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Los Alamos National Laboratory Corrugated Metal Pipe Saw Facility Preliminary Safety Analysis Report

Volume I

September 19, 1990

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Prepared by:

MASTER

Science Applications International Corporation
2109 Air Park Road SE
Albuquerque, New Mexico 87106

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1.0 INTRODUCTION

1.1 Description and Purpose

The Los Alamos Transuranic (TRU) Waste Corrugated Metal Pipe (CMP) Saw Facility will be located at Technical Area (TA) 54 (West). Flatow, Moore, Bryan, Shaffer, and McCabe will be the project architects, and Bernard Johnson, Inc. will be the project engineers. The facility will consist of two major areas; the 3165 ft² process area (designed to moderate hazard facility standards), and the 630 ft² support area (designed to UBC standards). The facility will share a wall of the support area with the Nondestructive Assay/Nondestructive Examination (NDA/NDE) - Transportation Facility.

The CMP Saw Facility will be operated for approximately one year to section (cut) and package CMPs which contain cemented neutralized process sludge and other aqueous process wastes contaminated with TRU radioisotopes. CMP sections will be packaged in approved waste packages in order to meet the Waste Isolation Pilot Project (WIPP) Waste Acceptance Criteria (WAC) for storage at WIPP.

There are approximately 158 CMPs to be sectioned in the facility. The CMPs are 30 inch in diameter (nominal), 20 ft long, and weigh on average 13,000 lbs. The average radioisotopic contributions (alpha activity) in the cemented paste are 99% Am-241, with less than 1% from Pu-238, Pu-239, U-235, U-238, and mixed fission products. The radioisotopic composition of each CMP is presented in Appendix A. The maximum beta-gamma contact measured exposure rate is 20 milliroentgens per hour (mR/hr) and an exposure rate of 5 mR/hr at 3.3 feet.

Alpha curie inventories for the 20 ft CMPs are as follows:

<u>Constituent</u>	<u>Inventory Maximum (Alpha Curies)</u>	<u>Mass Maximum (grams)</u>
Am-241	186.1	57.4
Pu-239	0.88	14.3
Pu-238	0.98	.06
U-235	$.17 \times 10^{-2}$	800
U-238	$.22 \times 10^{-3}$	648

maximum plutonium inventory = 1.64 alpha curies
 maximum TRU inventory = 186 alpha curies
 average plutonium inventory = 0.57 alpha curies (0.2 mCi/L)
 average TRU inventory = 66.3 alpha curies (24 mCi/L)

Up to three CMPs at a time will be received and staged in the receiving area of the facility. One CMP will be placed onto a hydraulic conveyor system in the receiving area from which it will be moved onto another hydraulic conveyor system housed inside a saw enclosure in the processing room. The second conveyor system will advance the CMP through the bed of a hydraulically-powered band saw until a section (usually about 4 ft.) can be cut off by the saw. The cut section will be held on the second conveyor system until it can be removed by a trolley hoist and placed into the bag-out module. When one section of CMP has been placed into the bagged-on waste package, the waste package will be bagged off. After a new waste package has been attached to the bag-out module, the bagged off package will be closed. After swipes have been assayed to document that the waste package surfaces are within permitted contamination limits, the waste package will be touch-up painted (if needed), labelled, and taken to the adjacent NDA/NDE Facility for shipment to the WIPP, or stored at TA-54 Area G until it can be transported to the WIPP.

Cutting will be remotely performed by a large band saw housed inside the saw enclosure which will be maintained at a negative pressure of .5 in (.9 mm Hg) water column (WC) with respect to the process room. The process room will be maintained at a negative

pressure of .25 in WC (.4 mm Hg) with respect to the outside environment and other areas of the building. The saw enclosure will receive its supply air from the process room through High Efficiency Particulate Air (HEPA) filters. Air from the saw enclosure and the rest of the process areas will be exhausted through separate HEPA filters and stacks. Air samples will be continuously collected from stack effluent and assayed for particulate alpha and beta/gamma radioisotopes. Air in the process area will be examined by continuous air monitoring (CAM) instruments to provide audible alarms to facility operators and to trigger a cutoff of process area air recirculation in the event airborne alpha contamination is present.

The band saw will use recirculated water as a cutting fluid to cool the carbide-impregnated blade and carry away cement paste removed from the cut. The kerf width of the blade will be approximately .09 in, which equates to a volume removed by one cut of 64 in³. Usually four cuts will be needed for each CMP to create five sections. Approximately four CMPs a week will be the planned throughput. Sixteen cuts a week will generate approximately 4.4 gal of cement cuttings. These cuttings will be allowed to settle out from the cutting fluid. The resulting sludge will be solidified by using a solidifying agent and some cutting decanted water into a waste package for later disposal at the WIPP. Cutting water will be periodically refreshed during scheduled washdowns of the saw enclosure.

The band saw blade will cut CMPs at a relatively slow rate so that there will be very little splashing and dispersal of contaminated sludge. The water cutting fluid and routine washdowns of the band saw enclosure will minimize levels of airborne or splashed contamination available to be collected by the HEPA filtered exhaust systems. Filters will be removed when the pressure drop across the filters is 3 inches of water (5.6 mm Hg) or greater. The saw enclosure area gloves, band saw blades, and other associated wastes will be disposed of with the CMP sections as TRU waste which will be sent to the WIPP.

Sanitary waste generated at the facility will be treated by an onsite septic tank and tile field. There will be no cross connections between the sanitary sewage and the liquid radioactive waste system.

The CMP Saw Facility will utilize several safety-related features and systems to protect facility personnel and the public/environment. These will include:

- Band saw control station - will provide the band saw operator with audible and visual alarms of abnormal band saw conditions such as a broken or seized band saw blade, lack of cutting fluid flow, and completion of cut.
- Ventilation control station - will provide the operator with audible and visual alarms when the negative pressures and air flows deviate from programmed parameters, and when HEPA filters need replacement.
- Liquid waste control panel - will provide the operator with audible and visual alarms for abnormal liquid levels in the band saw reservoir, settlement tank, decant tanks, and janitorial wash storage tank.
- Fire protection system - will consist of a process area wet sprinkler system which is hydraulically designed for ordinary hazard Group II occupancy.
- Fire alarm panel - will signal the Los Alamos CAS dispatcher in the event of a fire.
- Continuous air monitoring system - monitors will be located throughout the process area to provide prompt notice should airborne particulate alpha emitters become present.

In addition, the saw enclosure and the reinforced concrete structure of the process area will provide two levels of confinement, and the liquid waste tanks will be located in a floor trench to confine liquid spills.

After all CMPs have been sectioned and packaged, the saw enclosure area will be decommissioned and the process area decontaminated. A new PSAR and Final Safety Analysis Report (FSAR) will be generated to present the next scheduled operation in the facility, i.e., the TRU Waste Processing Facility. This facility will use a glove box line to process (sort and immobilize) the contents of drums which do not meet the WIPP WAC.

1.2 Personnel

The CMP Saw Facility will be operated by the HSE Division Waste Management Group to process and package waste in accordance with the WIPP WAC.

2.0 SUMMARY AND CONCLUSIONS

2.1 Management Overview of the PSAR

This PSAR has been prepared in fulfillment of the requirements of DOE/AL Order 5481.1B. The format and content guidance of that order were used to determine what would be included in the document and to fix placement of materials within the PSAR.

This PSAR addresses site assessment, facility design and construction, and design operation of the processing systems in the CMP Saw Facility with respect to normal and abnormal conditions. Potential hazards are identified, credible accidents relative to the operation of the facility and the process systems are analyzed, and the consequences of postulated accidents are presented. The risks associated with normal operations, abnormal operations, and natural phenomena were analyzed.

The accident analysis presented in Chapter 7.0 of this document shows that the impact of the facility will be acceptable for all foreseeable normal and abnormal conditions of operation. Specifically, under normal conditions the facility will have impacts within the limits posed by applicable DOE guidelines, and in accident conditions, the facility will similarly meet or exceed the requirements of all applicable standards.

2.2 Site Characteristics Important to Health and Safety

Specific site characteristics important to health and safety are summarized below:

Maximum temperature	95°F
Minimum temperature	-18°F
Maximum snow load	17.8 lb/ft ²
Maximum daily precipitation	3.48 in

Design tornado	none
Extreme straight wind	93 mph
Design flood	none
Design basis earthquake	0.22 g
Operating basis earthquake	0.17 g

As shown in Chapter 4.0, each of these environmental conditions will be factored into the design and construction of the CMP Saw Facility.

2.3 Impact of Natural Phenomena

Normal operation of the facility will occasionally be impacted by natural phenomena. Examples of such impacts can be taken from other facilities operating in the area. Specifically, freezing fog may clog facility air intakes forcing a normal shutdown. Lightening and wind may cause an occasional loss of offsite power resulting in a cessation of operations until power is restored. In addition, natural phenomena will occasionally interfere with facility operation due to a shortage of operating personnel caused by snow, wind, cold, or epidemic illness.

2.4 Risk Associated with Normal Operations

The level of risk, to facility personnel and the public/environment, posed by the operation of the CMP Saw Facility will be within the guidelines of the applicable DOE orders. An average exposure rate of 1843 mR/yr will most likely be spread among several facility operators, and is below the 5000 mR/yr maximum rate. The sawing operation will be a relatively simple process with little opportunity for either predicted or unforeseen failure. The use of a wet cutting technique, routine saw enclosure washdowns, training, standard operating procedures, operating instructions, and the full time presence of a health physics representative will ensure that the risks associated with normal operations will be maintained at an acceptable level.

2.5 Risk Associated with Abnormal Operations

Natural phenomena will have no influence on the facility risk because the design will exceed the foreseeable conditions of natural phenomena (developed in Chapter 3.0). That is to say, the wind, flood, earthquake, external fire, rainfall, snow, hail, and airborne missile have been analyzed for the CMP Saw Facility, and the facility is designed to withstand the effects of all of these foreseeable environmental conditions without compromise of the safety systems or impact on the public health and safety.

Risks to the public/environment, associated with abnormal operation of the facility, will be radiological risks only. The accident analysis developed in Chapter 7.0 shows that the effects of the worst-case credible accident will have a negligible impact on the public/environment.

Risks to facility personnel, associated with abnormal operation of the facility, will be both radiological and industrial type risks. Radiological risks may result from small contaminated liquid spills, band saw cutting fluid system failure, breach of saw enclosure confinement

caused by a CMP handling accident, and etc. The accident analysis shows that the effects of these accidents would be negligible to marginal. Industrial risks may result from a CMP handling accident, electrical shock, burns, and etc. The accident analysis shows that a CMP handling accident may have the worst effects, that is negligible to catastrophic effects.

2.6 Results of Accident Analysis

The worst-case credible accident that could impact the public/environment involves the failure of the band saw cutting fluid system, failure of the band saw control station to detect the absence of cutting fluid, and failure of the band saw operator to notice the absence of cutting fluid. This unlikely combination of events could result in dispersal of TRU contaminated cement dust which would have negligible effects on the environment and the public.

The accident would cause none to minimal dollar loss at the CMP Saw facility, and would involve only a brief program interruption.

The worst-case accident that could impact facility personnel involves mishandling of a CMP in the receiving area with a resulting "industrial-type" accident. This accident could have catastrophic effects if facility personnel were crushed by a 13,000 lb. CMP.

2.7 Impacts To and From Nearby Facilities

Several DOE-controlled facilities are in close proximity to TA-54 (see Figure 3.2). The CMP Saw Facility will share a common wall with the NDA/NDE-Transportation Facility. The Pajarito Laboratory Site, at TA-18, is located to the south, and TA-54 waste disposal sites are located to the east. Impact on the CMP Saw Facility from the Pajarito Laboratory Site is minimal and none of the other areas will have a credible effect on the CMP Saw

Facility. Doses from material releases in possible accidents at the facility would have negligible effects on personnel outside of the facility. Doses to personnel outside of the facility from direct radiation caused inside the facility will be nonexistent.

2.8 Level of Risk Posed by CMP Saw Facility

As demonstrated in sections 2.2 through 2.7, the overall facility risk is acceptably low for a nuclear facility. In accordance with DOE/AL 5481.1B, the CMP Saw Facility should be categorized as a medium hazard facility, which reflects the presence of nuclear material.

3.0 SITE DESCRIPTION AND ASSESSMENT

This chapter provides both general and site specific information concerning location and setting of the proposed Los Alamos Transuranic (TRU) Waste Corrugated Metal Pipe (CMP) Saw Facility and natural phenomena to which it could be subjected. Information is provided in the following categories:

- Location, demography, and land use;
- Nearby facilities;
- Meteorology;
- Surface hydrology;
- Subsurface hydrology;
- Geology; and
- Seismology.

This information is pertinent to the risk analysis performed for the CMP Saw Facility.

3.1 Site Description

Site descriptions that follow have been assembled from several sources, including the Los Alamos National Laboratory (LANL) publication *Environmental Surveillance at Los Alamos*, 1988 (LA-11628-ENV), and the *Los Alamos Scientific Laboratory Site Final Environmental Impact Statement*, 1979.

3.1.1 Location

LANL and associated residential areas of Los Alamos and White Rock are located in Los Alamos County, north central New Mexico, approximately 60 mi north-northeast of

Albuquerque and 25 mi northwest of Santa Fe. Figure 3.1-1 illustrates the location of Los Alamos. The 43 mi² Laboratory site and adjacent communities are situated on Pajarito Plateau. The plateau consists of a series of finger-like mesas separated by deep eastward oriented canyons cut by intermittent streams. Mesa tops range in elevation from approximately 7,800 ft on the flank of the Jemez Mountains to about 6,200 ft at their eastern termination above the Rio Grande valley.

There are currently 32 active LANL technical areas (TAs), the locations of which are shown in Figure 3.1-2. TA-54 includes all of Mesita del Buey and is located approximately 5 miles southeast of the Los Alamos townsite, approximately 2 miles west of White Rock, and is situated along Pajarito Road. The CMP Saw Facility will be located at the west end of TA-54 as shown in Figure 3.1-3.

3.1.2 Nearby Facilities

The CMP Saw Facility will share a common wall with the NDE/NDA-Transportation Facility. The combined facilities are isolated from external hazards such as fires and explosion from other facilities and operations either privately or DOE controlled. Some neutron radiation exposure from the critical assemblies at TA-18, the Pajarito Laboratory Site, can be found in the TA-54 (West) area. The CMP Saw Facility will be operated during normal business hours, during which times exposure levels from TA-18 area will be less than 25 mRem/year (Appendix B). Critical assemblies may be operated at higher powers during the evenings; however, no after-hours work at the Saw Facility will be allowed without prior arrangements with the Pajarito Laboratory Site.

Transportable Office Building TA-54-34 is 70 ft north, Building TA-54-1009 (future office and laboratory space) is 260 ft west, and the underground radiation exposure building TA-51-1 is 1,100 ft northwest of the Saw Facility site. Area H, an inactive classified waste

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Figure 3.1-1. Location Map for Los Alamos

Figure 3.1-2. Map of Los Alamos National Laboratory Technical Areas

TA 54 WEST Site

Figure 3.1-3. CMP Saw Facility Location Map

burial site, is 320 ft southwest, while Area J, an active nonhazardous controlled waste landfill site, is 120 ft east of the facility site. Area G, a radioactive waste disposal/storage site, and Area L, a chemical waste handling, packaging, and treatment site, are 1.4 and 1.0 miles, respectively, further east down Mesita del Buey Road.

Besides the DOE-controlled facilities mentioned above, there are no other nearby industrial, transportation, or military facilities except for the Los Alamos Airport.

The Los Alamos Airport has a single east-west runway, the west end of which is 2.8 mi northwest of the CMP Saw Facility. Because of local conditions, all air traffic enters from and exits to the east. The west end of the strip is used only for runups of taxiing. Some small aircraft are excluded because of the altitude, 7,150 ft. Scheduled flights currently account for between 350 and 400 flights per month, and private flights currently account for between 500 and 600 flights per month (private communication with Los Alamos Airport, 1989). There is limited air traffic at Los Alamos because of the location of the field, the necessity for traffic to both enter from and leave to the east, and the need for advance permission to land. Sandia National Laboratories in Albuquerque, New Mexico, has performed an aircraft crash analysis (Fuentes, 1988) and found that aircraft present a minimal hazard to facilities at TA-55. This is attributable to the restrictions to aircraft on overflights of LANL and monitoring of air traffic in the LANL area. Since TA-54 is even further away from the airport than TA-55, aircraft should present a minimal hazard to the CMP Saw Facility.

3.1.3 Population

LANL is located in Los Alamos County, which has an estimated 1988 population of 19,500 (based on the 1980 census adjusted for 1988). In the vicinity of the Laboratory, most of the population is located in the Laboratory technical areas. Populations of the technical areas

are shown in Table 3.1-1. About one-third of those employed in Los Alamos commute from other counties.

The Los Alamos townsite, the original area of development (and now including residential areas known as the Eastern Area, the Western Area, North Community, Barranca Mesa, and North Mesa), has an estimated population of 12,200. The White Rock area (including the residential areas of White Rock, Le Senda, and Pajarito Acres) has about 7,200 residents. There are a few permanent residents at Frijoles, but during the summer visitors to the Bandelier National Monument can increase the population by more than 1,000. Royal Crest Mobile Home Park is located approximately 3.2 mi. northwest of the CMP Saw Facility site.

The population distribution for the resident nonwork force is shown in Table 3.1-2. The distribution is calculated with respect to the Los Alamos Meson Physics Facility's stack at TA-53. The total population within 50 mi of Los Alamos is 203,000. The Albuquerque metropolitan area, approximately 60 mi to the south, has an estimated population of 500,000 (private communication with City of Albuquerque Planning Division, 1989).

3.1.4 Land and Water Use, Regionally and Locally

LANL is located in northern New Mexico between 7,000 and 8,000 ft altitude on the eastern slopes of the Jemez Mountains and about 35 mi by highway from the state capital, Santa Fe.

Private construction has expanded the original townsite in the area to the north, and a new area, White Rock, has been developed about seven miles to the east of the original town along the rim of the White Rock Canyon of the Rio Grande. Local government is entirely in the hands of the county, which has ordinance-making powers and serves in lieu of a town or city organization.

Table 3.1-1. Technical Area Populations¹.

<u>Area</u>	<u>Population</u>	<u>Area</u>	<u>Population</u>	<u>Area</u>	<u>Population</u>
0	549	21	242	46	371
2	24	22	76	48	193
3	6,495	28	n.a.	49	0
6	6	33	73	50	71
8	61	35	591	51	38
9	58	36	52	52	199
11	12	37	0	53	1,125
14	0	39	80	54	22
15	121	40	38	55	605
16	493	41	136	57	18
18	80	43	212	59	273
				Total	12,400²

¹ Based on 1988 figures.

² Value rounded to nearest "100."

Table 3.1-2. 1988 Population Within 80 km of Los Alamos^{a,b} (LANL, 1989)

	Distance in kilometers								
	<u>1-2</u>	<u>2-4</u>	<u>4-8</u>	<u>8-15</u>	<u>15-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-60</u>	<u>60-80</u>
Direction									
N	1	.	.	.	.	.	1,100	.	355
NNE	.	.	.	546	.	523	1,670	1,730	213
NE	1	.	.	.	306	14,800	974	1,090	3,690
ENE	.	.	.	1,840	1,510	2,570	2,610	1,150	2,190
E	.	.	79	24	526	1,080	658	0	1,440
ESE	.	.	.	.	.	277	21,900	1,060	1,470
SE	.	.	7,240	.	.	.	50,600	2,310	7
SSE	.	.	.	.	.	.	403	4,110	90
S	.	.	.	50	.	293	565	6,240	.
SSW	.	.	.	20	.	751	185	7,570	30,800
SW	.	.	.	.	.	.	289	3,820	.
WSW	.	.	.	.	.	289	288	2,340	190
W	.	.	.	.	.	.	.	151	122
WNW	.	1,540	7,000	.	.	.	.	.	2,830
NW	.	561	1,840	.	.	.	.	1,390	.
NNW	.	619	620	.	.	.	.	61	60

^a This distribution represents the resident, nonwork force population with respect to the Los Alamos Meson Physics Facility's stack at TA-53. A slightly different distribution for Los Alamos County townsites was used to model releases from the TA-2 stack, which is located closer to Los Alamos.

^b Total population within 80 km of Los Alamos is 203,000.

The county is located on the Pajarito Plateau, which is a shelf about 10 to 15 mi wide and 45 mi long, on the eastern flanks of the Jemez Mountains. The plateau has been deeply eroded by runoff toward the Rio Grande with the result that the area consists of a series of mesas separated by canyons, many of which are several hundred feet deep.

Most Laboratory and community developments are confined to mesa tops. The surrounding land is largely undeveloped with large tracts of land north, west, and south of the Laboratory site held by the Santa Fe National Forest, Bureau of Land Management, Bandelier National Monument, General Services Administration, and Los Alamos County. The San Ildefonso Pueblo borders the Laboratory to the east.

Laboratory land is used for building sites, test areas, waste disposal locations, roads, and utility rights-of-way. However, these account for only a small fraction of the total land area. Most land provides isolation for security and safety and is a reserve for future structure locations.

No hunting is permitted on land controlled by the Laboratory; however, limited access by the public is allowed in certain areas of the Laboratory reservation. An area north of Ancho Canyon between the Rio Grande and State Road 4 is open to hikers, rafters, and hunters, but woodcutting and vehicles are prohibited. Portions of Mortandad and Pueblo canyons are also open to the public.

3.1.4.1 Archeological Sites

The entire Los Alamos area is of archeological interest because of the presence of ruins of prehistoric Indian dwellings built during the period before the Spanish occupation. Laboratory lands contain about 900 known archeological and historical sites. The Laboratory's Environmental Evaluation Coordinator oversees management and protection

of cultural resources. Although the general area is of archeological interest, no known archeological ruins are at the CMP Saw Facility site. Some adjacent areas contain lithics (i.e., obsidian and pot fragments) not associated with any structures or building materials. Appropriate adverse impact mitigation is collection of 15% of the scatter area and curation at a recognized archeological repository. A Cultural Resource Survey Report was submitted to the New Mexico State Historical Preservation Office for consultation and concurrence as required by Section 106 of the National Historic Preservation Act as implemented by 36 CFR 800.

3.1.4.2 Flora

The semiarid climate precludes using the area for extensive crop production; however, natural vegetation is plentiful. Coniferous trees are the dominant vegetation in the county, with ponderosa pine and Douglas fir predominating at elevations above 6,900, while piñon pine and one-seeded juniper are most abundant at the lower elevations.

The vegetative understory is that vegetation growing under the dominant trees. The understory of the area in general is sparse, although certain locations (e.g., canyon bottoms, some south slopes, and some mesa tops) harbor a wide variety of shrubs, grasses, and forbs. The combination of a dense overstory and understory in the canyon bottoms, along with available free water, provides excellent habitat for wildlife, particularly in the restricted areas of government property.

3.1.4.3 Fauna

Wildlife is plentiful, particularly in the restricted areas of governmental ownership. Information concerning faunal resources in the Los Alamos environs is largely qualitative in nature. Species lists including birds, rodents, deer, bear, mountain lion, elk, and coyotes,

have been compiled from field observations and published data, although in some cases, species occurrence has not been verified. Several state-listed endangered or threatened species may occur in north central New Mexico; however, no endangered or threatened species are known to inhabit the CMP Saw Facility site.

3.1.4.4 Water

The Rio Grande, the regional master stream, drains more than 14,000 mi² of northern New Mexico and Colorado. The average discharge of the Rio Grande at the Otowi Bridge gaging station was about 0.82×10^6 acre-ft/yr for the 1955 to 1974 period.

Surface stream tributaries to the Rio Grande within about 60 mi of Los Alamos are the Chama, Caliente, Santa Cruz, Nambe, and Tesuque Rivers to the north and east; the Jemez and San Antonio Creeks to the west; and the Santa Fe and Galisteo Rivers to the south. Flood control, irrigation, and water supply reservoirs include Abiquiu on the Chama River; Santa Cruz on the Santa Cruz River; Two Mile, Nichols, and McClure on the Santa Fe River; Galisteo on the Galisteo River; Jemez on the Jemez River; and Cochiti on the Rio Grande.

Cochiti Reservoir began filling in 1976. It is designed to provide flood control, sediment retention, recreation, and fishery development. The 5.5 mi long earthfill dam is located on the Rio Grande about 19 mi southwest of Otowi Bridge and about 9 mi from the southernmost point of the LANL boundary. The 1,200 acre surface area permanent pool may extend upstream some 7.5 mi, reaching a point of about 3 mi from the southernmost point of the Laboratory boundary, and has a capacity of nearly 50,000 acre-ft. The flood control pool extends upstream to the Otowi Bridge with a total volume of 602,000 acre-ft.

Water for the Laboratory and community is supplied from 17 deep wells (in 3 well fields) and one gallery. The main aquifer is the only aquifer in the area capable of municipal and industrial water supply. Water from Guaje and Los Alamos Reservoirs are open for recreational use. The water from the reservoirs is available for irrigation of lawns and shrubs in the community and Laboratory through a separate transmission line.

There are no municipal water supplies taken directly from the Rio Grande downstream from LANL in New Mexico. Irrigation water is taken from the Rio Grande downstream from the Laboratory at numerous diversions starting below Cochiti Dam.

3.1.5 Fire Protection

The Los Alamos Fire Department is a well-equipped industrial fire department and is self-sufficient. Fire fighting or rescue assistance from nearby towns is unlikely, although in the case of a serious brush or forest fire, the U.S. Forest Service will help if equipment and manpower are available.

There are five fire stations located throughout LANL. The nearest fire station to the CMP Saw Facility site is 4.5 mi miles away by road. Although first priority is given to LANL, protection and response must also be given to the other areas.

Test runs made from the nearest station to the site, a distance of 4.5 mi under ideal conditions of daylight, good clear weather, and essentially no traffic, took 5 minutes. Included in this time was 30 seconds for receipt of the alarm, transmission of the alarm to the companies, and manning the equipment. Snow, rain, bad road conditions, or traffic could easily add 50% to 100% to the response time.

3.1.6 Emergency Medical

Los Alamos Medical Center is located 4 mi from the CMP Saw Facility site and is fully equipped to handle emergency medical patients, including radiation casualties. Ambulance response to is first from Fire Station Number 1, then Station Number 4 (Golf Course), and then Station Number 3 (White Rock).

3.2 Meteorology

The meteorological descriptions that follow have been assembled from the Los Alamos National Laboratory publications, *Los Alamos Climatology*, 1989, by Brent M. Bowen. The material has been condensed, to the extent possible, to include only the information necessary to describe meteorological hazards present at LANL and the CMP Saw Facility site.

Extreme annual weather variables are analyzed in order to estimate return periods for specific values. The 50- and 100- year precipitation magnitudes, for example, are useful for estimating stream run-off and structure design. Snowfall, snow depth, maximum wind gusts, and minimum temperatures, along with precipitation, are all analyzed for annual extreme value analyses.

3.2.1 Observation Network

The Los Alamos National Laboratory Environmental Surveillance Group (HSE-8) Air Quality and Meteorology Section maintains a meteorological tower and monitoring network. The measured meteorological variables include wind speed and direction, vertical wind speed, temperature, insolation, relative humidity, and precipitation. Not all variables are measured at each site, and some variables are measured at multiple tower levels. The six

tower heights range from 34 to 300 ft. Los Alamos cooperative weather data (temperature, precipitation, and snowfall) have been taken at TA-59 since 1979. Also, temperature, humidity, and precipitation records have been kept for White Rock since 1964. Precipitation only is measured at three other sites.

The sampling of meteorological data has been done at many locations surrounding the CMP Saw Facility site, including TA-50, White Rock, TA-53, and Bandelier. However, the best representation of meteorological data for the CMP Saw Facility probably comes from the TA-54 tower which began taking data in 1980.

3.2.2 Temperature

Despite LANL's southern location in the U.S., temperatures are cool at the nearly 7,400 ft elevation above sea level (ASL). Winter temperatures typically range from 15° to 25°F during the night and 30 to 50°F during the day. The record minimum temperature is -18°F recorded January 13, 1963. Summer afternoon temperatures are typically in the 70's and 80's (°F) and infrequently reach 90°F. Night temperatures drop to the 50's (°F) even after the warmest day. The record maximum temperature is 95°F, recorded June 22, 1981.

3.2.3 Precipitation

Normal annual precipitation, including rainfall and water-equivalent snowfall, totals nearly 18 in. LANL's precipitation is characteristic of a semiarid climate in that the year-to-year precipitation variations are quite large. For instance, the annual precipitation extremes range from 6.80 to 30.34 in over a 69-year record.

Forty percent of the annual precipitation falls in July and August. Thunderstorms are quite common at LANL, with 58 occurring in an average year. Lightning and hail can be frequent

and intense during the thunderstorms. Most often, the hailstones have diameters of about $\frac{1}{4}$ in, with a few somewhat larger. A thunderstorm on August 11, 1982, dropped about 3 in of hail near the Los Alamos airport, damaging windshields and vegetation in the area.

Winter precipitation falls primarily as snow, with accumulations of about 51 in seasonally. The seasonal snowfall extremes range from 9.3 in to the record 153.2 in that fell in 1986-87. The largest single snowfall on record, 48 in, with up to 60 in in the Los Alamos North Community, occurred during January 15-17, 1987. The water equivalent of the 60 in of snow totaled 3.43 in, which gives a snow load of 17.8 lb/ft².

Large-scale flooding is not common in New Mexico, and has never been observed in Los Alamos. Most of the LANL technical areas, including TA-54, are located on top of the finger mesas near drainage divides. However, flash floods from heavy thunderstorms are possible in susceptible areas such as arroyos and canyons.

3.2.4 Winds

LANL surface winds are generally light, with an average speed of nearly 7 mph. Wind speeds greater than 11 mph occur with frequencies ranging from 10% at TA-50 to 20% at the East Gate. On days with sunshine and light large-scale winds, a deep, thermally driven up-slope wind develops over the Pajarito Plateau. Winds reverse during the night, and a shallow, cold-air drainage wind often forms and flows down the plateau on clear nights with light, large-scale winds. Up-slope and drainage winds are generally less than 5.5 mph.

Although Los Alamos can be considered a light wind site, maximum wind gusts exceeding 50 mph are quite common during the spring. Kennedy, et al., 1989, recommend that an extreme wind speed of 93 mph be used for the Design Extreme Wind for moderate hazard

facilities at LANL, such as the CMP Saw Facility. This value is based on an annual probability of exceedance of 1×10^{-3} .

Historically, no tornados have ever been reported in Los Alamos County. Kennedy, et al., 1989, recommend that no Design Tornado need be considered at Los Alamos because the annual hazard probability of exceedance is smaller than 2×10^{-5} .

Wind distribution varies with site, height above ground, and time of day. Mean wind speed and direction frequencies have been calculated for day and night at five sites for the months of January, April, July, and October. The frequencies are presented as wind roses, which are circles with lines extending from the center representing the direction from which the wind blows. The length of each line is proportional to the frequency of the wind-speed interval from that particular direction. Each direction is 1 of 16 primary compass points (N, NNE, etc.) and is shown centered on a 22.5° sector of the circle. The frequency of calm winds (winds having a speed less than 1 mph) is given in the circle's center. Day and night are defined by sunrise and sunset.

Wind roses shown in Figures 3.2-1 through 3.2-4 represent winds at TA-59, 7,373 ft ASL; TA-50, 7,270 ft ASL; Bandelier, 7,040 ft ASL; East Gate, 7,019 ft ASL; and Area G, 6,688 ft ASL. Surface winds have been measured at a height of about 36 ft at all sites except TA 59, where the measuring height is 75 ft. TA-50 (upper left wind rose) has been chosen to represent the western Laboratory area, and TA-50 wind roses are displaced to the right on the maps, with an arrow pointing to the TA-50 location. The Bandelier site is located farthest to the south, East Gate is east-northeast of TA-50, and Area G is just to the west of White Rock.

3.2.5 Atmospheric Dispersion

The irregular terrain at Los Alamos favorably and unfavorably affects the atmospheric turbulence and dispersion. Enhanced dispersion promotes greater dilution of contaminants released into the atmosphere. The complex terrain and forests create an aerodynamically rough surface, forcing increased horizontal and vertical turbulence and dispersion. The dispersion generally decreases at lower elevations, where the terrain becomes smoother and less vegetated. The frequently clear skies and light winds cause good vertical daytime dispersion, especially during the warm season. The strong daytime heating during the summer can force strong vertical mixing up to 3,000-6,000 ft AGL.

The generally light winds are limited in diluting contaminants horizontally. The same clear skies and light winds have a negative effect on dispersion at night, causing strong, shallow surface inversions to form. These inversions can severely restrict near-surface vertical and horizontal dispersion. The inversions are especially strong during the winter. Shallow drainage winds can fill lower areas with cold air, thereby creating deeper inversions. A deeper inversion is common toward the Rio Grande Valley (White Rock) on clear nights with light winds. Canyons can also limit dispersion by channeling air flow. Strong, large-scale inversions during the winter can limit vertical mixing to under 10,000 ft ASL.

Overall dispersion is generally the greatest during the spring when winds are strongest. However, deep vertical mixing is the greatest during summer when the atmosphere is unstable up to 5,000 ft AGL or more. Low-level dispersion is generally the least during summer and autumn when winds are quite light. Even though low-level winter dispersion is generally greater, intense surface inversions can cause the least dispersive conditions during the night and early morning.

Figure 3.2-1. January Total Wind Roses at Los Alamos

Figure 3.2-2. April Total Wind Roses at Los Alamos

Figure 3.2-3. July Total Wind Roses at Los Alamos

Figure 3.2-4. October Total Wind Roses at Los Alamos

The frequencies of atmospheric stability (estimates of the atmospheric dispersive capability) are 29% unstable (A-C), 29% neutral (D), and 42% stable (E-F) during the winter at TA-54. The frequencies are 28%, 32%, and 40%, respectively, during the summer. The stability category frequencies are based on vertical wind variations. Stability generally increases (less dispersive atmosphere) toward the valley.

3.3 Surface Hydrology

The descriptions of the surface hydrology that follow have been assembled from several sources, including the LANL publications, *Environmental Surveillance at Los Alamos*, 1988 (LA-11628-ENV); *Water Supply at Los Alamos During 1982* (LA-9896-PR); and the *Los Alamos Scientific Laboratory Site Final Environmental Impact Statement*, 1979.

LANL is located on the Pajarito Plateau, at an elevation of approximately 7,200 ft. This plateau is dissected by narrow, steep-walled canyons cut through a cap of tuff by intermittent streams that drain west to east across the plateau. As a result, the country is characterized by long, finger-like mesas between the canyons.

Large-scale flooding is not common in New Mexico and has never been observed in Los Alamos. Most of the LANL technical areas, including TA-54, are located on top of the "finger" mesas near drainage divides and are not subject to flooding. However, highways are sometimes closed for an hour when flash floods in the canyons cross the pavement. This water drains rapidly into deep canyons and does not pose any threat to TA-54.

3.4 Subsurface Hydrology

Descriptions of subsurface hydrology that follow have been assembled from several sources, including the LANL publications, *Environmental Surveillance at Los Alamos*, 1988

(LA-11628-ENV) and *Hydrologic Characteristics of the Main Aquifer in the Los Alamos Area: Development of Ground Water Supplies*, 1984 (LA-9957-MS).

3.4.1 Ground Water Supplies

The Los Alamos National Laboratory and the communities of Los Alamos and White Rock are supplied by water pumped from deep wells in three fields located in Los Alamos Canyon, in Guaje Canyon, and on the Pajarito Plateau. Production from these wells is from the main aquifer of the Los Alamos area. The main aquifer is the only aquifer that is capable of municipal and industrial supply. In addition to the 18 supply wells that penetrate into the main aquifer, 10 test wells and 2 stock wells in the Los Alamos area are completed into the main aquifer.

3.4.2 Hydrology

The geology of the Los Alamos area is described in Section 3.5. The occurrence of ground water in the geologic strata is noted below.

3.4.2.1 Santa Fe Group

The Santa Fe Group, in ascending order, consists of the Tesuque Formation, the Puye Conglomerate, and the basaltic rocks of Chino Mesa.

Many individual beds in the Tesuque Formation are permeable and, where saturated, will yield water to a well. Some of the beds are relatively impermeable, and they restrict vertical and lateral movement of water within the formation. Beneath the Pajarito Plateau, coarse volcanic rock fragments of latite, basalt, rhyolite, tuff, and pumice predominate in the upper 1,000 ft of the Tesuque Formation. These coarse sediments yield larger amounts of water

to wells than do the finer sediments that predominate in the formation farther to the east along the Rio Grande.

The interbedded basalt flows in the Tesuque Formation may be fairly dense; when thin, they may be highly jointed and yield large amounts of water. Sediments of the interflow breccias (located between basalt flows) are coarse and should yield water readily.

The Puye Conglomerate is highly permeable and, when saturated, yields large amounts of water to wells.

Thin basalt flows, separated by interflow breccias beneath the central part of the Pajarito Plateau, are permeable and, when saturated, yield water readily. Open joints and cavities in thick-basalt flows also yield water; however, along the Rio Grande (White Rock Canyon), steepening of the contours on the surface of the main aquifer indicates that thick-basalt flows form a barrier to movement of ground water.

3.4.2.2 Volcanic Rocks of the Jemez Mountains

Volcanic rocks of the Jemez Mountains, along the eastern flanks of the Sierra de los Jemez and on the Pajarito Plateau, consist of the Tschicoma Formation and the younger Bandelier Tuff.

The Tschicoma Formation has low permeability and thus retards and restricts the movement of ground water. Open joints and interflow breccias within the formation, which could yield appreciable amounts of water, are limited.

The Bandelier Tuff is above the main ground-water body, and only in areas on the flanks of the Sierra de los Jemez does it contain small amounts of perched water, which discharges from springs.

3.4.2.3 Alluvium and Soil

Alluvium from the Sierra de los Jemez and the Pajarito Plateau has been deposited in the canyons of the plateau. Near the heads of canyons, bedrock commonly is exposed in the lower parts, but farther down the canyons, alluvium may be several hundred feet in width and as much as 100 ft thick. The alluvium in many places is discontinuous because it has been interrupted by basalt outcrops.

The alluvium is quite permeable in contrast to the underlying volcanic sediments and basalts, and it contains some water in the larger canyons; however, the amount is insufficient for water supply. The alluvium receives recharge from two sources: infiltration of storm runoff, and releases of industrial effluent from the Laboratory. Runoff in the canyons infiltrates into the alluvium until its downward movement is impeded by the less permeable volcanic sediments and basalts. The resulting alluvial groundwater flows down the canyons and percolates into the underlying volcanic sediments, is evapotranspired, or discharges from springs.

The rate of movement of water through the alluvium is on the order of 15 ft/day, on the basis of data available from the files of the Los Alamos National Laboratory.

Clayey soil derived from weathering of the Bandelier Tuff covers most of the fingerlike mesa of the Pajarito Plateau.

3.4.3 Main Aquifer of the Los Alamos Area

The main aquifer of the Los Alamos area is the only aquifer capable of municipal and industrial water supply. The upper surface of the main aquifer rises westward from the Rio Grande through the Tesuque Formation and into the lower part of the Puye Conglomerate beneath the central and western parts of the plateau (Purtymun, 1974). The water in the aquifer moves from the major recharge area, in the Jemez Caldera, eastward toward the Rio Grande, where a part is discharged into the river through seeps and springs.

The major recharge area for the aquifer is the intermountain basin formed by the Jemez Caldera. The upper sediments in the basin are lacustrine deposits of clay, sand, and gravels, which are underlain by volcanic debris resulting from collapse of the caldera (Conover, 1963). The sediments and volcanics in the basin are highly permeable and are saturated. The saturated "basin fill" recharges the main aquifer in sediments of the Tesuque Formation. Minor amounts of recharge may occur in the deep canyons containing perennial streams on the flanks of the mountains. The intermittent streams in the canyon, which are cut into the plateau, add little, if any, recharge to the main aquifer.

Radiometric measurements have been made using tritium and carbon-14 to date the age of the water in the main aquifer (time in transit from recharge to discharge). Tritium concentrations in water from wells from the Los Alamos and Guaje well fields have been less than 0.5 tritium units. Based on a natural occurrence of eight tritium units in precipitation (before hydrogen bomb tests), the age of the water in the aquifer in the two wells fields is greater than 50-years. Carbon-14 analyses of water from a well at the eastern edge of the Pajarito field have indicated that the age of water in the main aquifer is about 1,400 years. The radiometric age of water in the main aquifer indicates a slow rate of movement from the recharge area in the Jemez Caldera.

The gradient on the surface aquifer, beneath the Sierra de los Jemez and the western part of the Pajarito Plateau in the Los Alamos area, is about 120 ft/mi in the Tschicoma Formation interbedded with the Puye Conglomerate. As water in the aquifer moves into the more permeable sediments of the Puye Conglomerate in the central part of the plateau, the gradient decreases to 60-to-80 ft/mi. The gradient increases to 80-to-100 ft/mi along the eastern edge of the plateau as the water in the aquifer moves into the less permeable sediments of the Tesuque Formation. The depth to the aquifer ranges from about 1,200 ft along the western edge of the plateau, decreasing to about 600 ft along the eastern edge.

The Rio Grande is the principal ground water discharge area for the main aquifer. A gain in stream flow in the Rio Grande, in a 26 mi reach from the gaging stations at Otowi to Cochiti, has been computed at about 25 ft³/sec (Spiegel, 1963). The river also gains flow from Otowi to the mouth of the Frijoles Canyon, a distance of about 11.5 mi. Below Frijoles Canyon, the Rio Grande is a losing stream (Purtymun, 1980). Water from the river is lost to underlying sediments. It is estimated that the 11.5 mi reach of the canyon below Otowi receives a discharge from the main aquifer of 4,300 acre-ft/yr to 5,500 acre-ft/yr (Cushman, 1965).

The main aquifer extends to the south into Bandelier National Monument. The movement of water in the Monument tends more to the south than east, as in the Los Alamos area. The depth to water along the western edge of the Pajarito Plateau in the Monument ranges from 1,000 ft to about 1,200 ft with a gradient of 60 ft/mi to 80 ft/mi. The Rio Grande above the mouth of Frijoles Canyon is a gaining stream, whereas below Frijoles Canyon the Rio Grande is a losing stream. Thus, the surface of the aquifer north of Frijoles Canyon is slightly above the river level, but the surface of the aquifer to the south is at an elevation below the river level (Purtymun, 1980).

The main aquifer extends to the north of Los Alamos beneath the Pajarito Plateau around the northwestern flanks of the Sierra de los Jemez. Water movement is to the east and northeast in the Puye Conglomerate and the Tesuque Formation beneath the Pajarito Plateau, and within the Tesuque Formation in the Española Valley.

The thickness of the main aquifer is unknown; however, the Rio Grande Depression contains over 15,000 ft of volcanic rocks and sediments that overlie the Precambrian crystalline rocks (Budding, 1978). These volcanic rocks and sediments are a potential aquifer.

The volcanic rocks and sediments that fill the depression are apparently saturated. Water quality deteriorates at increasing depth. Most of the wells in the depression yield fresh (less than 1,000 mg/l TDS) to slightly saline (1,000 to 3,000 mg/l TDS) water (Kelly, 1974). The deepest well in the Los Alamos area penetrates about 2,250 ft of sediment in the depression. The TDS concentrations from this well are about 500 mg/l. It is estimated that the water in the depression is fresh to a depth of 6,000 to 7,000 ft before the TDS exceeds 1,000 mg/l. Thus, the main aquifer in the area has a saturated thickness of at least 6,000 ft before chemical quality may restrict the use of the aquifer for municipal and industrial supply.

3.4.4 Hydrologic Characteristics of the Main Aquifer

Hydrologic characteristics, pumping rates, specific capacities, transmissivities, and field coefficients of permeability were determined during aquifer tests or during periods of production from the wells or test holes.

The rock type or formation that forms the aquifer determines the hydrologic characteristics of the particular well or test hole, as shown in Table 3.4-1. Wells in the Los Alamos and Guaje Fields are completed in the Tesuque Formations. Basalt flow occurs in the Tesuque

Formation within the Guaje Field, but is absent in the Los Alamos Field. Test well TW-4 is completed in the Tschicoma Formation.

Supply wells in the Pajarito Field and test wells DT-5A, DT-9, and DT-10 are completed in the Puye Conglomerate and Tesuque Formation. Test wells TW-1, TW-2, TW-3, and TW-8 are completed in the Puye Conglomerate. Various thicknesses of saturation and different amounts of fines, such as silts, clays, and very fine sands in the various rock types, result in different hydrologic characteristics.

3.4.4.1 Tesuque Formation

The wells in the Los Alamos Field are completed in the fine sediments of the Tesuque Formation. The sediments contain no interbedded basalts. The saturated thicknesses penetrated by the wells range from 709 ft to 1,700 ft, with an average of 1,350 ft. At an average pumping rate of 365 gpm, the average specific capacity is 4.5 gpm/ft of drawdown, or an average drawdown of 91 ft.

The field coefficient of permeability ranges from 3.0 gpd/ft² to 9.3 gpd/ft², with an average of 5.6 gpd/ft². Transmissivity of the aquifer ranges from 2.5×10^3 gpd/ft to 15.7×10^3 gpd/ft, with an average of 8.4×10^3 gpd/ft. The rate of movement of water in the aquifer, based on hydrologic characteristics and gradient on the top of the main aquifer in the Los Alamos Field, is estimated at 20 ft/yr within the upper 1350 ft of the aquifer.

3.4.4.2 Tesuque Formation with Interbedded Basalts

All wells in the Guaje Well Field penetrate the sediments with interbedded basalts, except one well, G-2. The saturated thickness of the aquifer ranges from 942 ft to 1,722 ft, with

an average of 1,410 ft. At an average pumping rate of 376 gpm, the average specific capacity was 5.8 gpm/ft of drawdown, or an average drawdown of 65 ft.

The field coefficient of permeability ranged from 5.3 gpd/ft² to 11.3 gpd/ft², with an average of 8.2 gpd/ft². The average transmissivity of the aquifer in the Guaje Field is 11.6×10^3 gpd/ft.

The rate of movement of water in the upper 1,410 ft of the aquifer of sediments and basalts in the Guaje Field is estimated at 35 ft/yr.

3.4.4.3 Tschicoma Formation

Test well TW-4 is completed into a brecciated zone within the Tschicoma Formation. The saturated thickness is about 40 ft and the specific capacity is low at 0.6 gpm/ft during a pumping rate of 2.8 gpm. The transmissivity low is at 0.75×10^3 gpd/ft and the field coefficient of permeability averages 19 gpd/ft². The rate of movement of water in the 40 ft of the aquifer in the brecciated zone is estimated at 50 ft/yr.

Test well H-19 encountered water in the lower part of the Puye Conglomerate, which is underlain by a massive flow of Tschicoma Formation that would yield very little water to the well. Tests indicate that the saturated section of the Tschicoma Formation (joints and brecciated zone between the flows) is relatively impermeable and is not a source of water supply (Griggs 1964).

3.4.4.4 Tesuque Formation and Puye Conglomerate

The well in the Pajarito Field, and test wells DT-5A, DT-9, and DT-10, penetrate the main aquifer in the lower part of the Puye Conglomerate and the Tesuque Formation. The

Table 3.4-1. Average Hydrologic Characteristics of Los Alamos Area Main Aquifer

	Saturated THICKNESS (ft)	RATE (gpm)	Specific CAPACITY (gpm/ft)	Field Coefficient/ PERMEABILITY (gpd/ft ²)	TRANSMISSIVITY (10 ³ gpd/ft)
Los Alamos Field					
<i>Tesuque Formation</i>	1,350	365.0	4.5	5.6	8.4
Guaje Field					
<i>Tesuque Formation & Interbedded Basalt</i>	1,410	376.0	5.8	8.2	11.6
Pajarito Field					
<i>Tesuque Formation & Puye Conglomerate</i>	1,740	1,215.0	31.0	53.0	94.0
Test Hole TW-4					
<i>Tschicoma Formation</i>	40	2.8	0.6	18.0	0.7
Test Holes DT-5A, DT-9, and DT-10					
<i>Tesuque Formation & Puye Conglomerate</i>	490	82.0	15.0	83.0	36.0
Test Holes TW-1, TW-2, TW-3, and TW-8					
<i>Puye Conglomerate</i>	60	7.9	2.1	98.0	4.3

Pajarito Field and test wells are located on the Pajarito Plateau. Beneath the plateau, the Tesuque Formation contains interbedded basalt flows.

The saturated thickness of the Puye Conglomerate in the Pajarito Field ranges from 50 ft to 535 ft, with an average thickness of 270 ft, although the saturated thickness of the underlying Tesuque Formation ranges from 890 ft to 1,700 ft, with an average thickness of 1,470 ft. At an average pumping rate of 1,215 gpm, the average specific capacity is 31 gpm/ft of drawdown, or an average drawdown of 40 ft.

The field coefficient of permeability of the combined Puye Conglomerate and Tesuque Formation is 53 gpd/ft², with an average transmissivity of 94×10^3 gpd/ft. Rate of movement of water in the combined thickness of 1,740 ft of Puye Conglomerate and Tesuque Formation is 95 ft/yr.

The saturated thickness of the Puye Conglomerate in the three test wells (DT-5A, DT-9, and DT-10) ranges from 310 ft to 355 ft, with an average of 340 ft. The saturated thickness of the underlying Tesuque Formation ranges from 15 ft to 290 ft, with an average of 150 ft. At a pumping rate of 82 gpm, the average specific capacity is 15 gpm/ft of drawdown, or about 5.5 ft of drawdown.

The average field coefficient of permeability of the Puye Conglomerate and Tesuque Formation penetrated by the test holes is 83 gpd/ft², and the average transmissivity is 36×10^3 gpd/ft. The rate of movement of water in the 490 ft of aquifer penetrated by the test hole is 345 ft/yr.

3.4.4.5 Puye Conglomerate

Test wells on the plateau that are completed within the main aquifer in the Puye Conglomerate are TW-1, TW-2, TW-3, and TW-8. The saturated thickness of the conglomerate ranges from 29 ft to 97 ft, with an average of 60 ft. At an average pumping rate of 7.9 gpm, the specific capacity is 2.0 gpm/ft of drawdown, or an average drawdown of 17 ft. The average field coefficient of permeability is about 98 gpd/ft², with an average transmissivity of 4.3×10^3 gpd/ft. The rate of movement of water in the Puye Conglomerate with an average thickness of 60 ft is about 250 ft/yr.

3.5 Geology

The regional and site geological and seismological descriptions that follow have been assembled from the Dames & Moore report entitled, *Report of Geologic, Foundation, Hydrologic, and Seismic Investigation, Plutonium Processing Facility, Los Alamos Scientific Laboratory, Los Alamos, New Mexico*, 1972. More recent seismic information from the work of Gardner and House (1987), House and Cash (1988), and Wachs, et al. (1988) has also been incorporated. The material has been condensed to include only the background information necessary to describe the geological and seismic hazards present at LANL and the Technical Area 54 (TA-54) CMP Saw Facility Site.

