Type II modules are provided with pre-action sprinkler systems. Smoke detectors in the building must detect the fire. Upon detection, local and remote alarms are activated, the ventilation system is shut down, and the sprinkler system piping is charged with water. As the fire progresses, heat melts the fusible link of the sprinkler head(s) and allows water to flow, suppressing the fire.

This module is equipped with a drivethrough access for delivery of waste drums and boxes via flatbed trailer or electric forklift (see Figure 2-11). Also, the floors are coated with noncracking decontaminable surface. The Type I building encompasses the entire DVF without the use of movable walls or partitions.

2.4.2.6 WMF-636 Transuranic Storage Area - Retrieval Enclosure (TSA-RE). The TSA-RE is an engineered metal building approximately 313,000 ft^2. The nominal size of the enclosure that extends over the TSA-R and TSA-1 pad areas is 200-ft wide × 1,175-ft long, with an average ceiling height of 30 to 35 ft. An adjacent 184- × 425-ft annex extends over the TSA-2 pad. Figure 2-12 shows a building plan.

The purpose of the TSA-RE is to provide a work area that allows all year retrieval of CH TRU waste presently stored on asphalt pads within the TSA. These storage configurations do not meet the RCRA criteria and need to be reworked to meet the criteria. The TSA-RE provides a weather tight enclosure over three pads (TSA-1, TSA-2, and TSA-R) of waste containers that permits waste retrieval for restorage into a RCRA-approved configuration.

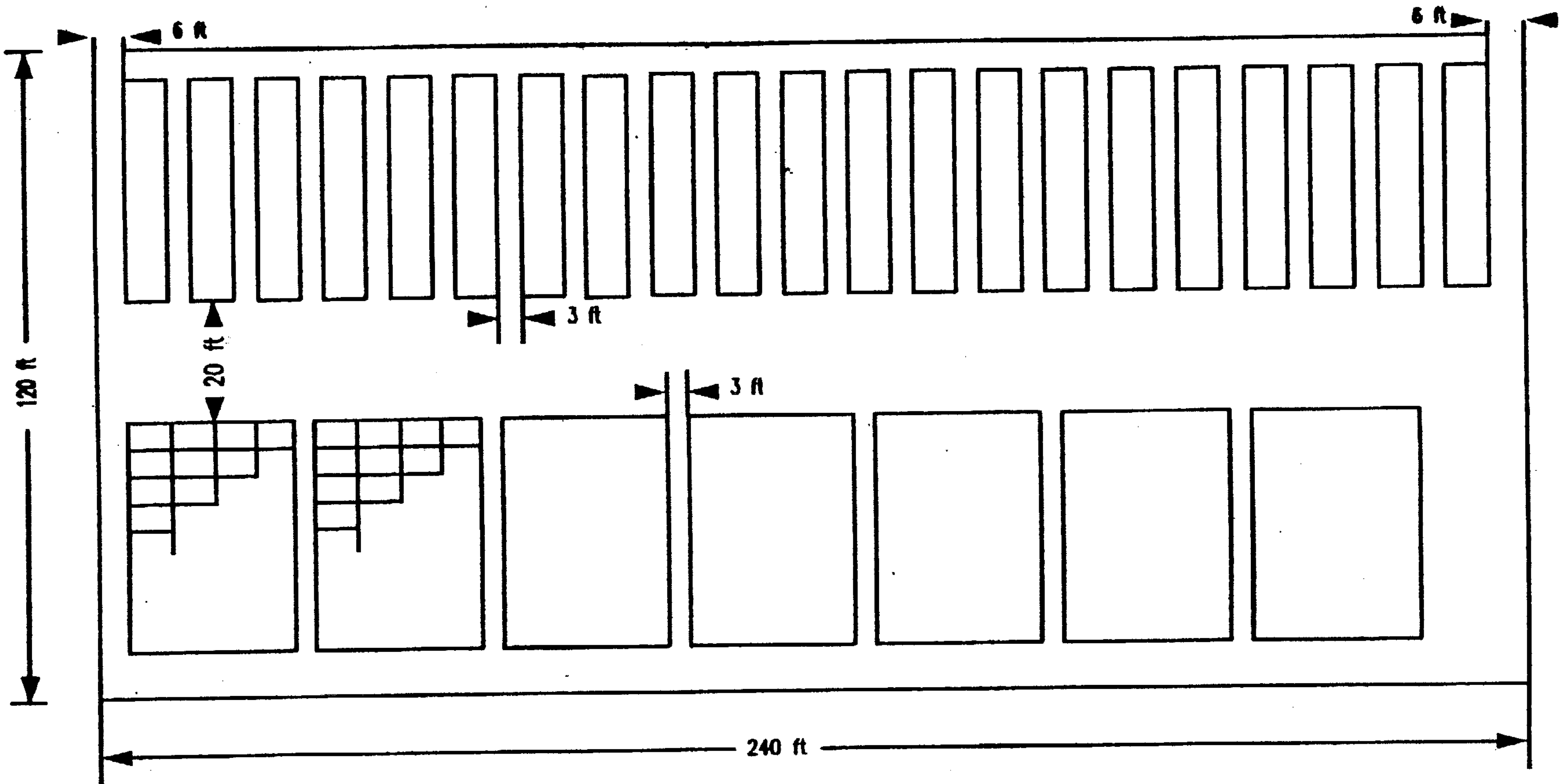
Presently, the TSA-RE is not operational (it is in a lay-up condition). This facility will be maintained, as required, until it becomes operational. The TSA-RE has an approved Safety Analysis Report (Reference 2-5).

2.4.2.7 Advanced Mixed Waste Treatment Project (AMWTP). The AMWTP is being constructed within the TSA. It is not a part of the RWMC facility and is being managed by British Nuclear Fuels Limited (BNFL). The AMWTP area is enclosed by an 8-ft chain link fence, and has separate controlled access from the RWMC. WMF-634 is enclosed within the AMWTP fence and is under the management control of BNFL. The AMWTP will operate under a separate safety analysis. AMWTP operations will be assessed for impact on the RWMC as the project progresses and before operations commence.

2.4.3 Administrative Area

The administrative area of RWMC (Figure 2-2) contains a number of administrative buildings that house the RWMC support staff. Each of the buildings is protected by fire detection and protection systems. Lighting, heating and ventilation, alarm systems, and communications are provided to ensure worker comfort and safety. Two buildings within the Administrative Area of the RWMC contribute to the operational integrity of the RWMC and are described in the following paragraphs:

2.4.3.1 WMF-619 Communications Building. WMF-619 (Figure 2-13) is a steel frame building with a slab on grade, having approximately 800 sq. ft, floor space. This building houses voice and data networks, Life Safety System, telephone switching stations, batteries, charges and rectifiers, video network, a UPS system, and radio and alarm systems for the RWMC. This building is not normally occupied.



Drum configuration 4 wide x 5 high x 23 deep (460 drums/row)
Total building capacity: 42 rows x 460 drums/row = 19,320 drums
Inspection:

Box configuration: 4 wide x 4 high x 11deep (176 boxes/row)
Tota building capacity: 15 rows x 176 boxes/row = 2,640 boxes
Inspection:

R94 0051

Note: Capacities are independent.

Figure 2-9. Typical floor plan of Type II storage modules (WMF-628 through -633).

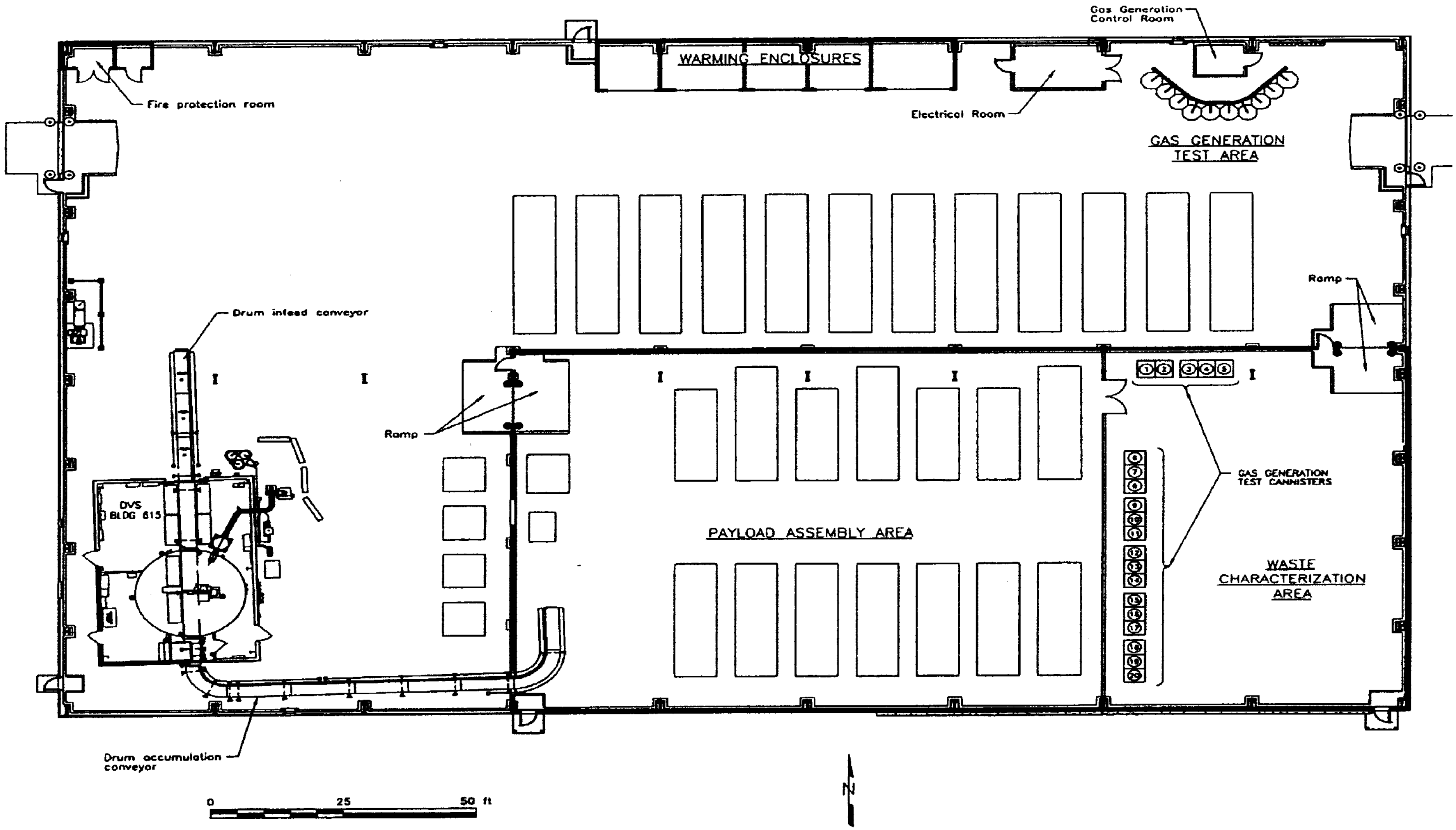


Figure 2-10. Typical floor plan of Type I storage modules (WMF-635).

