APR 19 2000

ENGINEERING DATA TRANSMITTAL

Page 1 of 1
1. EDT 629208

2. To: (Receiving Organization) Distribution		3. From: (Originating Organization) HL Humphreys, CTFM A5/A6		4. Related EDT No.: N.A.	
5. Proj./Prog./Dept./Div.: Project A5/A6/CTFM		6. Design Authority/Design Agent/Cog. Engr.: KE Ard/LA Rodgers/MT Husain		7. Purchase Order No.: N.A.	
8. Originator Remarks: Issued for approval and release.				9. Equip./Component No.: N.A.	
				10. System/Bldg./Facility: 70.2/105KW /100K	
11. Receiver Remarks: USQ Number K-00-0380				11A. Design Baseline Document? ☒ Yes ☐ No	
				12. Major Assm. Dwg. No.: N.A.	
				13. Permit/Permit Application No.: N.A.	
				14. Required Response Date: N.A.	

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason For Transmittal	Originator Disposition	Receiver Disposition
1	SNF-7037 6 Rev 4-13-00	N/A	0	Spent Nuclear Fuel Project Cask/MCO Helium Purge System Design Review Completion Report - Project A5/A6	S ^N QE	1	1	1

16. KEY					
Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec. 12.7)		1. Approval	4. Review	1. Approved	4. Reviewed no/comment
		2. Release	5. Post-Review	2. Approved w/comment	5. Reviewed w/comment
		3. Information	6. Dist. (Receipt Acknow. Required)	3. Disapproved w/comment	6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
1	1	Design Authority	<i>KE Ard</i>	4-13-00	KE Ard X3-74	1	1	Operations	<i>DE Bullock</i>	4/13/00	DE Bullock X3-76
1	1	Proj. Design Eng	<i>LA Rodgers</i>	4/13/00	LA Rodgers X3-85						
1	1	Cog. Eng.	<i>M.T. Husain</i>	4/13/00	MT Husain X3-76						
1	1	Cog. Mgr.	<i>J. L. Weamer</i>	4/13/00	Weamer X3-85						
1	1	QA	<i>K. Conrad</i>	4-13-00	KC Conrad X3-80						
1	1	Nuclear Safety	<i>BS Lew</i>	4/13/00	BS Lew X3-79						
1	1	Environmental	<i>GG Gant</i>	4/13/00	GG Gant X3-79						

17. H. L. Humphreys <i>H. L. Humphreys</i> 4/13/00 Signature of EDT Date Originator	18. J. L. Weamer <i>J. L. Weamer</i> 4/13/00 Authorized Representative Date For Receiving Organization	19. K. E. Ard <i>KE Ard</i> 4-13-00 Design Authority/ Date Cognizant Manager	20. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comment
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SNF-6037
Revision 0

Spent Nuclear Fuel Project Cask/MCO Helium Purge System Design Review Completion Report – Project A.5/A.6

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Fluor Hanford
P.O. Box 1000
Richland, Washington

SNF-6037
Revision 0
EDT 629208

Spent Nuclear Fuel Project Cask/MCO Helium Purge System Design Review Completion Report – Project A.5/A.6

K. E. Ard
Fluor Hanford

Date Published
April 2000

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
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Fluor Hanford
P.O. Box 1000
Richland, Washington

4/18/00
Release Approval Date

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Printed in the United States of America

Total Pages: 75

SUF-6037, Two

SPENT NUCLEAR FUEL PROJECT CASK/MCO HELIUM PURGE SYSTEM
DESIGN REVIEW COMPLETION REPORT –PROJECT A.5/A.6

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Charge Code: 105463/B000

B&R Code: EW04J1110

Key Words: Helium Purge System, Cask Loadout System (CLS), Cask Transportation Facility Modification (CTFM).

Abstract: This report documents the results of the design verification performed on the Cask and Multiple Canister Over-pack (MCO) Helium Purge System. The helium purge system is part of the Spent Nuclear Fuel (SNF) Project Cask Loadout System (CLS) at 100K area. The design verification employed the “Independent Review Method” in accordance with Administrative Procedure (AP) EN-6-027-01.

SPENT NUCLEAR FUEL PROJECT CASK/MCO HELIUM PURGE SYSTEM DESIGN REVIEW COMPLETION REPORT –PROJECT A.5/A.6

1.0 SCOPE

This report documents the results of the design verification performed on the Cask and Multiple Canister Over-pack (MCO) Helium Purge System. The helium purge system is part of the Spent Nuclear Fuel (SNF) Project Cask Loadout System (CLS) at 100K area. The design verification employed the "Independent Review Method" in accordance with Administrative Procedure (AP) EN-6-027-01.

2.0 SUMMARY

The comments as documented on Review Comment Records (RCR) forms in Appendix A were incorporated into the final design of the helium purge system. The helium purge system final design is acceptable and meets the approved design criteria in HNF-SD-SNF-FRD-025, Rev. 3. All action items identified on the RCR forms were signed off as acceptable by the reviewer and have been incorporated into the final design drawings and SNF-5878.

Appropriate As Low As Reasonably Achievable (ALARA) documentation, identified in the design verification process, is in Appendix B.

A parallel constructability review effort identified the need for an additional drawing detailing a valve station located in the South Loadout Pit. This detail will be shown on a future drawing, H-1-84834, Rev. 0, not included in this document.

3.0 DISCUSSION

The design verification was performed by qualified individuals independent of the engineers responsible for the helium system design. During the verification process the design review ensured:

- 1) The design inputs were correctly selected and incorporated.
- 2) Assumptions necessary to perform the design were adequately described.
- 3) Appropriate design methods were used.
- 4) The design outputs were reasonable compared to the design inputs

The review also verified that the results of the design process were consistent with the design basis and design requirements and that the design is adequate for the purging of the cask.

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Project A.5/A.6

Subject matter experts selected were independent of the design and are identified as follows:

Gene Bruschi	Nuclear Safety
Christine Bullock	Radcon/ALARA
Dave Bullock	Plant Operations
Keith Conrad	Quality Assurance
Ray Hernandez	Instrumentation Engineering
Muhammad Husain	Mechanical Engineering/Piping Engineer
Dennis Sherrell	Process Engineering

The design documents reviewed were:

- 1) SNF-5878, *System Review of Safety Function Components for the Design of the Cask/MCO Helium Purge System.*
- 2) Drawings H-1-84490, H-1-84491, Sheets 1 and 2, H-1-84492, H-1-84493, Sheets 1 and 2, and H-1-84725.
- 3) CGI-A.5/A.6-0003, *Pressure Indicator for Cask/MCO Helium Purge System.*
- 4) CGI-A.5/A.6-0004, *Pressure Transmitter for Cask/MCO Helium Purge System.*
- 5) CGI-A.5/A.6-0005, *Rupture disk for Cask/MCO Helium Purge System.*

Other relevant design input documents supporting this verification review were:

- 1) SNF-4889, *Cask/MCO Helium Purge System Conceptual Design Report.*
- 2) HNF-SD-SNF-FRD-035, Rev. 3, *Functions and Requirements for K Basins Cask Transportation Facility Modifications, Project A.5/A.6.*

The signed off and dispositioned RCRs generated by the reviewers during the verification process are provided in Appendix A. Appropriate ALARA documentation is located in Appendix B.

4.0 RCR DOCUMENTATION

Appendix C provides objective evidence of closure of RCR comments by incorporation of comments into the final design.

5.0 REFERENCES

AP EN-6-025-02, *Issuance and Change Control*.

AP EN-6-027-01, *Spent Nuclear Fuel Project Design Verification Process*.

CGI-A.5/A.6-0003, *Pressure Indicator for Cask/MCO Helium Purge System*.

CGI-A.5/A.6-0004, *Pressure Transmitter for Cask/MCO Helium Purge System*.

CGI-A.5/A.6-0005, *Rupture disk for Cask/MCO Helium Purge System*.

H-1-84490, Rev. 0

H-1-84491, Rev. 0, Sheets 1 and 2

H-1-84492, Rev. 0

H-1-84493, Rev. 0, Sheets 1 and 2

H-1-84725, Rev. 0

SNF-5878, Rev. 0, *System Review of Safety Function Components for the Design of the Cask/MCO Helium Purge System*.

APPENDIX A

REVIEW COMMENT RECORD (RCR) FORMS

**CONSISTING OF 15 PAGES
INCLUDING COVERSHEET**

APPENDIX A

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RCR Forms, Instrumentation Engineering, Ray Hernandez.....	A-13

Note: Reviewers Dave Bullock (Operations) and Muhammad Husain (Piping Engineer) concurred that the above RCR comments incorporated their comments. Additional RCRs were not submitted by these reviewers.

5. Document Number(s)/Title(s)

SNE-5878, REV A/SYSTEM REVIEW OF SAFETY FUNCTION COMPONENTS FOR CONCEPTUAL DESIGN OF THE CASK/MCSD HELIUM PURGE SYSTEM; H-1-84490/P&ID; H-1-84491/PLAN & SECTIONS; H-1-84492/BOTTLE BACK ASSEM; H-1-84492/HEPA ASSEN.

