# 5.6 DESCRIPTION OF PRINCIPAL STRUCTURES, SYSTEMS, AND COMPONENTS

This section provides a general description of the principal SSCs and their required support systems identified in Section 5.5.2. The identification of principal SSCs and their support systems is based on the analysis presented in Sections 5.4 and 5.5.

#### 5.6.1 Description of Principal SSCs and Required Support Systems

Table 5.6-1 lists the principal SSCs, required support systems, and associated safety functions required to satisfy the performance requirements of 10 CFR §70.61.<sup>1</sup> These support systems are also designated as principal SSCs. The receptors associated with each principal SSC are provided in Section 5.5.2. Principal SSCs are described in the following chapters:

- Chapter 5, Integrated Safety Analysis
- Chapter 6, Nuclear Criticality Safety
- Chapter 7, Fire Protection
- Chapter 8, Chemical Process Safety
- Chapter 10, Environmental Protection
- Chapter 11, Plant Systems
- Chapter 15, Management Measures.

Radiation and environmental protection during normal operation and anticipated occurrences (i.e., non-accident conditions) are related to facility safety and are described in Chapters 9 and 10, respectively.

A reference to the applicable SA section describing the design basis for the principal SSC is provided in Table 5.6-1. The level of detail is consistent with the SA purpose of identifying principal SSCs and required safety functions. Management measures required to ensure the availability and reliability of the listed principal SSCs are described in Chapter 15. More detailed descriptions will be provided in the ISA Summary to satisfy the purpose of demonstrating that IROFS are capable of performing their intended safety functions.

#### 5.6.2 MFFF Administrative Controls

The designation of principal SSCs also includes required administrative controls. Administrative controls are those provisions associated with personnel actions necessary to ensure the safe operation of the MFFF. The MFFF design has placed an emphasis on engineered controls over administrative controls to ensure a high degree of system reliability such that a limited number of administrative controls have been identified as principal SSCs. Required administrative controls are listed in Table 5.6-1 and are identified with an asterisk. A description of each administrative control is provided below.

<sup>1</sup> Table 5.6-1 also lists defense-in-depth SSCs that are not required or credited in the analysis to meet the performance criteria of 10 CFR §70.61.

### 5.6.2.1 Chemical Safety Controls

Chemical safety controls minimize the likelihood of explosions by ensuring the chemical makeup of the reagents and/or chemical species produced in the AP process are acceptable and that incompatible chemicals are segregated. This program includes both administrative controls and engineering features.

The reagent system chemical safety controls in the reagents building include the following:

- 1. Use of certified chemicals that have been independently certified prior to delivery to the reagents building for storage and use
- 2. Preparation of the reagents by utilizing measured quantities of chemicals and solvents
- 3. Transfer to AP Building (BAP) by the Control Room Operator only if the test results meet reagent chemical composition requirements
- 4. Chemical preparation conducted by trained personnel in accordance with approved procedures
- 5. Limiting quantities of materials stored and maintained

These measures ensure that the proper chemicals are delivered to the AP process from the reagents building.

Low usage reagent chemicals, such as manganese nitrate, are prepared in the BAP from aqueousbased reagent grade chemicals with known compositions that are mixed with measured quantities of chemical additives and the aqueous solvent. Before use, however, these prepared reagents undergo redundant testing procedures to ensure chemical composition. Transfer to head tanks or supply tanks by the Control Room Operator occurs only if the test results meet chemical composition requirements.

To ensure that incompatible chemical species do not propagate through the process, the AP process employs sampling measures to detect for incompatible chemical species. The principal SSC chemical safety controls is used to implement this sampling process and it utilizes the following engineering and administrative measures:

- 1. Isolation of process vessels, as necessary, to ensure a representative sample is obtained and to prevent inadvertent additions after sample is taken and prior to processing of sampled process fluid
- 2. Acquisition of sufficient number of samples to obtain a representative measurement
- 3. Redundant testing of samples to ensure chemical composition
- 4. A means to ensure results of tests performed on samples are correctly conveyed from the laboratory to process unit controller

In addition, chemical safety controls will ensure the chemicals used in the MFFF laboratories are properly controlled; assuring incompatible chemicals are separated/segregated. To establish these incompatibilities for the laboratory and reagents in general, a complete chemical interaction evaluation will be provided as part of the ISA.

As an additional protection feature, the chemicals in the reagents building are physically separated by type (for example, to ensure that oxidizers are not mixed with reducing compounds). Similarly, the nitric oxide (NOx), solvent (diluent with tributylphosphate), and hydroxylamine nitrate (HAN) are prepared in separate rooms to ensure segregation from incompatible chemicals. These measures, in addition to providing control of the chemical makeup of the reagents prior to piping into the BAP, also provide non-safety protection against chemical events in the BRP. Chapter 8 provides more details related to the chemical safety of the MFFF.

#### 5.6.2.2 Combustible Loading Controls

The principal SSC, combustible loading controls, is used to describe the control of combustible and transient combustible loads by design and the control of transient combustible loads during operations. The design limits the combustible loads inherent in the fixtures and equipment within a fire area. The safety function of these administrative controls is to limit the amount of transient combustible material within a fire area to allowable quantities during operations to ensure that the design basis fire is not exceeded. The administrative controls are enhanced by training, posting, routine house-keeping and periodic surveillance. Fire models will be performed as part of the ISA to demonstrate that combustible loading controls are effective. Refer to Section 7.1 for details about the Fire Protection Program.

5.6.2.3 Material Handling Controls

Material handling controls require loads to be handled using safe practices such that the resulting impacts are within the design basis of the container being handled or that impacts do not damage principal SSCs such that they would be unable to perform their safety functions. The design basis for containers (i.e., 3013 canister, 3013 transport cask, MOX fuel transport cask, waste containers) being lifted is discussed in Section 11.4.11. The safety function of the material handling controls is to ensure that primary confinement containers are handled properly such that, if dropped, there would be no release of radioactive material that could cause consequences that exceed 10 CFR §70.61 or that a drop of a load would not damage a principal SSC such that it would not be able to perform its safety function (such as a breach of a primary confinement that could cause consequences that exceed 10 CFR §70.61).

Loads are handled by qualified personnel, following an approved procedure controlling material to be moved, equipment (including specialized lifting fixtures), training, and precautions and limitations for the movement as applicable. Materials that will be handled by operators as part of the normal production process (pre-engineered production lifts) will have the same requirements as any other load. In addition to trained operators and proper procedures, material handling controls will also ensure the proper equipment is used having a sufficient capacity for the type and weight of load being lifted. Controls associated with the safety function of the principal SSC cranes include required testing and surveillance.

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## 5.6.2.4 Material Maintenance and Surveillance Programs

The primary means of preventing corrosion-related failures of principal SSCs is through the use of compatible materials within the MFFF fluid systems and to provide separation and segregation of incompatible chemicals. The safety function of the material maintenance and surveillance programs is to supplement these corrosion prevention measures by establishing programs to detect and limit the damage resulting from corrosion (principally to reduce failures associated with corrosion occurring to laboratory and AP gloveboxes containing corrosive chemicals, confinement ducting, and pneumatic transfer lines).

Material maintenance and surveillance programs consist of periodic system-level walkdowns, as well as non-destructive testing programs that can identify corrosion problems within the facility prior to catastrophic failures occurring, and provide a means of taking corrective actions to prevent such failures. These programs are not required to prevent corrosion which could result in small leaks. The frequency of surveillance and maintenance programs will be established based on industry experience.

## 5.6.2.5 Process Cell Entry Controls

The safety function of the process cell entry controls is to prevent the entry of personnel into process cells during normal operations and to ensure that workers do not receive a dose in excess of limits while performing maintenance in the process cells. The health physics program for the facility, described in chapter 9, includes process cell access controls during normal operations in order to limit radiation exposures. Work within the process area is performed via radiation work permits that are authorized by radiation protection staff. Work activities within radiation areas are monitored by health physics staff and radiation monitors. Process cells and gloveboxes are sealed during normal operations to avoid personnel exposures to airborne plutonium particulate contamination. Radiation monitors are positioned throughout the facility for fast response to confinement failures. Access to such sealed areas is strictly controlled under the health physics program, which also precludes exposures during accident conditions.

## 5.6.2.6 Facility Worker Action

Where events are obvious to a facility worker and the worker has time to respond by taking selfprotecting action, that action is credited in mitigating radiological or chemical consequences to the worker. Section 5.5 identifies several events that may require facility workers to evacuate the room where an event occurs.

Execution of training/qualification programs and the use of procedures are part of the qualitative demonstration of likelihood with respect to a facility worker's actions to protect themselves (e.g., by evacuation). In such circumstances, the facility worker will be aware of the event, and take appropriate action to minimize radiological or chemical exposures.

Worker actions to take self-protection measures are credited in certain scenarios. Much of the training and procedures that constitute management measures in support of these worker actions are provided under the health physics program. The health physics program is established as good management practice for a facility such as this, and pursuant to 10 CFR 20; it also provides for maintaining exposures ALARA, and provides additional protection features in support of

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worker safety. Continuous air radiation monitors are positioned close to work locations and within the ventilation air flow from potential release points. This feature provides additional assurance of an immediate response to a confinement failure. Other fixed air monitors are positioned within the process room for general surveillance. Monitors are designed for extremely high plutonium alpha radiation sensitivity – activity as low as 4 DAC-hours is detected (equivalent to doses in the range of a few millirem). Gloves are routinely surveyed for contamination. Gloves are also replaced frequently to prevent loss of confinement due to glove degradation. All workers are provided with respirators that are designed to filter plutonium particulate. The health physics program, including appropriate training with respect to worker evacuation, the use of respirators, etc., is a management measure that supports the principal SSC of worker actions for self-protection. The health physics program would also control activities associated with the longer-term response to and recovery from events to ensure that exposures are maintained within appropriate limits. The basic elements of the program are summarized in Section 9.2 of the CAR.

#### 5.6.2.7 Laboratory Material Controls

Laboratory material controls consist of administrative procedures that will be used to control the quantity of radiological and chemical materials in the laboratory. The safety function of the laboratory material controls program is to limit the extent of any potential explosion by limiting the quantity of hazardous chemicals that may be involved in the explosion and to limit the quantity of radiological/chemical material available for dispersion following a potential explosion.

Procedures will be developed to establish limits on sample size, the number of samples that may be stored and used in the laboratory overall and in any one laboratory location, and the quantity of chemicals, reagents or other hazardous materials that may be stored and used in a laboratory. Procedures will also be developed to ensure laboratory operations are performed in accordance with safe laboratory operating practices.

#### 5.6.2.8 Hazardous Material Delivery Controls

The safety function of hazardous material delivery controls is to ensure that the quantity of delivered hazardous material and its proximity to the MOX Fuel Fabrication Building structure, Emergency Generator Building structure, and the waste transfer line are controlled to within the bounds of the values used to demonstrate that the consequences of outside explosions are acceptable.

#### 5.6.2.9 Facility Worker Controls

The principal SSC facility worker controls credit the facility worker with taking proper actions prior to commencing an activity that could result in an event with unacceptable dose consequences. This differs from the principal SSC facility worker action where the facility worker is credited with taking self-protective measures to minimize dose consequences as a result of an event. Precautions associated with the radiation protection program (such as the use of a mask) are implemented prior to beginning operations involving, or potentially near to,

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primary confinements thereby ensuring the facility worker is protected in case radioactive material is released.

Specifically, in cases where the facility worker is performing a task with transient primary confinements within C3 areas (e.g., during bagout operations), facility worker controls ensure that facility workers take proper actions prior to commencing bag-out operations to prevent and/or limit their dose. Additionally, facility workers take proper actions prior to commencing maintenance activities in AP/MP C3 Areas to prevent and/or limit their exposure.

Similar to facility worker actions, many of the procedures and training that constitute management measures in support of these facility worker controls are provided under the health physics program. These measures provide a basis for the good planning of work tasks associated with the aforementioned activities. The health physics program is established as good management practice for a facility such as this, and pursuant to 10 CFR 20; it also provides for maintaining exposures ALARA, and provides additional protection features in support of worker safety. The basic elements of the program are summarized in Section 9.2 of the CAR.

## 5.6.3 Sole Principal IROFS

A list identifying IROFS that are the sole item preventing or mitigating an accident sequence whose risk could exceed the performance requirements of 10 CFR §70.61 will be provided in the ISA Summary submitted with the license application for possession and use of SNM.

# Tables

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Principal SSC	Safety Function	SA Design Basis Reference
3013 Canister	Withstand the effects of design basis drops without breaching	11.4.11
3013 Transport Cask	Withstand the design basis fire without breaching	11.4.11
	Withstand the effects of design basis drops without release of radioactive material	
Backflow Prevention Features	Prevent process fluids from back-flowing into interfacing systems.	11.8.7
C2 Confinement System Passive Barrier	Limit the dispersion of radioactive material	11.4.11
C3 Confinement System	Provide filtration to mitigate dispersions from the C3 areas	11.4.11
	Remain operable during design basis fire and effectively filter any release	
	Limit the dispersion of radioactive material	1
	Provide exhaust to ensure that temperature in the 3013 canister storage structure is maintained within design limits	
	Provide cooling air exhaust from designated electrical rooms	
C4 Confinement System	Provide design features to ensure that final C4 HEPA filters are not impacted by fire	11.4.11
	Maintain a negative glovebox pressure differential between the glovebox and the interfacing systems	
	Maintain minimum inward flow through small glovebox breaches	
	Ensure that C4 exhaust is effectively filtered	
	Operate to ensure that a negative pressure differential exists between the C4 glovebox and the C3 area	
	Contain a chemical release within a glovebox and provide an exhaust path for removal of the chemical vapors	

## Table 5.6-1. MFFF Principal SSCs

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Principal SSC	Safety Function	SA Design Basis Reference
Chemical Safety Controls*	Ensure that explosive concentrations of hydrogen peroxide do not occur	5.6.2.1
	Ensure a diluent is used that is not very susceptible to either nitration or radiolysis	
	Ensure that quantities of organics are limited from entering process vessels containing oxidizing agents and at potentially high temperatures	<b>u</b> •
	Ensure that hydrazoic acid is not accumulated in the process or propagated to units that might lead to explosive conditions	
	Ensure metal azides are not introduced into high temperature process equipment	
	Ensure the sodium azide has been destroyed prior to the transfer of the alkaline waste to the waste recovery unit	
	Ensure the valance of the plutonium prior to oxalic acid addition is not VI	
	Ensure that nitric acid, metal impurities, and HAN concentrations are controlled and maintained to within safety limits	
	Ensure concentrations of HAN, hydrazine nitrate, and hydrazoic acid are controlled to within safety limits	
	Ensure the proper concentration of hydrazine nitrate is introduced into the system	
	Ensure control of the chemical makeup of the reagents and ensure segregation/ separation of vessels/components from incompatible chemicals	

 Table 5.6-1. MFFF Principal SSCs (continued)

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Principal SSC	Safety Function	SA Design Basis Reference
Combustible Loading Controls*	Limit the quantities of combustibles in the filter area to ensure that the C4 final HEPA filters are not adversely impacted by a filter room fire	5.6.2.2
	Limit the quantity of combustibles in fire areas containing a storage glovebox such that any fire that may occur will not encompass a large fraction of the stored radiological material.	213
	Limit the quantity of combustibles in a fire area containing 3013 canisters to ensure that the canisters are not adversely impacted by a fire	
	Limit the quantity of combustibles in a fire area containing 3013 transport casks to ensure that the cask design basis fire is not exceeded	
	Limit the quantity of combustibles in a fire area containing fuel rods to ensure that the fuel rods are not adversely impacted by a fire	
	Limit the quantity of combustibles in a fire area containing MOX fuel transport casks to ensure that the cask design basis fire is not exceeded	• .
	Limit the quantity of combustibles in a fire area containing transfer containers to ensure that the containers are not adversely impacted by a fire	
	Limit the quantity of combustibles in areas containing the pneumatic transfer system to ensure this system is not adversely impacted	
Criticality Control	Prevent criticality events	6.4
Double-Walled Pipe	Prevent leaks from pipes containing process fluids from leaking into C3 areas	11.8.7

Table 5.6-1. MFFF Principal SSCs (continued)

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Principal SSC	Safety Function	SA Design Basis Reference
Emergency AC Power System	Provide AC power to emergency DC system battery charger	11.5.7
	Provide AC power to emergency diesel generator fuel oil system	
	Provide AC power to high depressurization exhaust system	
	Provide AC power to C4 confinement system	
	Provide AC power to emergency control room air-conditioning system	11 B
	Provide AC power to emergency diesel generator ventilation system	
	Provide AC power to emergency control system	
	Provide AC power to seismic monitoring system and seismic isolation valves	
Emergency Control Room Air-Conditioning System	Ensure habitable conditions for operators	11.4.11
Emergency Control System	Provide controls for high depressurization exhaust system	11.6.7
	Provide controls for C4 confinement system	
· • • •	Provide controls for emergency control room air-conditioning system	
	Provide controls for emergency AC system	
	Provide controls for emergency DC system	
	Provide controls for emergency generator ventilation system	
	Provide controls for emergency diesel generator fuel oil system	
	Shut down process on loss of power	
	Shut down and isolate process and systems, as necessary, in response to an earthquake	

# Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Emergency DC Power System	Provide DC power for high depressurization exhaust system	11.5.7
	Provide DC power for C4 confinement system	
	Provide DC power for emergency AC power system controls	
	Provide DC power for emergency control room air-conditioning system	
	Provide DC power for emergency control system	<b>21</b> 9
	Provide DC power for emergency generator ventilation system	
Emergency Generator Building Structure	Maintain structural integrity and prevent damage to internal SSCs from external fires, external explosions, earthquakes, extreme winds, tornadoes, missiles, rain, and snow and ice loadings	11.1.7
Emergency Generator Ventilation System	Provide emergency diesel generator ventilation	11.4.11
Emergency Diesel Generator Fuel Oil System	Provide emergency diesel generator fuel oil for the emergency diesels	11.5
Facility Worker Action*	Ensure that facility worker takes proper action to limit chemical and radiological exposure	5.6.2.6
Facility Worker Controls*	Ensure that facility workers take proper actions prior to bag-out operations to limit radiological exposure.	5.6.2.9
	Ensure that facility workers take proper actions during maintenance activities to limit radiological exposure.	5.6.2.9
Fire Barriers	Contain fires within a single fire area	7.5.3
Fire Detection and Suppression	Support fire barriers as necessary	7.5.3

## Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Fluid Transport Systems	Ensure that vessels, tanks, and piping are designed to prevent process deviations from creating over-pressurization events	11.8.7
	Withstand as necessary the effects of the DBE such that confinement of radionuclides is maintained	11.8.7
Glovebox	Maintain confinement integrity for design basis impacts	11.4.11
Glovebox Pressure Controls	Maintain glovebox pressure within design limits	11.4.11
Hazardous Material Delivery Controls*	Ensure that the quantity of delivered hazardous material and its proximity to the MOX Fuel Fabrication Building structure, Emergency Generator Building structure, and the waste transfer line are controlled to within the bounds of the values used to demonstrate that the consequences of outside explosions are acceptable.	5.6.2.8
Instrument Air System (Scavenging Air)	Provide sufficient scavenging airflow to dilute the hydrogen produced by radiolysis such that an explosive condition does not occur	11.9.5
Laboratory Material Controls*	Minimize quantities of hazardous chemicals in the laboratory	5.6.2.7
	Minimize quantities of radioactive materials in the laboratory	5.6.2.7
Material Handling Controls*	Ensure proper handling of primary confinement types outside of gloveboxes	5.6.2.3
	Ensure that design basis lift heights of primary confinement types (3013 canister, 3013 transport cask, MOX fuel transport cask, and transfer containers) are not exceeded	
	Prevent load handling activities that could potentially lead to a breach in the final C4 HEPA filters	

Table 5.6-1.	MFFF	<b>Principal</b>	SSCs (	(continued)
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Principal SSC	Safety Function	SA Design Basis Reference	
Material Handling Controls*	Prevent impacts to the glovebox during normal operations from loads outside or inside the glovebox that could exceed the glovebox design basis	5.6.2.3	
	Prevent load handling events that could breach primary confinements		
Material Handling Equipment	Limit damage to fuel rods/assemblies during handling operations	11.7.7	
	Prevent impacts to the glovebox through the use of engineered equipment		
Material Maintenance and Surveillance Programs*	Detect and limit the damage resulting from corrosion	5.6.2.4	
MFFF Tornado Dampers	Protect MFFF ventilation systems from differential pressure effects of the tornado	11.4.11	
Missile Barriers	Protect MOX Fuel Fabrication Building and Emergency Generator Building internal SSCs from damage caused by tornado- or wind-driven missiles	11.1.7	
MOX Fuel Fabrication Building Structure (including vent stack)	Maintain structural integrity and prevent damage to internal SSCs from external fires, external explosions, earthquakes, extreme winds, tornadoes, missiles, rain, and snow and ice loadings	11.1.7	
	Withstand the effects of load drops that could potentially impact radiological material		
MOX Fuel Transport Cask	Withstand the design basis fire without breaching	11.4.11	
	Withstand the effects of design basis drops without release of radioactive material		
Offgas Treatment System	Provide an exhaust path for the removal of gases in process vessels	11.4.11	
Pressure Vessel Controls	Ensure that primary confinements are protected from the impact of pressure vessel failures (bulk gas, breathing air, service air, and instrument air systems)	11.9.5	
Process Cells	Contain fluid leaks within process cells	11.4.11	

Table 5.6-1.	MFFF Princi	pal SSCs	(continued)
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Principal SSC	Safety Function	SA Design Basis Reference
Process Cell Entry Controls*	Prevent the entry of personnel into process cells during normal operations	5.6.2.5
	Ensure that workers do not receive a radiological or chemical exposure in excess of limits while performing maintenance in the AP process cells	
Process Cell Fire Prevention Features	Ensure that fires in the process cells are highly unlikely	7.5.3
Process Cell Ventilation System Passive Boundary	Provide filtration to limit the dispersion of radioactive material	11.4.11
Process Safety Control Subsystem		System design basis provided in 11.6.7. As necessary, basis for parameters provided as shown
	Prevent the formation of an explosive mixture of hydrogen within the MFFF facility associated with the use of the hydrogen-argon gas	8.5
	Ensure isolation of sintering furnace humidifier water flow on high water level	11.4.11 (See Sintering Furnace)
	Ensure the temperature of solutions containing HAN is limited to temperatures within the safety limits	8.5
	Control the flowrate into the oxidation column	8.5
	Ensure the temperature of solutions containing organic is limited to temperatures within safety limits	8.5
	Limit the residence time of organics in process vessels containing oxidizing agents and potentially exposed to high temperatures and in radiation fields	8.5
	Ensure the temperature of solutions potentially containing hydrazoic acid is limited to prevent an explosive concentration of hydrazoic acid from developing	8.5

# Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Process Safety Control Subsystem (continued)	Limit and control conditions under which dry-out can occur	8.5
	Ensure the temperature of solutions potentially containing metal azides is insufficient to overcome the activation energy needed to initiate the energetic decomposition of the azide	8.5
	Ensure the normality of the nitric acid is sufficiently high to ensure that the offgas is not flammable and to limit excessive hydrogen production	8.5
	Warn operators of glovebox pressure discrepancies prior to exceeding differential pressure limits	11.4.11
	Shut down process equipment prior to exceeding temperature safety limits	11.4.11
	Ensure the temperature of solutions containing solvents is limited to temperatures within safety limits	8.5
	Ensure the flow rate of nitrogen dioxide/ dinitrogen tetroxide is limited to the oxidation column of the purification cycle	8.5
Seismic Monitoring	Prevent fire and criticality as a result of	11.6.7 – for system
System and Associated Seismic Isolation Valves	an uncontrolled release of hazardous material and water within the MFFF Building in the event of an earthquake	11.8.7 – for valves
Sintering Furnace	Provide a primary confinement boundary against leaks into C3 areas	11.4.11
Sintering Furnace Pressure Controls	Maintain sintering furnace within design limits	11.4.11
Supply Air System	Provide unconditioned emergency cooling air to the storage vault and designated electrical rooms	11.4.11
Transfer Container	Withstand the effects of design basis drops without breaching	11.4.11

## Table 5.6-1. MFFF Principal SSCs (continued)

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Principal SSC	Safety Function	SA Design Basis Reference
Waste Containers Ensure that hydrogen buildup in exce limits does not occur while providing appropriate confinement of radioactiv materials		11.4.11
Waste Transfer Line	Ensure that the waste transfer line is protected from activities taking place outside the MOX Fuel Fabrication Building	10.5
	Prevent damage to the line from external fires, explosions, earthquakes, extreme winds, tornadoes, missiles, rain, and snow and ice loadings	10.5

 Table 5.6-1. MFFF Principal SSCs (continued)

\* Administrative control

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#### 5.7 GENERAL SA AND ISA COMMITMENTS

The SA is the first step in the ISA process. In the ISA Summary submitted with the license application for possession and use of SNM, IROFS will be identified. The safety function of each of the IROFS required to satisfy the performance requirements of 10 CFR §70.61 will be included. Methods for conducting the ISA and additional detailed analyses have been discussed previously in this and other chapters. The following sections describe DCS' programmatic commitments for performance and continuation of the ISA process.

#### 5.7.1 Process Safety Information

DCS will maintain written process safety information for the MFFF, which will be used to update the ISA and to identify and understand the hazards associated with the processes. The process safety information will include the following:

- A description of the hazards, including information of the pertinent chemical or physical properties of hazardous materials (e.g., toxicity, acute exposure limits, reactivity, chemical and thermal stability, or other applicable information that would typically be included on Material Safety Data Sheets)
- A description of the equipment used in the process (e.g., information of a general nature on such topics as the materials of construction, piping and instrumentation diagrams, ventilation, design codes and standards employed, material and energy balances, safety systems, interlocks, detection or suppression systems, electrical classification, relief system design, and the design bases)
- A description of the technology of the process (e.g., block flow diagrams or simplified process flow diagrams, a brief outline of the process chemistry, safe upper and lower limits for controlled parameters, and an evaluation of the health and safety consequences of process deviations).

This information is contained in analyses, specifications, drawings, and other documentation that is prepared, reviewed, and approved in accordance with design control and configuration management processes described in Chapter 15.

#### 5.7.2 ISA Updating

To ensure the continued accuracy of the ISA, DCS has made commitments to management measures, such as quality assurance, the configuration management system, and operating procedures. These commitments are contained in Chapter 15 and ensure the timely updating of the ISA. In particular, the ISA will be conducted in accordance with approved QA procedures for performing (and maintaining), reviewing, and approving analyses in accordance with design control procedures, and maintaining associated documentation in accordance with records management procedures. These processes and procedures are controlled under the MPQAP. Organizational responsibilities and administrative policies are given in Chapter 4.

Following issuance of the license for possession and use of SNM:

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- DCS will update the ISA Summary annually if changes occur that affect the ISA Summary. Changes in the process safety information or other site or facility changes that may alter the parameters of accident sequences will be evaluated. DCS will revise the ISA using an ISA team with qualifications appropriate for the nature of the change. IROFS and appropriate management measures will be implemented based on the results of the ISA.
- DCS commits to promptly addressing any safety-significant vulnerabilities or unacceptable performance deficiencies identified in the ISA. Whenever the ISA is updated, DCS will take prompt and appropriate actions to address any vulnerabilities that may have been identified. If a proposed change results in a new type of accident sequence or results in a change in the consequences, as defined in 10 CFR §70.61, to an unacceptable level, DCS commits to promptly evaluating the adequacy of existing IROFS and associated management measures and making necessary changes, if required.

#### 5.7.3 Facility Changes

Upon issuance of the license to possess and use SNM, DCS will control facility changes in accordance with the following requirements:

- DCS will implement a configuration management system, as described in Chapter 15, to evaluate, implement, and track each change to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel. This system will be documented in written procedures. The following will be addressed prior to implementing any change:
  - The technical basis for the change;
  - Impact of the change on safety and health or control of licensed material;
  - Modifications to existing operating procedures including any necessary training or retraining before operation;
  - Authorization requirements for the change;
  - For temporary changes, the approved duration (e.g., expiration date) of the change; and
  - The impacts or modifications to the ISA, ISA Summary, or other safety program information, developed in accordance with 10 CFR §70.62.
- Any change to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel will be evaluated, as described above, before the change is implemented. The evaluation of the change will determine, before the change is implemented, if an amendment to the license is required to be submitted in accordance with 10 CFR §70.34.
- Pursuant to 10 CFR §70.72, DCS may make changes to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel, without prior NRC approval, if the change:

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- Does not create new types of accident sequences that, unless mitigated or prevented, would exceed the performance requirements of 10 CFR §70.61 and that have not previously been described in the ISA Summary; or
- Does not use new processes, technologies, or control systems for which DCS has no prior experience;
- Does not remove, without at least an equivalent replacement of the safety function, an item relied on for safety that is listed in the ISA Summary;
- Does not alter any item relied on for safety, listed in the ISA Summary, that is the sole item preventing or mitigating an accident sequence that exceeds the performance requirements of 10 CFR §70.61; and
- Is not otherwise prohibited by 10 CFR §70.72, license condition, or order.
- Changes will be communicated to the NRC as follows:
  - For changes that require pre-approval under 10 CFR §70.72, DCS will submit an amendment request to the NRC in accordance with 10 CFR §70.34 and §70.65.
  - For changes that do not require pre-approval under 10 CFR §70.72, DCS will submit to the NRC annually, within 30 days after the end of the calendar year during which the changes occurred, a brief summary of all changes to the records required by 10 CFR §70.62(a)(2).
  - For all changes that affect the ISA Summary, DCS will submit to the NRC annually, within 30 days after the end of the calendar year during which the changes occurred, revised ISA Summary pages.
- If a change covered by 10 CFR §70.72 is made, the affected onsite documentation will be updated promptly.
- DCS will maintain records of changes to its facility carried out under 10 CFR §70.72. These records will include a written evaluation that provides the bases for the determination that the changes do not require prior NRC approval under paragraph (c) or (d) above. These records will be maintained until termination of the license.

Changes to the design prior to issuance of the license to possess and use SNM are discussed in Section 15.2.

#### 5.7.4 Other Commitments

DCS will use personnel with appropriate experience and expertise in engineering and process operations to update the ISA and keep it current. The ISA team for a process will include individuals knowledgeable in ISA methodology and in the operation and hazards of the particular process. The SA team described in Section 5.2 will be supplemented with personnel with such experience as appropriate.

DCS commits to implementing and maintaining IROFS to ensure the required reliability and availability to satisfy the performance requirements of 10 CFR Part 70. The management

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measures described in Chapter 15 comprise the principal mechanism by which the reliability and availability of IROFS are ensured.

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# **Appendix 5A Tables**

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Event Type/	Unmitigated Event Description/	Cause
Workshop or	Specific Location/	
Location/	Hazard Sources	
Event Number		
Event type: fire, explosion, dispersion of radioactive material, etc.	Description of unmitigated event including equipment, effects of event and applicable hazardous materials, without application of principal SSCs.	Event cause
Applicable Workshop or	Specific Location:	
Support Group: Aqueous Polishing, Powder, Pellet, etc.	Specific process unit(s) in which event may occur.	. u.
Alphanumeric event number.	Mode:	
Event type	Applicable facility operating mode. Normal Operation, Startup, Short Shutdown, Long Shutdown, All	
designator: E-1 through E-9.	Hazard Sources:	
	Hazardous material involved in event, radioactive or hazardous chemical	

# Table 5A-1. Unmitigated Event Description - Example

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire Aqueous Polishing	A fire involving the AP Calcining Furnace results in an energetic breach of the AP Calcining Furnace Glovebox and the dispersal of	1. Oxygen line leak or break and high temperature ignition source
AP-1	radiological materials.	
F-1	Specific Location:	
	AP-Precipitation-Filtration-Oxidation (Calcining Furnace Glovebox)	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in AP Calcining Furnace)	
Internal Fire	A solvent fire involving AP Glovebox results in	1. Temperature of solvent
Aqueous Polishing	an energetic breach of the AP Glovebox and the dispersal of radiological materials.	above flashpoint and ignition source
AP-2	· · ·	
	Specific Location:	
E-1	AP-Solvent recovery AP-Purification cycle AP-Sampling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in fire area)	

		Correct
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/		
Event Number		
Internal Fire	A solvent fire involving AP vessels, tanks and	1. Temperature of solvent
	piping in AP Process Cell results in an energetic	above flashpoint and ignition
Aqueous Polishing	breach of the AP vessels, tanks and piping and	source
	the dispersal of radiological materials.	
AP-3		
	Specific Location:	
	AP-Solvent recovery	
E-1	AP-Purification cycle	
	AP-Liquid Waste Reception	
		51.P
	Mode: All	
	Hazard Sources:	
]		
	Radiological Material (maximum inventory in	
	AP Process Cell including inventory in AP	1
	vessels, tanks and piping)	
Internal Fire	A fire involving AP vessels, tanks and piping	1. Combustible material and
	and combustible material in AP Process Cell	ignition source
Aqueous Polishing	results in an energetic breach of the AP vessels,	-
	tanks and piping and the dispersal of radiological	
AP-4	materials.	
12 4		
	Specific Location:	
	Spooline Looline	
E-1	AP-Solvent recovery	· · ·
1	AP-Precipitation-Filtration-Oxidation	
	AP-Sampling	
	AP-Oralic mother liquors recovery	1
1	AP_Off gas treatment	1
	AP-I ignid waste recention	
	A P. Dissolution	
1	A P-Dissolution of chlorinated feed	
	A D. A cid recovery	
	A D_Durification cycle	
1	AN -I WINGAUGH CYCIC	
1	Mode: All	
	Hazard Sources:	1
ł	Radiological Material (maximum inventory in	
1	AP Process Cell including inventory in AP	
	vessels, tanks and piping)	
1		

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

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ł

Front	Immitigated Event Description/Court	<u>C</u>
Type(Washabas	I continuing at the section of the s	Cause
Type workshop	Locauony mazard Sources	
Front Number		
Internal Fire	A first involving combustible metarials and a	
Internal Pite	topk containing refinetes in AD Decose Coll	1. Compussible material and
Aqueous Polishing	results in an energetic breach of the AB wards	Ignition source
Adress Louising	topks and piping and the dispersel of redicle risel	
AP-40	motoriala	
	maichais.	
	Specific Location:	
	opeenie zecaleli.	
E-1	AP-Acid recovery	
	AP-Purification cycle	
[	AP-Liquid Waste Reception	
		i de la constante de
	Mode: All	5.7
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	raffinates tank in AP Process Cell)	
Internal Fire	All Internal Fire events for MFFF-Gloveboxes	
	apply to Aqueous Polishing, as far as description	
Aqueous Polishing	and causes are concerned, and are bounding in	
_	terms of consequences. (Refer to MFFF	
AP-5	Gloveboxes, Events GB-1 and GB-2)	
	Specific Location:	
	AP-Acid recovery	
E-1	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Uxalic mother liquors recovery	
	Ar-Liquid waste Reception	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
1	AP glovebox)	

## Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

		0
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/		
Emert Manuel		
Event Number		
Explosion	Radiolysis induced hydrogen buildup in the	1. LOSS OF NORMAL CITUTION AIT
	vapor space of an AP vessel, tank or piping (in	flow
Aqueous Polishing	AP process cell or glovebox) results in a	2. Loss of offgas exhaust flow
Aqueous rousining	hudman evolution (given an ignition source)	
	nyurogen expression (given an ignition source),	
AP-6	an energetic breach of the AP vessel, tank or	
1. A	piping, and the dispersal of radiological	
	materials.	
E-2	Specine Location:	
	AP-PuO2 Decanning	
	AP-Solvent recovery	
	AD Brainisation Eiltration Ovidation	
1	Ar-recipitation-rituation-Oxidation	(
1 · · · · · · · · · · · · · · · · · · ·	AP-Oxalic mother liquors recovery	
	AP-Dissolution	1
	AP-Dissolution of chlorinated feed	
	AD Durification quele	
	Ar-runneauon cycic	
1	Mode: All	
	Hazard Sources:	
		· · · · · ·
	Dedialanias Material (manimum inventor in	1
	Katiological Material (maximum inventory in	
	AP vessel)	
		1 · · · · ·
	and the second	
Explosion	Radiolysis induced hydrogen buildup in the	1. Loss of normal dilution air
LAPIOSIOII	unner anone of a refineter tenk (in AD arrows	flow
	vapor space of a rammates tank (in AF process	2 Loss of offers anhoust flow
Aqueous Polishing	cell) results in a hydrogen explosion (given an	2. Loss of ongas exhaust now
	ignition source), an energetic breach of the AP	
AP-41	vessel, tank or piping, and the dispersal of	4 · · · · · · · · · · · · · · · · · · ·
	radiological materials	
	I Intological manifals.	
		1
	Specific Location:	
E-2		
	AP-Acid recovery	
	AP-Purification cycle	
	AD Liquid Waste Desertion	
	Ar-Liquid waste Reception	
	Mode: All	1
	Hazard Sources:	
	Lucard Durden.	1
		1
	Kadiological Material (maximum inventory in	ł
1	raffinates tank in AP Process Cell)	1
1		

# Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion AP-7	A process-related chemical over-pressurization involving flammable, explosive, or reactive chemicals in AP vessels, tanks and piping (in AP process cell or glovebox) results in an energetic breach of the AP vessels, tanks and piping and the Dispersal of Nuclear Materials.	1. Corrosive chemicals interact with vessels/piping/associated equipment 2. Incorrect chemical handling 3. Incorrect reagent
E-2	Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution of chlorinated feed AP-Uranium Dissolution AP-Acid recovery AP-Purification cycle Mode: All Hazard Sources: Radiological Material (maximum inventory in AP vessels, tanks and piping)	<ul> <li>4. Temperature of chemical(s) above flashpoint</li> <li>5. Hydrogen or other explosive gas released due to incompatible chemical addition errors</li> <li>6. Explosive gas and electrical short</li> <li>7. Explosive gas and unknown ignition source</li> </ul>
Explosion Aqueous Polishing	A process-related chemical explosion involving HAN/Nitric Acid in AP vessels, tanks and piping (in AP process cell or glovebox) results in an energetic breach of the AP vessels, tanks and	1. Incorrect or excessive chemical addition 2. Incorrect or excessive abarrian addition and filling
AP-8	piping and the Loss of Confinement / Dispersal of Nuclear Materials.	to perform required sampling of AP solutions 3. Incorrect reagent preparation
E-2	Specific Location: AP-Purification cycle AP-Precipitation-Filtration-Oxidation AP-Solvent Recovery AP-Acid Recovery AP-Oxalic Mother Liquors Recovery Mode: All Hazard Sources: Radiological Material (maximum inventory in AP vessels, tanks and piping)	<ul> <li>4. Reagent concentration due to evaporation</li> <li>5. Explosive gas and electrical short</li> <li>6. Explosive gas and unknown ignition source</li> </ul>

# Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
or Location/		
Event Number	· · · · · · · · · · · · · · · · · · ·	
Explosion	A process-related chemical explosion involving	1. Incorrect or excessive
	hydrazoic acid in AP vessels, tanks and piping	chemical addition
Aqueous Polishing	(in AP process cell or glovebox) results in an	2. Incorrect or excessive
	energetic breach of the AP vessels, tanks and	chemical addition and failure
AP-9	piping and the Loss of Confinement / Dispersal	to perform required sampling
	of Nuclear Materials.	or Ar solutions
		3. Incorrect reagent
		A Temperature of chemical(a)
E-2	Specific Location.	+. 1000000000000000000000000000000000000
	Specine Location:	5 Finlosive are and electrical
	A D-Durification avale	short
	AP-Salvent Recovery	6. Explosive gas and unknown
	AP-Precinitation-Filtration-Ovidation	ignition source
	AP-Off gas treatment	
	AP-Oxalic Mother Liquors Recovery	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	AP vessels, tanks and piping)	
<u> </u>		1 Control contors failure
Explosion	Uver-pressurization involving AF vessels, tanks	1. Conuor system rantife
A	A D Brogans Cell multi in an exercise broach of	1
Aqueous Polishing	AF FIGUESS CEILIESUIS III all Chergeue Dieach OF	
AD-20	dispersal of radiological materials	1
AI-20	asperat of fanological listicitats.	
	Specific Location:	
E-2	AP-Oxalic mother liquors recovery	
1	AP-Acid recovery	1
		1
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	evaporator in AP Process Cell)	
		<u> </u>

# Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

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Event	Inmitigated Event Decemintion/Specific	Conce
Tuno(Workshop	Unincigated Event Description/Specific	Cause
Type workshop	Locauon/Hazard Sources	
OF LOCALION		
Event Number		
Explosion	A process-related chemical explosion involving	1. Human error or equipment
	hydrogen peroxide (in AP process cell or	failure
Aqueous Polishing	glovebox) in AP vessels, tanks and piping results	
	in an energetic breach of the AP vessels, tanks	
AP.37	and nining and the Loss of Confinement /	
	Dispersal of Nuclear Materials	
	Dispersar of Nuclear Materials.	
E-2	Specific Location:	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	· · · · · · · · · · · · · · · · · · ·
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	A D vessels topks and piping)	
	Ar vessels, tailes and pipilig)	
Explosion	A process related shemical evaluation involving	1 Evelocing concentration of
LAPIOSION	A process-related chemical explosion involving	1. Explosive concentration of
	solvents in AP vessels, tanks and piping (in AP	solvent vapors in a confined
Aqueous Polisning	process cell or glovebox) results in an energetic	space with an ignition source
	breach of the AP vessels, tanks and piping and	
AP-38	the Loss of Confinement / Dispersal of Nuclear	
	Materials.	
E-2	Specific Location:	
_		
	AP-Purification cycle	
	AP-Solvent recovery	
	A.D. I jouid Waste Decention	
	ni -liquiu masie neuepuoli	
	Made, All	
	MOUE: All	
	Harrard Sources	
	riazaru Sources:	
	Radiological Material (maximum inventory in	
	AP vessels, tanks and piping)	

# Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Decent	The state of Frank Degeniation &	Conce
Event	Unmitigated Event Description/Specific	Lausc
1 ype/ worksnop	Locauon/Hazard Sources	
or Location/		
Event Number		1 Temperature chows 125 C
Explosion	A process-related chemical explosion involving	in heiler wareal enterly and
· · · · · · · · ·	red oil formation (nitrates or nitric acid solutions	in polici, vessel, or tank and
Aqueous Polishing	of neavy metals and TBP at temperatures in	presence of nurates of nuric
	excess of 135 C) in AP boiler, vessel, or tank (in	acid solutions of neavy metals
AP-39	AP process cell or glovebox) results in an	and IBP
	energetic breach of the AP boiler, vessel, or tank	
• · · · • • · · ·	and the Loss of Confinement / Dispersal of	
	Nuclear Materials.	
E-2		
	Specific Location:	
	AP-Purification cycle	
	AP-Solvent recovery	
	AP-Acid recovery	
	AP-Liquid Waste Reception	
	AP-Precipitation-Filtration-Oxidation	
	AP-Oxalic mother liquors recovery	
ta in a si ta in		
100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100	Mode: All	
		1
a a star	Hazard Sources:	
and the second		
	Radiological Material (maximum inventory in	
· .	AP vessels, tanks and piping)	
· · · · · · · · · · · · · · · · · · ·		
Explosion	A process-related chemical explosion involving	1. Temperature above 135 C
	an azide (other than hydrazoic acid) in an AP	in boiler, vessel, or tank and
Aqueous Polishing	boiler, vessel, or tank (in an AP cell or glovebox)	presence of azide solutions.
	results in an energetic breach of the AP boiler,	1
AP-44	vessel, or tank and the Loss of Confinement /	
	Dispersal of Nuclear Materials.	
	The second se	l · · · · · · · · · · · · · · · · · · ·
	A second s	
E-2	Specific Location:	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	AP-Purification cycle	
	AP-Solvent recovery	1 · · · · · · · · · · · · · · · · · · ·
	AP-Liquid Waste Reception	
· · ·		
	Mode: All	
e de la companya de la		
	Hazard Sources:	
and the second second	$= \frac{1}{2} \left[ \frac{1}{2}$	
	Radiological Material (maximum inventory in	
and the second second second	AP vessels, tanks and piping)	
<b>1</b>		

# Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

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Fyent	Unmitigated Event Description/Specific	Cauce
Type/Workshop	Location/Hazard Sources	Cause
or Location/		
Event Number		
Explosion	Electrolysis-induced hydrogen buildup in the	1. Incorrect chemical handling
	vapor space of an electrolyzer results in a	2. Incorrect reagent
Aqueous Polishing	hydrogen explosion and the dispersal of	preparation
1	radiological materials.	3. Hydrogen or other
AP-47		explosive gas released due to
		incompatible chemical
	Specific Location:	addition errors
	-	4. Explosive gas and electrical
E-2	AP-Dissolution	short
	AP-Dissolution of chlorinated feed	5. Explosive gas and unknown
		ignition source
	Mode: All	
	Hazard Sources:	
	A Bussels and sizes)	
	Ar vessels, tanks and piping)	
Explosion	A process-related chemical explosion involving	1 Incorrect chemical handling
Expresion	nlutonium (VD in the calcining furnace results in	2. Incorrect reagent
Acucous Polishing	an energetic breach of the furnace and glovebox	nrenaration
riquoous romaning	and the dispersal of radiological materials.	3. Hydrogen or other
AP-48		explosive gas released due to
		incompatible chemical
	Specific Location:	addition errors
		4. Explosive gas and electrical
E-2	AP-Precipitation-Filtration-Oxidation	short
		5. Explosive gas and unknown
	Mode: All	ignition source
	Uszard Soumae	
	Hazald Soules.	
	Radiological Material (maximum inventory in	
	AP vessels, tanks and piping)	
Explosion	A process-related chemical explosion involving	1. Corrosive chemicals
	liquid addition to the calcining furnace results in	interact with vessels/piping/
Aqueous Polishing	an energetic breach of the furnace and glovebox	associated equipment
4.0.40	and the dispersal of radiological materials.	2. Incorrect chemical handling
AP-49		5. Incorrect reagent
	Specific Location:	A Temperature of chemical(-)
		shove flashnoint
E-2	AP-Precipitation-Filtration-Oxidation	5. Hydrogen or other
		explosive gas released due to
1	Mode: All	incompatible chemical
1		addition errors
1	Hazard Sources:	6. Explosive gas and electrical
		short
	Radiological Material (maximum inventory in	7. Explosive gas and unknown
	Ar vesseis, tanks and piping)	ignition source
1	1	2

## Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)
Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material Aqueous Polishing AP-10 E-3	Excessive temperature of AP Calcining Furnace results in high temperature damage to and breach of the AP Calcining Furnace Glovebox and the dispersal of radiological materials. Specific Location: AP-Precipitation-Filtration-Oxidation (Calcining Furnace Glovebox) Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in AP Calcining Furnace Glovebox)	1. Control system failure 2. Loss of cooling of process equipment by glovebox ventilation
Loss of Confinement / Dispersal of Nuclear Material Aqueous Polishing	Excessive temperature of AP Electrolyzer results in high temperature damage to and breach of the AP Electrolyzer and damage to the glovebox panels and the dispersal of radiological materials.	<ol> <li>Control system failure</li> <li>Electric isolation failure</li> <li>Loss of cooling to process equipment</li> </ol>
E-3	Specific Location: AP-Dissolution (Electrolyzer Glovebox) AP-Dissolution of chlorinated feed Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in AP Electrolyzer Glovebox)	

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Event	Unmitigated Event Description/Specific	Conce
Type/Workshop	I ocation/Hazard Sources	Cause
or Location/	Evalutiv Mazar & Sources	
Event Number		
Loss of	Corrosion of an AP Glovebox by corrosive	1 Corrosive chemicals
Confinement /	chemicals results in a breach (i.e., material	interact with AP glovebox
Dispersal of	failure) of glovebox confinement and dispersal	leading to failure
Nuclear Material	of radiological materials.	
Aqueous Polishing	Specific Location:	
AP-12	AP-Acid recovery	
	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	
	AP-Sampling	
E-3	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	AP glovebox)	
Loss of	Back-flow from the AP Calcining Furnace	1. Loss of gas flow through
Confinement /	through a nitrogen or oxygen supply line to an	the supply line and failure of
Dispersal of	interfacing system followed by the opening of	pipes and valves
Nuclear Material	this interfacing system (during operation or	
	maintenance) results in a breach of glovebox	
Aqueous Polishing	primary confinement and dispersal of	
	radiological materials to areas where workers	
AP-13	might be present.	
E 2	Caral Ca Landian	
E-3	Specific Location:	
	AB Presidentian Biltration Onidation (Onlaining	
	AP-Precipitation-Filtration-Oxidation (Calcining	
	rumate Gioveoox)	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	AP Calcining Furnace)	

		Course
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/		
Event Number		
Loss of	Back-flow from AP vessels, tanks and piping	1. Loss of gas flow through
Confinement /	through a supply line (e.g., compressed air,	the supply line and failure of
Dispersal of	bubbler transmitter line) to an interfacing system	pipes and valves
Nuclear Material	followed by the opening of this interfacing	
	system (during operation or maintenance) results	
Aqueous Polishing	in a breach of primary confinement and dispersal	
	of radiological materials to areas where workers	
AP-14	might be present.	
	Specific Location:	
E-3	AP-PuO2 Decanning	
	AP-PuO2 Canning	
	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Off gas treatment	
	AP-Liquid waste reception	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Acid recovery	
	AP-Purification cycle	
	AP-Sampling	
and the second	a that is a second s	
	Mode: All	
	Hazard Sources:	
	1 ·	
	Radiological Material (maximum inventory in	1
	AP vessel, tank or piping)	

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Front	Unmitigated Event Decemintian/Eneritie	Correc
Type(Workshop	Unintigated Event Description/Specific	Cause
or Location/	Location/Hazaru Sources	
Event Number		
Loss of	A break or leakage in AP vessele tanks and	1 Correction of A Payersele
Confinement /	A bleak of leakage in AP vessels, taiks and	1. Contosion of AP vessels,
Dispersal of	of confinement, and the dispersal of endialogical	2 Machanical failure of AD
Nuclear Material	motoriale	2. Mechanical failure of AP
	materials.	vessels, tanks and piping
Aqueous Polishing	Specific Location:	
AP-16	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	
	AP-Oxalic mother liquors recovery	
	AP-Off gas treatment	
E-3	AP-Liquid waste reception	
-	AP-Dissolution	2.7
	AP-Dissolution of chlorinated feed	
	AP-Acid recovery	
	AP-Purification cycle	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	the effected equipment in AP Process Cell)	
Loss of	A break or leakage of a raffinates tank in an AP	1. Corrosion of raffinates tank
Confinement /	Process Cell results in a breach of confinement,	2. Mechanical failure of
Dispersal of	and the dispersal of radiological materials.	raffinates tank
Nuclear Material		
	Specific Location:	
Aqueous Polishing		
	AP-Acid recovery	
AP-42	AP-Purification cycle	
	AP-Liquid Waste Reception	
	Mode: All	
E-3		
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	raffinates tank in AP Process Cell)	
<u> </u>		
Loss of	Excessive temperature (due to decay heat) of	1. Loss or blockage of HVAC
Confinement /	PuOZ Buffer Storage Unit (powder storage area).	cooling system
Dispersal of		2. Loss of power to HVAC
Nuclear Material	Specific Location:	cooling system
Aqueous Polishing	Ar-rre-Polishing Milling Storage	
AP 46	Mode: All	
AT-40	MOUE: All	
	Unrowd Sources	
1	nazalu Jources:	
F.3	Padiological Material (maximum investors in	
	huffer storage unit)	
	burier storage unity	
1		

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Fuent	Unmitigated Event Description/Specific	Cauce
Type/Workshop	Location/Hazard Sources	Cause
or Location/		
Event Number		
Loss of	Back-flow from AP vessels, tanks and piping	1. Loss of liquid flow through
Confinement /	through a liquid supply line (e.g., steam or	the supply line and failure of
Dispersal of	condensate lines, acid recovery line, hot water	pipes and valves
Nuclear Material	lines) to an interfacing system results in a breach	
A	of confinement (i.e., leakage into an interfacing	
Aqueous Ponsning	system) and dispersal of radiological materials.	
AP-17	Specific Location:	
	AP-Precipitation-Filtration-Oxidation	
	AP-Oxalic mother liquors recovery	
E-3	AP-Off gas treatment	
	AP-Liquid waste reception	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Acid recovery	
	AP-Sampling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	AP vessel, tank or piping)	
		1. Loss of me on liquid flow
Loss of	Back-tiow from AP vessels, tanks and piping	1. Loss of gas of liquid now
Dispersel of	urough a reagent supply fine to an interfacing	failure of pipes and valves
Nuclear Material	interfacing system (during operation or	initiate of pipes and varies
Inficical Infatorial	maintenance) results in a breach of confinement	
Aqueous Polishing	and dispersal of radiological materials to areas	
0.11.1.1.1.1.1.0.0	where workers might be present.	
AP-18		
	Specific Location:	
	AP-Reagents	
E-3	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	
	AP-Oxalic mother liquors recovery	
	AP-Off gas treatment	
	AP-Liquid waste reception	
	AP-Dissolution	1
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	l
	AP-Acid recovery	
	Ar-runncanon cycle	
	Mode: Ali	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	AP vessel, tank or piping)	

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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
Frent Number		· ·
Loss of	A loss of exhaust flow involving the Off-Gas	1 Loss of normal electrical
Confinement /	Process Confinement System for AP vessels.	Dower
Dispersal of	tanks and piping results in degraded performance	2. Mechanical failure of off-
Nuclear Material	of the off-gas system (affecting both AP process	gas exhaust fans
	cells and AP gloveboxes).	-
Aqueous Polishing		
AD 21	Specific Location:	
AP-21	AP Solvent monumu	
	AP-Directinitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
E-3	AP-Oxalic mother liquors recovery	
	AP-Off gas treatment	
	AP-Liquid waste reception	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Acia recovery	
	Ar-Funncation cycle	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in single AP vessel)	
Loss of	Internal Flood due to a leak or rupture of cooling	1. Corrosive chemicals
Confinement /	water pipes to an AP electrolyzer results in	interact with cooling water
Dispersal of	breach of the AP electrolyzer glovebox and the	piping
Nuclear Material	dispersal of radiological materials.	
Aqueous Polishing	Specific Location:	
AP-22	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	Mode: Normal Operation	
E-3		
	Hazard Sources:	
	Radiological Material (maximum inventory in AP Electrolyzer Glovebox)	

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<b>D</b> 4	Ilemiticated Event Description Knosifie	Cansa
Event	Unmutgated Event Description/Specific	vause
i ype/worksnop	Location/nazaru Sources	
Or LOCAUON/		
Event rumber	All Loss of Confinement / Dispersel of Nuclear	
LOSS UI	Material events for MEEE Glovehoves apply to	
Disconnement /	A guegue Delishing as for as description and	
Dispersal of	Aqueous Poinsning, as far as description and	
Nuclear Maleriai	causes are concerned, and are bounding in terms	
A susseus Balishing	Events GR 3 through GR-7 and GR-11)	
Aqueous Polisining	Specific Location:	
AD 22	Specific Excation.	
Ar-23	A D-A cid recovery	
	AP-Solvent recovery	
	AP-PuO2 Decamping	
F-3	AP-Recanning	
	AP-Pre-polishing Milling	<b>u</b> .,
	AP-PhO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Oxalic mother liquors recovery	
-	AP-Liquid Waste Reception	
	·	
1	Mode: All	
	Hazard Sources:	
1	Radiological Material (maximum inventory in	
	AP glovebox)	
Loss of	A leak outside of a glovebox in piping results in	1. Corrosive chemicals
Confinement /	a release of radioactive material inside a room	interact with piping
Dispersal of	with C-3 ventilation.	2. Mechanical failure of AP
Nuclear Material		piping.
	Specific Location:	· · ·
Aqueous Polishing		
	AP-Precipitation-Filtration-Oxidation	1
AP-50		1
	Mode: Normal Operation	]
1	Hazard Sources:	
E-3		
	Kadiological Material (maximum inventory in	
	single AP vessel)	
1	1	I

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Exposure	Operator is inadvertently exposed to excessive direct radiation in Aqueous Polishing resulting in	1. Exposure due to unintended radioactive material buildup
Aqueous Ponsning AP-24	Specific Location:	access to High Radiation Area 3. Human error or equipment
	Aqueous Polishing	failure
E-4	Mode: All	
	Hazard Sources:	
	Maximum Direct Radiation Source	
Criticality	Re-configuration of fissile material potentially results in nuclear criticality and the release of	1. Excessive quantity of fissile material is accumulated in
Aqueous Polishing	radiological material.	process unit 2. Incorrect sample analysis
AF-25	Aqueous Polishing	3. Inadvertent concentration of process solution 4. Human error or equipment
E-5	Mode: All	failure 5. Change in geometry of
	Hazard Sources:	6. Internal flooding of process
	Fissile and Radiological Material	
Load Handling	A break or leakage in AP vessels, tanks and nining within an AP Glovebox results in a	1. Human error or equipment failure during load handling
Aqueous Polishing	breach of confinement, and the dispersal of radiological materials.	operations inside a glovebox
AP-36	Specific Location:	
E-6	AP-Acid recovery AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	
	Mode: All	
	Hazard Sources: Radiological Material (maximum inventory in AP glovebox including inventory in AP vessels, tanks and piping)	