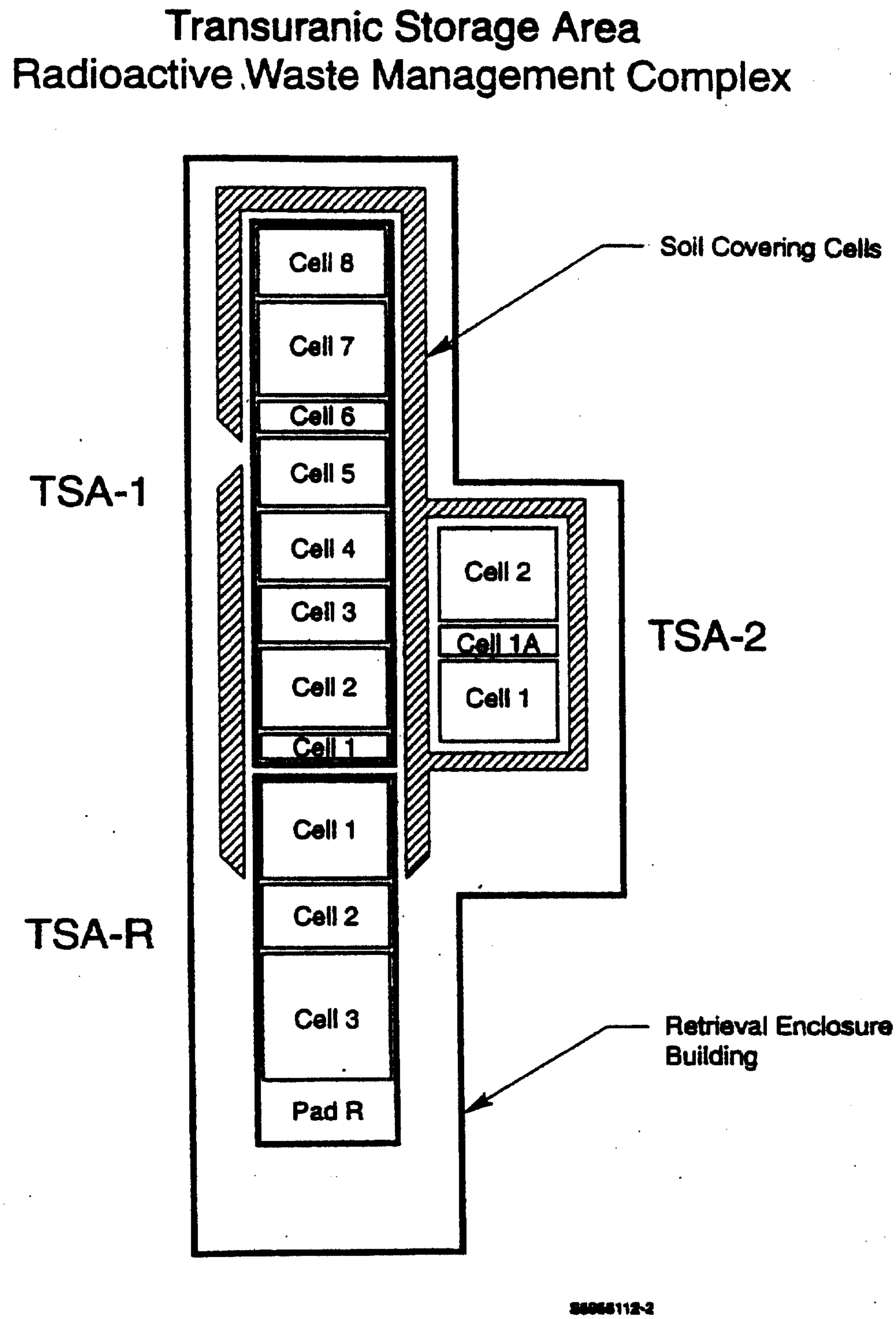


Figure 2-11. Location of cells at TSA-RE Pads TSA-1, -2, and -R.

2.4.3.2 WMF-637 Operations Control Building. WMF-637 (Figure 2-14) is the access control point for the RWMC. Card readers-actuated turnstiles screen entering personnel for access authority; security personnel screen and control visitor access. Personal dosimetry thermoluminscent dosimeters (TLDs) are obtained for personnel who enter the Operations Area, TSA, or SDA. TLDs are not required for those individuals who remain in the Administrative Area.

Vehicle access and egress are controlled by barrier gates operated by security personnel in WMF-637.

WMF-637 also contains the RWMC Emergency Control Center (Conference Rooms A and B).

2.4.4 Operations Area

The Operations Area of the RWMC (Figure 2-2) serves as a buffer between the Administrative Area, the TSA, and SDA.

The Operations Area contains a number of buildings that provides office space for operations and maintenance support personnel, maintenance activities, and general operations support activities. Each building contains fire detection and protection systems, alarms, communications, and heating and ventilation as required to ensure worker comfort and safety. Those buildings that contribute to the operational integrity of the RWMC are described in the following paragraphs:

2.4.4.1 WMF-601 Radiological Control Technician Building. WMF-601 is situated on a concrete pad and is a single story, steel-frame metal building with a mezzanine; it provides offices, restrooms, change rooms, and lockers for RCTs, and a radiological control laboratory. The laboratory contains a gamma spectrometer, with alpha channel, smear-counting scalers, an automated scaler, and a laboratory hood equipped with a HEPA filter. The laboratory hood is maintained in accordance with Company procedures. The laboratory may contain small quantities of radioactive material (in the form of smear samples, CAM filter samples, other samples, and radioactive sources). Exhaust fans provide for a 125-fpm face velocity. However, the general radiation levels that personnel are exposed to are <0.1 mR/h. The highbay provides room for storing materials and for an equipment laboratory. The mezzanine is used for storage only. The radiological control laboratory contains an alpha CAM for monitoring the fume hood and a PCM.

2.4.4.2 WMF-602 RWMC High Bay. WMF-602 is a 2,389 ft^2 prefabricated, corrugated metal on steel-frame modular building with overhead doors. This building is used for waste truck storage (55-ton cask), as a temporary accumulation storage area, and temporary storage of tractor trailers loaded with waste. The building is equipped with a 4" riser, wet-pipe fire sprinkler system. Utilities include 480/240/120vac, a fire water and truck fill station (outside of building), electric heat, and sewer. WMF-602 houses no tenants.

2.4.4.3 WMF-603 Pumphouse. WMF-603 is a single-story, steel-frame metal building on a concrete pad that houses the potable water supply pumps and auxiliary electric fire pump for the RWMC. The pumps in the building include a deep well pump, two domestic water pumps, one auxiliary electric firewater pump, and associated piping systems. A 175-kW, 480-V/277-V propane-powered standby electric generator powers selected loads in the event of commercial power failure.

2.4.4.4 WMF-604 Change Room and Lunch Room Building. WMF-604 is a prefabricated, steel-frame metal building, approximately 40 x 32 ft, on a concrete pad that provides change areas, a lunch room, a restroom, and showers for operations personnel. There are also two emergency exits.

2.4.4.5 WMF-620 Work Control Building. WMF-620 (Figure 2-15) is a double-wide, 55.4- x 27.5-ft trailer containing hard-wall offices, cubicles, and restrooms. It is the central work control point for RWMC operations and is one of the access points for the Operations Area, TSA, and SDA. WMF-620 houses the shift supervisor where work releases are processed. Personnel entering or returning from the Operations Area via WMF-620 pass through a portal monitor. Vehicle access and egress are also controlled by barrier gates at WMF-620.

2.4.4.6 WMF-639 Fire Water Pumphouse. WMF-639 is a single-story, steel-frame metal building on a concrete pad that houses electric and diesel fire water supply pumps for the RWMC. A small jockey and circulation pump are also housed in the building along with associated piping systems. There is a 300-gal diesel fuel storage tank located in the building that supplies the diesel fire pump.

2.4.4.7 WMF-709 Water Storage Tank. The storage tank is a 250,000-gal water tank constructed of 1/4-in. welded steel plates used for storing domestic water and as a backup fire water storage tank. The water tank is filled with the deep well pump located in WMF-603.

2.4.4.8 WMF-727 Fire Water Storage Tank. The storage tank is a 250,000-gal water storage tank constructed of 1/4-in. welded steel plates used for storage of fire water.

The level in the tank is measured by an ultrasonic tank level indicator that requires a 110-V source supplied from WMF-639. A circulation pump and heater circulate and heat the water during the winter months and the tank is insulated to prevent water from freezing.

2.5 Process Description

2.5.1 Shipping Waste

The waste generator is responsible for shipping waste packages in accordance with applicable waste acceptance criteria. All hazardous material shipments on public highways must meet DOT requirements or must be made "Out of Commerce," using government equipment and government drivers.

2.5.2 Receiving Waste

Waste is received at RWMC for storage, examination, or disposal in accordance with the INEEL Reusable Property, Recyclable Materials, and Waste Acceptance Criteria (RRWAC). Upon arrival at the RWMC, all documentation required to accompany the shipment is reviewed by the RWMC waste engineer. The shipment is visually examined for discrepancies and damage. Radiological control personnel perform surveys to ensure that the radiation and contamination readings meet requirements. If any abnormalities are discovered, they are resolved with the generator before formal acceptance of the waste.

The majority of waste received since 1989 has been INEEL-generated CH-LLW. Most of this waste is received in 4- x 4- x 8-ft plywood boxes handled with large all-terrain forklifts.

Some CH LLW is too large for standard boxes and is received either in special shipping containers or no containers at all. The waste not in containers is securely wrapped in a protective fabric. All nonstandard items not in containers (or shipped in reusable containers) are prerigged and are disposed of in the bulk pit.

Some INEEL RH LLW is received. This waste is shipped in reusable shielded casks which may or may not meet Department of Transportation (DOT) requirements. Casks that do not meet DOT requirements are shipped "out of commerce." This waste is disposed of in the SDA.

TRU waste received is packaged in DOT Type A containers and is normally shipped in a Type B package. All TRU waste received is placed in appropriate storage.

2.5.3 Disposing of Waste

Currently, LLW received at the RWMC may be disposed of in Pits 17 through 20 or in soil or concrete vaults. Delineators are installed on the centerline at the end of each row of soil vaults, at the end of each trench, and at the corner of each pit.

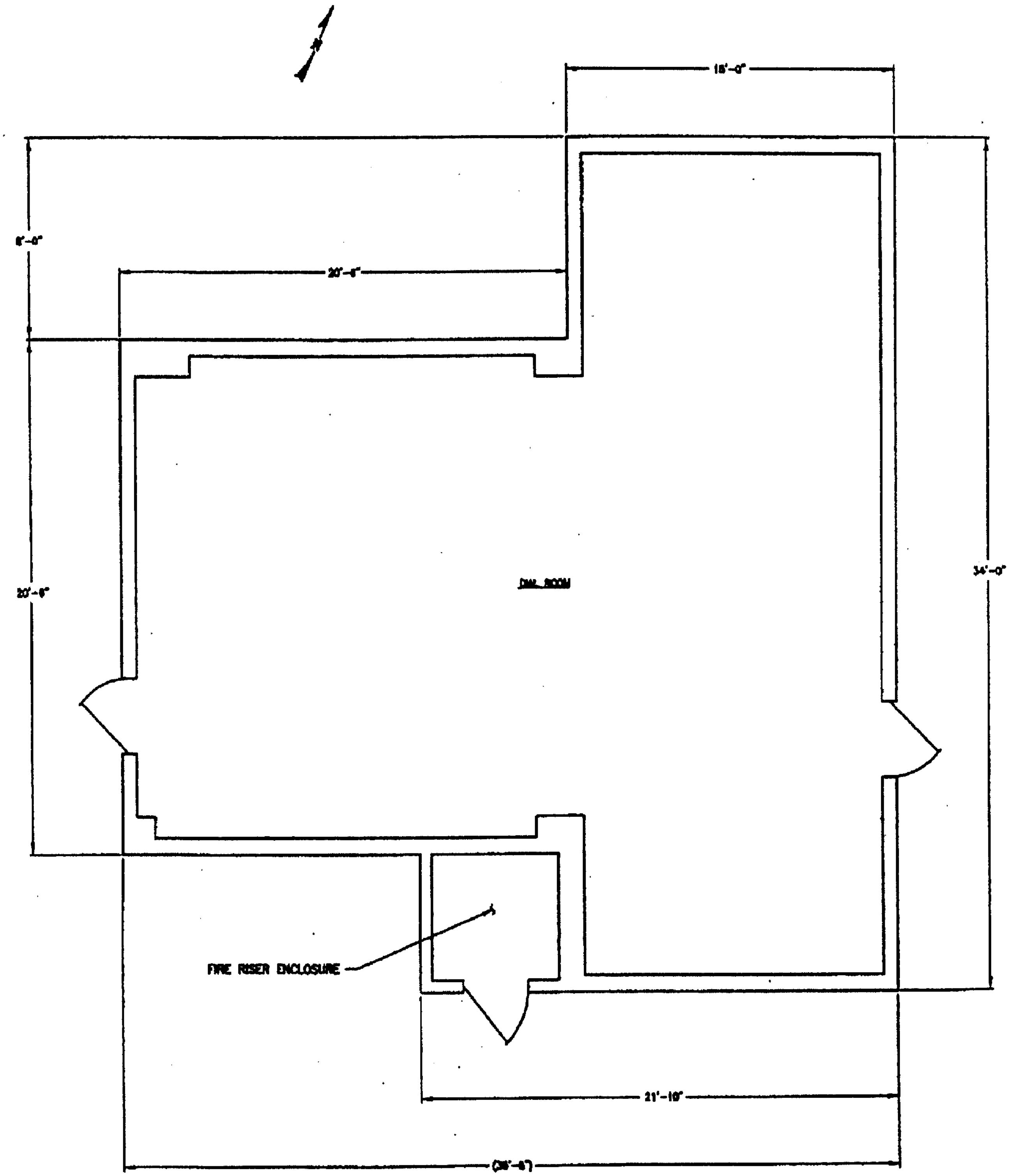


Figure 2-12. Typical floor plan of the communications building (WMF-619).

