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Project W-030 Safety Class Upgrade Summary Report

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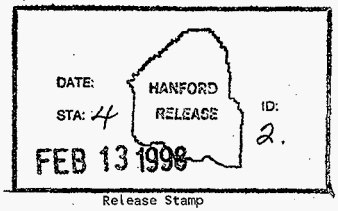
Abstract: This document presents a summary of safety class criteria for the 241-AY/AZ Tank Farm primary ventilation system upgrade under Project W-030, and recommends acceptance of the system as constructed, based on a review of supporting documentation.



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PROJECT W-030 SAFETY CLASS UPGRADE SUMMARY REPORT

HNF-1788 REV. 0

JIM KRISKOVICH
LOCKHEED MARTIN HANFORD CORPORATION
FEBRUARY 13, 1998

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PROJECT W-030 SAFETY CLASS UPGRADE SUMMARY REPORT

1.0 INTRODUCTION

This report evaluates equipment design and procurement of the 241-AY/AZ Tank Farms Ventilation Upgrade Project W-030. The system and some components originally were classified and procured as Safety Significant (SS) (WHC, 1993). The Tank Waste Remediation System (TWRS) Basis for Interim Operation (BIO) (LMHC, 1997b) for all TWRS facilities, which became effective on September 29, 1997, now classifies active ventilation systems on Aging Waste Facilities as Safety Class (SC).

The U.S. Department of Energy, Richland Operations Office, has authorized the startup and operation of the Project W-030 ventilation system as a SS system as originally designed (DOE-RL, 1997b) and identified in the preliminary safety equipment list developed for the project (WHC, 1993). This is a temporary exemption, pending further evaluation and resolution of the discrepancies between the BIO and the original project design requirements for safety-related equipment. This document provides that evaluation.

It was demonstrated that the system met the original safety classification requirements to which Project W-030 was designed and built (Kriskovich, 1997a). As a minimum, this included various certifications, test results, design calculations, and other appropriate documentation demonstrating that the equipment met all the requirements for a SS system.

An evaluation was performed to determine what deficiencies exist in the design that may prevent it from meeting the safety classification requirements of SC based on the BIO (Kriskovich, 1997d). The deficiencies identified are as follows:

- Procurement of Safety Class Items
- Safety Class Natural Phenomena Criteria
- Safety Class Redundancy Requirements
- Safety Class Electrical Power Requirements.

The purpose of this report is to evaluate equipment design and procurement of Project W-030 and recommend what measures, based on technical information, may be required to modify or dedicate the system to SC, and whether the benefits substantiate the added cost.

2.0 CRITERIA

Appendix A identifies the components of Project W-030 that will be designated as SC or SS. These safety structures, systems, and components (SSCs) are designated as SS or SC, based on the applicable facility safety

analyses and safety classification criteria defined in a Hanford Site procedure (PHMC, 1997c).

Appendix B contains a table of the components and an identification number and description listed for each component that were used to trace the specification that initiated the design and procurement of the item and any related vendor submittal or other documentation. The equipment was evaluated to determine if the design and procurement of a given item meets the requirements defined by the SC classification.

The original project design was based on the need for confinement to protect the onsite worker, corresponding to a SS classification. The BIO accidents relevant to ventilation are Flammable Gas Deflagrations and a within-structure Spray Leak (Section 5.3.2.14 and 5.3.2.20, LMHC, 1997b). According to this basis, the exhaust fans and any components supporting the safety function that provides flow are classified as SC. Included in this category are ductwork, piping, valves, supports, and electrical components whose failure could result in a loss of the safety function (flow). The continuous air monitor (CAM) interlock system is also classified as SC because of the spray leak accident scenario.

2.1 Procurement

All equipment for Project W-030 was classified and procured to either SS or general service (GS) requirements.

Procurement requirements for safety SSCs are defined in a site procedure (PHMC, 1997b). This procedure does not distinguish between SS and SC to the extent of prescribing differing procurement requirements. Therefore, SSCs originally procured as SS also meet the requirements for SC and should be suitable for use in SC applications, provided that the items in question, by their design, satisfy all the other safety functions and requirements (i.e., natural phenomena). Such items do not require any upgrade other than documenting their acceptance. This report will satisfy the acceptance of those items. Procurement requirements for safety SSCs are:

- The equipment must be supplied by a qualified supplier, or testing/verification of material is required.
- The vendor must provide certification documents and appropriate design calculations or test results that demonstrate compliance with the procurement requisition or specification.
- For any commercial grade items (CGI), the critical characteristics must be identified and the method of dedication must be specified.

Some items originally classified and procured as GS now have a safety function because of the BIO accident analyses (see Section 3.0). Items procured as GS often lack the documentation required to meet the current requirements for either SS or SC equipment, unless by a special dedication process or other means of upgrade (TWRS, 1997). If it is not possible to designate an item in this category as a safety SSC based on existing documentation, then the item would normally need to be modified, replaced, or

bypassed by other equipment that can perform the necessary safety function to maintain the technical basis for operating the system.

2.2 Natural Phenomena Hazards Mitigation

Designing for natural phenomena loads is a requirement for Safety Class Structures Systems and Components as identified in DOE Order 6430.1A, *General Design Criteria*, (DOE, 1989). DOE Order 6430.1A relies on local or site-specific criteria for the applicable factors used in the analyses. At the time design of Project W-030 was completed, the local or site-specific criteria were given in GC-Load-01, *Design Loads for Facilities*, (ICF KH, 1996). Although GC-Load-01 was recently replaced by HNF-PRO-97, *Engineering Design and Evaluation* (PHMC, 1997a) HNF-PRO-97 does not apply to this project because of the conceptual design date of Project W-030. HNF-PRO-97 only applies to design work initiated after October 15, 1997. As a result, this report will rely on the natural phenomena criteria identified in DOE Order 6430.1A and GC-Load-01.

Natural Phenomena for Safety Class SSCs consist of several different events. The SC events identified in DOE Order 6430.1A, and GC-Load-01 are as follows:

Seismic loading = 0.2g ground motion spectra

Wind Loading = 40 m/sec (90 mph) basic wind speed

Tornado and Wind Missile = 50 x 100 mm (2x4) timber blank 7 kg (15 lb) @ 22 m/sec (50 mph)

Volcanic Ash = 76 mm (3 inch) dry compacted ash @ 1540 kg/m^3 (96 lb/ft^3)

Flooding = 40,800 m^3/sec (1,440,000 ft^3/sec)

2.3 Redundancy Requirements

Redundancy and reliability are also SC design requirements identified in DOE Order 6430.1A. The requirements are important factors in SC design because these attributes are crucial to assure the system and components are operational to achieve the safety function. Redundancy requirements apply to both electrical and mechanical systems. Redundancy is not required for SS applications; therefore, this report evaluates the necessity and adequacy for SC redundancy.

2.4 Electrical Power Requirements

As was the case for redundancy, electrical power is a key component to assure that the safety function of the system is met. The requirements differ, as identified in HNF-W030-TI-001 (Kriskovich, 1997d), between SS and SC. The primary difference between the two electrical power criteria is emergency power. For SS applications emergency power is not required;

however, for SC applications it is required according to DOE Order 6430.1A. This report will evaluate whether it is necessary that emergency power be available to support the new ventilation system and if the adequacy of the original design is sufficient.

3.0 DISCUSSION

3.1 Procurement

Safety SSCs for Project W-030 were procured to SS requirements based on the original Project W-030 SEL (WHC, 1993). Items requiring an upgrade from SS to SC constitute a majority of those tabulated in Appendix B. Since the same procurement requirements apply for both SS and SC (PHMC, 1997b), it is possible, where necessary, to upgrade the SS items to SC based on a review of existing vendor submittal and other project documentation against the safety functions and failure modes and effects in the BIO.

Most of the existing primary ventilation valves, or dampers, were procured based on structural integrity of the valve body as it forms part of the confinement boundary, with no safety function attributed to the valve operator. Based on the performance of the valve and Appendix A, these valves also contribute to the safety function of flow. In addition to maintaining their structural integrity, the valves in the primary flow path must not fail, in either a closed or open position under normal operating conditions, unless they are in a location where they can be bypassed. Otherwise, their failure could lead to a loss of ventilation and accumulation of flammable gas in the tank. This failure mode is identified in Appendix A.

Several characteristics of these valves may be relied on for justifying their use, as procured, because of the additional failure mode and its effect on safety function. The valve operator is a simple mechanism that is inherently rugged and not prone to failure. The most common mode of failure is the inability to seat properly, as opposed to a major loss of function. This, combined with the relative ease of replacement, means that the valves are not a major concern in safety function and reliability, even when the additional criteria are considered. The original criteria of confinement, which ensured general integrity of the valve and valve body, can be relied on to provide the characteristics needed to support this safety application.