3.5.1 Geologic Setting

LANL lies within the Southern Rocky Mountain Province, west of the Rio Grande in the north-central portion of New Mexico. The laboratory is situated on Pajarito Plateau along the eastern flank of the Jemez Mountains. Pajarito Plateau is characterized by numerous finger-like mesas. The mesas are dissected by eastward-flowing, intermittent streams that originate in the Jemez Mountains and are tributaries of the Rio Grande. TA-54 is located

on Mesita del Buey, between Cañada del Buey to the north and Pajarito Canyon to the south. The CMP Saw Facility will be located at the western-most extent of TA-54.

Some of the more significant geologic features associated with the Rio Grande tectonic trough and located in the vicinity of LANL are shown in Figure 3.5-1. These features

include the Nacimiento and Jemez uplifts, Jemez and Pajarito fault systems, and the Jemez Caldera. TA-54 lies east of the Pajarito fault system and west of the Rio Grande.

3.5.2. Stratigraphy

Rocks that outcrop and are found in the subsurface at TA-54 are in ascending order, from oldest to youngest, the Tesuque formation, Puye formation, and Bandelier formation (Figure 3.5-2). The Bandelier tuff outcrops at TA-54, is the formation on which the CMP Saw Facility will be built.

The Tesuque formation consists of siltstones, sandstones with lenses of clay, and pebbly conglomerate. Interbedded with the sediments are basalt flows. Total thickness is unknown, but exceeds 2,350 ft.

The Puye formation overlies the Tesuque and is composed of a conglomerate of volcanic debris. Basalts are interbedded with the conglomerates. Based on data from a test hole near TA-55, also located on Mesita Del Buey (approximately 3 miles from the site), the formation is about 600 ft thick, including a basalt flow with a thickness of 120 ft.

The Bandelier tuff forms the upper part of the Pajarito Plateau and its maximum thickness is about 770 ft. It consists of three members (in ascending order):

- The Guaje member, an ashfall pumice;
- The Otowi member, an ashfall tuff; and
- The Tshirege member, a series of ashflow tuffs.

The pumice and tuff are rhyolitic in composition, consisting of quartz and sanidine crystals and crystal fragments, with a few small rock fragments of latite and rhyolite. The pumice is cellular in structure, while the tuff matrix is gray ash. The tuff and pumice range in porosity from 30% to about 60% by volume, with densities of less than 60 lb/ft³ (pumice) to as much as 115 lb/ft³ (moderately welded tuff).

The Guaje and Otowi members and the lower part of the Tshirege member do not outcrop in the site area, but are found at depth beneath the mesa.

3.5.3 Volcanism

The Jemez uplift is a complex accumulation of Tertiary and Quaternary volcanic rocks that is situated just west of Los Alamos and the Pajarito Plateau. The uplift is a geomorphic expression of a maturely eroded, central mountainous mass, surrounded by more youthfully-dissected plateaus and mesas with the Parajito Plateau and Mesita del Buey being examples. Central to the uplift is an ancient caldera complex, a sub-circular volcanic depression 12 mi to 15 mi in diameter, and 500 ft to 2,000 ft deep, which is surrounded by peaks that rise to altitudes exceeding 10,000 ft.

The caldera complex was formed about six million years ago, in late Pliocene time. This locus of volcanic activity produced the Lobato basalts and subsequently formed two giant calderas, an older Toledo caldera, and a later better-preserved Jemez caldera that all but destroyed the Toledo caldera. About five million years elapsed from the initiation of Toledo

Figure 3.5-1. Tectonic Map of the Rio Grande Depression and Adjacent Regions Near Los Alamos, New Mexico (After Kelley, 1961.)

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Figure 3.5-2. Diagrammatic Cross-Section Showing Generalized Stratigraphic Relations of the Santa Fe Group, Tschicoma Formation, and Bandalier Tuff in the Area of Los Alamos, New Mexico (After Purtymun, 1963.)

caldera activity before a sequence of differentiated magmas culminated with Pleistocene eruptions of rhyolitic ash flows and ash falls, which produced the Jemez caldera.

The Bandelier Tuff [1 million years before present (b.p.)], unconformably overlies all the older volcanic rocks and sediments that constitute the Toledo caldera edifice. This tuff underlies the Pajarito Plateau. It covers an area of nearly 400 mi², locally attaining a thickness of up to 1,000 ft, and represents the accumulation of more than 50 mi³ of ash and pumice. The Jemez caldera was then formed when the roof of the magma chamber collapsed along circular tensional fractures, as the result of resurgent magmatic pressures that developed subsequent to the eruption that formed the Bandelier ash flows.

A structural dome, known as the Redondo Dome, emerged within this central ring-fracture zone, as the result of post-collapse uplift of the caldera floor, rather than differential collapse of the caldera block. During and subsequent to the gradual rise of this structural dome, large quantities of viscous rhyolite were extruded from the peripheral ring-fracture zone, resulting in a nearly continuous ring of volcanic domes that now surround Redondo Mountain. These Pleistocene rhyolite domes are the youngest volcanic rocks in the Jemez Mountains, having been dated at 700, 500, and 400 thousand years b.p. The youngest of these eruptive centers is El Cajete. The welded tuff and glass flow from El Cajete have been estimated to have formed 100 thousand years b.p., as they post-date ash flows that have been dated at 430 thousand years old, but predate an ash flow that has been dated at 42 thousand years b.p. (Bailey, et al., 1969).

Vestiges of volcanism continue today, as evidenced by solfataric and hot spring activity within the caldera, notably at Sulfur Springs some 20 miles west of the site, and outside the caldera at several localities in San Diego Canyon along the present course of the Jemez River.

Repose Periodicity for Bandelier-Type Eruptions

The repose period between volcanic events appears to have increased as evidenced in the development of several post-Jemez caldera eruptions. The repose period between the deposition of the Bandelier Tuff members and the eruptions that created the most recent volcanic center is approximately 300 thousand years. Other eruptive events of similar type and magnitude within the volcanic complex and to the Bandelier eruptions have a repose periodicity ranging from 200 thousand to 500 thousand years. This would indicate that there should have been another eruption of Bandelier Tuff-type materials about 600 thousand years b.p. However, since the last Bandelier-type eruption is estimated to have occurred 1 million years ago, this suggests that the probability of such an event occurring is very small.

Repose Periodicity for Jemez Rhyolite-Type Eruptions

There is a mechanical or physical continuum between the Bandelier Tuff eruptions and the later Jemez Rhyolite eruptions of lesser magnitude. The Jemez Rhyolite eruptions comprise intrusive rhyolitic domes that were preceded by violent but relatively small ash fall eruptions within 50 thousand years of the initial collapse of the caldera. The repose period between these eruptions is about 100 thousand years. Since the last of these eruptions (Banco Bonito flow and El Cajete Tuff) occurred 100 thousand years ago, there is a much stronger probability of a future small El Cajete-type eruption than of a giant Bandelier-type eruption. The ring structure of Jemez rhyolite-type eruptions suggests, however, that this sequence of eruptions may be nearly finished. The spatial distribution of these intrusive domes and explosive tuffs indicates that another similar eruption, between Cerro del Medio and South Mountain (approximately 13 mi west of TA-54), would complete the seemingly incomplete ring pattern.

The decelerated volcanic activity in the Los Alamos area does not indicate that the Jemez volcanic complex is extinct, nor does it preclude the possibility of a new cycle of volcanic activity. The Jemez caldera complex is considered by scientists to be geologically active but currently dormant.

3.5.4 Seismology

3.5.4.1 Regional Seismic History

Over 230 earthquakes originating in New Mexico have been tabulated. A small number of additional shocks having origins outside the boundaries of New Mexico have been felt within the state. Intensities are defined according to the Modified Mercalli Intensity (Damage) Scale of 1931. Of the New Mexico events, Intensity VIII was reported four times, Intensity VII six times, Intensity VI seventeen times, and Intensity V forty times. Due to the incomplete record of small events, it is meaningless to attach statistical significance to reports of events with intensities of less than V. The tabulation for Intensity V itself is probably far from complete, even for the time span considered, as many communities fail to report such events.

A moderate sized event, close to TA-54, occurred August 17, 1952 of Intensity V. Its epicenter may have been about 8 mi east-southeast of TA-54. A tiny shock, Intensity II, was felt in Los Alamos during the evening of February 17, 1971. While it was recorded with instruments, it could not be precisely located, but its epicenter was probably directly under Los Alamos, since it was unreported in nearby communities. Another earthquake of Intensity V was felt on December 5, 1971. The epicenter for this event was located approximately 25 miles north of Los Alamos (Gardner and House, 1987). The most recent earthquake occurred on March 17, 1973, and was located in the same area as the December 1971 quake. This event registered Intensity V (Gardner and House, 1987).

The largest nearby earthquake was the May 28, 1918 Intensity VII to VIII Cerrillos earthquake, 35 mi southwest of the site. The intensity at Los Alamos for the Cerrillos event was inferred to be VI (Northrop 1949). Intensity VI may have occurred at LANL, making this the highest intensity earthquake that Los Alamos has experienced in historic time. Several Intensity VII earthquakes (1893) have occurred approximately 85 mi south-southwest of the site, and at Dulce (1966), 85 mi northwest of the site. Three Intensity VIII shocks were located approximately 140 mi south-southwest near Socorro in 1906. Other Intensity VIII shocks have been located in the region; however, none have been within 200 mi of the site.

Ground motion at the site caused by distant, large, out-of-state earthquakes is not considered to be a problem. West Texas (Valentine, 350 mi south-southwest) is the nearest seismogenic zone capable of generating events larger than those considered, and it is adequately distant from Los Alamos to attenuate ground motions to within operational basis earthquake (OBE) levels. The largest known earthquake for the New Mexico region was in Sonora, Mexico, in 1887 (Intensity VIII-IX, 375 mi south-southwest). However, ground motions from a similar Intensity VIII-IX future event in Sonora would be attenuated with distance to within OBE levels at Los Alamos.

3.5.4.2 Regional Faulting

The Rio Grande tectonic trough is a major rift zone, which is expressed in a linked series of echelon, structural depressions flanked by uplifted, northward-trending structural blocks (see Figure 3.5-1). The major faults within the trough express a predominantly northward trend and, although discontinuous, demonstrate a closely-spaced and parallel pattern. Combined vertical displacements along these trough blocks range from 6,562 ft to 22,967 ft. Stratigraphic evidence also suggests horizontal displacements of as much as several miles (Kelley, 1956).

3.5.4.3 Los Alamos Localized Faulting

Quaternary age faulting is ubiquitous in the Jemez Mountains. Only one major fault system is recognized in the vicinity of LANL; the Parajito Fault system (see Figure 3.5-3). This system is a complex series of normal faults with both the east and west blocks of individual faults alternating as the downthrown block in an echelon pattern. Displacement along the members of this fault system is predominantly dip slip. The features of the Pajarito Fault system exhibit both pre- and post-Bandelier Tuff ages (post-1 million years). Stream features and erosion analysis indicates that the youngest fault displacement within the Pajarito Fault system may have occurred during the late Pleistocene or early Holocene (Gardner and House, 1987).

In the last 1 million years, there has been great displacement within the Pajarito system. The Bandelier Tuff has been offset up to 500 ft. On LANL property, the dip separation of the Bandelier Tuff (apparently post-Tshirege age) approaches 300 ft and along the main trace of the Pajarito fault, maximum post-Tshirege displacement appears to be 430 ft. A 50 ft dip separation of the zonal contact between vitric and devitrified tuff of the Tshirege member, exposed in Pueblo Canyon, dissipates rapidly southward. There is no evidence of surface faulting along the north wall of Los Alamos Canyon, northwest of the CMP Saw Facility site. West of Guaje Mountain (northeast of the site), where Bandelier Tuff is juxtaposed with the Tertiary-age Tschicoma latite, a fault zone of brecciated latite is approximately 200 ft wide. This fault zone is secondary to the main fault plane and contains at least three or four auxiliary fault members. The intensity of fault deformation upon the Tertiary latite along the fault is much greater than that upon the overlying Bandelier Tuff and suggests that older branches of the fault system may continue southward under undisturbed Bandelier Tuff.

Movement has occurred that post-dates the development of the Pajarito Plateau surface; apparently having occurred between 500 thousand and 100 thousand years ago. Faulting in the Pajarito zones appears to predate the Holocene alluvial deposits and landslide deposits within the Jemez uplift; nevertheless, the above information indicates that this major fault system is geologically active. This fault system is considered to be structurally and tectonically related to other fault systems in the Rio Grande Tectonic Trough, and differ only in the dates of their initial activity and in the local distribution of their stress fields. The Pajarito Fault system, therefore, provides evidence for a long history of recurrent fault movement.

Upon review of a recently published pre-Bandelier tuff structure map (Figure 3.5-3) (Gardner and House, 1987), a fault has been interpreted as effecting the northwest portion of TA-54, close to the main entrance. This fault is in the vicinity of the CMP Saw Facility, and trends NE/SW.

The nearest surface fault zone to the CMP Saw Facility site is located approximately 0.8 miles to the NW and also trends NE/SW. The potential for seismic surface rupture at the CMP Saw Facility site is moderate (Gardner and House, 1987).

A preliminary mass wasting map (Gardner and House, 1987) indicates that the northwest half of TA-54, which includes the CMP Saw Facility site, has mass wasting potential.

3.5.4.4 Operating Basis Earthquake

Operating basis earthquake criteria are intended to indicate levels of ground motion to which facility structures might realistically be subjected during their economic life and maintain normal operation. On the basis of the seismic history of the area, it appears that the site will be subjected to only moderate levels of seismic ground motion during the life

of the TA-54 facility. It is probable that the maximum level of ground motion experienced in the past century at the site has been no more than Intensity VI. However, the occurrence of an earthquake similar to the 1918 Cerrillos event at Los Alamos, with a site Intensity of VII to VIII, is not improbable. For this condition, the maximum horizontal ground acceleration at the site would probably be on the order of 0.17g (Dames and Moore, 1972). This is the level of ground motion recommended for the Operating Basis Earthquake. The value is based on a hazard annual probability of exceedance of 1.8×10^{-3} , as shown in Figure 3.5-4 for a return period of 550 years.

3.5.4.5 Safe Shutdown Earthquake

Safe shutdown earthquake (SSE) criteria are intended to indicate levels of ground motion to which facility structures might be subjected and still provide containment of noxious materials under any credible conditions.

Based on an evaluation of the degree of ground motion that is remotely possible, considering both seismic and tectonic history and geologic structure, Kennedy, et al., (1988) recommend that an SSE value of 0.22g be used for moderate hazard facilities located at LANL. This best estimate peak ground acceleration value is based on hazard annual probability of exceedance of 1×10^{-3} , as shown in Figure 3.5-4 for a return period of 1,000 years. The acceleration value corresponds to the maximum acceleration that would be recorded by a three axis strong motion instrument on a small foundation pad at the freeground surface.

Vertical ground motion accelerations are recommended to be two-thirds of the horizontal ground motion accelerations; that is, 0.15g for the SSE of 0.22g. The CMP Saw Facility design, construction and ability to withstand and remain in operation after an OBE or SSE is discussed in Chapter 4.

New investigations by Gardner and House (1987), have concluded that further studies are required to determine a more relevant ground acceleration value for LANL. Their findings are based on the lack of certainty on which Dames and Moore made their 1972 approximations and the recent discoveries of more extensive faulting. In addition, recent studies by House and Phillips (1989) have determined that it may not be feasible to assign only one acceleration value to the laboratory properties and suggest that further investigation be conducted to determine more realistic values.

3.5.4.6 Response Spectra

Ground response spectra indicate the dynamic amplification of the earthquake ground motion during linear, elastic seismic response of facilities. These spectra provide information about the frequency content of potential earthquake ground motion at the site. Kennedy, et al. (1989) recommend that the response spectrum shown in Figure 3.5-5 be used as the design spectrum for facilities at LANL.

3.6 Summary of Conditions Affecting Facility Construction and Operations

Los Alamos National Laboratory is located in Los Alamos County, north-central New Mexico, approximately 53 mi north-northeast of Albuquerque and 25 mi northwest of Santa Fe. The 43 mi² Laboratory site is situated on Pajarito Plateau, which consists of a series of finger-like mesas separated by deep eastward oriented canyons cut by intermittent streams. Mesa tops range in elevation from approximately 7,800 ft on the flank of the Jemez Mountains to about 6,200 ft at their eastern termination above the Rio Grande Valley.

EXPLANATION

- Fault - dashed where inferred
- queried where no data exist
- Structure contour - dashed where inferred
- queried where no data exist
- Seismic line
- Seismic line - depth data used in contouring
- Water well or test well
- Major road

Figure 3.5-3. Structure Contour Map of the Pre-Bandelier Tuff Surface, Pajarito Plateau (Gardner and House, 1987)

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Figure 3.5-4. Earthquake Hazard at Los Alamos National Laboratory

Figure 3.5-5. Design Response Spectrum Scaled to 1.0 g for 2%, 5%, and 10% of Critical Damping

The CMP Saw Facility site is located on DOE controlled land at the west end of TA-54, south of the Los Alamos townsite. The facility is situated along Pajarito Road on Mesita del Buey above Pajarito Canyon.

The LANL location, remote from large population centers and surrounded by largely undeveloped land, provides an ideal setting for security and minimal environmental interaction. Large tracts of land north, west, and south of the Laboratory are held by the Santa Fe National Forest, Bureau of Land Management, Bandelier National Monument, General Services Administration, and Los Alamos County.

The total population within 50 mi of the Laboratory is 203,000. The closest facilities to the CMP Saw Facility site are TA-54, TA-51, and TA-18, with a combined population of 140. Royal Crest Mobile Home Park is located approximately 3.2 mi northwest of TA-54.

The Los Alamos airport has a single east-west runway, the west end of which is 2.8 mi northwest of the CMP Saw Facility site. The airport presents a minimal airplane crash hazard to the site (Fuentes, 1988).

The semi-arid climate and rugged terrain preclude using the LANL area for extensive crop production; however, natural vegetation is plentiful. Vegetation at the eastern edge of the county is similar to that of a continental, semi-arid region with pinons and junipers along with sagebrush and other hardy species. Toward the western edge of the county, at higher elevations, the vegetation becomes forests of Ponderosa pine and spruce with groves of aspen.

Wildlife is plentiful, particularly in the restricted areas of governmental ownership, and includes numerous species of birds as well as rodents, deer, bear, mountain lion, elk, and coyotes. Several state-listed endangered or threatened species may occur in north-central

New Mexico; however, no endangered or threatened species are known to inhabit the TA-54 vicinity.

The entire Los Alamos area is of archeological interest. Laboratory lands contain about 900 known archeological and historical sites. Although the general area is of archeological interest, no known archeological ruins are at the CMP Saw Facility site.

The Los Alamos Fire Department is a self-sufficient, well-equipped industrial fire department. The nearest fire station (station Number 1) to TA-54 is 4.5 mi away by road, with a response time of just under five minutes under ideal conditions, up to six minutes 40 seconds for traffic and weather delay.

The Los Alamos Medical Center is located about 4 mi from TA-54 and is fully equipped to handle emergency medical patients, including radiation casualties. The ambulance response to TA-54 is first from Fire Station Number 1.

A summary of the interaction of TA-54 with natural phenomena is as follows:

Maximum Temperature	95°F	LANL Record
Minimum Temperature	-18°F	LANL Record
Maximum Snow Load	17.8 lb/ft ²	Los Alamos North Community from single snowfall
Maximum Daily Precipitation	3.48 in	LANL Record

Design Tornado	None	UCRL-15910
Extreme Straight Wind	93 mph	UCRL-15910
Design Flood	None	Favorable Geographic Setting

Design Basis Earthquake	0.22g	UCRL-15910
Operating Basis Earthquake	0.17g	Dames & Moore, 1972
Volcanism	Jemez volcanic locus is considered active, but presently dormant.	Dames & Moore, 1972
Faulting	A fault is located in the vicinity of the CMP Saw Facility Site. Nearest surface fault is 0.8 mi NW. Potential for seismic surface rupture is moderate.	Gardner and House, 1987

The Laboratory's location, on top of a mesa, provides good atmospheric dispersion characteristics. Two key factors responsible for the dispersion characteristics at Los Alamos are the surrounding terrain's roughness scale and atmospheric stability. Frequency of atmospheric stability is approximately:

	<u>Winter</u>	<u>Summer</u>
Unstable (<i>good mixing</i>)	29%	28%
Neutral (<i>fair mixing</i>)	29%	32%
Stable (<i>poor mixing</i>)	42%	40%

The Laboratory is supplied by water pumped from deep wells in three well fields located in Los Alamos Canyon, Guaje Canyon, and on the Pajarito Plateau. Ground water production is from the main aquifer (Tesuque Formation and lower part of the Puye Conglomerate), which ranges in depth from about 1,200 ft along the western edge of the plateau to about 600 ft along the eastern edge. The main aquifer is the only aquifer capable of municipal and industrial water supply. The rate of groundwater movement in the main aquifer ranges from 20 to 345 ft/yr.

The great depth to the main aquifer, and the fact that its recharge zone is mainly in the Jemez Caldera, combine to make the main aquifer relatively isolated from Laboratory activities. Only minor recharge results from the small amounts of alluvial groundwater in the deeper reaches of the canyons.

3.7 Site Assessment

The information contained in the Site Description Section of this PSAR confirms that the TA-54 CMP Saw Facility site location is adequate to meet its program objectives. The geographic and demographic settings combine to make TA-54 an area which is remote and secure, with minimal environmental impact, and subject to few severe natural phenomena. We have considered the effects of postulated accidents on the facility and associated equipment. Accident analysis shows that the risks associated with operating the Facility are well within the acceptable bounds.

3.8 References

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4.0 DESCRIPTION OF FACILITY

4.1 Summary Description of Plant Design

The CMP Saw Facility will consist of two major areas designed and built to different specifications. The two areas are the process area and the support area. The floor plan is shown in Figure 4.1-1. In general, design and construction of the facility will conform with codes and standards of:

- a) DOE Order 6430.1A,
- b) Nuclear Air Cleaning Handbook, ERDA 76-21,
- c) American National Standards Institution (ANSI) N510 and N509,
- d) ANSI 58.1 - 1972,
- e) Uniform Building Code (UBC) - 19ICBO,
- f) American Concrete Institute (ACI) 318 - 71,
- g) National Fire Protection Association (NFPA),
- h) American Institute of Steel, and
- i) DOE Order 5480.1B.

The design calculations are on file in the Engineering Records Management Group (ENG-7) and have been reviewed through the Laboratory Facilities Engineering Division Quality Assurance Program for Construction. The contract drawings and specifications are on file as Laboratory Job 9313-54, and are available for review.

The process area will be designed and built in accordance with DOE moderate hazard facility standards, and will consist of the air-lock, receiving area, staging area, and processing room. The 175 ft² air-lock will provide buffer space between the process room, the staging area, and the receiving area. The 540 ft² receiving area will allow the gantry crane to bring

Figure 4.1-1. CMP Saw Facility Floor Plan.

in CMPs from trucks and load them on a conveyor system. The 410 ft² staging area will hold empty and filled WIPP WAC approved waste packages.

The 2040 ft² process room will contain the band saw enclosure, equipment accessories, and air filtration equipment. Some equipment to be included in the room includes a 3-ton capacity scissors table located in the scissors table pit, four 200 gal stainless steel tanks located in the covered tank trench (cover to support 6,000 pound forklift load), the band saw, saw enclosure with 7.5-ton capacity trolley hoist, and 2 conveyor systems.

A solidification station will probably be located in the saw enclosure area and will be used to mix a solidifying agent with the sludge into a waste package which will be bagged off after solidification has been accomplished. Near the solidification station, in a spill confinement floor trench, will be a 200 gal settling tank, two 200 gal decant tanks, and a 200 gal holding tank for janitorial wash water storage. The process area will have a height of approximately 26 ft and a ceiling height of approximately 20 ft. External walls will be load bearing and constructed of reinforced concrete. The floor will be a reinforced concrete slab on compacted fill. The roof will be a single ply membrane with ballast over precast concrete roof panels. Other design and construction details are not yet available.

The support area will be designed and built in accordance with Uniform Building Code standards, and will consist of the men's and women's change rooms, break room, janitorial closet, utility room and corridors.

The 308 ft² men's and women's change rooms will contain toilets, showers, and changing facilities. The 170 ft² break room will provide office space, a break area, and space to receive visitors. The 32 ft² janitorial closet will contain a sink and provide storage for janitorial supplies. The 120 ft² utility room will house mechanical and electrical equipment. The two corridors will provide for pedestrian circulation.

The height of the support area will be approximately 18 ft and the ceiling height will be approximately 12 ft. Other design and construction details are not yet available.

4.2 Process Area Structural and Mechanical Safety Criteria

Structural specifications for the facility have been presented in detail in the "Comparison to Criteria," Appendix C. Generally, the building structural specifications are drawn from the current DOE Order 6430.1A, General Design Manual, dated April 6, 1989.

4.2.1 Wind Loading

Process Area design for wind loads is in accordance with procedures in ANSI A58.1 and UCRL 15910. This structure has facility use Category III: Moderate Hazard Facilities. A mean recurrence interval of 1000 years and exposure "C" is used. The site-specific wind velocity for this moderate hazard facility is 93 mph as stated in Chapter 3.0 of this PSAR. Shelter from changes in the ground elevation and the height of other buildings has been disregarded.

4.2.2 Wind-Borne Missiles

All components of the process area structure are designed to absorb the kinetic energy of missiles propelled by the wind, and prevent any building penetration from the impact. The missile assumed for these calculations is a 2 by 4 inch timber plank, weighing 15 lbs, and hitting a wall at 50 mph at a maximum height of 30 ft.

4.2.3 Flood Design

Flood conditions are incredible at Los Alamos, as described in Chapter 3 of this PSAR. Therefore, no specific design features are called out for flood control. The area surrounding the facility will be a paved parking lot with rain water drainage primarily to the north of the facility. In addition, since groundwater occurs at a depth of several hundred feet below the surface, TA-54 can be considered to be effectively in an unsaturated hydrological climate.

4.2.4 Seismic Design

Seismic design is in accordance with the Uniform Building Code (UBC), 1988 edition for the Support Area, and UCRL 15910 for facility use Category III: Moderate Hazard Facilities, for the process area. The design basis earthquake is 0.22 g as discussed in Chapter 3.0 of the PSAR. An occupancy importance factor of 2.0 is used. Ductility of the structure is considered to assure compliance with the requirements of the UBC and UCRL 15910 requirements for ductility to resist seismic forces. This safety class structure, and the systems, and components will require dynamic analysis.

4.2.5 Snow Loading

The design ground snow load for Los Alamos is 30 psf. The roof is designed for this snow load, including drift factors, unbalanced loadings, rain-on-snow and its potential ponding effects, as specified in ANSI A58.1, with no reduction in snow load below 30 psf, even considering wind effects, thermal effects, or roof slope. If equipment is located on the roof, the weight of this equipment shall be included in the design loads, including any drift load in the vicinity of the equipment.

4.2.6 Load Combinations

Load combinations for the seismic bracing steel design conform to AISC N690. Load combinations for concrete design conform to ACI 349.

4.3 Description of Services and Utility Systems for Facility

4.3.1 Ventilation Systems

The CMP Saw Facility ventilation system will consist of two separate HEPA filter housings and exhaust stacks, as shown in Figures 4.3-1 and 4.3-2. Each HEPA filter housing will contain first and second stage HEPA filters.

One HEPA filtered exhaust stack will exhaust air at a rate of 3000 fpm from the saw enclosure area. The air will be drawn into the saw enclosure area, through a government furnished equipment HEPA filter, from the process area. The second HEPA filtered exhaust stack will exhaust air at a rate of 3000 fpm from the process area during the summer, and during the winter the air will be recirculated. Winter recirculation of process area air can be automatically shut-off by the continuous air monitoring system (CAM). CAMs are sited throughout the process area to provide prompt notice should airborne particulate alpha emitters become present.

Figure 4-3-1. Process Area Air Flow Summer Operation.

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Figure 4.3-2. Process Area Air Flow Winter Operation.

The process room will be maintained at a negative pressure of 0.15 in. WC (0.38 cm) with respect to the receiving area, 0.1 in. WC (0.25 cm) with respect to the air-lock, 0.15 in WC (0.38 cm) with respect to the shipping area, 0.2 in. WC (0.51 cm) with respect to the change rooms, and 0.35 in. WC (0.89 cm) with respect to the break room. The saw enclosure will be maintained at a negative pressure of 0.5 in WC (1.27 cm) with respect to the process room. There will be approximately seven air changes per hour in the process area.

Winter heating of recirculated process area air will be by electric furnace.

4.3.2 Electrical System

Electrical service will be provided by a 500 KVA transformer located north of the facility.

4.3.3 Compressed Air

A small, commercially-available air compressor will be located in the utility room of the facility.

4.3.4 Water

Water will be provided to the CMP Saw Facility by an underground 3 in. ductile iron pipe. The pipe will be divided inside the facility into an industrial water supply and potable water supply. Fire sprinkler water will be provided to the process area (moderate hazard portion) by an underground hardened 6 in. ductile iron pipe. Fire water will be provided to the support area (UBC portion) by a pipe from the adjacent NDA/NDE facility.

4.3.5 Sewage Treatment

Sanitary sewage will be treated by an on-site septic tank and tile field located approximately 175 ft northwest of the facility, and constructed according to the Environmental Protection Guidelines of the State of New Mexico.

4.3.6 Fire Protection Systems

The CMP Saw Facility will have a fire protection system that conforms to the "improved risk" criteria of DOE Order 5480.7 and 6430.1A. The facility will have a wet pip sprinkler system throughout (except for the area next to the NDA/NDE loading dock which will have a dry-pipe system), which is designed for Ordinary Hazard Group II Occupancy, per NFPA 13. The sprinkler system will automatically activate the fire alarm panel, which transmits the alarm or supervisory signal to the Los Alamos Central Alarm Station (CAS) at TA-3. The alarm/detection system will also be connected to the fire alarm panel in the adjoining NDA/NDE Transportation Facility.

4.3.7 Vacuum System

A centralized vacuum pump will be provided for the air sampling system.

4.3.8 Other Services

Low specific activity (LSA) liquid wastes will be collected in a holding tank in the spill confinement floor trench and periodically transported by tank truck to the Radioactive Liquid Waste Treatment Plant at TA-50. TRU contaminated liquid wastes will be solidified at the CMP Saw Facility. LSA room trash will be kept to a minimum, packaged, and transported to the Radioactive Solid Waste Disposal Site at TA-54. TRU contaminated

solid wastes will be packaged in accordance with the Waste Isolation Pilot Project Waste Acceptance Criteria (WIPP WAC) and is expected to be disposed of at the WIPP.

4.4 Environmental Safety and Health Protection Systems

4.4.1 General Confinement Features

The CMP Saw Facility process area will be constructed of concrete panel walls. A small air-lock will separate the staging area and the receiving area from the process room. The saw enclosure will be located within the process room. The saw enclosure will confine the CMP cutting, handling, box bag out, and solidification operations. Two tanks for liquid process waste settlement and storage operations and a janitorial wash water storage tank will be housed in a spill confinement floor trench.

4.4.2 Nuclear Criticality Safety

As previously discussed in Section 1.0, the average radioisotopic contributions (alpha activity) in the cemented paste of the CMPs are 99% Am-241, with less than 1% from Pu-238, Pu-239, U-235, U-238, and mixed fission products. The radioisotopic composition of each CMP is presented in Appendix A. The maximum beta-gamma contact measured exposure rate is 20 milliroentgens per hour (mR/hr) with a 3.3 ft exposure rate of 5 mR/hr. Alpha curie inventories for the 20 ft CMPs are as follows:

<u>Constituent</u>	<u>Inventory Maximum (Alpha Curies)</u>	<u>Mass Maximum (grams)</u>
Am-241	186.1	57.4
Pu-239	0.88	14.3
Pu-238	0.98	.06
U-235	$.17 \times 10^{-2}$	800
U-238	$.22 \times 10^{-3}$	648

maximum plutonium inventory = 1.64 alpha curies
 maximum TRU inventory = 186 alpha curies
 average plutonium inventory = 0.57 alpha curies (0.2 mCi/L)
 average TRU inventory = 66.3 alpha curies (24 mCi/L)

The total radioisotopic inventory inside each CMP is securely bound with cement and thus is not available for dispersal or concentration. The only portion that will be available for dispersal or safety related analysis will be the sludge cut from the CMP (during normal operation) or the cement dust produced during abnormal operation.

Studies performed by the HSE Division Waste Management Group on cemented contaminated sludge ground and placed into water confirm that the sludge and its associated activity settle out of water (leaving a visually clear decant) within an hour. Radioactive assay of the decant indicates that the contamination does not go into solution as it remains bound up with the concrete particles, therefore it cannot be concentrated by any natural process.

The kerf width of the band saw blade will be approximately .09 in. which gives a volume for one cut of approximately 63.6 in³. Thus the volume of one cut is .04% of the total volume of one CMP.

If all 158 CMPs are cut four times, and it is assumed that all CMPs contain the 800 g of U-235 that is the maximum amount in any one CMP, then the total amount of U-235 possible in any location of the liquid waste handling operation would be 202 g. This is a

fourth of a critical mass of U-235 under ideal uniform nitrate aqueous solution conditions. Only three CMPs contain as much as 800 g of U-235.

Likewise, if all 158 CMPs are cut four times, and it is assumed that all CMPs contain the 14.3 g of Pu-239 that is the maximum amount in any one CMP, then the total amount of Pu-239 possible in any location of the liquid waste handling operation would be 3.6 g. This is much less than a critical mass of Pu-239 which is 480 g under ideal uniform nitrate aqueous solution conditions.

Figure 4.4-1 presents a schematic flow of the secondary liquid wastes generated from the cutting operation. The band saw will have a 50 gal reservoir from which the cutting water will be recirculated to the cut surface. The sludge will be mixed and pumped to the settlement tank at the end of each working day. After an overnight settling, the decant will be pumped back to the reservoir tank where it will be reused for the next day's cutting operations. When an appropriate amount of concrete sludge has been accumulated in the settlement tank, the sludge will be assayed and solidified in a waste package with solidifying agent. As an added criticality safety measure, an administrative limit of 100 g total of Pu-239 and U-235 will be placed on the settlement tank.

4.4.3 Radiological Protection

All the radioisotopic inventory is fixed with cement inside the CMPs. The only portion available for dispersion will be the sludge cut from the CMP (during normal operation) or the cement dust produced during abnormal operation. The saw enclosure will be maintained at a greater negative pressure [.5 in. WC (.9 mm Hg)] than the process room which will be, in turn, maintained at a greater negative pressure [.25 in. WC (0.64 mm Hg)] than the outside environment. The saw enclosure will receive its supply air from the process room through a HEPA filter. Continuous air monitors will be sited throughout the process area

Figure 4.4-1 Secondary Process Liquid Waste Flow.

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to provide prompt notice should airborne particulate alpha emitters become present. Air samples will be continuously collected from the process areas and the exhaust stacks, and these will be analyzed weekly for particulate radioactivity. Hand and foot monitors will be positioned by all entry/exit doors and all equipment or personnel exiting the process area will be surveyed in order to control contamination. Anti-contamination (Anti-C) clothing and full face respiration equipment with HEPA filters will be worn during bag outs and saw enclosure entries.

4.4.4 Fire and Explosion Protection

Nonflammable hydraulic fluid will be used to power the band saw and the conveyor systems, and no flammable energy sources such as propane or natural gas will be permitted in the process area. The process area, and support portions of the facility, will be equipped with a complete fire sprinkler system. Fire sprinkler water will be provided to the process area (moderate hazard portion) by an underground hardened 6 in ductile iron pipe. Fire water will be provided to the support area (UBC portion) by a pipe from the adjacent NDA/NDE facility. The process area wet sprinkler system is hydraulically designed for ordinary hazard Group II occupancy.

4.4.5 Fuel Storage

There will be no fuel storage in the CMP Saw Facility.

4.4.6 Hazardous and Radioactive Waste Handling and Storage

There will be no hazardous waste produced in the CMP Saw Facility. Radioactive waste handling is the primary operation of the facility. Approximately three CMPs at a time will be received in the receiving area of the facility. Each will be sectioned and packaged for

proper disposal according to the WIPP WAC.

As presented under Section 4.4.2, "Nuclear Criticality Safety," TRU liquid wastes will be solidified for proper disposal at the WIPP.

Only LSA liquid wastes will be transported to TA-50-1 for treatment. Low-Level solid wastes will be properly packaged and documented for disposal at the TA-54, Area G, Disposal Site.

The tanks containing sludge and decant will be housed in the spill confinement floor trench.

4.5 Comparison to Criteria

This section documents the evaluation of the LANL CMP Saw Facility to the DOE 6430.1A, "General Design Criteria," (April 6, 1989). It focuses on the pertinent safety related design criteria for DOE 6430.1A, and evaluates the respective CMP Saw Facility Safety related structures, systems, equipment, and components for either compliance or nonconformance as required by DOE/AL Order 5481.1B, "Safety analysis and Review System."

The DOE Order 6430.1A has been reviewed and applicable design criteria have been chosen. The CMP Saw Facility comparison to criteria (CTC) is included in Volume II of this PSAR. Applicable design criteria are listed on the "left side" of the table. Compliance with these criteria is listed on the "right side" of the table along with a short justification to substantiate the decisions.

Each justification was developed based on technical documentation associated with the CMP Saw Facility, as well as information and comments obtained from the LANL and Pan Am world services technical support staff. Some of the compliance issues were addressed

directly by the project architects (Flatow, Moore, Bryan, Shaffer, and McCabe) during design.

5.0 DESCRIPTION OF OPERATIONS

5.1 Main Operations/Processes

This section reviews the main operations/processes involved in cutting and handling the CMPs.

5.1.1 Receiving

All 158 CMPs were moved in 1986 to TA-54 for current storage. They were decontaminated on their exterior surfaces at that time. The transportation was without incident. The CMPs will be retrieved from storage at TA-54 and transported to the Saw Facility. Up to three CMPs will be unloaded, one at a time, from a flatbed truck by a 7½ ton capacity gantry crane. The crane will be driven over the flat bed and the hoist will be rigged to a CMP by slings. When all three CMPs have been unloaded, the outside roll-up door of the receiving area will be closed and the truck bed surveyed to ascertain that no accidental contamination occurred.

5.1.2 Charging

The gantry crane will be used to load a CMP onto the 20 ft long receiving area conveyor system. Once a facility operator has verified that the saw enclosure is within the proper negative pressure range and its exhaust airflow is within the proper range, the pass-through port will be opened and the CMP advanced through the port into the saw enclosure and onto a second conveyor system. The second conveyor system is broken into independent sections driven by synchronized motors. This break is to prevent contamination from being brought back to the pass-through by a long conveyor.

Once a CMP has been completely loaded into the saw enclosure, the operator will close and lock the pass-through port. The opened diameter of the pass-through port will be approximately 48 in and the design air flow through the opened port will be at least 125 ft/min. As the CMP fills most of the opening during the charging step, the air flow will be increased, thereby sucking any possible contamination into the saw enclosure. The saw enclosure will be government furnished equipment, and the details of its construction are not yet available.

A continuous air monitor in the receiving area will monitor the air to provide an audible alarm in the remote event of airborne particulate radioactive contamination. A hand and foot alpha monitoring station will be used to survey individuals, equipment, and materials exiting the receiving area.

5.1.3 Loading the Band Saw Platform

A facility operator will remotely advance the second conveyor system until an appropriate length of CMP (usually 4.5 ft) has been advanced past the band saw blade. The proper position of the section will be visually verified by comparing the end of the CMP to a preset position. Once the proper length of CMP has been advanced, the charging conveyor system will be turned off to prevent inadvertent advancement of the CMP, and a holding ram will be actuated to hold the charging portion of the CMP firmly in place. The holding ram's position will be visually verified before the cutting operation.

5.1.4 Preliminary Cutting Steps

The operator will inspect the gauges provided on the band saw control station prior to initiating a cut in order to verify that cutting fluid flow rates are appropriate and that hydraulic systems are properly functioning.

5.1.5 Cutting

The operator will direct the band saw control station to begin the cut. Once the cut has been initiated, the operator will be free to perform other tasks for about 45 minutes. The self-monitoring system provides audible and visual signals should the blade become stuck or broken, when the cut is completed, or if cutting fluid ceases to flow due to pump failure or a clogged line. The kerf width of the blade will be approximately .09 in. The throughput rate is expected to be approximately four CMPs a week.

There will be a constant weight on the band saw blade which will make it cut faster at the beginning and end of a cut. However, since there is less cement to cut at the beginning and end of a cut, the effect will be to produce a fairly uniform rate of cuttings throughout each complete cut.

5.1.6 Section Unloading

When a CMP section has been cut, the cutting fluid flow and band saw will be turned off by the operator. A trolley hoist hook will be rigged onto the section to allow it to be lifted, moved into the bag-out module, and lowered into an alignment cradle already positioned in the WIPP-approved waste package.

5.1.7 Bag Out

When a section of CMP has been loaded into the waste package, the package will be lowered by a scissors table and bagged off the module. A walking electric forklift will be used to remove the bagged-off waste package and to replace it with a prepared empty package equipped with cradle and bag-on sleeve.

5.1.8 Paint

After swipe results indicate that no alpha contamination is present on the waste package, the package will be moved to the shipping area and the paint touched up, if necessary. Labels will be applied to the package, and it will be transported to on-site storage or directly to the WIPP via the adjacent NDA/NDE-Transportation Facility.

5.2 Support Operations/Processes

This section reviews the support operations/processes involved in supplying the saw with cutting fluid and handling the liquid wastes.

5.2.1 Secondary Liquid Waste from Saw Enclosure

The band saw will be equipped with a grate to screen out large pieces of CMP, should any be generated during the cutting operation. Beneath the grate will be a 50 gal reservoir tank equipped with a stirring rod and two pumps. The first pump will be mounted several centimeters above the bottom of the reservoir and will be used to recirculate the cleaner portion of the cutting fluid to the cutting operation. The second pump will be located in the bottom of the reservoir. At the end of each day of cutting the stirring rod will be turned on to mix the decant and the sludge. The mixture will then be pumped to the 200 gal settlement tank for an overnight separation. Each morning, the decant water will be pumped from the settlement tank back to the band saw reservoir and reused for the daily cutting operation. Additional make-up water will be added as needed.

5.2.2 Sludge Treatment

When an appropriate amount of sludge has been collected in the 200 gal settlement tank (an administrative limit of 100 g of Pu-239 and U-235 will be placed on the tank), it will be mixed with enough decant water to allow it to be sampled and then pumped into a waste package where it will be solidified with a solidifying agent.

5.2.3 Decant Tank

Two 200 gal decant tanks will provide reserve capacity during decontamination washes of the saw enclosure and also allow storage and sampling of the liquid before it is pumped into a tanker for transport as LSA liquid waste to TA-50, WM-1, for treatment and disposal. An in-line particulate filter upstream of the decant holding tank will provide assurance that any contaminated concrete particulates have been removed from material to be transported.

5.3 Processing, Storage of Radioactive Materials

This section reviews typical and maximum quantities and forms of radioactive and hazardous materials that will be processed and stored in the CMP Saw Facility, or elsewhere in conjunction with CMP Saw Facility activities.

5.3.1 Solid Radioactive Material

A maximum of seven CMP equivalents will be in the facility at any one time. This will be four CMPs and five sectioned CMPs inside of 25 finished waste packages. The CMPs contain cemented process sludge contaminated with TRU radioisotopes. The radioisotopic activity contribution in the cemented paste is 99% Am-241, less than 1% Pu-238, Pu-239, U-235, U-238, and mixed fission products (Appendix A). The maximum solidified plutonium

inventory in a CMP is 1.64 alpha curies with a maximum solidified TRU alpha inventory of 186 curies. The total quantity bound in four CMPs and 25 finished waste packages could be 15 alpha curies of plutonium with 1590 curies of total TRU alpha inventory.

5.3.2 Liquid Radioactive Materials

An appropriate amount of sludge (less than the 100 g of Pu-239 and U-235 administrative limit) from the wet cutting operations will be collected in a 200 gal settlement tank before it is solidified. Twenty-two gal of this sludge could contain 5.6 curies of TRU alpha activity and .04 curies of plutonium activity. The 200 gal settlement tank and two 200 gal decant tanks with particulate filter and associated piping will be contained within a spill confinement floor trench. The janitorial wash water will be collected in a 200 gal storage tank also located in the floor trench.

5.3.3 Other Hazardous Materials

The only possibly hazardous materials that may be utilized in the facility are paint, hydraulic fluid, and battery acid. In addition, cement dust may be a hazard if inhaled.

5.4 Support Systems

5.4.1 Saw Enclosure Exhaust Ventilation

Air exhausting from the saw enclosure will be passed through a two-stage HEPA filter. This ventilation system will maintain the saw enclosure at a negative pressure with respect to the rest of the process area, support area and outside environment, and remove any airborne particulate wastes from the saw enclosure (during abnormal operation).

5.4.2 Process Area Exhaust Ventilation

Air exhausting from the process area will be passed through a two-stage HEPA filter. This ventilation system will maintain the process area at a negative pressure with respect to the support area and outside environment, and remove any airborne particulate wastes from the process area (during abnormal operation).

5.5 Monitoring and Control Systems

5.5.1 Ventilation Control Station

A ventilation control station will be sited in the facility. The station will provide readouts and visual and audible alarms when the negative pressure relationships and air flows deviate from programmed parameters, and when the pressure drop across HEPA filters (3 in. WC [7.6 cm]) indicates that they require replacement.

5.5.2 Band Saw Control Station

A band saw control station with readouts and alarms will be sited by the cutting portion of the saw enclosure to allow an operator to control the band saw cutting operation. It will be provided with audible and visual alarms to notify the operators of conditions such as a broken or seized band saw blade, lack of cutting fluid flow, and completion of a CMP cut.

5.5.3 Conveyor Control Station

A conveyor control station in the receiving area will be provided to advance a CMP from the receiving area conveyor system onto the saw enclosure conveyor system. This control station is interlocked with a second control station by the band saw control station such that

the receiving station must be turned off to allow the cutting control station to control the saw enclosure conveyor system independently of the one in the receiving area.

5.5.4 Liquid Waste Control Panel

A third control panel will provide alarms and readouts for the liquid levels in the settlement tank, the decant tanks, and the janitorial wash storage tank.

5.5.5 Continuous Air Monitoring System

A continuous air monitoring system (CAM) will be provided to automatically shutoff winter process area ventilation recirculation in the event unacceptable levels of alpha-emitters are present in the process area.

5.6 Hazardous Materials

The majority of the hazardous material in the facility will be contained in the CMPs. The facility operation will be sectioning and packaging the CMPs and solidification of secondary TRU liquid waste. The radioisotopic inventory will be bound up in concrete inside the CMPs and, except for that which is removed from the saw kerf, will not be available for dispersal during accidents or routine operations. Cement dust may be hazardous if inhaled. In addition, paint, hydraulic fluid, and battery acid may be hazardous materials that will be present in the facility.

5.7 Methods for Maintaining Safe Control

Approved Standard Operating Procedures (SOPs) and Operating Instructions (OIs) will be written for all potentially hazardous operations at the CMP Saw Facility. They are written

by the HSE Division Waste Management Group with assistance from other LANL HSE groups. An emergency plan will be written which includes responsible persons, alarm signals, and re-entry procedures.

5.7.1 Standard Operating Procedure

The Standard Operating Procedure (SOP) describes procedures and controls for conducting potentially hazardous operations. It identifies potential hazards, precautions, responsible personnel, and organizations involved; provides detailed accounting of support services and equipment needed; and identifies specific actions to be taken in an emergency situation.

5.7.2 Operating Instructions

Operating Instructions (OI) provide detailed operating procedures to maintain operations within defined operating parameters. The OIs generated for the CMP Saw Facility will cover:

- 1 - Receipt and unloading of CMPs.
- 2 - Operation of the receiving area and saw enclosure conveyor systems, and use of the input port of the saw enclosure.
- 3 - Band saw operation and blade replacement.
- 4 - Unloading the CMP section and loading into the waste package.
- 5 - Bag-out operations.
- 6 - Waste package closure operations.
- 7 - Preparation of a WIPP waste package.
- 8 - Liquid waste treatment.
- 9 - Replacement of HEPA filters.
- 10 - Painting touch-up procedures.

11 - WIPP documentation.

5.7.3 Employee Training

Employees are trained to follow the SOP and OIs, and know that prior to any significant deviations from the OIs, they must have a special work permit signifying management acceptance of the deviation and any assumed risk. They are also trained with the use of forklifts and cranes, band saw operation, and WIPP requirements. They also must receive health physics instruction.

5.8 Instrumentation for Safety Related Processes

5.8.1 Ventilation

As previously mentioned in Section 5.5.1, alarms and readouts will monitor the ventilation system and HEPA filter performance.

5.8.2 Other Systems

The band saw and conveyor controls mentioned in Sections 5.5.2 and 5.5.3, and the liquid waste control system mentioned in Section 5.5.4, will monitor band saw, cutting fluid, and conveyor system operations and provide alarms that signify that action is needed should an important operational step be required.

5.8.3 Continuous Air Monitors

Continuous Air Monitors (CAMs) will be located throughout the facility to continuously sample air for the presence of airborne particulate alpha contamination, and to automatically

shutoff winter process area ventilation recirculation.

5.8.4 Fire Alarm Systems

Wet sprinkler systems and facility parameters will be automatically and continuously monitored by a fire alarm panel which will be connected to the Los Alamos CAS at SM-440. Should the system give an alarm, the CAS dispatcher will notify the Fire Department via radio and computer links. Under ideal conditions, response time of the Fire Department to the facility is just under five minutes.

5.9 Operational Reliability and Maintenance

5.9.1 Band Saw

The band saw cutting system is patterned after one in use at the Naval Reactor Facility at INEL. The band saw blade will be easily replaced through glove ports. The 20 horsepower electric motor and hydraulic pumps (using nonflammable hydraulic fluid) powering the band saw system will be housed outside the saw enclosure as will be the band saw control station. Most of the cover plates normally provided on band saws will be eliminated (not purchased) to allow ease of access during maintenance and decontamination operations.

5.9.2 Conveyor

The hydraulic pump providing power to the band saw will also power the conveyor inside the saw enclosure. The control stations will be located outside the saw enclosure.

5.9.3 Monorail Hoist

The electric power center and control station for the trolley hoist, will be housed outside the saw enclosure.

5.10 Provisions to Ensure Safe Operation or Safe Shutdown

5.10.1 Band Saw

The band saw control system will automatically turn off the blade when a cut is completed, when a blade breaks, or when the cutting fluid pump ceases operation. An "off" switch will be provided on the control panel should an accident or abnormal situation occur.

5.10.2 Conveyor Systems

An operator will be required to actively operate any of the conveyor systems. The receiving area conveyor can be connected with the conveyors inside the saw enclosure to facilitate the loading operation. Then the receiving area system can be disconnected during the sawing operation. This system must be locked off to allow the charging system to advance the CMP through the band saw throat.

All conveyor controls will be push button operated so that if the finger is removed from button, the system automatically turns off.

5.10.3 Trolley Hoist

The controls to the saw enclosure trolley hoist will be push-buttons so that when the finger is removed from the button, the selected function automatically stops.

5.11 Potential Operational Hazards

5.11.1 Industrial Hazards

Industrial hazards are associated with the operation of heavy equipment (e.g., forklift) and the band saw, and the handling of the heavy CMPs (average weight of 13,000 lbs). Improper rigging techniques could present hazards during receiving, loading, or packaging operations, and could result in personal injury such as crushed limbs, hands, or feet.

