

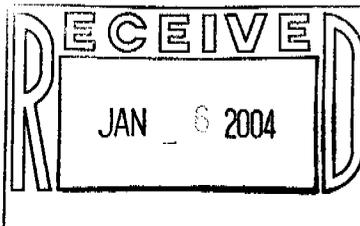
BUILDING 707
FIXED POWER BACKOUT PLAN

REVISION 1

DECEMBER 2003

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12/31/03
DATE



REVIEWED FOR CLASSIFICATION/UCM
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1/24

1.0 PURPOSE

The purpose of the Building 707 Fixed Power Back-out Plan is to lay out the scope, prerequisites, and process for removing the remaining fixed power systems from service and isolation of remaining Site power feeds to the fixed facility electrical distribution system in preparation for stripout. Execution of this backout plan will provide significant hazard reduction to the workers and is necessary for the safe completion of deactivation and decommissioning (D&D) activities within the facility.

Revision 1 to this Plan supersedes the original issue in its entirety. This is a complete re-write and no change bars are provided.

2.0 SCOPE

The scope of the Building 707 Fixed Power Back-out Plan is summarized as follows:

- Install three temporary power distribution panels (TPDPs) that are essentially construction power skids to supply 480V power to various 120V distribution panels ("bang boards") and other equipment throughout the facility. These TPDPs will be supplied from installed switchgear SWGR-707-3 and SWGR-707-6, and are used to support decommissioning tools and equipment.
- Install a temporary 13.8kV / 480V transformer on the west side of Building 707, external to the facility.
- Install temporary cabling from the temporary transformer to four (4) 480V temporary motor control centers (TMCCs) on the second floor of Building 707, and energize the TMCCs.
- Re-feed designated supply and exhaust fans from the TMCCs, using temporary cabling. Specific fans to be repowered are identified later in this Plan.
- Remove 707 diesel generators EGEN-1 and EGEN-2, and associated support systems from service (after criticality incredibility). The associated support equipment includes the main diesel generator output panel, distribution panels, wiring and conduit out to the Emergency Switchgear (ESWGR) 707-4, all EMCCs, and the Programmable Logic Control system. As soon as EGEN-3 is no longer required by Security, the fuel tank and 4000 gallons of diesel fuel can be removed.
- Remove the 707 Uninterruptible Power Supply (UPS) from service, including the battery bank, the UPS control system, and the UPS distribution panels.
- Install a second 13.8kV / 480V temporary transformer on the west side of Building 707, external to the facility.
- Re-feed the TPDPs from the second temporary transformer.
- Disconnect transformers and switchgear on lower east building roof. This will isolate all remaining fixed power systems within the facility, including all switchgear, motor control centers, transformers, and lighting panels fed from these switchgear: 707-1, 707-2, 707-3, 707-4, 707-5, and 707-6.

Prior to completing the isolation and removal of the remaining power systems from the facility, two specific prerequisites shall be satisfied:

- The 707/707A facility must achieve criticality incredibility prior to isolation of power to Switchgear 707-4, due to the impact of that isolation on the currently required Criticality Accident Alarm System (CAAS). A significant volume of work can occur prior to the implementation of an approved Criticality Incredibility evaluation, including the re-powering of loads required for continued safe facility operation, but the complete shutdown of power to the B707 CAAS from its current source is not permissible prior to achieving criticality incredibility. A page change to the facility Authorization Basis to delete the CAAS has been approved and will be implemented upon satisfaction of the criteria identified in the Criticality Incredibility evaluation.
- All security requirements necessary to remove the hard-wired security circuitry must be satisfied/verified.

3.0 PLANNED TEMPORARY POWER GRID CONFIGURATION

A temporary power grid will be established for B707 to distribute construction power and allow the facility power grid to be de-energized. Initially, three temporary power distribution panels (TPDPs) have been installed on the second floor, to serve as construction power skids during decommissioning, as follows:

- Each TPDP will contain a 600 amp main breaker and ten 60 amp circuit breakers powering ten 60 amp welding receptacles.
- TPDPs are installed in Rooms 200, 210, and 220, and are connected to existing switchgear SWGR 707-3 and 707-6.
- The welding receptacles can be used to supply power to construction power skids (i.e., bang boards), temporary heaters, and various decommissioning tools and equipment located throughout the facility. 480/240/120V transformers on the bang boards provide 240/120V power for local use.

A temporary 13.8kV/480V transformer will be installed on the west side of Building 707, external to the facility. Temporary cables will be installed from this transformer to supply 480V power to four (4) temporary motor control centers (TMCCs), as follows:

- TMCC-1 and TMCC-2 are new components in Room 200
- TMCC East and TMCC West are located in Room 210. These were formerly MCC 2H-17 and 2G-17, and have been disconnected from the facility and modified for stand-alone use.

The TMCCs will provide power and control for facility supply and exhaust fans required for completion of D&D activities. In addition, the facility MCCs that were converted to temporary TMCCs (TMCC East and TMCC West) have sufficient capacity to power miscellaneous components such as the elevator, rollup doors, etc.

A second temporary 13.8kV/480V transformer will eventually be installed on the west side of Building 707, external to the facility. Temporary cables will be installed from this second transformer to supply

480V power to the three TPDPs described above. This will allow all facility electric power needs to be supplied from temporary transformers.

The reliability of the temporary power grid and distribution system layout is maintained to the extent possible as follows:

- The Site Power Distribution System includes a 230 kV ac ring bus that can supply power from two separate offsite sources.
- The new temporary transformer is a single source of power to the TMCCs. Connection of building loads to the temporary transformer will not require isolation of existing facility switchgear, as would be the case if existing switchgear were being reconfigured for use in the temporary power distribution system.
- Four building exhaust ventilation systems may be repowered from the temporary power system, although decommissioning activities may progress to the point where it is not practical to repower all the associated fans. The four systems that are planned to be repowered are General Dry Air System (GDAS) 2, GDAS 3, GDAS 7, and GDAS 12. GDAS 2, 3, and 7 will be supplied from TMCCs-1 and -2, and GDAS 12 will be supplied from TMCCs-East and -West. A failure of TMCCs in one room will still allow a ventilation system to remain in service, and GDAS 2, GDAS 3, and GDAS 7 are each capable of maintaining the required negative pressure in the facility. GDAS 12, however, does not have the capacity by itself to maintain the required negative pressure in the facility.
- The two exhaust fans for each of the repowered exhaust ventilation systems are powered from separate TMCCs, so that the loss of a TMCC will not result in a total loss of flow through the ventilation systems.
- Temporary cabling will be high hazard duty rated cabling, of a type that has shown significant resistance to degradation in a D&D environment, as demonstrated in the 776/777 facility.