By design, most instrument loops depend on an interface through the Monitor and Control System (MCS) to perform their function. This interface is housed in the local control units (LCUs), those parts of the system which process and route various instrument signals and actually provide redundant, independent control of the ventilation system. The LCUs were procured SS and tested to withstand a SS seismic event as a procurement requirement. There are three instrument loops that currently interface with the MCS and LCUs that are safety related. The effects of losing the function of the LCUs and the safety-related instrumentation they support are not considered because the system can operate manually without the MCS and LCUs. Therefore, this interface was not evaluated.

The safety SSCs that interface with the LCU are the CAM interlock or primary high-efficency particulate air (HEPA) filter pressure differential switches (depending on which control is chosen) and the tank outlet air flow indicators and controllers. Either the CAM interlock or primary HEPA filter pressure differential will be classified as a Safety SSC to satisfy the technical safety requirement (TSR) (LMHC, 1997c) limiting control for operation for the spray leak accident scenario. For Project W-030, the CAM interlock was chosen.

For the CAM interlock, if the LCUs are lost, the stack monitor indication and alarm functions are designed to continue functioning independently of the LCU, but the fans must be shut down or switched manually in place of an automatic interlock function. Although this does not meet the requirements of Safety Class according to the BIO, design modifications are currently planned. The design modifications are part of the overall BIO implementation process to be completed before September, 1998. The modification will include an independently hardwired switch or other appropriate output function in parallel with the existing MCS software interface. In the meantime, since the alarm function is independent of the LCU and MCS interface the current design is sufficient and acceptable.

For the air flow indicators and controllers, if the LCUs are lost the automatic flow control function, as well as remote flow indication are lost; however, local indication of flow is still available, satisfying the SC safety function. Also, tank pressure is being utilized to indicate flow through the tank. As for the function of controlling flow, the valves remain in position on loss of signal and can be manually adjusted. The air flow indicators and controllers therefore meet the SC criteria without further qualification.

The Standby (Diesel Powered) Electrical System was procured as SS engineered equipment. For further discussion see Section 3.4.

A review of vendor submittal for the remaining safety SSCs that were procured SS shows that they also meet the requirements for SC, because there is no change in functional requirements and the items meet all requirements for SC. These are identified as SC in Appendix B, where the relevant submittal are also referenced.

Other SSCs were procured GS. As shown in Appendix B, items originally procured as GS that are now classified as SS or SC are as follows:

- Buildings: Ventilation, Generator, and Recirculation Cooling Cell (SS).
- High Efficient Mist Eliminator (HEME) Radiation Monitoring Instrument Loop (SS).
- Normal Power Supply 500A, 400A, and 225A Main Breakers (SC).
- Primary ductwork and valving downstream of primary HEPA filters [downstream only; ductwork and valving upstream of filters was procured SS] (SC).
- Hangers and supports for SC ductwork or equipment (SC).

Some of the above items may be upgraded by means of a dedication process; procedures HNF-PRO-447 (PHMC, 1997b) and HNF-PRO-0842 (LMHC, 1997a) define the requirements for this process. This approach will likely succeed with items for which ample documentation exists to verify the item can perform its safety function. The Ventilation, Generator, and Recirculation Buildings, HEME Radiation Monitor, and Normal Power Supply Breakers have sufficient documentation to warrant their use in SS or SC applications. Design calculations, certificates of compliance (COCs), and other submittal which support this conclusion are referenced in Appendix B.

Other GS items are not sufficiently documented as to materials and testing, to be dedicated based on review of existing vendor submittal. Components in this category are the valves and piping (ductwork) downstream of the primary HEPA filters, including a crossover line and connections between the fans and filter trains, and the various SC pipe and equipment supports which were procured GS or fabricated from GS materials for Project W-030. Because these items were designated and procured as GS, they were supplied without certified material test reports (CMTRs) or COCs. Actions can be taken to utilize the material (Section 4.1).

3.2 Natural Phenomena Hazards Mitigation

The natural phenomena criteria identified in Section 2.2 was evaluated for Project W-030 (Kriskovich, 1997d) against the SC criteria. The evaluation relied on analyses that were already completed for Project W-030 for Safety Significant criteria. The evaluation consisted of scaling the original analysis to the Safety Class criteria.

3.3 Redundancy Requirements

In parallel with the natural phenomena evaluation, a reliability study was performed on the system (Braun, 1997) to assess the actual benefits, in increased reliability, for upgrading the deficient items to make the system compliant with SC requirements. The scope of the assessment compared the reliability of the old 702-A system and the new Project W-030 system configurations to operate over the course of a year with no external challenges. The assessment also estimates the reliability of a fully compliant Project W-030 system for seismic loading. The analysis was done for both SS and SC designations.

3.4 Electrical Power Requirements

A reliability study was also performed on the electrical power supply of the system (Kriskovich, 1997c). The scope of the study consisted of a reliability evaluation of the electrical power distribution system supplying the electric motor driven fans for the primary ventilation system. The study also included an investigation of the past history for the time taken to restore power.

4.0 RESULTS

Results of the equipment evaluation are tabulated in Appendix B. An identification number and description are listed for each item of equipment, along with the specification used to procure the item, if applicable. Any equipment not listed is considered non-safety related, or GS.

4.1 Procurement

Two safety classifications are listed for each item in Appendix B. The "Required per BIO" column contains the classification of each SSC based on the safety function identified in the BIO, and as reflected in Appendix A. The "MEETS" column contains the present, minimum safety classification each item is judged to satisfy (SC, SS, or GS), based on the evaluation of procurement and design documentation against the criteria discussed in Section 2.0 above. (Kriskovich, 1997a). Supporting data are referenced in the "COMMENTS" column; submittal from vendors and contractors are retained with the corresponding specifications in the Project W-030 files.

Items not listed as meeting the required safety classification as identified in section 3.1, based on a review of procurement submittal, are listed below in Table 4.1.1. In each case, the justification for using the item in a safety-related application, even though procured to a lower classification, is also summarized. For a more detailed discussion, see the previous section of this report.

Table 4.1.1

SUMMARY OF SC UPGRADE EVALUATION RESULTS		
STRUCTURE OR COMPONENT	CLASSIFICATION MET, BASED ON PROCUREMENT	JUSTIFICATION FOR SC (OR SS) USE
BUILDINGS	GS	REQUIRED FOR SS APPLICATION; JUSTIFIED BASED ON DESIGN TO SS LOADS, AS DOCUMENTED IN CALCULATIONS, AS WELL AS COCs & CMTRs.
PRIMARY SYSTEM VALVES/DAMPERS, UPSTREAM OF HEPA FILTERS	SS	REQUIRED FOR SC APPLICATION; JUSTIFIED BASED ON INHERENT RUGGEDNESS OF VALVES, UNLIKELY MODE OF FAILURE, AND EASE OF REPLACEMENT.
DUCTWORK AND VALVES DOWNSTREAM OF HEPA FILTERS	GS	REQUIRED FOR SC APPLICATION; JUSTIFIED BASED ON INHERENT RUGGEDNESS OF VALVES AND PIPING, AS VERIFIED BY PRESSURE BOUNDARY LEAK TEST, AND EASE OF REPLACEMENT OF VALVES.
SC EQUIP. SUPPORTS AND HANGERS	GS	REQUIRED FOR SC APPLICATION; JUSTIFIED BASED ON RELIABILITY STUDY OF SYSTEM (BRAUN, 1997), AND DESIGN OR SELECTION TO MEET SS LOADS AS DOCUMENTED IN A/E CALCULATIONS.
CAM INTERLOCK	SS	REQUIRED FOR SC APPLICATION, PER SEL; JUSTIFIED BASED ON RELIABILITY STUDY OF SYSTEM (BRAUN, 1997), ACTION STATEMENTS ADDRESSING FAILURE IN TSRs.
PRIMARY HEPA DP FAN INTERLOCK	SS	REQUIRED FOR SC APPLICATION, AS A COMPENSATORY MEASURE; JUSTIFIED BASED ON RELIABILITY STUDY (BRAUN, 1997) OF SYSTEM, & ACTION STATEMENTS ADDRESSING FAILURE IN TSRs.
HEME RAD. MONITORING SYSTEM	GS	REQUIRED FOR SS APPLICATION; JUSTIFIED BASED ON VENDOR CERTIFICATION AND CALIBRATION DATA.
NORMAL POWER SUPPLY MAIN BREAKERS	GS	REQUIRED FOR SC APPLICATION; JUSTIFIED BASED ON RELIABILITY STUDY (KRISKOVICH, 1997C) OF ELECTRICAL SUPPLY SYSTEM, AND CERTIFIED VENDOR CATALOG INFORMATION.
STANDBY (DIESEL) POWER SUPPLY	SS	REQUIRED FOR SC APPLICATION; JUSTIFIED BASED ON RELIABILITY STUDY (KRISKOVICH, 1997C) OF ELECTRICAL SUPPLY SYSTEM.

