

**DNFSB Recommendation 2000-2
LANL, Chemistry and Metallurgy Research (CMR) Facility
Response to Criteria, Review, and Approach Document**

DNFSB VSS Phase I Operability Review:

Facility: TA-3-29, CMR

LANL FM Signatory: original signed by Scott Dick 3/01/01

LANL FMS Signatory: original signed by Robert Hurdle 3/01/01

LANL OAB Signatory: original signed by Patrick R. McCLure 3/01/01

LANL DNFSB R. 2000-2 Signatory: original signed by Beverly A Ramsey 3/01/01

LAAO FR Reviewer: Joe Houghton

Date: March 1, 2001

Kenneth Zamora, Assistant Area Manager for Facility

Original signed by Kenneth Zamora

Date: March 1, 2001

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System: Fire Suppression System

System Classification: Safety Class

VSS 1.1 *VSS safety functions are defined and understood by responsible line managers, and supporting information / documentation is available and adequate. System testing is adequate to ensure operability.*

The fire suppression system meets criteria VSS 1.1. This evaluation was derived from a combination of subject matter expertise, operating experience and objective evidence contained in reference documents provided below. The evaluation team included facility management, system engineering, maintenance and operations, and the authorization basis team.

Using the DOE-approved facility safety analysis (i.e., SAR, BIO, etc.), identify the following:

(a) *system safety functions*

To control and suppress fire, thereby, substantially limiting fire severity and significantly reducing off-site dose consequences.

(b) *normal, abnormal, and accident conditions under which the system is intended to perform its safety functions*

In accordance with the CMR Facility BIO the fire suppression system was found to have a mitigating impact on the following accidents.

- Wing-wide Fire
- LLW Storage Area Fire
- Flammable Gas Explosions within CMR
- Aircraft Crash
- Seismically Induced Fire

(c) *relevant system functional requirements and performance criteria*

NMT13-TSR-002, CMR Interim Technical Safety Requirements provides the following surveillance requirements for the fire suppression system. Refer to Attachment A for more detailed information regarding the TSR surveillance instructions.

- Perform a FSS pressure verification
- Perform control valve inspection and alignment verification
- Perform a main drain test
- Perform a sprinkler flow test
- Perform a control valve operation test

Identify the acceptance criteria from the surveillance tests used to verify that the system is capable of accomplishing its safety functions and performance criteria.

Acceptance criteria for the fire suppression system surveillance requirement are provided in the following TSR Surveillance Instructions. Refer to Attachment A for more detailed information regarding the TSR surveillance instructions.

- NMT 13 TSR 301, Fire Suppression System Control Valve Inspection and Alignment Verification
- NMT 13 TSR 302, Main Drain and Sprinkler Flow Test

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- NMT 13 TSR 304, Fire Suppression Hydrant Operation Test
- NMT 13 TSR 307, Fire Suppression System Notification Appliance Test

At what frequency are the tests performed? Are these tests and inspections required by Technical Safety Requirements, Operational Safety Requirements, or other Authorization Basis or Authorization Agreement requirements?

These surveillance instructions are performed at the frequencies specified by NMT13-TSR002, CMR Interim Technical Safety Requirements. Refer to Attachment A for more detailed information regarding surveillance instruction frequencies.

Are drawings that document the system configuration available? If so, identify the types of drawings.

Drawings documenting the fire suppression system configuration are available. These include physical and piping and instrumentation drawings. A list of these drawings is provided in CMR-SDD-012, Fire Protection System Design Description.

VSS 1.2 The backlog for surveillances, test, inspections, maintenance, repair, upgrades, or other work on the system is managed and kept to an appropriate minimum.

The fire suppression system meets criteria VSS 1.2. System documentation development is in progress and maintenance upgrades are in progress to correct deficiencies. This evaluation was derived from a combination of subject matter expertise, operating experience and objective evidence contained in reference documents provided below. The evaluation team included facility management, system engineering, maintenance and operations, and the authorization basis team.

Identify the current backlog for the system for items such as preventive maintenance, corrective maintenance, modifications, surveillances, tests, inspections, and corrective actions.

The maintenance backlog including planned maintenance activities are tracked in accordance with NMT-AP-017-Work Control and are available in computerized maintenance management system. Planned facility upgrades are tracked through the CMR facilities upgrades project.