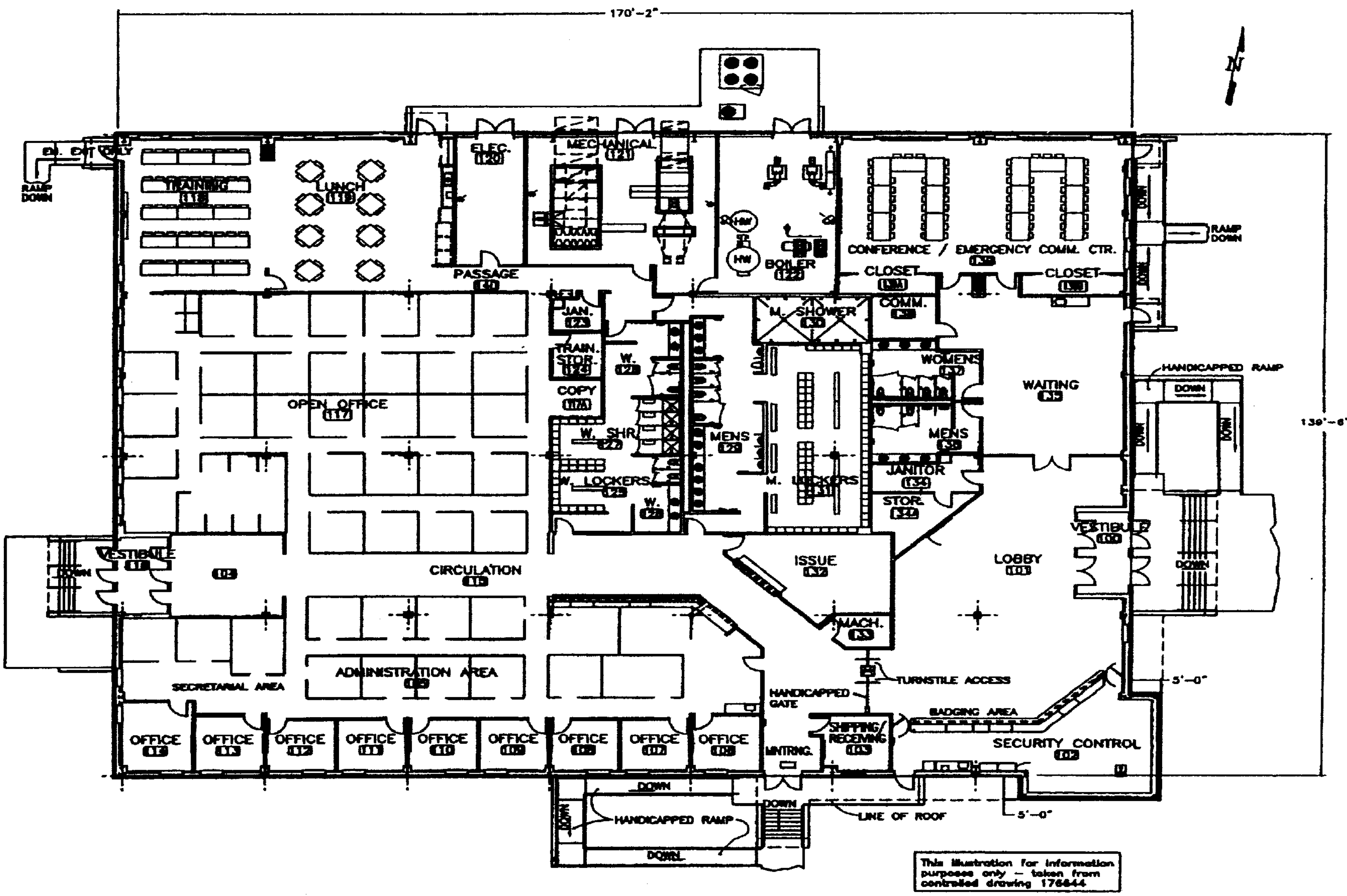


Figure 2-13. Floor plan of the operations control building (WMF-637).

Figure 2-14. Floor plan of the work control building (WMF-620).

2.5.3.1 Preparing the Soil Vaults. Disposal of waste in soil vaults was begun to provide better use of the SDA and to reduce radiation exposure to personnel. Rows of soil vaults are dug along predetermined centerlines in areas not suitable for pit disposal. The soil vault is excavated by drilling a hole in the ground large enough in diameter (1.3 to 6.5 ft) to permit the insertion of a removable liner and the waste package. Vaults are spaced to ensure 2 ft of soil separation from previously buried waste. The depth of the soil vault depends on the depth to the basalt; however, the vaults are a minimum of 6.5-ft deep. If the basalt is reached during drilling, 2 ft of soil is placed at the bottom of the vault to provide the necessary soil required for ion exchange; this inhibits migration of radionuclides. Barriers denoting radioactive hazards or open excavations are placed around any open soil vaults.

2.5.3.2 Using RH LLW Concrete Vaults. Space in which to install individual soil vaults is limited because of shallow soil depth over bedrock throughout the SDA. Prefabricated concrete vaults are placed in a tight array in existing pits, thus allowing efficient storage in the SDA. The array of precast reinforced concrete pipes is placed in a dense-pack configuration. The vaults are 19.6-ft deep and have a 3.9-ft thick plug positioned on top of them.

2.5.3.3 Disposing of Waste in Vaults. For disposal in concrete or soil vaults, the waste containers are discharged directly from the cask through a vault guide sleeve into the vault. The sleeve is removed when the waste stack is within 6.5 ft of its top, or if radiation levels preclude disposal of more waste in that vault. A controlled area (5 mR/h at the perimeter) is established around the vault to control worker exposure to radiation.

An RCT monitors these operations continuously. Airborne radioactivity is monitored and all feasible efforts are taken to minimize exposure of personnel to the high radiation fields.

2.5.3.4 Preparing Pits. Pits are excavated in previously surveyed areas in accordance with DOE requirements. Pits vary in length, but the average depths are 16 to 33 ft and widths are about 98 ft. The currently active pits (Pits 17 through 20) were blasted into the basalt to a total depth of approximately 33 ft. Workers excavated the basalt to maximize the SDA usability. The exposed basalt areas are covered with 2 ft of soil to permit filtration, absorption, and ion exchange with the radionuclides. Open pits are fenced and, to preclude flooding, bounded with 6- to 10-ft high contoured earthen berms.

2.5.3.5 Meeting the Criteria for Disposing of LLW. Newly generated LLW must meet the requirements of the RRWAC before disposal.

The stack height is limited by the self-supporting strength of containers and by administrative controls. The maximum stack height is generally about 24 ft. The containers are stacked using forklifts and cranes; therefore, the vehicle operators and other workmen have little contact with the waste containers. As production permits, the waste is covered with earth at least 3-ft thick, sloped for drainage, and seeded with a sod-building grass. Monuments are placed to define the area.

2.5.4 Storing Waste

2.5.4.1 Criteria for Storing TRU Waste. Newly generated TRU waste must meet the requirements of the RRWAC and, if applicable, the RCRA Permit. Waste is stored in the TSA to await disposal, shipment, or examination. The storage and examination processes are discussed below:

2.5.4.2 ILTSF Transfer Method. Waste containers can be placed in the vaults either by free-air transfer from the shipping container or by discharge from a shielded bottom-discharge cask. The Argonne National Laboratory-West (ANL-W) HFEF-5 cask is an example of a shielded bottom-discharge cask.

The HFEF-5 cask is a bottom-dump cask designed for the ANL-W storage facility. It weighs approximately 16,000 lb. The use of this cask enables personnel to lower a waste container into a vault with minimal risk of direct radiation exposure. The cask is positioned over a storage vault in the vertical position and is aligned by crane until the cask rests on a vault alignment ring which fits over the vault. When the bottom door of the cask is opened, the waste container is lowered into a storage vault.

Open-air transfer is accomplished by means of a drum-lifting device and crane. The crane boom and cable maneuver the drums into the vault. A mirror system may be used to facilitate positioning of the lifting device on a drum. Crane transfer from the shipping carrier is affected using the drum lifting mechanism. The drum is lowered into the vault and the lifting device is disconnected. A drum-centering device may be used to align the waste package within the vault opening during open-air transfers.

2.5.5 Drum Venting Operations

The DVF has been temporarily modified to allow for absorbent addition to sludge drums containing excess water. The safety analysis for absorbent addition operation is documented in Addendum F. The following discussions cover drum-venting operations in DVF. Some of the descriptive information contained in this section is still applicable to the general operation of DVF. Addendum F should be referred to for additional information on absorbent addition operations.

To minimize the hazards associated with hydrogen gas, TRU waste drums are vented consistent with the criteria imposed for shipping the waste to WIPP.

All waste drums shipped to the RWMC since 1983 are equipped with semipermeable lid gaskets. These gaskets are designed to allow internally generated gases to escape the drum while internal particulates are contained. Because studies have shown that flammable hydrogen gas concentrations do not accumulate in drums equipped with semipermeable gaskets, no further mechanical venting is necessary. Drums must be mechanically vented before shipment to WIPP.

The Drum Venting System (DVS) functions to remotely vent TRU waste drums and to insert a filter assembly into the vent hole. The filter assembly allows continuous aspiration of internally generated gases while containing radioactive particulates inside the drum. The assembly consists of a gasket-sealed, self-tapping, hollow, round-headed screw, with an internal filter element. The filter provides a particulate removal efficiency of 99.99% of particulates of 0.3 micron or greater.

The equipment directly involved in drum venting consists of a containment silo, punch & filter insertion machine (P&FIM), conveyor system, ventilation system and process control system. Later additions to the facility are headspace gas sampling and vapor recovery systems. These components operate in conjunction to transport, vent, and insert a filter in each drum remotely as it passes through the facility. Drum-venting process equipment and operations at the DVS facility are described in the following subsections:

2.5.5.1 Conveyor System. The DVS conveyor system consists of an inlet conveyor, interior conveyor, and an exit conveyor. Inlet and Exit (outer) conveyors have a trip pull cable that stops the conveyor when hit, moved, or disturbed to prevent personnel injury. A pressure-sensitive stepon pad stops the conveyors if an operator approaches the interior conveyor; personnel outside activate a pull rope to shut off the outside conveyor. Emergency stop buttons are installed at various locations throughout the building. Manual restart of the conveyors is required in order to proceed with the venting process. The DVF interior conveyor transports the drums one by one through the silo for venting and filter insertion.

2.5.5.2 Punching and Filter Insertion Machine. The DVS P&FIM is located in the approximate center of the silo. It contains a hydraulically powered, dual sliding-head assembly that punctures and inserts a filter assembly in each drum after it is properly positioned on the conveyor. The P&FIM is equipped with a clamping mechanism that adjusts the position of the drum on the conveyor and holds it in place for punching and filter insertion. The head is adjustable to accommodate 30-, 55-, and 83-gal drums.

The punch head assembly contains a hydraulically powered spindle that punches the drum and liner to vent the drum interior. The travel rate of the punching mechanism is controlled to reduce sparking potential. Positioned around the circumference of the punch is an outer sealing mechanism that seals the bottom of the punch with the drum lid during punching and then lifts away from the drum after venting. A line connected at the punch head mechanism draws away any off-gas to a sampling manifold where the gas can be sampled or discharged to the exhaust system. This exhausted gas is diluted with air through a mixing valve, then passes through a HEPA filter and VRS before being discharged to the stack.

2.5.5.3 Control System for Drum Venting. The DVS is equipped with an integrated control system that features a computer control console and a programmable logic controller. The programmable controller controls all the operations in the DVS. The controller is linked to several peripheral devices that provide input and output on system functional status. Overall, the system automates the DVS operation. This reduces the steps required to conduct DVS operations and therefore decreases the margin for operator error while enhancing operational efficiency.

The computer control console provides on-screen control and status of all the DVS system operations. It provides automatic and manual control of all DVF operations while allowing the operator to follow drum movement on the screen. This enables complete control of all phases of the operation from one central location.