4.2 Natural Phenomena Hazards Mitigation

The evaluation completed (Kriskovich, 1997d) showed that all the natural phenomena criteria were met, via the scaling method, except for six items. All six of those items failed to meet the SC seismic criteria. The portions of the system that do not meet the seismic criteria are explained in detail in HNF-SD-W030-TI-001 (Kriskovich, 1997d) and as follows:

- Sections of the ductwork
- Ductwork and pipe supports
- Filter room raised floor structure
- Portions of the back-up generator building
- Equipment functionality after a seismic event

- Toggle bolt anchorage for the cable trays.

Although the above components do not meet the criteria, the scaling method used is more conservative than other methods. For example, dynamic analysis is less conservative; therefore, if this were performed the above components may meet the criteria as is. However, the cost, and time to perform a dynamic analysis is significantly greater than the scaling method.

The maximum amount of over stress shown by the scaling was 22%. This occurred in the toggle bolt anchorage for the cable trays. Therefore, the possibility exists that dynamic analysis may show that the components do meet the criteria.

The reliability study that was performed for Project W-030 (Braun, 1997) evaluated the increased reliability if the SC seismic criteria were met. Table 4.3.1 indicates there is a minor increase in the reliability of the system. It would be of little benefit to either perform a dynamic analysis, or replace the equipment in the field to meet the criteria.

Results of analyses of representative flammable gas deflagration scenarios are provided in BIO section 5.3.2.14. For the particular analyses reported in this section of the BIO, offsite REGs are exceeded for the Double Contained Receiver Tanks and Single Shell Tanks. Onsite REGs are amply exceeded for the particular analysis scenarios reported for the Double Shell Tanks and the Aging Waste Facility Tanks. As there is considerable technical uncertainty associated with Flammable Gas USQ, these particular representative accident scenarios are not deemed to be necessarily bounding or representative of true risk. At this stage of the process to close the USQ, the representative analysis serve to emphasize the importance of design features and operational controls which rigorously address the potential for flammable gas hazards. This is accomplished through the designation of SSCs as Safety Class and case by case consideration of the cost-benefit associated with upgrading existing Safety Significant SSCs. The benefit aspect of this analysis cannot be quantified in terms of risk since the baseline risk is not defined by the particular analyses summarized in the BIO.

4.3 Redundancy Requirement

The reliability study (Braun, 1997) concluded that the system has a high degree of reliability as constructed, both in absolute terms and in comparison with the antiquated 702-A system it will replace. Table 4.3.1 summarizes the conclusions.

Table 4.3.1.

Variation	Existing 702-A System	Project W-030 System	
Basic System	90.29%	99.15%	
System Aging	72.34%	Safety Significant	Safety Class
Seismic/High Wind		98.60%	98.98%
HCLPF[1]		99.06%	99.13%

[1] High Confidence with Low Probability of Failure

As Table 4.3.1 indicates there is little to gain in increased reliability by replacing components with SC equivalents. The system is designed with several redundant features that include two separate filter trains, two fans, back-up power, two vacuum pumps (to support the CAM) and the ability to by-pass components. The only major piece of equipment that can not be bypassed is the ductwork from the tanks to the ventilation train. The only criteria that is not met to assure the ductwork remains functional is seismic loading. As Table 4.3.1 indicates the increase in reliability upon meeting the criteria is insignificant. Therefore, it is acceptable as is.

Discussion of the reliability question must also consider any completion time identified in the authorization basis to enable repairs or replacement of failed components (Kriskovich, 1997d).

4.4 Electrical Power Requirements

The reliability study for the electrical power supply for the Project W-030 ventilation system (Kriskovich, 1997c) concluded there is also a high degree of reliability in both the utility electrical power supply and the facility electrical supply distribution (Normal Power Supply) to the exhaust fans. The study demonstrated that postulated failures of the electrical distribution system will be significantly less than 72 hours. In fact, the study shows that the overall failure rate for loss of motive power is approximately 1.5 E-2 per year with outage times ranging from 6 to 44 hours. Because of these findings, the Standby Electrical System is unlikely to be operated for extended periods of time, and any modifications or upgrades will not result in a significant increase in overall reliability of the ventilation system. This is also confirmed in Table 4.3.1.

5.0 CONCLUSION

The foregoing discussion evaluated equipment, originally procured and designed for the 241-AY/AZ Project W-030 ventilation upgrade for use in SS (and, sometimes, GS) applications, from the standpoint of the BIO accident analyses that reclassify the system as SC. A review of submitted documentation and review of design analyses demonstrates that most equipment meeting SS criteria also meets the requirements for SC. The remaining SS

items, and other items that were procured and designed GS and now have a SS or SC safety function identified, would normally require a dedication process, replacement, reconfiguration or additional analysis if they are to be used in a safety application. These items are tabulated in Table 4.1.1 in Section 4.0, Results are identified in Section 4.2, Natural Phenomena Hazards Mitigation.

It is concluded that the deficiencies are not sufficient to justify the cost of such an upgrade. Reliability studies of the system and design analyses support this conclusion.

The report completed (Kriskovich, 1997b) supports this conclusion. That report identified several different alternatives to be completed to resolve the SC requirement issues discussed above along with costs associated with each alternative. Based on the costs and level of effort for each activity, the conclusion from that report supports these conclusions.

6.0 RECOMMENDATIONS

It is recommended that the system, as designed and procured, without modification, be accepted for SC application based on the technical information presented in this report and the fact that most safety SSCs were procured and designed to appropriate requirements. For those items originally procured and designed based on differing safety functions or designated GS, reliability studies and design analyses demonstrate that the added benefit of component replacements, system modifications, or additional engineering analyses to upgrade to SC do not provide a significant increase in reliability for the system or a reduction in risk. This recommendation is also based on the conclusions and recommendations from the alternative study (Kriskovich, 1997b) that identified the costs and level of effort to complete each alternative.

Meeting the natural phenomena criteria as identified in DOE Order 6430.1A and GC-Load-01 is still required. Although existing ventilation systems in other farms and the existing 702-A System do not meet and no plans are in place to meet the requirement, it is recommended that a waiver be pursued against 6430.1A SC seismic natural phenomena criteria for Project W-030 system/components. The waiver would be valid for the equipment currently installed and for any changes/modifications in the future (i.e., like for like replacement). Although the system and applicable components would be designated as SC, those changes/modifications would be completed to the original criteria as identified in this report. The technical bases to support the deviation are contained or referenced within this report. A rough order of magnitude cost estimate associated with this recommendation along with a schedule are identified in HNF-1518 (Kriskovich, 1997b).

If the above alternative is unacceptable, as an alternative, either a decision will need to be made on the applicability of DOE Order 6430.1A, or parts of the system will require additional analysis or physical upgrade to SC criteria, particularly the ductwork and valving downstream of the primary HEPA filters, discussed above as not satisfying applicable SC requirements under the new BIO criteria, and any pipe hangers and equipment supports identified

as SC. The review process for each component in question should include one or more of the following steps:

- Determine which criteria are applicable to the item.
- Document nonconformance of item by means of NCR process.
- Contact vendor to determine if QA program is acceptable, and applicable to the item; conduct source inspection or other evaluation as appropriate.
- Contact other sites (e.g., commercial) to inquire about similar equipment that has been qualified to similar requirements, to establish a history of satisfactory performance in SC applications.
- Take samples for analysis to verify materials, where CMTRs do not exist (e.g., for pipe supports).
- Test or otherwise qualify item to verify critical characteristics (in place or temporarily removed from the system).
- Replace with equivalent items that are procured and qualified as safety SSCs, or reconfigure the system in such a way that the item is bypassed and its safety function is performed by other components.
- Possibly perform additional design analysis.

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APPENDIX A

SAFETY EQUIPMENT LIST

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM IDENTIFICATION	SAFETY FUNCTION(S)	FUNCTIONAL REQUIREMENTS	CLASSIFICATION	JUSTIFICATION
241-AY/AZ Tank Farm Aging Waste Facility Primary, or "K1", Ventilation System	Provides flow to maintain flammable gas conc. in tank vapor space, due to steady-state gas releases, ≤25% LFL, and removes waste heat	DST/AWF Ventilation Systems shall maintain a 0.06 to 1.49 kPa (0.25 to 6.0 in. WG) vacuum in the vapor spaces of all tanks.	SC	HNF-SD-WM-BIO-001, Rev. 0, (BIO) Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 1.