The following table shows the current plans for re-configuring fan power sources to the temporary power distribution system, although some of these fans may be removed from service prior to being energized from temporary power:

System	Fan	MCC
GDAS 2	Supply fan F-2	TMCC-East
GDAS 3	Supply fan F-3	TMCC-East
GDAS 7	Supply fan F-7	TMCC-West
GDAS 12	Supply fan F-12	TMCC -1
FU-22 (GDAS 2 filter plenum)	Exhaust fan F-22	TMCC-2
	Exhaust fan F-23	TMCC-1
FU-23 (GDAS 3 filter plenum)	Exhaust fan F-24	TMCC-2
	Exhaust fan F-25	TMCC-1
FU-27 (GDAS 7 filter plenum)	Exhaust fan F-32	TMCC-2
	Exhaust fan F-33	TMCC-1
FU-46 (GDAS 12 filter plenum)	Exhaust fan F-63	TMCC-West
	Exhaust fan F-64	TMCC-East

4.0 TEMP POWER GRID STARTUP PROCESS

Setup and startup of the temporary power grid will be accomplished in phases, as described below.

4.1 Layout components and cable for temporary power grid.

These work activities were included in the original Fixed Power Backout Plan and are retained here because many of them have been completed. Many of these activities are changed by the revised Plan and other work packages may be included, as described later.

- T0111663 – Isolate and air gap MCC 2H-17 and 2G-17. This activity has been completed.
- T0109271-406 – Locate and secure MCC 2H-17 and 2G-17 for temporary stand alone use. Label as TMCC East and TMCC West (originally designated TMCC 2D-10 East and 2D-10 West, but the designation was shortened for simplicity). Feeder cables were routed from TMCCs to switchgear SWGR 707-3 and 707-6, but these are not being used. Feeder cables will be routed from the temporary transformer as part of the revised Plan.
- T0109271-414 – Install stop/start switches on TMCC East and West starters.
- T0109271-431 – Install two new TMCCs. Feeder cables were routed from TMCCs to switchgear SWGR 707-3 and SWGR 707-6, but these are not being used. Feeder cables will be routed from the temporary transformer as part of the revised Plan.
- T0109271-407 – Install 3 new TPDPs. Route feeder cables from TPDPs to switchgear SWGR 707-3 and SWGR 707-6 and terminate at TPDPs. This has been completed but the TPDPs will eventually be re-powered from a second temporary transformer.
- T0109271-430 – Route cables from fans and equipment to be re-powered from TMCCs to components. Cables were routed but not terminated.

Upon completion of these actions, all TMCCs, TPDPs, and feeder cables will be in place but not energized.

4.2 Energize the temporary power distribution panels (TPDPs) from installed switchgear.

This activity is substantially changed from the initial issue of the B707 Fixed Power Backout Plan, to reflect use of a temporary transformer to supply power to the TMCCs.

- T0111679 – Isolate / D&D buckets in switchgear 707-3/6 that will not be retained. This work package is hand over hand investigation to determine current status of switchgear 707-3/6, and will be performed in conjunction with T0111667. The original plan was to use SWGR 707-3 and 707-6 to re-power all remaining facility equipment, and part of this work package was used to supply 480V power to the three TPDPs. Remaining switchgear modifications to support TMCCs were not completed.

- T0111667 -- Terminate feed cables from three TPDPs at switchgear SWGR 707-3/6 and energize these power panels. This action has been completed.
- Supply D&D tooling and equipment, portable heaters, and construction power skids (bang boards) from the TPDPs. These actions have been completed and/or are ongoing.

Upon completion of these actions, the three TPDPs will be energized and supplying power to other facility users, and ventilation fans and other facility equipment will still be powered from the existing electrical power distribution system.

4.3 Install a temporary power source for 480V temporary motor control centers.

This activity was not included in the original Plan.

- Install a temporary transformer, approximately 1500 KVA, on the west side of Building 707, external to the facility.
- Install feeder cables between the temporary transformer and the four TMCCs installed previously, including a disconnect switch for each TMCC. Energize the TMCCs.

Upon completion of these actions, ventilation fans and other facility equipment will still be powered from the existing electrical power distribution system, the four TMCCs will be energized from the temporary transformer, and the three TPDPs will be energized from SWGR 707-3 and 707-6, and will supply power to other facility users.

4.4 Re-feed facility equipment from the TMCCs.

This activity is similar to the original Plan, except that some of the fans that were originally planned for re-powering are no longer required for the remaining D&D activities. The equipment listed below reflects current plans, although D&D activities are continuing and it may not be practical to repower some of these fans if their removal is imminent. Engineering will review fan repowering plans to ensure that building confinement pressure differential can be maintained as required by LCO 3.1.1.

- Convert supply fans F-2, F-3, F-7, and F-12 to the temporary power grid.
- Convert exhaust fans F-22, F-23, F-24, F-25, F-32, F-33, F-63, and F-64 to the temporary power grid.
- Convert miscellaneous equipment to the temporary power grid, including the elevator motor and rollup door motors.

Upon completion of these actions, ventilation fans and other facility equipment will be powered from the temporary power grid and the three TPDPs will be energized from the existing electrical power distribution system via SWGR 707-3 and SWGR 707-6. After the facility is designated "Criticality Incredible, Diesel Generators EGEN 707-1 and EGEN 707-2, and the UPS can then be removed from service.

4.5 Install a second temporary power source for the TPDPs.

This activity was not included in the original Plan.

- Install a second temporary transformer on the west side of Building 707, external to the facility. This transformer will likely come from the Building 776/777 project, after it is no longer needed.
- Install feeder cables between the temporary transformer and the three TPDPs installed previously. Energize the TPDPs.

Upon completion of these actions, all facility equipment and D&D tooling and equipment will be supplied from temporary power. The existing switchgear and transformers on the lower east building roof may then be de-energized and removed from the facility. These transformers contained PCBs and the transformer area is a previous PCB spill area. After removal of the transformers, this area can be remediated in accordance with applicable procedures and requirements.