17. Comment Submittal Approval;

6. Program/Project/
Building Number
SPENT NUCLEAR FUEL

7. Reviewer
D. L. She

1. Date

March 1, 2000

2. Review No.

4. Page

1 of 5

9. Location/Phone

Process Engineering

11. CLOSED

10.	Agreement with indicated comment disposition(s)
-----	---

Organization Manager (Optional)

Date 3/8/00 Reviewer/Point of Contact D. Chavira

Reviewer/Point of Contact

Author/Originator OL Koreis 3/8/00

Reviewer/Point of Contact: D. L. Howard
 Author/Originator: D. L. Kreis 3/8/00 DL Kreis

13. Comment(s)/Discrepancy(s) (Provide technical justification for the action required to correct/ resolve the discrepancy/problem indicated.)

SNF-5878 Sec. 2.0 & p&ID (see the first paragraph in section 2.0 as 212)

The third paragraph in section 2.0 contains a typo "recomendation" instead of "recommendation".

15. Disposition (Provide justification if NOT accepted.)	16. Status
Accept: The text will be changed to read 249 scf (the correct value) instead of 217 scf.	closed DPP

SNF-5878 Tables 6 -- Table 6 states that the function is to supply -250 cubic feet of gas at 2200 psi. The function is to supply the volume would be 2.4 scf. I would say "two to three" scf.

Accept: The text will be revised accordingly.	closed DPS 3/8/00
Accept: The text will be revised so that it doesn't imply that the 250 scf of gas will be delivered at the 2200 psig fill pressure.	closed DPS 3/8/00

Accept: The text will be revised accordingly.	closed DPS 3/8/00
Accept: The text will be revised so that it doesn't imply that the 250 scf of gas will be delivered at the 2200 psig fill pressure.	closed DPS 3/8/00

Accept: The text will be revised accordingly.	closed DPS 3/8/00
Accept: The text will be revised so that it doesn't imply that the 250 scf of gas will be delivered at the 2200 psig fill pressure.	closed DPS 3/8/00

REVIEW COMMENT RECORD (RCR)				
1. Date March 1, 2000		2. Review No. na		
3. Project No. A.5/A.6		4. Page 2 of 5		
12? Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/ resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
4	SNF-5878 Tables 7 -- Table 7 states that He-PRV-1 "Steps down the gas pressure from bottles at 2200 psi to 30 psig." The P&ID shows that the initial let-down function is provided by the main bottle regulator (CLS-REG-1) on the auto changeover manifold, which is typical industry practice. I would expect PRV-1 will never see much over 100 psig at its inlet (in fact, note 2 on H-1-84492 confirms this when it specifies a 130 psig MAXIMUM discharge pressure for REG-1). Also note that, while REG-1 may be provided by the same supplier that provides the CVDF's SC He supply, it will not be the same model regulator because the CVDF system is designed for larger bottles with initial fill pressures at ~4000 psig. On the other hand, if the intent is to use exactly the same gas supply, e.g., bottles, regulators, capacities, etc. as the CVDF's, then it will be necessary to rework all the drawings, descriptions, and safety evaluations in this package.		Accept: The text will be revised to eliminate the statement that He-PRV-1 "Steps down the gas pressure from bottles at 2200 psi to 30 psig", and replace it with a description that includes the initial step-down provided by CLS-REG-1, followed by a final ~100 psig to 30 psig step down via He-PRV-1. In addition, the text will be revised to eliminate any implication that the gas bottles, regulators, etc., will be identical to those at CVDF.	Closed DPS 3/8/00
5	SNF-5878, Sec. 3.2 & P&ID -- This write-up implies that there are two control switches (a "purge switch" and an "exhaust switch"), whereas the P&ID shows only one switch (HS-430-2), which appears, both from the write-up and the P&ID, to be a three position, momentary contact switch, designed to automatically return to the center (off) position. This may explain why the P&ID doesn't show HS-430-1.		Accept: The text will be revised to reflect the switch shown on the P&ID, which has a supply position, a neutral (off) position, and a vent position.	Closed DPS 3/8/00
6	SNF-5878, Sec. 3.2 & P&ID -- The 2nd to last sentence in Sec. 3.2 reads: "...until the pressure gage indicates zero pressure (actual pressure in the Cask/MCO will be 3 psig due to the inline back pressure valve). Considering that PI-430-1 is UPSTREAM of CLS-V-7 [why isn't this valve labeled CLS-BPRV-1], why would PI-430-1 read anything substantially under 3 psig? I would replace that sentence with: At this time, the operator presses and holds the vent switch [or...holds HS-430-2 in the exhaust position...] until PI-430-1 indicates 3 psig, or less.		Accept: The text will be revised accordingly.	Closed DPS 3/8/00
7	SNF-5878, Sec. 3.2 & P&ID -- If feed/vent operations are to proceed as described, then the "OFF" position of HS-430-2 (described & depicted as a 3-position, momentary contact switch) must result in closure of BOTH solenoid valves (SOV-1 & SOV-2). Considering that SOV-2 is shown as "NO" on the P&ID (including the figure on page 3 of SNF-5878), then either the hand switch AND the operating description are incorrectly described, or the normally open designation on SOV-2 is wrong, in which case the failure modes assessment in Sec. 4.0 is invalid.		Accept: The P&ID depicts the switch correctly (see Item 5). SOV-2 will be labeled "NC" (versus "NO") on the P&ID, and it will be specified as "NC" in Note 7 of H-1-84492. The failure modes assessment will also be revised.	Closed DPS 3/8/00
8	H-1-84492 (Isometric, including parts list) -- Part numbers are not shown, which makes it difficult or impossible to confirm that valves, etc., match the P&ID.		Accept: Will add P&ID part #s to next issue of H-1-84492.	Closed DPS 3/8/00

REVIEW COMMENT RECORD (RCR)				
1. Date March 1, 2000		2. Review No. na		16. Status
3. Project No. A.5/A.6		4. Page 3 of 5		
12 ¹ Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/ resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
9	H-1-84492 (Isometric, including parts list) -- Note 7 appears to confirm that SOV-2 is a normally open valve, (the valve under note 13 is "NC"), which means that the operations description AND the depiction of HS-430-2 in SNF-5878 (and on the P&ID) are incorrect. I would guess it is a two position, momentary contact switch that must be held in the "supply" (i.e., on) position during the two minute "HOLD" at 30 psig, and then allowed to return to the "vent" (i.e., off) position. One other option would be a simple on-off switch, however that would probably create problems for the failure modes assessment.		See Items 5 and 7, above.	Closed 2/25 3/8/00
10	H-1-84492 (Isometric, including parts list) -- Where is HS-430-2 described on the parts list? As far as I can tell, there are no switches of any sort on the list.		The switch specification (ECN 655726) will be referenced on the next issue of H-1-84492.	Closed 2/25 3/8/00
11	SNF-5878 Table 5 and P&ID -- It would appear that "He-HS-1" used to be the designation for what is now listed on the P&ID as "HS-430-2". All of the Tables need to be updated to reflect the latest P&ID component numbers and descriptions.		Accept: The P&ID part #'s will be incorporated into the next issue of SNF-5878.	Closed 2/25 3/8/00
12	SNF-5878 Section 4.1.3 & Table 4/Section 4.1.4 & Table 5 -- -- The functional descriptions in Tables 4 & 5 for the SS pressure transmitter and pressure indicator (PT-1/PI-1) are not strictly correct. While it is true that the PURPOSE of this PT/PI set is to measure and indicate pressure within the Cask/MCO assembly, that is not what PT-1 will actually measure, given the current system layout. What it actually measures is the supply/exhaust line pressure at a point that is external to, and well upstream of the Cask/MCO assembly. This may seem like a fine distinction, but it is a crucial one. The issue is that the Safety Significant function of this PT/PI set is dependent on provision of a clear flow channel through a short length of 1/4" stainless steel tubing, a 20 foot length of stainless steel flex hose, and a Hanson quick connect (see Item 13, below). The Functional and Failure Modes Assessment(s) in sections 4.1.1 and 4.1.3 must address any problems (e.g., a kinked hose, etc.) that could isolate the Cask head space from the point in the supply/exhaust line where the pressure is measured by PT-1. Note that any non-steady state pressure differences between the Cask head space and the location of PT-1 are of no consequence because the pressures are not measured until the system reaches steady state.		Accept: We intend to implement "Option 2" as described in the comment block of Item 13, below. Accordingly, the design will be revised to pressurize and vent the cask through the "Cask Secondary Vent Port Access Tool," and to provide a local pressure gage on the quick disconnect port to ensure that the cask really is functionally connected to the supply/vent line such that PT-1 is actually reading the cask pressure, as opposed to the pressure of an isolated line.	Closed 3/8/00 DJS