5.11.2 Contaminated Liquid Spill Hazards

Improper operation of the secondary liquid waste treatment system, or a pipe or tank rupture, could result in a contaminated liquid and/or sludge spill. However, any spills should be confined by the process area spill confinement floor trench.

5.11.3 Inhalation Hazards

Should respiratory protection procedures not be closely adhered to, individuals entering the saw enclosure for maintenance or other purposes could accidentally inhale contamination. Proper procedures should also be followed during charging operations to ensure that contaminants remain within the saw enclosure. The ventilation system, CAM system, and the confinement of the saw enclosure should reduce the hazard to operating personnel.

5.11.4 Contamination Migration

Should operators not routinely monitor themselves or their equipment, a pinhole leak in a saw enclosure glove, surface contamination on a CMP in the receiving area, or an accidental liquid spill could result in nuisance levels of radioactivity.

6.0 SYSTEM RISK ANALYSIS

The CMP sawing operation will be a relatively simple physical process that presents little opportunity for either predicted or unforeseen failures. The only chemical process may be the solidification of sludge before waste packaging. In addition, the vast majority of the TRU contaminants will remain securely bound with the cement matrix in the CMPs. What few hazards there may be are discussed in the next section.

6.1 General Hazards

General hazards that CMP Saw Facility personnel may possibly be subjected to are grouped into the following categories:

- Fire and/or explosion
- Hazardous material exposure
- Radioactive material exposure
- Cuts, contusions and crushing
- Criticality
- Burns
- Electrical shock

These possible hazards are briefly discussed in the following sections as a precursor to the discussion on safety systems. The discussion of hazards and safety systems is limited to the moderate hazard portion (process area) of the facility.

6.1.1 Fire and/or Explosion

Fires and/or explosions may be caused by ignition of flammable material by a heat source.

The CMP Saw Facility will contain a minimal amount of flammable materials. No natural gas will be piped to the process area and nonflammable hydraulic fluid will be used in the conveyor and band saw systems. However, paint which is probably flammable may be used to touch up the waste packages. Fire and/or explosion hazards may also involve radioactive material and burn hazards.

6.1.2 Hazardous Materials

CMP Saw Facility personnel will probably use few materials that may cause a hazardous material exposure by inhalation or ingestion. Paint from the waste package touch-up operation, battery acid from the electric forklift, and hydraulic fluid are examples of possibly hazardous materials that may be present. Airborne cement dust may be a hazardous material exposure hazard. It is also a radioactive exposure hazard.

6.1.3 Radioactive Material Exposure

Inhalation or ingestion of radioactive material is a possible hazard associated with the operation of the CMP Saw Facility. Airborne contaminated cement dust, in the saw enclosure and/or the rest of the process area, a contaminated liquid spill, and contaminated CMP surfaces are possible sources of radioactive material.

There will be a minimal radioactive material exposure associated with the handling of the CMPs at the CMP Saw Facility. The maximum CMP beta-gamma contact measured exposure rate is 20 milliroentgens per hour (mR/hr) with a 3.3 ft exposure rate of 5 mR/hr. An average exposure rate for handling of the CMPs in the saw facility will be assumed to be 10 mR/hr. There are 158 CMPs to be handled over a period of approximately one year. The following CMP handling times will be assumed:

- twenty minutes per CMP to unload in receiving area
- twenty minutes per CMP to load on conveyor and charge band saw
- thirty minutes per CMP to bag-out, package, and move

These figures give a total of 70 minutes per CMP handling time in the facility, for an average exposure of 11.7 mR per CMP, and a yearly dose of 1,843 mR. This dose will most likely be spread over several operators. The maximum allowable yearly dose for facility personnel is 5000 mR.

6.1.4 Cuts, Contusions and Crushing

Opportunities for personnel to receive cuts and contusions (and possibly crushed limbs) are numerous in an "industrial type" facility, such as the CMP Saw Facility, where heavy objects will be lifted and transported (the average weight of a CMP is 13,000 lbs), a band saw will be used, and heavy equipment (e.g., electric forklift) will be operated. Such hazards may also involve radioactive material exposure, such as a puncture wound from the jagged edge of a cut CMP.

6.1.5 Criticality

Criticality caused by changes in nuclear material concentration, geometry, or moderation is incredible for the operation of the CMP Saw Facility. Criticality concerns are focused mainly on the liquid waste handling operation, where geometry and moderation of the nuclear material may change.

If all 158 CMPs are cut four times, and it is assumed that all CMPs contain the 800 g of U-235 that is the maximum amount in any one CMP, then the total amount of U-235 possible in any location of the liquid waste handling operation would be 202 g. This is a

fourth of a critical mass of U-235 under ideal uniform nitrate aqueous solution conditions. Only three CMPs contain as much as 800 g of U-235.

Likewise, if all 158 CMPs are cut four times, and it is assumed that all CMPs contain the 14.3 g of Pu-239 that is the maximum amount in any one CMP, then the total amount of Pu-239 possible in any location of the liquid waste handling operation would be 3.6 g. This is much less than a critical mass of Pu-239 which is 480 g under ideal uniform nitrate aqueous solution conditions.

Tests indicate that concentration changes will not occur when cement dust is mixed with water, and the TRU contaminants will remain bound with the cement particles and will not go into solution. Also, measurements made during the original casting operation show that the TRU contaminants are dispersed throughout the CMP.

6.1.6 Burns

There will be few heat sources and few chemicals used in the CMP Saw Facility that may burn facility personnel. Two examples are possibly the ventilation system electric furnace and the electric forklift battery acid. Burn hazards may also involve fire and/or explosion hazards.

6.1.7 Electrical Shock

Opportunities for personnel to receive electrical shocks will be numerous in an "industrial type" facility, such as the CMP Saw Facility, where electrical equipment will be in use. Regular inspection of equipment, design to national codes, and proper use of equipment will reduce the risk of electrical shock.

6.2 Safety Related Systems

A number of safety-related features and systems will be designed and included into the CMP Saw Facility to prevent and/or mitigate possible hazards associated with operation of the facility. Appropriate design requirements will be imposed and subsequently implemented in procurement specifications and in acceptance testing to ensure that these systems meet requisite performance criteria, including capability to provide any required safety related functions under design basis accident conditions.

CMP Saw Facility safety-related features and systems will include:

- Band saw control station
 - cutting fluid system
- Ventilation control station
 - saw enclosure HEPA filtration and exhaust stack
 - process area HEPA filtration and exhaust stack
- Liquid waste control panel
- Fire protection system
- Fire alarm panel
- Continuous air monitoring system
- Conveyor and hoist systems

Descriptions of these features and systems are provided in Chapter 5 of this PSAR.

The performance of these safety-related systems to mitigate and/or prevent possible hazards that may impact facility personnel and/or the environment/public is analyzed in the following section. There are other facility features, however, that are designed to lower the risk to

facility personnel, the public, and the environment. The band saw will be designed to operate at a slow blade speed to suppress cement dust production and sludge splattering. Conveyor system and hoist controls will be push-button controls that turn off when released. In addition, the saw enclosure and the rest of the process area structure will provide two levels of confinement should contaminants become airborne.

6.3 Safety Related Systems Performance

An inductive analysis approach is used to identify significant component and subsystem failures impacting performance of each of the identified safety related systems. The technique used is the construction of a Failure Modes and Effects Analysis (FMEA) table, which is included as Table 6.3-1. In this approach, the system of interest is broken down into its discrete parts and examined for plausible failures. Possibilities for detection of the failures, the compensating action that would minimize failure effects, and a description of failure effects is also included in the FMEA. The FMEA approach is specified in DOE-AL Order 5481.1B. In addition, the Order also provides the category sets for ranking the failure effects. Two indices are used: Tables 6.3-2 and 6.3-3 define the categories for hazard severity and characterize the effects of failure.

Table 6.3-1: CMP Saw Facility FMEA

<u>System & Function</u>	<u>Failure Mode</u>	<u>Failure Mechanism</u>	<u>Failure Detection</u>	<u>Failure Compensation</u>	<u>Failure Effect</u>	<u>Effects Category</u>
BAND SAW CONTROL STATION						
Provides band saw operator with audible and visual alarms of abnormal band saw conditions such as a broken or seized band saw blade, lack of cutting fluid flow, and completion of cut.	Non-detected loss of cutting fluid.	Mechanical or electrical	Detected during routine testing of band saw control station.	Visual inspection of saw blade during operation is a backup system. Operator may notice airborne cement dust in saw enclosure. Pressure drop across exhaust filters increases.	Clogged exhaust filters. Cessation of band saw activities until saw enclosure is cleaned up and exhaust filters changed.	IVc
	Non-detected seized band saw blade.	Mechanical or electrical	Detected during routine testing of band saw control station.	Visual inspection of saw blade during operation is a backup system.	Band saw hydraulic system could be damaged. Cessation of band saw activities until band saw is repaired.	IVf to IVe.
	Non-detected completion of cut.	Mechanical or electrical	Detected during routine testing of band saw control station.	Visual inspection of saw blade during operation is a backup system.	None.	
	Non-detected broken band saw blade.	Mechanical or electrical	Detected during routine testing of band saw control station.	Visual inspection of saw blade during operation is a backup system.	None.	
	Normal power failure.	Electrical	Loss of power to band saw activities.	None.	Cessation of band saw activities until power is restored.	IVe.

Table 6.3-1: CMP Saw Facility FMEA

<u>System & Function</u>	<u>Failure Mode</u>	<u>Failure Mechanism</u>	<u>Failure Detection</u>	<u>Failure Compensation</u>	<u>Failure Effect</u>	<u>Effects Category</u>
VENTILATION CONTROL STATION						
Provides operator with audible and visual alarms when the negative pressures and air flows deviate from programmed parameters, and when HEPA filters need replacement.	Nondetected loss of negative pressure in saw enclosure.	Mechanical or electrical.	Detected during routine testing of ventilation control station.	None.	Loss of primary air flow confinement in the saw enclosure.	IVf to IVe.
	Nondetected loss of negative pressure in process room.	Mechanical or electrical.	Detected during routine testing of ventilation control station.	None.	Loss of secondary air flow confinement in the process room.	IVf to IVe.
	Nondetected pressure drop exceeding 5.6 mm Hg in saw enclosure area exhaust HEPA filter.	Mechanical or electrical.	Detected during routine testing of ventilation control station.	Clogged HEPA may make it difficult to maintain negative pressure in saw enclosure area. Ventilation alarm may be triggered.	Possible decline in saw enclosure area ventilation system air flow.	IVf to IVe.
	Nondetected pressure drop exceeding 5.6 mm Hg in process room exhaust HEPA filter.	Mechanical or electrical.	Detected during routine testing of ventilation control station.	Clogged HEPA may make it difficult to maintain negative pressure in the process room. Ventilation alarm may be triggered.	Possible decline in process room ventilation system air flow.	IVf to IVe.
	Normal power failure.	Electrical.	Loss of power to band saw activities.	None.	Cessation of band saw activities until power is restored.	IVe.

Table 6.3-1: CMP Saw Facility FMEA

<u>System & Function</u>	<u>Failure Mode</u>	<u>Failure Mechanism</u>	<u>Failure Detection</u>	<u>Failure Compensation</u>	<u>Failure Effect</u>	<u>Effects Category</u>	
LIQUID WASTE CONTROL PANEL							
	Provides operator with audible and visual alarms for abnormal liquid levels in the settlement tank, decant tanks, and janitorial wash storage tank.	Nondetected overflow of 200 gal settlement tank.	Mechanical or electrical.	Detected during routine testing of liquid waste control panel.	Visual inspection of liquid levels is a backup system.	Overflow of TRU contaminated liquids into spill containment floor trench.	IVa to IVb.
		Nondetected overflow of 200 gal decant tanks.	Mechanical or electrical.	Detected during routine testing of liquid waste control panel.	Visual inspection of liquid levels is a backup system.	Overflow of TRU contaminated liquids into spill containment floor trench.	IVa to IVb.
		Nondetected overflow of 200 gal janitorial wash storage tank.	Mechanical or electrical.	Detected during routine testing of liquid waste control panel.	Visual inspection of liquid levels is a backup system.	Overflow of TRU contaminated liquids into spill containment floor trench.	IVa to IVb.
	Normal power failure.		Electrical.	Loss of power to band saw activities.	None.	Cessation of band saw activities until power is restored.	IVc.

Table 6.3-1: CMP Saw Facility FMEA

<u>System & Function</u>	<u>Failure Mode</u>	<u>Failure Mechanism</u>	<u>Failure Detection</u>	<u>Failure Compensation</u>	<u>Failure Effect</u>	<u>Effects Category</u>
FIRE PROTECTION SYSTEM						
Process area wet sprinkler system which is hydraulically designed for ordinary hazard Group II occupancy.	Failure of sprinkler head system.	Mechanical.	None.	Fire extinguishers. Manually use sprinkler system water and hoses to fight fire.	Delay in fire fighting capabilities.	IVf to IVe.
	Loss of sprinkler system water supply.	Mechanical.	Possible visual detection of sprinkler water supply pipe breakage.	Use support area NDA/NDE fire water system.	Delay in fire fighting capabilities to possible absence of fire fighting water.	IVf to IVe.
FIRE ALARM PANEL						
In the event of a fire, the fire alarm panel signals the Los Alamos CAS dispatcher.	Panel fails to signal.	Electrical or mechanical.	Detected during routine testing of fire alarm panel.	Personnel can use regular phones to alert CAS dispatcher.	Possible delay in fire department arrival.	IVf to IVe.
	Normal power failure.	Electrical.	Loss of power to band saw activities.	None.	Cessation of band saw activities until power is restored.	IVe.

Table 6.3-1: CMP Saw Facility FMEA

<u>System & Function</u>	<u>Failure Mode</u>	<u>Failure Mechanism</u>	<u>Failure Detection</u>	<u>Failure Compensation</u>	<u>Failure Effect</u>	<u>Effects Category</u>
CONTINUOUS AIR MONITORING SYSTEM						
Monitors are located throughout the process area to provide prompt notice should airborne particulate alpha emitters become present. CAM's may shut down winter process area air recirculation.	Nondetected monitoring system failure.	Electrical or mechanical.	Detected during routine source tests.	Hand and foot monitors positioned by all entry/exit doors provide a backup system. Also, stack samples are analyzed weekly.	TRU particulates in the process area air may go undetected for longer than one week.	IVf to IVe.
	Normal power failure.	Electrical.	Loss of power to band saw activities.	None.	Cessation of band saw activities until power is restored.	IVe.
CONVEYOR AND HOIST SYSTEMS						
	Receiving area gantry crane slings fail to secure CMP's.	Mechanical.	Personnel observation.	Protective clothing such as hard hats and steel toe boots.	CMP falls, possibly rolls, and may strike facility personnel.	IVd to Id
	Saw enclosure holding ram fails to secure CMP during sawing.	Electrical or mechanical.	Personnel observation.	None.	Band saw blade may break.	IVf to IVe
	Saw enclosure trolley hoist fails to hold a cut CMP.	Electrical or mechanical.	Personnel observation.	None.	CMP may fall, damage scissors table, possibly damage the saw enclosure, and possibly breach confinement.	IVe to IIIb

Table 6.3-2. Qualitative Accident Hazard Severity

HAZARD CATEGORIES	CONSEQUENCES TO THE PUBLIC, WORKERS, OR THE ENVIRONMENT
Category I - Catastrophic	May cause deaths, or loss of the facility/operation, or severe impact on the environment.
Category II - Critical	May cause severe injury, or severe occupational illness, or major damage to a facility/operation, or major impact on the environment.
Category III - Marginal	May cause <i>minor</i> injury, or <i>minor</i> occupational illness, or minor impact on the environment.
Category IV - Negligible	Will not result in a significant injury, or occupational illness, or provide a significant impact on the environment.

Table 6.3-3. Failure Modes and Effects Analysis

Failure Modes and Effects Analysis (FMEA) for:

- I. Catastrophic
- II. Critical (major)
- III. Marginal (minor)
- IV. Negligible (trivial)

hazard categories include:

- a. Hazardous Materials* Release to the Environment
- b. Hazardous Materials* Release Within the Building
- c. Personnel Exposure to Hazardous Materials*
- d. Personnel Exposure to Safety Hazards Other than Hazardous Materials
- e. Loss of Operation Capability
- f. Loss of Systems Capability

*Including Radioactive Materials

7.0 ACCIDENT ANALYSIS

General hazards that CMP Saw Facility personnel may possibly be subjected to are discussed in Section 6.1 of this PSAR. Of those hazards, only the radioactive material exposure accident may possibly impact the public and/or environment. Facility personnel will probably be most at risk from "industrial type" hazards (e.g., cuts and contusions, electrical shocks, etc.) although "industrial type" accidents may occur in conjunction with radioactive material exposure accidents.

7.1 Accidents That May Impact Public/Environment

The approach taken in this accident analysis is to choose the worst case credible accident that may release radiological contaminants to the public/environment, and then to demonstrate that this accident will have negligible (Category IV) effects. This analysis will bound the impacts of credible accidents that may occur.

The worst case credible accident that may impact the public/environment involves the following scenario:

- The CMP band saw makes one complete cut of a CMP without any cutting fluid (water).
- A portion of the TRU contaminated cement dust becomes airborne and is sucked into the saw enclosure exhaust ventilation system.
- The saw enclosure exhaust HEPA filter filters out the majority of the contaminated cement dust.
- A person breathes the exhaust from the saw enclosure exhaust ventilation stack while standing right by it.

This accident scenario would require the failure of the band saw control station to detect the absence of cutting fluid, failure of the band saw operator to notice the absence of cutting fluid, and the completion of one complete cut, which takes about 45 minutes, without the operator detecting the failure or noticing airborne cement dust in the saw enclosure.

The accident calculations that follow are conservative because they use the maximum TRU inventory values (the average alpha inventory is 67 curies, compared to the maximum of 186 curies), they assume that a person is breathing the exhaust air right out of the stack without any plume dispersion effects, and they assume that the entire volume of airborne TRU contaminated cement dust would be exhausted within the 45 minutes it takes to make one complete CMP cut.

The TRU particulate concentration that a person standing at the stack would be exposed to is calculated as follows:

Volume of one cut

$$= \pi (15 \text{ in})^2 (.09 \text{ in}) = 63.6 \text{ in}^3$$

Total volume of one CMP

$$= \pi (15 \text{ in})^2 (20 \text{ ft}) (12 \text{ in/ft}) = 169,646 \text{ in}^3$$

The volume of one cut is approximately .04% of the total volume of one CMP. The maximum TRU inventory of Pu and Am in a single cut is approximately:

Pu inventory

$$= .04\% (1.64 \text{ Ci}) = 6.15 \times 10^{-4} \text{ Ci}$$

Am inventory

$$= .04\% (184.36 \text{ Ci}) = 6.91 \times 10^{-2} \text{ Ci}$$

The amount of cement dust actually released to the air in the saw enclosure area would be similar to a fire release for non-volatile solids. J.C. Elder, et al., in their document, *A Guide to Radiological Accident Considerations for Siting and Design of DOE Nonreactor Nuclear Facilities* (LA-10294-MS), Table VIII, indicate that approximately 1% of the cement dust could become airborne.

Pu inventory airborne

$$= 1\% (6.15 \times 10^4 \text{ Ci}) = 6.15 \times 10^6 \text{ Ci}$$

Am inventory airborne

$$= 1\% (6.91 \times 10^2 \text{ Ci}) = 6.91 \times 10^4 \text{ Ci}$$

The airborne cement dust would be filtered by the two-stage saw enclosure area HEPA filter. Elder, et al., state that a first stage reduction of 99.9%, and a second stage reduction of 99.8% can be expected from the HEPA filter. Cement typically has a particle diameter of 10 to 150 micrometers (Mark's Standard Handbook for Mechanical Engineers, 8th edition); therefore, it would be filtered by the HEPA filter which traps particles over 0.5 micrometers in diameter. These values are recommended for HEPAs that are periodically tested to ensure continued performance.

Pu inventory out stack

$$= 0.1\% (0.2\%) (6.15 \times 10^6 \text{ Ci}) = 1.23 \times 10^{-11} \text{ Ci}$$

Am inventory out stack

$$= 0.1\% (0.2\%) (6.91 \times 10^4 \text{ Ci}) = 1.38 \times 10^{-9} \text{ Ci}$$

If the saw enclosure exhaust HEPA filter were to become clogged by the cement dust, then the ventilation control station alarm would be activated and the band saw would be turned off. The remaining airborne cement dust would be trapped on the saw enclosure inlet

HEPA filter if an airflow reversal were created between the saw enclosure and the process room.

The cement dust that would be released through the saw enclosure stack would be diluted by approximately 1,300 ft³/min of ventilation system air exhausting through the stack. It would also take approximately 45 minutes to complete one CMP cut.

Volume of exhaust air

$$= 1,300 \text{ ft}^3/\text{min} (45 \text{ min}) = 58,500 \text{ ft}^3$$

Pu concentration out stack

$$= 1.23 \times 10^{-11} \text{ Ci} / 58,500 \text{ ft}^3 = 2.10 \times 10^{-16} \text{ Ci/ft}^3 = 7.42 \times 10^{-15} \text{ mCi/L}$$

Am concentration out stack

$$= 1.38 \times 10^{-9} \text{ Ci} / 58,500 \text{ ft}^3 = 2.36 \times 10^{-14} \text{ Ci/ft}^3 = 8.33 \times 10^{-13} \text{ mCi/L}$$

According to 10 CFR 20 Appendix B, the maximum permissible concentrations (MPCs) in air for an unrestricted area are:

$$\text{Pu}^{238} = 1 \times 10^{-12} \text{ mCi/L, and } \text{Am}^{241} = 4 \times 10^{-12} \text{ mCi/L}$$

And the MPCs for restricted area are:

$$\text{Pu}^{238} = 3 \times 10^{-11} \text{ mCi/L, and } \text{Am}^{241} = 1 \times 10^{-10} \text{ mCi/L}$$

Plutonium 238 was chosen as the plutonium isotope because it has the most conservative MPC. The TRU waste is reportedly a maximum of 99% Americium 241.

The fractions of Am²⁴¹ and Pu²³⁸ that are exhausted from the stack are compared to the MPCs in the following sum of fractions calculation:

Sum of fractions (unrestricted area)

$$= (7.42 \times 10^{-15}) / (1 \times 10^{-12}) + (8.33 \times 10^{-13}) / (4 \times 10^{-12}) = 0.22$$

Sum of fractions (restricted area)

$$= (7.42 \times 10^{-15}) / (3 \times 10^{-11}) + (8.33 \times 10^{-13}) / (1 \times 10^{-10}) = 0.009$$

This worst case credible accident analysis is a conservative analysis and indicates that a person breathing ventilation exhaust air at the saw enclosure stack would be well below MPCs for both a restricted and unrestricted area. The effects of this accident on the public/environment would be Category IV.

This accident would cause none to minimal dollar loss at the CMP Saw Facility, and would involve only a brief program interruption. The saw enclosure would have to be decontaminated; however, this is a routine operations and maintenance procedure.

7.2 Accidents That May Impact Facility Personnel

Facility personnel would be most at risk from "industrial type" accidents which may occur where whole and cut CMPs are handled in the receiving and saw enclosure areas, when packaged cut CMPs or sludge are moved with the forklift, or when the band saw is being operated. The CMPs are very heavy (average weight of approximately 13,000 lbs) and could cause Category IV to I effects if they were to strike facility personnel during an accident. Such accidents may involve the failure of only one safety system, for example, the failure of a sling on the receiving area gantry crane.

A CMP handling accident that may occur in the saw enclosure could possibly breach the confinement provided by the saw enclosure. Concrete around the edges of a CMP may crumble or there may be a small quantity of dispersible cement dust on or in the saw enclosure. Regardless, any radiological release to the process area would probably be negligible or marginal due to the lack of dispersible contaminants. The band saw could be immediately turned off and the CAM system would alert personnel if there was a radiological release. This accident would cause minimal dollar loss but would involve a

program interruption while the small-scale cleanup was performed and the saw enclosure repaired.

Likewise, there would probably be a negligible to marginal release of radiological contaminants accompanying a CMP forklift handling accident. There might be a small amount of cement that crumbles necessitating a small-scale cleanup. This would cause minimal dollar loss and a brief program interruption.

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8.0 APPENDICES

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8.1 Appendix A: Radioisotopic Composition of Corrugated Metal Pipes

FORM DATE 1-15-07

CORRUGATED METAL PIPES (CMPS)
IN STORAGE AT TA-54, AREA C
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	RSUD-NO	VOLUME - (M3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001150	SB63429	2.80000	.589667E+07	AM241 PU238 PU239	2.92800 .360000E-02 14.2700 0.00000 0.00000 0.00000	9.48672 .626400E-01 .876170 0.00000 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S004102
001151	SB63430	2.80000	.589595E+07	AM241 PU238 PU239	2.92800 .360000E-02 14.2700 0.00000 0.00000 0.00000	9.48672 .626400E-01 .876170 0.00000 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S004103
001152	SB63434	2.80000	.607811E+07	AM241 PU238 PU239 HFP	5.63100 .260000E-02 12.2000 0.00000 0.00000 0.00000	18.2444 .452400E-01 .749080 .188000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760312
001153	SB63435	2.80000	.589667E+07	AM241 PU238 PU239 HFP	9.42300 .260000E-02 12.2000 0.00000 0.00000 0.00000	30.5305 .452400E-01 .749080 .188000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760313
001150	SB63436	2.80000	.589667E+07	AM241 PU238 PU239 HFP	3.94800 .260000E-02 12.2000 0.00000 0.00000 0.00000	12.7915 .452400E-01 .749080 .188000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760314
001155	SB63437	2.80000	.616882E+07	AM241 PU238 PU239 HFP	3.94800 .260000E-02 12.2000 0.00000 0.00000 0.00000	12.7915 .452400E-01 .749080 .188000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760315
001156	SB63430	2.80000	.598739E+07	AM241 PU238 PU239 HFP	3.94800 .260000E-02 12.2000 0.00000 0.00000 0.00000	12.7915 .452400E-01 .749080 .188000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760316
001157	SB63431	2.80000	.589667E+07	AM241 PU238 PU239 HFP	3.94800 .267000E-02 4.08000 0.00000 0.00000 0.00000	9.81720 .464580E-01 .250512 .580000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760287
001158	SB63432	2.80000	.589595E+07	AM241 PU238 PU239 HFP	3.94800 .267000E-02 4.08000 0.00000 0.00000 0.00000	9.81720 .464580E-01 .250512 .580000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760288

RUN DATE 5/87

CORRUGATED ME - PIPES (CMP's)

IN STORAGE AT TA-54, AREA C

TO BE PROCESSED IN CMP SAW FACILITY

SEPIAL-NO	RSUD-NO	VOLUME - (m3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001159	S863433	2.80000	.589667E+07	AM241 PU238 PU239 MFP	3.83000 .267000E-02 4.00000 0.00000 0.00000 0.00000	9.81720 .464580E-01 .250512 .500000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760209
001160	S863445	2.80000	.571523E+07	PU238 PU239 AM241 MFP	.267000E-02 4.00000 3.83000 0.00000 0.00000 0.00000	.464580E-01 .250512 9.81720 0.00000 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760379
001161	S863446	2.80000	.598739E+07	PU238 PU239 AM241 MFP	.267000E-02 4.00000 3.83000 0.00000 0.00000 0.00000	.464580E-01 .250512 9.81720 0.00000 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760380
001162	S863447	2.80000	.598739E+07	PU238 PU239 AM241 MFP	.267000E-02 4.00000 3.83000 0.00000 0.00000 0.00000	.464580E-01 .250512 9.81720 0.00000 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760381
001163	S863439	2.80000	.571523E+07	AM241 PU238 PU239 MFP	.213000E-02 7.17000 0.00000 0.00000 0.00000 0.00000	9.16920 .370620E-01 .440238 .267000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760317
001164	S863440	2.80000	.598739E+07	AM241 PU238 PU239 MFP	.213000E-02 7.17000 0.00000 0.00000 0.00000 0.00000	9.16920 .370620E-01 .440238 .267000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760318
001165	S863441	2.80000	.571523E+07	PU239 AM241 PU238 MFP	.213000E-02 7.17000 0.00000 0.00000 0.00000 0.00000	9.16920 .370620E-01 .440238 .267000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760319
001166	S863448	2.80000	.580595E+07	PU239 AM241 PU238 MFP	.615000E-02 3.23000 0.00000 0.00000 0.00000 0.00000	.736800 1.07010 1.07010 0.00000 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760764
001167	S863449	2.80000	.598739E+07	PU239 PU238 AM241 MFP	.615000E-02 3.23000 0.00000 0.00000 0.00000 0.00000	.736800 1.07010 1.07010 0.00000 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S760765

PRINT DATE 12-13-07

CORRUGATED METAL PIPES (CMP's)
IN STORAGE AT TA-54, AREA C
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	PSWD-NO	VOLUME - (M3)	WEIGHT - (g)	NUCLIDE	GMAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001168	5863450	2.80000	.562452E+07	PU239 PU238 AM241 MFP	12.0000 .615000E-02 3.23000 0.00000 0.00000	.736800 .107010 10.4652 .130000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S760323
001169	5863442	2.80000	.571523E+07	PU239 PU238 AM241 MFP	12.0000 .615000E-02 3.23000 0.00000 0.00000	.736800 .377610E-03 10.4652 .130000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S760322
001170	5863451	2.80000	.589667E+07	PU239 PU238 AM241 MFP	12.0000 .615000E-02 3.23000 0.00000 0.00000	.736800 .107010 10.4652 .130000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761172
001171	5863452	2.80000	.580595E+07	PU239 PU238 AM241 MFP	12.0000 .615000E-02 3.23000 0.00000 0.00000	.736800 .107010 10.4652 .130000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761173
001172	5863447	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.328000E-02 8.20000 4.64000 0.00000 0.00000	.570720E-01 .508392 15.0336 .300000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761205
001173	5863443	2.80000	.571523E+07	PU238 PU239 AM241 MFP	.328000E-02 8.20000 4.64000 0.00000 0.00000	.570720E-01 .508392 15.0336 .300000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S760323
001174	5863444	2.80000	.607811E+07	PU238 PU239 AM241 MFP	.328000E-02 8.20000 4.64000 0.00000 0.00000	.570720E-01 .508392 15.0336 .300000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S760324
001175	5863453	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.328000E-02 8.20000 4.64000 0.00000 0.00000	.570720E-01 .508392 15.0336 .300000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761105
001176	5863456	2.80000	.598739E+07	AM241 MFP PU238 PU239	3.30000 0.00000 .193000E-01 0.00000 0.00000	10.6920 .400000E-03 .335000 .221040E-01 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761109

RUN DATE 12-15-87

CORRUPATED METAL PIPES (CMP's)
IN STORAGE AT TA-54, AREA G
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	RSWD-NO	VOLUME - (m3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001177	5863455	2.80000	.589467E+07	PU238 PU239 AM241 MFP	.360000 .193000E-01 3.30000 0.00000 0.00000 0.00000	.221040E-01 .335320 10.0000 .400000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761198
001178	5863454	2.80000	.589467E+07	PU238 PU239 AM241 MFP	.360000 .193000E-01 3.30000 0.00000 0.00000 0.00000	.221040E-01 .335320 10.0000 .400000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761187
001179	5863457	2.80000	.589467E+07	PU238 PU239 AM241 MFP	.201000E-02 4.76000 2.69000 0.00000 0.00000 0.00000	.349740E-01 .292264 9.36360 .153000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761191
001180	5863458	2.80000	.589467E+07	PU238 PU239 AM241 MFP	.201000E-02 4.76000 2.69000 0.00000 0.00000 0.00000	.349740E-01 .292264 9.36360 .153000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761192
001181	5863459	2.80000	.589739E+07	PU238 PU239 AM241 MFP	.201000E-02 4.76000 2.69000 0.00000 0.00000 0.00000	.349740E-01 .292264 9.36360 .153000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761193
001182	5863460	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.201000E-02 4.76000 2.69000 0.00000 0.00000 0.00000	.349740E-01 .292264 9.36360 .153000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761194
001183	5863461	2.80000	.571523E+07	PU238 PU239 AM241 MFP	.201000E-02 4.76000 2.69000 0.00000 0.00000 0.00000	.349740E-01 .292264 9.36360 .153000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761195
001184	5863462	2.80000	.589467E+07	PU238 PU239 AM241 MFP	.201000E-02 4.76000 2.69000 0.00000 0.00000 0.00000	.349740E-01 .292264 9.36360 .153000E-02 0.00000 0.00000	TRU CEMENT PASTE AREA T RSWD S761196
001185	5863463	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.201000E-02 4.76000 2.69000 0.00000 0.00000 0.00000	.349740E-01 .292264 9.36360 .153000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761197

RUN DATE

87

CORRUPTED ME IPES (LMP-)

IN STORAGE AT TA-54, AREA C

TO BE PROCESSED IN CMP SAN FACILITY

REF ID	PSWD-NO	VOLUME - (M3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001186	5863466	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.267000E-02 5.67000 4.89000 0.00000 0.00000 0.00000	.464580E-01 348139 15.8436 .233000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761203
001187	5863464	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.267000E-02 5.67000 4.89000 0.00000 0.00000 0.00000	.464580E-01 348139 15.8436 .233000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761200
001188	5863465	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.267000E-02 5.67000 4.89000 0.00000 0.00000 0.00000	.464580E-01 348139 15.8436 .233000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S761201
001189	5863469	2.80000	.571523E+07	PU238 PU239 AM241 MFP	.206000E-01 8.70000 6.40000 0.00000 0.00000 0.00000	.358440 534180 20.7360 .870000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S762077
001190	5863470	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.206000E-01 8.70000 6.40000 0.00000 0.00000 0.00000	.358440 534180 20.7360 .870000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S762078
001191	5863471	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.206000E-01 8.70000 6.40000 0.00000 0.00000 0.00000	.358440 534180 20.7360 .870000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S762079
001192	5863472	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.206000E-01 8.70000 6.40000 0.00000 0.00000 0.00000	.358440 534180 20.7360 .870000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S762080
001193	5863473	2.80000	.616882E+07	PU238 PU239 AM241 MFP	.206000E-01 8.70000 6.40000 0.00000 0.00000 0.00000	.358440 534180 20.7360 .870000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S762081
001194	5863474	2.80000	.625954E+07	PU238 PU239 AM241 MFP	.206000E-01 8.70000 6.40000 0.00000 0.00000 0.00000	.358440 534180 20.7360 .870000E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S762082

SAIC
9-19-90

8.2 Appendix B: Health, Safety, and Environmental Memorandum HSE-1 86-31

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Distribution

DATE: January 21, 1986

FROM: John C. Gallimore, HSE-1 Area Health
Physics, Associate Group Leader

MAIL STOP/TELEPHONE: P229/7-7137

SYMBOL: HSE-1 86-31

SUBJECT: RADIATION MEASUREMENT DURING SHEBA OPERATION

Reference: HSE-1 85-504C (Report Prepared By Roger Huchton, HSE-1)

On July 29, 1985, neutron dose equivalent rate and gamma dose rate measurements were made at TA-18 and environs during operation of the "Sheba" critical assembly.

The Sheba critical assembly was operated in Kiva I at a steady-state power level of 1 KW for the duration of the measurements. The radiation measurements were performed by three two-person teams comprised of HSE-1 Health Protection Technicians, and included a total of 23 locations distributed among TA-18, TA-36, TA-51, TA-54 and along Pajarito Road. Figure 1 depicts the approximate locations of the measurement points with the alphabetical legend indicative of relative distance from the source to each measurement locale (e.g., "A" is the closest measurement and "W" is the furthest away).

Table 1 summarizes the results of the measurements and provides the estimated distance from the source, a brief location description, the neutron dose equivalent rate, and the gamma dose rate.

Since the purpose of these measurements included future facility siting and design criteria, it was of interest to project the neutron dose equivalent measured at 1 kw power level to a total annual dose equivalent based on anticipated assembly operation. Discussions with Q-2 management indicated a operational schedule of 50 kw-hr would be reasonable. The extrapolated annual neutron and gamma dose equivalents based on continuous occupancy and an operational history of 50 kw-hr/yr are presented in Table 2.

In general, doses averaged over a year will be less than 25 mrem at occupied locations at TA-51 and TA-36. Only in the extreme case of an individual being present for every SHEBA run would the accumulated dose be as high as shown in Table II. The higher power runs are normally scheduled for evenings and weekends so that actual doses to individuals will be as low as reasonably achievable.

Attach. a/s

JCG:ib

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FIGURE 1

TABLE 1. NEUTRON AND GAMMA DOSE RATES MEASURED DURING SHEBA OPERATION
AT 1 KW

Survey Point	Distance (ft)	Location Description	Neutron Dose Equiv. Rate (mrem/hr)	Gamma Dose Rate (mrad/hr)
A	675	TA-18, Edge of Pajarito Canyon Rim	189	10
B	725	TA-18, 40 ft North of Canyon Rim	95	5
C	1150	TA-18, Roof of Bldg 30 by RM-16	45	3.2
D	1150	TA-18, Inside Bldg 30 Below RM-16	4	.5
E	1200	TA-18, Front Courtyard Bldg 30	32	1.8
F	1200	TA-51, North Side Pajarito Rd, on Island in Front of Bldg 15	37	1.9
G	1250	TA-51, North Side Pajarito Rd, TA-51/54 Intersection, power pole #2147A	31	1.3
H	1375	TA-18, Outside Entry Guard Station	25	1.5
I	1375	TA-18, Inside Entry Guard Station	7	1
J	1475	TA-51, North Side Pajarito Rd, SW of power pole #2145	21	1.2
K	1500	TA-18, Visitor Parking, TA-18 Entrance	19	1.2
L	1500	TA-51, West Side of TA-51 Roadway, Across from Accessory Road	17	.9
M	1650	TA-18, Driveway Corner Entrance to TA-18	12	.8
N	1700	TA-18, West Side Pajarito Rd on Rock Outcrop Overlooking TA-18	15	.9
O	1700	TA-51, Outer Perimeter Fence, Intersection of Cowpen and Perimeter Fences	6	.2
P	1775	TA-51, North Side Pajarito Rd, SW of Power Pole #2143	11	.6
Q	1800	TA-54, Outside Guard Station Overlook TA-18	15	1.2
R	1800	TA-54, Inside Guard Station Overlook TA-18	7	.9
S	2100	TA-51, North Side Pajarito Rd, Between Power Poles #2142 and #2141	5	.3

TABLE 1. (cont)

Survey Point	Distance (ft)	Location Description	Neutron Dose Equiv. Rate (mrem/hr)	Gamma Dose Rate (mrad/hr)
T	2125	TA-36, Outside Entry Guard Station	4	.1
U	2400	TA-51, North Side Pajarito Rd, SW of Power Pole #2139	2	.2
V	2800	TA-51, North Side Pajarito Rd East of LS-6 Turnoff, by Power Pole #2137	1	<0.1
W	2875	TA-51, Adjacent to SE Corner of Antiquity Site in LS-6 Compound	.8	<0.1

TABLE 2. ANNUAL NEUTRON AND GAMMA DOSE EQUIVALENTS PROJECTED FROM
50 KW-HR/YR OF SHEBA OPERATION

Survey Point	Distance (ft)	Location Description	Neutron Dose (mrem)	Gamma Dose (mrem)
A	675	TA-18, Edge of Pajarito Canyon Rim	9450	500
B	725	TA-18, 40 ft North of Canyon Rim	95	250
C	1150	TA-18, Roof of Bldg 30 by RM-16	2250	160
D	1150	TA-18, Inside Bldg 30 Below RM-16	200	25
E	1200	TA-18, Front Courtyard Bldg 30	1600	90
F	1200	TA-51, North Side Pajarito Rd, on Island in Front of Bldg 15	1850	95
G	1250	TA-51, North Side Pajarito Rd, TA-51/54 Intersection, power pole #2147A	1550	65
H	1375	TA-18, Outside Entry Guard Station	1250	75
I	1375	TA-18, Inside Entry Guard Station	350	50
J	1475	TA-51, North Side Pajarito Rd, SW of power pole #2145	1050	60
K	1500	TA-18, Visitor Parking, TA-18 Entrance	950	60
L	1500	TA-51, West Side of TA-51 Roadway, Across from Accessory Road	850	
M	1650	TA-18, Driveway Corner Entrance to TA-18	600	40
N	1700	TA-18, West Side Pajarito Rd on Rock Outcrop Overlooking TA-18	750	45
O	1700	TA-51, Outer Perimeter Fence, Intersection of Cowpen and Perimeter Fences	300	10
P	1775	TA-51, North Side Pajarito Rd, SW of Power Pole #2143	550	30
Q	1800	TA-54, Outside Guard Station Overlook TA-18	750	60
R	1800	TA-54, Inside Guard Station Overlook TA-18	350	45
S	2100	TA-51, North Side Pajarito Rd, Between Power Poles #2142 and #2141	250	15

TABLE 2. (cont)

Survey Point	Distance (ft)	Location Description	Neutron Dose (mrem)	Gamma Dose (mrem)
T	2125	TA-36, Outside Entry Guard Station	200	5
U	2400	TA-51, North Side Pajarito Rd, SW of Power Pole #2139	100	10
V	2800	TA-51, North Side Pajarito Rd East of LS-6 Turnoff, by Power Pole #2137	50	<0.1
W	2875	TA-51, Adjacent to SE Corner of Antiquity Site in LS-6 Compound	40	<0.1

8.3 Appendix C: Acronyms and Abbreviations

ACI	=	American Concrete Institute
Am	=	Americium
ANSI	=	American National Standards Institution
Anti-C	=	Anti-Contamination
ASL	=	Above Sea Level
atm	=	Atmospheres
CAM	=	Continuous Air Monitor (<i>or Continuous Air Monitoring</i>)
CAS	=	Central Alarm Station
CMP	=	Corrugated Metal Pipe
CTC	=	Comparison to Criteria
DOE	=	Department of Energy
DOT	=	Department of Transportation
ENG	=	Facilities Engineering Division
EIS	=	Environmental Impact Statement
ERDA	=	Energy Research & Development Administration
FMEA	=	Failure Modes and Effects Analysis
FSAR	=	Final Safety Analysis Report
HEPA	=	High Efficiency Particulate Air
HSE	=	Health, Safety, and Environmental
INEL	=	Idaho National Engineering Laboratory
KVA	=	Volt-Amperes (thousands)
LANL	=	Los Alamos National Laboratory (<i>nee, Los Alamos Scientific Laboratory</i>)
LAS	=	Los Alamos Station
LSA	=	Low Specific Activity
mc/L	=	Millicuries per liter
MPC	=	Maximum Permissible Concentration
mrem	=	millirem
mR/hr	=	Milliroentgens per hour
NACH	=	Nuclear Air Cleaning Handbook
NFPA	=	National Fire Protection Association
ND/NDE	=	Nondestructive Assay/Nondestructive Examination
OBE	=	Operational Basis Earthquake
OI	=	Operating Instructions
PSAR	=	Preliminary Safety Analysis Report
Pu	=	Plutonium
SAIC	=	Science Applications International Corporation
SM	=	Staff Member

SOP	=	Standard Operating Procedure
SSE	=	Safe Shutdown Earthquake
TA	=	Technical Area
TRU	=	Transuranic
TW	=	Test Well
U	=	Uranium
UBC	=	Uniform Building Code
WAC	=	Waste Acceptance Criteria
WC	=	Water Column
WIPP	=	Waste Isolation Pilot Project
WM	=	Waste Management

RUN DATE 5/87

COMPIGATED M PIPES (CHP)
IN STORAGE AT TA-54, AREA 6
TO BE PROCESSED IN CHP SAW FACILITY

SERIAL-NO	RSWD-NO	VOLUME - (M3)	WEIGHT - (G)	MUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001195	SR63475	2.80000	.571523E+07	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762085
001196	SR63476	2.80000	.571523E+07	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762086
001197	SR63477	2.80000	.598739E+07	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762087
001198	SR63468	2.80000	.616882E+07	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762076
001199	SR63478	2.80000	.598739E+07	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762099
001200	SR63479	2.80000	.616882E+07	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762100
001201	SR63480	2.80000	.598739E+07	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762101
001202	SR63481	2.80000	.598739E+07	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762102
001203	SR63482	2.80000	.598739E+08	PU239 PU238 AM241 MFP	10.7000 565000E-01 3.40000 0.00000 0.00000	.656980 .983100 11.0160 100000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA 1 RSWD 5762103

COPIED DATA FILE (CMP4)
IN STORAGE AT 1A-54, AREA 6
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NR	PSWD-NR	VOLUME - (M3)	WEIGHT - (G)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001204	5863485	2.80000	.598739E+07	PU238 PU239 AM241 MFP U235 U238	.660000E-02 6.15000 0.00000 6.21.000 131.000	.114040 .377610 8.42400 .700000E-03 .132894E-02 .436230E-04	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S762510
001205	5863484	2.80000	.580595E+07	AM241 MFP PU238 PU239 U235 U238	2.60000 0.00000 .660000E-02 6.15000 6.21.000 131.000	8.42400 .700000E-03 .114040 .377610 132894E-02 .436230E-04	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S762515
001206	5863486	2.80000	.580595E+07	PU238 PU239 AM241 MFP U235 U238	.660000E-02 6.15000 2.60000 0.00000 6.21.000 131.000	.114040 .377610 8.42400 .700000E-03 .132894E-02 .436230E-04	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S762533
001207	5863483	2.80000	.580595E+07	AM241 PU238 PU239 MFP U235 U238	2.60000 .660000E-02 6.15000 0.00000 6.21.000 131.000	8.42400 .377610 114840 .700000E-03 .132894E-02 .436230E-04	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S762513
001208	5863480	2.80000	.616802E+07	PU238 PU239 AM241 MFP	.700000E-03 7.00000 1.10000 0.00000 0.00000 0.00000	.121800E-01 .423800E-01 35.9640 .600000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S770914
001209	5863488	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.700000E-03 7.00000 1.10000 0.00000 0.00000 0.00000	.429800E-01 .121800E-01 35.9640 .600000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S770913
001210	5863487	2.80000	.598739E+07	PU238 PU239 AM241 MFP	.700000E-03 7.00000 1.10000 0.00000 0.00000 0.00000	.121800E-01 .423800E-01 35.9640 .600000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S770912
001211	5863490	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.175000E-02 2.90000 1.90000 0.00000 0.00000 0.00000	.304500E-01 1.78060 64.4760 .187000E-01 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S770914
001212	5863491	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.175000E-02 2.90000 1.90000 0.00000 0.00000 0.00000	.304500E-01 1.78060 64.4760 .187000E-01 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA 1 RSUD S770915

RUN DATE 15.97

COPIGATED METAL PIPES (CMPs)
IN STORAGE AT TA-54, AREA G
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	RSWD-NO	VOLUME - (M3)	WEIGHT - (T)	MUCLINE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001213	SB63492	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.175000E-02 2.00000 19.0000 0.00000 0.00000 0.00000	.304500E-01 178000 54.4740 187000E-01 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S770936
001214	SB63493	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.175000E-02 2.00000 19.0000 0.00000 0.00000 0.00000	.304500E-01 178000 54.4740 187000E-01 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S770937
001215	SB63531	2.80000	.589667E+07	PU238 PU239 AM241 U235 MFP U238	3.50000 133000E-02 20.1000 800.000 0.00000 648.000	.214000 231420E-01 171200E-02 800.000E-03 215784E-03	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771163
001216	SB63530	2.80000	.589667E+07	PU238 PU239 AM241 U235 MFP U238	3.50000 133000E-02 20.1000 800.000 0.00000 648.000	.214000 231420E-01 171200E-02 800.000E-03 215784E-03	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771162
001217	SB63529	2.80000	.589739E+07	PU238 PU239 AM241 U235 MFP U238	3.50000 133000E-02 20.1000 800.000 0.00000 648.000	.214000 231420E-01 171200E-02 800.000E-03 215784E-03	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771161
001218	SB63530	2.80000	.589667E+07	PU238 PU239 AM241 U235 MFP U238	3.50000 133000E-02 20.1000 800.000 0.00000 648.000	.214000 231420E-01 171200E-02 800.000E-03 215784E-03	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771168
001219	SB63535	2.80000	.589595E+07	PU238 PU239 AM241 U235 MFP	.330000E-03 330000 10.4000 0.00000 0.00000	.574200E-02 202620E-01 428000E-04 250000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771169
001220	SB63536	2.80000	.571523E+07	PU238 PU239 AM241 U235 MFP	.330000E-03 330000 10.4000 0.00000 0.00000	.574200E-02 202620E-01 428000E-04 250000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771170
001221	SB63537	2.80000	.589667E+07	PU238 PU239 AM241 U235 MFP U238	.100000E-01 4.80000 20.2222 240.500 0.00000 103.500	.174000 300000 574000E-01 135000E-02 344055E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771171

NUM DATE 12/15/87

COPIGATED METAL PIPES (CMPs)
IN STORAGE AT TA-54, AREA G
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	RSMD-NO	VOLUME - (M3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001222	5863532	2.80000	.580595E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TA TA-54 AREA T RSMD S771155
001223	5863533	2.80000	.571523E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S771166
001224	5863538	2.80000	.598739E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S771174
001225	5863523	2.80000	.580595E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S771152
001226	5863524	2.80000	.589667E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S771153
001227	5863525	2.80000	.589667E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S771154
001228	5863526	2.80000	.625954E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S771155
001229	5863527	2.80000	.598739E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S771156
001230	5863528	2.80000	.589667E+07	PU238 PU239 U235 AM241 HFP U238	.100000E-01 4.88599 268.500 22.2222 0.00000 103.500	.174000 300.000 .574590E-03 72.0000 .135000E-02 .344655E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S771157

IN STORAGE AT TA-54, AREA C
TO BE PROCESSED IN CMP SAW FACILITY

REF ID	RSWD-NO	VOLUME - (M3)	WEIGHT - (T)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION
001231	SB63514	2.80000	.571523E+07	PU238 PU239 AM241 MFP	.270115E-02 3.25733 24.6358 0.00000 0.00000 0.00000	.470000E-01 200000 86.3000 300000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771138
001232	SB63515	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.270115E-02 3.25733 24.6358 0.00000 0.00000 0.00000	.470000E-01 200000 86.3000 300000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771140
001233	SB63513	2.80000	.571523E+07	PU238 PU239 AM241 MFP	.270115E-02 3.25733 24.6358 0.00000 0.00000 0.00000	.470000E-01 200000 86.3000 300000E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771136
001234	SB63516	2.80000	.571523E+07	PU238 PU239 AM241 U235 U238 MFP	.120690E-01 7.16612 29.8611 401.000 171.000 0.00000	.210000 440000 96.7500 858140E-03 569430E-04 175000E-03	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771141
001235	SB63517	2.80000	.489877E+07	PU238 PU239 AM241 U235 U238 MFP	.120690E-01 7.16612 29.8611 401.000 171.000 0.00000	.440000 210000 96.7500 858140E-03 569430E-04 175000E-03	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771142
001236	SB63511	2.80000	.580595E+07	PU238 PU239 AM241 U235 MFP U238	.120690E-01 7.16612 29.8611 401.000 171.000 54.0000	.210000 440000 96.7500 858140E-03 569430E-04 175000E-03	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771129
001237	SB63518	2.80000	.589667E+07	PU238 PU239 AM241 U235 MFP	.120690E-01 7.16612 29.8611 401.000 171.000	.440000 210000 96.7500 858140E-03 569430E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771143
001238	SB63519	2.80000	.589667E+07	PU238 PU239 AM241 U235 MFP	.120690E-01 7.16612 29.8611 401.000 171.000	.440000 210000 96.7500 858140E-03 569430E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771144
001239	SB63510	2.80000	.580595E+07	PU238 PU239 AM241 U235 MFP U238	.120690E-01 7.16612 29.8611 401.000 171.000 54.0000	.210000 440000 96.7500 858140E-03 569430E-04 175000E-03	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771127