The programmable logic controller provides the computerized hardware and software to regulate overall system operation. It receives input regarding DVF door positions, drum positions along the conveyors, and operational status of the ventilation system blowers. These input signals are generated by photoelectric sensors, limit switches, manual control switches, and ventilation-system flow switches. Based on input received from these devices and the computer control console, the programmable controller either initiates the proper operational sequence or remains passive if the proper input logic is not received.

Several interlocks are programmed into the conveyor-controller software to prevent mishaps in handling material (for example, collisions between drums and automatic doors or collisions between adjacent drums). Another interlock prevents introducing a drum when one is already present at the vent station, thus ensuring that only one drum is in the silo during venting operations. Interlocks are also programmed into the P&FIM controller to prevent drum venting if any of the silo access doors are open, if a drum is not positioned at the vent station, or if any of the silo ventilation systems are not operating.

The programmable controller is equipped with battery backup power supplies to maintain the system during commercial power loss. This enables the controller to retain its memory during power outages so that it can resume the proper operational sequence when normal power is restored without requiring a total system reset.

DVS operator interface with the conveyor, P&FIM, and headspace sampling occurs at the computer control console. The computer provides a selection of screens the operator can bring up to perform various operations. This can vary from starting the inlet conveyors, to bringing a barrel into the silo, to initiating the P&FIM and headspace sampling, to discharging a drum from the silo and operating the outlet conveyors. The computer also provides on-screen monitoring of ventilation and silo pressures and differential pressures and flows, and other control interfaces for system operation and surveillance. Manual buttons enable personnel to stop the P&FIM and conveyors in an emergency, and to control both ventilation fans.

Controls are also provided for the RCT stationed at the survey area. These controls allow the RCT to rotate the conveyor turntable in 90-degree intervals to collect smears and to discharge a drum from the station when the survey is completed. An emergency stop button is provided to stop movement of the conveyor turntable or to terminate the drum-discharge sequence.

Safety interlocks incorporated into the system must be satisfied before the DVF can be operated. These interlocks are designed to prevent accidents that can cause releases of radiological contamination during the venting operation.

2.5.5.4 Process Description. Unvented drums are transported to the DVF where they are transferred in groups of five onto the DVS conveyor system and into the DVF. Each drum is surveyed before transport to the conveyor system for radioactive contamination. Once inside the DVF, the drums are automatically conveyed, one at a time, into the silo where drum venting and filter insertion are performed. The vented drum is conveyed from the silo to an inspection station before moving the next drum into the silo. The inspection ensures that filters are correctly inserted and that the drum lid is free of contamination before its transfer from the DVF onto the exit conveyor.

The survey consists of scanning the drum lid for contamination using a portable alpha survey instrument. Smears are also taken on the lid. Access to perform the surveys is provided by sealed glove assemblies installed in access ports. The glove assemblies provide enough dexterity to allow the RCT to manipulate the smear(s) to an access tray located in the inspection station. Smears are then removed from the tray for counting. If contamination is detected above the INEEL Radiological Control Manual limit, all DVS operations are stopped.

The exit door is not reopened until drum and/or area surface contamination is cleaned to below the limits specified in the INEEL *Radiological Control Manual* or until all surface contamination exceeding the limits is effectively immobilized or contained. Ultimately, any drum that becomes contaminated during drum venting is either overpacked or decontaminated to within INEEL *Radiological Control Manual* limits before being examined at SWEPP.

Explosion and fire risks resulting from hydrogen gas accumulation from aspirating drums in the drum survey area are minimal. Although some drums may contain a significant concentration of hydrogen, aspiration and generation rates are low. Furthermore, approximately 500 to 800 cfm of airflow is maintained through the survey station during DVS operations to ensure no hydrogen gas buildup. This air sweep flows directly over the top of the drum lid to the silo suction duct inlet.

2.5.6 Waste Certification and Segregation

WMF-610 houses several examination and certification processes for drums and containers. The processes are discussed in the following paragraphs:

2.5.6.1 Examination. All waste containers examined in SWEPP are initially surveyed by an RCT who uses portable radiological instruments and takes smears from the container surfaces to determine surface contamination and radiation levels. This survey information is used as part of waste certification. The container identity and survey information are entered into the data management system.

2.5.6.2 Weighing the Container. All waste containers are weighed as part of the examination process. The container weight information is then manually entered into the Transuranic Reporting, Inventory, and Processing System (TRIPS) using a local terminal.

2.5.6.3 Real-Time Radioscopy System. Discussions of the RTR systems are contained in INEL-94/0226, Addendum A, *Real-Time Radioscopy System Safety Analysis Report.*[2.5]

2.5.6.4 Gamma-Ray Spectroscopy. There are two gamma ray spectrometer systems installed at RWMC: The SWEPP Gamma-Ray Spectrometer System (SGRS) and the Waste Assay Gamma Spectrometer System (WAGS). Both systems are located at SWEPP and are used for passive gamma-ray analysis of radioactive waste packaged in up to 55-gal drums. The waste may contain uranium and TRU materials. Both systems are capable of identifying gamma-ray emitters at very low activity levels packaged in a wide variety of matrix materials. The systems record an energy spectrum of the gamma-rays emitted from a drum and processes the resultant information to arrive at calculated ratios of the mass of selected isotopes to the mass of ^{239}Pu and/or to the mass of ^{235}U. The reported isotopic mass ratios assume the ratios are constant throughout the entire contents of the drum. The isotopic mass ratio data are used to verify or adjust the quantitative results from the PAN waste assay system which assume the radioactive material to be weapons grade plutonium, which consists of ^{238}Pu, ^{239}PU, ^{240}PU, ^{241}PU, and ^{241}AM (a decay product of ^{241} PU) in nominal weapons grade proportions. The SGRS is operated remotely from the SWEPP control room and the WAGS is operated at WAGS location.

See INEL-94/0226, Addendum C, *Waste Assay Gamma Spectrometer Absolute Assay System*, for additional information on WAGS system.

2.5.6.5 Neutron Assay System. Discussions of the Neutron Assay System are contained in INEL-94/0226, Addendum D, "Hazard Evaluation of the SWEPP Passive Active Neutron Assay System.

2.5.6.6 Container Overpacking. Containers that do not meet the requirements of the WIPP-WAC are overpacked into steel boxes (standard waste boxes) before shipment to WIPP. Breached containers and containers with suspect integrity are also overpacked into containers suitable for contamination containment before storage. Any container that meets all WIPP-WAC requirements but does not meet the following criteria is designated for overpacking before shipment to WIPP.

- All drums must have a 90-mil liner
- All drums must have a valid container code
- No liquids between the liner and the drum.

2.5.6.7 Transuranic Reporting, Inventory, and Processing System. TRIPS accumulates, stores, and retrieves data on each waste container being examined at SWEPP. TRIPS is connected, via a modulator-demodulator and commercial telephone lines, to a remote database in which all information presently gathered on each container is stored. These data can be retrieved and displayed through TRIPS. At the conclusion of the SWEPP examination, the additional information gathered is added to the library of information in the remote database. TRIPS also creates a tape, upon command which includes all new and old data.

Remote terminals are located at each examination station to facilitate data entry by the station operator. Each terminal includes a CRT readout, a standard keyboard input, and a barcode reader. All information input to TRIPS is confirmed by a readout on the CRT to ensure entry correctness. TRIPS interfaces with the SWEPP examination steps and handling phases. Data are protected by a security password at each station.

TRIPS also provides an electronic process for gathering the process data, verifying authenticity through an electronic signature process, and coordinates the electronic review and approval of Levels 1 and 2 data validation in preparation for shipping to WIPP.

2.5.6.8 Gas Generation Testing System (GGTS). See INEL-94/0226, Addendum B, *Gas Generation Testing Systems,* for a system description.

See INEL-94/0226, Addendum A, *Real-time Radioscopy System Safety Analysis Report*, for an illustration of the SWEPP radioscopic examination system.

Figure 2-15. SWEPP radioscopic examination station.

2.5.7 TRUPACT

DOT 17C 55-gal TRU waste drums examined at SWEPP and subsequently certified as acceptable for shipment to WIPP are temporarily stored pending shipment to WIPP. Before the drums or the standard waste boxes may be shipped, they must be loaded into TRUPACT-II shipping containers.

TRUPACT-II is a reusable, double-contained, cylindrically shaped, Type B container licensed by the Nuclear Regulatory Commission to ship TRU waste. TRUPACT-II has been specifically designed to transport TRU-contaminated waste from various waste generators and storage facilities (including RWMC) to WIPP for final disposal. TRUPACT-II containers are shipped to their final destination via a semitractor and trailer.

2.6 Confinement Systems

2.6.1 DVF Silo Energy Dissipation System

The design of the DVF silo is based on the explosion of a single waste drum. The building roof design, illustrated in Figure 2-17, allows upward movement of the entire roof assembly to dissipate the energy released during the explosion of a single drum. The design of the silo side panels, viewing window, access doors, and roof assembly is sufficient to contain the pressure pulse generated during the explosion of a single drum. The drum venting portion of the DVF is designed to contain the force, effects, and debris of the maximum credible explosion (MCE), i.e., a 55-gal drum with a 75% void volume containing 30% hydrogen, 15% oxygen, and 55% nitrogen and with the ignition initiated by a spark. The MCE test performed in the DVS autoclave on September 29, 1983, defined the design basis requirements for containment of the hypothesized pressure transient. In this test, the maximum pressure transient measured was 3.7 psi, with a duration of 0.5 ms. This value was modified to include a 2.5 multiplier. The design requirement (based on the MCE) for the roof assembly is 7.34 psi analyzed to lift the roof approximately 0.54 in. The silo is qualified in accordance with UBC Zone 3 seismic loading.

Special features have been incorporated into the design of the silo to offset specific explosion, fire, and radiological hazards unique to the facility. Because the potential exists for flammable or explosive reactions of hydrogen and oxygen involving TRU waste drums, the silo contains limited combustible materials in its construction, and all exposed surfaces have been coated with a high-gloss, epoxy-based paint that is easily decontaminated. Internal electrical distribution and lighting systems are designed in accordance with NFPA Sections 70 and 70E, for a Class 1, Division2, Group "B" (hydrogen) hazardous area. Electrical equipment meeting this classification reduces the likelihood of ignition of a fuel/air mixture resulting from abnormal operations.

2.6.2 Silo Ventilation

The DVF has been temporarily modified to allow for absorbent addition to sludge drums containing excess water. The safety analysis for absorbent addition operation is documented in Addendum F. The following discussions cover drum-venting operations in DVF. Some of the descriptive information contained in this section is still applicable to the general operation of DVF. Addendum F should be referred to for additional information on absorbent addition operations.

Three independent systems ventilate the DVF silo, a recirculating or sweep system, a vapor recovery system (VRS), and a silo air-exchange system. During drum processing, the punch head assembly of the P&FIM seals the bottom of the punch with the drum lid. A line connected to the sample port of the punch assembly directs off-gas to a sampling manifold where the gas can be analyzed or discharged through a HEPA filter and VRS. The off-gas is then discharged to the stack.

See INEL-94/0226, Addendum B, *Gas Generation Testing System*, for illustration of the GGT Canister.

Figure 2-16. GGT Canister.

The sweep system facilitates the rapid mixing and dilution of the gases released during the venting process. The silo air-exchange system is designed to provide adequate dilution ventilation to ensure that a flammable/explosive atmosphere is not present inside the silo. Dilution ventilation is also provided to the drum contamination-survey station via the silo air-exchange system.

Supply air for the DVF ventilation system is provided through the drum contamination-survey station. Air enters the drum contamination-survey station through cracks and crevices around two doors and the silo, one door leading into the DVF and the other door leading out of the DVF (that is, no dedicated-supply air vents are installed). Supply air for the sweep ventilation system comes directly from the silo volume and leakage around entrance and exit doors. As previously mentioned, the sweep ventilation system functions independently of the silo air-exchange system; therefore, the volumetric flow of the sweep ventilation system is independent of the silo air-exchange volumetric flow.

Monitoring stack radionuclide emissions from the DVF silo are controlled through the use of a HEPA filter and through continuous monitoring via a stack probe which conforms to ANSI standards, and alpha and beta-gamma CAMs.

