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Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1	1	Cog.Eng. JIM KRISOVICH		10-19-94	S2-24	W. H. CLEMANS		10-26-94	S2-45	1	1
1	1	Cog. Mgr. W. W. JENKINS		10-19-94	S2-24	R. V. FILKOWSKI		10-26-94	S2-45	1	1
1	1	QA D. C. BOARD		10-26-94	S1-57	P. J. MARTELL		11-30		1	1
1	1	Safety M. N. ISLAM		11-2-94	R3-08	G. W. CUMMINS		11-2-94	R1-51	1	1
1	1	R. W. REED		3 Nov 94	R1-51	O.S.T.I. (2)			L8-07		
1	1	J. MCCLEES		11/2/94	R1-51						
		Central Files									

18. J. B. KRISOVICH Signature of EDT Originator	19. R. W. REED Authorized Representative for Receiving Organization	20. W. W. JENKINS Cognizant/Project Engineer's Manager	21. DOE APPROVAL (if required) Ltr. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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Kara M. Broz

November 10, 1994

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DESIGN BASIS & REQUIREMENTS

241-SY MODULAR EXHAUSTER
MECHANICAL INSTALLATION

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OCTOBER 1994

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1.0 PURPOSE

The purpose of this document is to serve as the design and functional requirements for the mechanical installation of the new 241-SY modular exhauster. The mechanical installation will include modifying the existing ductwork (i.e., installing a "T" to connect the new exhauster to the existing system), modifying the existing condensate drain lines to accommodate the new lines associated with the new exhauster, a maintenance platform near the stack of the new exhauster, guy wires and guy wire footings to support the stack of the new exhauster, as well as other miscellaneous tasks associated with the mechanical installation design effort.

2.0 SYSTEM DESCRIPTION

A new ventilation system is being installed to serve as the K-1 primary exhauster. The existing K-1 primary exhauster will then become the backup. The new ventilation system was designed and fabricated off-site per the specification written by Strickler (1993).

This ventilation system services waste tanks 241-SY-101, 102 and 103. The nominal flow rate through the ventilation system is 1000 cfm. The new ventilation system will contain a moisture eliminator, a heater, a prefilter, two stages of HEPA filtration, an exhaust fan, a stack and stack sampling system.

3.0 DESIGN BASIS - "T" CONNECTION AND DUCT

The "T" connection and associated ductwork will be used to connect the new exhauster to the existing duct.

3.1 SAFETY CLASSIFICATION - "T" CONNECTION AND DUCT

The Safety Classification for the new exhauster is Safety Class 2 (Kidder, 1993). The basis for the SC-2 determination is the need to assure continued operation of the exhauster which maintains confinement of hazardous aerosols and vapors over its design life (Kidder, 1993). Therefore, the connection of the new exhauster must be designed to assure continued operation of the exhauster. This includes the "T" section mentioned above. The Safety Class of the "T" section is assumed herein to be Safety Class 2 in accordance with WHC (1991). This assumption is based on the need for the ductwork (including the "T" section) to maintain confinement.

3.2 FUNCTIONAL REQUIREMENTS - "T" CONNECTION AND DUCT

- ♦ Provide air flow from existing duct to new exhauster.
- ♦ Provide system isolation for both K-1 systems.
- ♦ Provisions for isolating the new K-1 exhauster from the Ventilation header.

- ◆ Connection should slope down to the new K-1 exhaustor inlet to allow for condensate drainage.

3.3 DESIGN REQUIREMENTS - "T" CONNECTION AND DUCT

The following list of documents constitutes the design requirements for the new 241-SY Modular exhaustor "T" connection and duct.

- ◆ Engineering Procedures:

WHC-CM-6-1, Standard Engineering Practices.

- ◆ General Design Requirements:

- ◆ DOE Order 6430.1A, General Design Criteria.
- ◆ SDC-4.1, Standard Arch-Civil Design Criteria/Design Loads for Facilities.
- ◆ WHC-CM-1-3, MRP 5.46, Safety Classification of Systems, Components and Structures.

With the following exceptions -

Single Failure - This will be excluded because the main duct is not designed for single failure. Therefore, designing two ducts would not be beneficial because both of these ducts would be connected to one single duct.

Fire Protection - This will be excluded because it will not be beneficial to the existing system. The existing duct does not provide Fire Protection.

Backup Power - Neither the "T" section or the duct will require power. Therefore, backup power will be excluded.