THE ITEMS LISTED BELOW ARE UNIQUE COMPONENTS THAT MAKE UP THE SAFETY SSC

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
STRUCTURES						
Ventilation Building	241-AZ-702	Houses and supports primary exhaust fans, filter trains, system I&C, and other equipment	Structural damage or collapse due to natural phenomena	Crush or rupture of ductwork could impede flow, leading to a loss of ventilation and buildup of flammable gases in tank vapor space.	BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SS**
Generator Building	241-AZ-701	Houses and supports backup power supply, and elec. system switch gear	Structural damage or collapse due to natural phenomena	Physical damage to generator or switchgear could eliminate power to fans, leading to a loss of ventilation & buildup of flammable gases in tank vapor space.	BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SS**
Control Building	241-AZ-271	Houses control room and operating personnel	Structural damage or collapse due to natural phenomena	Event could damage control console, fixtures, or other supporting hardware, or could injure personnel.	Standard building codes for general service structures provide appropriate level of protection.	GS
Recirculation and Cooling Cell Bldgs.	241-AY-401, 241-AY-402, 241-AZ-401, 241-AZ-402	House and support recirculation fans, I&C, and other related equipment	Structural damage or collapse due to natural phenomena	Crush or rupture of SC portion of ductwork could impede flow, leading to a loss of ventilation and buildup of flammable gases in tank vapor space.	BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SS**

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Piping and equipment supports	-	Prevents loss of components due to natural phenomena; safety classification to match component supported	Structural damage or collapse due to natural phenomena, affecting integrity or function of supported equipment	Damage to SC ductwork or SC equipment could impede flow, leading to a loss of ventilation and buildup of flammable gases in tank vapor space; loss of non-SC equip. does not affect system safety function.	Supports for primary fans, filter trains, SC dampers, and SC ductwork are "SC", as failure could cause loss of flow; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14; (supports are "GS" for HEME, condensers, recirc. loop ductwork, other GS equip. and piping).	GS or SC
Primary Vent Exhaust Stack	296-A-42	Exhausts filtered primary flow to atmosphere; minimizes exposure of onsite worker under abnormal conditions (unfiltered release) by elevating discharge point and enhancing dispersal of effluent.	Structural damage or collapse due to natural phenomena	Loss of stack does not prevent flow and does not immediately prevent system from performing safety function.	Structural failure could affect worker safety, but standard building codes for general service structures provide appropriate level of protection.	GS
MECHANICAL EQUIPMENT						
Primary Exhaust Fans	AZ-K1-5-1A; AZ-K1-5-1B	Provide primary exhaust flow, to prevent accumulation of flammable gases.	Mech. failure of bearings, motor, or drive, loss of power, or struc. failure of fan housing.	Failure of fan could eliminate the motive force providing flow, resulting in increased flammable gas conc. in tank vapor space (fan and filter bank are redundant and can be switched, but offline/standby fan may be out of service)	BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 1.	SC

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Ventilation Ductwork from Tank, incl. equip. bypass lines and bypass portions of Recirculation Loops (ref. P&IDs H-2-131062-H-2-131065, H-2-131075, & H-2-131076)	10"-V-AZ103-M9, 10"-V-AZ105-M9, 10"-V-AZ106-D3, 10"-V-AZ107-D3, 10"-V-AZ108-D3, 10"-V-AZ109-D3, 10"-V-AY1102-M9 10"-V-AZ2102-M9 8"-V-AY1101-M9, 8"-V-AY2101-M9, 8"-V-AZ1101-M9, 8"-V-AZ2101-M9, 8"-V-AY1203-M9, 8"-V-AY2203-M9, 8"-V-AZ1203-M9, 8"-V-AZ2203-M9, and parts of: 10"-V-AZ100-M9, 10"-V-AZ102-M9, 10"-V-AY1200-M9 10"-V-AY2200-M9 10"-V-AZ1200-M9 10"-V-AZ2200-M9	Provides a confined path for primary flow from tanks.	Structural damage or failure (crushing or rupturing)	Ductwork is nonredundant and loss would preclude air flow from tank, leading to a loss of ventilation and buildup of flammable gases in tank vapor space	BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Ventilation Ductwork from Tank Air Inlet Station to Tank	6"-V-AY1100-M9, 6"-V-AY2100-M9, 6"-V-AZ1100-M9, 6"-V-AZ2100-M9	Confinement of radiological and hazardous materials; provides a flow path for fresh air into the tank.	Structural damage or failure (crushing)	Ductwork is nonredundant and loss could preclude fresh air flow into tank, leading to a loss of ventilation and buildup of flammable gases in tank vapor space	Primary pathway for air into the tank; failure could prevent flow; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Ventilation Ductwork from Tank, routed through HEME and primary condenser in non-bypass mode (ref. P&ID H-2-131075)	10"-V-AZ101-M9, 10"-V-AZ104-D3, and parts of: 10"-V-AZ100-M9, 10"-V-AZ102-M9	Provides a confined path for primary flow from tanks under normal conditions, but can be bypassed for HEME and condenser maintenance, etc.	Structural damage or failure (crushing or rupturing)	Ductwork is nonredundant but may be bypassed in case of loss, and would not preclude air flow from tank; loss would affect efficiency but not safety function of system.	Ductwork is nonredundant but may be bypassed.	GS

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Ventilation Ductwork, *Recirculation* Cooling System Loop in non-bypass mode (ref. P&IDs H-2-131062-H-2-131065)	8"-V-AY1201-M9, 8"-V-AY1202-M9, 8"-V-AY2201-M9, 8"-V-AY2202-M9, 8"-V-AZ1201-M9, 8"-V-AZ1202-M9, 8"-V-AZ2201-M9, 8"-V-AZ2202-M9, and parts of: 10"-V-AY1200-M9 10"-V-AY2200-M9 10"-V-AZ1200-M9 10"-V-AZ2200-M9	Confinement of radiological and hazardous materials; provides path for normal recirculation flow path.	Structural damage or failure (crushing, plugging, or rupturing)	Ductwork is nonredundant but may be bypassed in case of loss, and would not preclude air flow from tank; loss would affect efficiency but not safety function of system.	Nonredundant, but can be bypassed; failure affects efficiency but not safety function of vent system.	GS
Motor Operated Dampers, upstream and downstream of either filter train	MK-AZK1-1A, MK-AZK1-1B, MK-AZK1-2A, MK-AZK1-2B	Part of primary flow path from tanks, or part of confinement barrier; used to route or reroute primary flow automatically (i.e., to switch exhaust trains).	Mechanical or electrical failure of damper actuator; structural failure of damper body; any failure of damper in a closed or open position.	Damper failure could preclude air flow from tank, leading to a loss of ventilation and buildup of flammable gases in tank vapor space.	Failure of dampers would prevent flow; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Motor Operated Dampers, Tank Air Inlets	MK-AY101K1-1, MK-AY102K1-1, MK-AZ101K1-1, MK-AZ102K1-1	Provide a flow path for fresh air into the tank.	Mech. or elec. failure of damper actuator; structural failure of damper body; any failure of damper in a closed position.	Damper failure would preclude fresh air flow into tank, leading to a loss of ventilation and buildup of flammable gases in tank vapor space.	Primary pathway for air into the tank; failure of dampers in closed position could prevent flow; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Motor Operated Flow Control Dampers, outlet from Tank	MK-AY101K1-2, MK-AY102K1-2, MK-AZ101K1-2, MK-AZ102K1-2	Part of primary flow path from tanks; used to regulate flow from each tank and balance system automatically; may be isolated and bypassed by manual dampers.	Mechanical or electrical failure of damper actuator; structural failure of damper body; any failure of damper in a closed or open position.	Damper failure does not eliminate flow or ability to control primary flow or system balance; damper may be bypassed and flow adjusted using manual bypass damper and flow indicating instruments.	Damper failure does not affect system safety function.	GS

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Manually Operated Dampers, bypass and isolation for primary flow path around flow control dampers	MK-AY101K1-2A1, MK-AY101K1-2A2, MK-AY101K1-2A3 (similar, for other 3 tanks; ref. P&ID H-2-131075)	Part of normal primary flow path from tanks, or part of confinement barrier (with ductwork) when motor operated flow control damper is bypassed for maintenance.	Mechanical failure of damper; structural failure of damper body.	Failure of isolation dampers in open position, or bypass damper in a closed position, concurrent with a failure of flow control damper, could limit ventilation flow from tank, leading to a buildup of flammable gases in tank vapor space.	Used to bypass flow control damper; damper failure could prevent or limit flow; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Manually Operated Dampers, Recirc. Loop (bypass and isolation dampers for primary flow path)	MK-AY101K4-1, MK-AY101K4-2, MK-AY101K4-3, MK-AY101K4-4 (similar, for other 3 tanks; ref. P&IDs H-2-131062-H-2-131065)	Part of primary flow path from tanks, or part of confinement barrier (with ductwork) when recirc. loop is bypassed.	Mechanical failure of damper in an open position; structural failure of damper body.	Damper failure concurrent with a rupture in recirc. loop could limit ventilation flow from tank, leading to a buildup of flammable gases in tank vapor space.	Used to bypass recirc. loop; failure of isolation dampers in open position could prevent or limit flow; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Manually Operated Dampers, balance of system, incl. condenser and HEME bypass and isolation dampers	MK-AZK105-1A1, MK-AZK105-1A2, MK-AZK105-1B1, MK-AZK105-1B2, MK-AZK1-3A, MK-AZK1-3B, MK-AZK108-1A, MK-AZK108-1B, MK-AZK108-1C, MK-AZK109-1A, MK-AZK109-1B, MK-AZK109-1C	Part of primary flow path from tanks; used to route or reroute primary flow or bypass equipment for maintenance; may form part of confinement barrier if used for isolation.	Mechanical failure of damper in a closed or open position; structural failure of damper body.	Damper failure could preclude air flow from tank, leading to a loss of ventilation and buildup of flammable gases in tank vapor space.	Failure of dampers in closed position (or of isolation dampers in open position) could prevent flow; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Primary HEPA Filters	AZ-K1-4-1A, AZ-K1-4-1B, AZ-K1-4-2A, AZ-K1-4-2B	Confinement of radiological and hazardous materials; housings form part of primary flow path confinement barrier.	Breach due to high temperature or pressure; substantial plugging due to ice, moisture, or dust buildup not a credible event.	Failure may result in exposure of onsite worker, but does not prevent flow; CAM interlock and diff. press. switches provide appropriate level of protection against onsite exposure.	CAM interlock to fans (part of radiation monitoring system, RAH-AZK1-1, ref. H-2-131078) switches fans/trains to provide SSC control; diff. press. switches provide add'l compensatory measure.	GS