FORM DATE 12/15/87

CORRUGATED METAL PIPES (CMPs)
IN STORAGE AT TA-54, AREA C
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	RSWD-NO	VOLUME - (M3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001210	SB63509	2.80000	.598739E+07	PU238 PU239 AM241 U235 HFP U238	.120690E-01 5.21173 5.4383 17.000 0.0000 54.0000	.210000 320000 186.100 363800E-03 150000E-02 179820E-04	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771125
001241	SB63512	2.80000	.598739E+07	PU238 PU239 AM241 U235	.377011E-02 5.87948 41.4506 200000 0.00000	.656000E-01 361000 134.300 428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771124
001242	SB63520	2.80000	.598667E+07	PU238 PU239 AM241 U235	.377011E-02 5.87948 41.4506 200000 0.00000	.656000E-01 361000 134.300 428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771147
001243	SB63521	2.80000	.580595E+07	PU238 PU239 AM241 U235	.377011E-02 5.87948 41.4506 200000 0.00000	.656000E-01 361000 134.300 428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771148
001244	SB63522	2.80000	.625954E+07	PU238 PU239 AM241 U235	.377011E-02 5.87948 41.4506 200000 0.00000	.656000E-01 361000 134.300 428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771149
001245	SB63499	2.80000	.589667E+07	PU238 PU239 AM241 U235	.377011E-02 5.87948 41.4506 200000 0.00000	.656000E-01 361000 134.300 428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771109
001246	SB63500	2.80000	.589667E+07	PU238 PU239 AM241 U235	.377011E-02 5.87948 41.4506 200000 0.00000	.656000E-01 361000 134.300 428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771110
001247	SB63501	2.80000	.553380E+07	PU238 PU239 AM241 U235	.377011E-02 5.87948 41.4506 200000 0.00000	.656000E-01 361000 134.300 428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771111
001248	SB63502	2.80000	.571523E+08	PU238 PU239 AM241 U235	.377011E-02 5.87948 41.4506 200000 0.00000	.656000E-01 361000 134.300 428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA I RSWD 5771112

CORRUGATED METAL PIPES (CMP's)
IN STORAGE AT TA-54, AREA C
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	RSWD-NO	VOLUME - (M3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001249	S863503	2.80000	.589667E+07	PU238 PU239 AM241 U235	.377011E-02 10.7635 41.4506 0.00000 0.00000	.656000E-01 .661000 134.300 .428000E-06 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771113
001250	S863506	2.80000	.589667E+07	PU238 PU239 AM241 HFP	.165230E-01 1.54723 28.7654 0.00000 0.00000	.287500 .950000E-01 93.2000 .917500E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771119
001251	S863507	2.80000	.589667E+07	PU238 PU239 AM241 HFP	.165230E-01 1.54723 28.7654 0.00000 0.00000	.287500 .950000E-01 93.2000 .917500E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771120
001252	S863504	2.80000	.498949E+07	PU238 PU239 AM241 HFP	.165230E-01 1.54723 28.7654 0.00000 0.00000	.287500 .950000E-01 93.2000 .917500E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771117
001253	S863505	2.80000	.588021E+07	PU238 PU239 AM241 HFP	.165230E-01 1.54723 28.7654 0.00000 0.00000	.287500 .950000E-01 93.2000 .917500E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771118
001254	S863497	2.80000	.589667E+07	PU238 PU239 AM241 HFP	.258621E-01 3.25733 49.3827 0.00000 0.00000	.450000 .200000 160.000 .162000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771051
001255	S863498	2.80000	.598739E+07	PU238 PU239 AM241 HFP	.258621E-01 3.25733 49.3827 0.00000 0.00000	.450000 .200000 160.000 .162000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771101
001256	S863508	2.80000	.589667E+07	PU238 PU239 AM241 HFP	.258621E-01 3.25733 49.3827 0.00000 0.00000	.450000 .200000 160.000 .162000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771124
001257	S863494	2.80000	.580595E+07	PU238 PU239 AM241 U235 HFP	.258621E-01 3.25733 49.3827 6.00000 2.00000	.450000 .200000 160.000 .128400E-04 .906000E-06 .102000E-02	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S771049

RUN DATE 12/15/87

CORRUGATED METAL PIPES (CMPs)
IN STORAGE AT 1A-54, AREA C
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	PSWD-NO	VOLUME - (M3)	WEIGHT - (G)	MIXTURE	GRAM AMOUNTS	ALPHA CUPES	DESCRIPTION:
001258	S863495	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.258625E-01 3.257319 49.3827 0.00000 0.00000 0.00000	.450000 .200000 160.000 .162800E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA T RSMD S771049
001259	S863496	2.80000	.598739E+07	PU238 PU239 AM241 MFP	.258625E-01 3.257319 49.3827 0.00000 0.00000 0.00000	.450000 .200000 160.000 .162800E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA T RSMD S771050
001260	S863544	2.80000	.580595E+07	PU238 PU239 AM241 MFP	.369425E-01 6.86319 53.7963 1.00000 3.00000 0.00000	.642800 .421400 174.300 .214000E-02 .940000E-06 .242600E-02	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA T RSMD S772492
001261	S863545	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.369425E-01 6.86319 53.7963 0.00000 0.00000 0.00000	.642800 .421400 174.300 .242600E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA T RSMD S772493
001262	S863539	2.80000	.571523E+07	PU238 PU239 AM241 MFP	.369425E-01 6.86319 53.7963 0.00000 0.00000 0.00000	.642800 .421400 174.300 .242600E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-50 AREA T RSMD S772487
001263	S863540	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.369425E-01 6.86319 53.7963 0.00000 0.00000 0.00000	.642800 .421400 174.300 .242600E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA T RSMD S772488
001264	S863541	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.369425E-01 6.86319 53.7963 0.00000 0.00000 0.00000	.642800 .421400 174.300 .242600E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-50 AREA T RSMD S772489
001265	S863542	2.80000	.498949E+07	PU238 PU239 AM241 MFP	.369425E-01 6.86319 53.7963 0.00000 0.00000 0.00000	.642800 .421400 174.300 .242600E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA T RSMD S772490
001266	S863543	2.80000	.462662E+07	PU238 PU239 AM241 MFP	.369425E-01 6.86319 53.7963 0.00000 0.00000 0.00000	.642800 .421400 174.300 .242600E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO 1A-54 AREA T RSMD S772491

SHIP DATE 10/15/87

CORRUGATED METAL PIPES (CMP)
IN STORAGE AT TA-54, AREA G
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	PSWD-NO	VOLUME - (M3)	WEIGHT - (Q)	MUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION
001267	SB63568	2.80000	.462662E+07	PU238 PU239 AM241 MFP	.373563E-02 11.6857 48.3951 0.00000 0.00000	.650000E-01 717500 156.800 .965000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780224
001268	SB63561	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.373563E-02 11.6857 48.3951 0.00000 0.00000	.650000E-01 717500 156.800 .965000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780225
001269	SB63562	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.373563E-02 11.6857 48.3951 0.00000 0.00000	.650000E-01 717500 156.800 .965000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780226
001270	SB63563	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.373563E-02 11.6857 48.3951 0.00000 0.00000	.650000E-01 717500 156.800 .965000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780227
001271	SB63564	2.80000	.498949E+07	PU238 PU239 AM241 MFP	.373563E-02 11.6857 48.3951 0.00000 0.00000	.650000E-01 717500 156.800 .965000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780228
001272	SB63565	2.80000	.635026E+07	PU238 PU239 AM241 MFP	.373563E-02 11.6857 48.3951 0.00000 0.00000	.650000E-01 717500 156.800 .965000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780229
001273	SB63566	2.80000	.498949E+07	PU238 PU239 AM241 MFP	.373563E-02 11.6857 48.3951 0.00000 0.00000	.650000E-01 717500 156.800 .965000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780230
001274	SB63567	2.80000	.544308E+07	PU238 PU239 AM241 MFP	.373563E-02 11.6857 48.3951 0.00000 0.00000	.650000E-01 717500 156.800 .965000E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780234
001275	SB63568	2.80000	.488805E+07	PU238 PU239 AM241 MFP	.510057E-02 13.3143 30.0926 0.00000 0.00000	.807500E-01 817500 97.5000 .518000E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSUD S780232

Flow Path 15/87

CORRUGATED METAL PIPES (CMPs)
IN STORAGE AT 1A-54, AREA C
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	RSWD-NO	VOLUME - (m3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001276	S863569	2.80000	.453590E+07	PU238 PU239 AM241 MFP	.510057E-02 13.3143 30.0926 0.00000 0.00000	.887500E-01 .817500 97.5000 .518000E-02 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780263
001277	S863570	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.510057E-02 13.3143 30.0926 0.00000 0.00000	.887500E-01 .817500 97.5000 .518000E-02 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780254
001278	S863571	2.80000	.498949E+07	PU238 PU239 AM241 MFP	.510057E-02 13.3143 30.0926 0.00000 0.00000	.887500E-01 .817500 97.5000 .518000E-02 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780136
001279	S863572	2.80000	.480805E+07	PU238 PU239 AM241 MFP	.510057E-02 13.3143 30.0926 0.00000 0.00000	.887500E-01 .817500 97.5000 .518000E-02 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780266
001280	S863550	2.80000	.598739E+07	PU238 PU239 AM241 MFP	.510057E-02 13.3143 30.0926 0.00000 0.00000	.887500E-01 .817500 97.5000 .518000E-02 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780182
001281	S863551	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.510057E-02 13.3143 30.0926 0.00000 0.00000	.887500E-01 .817500 97.5000 .518000E-02 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780183
001282	S863552	2.80000	.598739E+07	PU238 PU239 AM241 MFP	.510057E-02 13.3143 30.0926 0.00000 0.00000	.887500E-01 .817500 97.5000 .518000E-02 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780184
001283	S863553	2.80000	.625954E+07	PU238 PU239 AM241 U12	.122356E-01 13.3143 30.0926 2206.80 0.00000	.212900 .197100 90.9600 .768096E-03 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780189
001284	S863554	2.80000	.571523E+07	PU238 PU239 AM241 U12	.122356E-01 13.3143 30.0926 2206.80 0.00000	.212900 .197100 90.9600 .768096E-03 0.00000	TRU CEMENT PASTE-OLD CMP TO 1A-54 AREA T RSWD S780190

END DATE 12-15-87

CORRUGATED METAL PIPES (CMPS)
IN STORAGE AT TA-54, AREA C
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	PSWD-NO	VOLUME - (M3)	WEIGHT - (Q)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001295	SR63555	2.80000	.625954E+07	PU238 PU239 AM241 U12	.123356E-01 3.21010 28.0741 2286.00 0.00000 0.00000	.212900 .197100 0.00000 .768096E-03 0.00000 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSMD S780191
001286	SR63556	2.80000	.589667E+07	PU238 PU239 AM241 U12	.123356E-01 3.21010 28.0741 2286.00 0.00000 0.00000	.212900 .197100 0.00000 .768096E-03 0.00000 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSMD S780192
001287	SR63557	2.80000	.498949E+07	PU238 PU239 AM241 U12	.123356E-01 3.21010 28.0741 2286.00 0.00000 0.00000	.212900 .197100 0.00000 .768096E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S780193
001288	SR63558	2.80000	.498949E+07	PU238 PU239 AM241 U12	.123356E-01 3.21010 28.0741 2286.00 0.00000 0.00000	.212900 .197100 0.00000 .768096E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S780194
001289	SR63559	2.80000	.508021E+07	PU238 PU239 AM241 U12 U235	.123356E-01 3.21010 28.0741 2286.00 0.00000 0.00000	.212900 .197100 0.00000 .768096E-03 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S780195
001290	SR63573	2.80000	.571523E+07	PU238 PU239 AM241 HFP U235	.110862E-01 1.65147 11.3364 0.00000 0.00000 0.00000	.192900 .101400 36.7300 .377100E-02 .593044E-03 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSMD S780271
001291	SR63574	2.80000	.571523E+07	PU238 PU239 AM241 HFP U235	.110862E-01 1.65147 11.3364 0.00000 0.00000 0.00000	.192900 .101400 36.7300 .377100E-02 .593044E-03 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSMD S780272
001222	SR63575	2.80000	.580595E+07	PU238 PU239 AM241 HFP U235	.110862E-01 1.65147 11.3364 0.00000 0.00000 0.00000	.192900 .101400 36.7300 .377100E-02 .593044E-03 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSMD S780273
001293	SR63576	2.80000	.462662E+07	PU238 PU239 AM241 HFP U235	.110862E-01 1.65147 11.3364 0.00000 0.00000 0.00000	.192900 .101400 36.7300 .377100E-02 .593044E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSMD S780274

PUP DATE 1/15/87

CORRUGATED METAL PIPES (CMPs)
IN STORAGE AT TA-54, AREA G
TO BE PROCESSED IN CMP SAW FACILITY

SERIAL-NO	RSWD-NO	VOLUME - (m3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
001294	5863577	2.80000	.635026E+07	PU238 PU239 AM241 HFP UB1	.110862E-01 1.65147 11.3364 0.00000 1714.00 0.00000	.192900 1.01400 36.7300 .377100E-02 .593044E-03 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSWD 5780275
001295	5863578	2.80000	.589667E+07	PU238 PU239 AM241 HFP UB1	.110862E-01 1.65147 11.3364 0.00000 1714.00 0.00000	.192900 1.01400 36.7300 .377100E-02 .593044E-03 0.00000	TRU CEMENT PASTE-OLD CMP TA-54 AREA T RSWD 5780276
001296	5863579	2.80000	.453590E+07	PU238 PU239 AM241 HFP UB1	.110862E-01 1.65147 11.3364 0.00000 1714.00 0.00000	.192900 1.01400 36.7300 .377100E-02 .593044E-03 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD 5780277
001297	5863580	2.80000	.480805E+07	PU238 PU239 AM241 HFP	.418736E-02 .907329 11.0154 0.00000 0.00000 0.00000	.728600E-01 .557100E-01 35.6900 .721400E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD 5780282
001298	5863581	2.80000	.598739E+07	PU238 PU239 AM241 HFP	.418736E-02 .907329 11.0154 0.00000 0.00000 0.00000	.728600E-01 .557100E-01 35.6900 .721400E-02 0.00000 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSWD 5780283
001299	5863582	2.80000	.508021E+07	PU238 PU239 AM241 HFP	.418736E-02 .907329 11.0154 0.00000 0.00000 0.00000	.728600E-01 .557100E-01 35.6900 .721400E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD 5780284
003301	5863583	2.80000	.480805E+07	PU238 PU239 AM241 HFP	.418736E-02 .907329 11.0154 0.00000 0.00000 0.00000	.728600E-01 .557100E-01 35.6900 .721400E-02 0.00000 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSWD 5780285
003302	5863584	2.80000	.498949E+07	PU238 PU239 AM241 HFP	.418736E-02 .907329 11.0154 0.00000 0.00000 0.00000	.728600E-01 .557100E-01 35.6900 .721400E-02 0.00000 0.00000	TRU CEMENT PASTE-OLD CMP TO TA-54 AREA T RSWD 5780286
003303	5863585	2.80000	.517093E+07	PU238 PU239 AM241 HFP	.418736E-02 .907329 11.0154 0.00000 0.00000 0.00000	.728600E-01 .557100E-01 35.6900 .721400E-02 0.00000 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD 5780287

PUR DATE 12/15/87

CORRUPTED METAL PIPES (CMPs)
IN STORAGE AT TA-54, AREA G
TO BE PROCESSED IN CMP SAM FACILITY

SERIAL-NO	RSWD-NO	VOLUME - (M3)	WEIGHT - (g)	NUCLIDE	GRAM AMOUNTS	ALPHA CURIES	DESCRIPTION:
003304	SB63586	2.80000	.480805E+07	PU238 PU239 AM241 MFP	.418736E-02 907120 11.8154 0.0000 0.0000	.228400E-01 .557100E-01 35.3500 .721300E-02 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S780288
003305	SB63546	2.80000	.544308E+07	PU238 PU239 AM241 MFP	.689655E-02 447883 10.9105 0.0000 0.0000	.120000 .275000E-01 35.3500 .168100E-01 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S780135
003306	SB63547	2.80000	.498949E+07	PU238 PU239 AM241 MFP	.689655E-02 447883 10.9105 0.0000 0.0000	.120000 .275000E-01 35.3500 .168100E-01 0.00000	TRU CEMENT PASTE - OLD CMP TO TA-54 AREA T RSWD S780136
003307	SB63548	2.80000	.635026E+07	PU238 PU239 AM241 MFP	.689655E-02 447883 10.9105 0.0000 0.0000	.120000 .275000E-01 35.3500 .168100E-01 0.00000	TRU CEMENT PASTE CMP TO TA-54 AREA T RSWD S780137
003308	SB63549	2.80000	.589667E+07	PU238 PU239 AM241 MFP	.689655E-02 447883 10.9105 0.0000 0.0000	.120000 .275000E-01 35.3500 .168100E-01 0.00000	TRU CEMENT PASTE OLD CMP TO TA-54 AREA T RSWD S780138

TOTALS: 158 CMPs 442.399 M3 .101160E+10 g 10475.2 CURIES

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
Division 1	General Requirements		
0110	Architectural and Special Design Requirements		
0110-99	Special Facilities		
0110-99.0	Nonreactor Nuclear Facilities-General		
0110-99.0.1	General		
	Special facility structures that need not be designed to withstand severe natural phenomena or man-made events shall be designed to the requirements in Section 0111-1.	N/A	
	A case-by-case written evaluation shall be performed to determine which structures or components may be excluded from these criteria.	TBD	By HSE and ENG.

C = Conformance
 NC = Nonconformance
 N/A = Not Applicable
 TBD = To Be Determined

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0200	Site Development		
0200-1	Facility Siting		
0200-1.1	General		
	The selection of sites for new facilities shall comply with DOE 4300.1B. Site development and facility utilization planning shall comply with DOE 4300.1B. A site development plan shall be used to locate new facilities on existing or new sites to assure effective site utilization and to preclude future conflicts between existing and new facilities.	TBD	ENG-2.
0200-1.2	Radiological Siting Requirements		
	For those facilities in which radioactive materials are processed, used, or stored, or those facilities that incorporate radiation-producing machines, the acceptability of the site shall be evaluated in terms of potential radiological consequences.	TBD	ENG-2 and HSE.
	Radiation dose to an offsite individual receiving maximum exposure shall be evaluated.	TBD	HSE.

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The offsite individual receiving the maximum dose shall be assumed to be located at the point of highest concentration (or highest exposure rate) outside the boundary controlled by the site. Meteorological conditions used in dose calculations shall be representative unfavorable dispersion, determined by comparing the 0.5 percent dispersion factors (X/Q) for each section to the 5 percent overall sit X/Q and selecting the highest value. The dose assessment shall consider both the duration of the event and, consistent with emergency response capability to control or evacuate individuals, the duration of exposure. The duration of exposure should not exceed two hours. The dose calculated shall be compared to the numerical guidelines within 0200-1.2, Radiological Siting Guidelines.	TBD	HSE.
	Consideration shall be given to onsite individuals. Prudent measures associated with the radiological protection of onsite personnel and in conjunction with the onsite emergency response planning, as required through implementation of DOE 5500.3, shall be incorporated into the design and siting of a new facility.	TBD	HSE
	Information on the siting evaluation, including the models, parameters, and assumptions used in the dose calculations shall be documented for use in the facility's SAR and emergency response plans. See DOE 5440.1C and DOE 5481.1B.	TBD	HSE
0200-1.3	Radiological Siting Guidelines		
	The following siting guidelines apply to offsite individuals receiving maximum dose from exposure to internally-deposited radioactive materials and/or to radiation from external sources. Guidelines are based on a 50 year committed dose equivalent.	TBD	HSE

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The maximum calculated dose shall not exceed 25 rem to the whole body, 300 rem to the thyroid, 300 rem to the bone surface, 75 rem to the lung, or 150 rem to any other organ. If multiple organs receive doses from the same exposure, the effective dose equivalent from all sources shall not exceed 25 rem when calculated by using the ICRP Report No. 26 weighing factors.	TBD	HSE
	These siting guidelines apply to nonreactor nuclear facilities. Siting and design criteria for nuclear reactors appear in DOE 5480.6.	TBD	HSE
	The use of doses as set forth in these guides is not intended to imply that these doses constitute acceptable limits for emergency doses to the public under accident conditions. Rather, these are reference values that can be used in the evaluation of facility design in combination with the suitability of the site with respect to accidents having a low probability of occurrence and low risk of public exposure to radiation.	TBD	HSE
	When calculating these doses, degraded performance of ESF and administrative controls shall be assumed unless they can be clearly shown to be unaffected by the accident (capable of performing their safety function) by proper design, installation, testing, and maintenance according to prescribed standards.	TBD	HSE
0200-2	Building Location		
	New buildings and building additions shall be located in accordance with the site development plan. During site selection for new buildings the following conditions and requirements shall be considered:	TBD	ENG-2.

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Architectural and functional compatibility with the environment • Operation and service functional relationships • Natural topographic and geologic conditions • Existing cultural and archeological resources • Historical sites • Abandoned mines or wells and potential for subsidence • Endemic plant and animal species • Availability of existing utility services • Building setback requirements • Availability of existing road systems • Traffic volume • Refuse handling and loading zone requirements • Adequacy for parking, future expansion, and other land use requirements • Health, safety, and environmental protection requirements 		

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> Indoor air quality impacts (e.g., presence of radon in foundation soils, building materials that off-gas irritating chemical vapors and the need to "bake out" new buildings prior to occupancy) Physical protection requirements Security and safeguard requirements Energy conservation requirements Impact of site selection Minimum fire separation between buildings (in accordance with NFPA 80A) 		
	Open space shall be provided between structures (to accommodate site security, landscaping and other environmental considerations).	N/C	The new building is located adjacent to the existing facility with expansion for earthquake induced sway allowed for.
	Sufficient access shall be provided around building exteriors (to accommodate emergency vehicles, maintenance vehicles and snow removal equipment).	C	
	In cold climates, building entrances, stairs and other pedestrian circulation features should not be placed along the north side of buildings or within shaded areas.	N/C	Life Safety Code requires 2 exits form all areas. North facing doors are the only way to comply.
	Sites selected for new buildings shall comply with DOE 4330.2C	TBD	Need DOE 4339.2C to determine compliance.
	Location analyses performed during the preparation of CDRs shall consider but not be limited to the above criteria.	TBD	By ENG-2?

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0200-99	Special Facilities		
0200-99.0	Nonreactor Nuclear Facilities - General		
0200-99.0.1	General		
	Site evaluation and studies necessary to provide the technical basis for location, design, and operation (under normal conditions, severe and extreme environmental conditions, and DBA conditions) of the facility shall include but not be limited to the items indicated below. In addition, appropriate consideration shall be given to the long-term and immediate consequences of releases of radioactive or other hazardous materials to the environment. New site selection requirements and procedures are also prescribed in DOE 4300.1B.	TBD	ENG-2 HSE.
0200-99.0.2	Other Facilities and Operations		
	The potential hazards from other onsite facilities and offsite sources of hazards that could affect the safe operation of the special facility shall be considered. Typical onsite hazards are fire, explosion, radioactive materials, gas mains, large quantities of explosives, flammable gases, and other hazardous materials. Offsite hazards can be due to the facility's proximity to airports, transportation routes (highways, railways, and waterways), private industrial facilities, and military facilities.	TBD	ENG-2 HSE
0200-99.0.3	Services		
	The proximity of the facility to utilities, the fire department, and other services shall be considered.	TBD	ENG-2

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The design of utility services shall provide reliability consistent with operational requirements, the value of in-process product, and the potential hazard for identifiable probable conditions. Utility systems essential to the support of safety class items shall be designed as safety class items.	TBD	1) Safety Classification 2) Drawing 3) Engineering and HSE
0200-99.0.4	Meteorology		
	Available meteorological data shall be considered to identify conditions that may influence the design and operation of the facility. Meteorological data to be considered shall include expected annual ranges and distributions of the following variables: <ul style="list-style-type: none"> • Wind direction and speed • Atmospheric stability • Temperature • Atmospheric water vapor • Mean joint temperature and specific humidity <p>As a minimum, at least one year of valid meteorological data shall be used to properly develop estimated joint frequency distributions of wind speed and stability conditions. These data shall be used to estimate the dispersal of effluents under normal and accident conditions.</p>	C	See Section 4 of draft PSAR for data.

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0200-99.0.5	Hydrology		
	Site studies shall be performed to determine groundwater levels, flood runoff, drainage, and other hydrological characteristics that could influence the design or operation of the facility. The hydrological studies shall include the following:	C	See Section 4 of draft PSAR for data.
	<ul style="list-style-type: none"> Flooding (probable maximum flood, 10-year flood, 25-year flood, flash flooding due to tsunamis, flooding due to dam failures, flooding due to ice jams) 	C	A storm frequency of 100-year flood shall be the basis of design for storm drainage. The rainfall intensity-duration-frequency curve, developed by ENG-2 for the Los Alamos area should be used.
	<ul style="list-style-type: none"> Groundwater levels 	N/A	
	<ul style="list-style-type: none"> Tsunamis 	N/A	
	<ul style="list-style-type: none"> Dam failures and breaches (including seismically induced dam failures) 	N/A	
	<ul style="list-style-type: none"> Ice loadings from water bodies 	N/A	
	<ul style="list-style-type: none"> Potential transport of radioactive and chemical contaminants in surface water and in groundwater. 	TBD	
0200-99.0.6	Seismology		
	Studies shall be performed to determine site features such as ground failure under dynamic loading, surface faulting, liquefaction, vibratory ground motion, and site amplification that could influence the design or operation of the facility.	C	UCRL 15910 and UCRL 53582 meet this requirement. See Section 4 of draft PSAR.

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
02017	Subsurface Investigations		
0201-1	General		
	For all permanent structures, subsurface conditions shall be determined by means of borings or other methods that adequately disclose soil and groundwater conditions. Data and other information obtained from prior subsurface investigations shall be used, supplemented by additional investigations at the specific location as deemed necessary by the design professional. Subsurface investigations shall be made for critical facilities.		
	Subsurface investigations shall be performed under their direction of a qualified soils engineer. In earthquake-prone areas, appropriate geological investigations shall be made to determine the contribution of the foundation (subsurface) to the earthquake loads imposed on the structure and shall include, but not be limited to, a recommendation of foundation type, determinations of allowable soil bearing design capacity, and the possible effects of seismic activity on the soil mass. A settlement analysis under differential design loads shall be performed where differential settlement may cause structural or architectural damage.	C	

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0201-2	Drilling and Sampling Methods		
	Drilling and sampling shall comply with ASTM standards, including ASTM D1586, ASTM D1587, and ASTM D2113. Soil samples shall be taken below existing grade and at each change in soil stratification or soil consistency. The depth of soil samples shall be determined by the soils engineer after consulting with the project engineer on site-specific design requirements.	C	Soils Report Spec's Div. 2.
	Soil samples shall be preserved until the subsurface investigation has been approved by the cognizant DOE authority.	C	Soil Report Spec's Div. 2.
0201-3	Field and Laboratory Reports		
	All data required to be recorded according to the ASTM or other standard test methods used shall be obtained, recorded in the field, and referenced to boring numbers. Soil shall be visually classified in the field logs in accordance with ASTM D2488, M but the classification for final logs shall be based on the field information, the results of tests, and further inspection of samples in the laboratory by the soils engineer preparing the report. As a minimum the report shall:	C	Soils Report Spec's Div. 2.
	• Include a chart illustrating the soil classification criteria and the terminology and symbols used on the boring logs	C	
	• Identify the ASTM or other recognized standard sampling and test methods used	C	

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	• Provide a plot plan giving dimensioned locations of test borings	C	
	• Provide vertical sections for each boring plotted and graphically presented, showing number of borings, date of start and finish, surface elevations, description of soil and thickness of each layer, depth to loss or gain of drilling fluid, hydraulic pressure required or number of blows per foot (N value), and, where applicable, depth to wet cave-in, depth to artesian head, groundwater elevation and time when water reading was made, and presence of gases	C	
	• Note the location of strata containing organic materials, weak materials or other inconsistencies that might affect engineering conclusions	C	
	• Describe the existing surface conditions	C	
	• Summarize the subsurface conditions present	C	
	• Provide pavement structural design data including California Bearing Ratio tests or modules of subgrade reaction tests	N/A	
	• Provide a profile and/or topographic map of rock or other bearing stratum	C	
	• Analyze the probable variations in elevations and movements of subsurface water due to seasonal influences	C	

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Report all laboratory determinations of soil properties including shrinkage and expansion properties 	C	
0201-4	<p>Foundation Engineering Evaluation and Recommendations</p> <p>The soils engineer shall analyze the information developed by investigation or otherwise available, including any aspect of the soil conditions that might affect design and construction of proposed structures, and shall consult with the engineer on the design requirements of the project. The soils engineer shall submit a professional evaluation, recommended construction specifications, and recommendations including the following where applicable:</p> <ul style="list-style-type: none"> • Foundation support of the structure and slabs, including soil bearing pressures, bearing elevations, foundation design recommendations and anticipated settlement • Anticipation of, and management of, groundwater • Lateral earth pressures and pressure coefficients (active, passive, and at rest) and internal friction angles for design of walls below grade, including backfill, compaction and subdrainage and their requirements • Soil material and compaction requirements for site fill, construction backfill, and for the support of structures and pavement • Recommendations and design criteria for shoring and underpinning systems 		

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Design criteria for temporary excavation, temporary protection such as sheet piling, underpinning and temporary dewatering systems • Stability of slopes • Seismic activity • Frost penetration depth and effect • Analysis of the effect of weather and construction equipment on soil during construction • Analysis of soils to ascertain presence of dispersive potentially expansive, deleterious, chemically active or corrosive materials or conditions, or presence of gas • Recommendation of the most proper foundation system and other alternative workable systems • Specific recommendations and design and construction criteria for ponds, reservoirs, slurry cut-off walls, drainage systems, etc. 		
0205	Demolition, Decontamination, and Decommissioning	N/A	No demolition, decontamination or decommissioning in project.
0205-1	Demolition		
	Demolition plans shall ensure that remaining buildings, trees, and environmental resources are protected.		

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The design professional shall determined whether the use of explosives will be allowed and whether prior approval of such decision must be obtained from DOE.		
	Demolition plans shall define:	N/A	
	<ul style="list-style-type: none"> • The extent of demolition, abandonment, and removal of existing facilities and utilities • Methods for handling and disposing of hazardous waste materials (asbestos, PCB-filled equipment, and other hazardous waste materials) • Materials to be salvaged • Backfilling of removed materials and cleanup 		
0214	Dewatering		
0214-2	Groundwater Investigation		
	A groundwater investigation shall be made before selection of a dewatering control system. The investigation shall examine the character of subsurface soils, groundwater conditions and quality, and the availability of an electric power source. The source of seepage shall be determined and the boundaries and seepage flow characteristics of geologic and soil formations at and adjacent to the site shall be analyzed in accordance with the mathematical, graphic, and electroanalogous methods discussed in TM 5-818-5.		

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0235	Building Foundations		
0235-2.2	Adverse Subsurface Conditions		
	One of the following procedures shall be used to ensure satisfactory foundation performance where poor soil conditions are encountered:		
	<ul style="list-style-type: none"> • Bypass the poor soil by means of deep foundations extending to or into a suitable bearing material • Design structure foundation to accommodate anticipated differential settlements • Remove the poor material, and either treat and replace it or substitute good compacted fill material • Treat the soil in place before construction to improve its properties 		

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0270	Sanitary Wastewater Collection and Stormwater Management Systems		
0270-2	Stormwater Management Systems		
0270-2.1	General		
	Stormwater management systems shall be designed for not less than the 25-year, 6-hour storm. The potential effect of larger storms (up to the 100-year, 6-hour storm) shall also be considered. With the approval of the cognizant DOE authority, lesser design storms may be used where a large expenditure for flood protection cannot be economically justified.		
0270-2.2	Hydrology		
0270-2.2.1	General		
	The design flood shall be based on a study of precipitation frequency, runoff potential, and runoff distribution relative to physical characteristics of the watershed.		

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0285	Solid Waste Systems		
0285-3	Site Design		
0285-3.2.4	Surface Water Resources		
	Quality, quantity, source, and seasonal variations of surface waters in the vicinity of the solid waste system shall be determined. These data shall serve as the basis for design of surface water protection and monitoring systems.		
0285-3.2.5	Flood Protection		
	Flood protection measures (defined by the 100-year flood level or, for a "critical action," the 500-year flood level) shall comply with procedures described in WRC Bulletin No. 17A. If all or part of the facility lies within the 100-year floodplain, a suitable levee shall be provided to prevent facility inundation.		

**TABLE 1. SITE REQUIREMENTS - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH
DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0285-99	Special Facilities		
0285-99.0	Nonreactor Nuclear Facilities-General		
	Design of special facilities shall include adequate provisions for the safe collection, packaging, inventory, storage, and loading for transport of solid waste that is contaminated with radioactive material. These provisions shall include allocation of adequate space for sorting and safe temporary storage of solid waste, equipment for assay of the waste, and facilities for volume reduction appropriate to the types and quantities of solid waste to be produced. All packages containing contaminated solid waste shall be appropriately monitored, both before being moved to temporary storage locations and before being loaded for transport to a disposal site. Nuclear criticality safety shall be considered in the design of radioactive solid waste facilities.	C	This is the basic function of this facility.

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0110-6.4	Hazardous Areas		
	Hazardous areas, such as radioactive spaces or spaces with inert atmospheres, shall have sufficient alarms and interlocks to assure that access by emergency personnel will not endanger such personnel or result in a public hazard.	TBD	HSE responsibility.
	The design of hazardous areas shall facilitate access by emergency personnel from the exterior and, at the same time, shall maintain any required confinement or containment using air locks or other features.	C	Site inspection, drawings, etc.
0110-99.0	Nonreactor Nuclear Facilities - General		
0110-99.0.4	Building Layout		
	The design of the facility shall include controlled access to areas of potential hazards within the facility.	TBD	By HSE.
	The facility layout shall provide for the segregation of administrative and other support personnel from operations and process activities and areas.	C	Site inspection, occupancy drawings, design analysis.
	The arrangement and location of process equipment and its maintenance provisions shall ensure that exposure to radiation and other hazardous materials is within the requirements of DOE 5480.11 and DOE 5480.11, respectively.	TBD	By HSE.

C = Conformance
 NC = Nonconformance
 N/A = Not Applicable
 TBD = To Be Determined

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The design shall protect workers sufficiently from hazards to ensure that workers can perform actions required during normal operations, anticipated operational occurrences and postulated DABs.	TBD	By HSE.
	The design shall ensure prompt, safe shutdown in emergencies and allow ready access to areas where manual corrective actions are required and to areas that contain radiation monitoring equipment.	TBD	By HSE.
	A minimum number of entrances shall be provided for security areas. However, exits shall comply with NFPA 101.	C	By HSE; Engr-8.
	A least two exits shall be provided in rooms where hazardous materials are handled. (Exceptions for explosives facilities appear in Chapter II, Section 2.2, of DOE/EV 06194.)	C	Explosive materials are not projected to be present in this facility.
	In those areas where an accidental breach of a primary confinement systems could expose personnel to radioactive material, a distance of 75 feet as measured by the method in the NFPA 101 shall be the maximum travel distance to ensure that personnel can exit through the next confinement barrier. This barrier is the partition separating two different air zones, the area of refuge being on the upstream side of the barrier.	C	The travel distance to personnel exits through the confinement barrier is less than 75 feet (to exterior or change rooms).
	The assured airflow through the barrier shall be in the direction opposite of exit travel.	C	Engineering design documents, analysis, etc.; site inspection, ventilation flow drawings.

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The facility design shall provide space to accommodate all planned activities, operations, and maintenance (e.g., processing, research and development, scrap and waste handling, sample analysis, shipping and receiving, and material staging required for equipment installation and modifications).	TBD	User needs to verify that plans meet this criteria; design criteria.
	The design shall minimize the hazard of handling flammable and other hazardous materials.	TBD	By user and HSE.
	In addition to the usual industrial safety features required in a nuclear facility, the design shall also include the following safety features, as appropriate: <ul style="list-style-type: none"> Layout of the facility shall provide specific control and isolation, if possible, of quantities of flammable, toxic, and explosive gases, chemicals, and other hazardous materials admitted to the facility. Provision of additional space shall be considered for temporary shielding or for additional shielding in the event radiation levels are higher than anticipated. 	TBD	By user and HSE.
	Storage areas (or vaults) shall be located in light of the hazards of materials stored (e.g., radiation and criticality of nuclear materials), fire-fighting capabilities, and contamination control.	TBD	By HSE and user.
	Storage areas having heavy floor loadings shall be placed on grade or compacted fill.	C	Specs, design criteria, structural drawings.

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Storage facilities shall be physically separated from process operations, areas for the storage of nonnuclear materials or equipment, and functions not directly required for storage operations.	C	HSE.
	Physical protection of stored SNM shall comply with the DOE 5632 series.	N/A	No SNM to be stored or processed.
	Suitable physical compartmentalization shall be provided, as determined from the safety analysis, to limit the quantities of stored materials in each compartment to safe levels; ensure the necessary access features and controls; and satisfy the loss limitation criteria in Section 0110-99.0.7, Loss Limitations.	TBD	By HSE and user.
	All corridors and door openings shall meet NFPA 101 or more stringent requirements based on the hazards of materials to be handled or operations to be performed, as established by the cognizant DOE Health and Safety authority.	C	HSE; Engineering 8; review of site to NFPA 101.
0110-99.0.6	Fire Resistance		
	The structural shell surrounding the critical areas and their supporting members shall remain standing and continue to act as a confinement structure during the DBF under conditions of failure of any fire suppression system not designed as a safety class item. Fire resistance of this shell shall be attained by an integral part of the structure (concrete slabs, walls, beams, and columns) and not by a composite assembly (membrane fireproofing).	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0110-99.0.8	Personnel and Public Safety		
	The design of special facilities shall reduce the consequences of normal and DBA events by incorporating ALARA design concepts. Occupancy time, spacing, remote handling equipment, and shielding shall be considered.	TBD	Define DBA and ALARA; need classification of facility first to evaluate to ALARA and DBA.
	DOE 5480.5 contains requirements for safety of nuclear facilities. In addition to its requirements, personnel exposure levels shall comply with Section 1300-5.2, Shielding Design, and exposure of the public shall comply with Section 1300-1.4, Guidance on Limiting Exposure of the Public. Proper consideration shall also be given to chemical toxicity protection, as well as radiation protection. As an example, for unirradiated enriched uranium, under postulated accident conditions, chemical toxicity exposure will often be the controlling factor.	TBD	HSE.
0111	Structural Design Requirements		
0111-1	General		
	The structural design drawings shall indicate design criteria, the structural materials and their strengths with applicable materials standards, the design loads including loads that can occur during construction, and the allowable foundation loads that were used in the design.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Where earthquake resistance is required, the cognizant DOE authority should consult LBL-9143 for practical guidelines for engineering earthquake safety and management planning and technical procedures for design of new facilities or evaluation of existing ones.	C	
0111-2	Loads		
0111-2.1	General Requirements		
	Structures and their elements shall be designed for the loads prescribed in these criteria.	C	
0111-2.2	Dead Loads		
0111-2.2.1	General		
	Dead loads are loads that remain permanently in place. They shall include the weights of all permanent materials and equipment, including the structure's own weight, supported in, or on, a structure.	C	
	Load calculations shall include an allowance for any loadings anticipated to be added at a later date. Initially assumed loads shall be revised so that the final design reflects the configuration shown on the drawings.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.2.2	Unit Weights		
	The unit weights of materials and construction assemblies for buildings and other structures shall be those given in ANSI A58.1. Where unit weights are neither established in that standard nor determined by test or analysis, the weights shall be determined from data in manufacturers' drawings or catalogs.		
0111-2.2.3	Service Equipment		
	Design dead loads shall include the weight of all permanent service equipment.	C	
0111-2.2.4	Allowance for Partition Loads		
	The minimum allowance for weights of partitions, where partitions are likely to be rearranged or relocated shall be as follows:		
	<ul style="list-style-type: none"> For partition weights of 150 plf or less, an equivalent uniform dead load of 20 psf shall be used. 	C	
	<ul style="list-style-type: none"> For partition weights above 150 plf, the actual linear loads shall be used. 	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.3	Live Loads		
0111-2.3.1	General		
	Live loads shall include all loads resulting from the occupancy and use of the structure, whether acting vertically down, vertically up, or laterally. Operating, moving, stopping, and impact forces shall be considered part of the live loads. Live loads shall include neither dead loads nor loads from the environment, such as wind, tornado, earthquake, thermal forces, earth pressure, and fluid pressure.	C	
0111-2.3.2	Buildings and Other Structures		
	Live loads for buildings and other structures shall be those produced by the intended use or occupancy.	C	
	In no case shall they be less than the minimum uniform load or concentrated load stipulated in ANSI A58.1.	C	
	Live loads on roofs shall be as stipulated in ANSI A58.1. They shall include the minimum roof live loads or the snow loads and snow drifts or possible rain loads stipulated therein, whichever produces the more severe effect.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.4	Wind Loads		
0111-2.4.1	General		
	The structural frame and exterior components of all buildings, signs, tanks, towers, and other exposed structures shall be designed to resist pressures due to wind assumed to act from any direction.	C	
0111-2.4.2	Buildings and Other Structures		
	Wind load design for buildings and other structures shall be determined in accordance with procedures in ANSI A58.1 with the basic wind speed being obtained from UCRL 15910.	C	
	The basic wind speed shall be derived from DOE site-specific hazard model studies summarized in UCRL 53526, Rev. 1. If site-specific hazard model studies are not available, a hazard model shall be developed that is consistent with the approach used in UCRL 53526, Rev. 1.	C	
	The basic wind speeds for any specific site shall be determined following the procedures in UCRL 15910, except that Exposure "C" should be used for all construction unless it can be shown that the necessary permanent shielding will be provided by natural terrain (not including shielding from trees or adjacent buildings).	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	To determine the design wind loads, all factors and coefficients stipulated in ANSI A58.1 shall be applied to the site-specific basic wind speeds.	C	
	Building additions shall be designed as parts of a totally new building without regard to shielding from the original building and without regard to lesser wind resistance for which the original building may have been designed. The possibility that the original portion of the building may require strengthening due to an increase in the wind loads acting on it shall be considered.		
0111-2.5	Tornado Loads		
	The basic wind speed and missile parameters shall be derived from DOE site-specific hazard models studies summarized in UCRL 53526, Rev 1. If site-specific hazards model studies are not available, a hazard model shall be developed consistent with the approach used in UCRL 53526, Rev. 1.	C	
	Facilities for radioactive material handling, processing, or storage, and other facilities having high value or vital importance to DOE programs that are classified as critical facilities, shall require special tornado loading criteria as stipulated in Section 0111-99.0, Nonreactor Nuclear Facilities-General.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.6	Internal Shock and Blast Loads		
	Building structures (excluding explosive facilities) that house operations that may release energy from rupture of equipment or explosions, either inadvertently or purposely (such as testing), shall be designed to control the resulting internal shock pressure loads per applicable criteria.	C	
0111-2.7	Earthquake Loads		
0111-2.7.1	Buildings and Other Structures		
	Earthquake load design for buildings and other structures shall be determined in accordance with the procedures contained in UBC and UCRL 15910.	C	
	The provisions and design procedures of TM 5-809-10 for the application of seismic loadings to conventional buildings shall also apply. For critical facilities, the provisions and design procedures of TM-5-809-10.1 shall be used.	C	
	Facilities for radioactive material handling, processing, or storage, and other facilities having high value or vital importance to DOE programs that are classified as critical facilities shall require application of dynamic analysis in determining structural requirements for earthquake loading as stipulated in Section 0111-99.0, Nonreactor Nuclear Facilities - General.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	An independent review of the seismic design shall be made for facilities and buildings where a seismic event can have a potential risk to operator lives, to public safety, or of large economic loss. The review shall be made in two stages, the first at the end of preliminary design and the second before final design is complete. For additional guidance on independent reviews, see LBL-9143 and UCRL 15910.	C	
0111-2.8	Other Loads for Buildings and Other Structures		
0111-2.8.1	Vibratory Loadings		
	Equipment supports shall be designed to avoid resonance resulting from the harmony between the natural frequency of the structure and the operating frequency of reciprocating or rotating equipment support on the structure.	C	
	(A) The operating frequency of supported equipment shall be determined from manufacturer's data prior to completion of structural design.		
	(B) Resonance shall be prevented by designing equipment isolation supports to reduce the dynamic transmission of the applied load to as low a level as can be economically achieved in the design.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.8.2	Earth and Groundwater Pressures		
	Every foundation wall or other wall serving as a retaining structure shall be designed to resist, in addition to the vertical loads acting on it, the incident lateral earth pressures and surcharges, plus hydrostatic pressures corresponding to the maximum probable groundwater level.	C	
	Retaining walls shall be designed for earth pressures and potential groundwater levels producing the highest stresses and overturning moments. When a water-pressure-relief system is incorporated into the design, only earth pressures need be considered. In cohesive soils, the long-term consolidation effects on the stability of the walls shall be considered. Lateral earth pressures shall be determined in accordance with accepted structural and geotechnical engineering practice.	C	
0111-2.8.3	Fluid and Gas Pressure		
	The design of components of buildings and other structures shall include the effects of fluid and gas pressures, both internal and external.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.8.4	Thermal Forces		
	The design of structures shall include the effects of stresses and movements resulting from variations in temperature. The rise and fall in the temperature shall be determined for the localities in which the structures are to be built. Structures shall be designed for movements resulting from the maximum seasonal temperature change. The design shall provide for the lags between air temperatures and the interior temperatures of massive concrete members or structures. In cable-supported structures, changes in cable sag and tension shall be considered.		
0111-2.8.5	Creep and Shrinkage Forces		
	Concrete and masonry structures shall be investigated for stresses and deformations induced by creep and shrinkage.	C	
	For concrete and masonry structures, the minimum linear coefficient of shrinkage shall be assumed to be 0.0002 inch/inch, unless a detailed analysis is undertaken. The theoretical shrinkage displacement shall be computed as the product of the linear coefficient and the length of the member.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.10	Combination of Loads and Design Requirements for Buildings and Other Structures		
	Combination of loads, allowable stresses, and strength requirements for buildings and other structures shall be as stipulated in the UBC, except as otherwise indicated in 0111-99, Special Facilities.	C	
0111-3	Structural Systems for Buildings and Other Structures		
0111-3.1	Framing		
	Buildings shall be framed to allow simple formwork, fabrication, and construction procedures.		
	Structural systems shall be designed for ductile modes of failure to the extent feasible.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>In the selection of a particular framing system, consideration shall be given to the structure's functional requirements, including:</p> <ul style="list-style-type: none"> • Column-free areas • Floor-to-ceiling heights • Number of stories • Elevator, crane, or hoist installations • Heavy loads • Other particular requirements pertaining to the specific facility. 		
0111-3.2	Floors		
	Where the first floor uses concrete-slab-on-grade construction, the slab shall be placed on a free-draining aggregate base overlying a compacted subgrade.	C	
	A plastic vapor barrier shall be used under the slab where moisture conditions warrant.	C	
	Excessive loads or equipment subject to vibration shall be supported by separate pads isolated from the rest of the floor slab with flexible joints.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-3.3	Control Joints		
	Control joints shall be designed and placed in such a manner as to avoid structural distress and uncontrolled cracking from thermal expansion and contraction, concrete shrinkage, and movements due to wind and earthquake forces.	C	
0111-3.4	Foundations		
0111-3.4.1	General Requirements		
	The provisions of the UBC shall be the minimum requirements for foundations design. The potential adverse effects of frost heave and movements due to expansive soils shall also be considered in the design.	C	
	For all structures, Section 0201, Subsurface Investigations, shall be complied with to determine subsurface conditions, recommended foundation type, allowable design soil bearing pressure, seismic potential, and differential settlement.	C	
0111-3.4.2	Foundation Vibrations		
	Analysis of foundation vibrations, design to avoid resonance, and vibration and shock isolation, where required, shall be in accordance with Chapter 1 of DM-7.03.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-99	Special Facilities		
0111-99.0	Nonreactor Nuclear Facilities - General		
0111-99.0.1	General		
	Safety class structures are sometimes required in special facilities for the following reasons:		
	• For nuclear criticality safety	C	
	• To prevent or mitigate the release of quantities and concentrations of radioactive materials that have the potential to exceed the release guidelines contained in Section 1300-1.4, Guidance on Limiting Exposure of the Public	C	
	• To achieve and maintain the facility in a safe shutdown condition	C	
	Special facility structures that need not be designed to withstand severe natural phenomena or man-made events shall be designed to the requirements in Section 0111-2, Loads. A case-by-case written evaluation shall be performed to determine which structures or components may be excluded from these criteria.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Facilities containing plutonium, other radioactive material, or other material that would be likely to produce significant health or safety hazards shall be evaluated as to the degree of risk, and more stringent criteria applied in structural design, as necessary.		
	Safety class structures shall be protected against dynamic effects, including effects of wind driven missiles and discharging fluids, that may result from natural phenomena, accidents at nearby facilities, including military installations and transportation facilities, equipment failure, and similar events and conditions inside and outside the facility.	C	
	The design bases for such events shall take into account their historic frequency and severity if the region of the site and the potential risk to the environment or the health and safety of the public. However, earthquakes, tornados, straight winds and floods shall be addressed.	TBD	Need facility classification level and then support documentation from HSE and Eng.
	Where floor-mounted special facilities equipment will have a commonality of use, it shall be centrally located with respect to special facilities operations.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The design of structures, including their supports, that are confinement system barriers shall ensure satisfaction of the functional requirements for the specific confinement system they are part of. In addition, safety class confinement barriers (barriers whose continued integrity is shown by a safety analysis to be required following severe natural phenomena, including DBE, and man-made events) shall be designed to withstand secondary events as well as primary events. Potential secondary events might be fire, explosion, or nuclear criticality caused by the DBE.	C	
0111-99.0.2	Tornado and Extreme Wind		
	Determination of Design Basis Tornado		
	DOE site-specific hazard model studies summarized in UCRL 53526, Rev. 1, shall be used to select the DBT and extreme wind characteristics for the design of structures.	C	
	If site-specific hazard model studies are not available, a hazard model shall be developed consistent with the approach used in UCRL 15910.		
	In applying UCRL 53526, Rev. 1, specific guidance on relating frequency of occurrence to facility hazard levels shall be obtained from UCRL 15910.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Tornado Analysis	C	
	In designing for tornado or extreme wind resistance:		
	<ul style="list-style-type: none"> The tornado rotational speed shall be appropriately combined with the transnational speed. 	C	
	<ul style="list-style-type: none"> Resulting loads from the rate of pressure drop, taking into consideration any pressure equalization due to permissible venting, shall be combined with velocity-induced pressure loads as stipulated in UCRL 15910. 	C	
	<ul style="list-style-type: none"> UCRL 53526, Rev. 1, provides the characteristics of typical potential tornado-generated missiles. Additional missiles may be identified from review of on-site sources and possible missiles that could be borne to the site by a tornado. Both small high-velocity missiles and massive low-velocity missiles shall be considered separately in terms of penetration, perforation, or crushing effects. The horizontal and vertical velocities of the missiles shall be combined in the design. 	C	
	<ul style="list-style-type: none"> The minimum wind speed used shall be 70 mph. 	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-99.0.3	Floods		
	The design loads from flooding shall comply with UCRL 15910. In calculating design loads from flooding, a conservative approach shall be taken to ensure that the loads used in the design are as follows:		
	<ul style="list-style-type: none"> • Greater than the maximum historic levels recorded for the site • No less than the probable maximum flood (PMFL) 	C	
0111-99.0.4	Earthquakes		
	General		
	The systems, components, and structures that shall be designed to meet these special facility criteria shall be identified through a written evaluation (see Section 0111-99.0.1, General). Such systems, components, and structures shall be designed to provide their passive or active functions as required by the SAR in accord with their designated safety classes.		
	Site-specific seismic parameters shall be determined for a DBE. The SSE shall be equivalent to the DBE.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	New seismic design, including additions or modifications to existing structures, shall be reviewed by a qualified, independent organization. This review must include evaluation of the design approach, the lateral force resisting system, and the design detailing, per UCRL-15910. TM-5-809-10 can be used for design detail guidance.		
	Earthquake Occurrence	C	
	The DBE shall be assumed capable of occurring at any time, except that the simultaneous occurrence with any other limiting site-related event such as a tornado, fire, or flood need not be considered for design purposes, except where the joint occurrence is causally related (e.g., fire or flood). Determination of DBE		
	Generally, a DBE shall have a ground acceleration of 0.1g or greater.		
	To determine the DBE, site-specific earthquake hazard models and response spectra given in UCRL 53582, Rev. 1, shall be used to select the appropriate seismic ground acceleration. Design guidance in UCRL 15910 shall be used in applying UCRL 53582, Rev. 1.	C	
	The DBE shall be defined by design response spectra, appropriate for the site, or by acceleration time histories, representative of the anticipated ground motions.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>The ratio of vertical-to-horizontal acceleration shall be two-thirds, unless site-specific data justify use of a different ratio.</p> <p>Seismic Analysis</p> <p>The adequacy of systems, components, and structures to withstand a seismic event shall be verified by a dynamic analysis, except where it can be demonstrated that the use of a simplified approach, such as static load method, component testing, or a combination of testing and analysis provides assurance of adequate seismic design. The ration of vertical-to-horizontal acceleration shall be two-thirds, unless specific data justify use of a different ratio.</p>	C	
0111-99.0.5	Aircraft		<p>Unless the safety analysis can demonstrate that the risk from an aircraft crashing into the facility is acceptable, potential aircraft crashes shall be considered among the spectrum of man-made missiles that confinement structures shall be designed to withstand or against which they shall be protected.</p>