5.0 BUILDING 707 FIXED POWER SHUTDOWN AND BACKOUT PROCESS

The goal of the fixed power backout process is to remove power to facility equipment in a controlled manner that will allow MCCs, EMCCs and other electrical panels to be removed from facility walls. This will allow the abatement of asbestos containing materials from the sheetrock wall surfaces. In addition, once all installed electrical equipment and cables are de-energized, then the potential for electric shock to dismantlement crews will be substantially reduced and bulk strip-out of electrical components can be performed without the need for hand-over-hand walk downs.

The controlled removal of power from facility equipment includes the following considerations:

- Prior to declaring the CAAS detection and alarm system and the Security system out of commission, shutting down the existing electrical power distribution system would involve significant rewiring to maintain operability of these systems, at considerable expense. Therefore, the switchgear, EMCCs, and lighting panels that support the CAAS will remain energized under the existing electrical power distribution system until after the facility has been declared Criticality Incredible and any associated actions have been implemented. Also, any electrical panels associated with the Security system will not be removed from service until after the Security status of the facility has been downgraded.
- The control circuitry for building ventilation exhaust fans runs through the SOE control room, including controls that sequence loads on the Standby Diesel Generators (EGENs) after a loss of power. Although the facility no longer relies on remote fan controls or on the ability of the EGENs to automatically pick up essential equipment loads in the event of a loss of power, the status of fan operations would be indeterminate if these control circuits were merely abandoned. Therefore, the ventilation fan controls in the SOE control room will be maintained until the fans are transferred to the temporary power grid. Fan controls are supplied with uninterruptible electrical power from the UPS, to allow safe shutdown of these systems in the event of a loss of power. After the fans are transferred to the temporary power grid, fan controls will no longer be functional and the UPS will be removed from service. The UPS is maintained under AC 5.6.1, and permanently removing it from service requires appropriate 7 day notification in accordance with AC 5.6.1.3.

- The temporary power source does not include supply/exhaust fan interlocks, which are currently maintained under AC 5.6.1. Transferring Zone II ventilation system supply or exhaust fans to a temporary power source will require appropriate 7 day notifications in accordance with AC 5.6.1.3.
- Building 708 includes various support equipment and components, many of which are electrically supplied by transformers that are independent from Building 707. Breathing air compressors will be maintained as long as workers need supplied air, or until facility air requirements can be supplied from the breathing air trailer. Breathing air monitoring instruments are being installed in Building 708 so that this equipment can be operated locally. If required, equipment supplied from Building 707 transformers may be re-powered from Building 708 power sources.
- EGEN-1 and EGEN-2 currently supply backup power to B707 and B708. After Criticality Incredibility and after facility fans are re-powered from the temporary power grid, EGENs-1 and -2 will be taken out of service, isolated, and air gapped. The diesel generators are maintained under AC 5.6.1, and permanently removing them from service will require appropriate 7 day notifications in accordance with AC 5.6.1.3.
- EGEN-3 is located in B708 but it supports Protected Area security systems for other parts of the site. The operating status of EGEN-3 has been indicated in the B707 control room, although this remote indication is not required by any AB document. Wiring for this indication will be isolated and EGEN-3 will remain operational until it is no longer needed.
- The control and monitoring circuitry between control areas in B707 and equipment in B708 will be isolated, and equipment will be controlled locally as needed.
- Building 731 houses receiving / holding tanks for B707 plenum drains and other process liquid drains, and includes transfer pumps and a ventilation fan. This equipment will not be re-powered. Any liquid that drains into the tanks may be removed via a portable pump and tanker, and a portable fan (e.g., air mover) will be installed if needed.
- Building 707 fire riser flow alarms are powered from Building 707 and utilize the Simplex fiber optic communication loop. Fire riser flow alarms will be replaced with battery powered wireless transmitters. The Simplex fiber optic communication loop will be reconfigured to remove Building 707 from the loop.
- An emergency power panel in Building 750 (EPD 1A-105) is fed from Building 707 (SWGR 707-4 via EMCC 2C-6). This panel provides emergency power for the B707 CAAS, Fire Protection alarm panels, and other miscellaneous loads in the courtyard area. The emergency panel will not be isolated until after B707 is declared Criticality Incredible, however RISS will convert the fire protection alarms to a battery powered wireless configuration, so that after Criticality Incredible / Security Downgrade, the panel can be isolated with no impact.
- Building 778 interfaces with Building 707. Power connections between the two buildings will be isolated as necessary. The Simplex fire alarm connections from B707 to B778 will remain in service until the flow transmitter is converted to a wireless system.
- After Criticality Incredibility and Security Downgrade, all remaining Building 707 loads will be transferred to the temporary power system. The existing 13.8kV/480V transformers will be isolated

and air gapped on the 13.8 line side and on the 480V load side. This will de-energize all Building 707 facility equipment not on the temporary power grid, including criticality and security alarms.

- After Criticality Incredibility and Security Downgrade, the LS/DW system will be supplied with power from one of the temporary bang boards. The LS/DW system is currently maintained under AC 5.6.1 and replacing it with a temporary system, such as a transmitter with wireless receiver / speaker carts, requires appropriate 7 day notifications in accordance with AC 5.6.1.4. After the LS/DW is no longer required for CAAS alarms, it will be maintained under several Safety Management Programs such as Emergency Preparedness, Fire Protection, Radiological Protection, and Conduct of Operations.
- All conduits penetrating Building 707 will be isolated and air-gapped. After Criticality Incredibility and Security Downgrade, this will include CAAS and security systems.
- Power panels inside Building 707 will be air gapped after their loads are transferred to temporary power or after their loads are determined no longer required. This action will confirm electrical isolation of the facility.

6.0 Notifications to DOE-RFFO prior to plan execution

Formal AC 5.6.1 notification to DOE-RFFO is required prior to execution of this plan, as numerous SSCs listed in AC 5.6.1.3 and 5.6.1.4 are impacted and are noted in Sections 4 and 5 of this plan. The 707/776/777 Closure Project Facilities Manager will provide documented notification to the DOE-RFFO following approval of the plan and completion of the necessary Nuclear Safety assessment of the plan and its impacts.