2.6.3 WSF Spill Containment

Because containment of both liquid and solid wastes is required, the WSF modules are designed in accordance with RCRA standards, 40 Code of Federal Regulations (CFR) 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," July 1992, for liquid wastes and each module is fully enclosed. The modules are constructed on sealed floor slabs with integrally cast containment curbs which form a basin to contain any liquids that may leak from the waste containers per 40 CFR 264.

2.7 Safety Support Systems

2.7.1 Facility Fire Water Protection System

The RWMC firewater distribution system was separated from the potable water system in 1995. The main supply for the system consists of a pump house (WMF-639), and 250,000-gal water storage tank (WMF-727). Two 2,000 gpm at 125 psi fire pumps, one electrically powered and the other driven by a diesel engine, provide the primary and backup required fire flows for the facility. The diesel fire pump starts automatically upon loss of commercial power to the primary electric fire pump. The potable water pumps maintain the normal static pressure in the fire water distribution system. The potable and auxiliary firewater supply is a pumphouse (WMF-603) and a 250,000-gal water storage tank (WMF-709). An auxiliary 1,500 gpm at 125-psi electrically powered fire pump is maintained in pumphouse WMF-603. WMF-603 also houses two potable water pumps and a deep well pump. The deep well pump maintains the water level in tank WMF-709.

The water level in tank WMF-727 is maintained by the two potable water pumps in WMF-603. A backflow preventer is provided on the cross connection between the two systems.

The water level in tank WMF-727 is maintained to provide a two-hour fire water supply for the most demanding fire sprinkler system at the facility. A circulation pump, water heater, and tank insulation maintain the water temperature in tank WMF-727 above freezing. Water circulation and tank insulation maintain the water temperature in tank WMF-709 above freezing. In the event of a fire, the water is distributed from tank WMF-727 by the fire pumps through underground water mains to fire hydrants and building suppression systems. Dry barrel fire hydrants are strategically distributed throughout the TSA and Administrative Area to provide a water source for manual fire suppression efforts. Table 2-3 provides additional information on building fire suppression systems.

In addition, a 3,500-gal water truck is maintained at RWMC that may be used during nonfreezing weather to supply water for fire suppression efforts. The water truck also supplies water during soil compaction operations, for cleaning asphalt pads, and for dust suppression efforts.

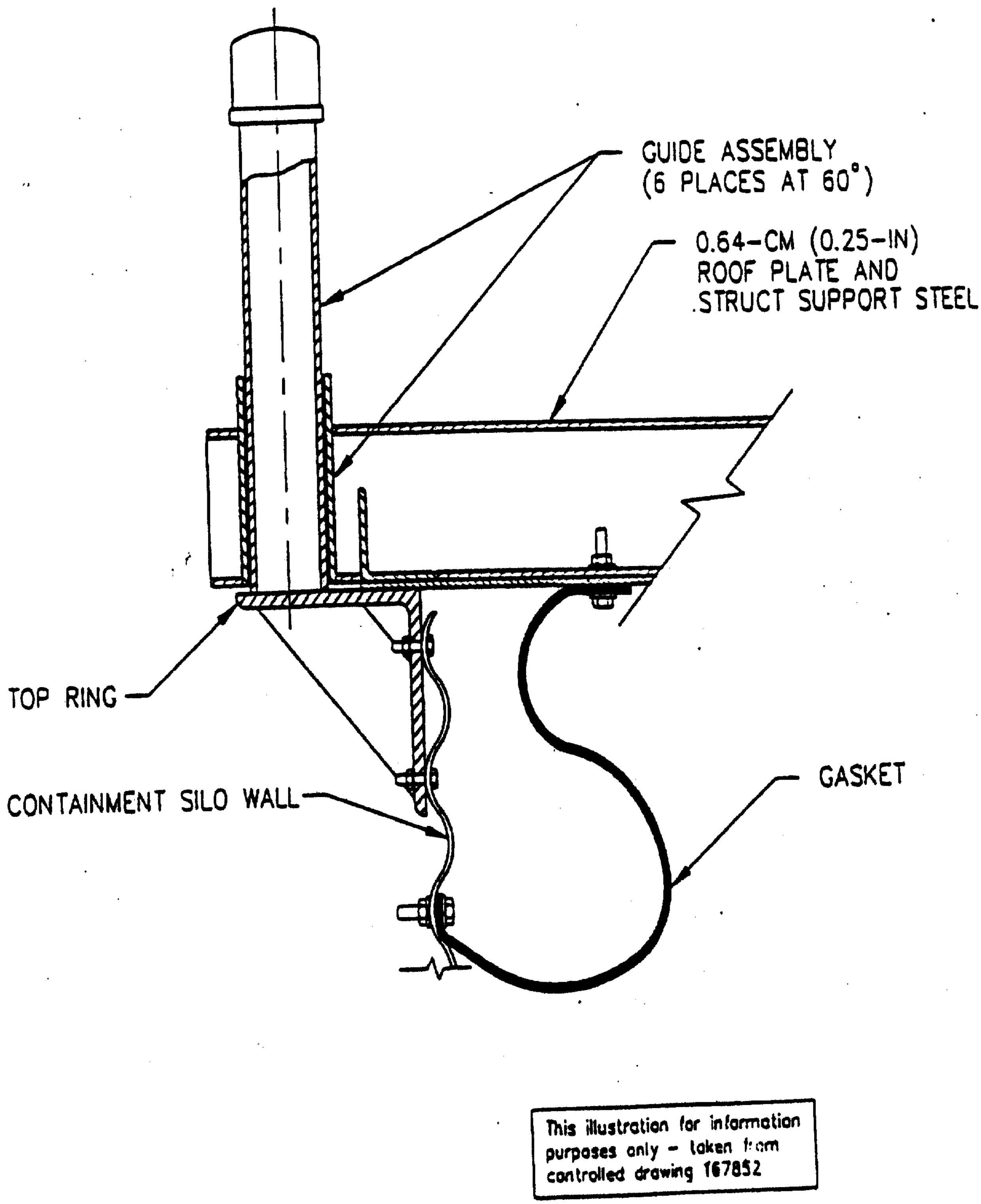


Figure 2-17. DVF silo roof detail.

2.7.2 Hazardous Gas Detection and Safety Support Systems

Three independent propane systems are at the RWMC. One system is located in the Administrative Area. Another system provides propane to the Pump House (WMF-603). The third system, located in the TSA, provides propane to equipment in SWEPP (WMF-610), ASB-II (WMF-711), and TSA-RE (WMF-636).

The Pump House propane system consists of a 500-gal storage tank and vaporizer unit that provides fuel, through an underground line, to the 175-kW Standby Power Generator located in the Pump House. Shutoff valves are located at the storage tank and the vaporizer.

The Operations Control Building propane system consists of a 12,000-gal storage tank, vaporizer unit, and local fill station with emergency valve isolation capacity and provides fuel, through an underground line, for two propane-fired boilers and one propane-fired water heater in the Operations Control Building. Shutoff valves are located at the storage tank and the vaporizer unit. The tank is protected from fire with a thermal insulation barrier.

The third propane system consists of a 30,000-gal storage tank, pump shed, vaporizer shed, and remote fill station with emergency valve isolation capacity. A 2-in. underground line from the pump enclosure provides liquid propane to the TSA-RE. A second 2-in. underground line from the Vaporizer Shed provides fuel to the snow melt furnace and an auxiliary propane-driven fan engine located at ASB-II. This line also provides propane to a 75 kW standby generator and a building heating furnace in SWEPP. Shutoff valves are located at the storage tank, pump, and vaporizer. The tank is protected from fire by an automatic deluge water spray system.

In addition, propane, diesel-powered, and liquified natural gas (LNG) vehicles are used at the RWMC; the use of these vehicles involves the potential for accumulating propane or carbon monoxide. Industrial Hygiene personnel perform monitoring as necessary to detect the presence of hazardous gases and vapors.

2.7.2.1 Propane Detection. Propane detectors are installed in the SWEPP building. The SWEPP detection system consists of a controller, terminal box, alarm panel, and two sensors. One of the sensors is located in the SWEPP furnace room, the other in the standby generator room. Detection of propane in the furnace room activates a rotating amber beacon and horn. In addition to activating a rotating amber beacon and horn, detection of propane in the standby generator room opens ventilation dampers and starts an exhaust fan which exhausts to the outside. These activities are initiated if propane levels reach an approximate concentration of 20% of the lower explosive limit (LEL) which is the lower alarm set point.

2.7.2.2 Carbon Monoxide Detection. When propane and diesel powered forklifts operate in the high bay area of the SWEPP building, ASB-II, or the TYPE I or Type II Storage Modules there is a potential for the buildup of carbon monoxide (CO) to dangerous levels inside these buildings. During such activities, on a short-term basis, CO levels are monitored and evaluated by industrial hygiene personnel. When determined necessary by industrial hygiene personnel, portable CO monitors equipped with audible alarms are used during the operation of fossil fuel vehicles to ensure worker protection.

2.7.3 Alarm and Communications Systems

Communications and alarm systems at the RWMC provide warning of potential emergency conditions throughout the facility. These systems include telephones, an intercom, two way radios, fire alarms, evacuation alarms, and CAM and RAM alarms.

Telephones are available in all normally occupied buildings at the RWMC. Operating personnel stationed at other buildings, or at outside waste disposal and storage areas, are equipped with two way radios. The RWMC Command Post, in WMF-637, is equipped with several telephones dedicated for use during emergency conditions.

Evacuation notification at the RWMC consists of four manually actuated combination alarm-voice paging control panels. All normally occupied areas receive audible alarms and voice paging. Audible alarms and warning beacons are also located throughout exterior areas to provide complete facility notification.

The RWMC fire alarm system is linked to the INEEL Fire Alarm Monitoring System (FAMS). Signals (alarm, supervisory, and trouble) are transmitted from the RWMC to the INEEL FAMS receiving computer located at the fire station at the Central Facilities Area (CFA) (CF-666). Alarm signals are initiated by manual pull boxes, automatic sprinkler system water flow alarms, and smoke detection systems. Supervisory signals are initiated for sprinkler system control valves in closed position, low dry-pipe sprinkler system air pressure, low water tank level or water temperature, low air temperature, and abnormal fire pump assembly conditions. Trouble signals are initiated when a Multiplex Interface Panel fails to communicate with the FAMS receiving computer upon loss of AC power to a Multiplex Interface Panel, or as a result of other abnormal system conditions.

Any alarm condition is sent to the FAMS receiving computer which activates an alarm printer and audible signal in the fire station at the CFA. This computer also:

- Returns an event message to a printer in the OCB (WMF-637)
- Notifies the Warning Communication Center
- Prints a "run card" detailing information essential to the firefighting effort.

Any supervisory or trouble condition is sent to the FAMS receiving computer which activates an alarm printer and audible signal in the fire station at the CFA. The operator then notifies the RWMC of the condition requiring corrective action.

All normally occupied buildings have local fire alarm notification devices activated upon any alarm condition. Most normally occupied buildings have speakers that relay a voice message indicating a fire condition in other buildings (see Table 2-4). Additionally, each sprinkler system has a water motor gong mounted on an exterior wall that notifies personnel in the immediate area that the building sprinkler system has activated.

2.8 Utility Distribution Systems

2.8.1 Electrical Power

Power is supplied to the RWMC by a 12.5 kV line from the Scoville substation at CFA via Experimental Breeder Reactor-I (EBR-I) to Pole E-133. Pole E-133, located north of WMF-655, supplies power to a 600A Vacuum Fault Interrupter (N-SCSW-MC01). Power is routed underground in a loop configuration to various 15 kV fused load break sectionalizing terminal posts throughout the RWMC area. This power loop arrangement allows some flexibility on how power is routed throughout the facility. The sectionalizing terminal posts are dedicated to specific stepdown transformers to meet building voltage requirements. Also, a 12-kV line is routed underground near the Pit 9 area then overhead to supply power around the perimeter of the SDA. Figure 2-18 shows power routing from the CFA to the RWMC. Figure 2-19 shows the electrical power distribution system around the RWMC area and Figure 2-20 shows the electrical power distribution around the SDA area. The high voltage electrical distribution system is maintained and operated by the Power Management organization. Electrical power within the various facilities is maintained and operated by cognizant RWMC personnel. Table 2-5 is a summary of components that may be used to deenergize all or major portions of the RWMC.