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-99.0.6	Nearby Explosions and Externally Generated Missiles		
	The potential effects of a major explosion at a nearby facility or transportation route shall be considered among the spectrum of external blast effects and missiles that confinement structures shall be designed to withstand or against which they shall be protected.	C	
0111-99.0.7	Explosion, Internal Pressurization, Criticality, and Other DBA Causes	C	
	The probable consequence of DBAs involving internally generated missiles or blast effects shall be considered. Such DBAs typically involve failure of high-speed rotating machinery, cranes, experimental facilities, high-energy fluid system components, or explosives. Structures required to function following such accidents shall be designed to withstand these DBAs.		
0111-99.0.8	Load Combinations		
	Safety class structures and structural members shall be designed to resist the appropriate load combinations provided in UCRL 15910.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Concrete Structures		
	Concrete structures and structural members for safety class concrete structures shall meet the design and construction requirements of ACI 349 for new construction or original (or equivalent) codes for existing construction providing the margin of safety of the overall facility is maintained.	C	
	Steel Structures		
	Safety class steel structures shall meet the design, fabrication, and erection requirements of AISC N690 for new construction or original (or equivalent) codes for existing construction providing the margin of safety of the overall facility is maintained.	C	
0201	Subsurface Investigations		
0201-1	General		
	For all permanent structures, subsurface conditions shall be determined by means of borings or other methods that adequately disclose soil and groundwater conditions.	C	
	Subsurface investigations shall be made for critical facilities.	C	
	A settlement analysis under differential design loads shall be performed where differential settlement may cause structural or architectural damage.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0201-4	Foundation Engineering Evaluation and Recommendations		
	The soils engineer shall analyze the information developed by investigation or otherwise available, including any aspect of the soil conditions that might affect design and construction of proposed structures, and shall consult with the engineer on the design requirements of the project.	C	
	The soils engineer shall submit a professional evaluation, recommended construction specifications, and recommendations including the following where applicable:		
	<ul style="list-style-type: none"> Foundation support of the structure and slabs, including soil bearing pressures, bearing elevations, foundation design recommendations and anticipated settlement 	C	
	<ul style="list-style-type: none"> Soil material and compaction requirements for site fill, construction backfill, and for the support of structures and pavement 	NC	
	<ul style="list-style-type: none"> Recommendations and design criteria for shoring and underpinning systems 	C	
	<ul style="list-style-type: none"> Seismic activity 	C	
	<ul style="list-style-type: none"> Analysis of the effect of weather and construction equipment on soil during construction 	NC	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> Analysis of sills to ascertain presence of dispersive potentially expansive, deleterious, chemically active or corrosive materials or conditions, or presence of gas 	C	
	<ul style="list-style-type: none"> Recommendation of the most proper foundation system and other alternative workable systems 	C	
0205-2	Decontamination and Decommissioning		
	Facilities where radioactive or other hazardous contaminating materials will be used or will result from facility operation shall be designed to limit dispersion and simplify periodic decontamination and ultimate facility decommissioning and disposal or reuse. Requirements are provided in Section 1300-11, Decontamination and Decommissioning.	N/A	
0220	Earthwork		
0220-3	Design		
	The earthwork design and specification shall comply with the recommendations in the project subsurface investigation.		
0235	Building Foundations		
0235-1	General		
	Building foundations shall be designed in accordance with the requirements of the UBC and ACI 318.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0235-2	Foundation Design Criteria		
0235-2.1	General		
	Based on preliminary information concerning the purpose of the structure, foundation loads, and subsurface soil conditions, the design professional shall consider alternative types of foundations for the bearing capacity and total and differential settlements.		
0235-2.2	Adverse Subsurface Conditions		
	One of the following procedures shall be used to ensure satisfactory foundation performance where poor soil conditions are encountered:		
	<ul style="list-style-type: none"> • Bypass the poor soil by means of deep foundations extending to or into a suitable bearing material • Design structure foundations to accommodate anticipated differential settlements • Remove the poor material, and either treat and replace it or substitute good compacted fill material • Treat the soil in place before construction to improve its properties. 		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0235-3	Concrete		
	Concrete for building foundations shall be designed in accordance with Section 0330, Cast-In-Place Concrete.	C	
0235-4	Pier-And-Beam Foundation		
	Grade beams shall comply with ACI 318. Piers shall comply with ACI 336.3R.		
0235-5	Pile Foundations		
	Pile foundations shall comply with UBC and ACI 543R.		
0235-6	Ribbed-Mat Slab Foundations		
	Ribbed-mat slabs shall comply with ACI 336.2R.		
0235-7	Expansive Soils		
	Where expansive soils are encountered, the magnitude of swell or settlement shall be determined in accordance with ASTM D4546 or AASHTO T 258. Based on the results of these tests, the foundation design shall consider one of the following options:		
	<ul style="list-style-type: none"> • Mechanically or chemically altering the soil characteristics • Controlling moisture conditions 		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> Designing the foundation to tolerate the estimated volume change 		
0235-8	Equipment Foundations		
	Heavy, vibration-producing equipment, such as high-pressure air compressors, chillers, fire pumps and engine/generator sets, shall have separate, isolated foundations.		
0300	Coverage		
0301	General Requirements		
0301-1	Buildings and Other Structures		
	Concrete materials, design, and construction for buildings and other structures shall comply with ACI 318 and 40 CFR 249.	C	
0320	Concrete Reinforcement		
0320-1	Materials for Reinforcement		
	Reinforcement materials for buildings and other structures shall comply with ACI 318; for highway structures, with the AASHTO HB-13; for railway structures, with the AREA Manual for Railway Engineering (Fixed Properties); for special facilities, with ACI 349 (see Section 0111-99.0, Non-reactor Nuclear Facilities - General).	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0320-2	Detailing of Reinforcement		
	Reinforcement details shall comply with ACI 352R and ACI SP-66 in addition to ACI 318 for buildings and other structures, the AASHTO HB-13 for highway structures, the AREA Manual for Railway Engineering (Fixed Properties) for railway structures.	C	
0330	Cast-In-Place Concrete		
0330-1	Coverage		
	This section covers the selection of materials, proportioning of mixes, mixing, placing, testing, and quality control of cast-in-place concrete.		
0330-2	Materials, Testing, and Quality Control		
	Materials, testing, and quality control for cast-in-place concrete shall comply with ACI 318 for buildings and other structures, with the AASHTO HB-13 for highway structures, with the AREA Manual for Railway Engineering (Fixed Properties) for railway structures, and with ACI 349 (see Section 0111-99, Special Facilities) for special facilities.		
	Tolerances for formed concrete shall be as suggested in ACI 347.	C	

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0330-3	Selecting Proportions for Concrete Mixes		
0330-3.1	Normal, Heavyweight, and Mass Concrete		
	The selection of proportions for concrete mixes for normal, heavyweight, and mass concrete shall comply with ACI 211.1.	C	
0330-3.2	Structural Lightweight Concrete		
	The selection of proportions for structural lightweight concrete shall comply with ACI 211.2.		
0330-4	Mixing, Transporting, and Placing		
	The mixing, transporting, and placing of cast-in-place concrete shall comply with ACI 304.	C	
0330-5	Climatic Considerations		
0330-5.1	Hot Weather Concreting		
	Hot weather concreting shall comply with ACI 305R.		
0330-5.2	Cold Weather Concreting		
	Cold weather concreting shall comply with ACI 306R.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
0340	Precast Concrete		
0340-2	General		
	In addition to the provisions of Section 0301, General Requirements, precast concrete shall comply with the PCI MNL-116. PCI MNL-120 and PTI Post-Tensioning Manual may also be used as guides for the design and construction of precast concrete structures.		
0370	Repair and Restoration of Concrete Structures		
0370-2	General		
	Methods, procedures, and materials for the repair and restoration of concrete structures shall comply with guidelines ACI 503.4, ACI 546.1R, the AREA Manual for Railway Engineering (Fixed Properties) and the AASHTO Manual for Bridge Maintenance.	C	
0512	Structural Steel		
0512-1	Buildings and Other Structures		
	Structural steel for buildings and other structures shall comply with the following:		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • UBC • AISC S326 • AISC M011 		
0512-2	Light-Gauge Steel		
	Light-gauge steel shall comply with AISI Specifications for the Design of Cold-Formed Steel Structural Members.		
0521	Steel Joists		
	Steel joist floor and roof construction shall comply with the SJI Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders.		
0760	Flashing and Sheet Metal		
0760-1	Sheet Metal Roofing		
	Sheet metal roofing shall comply with UBC Chapter 32 for roof construction and covering, UBC Chapter 45 for marquees roof construction, and UBC Chapter 23 for roof design and wind design.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0810	Metal Doors and Frames		
0810-1	Steel Doors and Frames		
	Hollow steel doors and frames shall comply with SDI 100 and SDI 108.	TBD	SDI 100 is referenced in spcs. Need copy of SDI 100 to verify.
	Insulated steel door systems shall comply with ISDSI 102.	TBD	Spec refers to ASTM C236. Need copy of ISDSI 102.
0830	Special Doors		
	Single-leaf double-acting doors shall have vision panels. Single-leaf double-acting doors shall not be used except as interior personnel passage doors between work spaces that have no security requirements, that have relatively few people, and that do not receive, store, or transfer hazardous, critical, or fragile material or equipment.	N/A	There are no double-acting doors in the project.
	Where a single-leaf double-acting door is functionally needed but otherwise unacceptable, one of the following shall be used:	N/A	There are no double-acting doors in the project.
	<ul style="list-style-type: none"> • A pair of manually- or automatically-operated single-acting doors, with each door swinging in a different direction. • An automatic single horizontal sliding door or pair of horizontal sliding doors. 		
	Pairs of double-acting doors shall have a vision panel in each leaf.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>Pairs of double-acting doors shall not be used except as interior passage doors between industrial type areas that have no security requirements, that have relatively few people and little cross traffic, and that do not receive, store, or transfer hazardous, critical, or fragile material or equipment.</p> <p>Where a pair of double-acting doors is functionally needed but otherwise unacceptable, one of the following shall be used:</p> <ul style="list-style-type: none"> • Two pairs of single-acting doors, with each pair swinging in a different direction. • A pair of automatic sliding doors. • An automatic overhead coiling door. 		
0833	Coiling Doors.		
	Exterior overhead rolling curtain doors shall be fully weatherstripped.		
0836	Sectional Overhead Doors.		
	Sectional overhead doors shall comply with ANSI A216.1.		
0870	Hardware.		
	Door and window hardware shall comply with the ANSI A156 series.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>The preparation of doors and frames for the installation of bolts, closers, latches, locks, pivots, and strikes shall comply with the ANSI A115 series.</p> <p>Keying systems for new and renovated facilities and new additions shall be coordinated with existing facilities on a site.</p> <p>Doors that are part of a fire-rated wall assembly, and exterior swinging doors that open out shall have door closers.</p> <p>Zinc hardware shall not be used.</p> <p>The locks on at least one door of any room shall be equipped to prevent personnel from being locked inside, except as otherwise required to satisfy DOE safeguards and security standards.</p>		
0900	Finishes		
0900-99	Special Facilities		
0900-99.0	Nonreactor Nuclear Facilities-General		
	<p>Rounded corners and epoxy coated concrete walls and floors shall be considered for nuclear materials storage and work areas.</p>		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	In addition to the coating requirements provided in Section 0950, Acoustical Treatment, the design professional shall consider the coating guidelines in ASTM D4256 and ANSI N512 for facilities that require coatings to enhance decontamination of surfaces or because of environmental conditions.		
Division 11	Equipment		
1100	General		
	Equipment specifications shall reflect standard, commercially available equipment that allows a reasonable range of competitive bidding. At least three companies shall be capable of manufacturing equipment.		
	Major equipment, e.g., boilers and chillers, shall have a satisfactory commercial or industrial operations experience of at least 6,000 operating hours prior to bid opening.		
	Special equipment that is not a standard product of a recognized manufacturer or is not offered competitively shall not be used unless it complies with 48 CFR 10.		
	Full-load and part-load energy efficiencies shall be given special consideration in evaluating equipment performance. (Refer to ASHRAE Standard 90 and Section 0110-12, Energy Conservation.)		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
Division 13	Special Facilities		
1300	General Requirements		
1300-1	Coverage and Objectives		
1300-1.3	Objectives		
	The design of special facilities shall:		
	<ul style="list-style-type: none"> • Protect the public and facility personnel from hazards associated with the use of radioactive and other hazardous materials as a result of normal operations, anticipated operational occurrences, and DBA conditions, including the effects of natural phenomena pertinent to the site, and maintain these effects ALARA. • Ensure compliance with DOE policies regarding nuclear safety, criticality safety, radiation safety, explosives safety, industrial safety, fire protection, environmental protection, and safeguards and security protection for special nuclear material. • Protect government property and essential operations from the effects of potential accidents. 		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> Minimize exposures of personnel and the general public to hazardous materials by emphasizing ALARA concerns during all design, construction, and operational phases of special facilities. 		
	<p>The design of new or modification of existing special facilities shall address the health hazards represented by all hazardous materials in enclosures, general work areas, and noncontaminated areas.</p>		
	<p>The release of hazardous materials under normal operating conditions and anticipated operational upset occurrences shall be designed to be less than release guideline limits contained in applicable orders, regulations, and requirements.</p>		
	<p>In addition, to the extent practical, such releases shall be maintained ALARA..</p>		
	<p>Consideration shall be given to the frequency of occurrence and the effects of DBAs in the design features of special facilities. The depth of the risk analysis involved in this consideration should be in some measure proportional to the level of risk at the facility under consideration.</p>		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Protection of employees within the facility and at nearby facilities shall be a requirement in all aspects of the design. Protection shall be provided for normal operation and for those accidents that can be anticipated as occurring during the facility lifetime such as radioactive materials spills and small fires controlled by the facility fire suppression system.		
	Occupational exposure to radiation shall be limited according to the directive on Requirements for Radiation Protection in the DOE 5480 series.		
	Design goals shall be established to maintain radiation exposure of employees ALARA.		
	The nature of the hazardous materials in the facility including radionuclides, shall be considered in the assessment of potential employee exposure.		
1300-1.4	Guidance on Limit Exposure of the Public		
1300-1.4.1	General		
	The confinement of hazardous materials produced, processed, or stored in special facilities shall be designed to minimize dose to a maximally exposed member of the public.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
1300-1.4.2	<p>Accidental Releases</p> <p>Releases of hazardous materials postulated to occur as a result of DBAs shall be limited by designing facilities such that at least one confinement system remains fully functional following any credible DBA (i.e., unfiltered/unmitigated releases of hazardous levels of such materials shall not be allowed following such accidents).</p> <p>Facility design shall provide attenuation features for postulated accidents (up to and including DBAs that preclude offsite releases that would cause doses in excess of the DOE 5480 series limits for public exposure.</p> <p>To the extent practical, ALARA concepts shall be applied when designing special facilities to mitigate post-DBA releases of hazardous materials.</p>		
1300-1.4.3	<p>Routine Releases</p> <p>The annual dose resulting from postulated, planned, or expected releases from the proposed facility shall be considered in combination with the annual doses resulting from planned or expected releases from other facilities at the same site.</p>		

TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
	The sum of the doses from the site shall be limited according to <i>DOE Radiation Standards of Protection of the Public in the Vicinity of DOE Facilities</i> , or subsequent guidance included in the directive on <i>Radiation Protection of the Public and the Environment</i> in the DOE 5480 series.		
1300-1.4.4	Releases shall be monitored in accordance with the directive on Radiological Effluent Monitoring and Environmental Surveillance in the DOE 5400 series.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
1300-2	Safety Analysis.		
	Safety analysis shall comply with DOE 5481.1B.		
1300-3	Safety Class Criteria		
1300-3.1	General.		
	Special facility components, systems, and structures shall be designed, fabricated, erected, and tested to standards and quality commensurate with the hazards and potential consequences associated with both the facility and the role of each component, system, and structure in mitigating the consequences of DBAs.		
1300-3.2	Safety Class Items.		
	Safety class items shall be subject to appropriately higher-quality design, fabrication, and industrial test standards and codes such as those specified in Sections 0106 and 0109, the increase the reliability of the item and allow credit to be taken for its capabilities in a safety analysis.		
	Safety class items shall be designed to the <i>ASME Boiler and Pressure Vessel Code</i> (Section III, Class II) or to other comparable safety-related codes and standards that are appropriate for the system being designed.		
	Safety class and non-safety class items shall comply with Section 0140, Quality Assurance.		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>The design of systems, components, and structures that are not safety class items shall, as a minimum, be subject to conventional industrial design standards, codes, and quality standards.</p> <p>Failure of these items shall not adversely affect the environment or the safety and health of the public. In addition, their failure shall not prevent safety class items from performing their required functions.</p>		
1300-3.3	Single Failure Criterion and Redundancy.		
	<p>The design shall ensure that a single failure does not result in the loss of capability of a safety class system to accomplish its required safety functions.</p> <p>To protect against single failures, the design shall include appropriate redundancy and shall consider diversity to minimize the possibility of concurrent common-mode failures of redundant items.</p>		
1300-3.4	Equipment Environment Considerations.		
1300-3.4.1	General.		
	<p>Safety class items shall be designed to withstand the effects of, and be compatible with, the environmental conditions associated with operation, maintenance, shutdown, testing, and accidents.</p>		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>The environmental capability of equipment shall be demonstrated by appropriate testing, analysis, and operating experience, or other methods that can be supported by auditable documentation, or a combination of these methods.</p>		
1300-3.4.2	<p>Environmental Qualification of Equipment.</p> <p>Equipment qualification shall provide assurance that safety class items will be capable of performing required safety functions under DBA conditions.</p> <p>The qualification shall demonstrate that the equipment can at least perform for the period of time that its safety functions are required. Subsequent equipment failure, after its safety function is no longer required, may be allowable.</p> <p>Temperature, pressure, and humidity environments shall be based on the most severe postulated accident affecting the particular item.</p> <p>The postulated environment shall reflect an environment that considers both radiological composition and chemical composition of all material physical forms likely to affect the equipment.</p>		
1300-3.5	<p>Maintenance.</p> <p>Facility design shall provide for routine maintenance, repair, or replacement of equipment subject to failure.</p>		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>Safety class items shall be designed to allow inspection, maintenance, and testing to ensure their continued functioning, readiness for operation, and accuracy.</p> <p>Ancillary equipment, such as pumps, blowers, motors, compressors, gear trains, and controls, shall be located in an area least likely to be contaminated.</p>		
1300-3.6	<p>Testing</p> <p>The design shall include provisions for periodic testing of monitoring, surveillance, and alarm systems.</p> <p>In addition, the design shall provide the capability to test periodically, under simulated emergency conditions, safety class items that are required to function under emergency conditions.</p> <p>All systems for which credit is taken to meet the criteria of Section 1300-1.4.2, Accidental Releases, shall be in-place, testable in terms of pressure, filtration, or removal efficiency, alarm capability, leak resistance, and the like.</p> <p>Safety class items shall be designed to be testable on a regular schedule.</p> <p>The facility design shall allow for routine in-place testing of HEPA filtration systems as outlined by ASME N510.</p>		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
1300-4	Nuclear Criticality Safety		
	<p>An assessment of a design shall be made as early as practical to determine if the potential for nuclear criticality exists. When such a potential exists, the design of nuclear criticality control provisions, including equipment and procedures, shall meet, as a minimum, the requirements of DOE 5480.5 and the ANS 8 series on Nuclear Criticality Safety.</p>		
	<p>The design shall ensure that material shall not be displaced or allowed to accumulate to form a critical mass in the event of an internal or external accident. The design shall emphasize geometrically favorable compartments or spacing to minimize reliance on administrative control, and shall prevent the unsafe accumulation of moderator or reflection materials (e.g., water from a fire sprinkler system). Also, heating or cooling jackets in the safe dimension of geometrically safe vessels shall preclude a leak in the jacket that causes an increase in the system's reactivity.</p>		
	<p>Process designs shall incorporate sufficient factors of safety so that at least two unlikely and independent concurrent changes must occur in process conditions before a criticality accident is possible.</p>		

**TABLE 2. FACILITY - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA", DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>Structures, systems, and components that provide nuclear criticality safety shall be designed as safety class systems and be capable of performing their criticality safety functions during and following design basis accidents and events. A criticality monitoring and alarm system (gamma and/or neutron) shall be provided where necessary to meet the requirements of DOE 5480.5 and ANS 8.3.</p>		
	<p>Nuclear criticality safety shall be controlled, in decreasing priority, by geometric spacing, density and/or mass limitation, fixed neutron absorber, soluble neutron absorber, and administrative control. The design of the facility shall emphasize engineered safeguards and shall not rely strictly on administrative controls.</p>		
	<p>Process systems shall be designed to prevent the carryover of fissile material and other material capable of sustaining a chain reaction from geometrically favorable portions of the facility to other areas.</p>		
	<p>A system of positive control and backflow prevention, such as air gaps (siphon breakers) shall be used to prevent inadvertent transfer of fissile material and other material capable of sustaining a chain reaction from geometrically favorable or poisoned containers to unsafe containers.</p>		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0110-99.0	Nonreactor Nuclear Facilities - General		
0110-99.0.1	General		
	<p>The type and level of hazard shall be determined for each functional area of the special facility, the attendant degree of risk established, and the possibility of cross-contamination considered. Wherever possible, areas for work with radioactive or other hazardous contaminants shall be possible, areas for work with radioactive or other together to simplify solutions to problems of air supply and exhaust, waste disposal, decontamination, and cross-contamination.</p>		
0110-99.0.2	Building Services and Distribution		
	<p>Vertical chases shall be provided with fire cutoffs, preferably at each floor level and at the enclosing partitions, consistent with the building construction code classification.</p> <p>To ensure both the safety of personnel and the effective administration and control of special facilities, access to hazardous areas (e.g., hazardous gas storage locations and electrical power and distribution panels) shall be controlled by locked gates, doors, power panels, or other physical barriers.</p>		

C = Conformance
 NC = Nonconformance
 N/A = Not Applicable
 TBD = To Be Determined

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Suitable access doors or removable panels shall be provided in service chases for access to valves, dampers, and so forth.		
	To ensure both the safety of personnel and the effective administration and control of special facilities, access to hazardous areas (i.e., hazardous gas storage locations and electrical power and distribution panels) shall be controlled by locked gates, doors, power panels, or other physical barriers.		
0111	Structural Design Requirements		
0111-1	General		
	Materials, framing systems, and details shall be compatible with the following:		
	• Clear space and span requirements.		
	• Serviceability requirements.		
	• Clear space and span requirements.	C	Materials clear span from exterior wall to dividing wall of each functional area.
	• Serviceability requirements		
	• Applicable fire protection requirements.	C	Materials are non-combustible and meet fire rating requirements.
	• Security requirements.		
	• Foundation conditions.	C	Foundation design in agreement with geotechnical report.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Future expansion requirements. • Architectural treatment. • Climatic conditions. • Structural design loads for the specific facility and location. 	C	Structural loads are in accord with the facility requirements and location.
	The structural design drawings shall indicate the design criteria, the structural materials and their strengths with applicable material standards, the design loads including loads that can occur during construction, and the allowable foundation loads that were used in the design.	C	The design information will be shown on the first structural drawing or in the Technical Provisions per LANL standard procedures.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Where earthquake resistance is required, the cognizant DOE authority should consult LBL-9143 for practical guidelines for engineering earthquake safety and management planning and technical procedures for design of new facilities or evaluation of existing ones.	TBD	Earthquake design performed in accord with UCRL 15910 requirements. Need a copy of ??-9143 to determine information.
0111-2	Loads.		
0111-2.1	General Requirements.		
	Structures and their elements shall be designed for the loads prescribed in these criteria.	C	
0111-2.2	Dead Loads.		
0111-2.2.1	General.		
	Dead loads shall include the weights of all permanent materials and equipment, including the structure's own weight, supported in, or on, a structure.	C	
	Load calculations shall include an allowance for any loadings anticipated to be added at a later date.	C	Lab standards require 10 psf on all floors/ceilings for future piping/ductwork loads.
	Initially assumed loads shall be revised so that the final design reflects the configuration shown on the drawings.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.2.2	Unit Weights		
	The unit weights of materials and construction assemblies for buildings and other structures shall be those given in ANSI A58.1. Where unit weights are neither established in that standard nor determined by test or analysis, the weights shall be determined from data in manufacturers' drawings or catalogs.	C	
	The unit weights of materials for highway structures shall be those given by AASHTO standards. The unit weights for railway structures shall be those given in AREA Manual for Railway Engineering (Fixed Properties).	N/A	
0111-2.2.3	Service Equipment		
	Design dead loads shall include the weight of all permanent service equipment.	C	
0111-2.2.4	Allowance for Partition Loads.		
	The minimum allowance for the weights of partitions, where partitions are likely to be rearranged or relocated, shall be as follows:	C	Non load bearing partitions are designed for interior pressure differential across the wall.
	<ul style="list-style-type: none"> • For partition weights of 150 plf or less, an equivalent uniform dead load of 20 psf shall be used. • For partition weights above 150 plf, the actual linear loads shall be used. 		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.3	Live Loads.		
0111-2.3.1	General.		
	Live loads shall include all loads resulting from the occupancy and use of the structure, whether acting vertically down, vertically up, or laterally.	C	ANSI A58.1 was used for snow loads on roofs. (30 pst ground snow load.)
	Live loads shall include neither dead loads nor loads from the environment, such as wind, tornado, earthquake, thermal forces, earth pressure, and fluid pressure.	C?	Design loads meet this requirements.
0111-2.3.2	Buildings and Other Structures.		
	Live loads for buildings and other structures shall be those produced by the intended use or occupancy. In no case shall they be less than the minimum uniform load or concentrated load stipulated in ANSI A58.1.	C	
	Live loads on roofs shall be as stipulated in ANSI A58.1. They shall include the minimum roof live loads or the snow loads and snow drifts or possible rain loads stipulated therein, whichever produces the more severe effect.	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.4	Wind Loads.		
0111-2.4.1	General.		
	The structural frame and exterior components of all buildings, signs, tanks, towers, and other exposed structures shall be designed to resist pressures due to wind assumed to act from any direction.	C	UCRL 15910 was used for wind load analysis.
0111-2.4.2	Buildings and Other Structures.		
	Wind load design for buildings and other structures shall be determined in accordance with procedures in ANSI A58.1 with the basic wind speed being obtained from UCRL 15910.	C	
	The basic wind speed shall be derived from DOE site-specific hazard model studies summarized in UCRL 53526, Rev. 1. If site-specific hazard model studies are not available, a hazard model shall be developed that is consistent with the approach used in UCRL 53526, Rev. 1.	C	
	The basic wind speeds for any specific site shall be determined following the procedures in UCRL 15910, except that Exposure "C" should be used for all construction unless it can be shown that the necessary permanent shielding will be provided by natural terrain (not including shielding from trees or adjacent buildings).	N/A	Site specific data are available for use.
	To determine the design wind loads, all factors and coefficients stipulated in ANSI A58-1 shall be applied to the site-specific basic wind speeds.	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Building additions shall be designed as parts of a totally new building without regard to shielding from the original building and without regard to lesser wind resistance for which the original building may have been designed.	C	
	The possibility that the original portion of the building may require strengthening due to an increase in the wind loads acting on it shall be considered.	NC	This was not a part of the scope of work assigned to the design A-E.
0111-2.6	Internal Shock and Blast Loads		
	Building structures (excluding explosive facilities) that house operations that may release energy from rupture of equipment or explosions, either inadvertently or purposely (such as testing), shall be designed to control the resulting internal shock pressure loads per applicable criteria.	N/A	
0111-2.7	Earthquake Loads.		
	The basic seismic parameters shall be derived from DOE site-specific hazard model studies summarized in UCRL 53582. In applying UCRL 53582, specific guidance on relating frequency of occurrence to facility hazard levels shall be obtained from UCRL 15910.	C	
	Earthquake load designs for buildings and other structures shall be determined in accordance with the procedures contained in the UBC and UCRL 15910.	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The provisions and design procedures of TM 5-809-10 for the application of seismic loadings to conventional buildings shall also apply.	N/A	
	Facilities for radioactive material handling, processing, or storage, shall require application of dynamic analysis in determining structural requirements for earthquake loading as stipulated in section 0111-99.0.		See Section 0110-99.0.
	An independent review of the seismic design shall be made for facilities and buildings where a seismic event can have a potential risk to operator lives, to public safety, or of large economic loss.	C	Laboratory personnel review the design criteria, calculations and final construction drawings.
	The review shall be made in two stages, the first at the end of preliminary design and the second before final design is complete.	C	
0111-2.7.1	Buildings and Other Structures		
	The basic seismic parameters shall be derived from DOE site-specific hazard model studies summarized in UCRL 53582. If site-specific hazard model studies are not available, a hazard model shall be developed that is consistent with the approach used in UCRL 53582. In applying UCRL 53582, specific guidance on relating frequency of occurrence to facility hazard levels shall be obtained from UCRL 15910.	C	A specific model is available for Los Alamos.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Earthquake load design for buildings and other structures shall be determined in accordance with the procedures contained in the UBC and UCRL 15910. The provisions and design procedures of TM 5-809-10 for the application of seismic loadings to conventional buildings shall also apply. For critical facilities, the provisions and design procedures of TM 5-809-10.1 shall be used.	C	The criteria specified in UCRL 15910 were used for the design of this structure.
	Facilities for radioactive material handling, processing, or storage, and other facilities having high value or vital importance to DOE programs that are classified as critical facilities, shall require application of dynamic analysis in determining structural requirements for earthquake loading as stipulated in Section 011-99.0, Nonreactor Nuclear Facilities-General.	C	Dynamic analysis was utilized in accord with UCRL 15910 criteria for medium hazard classification.
	An independent review of the seismic design shall be made for facilities and buildings where a seismic event can have a potential risk to operator lives, to public safety, or of large economic loss. The review shall be made in two stages, the first at the end of preliminary design and the second before final design is complete. For additional guidance on independent reviews, see LBL-9143 and UCRL 15910.	C	BJI personnel and Laboratory reviewers performed this function.
0111-2.8	Other Loads for Buildings and Other Structures.		
0111-2.8.1	Vibratory Loadings.		
	Equipment supports shall be designed to avoid resonance resulting from the harmony between the natural frequency of the structure and the operating frequency of reciprocating or rotating equipment supported on the structure.	N/A	The natural frequency of the reinforced structure is very low compared to the vibrations endured by fans and motors.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The operating frequency of supported equipment shall be determined from manufacturer's data prior to completion of structural design.	C	
	Resonance shall be prevented by designing equipment isolation supports to reduce the dynamic transmission of the applied load to as low a level as can be economically achieved in the design.	C	
0111-2.8.2	Earth Pressures.		
	Every foundation wall or other wall serving as a retaining structure shall be designed to resist, in addition to the vertical loads acting on it, the incident lateral earth pressures.	C	
	Retaining walls shall be designed for earth pressures producing the highest stresses and overturning moments.	C	
	In cohesive soils, the long-term consolidation effects on the stability of the walls shall be considered.	N/A	
	Lateral earth pressures shall be determined in accordance with accepted structural and geotechnical engineering practice.	C	
0111-2.8.3	Fluid and Gas Pressures.		
	The design of components of buildings and other structures shall include the effects of fluid and gas pressures, both internal and external.	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-2.8.4	Thermal Forces.		
	The design of structures shall include the effects of stresses and movements resulting from variations in temperature.	NC	The process area is designed as a monolithic structure for control of exhaust. The support area is separate from the existing.
	The design shall provide for the lags between air temperature and the interior temperatures of massive concrete members or structures.	NC	
0111-2.8.5	Creep and Shrinkage Forces.		
	Concrete and masonry structures shall be investigated for stresses and deformations induced by creep and shrinkage.	C	
	For concrete and masonry structures, the minimum linear coefficient of shrinkage shall be assumed to be 0.0002 inch/inch unless a detailed analysis is undertaken.	C	
	The theoretical shrinkage displacement shall be computed as the product of the linear coefficient and the length of the member.	C	
0111-2.10	Combination of Loads and Design Requirements for Buildings and Other Structures.		
	Combination of loads, allowable stresses, and strength requirements for buildings and other structures shall be as stipulated in the UBC, except as otherwise indicated in 0111-99.	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-3	Structural Systems for Buildings and Other Structures.		
0111-3.1	Framing.		
	Buildings shall be framed to allow for simple formwork, fabrication, and construction procedures.	C	
	Structural systems shall be designed for ductile modes of failure to the extent feasible.	C	Structural analysis was performed in accord with UCRL 15910 for intermediate hazard classification.
	In the selection of a particular framing system, consideration shall be given to the structure's functional requirements, including:		
	<ul style="list-style-type: none"> • Column-free areas. • Floor-to-ceiling heights. • Number of stories. • Elevator, crane, or hoist installations. • Heavy loads. 	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> Other particular requirements pertaining to the specific facility. 		
0111-3.2	Floors.		
	Where the first floor use concrete slab-on-grade construction, the slab shall be placed on a free-draining aggregate base overlying a compacted subgrade.	C	
	A plastic vapor barrier shall be used under the slab where moisture conditions warrant.	C	According to the geotechnical report, moisture conditions requiring a vapor carrier are not present.
	Excessive loads or equipment subject to vibration shall be supported by separate pads isolated from the rest of the floor slab with flexible joints.	N/A	
0111-3.3	Control Joints.		
	Control joints shall be designed and placed in such a manner as to avoid structural distress and uncontrolled cracking from thermal expansion and contraction, concrete shrinkage, and movements due to wind and earthquake forces.	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-3.4	Foundations.		
0111-3.4.1	General Requirements.		
	The provisions of the UBC shall be the minimum requirements for foundation design. The potential adverse effects of frost heave and movements due to expansive soils shall also be considered in the design.	C	
	For all structures, section 0201 shall be complied with to determine subsurface conditions, recommended foundation type, allowable design soil bearing pressure, seismic potential, and differential settlement.	C	
0111-3.4.2	Foundation Vibrations.		
	Analysis of foundation vibrations, design to avoid resonance, and vibration and shock isolation, where required, shall be in accordance with Chapter 1 of DM 7.03.	N/A	
	Where floor-mounted special facilities equipment will have a commonality of use, it shall be centrally located with respect to special facilities operations.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>The design of structures, including their supports, that are confinement system barriers shall ensure satisfaction of the functional requirements for the specific confinement system they are part of. In addition, safety class confinement barriers (barriers whose continued integrity is shown by a safety analysis to be required following severe natural phenomena, including DBE, and man-made events) shall be designed to withstand secondary events as well as primary events. Potential secondary events might be fire, explosion, or nuclear criticality caused by the DBE.</p>		
0111-99	Special Facilities.		
0111-99.0	Nonreactor Nuclear Facilities - General.		
0111-99.0.1	General.		
	Safety class items required to function during or following severe natural phenomena shall not be prevented from performing their required safety functions by the failure of components, systems, or structures that are not designed to the severe natural phenomena criteria.	TBD	
	The type of severe events to be considered will vary among sites; however, earthquakes, tornados, straight winds, and floods shall be addressed.	C	
	Facilities containing plutonium, other radioactive material, or other material that would be likely to produce significant health or safety hazards shall be evaluated as to the degree of risk, and more stringent criteria applied in structural design, as necessary.	TBD	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Many buildings are subject to additional future ceiling-roof equipment loadings. In planning and designing buildings for special facilities, consideration shall be given to providing for a future 10 to 20 psf additional structural loading.	C	LANL design procedures use 10 pst for future mechanical loads.
	Where floor-mounted special facilities equipment will have a commonality of use, it shall be centrally-located with respect to special facilities operations.	C	The equipment is located in accord with the user's directions.
	Floor loadings and location of equipment and projections of future additional equipment requirements and their floor loadings shall be considered and provided for in structural planning and design.	C	Floors are designed for a forklift load or uniform live load, whichever is greater.
	The design of structures, including their supports, that are confinement system barriers shall ensure satisfaction of the functional requirements for the specific confinement system of which they are a part.	C	
	In addition, safety class confinement barriers (barriers whose continued integrity is shown by a safety analysis to be required following severe natural phenomena, including the DBE, and man-made events) shall be designed to withstand secondary events as well as primary events.	TBD	
0111-99.0.2	Tornado and Extreme Wind		
	Determination of Design Basis Tornado		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	DOE site-specific hazard model studies summarized in UCRL 53526, Rev. 1, shall be used to select the DBT and extreme wind characteristics for the design of structures.		
	In applying UCRL 53526, Rev. 1, specific guidance on relating frequency of occurrence to facility hazard levels shall be obtained from UCRL 15910.	N/A	
	Tornado Analysis		
	In designing for tornado or extreme wind resistance:	N/A	
	<ul style="list-style-type: none"> The tornado rotational speed shall be appropriately combined with the translational speed. Resulting loads from the rate of pressure drop, taking into consideration any pressure equalization due to permissible venting, shall be combined with velocity-induced pressure loads as stipulated in UCRL 15910. UCRL 53526, Rev. 1, provides the characteristics of typical potential tornado-generated missiles. Additional missiles may be identified from review of on-site sources and possible missiles that could be borne to the site by a tornado. Both small high-velocity missiles and massive low-velocity missiles shall be considered separately in terms of penetration, perforation, or crushing effects. The horizontal and vertical velocities of the missiles shall be combined in the design. 		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> The minimum wind speed used shall be 70 mph. 		
	<p>Loads resulting from the DBT shall be assumed capable of occurring at any time. However, for design purposes, DBT loads need not be assumed to occur simultaneously with other severe site-related events such as an earthquake, fire, or flood, except where the simultaneous occurrence is related (e.g., fire from lightning or other wind-related causes).</p>	N/A	UCRL 15910 specifies design basis wind velocities which do not include Tornadoes for this building classification.
0111-99.0.3	<p>Floods</p> <p>The design loads from flooding shall comply with UCRL 15910. In calculating design loads from flooding, a conservative approach shall be taken to ensure that the loads used in the design are as follows:</p> <ul style="list-style-type: none"> Greater than the maximum historic levels recorded for the site No less than the probable maximum flood (PMFL) 		
0111-99.0.4	<p>Earthquakes</p> <p>General</p> <p>The systems, components, and structures that shall be designed to meet these special facility criteria shall be identified through a written evaluation (see Section 0111-99.0.1, General). Such systems, components, and structures shall be designed to provide their passive or active functions as required by the SAR in accord with their designated safety classes.</p>		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Such systems, components, and structures shall be designed to provide their passive or active functions as required by the SAR in accord with their designated safety classes.	C	
	Site-specific seismic parameters shall be determined for a DBE. The SSE shall be equivalent to the DBE.		
	New seismic design, including additions or modifications to existing structures, shall be reviewed by a qualified, independent organization. This review must include evaluation of the design approach, the lateral force resisting system, and the design detailing, per UCRL-15910. TM-5-809-10 can be used for design detail guidance.		
	Earthquake Occurrence		
	The DBE shall be assumed capable of occurring at any time, except that the simultaneous occurrence with any other limiting site-related event such as a tornado, fire, or flood need not be considered for design purposes, except where the joint occurrence is causally related (e.g., fire or flood).		
	Determination of DBE		
	Generally, a DBE shall have a ground acceleration of 0.1g or greater. To determine the DBE, site-specific earthquake hazard models and response spectra given in UCRL 53582, Rev. 1, shall be used to select the appropriate seismic ground acceleration. Design guidance in UCRL 15910 shall be used in applying UCRL 53582, Rev. 1.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The DBE shall be defined by design response spectra, appropriate for the site, or by acceleration time histories, representative of the anticipated ground motions.		
	The ratio of vertical-to-horizontal acceleration shall be two-thirds, unless site-specific data justify use of a different ratio.		
	Seismic Analysis		
	The adequacy of systems, components, and structures to withstand a seismic event shall be verified by a dynamic analysis, except where it can be demonstrated that the use of a simplified approach, such as static load method, component testing, or a combination of testing and analysis provides assurance of adequate seismic design.		
	The ratio of vertical-to-horizontal acceleration shall be two-thirds, unless specific data justify use of a different ratio.		
	The use of earthquake experience data is an acceptable approach to the seismic qualification of safety class items. If experience data are used for seismic qualification, the following shall be considered:		
	<ul style="list-style-type: none"> Safety class equipment shall be essentially identical to the equipment that has data in the experience data base (i.e., this comparison should take into account the manufacturer, vintage, and general configuration of such equipment). 	N/A	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> Equipment shall be mounted and anchored in essentially an identical fashion as that for the experience data base equipment. 	N/A	
	Consideration of the above and an independent review of this consideration must be adequately documented.		
0111-99.0.5	Aircraft		
	Unless the safety analysis can demonstrate that the risk from an aircraft crashing into the facility is acceptable, potential aircraft crashes shall be considered among the spectrum of man-made missiles that confinement structures shall be designed to withstand or against which they shall be protected.		
0111-99.0.6	Nearby Explosions and Externally Generated Missiles		
	The potential effects of a major explosion at a nearby facility or transportation route shall be considered among the spectrum of external blast effects and missiles that confinement structures shall be designed to withstand or against which they shall be protected.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0111-99.0.7	Explosion, Internal Pressurization, Criticality, and Other DBA Causes		
	The probable consequence of DBAs involving internally generated missiles or blast effects shall be considered. Such DBAs typically involve failure of high-speed rotating machinery, cranes, experimental facilities, high-energy fluid system components, or explosives. Structures required to function following such accidents shall be designed to withstand these DBAs.		
0111-99.0.8	Load Combinations		
	Safety class structures and structural members shall be designed to resist the appropriate load combinations provided in UCRL 15910.		
	Concrete Structures		
	Concrete structures and structural members for safety class concrete structures shall meet the design and construction requirements of ACI 349 for new construction or original (or equivalent) codes for existing construction providing the margin of safety of the overall facility is maintained.		
	Steel Structures		
	Safety class steel structures shall meet the design, fabrication, and erection requirements of AISC N690 for new construction or original (or equivalent) codes for existing construction providing the margin of safety of the overall facility is maintained.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0201-4	<p>Foundation Engineering Evaluation and Recommendations</p> <p>The soils engineer shall analyze the information developed by investigation or otherwise available, including any aspect of the soil conditions that might affect design and construction of proposed structures, and shall consult with the engineer on the design requirements of the project.</p> <p>The soils engineer shall submit a professional evaluation, recommended construction specifications, and recommendations including the following where applicable:</p> <ul style="list-style-type: none"> • Foundation support of the structure and slabs, including soil bearing pressures, bearing elevations, foundation design recommendations and anticipated settlement • Soil material and compaction requirements for site fill, construction backfill, and for the support of structures and pavement • Recommendations and design criteria for shoring and underpinning systems • Seismic activity • Analysis of the effect of weather and construction equipment on soil during construction 		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Analysis of sills to ascertain presence of dispersive potentially expansive, deleterious, chemically active or corrosive materials or conditions, or presence of gas • Recommendation of the most proper foundation system and other alternative workable systems 	C	
0220	Earthwork		
0220-1	General		
	Earthwork includes excavating, filling, stabilizing, and compacting earth at the site. Earthwork includes the addition of borrow and disposal of excavated material.	C	Optimum density shall be in accordance with ASTM D1557. Soil compaction shall be 75% of maximum density.
0220-2	Subsurface Data		
	Prior to earthwork design, the design engineer shall confer with the soils engineer to define subsurface investigation recommendations required in accordance with Section 0201, Subsurface Investigations.	C	Pan-Am World Services geotechnical investigation meets this requirement.
0220-3	Design		
	The earthwork design and specification shall comply with the recommendations in the project subsurface investigation.	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0235	Building Foundations		
0235-1	General		
	Building foundations shall be designed in accordance with the requirements of the UBC and ACI 318.		
0235-2	Foundation Design Criteria		
0235-2.1	General		
	The design professional shall consider alternate types of foundations for the bearing capacity and total differential settlements.		
	Based on preliminary information concerning the purpose of the structure, foundation loads, and subsurface soil conditions, the design professional shall consider alternative types of foundations for the bearing capacity and total and differential settlements.		
0235-2.2	Adverse Subsurface Conditions		
	One of the following procedures shall be used to ensure satisfactory foundation performance where poor soil conditions are encountered:		
	<ul style="list-style-type: none"> • Bypass the poor soil by means of deep foundations extending to or into a suitable bearing material • Design structure foundations to accommodate anticipated differential settlements 		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Remove the poor material, and either treat and replace it or substitute good compacted fill material • Treat the soil in place before construction to improve its properties. <p>Where reasonable alternative design foundation types are possible, preliminary designs shall be prepared for the purpose of detailed cost comparisons. These preliminary designs shall be sufficiently complete to determine the approximate size of footings, length and number of piles required, etc. The behavior of existing foundation types in the immediate vicinity to those proposed shall be ascertained during preliminary design. The long-term effects of subsurface conditions (bearing capacity and settlement) on each foundation type shall be considered. See Section 0201, Subsurface Investigations.</p>		
0235-2.3	Cost Estimates and Final Selection		
	Final foundation design shall not be initiated until the evaluation and cost comparison of the proposed alternatives have been completed. On the basis of tentative designs, the cost of each promising alternative shall be estimated. Estimate sheets shall include items, dimensions, quantities, unit material and labor costs.	C	
0235-3	Concrete		
	Concrete for building foundations shall be designed in accordance with Section 0330, Cast-In-Place Concrete.	C	Concrete foundations were designed in accord with ACI 318-83.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0300	Concrete		
0301	General Requirements		
0301-1	Buildings and Other Structures		
	Concrete materials, design, and construction for buildings and other structures shall comply with ACI 318 and 40 CFR 249.		
0310	Concrete Formwork		
	Formwork for concrete construction shall comply with ACI 347 and ACI SP-4.		
0320	Concrete Reinforcement		
0320-1	Materials for Reinforcement		
	Reinforcement materials for buildings and other structures shall comply with ACI 318; for highway structures, with the AASHTO HB-13; for railway structures, with the AREA Manual for Railway Engineering (Fixed Properties); for special facilities, with ACI 349 (see Section 0111-99.0, Non-reactor Nuclear Facilities - General).		
0320-2	Detailing of Reinforcement		
	Reinforcement details shall comply with ACI 352R and ACI SP-66 in addition to ACI 318 for buildings and other structures, the AASHTO HB-13 for highway structures, the AREA Manual for Railway Engineering (Fixed Properties) for railway structures.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0330	Cast-In-Place Concrete		
0330-1	Coverage		
	This section covers the selection of materials, proportioning of mixes, mixing, placing, testing, and quality control of cast-in-place concrete.		
0330-2	Materials, Testing, and Quality Control		
	Materials, testing, and quality control for cast-in-place concrete shall comply with ACI 318 for buildings and other structures, and with ACI 349 (see section 0111-99) for special facilities.		
	Tolerances for formed concrete shall be as suggested in ACI 347.		
0330-3	Selecting Proportions for Concrete Mixes		
0330-3.1	Normal, Heavyweight, and Mass Concrete		
	The selection of proportions for concrete mixes for normal, heavyweight, and mass concrete shall comply with ACI 211.1.	C	
0330-3.2	Structural Lightweight Concrete		
	The selection of proportions for structural lightweight concrete shall comply with ACI 211.2.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0330-4	Mixing, Transporting, and Placing		
	The mixing, transporting, and placing of cast-in-place concrete shall comply with ACI 304.		
0330-5	Climatic Considerations		
0330-5.1	Hot Weather Concreting.		
	Hot weather concreting shall comply with ACI 305 R.	C	
0330-5.2	Cold Weather Concreting.		
	Cold weather concreting shall comply with ACI 306 R.	C	
0330-6	Post-Tensioned Construction.		
	In addition to the provisions of Section 0330-2, Materials, Testing, and Quality Control, the PTI Post-Tensioning Manual may be used for the design and construction of post-tensioned concrete structures.	N/A	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0340	Precast Concrete.		
0340-2	General.		
	In addition to the provisions of Section 0301, General Requirements, precast concrete shall comply with the PCI MNL-116. PCI MNL-120 and PTI Post-Tensioning Manual may also be used as guides for the design and construction of precast concrete structures.	C	
0350	Cementitious Decks for Buildings		
0350-1	Coverage		
	This section covers materials, design, and construction of cementitious decks for building structures and prefabricated floor and roof systems such as:		
	• Precast reinforced concrete floor systems	C	
	• Precast and prestressed concrete floor systems	C	
	• Lightweight precast reinforced concrete planks	C	
	• Lightweight precast reinforced concrete channel slabs	C	
	• Precast concrete roof units	C	
	• Reinforced gypsum planks	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	• Structural cement fiber roof deck systems	C	
	• Reinforced poured gypsum over formboard roof systems	C	
0350-2	General		
	The materials, design, and construction of cementitious decks for buildings shall comply with the UBC and the manufacturer's recommendations.	C	
	In the event of a conflict between the UBC and the manufacturer's recommendations, the more stringent shall apply.	C	
0380	Mass Concrete.		
0380-2	General.		
	The selection of materials, mix proportioning, and construction methods and procedures for mass concrete shall comply with ACI 207.1R and ACI 207.4R.	N/A	
0400	Coverage		
	This division covers the design and construction of masonry structures other than highway and railway structures. It shall apply to unit masonry construction, reinforced and unreinforced, using cement, clay, and stone products, and including brick, block, and tile structures. The requirements of this division shall be used in conjunction with those of Section 0111, Structural Design Requirements.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0401	<p>General</p> <p>Materials, design, and construction of masonry structures shall comply with the UBC.</p> <p>The following sources may also be used as guides for the design of masonry structures:</p> <ul style="list-style-type: none"> • ACI 531 • ACI 531.1 • NCMA TR 75B • BIA Building Code Requirements for Engineered Brick Masonry <p>Masonry walls shall be insulated in compliance with Section 0721-1, Cavity Walls.</p>		
Division 5	Metals		
0512-1	Structural Steel		
0512-1	Buildings and Other Structures		
	Structural steel for buildings and other structures shall comply with the following:	C	UBC, and AISC M016 were used for design of structural steel.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • UBC • AISC S326 • AISC M011 - 8th edition AISC steel code 		
0512-2	Light-Gauge Steel		
	Light-gauge steel shall comply with AISI Specifications for the Design of Cold-Formed Steel Structural Members.	C	
0512-3	Pre-Engineered Metal Buildings		
	Pre-engineered buildings shall comply with MBMA Metal Building Systems Manual and Section 0111, Structural Design Requirements.		
	Where the use of the design loadings specified in Section 0111, Structural Design Requirements, would prevent procurement of pre-engineered metal buildings, consideration may be given to deviation from said loadings. Such consideration shall be based on review of the type of occupancy and functional requirements of the particular building and a determination as to whether such deviation could be justified and permissible in accordance with Section 0101-2, Criteria Deviations.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0514	Structural Aluminum		
0514-2	Use With Dissimilar Metals or Concrete		
	Aluminum shall be isolated in applications involving contact with dissimilar metals or with concrete. Isolation shall be achieved by use of coatings, paints, or separating materials.		
	The use of stainless steel in contact with aluminum, without isolation, is acceptable.		
0512-5	Steel Water Tanks, Standpipes and Reservoirs		
	Steel water tanks, standpipes and reservoirs shall comply with NFPA 22 and AWWA D100.	N/A	
0521	Steel Joists		
	Steel joist floor and roof construction shall comply with the SJI Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders.	C	
0532	Metal Fastening		
	Structural connections for buildings and other structures shall comply with the requirements of the UBC and AISC M011; for highway structures the requirements of AASHTO LTS-1; and for railway structures the requirements of AREA Manual for Railway Engineering (Fixed Properties).	C	Welded connections were designed in accord with AWS D1.1.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
Division 7	Thermal and Moisture Protection		
0710	Waterproofing		
0710-1	General		
0710-1.1	Use		
	Waterproofing shall be used at walls, floors, or other building elements that at any time are subject to hydrostatic pressure, are below the water table, or are liable to be immersed in water	C	According to the geotechnical report there is no water table with the depth of construction of the project. Waterproofing is required of the ?? area
	Waterproofing shall also be used at walls, floors, and other building elements to prevent water leakage from showers, built-in refrigerators and freezers, areas using water wash-down, containment areas, and other types of water basins.	TBD	Need reference standards
	Where water is to be contained, waterproofing shall extend up walls to above the expected high water level.	TBD	Need reference standards.
	Where water wash-down is used, waterproofing shall extend to fully cover the expected wall areas to be washed.	TBD	Need reference standards.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Wall, floor, slab-at-grade, and other building element waterproofing shall meet base course and through-the-wall flashings, and shall make a bond with these flashings; see Section 07145, Dampproofing.	TBD	Need reference standards.
0710-1.2	Materials and Construction		
	Concrete waterproofing shall comply with ACI Guide to the Use of Waterproofing, Dampproofing, Protective and Decorative Barrier Systems for Concrete.	TBD	Need reference standards.
	Concrete masonry waterproofing shall comply with NCMA Waterproof Coatings for Concrete Masonry and NCMA Waterproofing Concrete Masonry Basements and Earth-Sheltered Structures.	TBD	Need reference standards.
	Brick masonry waterproofing shall comply with BIA Dampproofing and Waterproofing Masonry Walls.		
0710-1.6	Drainage and Drainage Piping		
	Positive drainage away from the facility shall be provided.		
	Drainage piping shall be provided at the bottom of exterior walls where the amount and intensity of rain is significant. Drainage piping shall be provided at the bottom of exterior walls and under the waterproofing of slabs-at-grade where the water table at any time is at or near the level of the waterproofing.		

