

ENCLOSURE 4

Calculation Number 1098-8, Revision 3,
Helium Leak Testing Vent and Siphon Ports for Leak Tight NUHOMS® DSCs

(Non-Proprietary version)

A TRANSNUCLEAR	Form 3.1-1 Calculation	Calc. No.: 1098-8
		Rev. No.: 3
Title: Helium Leak Testing Vent & Siphon Ports for Leak Tight NUHOMS® DSC's		Page: 1 of 5
		Project No.: 1098
		DCR No.: 1098-39

Project Name: Project 1098, NUHOMS® 61BT for Oyster Creek Nuclear Generating Station

Calculation Title: Helium Leak Testing Vent & Siphon Ports for Leak Tight NUHOMS® DSC's

Number of CDs attached: _____

If original issue, 10CFR72.48 review required?

No (explain) **Yes, SR No.** _____

1. This calculation is complete and ready for independent review

Originator's Signature *J. Schmalz* Date: 04/02/04

2. This calculation has been checked for consistency, completeness, and arithmetic correctness.

Checker Signature *W. Bracy* Date: 04/02/04

3. Calculation preparation and check complies with procedure - package is complete

PE's Signature *W. Bracy* Date: 04/02/04

A TRANSNUCLEAR	Form 3.1-1 Calculation	Calc. No.: 1098-8
		Rev. No.: 3
Title: Helium Leak Testing Vent & Siphon Ports for Leak Tight NUHOMS® DSC's		Page: 2 of 5

1. Background and Purpose:

The leak test limit in NUHOMS® 61BT Technical Specification 1.2.4a (Amendment 7 to Certificate of Compliance 1004) is 1×10^{-7} reference $\text{cm}^3/\text{second}$. The objective is to "demonstrate the top cover plate to be 'leak tight', as defined in ANSI N14.5-1997."

In order to fulfill the requirements of the Technical Specification and of ANSI N-14.5, it is necessary to correlate test conditions to the reference conditions. That is the purpose of this calculation.

The Technical Specification applicability is to the "inner top cover plate seal weld." The vent and siphon port covers are not mentioned, but it is conservative to include them in the leak testing as well. To do this, helium may be injected below the vent and siphon port covers ("silver dollars") prior to welding. Testing has been performed to determine the amount of helium remaining after welding, using various injection techniques (ref 4).

Because the gas under the silver dollars may be a mixture of air and helium, and may be at subatmospheric pressure due to the gas heating up during welding, then cooling down by the time of leak testing, the leak tight acceptance criterion of 10^{-7} reference cm^3/s must be adjusted for these conditions. The silver dollars and the inner top cover plate weld are typically leak tested simultaneously via the test port on the outer top cover plate. In this case, the leak test rate for the silver dollars will be the determining rate, because the helium behind the outer top cover plate weld (the helium in the canister) will be nearly 100% pure and above atmospheric pressure.

The results of this calculation are equally applicable to any NUHOMS® DSC requiring testing to the 10^{-7} ref cm^3/s leak tight standard.

Proprietary information withheld pursuant to 10 CFR 2.390

2. References:

- 1) ANSI N14.5-1997, Leak Tests on Packages for Shipment
- 2) NUHOMS® FSAR, NUH-003 rev 6
- 3) NUHOMS® Certificate of Compliance 72-1004, amendment 7
- 4) Transnuclear document E-19308, Test Report For Helium Entrainment In Siphon And Vent Cavity With Welded "Silver Dollars".

A TRANSNUCLEAR	Form 3.1-1 Calculation	Calc. No.: 1098-8
		Rev. No.: 3
Title: Helium Leak Testing Vent & Siphon Ports for Leak Tight NUHOMS®		Page: 3 of 5
DSC's		

3. Assumptions

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4. Method

ANSI N14.5 will be followed throughout.

5. Calculations

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A TRANSNUCLEAR	Form 3.1-1 Calculation	Calc. No.: 1098-8
		Rev. No.: 3
Title: Helium Leak Testing Vent & Siphon Ports for Leak Tight NUHOMS®		Page: 4 of 5
DSC's		

Proprietary information withheld pursuant to 10 CFR 2.390

A TRANSNUCLEAR	Form 3.1-1 Calculation	Calc. No.: 1098-8
		Rev. No.: 3
Title: Helium Leak Testing Vent & Siphon Ports for Leak Tight NUHOMS®		Page: 5 of 5
DSC's		

Proprietary information withheld pursuant to 10 CFR 2.390

6. Conclusion

For a helium injection technique whereby helium is injected under an unmodified silver dollar prior to the start of welding, a measured leak rate of 3.4×10^{-8} atm cc/s helium or less will satisfy the Technical Specification limit of 10^{-7} ref cm^3/s .

For helium injection techniques whereby helium is injected under a modified silver dollar after the root pass is nearly complete, a measured leak rate of 8.8×10^{-8} atm cc/s helium or less will satisfy the Technical Specification limit of 10^{-7} ref cm^3/s .

ENCLOSURE 5

24 PHB leakage rates

Listing of the input and output for the 24 PHB leakage rates

Disk ID No. (size)	Discipline	System/ Component	File Series (topics)	Number of Files
(Enclosure 6 (84.0 KB for Thermal)	Thermal	24PHB Leakage Rate	001- 24PHB_Leakage- Directory	
			(24PHB_Leakage.xls (Proprietary – Trade Secret) Input and output for the 24PHB leakage rates. In the spreadsheet, the worksheet “Bounding” uses the conservative leakage rate determined by Ocone using the conservative correction factor at 105°F. The worksheet “Std Leak” repeats the computations from Calculation 1098-08 Rev.3 to validate the formula in the excel spreadsheet.)	1