Building 707 Fixed Power Back-out Plan

Nuclear Safety Assessment

Revision 1

December 2003

Sam W. Chesnutt

QEV – S. W. Chesnutt

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Approval – Nuclear Safety Manager – M. A. Carman

REVIEWED FOR CLASSIFICATION/UCNI
By DAN HEPLER (UNO)
Date 12/31/2003

Introduction

The Building 707 Facility Complex at Rocky Flats Environmental Technology Site (RFETS) is undergoing decommissioning. The removal of structures, systems, and components (SSCs) has proceeded to a point that requires the electrical isolation and removal of electrical power distribution equipment. Motor control centers (MCCs) and other electrical panels must be removed from building walls to support abatement of asbestos from sheetrock installations, and equipment and conduits must be de-energized to support their safe removal from the facility.

The Building 707 Fixed Power Back-out Plan (Reference 1) describes how existing installed power supplies will be disconnected and select equipment will be re-powered using temporary equipment. This Nuclear Safety Assessment evaluates the Revised Fixed Power Back-out Plan, effective December 2003, and supersedes earlier assessments. The revised plan includes the following actions:

- Install temporary power distribution panels (TPDPs) to supply power from installed switchgear SWGR 707-3 and 707-6 to decommissioning tooling, heaters, air movers, and other equipment
- Install temporary 13.8kV / 480V transformer on west side of Building 707
- Energize four temporary motor control centers (TMCCs) from the temporary transformer
- Transfer building supply and exhaust fans one at a time to TMCCs
- Remove standby diesel generators and uninterruptible power supply from service
- Install second temporary transformer on west side of Building 707 to supply temporary power distribution panels (TPDPs)
- Remove installed electrical power distribution equipment after it is no longer needed

The revised power back-out plan allows individual MCCs and Emergency MCCs (EMCCs) to be de-energized and removed as soon as they are no longer supplying power to equipment performing safety functions. The MCCs and EMCCs must be removed from building walls to support abatement of asbestos containing materials in the sheetrock installations. In addition, the revised plan allows the main transformers and switchgear on the lower east building roof to be removed. This area is a previous PCB spill area and it is scheduled to be remediated prior to building demolition.

The temporary power distribution system includes a single transformer and temporary cabling to supply power to remaining ventilation equipment in the facility. This installation has less redundancy than the existing power distribution system, however, facility activities are aggressively removing material at risk (MAR) so that the risks associated with analyzed accident scenarios are continually being reduced.

Building 707 electrical power supports the operability of Heating, Ventilating, and Air Conditioning (HVAC) System exhaust fans, Life Safety/Disaster Warning (LS/DW) System, Fire Detection and Alarm System, and the Criticality Accident Alarm System (CAAS). Building 707 Decommissioning Basis for Interim Operation (DBIO)

Administrative Control AC 5.6.1 allows certain equipment items to be removed and/or replaced with temporary equipment, provided appropriate notifications are provided to DOE-RFFO. This Nuclear Safety Assessment provides technical justification to support AC 5.6.1 notifications associated with the Building 707 Fixed Power Back-out Plan. This assessment is based on the criteria in 10 CFR 830, *Nuclear Safety Management*, and the Technical Safety Requirements (TSRs) in the Building 707 DBIO.

Discussion

The Power Back-out process transfers all equipment important to safety to temporary power supplies, so that installed MCCs, EMCCs and other equipment can be safely removed. MCCs, EMCCs and associated equipment and wiring must be removed to support the abatement of asbestos in sheetrock walls behind this equipment. Also, the extensive cabling and conduits that run throughout the facility interfere with the removal of ducting and other overhead items and they need to be removed.

In addition, installed wiring, conduits and electrical equipment should be de-energized so that workers can safely cut through walls, dismantle equipment, and remove obstructions without the risk of running into live electrical circuits, and without needing to perform hand-over-hand walkdowns to verify conduit routing and circuit boundaries.

This discussion addresses the following activities and considerations associated with the Power Back-out process:

- Requirements of the temporary power system and disposition of existing equipment
- Electrical power supplies – existing and proposed
- Electrical power distribution to components – existing and proposed
- Reliability and redundancy considerations
- TSR requirements – Configuration Management

A. Requirements of Temporary Power Distribution System and Disposition of Existing Equipment

Facility equipment items that need to be re-powered to support the TSRs are limited. Each TSR LCO and Bases identifies the required functions, essential support systems, and non-essential systems that are not required for LCO compliance. Equipment items in each of these categories are identified as follows:

A.1 LCO-Related Equipment

The following equipment items are required to perform TSR LCO functions and are considered LCO-related equipment:

- HVAC Exhaust Fans
HVAC exhaust fans are required to support LCO 3.1.1, *Confinement Pressure Differential*. Zone II building exhaust fans will be re-powered to maintain building confinement differential pressure in accordance with LCO

requirements. Exhaust fans may be re-powered in filter plenums FU-22, FU-23, FU-27, and FU-46, depending on the progress of D&D activities. Air flow within the facility and into radiological containment areas is maintained in accordance with the Radiological Protection Safety Management Program (SMP). Module walls are being removed, which supports open ventilation communication within the facility, and portable air movers may be used where needed for contamination control purposes.

As decommissioning activities progress, Engineering and facility operations personnel will adjust system alignments and fan operations to maintain confinement pressure differential as required.

- HVAC Exhaust HEPA Filters
HVAC exhaust HEPA filters are required to support LCO 3.1.2, *Confinement Exhaust Filtration*. These filters do not require electrical power.
- Fire Sprinkler Systems
Fire suppression sprinkler systems are required to support LCO 3.2, *Fire Sprinkler Systems*. Fire suppression sprinkler systems do not require electrical power. Fire flow alarms are not credited in the DBIO accident analyses and are discussed below as Non-essential Equipment.
- Plenum Deluge Systems
Plenum deluge systems are required to support LCO 3.3, *Plenum Deluge Systems*. Plenum deluge systems are manually actuated in Building 707/707A and do not require electrical power. Plenum deluge heat detectors and alarms are not credited in the DBIO accident analyses and have been removed from service in accordance with AC 5.6.1.
- CAAS
A criticality accident alarm system is required to support LCO 3.4, *Criticality Accident Alarm System (CAAS)*, and will be maintained operable using existing power supplies until Building 707/707A is declared "Criticality Incredible." A TSR page change has been approved to delete the CAAS LCO and will be implemented after the pre-requisite conditions are met as identified in the applicable Criticality Safety Evaluation. The TSR page change also deletes AC 5.7, *Inadequate CAAS Annunciation*, and revises AC 5.6.1 to delete the CAAS from the list of equipment that requires notification to DOE-RFFO prior to removal or replacement with temporary equipment.
- EGEN-3
Diesel Generator EGEN-3 is not required by the Building 707/707A DBIO but it is currently required by the Site Safety Analysis Report (Site SAR), SEC 4, *Site Alarm System*. EGEN-3 is located in Building 708 and provides emergency power for the alarm station in Building 765 and for the Site's Perimeter Intrusion Detection and Alarm System (PIDAS) data collection facility in Building 764. The provision of emergency power to the alarm station supports Site fire alarms that pass through that facility and is described in Site SAR Section 7.7.3, *Bases for Site Engineered Controls*.