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/		
Event Number		
Load Handling	All Load Handling events for MFFF-Gloveboxes	
Tom timpening	exply to Aqueous Polishing as far as description	
A sussia Delishing	appry to Aqueous Fonsiting, as fai as description	
Aqueous Polishing	and causes are concerned, and are bounding in	
	terms of consequences. (Refer to MFFF	
AP-26	Gloveboxes Events GB-8 through GB-10)	
	Specific Location:	
	•	
E-6	AP-Acid recovery	
20	AD-Solvent recovery	
	AB BiO2 Decembra	
	AP-PuOZ Decaming	
	AP-Kecanning	<b>11.9</b>
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	•
	AP-Ovalic mother liquors recovery	
	AD Liquid Waste Depention	
·	Ar-Liquid Wasie Reception	
and the second se	Mode: All	
	Hazard Sources:	
	Dediclosical Material (maximum inventory in	
	Kauloiogicai Materiai (maximum mventory m	
	glovebox)	
	glovebox)	
Load Handling	glovebox)	1. Human error or equipment
Load Handling	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and	1. Human error or equipment failure during maintenance
Load Handling	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials.	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials.	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location:	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location:	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Durification cycle	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Prurification cycle	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Prurification cycle	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Purification cycle Mode: All	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Purification cycle Mode: All	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Purification cycle Mode: All Hazard Sources:	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Purification cycle Mode: All Hazard Sources:	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Purification cycle Mode: All Hazard Sources: Radiological Material (maximum inventory in	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Purification cycle Mode: All Hazard Sources: Radiological Material (maximum inventory in AP Process Cell – dissolution - including	1. Human error or equipment failure during maintenance activities
Load Handling Aqueous Polishing AP-27 E-6	A Load Handling event involving miscellaneous load handling devices and AP vessels, tanks, and piping within an AP Process Cell results in a dispersal of radiological materials. Specific Location: AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Acid recovery AP-Purification cycle Mode: All Hazard Sources: Radiological Material (maximum inventory in AP Process Cell – dissolution - including inventory in AP vessels, tanks and piping)	1. Human error or equipment failure during maintenance activities

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Enert	II	
Event	Unintigated Event Description/Specific	Cause
I yper worksnop	Location/Hazard Sources	
or Location		
Event Number		
Load Handling	A Load Handling event involving miscellaneous	1. Human error or equipment
	load handling devices and a raffinates tank in an	failure during maintenance
Aqueous Polishing	AP Process Cell results in a dispersal of	activities
	radiological materials.	
AP-43	_	
	Specific Location:	
	•	
	AP-Acid recovery	
E-6	AP-Purification cycle	
	AP-Liquid Waste Reception	
	Mode: All	
		24.9
	Hazard Sources:	
	mande Sources.	
	Radiological Material (maximum inventory in	
	raffinates tank in A P Process Call)	
	Tarimates tark in AF Frocess Cenj	
Chemical	A chemical release due to fire in a C2 Area	1 Imition of combustible
Circinicai	A chemical release due to file in a CZ Alea	T. Ignuton of compusible
Aqueous Polishing	reactive chemicals in AD vessels tooks and	material by electrical
Aqueous Folishing	reactive chemicals in AF vessers, tanks and	equipment (e.g., spark)
47.00	piping results in a chemical release with	2. Incorrect reagent addition
AP-28	potential impact on the worker and on control	and subsequent reaction
	area habitability.	3. Other causes for ignition
E-7	Specific Location:	
	AP-Keagents	
	Mode: All	
	Hazard Sources:	
	Hazardous Chemicals	
Chemical	A break or leakage in AP vessels, tanks and	1. Mechanical failure of AP
	piping in C2 Areas results in a chemical release	vessels, tanks and piping
Aqueous Polishing	with potential impact on the worker and on	2. Corrosive failure of AP
	control area habitability.	vessels, tanks and piping
AP-30		
	Specific Location:	
E-7	AP-Reagents	
1	Mode: All	
	1	
· · ·	Hazard Sources:	
		8
1	Hazardous Chemicals	

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/		
Event Number		1 Machanical failure of
Chemical	A loss of tank venting in AP vessels, tanks and	1. Mechanical failure of
	piping in C2 Areas results in a chemical release	ventilation system
Aqueous Polishing	with potential impact on the worker and on	
	control area nabitability.	
AP-31		
	Specific Location:	
	Specific Location.	
F-7	AP-Reagents	
	Mode: All	
	Hazard Sources:	
	Hazardous Chemicals	
	The second secon	1 Incorrect reagent addition
Chemical	Excessive temperature (due to chemical reaction)	1. meonect reagent author
A Delishing	Involving AP vessels, tanks and piping in C2	
Aqueous Polishing	Areas results in a chemical release with potential	
AD-32	habitability	
AF-52	haonaonny.	
	Specific Location:	
	openine account of	
E-7	AP-Reagents	
	-	
	Mode: Normal Operation, Startup	
	Hazard Sources:	
		[
	Hazardous Chemicals	
	Descurse high as then the design pressure of tank	1 Pressurizing chemical
Chemical	Pressure nigher than the design pressure of tank	reaction
A queous Polishing	Areas results in a chemical release with potential	2. Pressurizing steam injection
Aqueous Fonsieing	impact on the worker and on control area	
AP-33	habitability.	
	Specific Location:	1
E-7	AP-Reagents	1
	Mode: Normal Operation, Startup	1
	Herend Sources	
1	nazau Sources.	
	Hazardous Chemicals	1
1	I MAR CARD CRAMINE	

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Chemical	A break or leakage in AP vessels, tanks and	1. Mechanical failure of AP
Aqueous Polishing	piping results in a release of chemical by- products.	vessels, tanks and piping. 2. Corrosive failure of AP vessels, tanks and piping.
AP-45	Specific Location:	
	Aqueous Polishing	
E-7	Mode: All	
	Hazard Sources:	
	Chemical by-products	11.7
External Events	See external events at the end of the hazard evaluation table.	
AP-34		
E-8		
Natural Phenomena	See natural phenomena events at the end of the hazard evaluation table.	
AP-35		
E-9		

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire MFFF-Receiving Workshop RC-1	Fire (due to transient combustibles, electrical equipment, etc.) affects C2 Storage Area (powder storage area) and results in an energetic breach of powder cans and dispersal of radiological materials from the powder storage area.	<ol> <li>Ignition of transient combustible material</li> <li>Combustibles and unknown ignition source</li> </ol>
E-1	Specific Location: PuO2 3013 Storage Unit PuO2 Receiving Unit Mode: All Hazard Sources: Radiological Material (maximum inventory in powder storage area)	<b>24</b> 9
Internal Fire MFFF-Receiving Workshop RC-2	Fire (due to transient combustibles, electrical equipment, etc.) affects UO2 Receiving or Storage Area (powder storage area) and results in an energetic breach of UO2 drum and dispersal of radiological materials from the powder storage area.	<ol> <li>Ignition of transient combustible material</li> <li>Combustibles and unknown ignition source</li> </ol>
E-1	Specific Location: UO2 Receiving Unit UO2 Storage Unit Mode: All Hazard Sources: Radiological Material (maximum inventory in	

Table 5A-3. Unmitigated Events, Receiving Workshop

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The second second		
Event	Unmitigated Event Description/Specific	Cause
ar Location/Event	Location Hazard Sources	
Number		
Internal Fire	A fire in the truck hav (e.g. fuel fire) involving	1 Imition of combustible
incinal inc	transport packages results in an epergetic breach	material due to electrical
MEEE-Receiving	of the containers (transport packages) and the	short
Workshop	dispersal of radiological materials	2 Combustibles and
	dispersa of functogreat materials.	unknown ignition source
RC-3		
	Specific Location:	
	•	
	PuO2 Receiving Unit, Truck Bay	
E-1		
	Mode: All	<b>u 9</b>
	ý	
	Hazard Sources:	
	Padialagical Material (maximum inventory in	
	transport packages and maximum number of	
	packages)	
Internal Fire	A container of contaminated or radioactive	1. Ignition of combustible
	material (i.e., a waste drum) fails or is involved	material due to electrical
MFFF-Receiving	in a fire and results in breach of the container	short
Workshop	and the dispersal of radiological materials.	2. Combustibles and
		unknown ignition source
RC-16		
	Specific Location:	
	Specific Locaton.	
E-1	PuO2 Receiving Unit-Truck Bay	
	5	
	Mode: Normal Operation	
	W	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	container)	
·		

T	The midicated Event Decemintion/Encoder	Course
Event	Unmugated Event Description/Specific	Vause
Type/Workshop	Location/Hazard Sources	
or Location/ Event		
Number	All Line of Fire suggest for MEEE Claushours	
Internal Fire	All Internal Fire events for MFFF-Gloveboxes	
	apply to this workshop, as far as description and	
MFFF- Receiving	causes are concerned, and are bounding in terms	
Workshop	of consequences. (Refer to MFFF Gloveboxes	
	Events GB-1 and GB-2)	
RC-4		
	Specific Location:	
	PuO2 Buffer Storage Unit	
E-1	UO2 Drum Emptying Unit	
	Mode: All	<b>43</b>
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	glovebox)	
Loss of	Excessive temperature (due to decay heat) of C2	1. Loss or blockage of HVAC
Confinement /	Storage Area (powder storage area).	cooling system
Dispersal of		2. Loss of power to HVAC
Nuclear Material	ł	cooling system
	1	
MFFF-Receiving	Specific Location:	
Workshop		l
	PuO2 3013 Storage Unit	
RC-5		
	Mode: All	1
	<ul> <li>A second s</li></ul>	
	Hazard Sources:	
E-3		
	Radiological Material (maximum inventory in	
	powder storage area)	

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area).	1. Loss or blockage of HVAC cooling system 2. Loss of power to HVAC cooling system
MFFF-Receiving Workshop RC-6 E-3	Specific Location: PuO2 Buffer Storage Unit Mode: All Hazard Sources: Radiological Material (maximum inventory in buffer storage unit)	ж <b>э</b>
Loss of Confinement / Dispersal of Nuclear Material MFFF- Receiving Workshop RC-8 E-3	All Loss of Confinement / Dispersal of Nuclear Material events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-3 through GB-7 and GB-11) Specific Location: PuO2 Buffer Storage Unit UO2 Drum Emptying Unit Mode: All Hazard Sources: Radiological Material (maximum inventory in glovebox)	

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Event	Ilamitigated Event Description/Specific	Cause
Eveni Temo/Monkshop	L agation/Harard Sources	Cause
Type/workshop	Location/Hazard Sources	
or Location Event		
Franci Encourt	Onemter is inclustently exposed to excessive	1 Exposure due to
External Exposure	Operator is manyementing exposed to excessive	1. Exposure due to
	direct radiation in the MIFFF Receiving	material buildur
MFFF-Keceiving	workshop resulting in excessive radiation	Material oundup
workshop	exposure.	2. Unplainted of unintended
		access to Fligh Kadiation
RC-9	Specific Location:	Alta
		3. Human error or equipment
	PuO2 Receiving Unit	failure
	PuO2 3013 Storage Unit	
E-4	PuO2 Buffer Storage Unit	
	PuO2 Receiving Unit-Truck Bay	
	UO2 Receiving Unit	***
	UO2 Storage Unit	
	UO2 Drum Emptying Unit	
	Mode: All	
	Harand Sources	
	Hazard Sources:	
	Maximum Direct Pediation Source	
	Maximum Direct Radiation Source	
Criticality	Re-configuration of fissile material potentially	1. Excessive quantity of
	results in nuclear criticality and the release of	fissile material is
MFFF-Receiving	radiological material.	accumulated in process unit
Workshop		2. Improper placement of
	Specific Location:	fissile material outside of
RC-10		criticality safe storage
	PuO2 Receiving Unit	locations
	PuO2 3013 Storage Unit	3. Human error or equipment
	PuO2 Buffer Storage Unit	failure
F-5	PuO2 Receiving Unit-Truck Bay	4. Introduction of moderator
		(e.g., internal flooding of
	Mode: All	process unit)
1		
	Hazard Sources:	1
		1
	Fissile and Radiological Material	1

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Receiving Workshop	Inadvertent opening or damage to the inner can of a 3013 storage can, while opening the 3013 storage can, resulting in the breach of the inner can and the dispersal of radiological materials.	1. Human error or equipment failure
RC-7	Specific Location:	
E-6	PuO2 Receiving Unit PuO2 3013 Storage Unit	
	Hazard Sources:	u <b>,</b>
	Radiological Material (maximum inventory in 3013 container in a glovebox)	
Load Handling MFFF-Receiving Workshop RC-11	A UO2 drum fails or is damaged, while being handled by miscellaneous load handling devices, resulting in a breach of the drum and the dispersal of radiological materials contained in the drum.	1. Human error or equipment failure during load handling operations
E-6	Specific Location: UO2 Receiving Unit UO2 Storage Unit	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in UO2 drum)	

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling	The drop of a radioactive material container (i.e., a 3013 can) onto another radioactive material	1. Human error or equipment failure during hoisting
MFFF-Receiving Workshop	container (i.e., another 3013 can) while utilizing hoisting equipment results in a breach of the container, and the dispersal of radiological	operations
RC-12	material.	
	Specific Location:	
E-6	PuO2 Receiving Unit PuO2 3013 Storage Unit	
	Mode: All	***
	Hazard Sources:	
	Radiological Material (maximum inventory in two 3013 containers in C2 Area)	
Load Handling	A load drop onto a radioactive material container (i.e., a 3013 can) while utilizing hoisting	1. Human error or equipment failure during hoisting
Workshop	and the dispersal of radiological material.	Upciations
RC-13	Specific Location:	
	PuO2 Receiving Unit PuO2 3013 Storage Unit	
E-0	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in 3013 container(s))	

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Receiving Workshop	The drop of a radioactive material container (i.e., a 3013 transport package) onto another radioactive material container (i.e., another 3013 transport package) or onto the floor while	1. Human error or equipment failure during hoisting operations
RC-17	utilizing hoisting equipment results in a breach of the package, and the dispersal of radiological material.	
E-6	Specific Location: PuO2 Receiving Unit PuO2 3013 Storage Unit	
	Mode: All	23
	Hazard Sources: Radiological Material (maximum inventory in	
	two 3013 packages in C2 Area)	
Load Handling MFFF-Receiving Workshop	A container of contaminated or radioactive material (i.e., a waste drum) fails or is damaged while being handled by miscellaneous handling devices and results in breach of the container and the dispersal of radiological materials.	1. Human error or equipment failure during waste drum handling operations
RC-15		
E-6	Specific Location: PuO2 Receiving Unit	
	PuO2 Receiving Unit-Truck Bay	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in container)	

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Receiving Workshop RC-14 E-6	All Load Handling events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10) Specific Location: PuO2 Buffer Storage Unit UO2 Drum Emptying Unit	
	Mode: All Hazard Sources: Radiological Material (maximum inventory in glovebox)	27

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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		/
Internal Fire	All Internal Fire events for MFFF-Gloveboxes	
	apply to this workshop, as far as description and	
MFFF-Powder	causes are concerned, and are bounding in terms	
Workshop	of consequences. (Refer to MFFF Gloveboxes	
•	Events GB-1 and GB-2)	
PW-1	,	
	Specific Location:	
	PuO2 Container Opening & Handling Unit	
E-1	Jar Storage and Handling	1 1
	Primary Dosing Unit	
	Final Dosing Unit	
	Powder Auxiliary	
	Scran (Powder) Processing Unit	1
	Ball Milling Units	1
	Homogenization and Pelletizing Units	1
÷	AP-Pre-polishing Milling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	slovebox)	1
	gloveoux)	
Loss of	All Loss of Confinement / Dispersal of Nuclear	
Confinement /	Material events for MEEE Gloveboxes apply to	1
Dispersal of Nuclear	this workshop as far as description and causes	
Material	are concerned, and are bounding in terms of	
	consequences (Refer to MEFE Gloveboxes	
MFFF-Powder	Events GB-3 through GB-7 and GB-11)	
Workshop		
	Specific Location:	
PW-2		1
	PuO2 Container Opening & Handling Unit	1
	Jar Storage and Handling	
	Primary Dosing Unit	1
E-3	Final Dosing Unit	1
	Powder Auxiliary	1 1
	Scrap (Powder) Processing Unit	
	Ball Milling Units	1
	Homogenization and Pelletizing Units	
	AP-Pre-polishing Milling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	glovedox)	

Table 5A-4.	Unmitigated	<b>Events</b> , <b>Powder</b>	Workshop
			•

Front	Unmitigated Event Description/Specific	Cause
Type Workshop or	Location/Hazard Sources	Cuesci -
Location/Event		
Number		
External Exposure	Operator is inadvertently exposed to excessive	1. Exposure due to
Exame Exposere	direct radiation in the MFFF-Powder Workshop	unintended radioactive
MFFF-Powder	resulting in excessive radiation exposure.	material buildup
Workshop		2. Human error or equipment
	Specific Location:	failure
PW-3		
• •	PuO2 Container Opening & Handling Unit	
	Jar Storage and Handling	
	Primary Dosing Unit	
E-4	Final Dosing Unit	
	Powder Auxiliary	2.9
	Scrap (Powder) Processing Unit	
	Ball Milling Units	
	Homogenization and Pelletizing Units	
	AP-Pre-polishing Milling	
	· ·	
	Mode: All	
	Hazard Sources:	
	Maximum Direct Radiation Source	
		1 Exercise quantity of
Criticality	Ke-configuration of fissile material potentially	facile material is
ACTES Develop	results in nuclear criticality and the release of	issue matchai is
MFFF-POwder Workshop	radiological material.	2 Improper placement of
workshop	Specific Location:	fissile material outside of
BUL A	Specific Location.	criticality safe storage
L A1-4	PuO2 Container Opening & Handling Unit	locations
	Jar Storage and Handling	3. Human error or equipment
	Primary Dosing Unit	failure
F-5	Final Dosing Unit	4. Introduction of moderator
	Powder Auxiliary	(e.g., internal flooding of
	Scrap (Powder) Processing Unit	process unit)
	Ball Milling Units	
	Homogenization and Pelletizing Units	
	AP-Pre-polishing Milling	1
	Mode: All	
1	Hazard Sources:	1
	Fissile and Radiological Material	1

 Table 5A-4. Unmitigated Events, Powder Workshop (continued)

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Powder Workshop PW-5	All Load Handling events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10) Specific Location:	
E-6	PuO2 Container Opening & Handling Unit Jar Storage and Handling Primary Dosing Unit Final Dosing Unit Powder Auxiliary Scrap (Powder) Processing Unit Ball Milling Units Homogenization and Pelletizing Units AP-Pre-polishing Milling Mode: All Hazard Sources:	<b>u</b> .•
	Radiological Material (maximum inventory in glovebox)	