- ◆ ERDA 76-21 (Nuclear Air Cleaning Handbook). Excluding 2500 fpm velocity through duct. The basis is because the duct size that will be installed will be the same as the size that is existing, 12 inch. This does not provide the minimum velocity, as a result this will be excluded.
- ◆ ASME N509 (Nuclear Power Plant Air Cleaning Units and Components)
- ◆ ASHRAE 1993 Fundamentals
- ◆ AISC

3.3.1 Design Loads:

- ◆ Natural Phenomena per Kidder (1993) Safety Class 2 (wind, seismic), equivalent static load for seismic, with the following excluded: Missile analysis will not be performed

on the "T" section and duct. The basis for this is because the existing duct that the "T" is being connected to has not, to the best of UTS's knowledge, been designed for missiles. Therefore, no benefit will result from designing the new "T" and duct to withstand missiles.

3.3.2 Other Loads:

- ◆ Equipment: Pipe, Flanges, Bolts, etc...

4.0 DESIGN BASIS - CONDENSATE DRAIN LINES

The condensate drain lines will be used to return condensate that is generated and collected in the duct that connects the exhauster to the vent header, the moisture eliminator section of the exhauster, the heater plenum, filter section, the fan and the stack sampling cabinet (if required). The lines will be connected to the existing condensate drain lines of the K-1 Exhauster.

4.1 SAFETY CLASSIFICATION - CONDENSATE DRAIN LINES

The Safety Classification for the new exhauster condensate drain lines is Safety Class 3 (*Kidder, 1993, p. G-108*).

4.2 FUNCTIONAL REQUIREMENTS - CONDENSATE DRAIN LINES

To return the condensate that is generated and collected in the duct that connects the exhauster to the vent header, the moisture eliminator section of the exhauster, the heater plenum, filter section, fan and stack sampling cabinet (if required). The lines will be connected to the existing condensate drain lines of the K-1 Exhauster. The condensate will be returned back to waste storage tank 241-SY-102.

4.3 DESIGN REQUIREMENTS - CONDENSATE DRAIN LINES

The following list of documents constitutes the design requirements for the new 241-SY Modular exhauster condensate drain lines.

- ◆ Engineering Procedures:

WHC-CM-6-1, Standard Engineering Practices.

- ◆ General Design Requirements:

- ◆ DOE Order 6430.1A, General Design Criteria.

- ◆ SDC-4.1, Standard Arch-Civil Design Criteria/Design Loads for Facilities.

- ♦ AISC

4.3.1 Design Loads:

- ♦ Natural Phenomena per SDC-4.1 (wind, and seismic) equivalent static load for seismic.

4.3.2 Other Loads:

- ♦ Equipment: Condensate pipe, heat trace, miscellaneous fittings, etc....

5.0 DESIGN BASIS - MAINTENANCE PLATFORM

The maintenance platform will be located near the exhaust stack of the new ventilation system. The platform will be used to service the new stack sampling system, which is located directly on the stack, and allow workers to take stack flow measurements. By designing and installing the platform it will allow the above work to be completed without needing scaffolding brought in each time service is required or each time the measurements are to be taken.

5.1 SAFETY CLASSIFICATION - MAINTENANCE PLATFORM

The Safety Classification for the new exhauster is Safety Class 2 (*Strickler, 1993 and Kidder, 1993*). The basis for the SC-2 determination is the need to assure continued operation of the exhauster which maintains confinement of hazardous aerosols and vapors over it's design life (*Kidder, 1993*). Therefore, since the exhauster is SC-2 and since the failure of the maintenance platform could prevent the exhauster from performing it's safety function, the maintenance platform must be designed as SC-2. This was determined in accordance with WHC (1991).

5.2 FUNCTIONAL REQUIREMENTS - MAINTENANCE PLATFORM

The maintenance platform will be located near the exhaust stack of the new ventilation system. The platform will be required to provide a safe access and footing to support workers that will be servicing the new stack sampling system, which is located directly on the stack, and support workers taking stack flow measurements.

5.3 DESIGN REQUIREMENTS - MAINTENANCE PLATFORM

The following list of documents constitutes the design requirements for the new 241-SY Modular exhauster maintenance platform.

♦ Engineering Procedures:

WHC-CM-6-1, Standard Engineering Practices.

♦ General Design Requirements:

DOE Order 6430.1A, General Design Criteria.