EGEN-3 operational conditions have been monitored in the Building 707 SOE Control Room, however, this monitoring connection is being disconnected. EGEN-3 has local monitoring instruments that will continue to be monitored by SOEs during their normal rounds. Removal of indication from the control room will not affect generator function or performance.

EGEN-3 will remain in service until its functions can be provided in some other manner or until it is no longer required by the Site SAR.

A.2 *Essential Support Systems*

The following equipment is identified in the LCO Bases as Essential Support Systems:

- Electrical power system
Electrical power is required to support LCO 3.1.1, *Confinement Pressure Differential*. Power will be supplied from a temporary transformer using newly-installed temporary power cables as described below. Electrical power also supports LCO 3.4, CAAS, which will be deleted after the facility has satisfied the requirements for "Criticality Incredibility."
- LS/DW System
The LS/DW system supports LCO 3.4, CAAS, and also supports various SMPs, such as Emergency Preparedness, Fire Protection, Radiological Protection, and Conduct of Operations, to notify workers of emergency conditions and protective actions. After the facility has satisfied the requirements for "Criticality Incredibility," the LS/DW system will be maintained in accordance with the applicable SMPs. The LS/DW system will be changed to a radio-based system and its transmitter(s) will be re-powered using temporary cables. Radio headsets and portable carts may be used to provide notification capability to workers, and the existing hard-wired LS/DW speakers and LS/DW batteries will be disconnected.

DOE-RFFO has indicated that directions are being considered to keep the LS/DW system under the Configuration Management requirements of AC 5.6.1. In this case, changes to the LS/DW system will be processed consistent with AC 5.6.1, and will be addressed in separate documentation.

A.3 *Non-essential Equipment*

Non-essential equipment that uses electrical power and that is identified in the LCO Bases as not required for LCO compliance includes the following:

- Diesel Generators
EGEN-1 and EGEN-2 will be removed from service after Criticality Incredibility and after the ventilation fans have been re-powered from the temporary power distribution system. EGEN-1 provides backup electrical power for selected equipment in Building 707 and EGEN-2 provides backup power for Building 708 equipment.

The diesel generators may be removed from service after notifying DOE-RFFO in accordance with AC 5.6.1.3, because the DBIO accident analysis does not rely on backup power. The Bases for LCO 3.1.1, *Confinement Pressure Differential*, state that the accident analysis assumes a relatively unreliable HVAC system to account for changes in equipment and operating modes during the decommissioning project. Also, the Bases for LCO 3.4, CAAS, state that the CAAS is not operable if the CAAS is operating on battery backup or diesel generator power. Therefore, the diesel generators are not required for the duration of the project and may be removed after notifying DOE-RFFO in accordance with AC 5.6.1.3.

- UPS
The UPS system will be removed from service after ventilation fans have been re-powered from the temporary power distribution system. The UPS supported automatic HVAC controls and differential pressure monitoring. These functions are no longer in use because the HVAC systems have been placed in the manual control mode and building differential pressure monitors no longer have remote alarms. The UPS provided at least 15 minutes of electrical power to HVAC control panel instruments and controls, including the Data Acquisition and Control System (DACS), to support an orderly shutdown of operations in the event of a station blackout. The DACS and the UPS are not credited in the DBIO accident analysis.
- Fire Detection and Alarm System
The fire detection and alarm system includes fire sprinkler flow alarms and plenum deluge heat detector alarms that are not credited in the DBIO but are maintained through the Fire Protection SMP. The fire detection and alarm system is being modified to use a wireless alarm system that depends on battery power alone and does not require fixed electrical power. Notification was provided to DOE-RFFO, and concurrence was obtained, regarding the change to wireless flow transmitters and also regarding the removal from service of plenum deluge heat detector alarms, consistent with AC 5.6.1.3.
- Facility heaters
Facility heaters are not specifically identified in the LCO Bases but are implicitly required to provide freeze-protection on water-filled fire sprinkler systems for LCO 3.2, *Fire Sprinkler Systems*, and LCO 3.3, *Plenum Deluge Systems*. Temporary heaters will be provided.

A.4 Other Equipment

Other equipment items will be re-powered for worker safety, although they are not identified in the TSR LCOs, including the following:

- Temporary Lighting
- Portable SAAMs/CAMs
- Air movers for radiological containments

B. Electrical Power Supplies

B.1 Existing Electrical Power Supplies

There are essentially three electrical power sources that serve the Building 707 facility complex:

1. Site power from offsite sources via a Site distribution network through Substation 517/518 (115 kV / 13.8 kV) located northwest of Building 707, and six building transformers (13.8 kV / 480 V) located on the lower building roof on the east side of Building 707. Substation 679/680 (661/675) southwest of Building 707 supplies some of the equipment in Building 708. Two independent offsite transmission lines supply the onsite ring bus distribution network
2. Uninterruptible Power Supply (UPS) from batteries to selected loads, including HVAC instruments and controls, and the Data Acquisition and Control System (DACS).
3. Diesel generators to selected loads, including certain HVAC exhaust fans, an instrument air compressor, LS/DW system equipment, Fire Detection and Alarm System, radiation monitoring equipment, and lighting.

Site power is supplied to Building 707 through six transformers (707-1 through 707-6) and four switchgear units (SWGR 707-1/2, SWGR 707-3/6, ESWGR 707-4, and SWGR 707-5). Additional switchgear supplies the auxiliary equipment in Building 708. ESWGR 707-4 is capable of supplying standby electrical power from diesel generator EGEN-1 to selected loads and motor control centers, and EGEN-2 supplies loads in Building 708.