REVIEW COMMENT RECORD (RCR)		1. Date March 1, 2000	2. Review No. na	
		3. Project No. A.5/A.6	4. Page 4 of 5	
121 Item 13	<p>13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/ resolve the discrepancy/problem indicated.)</p> <p>SNF-5878 Section 4.1.3 & Table 4/Section 4.1.4 & Table 5 -- Tables 4 and 5 list He-QC-1 (the Hanson quick connect) as a General Services component. This should come as no surprise to me, considering that I attended an August 16, 1999 HPS design review where the overall system was determined to be General Services, along with most of the individual components, including the quick connect. This decision was based on the premise that an entire system, including most, or even all of its individual components, may be designated General Services, even though the sole purpose of the system is to perform a Safety Significant function (e.g., purge and backfill of the Cask/MCO assembly with helium to prevent combustion).</p> <p>The rationale for that premise is that performance of the safety significant function can be assured (despite the use of General Services components and assemblies, etc.) by means of appropriate procedures and administrative controls. In other words, it doesn't matter whether or not a critical component (such as a valve that must be open) is absolutely reliable, provided that the physical system and the operating procedures are designed to ensure that any malfunction of the component (e.g., failure of a valve to open) will be identified and corrected before the process is allowed to proceed any further.</p> <p>A typical example would be the failure of SOV-1 to open when HS-430-2 is moved to the "supply" position. If SOV-1 fails to open, then no pressure increase will be observed on PI-430-1, and the process will be placed on hold until the problem has been corrected. Conversely, if SOV-1 functions properly, but PI-430-1 fails to indicate the pressure increase for one reason or another, the process will still be placed on hold until the problem has been identified and corrected. Either way, the Safety Significant function of the system will eventually be performed (provided that it is not time dependent).</p>	14. Hold Point	15. Disposition (Provide justification if NOT accepted.) Accept: See Item 12, above.	16. Status <i>Closed</i> <i>DPS</i> <i>3/8/00</i>

REVIEW COMMENT RECORD (RCR)		1. Date March 1, 2000	2. Review No. na	
		3. Project No. A.5/A.6	4. Page 5 of 5	
12: Item cont 13	<p>13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/ resolve the discrepancy/problem indicated.)</p> <p>The issues here are: 1) that sections 4.1.3 and 4.1.4 neither acknowledge nor address the fact that the internal valve on the Cask's GS rated Hanson quick connect fitting has a "mission critical" function to provide a flow path between the supply piping that communicates with PT-430-1 and the head space of the Cask; and 2) that I can see no way to absolutely confirm that the quick connect is actually providing that function, given the present system design.</p> <p>I can think of several possible options, there are undoubtedly others:</p> <p>Option 1: The quick connect port could continue to be used as it is presently designed, while the Cask Secondary Vent Port Access Tool could be used to attach a local pressure gage directly to the Cask lid (via the tool's dedicated port). Note that the local gage need not be an SS rated, precision gage. It just needs to serve as an initial indicator that the Cask's head space is functionally connected to the supply exhaust line prior to completing the five purge cycles.</p> <p>Option 2: Identical to Option 1, with the local gage on the quick disconnect and the supply/exhaust connection on the tool.</p> <p>Option 3: Add a GS rated, non-precision flow indicator (probably a little panel mounted roto-meter) to the supply/exhaust line to indicate that gas is actually flowing into the Cask.</p> <p>Option 4: Identical to Option 3, with the flow indicator hooked up to indicate that exhaust gas is actually flowing from the Cask.</p> <p>Option 5: Addition of two flow indicators with check valves to allow indication of flow in both directions.</p>	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
				see pg 4 4 of 5 DLS 3/8/00

REVIEW COMMENT RECORD (RCR)		1. Date 03-06-00	2. Review No.
		3. Project No. A.5/A.6	4. Page 1 of 2

5. Document Number(s)/Title(s) Helium Purge System	6. Program/Project/ Building Number SNFP/CTFM	7. Reviewer Keith Conrad	8. Organizations/Group Quality Assurance	9. Location/Phone MO-401/373-7536
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17. Comment Submittal Approval:

10. Agreement with indicated comment disposition(s)

11. CLOSED

Organization Manager (Optional)

Date

Reviewer/Point of Contact

K. Conrad 3/8/00

Date

Reviewer/Point of Contact

K. Conrad 3/8/00
Author/Originator

12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/ resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
01	SNF-5878, R/O, pg. 2, 2.0, 2 nd & 3 rd par.: Both par. indicate that the helium bottles are located on the North outside wall of the K Basin. H-1-84491 shows them on the West wall.		Accepted and Revised	<i>[Signature]</i>
02	SNF-5857, R/O, pg. 5, 3.2, 1 st par.: The operator is required to hold the exhaust switch until the pressure gage indicates zero, but the actual pressure in the sys. is approx. 3 psig, according to the next statement.		Accepted and Revised	<i>[Signature]</i>
03	SNF-5857, R/O, pg. 6, 4.1.1, 1 st par.: The first sentence identifies the helium bottles as He-TK-1 & He-TK-2. However, H-1-84490 & H-1-84492 do not.		Accepted and Revised	<i>[Signature]</i>
04	SNF-5857, R/O, pg. 7, 4.1.2, 2 nd par.: Text calls out the pressure relief valve as CLS-SRV-1 & H-1-84490 does also. However, H-1-84492 shows it as CLS-SRV-2" (item 7).		Accepted: H-1-84492 needs to be revised	<i>[Signature]</i>
05	SNF-5857, R/O, pg. 8, 4.1.3, 1 st par.: Text calls out valve CLS-SOV-1 as normally closed (NC). H-1-84492 also shows the valve item (9) as NC. However, Note 7 on H-1-84492 calls out the valve as "normally open" (NO).		Accepted: SNF 5878 & drawings are to be revised for this and other references. All solenoid valves will be NC when drawings are reissued.	<i>[Signature]</i>
06	SNF-5857, R/O, pg. 8, 4.1.3, 1 st par.: Text calls out valve CLS-SOV-2 as normally open (NO). H-1-84492 also shows the valve (item 16) as NO. However, Note 13 on H-1-84492 calls out the valve as "normally closed (NC).		All solenoid valves will be NC when drawings are revised	<i>[Signature]</i>

REVIEW COMMENT RECORD (RCR)		1. Date 03-06-00	2. Review No.
		3. Project No. A.5/A.6	4. Page. 2 of 2

12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
07	SNF-5857, R/0, pg. 13, Table 5, last item: Table 5 identifies the valve down stream of CLS-HEPA-F-2 as e-HV-6. Should be CLS-V-6?		Accept: Will revise	<i>[Signature]</i>
08	SNF-5857, R/0, pg. 15, Table 6, & pg. 22, Table 10: Both tables show the valve down stream of CLS-HEPA-F-2 as CLS-V-5. Should be CLS-V-6?		Accept: Will revise	<i>[Signature]</i>
09	H-1-84490 & H-1-84492 both show the valve down stream of CLS-HEPA-F-2 as CLS-V-5. Should be CLS-V-6?		Accept : Will revise on drawing	<i>[Signature]</i>

REVIEW COMMENT RECORD (RCR)		1. Date	2. Review No.
		3. Project No.	4. Page
		03/08/00	1 of 2

5. Document Number(s)/Title(s) SNF-5878, H-1-84490, H-1-84491 (Pg 1 & 2), H-1-84492, H-1-84493 (Pg 1 & 2), and H-1-84725. All documents Rev 0. Plus support documents HNF-SD-SNF-FRD-025, SNF-4889, and CGI-A.5/A.6-0003, -0004, -0005.	6. Program/Project/ Building Number Spent Nuclear Fuel Project A.5/A.6	7. Reviewer Gene R. Bruschi	8. Organization/Group Engineering - Nuclear Safety	9. Location/Phone 2752/E/E112/200E 372-0209
--	---	--------------------------------	---	---

17. Comment Submittal Approval:

10. Agreement with indicated comment disposition(s)

11. Closed

Organization Manager (Optional)

3-8-00
Date

Reviewer/Point of Contact

 Author/Originator

3-8-00
Date

Reviewer/Point of Contact

 Author/Originator

12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/ resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status
#1	<p>There appeared to be a large number of discrepancies between documents and some potential errors. The following were found in the support documents and are noted for your review but don't require my concurrence for closure:</p> <ul style="list-style-type: none"> • SNF-4889 Pg. 3 calls the Rupture Disc set pressure at 60 psig. • CGI-A.5/A.6-0003 and -0004 call out equipment numbers that don't match P&ID H-1-84490. • CGI-A.5/A.6-0004 calls for Class 1 Div 1 Group B for the pressure transmitter but on CGI-A.5/A.6-0003 (indicator) it calls for Class 1 Div 2 Group B? • CGI-A.5/A.6-0003 and -0004 have their scaling acceptance criteria modified from a five-point check to a two-point check? • CGI-A.5/A.6-0005 on the header of Page 4 calls out NFPA, while a rupture disc should be ANSI and ASME. In addition no where in the CGI do we specify the set pressure and tolerance as a critical characteristic? 		<p>Correct setting is 65 PSIG</p> <p>Will correct on final issue</p> <p>For this projects needs division 1 or division 2 are the same. Ok as is.</p> <p>Vendor will only check two points</p> <p>Will change to ASME: Pressure rating of rupture disk was added to CGI document. (ie. 65 PSIG +/- 10%)</p>	<p>CLOSED</p> <p>3-8-00</p>