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Primary HEGA (Charcoal) Filters	AZ-K1-10-1A, AZ-K1-10-1B	Confinement of radiological and hazardous materials; housings form part of primary flow path confinement barrier.	Breach due to high temperature or pressure; substantial plugging due to ice, moisture, or dust buildup not a credible event.	Failure may result in exposure of onsite worker, but does not prevent flow; CAM interlock and diff. press. switches provide appropriate level of protection against onsite exposure.	CAM interlock provides SSC control; diff. press. switches provide add'l compensatory measure.	GS
Primary Heaters	AZ-K1-2-1A, AZ-K1-2-1B.	Protects filters from moisture damage and improves efficiency, by heating airstream, aids in confinement of radiological and hazardous materials; housings form part of confinement barrier.	Heater failure or loss of power resulting in loss of airstream heating; or heater may overheat and damage filters.	Heater failure may eventually result in filter damage or loss of filter efficiency.	Failure affects life and efficiency of filters, but has no immediate effect on flow or system safety function.	GS
HEME	AZ-K1-9-1	Confinement of radiological and hazardous materials; confinement of majority of tank liquids to "hotter" side of system to reduce moisture, salts, and radiological load on HEPA filters; shell forms part of confinement barrier.	Mechanical failure resulting in carryover of liquids to filter train.	Increased contamination levels in HEPA/HEGA filter train and reduced system efficiency.	Nonredundant, but can be bypassed; failure affects efficiency but not safety function of filters & vent system, and does not prevent flow.	GS
Primary Condenser	AZ-K1-8-1	Confinement of radiological and hazardous materials; confinement of majority of tank liquids to "hotter" side of system to reduce moisture, salts, and radiological load on HEPA filters; shell forms part of confinement barrier.	Mechanical failure resulting in carryover of liquids to filter train.	Increased contamination levels in HEPA/HEGA filter train and reduced system efficiency.	Nonredundant, but can be bypassed; failure affects efficiency but not safety function of filters & vent system, and does not prevent flow.	GS

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Primary Tank and Risers	TK-AY-101, TK-AY-102, TK-AZ-101, TK-AZ-102	Primary confinement of tank waste and vapors; connects to air inlet and exhaust ventilation ductwork.	Structural failure of tank or risers due to natural phenomena.	Leakage or loss of confinement of tank waste.	Not classified; ref. related note to this table, or BIO Sec. 2.0.	***
Tank Air Inlet HEPA Filters	AY101-K4-4-1, AY102-K4-4-1, AZ101-K4-4-1, AZ102-K4-4-1	Confinement of radiological and hazardous materials; housings form part of confinement barrier.	Breach of filter due to high temperature or pressure; substantial plugging due to ice, moisture, or dust buildup not a credible event.	Failed filter will not confine tank atmosphere in the event of a tank pressurization, with poss. effect on onsite worker; no effect on flow.	Inlet filters do not carry a significant inventory; confinement function is insignificant as it applies only in case of a tank pressurization.	GS
Tank Air Inlet Prefilters	AY101-K4-3-1, AY102-K4-3-1, AZ101-K4-3-1, AZ102-K4-3-1	Helps protect integrity of air inlet HEPA filter.	Breach of filter due to high temperature or pressure; substantial plugging due to ice, moisture, or dust buildup not a credible event.	Failed prefilter will allow inlet HEPA filter to load up faster and lose efficiency; no immediate effect on system safety function.	Failure affects life of air inlet HEPA filters; no immediate effect on confinement function.	GS
Tank Air Inlet Heaters	AY101-K4-2-1, AY102-K4-2-1, AZ101-K4-2-1, AZ102-K4-2-1	Helps protect integrity of air inlet HEPA filter, by heating airstream.	Heater failure or loss of power resulting in loss of airstream heating function; alternatively, heater may overheat and damage filter.	Heater failure may eventually result in filter damage or loss of filter efficiency; no effect on flow.	Failure affects life of air inlet HEPA filters; no immediate effect on confinement function or flow.	GS
Recirculation Fans	AY101-K4-5-1, AY102-K4-5-1, AZ101-K4-5-1, AZ102-K4-5-1	Provide recirculation flow for waste/vent cooling; housings form part of confinement barrier but not part of primary flow path.	Mech. failure of bearings, motor, or drive, loss of power, or struc. failure of fan housing or supports.	Failure of fan could eliminate the motive force providing recirculation flow, resulting in loss of cooling and decreased system efficiency, but not safety function.	Nonredundant, but can be bypassed; failure limits waste cooling function, affecting efficiency but not safety function of vent system.	GS

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SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Recirc. Loop Moisture Separators	AY101-K4-1-1, AY102-K4-1-1, AZ101-K4-1-1, AZ102-K4-1-1	Confinement of liquids to tank and reduced filter loading; housings form part of confinement barrier but not part of primary flow path.	Mechanical failure resulting in carryover of liquids and loss of cooling, system efficiency.	Failure could result in loss of cooling and decreased system efficiency, but not safety function.	Nonredundant, but can be bypassed; failure affects efficiency but not safety function of system.	GS
Recirc. Loop Moisture Condensers	AY101-K4-8-1, AY102-K4-8-1, AZ101-K4-8-1, AZ102-K4-8-1	Waste/vent cooling; confinement of liquids to tank and reduced filter loading; housings form part of confinement barrier but not part of primary flow path.	Mechanical failure resulting in carryover of liquids and loss of cooling, system efficiency.	Failure could result in loss of cooling and decreased system efficiency, but not safety function.	Nonredundant, but can be bypassed; failure affects efficiency but not safety function of system.	GS
Duct encasements (secondary containment system)	"-ENC-M26" various (ref. P&IDs H-2-131062-H-2-131065 & H-2-131075)	Contains condensate in the event of leakage from ductwork.	Structural damage or failure (crushing or rupturing)	Encasement is nonredundant and failure, if concurrent with a piping or duct failure, would result in loss of confinement and liquid containment.	Condensate is not a significant source term, and is not included in BIO accident scenarios.	GS
Process condensate drains	"-PC--M27" various (ref. P&IDs H-2-131062-H-2-131065 & H-2-131075)	Contains condensate from various equipment	Structural damage or failure (crushing, plugging, or rupturing)	Piping is nonredundant and failure would result in loss of liquid containment.	Condensate is not a significant source term, and is not included in BIO accident scenarios.	GS
241-AZ-702 Building Ventilation (Subsystem)	(Ref. H-2-131077 & H-2-131081)	Supplies cooling to fan motors and drives.	Mechanical failure of fan or other components, loss of power.	Loss of ventilation for equipment cooling.	Failure has no immediate effect on system safety function.	GS
ELECTRICAL AND I&C EQUIPMENT						
Normal Power Supply (Subsystem)	(Ref. H-2-131353, Sh. 1)	Provide power to exhaust fan drives.	Loss of main power source, loss of switchgear or transformer.	Failure of fan power supply eliminates the motive force providing flow, leading to a buildup of flammable gases in tank vapor space.	BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Backup Power Supply (Subsystem)	(Ref. H-2-131353, Sh. 2)	Provide backup power to exhaust fan drives on loss of normal power.	Loss of diesel fuel supply, collapse of gen. bldg., mech. failure of generator.	Failure of fan power supply eliminates the motive force providing flow, leading to a buildup of flammable gases in tank vapor space.	BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Variable Speed Drives	VSD-1; VSD-2	Provide power to exhaust fans.	Loss or failure of electrical components by overheating or deterioration.	Failure of fan drive eliminates the motive force providing flow, leading to a buildup of flammable gases in tank vapor space.	Failure of fan eliminates the motive force providing flow; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Tank Flow Indication Instrument Loop (Tank Exhaust Outlet)	FE-AY101K1-2, FT-AY101K1-2, & FIC-AY1K1-2 (similar, for other 3 tanks; ref. P&ID H-2-131075)	Indicates/verifies rate of exhaust air flow from each primary tank.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to verify system is performing safety function and maintaining flow; could lead to a buildup of flammable gases in tank vapor space.	Monitors and supports safety function of exhaust fan; BIO Sec. 5.3.2.14, Flammable Gas Deflagrations; Criteria 14.	SC
Tank Flow Indication Instrument Loops (Tank Air Inlet)	FE-AY101K1-1, FT-AY101K1-1, & FIC-AY1K1-1 (similar, for other 3 tanks; ref. P&ID H-2-131075)	Indicates/verifies rate of fresh air flow into primary tank (via air inlet station only, may not include all sources of inflow).	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to verify system air flow through normal tank inlet path; failure does not affect safety function of system or flow, as flow is more reliably monitored at tank outlet.	Can help optimize or monitor performance of air inlet stations, but not necessary for function.	GS
Damper Limit Switches, all manual and motor-operated dampers (ref. P&IDs)	"ZS-" or "ZT-/ZI-" various (ref. P&IDs, incl. bypass & recirc. lines; located with dampers)	Indicates damper positions.	Instrument malfunction, loss of calibration, or loss of power or signal.	Loss of signal verifying positions of dampers routing primary flow path.	Failure would not affect safety function of system, as there are alternate means of verifying valve lineup.	GS
HEME Radiation Monitor	RIAS-AZK109-1	Indicates radioactive inventory of HEME; used to indicate need for HEME changeout.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to changeout HEME on a timely basis as required by TSR Administrative Control.	TSR AC 5.18, HEPA Filter Controls; BIO Sec. 5.3.2.2, HEPA Filter Failure; Criteria 4.	SS