Building 778, located between Buildings 707 and 776/777, is part of the Building 707 facility complex and was previously supplied electrical power from Building 776/777. As part of Building 776/777 decommissioning activities, the electrical supply for Building 778 has been reconfigured and the building is supplied by temporary transformers connected to site power. [T0111263, USQD-RFP-03.1218-SWC]. There are also connections from Building 707 that supply mainly office areas and will be repowered or isolated as needed.

B.2 Proposed Temporary Electrical Power Supply

The facility is proposing to reconfigure the Building 707 electrical power distribution system to permit the removal of installed equipment to the extent possible. The proposed configuration will install a temporary 13.8 kV / 480 V, 1500 kVa transformer on the west side of Building 707, external to the facility. This transformer will supply power from the 517/518 substation to four temporary motor control centers (TMCCs) inside the facility. An additional temporary transformer will be installed at a later date to supply three temporary power distribution panels (TPDPs) in the facility. This second transformer will also be located on the west side of the building, external to the facility. Power will be routed from the transformers through temporary cabling to systems and equipment that continue to require electrical power.

Power will be distributed from the temporary transformers to four TMCCs and three new TPDPs located on the second floor of Building 707. Two of the TMCCs are facility MCCs modified for stand-alone use and relocated to Room 210 and two TMCCs are new units located in Room 200. One TPDP is installed in each of Rooms 200, 210, and 220. Each TPDP will provide 480V, 60 amp service. New temporary power cables will be routed from the TMCCs to HVAC fans, and from the TPDP units to heaters and temporary distribution panels (bang boards, which include transformers to supply 120/208 V power), and other equipment as needed to support decommissioning activities. Temporary lighting will typically be supplied from bang boards.

New temporary cabling will be installed throughout the facility to supply power to required systems and components. New cabling will be high hazard duty rated cable that is resistant to physical damage that could occur during D&D activities, and will not be routed in conduit. Since existing electrical power cabling was installed in conduits, and to a limited extent some cable trays, the use of temporary cabling will permit easy identification in the field of which cables and components are energized and should not be tampered with during the ongoing removal of equipment from the facility.

In addition to the power distribution reconfiguration, the proposed changes will result in isolation and permanent removal from service of the facility diesel generators and UPS. After building cooling requirements have been sufficiently reduced, all auxiliary cooling equipment in Building 708, the process cooling water pumps, and cooling tower will be removed from service. This will permit the decommissioning and removal of these components.

C. Electrical Power Supply Distribution to Components

C.1 Existing Component Electrical Power Supply Configuration

The safety significant equipment items that currently require electrical power are the HVAC exhaust fans, CAAS, LS/DW System, and Fire Detection and Alarm System.

The HVAC exhaust fans are currently supplied power from either ESWGR 707-4 or SWGR 707-3/6. These buses are normally aligned to assure that with the loss of a bus or feed from the site power system, the required safety functions can continue to be satisfied. In addition, if a loss of power occurs, the facility diesel generator can be aligned to supply power to select motor control centers from the ESWGR 707-4 switchgear and continue to satisfy the requirements of components performing credited functions. HVAC systems in Building 707 have been converted to rely on manual damper control.

Supply fans are equipped with interlocks that will cause the associated supply fan to trip if a loss of differential pressure is sensed in the area being supplied by the fan.

Building 707 confinement differential pressure monitoring instrumentation has been modified so that the facility SOEs observe and record differential pressure readings from eight instruments located around the periphery of the building. No credited automatic alarm or monitoring functions remain.

The CAAS, LS/DW System, and Fire Detection and Alarm System are currently supplied power from ESWGR-4 and each system has battery backup power supplies.

C.2 Proposed Component Electrical Power Supply Configuration

The proposed temporary power distribution system will provide power from the site AC ring bus, through a single temporary transformer, through temporary cabling, to the remaining HVAC exhaust fans and other components that continue to assure the safety of the facility.

The new electrical power supply configuration to the HVAC supply and exhaust fans will require manual operation of the fans and will bypass the original control circuitry. Fans will be started and stopped by SOEs utilizing local controls. The fan dampers are already operated manually to control pressures in the facility. The new configuration will also remove the supply fan interlock feature. The new power supply configuration will ensure that the two HVAC exhaust fans associated with each exhaust filter plenum will each be supplied from a different TMCC. Loads will be distributed between the new TMCCs so that if any one TMCC is lost, power will still be supplied to at least one exhaust fan in each of the remaining ventilation systems. In this manner, the remaining exhaust fans will be able to maintain required building confinement pressure differential with minimal SOE actions to adjust ventilation systems.

Facility differential pressure monitoring will continue to be performed by manually reading differential pressure instruments located outside on the perimeter of Buildings 707/707A on a 4-hour surveillance interval, in accordance with LCO 3.1.1.

The Fire Detection and Alarm System will be replaced with wireless battery-powered transmitters that will send flow alarm signals to the Fire Dispatch Center. Local fire alarms will be replaced with LS/DW announcements.

The CAAS will be removed from service because the facility will be declared "Criticality Incredible." After the facility has been declared "Criticality Incredible" and the CAAS LCO has been removed from the Building 707 TSRs, the LS/DW System will be replaced with a radio-based system. This radio-based LS/DW system will be supplied with temporary power and will use portable speaker carts, radio headsets, and hand-held radios, as applicable.

D. Reliability and Redundancy Considerations

The diesel generators, UPS, and other electrical system components must be decommissioned and removed to support future decommissioning and demolition (D&D) activities. Removal of the diesel generators and UPS will remove power supplies that are independent and diverse from the offsite power system. However, diversity in power supplies is not credited in the DBIO accident analyses. The Bases for LCO 3.1.1 states that diesel generators and the UPS "contribute to reliability or ease of operation [of the HVAC systems]. However, in order to support the entire project duration, the accident analysis assumes a relatively unreliable HVAC system (loss of Zone I or Zone II pressure differentials is anticipated) specifically to account for the modifications required

to dismantle HVAC equipment, operating in manual modes, and use of temporary electrical systems and air movers.”