REVIEW COMMENT RECORD (RCR)				1. Date 03/08/00	2. Review No.
				3. Project No.	4. Page 2 of 2
12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/ resolve the discrepancy/problem indicated.)	14. Hold Point	15. Disposition (Provide justification if NOT accepted.)	16. Status	
#2	<p>The document SNF 5878 appears to be a good technical document that was never completed. The following require correction prior to closure concurrence:</p> <ul style="list-style-type: none"> References in Section 1.0, 2.0, and 3.0 do not appear or are not numbered correctly in Section 6.0. In the first paragraph of Section 2.0 and 3.0 the "Reference 4" appears after the period. Use a consistent style either "Ref" or "Reference". The fourth paragraph of Section 2.0 says "One-quarter inch or 3/8" tubing"; use consistent style for fractions and correct the units for 3/8. The Drawing on Page 3 and the text (Pg. 4 through 18) have equipment designators that do not match the P&ID H-1-84490. Section 4.4 and 5.0 need to be completed 		<p>Added to latest internal revision of document</p> <p>Added to latest internal revision of document</p> <p>Corrected in latest revision of document</p> <p>Corrected in latest revision of document</p>	CLOSED HQS 3-8-00	
#3	Does the Pressure Indicator PI 430-4 have to be isolated from the system during the pressurization cycles to prevent over-ranging the instrument? If this is the instrument that is used to set the MCO/Cask Package backfill pressure then we should make this instrument Safety Significant since the minimum pressure is set to prevent air in-leakage, which is part of the overall function to preclude a flammable gas mixture.		The pressure indicator pressure range will be revised to reflect the 30 PSIG pressurization cycle.	CLOSED HQS 3-8-00	

REVIEW COMMENT RECORD (RCR)					1. Date 3/1/00	2. Review No. []
					3. Project No. A.5/A.6	4. Page 1 of 2
5. Document Number(s)/Title(s)	6. Program/Project/Building Number	7. Reviewer	8. Organization/Group	9. Location/Phone		
SNF-5878 Rev 0	He Purge Final Design	Christine Bullock	ALARA/Radcon	Mo-102/376-2473/85-5857		
17. Comment Submittal Approval:		10. Agreement with indicated comment disposition(s)		11. CLOSED		
Organization Manager (Optional) _____ Date <u>3/8/2000</u> Reviewer/Point of Contract _____ Date <u>3/8/2000</u> Reviewer/Point of Contract _____		Author/Originator _____ Date _____ Reviewer/Point of Contract _____ Date _____ Reviewer/Point of Contract _____				
12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated.)	14. Reviewer Concurrence Required	15. Disposition (Provide justification if NOT accepted.)	16. Status		
1	H-1 drawings do not match the text or the drawing on page 3 of the document for valve, PI, PSE, PT numbers.		Will correct on CGI documentation to be compatible with drawing	Closed		
2	Section 4.4 - Recommendations are not complete sentence. I get the feeling that some words are missing.		Will be corrected prior to release	Closed		
3	Section 5.0 is blank - How about some conclusions of the assessment.		Will be corrected prior to release	Closed		
4	Drawing 84492 - It is not clear if PI-430-3 and CLS-V-2 are inside the basin or outside. If inside where will they be located?		This is inside the basin and will be shown located at the SLOP	Closed		
5	If this is work that was not previously considered - where's the ALARA documentation?		ALARA Check Sheets have not been completed as yet.	Closed		

REVIEW COMMENT RECORD (RCR)

1. Date 2/23/00		2. Review No. 1	
3. Project No. A.5/A.6		4. Page 1 of 3	
5. Document Number(s)/Title(s) SNF-5878, H-1-84490, H-1-84491, Sh 1&2, H-1-84492, H-1-84493, Sh 1&2, H-1-84725 (all docs. Rev. 0).		9. Location/Phone MO293/2-0112	
6. Program/Project/Building Number SNFP/105K		8. Organization/Group K Basin Project	
7. Reviewer R. Hernandez		11. CLOSED	
10. Agreement with indicated comment disposition(s) 3/9/00 Date Reviewer/Point of Contact Ray Hernandez Author/Originator		11. CLOSED 3/9/00 Date Reviewer/Point of Contact Ray Hernandez Author/Originator	
17. Comment Submittal Approval Organization Manager (optional)			
12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated).	14. Hold Point	15. Disposition (provide justification if NOT accepted).
1	Drawing H-1-84490 - Location of rupture disk and PRV do not protect all piping against over pressurization. Move upstream of CLS-PRV-1.		Accept Closed RH
2	Drawing H-1-84490 CLS-V-8 is set at 65 psig. HNF-4889 identifies set point at 60 psig.		65 PSIG is the correct pressure Closed RH
3	Drawing H-1-84490 - PT-430-1 does not have isolation valve and test port to allow calibration.		Accept: will correct on drawings Closed RH
4	Drawing H-1-84490 - PI-430-1, 0-100 psig does not agree with CGI document 0-60 psig.		Calibration is performed at two points, 0 PSIG and 60 PSIG. Will change P&ID to reflect 0-60 PSIG. Closed RH
5	Drawing H-1-84490 - Where/how are PI-430-1 and HS-430-2 going to be procured. The detailed design information does not exist. (Caution see SNF-4889 for switch detail.)		The CGI documents were corrected to reflect PI-430-1 and PT-430-1. HS-430-2 was bought from a separate electrical/instrument ECN, previously released before this review. Closed RH
6	Drawing H-1-84490 - CLS-V-7, how does valve provide/maintain 3 psig upstream and also protect over pressurization of HEPA's?		This valve is a spring/diaphragm valve with internal pressure regulation based on the upstream pressure. At 3 PSIG the force due to upstream pressure acting on the diaphragm will match the preset spring force causing the valve to close. The HEPA will be protected from pressure surges by the addition of a throttling valve upstream of the filters and the large gas volume expansion provided between the inlet tubing and the filter canister housing. Closed RH
7	Drawing H-1-84490 - Does PDI-430-5 contain a diaphragm and is there a concern of uncontrolled release via this valve?		PDI-430-5 does contain a diaphragm with a 500 PSIG burst pressure. Max. system pressure is 65 PSIG. (Rupture disk setting) Closed RH

REVIEW COMMENT RECORD (RCR)				1. Date 2/23/00	2. Review No. 1
				3. Project No. A.5/A.6	4. Page 2 of 3
5. Document Number(s)/Title(s)	6. Program/Project/Building Number SNFP/105K	7. Reviewer R. Hernandez	8. Organization/Group K Basin Project	9. Location/Phone MO293/2-0112	
10. Agreement with indicated comment disposition(s)		11. CLOSED			
17. Comment Submittal Approval Organization Manager (optional)		Reviewer/Point of Contact Date		Reviewer/Point of Contact Date	
Author/Originator		Author/Originator		Author/Originator	
12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated).	14. Hold Point	15. Disposition (provide justification if NOT accepted).	16. Status	
8	Drawing H-1-84490 – Should there be a check valve downstream of rupture disk to prevent uncontrolled releases path from cask?		<p>No. The probability of an uncontrolled release is small. The space between the cask lid and the shield plug in the MCO should contain very little contamination. Therefore the helium tubing up steam of the cask should remain relatively clean.</p> <p>The chance of an inadvertent failure of the rupture disk is also small since it is engineered and tested for its design pressure setting of 65 PSIG. A rupture disk failure would have to happen at the same time as the operator is supplying helium to the MCO/Cask and the operator would have to hold the HS-430-2 switch open while the pressure indicator PI-430-1 decreases. The operator would notice a problem when the pressure is decreasing on PI-430-1 when it should be increasing.</p> <p>Multiple system failures would have to occur from over pressurization by the helium source : 1) The two pressure regulating valves and the pressure relief valve would have to fail (CLS-Reg-1, CLS-PRV-1 and CLS-SRV-1 set at 50 PSIG) . This would then cause the rupture disk (CLS-V-8 Set at 65 PSIG) to fail . 2) The operator would have to hold the hand switch HS-430-2 in the supply position until all the helium in the two helium supply bottles were exhausted down to approx. 30 psig (Note: this would take a while). Then the 30 psig pressure stored in the MCO and supply piping would bleed back through the open solenoid valve CLS-V-5, flow back through about 100 feet of tubing before reaching the rupture disk.</p>	Closed <i>RL</i>	