VSS 1.3 Configuration Management and Maintenance programs effectively ensure operational availability of the system.

The fire suppression system meets criteria VSS 1.3. System documentation development is in progress and maintenance upgrades are in progress to correct deficiencies. This evaluation was derived from a combination of subject matter expertise, operating experience and objective evidence contained in reference documents provided below. The evaluation team included facility management, system engineering, maintenance and operations, and the authorization basis team.

Identify formally scheduled activities, in addition to those addressed above, that are intended to help ensure reliable performance of the system. Include preventive maintenance, walkdowns, inspections, and assessments as appropriate.

Formal maintenance procedures and programmatic controls established to ensure compliance with system TSR operability requirements are summarized in Appendix C of CMR-SDD-012, Fire Protection System. Formal preventive, predictive, and surveillance procedures controls established to meet system availability requirements

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will also be summarized in Appendix C, which is currently under development and will be included in a subsequent revision. The implemented activities are currently performed in accordance with NMT-AP-017- Work Control and are located and tracked in the facility computerized maintenance management system (CMMS).

Review the application of processes used to ensure that work on the system and changes to the system are properly controlled (i.e., formally reviewed, approved, implemented, tested, USQ review performed if required, documents updated, and work/change accepted).

Work on the fire suppression system and changes to the system are properly controlled in accordance with NMT-AP-017, Work Control, Acceptance Test Requirements, Design Change Packages, and the USQ process. Objective evidence exists in the facility work control work package files and the CMMS.

Determine whether surveillance procedures and system drawings are controlled under a formal document control process, and indicate whether the process requires that documents be updated as necessary to maintain their accuracy.

Surveillance procedures and system drawings are controlled using a formal process in accordance with NMT-AP-001, Document Control. Frequencies for drawing updates are established in design change packages and the design change manual.

VSS 1.4 The system is operable and available to fulfill its safety function when required.

The fire suppression system meets criteria VSS 1.4. This evaluation was derived from a combination of subject matter expertise, operating experience and objective evidence contained in reference documents provided below. The evaluation team included facility management, system engineering, maintenance and operations, and the authorization basis team.

For each of the past three years:

(a) identify the number of times that the system has failed to meet its test acceptance criteria.

Failure of the fire suppression system acceptance criteria and appropriate limiting condition for operation activities are formally tracked in the operations center logbook. Information for the exact number of failures is not easily accessible. Objective evidence is located in master work-package files.

(b) identify the number of times that the system has failed in response to facility operating conditions.

Failure of the fire suppression system acceptance criteria and appropriate limiting condition for operation activities are formally tracked in the operations center logbook and information for the number of fire suppression system failures due to facility operating conditions is not easily accessible.

(c) estimate the percentage of time that the system was not capable of accomplishing its safety functions when required to be operable.

The information is available as stated in VSS 1.4 (a); however, a means of formally tracking the fire suppression system availability is not currently in place.

Identify any systems and equipment (e.g., electric power, instrument or control air, diesel fuel transfer, vacuum, heat tracing, etc.) that directly support the operation of the

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vital safety system being assessed that are not included within the defined system boundary.

CMR-SDD-012, Fire Protection System identifies the following supporting systems for the CMR facility fire suppression system.

- Basic Rapid Suppression Security System
- Building Structure
- Digital Alarm Monitoring Unit
- Electric Power System
- Heating Ventilation and Air Conditioning
- Non-potable water

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The following information is in response to the DNFSB Recommendation 2000-2, Criteria, Review, and Approach Document.

System: Ventilation System

System Classification: Safety Significant

VSS 1.1 *VSS safety functions are defined and understood by responsible line managers, and supporting information / documentation is available and adequate. System testing is adequate to ensure operability.*

The ventilation system meets criteria VSS 1.1. This evaluation was derived from a combination of subject matter expertise, operating experience and objective evidence contained in reference documents provided below. The evaluation team included facility management, system engineering, maintenance and operations, and the authorization basis team.

Using the DOE-approved facility safety analysis (i.e., SAR, BIO, etc.), identify the following:

(a) system safety functions

The ventilation system reduces the concentrations of radioactive / hazardous materials in occupied spaces, and directs air flow through the stacks and exhaust filtration to reduce radioactive quantities released from the facility.