The Building 707 DBIO accident analysis in Section 6.2.5 evaluates a Station Blackout due to a loss of external building power. The scenario as further described in calculation CALC-707-01.1081-SWF (Reference 3) assumes a loss of the ventilation system and other radiological confinement support systems. Negative pressure confinements are assumed to go positive spreading radioactive contamination, although only 10% of material is assumed to be re-suspended during low airflow conditions. The accident analysis does not credit redundant power supplies, the diesel generators, UPS system, or supply fan interlocks for the station blackout event as either a credited control or as defense-in-depth (DBIO Table 6.2.5-1B, *Accidents Bounded by Scenario 6.2.5.1(Natural Phenomena Hazard – Earthquake)*). The station blackout analysis evaluates this as an *Anticipated* event and is Risk Class III to the public and worker with no credited or defense-in-depth controls. Therefore the permanent removal of these electrical power systems will not affect the frequency or consequences of any accident previously analyzed for the facility. Also, no change to the TSRs is required to support the proposed reconfiguration of the facility power systems.

The use of temporary cabling has little or no effect on overall reliability of the power system based on the robust design of the cable being used to power equipment in the facility. New cabling will be high hazard duty rated cable that is resistant to physical damage that could occur during D&D activities. In addition, the use of different cabling, not routed in conduit, will help D&D workers readily identify equipment and cables that are energized and should not be tampered with during the ongoing removal of SSCs from the facility. The new power distribution system is simpler than the original configuration, has fewer components to fail, relies on new, refurbished, or inspected used parts, and will be tested before placing in service.

TSR requirements do not require specific fan configurations, only maintaining the pressure differential. Removal of control loops and interlocks, and manual operation of fans removes some failure modes associated with automatic fan operation. This simplified control scheme will also simplify the required SOE response actions if an upset condition occurs. The failure modes for the re-powered equipment existed with the original fan configuration. Therefore, no increase in probability or consequences or new type of malfunction of this equipment is expected.

TSR Surveillance Requirement SR 4.1.1.1 requires a 4-hour surveillance to verify that the pressure differentials in the areas required are negative with respect to atmosphere. This surveillance requirement is currently being implemented and will not be affected by the proposed activities associated with re-powering the facility.

E. TSR Requirements – Configuration Management

TSR AC 5.6.1, *Configuration Management Requirements*, includes several requirements for tracking and managing configuration changes that are applicable to the Building 707 Fixed Power Back-out Plan. This Nuclear Safety Assessment provides technical justification to support the DOE-RFFO notification requirements associated with AC 5.6.1, as follows:

AC 5.6.1.3, *Non-LCO Equipment Maintenance and Removal*, requires that DOE-RFFO be notified at least 7 calendar days prior to permanently, intentionally shutting down or removing a list of systems or functions/components that includes the following:

- Diesel Generators
- UPS System
- Standby or Redundant Exhaust Fans
- Supply / Exhaust Fan Interlocks
- Sprinkler system waterflow alarms / Fiber-optic and SIO Loop (i.e., Fire Department notification)
- Plenum Deluge system heat detectors / Fire Alarm Control Panel / Fiber-optic Loop – notification that these heat detectors are being removed from service was previously provided
- CAAS Panel Batteries – will be deleted by CAAS page change
- LS/DW Batteries – will be deleted by CAAS page change
- Remote CAAS Alarms / SIO Loop – will be deleted by CAAS page change

AC 5.6.1.4, *Safety Equipment Replacement*, requires that DOE-RFFO be notified at least 7 calendar days prior to replacing existing equipment performing safety functions or listed essential support equipment that includes the following:

- Electrical Power
- Domestic Cold Water System
- LS/DW System

Nuclear Safety Assessment

This assessment evaluates the subject Power Back-out Plan to determine whether the proposed activities will involve an Unreviewed Safety Question as identified in 10 CFR 830, *Nuclear Safety Management*, as follows:

“Unreviewed Safety Question (USQ) means a situation where:

- (1) The probability of the occurrence or the consequences of an accident or the malfunction of equipment important to safety previously evaluated in the documented safety analysis could be increased;
- (2) The possibility of an accident or a malfunction of a different type than any evaluated previously in the documented safety analysis could be created;
- (3) A margin of safety could be reduced; or
- (4) The documented safety analysis may not be bounding or may be otherwise inadequate.”

Individual work documents will be evaluated in accordance with procedure PRO-664-NSP-USQP, *Unreviewed Safety Question Process*, at a later time.

The proposed temporary power distribution system does not include redundant transformers and may be more prone to a loss of power than the existing power distribution system. However, this is acceptable for the remaining activities and risks in

the project and is consistent with the DBIO analysis. DBIO Accident Analysis Table 6.2.5-1B identifies a Station Blackout (Scenario 707-6-53) as an *anticipated* event with unmitigated and unprevented Risk Class III to both the public and worker. The Bases for LCO 3.1.1, *Confinement Pressure Differential*, provide several statements that acknowledge that decommissioning activities were anticipated to eventually reach a point where electrical supplies would be less reliable:

- Page TSR-22, Support Systems: "Electrical power will be maintained in accordance with contractor procedures until the LCO is discontinued. Configuration changes may be necessary as D&D progresses. Auxiliary or temporary configurations or systems may be required."
- Page TSR-26, Not Required: "...At some point, [ventilation] systems will be placed in manual operation and adjusted as necessary as ductwork, controllers, and walls that define the zones are removed. The system will be configured in a manner not conducive to interlocks..."
- Page TSR-27, Not Required: "To account for the *reduction in reliability* associated with the modifications required to dismantle HVAC systems and use of temporary systems, the accident analysis anticipates pressure differential upsets." (emphasis added)

Decommissioning activities in Building 707 have progressed to the point where the risks due to remaining material in the facility are substantially reduced. The transition to temporary power is currently planned to be performed as follows:

- Install first temporary transformer January 2004
 -- energize TMCCs
- Re-power ventilation fans January, February 2004
 -- one at a time
- Remove EGENs, UPS from service March 2004 (after Crit Incredible)

The supply fan / exhaust fan interlock for each ventilation system will be discontinued as the fans are disconnected from their current power supply. This interlock currently shuts down a supply fan if one or more of its associated exhaust fans is lost, to avoid pressurizing the affected area. As module walls and doors are being removed, Building 707/707A is becoming a large area with open communication between areas covered by different ventilation systems. The loss of an exhaust fan will not have as significant an effect on overall building differential pressure as was the case when ventilation systems supported individual modules or groups of modules. SOEs will make adjustments to flows and fan alignments as necessary and if building differential pressure cannot be maintained, then the Required Actions in LCO 3.1 will be implemented. As noted above, the Bases for LCO 3.1.1 state that the accident anticipates pressure differential upsets.