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>Drainage piping shall also be provided where any one or combination of the following conditions occur:</p> <ul style="list-style-type: none"> • Walls extend above grade in a plane more than 30 feet • Roof drains discharge directly at grade • Water runs directly off the roof • The unpaved grade does not slope sharply away from exterior walls • Lawn sprinklers are used 		
0750	Membrane Roofing		
0750-1	Design		
	Membrane roofing shall comply with UBC Chapter 32 for roof construction and covering, UBC Chapter 45 for marquee roof construction, and UBC Chapter 23 for roof design and wind design.	<p>C</p> <p>N/A</p> <p>TBD</p>	<p>UBC 32</p> <p>UBC 45</p> <p>UBC 23 - Mike Smith?</p>

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0750-2	Slope		
	Where a roof deck's slope, after considering deflection and construction tolerances, is less than the slope required for the roofing, the slope shall be increased the required amount by the addition of fill, or tapered insulation in accordance with NRCA Roofing and Waterproofing Manual, NRCA, Handbook of Accepted Roofing Knowledge, and manufacturers' recommendations.	C	Roof slopes are nominally ½" per feet. Need reference standards to verify compliance.
0760	Flashing and Sheet Metal		
0760-1	Sheet Metal Roofing		
	Sheet metal roofing shall comply with UBC Chapter 32 for roof construction and covering, UBC Chapter 45 for marquees roof construction, and UBC Chapter 23 for roof design and wind design.		
0760-2.3	Drains, Gutters, and Accessories		
0760-2.3.1	General		
	Roof drains and gutters shall comply as a minimum with SMACNA Architectural Sheet Metal manual for a storm of 5 minutes' duration that is exceeded only once in 10 years. Roof drainage details shall comply with NRCA Construction Details and NRCA Steep Roofing manual.	TBD	Roof drains are designed in accordance with UPC for a 4" rainfall per hour. Need NRCA details at steep roofing manual.

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0760-2.3.2	Overflow outlets shall be provided on all roofs with parapets or curbs. The weight of retained water including that attributed to deflection of the roof due to the load of water below the bottom level of the overflow outlets shall be included as a load in structural calculations; see Section 0111, Structural Design Requirements.	C	Overflow drains provided.
	Tile roofs shall use only exterior gutters and downspouts.	N/A	
	Drains and Gutters		
	Drains shall comply with UBC Chapter 32.	C	All drain leaders are interior.
	Interior roof drains or exterior roof drains and gutters shall be used in locations where temperatures remain above freezing. Where temperatures remain below freezing, and freezing of gutters or downspouts is a problem, only interior roof drains shall be used, except that exterior overflow outlets are acceptable.	N/A	
	Interior built-in gutters shall not be used, except with sheet metal roofing and only in locations where temperatures remain above freezing.	C	Separate roof drains and overflow drains.
	No building roof with interior drains shall have fewer than two independent drains. Each such independent drain shall be independently connected to the storm drain.	C	
	Roof drain spacing shall not exceed 75 feet in any direction	C	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	No roof drain shall serve a roof area greater than 10,000 square feet.	C	Building does not exceed 10,000 sf
	Interior roof drains shall be located only at roof low points.	C	Roof is sloped to drains
	Drain inlets shall be recessed below the adjacent roof level.	C	
	Drains shall have strainers.	C	
	No drain shall be less than 4 inches in diameter.	NC	Roof drains and overflow drains for change areas are 3" diameter.
	On exterior roof drains 30 feet or longer, leader heads shall be used at the junction of drains and gutters.	N/A	
	Exterior roof drains that discharge onto roofs shall have splash pans secured to the bottom of the drains.	N/A	
	Drains, gutters, and accessories shall have a service life at least equal to that of the roofing, and shall be compatible with the roofing.	C	
	Exterior roof drains shall be protected from yard maintenance and building maintenance equipment, and from vehicles at roads, parking areas, and loading areas.	N/A	
	Where soil erosion can occur from the discharge of exterior roof drains at grade, roof drains shall be connected to storm sewers or shall discharge into stabilized drainage ditches, splash blocks, or paving.	N/A	

**TABLE 3. STRUCTURE - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
Division 8	Doors and Windows.		
0800	General. Doors and windows located in potentially corrosive environments shall be corrosion resistant or protected against corrosion.		
0800-1	Doors.		
0800-1.1	General. Frequently-used doors shall have a vision panel, except where privacy, security, or fire safety requirements preclude installation.	C	
	Doors shall offer substantial resistance to unauthorized entry, but need not be more resistant to penetration than adjoining walls, ceiling, and floors.	TBD	"Substantial resistance" is indefinite.
	When doors are used in pairs, an overlap molding is required where the doors meet.	C	
	Door jambs shall be reinforced when necessary to make it more difficult to open by use of a wedge, jimmy, or similar tool.	NC	This request is not in the Design Criteria.

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0110	Architectural and Special Design Requirements		0110-6.1 General
0110-6	Fire Protection		
	Facilities shall comply with the following:		
	• DOE 5480.4 Attachment 2, Section 2.		DOE Order 5480.4, Attachment 2, Section 2.C, requires mandatory compliance with the following standards:
			1. "National Fire Codes" (NFPA),
			2. "Standard for Fire Protection of AEC Electronic Computer Data Processing systems." Compliance with this standard satisfies the requirements of NFPA-75 (WASH 1245.1) (DOE),
			3. "Product Directories of Underwriters Laboratories,; together with the periodic supplements (UL),
			4. "Factory Mutual Approval Guide" (FM)
			5. "General Fire Fighting Guidance for Nuclear Weapons" (this document is Confidential Restricted Data) (TP20-11) (DOE),
			6. DOE/EV-0043, 8-79, "Standard on Fire Protection for Portable Structures" (DOE).

C = Conformance
 NC = Nonconformance
 N/A = Not Applicable
 TBD = To Be Determined

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	•DOE 5480.7		
	• Section 1530, Fire Protection (6430.1A)		
	Facilities shall also comply with 29 CFR 1926 and CFR 1910. Except as required by other sections of these criteria, NFPA 101 shall apply where 29 CFR 1926 and 29 CFR 1910 does not apply or where NFPA 101 exceeds the requirements of 29 CFR 1926 and 29 CFR 1910.		
	Definitions, fire resistance ratings, and types of construction shall be as contained in the UBC.		
	Any materials with unusual fire characteristics such as urethane foams, and any materials that develop significant quantities of toxic or other harmful products of combustion, shall not be used as interior finishes or other interior applications without the approval of the cognizant DOE fire protection authority. The use of foamed plastics in construction shall be prohibited unless it fully complies with FM 1-57.		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The use of foamed plastics in construction shall be prohibited unless it fully complies with FM 1-57.	TBD	Need copy of FM 1-57 to determine compliance of dryvit on exterior and rigid insulation at roof.
0110-6.2	<p>Fire Protection Design Analysis</p> <p>A special fire protection design analysis shall be made of each facility vital to DOE mission accomplishment. The analysis shall use time parameters established in accordance with DOE 5480.7. The analysis shall identify the special fire prevention and protection features and controls deemed by the cognizant DOE fire protection authority to achieve a level of fire protection for vital facilities and programs that meets or exceeds the "improved risk" level.</p> <p>A general fire protection design analysis shall be made of each facility to ascertain and limit the cost of future damage repair and replacement of facilities and their contents from fire. The analysis shall be made using those parameters established in DOE 5480.7. The analysis shall determine the special fire prevention and protection features and controls deemed by the cognizant DOE fire protection authority to achieve a level of improved risk fire protection that limits damage to an acceptable level.</p> <p>The analysis shall be documented in report form in the facility project files and referenced by the SAR.</p> <p>Fire protection design analysis shall be done as soon as possible and included as a portion of the Title I Design Summary document required by DOE 4700.1.</p>		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0110-6.3	<p>Fire Resistance Ratings</p> <p>All facilities shall be divided into areas in which the total potential fire loss to each area and its equipment does not exceed \$75 million as described in DOE 5480.7. Areas shall be separated by fire walls and barriers with not less than 4-hr fire-resistance ratings. Where exceptions are necessary for reasons of operations or equipment, exemption procedures shall comply with DOE 5480.7.</p> <p>Wall, floor and ceiling, and roof and ceiling assemblies shall be tested and rated for their fire resistance by UL or similar nationally accredited testing laboratories, or shall be listed for their fire resistance as approved by FM or similar national insurance organizations.</p>		
0110-6.4	<p>Hazardous Areas</p> <p>Hazardous areas, such as radioactive spaces or spaces with inert atmospheres, shall have sufficient alarms and interlocks to assure that access by emergency personnel will not endanger such personnel or result in a public hazard.</p> <p>The design of hazardous areas shall facilitate access by emergency personnel from the exterior, and at the same time, shall maintain any required confinement or containment using air locks or other features.</p>		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The design of the exteriors of facilities shall follow the recommendations of NFPA 80A. Facilities that are not separated as recommended by NFPA 80A shall have fire protection systems such as exterior sprinklers or barrier walls.		
0110-99	Special Facilities		
0110-99.0	Nonreactor Nuclear Facilities		
0110-99.0.6	Fire Resistance		
	Development of the DBF shall include consideration of conditions that may exist during normal operations and special situations (e.g., during periods of decontamination, renovation, modification, repair, and maintenance).		
	The structural shell surrounding the critical areas and their supporting members shall remain standing and continue to act as a confinement structure during the DBF under conditions of failure of any fire suppression system not designed as a safety class item.	TBD	ENG-8?
	Fire resistance of this shell shall be attained by an integral part of the structure (concrete slabs, walls, beams, and columns) and not by a composite assembly (membrane fireproofing).	C	The shell is constructed of reinforced concrete and reinforced masonry.
	In no event shall the fire resistance rating be less than two-hours under conditions of failure of any fire suppression system not designed as a safety class item.		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Penetrations in this shell shall incorporate, as a minimum, protection against DBF exposures unless greater protection is required by other sections of these criteria.		
0110-99.0.7	Loss Limitations		
	The design shall provide sufficient structural integrity, fire resistance, compartmentalization, detection, and extinguishing systems and alarms (plus other engineered safety systems where required) to generally limit property loss from any single DBA (excluding earthquake and tornados) to less than \$1 million for those special facilities in which safety systems are provided and function properly, and to less than \$25 million where safety systems do not function properly. See Section 0110-6.3, Fire Resistance Ratings, and DOE 5480.7 for maximum possible fire loss criteria.		
0111	Structural Design Requirements		
0111-99	Special Facilities		
0111-99.0	Nonreactor Nuclear Facilities--General		
0111-99.0.1	General		
	In no case shall the total combustible loading located in a fire area exceed the fire resistance rating of the area enclosure. This shall be documented in a fire risk analysis.		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0266	Water Distribution Systems		
0266-4	System Design Considerations		
	Domestic water distribution systems that also serve fire protection requirements shall be designed to satisfy fire flow requirements plus 50 percent of the average domestic requirements plus any industrial or process demands that cannot be reduced during a fire.	N/A	
	Each fire hydrant within the distribution system must be capable of delivering 1000 gpm at a residual pressure of not less than 10 psi. Where domestic water distribution systems are to serve internal fire protection systems (i.e., sprinklers or foamite systems), adequate residual pressures shall be maintained for proper operation of such fire protection systems.		
	Fire hydrant branches (from main to hydrant) shall be not less than 6 inches in diameter and no longer than 300 feet. A gate valve shall be installed within each fire hydrant branch to facilitate maintenance.		
	Fire hydrants shall be installed at a maximum spacing of 400 feet. Fire hydrants shall not be located more than 300 feet from the buildings to be protected. Each building shall be protected by a minimum of two hydrants.		
0727	Firestopping		
	Firestopping shall comply with NFPA 101, Chapter 6.		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>Firestopping materials and assemblies shall be tested for their fire resistance and listed by UL or similar nationally accredited testing laboratories, or shall be listed for their fire resistance as approved by FM or similar national insurance organizations. Unrated and unapproved assemblies shall be tested and approved before being considered for use in a DOE facility.</p> <p>Where Fire-rated assemblies (walls, floor-ceilings, roof-ceilings) are either partially or fully penetrated by pipes, ducts, conduits, or other such building elements, firestopping material shall be placed in and around the penetrations to maintain the fire resistance rating of the assembly.</p>		
0800-1.2	Fire Protection		<p>Fire doors, frames, and hardware shall be either tested and listed by UL or similar nationally accredited testing laboratories, or approved by FM or similar national insurance organizations. Fire doors, frames, and hardware shall be installed with label attached in accordance with NFPA 80.</p>
0800-2	Windows		
0800-2.2	Fire Protection		<p>Where required by code, fire windows, frames, and hardware shall be either tested and listed by UL or similar nationally accredited testing laboratories or approved by FM or similar national insurance organizations. Such fire windows, frames, and hardware shall be installed with label attached in accordance with NFPA 80</p>

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Applicable Section	Item Number/Criteria	Status	Comments
	Doors that are part of a fire-rated wall assembly, and exterior swinging doors that open out shall have door closers.		
Division 10	Specialties		
1052	Fire Protection Specialties		
	Fire protection specialties shall be tested and listed by UL or similar nationally accredited testing laboratories or approved by FM or similar national insurance organizations.		
	Requirements for portable fire extinguishers appear in Section 1530-7, Portable Fire Extinguishers.		
1161	Enclosures		
1161-3	Fire Protection		
	Automatic fire suppression provisions shall comply with Section 1530-99, Special Facilities. When an automatic fire suppression system is mandatory and protection against loss from fire originating within the enclosure system is required, a highly reliable, fast-acting system shall be provided. Instead of such a system, an inert atmosphere can be used within the enclosure, provided its reliability is commensurate with an approved fire suppression system (e.g., dedicated gas supply, component quality, and redundancy where appropriate). The oxygen concentration shall be less than the minimum concentration that would allow ignition or combustion of the enclosure contents.		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	Where automatic systems are not required, fire detection shall be installed.		
	Provisions shall also be made for manual fire suppression where deemed necessary.		
	Fire detection systems shall be integrated with any central alarm location and any associated automatic fire suppression systems.		
Division 15	Mechanical.		
1530	Fire Protection		
1530-1	General		
	Fire protection systems shall comply with DOE order 5480.7.		All applicable sections of DOE 5480.7 are repeated in DOE 6430.1A.
1530-2	Improved Risk Concept for Fire Protection Systems		
1530-2.1	General		
	Fire protection shall incorporate an "improved risk" level of fire protection as directed in DOE order 5480.7 as well as Section 0110-5, Health and Safety.		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1530-2.2	Vital Programs		
	Fire protection systems for vital programs shall incorporate a "higher standard of protection" than the "improved risk" level as directed by DOE order 5480.7.		
1530-2.3	Maximum Possible Fire Loss		
1530-2.3.1	General		
	The "improved risk" level of protection requires that the "maximum possible fire loss" shall be the basis for determining the need to provide automatic fire suppression systems and for additional fire protection systems and features. "Maximum possible fire loss" is defined in DOE 5480.7. Criteria I through V as discussed in DOE 5480.7 correspond with Section 1530-2.3.2, Criterion I, through Section 1530-2.3.6, Criterion V. The application of these criteria shall be considered by an experienced fire protection engineer.		
1530-2.3.2	Criterion I		
	Whenever the maximum possible fire loss exceeds \$1 million, automatic fire suppression systems shall be provided.		
1530-2.3.3	Criterion II		
	The need for automatic fire suppression systems shall be considered when the maximum possible fire loss is below \$1 million.		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	<p>Some examples of situations where automatic fire suppression systems may be warranted for potential fire losses below \$1 million are:</p> <ul style="list-style-type: none"> • Facilities that contain critical or long-procurement-time construction items • A temporary-use trailer used as a control center for a vital one-time activity • A facility with high public visibility or sensitivity • Electric power transformers with combustible contents that, if damaged, could result in an extended shut-down of the facilities they serve • Facilities in which a fire could result in the accidental release of toxic or hazardous materials or emissions • Cooling towers of combustible construction • Facilities that can be easily protected by extending automatic sprinkler systems from an adjacent protected facility at a low incremental cost • Facilities in which a fire could damage more important adjacent facilities • Facilities that may warrant automatic fire suppression systems in the future 		

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Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Facilities where required for protection of human life 		
1530-2.3.4	<p>Criterion III</p> <p>Automatic fire suppression systems are not required if all of the following conditions are satisfied:</p> <ul style="list-style-type: none"> • The maximum possible fire loss is less than \$250,000. • There is no hazard to human life • There is no danger of a fire resulting in release of toxic or hazardous materials or emission. • Adequate separation from other facilities is provided • Important operations or program missions will not suffer unacceptable delays as a result of fire (see DOE 5480.7 for qualification criteria). 		
1530-2.3.5	<p>Criterion IV</p> <p>Whenever the maximum possible fire loss exceeds \$25 million, the area shall be subdivided with free-standing fire rated walls or suitable redundant fire protection systems, to limit the credible loss to less than \$25 million even in the event the primary system fails. In no case shall the maximum loss potential exceed the \$75 million loss limit established in DOE 5480.7; failure-proof systems such as physical separations shall be provided to prevent this possibility.</p>		

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Applicable Section	Item Number/Criteria	Status	Comments
	<p>Response capability of on-site fire departments and availability of adequate water quantity and pressure at well-located hydrants may be the principal basic method of redundant fire protection for most DOE facilities, but automatic redundant protection systems may be needed to meet or exceed "improved risk" levels of protection for some facilities.</p> <p>Redundant fire protection systems may include dual water supplies to sprinkler systems, dual piping risers, or valving systems such that adequate redundancy in water supply to the sprinkler heads is provided to cover maintenance or emergency outages of either of the water supply systems; or, may include multiple types of automatic fire suppression systems (e.g., water sprinklers and Halon).</p> <p>Some DOE sites or facilities must rely on local (e.g., city or county) fire department response capability for redundant protection. The fire department capability to reduce loss due to a well-developed fire shall be considered in terms of the following factors:</p> <ul style="list-style-type: none"> • Location of fire station(s) with respect to the facility to be protected • Staffing of stations (e.g., continuously or "on-call" volunteer) • Ability to perform initial fire attack as outlined in NFPA 1410 • Method(s) of fire department notification or alarm reception 		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Familiarity of station staff with the DOE facility, and training in preparation for effective response to an alarm at the DOE facility • Degree of commitment that fire department(s) make to respond to fire emergencies in DOE facilities. This factor shall be emphasized. <p>Portable fire extinguishers, interior fire hose systems, or interior fire detection and alarm systems do not meet the definition of a redundant fire protection system.</p>		
1530-2.3.6	<p>Criterion V</p> <p>The need for redundant fire protection systems or methods, or for supplementing existing redundant fire protection capability, shall be considered on a case-by-case basis when the maximum fire loss potential is below \$25 million. Factors to be considered include:</p> <ul style="list-style-type: none"> • Fire department response capability • Hazards involved in the operation • Operating and program-mission effect of interruption and delays due to fire <p>The application of these criteria shall be considered by an experienced fire protection engineer.</p>		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1530-3	Waterflow and Pressure Requirements for Fire Protection		
1530-3.1	General		
	Total volume, pressure, and design flow rate of water necessary to provide fire protection for facilities shall be determined by the methods described in the following paragraphs.		This is a lead-in paragraph and as such does not warrant a response.
	All sprinkler or other automatic fire suppression system components shall be UL- or FM-approved for the particular application chosen.		
1530-3.2	Occupancy Hazard Classification		
	NFPA 13 shall be used to determine the occupancy Hazard Classification for any facility. Light hazard occupancy rules are prohibited.		
1530-3.3	Water Demands for Sprinklered Facilities		
1530-3.3.1	Schedule-Designed Sprinkler Systems		
	For systems designed using schedule methods, NFPA 13 shall be used for calculating water demand in the absence of specific requirements provided by cognizant DOE fire protection authorities based on unusual occupancies or special hazards.		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	<p>Precautions shall be taken to ensure that adequate residual pressure exists at full demand flow rate to fulfill the density and coverage requirements for schedule-designed systems. If water supply or pressure is marginal the pressure loss from the base of the riser to the most remote head should be calculated to confirm that the schedule designed system will meet requirements, or the system shall be hydraulically designed.</p>		
1530-3.3.2	Hydraulically Designed Sprinkler Systems		
	<p>NFPA 13 shall be used to determine water supply requirements for hose streams (gpm) and duration (min). Density curves presented in NFPA 13 shall be used for calculating sprinkler demand for hydraulically designed systems. For hazard classifications not covered in NFPA 13 and certain other special occupancies or hazards, design density and area of coverage shall be as specified by other more appropriate standards referenced in NFPA 13 or project-specific requirements as determined by the cognizant DOE fire protection engineer.</p> <p>For ordinary hazard occupancies and above, hose stream requirements shall be a minimum of 500 gpm regardless of the hose stream demands listed in the above references unless otherwise specified by the DOE project criteria.</p> <p>Determination of adequacy of water supply shall be made on the basis of actual flow test data gathered using the methods in NFPA 13, Appendix B.</p>		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1530-3.3.3	Fire Hydrant Demand		<p>Where reliance is placed on fire department response, either for protection of unsprinklered building or where the fire department will serve as redundant (backup) protection, as a general rule the water supply should be adequate to supply at least 0.03 gpm per cubic foot of fuel (building and contents) in the largest fire area (for high-BTU-content fuels, convert equivalent to ordinary BTU loads).</p> <p>This water supply should be available at 20 psig residual pressure at the hydrants.</p>
1530-4	Automatic Sprinkler Protection		
1530-4.1	General		<p>All sprinkler systems shall comply with NFPA 13.</p>
1530-4.2	Types of Sprinkler Systems		
1530-4.2.1	Wet Pipe		<p>Sprinkler systems shall normally be wet pipe using pipe schedule sizes listed in NFPA 13 for ordinary installations.</p> <p>Hydraulic designs should be considered for all systems. The system shall be hydraulically designed where residual pressure is marginal, water application rate is high, response time is critical, or special risks are involved.</p>

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Applicable Section	Item Number/Criteria	Status	Comments
	<p>The system shall be hydraulically designed where residual pressure is marginal, water application rate is high, response time is critical, or special risks are involved.</p>		
1530-4.2.2	Dry Pipe		<p>In unheated areas or other areas subject to freezing temperatures, dry pipe systems shall be provided. Because of the time delays associated with release of air in the system, water demands for dry pipe systems to be computed over areas 30% greater than for comparable wet pipe systems. Where the unheated area is small it may be cost effective to install an antifreeze system or small dry pipe system supplied from the wet pipe system in the main heated area.</p>
1530-4.2.3	Preaction		<p>A preaction system shall be used where it is particularly important to prevent the accidental discharge of water.</p> <p>Need for a preaction system shall be based on review by and recommendation of a professional fire protection engineer.</p> <p>The detection system chosen to activate the preaction valve shall have high reliability and a separate alarm/supervisory signal to indicate status.</p>

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Applicable Section	Item Number/Criteria	Status	Comments
1530-4.2.4	Deluge		
	For extra hazard areas and specific hard-to-extinguish fuels such as explosives and pyrophoric metals, a deluge system with open sprinkler heads may be used to wet down the entire protected area simultaneously. Deluge systems shall comply with NFPA 13.		
1530-4.2.5	Self-Restoring		
	Self-restoring sprinkler systems such as the on-off multicycle system or systems using individual on-off sprinkler heads shall be used where the water from sprinklers will be contaminated by contact with room contents, where there is a concern for water damage, or where water supply or storage volume is marginal.		
1530-4.2.6	Quick-Response		
	Where there are high-value concentrations (values per square foot), quick-response sprinklers shall be considered in lieu of conventional sprinklers.		
1530-5	Special Protection Systems		
1530-5.2	Types of Special Suppression Systems		
1530-5.2.1	Water Spray		
	Installation of water spray systems shall comply with NFPA 15.		

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Applicable Section	Item Number/Criteria	Status	Comments
1530-5.2.2	Carbon Dioxide Carbon dioxide agent quantity requirements and installation procedures shall comply with NFPA 12.		
1530-5.2.3	Dry Chemical Dry chemical systems shall comply with NFPA 17.		
1530-5.2.4	Foam Foam systems shall comply with NFPA 11, 11A, 16, 16A, and NFPA 409.		
1530-5.2.5	Halon The installation of Halon 1301 systems and Halon 1211 systems shall comply with NFPA 12A and NFPA 12B, respectively.		
1530-6	Standpipes and Hose Systems Installation of standpipe systems shall comply with NFPA 14.		
1530-7	Portable Fire Extinguishers Portable fire extinguishers shall comply with NFPA 10.		

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Applicable Section	Item Number/Criteria	Status	Comments
1530-8	Fire Detection and Alarm Systems		
1530-8.1	General		
	All fire detection and alarm devices shall have UL-listed components or be FM-approved.		
	Devices and systems shall comply with NFPA 71, NFPA 72A, NFPA 72B, NFPA 72C, NFPA 72D, NFPA 72E, NFPA 72F, NFPA 72G and NFPA 72H as applicable.		
1530-8.2	Alarm Systems		
1530-8.2.1	General		
	Fire alarm systems shall have the following basic features:		
	<ul style="list-style-type: none"> • Transmission of signals to the DOE facility fire department alarm center and other constantly attended locations in accordance with the appropriate NFPA Signaling Systems Standard • Local alarms for the building or zone in alarm • Trouble signals as required by the appropriate NFPA Signaling Systems Standard • Emergency battery backup for system operation 		

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Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Electric supervision of all circuits as required by the appropriate NFPA standard • Supervisory devices for all critical functions (valve position switches, water level, temperature) • Capability of annunciating at least three separate conditions: 1) a fire alarm, 2) a supervisory alarm, and 3) a trouble signal indicating a fault in either of the first two. Annunciation of each condition shall be separate and distinct from the other two. <p>Fire alarm systems for new DOE buildings shall be compatible with those for the DOE complex where the new building is to be located.</p>		
1530-8.2.2	Alarm Actuating Devices		
	<ul style="list-style-type: none"> • Alarms that respond to flow of water shall be provided wherever a sprinkler system is installed and shall comply with requirements of the NFPA standard for the type of signaling system used • A manual fire notification method such as manual fire alarm boxes shall be provided and located in accordance with the appropriate NFPA standard • Combined watch reporting and fire alarm systems, if used, shall be in accordance with the appropriate NFPA standard 		

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Applicable Section	Item Number/Criteria	Status	Comments
1530-8.3	Automatic Fire Detection Systems		
1530-8.3.1	General		
	Automatic fire detectors shall comply with NFPA 72E. Detector spacing shall be in accordance with NFPA 72E, Appendices A, B, and C.		
1530-8.3.2	Heat-Actuated Detectors		
	Heat-actuated detectors are appropriate when any of the following conditions exists:		
	<ul style="list-style-type: none"> • Speed of detection is not the prime consideration. • The space is small or confined and rapid heat build-up is expected. • Ambient conditions do not allow the use of other detection devices. 		
1530-8.3.3	Flame-Actuated Detectors		
	Flame-actuated detectors are appropriate when rapid detection is of prime importance in high hazard areas, such as:		
	<ul style="list-style-type: none"> • Fuel-loading platforms • Industrial process areas 		

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Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Hyperbaric chambers • High ceiling areas • Atmospheres where explosions or very rapid fires may occur. <p>Since this type of devices must "see" the flame to operate, the number of devices and their aiming must be carefully engineered. False trips from extraneous radiation sources are also possible. For the above reasons use of this type of device shall require coordination among the fire protection engineer, DOE project manager, and the equipment manufacturer.</p>		
1530-8.3.4	Smoke Detectors		<p>Smoke detectors shall be installed in all areas where required by the appropriate NFPA standard or by the cognizant DOE fire protection authority.</p> <p>Smoke detectors shall be of a type operating on one of the principles described in NFPA 72E. Location and required spacing of smoke detectors shall be determined by the methods of NFPA 72E and its Appendix C. Spacing shall be based upon threshold fire size, fire growth rate, and ceiling height as described in these standards.</p>

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Applicable Section	Item Number/Criteria	Status	Comments
1530-9	<p>Water Storage and Distribution</p> <p>Wherever practical, dedicated fire water storage and distribution systems shall be used. If a dedicated fire water supply system cannot be provided, the fire protection water supply shall assure availability regardless of simultaneous process and domestic water usage.</p> <p>Where automatic sprinkler systems or standpipes are fed from a potable water system, approved check valves shall be installed in sprinkler lead-ins to preclude the introduction of pollutants from systems or recirculation of stagnant water that would contaminate the domestic water system.</p> <p>Underground fire water mains or combined fire and domestic water mains, including valves, hydrants, and fittings, shall be installed, flushed, sterilized, and tested in accordance with NFPA 24 and Section 0260, Piped Utility Materials. Water storage tanks shall comply with NFPA 22. Fire pumps shall comply with NFPA 20. Water storage shall be sufficient to meet the density, pressure, and duration requirements of NFPA 13.</p> <p>Fire mains (except those supplying a single hydrant or extensions of existing smaller mains) shall be at least 8 inches. Mains shall be sized to supply the largest fire demand plus the largest domestic and process demand with consideration for residual sprinkler system pressure requirements.</p>		

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	Sprinkler supply lead-ins should be at least 6 inches, except lead-ins of 4 inches may be used for very small sprinkler systems when substantiated by hydraulic calculations. In no case shall the lead-in be smaller than the sprinkler riser.		
	Where combined fire and domestic-process water systems are used, the supplies to each building shall be arranged and valved so that the domestic and process systems can be shut down without shutting off the fire system supply.		
	Sprinkler risers should be located at an exterior wall. Sprinkler supply lead-ins should run under buildings the minimum distance possible. Where a riser must be located in a potentially contaminated area, consideration should be given to locating the riser exterior to the building in a heated enclosure.		
	Outside control valves that can be locked open shall be provided on each supply lead-in, located if possible a minimum distance of 40 feet from the building. PIVs should be used where possible. If site conditions preclude the use of PIVs, such as where they would be subject to mechanical damage and cannot be properly guarded, OS&Y valves in pits may be used.		
	Key-operated buried valves shall not be used for sprinkler control valves. In no case shall there be more than one valve controlling a sprinkler supply lead-in.		

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	<p>All lead-ins shall be connected with the sprinkler system at the base of the riser. Alarm valves shall be located as close as practical to the building entry point.</p> <p>Hydrants shall be provided so that hose lays from hydrants to all exterior portions of a protected building are no more than 300 feet. Hydrants shall not be closer to buildings than 50 feet.</p>		
1530-99	Special Facilities		
1530-99.0	Nonreactor Nuclear Facilities-General		
	<p>An assessment shall be made early in the design or modification to determine the facility structures, systems, and components that shall be protected against the effects of a DBF and explosion.</p> <p>A fire protection engineer or person knowledgeable in applying the principles of fire protection shall develop the fire protection system.</p> <p>To maximize the protection against fire, the system shall contain an appropriate integration of fire prevention, detection, and suppression features.</p> <p>Fire protection systems shall not:</p> <ol style="list-style-type: none"> 1) prevent a facility from achieving and maintaining a safe shutdown condition, 2) prevent the mitigation of DBA consequences, or 		

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	3) cause an inadvertent nuclear criticality.		
	Total reliance shall not be placed on a single fire suppression system. Appropriate backup capability shall be provided.		
	To ensure that redundant safety class components shall be capable of performing the necessary safety functions, the facility design shall provide appropriate separation against fire, explosion, and failure of fire suppression systems.		
	Fire protection systems, or portions of them, that must function to control effects of a DBA event (as determined by safety analysis accident scenarios) shall be designed to be functional for all conditions included in the accident scenario. This shall include both the event initial cause and its consequences.		
	Mechanical- and fluid-system portions of the fire protection system shall meet the appropriate NFPA requirements.		
	The operation or failure of a fire protection system that interfaces with a safety class system such as a safety class water system, shall not prevent the safety class system from completing its safety functions when required. Wherever practical, special facilities shall be designed and constructed using building components of fire-resistant and noncombustible material, particularly in locations vital to the functioning of confinement systems. To the extent practicable, combustible materials shall not be used in the construction of process system confinement barriers.		

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Applicable Section	Item Number/Criteria	Status	Comments
	When the use of water sprinkler coverage is precluded because of nuclear criticality or other hazards, non-aqueous extinguishing systems (i.e., inert gas, carbon dioxide, high-expansion foam, or halogenated organics) shall be used.		
	Fire protection systems shall be designed so that the failure of any component (equipment or control device) shall not disable the entire fire protection system.		
	Fire protection systems and components shall have fail safe features and audible and visual alarms for operability and trouble indications.		
	An emergency source of electric power shall be provided to operate fire protection systems. Fire protection systems shall be capable of operating during a normal power outage. The emergency power sources and the electrical distribution circuits shall have independence and testability to ensure performance of their safety functions assuming any single failure.		

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	<p>The designers of the fire protection system shall consider the fire and explosion potential of the materials being processed and the solvents used during processing. In addition, the design shall include facility-specific fire protection systems to mitigate the damage from pyrophoric and other materials that are fire hazards, (e.g., magnesium, ion exchange resins, nitrate solvent and nitrate reduction reactions, and zirconium fuel element cladding hulls). When the process uses or produces combustible gases or vapors, the design shall include features such as inert gas purging, premixing hydrogen to a nonflammable percent with inert gas, and increasing the air flow within process confinement barriers to provide the dilution required to maintain the concentration of gases or vapors below the lower limit for flammability.</p>		
	<p>Automatic water sprinkler coverage shall be provided throughout the facility except in areas where nuclear criticality or other hazards specifically preclude its use or where Halon systems are required to reduce equipment damage.</p>		
	<p>The water supply for the permanent fire protection installation shall have a minimum of two reliable, independent sources each with sufficient capacity (based on maximum demand) for firefighting until other sources become available. only one of these two sources shall be required to be DBE qualified.</p>		

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Applicable Section	Item Number/Criteria	Status	Comments
	<p>To protect the integrity of process confinement systems, fire protection systems shall include the following features:</p> <ul style="list-style-type: none"> • Automatic and redundant fire detection devices • A fire-extinguishing system to rapidly remove heat produced by fire to prevent or minimize the pressurization of a process confinement and to rapidly extinguish a fire to minimize the loading of ventilation system filters with combustion products • The introduction of the extinguishing agent in a way that does not result in overpressurization of the confinement barriers <p>Where fire barriers are penetrated by the confinement system's ventilation ducting, fire dampers shall be appropriately used to maintain the barrier integrity. However, the closure of such dampers shall not compromise the functions of the confinement system where the loss of confinement might pose a greater threat than the spread of fire. In such cases, alternative fire protection means (e.g., duct wrapping) shall be used as a substitute for fire barrier closure. In no case shall a sprinkler system (including safety class sprinklers) be considered a fire barrier substitute.</p> <p>Because of flammable or potentially flammable atmospheres, electrical installations in hazardous process locations shall be designed to preclude the introduction of any ignition source by the electrical equipment.</p>		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
1540	Plumbing/Service Piping		
1540-99.0.3	Other Collection Systems		
	<p>Where fire barriers are penetrated by the confinement system's ventilation ducting, fire dampers shall be appropriately used to maintain the barrier integrity. However, the closure of such dampers shall not compromise the functions of the confinement system where the loss of confinement might pose a greater threat than the spread of fire. In such cases, alternative fire protection means (e.g., duct wrapping) shall be used as a substitute for fire barrier closure. In no case shall a sprinkler system (including safety class sprinklers) be considered a fire barrier substitute.</p>		

**TABLE 4. FIRE PROTECTION - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Because of flammable or potentially flammable atmospheres, electrical installations in hazardous process locations shall be designed to preclude the introduction of any ignition source by the electrical equipment.		
1600	General Requirements		
1670	Exterior Communications and Alarm Systems		
1670-2	Fire Alarm and Supervisory Systems		
	Fire alarm and supervisory systems shall comply with NFPA 71, NFPA 72A, NFPA 72B, NFPA 72C, NFPA 72D, NFPA 72E, NFPA 72F, NFPA 72G, NFPA 72H, NFPA 1221, and ANSI C2 as appropriate for the location. Outside cable plant for fire alarm and supervisory systems shall comply with the standards for telephone cable plant. In the joint use of poles for electric power distribution and for supporting fire alarm and telephone cables, separate fire alarm cable shall be placed below the telephone cable.		
	Fire alarm cables installed in underground ducts shall be distinctively marked within manholes and handholes that are shared with other communications cables and shall be kept physically separated from all power conductors.		
	Exterior fire alarm pull boxes and emergency-reporting telephones shall be installed in weatherproof housings manufactured specifically for the mechanism.		

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Applicable Section	Item Number/Criteria	Status	Comments
0275	Industrial Wastewater Treatment		
0275-99	Special Facilities		
0275-99.0	Nonreactor Nuclear Facilities-General		
0275-99.0.2	Process Wastes		
	<p>Liquid process wastes containing radioactive or other hazardous material shall be collected and monitored near the source of generation before batch transfer through appropriate pipelines or tank transfer to a liquid waste treatment plant or area. These wastes shall be individually collected at that facility in storage tanks that are equipped with stirrers or other accepted means of mixing, sampling and volume measuring devices, and transfer systems. Waste storage tanks and transfer lines shall be designed and constructed so that any leakage shall be detected and contained before it reaches the environment. Radiation, liquid level, or conductivity detectors shall be provided in collection systems. Transfer lines shall have inspection and collection pits at practical intervals into which leakage can drain by gravity. Double-walled transfer pipelines or multi-pipe encasements shall be used for high-level radioactive liquid wastes and other equally hazardous nonradioactive liquid wastes as defined by safety analysis. Provisions shall be made for the collection, transfer, and disposal of infiltration into the annulus of double-walled pipelines and for the collection, transfer, and storage (as appropriate) of leakage from the pipe of double-walled transfer pipelines.</p>	C	Same as 99.0.1 above, process waste drains into tanks in pit and is pumped to treatment. Dwg. M-13, M-14, M-15.

C = Conformance
 NC = Nonconformance
 N/A = Not Applicable
 TBD = To Be Determined

**TABLE 5. CONFINEMENT - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	Nuclear criticality safety shall be considered in the design of liquid radioactive waste processing systems.	TBD	Criticality TBD by HSE
	Radioactive waste collection, transfer, and storage systems shall be such as to avoid the dilution of radioactive waste by wastes of lower level radioactivity or other waste. This may require the provision of multiple and parallel systems. Systems that involve the possible dilution of radioactive waste shall only be used with the concurrence of the sponsoring DOE program office.	N/A	
1161	Enclosures		
1161-1	General Considerations		
	Enclosures as used here are physical barriers (e.g., cubicles, glove boxes, fume hoods, conveyor tunnels) that, together with their ventilation and operating systems, prevent the release of radioactive or other hazardous material to the work space or the environment. Accordingly, their structural and confinement integrity shall be primary design considerations.		
	DOE project manager shall provide the design professional criteria on the location, size, fume composition, and operating schedule for enclosures. Unless more specific design guidance is provided to the design professional from DOE project manager, the primary reference source shall be the ACGIH Industrial Ventilation Manual.		

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Applicable Section	Item Number/Criteria	Status	Comments
	<p>The design objective shall be to prevent exposure of the plant personnel to airborne contamination and shall implement ALARA concepts as practical to minimize operator exposures. The enclosure system, including its internal and external support structures, shall be designed to withstand the effects of normal operating conditions and the environment. Also, DBAs such as fire, explosion, criticality, and natural phenomena shall be considered in the design of the enclosure. Enclosure stability during a seismic event shall be based on the seismic parameters described in Section 0111-99.0.4, Earthquakes. The criticality considerations should include water or other liquid sources, potential liquid level in the enclosure (during operations or fire fighting), and drains to limit liquid level in the enclosure.</p> <p>Where practical and without penetrating the enclosure, all equipment components not functionally required to operate directly in the presence of radioactive materials shall be located outside the enclosure. All equipment that must be located within the enclosure shall be designed to allow for in place maintenance and/or replacement.</p> <p>The design and operation of support and protection systems, such as fire protection, shall not promote the failure of the enclosure system integrity or the loss of confinement.</p>		

**TABLE 5. CONFINEMENT - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1161-2	Construction		<p>Noncombustible or fire-resistant materials shall be used for enclosures and, to the maximum extent practicable, for any required radiation shielding. In no case shall the total combustible loading located in a fire area exceed the fire resistance rating of the structural envelope (see Section 0110-99.0.6, Fire Resistance). This shall be documented in a fire risk analysis performed according to a methodology approved by the DOE Fire Protection Authority. This analysis should include estimated fire area combustible loadings, ventilation parameters, room dimensions, maximum average gas temperature, fire duration, maximum average heat flux, and the calculational method used. Enclosures (except open-face hoods) shall be designed with the objective of being leak-tight. In conjunction with their ventilation systems, all enclosures shall be capable of maintaining confinement (i.e., negative pressure with respect to the surrounding operating area). Without their associated ventilation systems enclosures shall be designed with appropriate physical features to provide an essentially leak-tight confinement (except open-face hoods, which shall provide filtered confinement) for the contaminants they handle.</p> <p>Enclosure specifications should include the following standardized features, where applicable:</p> <ul style="list-style-type: none"> • Windows and mountings • Glove ports (size, location and height) • Ease of cleaning (radius corners, smooth interior and exterior surfaces, minimal protuberances, and accessibility of all parts)

**TABLE 5. CONFINEMENT - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Adequate interior illumination (from fixtures mounted on the exterior where feasible) • Connections for services lines, conduits, instrument leads and ductwork • Fire barriers and filter installation • Sample removal ports • Pressure differential readouts • Attachments for interconnection of enclosures <p>Appropriately sized and located windows shall be part of the enclosure design to provide operators with visual access to the enclosure interior. Viewing windows in enclosures shall be as small as practicable. The windows shall be constructed of noncombustible or approved fire-resistant materials as specified in Section 0727, Firestopping. Consideration shall be given to resistance of the selected material to impact and radiation damage. The use of Mylar-glass laminates shall be considered for use as viewing windows and lighting fixture covers where hydrofluoric acid environments are present. Window design shall be such that it will enable replacement with minimum risk of releasing contamination to the working area. The selection of appropriate window material shall be based on specific process, combustible loading, and radiological safety considerations.</p>		

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	<p>Glove ports shall be located to facilitate both operations and maintenance work inside the enclosure. They shall have flexible gloves attached to allow operating personnel access to all interior surfaces and equipment. They shall be designed to allow replacement of gloves without losing contamination control and with minimum exposure to the operator. When gloves are not in place, a noncombustible shield or cover for each glove port shall be provided.</p> <p>To reduce migration of contamination, closure devices or permanent seals shall be provided on entrances and exits of piping, ducts, or conduits penetrating confinement barriers. Such closures or seals shall have an integrity equal to or greater than the barrier itself.</p> <p>Where pertinent to safety, the enclosure design shall consider the heat generation in the enclosure. Such heat sources may be from processes, lighting, and the decay of radioactive material. Consideration of radioactive material as a heat source is particularly applicable to storage enclosures.</p> <p>Consideration shall be given to incorporating transfer systems such as a double-door, sealed transfer system for removal of hazardous material from a glove box. Various types of removal and transfer systems appear in IAEA Safety Series No. 30. These systems are designed to allow entry and removal of material without breaching the integrity of the glove box.</p>		

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	<p>Consideration shall be given to modular construction, versatility, relocation, and incorporation of shielding. Structural support shall be provided to accommodate any anticipated loading resulting from shielding. The design professional shall consider techniques for limiting size to anticipate limitations on the dimensions of packing crates for disposal (e.g., current DOE criteria limit the size of TRU containers that will be accepted at the WIPP repository to 4 ft. x 4 ft. x 7 ft.).</p> <p>Discrete work stations or process areas shall be separated from each other by a barrier designed to prevent the spread of fire based on safety analysis review. Generally, the fire barriers within and between enclosures will be normally closed. Where operations require that the fire barrier be in the open position, it shall automatically close on activation of the fire detection system or by release of a fusible device. Design of the enclosure system shall allow automatic closure of the fire barrier without loss of confinement, without degradation of the enclosure system's integrity, and without injury to personnel. The fire barrier shall be capable of being opened or closed manually from the exterior and interior of the enclosure. Allowable open area around a fire barrier shall be minimized.</p>		
1161-5	Operational Compatibility		<p>Shielding, shape, size, and any other pertinent design criteria for all enclosures, glove boxes, conveyor tunnels, hoods, and process equipment should be coordinated with operations requirements to ensure continuity and performance of operations; and by the Safeguards and Security Group (function) to ensure that SNM control and accountability considerations have been considered along with other DOE physical protection requirements (DOE 5632</p>

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Applicable Section	Item Number/Criteria	Status	Comments
	series).		
1300	General Requirements		
1300-3.5	Maintenance		
	The design of equipment that must be located within confinement systems shall allow for in-place maintenance or replacement.		
	The capability shall be provided for the maintenance of contaminated equipment that cannot be repaired in place. This capability shall include the necessary provisions for confinement, ventilation, and waste control.		
	The design of all process equipment shall include features to minimize self-contamination of the equipment, piping, and confinement areas. The design of process equipment shall also include features to minimize the spread of contamination out of local areas.		
1300-6	Radiation Protection		
1300-6.1	General		
	Special facilities shall be designed to minimize personnel exposures to external and internal radiological hazards provide adequate radiation monitoring and alarm systems, and provide space for health physics activities.		
	Primary radiation protection shall be provided by the use of engineered controls (e.g., confinement, ventilation, remote handling, equipment layout, and shielding).		

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Applicable Section	Item Number/Criteria	Status	Comments
	Secondary radiation protection shall be provided by administrative control.		
1300-6.2	Shielding Design		
	The shielding design basis shall be to limit the maximum exposure to an individual worker to one-fifth the design goals for occupational external exposure limits specified in DOE 5480-11.		
	Within this design basis, personnel exposures shall be maintained ALARA.		
	Specifically, the shielding shall be designed with the objective of limiting the total EDE to less than 1 rem per year to workers, based on their predicted exposure time in the normally occupied area.		