SDC-4.1, Standard Arch-Civil Design Criteria/Design Loads for Facilities, Rev 12.

WHC-CM-1-3, MRP 5.46, Safety Classification of Systems, Components and Structures.

With the following exceptions -

Single Failure - This will be excluded because the function that platform serves is not to operate continuously such as the exhauster. However, analysis will be completed on the maintenance platform and will include an acceptable factor of safety (i.e., ≥ 2) to ensure redundancy in anchoring the platform.

Fire Protection - This will be excluded because it will not be beneficial to the platform.

Backup Power - The platform does not require power, therefore, backup power will be excluded.

♦ WHC-CM-4-3, Industrial Safety Manual, CM-12, Elevated Work Platforms

♦ AISC

♦ OSHA

5.3.1 Design Loads:

- ♦ Natural Phenomena per WHC (1991) Safety Class 2 (wind, seismic,), equivalent static load for seismic, with the following excluded: Missile analysis will not be performed on the maintenance platform. The basis for this is because UTS believes it is remote/incredible that the maintenance platform would be hit by a projectile and cause it to fail.

5.3.2 Other Loads:

- ♦ Workers and equipment needed to perform work on sampling system and taking stack flows.

6.0 DESIGN BASIS - GUY WIRES & GUY WIRE FOOTINGS

The guy wires will be used to help support and hold up the exhaust stack of the new ventilation system. The analysis, which determined the forces that would be acting on the wires, was completed and is located in Kriskovich (1994). The guy wire footings will be used to anchor down the guy wires.

6.1 SAFETY CLASSIFICATION - GUY WIRES & GUY WIRE FOOTINGS

The Safety Classification for the new exhauster and the stack sampling system is Safety Class 2 (*Strickler, 1993 and Kidder, 1993*). The basis for the SC-2 determination of the exhauster is the need to assure continued operation of the exhauster which maintains confinement of hazardous aerosols and vapors over it's design life (*Kidder, 1993*). The basis for the SC-2 determination of the stack sampler is that failure of the continuous monitors and record sample cabinet would lead to failure of monitoring potential onsite doses of 5 rem EDE (*Kidder, 1993*). As a result, if the stack fails (the sampling system is located directly on the stack) it could prevent the SC-2 sampling system from performing it's safety function. Furthermore, if the stack fails it could prevent the exhauster from performing it's safety function. Therefore, the guy wires and guy wire footings will be designed as SC-2. This was determined in accordance with WHC (1991).

6.2 FUNCTIONAL REQUIREMENTS - GUY WIRES & GUY WIRE FOOTINGS

The guy wires will be used to help support and hold up the exhaust stack of the new ventilation system. The guy wire footings will be used to anchor down the guy wires.

6.3 DESIGN REQUIREMENTS - GUY WIRES & GUY WIRE FOOTINGS

The following list of documents constitutes the design requirements for the new 241-SY Modular exhauster maintenance platform.

- ♦ Engineering Procedures:

- WHC-CM-6-1, Standard Engineering Practices.

- ♦ General Design Requirements:

- ♦ DOE Order 6430.1A, General Design Criteria.
 - ♦ SDC-4.1, Standard Arch-Civil Design Criteria/Design Loads for Facilities, Rev 12.
 - ♦ WHC-CM-1-3, MRP 5.46, Safety Classification of Systems, Components and Structures.

With the following exceptions -

Single Failure - This will be excluded because there are four guy wires for the stack. Furthermore, analysis will be completed on the guy wires and footings and will include an acceptable factor of safety (i.e., ≥ 2) or over design (i.e., ≥ 2) to ensure redundancy in anchoring the guy wires.

Fire Protection - This will be excluded because it will not be beneficial to the guy wires.

Backup Power - The guy wires or footings do not require power, therefore, backup power will be excluded.

- ♦ ACI-318
- ♦ UBC
- ♦ AISC

6.3.1 Design Loads:

- ♦ Natural Phenomena per WHC (1991) Safety Class 2 (wind, seismic,), equivalent static load for seismic, with the following excluded: Missile analysis will not be performed on the guy wires. The basis for this is because UTS believes it is remote/incredible that the guy wires would be hit by a projectile and cause them to fail. Therefore, there is no benefit of performing this type of analysis.

6.3.2 Other Loads:

- ♦ No other loads are associated with the guy wires.

7.0 REFERENCES

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