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SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Temperature Indic. Instr. Loops, before and after Primary Heaters and Filters (ref. H-2-131076)	TE-AZK102-1A, TE-AZK102-1A1, TT-AZK102-1A, TI-AZK12-1A, TDIC-AZK12-1A, TIC-AZK102-1A, etc. (similar, for 'B' train)	Helps protect integrity of primary filters by monitoring and controlling heater function, and preventing high temperature at filter face.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to verify airstream temperature at filter face; disabling of automatic high temperature heater shutdown; could result in failure of primary HEPA/HEGA filters.	Failure has no immediate effect on flow or confinement; CAM interlock and diff. pressure instruments initiate corrective actions.	GS
Temperature Indic. Instr. Loop, before and after Primary Condenser	TE-AZK108-1A1, TE-AZK108-1A2, TT-AZK108-1A, TI-AZK18-1A, TE-AZK108-1B1, TE-AZK108-1B2, TT-AZK108-1B, TI-AZK18-1B	Monitors or verifies proper function of condenser; indication only.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to monitor or verify equipment performance; could result in reduced system operating efficiency.	Helps optimize performance of equipment but not necessary for safety function.	GS
Temperature Indic. Instr. Loop, after Tank Air Inlet Heater	TIC-AY101K102-1 TAL-AYK12-1 (similar, for other 3 tanks; ref. P&ID H-2-131075)	Monitors temperature at face of air inlet filter; controls heater and actuates alarm.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to verify airstream temperature at filter face; disabling of automatic high temperature heater shutdown; could result in failure of inlet HEPA filter.	Supports a general service component.	GS
Temperature Indic. Instr. Loop, before and after Recirc. Condenser (ref. P&IDs H-2-131062-H-2-131065)	TE-AY101K408-1A TI-AY101K408-1A TE-AY101K408-1B TI-AY101K408-1B TE-AY101EWS-1 TI-AY1EWS-1 TE-AY101EWR-1 TE-AY1EWR-1 (similar, for other 3 tanks)	Monitors or verifies proper function of recirc. condenser; indication only.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to monitor or verify equipment performance; could result in reduced system operating efficiency.	Helps optimize performance of equipment but not necessary for safety function.	GS
Pressure Instrument Loops, Primary HEPA & HEGA Filters (ref. H-2-131076)	PDT-AZK104-1A, PDT-AZK104-2A, PDT-AZK110-1A, PDI-AZK14-1A, PDI-AZK110-1A, PDI-AZK14-2A (similar, for 'B' train)	Helps protect integrity of primary filters by monitoring pressure drop across filters and initiating corrective action in the event of high or low diff. pressure.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to verify pressure drop across HEPA and HEGA filters; disabling of automatic high diff. pressure shutdown; could result in failure of primary HEPA/HEGA filters and onsite release.	Failure affects onsite worker safety; a compensatory measure in lieu of CAM interlock to initiate corrective action in the event of a filter breach; BIO Sec. 5.3.2.2; Criteria 12.	SS

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Pressure Instrument Loop, HEME	PDT-AZK109-1, PDI-AZK19-1	Monitors or verifies proper function of HEME; alarms on high diff. pressure.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to verify pressure drop across HEME; disabling of alarm function.	Helps optimize performance of equipment but not necessary for safety function; HEME may be bypassed.	GS
Pressure Instrument Loop, Primary Condenser	PDT-AZK108-1, PDI-AZK18-1	Monitors or verifies proper function of condenser; alarms on high diff. pressure.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to verify pressure drop across condenser; disabling of alarm function.	Helps optimize performance of equipment but not necessary for safety function; condenser may be bypassed.	GS
Pressure Instrument Loops, Tank Air Inlet Filters	PDI-AY101K103-1 PDI-AY101K104-1 PDIS-AY101K1-1 (similar, for other 3 tanks; ref. P&ID H-2-131075)	Helps protect integrity of air inlet filters by monitoring pressure drop across filters and initiating corrective action in the event of high or low diff. pressure.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to verify pressure drop across inlet HEPA filter; disabling of alarm; could result in failure of inlet HEPA filter and loss of confinement (only if concurrent with a tank pressurization).	Not necessary for safety function.	GS
Pressure Instrument Loops, Recirc. Moisture Separators and Condensers	PDE-AY101K405-1 PDT-AY101K405-1 PDI-AY1K45-1, PDE-AY101K408-1 PDT-AY101K408-1 PDI-AY1K48-1 (similar, for other 3 tanks; ref. P&IDs H-2-131062-H-2-131065)	Monitors or verifies proper function of condenser; alarms on high diff. pressure.	Instrument malfunction, loss of calibration, or loss of power or signal..	Inability to monitor or verify equipment performance; could result in reduced system operating efficiency.	Helps optimize performance of equipment but not necessary for safety function.	GS
Leak detection instrumentation on duct encasement lines, etc.	"LD-" (various, ref. P&ID H-2-131062-H-2-131065 & H-2-131075)	Notifies operator in the event of a condensate leak from ductwork.	Instrument malfunction, loss of calibration, or loss of power or signal.	Inability to monitor or verify loss of condensate from breach in ductwork; does not preclude other means of detecting a breach in primary ductwork.	Condensate is not a significant source term, and not included in BIO accident scenarios.	GS

Table A-1. Active Ventilation for 241-AY/AZ, Project W-030 Ventilation Upgrade. (11 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					

NOTES:

* SC = Safety Class; SS = Safety Significant; GS = General Service (not safety related). Assignments based on BIO safety analyses and "SSC Criteria" in HNF-PRO-516 (formerly Sec. 9.0 of WHC-CM-4-46, Safety Analyses Manual, Westinghouse Hanford Company, Richland, Washington); see Table 2 in Sec. 3.1, this SEL.

** "SS" classification of buildings is based on Appendix A, para. 3.e of HNF-PRO-516, regarding interaction hazards. Structures housing SC components must be designed to applicable SC seismic, wind, and other natural phenomena design loads, except where it can be shown that interaction hazards to SC equipment are unlikely or do not adversely affect a safety function.

*** Double-shell tanks (DSTs), including AWF tanks, are not included in the list of Safety Class or Safety Significant SSCs in the BIO. The classification of these passive design features as Safety Class, Safety Significant, or general service will be provided in the TWRS final safety analysis report, or FSAR (ref. BIO, Sec. 2.0).

Table A-2. Ventilation CAM Interlock for 241-AY/AZ, Project W-030 Ventilation Upgrade. (2 Sheets)

SYSTEM IDENTIFICATION	SAFETY FUNCTION(S)	FUNCTIONAL REQUIREMENTS	CLASSIFICATION	JUSTIFICATION
241-AY/AZ Tank Farm Active Ventilation CAM Interlock System (located on 296-A-42 Primary Exhaust Stack), ref. P&ID H-2-131078.	Prevents an unfiltered release from occurring for more than 10 minutes	The CAM must operate continuously while the exhaust system is operating, maintaining isokinetic sampling conditions. The CAM must measure the radiation level in the sampled flow stream and detect levels in excess of a preset level. The CAM shall activate an interlock to shut down the exhauster, or switch exhaust trains, within 10 minutes of detecting an excess radiation level. Upon CAM failure, the monitors must actuate an alarm and an interlock to shut down the exhaust system.	SS	HNF-SD-WM-BIO-001, Rev. 0, (BIO) Sec. 5.3.2.2, HEPA Filter Failure; Safety SSC Criteria 6.
	Ensures exhaust fan is shut down or switched in the event exhaust HEPA filters break through; prevents unfiltered aerosol release to the atmosphere.	The stack CAM must operate continuously while the exhaust system is operating, and must be capable of alarming and shutting down the exhaust fan when radiation levels above background are detected in the stack.	SC	HNF-SD-WM-BIO-001, Rev. 0, (BIO) Sec. 5.3.2.20, Spray Leak in Structure or Overground Waste Transfer Line; Criteria 1.