## Table 5A-4. Unmitigated Events, Powder Workshop (continued)

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<u> </u>	WT. 141.4.3 W	<b>C</b>
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/Event		
Number		· · · · · · · · · · · · · · · · · · ·
Internal Fire	All Internal Fire events for MFFF-Gloveboxes	
	apply to this workshop, as far as description and	
MFFF-Pellet	causes are concerned, and are bounding in terms	
Workshop	of consequences. (Refer to MFFF Gloveboxes	
	Events GB-1 and GB-2)	
PT-1		
	Specific Location:	
	Pellet Inspection and Sorting Units	
E-1	Ground and Sorted Pellet Storage	
	Green Pellet Storage	5. T
	Sintering Furnaces	
	Sintered Pellet Storage	
	Scrap Pellet Storage	
	Quality Control and Manual Sorting	
	Scrap Box Loading	
	Pellets Handling	
	Grinding Units	
	Pellets Renackaging	
	I CHOW INCOMMENTE	
	Mode: All	
	Hazard Sources	
	Halald Boulous.	
	Padiological Material (maximum inventory in	
and the second	Raubiogical Matchia (maximum mychiory m	
	giovebox)	-
Internal Eine	A fire in Dellet Storage involving MD Clouchov	1 Ignition of combustible
Internal File	A me in Fener Storage involving wir Olovebox	material due to electrical
MITTE Dallas	compusibles (e.g., electrical equipment, and	short
Mrrr-Pelict	transient compusitoies) results in an energene	2 Combustibles and
Workshop	breach of Pellet Storage and the dispersal of	2. Compusibiles and
200	radiological materials.	unknown ignulon source
PT-2		
1		
	Specific Location:	
	Care Dallat Sterrage	
E-I	Green Pellet Storage	
	Sintered Pellet Storage	
	Ground and Sorted Pellet Storage	
	Scrap Pellet Storage	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	MP Glovebox: Pellet Storage)	
1		

 Table 5A-5. Unmitigated Events, Pellet Workshop

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Event	Unmitigated Event Description/Specific	Cauca
Type/Workshop or	Location/Hazard Sources	Cause
Location/ Event		
Number		
internal rire	A fire involving MP Glovebox combustibles and	1. Ignition of combustible
MFFF-Pellet	grinding or laser equipment) results in an	short
Workshop	energetic breach of the MP Glovebox and the	2. Ignition of combustibles
	dispersal of radiological materials.	during grinding operations
PT-3		3. Combustibles and
		unknown ignition source
	Specific Location:	
E-1		
	Grinding Units	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	MP glovebox)	
Explosion	Hudrogen and avugen buildun in a cintering	1 Exercise budgerer
Expressed	furnace of in the sintering furnace room results	introduced to furnace
MFFF-Pellet	in a hydrogen explosion, an energetic breach of	2. Hydrogen accumulation in
Workshop	the sintering furnace confinement, and the	room or in adjoining furnace
PT_A	dispersal of radiological materials.	entry/exit or cooling
11-4		3 Oxygen leaks into furnace
	Specific Location:	or airlocks
		4. Improper mixing of
E-2	Sintering Furnaces	hydrogen in C4 exhaust
	racinty wide (pipes)	sueam.
	Mode: Normal Operation, Startup	
	Hazard Sources:	
	Radiological Material (maximum inventory in Sintering Furnace)	

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		<u></u>
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Loss of	All Loss of Confinement / Dispersal of Nuclear	
Confinement /	Material events for MEFE-Gloveboxes apply to	
Dispersel of Nuclear	this workshop, as far as description and causes	
Dispensar of Nuclear	uns workshop, as far as description and causes	
Material	are concerned, and are bounding in terms of	
	consequences. (Refer to MFFF Gloveboxes	
MFFF-Pellet	Events GB-3 through GB-7 and GB-11)	
Workshop		
-	Specific Location:	
PT-5		
	Pellet Inspection and Sorting Units	
	Ground and Sorted Pellet Storage	
	Green Bellet Storage	
<b>F</b> 2	Sintering Europee	21.9
E-3	Sintering runaces	
	Sintered Pellet Storage	
	Scrap Pellet Storage	
1	Quality Control and Manual Sorting	
	Scrap Box Loading	
	Pellets Handling	
	Grinding Units	
	Pellets Renackaging	
	I once Representing	
	Mode: All	
	Mode. All	
	Manual Courses	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	glovebox)	1
	1	
Loss of	Sintering Furnace seal failure or	1. Failure of control system
Confinement /	overpressurization (e.g. excessive pressurization	for hydrogen/argon supply
Dispersal of Nuclear	by hydrogen/argon line) affects the Sintering	line
Motorial	Europees and results in a breach of the	2 Sintering Euroace exhaust
Wiatchiai	Sintering Europea(a) confinement and the	austam failure
A STATE Dellas	Sintering Furnace(s) commentent, and the	2 Sintering Europe cool
MFFF-Pellet	dispersal of radiological materials.	5 Sintering Furnace seal
Workshop		leakage
PT-6		
	Specific Location:	
	-	
	Sintering Furnaces	
E-3		
2-3	Mode: Normal Operation Startup	
	i more i tormai operation, stattup	
1	11	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	both Sintering Furnaces)	
1		

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature of Sintering Furnace(s) results in high temperature damage to and breach of the Sintering Furnace(s), the furnace entry/exit air locks, or the connecting gloveboxes.	<ol> <li>Control system failure</li> <li>Loss of cooling</li> </ol>
MFFF-Pellet Workshop	Specific Location:	
PT-7	Sintering Furnaces	
	Mode: Normal Operation	
E-3	Hazard Sources:	29
	Radiological Material (maximum inventory in a single Sintering Furnace)	
External Exposure	Operator is inadvertently exposed to excessive	1. Exposure due to
MFFF-Pellet Workshop	resulting in excessive radiation exposure.	material buildup 2. Unplanned or unintended
PT-8	Specific Location:	access to High Radiation
	Pellet Inspection and Sorting Units Ground and Sorted Pellet Storage Green Pellet Storage	3. Human error or equipment failure
E-4	Sintering Furnaces Sintered Pellet Storage Scrap Pellet Storage Quality Control and Manual Sorting	
	Pellets Handling	
	Grinding Units Pellets Repackaging	
	Mode: All	
	Hazard Sources:	
	Maximum Direct Radiation Source	ļ

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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Criticality	Re-configuration of fissile material potentially	1. Excessive quantity of
	results in nuclear criticality and the release of	fissile material is
MFFF-Pellet	radiological material.	accumulated in process unit
Workshop		2. Improper placement of
	Specific Location:	fissile material outside of
PT-9	- <b>t</b>	criticality safe storage
	Pellet Inspection and Sorting Units	locations
	Ground and Sorted Pellet Storage	3. Human error or equipment
	Green Pellet Storage	failure
E-5	Sintering Furnaces	4. Introduction of moderator
	Sintered Pellet Storage	(e.g., internal flooding of
	Scrap Pellet Storage	process unit)
	<b>Ouality Control and Manual Sorting</b>	
	Scrap Box Loading	
	Pellets Handling	
	Grinding Units	
	Pellets Repackaging	
	Mode: All	
	Hazard Sources	
	milling boundes.	
	Fissile and Radiological Material	
Load Handling	A Load Handling Event involving miscellaneous	1. Human error or equipment
	load handling devices within the MP Glovebox	failure during load handling
MFFF-Pellet	Area surrounding the Sintering Furnace results in	operations around the
Workshop	a breach of the Sintering Furnace, the furnace	furnace
	entry/exit air locks, or the connecting	
PT-10	gloveboxes, and the dispersal of radiological	
	materials.	
	Specific Location:	
E-6		
	Sintering Furnaces	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	Sintering Furnace)	

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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Load Handling	All Load Handling events for MFFF-Gloveboxes	
_	apply to this workshop, as far as description and	
MFFF-Pellet	causes are concerned, and are bounding in terms	
Workshop	of consequences. (Refer to MFFF Gloveboxes	
•	Events GB-8 through GB-10)	
PT-11		
	Specific Location:	
	· · · · · · · · · · · · · · · · · · ·	
	Pellet Inspection and Sorting Units	
E-6	Ground and Sorted Pellet Storage	
	Green Pellet Storage	
	Sintering Furnaces	
	Sintered Pellet Storage	
	Scron Pellet Storage	
	Quality Control and Manual Sorting	
	Serve Box Loading	
	Dellete Hendling	
	Crinding Units	
	Pallete Persokasing	
	renets Repackaging	
	Mode: All	
	Hazard Sources:	
	Dedielegies) Meteriel (menimum investory in	
	Kadiological Material (maximum inventory in	
	giovedox)	
<b>P</b> 1		
Explosion	water entry in to the sintering furnace from the	1. Humidiner level controller
Martin Delles	sintering furnace numiciner results in a steam	failure
Mrrr-reliet	explosion, an energetic breach of the sintering	
Workshop	furnace confinement, and the dispersal of	
	radiological materials.	
PT-12		
	Specific Location:	
E-2	Sintering Furnaces	
	Facility Wide (pipes)	
	Mode: Normal Operation, Startup	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	Sintering Furnace)	

Decent	Il-witigated Event Decemintion/Enerific	Course
Event Type/Workshop or Location/Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Laust
Loss of Confinement / Dispersal of Nuclear Material	Sintering Furnace gases from the normally pressurized sintering furnace leak into the process room due to a breach in the furnace confinement barrier.	1. Furnace seal failure
MFFF-Pellet Workshop	Specific Location:	
PT-13	Sintering Furnaces	
E-3	Mode: Normal Operation,	27
	Hazard Sources: Radiological Material (maximum inventory in	
	Sintering Furnace)	

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Enert		
Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
internal rite	Fire (due to electrical equipment, transient	1. Ignition of combustible
	combustibles, etc.) affects C2 Area (fuel rods) and	material due to electrical
MFFF-Cladding and	results in an energetic breach of fuel rod confinement	short
Rod Control	and dispersal of radiological materials.	2. Combustibles and
Workshop		unknown ignition source
	Specific Location:	
RD-1		
	Rod Storage	
	X-ray Inspection Unit	
	Helium Leak Test	
E-1	Rod Scanning	·
	Rod Tray Handling	
	Rod Tray Loading	
	Rod Inspection and Sorting	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in rods)	
Internal Fire	All Internal Fire events for MFFE-Gloveboxes apply	
	to this workshop, as far as description and causes are	
MFFF-Cladding and	concerned and are bounding in terms of	
Rod Control	consequences (Refer to MEEE Gloveboxes Events	
Workshop	GB-1 and GB-2)	
W OIMSHOP	GD-1 and $GD-2$	
RD-2	Specific Location:	
	Pod Cladding and Decontamination	
	Rod De aladina Unio	
F.1	Rou De-classing Unit	
B-1	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

## Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop

Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire MFFF-Cladding and Rod Control Workshop RD-3	A fire involving MP Glovebox combustibles (e.g., transient combustibles, welding equipment, isopropanol used in decontamination) results in an energetic breach of the MP Glovebox and the dispersal of radiological materials.	<ol> <li>Ignition of combustible material due to electrical short</li> <li>Ignition of combustibles during welding operations</li> <li>Combustibles and unknown ignition source</li> </ol>
	Specific Location:	<b>24.9</b>
E-1	Rod Cladding and Decontamination Mode: Normal Operation Hazard Sources:	
	Radiological Material (maximum inventory in MP glovebox)	
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature (due to decay heat) of C2 Storage Area (other than powder storage area) results in breach of fuel rod confinement.	<ol> <li>Loss of normal ventilation system</li> <li>Loss of power</li> </ol>
MFFF-Cladding and Rod Control Workshop	Specific Location: Rod Storage	
RD-4	Mode: All	
E-3	Hazard Sources: Radiological Material (maximum inventory in fuel rod storage area)	

# Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)

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		<u> </u>
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Loss of	Leakage from fuel rods in C2 Areas results in breach	1. Defective fuel rod(s)
Confinement /	of confinement, and dispersal of radiological	
Dispersal of Nuclear	materials.	
Material		
MFFF-Cladding and	Specific Location:	
Rod Control		
Workshop	X-Ray Inspection Unit	
•	Rod Tray Handling	
RD-5	Rod Tray Loading	
	Rod Inspection and Sorting	
	Helium Leak Test	
	Rod Storage	
E-3 \	Rod Scanning	
	Mode: All	
	Hazard Sources:	
1	·.	
	Radiological Material (maximum inventory in fuel	
	rod or rods)	
Loss of	All Loss of Confinement / Dispersal of Nuclear	
Confinement /	Material events for MFFF-Gloveboxes apply to this	
Dispersal of Nuclear	workshop, as far as description and causes are	
Material	concerned, and are bounding in terms of	
	consequences. (Refer to MFFF Gloveboxes Events	
MFFF-Cladding and	GB-3 through GB-7 and GB-11)	
Rod Control		
Workshop	Specific Location:	
RD-6	Rod Cladding and Decontamination	
	Rod De-cladding Unit	
	Mode: All	
E-3		
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	glovebox)	
	G	

#### Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Loss of	The fracture of one or multiple fuel rods while	1. Human error or equipment
Confinement /	utilizing fuel rod handling equipment results in breach	failure
Dispersal of Nuclear	of confinement, and dispersal of radiological	
Material	materials.	
MFFF-Cladding and	Specific Location:	
Rod Control		
Workshop	X-Ray Inspection Unit	·
	Rod Tray Handling	
RD-11	Rod Tray Loading	
	Rod Inspection and Sorting	23
· · · · · · · · · · · · · · · · · · ·	Helium Leak Test	
	Rod Storage	
E-3	Rod Scanning	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in fuel	
	rod or fuel rods)	
External Exposure	Operator is inadventently exposed to excessive direct	1. Human error or equipment
	radiation in the MFFF-Cladding and Kod Control	2 Unplemed or unintended
Mrrr-Cladding and	workshop resulting in excessive radiation exposure.	2. Ouprained of unincluced
Kod Control	O	exposure to x-rays
worksnop	Specific Location:	
2007	Ded Cladding and Decontemination	
KD-7	X Day Inconsting Unit	
	A-Kay Inspection Ont	
	Pod Tray Loading	
EA	Rod Inspection and Sorting	
<b>D-4</b>	Helium Leak Test	
	Pod Storage	
	Rod Scapping	
	Rod De-cladding Linit	1
	Mode: All	1
	Hazard Sources:	1
	Maximum Direct Radiation Source	
1		1

## Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)

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Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Criticality	Re-configuration of fissile material potentially results	1. Excessive quantity of
Childrenty	in nuclear criticality and the release of radiological	fissile material is
MFFF-Cladding and	material.	accumulated in process unit
Rod Control		2. Improper placement of
Workshop	Specific Location:	fissile material outside of criticality safe storage
RD-8	Rod Cladding and Decontamination	locations
	X-Ray Inspection Unit	3. Introduction of moderator
	Rod Tray Handling	(e.g., internal flooding of
	Rod Tray Loading	process unit)
E-5	Rod Inspection and Sorting	4. Human error or equipment
	Helium Leak Test	failure
	Rod Storage	
	Rod Scanning Bod De eledding Unit	
	Rou De-clauding Onit	
	Mode: All	
	Hazard Sources:	
	Fissile and Radiological Material	
Load Handling	The drop of a heavy load onto fuel rods while	1. Human error or equipment
	utilizing miscellaneous load handling devices results	failure
MFFF-Cladding and	in breach of confinement, and dispersal of	
Rod Control	radiological materials.	
Workshop		
סתק	Specine Location:	
	X-Bay Inspection Unit	
	Rod Tray Handling	
	Rod Tray Loading	
E-6	Rod Inspection and Sorting	
	Helium Leak Test	
	Rod Storage	
	Rod Scanning	1
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in fuel rod or rods)	

## Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)
<b>T</b>		0
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Load Handling	The drop of fuel rods onto the floor while utilizing	1. Human error or equipment
	hoisting equipment results in breach of confinement,	failure
MFFF-Cladding and	and dispersal of radiological materials.	
Rod Control		
Workshop	Specific Location:	
RD-10	X-Ray Inspection Unit	
	Rod Tray Handling	
	Rod Tray Loading	
	Rod Inspection and Sorting	
E-6	Helium Leak Test	
	Rod Storage	
	Rod Scanning	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory of rod tray)	
Load Handling	All Load Handling events for MEEE-Gloveboxes	
Loau Handing	apply to this workshop as for as description and	
MEEE Cladding and	courses are concerned and are bounding in terms of	
Pad Control	causes are concerned, and are bounding in terms of	
Workshop	GB-8 through GB-10)	
workshop	OD-6 HEOLEN OD-10)	
PD 12		
KD-12 .	Specific Location:	
	Rod Cladding and Decontamination	
E-6	Pod De-cladding Unit	
	Tron To-cimplifie Office	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

## Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop<br/>(continued)

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r —		
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Internal Fire	Fire (due to electrical equipment, transient	1. Ignition of combustible
	combustibles, etc.) affects C2 Area (assemblies) and	material due to electrical
MFFF-Assembly	results in an energetic breach of fuel rod confinement	short
Workshop	and dispersal of radiological materials from the	2. Combustibles and
PP	assembly storage areas.	unknown ignition source
AS-1		
	Specific Location:	
	Specific Location.	• • •
	Assembly Deckoging	
<b>P</b> 1	Assembly Packaging	
E-1	Assembly Mockup Loading	
	Assembly Handling and Storage	
	Assembly Mounting Unit	
	Assembly Dry Cleaning	
	Assembly Dimensional Inspection	
	Assembly Final Inspection	
	Mode: All	
	Hazard Sources:	1
	Radiological Material (maximum inventory in	
	assembly storage area)	
Internal Fire	Fire (due to ignition of pyrophoric zircaloy chips or	1. Ignition of pyrophoric
	shavings) affects C2 Area (assemblies) and results in	material
MFEE-Assembly	an energetic breach of fuel rod confinement and	
Workshop	dispersal of radiological materials from the assembly	
workshop	day cleaning whit	
162	di y cicaning unit.	
no-2	Sanaifia Lanation	1
	Specific Location:	1
	A	1
	Assembly Dry Cleaning	
E-1		
	Mode: All	
		]
	Hazard Sources:	1
1		1
	Radiological Material (maximum inventory of fuel	1
	assembly)	