(b) normal, abnormal, and accident conditions under which the system is intended to perform its safety functions

In accordance with the CMR Facility BIO hazard analysis the ventilation system was found to have a mitigating impact on the following accidents.

- Wing Wide Fire
- HEPA Filter Fire
- Spills of Radioactive Material
- Flammable Gas Explosions within CMR
- Air Craft Crash
- Seismically Induced Fire
- Hot Cell Operations

(c) relevant system functional requirements and performance criteria

NMT13-TSR-002, CMR Interim Technical Safety Requirements provides the following surveillance requirements for the ventilation system. Refer to Attachment A for more detailed information regarding the TSR surveillance instructions.

- Verify appropriate differential pressures across HEPA filter plenums
- Verify laboratory exhaust header differential pressures are above minimum specifications
- Ensure adequate face velocity for ventilated hoods
- Verify adequate HEPA filter bank efficiency

Identify the acceptance criteria from the surveillance tests used to verify that the system is capable of accomplishing its safety functions and performance criteria.

Acceptance criteria for the ventilation system surveillance requirement are provided in the following TSR Surveillance Instructions. Refer to Attachment A for more detailed information regarding the TSR surveillance instructions.

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- NMT13-003, Surveillance Rounds
- NMT13-TSR101 Performance Tests for Ventilated Hoods
- NMT13-TSR 103 A through D HEPA Filter In-Place Efficiency Testing

At what frequency are the tests performed? Are these tests and inspections required by Technical Safety Requirements, Operational Safety Requirements, or other Authorization Basis or Authorization Agreement requirements?

These surveillance instructions are performed at the frequencies specified by NMT13-TSR002, CMR Interim Technical Safety Requirements. Refer to Attachment A for more detailed information regarding the TSR surveillance instructions.

Are drawings that document the system configuration available? If so, identify the types of drawings.

Drawings documenting the ventilation system configuration are available. These include flow, physical, and piping and instrumentation diagrams. A list of these drawings is provided in CMR-SDD-006, Heating Ventilation, and Air Conditioning System Design Description.

VSS 1.2 The backlog for surveillances, test, inspections, maintenance, repair, upgrades, or other work on the system is managed and kept to an appropriate minimum.

The ventilation system does not meet criteria VSS 1.2 due to the volume and magnitude of deficiencies associated with the ventilation system; however, positive maintenance actions and response are improving the posture. This evaluation was derived from a combination of subject matter expertise, operating experience and objective evidence contained in the reference documents provided below. The evaluation team included facility management, system engineering, maintenance and operations, and the authorization basis team.

Identify the current backlog for the system for items such as preventive maintenance, corrective maintenance, modifications, surveillances, tests, inspections, and corrective actions.

Long term configuration management and maintenance cost and schedules are undetermined. Maintenance actions and deficiencies are partially addressed on a year to year basis and depend on approved funding. The maintenance backlog including planned maintenance activities are tracked in accordance with NMT-AP-017- Work Control and are available in computerized maintenance management system. Planned facility upgrades are tracked through the CMR facilities upgrades project. Upon completion of the planned ventilation system upgrades additional maintenance activities will be implemented.

VSS 1.3 Configuration Management and Maintenance programs effectively ensure operational availability of the system.

The ventilation system does not meet criteria VSS 1.3 due to the volume and magnitude of deficiencies associated with the ventilation system; however, positive maintenance actions and response are improving the posture. This evaluation was derived from a combination of subject matter expertise, operating

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experience and objective evidence contained in the reference documents provided below. The evaluation team included facility management, system engineering, maintenance and operations, and the authorization basis team.

Identify formally scheduled activities, in addition to those addressed above, that are intended to help ensure reliable performance of the system. Include preventive maintenance, walkdowns, inspections, and assessments as appropriate.

Formal maintenance procedures and programmatic controls established to ensure compliance with system TSR operability requirements are summarized in Appendix C of CMR-SDD-006, Heating Ventilation and Air Conditioning. Formal preventive, predictive, and surveillance procedures controls established to meet system availability requirements will also be summarized in Appendix C, which is currently under development and will be included in a subsequent revision. The implemented activities are currently performed in accordance with NMT-AP-017- Work Control and are located and tracked in the facility computerized maintenance management system (CMMS).