REVIEW COMMENT RECORD (RCR)						1. Date 2/23/00	2. Review No. 1
						3. Project No. A.5/A.6	4. Page 3 of 3
5. Document Number(s)/Title(s)		6. Program/Project/Building Number SNFP/105K	7. Reviewer R. Hernandez	8. Organization/Group K Basin Project	9. Location/Phone MO293/2-0112		
17. Comment Submittal Approval		10. Agreement with indicated comment disposition(s)		11. CLOSED			
Organization Manager (optional)		Date	Reviewer/Point of Contact	Date	Reviewer/Point of Contact		
		Date	Author/Originator	Date	Author/Originator		
12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated).	14. Hold Point	15. Disposition (provide justification if NOT accepted).	16. Status			
9	Drawing H-1-84490 should be an Essential Drawing when released to facility.		Accept	Closed <i>RH</i>			
10	All drawings should be issued under Project Status.		Accept	Closed <i>RH</i>			
11	Drawing H-1-84490 – Note 3 implies multiple valves would be required, but there's only one ID component.		Revise drawing for only one valve.	Closed <i>RH</i>			
12	Drawing H-1-84491, Sheet 1 – Delete notes 5B, 5C and 5D.		Accept	Closed <i>RH</i>			
13	Drawing H-1-84491, Sheet 2 – Correct PI-430-5 to PDI-430-5, Zone C3.		Accept	Closed <i>RH</i>			
14	Drawing H-1-84492 – Note 6 identifies rupture disc rated at 65 psig. SNF-4889 identifies 60 psig.		65 PSIG is correct	Closed <i>RH</i>			
15	Drawing H-1-84492 – Zone D8 identify PI-430-2 and part # from Material List.		Accept	Closed <i>RH</i>			
16	Drawing H-1-84492 – Zone E8 correct label to CLS-SRV-1.		Accept	Closed <i>RH</i>			
17	Drawing H-1-84492 – Zone D4 correct label to PDI-430-5.		Accept	Closed <i>RH</i>			
18	Drawing H-1-84492 – Material List Item 13 is unclear whether R's or H's should H's.		H for Hansen is correct	Closed <i>RH</i>			
19	Drawing H-1-84492 – Zone D unknown symbol by Item 34.		Will correct	Closed <i>RH</i>			
20	CGI for PT-420R-1 and PI-420-1.		Will correct on CGI	Closed <i>RH</i>			
21	CGI--A.5/A.6-0003, Page 4 has accuracy of +/- 1% and Page 9 has +/- 0.5%.		One reading is in % and the other is in PSIG (ie. +/- .5PSIG). Correct as is.	Closed <i>RH</i>			

APPENDIX B

HELIUM PURGE SYSTEM ALARA DOCUMENTATION

**CONSISTING OF 3 PAGES
INCLUDING COVERSHEET**

INTEROFFICE

CORRESPONDENCE

00-SNF/CAB-041

To: K. E. Ard X3-85

From: C. A. Bullock X3-68

cc: T. E. Bratvold X3-61
W. A. Decker X3-68
J. C. Elgin X3-68
J. M. Haan X3-68
P. G. Huntley X3-68
J. E. Kurtz X3-68
D. T. Southerland X3-68
CAB LB/ File X3-68

Date: March 13, 2000

Telephone: 376-2473

Subject: CASK TRANSPORT FACILITY MODIFICATION HELIUM PURGE SYSTEM MODIFICATION

As you requested the radiological control/ALARA organization reviewed the helium purge system design report and background documentation. Administrative procedure AP-12-009-01, *Radiological Design Review*, defines the Spent Nuclear Fuel Project requirements for radiological design reviews of new facilities and equipment and modifications of existing facilities and equipment. This procedure allows the design review to go one of two ways based on whether the design is a major or minor modification.

A major modification is defined as a physical change to a structure, or set of structures or system(s), which could result in a change of collective radiation exposure due to installation, maintenance and operations of one person-rem total effective dose equivalent (TEDE) or greater or a change in collective extremity dose of 10 person-rem or greater over the life of the project. A major modification must go through a radiological design review.

A minor modification is defined as a physical change to a structure, or set of structures or system(s), which meet the radiological design review screening criteria but do not meet the definition of major modification. A minor modification can go directly to the ALARA work planning process (AP-RP-12-010-01, *ALARA Work Planning*) and use the team approach to planning the modification.

The Helium Purge System modification to 105K West includes the installation of two Helium tanks on the exterior of 105K West, 3/8" piping from the northwest corner of 105K West along the north wall and east beneath the mezzanine to the South Loadout Pit. The Helium Purge System will be used to replace the air in the space between the MCO and the cask lid with helium prior to transport of the cask to the Cold Vacuum Drying facility. Air/helium vented from the space between the MCO and cask will be filtered through two HEPA units and released

K. E. Ard
Page 2
March 13, 2000

near the ceiling. These modifications do not result in a change of collective radiation exposure due to installation, maintenance and operations of one person-rem (TEDE) or greater or a change in collective extremity dose of 10 person-rem or greater over the life of the project, therefore, this modification does not meet the definition of a major modification and can be classified as a *minor modification*.

Please call Christine Bullock on 376-2473 or Jerry Kurtz on 373-3249 with any questions.

bag

APPENDIX C

FINAL DESIGN DOCUMENTATION

**CONSISTING OF 50 PAGES
INCLUDING COVERSHEET**

APPENDIX C

TABLE OF CONTENTS

CGI-A.5/A.6-0003, <i>Pressure Indicator for Cask/MCO Helium Purge System</i>	C-3
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H-1-84490, Rev. 0.....	C-44
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H-1-84492, Rev. 0.....	C-47
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Commercial Grade Item Upgrade Dedication Form		Rev. 1
ECN No. 655726 CGI No. CGI-A.5/A.6-0003		Page 1
Title: PRESSURE INDICATOR FOR CASK/MCO HELIUM PURGE SYSTEM		

Section 1 Part Information		
Item No.: PI-420-1 PI-430-1	Manufacturer: OTEK CORP.	Supplier: OTEK CORP.
Mfg. Part/Model No.: 6171-010-32	Supplier's P/N: N/A	
Part Description: LOOP POWERED PROCESS INDICATOR		
End Use Description: INDICATES PRESSURE OF HELIUM PURGE OPERATION FOR SYSTEM 7.7 (CASK LOADOUT SYSTEM)		

Section 2a Component Information			
Equipment No.: PI-420-1	Specification No.: Dwg H-1-84381 SH 1 AND 2, as added by ECN 655726	Manufacturer: OTEK CORP.	Past P.O. No.: N/A
Procurement and/or Model No.: 6171	Equipment Supplier (if different from manufacturer): N/A	Equip. Supplier's Part No.: N/A	
Component Description: LOOP POWERED PROCESS INDICATOR			

Section 2b Commercial Availability of the Item														
<p>1. Is the Item available from a catalogue of a qualified NQA1 supplier? (coordinate with project CGI interface Engineer or BTR)</p> <p>☐ YES (go to #2 below)</p> <p>☒ NO (go to procedure step 5.3.2, proceed to dedicate Item.)</p> <p>If not available from a qualified NQA1 supplier, is it available from an ISO 9000 supplier? (coordinate with project CGI interface Engineer or BTR)</p> <p>☐ YES (go to #2 below, then go to procedure step 5.3.2, proceed to dedicate Item)</p> <p>☒ NO (go to procedure step 5.3.2, proceed to dedicate Item.)</p>														
<p>2. List of Candidate qualified suppliers or ISO 9000 suppliers</p> <table border="0"> <tr> <td>company name & type</td> <td>contact name</td> <td>phone</td> </tr> <tr> <td colspan="3">NA</td> </tr> <tr> <td colspan="3">_____</td> </tr> <tr> <td colspan="3">_____</td> </tr> </table>			company name & type	contact name	phone	NA			_____			_____		
company name & type	contact name	phone												
NA														

<p>3. Recommended Procurement Strategy (coordinate with project CGI interface Engineer or BTR):</p> <p>NA</p>														

Section 2c CGI Determination

Commercial Grade Item Upgrade Dedication Form		Rev. 1
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1. Question #1: Is the Item subject to design or specification requirements that are unique to nuclear facilities or activities? [] YES (the Item is not commercial grade) [X] NO (continue)
2. Question #2: Is the Item used in applications other than nuclear facilities or activities? [] NO (the item is not commercial grade) [X] YES (continue)
3. Question #3: Is the Item ordered from manufacturer/supplier on the basis or specifications set forth in the published product information (e.g. manufacturer's catalog)? [] NO (the Item is not commercial grade) [X] YES (continue)
[X] All three criteria have been satisfied. The Item meets the definition of commercial grade.
Section 2d Reason for Dedication The above described Item is being Dedicated for use in the application cited for the following reason(s):
[] Item is being purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Class application.
[X] Item is being purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Significant application.
[] Item was purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Class application.
[] Item was purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Significant application.
[] Other ('like-for-like', similar, substitution, replacement evaluation)
Section 3 Failure Effects Evaluation
A. Part/Component Safety Function:
1. PROVIDES VERIFICATION TO OPERATOR THAT HELIUM SUPPLY USED TO PURGE CASK IS ADEQUATE
2.
3.