Whenever commercial power is disrupted, three generators can come online and supply power to various facilities at the RWMC unless manually overridden at their respective control panels. A 500-kW generator provides 480 V standby power to the Type I storage module (WMF-635), the Type II storage modules (WMF-628 through WMF-634), and the TSA-RE facility (WMF-636). A 175-kW generator, located in the Pump House (WMF-603), supplies 480-V standby power to the Operations Office (WMF-611), the Operations Control Building (WMF-637), the Pump House (WMF-603), the Radiological Control Office (WMF-601), the ASB-II (WMF-711), Dial Room (WMF-619), and to Information Technologies (WMF-658). A 75-kW generator, located in the SWEPP Examination Building (WMF-610), provides 480-V standby power to WMF-610.

2.8.2 Facility Potable Water System

Water is supplied by a 240-gpm deep-well pump (production pump) located in WMF 603. The water is pumped into the 250,000-gal water storage tank (WMF 709). Potable water is supplied to buildings by two 250-gpm domestic supply pumps.

Table 2-3. Fire suppression systems at RWMC buildings.

	Fixed Automatic Suppression System		Fixed Manual Suppression System	
Building No.	Riser Size and Type	Building Riser Supply Line Size (in.)	Halon System	Standpipe
WMF-601	4 in./wet	4	—	—
WMF-602	4 in./wet	4	—	—
WMF-603	4 in./wet	3	—	—
WMF-604	2 in./wet	4	—	—
WMF-609	6 in./dry	8	—	—
WMF-610	4 in./wet	6	—	—
WMF-613	4 in./wet	6	—	—
WMF-615	6 in./ wet	8	1211*	—
WMF-617	2 in./wet	6	—	—
WMF-618	4 in./wet	4	—	—
WMF-619	2 in./ wet	6	—	—
WMF-620	4 in./wet	6	—	—
WMF-621	4 in./wet	6	—	—
WMF-622	4 in./wet	6	—	—
WMF-624	6 in./waterspray	6	—	—
WMF-628	6 in./preaction	8	—	1-dry
WMF-629	6 in./preaction	8	—	1-dry
WMF-630	6 in./preaction	8	—	1-dry
WMF-631	6 in./preaction	8	—	1-dry
WMF-632	6 in./preaction	8	—	1-dry
WMF-633	6 in./preaction	8	—	1-dry
WMF-635	2-6 in./wet pipe	8	—	1-dry
WMF-636	8-6 in./dry pipe	8	—	8-dry
WMF-637	4 in./wet	8	—	—
WMF-639	2 in./wet	10	—	—
WMF-645	3 in./wet	4	—	—
WMF-646	3 in./wet	4	—	—
WMF-653	4 in./wet	6	—	—
WMF-658	4 in./wet	6	—	—
WMF-655	4 in./preaction	6	—	—
WMF-656	4 in./wet	6	—	—
WMF-657	3 in./wet	4	—	—
WMF-711	—	—	—	1-dry

* Manual activation only.

Table 2-4. Fire alarm/detection at RWMC buildings.

Building No.	Detection: Smoke, Heat, or Waterflow Alarm	Manual Pull Boxes Available	Local Alarm System Available	Alarm to Fire Station
WMF-601	Yes	Yes	Yes	Yes
WMF-602	Yes	Yes	Yes	Yes
WMF-603	Yes	Yes	Yes	Yes
WMF-604	Yes	Yes	Yes	Yes
WMF-609	Yes	Yes	Yes	Yes
WMF-610	Yes	Yes	Yes	Yes
WMF-613	Yes	Yes	Yes	Yes
WMF-615	Yes	Yes	Yes	Yes
WMF-617	Yes	Yes	Yes	Yes
WMF-618	Yes	Yes	Yes	Yes
WMF-619	Yes	Yes	Yes	Yes
WMF-620	Yes	Yes	Yes	Yes
WMF-621	Yes	Yes	Yes	Yes
WMF-622	Yes	Yes	Yes	Yes
WMF-628	Yes	Yes	Yes	Yes
WMF-629	Yes	Yes	Yes	Yes
WMF-630	Yes	Yes	Yes	Yes
WMF-631	Yes	Yes	Yes	Yes
WMF-632	Yes	Yes	Yes	Yes
WMF-633	Yes	Yes	Yes	Yes
WMF-635	Yes	Yes	Yes	Yes
WMF-636	Yes	Yes	Yes	Yes
WMF-637	Yes	Yes	Yes	Yes
WMF-639	Yes	Yes	Yes	Yes
WMF-645	Yes	Yes	Yes	Yes
WMF-646	Yes	Yes	Yes	Yes
WMF-653	Yes	Yes	Yes	Yes
WMF-655	Yes	Yes	Yes	Yes
WMF-656	Yes	Yes	Yes	Yes
WMF-657	Yes	Yes	Yes	Yes
WMF-658	Yes	Yes	Yes	Yes
WMF-711	No	No	No	No
WMF-624	Yes	Yes	Yes	Yes

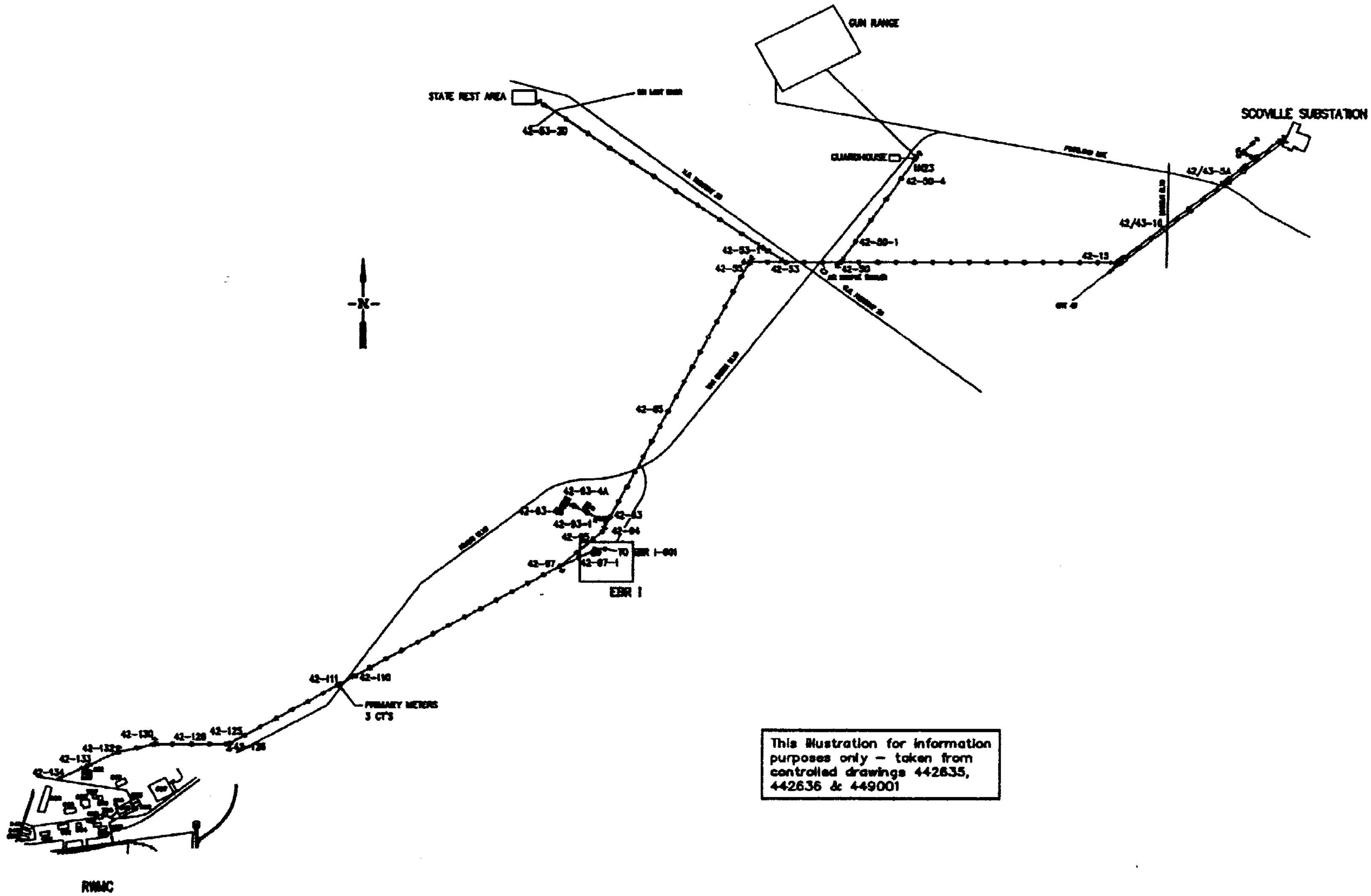


Figure 2-18. Power routing from Central Facilities Area to the RWMC.

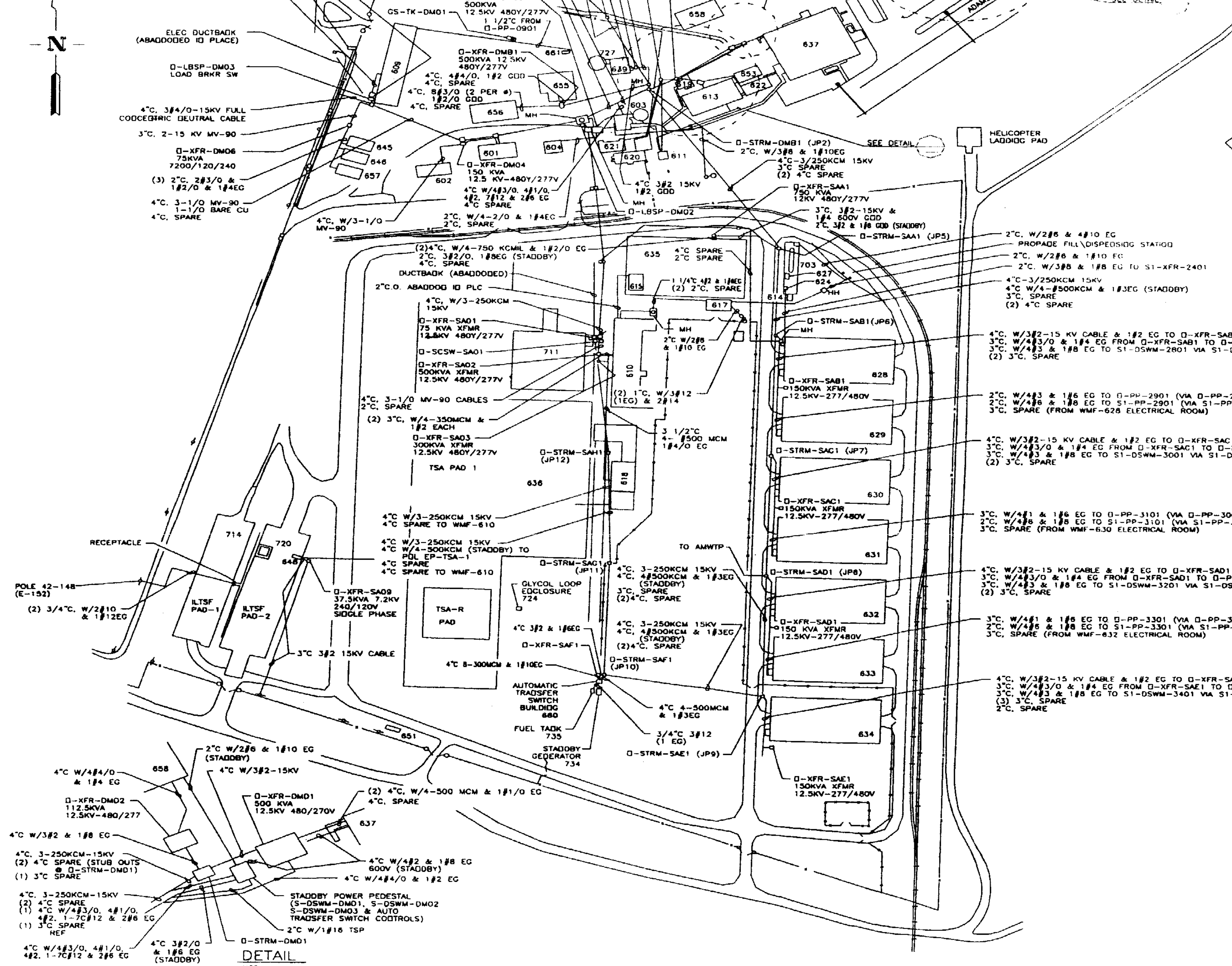


Figure 2-19. Power distribution and transformer location within the RWMC TSA.