Redundancy in power supplies will be maintained until the last fan is transferred to temporary power, currently scheduled for February 2004. By the time redundancy in power supplies to the ventilation exhaust fans is lost, remaining risks in the building are expected to be substantially reduced, as follows:

- Criticality Incredibility Expect to achieve in February 2004
- Container repackaging Expect to complete in February 2004
- Removal of holdup Expect to complete in March 2004
 - Zone I ducts, enclosures
- Facility MAR inventory < 900 grams Expect to achieve in April 2004
 - Hazard Category III condition

Remaining activities will include:

- Asbestos abatement Scheduled completion in May 2004, but may extend several months
- Concrete shaving Expected through September 2004
 - minor airborne hazard
- Zone II removal Expected through July 2004, may extend through concrete shaving
- Final Status Survey Expect through September 2004
 - negligible remaining risk

Although current schedules may be changed to accommodate facility conditions and changing work priorities, the above summary of work activities illustrates that the Building 707 Closure Project is rapidly reducing the amount of MAR and remaining risks in the facility. This reduction in MAR and in the associated risks supports reduced reliability in the electrical power distribution system. Furthermore, the reduction in reliability is consistent with the DBIO and does not increase any analyzed risks or reduce any margin of safety as described in the Bases for the TSRs.

The proposed changes will not increase the frequency of any accident or malfunction of equipment important to safety previously evaluated because the affected equipment is either not credited, or if credited (i.e. the fans), will remain capable of performing its design and safety function as described in the AB. The diesel generator, UPS and supply fan interlocks are not credited in the existing analyses and their presence or removal has no affect on the frequency of previously analyzed accidents. Fan operation is not an accident initiator in the DBIO. Electrical distribution is a potential accident initiator (fires). The new distribution system components are equivalent or more robust than the original design. Installation will be per site standards and electrical code requirements to ensure integrity and to minimize the potential for a fire.

The proposed changes will not increase the consequences of any accident or malfunction of equipment important to safety because the safety-related equipment affected by the proposed changes will remain capable of performing their required accident mitigative functions. The selected exhaust fans have been evaluated by Engineering and determined adequate for maintaining facility negative pressure differential to ensure filtered exhaust air (Engineering Calculation OTHER-707-VEXH-000523, Reference 4). Engineering and SOEs will adjust system flows and supply fan / exhaust fan configurations to maintain required building confinement differential pressures with the re-powered equipment. Equipment loads will be distributed between TMCCs so that even in the event of a loss of one TMCC, the remaining fans will be able

to maintain building confinement differential pressure with minimal SOE actions to adjust ventilation systems. The existing differential pressure instrumentation will ensure the requirements of TSR SR 4.1.1.1 are maintained. Electrical power cable will be robust and designed for high hazard use. The diesel generator and UPS are not credited in the existing analyses and their presence or removal has no effect on the consequences of previously analyzed accidents.

In addition, the consequences of accidents analyzed in the DBIO are expected to be reduced by the ongoing reduction in the amount of MAR remaining in the facility. This value has been significantly reduced from that evaluated in the DBIO, and will continue to be reduced. The annual update to the DBIO revised the accident scenarios to reflect reduced MAR values. Further analysis to reflect recent and projected MAR reductions is not provided, but the reduction of MAR described above (e.g., total inventory less than 900 grams by April, 2004) is qualitatively evaluated to show that the consequences of accidents are not increased by the proposed temporary power installation.

The proposed changes will not create the possibility of a new accident or malfunction of equipment important to safety because the new electrical power supply system capabilities and equipment are similar to those of the existing system. No substantially new or different types of components will be utilized that will create the possibility of a new failure. Operation of fans in manual mode and elimination of original control loops will remove some failure modes. The removal of supply fan / exhaust fan interlocks creates the potential for supply fans to operate when the exhaust fans are shut off. This failure mode is consistent with the DBIO accident analysis which anticipates pressure differential upsets. As noted above, these upsets are anticipated to account for the reduction in reliability associated with the modifications required to dismantle HVAC systems and the use of temporary systems. The Bases for LCO 3.1.1 acknowledge that the supply fan / exhaust fan interlocks will not be maintained at some point in the project, and states that fan configuration and HVAC controls are not required for LCO compliance. The potential duration of differential pressure upsets is minimized by the performance of 4-hour surveillances in accordance with LCO 3.1.1. Remaining failure modes are the same as those that exist in the existing electrical distribution and fan control designs.

The margin of safety of the electrical power system is not explicitly identified in the facility TSRs or Bases, however the new temporary power system will remain capable of providing its required functions and reliability as assumed in the DBIO accident analyses. The remaining exhaust and supply fans will be operated and monitored to ensure that any unexpected differential pressure upsets are identified and corrected in a timely manner, consistent with LCO 3.1.1.

After the facility has been designated "Criticality Incredible," the DBIO will be revised to delete CAAS descriptions from Chapter 2 and CAAS requirements from TSR LCO 3.4 and AC 5.7. Also, DOE-RFFO notification requirements regarding LS/DW system changes will be revised accordingly in the TSR Configuration Management controls in AC 5.6. No other changes to the facility TSRs are required by the proposed changes.

Based on the Building 707 Fixed Power Back-out Plan for removing the installed electrical power system, and the discussion above, the proposed activity is consistent

with the facility authorization basis and an Unreviewed Safety Question will not be created. DOE notification is required as described in the facility TSR 5.6, *Configuration Management*.

Conclusion

As described in Section 4.5 of the DBIO, decommissioning the facility ultimately requires that all equipment, systems, and structures be dismantled and removed or demolished. The proposed installation of a temporary electrical power distribution system is consistent with the description and analyses provided in the DBIO and no new hazards or conditions are created. The Building 707 Fixed Power Back-out Plan has been evaluated and determined to not create an Unreviewed Safety Question using the guidance in 10 CFR 830, *Nuclear Safety Management*.

References

1. Building 707 Fixed Power Back-out Plan, Revision 1, December 2003
2. Building 707 Complex Decommissioning Basis for Interim Operation (DBIO), Revision 4, 2002 and subsequent page changes and JCOs.
3. Engineering Calculation CALC-707-01.1081-SWF, Revision 1, Supporting Calculations for the Building 707 Decommissioning Basis for Interim Operations
4. Engineering Calculation OTHER-707-VEXH-000523, Revision 4, Engineering Evaluation of Confinement Pressure Differential Instruments Required to Comply With Building 707/707A DBIO