Commercial Grade Item Upgrade Dedication Form		Rev. 1
ECN No. <u>655726</u> CGI No. <u>CGI-A.5/A.6-0003</u>		Page 3
Title: PRESSURE INDICATOR FOR CASK/MCO HELIUM PURGE SYSTEM		

B. Part/Component Functional Mode:

Safety Function #1:

☒ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function

☐ Passive – Change of state is not required for the component to perform its safety function

Safety Function #2:

☐ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function.

☐ Passive – Change of state is not required for the component to perform its safety function

Safety Function #3:

☐ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function.

☐ Passive – Change of state is not required for the component to perform its safety function

C. Host Component Safety Function (if applicable): *N/A*

D. Failure Mode(s) and the effects on component or system safety function (see Worksheet 1):

1. OPEN CIRCUIT CAUSES DEVICE TO READ INCORRECTLY

2. SHORT CIRCUIT CAUSES DEVICE TO READ INCORRECTLY

3. POWER SUPPLY CAUSES DEVICE TO READ INCORRECTLY

4.

5.

Section 4 Environmental & Natural Phenomena Hazard Design

Environmental Qualification Required: Yes ☐ No ☒	If yes: Environmental Qualification Requirements Limiting Environmental Conditions: Required Safety Functions: Qualification Period:
Natural Phenomena Hazard (NPH) Design Required: Yes ☐ No ☒	If yes: NPH Design Requirements Performance Category: NPH Design Req'ts.: Required Safety Functions:

Section 5 Component Functional Classification

☐ Safety Class (SC)	☐ General Service (GS)	☒ Safety Significant (SS)
If part/component classification is different from host component/system, document basis. N/A		

Section 6 (Reserved)

Section 7 (Reserved)

Section 8 References (for Functional Classification)

Commercial Grade Item Upgrade Dedication Form				Rev. 1	
ECN No. 655726 CGI No. CGI-A.5/A.6-0003				Page 4	
Title: PRESSURE INDICATOR FOR CASK/MCO HELIUM PURGE SYSTEM					

National Codes/Standards: NFPA 70	Safety Analysis Report (SAR): WHC-SD-WM-SAR-062 REV. 3K	Drawings: H-1-84381 SH 1 AND 2, AS ADDED BY ECN 655726
Vendor Manual/Manufacturer/Supplier Information: OTEK CORP. PROCESS & CURRENT LOOP MODEL NO. 6171 OPERATING MANUAL		
Other: HNF-SD-SNF-FRO-025, REV.3 SNF-4889, REV.0		

Section 9. Critical Characteristics				
Critical Characteristics Verification Document:	Acceptance Criteria/Tolerances	Acceptance Method	ID	Function
1. Item Identification Critical Characteristics (necessary for reasonable assurance that the Item delivered is the Item specified)				
PACKING LIST	PACKING LIST AGREES WITH PURCHASE DOCUMENTS AND ENGINEERING DRAWINGS	1, IN	X	
FM STICKER	FM STICKER LABELING ON DEVICE STATES CLASS I DIV 2 GROUP B	1, IN	X	
ACCURACY	CALIBRATION REPORT VERIFIES AN ACCURACY OF +/- 1%	1, IN	X	
2. Physical Critical Characteristics (for reasonable assurance that the Item delivered is the Item specified)				
Critical Characteristics Verification Document:	Acceptance Criteria/Tolerances	Acceptance Method	ID	Function
PHYSICAL DAMAGE	NO PHYSICAL DAMAGE, SCRATCHES, OR DENTS	1, IN	X	
3. Performance Critical Characteristics (for reasonable assurance that the Item will perform its intended safety function(s))				
4. Notes and Legend:		Acceptance Method: 1. Special Test and Inspection 1, IN for Inspection 1,T for Test 2. Commercial Grade Survey 3. Source Verification 4. Vendor/Item History		

Commercial Grade Item Upgrade Dedication Form		Rev. 1
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Title: <u>PRESSURE INDICATOR FOR CASK/MCO HELIUM PURGE SYSTEM</u>		

Section 10 Initial Review and Approval	
Approvals:	
Designated Engineer:	<u>Mark Friedlich</u> <u>7/28/00</u>
Design Authority:	<u>DC Phil</u> <u>7/29/00</u>
QA Engineer:	<u>K. Conrad</u> <u>7/29/00</u>

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WORKSHEET 1 DETERMINATION OF FAILURE MECHANISMS/MODES		
Section 1		
Typical Failure Mechanisms	Definition	Applicable to Component under Evaluation
Fracture	Separation of a solid accompanied by little or no macroscopic plastic deformation.	Yes [] No [X]; If Yes, indicate failure Mode _____
Corrosion	The gradual deterioration of a material due to chemical or electrochemical reactions, such as oxidation, between the material and its environment.	Yes [] No [X]; If Yes, indicate failure Mode _____
Erosion	Destruction of materials by the abrasive action of moving fluids, usually accelerated by the presence of solid particles carried with the fluid.	Yes [] No [X]; If Yes, indicate failure Mode _____
Open Circuit	An electrical circuit that is unintentionally broken so that there is no complete path for current flow.	Yes [X] No []; If Yes, indicate failure Mode DEVICE WILL NOT READ CORRECTLY
Short Circuit	An abnormal connection by which an electrical current is connected to ground, or to some conducting body, resulting in excessive current flow.	Yes [X] No []; If Yes, indicate failure Mode DEVICE WILL NOT READ CORRECTLY
Blockage	Clogging of a filtering medium resulting in the inability to perform its purification function or blockage of flow.	Yes [] No [X]; If Yes, indicate failure Mode _____
Seizure	Binding of a normally moving item through excessive pressure, temperature, friction, jamming.	Yes [] No [X]; If Yes, indicate failure Mode _____
Unacceptable Vibration	Mechanical oscillations produced are beyond the defined permissible limits due to unbalancing, poor support, or rotation at critical speeds.	Yes [] No [X]; If Yes, indicate failure Mode _____
Loss of Properties	A loss of mechanical and physical properties of a material due to exposure to high temperatures, radiation exposure.	Yes [] No [X]; If Yes, indicate failure Mode _____
Excess Strain	Under the action of excessive external forces the material of the part has been deformed or distorted.	Yes [] No [X]; If Yes, indicate failure Mode _____
Mechanical Creep	From prolonged exposure to high temperature and stress, the object will show a slow change in its physical (shape and dimension) and mechanical characteristics.	Yes [] No [X]; If Yes, indicate failure Mode _____
Ductile Fracture	Fracture characterized by tearing of metal accompanied by appreciable gross plastic deformation.	Yes [] No [X]; If Yes, indicate failure Mode _____
Section 2: Additional Failure Modes Applicable to the Component Under Evaluation		
1.	POWER SUPPLY PROVIDES INSUFFICIENT OR OVERSUFFICIENT VOLTAGE TO DEVICE	
2.		
3.		
4.		
5.		

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CHECKLIST 1
ACCEPTANCE METHOD 1
SPECIAL TEST/INSPECTION VERIFICATION

SECTION 1			
Item Description: PRESSURE INDICATOR		Equip #: PI-420-1	
System #: HELIUM PURGE		Procurement and/or Model #: OTEK 6171	
Manufacturer (Address/Phone): OTEK CORP. 4016 E. TENNESSEE ST. TUCSON, ARIZONA 85714 (520) 748-7900		Supplier (Address/Phone): 	
SECTION 2 CRITICAL CHARACTERISTICS TO BE VERIFIED BY METHOD 1.			
Insp	Test	Post-Test	
☒	☐	☐	1. PACKING LIST
☒	☐	☐	2. FM STICKER
☒	☐	☐	3. ACCURACY
☒	☐	☐	4. PHYSICAL DAMAGE
☐	☐	☐	5.
☐	☐	☐	6.
☐	☐	☐	7.
☐	☐	☐	8.