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	<p>The EDE shall be the sum of all contributing external penetrating radiation (gamma and neutron).</p> <p>In addition, appropriate shielding shall be installed, if necessary, to minimize nonpenetrating external radiation exposures to the skin and lens of the eye of the worker.</p> <p>Shielding and other radiation protection measures shall be provided for areas requiring intermittent access, such as for preventive maintenance, component changes, adjustment of systems and equipment, and so forth. The projected dose rates based on occupancy, time, and frequency of exposure shall not exceed 1 rem/yr.</p> <p>Concrete radiation shielding design shall comply with ANS 6.4 and ACI 349 and shall consider the material specifications of ANS 6.4.2 where it provides a critical confinement or structural function.</p> <p>Straightline penetration of shield walls shall be avoided to prevent radiation streaming.</p>		
1300-6.3	Hand and Forearm Protection.		<p>Remote shielding operation shall be considered where it is anticipated that exposures to hands and forearms would otherwise approach the dose guidance in the directive on Requirements for Radiation Protection in the DOE 5480 series, or where contaminated puncture wounds could occur.</p>
1300-6.4	Internal Radiation Exposure		

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	<p>The design shall ensure that occupied operating areas do not exceed the airborne concentration limits of the DOE 5480 series for normal operating conditions.</p> <p>In addition, to the extent practical, the concept of ALARA shall be used when designing confinement and ventilation systems to limit airborne contamination levels.</p> <p>The design shall ensure that respirators are not required to meet the dose limits for normal operation.</p> <p>Engineered controls and features shall also be provided to minimize potential inhalation of radioactive and other hazardous materials under all conditions.</p>		
1300-6.5.6	Nuclear Accident Dosimetry		
	<p>Where there is the potential for a criticality excursion causing personnel exposures, nuclear accident dosimeters shall be provided with performance features and placement consistent with DOE 5480.11.</p>		
1300-7	Confinement Systems		
1300-7.1	Objectives.		
	<p>Containment systems shall accomplish the following:</p> <ul style="list-style-type: none"> Minimize the spread of radioactive and other hazardous materials with the unoccupied process areas. 		

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"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> • Prevent, if possible, or else minimize the spread of radioactive and other hazardous materials to occupied areas. • Minimize the release of radioactive and other hazardous materials in facility effluent during normal operation and anticipated operational occurrences. 		
1300-7.2	<p>General</p> <p>Confinement capabilities, including confinement barriers and associated ventilation systems, shall maintain a controlled, continuous airflow pattern from the environment into the confinement building, and then from noncontaminated areas of the building to potentially contaminated areas, and then to normally contaminated areas.</p> <p>For a specific nuclear facility, the number and arrangement of confinement barriers and their required design features and characteristics shall be determined on a case-by-case basis. Engineering evaluations, trade-offs, and experience shall be used to develop a practical design that achieves confinement system objectives.</p> <p>Although individual confinement systems are not required to withstand the effects of every accident, they shall effectively perform their required functions for the DBAs they are required to withstand.</p>		

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Applicable Section	Item Number/Criteria	Status	Comments
	<p>Sufficient redundancy shall be provided in the unlikely event of a confinement system failure. At least one of the confinement systems shall be designed to ensure that it can withstand the effects of severe natural phenomena and man-made events (see Section 0111-99.0, Nonreactor Nuclear Facilities-General), including the postulated DBAs and DBF initiated by these events, and remain functional to the extent that the guidelines of Section 1300-1.4.2, Accidental Releases, are not violated.</p> <p>The secondary and tertiary barriers may exist in common as a single structural envelope (e.g., walls, roof slab, floor slab), provided the barrier can withstand the effects of man-made events and DBAs including the DBE, and does not contain access ways that permit the transfer of personnel, equipment, or materials directly from the exterior of the facility.</p> <p>The adequacy of the design of these confinement systems to effectively perform their required functions shall be demonstrated by the safety analysis.</p> <p>Design of confinement areas shall provide adequate means for decontamination of the areas prior to entry or breaching for maintenance and repair purposes.</p>		

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Applicable Section	Item Number/Criteria	Status	Comments
1300-7.3	Access Ways.		
	Special features (e.g., air locks, enclosed vestibules) shall be considered for access through confinement barriers to minimize the impact of facility access requirements on the ventilation system and to prevent the release of radioactive airborne materials.		
	Provision for normal and emergency equipment shall be provided in or adjacent to the access ways.		
	Consideration shall be given to emergency lighting, paging systems, automatic access door switches, hand and foot monitors, storage for clothing and emergency equipment, warning lights, air sampling, and breathing air outlets.		
1300-7.4	Transfer Pipes and Encasements		
	Double-walled pipes or pipes within a secondary confinement structure encasement shall be used in all areas where the primary pipe leaves the facility. In areas within the facility, the use of double-walled pipe shall be considered. Leakage monitoring shall be provided to detect leakage into the space between the primary pipe and the secondary confinement barrier.		

**TABLE 5. CONFINEMENT - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1323	Radioactive Liquid Waste Facilities		
1323-4	Special Design Features		
1323-4.1	General		
1323-5	Confinement Systems		
	The use of multiple barriers shall be emphasized when necessary, to restrict the movement of radioactive liquid waste that has the potential for human contact or for reducing groundwater quality below the requirements set forth in the directive in DOE 5400.1.		
1323-5.1	General		
	The degree of confinement in a radioactive liquid waste facility is both storage-specific and process-specific, but in either case shall suit the most restrictive case anticipated. Systems, components, and structures that compose the process system and/or primary storage tanks shall be designed to ensure their integrity for all normal operations, anticipated operational occurrences, and DBAs they are required to withstand.		
	Systems, components, and structures that compose the process system and/or primary storage tanks shall be designed to ensure their integrity for all normal operations, anticipated operational occurrences, and DBAs they are required to withstand.		
	Unless it can be demonstrated that the risk is acceptable, the process system and/or primary storage tanks and associated supports shall be designed to remain functional following a DBE, and shall facilitate the maintenance of a safe shutdown condition.		

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Applicable Section	Item Number/Criteria	Status	Comments
	<p>The primary confinement system consisting of the process equipment and/or primary storage tanks shall be designed to operate under process conditions that prevent or minimize the probability of potential explosive chemical reactions.</p> <p>Spills, overflow, or leakage from storage vessels or other primary confinement structures shall be collected and retained within a suitable secondary confinement structure. The secondary confinement structure shall be capable of retaining the maximum radioactive liquid waste inventory that may be released from the primary confinement structure. The capability shall exist to transfer such collected liquid from the secondary confinement structure to a suitable storage location.</p> <p>Directly buried storage tanks shall be designed in accordance with the applicable requirements specified in DOE 5400.1. The use of underground storage tanks should be avoided if at all possible.</p>		
1323-5.3	Low-Level Liquid Waste Confinement		
	<p>The following shall be applicable to the low-level liquid waste confinement system:</p> <ul style="list-style-type: none"> • A dike or berm around the process system shall provide secondary confinement for low-level liquid wastes. • A tertiary confinement system is not required for the low-level liquid waste system. • Process and waste storage vessel vents shall be provided as discussed in Section 1323-5.2, High-Level Waste Confinement. 		

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Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> Retention basins shall comply with DOE 5400.1 and shall be lined, fenced, and posted with appropriate radiation warning signs. A system for monitoring radionuclide migration from the basin shall be available. An impervious berm or dike shall be capable of retaining the maximum radioactive liquid waste inventory that may be released by a leak or failure of a primary confinement vessel. A capability shall exist to transfer waste that has leaked into the secondary confinement. 		
1323-5.4	<p>Transuranic-Contaminated Liquid Waste Confinement</p> <p>The following shall be applicable to the transuranic-contaminated (to include enriched uranium and uranium-233) liquid waste confinement system:</p> <ul style="list-style-type: none"> A storage or process building shall provide secondary confinement for transuranic-contaminated liquid wastes. Tank and piping systems used for transuranic-contaminated liquid waste collection, treatment, and storage shall be of welded construction to the fullest extent practical. 		
1323-6.2	Contaminated Liquid Waste		
1323-6.2.1	<p>Process Wastes</p> <p>Disposal operations involving discharge of low-level liquid wastes directly to the environment or on natural soil columns is prohibited unless specifically approved by the cognizant DOE authority.</p>		

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Applicable Section	Item Number/Criteria	Status	Comments
1324-6	Confinement System		
1324-6.1	Confinement Systems		
	General		
	<p>The following provisions are typical for a RSWF confinement system. The actual confinement system requirements for a specific RSWF shall be determined on a case-by-case basis.</p> <p>The degree of confinement required in a radioactive solid waste facility is both storage-specific and process-specific, but in either case shall suit the most restrictive case anticipated.</p> <p>In general, the primary contamination confinement shall be the radioactive solid waste process systems equipment and associated off-gas or vent systems during the treatment stage of processing. In special cases, such as radioactive solid waste facilities where the processes or storage include corrosive or noxious materials, the radioactive solid waste process or storage system shall be totally enclosed and provided with its own ventilation system and off-gas cleanup system. In such cases, the radioactive solid waste process or storage system shall be treated as the primary confinement system. However, depending on the waste being processed and stored, the primary confinement and secondary confinement shall consist of a sit-specific engineered system of barriers (e.g., drums, liners, concrete casks) when the primary confinement described above is not required.</p> <p>Secondary confinement for radioactive solid waste during treatment shall be a process cell or building and its ventilation system, while for such waste during interim storage, a storage building or structure shall be used.</p>		

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Applicable Section	Item Number/Criteria	Status	Comments
	<p>Tertiary confinements are not required in most cases for radioactive solid waste during the treatment or interim storage phase of the radioactive solid waste management process. However, the final repository for all such solid wastes shall be tertiary confinement by the natural geologic setting that has been selected as a site and for the specific solid wastes processed at the facility.</p> <p>In addition to these principal confinement systems, features such as change rooms and special access ways shall be used to minimize the spread of radioactive contamination within the facility.</p>		
1324-6.2	Primary Confinement System		
	<p>The primary confinement system consists of process systems equipment and its associated ventilation and offgas system, storage containers, or other waste and site-specific engineered barriers.</p> <p>Systems, components, and structures that compose the process system and/or storage containers shall be designed to ensure their integrity for normal operations, anticipated operational occurrences, and for the DBAs they are required to withstand.</p> <p>As a minimum, portions of the process system and/or storage containers whose failure would result in an unacceptable risk and whose functions are necessary to facilitate a safe shutdown condition shall be designed to remain functional following a DBE. High-level enriched uranium, uranium-233, and transuranic solid waste processes and/or storage containers shall meet these requirements. The need to meet these requirements for other solid wastes shall be determined on a case-by-case basis and shall be commensurate with the potential hazards associated with the waste.</p>		

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Applicable Section	Item Number/Criteria	Status	Comments
1324-6.3	Secondary Confinement System		<p>The secondary confinement system consists of the process cell barriers and the ventilation systems associated with the cells or building, or a storage building or structure. In some cases, a drum, cask, or other waste and site-specific engineered barrier shall provide secondary confinement.</p> <p>The process cell and/or building confinement barriers and associated ventilation systems shall be capable of performing their necessary functions following a DBE. Other secondary confinements shall be considered to determine the need to meet these requirements commensurate with the hazards associated with the radioactive solid waste to be confined.</p> <p>The secondary confinement shall be designed to ensure that it can withstand the effects of severe natural phenomena and man-made events, including the DBAs and DBF initiated by these events, and remain functional to the extent that the guidelines in Section 1300-1.4.2, Accidental Releases, are not violated.</p> <p>All penetrations of the secondary confinement shall have positive seals to prevent the migration of contamination out of the secondary confinement area.</p>

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	<p>Process cells shall be supplied with ventilation air from the building ventilation system, and shall be provided exhaust ventilation with sufficient capacity to ensure an adequate controlled ventilation flow as required in the event of a credible breach in the secondary confinement barrier. Pressure in the compartments shall be negative with respect to the building ventilation system. Special features (e.g., air locks or enclosed vestibules) shall be considered for access through secondary and tertiary confinement barriers.</p>		
1324-6.4	Tertiary Confinement System		
	<p>The natural geologic setting composes the tertiary confinement system.</p>		
	<p>The tertiary confinement system shall function during normal operations, anticipated operational occurrences, and the DBAs it is required to withstand. It shall be capable of performing its necessary functions following a DBE.</p>		
	<p>The tertiary confinement shall remain functional following DBAs and the severe natural phenomena postulated for the facility site. In additions, the tertiary confinement system shall meet the following performance objectives:</p>		
	<ul style="list-style-type: none"> • Following permanent closure, ongoing site maintenance shall not be needed. • In the absence of unplanned natural processes or human contact with a low-level waste disposal facility, calculated contaminant levels in groundwater at the site boundary shall not exceed the maximum contaminant levels established in 40 CFR 141. 		

**TABLE 5. CONFINEMENT - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none"> In the event of human-induced activities following permanent closure, or reasonably foreseeable but unplanned natural processes, the guidelines of Section 1300-1.4.2, Accidental Releases, shall not be violated. Institutional controls may be relied on for a limited time following closure to preclude reclamation activities at a low-level waste disposal site. For the purposes of calculation, these controls shall not be relied on for more than 100 years following permanent closure. 		
1324-7.3	Effluents		
1324-7.3.1	Airborne Effluents		
	<p>The airborne radioactive wastes typically associated with radioactive solid waste facilities that shall be considered during the design include but are not limited to the airborne effluents from process system vents and fission product gases. Effluent system designs shall preclude the holdup or collection of fissile material and other material capable of sustaining a chain reaction in portions of the system not geometrically favorable. Nuclear criticality safety shall be considered in the design of airborne effluent systems.</p> <p>Exhaust outlets that may contain transuranics or fission products shall be provided with two monitoring systems. These monitoring systems shall comply with Section 1589-99.0.1, Radioactive airborne Effluents.</p>		
1530-99.0	Nonreactor Nuclear Facilities - General		
	<p>Confinement systems, particularly the building structural shell and its associated ventilation systems, shall be designed with the capability of retaining the confinement function during the DBF.</p>		

**TABLE 5. CONFINEMENT - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1540	Plumbing/Service Piping		
1540-99	Special Facilities		
1540-99.0	Nonreactor Nuclear Facilities-General		
1540-99.0.3	Other Collection Systems		
	Consideration shall be given to the collection and monitoring of radioactive and nonradioactive contaminants in natural runoff (e.g., roof drainage) and blowdowns from heating and cooling systems before discharge to the environment.		
1550	Heating, Ventilation, and Air Conditioning Systems.		
1550-99.0.2	Confinement Ventilation Systems		
	The design of a confinement ventilation system shall ensure the ability to maintain desired airflow characteristics when personnel access doors or hatches are open. When necessary, air locks or enclosed vestibules shall be used to minimize the impact of this on the ventilation system and to prevent the spread of airborne contamination within the facility.		
	The ventilation system design shall provide the required confinement capability under all credible circumstances with the addition of a single failure in the system.		
	If the maintenance of a controlled continuous confinement airflow is required, electrical equipment and components required to provide this airflow shall be supplied with safety class electric power and provided with an emergency power source.		

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Applicable Section	Item Number/Criteria	Status	Comments
	<p>Air cleanup systems shall be provided in confinement ventilation exhaust systems to limit the release of radioactive or other hazardous material to the environment and to minimize the spread of contamination within the facility as determined by the safety analysis.</p> <p>The following general cleanup system requirements shall be met, as appropriate, for ventilation system design:</p> <ul style="list-style-type: none"> • The level of radioactive material in confinement exhaust systems shall be continuously monitored. Alarms shall be provided that will annunciate in the event that activity levels above specified limits are detected in the exhaust system. Appropriate manual or automatic protective features that prevent an uncontrolled release of radioactive material to the environment or workplace shall be provided. <p>To limit onsite doses and to reduce offsite doses by enhancing atmospheric dispersion, elevated confinement exhaust discharge locations are required. The height of the exhaust discharge location shall ensure that the calculated consequences of normal or accidental releases shall not exceed the radiological guidance contained in Section 1300-1.4, Guidance on Limiting Exposure of the Public. In addition, to the extent practical, all normal and accidental releases shall be maintained at ALARA levels.</p> <ul style="list-style-type: none"> • An elevated stack shall be used for confinement exhaust discharge. Provisions shall be made to ensure an adequate ventilation exhaust discharge path in the event of stack failure. The stack shall be located so that it can not fall on the facility or an adjacent facility containing safety class items. The alternative is the construction of a stack that shall remain 		

**TABLE 5. CONFINEMENT - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	functional following a DBE, severe natural phenomena, and man-made events. Stack location and height shall also consider intakes on the facility and adjacent facilities to preclude uptake.		
	<ul style="list-style-type: none"> • Safety class air filtration units shall be designed to remain functional throughout DBAs and to retain collected radioactive material after the accident. • Air sampling locations shall meet ACGIH/ASHRAE criteria. Sample collecting devices shall be located as close to the sampling probe as possible. • The number of air filtration stages required for any area of a facility shall be determined by safety analysis based on the quantity and type of radioactive materials to be confined. • Air filtration units shall be installed as close as practical to the source of contaminants to minimize the contamination of ventilation system ductwork. • Ducts shall be sized for the transport velocities needed to convey, without settling, all particulate contaminants. • Air filtrations units shall be located and provided with appropriate radiation shielding to maintain occupational doses ALARA during operations and maintenance. • Air filtrations units shall be designed for ease of recovery of fissile material and other materials capable of sustaining a chain reaction in case of an accident as well as during normal operations. 		

TABLE 5. CONFINEMENT - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	<ul style="list-style-type: none">• The cleanup system shall have installed test and measuring devices and shall facilitate monitoring operations, maintenance, and periodic inspection and testing during equipment operation or shutdown, as appropriate.• Either HEPA filtration or fail-safe backflow prevention for process area intake ventilation systems shall be provided.• Consideration shall be given to providing roughing filters or prefilters upstream of a HEPA.		

TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
0110-99.0.8	Personnel and Public Safety		
	Automatic monitoring and alarm devices shall be provided (where required by the form and potential hazard of the material being handled or stored) to detect the presence of significant levels or increases of radioactivity and, if feasible, any other hazardous materials, either released in the special facility or escaping from it. (Where monitoring devices are not available for specific contaminants, sampling devices shall be substituted and be evaluated on a frequency sufficient to detect release levels of interest).		
	Cautionary systems or interlocks shall prevent inadvertent entry into hazardous areas. All safety alarm systems shall annunciate inside of the special facility so as to identify hazardous areas. The need for visual alarm devices within the special facility, in addition to audible alarm devices, shall be considered. Where alarms can preclude or minimize exposures outside of the facility, they shall be provided (such as criticality alarms or evacuation alarms).		

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**TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE
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Applicable Section	Item Number/Criteria	Status	Comments
0275-99.0	Nonreactor Nuclear Facilities - General		
0275-99.0.1	Industrial Waste		
	The radioactivity monitor shall have an alarm that annunciates locally as well as in an occupied area where corrective action can be initiated.		
1300	General Requirements		
1300-3.4.3	Equipment Operability Qualification.		
	Testing, or a combination of testing and analysis, shall be the preferred method of demonstrating the operability of fluid system components, mechanical equipment, instrumentation, and electrical equipment that are required to operate during and following a DBE. Seismic experience data may be used as an alternative to testing or dynamic analysis where such data have been documented and validated. (See Section 011199.0, Nonreactor Nuclear Facilities - General.)		
1300-3.5	Maintenance.		
	The design shall consider the maintainability factors peculiar to the specific equipment to be used in the facility.		

**TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE
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Applicable Section	Item Number/Criteria	Status	Comments
1300-6	Radiation Protection		
1300-6.5	Monitoring, Warning, and Alarm Systems		
1300-6.5.1	General		
	All monitoring systems shall be calibrated annually with appropriate national standards to ensure validity of reported values.		
	All radiation monitoring, alarm, and warning systems that are required to function during a loss of normal power shall be provided with an emergency UPS (internal or external on-line) unless it is demonstrated that they can tolerate a temporary loss of function without losing needed data and they are provided with standby or emergency (switched) power. Determination of the power supply type and quality shall be based on the safety classification of the monitoring system or device. The sampling motivation (vacuum) shall be installed to the same requirement.		
1300-6.5.2	Air monitoring and Warning Systems		
	Air monitoring and warning systems shall be installed in work areas where hazardous materials are stored or handled and where hazardous airborne particles or vapors may be present.		
	Air sampling heads shall be located to provide a representative sample of potential airborne radioactive materials being breathed.		
	Air monitoring systems shall comply with ANSI N13.1.		

**TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE
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Applicable Section	Item Number/Criteria	Status	Comments
1300-6.5.3	<p>Personnel Monitoring and Warning Devices</p> <p>Provisions shall be made for personnel monitoring devices, such as hand and foot counters, in the vicinity of work stations.</p> <p>Installed monitors (supplemented with personal monitoring methods if necessary) shall be used to monitor personnel exiting an operating area through access ways.</p> <p>CAMSs shall be provided to detect and to alarm at prescribed airborne radioactivity levels.</p>		
1300-6.5.4	<p>Ionizing Radiation Monitoring System</p> <p>Where ionizing radiation is present (due to process material, equipment, or operations), an area radiation monitoring system shall be provided to alert personnel of unexpected increases in ionizing radiation levels.</p>		
1300-6.5.5	<p>Warning and Alarm Systems Features</p> <p>Warning and alarm systems shall be designed, installed, and tested to ensure that they can be heard in the ambient conditions of the area they are intended to cover.</p> <p>Evacuation alarm systems shall comply with ANSI N2.3.</p>		

TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
1300-6.5.7	Central Radiation Monitoring and Alarm Readout		
	In addition to a local station alarm, radiation monitoring system (criticality alarms, CAMSs, alarms associated with stack monitoring systems, and so on) shall have central (i.e., control room or radiation monitoring office) readout and alarm panels that are accessible after a DBA to evaluate internal conditions.		
1300-12	Human Factors Engineering		
1300-12.4	General Human Factors Implementation Criteria and Considerations		
	The organization of operator movements and the arrangement and accessibility of equipment and controls in the work area shall facilitate convenient access to each system component for operation and maintenance.		
1300-12.4.8	Warning and Annunciator Systems		
	An effective warning system shall alert personnel to a problem or abnormal condition and shall provide sufficient time to respond appropriately to the problem. For the special case of control room annunciators, see NUREG 0700, Section 6.3. For auditory signals guidelines, see NUREG 0700, Section 6.2.		
	Each stimulus shall be easily distinguishable from other stimuli in the same modality but it shall not be a distraction. If an alarm can be one of many similar alarms that may occur simultaneously, it shall be easy to locate.		

TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
	Any specific stimulus shall have only one meaning. It can either designate one problem or it can be a signal to look at a particular place to define the alarm further. When there are many annunciator alarms, priority coding such as "first in/out" shall be used to assist in determining message significance.		
	False alarms and nuisance alarms shall be removed. Set point determination shall allow sufficient response time to the operator.		
	Provision shall be made for active acknowledgement and for silencing of auditory alarms after they have been acknowledged.		
	Provision shall be made for maintaining personnel awareness of alarm conditions until they have been corrected or "cleared." Clearing of the alarm shall require a positive response from the assigned personnel.		
1300-12.4.9	Communication Systems		
	The system shall have provisions for periodic maintenance tests, instructions for the use of each system used, and procedures for handling emergency communications where applicable.		

TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
1589	Air Pollution Control		
1589-99	Special Facilities		
1589-99.0	Nonreactor Nuclear Facilities-General		
1589-99.0.1	Radioactive Airborne Effluents		
	<p>All exhaust ducts (or stacks) that may contain radioactive airborne effluents shall be provided with effluent monitoring systems that are designed in accordance with the applicable requirements contained in the directive on Radioactive Protection of the Public and the Environment in the DOE 5400 series and the directive on Radiological Effluent Monitoring and Environmental Surveillance in the DOE 5400 series. Backup capability for monitoring systems shall be considered in the design of each system (e.g., redundant detectors, additional sample line ports, additional sampler trains, etc.). Continuous stack sampling and continuous radiation detection shall be considered. Sampling systems shall be designed in accordance with ANSI N13.1 and associated appendixes to ensure representative sampling of the effluent stream. Isokinetic sampling shall be provided for effluent streams that are expected to contain particulate radionuclides. The range capability of continuous monitors shall cover from routine to potential DBA releases of radionuclides.</p>		

TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
1595	Controls		
1595-1	General		
	<p>This section covers safety and operating controls, automatic temperature and humidity controls, energy monitoring and (central supervisory) control systems, energy conservation requirements for controls, and zoning requirements and restrictions.</p> <p>Specific safety control system requirements for individual types of equipment are discussed in Section 1550, Heating, Ventilating and Air-Conditioning Systems. Lighting, security, and fire protection control systems related to central supervisory control systems are discussed in Section 0110-12, Energy Conservation, and Division 16, Electrical.</p> <p>Special control requirements shall be indicated in DOE project-specific criteria. Selection of control system types and associated equipment, shall be based on the most economical and maintainable system.</p> <p>Control systems shall be designed to use the closed-loop[feedback method of control. Open-loop systems shall not be used. Proportional-type control shall be used for all control systems; other type control systems shall be used as needed according to the degree of control required.</p>		

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	<p>All control equipment shall be easily accessible. One temperature control panel shall be provided for each system, complete with panel-face-mounted indicators, switches, pilot lights, and tags. All control interlocks shall be through HOA switches.</p> <p>Control air compressors shall be duplex non-lubricated type with oil lubricated crankcase and distance piece. Air shall be filtered and dried using refrigerated air dryers for dew point of 15°F and regenerative silica type for dew point below 15°F.</p> <p>Copper piping shall be used for high pressure air in inaccessible locations (plastic piping may be used if installed in conduit). Air leakage shall not exceed 5 percent of pressure in 24 hours. Transmitters shall be capable of field calibration and thermometers or pressure gauges shall be provided at transmitters. All controllers and thermostats shall be pilot-bleed type.</p>		
1595-2	<p>Zoning</p> <p>Zoning for automatic control of space temperatures, static pressures, humidities, ventilation, smoke and fire detection, security, and lighting shall satisfy health and safety requirements as indicated in DOE project criteria, NFPA 101, space operational and occupancy requirements, and zoning exposure with relation to building size, orientation and configuration.</p> <p>Zoning requirements are as follows:</p> <ul style="list-style-type: none"> • Each HVAC system shall have a separate thermostat for space temperature regulation and a separate humidistat if humidity 		

TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
	control is provided.		
	<ul style="list-style-type: none"> • No zone shall contain more than a single building floor regardless of floor space. • Automatic controls shall be provided to shut off heating or cooling to any individual zone • Interior zones shall not be combined with external zones. • Interior space zones shall be placed on separate air handling systems from external, if cost effective. External space zones shall be selected for each individual exposure. • For office facilities and similar occupancies, each major orientation shall be zoned to have no more than 2,000 square feet of floor area with exterior exposure, and no more than 3,000 square feet of floor area with no exterior exposure. 		

TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
1660-99	Special Facilities.		
1660-99.0	Nonreactor Nuclear Facilities - General.		
1660-99.0.1	Safety Class (Emergency) Electrical Systems		
	Electric power and electrical instrumentation and control systems are designated safety class electric if they are required to satisfy the safety class criteria in Section 1300-3.1, General, through Section 1300-3.4, Equipment Environment Considerations. These components and systems are subject to the basic approach outlined in the IEEE 308 standards and to higher quality assurance requirements as needed.		
1660-99.0.2	Protection System and Instrumentation and Controls.		
	Safety Class Instrumentation and Controls.		
	Safety class instrumentation shall sense abnormal conditions affecting safety and subsequently provide an alarm, e.g., low differential pressure between HVAC zones, criticality monitoring.		
	Safety class instrumentation and control systems shall provide audible and visual alarms so that the operator can take timely corrective actions to ensure the safety of operating personnel and the public.		
	The safety class instrumentation shall be designed to monitor safety-related variables and safety class systems over expected ranges for normal operation, anticipated operational occurrences,		

**TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE
ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	DBA conditions, and for safe shutdown.		
	Safety class controls shall be provided when they are necessary to control these variables.		
	The design of safety class instrumentation and controls shall provide suitable redundancy and diversity to ensure that safety functions can be completed when required, and that no single failure will result in the loss of the protective functions.		
	The safety class instrumentation and controls shall fail in a safe state following a component or channel failure or loss of power (e.g., control air, electric power).		
1660-99.03	Qualification.		
	Protection systems and safety class instrumentation and control equipment shall be qualified to the environmental qualification requirements in Section 1300-3.4, Equipment Environment Considerations.		
1660-99.04	Separation and Physical Protection.		
	Redundant protection system and safety class instrument channels shall be physically protected or separated to prevent a common external event or failure of one channel from causing a failure in the redundant channel.		
	The safety class protection system and safety class instrumentation and control system shall be appropriately separated or isolated from		

TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A, "GENERAL DESIGN CRITERIA," DATED 04/06/89

Applicable Section	Item Number/Criteria	Status	Comments
	other instrumentation and control systems to the extent that a failure (e.g., electrical, control air) in these other systems will not degrade the safety class systems to the extent that they are unable to perform their necessary safety functions.		
1660-99.0.5	Test and Calibration.		
	The design of protection system and safety class instrumentation and control systems shall provide for the periodic in-place testing and calibration of instrument channels and interlocks.		

**TABLE 6. INSTRUMENTATION AND CONTROL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE
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Applicable Section	Item Number/Criteria	Status	Comments
	The design shall allow periodic testing of protective functions to determine whether failure or loss of redundancy may have occurred.		
1660-99.0.6	Power Sources		
	An analysis shall be made to determine power requirements for safe shutdown of the process. Safety class electric power or a safety class control air system shall be provided unless adequate system performance including fail-safe shutdown can be demonstrated when only the conventional power sources are used.		
1660-99.0.7	Control Areas		
	Control areas or a control room shall be designed to allow occupancy and actions to be taken to operate the facility safely under normal conditions, anticipated operational occurrences, and DBA conditions to achieve and maintain a safe shutdown condition including the remote manual initiation and control of safety functions, if used. In the event that a control area or control room is disabled, there shall be sufficient redundancy and capability to allow the facility to be placed in a safe shutdown condition.		

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0110-12	Energy Conservation		
0110-12.2	General		
	1. For existing construction, ASHRAE Standard 100 shall apply.		
1100	General		
	2. All air-conditioning equipment shall comply with applicable ARI standards as a minimum requirement.	N/A	No air conditioning.
1161	Enclosures		
1161-4	Ventilation		
	3. The design professional shall consider the possible necessity to remove moisture, heat, and explosive and corrosive gases, as well as other contaminants.		
	4. A ventilation system shall be installed on all enclosure systems to maintain minimum negative pressure differential of 0.3 in. of water inside the enclosure (except open-face hoods) with respect to the operating area.	NC	Comply except no emergency power. Write to the criteria; shall means must be required.
	5. Open-face hoods shall be ventilated such that flow from the operating area into the hood is maintained. Safety class items of the ventilation system shall be supplied with emergency power.		

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"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	6. Failure of any single component or control function shall not compromise minimum adequate ventilation. The design professional shall consider the possible necessity to remove moisture, heat, and explosive and corrosive gases, as well as other contaminants. Perchloric acid fume exhaust systems shall comply with NFPA 45, Chapter 6.		
	7. HEPA filters shall be provided at the interface of the enclosure outlet and the ventilation system to minimize the contamination of ductwork and at the enclosure inlet to prevent movement of contamination within the enclosure to the operating area in the event of a flow reversal. A roughing filter should be installed to reduce HEPA filter loading	C	
	8. The system shall be designed to automatically ensure adequate inflow of air through a credible breach in the enclosure system.		
	9. Minimum inward air velocity shall be 125 plus or minus 25 linear ft/min or as determined from guidance provided in the ACGIH Industrial Ventilation Manual.		
	10. The design of the enclosure ventilation flow pattern shall minimize the spread of fire, and fire screens shall be provided where necessary.		

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	11. For enclosures where overpressurization is possible, a system shall be provided to ensure that confinement is not breached.	N/A	
	12. Small enclosure systems with positive-pressure supplied gases shall have positive-acting, pressure-relief devices (connected into the exhaust system) to prevent pressurization of the enclosure.		
	13. Hood faces shall not be located within 10 feet of the closest air supply or exhaust point. Hoods shall not be located in or along normal traffic routes. An open-faced hood shall be designed and located to provide a minimum air velocity of 124 plus or minus 25 linear ft/min over the hood face area. A hood should not be used in a location where room air currents of >50 linear ft/min at the face of the hood will disrupt uniform air entrance. All open-face hoods shall be designed to provide appropriate face velocity to ensure capture of contaminants in the hood exhaust (see the ACGIH Industrial Ventilation Manual). Exhaust air from a hood shall not be recirculated to occupied areas.	TBD	HSE and user.
1300	Special Facilities		
1300-6	Radiation Protection		
1300-6.8	Change Rooms		
	14. The change room exhaust air shall be HEPA-filtered if dispersible radionuclides are handled in the process areas it serves.	TBD	

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
Division 15	Mechanical		
1550	Heating, Ventilating and Air-Conditioning Systems		
1550-1	General Sizing and Design Criteria		
1550-1.1	General Selection Procedures for HVAC Systems		
	15. The design professional shall evaluate building HVAC systems and sub-systems and select major HVAC equipment components based on a consideration of health and safety requirements, initial costs, operating costs, and maintenance costs according to the procedures listed in 0110-12.7, Building Design Analysis.		
	16. HVAC equipment shall be sized to satisfy the building heating and cooling load requirements and to meet all general equipment design and selection criteria contained in the ASHRAE Fundamentals handbook, ASHRAE Equipment handbook, ASHRAE Systems handbook, ASHRAE Applications handbook, and ASHRAE Refrigeration handbook. Calculations and equipment selection shall be made according to the procedures given in ASHRAE GRP 158 and appropriate chapters of the ASHRAE Fundamentals handbook.		

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	meet the ambient air quality standards for particulates, gases, or other contaminants, it shall be treated to remove particles and gases and vapors as required to meet the minimum ambient air quality standards.		
1550-1.5.3	Personnel Ventilation Air Requirements		
	20. The outdoor air shall be provided in the quantities indicated for conditioned offices and other occupied spaces in ASHRAE Standard 62. Outdoor air in addition to the quantities required by ASHRAE Standard 62 shall be provided when required to balance a building's or space's exhaust air rate or to maintain the building or space under a positive pressure. Proper ventilation rates shall be demonstrated by calculation if natural ventilation or infiltration is used as the outdoor air introduction method.	C	Outside air quantities balance exhaust air quantities.
1550-1.5.4	Recirculation		
	21. When air is supplied to a space, the portion of the total supply air that exceeds the required outdoor air quantity shall be recirculated through the ventilation system except from areas in which recirculation is specifically prohibited. If the indoor air quality does not meet or exceed the limits given in ASHRAE Standard 62, the recirculated air must be treated and monitored.	C	Recirculated air is filtered through a double HEPA filter before it is reintroduced to the space.

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Applicable Section	Item Number/Criteria	Status	Comments
	22. Areas from which air shall not be recirculated include areas that produce or emit dust particles, heat, odors, fumes, spray, gases, smoke, or other contaminants that cannot be sufficiently treated and could be potentially injurious to health and safety of personnel or are potentially damaging to equipment. These areas shall be 100-percent exhausted. Project criteria shall indicate other areas of non-recirculation.	C	change rooms, toilets, and the enclosure are 100% exhausted.
	23. Ventilation and exhaust air systems serving these areas or other special areas shall meet all the deliverable-air quantity requirements of ASHRAE Standard 62 and any other specific equipment requirements as discussed in Section 1550-2.5, Air Handling and Air Distribution Systems, and Section 1550-99, Special Facilities.	C	All air is filtered with minimum 35% filters.
	24. Rest rooms, janitor's closets, garbage rooms, and other malodorous spaces shall be exhausted at a rate of not less than 2 cfm per square foot or as specified in ASHRAE Standard 62, whichever is the more stringent, regardless of any other calculated ventilation requirements. Space ventilation air from adjacent spaces should be used as the ventilation supply air for the 100-percent exhausted spaces, as long as: <ul style="list-style-type: none"> • Ventilation by this method does not violate any requirements of NFPA 90A, NFPA 101, or special space pressurization requirements • The air supplied is not potentially more hazardous than the air from the space exhausted 	C	Change rooms and toilets exhausted at 2 cfm/sq. ft.

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Applicable Section	Item Number/Criteria	Status	Comments
1550-1.5.5	Industrial Ventilation Requirement		
	25. Industrial type facilities and laboratories shall be provided with ventilation (supply and exhaust) systems as required for heat exposure control, or dilution ventilation. Ventilation air shall be provided in the quantities required to maintain OSHA air quality limits, all the PELs established by 29 CFR 1910 and all ACGIH TLVs. Design air quantities and transport velocities shall be calculated according to the calculation methods prescribed by the ASHRAE Systems handbook, the ASHRAE Applications handbook, the ACGIH Industrial Ventilation Manual, 29 CFR 1910, and NFPA 45. Designers shall consider ASHRAE Applications Chapter 14, "Laboratories," when designing laboratories and laboratory buildings. Makeup air shall be provided in the quantities required to maintain required positive or negative room static pressure requirements and to offset local exhaust air quantities. Makeup air shall be tempered.		
	26. Design air quantities and transport velocities shall be calculated according to the calculation methods prescribed by the ASHRAE Systems handbook, the ASHRAE Application handbook, the ACGIH Industrial Ventilation Manual, 29 CFR 1910, and NFPA 45.		
	27. Makeup air shall be provided in the quantities required to maintain required positive or negative room static pressure requirements and to offset local exhaust air quantities. Makeup air shall be tempered.		

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
1550-1.5.6	Local Exhaust Systems		
	28. DOE project-specific criteria shall provide information on the source, quantity, and type of contaminants. Local exhaust systems shall be designed to maintain the required capture air velocities for source containment control. Air quantities and transport shall be calculated based on the calculation methods prescribed by the ASHRAE systems handbook, the ASHRAE Applications handbook and the ACGIH Industrial Ventilation Manual. Further design criteria for local exhaust systems are contained in Section 1550-2.5, Air Handling and Air Distribution Systems, and Section 1550-99, Special Facilities.		
1550-1.5.7	Equipment Room Ventilation		
	29. Mechanical and electrical equipment rooms shall be exhausted so that room temperature does not exceed NEMA equipment ratings. DOE project criteria shall provide the space temperature limit criterion. Where mechanical ventilation cannot maintain a satisfactory environment, evaporative cooling systems or other mechanical cooling systems shall be provided.		

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1550-2	Heating, Ventilating, and Air-Conditioning Systems Selection		
1550-2.5	Air Handling and Air Distribution Systems		
1550-2.5.1	General		
	30. The design professional shall consider and design air handling equipment and air distribution systems sized to optimize both initial cost and air handling system operating and maintenance costs according to the procedures outlined here and in Section 011-12.7, Building Analysis Procedures.	TBD	0110.12.7 not included in C to C.
	31. The design professional shall provide all air handling system equipment (fans, terminal units, air handling units, etc.) with vibration isolators and flexible ductwork connectors to minimize transmission of vibration and noise. Systems shall satisfy the NC levels recommended for various types of spaces and vibration criteria as listed in the ASHRAE handbooks. Where air handling equipment and air distribution systems cannot meet these requirements, sound attenuation devices shall be installed in the air handling systems.	C	All air handling equipment is furnished with vibration isolators and flexible duct connectors.
	32. Airflow diagrams shall be developed and provided in the preliminary design phase unless waived by the DOE project criteria.	C	Included in Title II Design, Sheet M-8.
	33. These diagrams shall be provided for each air handling and air distribution system, and shall include capacities and locations of fans, coils, filters, terminal devices, and other major air distribution system equipment, as well as air flows	C	Sheet M-8.

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Applicable Section	Item Number/Criteria	Status	Comments
	and system air pressures and space pressure differentials.		
	34. Airflow velocities shall be designed to minimize settling of entrained particles as outlined in the ACGIH Industrial Ventilation Manual.		
	35. Air handling and air distribution systems shall meet the energy conservation requirements for transport energy in ASHRAE Standard 90. Controls for air handling and air distribution equipment shall comply with Section 1595-6, Control of Air Handling Systems.		
	36. Supply and outdoor air intakes shall be located a minimum of 10 feet from any exhaust opening.	C	Intake is on grade, exhaust on roof.
1550-2.5.2	Air Handling Units		
	37. The design professional shall select packaged air handling units complete with filters, coils, mixing boxes, fan section, and other accessories or built-up air handling units based on an LCC evaluation and the requirements of NFPA 90A, AMCA Publication 99, AMCA Publication 261, and ARI 430.	C	Built-up air handling unit was required due to specialized design criteria.

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Applicable Section	Item Number/Criteria	Status	Comments
1550-2.5.3	Fans/Motors		
	38. Fans shall be designed and specified to assure stable, nonpulsing aerodynamic operation in the range of operation over varying speeds. Air handling units and fans in size 3s over 1 hp shall use belt drives. Fans with motors of 10 hp or less shall be designed with adjustable motor pulley sheaves to assist in air balancing of systems. Fans with motors greater than 10 hp shall use fixed (non-adjustable) drives that can be adjusted by substituting fixed motor pulley sheaves of different diameters. Supply air handling units and return air fans in variable-air-volume systems shall control capacity through the use of variable-speed drives, inlet vanes or scroll bypass dampers. All fans shall comply with AMCA Standard 210, ASHRAE Standard 51, and ASHRAE Equipment handbook.	C	Fans are selected based on peak efficiency on the fan curve over the variable speed range. All fans are furnished with adjustable pulley sheaves.
	39. Fans shall be located within the ductwork system according to the requirements of AMCA Publication 201 and ACGIH Industrial Ventilation Manual. The design professional shall consider the use of variable-speed drives on fans in variable-air-volume systems where the supply fans are larger than 5 BHP. Motors shall be sized according to properly calculated BHP fan requirements and shall not use oversized fans and motors to meet future capacity needs unless so directed by DOE project criteria.		
	40. The design professional shall consider the selection of fan construction materials based on corrosion resistance and cost. Spark-resistant construction shall be used where required by NFPA.	C	Fans do not require special construction for corrosion. Fans are based on standard industry rated construction.

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Applicable Section	Item Number/Criteria	Status	Comments
	41. All fans and accessories shall be designed and specified to meet all smoke and flame spread requirements of NFPA 255.		
1550-2.5.5	Air Cleaning Devices		
	General		
	42. Air cleaning equipment for ductwork installation shall be easily removable, serviceable, and maintainable.	C	All filters are located with adequate clearance for service.
	xx. Air cleaning equipment shall have face velocities as recommended by the filter manufacturer and the design manuals recommended above to achieve maximum efficiency and minimum pressure drop.	C	Face velocities are designed for maximum efficiency.
	xx. Filters shall be constructed of noncombustible materials meeting the requirements for UL 900, Class I.	C	Filters meet UL Class I rating.
	xx. Air filters shall be located on the suction side of fans and coils and in other special locations as required for air treatment.	C	Located in mixing box in air handling unit.
	xx. Air filter pressure drop gauges of the diaphragm-activated, dial-type (preferred) or the included manometer type shall be located on all filter assemblies.	C	All filters equipped with pressure drop gauges.
	<u>High-Efficiency Particulate Air Filters</u>		
	21. HEPA filter assemblies shall comply with ASME N509.	C	Plenum housings and filters are pre-approved by LANL. A/E follows lab's recommendations.

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	22. HEPA filtration systems shall be used to minimize the release of particulate contaminants such as carcinogens, infectious agents, radioisotopes, or highly toxic materials when determined by safety analysis to be necessary.		
	23. The design professional shall design for a location that facilitates in-place testing of HEPA filters, with particular attention given to plenum hardware provisions that allow for testing of the HEPA filter bank without requiring the testing personnel to enter the plenum.	C	Filter plenums are equipped with DOP test plugs upstream and downstream of each filter bank.
	xx. Utility services shall be extended to the plenum location (e.g., electrical receptacles and compressed air) to facilitate testing work.	N/A	None required.
	24. In-place testing design requirements shall meet all the recommendations of UL 586, ASME N510, and ERDA 76-21.	TBD	By HSE.
	25. HEPA filtration systems shall be designed with prefilters installed upstream of HEPA filters to extend the HEPA filter's life. The design professional may eliminate the installation of pre-filters if an analysis of filtration requirements and consideration of the filter assembly justifies omission.	C	Standard practice, LANL standard specification requires 4 inch pre-filters on all filter plenums.

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Applicable Section	Item Number/Criteria	Status	Comments
Filters for Air Handling Systems Serving Inhabited Spaces			
	xx. Filters include air filter devices and air filter media used in building environmental air handling systems for removing particulate matter from atmospheric air. These filters shall be specified to meet minimum efficiencies required by the ASHRAE Dust Spot method using atmospheric dust for medium-efficiency applications. Filters shall be specified and installed for use as pre-filters, medium-efficiency filters, or high-efficiency filters. These filters shall comply with ARI 850.	C	Pre-filters are specified to be tested in accordance with ASHRAE standards.
	xx. High-efficiency filters and assemblies shall comply with DOE project criteria. Electronic air cleaners and extended dry-surface filters shall be considered for use as high-efficiency filters. Pre-filters are normally provided, being either pre-filter or medium-efficiency filters depending on the upstream air particle size distribution	C	HEPA filters are GRE, plenums include pre-filter section.
1550-2.5.6	Ductwork Systems		
	xx. Ductwork systems shall be designed to meet the leakage rate requirements of <i>SMACNA HVAC Air Duct Leakage Test Manual</i> .		
	xx. Ductwork, accessories, and support systems shall be designed to comply with the following:		
	• ASHRAE Fundamentals Handbook	C	

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Applicable Section	Item Number/Criteria	Status	Comments
	• SMACNA HVAC Duct Construction Standards - Metal and Flexible	C	
	• SMACNA fibrous Glass Duct Construction Standards	N/A	No Fiberglass ducts.
	• SMACNA Round Industrial Duct Construction Standards	C	
	• SMACNA HVAC Duct Design Manual	C	
	• ACGIH Industrial Ventilation Manual	C	
	• NFPA 45		
	• ERDA 76-21		
xx.	Ductwork thermal insulation shall comply with ASHRAE Standard 90. Ductwork shall be acoustically insulated to meet acceptable noise criteria.	NC	
xx.	Ductwork systems shall have testing and balancing dampers and accessories specified and installed as discussed in Section 1550-3.2, Testing and Balancing Devices.	C	Balancing damper furnished for all branch take-offs and at each diffuser.

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	xx. The design professional shall specify automatic controls for ductwork systems and provide them in required locations as discussed in Section 1595, Control of Air Handling Systems.	C	See sheet M-9 and Specification Section 15990.
	<u>Fire Protection of HEPA Filter Assemblies</u>		
	26. In providing fire protection for the HEPA filters, the design shall separate prefilters or fire screens equipped with water spray sufficiently from the HEPA filters to restrict impingement of moisture on the HEPA filters. Under conditions of limited separation, moisture eliminators or other means of reducing entrained moisture shall be provided.		
	27. The HEPA filter fire protection system shall be activated in a manner consistent with the fire protection system in the room or building in which the filters are located and as directed by the cognizant DOE fire protection authority.		
	<u>Air Cleaning Devices for Special Applications</u>		
	28. Adsorbers for nuclear or toxic applications should comply with ERDA 76-21, ASME N509, and ASME N510.		
1550-3	Testing, Adjusting and Balancing		
1550-3.1	System Performance Tests		
	xx. The design professional shall specify system performance tests for mechanical air distribution and HVAC water distribution systems to verify compliance with DOE project criteria.	C	See LANL standard T & B Specification, Section 15990.

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	xx. These tests shall be performed by an independent AABC testing organization in accordance with the guidelines contained in ASHRAE Systems Handbook and the AABC volume A-82, or by others as dictated in project-specific criteria.	C	LANL Specification dictates independent T & B.
1550-3.2	Testing and Balancing Devices		
	29. The HVAC air and water distribution systems shall be provided with permanently installed calibrated testing and balancing devices and access as needed to accurately measure and adjust water flows or air flows, pressures, or temperatures as require.	C	See control diagrams and airflow diagrams.
	xx. Test devices shall be located and installed according to AABC Volume A-82.		
1550-3.3	General Guidelines		
	30. Test and measuring locations shall be noted on construction drawings.	NC	Don't want to limit contractor's options.
	xx. The use of duct mounted air flow monitoring stations shall be considered where limited duct space or configuration restrict the use of pitot tube traverse procedures or where especially sensitive measuring requirements are dictated by the DOE project criteria.	N/A	

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1550-99	Special Facilities		
1550-99.0	Nonreactor Nuclear Facilities - General		
1550-99.0.1	General Ventilation and Offgas Criteria		
	31. These criteria cover ventilation and offgas systems, or portions of them, that are classified as safety class items in accordance with Section 1300-3.2, Safety Class Items.		
	32. Ventilation systems shall be designed to provide a continuous airflow pattern from the environment into the building and then from noncontaminated areas of the building to potentially contaminated areas and then to normally contaminated areas. Thus, the air flow is toward areas of higher radioactive or hazardous material contamination.	C	Areas of pressurization direct air to the most hazardous area for containment. Airflow is continuous.
	33. Dampers shall be located so that cross-contamination will not occur in case of a localized release of material.	NC	Low probability.
	34. Electronic air cleaners shall not be used in systems recirculating air.	C	Negative pressures in all potentially hazardous areas.
	35. Ventilation system balancing shall be specified to ensure that the building air pressure is always negative with respect to the outside atmosphere.		
	36. The use of down draft ventilation within occupied process areas shall be considered as a means to reduce the potential inhalation of contamination.		

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	37. Hydrogen gas storage areas that use hydrogen shall have provisions for sufficient ventilation to ensure that under all conditions (normal operation, anticipated operational occurrences, and DBA conditions), the hydrogen concentration in the air and/or off-gas will never exceed 4 percent by volume.		
	38. Portions of ventilation and offgas systems that provide required functions following a seismic event shall be designed to be functional following a DBE. The use of downdraft ventilation within occupied process areas shall be considered as a means to reduce the potential inhalation of contamination.	NC	
	39. The failure of ventilation and offgas systems not designed as safety class systems shall not prevent other facility safety class systems from performing their required safety functions.	N/A	
	40. Gas storage areas and process areas that use nonradioactive hazardous materials shall have ventilation systems designed to ensure that the hazardous material concentrations do not exceed the limits referenced in DOE 5480.10 and are ALARA in the workplace environment.		
	41. Effective loss-of-ventilation alarms shall be provided in all of these areas.		
	xx. Components of ventilation and off-gas systems that require electric power to perform their safety functions shall be considered safety class loads.	N/A	

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	42. Adequate instrumentation and controls shall be provided to assess ventilation or offgas system performance and allow the necessary control of system operation.	C	Controls are all manually adjustable with manual bypasses. See control diagram.
	43. Equipment in ventilation and offgas systems shall be appropriately qualified to ensure reliable operation during normal operating conditions, anticipated operational occurrences, and during and following a DBE.	NC	No back-up systems designed.
1550-99.0.3	Off-Gas Systems		
	44. The sources and characteristics of radioactive material in off-gas systems shall be identified. The design of an off-gas system shall be commensurate with the characteristics of the radioactive material in the off-gas and the risk associated with its release as an effluent.		
	45. The design of the off-gas system shall ensure that off-site doses resulting from normal system operation are maintained within the guidelines referenced in Section 1300-1.4.3, Routine Releases, and are ALARA.		
	46. Portions of off-gas systems and components that are required to control or limit the release of radioactive material to the environment or for safe operation of the system shall be provided with redundancy.		
	47. Electrical equipment and components of off-gas systems that require electric power to perform their safety functions shall be considered safety class loads.		