Review the application of processes used to ensure that work on the system and changes to the system are properly controlled (i.e., formally reviewed, approved, implemented, tested, USQ review performed if required, documents updated, and work/change accepted).

Work on the ventilation system and changes to the system are properly controlled in accordance with NMT-AP-017, Work Control, Acceptance Test Requirements, Design Change Packages, and the USQ process. Objective evidence exists in the facility work control work package files and the CMMS.

Determine whether surveillance procedures and system drawings are controlled under a formal document control process, and indicate whether the process requires that documents be updated as necessary to maintain their accuracy.

Surveillance procedures and system drawings are controlled using a formal process in accordance with NMT-AP-001, Document Control. Frequencies for drawing updates are established in design change packages and the design change manual.

VSS 1.4 The system is operable and available to fulfill its safety function when required.

The ventilation system does not meet criteria VSS 1.4 due to the volume and magnitude of deficiencies associated with the ventilation system; however, positive maintenance actions and response are improving the posture. This evaluation was derived from a combination of subject matter expertise, operating experience and objective evidence contained in the reference documents provided below. The evaluation team included facility management, system engineering, maintenance and operations, and the authorization basis team.

For each of the past three years:

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(a) *identify the number of times that the system has failed to meet its test acceptance criteria.*

Failure of ventilation system acceptance criteria and appropriate limiting condition for operation activities are formally tracked in the operations center logbook. Information for the exact number of failures is not easily accessible. Due to the volume and magnitude of deficiencies associated with the antiquated system and equipment, many maintenance actions are scheduled and several reworked in order to meet equipment acceptance criteria. Objective evidence is located in master work-package files.

(b) *identify the number of times that the system has failed in response to facility operating conditions.*

Failure of ventilation system acceptance criteria and appropriate limiting condition for operation activities are formally tracked in the operations center logbook and information for the number of ventilation system failures due to facility operating conditions is not easily accessible.

(c) *estimate the percentage of time that the system was not capable of accomplishing its safety functions when required to be operable.*

The information is available as stated in VSS 1.4 (a); however, a means of formally tracking the ventilation system availability is not currently in place.

Identify any systems and equipment (e.g., electric power, instrument or control air, diesel fuel transfer, vacuum, heat tracing, etc.) that directly support the operation of the vital safety system being assessed that are not included within the defined system boundary.

CMR-SDD-006, Heating Ventilation, and Air Conditioning identifies the following supporting systems for the CMR facility ventilation system.

- Building Structure
- Compressed Air System
- Duct Cool Down
- Duct Washdown
- Electric Power System
- Fire Protection System
- Facility Monitoring System
- Hot Water Heating
- Industrial Liquid Waste
- Lightning Protection System
- Non-potable water

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Facility: Chemistry and Metallurgy Facility, TA-3, Building SM-29

Facility Manager: Scott Dick **Owning Division Director:** Tim George

Date VSS Form Completed: February 1, 2001

Vital Safety System	Cognizant System Engineer	Reference in which VSS Identified	Comments
Fire Suppression System	Jim Tsiagkouris	CMR-SDD-012, Fire Protection System, NMT13-TSR-002, CMR Interim Technical Safety Requirements	
Fire Alarm System	Jim Tsiagkouris	CMR-SDD-012, Fire Protection System, NMT13-TSR-002, CMR Interim Technical Safety Requirements	
*Hot Cells	Thad Hahn	NMT13-TSR-002, CMR Interim Technical Safety Requirements, CMR-SDD-016, Hot Cells	Includes interlocks
*Floor Wells	Thad Hahn	NMT13-TSR-002, CMR Interim Technical Safety Requirements, CMR-SDD-017-Floor Wells	
Ventilation System	Thad Hahn	NMT13-TSR-002, CMR Interim Technical Safety Requirements, CMR-SDD-006-Heating, Ventilation, and Air Conditioning	
Radiation Monitoring System	Thad Hahn	NMT13-TSR-002, CMR Interim Technical Safety Requirements	
*Vault	Jim Tsiagkouris	NMT13-TSR-002, CMR Interim Technical Safety Requirements	
*Alpha Box	Jim Tsiagkouris	NMT13-TSR-002, CMR Interim Technical Safety Requirements	Upgrade in progress the system is not operational.
*Building Structure	Jim Tsiagkouris	NMT13-TSR-002, CMR Interim Technical Safety Requirements, CMR-SDD-008, Building / Structure	Includes shielding, berms, and fire barriers
Electrical Power System	Jim Tsiagkouris	CMR-SDD-025, Electrical Power System	Defense in Depth Support System
*Type A & B containers			
Hood Washdown			Not approved for use.