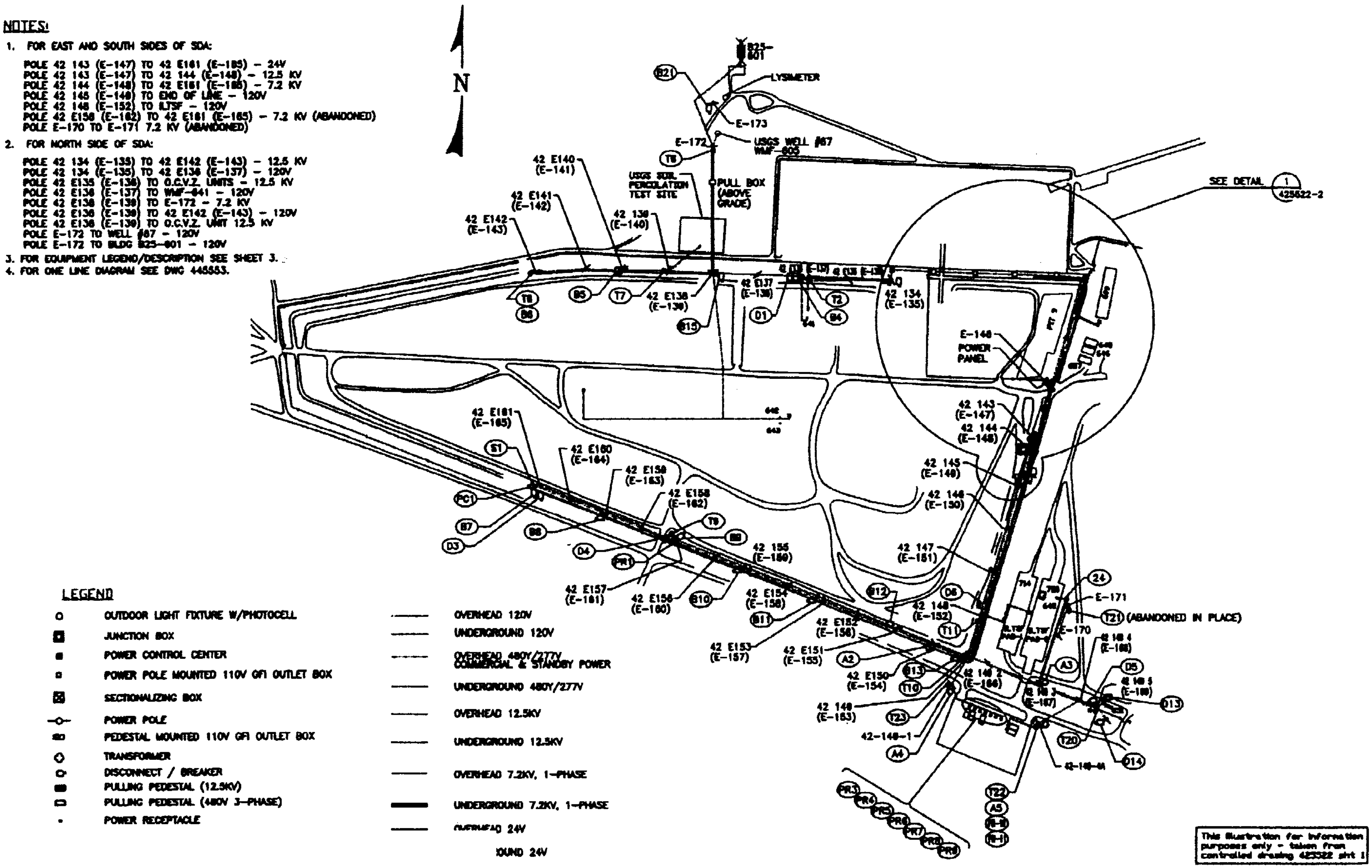


Figure 2-20. Power distribution and transformer location within the RWMC SDA.

Table 2-5. Components that may be used to deenergize RWMC areas.

Component	Affected RWMC Area
Disconnect switch near EBR-I	All of RWMC
600A vacuum fault interrupter (N-SCSW-MC01, SW1)	All of RWMC
600A vacuum fault interrupter (N-SCSW-MC01, VF1-1)	Administrative Area and TSA
600A vacuum fault interrupter (N-SCSW-MC01, VF1-2)-	SDA area
Load break switch (LBSP-DM03)	SDA area

2.9 Auxiliary Systems and Support Functions

2.9.1 Roads

The principal route to the RWMC is via Adams Blvd., approximately 11 km (6.8 mi) from the INEEL fire station, located at the CFA. Both are paved, all-weather roads intended for heavy truck use. Approximately 10 min are required for the INEEL Fire Department to arrive at RWMC in response to an alarm.

Two alternate, weather-dependent routes are to the RWMC via graded dirt roads (see Chapter 1, Figure 1-1). The east approach follows the railroad track south, then west to the site, 12 km (7.45 mi) from CFA. The west approach follows the Big Lost River to the "Y" junction. The left fork goes east to the RWMC (18 km [11.2 mi]); the right fork continues around to the south, then north to the RWMC, 20 km from CFA.

A graded, graveled, all-weather road runs the length of the SDA from east to west. Temporary roadways intersect this main road, to serve open areas for waste disposal. Alternate access into the SDA is provided by graveled boundary roads from the west and south.

Within the TSA, the three storage pad aprons provide all-weather surfaces for vehicular traffic. All access roads are paved.

2.9.2 Monitoring the Environment

Environmental monitoring requirements are conveyed by the INEEL Radiological Environmental Surveillance Program in the *Environmental Handbook for the RWMC and Other Waste Management Facilities* which provide both routine surveillance data for all INEEL Waste Management Program facilities and nonroutine or special-request monitoring at all INEEL areas. The Radiological and Environmental Sciences Laboratory performs routine surveillance outside all operational facilities on the INEEL Site and at the INEEL boundaries and distant locations off the INEEL. The Radiological Environmental Surveillance Program for the RWMC is conducted by the Environmental Monitoring organization. Surveillance activities include: ambient air monitoring, surface soil sampling, surface water sampling, biota surveillance, penetrating radiation monitoring, and visual inspection.

The general requirements for environmental monitoring programs at DOE sites are contained in the following DOE Orders and regulatory guides:

- Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance
- DOE Order 5400.1, General Environmental Protection Program, Chapter IV, November 1988, Chg. 1, June 1990
- DOE Order 5400.5, Radiation Protection of the Public and the Environment, Chapter I, Section 8 and Chapter II, Section 6, February 1990, Chg. 2, January 1993.

The Radiological Environmental Surveillance Program ensures compliance with applicable requirements regarding environmental surveillance of radioactivity at DOE waste management facilities; identifies trends in concentrations of radioactivity in environmental media near waste management facilities; provides indications of confinement integrity at radioactive waste storage and disposal facilities; and makes monitoring data available to other programs conducting activities such as performance assessment, pathways analysis, and dose estimation.

2.9.3 Environmental Restoration Activities.

The Environmental Restoration (ER) Program includes project managing, integrating, and coordinating the remediation of inactive waste sites at the INEEL. The Buried Waste Program was established to address remediation at the RWMC [also known as waste area group (WAG)-7]. The Buried Waste Program activities include investigating and remediating releases of hazardous substances from buried waste at the SDA and from waste stored in the TSA and active subsurface disposal areas or other solid waste management units within the RWMC. The ER Program characterization and remediation are regulated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and administered as defined in the Federal Facilities Agreement and Consent Order. This process may require development of new technologies to probe, sample, retrieve, process, and dispose of wastes. The Environmental Operations organization provides coordination and minimization of interfaces required for successful execution of the ER Program and the Buried Waste Program and management of the RWMC.

Examples of past environmental remediation activities at the RWMC are the characterization of the Acid Pit and remediation of Pad A. Safety analysis of these activities was included as addenda in the previous version of the RWMC Safety Analysis Report but is not included in this report because they have been completed. These activities are briefly discussed below.

The Acid Pit is a closed disposal area of the SDA which was an open pit used for the disposal of chemical wastes which may have also been radioactively contaminated. Closure of the pit occurred some years ago and involved placing lime in the pit and covering it with earth. Investigations of the Acid Pit include a soil gas survey in 1987, drilling and sampling the pit perimeter in 1990, and drilling and sampling the acid pit interior in 1991 and 1992.

Pad A was constructed in 1972 for the disposal of containerized radioactive waste contaminated with TRU isotopes at <10 nCi/g with a dose rate of less than 200 mR/h at the container surface. Boxes and drums were stacked on an asphalt pad until 1978 when the pad was closed. Closure was performed by placing plywood or polyethylene over the containers. The waste pile was then covered with a soil layer 3- to 6-ft thick. At the time of closure, the pad contained 18,232 drums and 2,020 boxes. In 1979, ten rows of drums and approximately three rows of boxes were uncovered and examined and in 1989, an attempt was made to retrieve drums from Pad A for inspection. These investigations are completed and the pad is now completely covered with overburden. Pad A was recontoured and a liquid sample system was installed in 1995.

Some remedial activities are planned for the immediate future. These include the environmental monitoring activities described above and subsurface soil sampling of the SDA. The subsurface soil sampling project requires that holes be drilled into the soil between some pits and trenches (holes are not drilled directly into the waste) and that the subsurface soils be removed and evaluated. Other similar remediation activities may be required after this SAR is issued. These activities will be evaluated using the unreviewed safety question process to determine if DOE approval is required before proceeding.

2.9.4 WAG-7 Operable Units

Descriptions of the Operable Units (OUs) are as follows:

2.9.4.1 OU 7-01-SDA Soil Vaults. Soil vaults at the SDA are cylindrical holes drilled into the ground for disposal of waste having radiation levels higher than 500 mR/h at 3 ft from the container surface. These containers were placed in the vaults between 1977 and 1983. Suspected contaminants include radioactive and possible nonradioactive hazardous materials.

2.9.4.2 OU 7-03-Non-TRU-Contaminated Waste Pits and Trenches. This OU is defined as those pits and trenches within the SDA, which, based on examination of historical records, do not contain TRU-contaminated wastes (greater than 10 nCi/g) from the Rocky Flats Plant (RFP) and are not addressed in other WAG-7 OUs. These pits and trenches will, however, be investigated for possible radioactive and nonradioactive hazardous substances.

2.9.4.3 OU 7-04-Air Pathway. This OU is the air surrounding the RWMC that could possibly be contaminated by releases of airborne radioactive or nonradioactive hazardous aerosols or particulates.

2.9.4.4 OU 7-05-Surface Water Pathway and Surficial Sediments. The surface water pathway is described as surficial sediments that may have been contaminated by surface water runoff from the RWMC to the Big Lost River drainage system. Surficial sediments at and near the RWMC were sampled to detect any radioactive and nonradioactive materials. WAG-7 has recommended that further studies be conducted under the Comprehensive Remedial Investigation/Feasibility Study (OU 7-14).

2.9.4.5 OU 7-06-Groundwater Pathway. This OU is the Snake River Plain Aquifer beneath, and within the immediate vicinity of, the RWMC, including water in the subsurface fracture zones, intermediate sedimentary beds, and perched water. The aquifer is tested and monitored for radioactive and nonradioactive hazardous materials to detect releases and to determine the extent of contaminant migration.

2.9.4.6 OU 7-07-Vadose Zone. The vadose zone OU is the subsurface unsaturated region beneath the RWMC, extending down to the top of the Snake River Plain Aquifer. Suspected contaminants are nonvolatile radioactive substances, nonvolatile organics, and heavy metals.

2.9.4.7 OU 7-08-Organic Contamination in the Vadose Zone. This OU is the area contaminated with volatile organic compounds that have vaporized and migrated into the vadose zone from buried organic wastes in the SDA. Vapor Vacuum Extraction with Treatment (VVET) Units have been constructed and are operating in the SDA to remove volatile organic compounds from the vadose zone.

The treatment operation process of the VVET Units is divided into three basic phases: pretreatment, thermal oxidation, and post treatment management of the oxidized exhaust gas. Activities include:

- Operation of the VVET unit is performed by the VVET technician.
- The units are controlled through a control panel that adjusts the intake of vapors from the wells, intake of supplemental air, fuel uptake, and the thermal oxidation of the units.
- Operation of the units also requires the VVET technician to open and adjust various valves on the unit.