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Applicable Section	Item Number/Criteria	Status	Comments
	48. Adequate instrumentation shall be provided to monitor and assess system performance and to provide necessary alarms. Appropriate manual or automatic protective features shall be provided to prevent an uncontrolled release of radioactive material to the environment and to minimize the spread of contamination within the facility.		
	49. The off-gas system shall be designed to allow periodic maintenance, inspection, and testing of components.		
	50. The system's capacity shall be consistent with the needs for handling off-gas from components and systems during normal operations, anticipated operational occurrences, and DBA conditions. Process system tanks and other sealed components shall be vented to an off-gas system.		
	51. The design of process confinement off-gas treatment systems shall preclude the accumulation of potentially flammable quantities of hydrogen generated by radiolysis or chemical reactions within process equipment.		
	52. Vents from liquid components shall be provided with traps and drains to prevent inadvertent flooding of off-gas systems.		

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Applicable Section	Item Number/Criteria	Status	Comments
	53. Adequate shielding shall be provided for filters, adsorbers, scrubbers, and other off-gas treatment system components to maintain occupational exposures within the limits specified in DOE 5480.11. In addition, to the extent practical, the shielding design shall use ALARA principles to minimize overall exposures.		
1589	Air Pollution Control		
1589-99	Special Facilities		
1589-99.0	Nonreactor Nuclear Facilities-General		
1589-99.0.1	Radioactive Airborne Effluents		
	xx. All airborne effluents from confinement areas shall be exhausted through a ventilation system designed to remove particulate material, vapors, and gases as needed to comply with the guidance provided in Section 1300-1.4.3, Routine Releases, and, if other hazardous materials are additionally present, with DOE 5400.1. ALARA design principles shall be implemented to minimize effluent concentrations and quantities released for all hazardous materials.	C	HSE and users.

**TABLE 7. VENTILATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1595	Controls		
1595-6	Control of Air Handling Systems		
1595-6.1	Mechanical Ventilation Control		
	xx. All supply, return, and exhaust ventilation systems shall be equipped with automatic and manual control of fan operation to shut off the fan when ventilation is not required. These systems shall also be provided with manual gravity-operated or automatic control of dampers for outside air intake and exhaust or relief to prevent introduction of outside air when ventilation is not required.	C	
	xx. Systems that circulate air shall be provided with minimum outdoor air damper position control to assure that the minimum outdoor air quantity is being introduced to the system.	C	29% is minimum setting.
	xx. Automatic dampers should fail open for return air and fail closed for outside air.	C	See mechanical drawings and calculations.
1595-6.3	Automatic Control Dampers		
	xx. Automatic air control dampers shall be specified to be the low-leakage type with a maximum leakage of 6 CFM/square foot at maximum system velocity of 1500 FPM and 1-inch pressure differential. The dampers shall be opposed-blade type for modulating control, but may be parallel-blade type for two-position control. Dampers shall be sized for at least 20 percent of the total ductwork resistance pressure drop.	C	See mechanical drawings and calculations.

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Applicable Section	Item Number/Criteria	Status	Comments
	xx. Return air dampers shall never be sized less than 1500 FPM. Pilot positioners and operators shall be out of airstream.	C	See mechanical drawings and calculations.
1595-6.4	Variable-Air-Volume System Fan Control		
	xx. Variable-air-volume systems shall be designed with control devices to sense ductwork static air pressure and velocity air pressure and control supply fan airflow and static pressure output through modulation of variable inlet vanes, mechanical speed drive controls, or variable frequency electric drive controls. These control systems shall have a minimum of one static pressure sensor mounted in ductwork downstream of the fan and one static pressure controller to vary fan output either through inlet vane, damper, belt modulator, or speed control. Exhaust fans, supply fans, and return or relief fans shall have control devices that interface the operation of the fans to "track" air volumes and maintain fixed minimum outdoor air ventilation requirements.	N/A	

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
0110-99.0	Nonreactor Nuclear Facilities - General		
0110-99.0.2	Building Services and Distribution		
	1. Special facilities services and building utilities shall be planned to achieve maximum flexibility and ease of access. Vertical and horizontal headers shall be specifically located as planning and preliminary design progresses.	C	
	2. Priority shall be given to gravity-flow piped services and utilities and large air distribution and exhaust duct headers when analyzing the following: <ul style="list-style-type: none"> • Establishment of zones (space) in vertical and horizontal service chases • Determination of service header sizes • Assignment of spaces 	C	Engr - 3 drawings.
	3. To maintain the necessary degree of protection required by the particular building code classification, equipment selections shall be made from products listed by UL or other approved testing organization.		

C = Conformance
NC = Nonconformance
N/A = Not Applicable
TBD = To Be Determined

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	4. Compressed gas cylinders shall be isolated outside of the special facilities building or housed in a special hazardous materials storage room, exhausted gas cabinets, or similar types of containment.		
	5. To maintain the necessary degree of protection required by the particular building code classification, equipment selections shall be made from products listed by UL or other approved testing organization.		
	6. Compressed gas cylinders shall be isolated outside of the special facilities building or housed in a special hazardous materials storage room, exhausted gas cabinets, or similar types of containment.		
	7. Where continuous services are required, service headers shall be looped and appropriately valved to maintain such services during routine maintenance or systems alterations.	N/A	
	8. Special facilities services shall extend from horizontal service headers. Services shall be located to avoid penetration of adjacent facility walls and floors in those cases where routine maintenance or alterations of these services would result in undesirable curtailment or interruption of operations in the adjacent special or other facilities. All piping shall be located outside hazardous areas whenever possible to reduce personnel exposure during maintenance.	C	Visual inspection, Engr-3 material Pan-Am services (drawings).
	9. All piping shall be located outside hazardous areas whenever possible to reduce personnel exposure during maintenance.		

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
0200	Site Development		
0260	Piped Utility Material		
	10. This section covers exterior utilities such as water mains, water storage facilities, and gas piping.		
0260-2	Exterior Utilities		
	11. Exterior utilities are defined as those that are more than 5 feet from any building exterior.		
	12. The design of exterior utilities shall consider possible future extensions of the utility. Any site development plans for the area shall be consulted. In general, if expansion is planned, utilities should be extended to the edge of the site or to a point where connection can be made without damage or disruption to existing facilities. Utility corridors shall be established that give each utility a defined location within the corridor.		
	13. All water mains, supplying fire protection systems, fire hydrants, etc., shall be treated as fire mains and installed in accordance with NFPA 24.		
	14. Water storage facilities shall comply with NFPA 22.		
	15. Gas distribution shall comply with local codes and requirements. Fuel gas shall comply with NFPA 54. Liquefied petroleum gas shall comply with NFPA 58.		

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	16. Separation of utilities from security-related equipment must be considered when planning utility installations. Special emphasis should be given to security fences and in security areas. Utilities that penetrate or pass under a security barrier through an opening of more than 96 square inches in smallest dimension shall provide the same degree of penetration delay as is required for the security barrier.		
	17. Overhead utilities must not pass between secure and nonsecure areas. Utility equipment and supports must not be located so as to conceal or aid an adversary in penetrating a security boundary. Sanitary and drain sewers that penetrate security areas must be provided with special security features if openings exceed the size limit set forth in the DOE 5632 series.		
	18. Domestic water supply lines shall comply with 40 CFR 141 and 40 CFR 142.		

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
0266	Water Distribution Systems		
0266-1	General		
	19. This section shall apply to corrosion control design for underground steel structures and pipe storage facilities, and other facilities where corrosive conditions can occur. Types of corrosion control are protective coatings and cathodic protection. See Section 060, Piped Utility Materials. The design engineer shall determine whether the services of a corrosion control specialist shall be used in corrosion control design.	C	LANL procedures recognize the corrosive nature of volcanic tuff. Protective coatings are used to resist the effect of tuff and rainwater.
0266-2	Regulatory Overview		
	20. Domestic water conveyed within distribution systems that serve DOE facilities shall comply with the applicable SDWA, 40 CFR 141, 40 CFR 142 requirements and with all other State, regional and local requirements. The radionuclide content of these drinking water systems shall comply with the requirements of the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series. The quality of domestic water within such distribution systems shall be protected from degradation by installation of backflow prevention assemblies, as necessary, to preclude backflow of contaminants or pollutants into the system.	C	HSE.

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Applicable Section	Item Number/Criteria	Status	Comments
0266-4	System Design Considerations		
	21. Domestic water distribution systems shall be designed to deliver the peak domestic flow of 2-1/2 times the average daily demand, plus any special demands, at a minimum residual pressure of 30 psi at ground elevation (or higher if special conditions require).	C	Domestic water system designed in accordance with Uniform Plumbing Code. Pan Am services.
	22. Water distribution system mains shall be located in accordance with Section 0260, Piped Utility Materials. Water mains shall have a minimum pressure rating of 150 psi. Water distribution systems shall be designed to maintain a normal operating pressure range of 40 psi to 100 psi (at ground level) in distribution mains and building service lines.		
	23. Where the gradient across the service area is such that multiple pressure zones are necessary to maintain normal operating pressures, pressure reducing valves shall be used to separate each pressure zone.		
	24. Use of pressure relief and surge relief valves shall be considered, as necessary, to preclude system damage from water hammer.	C	Shock arresters installed on domestic cold water line at flush valves. In toilets. Spec Section 15411, 3.01.C.

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	25. Gate valves shall be installed at maximum intervals of 5000 feet on long supply lines and at maximum intervals of 1,200 feet on main distribution loops, feeders, and all primary branches connected to these lines. Gate valves shall also be installed at selected points throughout the distribution system to provide system control over each service area. At intersections of distribution mains, one less gate valve than the total number of intersecting mains shall be provided.	C	Gate valves installed on all branch piping to toilet or plumbing fixture groups. Stop valves installed at each fixture. Spec section 15050, 3.02.J. Engr-8 and site inspection and/or drawings.
	26. Air release and vacuum valves shall be installed, as necessary, at high points within the distribution system and in long supply mains.		
	27. Distribution system mains shall have a minimum depth of cover of 2-1/2 feet. Additional cover shall be provided to prevent freezing in cold climates, at roadway crossings in high traffic areas, and at railroad crossings.		
	28. Building service lines shall be a minimum of 1 inch in diameter. Service lines less than 2 inches in diameter shall be connected to the distribution main by a corporation stop and a copper gooseneck, with a service stop below frostline. Service lines larger than 2 inches in diameter shall be connected to the distribution main by a rigid connection and shall have a gate valve located below frostline. Risers from frostline to floorlines of buildings shall be adequately insulated.	C	Minimum depth of cover on pipe shall be 4 feet.

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	29. Site soil and groundwater conditions (e.g., soil corrosivity) shall be considered during the selection of distribution system pipe and pipe joint materials. Where ferrous pipe is installed within the distribution system, insulating couplings shall be installed to preclude galvanic corrosion. See Section 0262, Corrosion Control, for further criteria.	C	Pan Am.
	30. Water mains shall have a minimum pressure rating of 150 psi.		
	31. Water distribution systems shall be designed to maintain a normal operating pressure range of 40 psi to 100 psi (at ground level) in distribution mains and building service lines.		
0273	Water Pollution Controls		
0273-99.0	Non-Reactor Facilities - General		
	32. There shall be no interconnection among stormwater systems, the sanitary waste system, and radioactive or other hazardous material handling systems or areas. Maintaining separation such as accomplished by separation trenches is acceptable; however, all crossings, parallel runs, and separation distances shall comply with the UPC. Installations shall be in compliance with the UPC and ASCE 37.	C	Storm water is diverted by catch basins and culverts. Drainage is by sheet flow across the parking lots.

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	33. The sanitary waste system at each facility shall be monitored or sampled and analyzed (e.g., alpha emitters) for radioactivity unless the site sanitary treatment system is monitored. In addition, there shall be no interconnections between the potable water system, the sanitary waste system, and process systems.	C	The sanitary sewer line is separate and flows to an existing treatment system. Industrial waste water is a closed system within the building.
0275	Industrial Wastewater Treatment		
0275-4	Control of Pollution From Other Sources		
	34. Structural requirements are found in:		
	<ul style="list-style-type: none"> • 40 CFR 280.30 (draft), which details requirements for spill or overfill prevention devices on new and existing tank systems. • 40 CFR 264.193, which details requirements for secondary containment on new and existing hazardous waste tank systems. • 40 CFR 264.194, which also requires use of spill prevention controls (check valves), overfill prevention controls (sensing devices, cutoffs and bypasses), and maintaining sufficient freeboard. 		
0275-99.0.1	Industrial Waste		
	35. Industrial wastes such as discharges from mop sinks, overflow from positive pressure circulating waste systems, and process steam condensate shall be collected and transferred to a waste treatment plant or similar treatment area.	C	All potentially hazardous waste is piped to a holding pit with tanks. Tanks and pit shall be pumped to liquid waste treatment. See sheet M-13, M-14, and M-15.

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
0275.99.0.3	Nonradioactive Liquid Effluents		
	36. For nonradioactive effluents, the point of release shall be considered the point at which the effluent exits, the pipe, etc.	C	Effluent discharges into septic system.
0285	Solid Waste Systems		
0285-2.2	Recommended Practices		
0285-2.2.5	Sites Traversed by Utilities		
	37. Sites traversed by buried pipe utility trenches shall not be used for TSD facilities unless the relocation or protection of these utilities is economically feasible. Since buried pipe utility trenches can serve as a pathway for migration of gas, leachate, and other contaminants, provisions shall be made for pipe maintenance for repair.		
1300	Special Facilities		
1300-6.1	Radiation Protection		
	38. Special facilities shall be designed to minimize personnel exposures to external and internal radiological hazards, provide adequate radiation monitoring and alarm systems, and provide adequate space for health physics activities. Primary radiation protection shall be provided by the use of engineered controls (e.g., confinement, ventilation, remote handling, equipment layout, and shielding); secondary radiation protection shall be provided by administrative control.		

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
1540	Plumbing/Service Piping		
1540-1	Plumbing		
1540-1.1	General		
	39. These criteria apply to interior plumbing systems (fixtures, supply, drain, waste and vent piping, service water heating system, safety devices, and appurtenances) up to 5 feet beyond the building exterior wall.		
	40. Domestic water shall be supplied by a separate service line and not be a combined fire protection and potable water service or a combined process water and potable water system within the building.		
	41. Plumbing shall comply with the NSPC (or other locally adopted nationally recognized plumbing code), ASHRAE Handbooks, and ASHRAE Standard 90.		
	42. Design criteria for special systems related to the facility process or research requirements shall be provided by the cognizant DOE authority.		
	43. Penetrations of piping through security barriers shall be minimized. Such penetrations more than 96 square inches in area and more than 6 inches in minimum dimension shall provide a penetration delay equal to that required for the security barrier. The physical attributes and intended service of the piping and the axial configuration of the barrier penetration shall be considered when evaluating that penetration delay.		

**TABLE 8. UTILITIES - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1540-1.5	Safety Devices		
	44. As directed by project criteria, emergency eye washes, emergency showers, or combination eye-wash/showers shall be provided where corrosive or other skin or eye irritant chemicals are stored, handled, used, or dispensed.		
	45. Equipment shall comply with ANSI Z358.1 and be serviced by the potable water system.		
	46. Backflow preventers and air gaps shall be used to prevent cross-connection (contamination) of potable water supplies. Vacuum breakers (to prevent back-siphonage) shall be used only in conjunction with administrative control.		
1540-99.0.5	Water Supplies and Other Utility Services		
	47. On-site water supplies and other utilities shall be provided as necessary for emergency use. The design of each utility service or cooling water system shall consider the demands for normal operations, anticipated operational occurrences, and DBA conditions.	N/A	None required.

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
1605	Basic Electrical Materials and Methods		
1605-1	General		
	1. All systems shall comply with NFPA 70 and ANSI C2.	C	See specs, design criteria, design calcs, and advice from Engr. 5, Pan Am Services. Refer also to electrical drawings.
	2. Electrical Systems shall be designed so that all components operate within their capacities for initial and projected loads.		
	3. Preferred standard voltages in conformance with ANSI C84.1 shall be used, with a single-voltage level characteristic in any classification, to minimize stocks of spare equipment and to standardize operating and maintenance practices and procedures.	C	Same comment as above.
	4. Electrical materials and equipment shall be UL- or FM-tested, with label attached, for the purpose intended, whenever such products are available. Where there are no UL- or FM- listed products of the type, testing and certification by another nationally recognized testing agency may be acceptable.	C	Same comment as above.

C = Conformance
 NC = Nonconformance
 N/A = Not Applicable
 TBD = To Be Determined

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	x. Installation methods shall be in accordance with the manufacturer's instructions, with NFPA 70, and with other applicable requirements.		
	5. Onsite acceptance testing shall be required for each major electrical system. Tests shall be specified to demonstrate that each function and important parameter is implemented. Specific criteria shall be included to determine pass/fail acceptance. Tests shall be performed in the presence of a government representative. Copies of all test results shall be submitted for approval.	C	Same comment as above.
1605-2	Wiring System		
1605-2.1	Raceways		
1605-2.1.1	General		
	6. Raceways that penetrate fire-rated assemblies shall be noncombustible.		
	7. The complete installation shall be suitably sealed to maintain the established fire ratings as defined in UL Building Materials Directory and UL 1479.		
	8. Raceways shall be 1/2-inch minimum in diameter. Raceways embedded in concrete or masonry shall be 3/4-inch minimum and shall be adequate in number and capacity for the initial and projected facility requirements.		
1605-2.1.2	Electrical Metallic Tubing		

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	9. Electrical Metallic Tubing (EMT) shall be used to enclose circuit power conductors, alarm and signal circuits in nonhazardous and noncorrosive locations.		
	10. It shall not be installed where subjected to physical damages during installation or while in service. EMT shall not be installed underground and shall not be encased in concrete.		
	11. When EMT is used outdoors or in damp locations, compression type (rain tight) fittings must be used.		
1605-2.1.3	Flexible Steel Conduit		
	12. Flexible steel conduit shall be used for connection to equipment subject to vibration and connection from junction boxes to recessed lighting fixtures.	C	See specs, design criteria, design calcs, and advice from Engr 5 and Pan Am Services. Refer also to electrical drawings.
1605-2.1.4	Rigid Steel Conduit and Intermediate Metal Conduit		
	13. Rigid steel conduit or intermediate metal conduit shall be used in locations classified as hazardous by NFPA 70.	N/A	Same comment as above.
1605-2.1.7	Surface-Metal or Nonmetallic Systems		
	Except for vertical routings to source or termination points, surface-metal or nonmetallic raceways and multi-outlet assemblies shall be used only where allowed by NFPA 70. Surface-metal raceways passing from one floor to another shall have mechanical protection to a height of 4 feet above the floor level.	N/A	
1605-2.1.8	Cable Trays		

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	<p>The use of cable trays shall be considered for large multiple-cable applications in both interior and exterior locations.</p> <p>Cable trays that penetrate security barriers shall provide the same degree of penetration resistance as required by the site-specific security plan for the barrier through which they penetrate. This provision applies when the opening at the point the barrier is penetrated is more than 96 square inches in area and over 6 inches in smallest dimension and is located less than:</p> <ul style="list-style-type: none"> • Eighteen feet above uncontrolled ground, roofs, or ledges • Fourteen feet diagonally or directly opposite windows, fire escapes, roofs, or other openings in uncontrolled buildings • Six feet from uncontrolled openings in the same barrier 	N/A	Same comment as above
1605-2.1.5	<p>Aluminum Conduit</p> <p>14. Aluminum conduit shall be used for high-frequency circuits where steel will cause magnetic problems or in atmospheres where steel conduit is unsuitable.</p> <p>15. Aluminum conduit shall not be installed underground, encased in concrete, or where the atmosphere is corrosive to aluminum.</p>		

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
1605-2.1.6	Nonmetallic Conduit Resistant to Moisture and Chemical		
	16. Nonmetallic conduit shall be used only where allowed by NFPA 70.		
1605-2.1.7	Surface-Metal or Nonmetallic Systems		
	17. Except for vertical routings to source or termination points, surface-metal or nonmetallic raceways and multi-outlet assemblies shall be used only where allowed by NFPA 70.		
	18. Surface-metal raceways passing from one floor to another shall have mechanical protection to a height of 4 feet above the floor level.		
1605-2.2	Conductors		
1605-2.2.1	General		
	19. Conductors for interior electrical systems shall be copper, except that aluminum conductors size No. 4 AWG and larger may be used.	C	
	20. Conductors for power and lighting branch circuits shall not be smaller than No. 12 AWG.	C	
	21. No. 10 and No. 12 AWG conductors for power and lighting branch circuits shall be solid.	C	
	22. No. 8 AWG conductors and larger shall be stranded.	C	

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	23. Conductors for Class 1 remote-control and signal circuits shall be enclosed in cable and shall comply with NFPA 70.	C	
	24. Conductors for Class 2 low-energy remote-control and signal circuits shall be not smaller than No. 18 AWG.	C	
	25. Power and lighting conductors shall be 600-volt, Type THW, XHHW, or THWN.	C	
	26. Conductors required to be rated 90 degrees C in accordance with NFPA 70 shall be Type RHH, THW, or THHN.	C	
	27. Conductors in high-temperature areas shall be NEC Type FEP or TFE as required.	C	
	28. Direct-burial conductors shall be Type UF, UL 493.	C	
	29. Bonding and grounding conductors shall be ASTM B1 solid, bare copper for sizes No. 8 AWG and smaller and shall be ASTM B8 Class B stranded copper for wire sizes No. 6 AWG and larger.	C	
	30. Each set of contract documents shall indicate the basis for the size of the conductors shown on those plans when the option for aluminum conductors has been chosen.	C	
	Aluminum Conductor Termination		
	31. The termination of aluminum conductors, the connection of aluminum terminating lugs to copper or aluminum pads, and the use of Belleville washers shall comply with IEEE 141. Setscrew termination shall be allowed for connection to		

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	approved circuit breakers. Split-bolt terminators shall not be used.		
1605-2.2.3	Conductor Identification		
	32. Voltage levels, grounded conductors, equipment grounding conductors and ungrounded phase conductors shall be identified.		
	33. Existing field center wire color-code systems shall be used. If no present field center wire color code exists, the following color-coding system shall be used:		
	<ul style="list-style-type: none"> • Color coding for 240/120-volt, single-phase systems <ul style="list-style-type: none"> - Grounded neutral white - Grounding conductor green or bare - Ungrounded conductor black - Ungrounded conductor red • Color coding for 208Y/120-volt, three-phase systems <ul style="list-style-type: none"> - Grounded neutral white - Grounding conductor green or bare - Phase "A" (ungrounded) conductor black - Phase "B" (ungrounded) conductor red - Phase "C" (ungrounded) conductor blue • Color coding for 480Y/277-volt, three-phase systems <ul style="list-style-type: none"> - Grounded neutral gray - Grounding conductor green or bare - Phase "A" (ungrounded) conductor brown - Phase "B" (ungrounded) conductor orange 		

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Applicable Section	Item Number/Criteria	Status	Comments
	- Phase "C" (ungrounded) conductor yellow		
1605-2.3	Receptacles		
	34. Receptacles shall comply with general grade as defined in FS W-C-596.		
	35. Receptacle circuits shall be provided with ground-fault circuit-interrupters as directed by NFPA 70.		
	36. Receptacle circuits that serve receptacles installed outdoors (except receptacles that are in secure circuits are not readily accessible) and within 6 feet of sinks and building entrances shall be provided with ground-fault circuit-interrupters.		
1630	Exterior Electrical Utility Service		
1630-1	General		
1630-1.1	Load Requirements		
	Demand and diversity factors shall comply with NFPA 70. Demand and diversity for feeder and substation load calculations shall be as stated in Fink and Beaty, Standard Handbook for Electrical Engineers.	C	
	Electric service quality and reliability shall be considered in conformance with IEEE 493 to ensure that they meet the load requirements.	C	

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Where loads require a high degree of voltage and frequency stability, the available short-circuit MVA at the service connection and the stability of the supplying utility systems shall be considered to ensure adequate power quality.	N/A	
1630-1.3	Redundancy		
	Facilities designated by the cognizant DOE authority as critical shall be served by dedicated, redundant circuits. The two services shall be separated by a 4-hour fire-rated barrier and shall be served from separate sources. In lieu of providing two separate services, a single service supplied from a loop-type transmission or distribution system having sectionalizing features may be provided when the reliability of the single service proves adequate when considered in conformance with IEEE 399 and IEEE 493.		
1630-2	Supply Equipment and Facilities		
1630-2.1	General		
	37. Relaying shall comply with IEEE 242, and switchgear shall comply with IEEE C37 series.		
1630-2.2	Power Supply Lines		
1630-2.2.1	General		
	38. Circuits shall be arranged so that faults, failures, or maintenance on less critical circuits will not jeopardize critical loads. Protective devices shall be used and coordinated for sequential operation from the load to the source.	N/A	

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	39. Line location shall be established in accordance with clearance requirements stated in ANSI C2 and shall be routed within established rights-of-way for each facility.		
	40. Minimum rights-of-way shall extend 5 feet beyond outside conductors.		
	41. The cognizant DOE authority shall establish facilities and areas that require additional clearances for security and safety.		
1630-2.2.2	Overhead Lines		
	42. Joint use of poles for power and communications distribution shall maintain safety standards and shall limit electrical interference to communications services.		
	43. Use of double-stacked crossarm construction shall be permitted only where proper clearance for hot-line maintenance work can be ensured. Clearances shall comply with ANSI C2.		
1630-2.2.3	Underground Lines		
	44. In congested areas and where required for safety, for service continuity, or for conformance with local practices, primary and secondary power distribution circuits shall be placed underground.		

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1630-2.3.5	Oil-Filled Equipment		
	45. Dikes and drainage provisions shall be built as required by the local SPCC in conformance with 40 CFR 112.		
	46. PCB or PCB-contaminated electrical equipment and the treatment of PCB oil spills shall comply with 40 CFR 761. Oil-filled transformers installed near buildings shall comply with FM 5-4/14-8. Existing PCB or PCB-contaminated equipment shall be provided with warning signs and shall not be relocated or reused in other existing or new facilities.		
	47. Electrical equipment cooling material shall be handled in accordance with 29 CFR 1910.1200.		
1630-5	Lightning Protection		
	48. Lightning protection systems shall comply with NFPA 78.	NC	LANL design criteria is LPI-175.
	49. Lightning protection systems shall be considered for buildings containing facilities for the use, processing, and storage of radioactive, explosive, and similarly hazardous materials; for buildings over 50 feet in height; and for buildings containing valuable equipment. A risk assessment using the guide in Appendix I of NFPA 78 shall be made of these buildings to determine the risk of loss due to lightning.		
	50. Electric power and communication services to all buildings and facilities and to underground power cables, where connected by overhead power distribution lines, shall have lightning and surge protection.	N/A	Building service is underground from an existing unit substation.

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1639	Grounding		
1639-1	General		
	51. Grounding systems shall comply with NFPA 70 And IEEE 142. A separate ground conductor shall be used. Raceway systems shall not be used as ground path.	C	
1639-2	Substation and Switching Station Grounding		
	Substation and switching station grounding systems shall comply with IEEE 80. Grounding connections shall comply with IEEE 837.	N/A	
1639-3	Fence Grounding		
	Permanent fence grounding shall comply with NASI C2. Grounding of temporary fences shall depend on the type of fence, consideration of the potential hazards, the expected duration use and guidance from cognizant DOE safety personnel.	N/A	

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
1639-4	Isolated Ground Systems		
	52. Isolated ground systems may be required to meet special instrumentation or other equipment needs. Such ground systems shall be clearly identified, protected against improper usage, and installed in conformance with NFPA 70.	N/A	
1640	Interior Electrical Systems		
1640-1	General		
1640-1.4	Power System Reliability		

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	Power system reliability consideration shall comply with IEEE 493 to ensure continual power supply to systems and equipment designated as critical by the cognizant DOE authority. The need for multiple transformer-switchgear service equipment, to ensure power supply continuity within the facility during scheduled or emergency equipment outages, shall also be considered.	C	UPS provided for radiation monitoring/alarm systems.
1640-1.7	Ground-Fault Protection		
	53. Ground-fault protection shall comply with NFPA 70. See also Section 1605-2.3, Receptacles.		
1640-2	Service Equipment and Facilities		
1640-2.1	General		
	54. Interior electrical systems shall comply with NFPA 70. Switchgear criteria shall comply with IEEE C37 series.		
1640-2.3	Transformers		
	55. Interior service transformer installations shall comply with NFPA 70.		
	56. Transformer protection and appurtenances shall comply with IEEE C37.91.		
	57. Transformer installation shall comply with FM 5-4/14-8.		
1640-2.4	Motors		

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Applicable Section	Item Number/Criteria	Status	Comments
	58. Motors shall comply with NEMA MG-1, except that hermetic refrigerant motor compressors shall comply with UL 984.		
	59. Polyphase motors shall comply with NEMA Design B, unless other characteristics are required by the driven machine or the speed controller.		
1640-2.5	Motor Control		
	60. Control equipment shall comply with the NEMA ICS standards and UL 508.		
	61. All motors shall be provided with fully coordinated control equipment to perform the functions required. Overcurrent devices shall be provided in each ungrounded conductor; overcurrent devices located in the motor or controller shall be rated in accordance with the manufacturer's instructions. Manually reset devices are recommended.		
	62. Control devices shall be of adequate voltage and current rating for the duty to be performed. Pilot control circuits shall operate with one side grounded, at no greater than 120 volts.		
	63. Where control power transformers are required, they shall be located inside the associated motor starter housing, shall be protected against faults and overload by properly sized overcurrent devices, and shall be of sufficient capacity to serve all devices connected to them without overload.		
	64. Reduced-voltage starters shall be provided for larger		

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	motors where starting the motor may result in unacceptable voltage dip.		
1640-3	Power Service for Security, Communications, and Alarm Systems		
1640-3.2	Primary Power Supply		
	65. Normal primary power for protective alarm and communications systems shall come directly from the on-site power distribution system or, in the case of isolated facilities, shall come directly from the public utility. Where several primary power sources are available, the most reliable source shall be used.		
1650	Exterior Lighting		
1650-1	General		
	66. Exterior lighting systems shall comply with IES Lighting handbook. System control shall use time clock and/or photocell to provide illumination only when needed.		

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Applicable Section	Item Number/Criteria	Status	Comments
1650-2	Lighting Sources		
	67. Maximum use shall be made of high-efficiency HID lamps such as metal halide or high-pressure sodium vapor lamps.		
	68. HID lamps shall not be used for exterior lighting within 25 miles of observatories.		
	69. See Section 0283-7, Lighting, for use of HID lamps for protective lighting.		
1655	Interior Lighting		
1655-1	General		
	70. Interior lighting systems shall comply with the IES Lighting handbook. Nonuniform lighting practices shall comply with 41 CFR 101-20.116-2 and with Section 1694, Energy Conservation. Lighting power budget shall be determined in conformance with ASHRAE Standard 90. Exit and emergency lighting systems shall comply with NFPA 101 and NFPA 110.		

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Applicable Section	Item Number/Criteria	Status	Comments
1655-2	Lighting Sources		
	71. Maximum use shall be made of fluorescent and HID lamps. Where HID lamps are used, a standby lighting system shall be provided to meet emergency lighting requirements during HID lamp restrike periods. When using HID lighting indoors, careful consideration of the required color rendition shall be made from visual and health safety perspectives.		
1655-3	Fixtures		
	72. Fixtures shall have diffusers and lenses constructed of noncombustible materials.		
1660	Special Systems		
1660-1	General		
	Standby and emergency systems shall serve loads set forth in NFPA 110. Additional standby or emergency systems shall be provided to support systems or equipment components whose operating continuity is determined to be vital by the cognizant DOE authorities for protection of health, life, property, and safeguards and security systems. Safety Class 1 items shall be provided with emergency power.	N/A	
	Optional standby systems shall be provided for production process operations in cases where the cognizant DOE authority determines that the process will become unstable on loss of power or that a severe monetary loss will result.	N/A	

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
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Applicable Section	Item Number/Criteria	Status	Comments
	Uninterruptible power shall be provided for equipment that cannot sustain functions through the momentary power loss that occurs when an alternate power source comes on line and picks up the load. See Section 1660-3, Uninterruptible Power Systems.	C	UPS provided for radiation monitoring/alarm systems.
	Emergency power shall be provided for protective alarm and communications systems as dictated by the system requirements. Switchover to emergency power shall be automatic on failure of the primary power source and shall be indicated on an annunciator panel. The annunciator shall be located in an occupied area and shall indicate any problems with the emergency system. Definition of "emergency systems," "legally required standby systems," and "optional standby systems" shall be in accordance with NFPA 70.	N/A	
	Emergency power equipment areas shall be ventilated to exhaust hazardous gases (if applicable) and to maintain satisfactory ambient temperatures for equipment operation or personnel access.	N/A	
	Emergency or standby power shall service fire alarm, security alarm, and supervisory sensing devices designated essential by the cognizant DOE authority.	N/A	
	Emergency power systems are further detailed in Section 1660-99, Special Facilities.		
1660-2	Emergency Power Systems		
	Emergency power systems shall comply with NFPA 37, NFPA 70, NFPA 101, NFPA 110, and IEEE 446.	N/A	

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Emergency power systems shall be capable of maintaining full operation of emergency loads for the full time period specified by the cognizant DOE authority (nominally, a minimum of 24 hours). Such power sources shall have the necessary built-in features to facilitate operational testing on a periodic basis to verify their readiness.		
	Where emergency generators are required for loads 25 kVA and smaller, gasoline or LPG engines may be used. For loads greater than 25 kVA, diesel engines shall generally be used. Steam-turbine generators may be used if steam is being produced for on-site processes. Gas turbines may be used if an LCC analysis warrants and if the NEC criteria to emergency power thro-over time is met.	N/A	
	Application of diesel engines shall comply with FCC Technical Report No. 69.	N/A	
	Batteries, when required, shall be rechargeable and shall be kept fully charged at all times when primary power is available. The charger shall automatically switch from float to fast charge rate at a preset drop in DEC bus voltage. The charger shall be furnished with a capacity to charge the battery from a fully discharged state to not less than 85 percent of the rated ampere-hour capacity within 24 to 72 hours. See also IEEE 308.	N/A	
	Emergency power systems legally required by NFPA 70 shall be installed to meet normal emergency power requirements. More stringent emergency power requirements shall be identified by the cognizant DOE authority on a case-by-case basis.	N/A	
1660-3	Uninterruptible Power Systems		

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	Uninterruptible power supplies shall be provided for those loads requiring guaranteed continuous power. Application of UPSs shall comply with IEEE 446, as modified by the cognizant DOE authority. UPS installations may be Safety Class 1 (Seismic Category I functional) or standby type dependent on the classification of the loads served.	C	UPS provided for radiation alarm/monitoring systems. Less than 2 kVA capacity.
1660-99	Special Facilities		
1660-99.0	Nonreactor Nuclear Facilities-General		
1660-99.0.1	Safety Class (Emergency) Electrical Systems		
	For safety class items that require electric power to perform their safety functions, the design shall provide safety class emergency electric power systems (AC, DC, and their distribution systems). The design shall define the type, capacity, performance characteristics, and features of the safety class electric systems, including generator and batteries, required to meet safety class system needs.	N/A	
	Safety class electric systems shall be provided with suitable redundancy and separation to ensure that adequate capacity and capability are available with the addition of a single failure.	N/A	
	Redundant safety class electric systems shall be physically protected or separated to prevent a common external event from causing a failure of the redundant systems. IEEE 379 and IEEE 384 shall be used as redundancy and separation criteria.	N/A	

**TABLE 9. ELECTRICAL - EVALUATION OF CMP SAW FACILITY, IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/89**

Applicable Section	Item Number/Criteria	Status	Comments
	The connection of loads that do not require safety class power to safety class buses shall be minimized. Where such loads must be connected to a safety class electric power system, the loads shall be provided with suitable separation or devices that will prevent failures from affecting the safety class electric system.	N/A	
	Safety class electric systems shall be qualified to the requirements in Section 1300-3.4, Equipment Environment Considerations, and, as appropriate, to the structural requirements imposed on safety class items in Section 0111-99, Special Facilities.	N/A	
	Testing or a combination of testing and analysis shall be the preferred method of demonstrating the operability of instrumentation and electrical equipment that are required to operate during and following a DBE. Seismic experience data may be used as an alternative to testing or dynamic analysis where such data have been documented and validated.	N/A	
	The capability to periodically test safety class electric systems to verify system performance shall be provided.	N/A	

**TABLE 10. ADMINISTRATION - EVALUATION OF CMP SAW FACILITY IN ACCORDANCE WITH DOE ORDER 6430.1A,
"GENERAL DESIGN CRITERIA," DATED 04/06/90**

Applicable Section	Item Number/Criteria	Status	Comments
0110	Architectural and Special Design Requirements		
0110-5	Health and Safety		
0110-5.1	Performance Objectives		
	1. Health and safety performance objectives to be achieved in the design of DOE facilities include:		
	<ul style="list-style-type: none"> • Protection of the public and all personnel from injury and from exposure to toxic materials, radiation, and other hazards in accordance with DOE requirements and allowable limits • Protection of private and public property against damage resulting from DOE operations • Continuation of operations by minimizing accident potential 		
0110-5.2	Safety Analysis		
	2. All DOE facilities shall be evaluated for potential risks to the operators, the public, and the environment.	TBD	By HSE and user?

C = Conformance
 NC = Nonconformance
 N/A = Not Applicable
 TBD = To Be Determined

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	3. Each facility that has potential on-site and off-site effects during normal or abnormal operations shall have an Emergency Plan prepared which shall be incorporated with the Site Emergency Preparedness Plan.				
0110-5.3	Emergency Preparedness Planning				
	4. Each facility that has potential on-site or off-site effects during normal or abnormal operations shall have an Emergency Plan prepared which shall be incorporated with the Site Emergency Preparedness Plan.			TBD	By HSE and user?
0140	Quality Assurance				
	6. A QA program shall be developed and implemented in compliance with DOE 5700.6b and using the elements of DOE 4700.1 and ANSI/ASME NQA-1.				
0200	Site Development				
0200-1	Facility Siting				
0200-1.2	Radiological Siting Requirements				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	Dose shall be calculated and compared to the dose guidelines established below. Comparisons shall be based on a 50-year committed effective dose-equivalent.			TBD	HSE
0275-4	Control of Pollution From Other Sources				
	7. In 40 CFR 280.21 (draft) it is require that all existing tanks be upgraded to meet the same performance standards as new tanks and piping within 10 years from the effective date to the final regulations (i.e., either be constructed out of materials to prevent corrosion, install cathodic protection, or close the tank). In 40 CFR 264.192 it is required that, for new hazardous waste tank systems, the written assessment of proposed tank systems (to be performed by an independent registered engineer) shall include design standards by which the tanks and ancillary equipment are to be constructed, characteristics of the wastes, and other installation considerations. Where any external metal component comes in contact with water or soil, a list of factors affecting potential for corrosion and type and degree of required external corrosion protection is required.				
	8. For existing tanks, 40 CFR 264.191 addresses requirements for system integrity. An assessment of each tank system without secondary containment must be made by 1/12/88, including an evaluation of existing corrosion protection.				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
0285	Solid Waste Systems				
0285-1	Regulatory Overview				
0285-1.1	General				
	9. Management of hazardous solid waste shall comply with 40 CFR 256 and Subtitle C of the RCRA.				
0285-1.2	EPA Identification Number				
	10. In accordance with the EPA notification procedure (45 FR 12746), and application for an EPA identification number must be filed with EPA for all generating and all TSD facilities for hazardous, nonhazardous, and low-level radioactive solid wastes.				
0285-3.3	Selection of Methods				
	11. Approval of selected TSD methods shall be obtained from the cognizant DOE Operations Office. The selected method of TSD of hazardous, nonhazardous or radioactive solid waste shall be in compliance with the following.				
	<ul style="list-style-type: none"> • 40 CFR 122, 40 CFR 192, 40 CFR 240, 40 CFR 241, 40 CFR 256, 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, and 40 CFR 267 • DOE 5820.2A • RCRA, Subtitles C and D 				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
1300	General Requirements				
1300-2	Safety Analysis				
	12. Safety Analysis shall comply with DOE 5481.1B. See also Section 0110-5.2, Safety Analysis.				
1300-4	Nuclear Criticality Safety				
	Nuclear criticality safety shall be achieved by exercising control over both the quantity and distribution of all fissile materials and other materials capable of sustaining a chain reaction, and over the quantities, distributions, and nuclear properties of all other materials with which the fissile materials and other materials capable of sustaining a chain reaction are associated. Design considerations for establishing such controls shall be mass, density, geometry, moderation, reflection, enrichment, interaction, material types, and nuclear poison.				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
1300-8	Waste Management				
1300-8.1	General				
	<p>13. Wastes from special facilities may include both radioactive and nonradioactive materials and may be in the form of liquid or gaseous effluents, or solids. The process systems shall minimize the production of wastes at the sources and minimize the mixing of radioactive and nonradioactive hazardous wastes. The waste management systems shall provide facilities and equipment (or incorporate existing facilities and equipment) to handle those waste safely and effectively. Volume reduction equipment for both liquid and solid wastes shall be required where feasible and shall be designed for process capability and capacity commensurate with the types and quantities of wastes expected. Waste handling areas shall comply with the standards of confinement and ventilation requirements commensurate with the potential for spreading contamination by the waste packages/forms handled. Specific DOE design and operating requirements for radioactive wastes (HLW, LLW, and TRU) appear in DOE 5820.2A. See also Section 0273, Water Pollution Controls; Section 0275, Industrial Wastewater Treatment; Section 0285, Solid Waste Systems; Section 1540, Plumbing and Service Piping; and Section 1589, Air Pollution Control.</p>	C			By separating solids from effluent and recirculating effluent to sawing process.

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
1300-8.2	<p>Hazardous Waste Requirements</p> <p>Hazardous waste requirements appear in the directive in DOE 5480.1B, chapter 2. Additionally, the RCRA as amended, 40 CFR 264 and 40 CFR 265, contain specific design and operating requirements and standards for owners and operators of hazardous waste TSD facilities. Part 267 of RCRA contains interim standards for owners and operators of new hazardous waste land disposal facilities. Part 268 of RCRA contains land disposal restrictions and treatment standards for hazardous waste.</p>				
1300-8.3	<p>Mixed Waste</p> <p>14. Radioactive mixed waste, i.e., waste containing radioactive materials and other hazardous waste, shall be avoided where practicable. Mixed waste that cannot be avoided shall be identified and considered in the design at the earliest possible time. Mixed waste shall be segregated and handled separately from other types of waste in accordance with DOE 5400.3.</p>				
1300-8.4	<p>Waste Segregation</p> <p>Facility design shall provide for the segregation of hazardous wastes into compatible groups for storage in accordance with the DOE 5400 series and DOE 5480 series. Suggested compatibility groups are acids, caustics, flammable materials, and organic materials.</p>				
1300-8.5	<p>Spill Prevention and Control</p>				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	Spill prevention and control shall be considered in the design stage of the facility to minimize the possibility of accidentally releasing hazardous waste to the environment				
1300-8.6	Approvals and Permits				
	15. The construction of a new facility or modification of an existing facility that either release hazardous wastes (including airborne radioactive effluents - see 40 CFR 61, Subpart H) to the environment or manages hazardous wastes shall in most cases be approved by the EPA or authorized State agency prior to the beginning of construction. In addition to obtaining approval for construction or modification of a facility, operating permits shall also be obtained for facilities that manage hazardous wastes as specified in RCRA.			N/A	
	16. Environmental discharges of any effluent, including hazardous and nonhazardous wastes, shall meet applicable Federal and State laws and regulations and DOE orders.	C			

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
1300-9	Effluent Control and Monitoring				
	17. Hazardous effluents released to the environment (radioactive and nonradioactive) shall not exceed the limits referenced in DOE 5400.1 and the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series. Emphasis shall be placed on reducing total quantities of effluents released to the environment to ALARA levels using the best technology economically available at the time of design. Effluents shall comply with all applicable Federal, State, and local laws and regulations. State and local laws and regulations shall be carefully consulted, as they may provide more restrictive limits than Federal laws and regulations.		TBD		By HSE.
	18. During normal operations, the effluent concentrations of radionuclides measured at the site boundary shall not exceed the DCGs specified in the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series.		TBD		By HSE.
	19. At the point of discharge of the facility, i.e., stack or equivalent, the effluent concentration shall not exceed the DCGs specified in DOE 5480.11.				
	20. The guidance on radioactive protection referenced in Section 1300-1.4.3, Routine Releases, shall also apply to effluent treatment and discharge systems.				
	21. All effluent streams shall be sampled or monitored in accordance with the requirements of 5400.1, the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series, and the directive on Radiological Effluent				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	Monitoring and Environmental Surveillance in the DOE 5400 series. Sampling and monitoring shall ensure adequate and accurate measurements under normal operations, anticipated operational occurrences, and DBA conditions.				
	22. Effluents shall comply with all applicable Federal, state, and local laws and regulations. State and local laws and regulations shall be carefully consulted as they may provide more restrictive limits than Federal laws and regulations.				
	23. Groundwater protection programs shall comply with DOE 5400.1, DOE 5400.3, and the directive on Radiation Protection of the Public and the Environment in the DOE 5400 series.				
1300-11	Decontamination and Decommissioning				
1300-11.2	Decommissioning				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	Designs consistent with the program requirements of DOE 5820.2A shall be developed during the planning and design phases based on a proposed decommissioning method or a conversion method leading to other uses.			TBD	By HSE.
1324	Radioactive Solid Waste Facilities				
1324-1	Coverage				
	24. Section 1300, General Requirements, shall apply. These requirements are in addition to the requirements of that section and other applicable sections of these criteria, particularly those sections numbered -99.0, Nonreactor Nuclear Facilities-General.			TBD	By HSE.
	25. Radioactive solid waste facilities store, treat, and dispose of the range of solid waste generated by DOE nuclear facilities and reactor facilities. This waste contains high-level, low-level, and transuranic-contaminated solid waste including radioactive mixed waste. These radioactive solid waste facilities, may be separate facilities or they may be adjunct to another type of nuclear facility (e.g., a high-level solid waste storage facility associated with a reprocessing facility). The environmental, safety, and health concerns to be addressed to fulfill the design requirements for these facilities vary significantly according to the nature of the waste, the waste management techniques that are implemented, and the characteristics of the facility site.			TBD	By HSE.

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	26. For those DOE facilities regulated by the NRC (see 10 CFR 60.1 and 10 CFR 61), the requirements specified in 10 CFR 60 and 10 CFR 61 shall take precedence if a conflict arises between those regulations and these criteria.			TBD	By HSE and user.
1324-2	Objectives				
1324-2.1	General				
	27. The design objective shall be to ensure that conservatively estimated consequences of normal operations and credible accidents are limited in accordance with the guidelines contained in Section 1300-1.4, Guidance on Limiting Exposure of the public.			TBD	By HSE and user.
1324-2.2	Siting Design Dose Objectives for Normal Operations and Anticipated Operational Occurrences				
1324-2.2.1	Disposal (Permanent Isolation) Facilities				
	28. For those DOE facilities not regulated by the NRC, the combined annual dose equivalent to any member of the public in the general environment resulting from discharges of radioactive material and direct radiation shall not exceed 25 mrem (0.24 mSv) to the whole body and 75 mrem (0.75 mSv) to any organ (40 CFR 191.03 (b)). WIPP operations are subject to these dose limits. Section 1300-1.4.3, Routine Releases, provides references for additional limits that are applicable to these facilities.				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	29. For those DOE facilities regulated by the NRC, the combined annual dose equivalent to any member of the public in the general environment resulting from discharges of radioactive material and direct radiation shall not exceed 25 mrem (0.25 mSv) to the whole body, 75 mrem (0.75 mSv) to the thyroid, and 25 mrem (0.25 mSv) any other organ (40 CFR 191.03 (a)). Additional requirements specific to these facilities are provided in 10 CFR 60 and 10 CFR 61.				
1324-3	Nuclear Criticality Safety				
	Nuclear criticality safety at RSWFs is applicable to those facilities that store or process enriched uranium, uranium-233, or transuranic contaminated solid waste. For other radioactive solid waste facilities, nuclear criticality safety is not a design or operational consideration.				
	Nuclear criticality control provisions for RSWF shall consider the following:				
	<ul style="list-style-type: none"> Design of radioactive solid waste storage and/or process systems to prevent the carry-over of fissile material and other material capable of sustaining a chain reaction from geometrically favorable portions of the facility to other areas of the facility (e.g., from a compaction area to a storage area) 				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	<ul style="list-style-type: none"> A system of positive control and backflow preventers, such as air gas (siphon breakers), to prevent inadvertent transfer of fissile materials and other material capable of sustaining a chain reaction from geometrically favorable or poisoned containers to unsafe containers Inclusion of heating or cooling jackets in the favorable dimension of geometrically favorable vessels to preclude a leak in the jacket from causing an unacceptable reduction of the margin of subcriticality The design of sumps for nuclear criticality safety if a credible mechanism exists for accumulating fissile material and other material capable of sustaining a chain reaction (e.g., due to leakage from or failure of the primary confinement boundary and/or cooling water system) 				
1324-4	Radiation Protection				
	30. For those DOE facilities regulated by the NRC, the occupational radiation protection requirements specified in 10 CFR 20 and DOE 5480.11. both apply (the most conservative limits taking precedent).		TBD		By HSE and user.
1589	Air Pollution Control				
1589-1	General				
	31. These criteria shall be applied to the control, treatment, and subsequent disposal of all airborne and gaseous wastes to assure compliance with the following:				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	<ul style="list-style-type: none"> • DOE 5400.1 • DOE 5440.1C. • DOE 5480.4 • Federal, State and local standards including restrictions on sulfur content of fuel and other requirements specifically related to the control of air pollutants, as referred to in Executive Order 12088. 				
1589-5	Refuse Disposal Facilities				
1589-5.2	Off-Site Disposal				
	32. Nearby public and commercial disposal facility capabilities shall be considered and used if economically and operationally feasible. Such facilities shall comply with applicable air and water quality standards, regulations, and permit requirements.				
1589-5.3	Landfill and Dumping				
	33. Any land disposal shall comply with RCRA, as amended, and implementing regulations in 40 CFR 241, et seq. The appropriate State environmental agency or regional EPA office shall be consulted when wastes will be generated and not incinerated.				
1589-99.0.2	Nonradioactive Airborne Effluents				

Applicable Section	Item Number/Criteria	C	NC	TBD	Comments
	For nonradioactive hazardous gaseous or airborne effluents, the point of release shall be considered the point at which the effluent exits the stack, vent, etc. Nonradioactive gaseous or airborne effluent releases shall not exceed the guidelines contained in DOE 5400.1 and shall comply with all other applicable Federal, State, and local requirements. To the extent practical, ALARA principles shall be applied to minimize adverse impacts to the public and the environment.			N/A	