Table 5A-7.	Unmitigated	<b>Events</b> , Assembly	Workshop
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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Internal Fire	Fire (due to electrical equipment, transient	1. Ignition of combustible
	combustibles, etc.) affects Fuel Assembly Truck Bay	material due to electrical
MFFF-Assembly	and results in an energetic breach of fuel assemblies	short
workshop	in snipping cask(s) and dispersal of radiological	2. Compusibles and
AS.11	materials from the truck day.	unknown ignnion source
A5-11	Specific Location:	
F_1	Assembly Packaging (Truck Bay)	
E-1	Mode: All	ັ <b>ນ</b> າ
	Hazard Sources:	
	Radiological Material (maximum inventory in shipping package(s))	
Internal Fire	A container of contaminated or radioactive material	1. Ignition of combustible
	(i.e., a waste drum) is involved in a fire and results in	material due to electrical
MFFF-Assembly	breach of the container and the dispersal of	short
Workshop	radiological materials.	2. Combustibles and
		unknown ignition source
AS-13		
	Specific Location:	
E-1	Assembly Packaging (Truck Bay)	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in container)	
Loss of	Excessive temperature (due to decay heat) of C2	1. Loss of normal ventilation
Confinement /	Storage Area (other than powder storage area) results	system
Dispersal of Nuclear	in breach of fuel rod confinement.	2. Loss of power
Material		
MFFF-Assembly Workshop	Specific Location:	
AS-3	Assembly Handling and Storage	
	Mode: All	
F-3	Hazard Sources:	
	Radiological Material (maximum inventory in fuel rod or rods)	

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	The fracture of multiple fuel rods while utilizing assembly handling equipment results in breach of confinement, and dispersal of radiological materials.	1. Human error or equipment failure
MFFF-Assembly Workshop AS-10	Specific Location: Assembly Mockup Loading Assembly Mounting Unit	
E-3	Mode: Normal Operation Hazard Sources:	2.7
	Radiological Material (maximum inventory in multiple fuel rods)	
Loss of Confinement / Dispersal of Nuclear Material	Leakage from fuel rods in C2 Areas results in breach of confinement, and dispersal of radiological materials.	1. Defective Fuel rod(s )
MFFF-Assembly Workshop	Specific Location:	
AS-4	Assembly Packaging Assembly Mockup Loading Assembly Handling and Storage Assembly Mounting Unit	
E-3	Assembly Dry Cleaning Assembly Dimensional Inspection Assembly Final Inspection	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in fuel rod or rods)	

Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Exposure	Operator is inadvertently exposed to excessive direct radiation in the MFFF-Rod/Assembly Workshop	1. Human error or equipment failure
MFFF-Assembly Workshop	resulting in excessive radiation exposure.	
AS-5	Specific Location:	
E-4	Assembly Packaging Assembly Mockup Loading Assembly Handling and Storage Assembly Mounting Unit Assembly Dry Cleaning Assembly Dimensional Inspection Assembly Final Inspection	247
	Mode: All Hazard Sources:	
<b></b>	Maximum Direct Radiation Source	1 Encouring quantity of
Criticality	in nuclear criticality and the release of radiological	fissile material is
MFFF-Assembly Workshop	material.	accumulated in process unit 2. Improper placement of
AS-6	Specific Location:	fissile material outside of criticality safe storage
	Assembly Packaging Assembly Mockup Loading Assembly Handling and Storage	3. Introduction of moderator (e.g., internal flooding of
E-5	Assembly Mounting Unit Assembly Dry Cleaning	process unit) 4. Human error or equipment
	Assembly Dimensional Inspection Assembly Final Inspection	
	Mode: All	
	Hazard Sources:	
	Fissile and Radiological Material	

Enant		1
Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Number		
Load Handling	A suspended fuel assembly in motion impacts an	1. Human error or equipment
	object or another assembly while utilizing a crane or	failure
MFFF-Assembly	hoisting equipment and results in breach of	, and c
Workshop	confinement, and dispersal of radiological materials.	
AS-7	Specific Location:	
	Assembly Handling and Storage	
	Assembly Dry Cleaning	
E-6	Assembly Dimensional Inspection	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory of two fuel assemblies)	
Load Handling	The drop of a heavy load onto an assembly on	1 11
	assemblies while utilizing miscellaneous load	1. Human error or equipment
MFFF-Assembly	handling devices results in breach of confinement	Tanuic
Workshop	and dispersal of radiological materials.	
AS-8	Specific Location:	
	Assembly Packaging	
	Assembly Mockup Loading	
E-6	Assembly Handling and Storage	
	Assembly Mounting Unit	
	Assembly Dry Cleaning	
	Assembly Dimensional Inspection	
	Assembly Final Inspection	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory of fuel assembly or assemblies)	

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		· · · ·
Number		
Load Handling	The drop of an assembly onto the floor or onto	1. Human error or equipment
_	another assembly while utilizing hoisting equipment	failure
MFFF-Assembly	results in breach of confinement, and dispersal of	
Workshop	radiological materials.	
AS-9	Specific Location:	
10 /	opeenne zoemien.	
	Assembly Packaging	
	Assembly Maclaun Loading	
E C	Associative Mockup Loading	
E-0	Assembly Handling and Storage	
	Assembly Mounting Unit	
	Assembly Dry Cleaning	***
	Assembly Dimensional Inspection	
	Assembly Final Inspection	
	Mode: Normal Operation	
1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	Hazard Sources:	
	Radiological Material (maximum inventory of two	
	fuel assemblies)	
Load Handling	A container of contaminated or radioactive material	1. Human error or equipment
	(i.e., a waste drum) fails or is damaged while being	failure during waste drum
MEEE-Assembly	handled by miscellaneous handling devices and	handling operations
Workshop	mentee by miscentations matching devices and	mananing operations
VI OI ASIROP	ndiological materials	
46.10	radiological materials.	
A3-12		
	Specific Location:	
E-6		
	Assembly Packaging (Truck Bay)	
	Mode: Normal Operation	
	Hazard Sources:	
1	Radiological Material (maximum inventory in	
1	container)	
	-	
Load Handling MFFF-Assembly Workshop AS-12 E-6	Assembly Final Inspection Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory of two fuel assemblies) A container of contaminated or radioactive material (i.e., a waste drum) fails or is damaged while being handled by miscellaneous handling devices and results in breach of the container and the dispersal of radiological materials. Specific Location: Assembly Packaging (Truck Bay) Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in container)	1. Human error or equipment failure during waste drum handling operations

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Assembly Workshop	The drop of an assembly transport package onto the floor while utilizing hoisting equipment results in breach of confinement, and dispersal of radiological materials.	1. Human error or equipment failure
AS-14	Specific Location:	
E-6	Assembly Packaging Assembly Packaging (Truck Bay) Mode: Normal Operation	
	Hazard Sources:	23
	Radiological Material (maximum inventory of one fuel assembly transport package)	

1

Encent	Inmitigated Event Description/Encrific	Cance
Event Type/Workshop or	I ocation/Hazard Sources	Cause
I ype workshop of	Location Mazar & Bour Ces	
Number		
Internal Eire	Waste containers are involved in a fire and are	1. Combustibles and
Internal Flic	domaged while being handled outside a glovebox	electrical short
Waste Handling	which results in the dispersal of radiological	2 Combustion of waste from
waste manuting	materiale	exposure to chemicals
W7LI 1	maichais.	3 Ignition of Zircalov swarf
** 11-1		waste
	Specific Location:	4. Combustibles and
	Specific Excatori.	unknown ignition source
F_1	Waste storage areas	
<b>L</b> -1	Waste Nuclear Counting	
	Maintenance and	
	Mechanical Dismantling	
•	Filter Dismantling	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in waste	
	containers)	
Internal Fire	All Internal Fire events for MFFF-Gloveboxes apply	
	to this workshop, as far as description and causes are	
Waste Handling	concerned, and are bounding in terms of	<b>1</b> .
-	consequences. (Refer to MFFF Gloveboxes Events	
WH-2	GB-1 and GB-2)	
	Specific Location:	
1		
E-1	Maintenance and	
	Mechanical Dismantling	
	Filter Dismantling	
	Mode: All	
	Hazard Sources:	
	Padiological Material (maximum inventory in	
	dovehor)	
	BULLOUN)	
	RIOTEDON)	

## Table 5A-8. Unmitigated Events, Waste Handling

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Eveni Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion	Radiolysis induced hydrogen accumulation in a waste	1. Presence of organic and
	container involving radioactive materials with	radioactive material in
Waste Handling	hydrocarbons results in a hydrogen explosion with	container
	impact on the worker and on control area habitability.	
WH-3		
	Specific Location:	
	Waste storage areas	
E-2	Waste Nuclear Counting	
	Maintenance and	
	Mechanical Dismantling	23
	Filter Dismantling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in a waste container)	
Loss of	A waste container fails or is damaged while being	1. Human error or equipment
Confinement /	handled outside a glovebox and results in the	failure
Dispersal of Nuclear Material	dispersal of radiological materials.	
Waste Handling	Specific Location:	
WH-4	Waste storage areas	
	Waste Nuclear Counting	
	Maintenance and	
	Mechanical Dismantling	
E-3	Filter Dismantling	
· · · · · · · · · · · · · · · · · · ·	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in waste container, e.g., filters)	

#### Table 5A-8. Unmitigated Events, Waste Handling (continued)

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		<u> </u>
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/Event		
Number		
Loss of	All Loss of Confinement / Dispersal of Nuclear	
Confinement /	Material events for MFFF-Gloveboxes apply to this	
Dispersal of Nuclear	workshop, as far as description and causes are	
Material	concerned and are bounding in terms of	
	consequences (Refer to MEEE Gloveboxes Events	
Weste Hendline	CP 2 through CP 7 and CP 11)	
waste mandling	OD-3 Infough OD-7 and OD-11)	
11/11 P		
WH-D	Specific Location:	
a for a second of the	Maintenance and	
and the second	Mechanical Dismantling	
E-3	Filter Dismantling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	glovebox)	
External Exposure	Operator is inadvertently exposed to excessive direct	1. Exposure due to
	radiation in the MFFF-Waste Handling resulting in	unintended radioactive
Waste Handling	excessive radiation exposure	material buildur
waste manoring	excessive facilation exposure.	2 Uuman error or equipment
W/U 6	Specific Leasting.	2. Human chor or equipment
	Specific Location.	
	Waste stornes areas	
	Waste Muslear Counting	
	waste Nuclear Counting	
E-4	Maintenance and	
	Mechanical Dismantling	
	Filter Dismantling	
	Mode: All	
	Hazard Sources:	
	Maximum Direct Radiation Source	

#### Table 5A-8. Unmitigated Events, Waste Handling (continued)

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Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Criticality	Re-configuration of fissile material potentially results	1. Excessive quantity of
Waste Handling	in nuclear criticality and the release of radiological material.	fissile material is accumulated in process unit
WH-7	Specific Location:	fissile material outside of criticality safe storage
	Waste storage areas	locations
	Waste Nuclear Counting	3. Introduction of moderator
E-5	Maintenance and	(e.g., internal flooding of
	Mechanical Dismantling	process unit)
	Filter Dismantling	4. Human error or equipment
	Mode: All	tailure as
	Hazard Sources:	
	Fissile and Radiological Material	
Load Handling	A dropped waste drum or waste disposal bag fails or	1. Human error or
Waste Handling	load handling devices, resulting in a breach of the	load handling operations
31777 0	drum and the dispersal of radiological materials	
WH-8	contained in the drum.	
	Specific Location:	
E-6	Specific Location.	
	Waste storage areas	
	Waste Nuclear Counting	
	Maintenance and	
	Mechanical Dismantling	
	Filter Dismantling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in waste container)	

## Table 5A-8. Unmitigated Events, Waste Handling (continued)

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling Waste Handling WH-9	All Load Handling events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10)	
E-6	Specific Location: Maintenance and Mechanical Dismantling Filter Dismantling	
	Mode: All Hazard Sources: Radiological Material (maximum inventory in glovebox)	13.9 -

## Table 5A-8. Unmitigated Events, Waste Handling (continued)

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Front	The state of a 3 The set of the state of the	
Type/Workshop or	Unmitigated Event Description/Specific	Cause
Location/ Event	Location/Hazard Sources	
Number		
Internal Fire	A fire involving combustibles and ignition sources	1 Combustibles and
	(e.g. transient combustibles, solvente, flammable	1. Compusibles and
MEEF-	gases and electrical equipment plasma tomber	2 Combustion of which from
Miscellaneous	evanorators furnaces beating plates) in a laborators	2. Combusion of waste from
Areas)	with a Glovebox results in an energetic breach of the	3 Maintenance activities
· - · · · · ·	Glovebox and the dispersal of radiological materials	A Multiple ignition sources
MA-1		4. Manupic Ignuon Sources
	Specific Location:	
E-1	Laboratories	2.9
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in laboratory glovebox)	
Internal Fire	A fire in a C2 Area involving combustibles (e.g.,	1. Combustibles and
MFFF-	filter) results in a breach of a container of	2 Combustion of unste from
Miscellancous Areas	contaminated or radioactive material (i.e. a transfer	exposure to chemicale
	container) and the dispersal of radiological materials.	3. Maintenance activities
MA-2		4. Combustibles and
		unknown ignition source
	Specific Location:	
E-1	AP-Liquid Waste Reception	
	MFFF-Air locks, corridors, stairways, and safe areas	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in container)	

## Table 5A-9. Unmitigated Events, Miscellaneous Areas

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E	TI	Causa
Event Two/Workshop or	I acation/Hazard Sources	Cause
Location/Event	Excation fiazai u Sour CCS	
Number		
Internal Fire	A fire in a C2 Area involving combustibles (e.g.,	1. Combustibles and
	electrical equipment, transient combustibles, HEPA	electrical short
MFFF-	filter) results in a breach of a container of	2. Combustion of waste from
Miscellaneous Areas	contaminated or radioactive material (i.e., a waste	exposure to chemicals
	drum) and the dispersal of radiological materials.	3. Maintenance activities
MA-12		4. Combustibles and
		unknown ignition source
	Specific Location:	-
ч. Ч		
E-1	AP-Liquid Waste Reception	
	MFFF-Air locks, corridors, stairways, and safe	2.9
	havens	
	Mode: All	
	Hazard Sources.	
	Radiological Material (maximum inventory in	
	container)	
· · · · · · · · · · · · · · · · · · ·		
Internal Fire	A fire (due to electrical equipment, transient	1. Combustibles and
	combustibles, etc.) affecting miscellaneous areas	electrical short
MFFF-	(e.g., air locks, corridors, stairs, etc.) in a C2 area	2. Maintenance activities
Miscellaneous Areas	results in fire damage but no safety related impact.	3. Combustibles and
		unknown ignition source
MA-3		
	Specific Location:	· · ·
	MEEE Air locks corridors stainways and safe areas	1
F-1	MFFF-Storage Areas (non-waste)	
	MFFF-Offices and personal access areas	
· · · · · · · · · · · · · · · · · · ·		
	Mode: All	
	Hazard Sources:	
	N	
and the second second	NONE	
1		1

## Table 5A-9. Unmitigated Events, Miscellaneous Areas (continued)

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion MFFF- Miscellaneous Areas	An explosion in a laboratory involving flammable, explosive, or reactive chemicals (e.g., organics or explosive gases) results in the dispersal of radiological material.	<ol> <li>Leak or spill of flammable liquids or gasses</li> <li>Chemical reaction releases explosive gasses</li> </ol>
MA-4	Specific Location: Laboratories	
E-2	Mode: All	1.1
	Hazard Sources:	
	Radiological Material (maximum inventory in laboratory)	
Loss of Confinement / Dispersal of Nuclear Material MFFF- Miscellaneous Areas MA-5 E-3	A container of contaminated or radioactive material (i.e., a transfer container or a 3013 container) fails or is damaged while being handled by miscellaneous handling devices in a C2 Area and results in breach of the container and the dispersal of radiological materials. Specific Location: AP-Liquid Waste Reception MFFF-Airlocks, corridors, and stairways Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in container)	1. Human error or equipment failure during container handling operations
Loss of Confinement / Dispersal of Nuclear Material	Corrosion of a laboratory glovebox by corrosive chemicals results in a breach (i.e., material failure) of glovebox confinement and dispersal of radiological materials.	1. Corrosive chemicals interact with glovebox leading to failure
MFFF- Miscellaneous Areas	Specific Location:	
MA-6	Laboratories Mode: All	
E-3	Hazard Sources: Radiological Material (maximum inventory in laboratory glovebox)	

## Table 5A-9. Unmitigated Events, Miscellaneous Areas (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	Clust
Location/ Event		
Number		
External Exposure	Operator is inadvertently exposed to excessive direct	1. Exposure due to
	radiation in the MFFF-Miscellaneous Areas resulting	unintended radioactive
MFFF-	in excessive radiation exposure.	material buildup
Miscellaneous Areas		2. Human error or equipment
N/A 7	Specific Location:	raiture
MA-/	Laboratories	
	Laboratories	
	Mode: All	
E-4		
	Hazard Sources:	
		2.9
	Maximum Direct Radiation Source	
Criticality	Re-configuration of fissile material potentially results	1. Excessive quantity of
	in nuclear criticality and the release of radiological	nissue material is
Mrrr-	maleriai.	2 Improved placement of
Miscellaneous Areas	Specific Location:	2. Improper placement of fissile material outside of
MA-R	Specific Location.	criticality safe storage
MIN-0	Laboratories	locations
		3. Introduction of moderator
	Mode: All	(e.g., internal flooding of
E-5		process unit)
	Hazard Sources:	4. Human error or equipment
		failure
	Fissile and Radiological Material	
Lood Hendling	A container of contemineted or radioactive material	1 Human error or equipment
Load Handling	(i.e., a waste drum) fails or is damaged while being	failure during waste drum
MEEE.	handled by miscellaneous handling devices in a C2	handling operations
Miscellaneous Areas	Area and results in breach of the container and the	op =
	dispersal of radiological materials.	
MA-11		1
Ec	Specine Location:	1
E-0	A P-Liquid Weste Recention	1
	MFEE-Airlocke corridors and stainways	
	MIT I I MILIOCKS, CONTROLS, WAR Swill Ways	
	Mode: Normal Operation	
	•	
	Hazard Sources:	
	Kadiological Material (maximum inventory in	
	Container)	1
		1
<u> </u>		

## Table 5A-9. Unmitigated Events, Miscellaneous Areas (continued)

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Chemical	A fire offects the Additives Dreporation Area and	1 Combustibles and
Chemical	A me anecis de Additives Preparation Alea and	1. Combusubles and
	results in toxic chemicals being released from the	electrical short
MFFF-	chemical containers with potential impact on the	2. Combustion of waste from
Miscellaneous Areas	worker and on control area habitability.	exposure to chemicals
]		3. Maintenance activities
MA-9		4. Combustibles and
		unknown ignition source
	Specific Location:	unknown igindon source
	Specific Location.	J
E7	MEET Addition Demonster Anna	
E-7	MFFF-Additives Preparation Area	
	Mode: All	2.9
	Hazard Sources:	· · · · ·
	Hazardous Chemicals	
Chemical	A breach of hazardous chemical containers in the	1. Human error or equipment
	Additives Preparation Area results in a chemical	failure
MFFF-	release with potential impact on the worker and on	2. Corrosion of containers
Miscellaneous Areas	control area habitability	3 Drop of container(s)
		5. Drop of container(s)
MA-10		
1111-10	Creatifier Laureline	
	Specific Location:	
	MFFF-Additives Preparation Area	
E-7		
	Facility Wide	
	Mode: All	
	Hazard Sources:	
	Hazardous Chemicals	