* Passive Design Systems

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DOE employee who reviewed this assessment: Joe Houghton, DOE Representative

Provide an estimate of the number of hours (contractor and DOE) needed to complete the data gathering, assessment, and documentation:

DOE: 15 hours

Contractor: 20 hours

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Building/Facility: Chemistry and Metallurgy Research Facility

Facility Manager: Scott Dick, NMT-DO

DOE Cognizant Representative: Veronica Martinez, Joe Houghton

Vital Safety System	System Engineer	Configuration Management	Maintenance	Operations	Assessments/Audits	Overall
(1)	(2)	(3) Color & arrow	(4) Color & arrow	(5) Color & arrow	(6) Color & arrow	(7) Color & arrow
Fire Suppression System	Jim Tsiagkouris	↗	↗	→	→	↗
Fire Alarm System	Jim Tsiagkouris	↗	↗	→	→	↗
Hot Cells	Thad Hahn	↗	↗	↗	→	↗
Floor Wells	Jim Tsiagkouris	↗	→	→	→	→
Ventilation System	Thad Hahn	↗	↗	→	→	→
Continuous Air Monitoring System	Thad Hahn	→	→	→	→	→
Vault	Jim Tsiagkouris	→	→	→	→	→
Alpha Box	Jim Tsiagkouris	*	*	*	*	*
Building Structure	Jim Tsiagkouris	→	→	→	→	→
Electric Power Screen	To Be Determined					
Type A & B Containers	To Be Determined					
Hood Washdown	To Be Determined					

* Included in the BIO, equipment and controls developed but not installed. Operations and readiness not established.

(1) **Vital Safety System** refers to those systems designated as a Vital Safety System per other 2000-2 guidance.

(2) **System Engineer** refers to the individual responsible for the system.

(3) **Configuration Management** refers to the set of controlled information that describes the configuration of the system. Green means that configuration management and maintenance programs effectively ensure operational availability of the system; configuration procedures have been identified and implemented; all required documentation is in place and up to date; the “as-is” condition of equipment, components, tools and other controlled items has been verified; and the set of controlled documentation accurately reflects the actual status of the system. Yellow means some controlled documentation of associated or non-vital components of or connecting to the VSS may require periodic updating, have not been verified or are not complete, but it is known that none of these effect the operability of the VSS. Red means configuration management of the VSS is in an unknown state or is known to be deficient to the extent that operability of the VSS may be effected.

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(4) **Maintenance** refers to all corrective and preventive maintenance. Green means all maintenance is completed or has certain schedule and funding and the backlog for surveillances, tests, inspections, maintenance, repair, upgrades, or other work on the system is managed and kept to an appropriate minimum. Yellow means some maintenance is not completed or has an uncertain schedule and funding, but the facility is still operational. Red means maintenance is so far behind that the facility's availability for operations is jeopardized.

(5) **Operations** refers to the effect of facility condition on the ability to conduct all operations intended for the facility, even if those operations are not currently authorized or in progress. Green means the system is operable and available to fulfill its safety function when required, system testing is adequate to ensure operability and, subsequently, the facility is reliably available for all intended missions. Yellow means the facility must rely on compensatory measures to continue operations, is not available for all intended missions, or that the facility conditions / breakdowns interrupt operations so frequently that operations are significantly affected. Red means that the facility is so unreliable that its availability affects decisions on the use of the facility.

(6) **Assessments/Audits/Corrective Action Plans** refers to all reviews, formal and informal, which assess facility condition and availability and associated corrective action plans for those assessments already conducted. Green means all corrective actions are up to date and scheduled in a manner that will keep them up to date. Yellow means there are some corrective actions either delinquent or will become delinquent if held as currently scheduled. Red means the facility cannot perform an intended mission because an assessment or audit or corrective action has not been done.