THE ITEMS LISTED BELOW ARE UNIQUE COMPONENTS THAT MAKE UP THE SAFETY SSC

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Beta/Gamma Radioactive Particulate Monitor Instr. Loop and interlock to fans	RE-AZK1-1 & RIAS-AZK1-1	Monitors for radiation in exhaust stream, and interlocks to shut down fan	Malfunction caused by excessive moisture in sample line or high temperature, loss of calibration.	Failed CAM will not shut down the active ventilation system in the event of a failed HEPA filter, resulting in an unmonitored, unfiltered release of radioactive particulate.	BIO Sec. 5.3.2.20, Spray Leak in Structure; Criteria 14.	SC
Vacuum Pumps	AZ-K1-11-1 & AZ-K1-11-2	Draw sample from exhaust stream	Failure of motor due to heating or loss of power; mech. failure of pump.	Loss of sample stream to CAM, or loss of consistent sample gas flow rate; failure of CAM to detect radioactive particulate and shut down exhauster in the event of a HEPA filter failure.	BIO Sec. 5.3.2.20, Spray Leak in Structure; Criteria 14.	SC

Table A-2. Ventilation CAM Interlock for 241-AY/AZ, Project W-030 Ventilation Upgrade. (2 Sheets)

SYSTEM, STRUCTURE, OR COMPONENT		SAFETY FUNCTION(S)	FAILURE MODE	EFFECT OF FAILURE ON SAFETY FUNCTION	JUSTIFICATION FOR SAFETY CLASSIFICATION	SAFETY CLASS*
DESCRIPTION	IDENTIFICATION NO.					
Flow Alarm Switch Instr. Loop	FE-AZK1-1, FIT-AZK1-1, UC-AZK1-2, & FAL-AZK1-1A	Senses sample stream flow rate and alarms upon low flow	Mechanical or elec. failure of switch, loss of calibration	Continued operation of ventilation system without CAM function, failure to shut down active ventilation in the event of a failed HEPA filter, resulting in an unmonitored, unfiltered release of radioactive particulate.	BIO Sec. 5.3.2.20, Spray Leak in Structure; Criteria 14.	SC
Flow Regulator (MOV)	MV-AZK1-1	Regulates constant sample flow through CAM system	Mechanical or elec. failure of valve actuator	Failure of regulator is normally detected by the flow alarm switch, resulting in corrective action to restore system to operation.	Flow alarm switch provides safety function; failure of regulator will not affect safety function of system.	GS

NOTE:

* SC = Safety Class; SS = Safety Significant; GS = General Service (not safety related). Assignments based BIO analyses and "SSC Criteria" in HNF-PRO-516 (formerly Sec. 9.0 of WHC-CM-4-46, Safety Analyses Manual, Westinghouse Hanford Company, Richland, Washington); see Table 2 in Sec. 3.1, this SEL.

APPENDIX B

SAFETY CLASS UPGRADE SUMMARY TABLE

SAFETY CLASS UPGRADE SUMMARY TABLE

EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION	SPECIFICATION	CLASSIFICATION		COMMENTS
			Required per BIO	MEETS	
241-AZ-702	Ventilation Building	W-030-C2	SS	GS*	Designed to SS loads, procured to GS requirements. Cert. of Compliance (COC) in vendor submittal 85; design anal. in submittal 162. *See also discussion, Sec. 3.0 & 4.0.
241-AZ-701	Generator Building		SS	GS*	Designed to SS loads, procured to GS requirements. Design anal. in vendor submittal 162. *See also discussion, Sec. 3.0 & 4.0.
241-AY-401, 241-AY-402, 241-AZ-401, 241-AZ-402	Recirculation and Cooling Cell Bldgs.		SS	GS*	Designed to SS loads, procured to GS requirements. *See also discussion, Sec. 3.0 & 4.0.
	Primary tank vent system Air Inlet Stations	W-030-P5			*See discussion of valves, Sec. 3.0 & 4.0.
MK-AY101K1-1 MK-AY102K1-1 MK-AZ101K1-1 MK-AZ102K1-1	Pressure Control Valves. Butterfly, 6", electrically operated.		SC	SS*	Entire air inlet station procured and qualified per spec. as an assembled unit. COC from vendor in CVI#22525, Supp. 94, stating all requirements of spec. have been met. CMTRs for the steel used to fabricate the stations are in CVI#22525, Supp 94, design analysis in CVI#22525, Supp 91.
Ducting Housings Struct. Frame Base	Tubing, ASTM A269, 304 Sheet, 12 Ga., SST ASTM A240 304 Channel, ASTM A36, CS Channel, ASTM A36, CS		SC	SC	
	The above components were supplied with the four Air Inlet Stations designed and built vendor; refer to CVI#22525, Supp 98.				

EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION	SPECIFICATION	CLASSIFICATION		COMMENTS
			Required per BIO	MEETS	
	Primary tank vent system	W-030-C3			
V-AY1100-M9 V-AY2100-M9 V-AZ1100-M9 V-AZ2100-M9	Piping into the waste tanks from the Air Inlet Stations.		SC	SC	CMTRs from qualified suppliers in vendor submittal 5.
V-AY1101-M9 V-AY2101-M9 V-AZ1101-M9 V-AZ2101-M9 V-AY1102-M9 V-AZ2102-M9 V-AZ100-M9	Piping out of waste tanks (bypass mode) from recirculation vent cooling modules. Pipe: Sched 40S, SST ASTM A312 Gr TP 304L. Fittings: SST ASME SA 403 Class WP-S 304L. See pipe code M-9 of W-030-C3, Section 15493.		SC	SC	
V-AZ103-M9	Cell piping (condenser and HEME bypassed). Pipe: Sched 40S, SST ASTM A312 TP 304L. Fittings: SST ASTM A403 WP 304L. Flanges: CL 150# Forged SST ASTM A182 F304L. See pipe code M-9 of W-030-C2, Section 15493.	W-030-C2	SC	SC	CMTRs from qualified supplier in vendor submittal 130.
Hangers Supports	See Para. 2.2.9, Sec. 15500, W-030-C2		SC	GS*	Procured GS; no documentation to show that hangers and supports meet SC procurement requirements. *See discussion of hangers and supports, Sec. 3.0 & 4.0.
MK-AZK108-1C MK-AZK109-1C	Cell valving (condenser and HEME bypassed). Butterfly, 10", wafer style, CL 150# SST body, stem and disc, bubble tight. Remote operator. See pipe code M-9 of W-030-C2, Section 15493.	W-030-C2	SC	SS*	COC from the prime contractor for constr. spec., for valve bodies and bonnets, in Submittal 132.
MK-AZK108-1A MK-AZK108-1B MK-AZK109-1A MK-AZK109-1B	Cell isolation valving (condenser and HEME bypassed). Butterfly, 10", wafer style, CL 150# SST body, stem and disc, bubble tight. Remote operator. See pipe code M-9 of W-030-C2, Section 15493.		SC	SS*	COC from prime constr. contractor, Sub. 132. Meets intent of original SS, providing confinement. *See discussion of valves, Sec. 3.0 & 4.0.

EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION	SPECIFICATION	CLASSIFICATION		COMMENTS
			Required per BIO	MEETS	
FE-AY101K1-2, FT-AY101K1-2, & FIC-AY1K1-2 (similar, for other 3 tanks; ref. P&ID H-2-131075)	Tank Air Flow Indication & Control Instrument Loop (Tank Exhaust Outlet); incl. flow indicator controllers, located in local control units (LCUs) 1 & 2, E/I Rooms, Bldg. 241-AZ-702.	W-030-P27 & WHC-S-4013	SC	SS*	Instrument loops use interface with MCS and also provide local readout independently of MCS. LCU cabinets and instruments qualified to SS. QAP in Submittal 5, Environ. & seismic qualification doc. in CVI#22525 Supp. 48. *See discussion, Sec. 3.0 & 4.0.
RE-AZK109-1 & RIAS-AZK109-1	HEME Radiation Monitor Instrument Loop	W-030-P25	SS	GS*	Instruments depend on interface with MCS to perform SS safety function per BIO. System was procured to GS, with GS (UBC) seismic requirements. Certificate of calibration in CVI#22525, Supp. 69. *See discussion, Sec. 3.0 & 4.0.
	Primary tank vent system, Filter Train piping	W-030-C2			
V-AZ105-M9	See pipe code M-9, Sec. 15493.		SC	SC	CMTRs in vendor submittal 130.
V-AZ102-D3* V-AZ103-D3* V-AZ106-D3 V-AZ107-D3 V-AZ108-D3 V-AZ109-D3	Duct: Sched 10S, SST ASTM A312 TP 304L. Fittings: SST ASTM A403 Class CR 304. Flanges: Slip-on, light weight, SST. See duct code D-3 of W-030-C2, Section 15500.		SC	GS*/SC	No CMTRs for sched 10S materials. * Ductwork upstream of filters (V-AZ102 & V-AZ103) procured SS as part of filter train piping, per W-030-P3; remaining ductwork, downstream of filters, outside confinement boundary, procured GS. See also discussion, Sec. 3.0 & 4.0.
	Primary tank vent system, Filter Trains	W-030-P3			*See discussion on valves, Sec. 3.0 & 4.0.
Ducting Housing	300 series SST		SC	SC	Two filter trains procured as unit assemblies w/ vendor certified documentation. CVI#22525, Supp. 113 contains COC from vendor stating all requirements of W-030-P3 have been met, also separate COCs for valves, CMTRs for ducting, housing and frame materials. Vendor submittal 6 contains leak test data. Filter train valves meet intent of original SS, based on confinement.
Support Frame	CS, ASTM A36		SC	SC	
MK-AZK1-1A MK-AZK1-1B MK-AZK1-2A MK-AZK1-2B	Valve, butterfly, 10", flanged, CL 150# SST with electric actuators.		SC	SS*	
MK-AZK105-1A1 MK-AZK105-1B1	10" Butterfly valves, SST, manually operated.		SC	SS*	

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EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION	SPECIFICATION	CLASSIFICATION		COMMENTS
			Required per BIO	MEETS	
MK-AZK1-3A MK-AZK1-3B MK-AZK105-1A2 MK-AZK105-1B2	Valving downstream from the filter trains. 10" butterfly, SST, Manual operators.	W-030-C2	SC	GS*	*See also discussion on valves, Sec. 3.0 & 4.0. Downstream valving is outside confinement boundary, procured GS per W-030-C2.
AZ-K1-5-1A, AZ-K1-5-1B	Primary Exhaust Fans: centrifugal type, 0-1000 SCFM.	W-030-P3	SC	SC	Each fan procured and qualified as part of an assembly, with filter train; COC, CMTRs, and test data for primary fans and drives in Submittal 6 or CVI#22525, Supp. 113.
VSD-1 VSD-2	Variable frequency drives.	W-030-P3	SC	SC	See comments for primary fans, above. Seismic qualification to 0.50 g @ 3-100 Hz in CVI#22525, Supp. 113.
PDT-AZK104-1A PDT-AZK104-2A PDT-AZK110-1A PDI-AZK14-1A PDI-AZK14-2A PDI-AZK110-1A (similar, for 'B' train)	Pressure Instrument Loops, Primary HEPA & HEGA Filters (ref. H-2-131076)	W-030-P3	SC*	SS*	Procured and qualified with filter train, as part of overall assembly. Instruments depend on interface with MCS to perform safety function; LCU cabinets and instruments qualified to SS per original requirements; see CVI#22525, Supp. 113. * Required as a compensatory measure, per TSRs; see also discussion, Sec. 3.0 & 4.0.
	Recirculation vent cooling modules.	W-030-C2			
V-AY1200-M9 V-AY2200-M9 V-AZ1200-M9 V-AZ2200-M9 V-AY1203-M9 V-AY2203-M9 V-AZ1203-M9 V-AZ2203-M9	Piping out of tanks (bypass mode). Pipe: Sched 40S, SST ASTM A312 TP 304L. Fittings: SST ASTM A403 WP 304L. Flanges: CL 150# Forged SST ASTM A182 F304L Gaskets and expansion joints may be CGI w/ COCs and QC inspection on receipt. See pipe code M-9 of W-030-C2		SC	SC	CMTRs from qualified suppliers in submittal 130. COC from the prime contractor for this constr. specification, in submittal 132.
Hangers Supports	See Para. 2.2.1.3, Section 15493: "Pipe supports and attachments ....may be noncertified material provided material bears type identifying mark, is suitable for welding, and is compatible with material to which it is attached." Sec. 15493, W-030-C2		SC	GS*	CMTRs, COC or dedication needed to certify the material's allowable strength for the pipe system design analyses. * See also discussion on hangers and supports, Sec. 3.0 & 4.0.

EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION	SPECIFICATION	CLASSIFICATION		COMMENTS
			Required per BIO	MEETS	
	Recirc. vent cooling modules, cont'd.	W-030-C2			* See also general discussion on valves, Sec. 3.0 & 4.0.
MK-AY101K4-4 MK-AY102K4-4 MK-AZ101K4-4 MK-AZ102K4-4	Valving out of tanks (bypass mode). Butterfly, 8", wafer style, CL 150# SST body, stem and disc, bubble tight. With remote operators. See pipe code M-9, Section 15493.		SC	SS*	Valving meets SS based on confinement. COC from prime constr. contractor, stating valve bodies and bonnets, expansion joints and gaskets comply with the specifications and drawings, in CVI#22525, Supp. 113.
MK-AY101K1-2A1 MK-AY102K1-2A1 MK-AZ101K1-2A1 MK-AZ102K1-2A1 MK-AY101K1-2A2 MK-AY102K1-2A2 MK-AZ101K1-2A2 MK-AZ102K1-2A2 MK-AY101K1-2A3 MK-AY102K1-2A3 MK-AZ101K1-2A3 MK-AZ102K1-2A3 MK-AY101K4-1 MK-AY102K4-1 MK-AZ101K4-1 MK-AZ102K4-1 MK-AY101K4-2 MK-AY102K4-2 MK-AZ101K4-2 MK-AZ102K4-2 MK-AY101K4-3 MK-AY102K4-3 MK-AZ101K4-3 MK-AZ102K4-3	Isolation valving (bypass mode). Butterfly, 8" & 10", wafer style, CL 150# SST body, stem and disc, bubble tight. All with remote operators. See pipe code M-9 of W-030-C2, Section 15493.		SC	SS*	COC from prime constr. contractor for valve bodies and bonnets in CVI#22525, Supp. 113.
	Stack Monitoring System	W-030-P16			QAP in vendor submittal 2.
RE-AZK1-1 & RIAS-AZK1-1	Beta/Gamma Radioactive Particulate Monitor Instr. Loop and CAM Interlock to fans		SC	SS	CAM Interlock depends on interface with MCS to perform safety function; LCU cabinets and instruments qualified to SS. * See also discussion, Sec. 3.0 & 4.0.
AZ-K1-11-1 & AZ-K1-11-2	CAM Vacuum Pumps		SC	SC	Pumps ordered per specification as part of entire sampling system; pumps are an engineered item and meet requirements for SC.

EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION	SPECIFICATION	CLASSIFICATION		COMMENTS
			Required per BIO	MEETS	
FE-AZK1-1, FIT-AZK1-1, UC-AZK1-2, & FAL-AZK1-1A	CAM Flow Alarm Switch Instr. Loop		SC	SC	Procured as part of entire sampling system; instruments are hardwired and do not depend on interface with MCS to perform safety function.
LCU-1 & LCU-2	MCS Instrument Interface Cabinets	WHC-S-4013	SS	SS	Assembled cabinets qualified to SS, incl. 0.12 g DBE, based on vendor test report.
	Power Supply - Normal	W-030-C2			* See also discussion of elec. power supplies, Sec. 3.0 & 4.0.
Wiring	600V, Type TC, Hypalon or PVC jacket		SC	SS*	Power cable dedicated in Design Analysis W-030-086 with receipt inspection in vendor submittal 175 (CGI dedication).
Breakers	500A, 400A, and 225A trip, UL listed.		SC	GS*	
	Power Supply - Backup	W-030-P11			* See also discussion of elec. power supplies, Sec. 3.0 & 4.0.
Diesel generator	125 kW		SC	SS*	Qualified to SS requirements, see vendor submittal 4. System includes diesel generator, breakers and ATS-1 & -2.
Breakers	600 V, 3 pole, 200A trip, UL listed		SC	SS*	
ATS-1 ATS-2	480 VAC, 225A, 3 PH, 4 W		SC	SS*	
UPS-1 UPS-2 UPS-3	8 kW/10 KVA Rating	W-030-P17	SC	SS*	UPSs dedicated for SS use in Design Analysis W-030-89. See CVI#22525, Supp. 16.
Wiring	600V, Type TC, Hypalon or PVC jacket	W-030-C2	SC	SS*	CGI Dedication for wire in W-030-86, w/ receipt inspection in submittal 175.
ATS-3	480 VAC, 60 A, 3 PH, 3 W, UL listed	W-030-C2	SC	SS*	
Supply Tank	300 gal capacity with secondary containment.	W-030-P24	SC	SS*	CMTRs and design analyses for tank in CVI#22525, Supp. 34.

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