## Table 5A-9. Unmitigated Events, Miscellaneous Areas (continued)

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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Internal Fire	A fire (involving diesel fuel storage, gas storage	1. Combustibles and
	platform, the Reagents Processing Building, etc.)	electrical short
Support Facilities	occurs and affects the MFFF Building resulting in	2. Combustion of waste from
Outside MFFF	structural damage.	exposure to chemicals
		3. Maintenance activities
SF-1	Specific Location:	4. Combustibles and
51-1	opeente zoemen.	unknown ignition source
	General Plant and Outside Areas	Lindio de Briton Donio
	Descents Processing Building	
	Cas Starses Escility	
E-1	Gas Storage Facility	
	Emergency Diesel Generator Building	2.9
	Standby Diesel Generator Building	
	Secured Warehouse Building	
·	Access Control Building	
	Administration Building	
	Technical Support Building	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF	
	susceptible to the consequences of external fires or	
	explosions)	
Internal Fire	A fire (involving electrical equipment transient	1. Combustibles and
Incinal The	combustibles etc.) affects I/O2 drums outside the	electrical short
Summert Engilities	A DAAD Building (e.g. in the Secured Warehouse	2 Combustibles and
Support Facilities	Duilding) and exclute in a kreach of confinement and	upknown ignition source
Outside MIFFF	building) and results in a breach of commencement and	unknown rgindon source
	the dispersal of radiological materials.	
SF-Z		1
	Specific Location:	
	General Plant and Outside Areas	1
E 1	Secured Warehouse Building	
1.5-1	Scence wateriouse purrantik	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory of UO2 in	1
	Secured Warehouse Building)	
	-	

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		· · · · · · · · · · · · · · · · · · ·
Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion Support Facilities Outside MFFF SF-3 E-2	An explosion at a nearby support facility (e.g., diesel fuel storage, gas storage platform, the Reagents Processing Building, nearby MFFF support facility on the MFFF site) outside the MFFF Building results in structural damage to the MFFF. Specific Location: General Plant and Outside Areas Reagents Processing Building Gas Storage Facility Emergency Diesel Generator Building Standby Diesel Generator Building Access Control Building (Armory)	1. Fuel oil or gas leak combined with electrical short or Combustibles and unknown ignition source 2. Unintended interaction of chemicals which are explosively incompatible 3. Human error or equipment failure
	Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to disruption by structural damage)	
Loss of Confinement / Dispersal of Nuclear Material Support Facilities Outside MFFF	A leak or break in an underground waste pipeline outside MFFF results in a breach of confinement, and the dispersal of radiological materials. Specific Location:	<ol> <li>Mechanical failure of piping</li> <li>Corrosion induced failure of piping</li> <li>Human error results in pipe break</li> </ol>
SF-14	General Plant and Outside Areas Mode: All	
E-3	Hazard Sources: Radiological Material (maximum inventory of waste tank)	

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling Support Facilities Outside MFFF SF-13	A handling accident, a fire or natural phenomena affects UO2 drums outside the AP/MP Building (e.g., in the Secured Warehouse Building) and results in a breach of confinement and the dispersal of radiological materials.	1. Human error or equipment failure during load handling operations 2. Combustibles and electrical short 3. Combustibles and unknown ignition source
E-6	Specific Location: General Plant and Outside Areas Secured Warehouse Building	2.
	Mode: All Hazard Sources: Radiological Material (maximum inventory of UO2 in Secured Warehouse Building)	
Chemical Support Facilities Outside MFFF	A diesel fuel oil leak from a diesel fuel tank or associated piping results in a chemical release with potential impact on the worker and on control area habitability.	<ol> <li>Mechanical failure of fuel tank</li> <li>Inadvertent puncture of fuel tank</li> </ol>
E-7	Specific Location: Emergency Diesel Generator Building Standby Diesel Generator Building	
	Mode: All Hazard Sources:	
	Hazardous Chemicals	

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Event	Unmitigated Event Description/Specific	Cause
Location/ Event Number	LocanonyHazard Sources	
Chemical Support Facilities Outside MFFF SF-6	A loss of ventilation in the Reagents Processing Building results in toxic chemicals being released from the vessels, tanks, and piping in the building (but not being ventilated) and potentially impacting the worker and control area habitability.	<ol> <li>Loss of all normal control systems</li> <li>Loss of power</li> <li>Mechanical failure of ventilation system</li> </ol>
E-7	Specific Location: Reagents Processing Building Mode: All Hazard Sources: Hazardous Chemicals	32.9
Chemical Support Facilities Outside MFFF SF-7	Extreme weather affects the Reagents Processing Building and results in toxic chemicals being released from the vessels, tanks, and piping in the building and potentially impacting the worker and control area habitability.	1. Extreme weather
E-7	Specific Location: Reagents Processing Building	
	Mode: All Hazard Sources: Hazardous Chemicals	

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Chemical Support Facilities Outside MFFF SF-8	An external or internal impact affects the Reagents Processing Building and results in toxic chemicals being released from the vessels, tanks, and piping in the building and potentially impacting the worker and control area habitability.	1. Human error or equipment failure
E-7	Specific Location: Reagents Processing Building	2,7
	Mode: All	
	Hazard Sources: Hazardous Chemicals	
Chemical Support Facilities Outside MFFF	A pipe break or leak from vessels, tanks, and piping in the Reagents Processing Building results in toxic chemicals being released from the vessels, tanks, and piping and potentially impacts the worker and control area babitability.	1. Mechanical failure of vessels, tanks, or piping
SF-11	area mannaonny.	
E-7	Specific Location: Reagents Processing Building	
	Mode: All	
	Hazard Sources: Hazardous Chemicals	
Chemical Support Facilities Outside MFFF	A loss of tank venting in vessels, tanks and piping in the Reagents Processing Building results in a chemical release with potential impact on the worker and on control area habitability.	1. Mechanical failure of ventilation system
SF-12	Specific Location:	
E-7	Reagents Processing Building Mode: All	
	Hazard Sources:	
	Hazardous Chemicals	

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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	Cause
Location/Event		
Number		
Internal Fire	A fire in the C4 VHD System (i.e., C4 Dynamic	1 Combustibles and
	Confinement) disables the system or damages the	electrical short circuit
MEFE-HVAC	HEPA filters and results in a loss of negative pressure	2 Other causes for ignition
Systems	in the gloveboxes, breach of confinement and	of combustible material
	dispersal of radiological materials	
HV-1	aspersus of randooglour materials.	
	Specific Location:	
	AP-Acid recovery	
E-1	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Mode: Ali	
	Hazard Sources:	
	Radiological Material (maximum inventory in HEPA filters and maximum inventory airborne in the gloveboxes)	

## Table 5A-11. Unmitigated Events, HVAC Systems

MFFF Construction Authorization Request Docket No. 070-03098

· · · · · · · · · · · · · · · · · · ·		
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Internal Fire	A fire in the AP Process Offgas System disables the	1. Combustibles and
	system or damages the HEPA filters and results in a	electrical short circuit
MFFF-HVAC	loss of negative pressure in the AP pipes and vessels,	2. Other causes for ignition
Systems	breach of confinement, and dispersal of radiological materials.	of combustible material
HV-17		
	Specific Location:	
	AP-Acid recovery	
E-1	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	***
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Purification cycle	
	AP-Oxalic mother liquors recovery	
	AP-Liquid waste reception	
	AP-Off gas treatment	
	AP-Reagents	
4	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in HEPA filters and maximum inventory airborne in the AP pipes and vessels)	
1		

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MFFF Construction Authorization Request Docket No. 070-03098

Event	Unmitigated Event Description/Specific	Cause
TwoofWorkshop or	I contion/Jagard Sources	Cause
I yper workshop of	Location Mazar & Sour CS	
Locationy Event		
Number		
internal Fire	A fire in the C3 HVAC System (i.e., C3 Dynamic	I. Compusibles and
	Confinement), the C2 HVAC System, or the Process	electrical short circuit
MFFF-HVAC	Cell Ventilation System involving electrical	2. Other causes for ignition
Systems	equipment disables the system or damages the HEPA	of combustible material
	filters and results in a breach of confinement, and	
HV-2	dispersal of radiological materials.	
	Specific Location:	
E-1	•	
	AP-Acid recovery	
	AP-Solvent recovery	
	AP-PuO2 Decanning	1. P
	AP-Recanning	1 1
	AP-Pre-nolishing Milling	
	AP-Pu()? Canning	
	A D-Dracinitation-Filtration-Oxidation	
	AD Homogenization Sampling	
	AP Dissolution	
	AP-Dissolution AP Dissolution of chloringted food	
	AP-Dissolution of chlorinated feed	
	AP-Oranium Dissolution	
	AP-Punncanon cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	(
	AP-Process Off-Gas Treatment	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	[ ]
	Mode: All	
		1 1
	Hazard Sources:	
	Radiological Material (maximum inventory in C3 HVAC System)	
	l	

Table 5A-11. Un	mitigated Events,	HVAC Systems	(continued)
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MFFF Construction Authorization Request Docket No. 070-03098

Event	Unmitigated Event Description/Specific	Conce
Type Warkshop or	I ocation/Hazard Sources	Cause
Location/Event		
Number		
Loss of	A loss of negative pressure or a flow perturbation	1. Loss of all normal control
Confinement /	involving the C3 Dynamic Confinement results in a	systems
Dispersal of Nuclear	ventilation air flow reversal into a C2 Area	2. Loss of power
Material		3. Mechanical failure of
	Specific Location:	ventilation system
MFFF-HVAC		
Systems	AP-Acid recovery	
0,000	AP-Solvent recovery	
HV-3	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
E-3	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	-
	Cladding and Kod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Mode: All	
	Harris Courses	
	nazaru Sources:	
	Radiological Material	

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Event	Unmitigated Event Description/Specific	Cauga
Type/Workshop or	Location/Hazard Sources	Lause
Location/Event	Locaciony Macar & Sources	
Number		
Loss of	A loss of negative pressure or a flow perturbation	
Confinement /	involving the Process Cells HVAC results in a	1. LOSS OF All HOFILIAL COLLEGE
Dispersal of Nuclear	ventilation air flow reversal into a C? Area	Systems
Material	vontination an new revelsar mite a C2 rite.	2. Loss of power
	Specific Location:	5. Mechanical minie of
MFFF-HVAC		ventration system
Systems	AP-Solvent recovery	1
	AP-Oxalic mother liquors recovery	1
HV-4	AP-Off gas treatment	
	AP-Liquid waste reception	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
E-3	AP-Acid recovery	2.7
	AP-Purification cycle	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum airborne inventory in AP Process Cell not including inventory in AP vessels, tanks and piping)	

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<b>5</b>	VI	Cauca
Event	Unmitigated Event Description/Specific	Cause
Type/workshop or	Location/Hazard Sources	
Location/ Event		1
Number		
Loss of	A loss of negative pressure or a flow perturbation	1. Loss of normal control
Confinement /	involving the C4 Dynamic Confinement results in a	system
Dispersal of Nuclear	ventilation air flow reversal into a C3 Area.	2. Loss of all power
Material		3. Mechanical failure of
	Specific Location:	ventilation system
MFFF-HVAC		
Systems	AP-Acid recovery	
	AP-Solvent recovery	
HV-5	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
E-3	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Mode: All	
	Hazard Sources:	
		1
	Radiological Material (maximum airborne inventory	
	in all connected gloveboxes)	
		1

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Event Type/Workshop or	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Location/ Event Number		
Loss of Confinement / Dispersal of Nuclear Material	Back-flow from a glovebox room through a C3 ventilation system supply duct to another glovebox room results in a breach of C3 ventilation system confinement and cross contamination of MP and AP	1. Loss of air flow through a C3 ventilation system supply duct
MFFF-HVAC Systems		
HV-6	AD A 11 contract	
<b>F</b> 2	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP PuO2 Compise	24,7
E-3	AP-PuO2 Canning AP-Recanning AP-Pre-polishing Milling AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed	
	AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery	
	Receiving Workshop Powder Workshop Pellet Workshop	
	Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories)	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in C3 area outside of gloveboxes)	
Loss of Confinement / Dispersal of Nuclear Material	A loss of negative pressure or a flow perturbation involving the C2 Dynamic Confinement results in a ventilation air flow reversal into adjacent areas and contamination of those areas.	<ol> <li>Loss of all normal control systems</li> <li>Loss of power</li> <li>Mechanical failure of ventilation system</li> </ol>
MFFF-HVAC Systems	Specific Location:	
HV-10	AP-Reagents MFFF-Miscellaneous Areas Assembly Workshop Cladding and Rod Control Workshop	
E-3	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum unconfined inventory in C2 Areas)	

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Event Type/Workshop or	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Location/ Event Number		
Loss of Confinement / Dispersal of Nuclear Material	Leakage from C3 Ventilation System, C2 Ventilation System, or Process Cell Ventilation Duct, facility wide, results in a breach of confinement, and the dispersal of radiological material.	1. Corrosion and penetration of ventilation duct
MFFF-HVAC Systems		
HV-11	Specific Location:	
	HVAC, Facility Wide	
E-3	Mode: All	23
	Hazard Sources:	
	Radiological Material (maximum inventory in C3 Ventilation System or Process Cell Ventilation Duct)	
Loss of Confinement / Dispersal of Nuclear Material	Leakage from C4 HVAC System or Process Offgas Ventilation Duct, facility wide, results in a breach of confinement, and the dispersal of radiological material.	1. Corrosion and penetration of ventilation duct
MFFF-HVAC Systems		
HV-12	HVAC, Facility Wide	
E-3	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in C4 Ventilation System or Process Cell Ventilation Duct)	

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Event Type/Workshop or Location/Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-HVAC Systems HV-14	A Load Handling Event involving miscellaneous load handling devices, which impact and penetrate the HVAC system and HEPA filter(s), results in a breach of confinement, and the dispersal of radiological materials	1. Human error or equipment failure during load handling operations around the HVAC system
E-6	Specific Location: HVAC, Filter Rooms Mode: All	11. Y
	Hazard Sources: Radiological Material contained in C4 HVAC system and filters	
Load Handling MFFF-HVAC Systems HV-15	A Load Handling Event involving miscellaneous load handling devices, which impacts the HVAC system, results in a bumped HEPA filter or HEPA filter(s), the cascade of contamination through the HVAC system, and the dispersal of radiological materials.	1. Human error or equipment failure during load handling operations around the ventilation system
	Specific Location:	
E-6	HVAC, Filter Rooms Mode: Long Shutdown Hazard Sources: Radiological Material contained in HVAC system and filters	
Chemical MFFF-HVAC Systems HV-16	A loss of ventilation air flow involving the C2 Dynamic Confinement System results in a chemical release with potential impact on the worker and on control area habitability.	<ol> <li>Loss of all normal control systems</li> <li>Loss of power</li> <li>Mechanical failure of ventilation system</li> </ol>
E-7	Specific Location: AP-Reagents MFFF-Miscellaneous Areas Mode: All	
	Hazard Sources: Hazardous Chemicals	

Enont	Il-mitigated Event Description/Specific	Course
Eveni Turse (Werkshop or	Leastion/Hazard Sources	Cause
I ype/ workshop or	Location/Hazaru Sources	
Location/ Event		
Number	A fer involving claushor combustibles (a g	1 Combustibles and
Internal Fire	A fire involving glovebox combustibles	electrical short
METE Clausheres	Accurate equipment, transient combustiones,	2 Combustion of waste from
MFFF-Gloveboxes	hammable liquids, HEPA litter) results in a breach of	2. Compute to chemicals
CD 1	the Glovebox and the dispersal of fadiological	2 Ignition of flammable
08-1	materials.	liquid (a g isopropupol used
		in rod cleaning)
	Specific Location:	Maintenance estivities
		5. Maintenance activities
E-1	AP-Acid recovery	4. Compussiones and
	AP-Solvent recovery	unknown ignition source
	AP-PuO2 Decanning	5. Spontaneous nearing of
	AP-Recanning	$UO_2/PuO_2$ .
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in a fire area)	

Table 5A-12.	Unmitigated	Events,	Gloveboxes
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MFFF Construction Authorization Request Docket No. 070-03098

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Internal Fire	A transfer container (containing contaminated process	1. Combustibles and
	equipment or contaminated HEPA filters) is involved	electrical short
MFFF-Gloveboxes	in a fire and is damaged while outside a glovebox and	2. Combustion of waste from
	results in the dispersal of radiological materials.	exposure to chemicals
GB-2		3. Maintenance activities
	Specific Location:	4. Combustibles and
		unknown ignition source
	AP-Acid recovery	
E-1	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	2.9
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in waste container)	

Table 5A-12.	Unmitigated	Events,	Gloveboxes	(continued)
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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number	······································	
Loss of	Over-pressurization of the glovebox (i.e., C4	1. Rupture of a high flow or
Confinement /	Dynamic Confinement) by rupture of a high flow or	high pressure supply line
Dispersal of Nuclear	high pressure supply line or by HEPA filter clogging	2. Clogged outlet HEPA
Material	results in a ventilation air flow reversal into a C3	filter
	Area.	
MFFF-Gloveboxes		
GB-3	Specific Location:	
	AP-Acid recovery	
	AP-Solvent recovery	
E-3	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	1
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
1	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
		1
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	glovebox)	

Table 5A-12.	<b>Unmitigated Even</b>	ts, Gloveboxes	(continued)

MFFF Construction Authorization Request Docket No. 070-03098 I

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material MFFF-Gloveboxes GB-4	Failure of a glove during normal operation or maintenance results in a breach of glovebox confinement and dispersal of radiological materials. Specific Location: AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning	<ol> <li>Human error results in glove failure during normal operation or maintenance</li> <li>Equipment failure</li> </ol>
E-3	AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop	¥.9
-	Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Waste Handling Mode: All Hazard Sources: Radiological Material (maximum inventory in glovebox)	

## Table 5A-12. Unmitigated Events, Gloveboxes (continued)
Event	Unmitigated Event Description/Specific	Cause
Type/workshop or	Location/Hazard Sources	
Location/ Event		
Number	De 1. Com clauster through interfering and line	1. Loss of gas flow through
Loss of	Back-now from glovebox through interfacing gas line	1. Loss of gas now unough
Confinement /	(e.g., nitrogen, nelium) to interfacing system followed	the suppry line
Dispersal of Nuclear	by the opening of this interfacing system (during	
Material	operation or maintenance) results in a breach of	
	glovebox primary confinement and dispersal of	
MFFF-Gloveboxes	radiological materials to areas where workers might	
	be present.	
GB-5		
	Specific Location:	
	AP-Acid recovery	
E-3	AP-Solvent recovery	2.9
•	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	1
	Cladding and Rod Control Workshop	1
	Miscellaneous Areas (Laboratories)	1
	Waste Handling	
	č	
	Mode: All	
	Hazard Sources:	
a, a	Radiological Material (maximum inventory in glovebox)	