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SECTION 3 VERIFIED BY INSPECTION
* See Attachment G of Desk Instruction for Sampling Size
Characteristic: PACKING LIST Sample Size*: N/A Acceptance Criteria: PACKING LIST AGREES WITH PURCHASE DOCUMENTS As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____
Characteristic: FM STICKER Sample Size*: N/A Acceptance Criteria: LABELED "CLASS 1 DIV 2 GROUP B" As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____
Characteristic: ACCURACY Sample Size*: N/A Acceptance Criteria: VERIFY CALIBRATION REPORT PROVIDED As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____
Characteristic: PHYSICAL DAMAGE Sample Size*: N/A Acceptance Criteria: VERIFY NO PHYSICAL DAMAGE As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____

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SECTION 4 VERIFIED BY SPECIAL TEST	
* See Attachment G of Desk Instruction for Sampling Size	
Test To Be Performed by: ☐ Purchaser ☒ Supplier/Manufacturer** ☐ Other	Number of Items to be Tested: Test/Inspection Location: TESTING PERFORMED AT SUPPLIERS FACILITY
Characteristic for Test: ACCURACY Acceptance Criteria: VERIFY THAT INDICATOR READINGS ARE 0.0 AND 60.0 +/- 0.5 PSIG, RESPECTIVELY; WHEN MILLIAMP SIGNALS OF 4 AND 20 ARE APPLIED FROM A CALIBRATED CURRENT GENERATING INSTRUMENT. USE INSTRUMENTS WHICH BEAR VALID CALIBRATION STAMPS SHOWING DATES OF CALIBRATION AND EXPIRATION DATES OF STAMPS. CALIBRATION AND ACCURACY OF INSTRUMENTS SHALL BE CERTIFIED BY AN INDEPENDENT TESTING LABORATORY HAVING STANDARDS TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. PROVIDE CALIBRATION TEST CERTIFICATE. Sample Size*: N/A Actual Test Value: Test Plan and Report #: _____ References (see Section 8): _____	

** If Supplier/Manufacturer or Other, Refer to CGI Checklist-2 for Support Information

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Section 5 Test / Inspection Summary (Acceptance Method 1)											
1. SUMMARY OF VERIFIED CRITICAL CHARACTERISTICS, THEIR VERIFICATION METHODS, AND RESULTS											
ITEM DESCRIPTION:											
Critical Characteristics				Verification Results							
Critical Characteristics	Acceptance Criteria/Tolerances	ID	Function	Method T/IN	Procedure or RG#	Check-list ID	Number Tested	Number Failed	Verifying Organization	Printed Name Signature	Date
PACKING LIST	VERIFY PACKING LIST MATCHES PROCUREMENT DOCUMENTS	X		IN							
FM STICKER	LABELED "CLASS I DIV 2 GROUP B"	X		IN							
ACCURACY	VERIFY CALIBRATION REPORT PROVIDED	X		IN							
PHYSICAL DAMAGE	VERIFY NO PHYSICAL DAMAGE	X		IN							
2. DISPOSITION OF UNVERIFIED OR FAILED CRITICAL CHARACTERISTICS											
Critical Characteristic				Disposition							

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3. SIGNATURE INDICATES ALL CRITICAL CHARACTERISTICS VERIFIED SATISFACTORY OR ACCEPTABLY DISPOSITIONED AND COMMERCIAL GRADE DEDICATION IS SATISFACTORY AND COMPLETE.			
Testing Agency Approval: _____		BUYER VERIFICATION	
Date _____		Design Authority: _____	Date _____
Testing Agency QA Engineer: _____		QA Engineer: _____	Date _____

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SECTION 6 CONTACTS / PHONE NUMBERS		
	Name	Phone
Design Authority	K.E. ARD	() 376-8712
QA	K.C. CONRAD	() 373-7536
QC	C.R. NOBLE	() 376-7123
Cog - Engineer		()
CGI Engineer	M.A. FRIEDRICH	() 376-7408
Procurement Engineer	F.A. GAUTHIER	() 373-0720
Other		()
SECTION 7 SUPPORTING DOCUMENTATION FOR THIS CHECKLIST		
Initial Procurement Documents	For Critical Characteristics	
☐ Drawings:		
☐ Manuals (specify type & number):		
☐ Design Calculations		
☐ Installation Instructions		
☐ Operation Instructions		
☐ Calibration Instructions		
☐ Manufacturer's Recommended Spare Parts List		
☐ Other:		
Procurement Documents		
☐ Certificate of Conformance/Compliance		
☐ Seismic Qualification Certificate		
☐ Environmental Qualification Certificate		
☐ Test Report (s):		
☐ Inspection Report (s):		
☐ CMTRs for ASME Pressure Retaining Materials		
☐ Valve Seat Leakage Report		
☐ Weld Records		
☐ Material Traceability Record		
☐ Other:		

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Section 1 Part Information		
Item No.: PT-420R-1 PT-430R-1	Manufacturer: ROSEMOUNT	Supplier: PCE PACIFIC INC.
Mfg. Part/Model No.: 3051CG4A22A1JB4E5Q4Q8P1	Supplier's P/N: N/A	
Part Description: PRESSURE TRANSMITTER		
End Use Description: INDICATES PRESSURE OF HELIUM PURGE OPERATION FOR SYSTEM 7.7 (CASK LOADOUT SYSTEM)		

Section 2a Component Information			
Equipment No.: PT-420R-1	Specification No.: Dwg H-1-84492	Manufacturer: ROSEMOUNT	Past P.O. No.: N/A
Procurement and/or Model No.: 3051CG	Equipment Supplier (if different from manufacturer): PCE Pacific Inc.	Equip. Supplier's Part No.: N/A	
Component Description: PRESSURE TRANSMITTER			

Section 2b Commercial Availability of the Item														
<p>1. Is the Item available from a catalogue of a qualified NQA1 supplier? (coordinate with project CGI interface Engineer or BTR)</p> <p>☐ YES (go to #2 below)</p> <p>☒ NO (go to procedure step 5.3.2, proceed to dedicate Item.)</p> <p>If not available from a qualified NQA1 supplier, is it available from an ISO 9000 supplier? (coordinate with project CGI interface Engineer or BTR)</p> <p>☐ YES (go to #2 below, then go to procedure step 5.3.2, proceed to dedicate Item)</p> <p>☒ NO (go to procedure step 5.3.2, proceed to dedicate Item.)</p>														
<p>2. List of Candidate qualified suppliers or ISO 9000 suppliers</p> <table border="0"> <tr> <td>company name & type</td> <td>contact name</td> <td>phone</td> </tr> <tr> <td colspan="3">NA</td> </tr> <tr> <td colspan="3">_____</td> </tr> <tr> <td colspan="3">_____</td> </tr> </table>			company name & type	contact name	phone	NA			_____			_____		
company name & type	contact name	phone												
NA														

<p>3. Recommended Procurement Strategy (coordinate with project CGI Interface Engineer or BTR):</p> <p>NA</p>														

Section 2c CGI Determination

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1. Question #1: Is the Item subject to design or specification requirements that are unique to nuclear facilities or activities? ☐ YES (the Item is not commercial grade) ☒ NO (continue)
2. Question #2: Is the Item used in applications other than nuclear facilities or activities? ☐ NO (the Item is not commercial grade) ☒ YES (continue)
3. Question #3: Is the Item ordered from manufacturer/supplier on the basis of specifications set forth in the published product information (e.g. manufacturer's catalog)? ☐ NO (the Item is not commercial grade) ☒ YES (continue)
☒ All three criteria have been satisfied. The Item meets the definition of commercial grade.
Section 2d Reason for Dedication The above described Item is being Dedicated for use in the application cited for the following reason(s):
☐ Item is being purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Class application.
☒ Item is being purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Significant application.
☐ Item was purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Class application.
☐ Item was purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Significant application.
☐ Other ('like-for-like', similar, substitution, replacement evaluation)
Section 3 Failure Effects Evaluation
A. Part/Component Safety Function:
1. PROVIDES VERIFICATION TO OPERATOR THAT HELIUM SUPPLY USED TO PURGE CASK IS ADEQUATE
2.
3.

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B. Part/Component Functional Mode:

Safety Function #1:

☒ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function

☐ Passive – Change of state is not required for the component to perform its safety function

Safety Function #2:

☐ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function.

☐ Passive – Change of state is not required for the component to perform its safety function

Safety Function #3:

☐ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function.