A discussion of general specifications and performance of major process equipment follows:

Stage 1—Pretreatment

- The pretreatment equipment functions to collect the vapors into a header using a vacuum blower, inject air and/or supplemental fuel, and thoroughly mix the vapors /air/fuel mixture.
- Vapors are withdrawn from the extraction well head by vacuum and conducted through heat traced and insulated piping to the vapor header on the process skid.

- In the main header, supplemental air is introduced into the line by vacuum. The gas then enters a vacuum blower, which is capable of producing both the vacuum required at the well head and the pressure required to push the gas through the process system.
- Supplemental fuel gas is injected through a sparger into the line (as needed) to maintain the oxidation temperature set point. The vapor stream and fuel are then mixed in a static in-line mixer, which ensures the air and vapor, are adequately mixed before entering the oxidizer. Once air and/or fuel have been mixed with the vapor the combined stream enters the thermal oxidizer. Temperature, pressure, and/or flow headers are monitored and controlled in the main vapor header.

Stage 2—Thermal Oxidation. The thermal oxidizer consists of four major parts:

- A pre-heater used to bring the oxidizer to operating temperature
- A metal shell or containment vessel
- The refractory
- The "matrix."

The function of the matrix is to contain and control the oxidation reaction. Basic control is achieved by balancing the mass velocity in an upward direction with reaction velocity in a downward direction to maintain the reaction zone within a fixed location in the reactor. Since total flow to the reactor is controlled, the only remaining variable is reaction velocity, which is a function of temperature. If the vapor is lean, supplemental fuel is added to the vapor through the sparger; if the vapor is rich, the temperature indicating control will reduce or eliminate fuel addition.

During startup, the main vapor line is isolated from the thermal oxidizer. Combustion air and fuel gases are admitted to the oxidizer pre-heater pilot utilizing a burner management system. The upper section of the oxidizer is then heated to establish an appropriate "profile."

The metal shell of the oxidizer provides containment of the process gases. The refractory lining acts as an insulating medium to minimize heat loss and prevent the metal shell from reaching the high oxidation temperatures found in the matrix.

The matrix consists of inert media selected for its thermal and flow distribution properties. The matrix is divided into two zones, the mixing zone and the oxidation or reaction zone. Ceramic balls and saddles of various sizes are selected to provide good mixing and distribution of the vapor in the mixing zone and to provide both a sink and source for heat energy in the reaction zone. During normal operation, vapor, supplemental fuel, and/or air are thoroughly mixed as the gas flows through the mixing zone. As the gas flows towards the reaction zone, it absorbs heat from the matrix. When the gas reaches the oxidation temperature, organic compounds oxidize to form carbon dioxide, hydrogen chloride, unoxidized VOCs, and water vapor, releasing heat that is reabsorbed by the matrix.

Temperatures, pressures, and/or flows are monitored and controlled in the thermal oxidizer.

Stage 3—Post-treatment. Based upon anticipated oxidizer inlet concentrations and the anticipated destruction removal efficiencies of the units, post-treatment will be unnecessary.

2.9.4.8 OU 7-09-Transuranic Storage Area Releases. OU 7-09 is a 22.7-ha (56-acre) area at the RWMC consisting of four aboveground storage pads and soil vaults. The TSA and the waste stored there are regulated by RCRA and are not, therefore, part of the WAG-7 program. This OU will be investigated for potential historical releases to determine if any action is warranted.

2.9.4.9 OU 7-10-Pit 9. OU 7-10 which covers approximately 43,000 ft^2 within the SDA, contains drums of plutonium-contaminated sludge from RFP, drums of assorted waste, cardboard boxes containing empty contaminated drums, and 72 containers of unspecified waste. Environmental remediation activities are planned for Pit 9. These activities will be performed in three stages. Stage 1 includes a series of borings, samplings, analyses, and monitoring within the pit to obtain waste information. Stage 2 includes the retrieval of 200 yd^3 of waste from the pit as a means of obtaining additional materials for treatability studies and to obtain information related to the condition of the pit contents. Information obtained in Stage 2 will be used to ensure a cost-effective approach to Stage 3, full remediation of the pit. The authorization basis for Pit 9 activities will be determined as required.

Cased probe holes have been installed into the Pit 9 as part of Stage I activities. These cased probe holes will be used to gather in situ data about the radiation fields and geophysical properties in Pit 9. Active neutron monitoring will be used to determine locations of Rocky Flats Plant waste that contains 74 series sludge (containing TRU waste). Additional probe holes will be installed as necessary to further define the distribution and amounts of the key contaminants so future remediation may be planned.

The cased probes are inserted into the pit using a sonic drill rig. The drill rig is remote controlled to protect the workers during probing activities. The rig uses video cameras for viewing operations at a remote location. Field personnel are a minimum of 50-ft away from the drill during advancement. A drill string enclosure is not required for installing the cased probe holes. The probe holes are advanced through the waste to the top of the basalt or until refusal. The casing utilized will be a minimum of 4.5-in ID and a maximum of 5.5-in OD. It will penetrate the overburden, waste and underburden to an average depth of 17.5-ft. The probe holes are not expected to exceed a 25-ft depth.

A gamma spectroscopy logging system, a passive/active neutron sensor array, and potentially other geophysical arrays will be used to provide downhole logging of OU 7-10 cased probe holes installed as described above. The gamma spectroscopy systems consist of high purity germanium (HPGe) and/or thalium activated sodium-iodide gamma-ray detectors for quantitative and qualitative in situ measurements of the OU 7-10 gamma-emitting radionuclides. These logging instruments are provided in a self-contained vehicle that will be driven on to the OU 7-10 project site. Passive/active neutron logging will be performed by a subcontractor. For active neutron logging, a neutron radiation source will be used.

2.9.4.10 OU 7-12-Pad A. Pad A is an aboveground area for disposal of low-level radioactive waste and sodium and potassium nitrates. The selected remedy for this OU is maintenance of the existing soil cover and monitoring.

2.9.4.11 OU 7-13/14 - SDA. OU 7-13/14 covers all pits and trenches in the SDA that contain primarily TRU wastes from the RFP and LLW from the INEEL and soil vaults that contain activated metals. Environmental remediation activities for OU 7-13/14 are probing and in-situ sampling to characterize buried waste.

The insertion location of probe casings is determined from previous studies, disposal records (complete waste content is unknown), and regions of the disposal area that contain target contaminants. The probes are inserted by a sonic drill rig or hydraulically driven probing machine. The drill rig is remote controlled to protect the workers during probing activities. The rig uses video cameras for viewing operations at a remote location. Field personnel are a minimum of 50-ft away from the drill during advancement. During insertion, the probe casings are advanced through the waste to the top of the basalt layer or until refusal. Probe advancement and rotation is controlled to prevent tip temperatures from exceeding 150°C. The casings are driven into the subsurface to allow for maximum advancement with the least disturbance. After insertion, the casings are capped when not in use to prevent the introduction of fluids.

Two types of probes are used, Type A and Type B. The Type A probes are primarily used for in-situ waste characterization by down-hole logging. The Type A probes are constructed of threaded sections of Schedule 40 carbon steel piping, which is less than 6 inches outside diameter. When inserted, the Type A probes provide a barrier between buried waste and the atmosphere. Logging activities include neutron moisture logging, spectral gamma-ray logging, passive neutron logging, and directional gamma-ray logging. The gamma spectroscopy systems consist of high purity germanium (HPGe) and/or thalium activated sodium-iodide gamma-ray detectors for quantitative and qualitative in situ measurements of buried waste gamma-emitting radionuclides. For active neutron logging, a neutron radiation source will be used. The following sealed sources are used for these logging activities:

- Americium 241 with a maximum activity of 5.55 GBq (0.15 Ci). The dose rates from this source are 4 mR/hour gamma and 13 mrem/hour neutron at contact with the source and 1.5 mR/hour gamma and 1.5 mrem/hr neutron at contact with the source container.
- Californium 252 with a maximum activity of 3.68 mCi. The dose rates from this source are 1.25 rem/hour neutron and 700 mR/hour gamma at contact with the source and 50 mrem/hour neutron and 18 mR/hour gamma at contact with the source container.
- Potassium- 40, U 238, and Th 232 with a maximum activity of 2.07 μCi. The dose rates for these are less than 0.1 mR/hour.

Because logging is performed in the probes, the exposure times are limited to the time it takes to remove the source from its container and place it in the shielded instrument at the beginning of the logging cycle and the time it takes to place the source back in its container at the end of the logging cycle.

Type B probes are primarily used for in-situ characterization of buried waste by liquid and vapor sampling, moisture testing, geochemical testing, and visual inspection. Type B probes are inserted as described for the Type A probes. A description of the Type B probes and sampling methods is discussed here.

1. Tensiometer - has a steel casing with internal instrumentation above a porous, approximately 6-in steel section attached to a bottom drive point. The tensiometer will be used in conjunction with other Type B probes to determine moisture data from within the waste and from the soil below the waste. A small amount of water (<500 ml) will be added to a reservoir inside the probe approximately every two or three months to initiate data from the internal pressure transducer.
2. Soil Moisture Probe - has electrodes attached immediately above the bottom drive point of a steel casing. The electrodes indirectly measure the moisture content of the waste and soil, and also provide resistivity surveys of the probe surroundings. Over time, relative changes in moisture content will supplement and corroborate matric potential measurements from other Type B probes.
3. Lysimeter - has a steel casing connected to a porous, approximately 6-in steel section attached to a bottom drive point. The lysimeter will be used to collect soil water samples. Water samples will be collected from lysimeters using a variation of previously approved methods.
4. Vapor Port - has a steel casing connected to a commercially available probe. The "Conesipper" vapor port probe will be used to collect soil vapor samples. The vapor samples will be handled using standard sample handling and analysis techniques.
5. Visual Probes - have hollow, transparent Lexan casings attached to a steel bottom drive point. The Lexan probes will allow visual inspection of the soil and waste layer in the pits by providing an access path for small video cameras. The installation technique requires an inner steel push rod seated on the drive tip. As the push rod is driven to refusal, the drive tip pulls the Lexan casing into the ground.

6. Geochemical Probes - have a steel casing with electronic sensors mounted in the walls which will measure alkalinity or acidity, oxidation reduction potential, and temperature. Time histories of the geochemical properties will be developed from the data, for further understanding and calibration of the source term model.

Liquid and vapor samples are collected from the Type B probes and placed in appropriate shipping containers to be transferred to an offsite laboratory.

The sample transfer system consists of an enclosure (glove bag) to provide the safe acquisition of the samples. Personnel prepare for the sample acquisition by donning appropriate personal protective equipment (PPE) and transferring the glove bag, with the correct sampling equipment installed, to the sampling site. The appropriate sample lines are connected following pre-set procedures designed to minimize contamination spread. Water is drawn out of the lysimeter reservoir or vapor samples are taken from the vapor ports and collected inside the glove bag. The maximum sample size for liquids and vapor will be one liter per sample. It may take a week or more for sufficient water to collect in the lysimeter reservoir. The water samples are transferred to a second glove bag located in trailer for the required separation prior to packaging for transfer. Sample containers, chemicals, labeling, and packaging equipment necessary to transfer the samples off-site (out of the SDA) are included in the sample transfer system. An RCT provides full-time support while sample collection and splitting operations are performed. All waste is properly disposed of using RCT support after sampling operations are complete.

After all samples are obtained, quick disconnects are removed and decontaminated and the glove bag is removed.

2.10 References

NOTE: *References to DOE Orders and Standards; Company manuals; and citations from the Code of Federal Regulations are not treated as standard references. Full information on each of these types is presented in the text when the item is first mentioned. Subsequent referrals are to the shortened title or number (for example, DOE Order 420.1, "Facility Safety," 10 CFR 20). They are therefore not listed in the references.*

2-1. D. L. Stephens, *Seismic Stability Calculations, EGG-EDF-0047, August 25, 1992.*

2-2. Lawrence Livermore National Laboratory, *Design and Evaluation Guidelines for Department of Energy Facilities Subjected to National Phenomena,* UCRL 15910, Lawrence, CA, 1988.

2-3. D.M. Johnson, *RH-LLW Disposal Vault Plug Shielding Analysis,* EGG-RWMC-580, January 15, 1993.

2-4. E.L Baker, *SWEPP Drum Venting System Building,* EDF-RWMC-240, June 16, 1986.

2-5. INEL-94/0226, Addendum A, *Real-Time Radioscopy System Safety Analysis Report,* current revision.