(7) **Overall** refers to the general condition of the facility and represents a subjective weighted average of the Configuration Management, Maintenance, Operations, Assessment / Audits columns with the assurance that the VSS safety functions are identified and understood by responsible line managers, and supporting information / documentation is available and adequate.

slant upward if conditions are improving	↗
are horizontal if conditions are stable	→
slant downward if conditions are deteriorating	↘

Arrows:

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Building/Facility: Chemistry and Metallurgy Research Facility

Facility Manager: Scott Dick, NMT-DO

DOE Cognizant Representative: Veronica Martinez, Joe Houghton

Explanation of Yellow/Red Ratings

Vital Safety System	Item	Color & Arrow	Explanation
Note 1	Note 2	Note 3	Note 4
Fire Suppression System	Overall	↗	The overall rating is yellow and improving. Configuration management and maintenance are yellow and improving. System documentation development is in progress and maintenance upgrades are in progress to correct known deficiencies.
Fire Alarm System	Operations	↗	The overall rating is yellow and improving. Configuration management and maintenance are yellow and improving. System documentation development is in progress and maintenance upgrades are in progress to correct known deficiencies.
Hot Cells	Overall	↗	The overall rating is yellow and improving. Configuration management, maintenance and operations are yellow and improving. System documentation development is in progress, maintenance for hydraulic systems and upgrades for lighting, and pressure indications are in progress to correct deficiencies.
Ventilation System	Overall	→	The overall rating is yellow and stable. Configuration management and operations are yellow and improving. Maintenance is red and improving. System documentation development is in progress. Operational impacts occur frequently due to equipment failure. Maintenance red due to the volume and magnitude of deficiencies associated with the antiquated system and equipment. Positive maintenance actions and response are improving the posture.

1. System name from Page 1
2. Maintenance, Operations, Assessment/Audits, or Overall
3. Color & Arrow for item in 2) from page 1.
4. Explanation of Color & Arrow. Limit to a few sentences

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Building/Facility: Chemistry and Metallurgy Research Facility

Facility Manager: Scott Dick, NMT-DO

DOE Cognizant Representative: Veronica Martinez, Joe Houghton

Long Term Needs

Note:
 The cost of complete effective implementation of configuration management for all items listed below including the cost of maintenance to the ventilation system is not calculated. As a result of the age and condition of the facility it is estimated to require funding beyond that which will be considered and the schedule will exceed the mission life of the facility. As a part of the CMR Upgrades Project, re-baseline effort, in 1999, a package of upgrades was selected for accomplishment. The selection process focused on protection of the public and workers, and upgrades required for compliance. Items related solely to reliability were not accepted into the final baseline. The yearlong effort used cost benefit analysis, , DOE/LANL workshops, and briefings/comments from all levels of DOE and the DNFSB

Vital Safety System	Change	Date	Cost Estimate	Fund
(1)	(2)	(3)	(4)	(5)
Fire Suppression System	Complete upgrades projects and correct maintenance deficiencies. Long term configuration management costs and schedule associated with fire suppression and alarm system is undetermined (see note above).	2001	500 K	Yes – does not include noted items
Fire Alarm System	CMR Upgrades project scope for the fire suppression system incorporates 90 percent of the fire alarm deficiencies. Some, balance of system maintenance items such as ops center remote alarm monitoring, are carried here.	2001	10 K	Yes - does not include noted items
Hot Cells	Complete CMR Upgrades and correct deficiencies with the hydraulic and pressure monitoring systems. Long term configuration management costs and schedule are not determined (see note above).	2001	250K	Yes – does not include noted items
Ventilation System	Long term configuration management and maintenance cost and schedules are undetermined. Maintenance actions and deficiencies	2001	Unknown	Yes – partial FY2001 budget

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	are partially addressed on a year to year basis and depend on approved funding (see note above).			only. Does not include noted items
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- (1) **Vital Safety System** is taken from Page 1.
- (2) **Change** is a short (“25 words or less”) description of all planned upgrades, repairs or similar actions needed to take the current facility from its current condition to one which can meet all intended missions, now or in the future, safely.
- (3) **Date** is the planned date of commencing the upgrade, repair or similar action.
- (4) **Cost** is the best estimate currently available for the action. Use best numbers available, but don’t generate any new ones.
- (5) **Fund** is “Yes” if the action is in the budget or a budget request and is above target and “No” if otherwise.