## Table 5A-12. Unmitigated Events, Gloveboxes (continued)

MFFF Construction Authorization Request Docket No. 070-03098 I

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear	Excessive temperature of process equipment inside a glovebox results in high temperature damage to and breach of the glovebox and the dispersal of	<ol> <li>Failure of process control system</li> <li>Loss of cooling to process</li> </ol>
Material	radiological materials.	equipment
MFFF-Gloveboxes	Specific Location:	
GB-6	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning	
E-3	AP-Recanning AP-Pre-polishing Milling	
	AP-PuO2 Canning AP Provincion Filmation Oridation	2.9
	AP-Homogenization-Sampling	
	AP-Dissolution AP-Dissolution of chlorinated feed	
	AP-Purification cycle AP-Samoling	
	AP-Oxalic mother liquors recovery	
i	Receiving Workshop	
	Powder Workshop Pellet Workshop	
	Cladding and Rod Control Workshop	
	Waste Handling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

Table 5A-12.	<b>Unmitigated Events</b> ,	Gloveboxes (continued)	)
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	Manufactured France Description/Samific	Causa
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Loss of	A plastic bag (containing contaminated process	1. Human error or equipment
Confinement /	equipment or contaminated HEPA filters) fails or is	failure during load handling
Dispersal of Nuclear	damaged while being handled outside a glovebox and	operations outside a
Material	results in the dispersal of radiological materials.	glovebox
MFFF-Gloveboxes	Specific Location:	
GB-7	AP-Acid recovery	
	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	
E-3	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
	Hazard Sources:	l
	Radiological Material (maximum inventory in waste	
	container)	
	,	

## Table 5A-12. Unmitigated Events, Gloveboxes (continued)

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	A transfer container (containing contaminated process equipment or contaminated HEPA filters) fails or is damaged while being handled outside a glovebox and results in the dispersal of radiological materials.	1. Human error or equipment failure during load handling operations outside a glovebox
MFFF-Gloveboxes	Specific Location:	
GB-11	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning	
E-3	AP-Pre-polishing Milling AP-Pre-polishing Milling AP-Precipitation-Filtration-Oxidation AP-Precipitation-Filtration-Oxidation AP-Dissolution of chlorinated feed AP-Dissolution of chlorinated feed AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Waste Handling	34.7
	Mode: All Hazard Sources: Radiological Material (maximum inventory in waste	
	container)	

	Table 5A-12.	Unmitigated	Events,	Gloveboxes	(continued)	)
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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling	A container handling accident within a glovebox (e.g., a container impact with the glovebox) results in a	1. Human error or equipment failure during load handling
MFFF-Gloveboxes	breach of the container and the glovebox, and the dispersal of radiological materials.	operations inside a glovebox
GB-8	Specific Location:	
E-6	AP-Acid recovery AP-Solvent recovery	
	AP-PuO2 Decanning AP-Recanning	
	AP-Pre-polishing Milling AP-PuO2 Canning	2.7
	AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling	
	AP-Dissolution AP-Dissolution of chlorinated feed	
	AP-Purification cycle AP-Sampling	
	AP-Oxalic mother liquors recovery Receiving Workshop	
	Powder Workshop Pellet Workshop	
	Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

# Table 5A-12. Unmitigated Events, Gloveboxes (continued)

MFFF Construction Authorization Request Docket No. 070-03098

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Load Handling	A Load Handling Event involving miscellaneous load	1. Human error or equipment
	handling devices outside a glovebox results in a	failure during load handling
MFFF-Gloveboxes	breach of the glovebox, and the dispersal of	operations outside a
GB-9		giovedux
	Specific Location:	
	AP-Acid recovery	
E-6	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	2.1
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

## Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event	Immitigated Event Description/Specific	Cause
Event Type/Workshop or	Location/Hazard Sources	Cause
Location/Event		
Number		
Load Handling	A container handling accident or container failure	1. Human error or equipment
Loud Handing	within a glovebox (i.e., a leak, break, or spill) results	failure during load handling
MEEE-Gloveboxes	in a breach of the container, and the dispersal of	operations inside a glovebox
	radiological materials within the glovebox.	
GB-10	IndioioProfit Humaning and Human	
02.10	Specific Location:	
	AP-Acid recovery	
E-6	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
1	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
1	AP-Oxalic mother liquors recovery	
	Receiving Workshop	· · · ·
and the second	Powder Workshop	
1	Pellet Workshop	
	Cladding and Rod Control Workshop	
and the second	Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
		1
	Hazard Sources:	
	Radiological Material (maximum inventory in	
1	glovebox)	
1		

## Table 5A-12. Unmitigated Events, Gloveboxes (continued)

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire Facility Wide FW-1 E-1	A facility wide fire (due to electrical equipment, transient combustibles, etc.) involves the MFFF Building and results in a breach of confinement, and the dispersal of radiological material. Specific Location: All Process Units and Support Units with radioactive material present Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to a facility wide fire)	<ol> <li>Combustibles and electrical short</li> <li>Combustion of waste from exposure to chemicals</li> <li>Maintenance activities</li> <li>Combustibles and unknown ignition source</li> </ol>
Internal Fire Facility Wide FW-2 E-1	A fire (due to electrical equipment, transient combustibles, etc.) involves the Pneumatic Pipe Automatic Transfer System and results in a breach of confinement, and the dispersal of radiological material. Specific Location: Facility Wide (Two pneumatic transfer systems) Mode: All Hazard Sources:	<ol> <li>Combustibles and electrical short</li> <li>Combustion of waste from exposure to chemicals</li> <li>Maintenance activities</li> <li>Combustibles and unknown ignition source</li> </ol>
	Radiological Material (maximum inventory in Pneumatic Pipe Automatic Transfer System)	

#### Table 5A-13. Unmitigated Events, Facility Wide

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion	Pressure vessel or gas bottle failure, facility wide, results in explosive release and potential worker	1. Pressure vessel overpressurization and pressure vessel located close
FW-3	confinement zones.	to areas containing plutonium 2. Pressure vessel
	Specific Location:	overpressurization and pressure vessel not in
E-2	All Process Units and Support Units with a pressure vessel or gas bottle and radioactive material present	accordance with ASME Code 3. Pressure vessel
	Mode: All	overpressurization and pressure vessel relief not
	Hazard Sources:	provided
	confinements)	
Explosion	An explosion due to flammable, explosive, or reactive chemicals in the contaminated drains, facility wide,	1. Explosive gas and unknown ignition source
Facility Wide	results in a breach of confinement, and the dispersal of radiological material.	
rw-4	Specific Location:	
E-2	All Process Units and Support Units with contaminated drains	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in contaminated drain)	

Table 5A-13. Unmitigated Events, Facility Wide (continued)

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Event	Unmitigated Event Decemintian/Specific	Causa
Type/Workshop or Location/ Event	Location/Hazard Sources	Cause
Explosion	Over-pressurization due to flammable, explosive, or	1. Over-pressurization due to
Facility Wide	reactive chemicals in the contaminated drains, facility wide, results in a breach of confinement, and the	unanticipated chemical reaction
500 /	dispersal of radiological material.	2. Human error or equipment
rw-0		failure
E-2	Specific Location: All Process Units and Support Units with contaminated drains	
		29
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in contaminated drain)	
Loss of	Leakage from contaminated drains, facility wide.	1. Corrosion of contaminated
Confinement /	results in a breach of confinement, and the dispersal	drains
Dispersal of Nuclear	of radiological material.	2. Mechanical failure of
Materiai	Specific Location:	contaminated drains
Facility Wide		
FW-5	All Process Units and Support Units with contaminated drains	
	Mode: All	
E-3	Hazard Sources:	
	Radiological Material (maximum inventory in contaminated drain)	
Loss of	Accident (e.g., Fire) leads to Radiation Air	1. Fire due to combustibles
Confinement / Dispersal of Nuclear	Monitoring System HEPA filter failures (i.e., breach	and unknown ignition source
Material	through the centralized air monitoring system.	
Facility Wide		
	Specific Location:	
L.44-1	All Process Units and Support Units with radiation	
	monitors associated with the centralized air	
	monitoring system	
E-3	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in C3 HVAC system)	

#### Table 5A-13. Unmitigated Events, Facility Wide (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/Event		
Number		1 Look in Dediction Air
Loss of	During normal operation, contamination spreads	1. Leak in Radiation Air
Continement /	through the Radiation Air Monitoring System	Monitoring System
Dispersal of Nuclear	resulting in a breach of Secondary Confinement (i.e.,	-
Material	leakage into an interfacing system) and dispersal of	
Engility Wide	radiological materials.	
Facility wide	Specific Location:	
FW-9	Specific Location.	
1.44-0	All Process Linits and Support Linits with radiation	
	monitors associated with the centralized air	
	monitoring system	
E-3	montoving official	
2.5	Mode: Normal Operation	12.D
	Hazard Sources:	
	Radiological Material (maximum inventory in a	
	Secondary Confinement)	
Loss of	Over-pressurization or under-pressurization of the	1. Control system failure
Confinement /	Pneumatic Pipe Automatic Transfer System due to	
Dispersal of Nuclear	improper operation of the Pneumatic Transfer	
Material	Vacuum System results in a breach of confinement	
	and dispersal of radiological materials.	
Facility Wide		
	Specific Location:	
FW-9		
1	Facility wide (1 wo pneumanc transfer systems)	
	Made Namel Operation	
E 2	Mode: Normai Operation	
E-3	Harard Sources	
	Hazald Sources.	
	Radiological Material (maximum inventory in	
	Pneumatic Pine Automatic Transfer System)	
1		
Loss of	Corrosion of the Pneumatic Pipe Automatic Transfer	1. Corrosion of the
Confinement /	System due to corrosive chemicals results in a breach	Pneumatic Pipe Automatic
Dispersal of Nuclear	of confinement and dispersal of radiological	Transfer System
Material	materials.	
Facility Wide		
	Specific Location:	
FW-11		
	Facility Wide (Two pneumatic transfer systems)	1
	Mode: All	
E-3	IT	
	Hazaro Sources:	
	Padialagical Material (maximum inventory in	
	Radiological Material (maximum inventory in Desentic Dire Automatic Transfer System)	}
1	I nommeric Libe variamente manster obstem)	1

## Table 5A-13. Unmitigated Events, Facility Wide (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material Facility Wide	Back-flow (from a support system outside a glovebox) through a liquid supply line (e.g., Chilled Water or Cooling Water) to Secondary Confinement, facility wide, results in a breach of confinement (i.e., leakage into an interfacing system) and dispersal of radiological materials.	1. Loss of liquid flow through the supply line
FW-12	Specific Location:	
E-3	All Process Units and Support Units with support systems with liquid supply lines to a glovebox	1.V
	Mode: All	
	Hazard Sources:	
	Radiological Material (Contamination in support system)	
Load Handling	A heavy load impacts and damages MFFF structure while utilizing miscellaneous had handling devices	1. Human error or equipment
Facility Wide	resulting in a breach of a primary confinement or in a breach of a container bolding nuclear materials	
FW-15	order of a container nothing indicate materials.	
	Specific Location:	
E-6	All Process Units and Support Units with radioactive material present	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in container or primary confinement)	

#### Table 5A-13. Unmitigated Events, Facility Wide (continued)

Envel		Carres
Event Turno/Workshop on	Unmitigated Event Description/Specific	Cause
Location/Event	Location/Hazaru Sources	
Number		
Load Handling	External impact on contaminated drains while	1. Human error or equipment
	utilizing miscellaneous load handling devices results	failure
Facility Wide	in breach of confinement, and dispersal of	
	radiological materials.	
FW-16		
	Specific Location:	
EC	All Brosses I Inite and Summert Hinite with	
E-0	an Process Units and Support Units with	
	Mode: All	
		2.3
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	contaminated drain)	
T and TT dti	A load imposed the Desamatic Direct Automotic	
Load Handling	A load impacts the Pheumanic Pipe Automatic	1. Human error or equipment failure during load handling
Facility Wide	handling devices resulting in a breach of confinement	operations around the
Tacinty wild	and dispersal of radiological materials.	pneumatic transfer nining
FW-17	and appoint of radiological materials.	Procession and the baband
	Specific Location:	
	Facility Wide (Two pneumatic transfer systems)	
E-6		
	Mode: All	
	Hannad Courses	
	Hazard Sources.	
	Radiological Material (maximum inventory in	
	Pneumatic Pipe Automatic Transfer System)	
Load Handling	A transfer container is dropped onto the floor and	1. Human error or equipment
	results in a breach of the transfer container and the	failure during container
Facility Wide	dispersal of radiological materials.	handling operations
EW-20		
1 11-20		
	Specific Location:	
E-6	All Process Units and Support Units with transfer	
	containers	
	Mode: All	1
		1
	Hazard Sources:	1
	Tacara Jourees.	
	Radiological Material (maximum inventory in	
	container, e.g. HEPA filters)	

## Table 5A-13. Unmitigated Events, Facility Wide (continued)

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Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling Facility Wide	A load is dropped onto a radioactive material container and results in a breach of the container and the dispersal of radiological materials.	1. Human error or equipment failure during waste drum handling operations
FW-21		
	Specific Location:	
E-6	All Process Units and Support Units with radioactive material containers	
	Mode: All	34 Y
	Hazard Sources:	
	Radiological Material (maximum inventory in container)	
Chemical	A breach of hazardous chemical containers, facility wide, results in a chemical release with potential	1. Human error or equipment failure
Facility Wide	impact on the worker and on control area habitability.	2. Corrosion of containers
FW-18	Specific Location:	
	Facility Wide	
E-7	Mode: All	
	Hazard Sources:	
	Hazardous Chemicals	

#### Table 5A-13. Unmitigated Events, Facility Wide (continued)

	•	
Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Event (Industrial and Transport Infrastructure Accidents)	A transportation accident (fire or explosion) outside the MFFF Building results in structural damage to the MFFF or negatively impacts control area habitability.	1. Transportation accident
General Hazard	Specific Location:	·
GH-2	Mode: All	
E-8	Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to disruption by structural damage)	
External Event (Industrial and Transport Infrastructure Accidents)	A fire or explosion at a nearby facility outside the MFFF Building (e.g., other SRS facility, Pit Disassembly and Conversion Facility, etc.) results in structural damage to the MFFF or negatively impacts control area habitability.	1. Human error or equipment failure
General Hazard GH-3	Specific Location: Outside AP/MP Building	
E-8	Mode: All Hazard Sources:	
	Radiological Material (maximum inventory in MFFF susceptible to disruption by structural damage)	
External Event	A fire (involving other nearby facilities, nearby	1. Forrest fire
General Hazard	Building resulting in structural damage.	3. Combustibles and unknown ignition source at
GH-13	Specific Location:	nearby facility
E-8	General Plant and Outside Areas Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF susceptible to the consequences of external fires or explosions)	

## Table 5A-14. Unmitigated Events, General Hazard

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Event General Hazard	A container spill occurs within the site boundary resulting in the dispersal of radioactive material.	1. Vehicular accident
GH-14	Specific Location: Outside Areas	
E-8	Mode: Transportation Hazard Sources:	
	Radiological Material (maximum inventory in MFFF susceptible to the consequences of a spill).	5 X X

#### Table 5A-14. Unmitigated Events, General Hazard

Event	Immitigated Event Description/Specific	Cause
Even Type/Workshop or	Location/Hazard Sources	Chase
Location/ Event		
Number		
Natural Phenomena	Extreme weather (i.e., a tornado, tornado missiles, or	1. Tornado
(Tornado related	high velocity straight wind) affects the Reagents	2. High velocity straight
chemical release)	Processing Building and results in toxic chemicals	wind
	being released from the vessels, tanks, and piping in	
General Hazard	the building and potentially impacting the worker and	
	control area habitability.	
GH-4		
	Specific Location:	1
E-0	Specific Location.	2,9
E-7	Reagents Processing Building	
	1.0.10 1.1000000BB	
	Mode: All	
a ser and services and	Hazard Sources:	
	Hazardous Chemicals	
	A such as the set is all the the Davies Pasie	1 Earthquake
Natural Phenomena	An earinquake up to and including the Design Dasis	1. Daluquare
(Earinquake)	Earthquake occurs and anects the MITT Building.	
General Hazard		
Ocheral Hazard	Specific Location:	
GH-5		
	Facility Wide	
	Mode: All	
E-9		
	Hazard Sources:	
	Rediological Material (maximum inventory in MFFF	
	susceptible to an earthquake)	
Natural Phenomena	Extreme weather occurs and affects the MFFF	1. Flooding rain
(External Flooding)	Building resulting in flooding.	· ·
General Hazard		
	Specine Location:	l.
GH-0	Facility Wide	
	Larin's Alte	
	Mode: All	
E-9		1
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	susceptible to flooding)	

## Table 5A-14. Unmitigated Events, General Hazard (continued)

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Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
(Tamada)	Extreme weather (tornado or high velocity straight	1. Tornado
(10mado)	winds) occurs and affects the MFFF Building	2. High velocity straight
Conoral Harard	resulting in failure of dynamic confinement systems	wind
Ocheral Hazard	due to pressure differential.	
GH-7		
	Specific Location:	
	Facility Wide	
E-9	•	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF	
	susceptible to tornado)	
Natural Phenomena	Extreme weather (e.g. high velocity straight winds	1 Tomada
(Tornado or High	tornado or tornado missiles) occurs and affects the	7 High velocity straight
Winds)	MFFF Building resulting in structural damage.	wind
General Hazard		
	Specific Location:	
GH-8		
	Facility Wide	
	Moder All	
E-9	Mode: All	
27	Hazand Sources:	
	Radiological Material (maximum inventory in MFFF	
	susceptible to high velocity straight winds, tornado, or	
	tornado missiles)	
Natural Phenomena	Extreme weather (e.g., rain, snow or hail) occurs and	1. Rain, snow, or hail
Conoral Harand	affects the MFFF Building resulting in structural	
General Hazard	damage.	
GH-9	Specific Location:	
	Specific Location.	
	Facility Wide	
	•	
E-9	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventors in MEEE	
	suscentible to distination by structural damage)	
	server a maraphon of success and and by	

#### Table 5A-14. Unmitigated Events, General Hazard (continued)

Fyent	Immitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Natural Phenomena	Extreme weather (excessive high temperature) occurs	1. High Temperature in the
	and affects the MFFF Building resulting in a thermal	environment
General Hazard	excursion in the process areas or in the PUO2 storage	
011.10	area.	
GH-IV	Specific Location.	
	Specific Location.	
	Facility Wide	
E-9	, ·····	A. C.
	Mode: All	
	Hazard Sources:	2.7
	Dedicherie Meteriel (menimum insuetom in MEEE	
	Kadiological Matchal (maximum inventory in MIFFF	
	susceptible to excessive lingh temperature in the	
Natural Phenomena	Extreme weather (lightning) occurs and affects the	1. Lightning
	MFFF Building resulting in failures of electrical	
General Hazard	equipment or external fires or explosions potentially	
	impacting control area habitability.	
GH-11		
	Specific Location:	
	Specific Location.	
E-9	Facility Wide	
	Mode: All	
	Hannad Courses	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF	
	susceptible to the consequences of failures of	
	electrical equipment or external fires or explosions)	
Natural Phenomena	Land subsidence affecting the MFFF Building results	1. Land subsidence
Conoral Harard	in siructural damage.	
Ocheral Hazard		
GH-12	Specific Location:	· · ·
	Facility Wide	
E-9	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF	
1	susceptible to disruption by structural damage)	1
		1

## Table 5A-14. Unmitigated Events, General Hazard (continued)