☐ Passive – Change of state is not required for the component to perform its safety function

C. Host Component Safety Function (if applicable): N/A

D. Failure Mode(s) and the effects on component or system safety function (see Worksheet 1):

1. OPEN CIRCUIT CAUSES DEVICE TO READ INCORRECTLY

2. SHORT CIRCUIT CAUSES DEVICE TO READ INCORRECTLY

3. POWER SUPPLY CAUSES DEVICE TO READ INCORRECTLY

4. _____

5. _____

Section 4 Environmental & Natural Phenomena Hazard Design

Environmental Qualification Required: Yes ☐ No ☒	If yes: Environmental Qualification Requirements Limiting Environmental Conditions: Required Safety Functions: Qualification Period:
Natural Phenomena Hazard (NPH) Design Required: Yes ☐ No ☒	If yes: NPH Design Requirements Performance Category: NPH Design Req'ts.: Required Safety Functions:

Section 5 Component Functional Classification

☐ Safety Class (SC)	☐ General Service (GS)	☒ Safety Significant (SS)
If part/component classification is different from host component/system, document basis. N/A		

Section 6 (Reserved)

Section 7 (Reserved)

Section 8 References (for Functional Classification)

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National Codes/Standards: NFPA 70	Safety Analysis Report (SAR): WHC-SD-WM-SAR-062 REV. 3K	Drawings: H-1-84492
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Vendor Manual/Manufacturer/Supplier Information: ROSEMOUNT MODEL NO. 3051CG OPERATING MANUAL					
Other: SNF-4889, REV.0 HNF-SD-SNF-FRO-025, REV.3					

Section 9 Critical Characteristics					
Critical Characteristics Verification Document:	Acceptance Criteria/Tolerances	Acceptance Method	ID	Function	
1. Item Identification Critical Characteristics (necessary for reasonable assurance that the Item delivered is the Item specified)					
PACKING LIST	PACKING LIST AGREES WITH PURCHASE DOCUMENTS AND ENGINEERING DRAWINGS	1, IN	X		
FM STICKER	FM STICKER LABELING ON DEVICE STATES CLASS I DIV 1 GROUP B	1, IN	X		
ACCURACY	CALIBRATION CERTIFICATE VERIFIES AN ACCURACY OF +/- 0. 5%	1, IN	X		
2. Physical Critical Characteristics (for reasonable assurance that the Item delivered is the Item specified)					
Critical Characteristics Verification Document:	Acceptance Criteria/Tolerances	Acceptance Method	ID	Function	
PHYSICAL DAMAGE	NO PHYSICAL DAMAGE, SCRATCHES, OR DENTS	1, IN	X		
PANEL OR PIPE MOUNT	MOUNTING BRACKET PROVIDED	1, IN	X		
3. Performance Critical Characteristics (for reasonable assurance that the Item will perform its intended safety function(s))					
4. Notes and Legend:					
		Acceptance Method: 1. Special Test and Inspection 1, IN for Inspection 1,T for Test 2. Commercial Grade Survey 3. Source Verification 4. Vendor/Item History			

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Section 10 Initial Review and Approval	
Approvals:	
Designated Engineer: <u>Mark Friedlich</u>	
Design Authority: <u>BC</u>	
QA Engineer: <u>R. Conrad 2/29/00</u>	

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WORKSHEET 1 DETERMINATION OF FAILURE MECHANISMS/MODES		
Section 1		
Typical Failure Mechanisms	Definition	Applicable to Component under Evaluation
Fracture	Separation of a solid accompanied by little or no macroscopic plastic deformation.	Yes [] No [X]; If Yes, indicate failure Mode _____
Corrosion	The gradual deterioration of a material due to chemical or electrochemical reactions, such as oxidation, between the material and its environment.	Yes [] No [X]; If Yes, indicate failure Mode _____
Erosion	Destruction of materials by the abrasive action of moving fluids, usually accelerated by the presence of solid particles carried with the fluid.	Yes [] No [X]; If Yes, indicate failure Mode _____
Open Circuit	An electrical circuit that is unintentionally broken so that there is no complete path for current flow.	Yes [X] No []; If Yes, indicate failure Mode DEVICE WILL NOT READ CORRECTLY
Short Circuit	An abnormal connection by which an electrical current is connected to ground, or to some conducting body, resulting in excessive current flow.	Yes [X] No []; If Yes, indicate failure Mode DEVICE WILL NOT READ CORRECTLY
Blockage	Clogging of a filtering medium resulting in the inability to perform its purification function or blockage of flow.	Yes [] No [X]; If Yes, indicate failure Mode _____
Seizure	Binding of a normally moving item through excessive pressure, temperature, friction, jamming.	Yes [] No [X]; If Yes, indicate failure Mode _____
Unacceptable Vibration	Mechanical oscillations produced are beyond the defined permissible limits due to unbalancing, poor support, or rotation at critical speeds.	Yes [] No [X]; If Yes, indicate failure Mode _____
Loss of Properties	A loss of mechanical and physical properties of a material due to exposure to high temperatures, radiation exposure.	Yes [] No [X]; If Yes, indicate failure Mode _____
Excess Strain	Under the action of excessive external forces the material of the part has been deformed or distorted.	Yes [] No [X]; If Yes, indicate failure Mode _____
Mechanical Creep	From prolonged exposure to high temperature and stress, the object will show a slow change in its physical (shape and dimension) and mechanical characteristics.	Yes [] No [X]; If Yes, indicate failure Mode _____
Ductile Fracture	Fracture characterized by tearing of metal accompanied by appreciable gross plastic deformation.	Yes [] No [X]; If Yes, indicate failure Mode _____
Section 2 Additional Failure Modes Applicable to the Component Under Evaluation:		
1. POWER SUPPLY PROVIDES INSUFFICIENT OR OVERSUFFICIENT VOLTAGE TO DEVICE		
2. _____		
3. _____		
4. _____		
5. _____		

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CHECKLIST 1
ACCEPTANCE METHOD 1
SPECIAL TEST/INSPECTION VERIFICATION

SECTION 1			
Item Description: PRESSURE TRANSMITTER System #: HELIUM PURGE		Equip #: PT-420R-1 Procurement and/or Model #: ROSEMOUNT 3051CA	
Manufacturer (Address/Phone): ROSEMOUNT INC. 8200 MARKET BOULEVARD CHANHASSEN, MINNESOTA 55317 (800) 999-9307		Supplier (Address/Phone): PCE PACIFIC INC. 1916 220TH STREET SE BOTHELL, WASHINGTON 98021-8471 (425) 487-9600	
SECTION 2 CRITICAL CHARACTERISTICS TO BE VERIFIED BY METHOD 1.			
Insp	Test	Post-Test	
☒	☐	☐	1. PACKING LIST
☒	☐	☐	2. FM STICKER
☒	☐	☐	3. ACCURACY
☒	☐	☐	4. PHYSICAL DAMAGE
☒	☐	☐	5. PANEL MOUNT
☐	☐	☐	6.
☐	☐	☐	7.
☐	☐	☐	8.

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SECTION 3. VERIFIED BY INSPECTION

* See Attachment G of Desk Instruction for Sampling Size

Characteristic: **PACKING LIST**

Sample Size*: N/A

Acceptance Criteria: **PACKING LIST AGREES WITH PURCHASE DOCUMENTS**

As Found: _____ Passed: Y / N (Circle)

Receipt Inspection Plan / Report #: _____

References (see Section 8): _____

Characteristic: **FM STICKER**

Sample Size*: N/A

Acceptance Criteria: **LABELED "CLASS I DIV 1 GROUP B"**

As Found: _____ Passed: Y / N (Circle)

Receipt Inspection Plan / Report #: _____

References (see Section 8): _____

Characteristic: **PHYSICAL DAMAGE**

Sample Size*: N/A

Acceptance Criteria: **VERIFY NO PHYSICAL DAMAGE**

As Found: _____ Passed: Y / N (Circle)

Receipt Inspection Plan / Report #: _____

References (see Section 8): _____

Characteristic: **PANEL MOUNT**

Sample Size*: N/A

Acceptance Criteria: **VERIFY MOUNTING BRACKET PROVIDED**

As Found: _____ Passed: Y / N (Circle)

Receipt Inspection Plan / Report #: _____

References (see Section 8): _____

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SECTION 4 VERIFIED BY SPECIAL TEST	
• See Attachment G of Desk Instruction for Sampling Size	
Test To Be Performed by: [] Purchaser [X] Supplier/Manufacturer** [] Other	Number of Items to be Tested: FOUR Test/Inspection Location: TESTING PERFORMED AT SUPPLIERS CALIBRATION LAB
Characteristic for Test: ACCURACY Acceptance Criteria: VERIFY THAT TRANSMITTER OUTPUTS ARE 4.00 AND 20.00 +/- 0.08 MILLIAMP, RESPECTIVELY; WHEN PRESSURES OF 0, AND 60 PSI ARE APPLIED FROM A CALIBRATED PRESSURE SOURCE. USE INSTRUMENTS WHICH BEAR VALID CALIBRATION STAMPS SHOWING DATES OF CALIBRATION AND EXPIRATION DATES OF STAMPS. CALIBRATION AND ACCURACY OF INSTRUMENTS SHALL BE CERTIFIED BY AN INDEPENDENT TESTING LABORATORY HAVING STANDARDS TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. PROVIDE CALIBRATION TEST CERTIFICATE. Sample Size*: N/A Actual Test Value: Test Plan and Report #: _____ References (see Section 8): _____ _____ _____ _____	

** If Supplier/Manufacturer or Other, Refer to CGI Checklist-2 for Support Information

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Section 5 Test / Inspection Summary (Acceptance Method 1)											
1. SUMMARY OF VERIFIED CRITICAL CHARACTERISTICS, THEIR VERIFICATION METHODS, AND RESULTS											
ITEM DESCRIPTION:											
Critical Characteristics				Verification Results							
Critical Characteristics	Acceptance Criteria/Tolerances	ID	Function	Method T/N	Procedure or RR#	Check-list ID	Number Tested	Number Failed	Verifying Organization	Printed Name Signature	Date
PACKING LIST	VERIFY PACKING LIST MATCHES PROCUREMENT DOCUMENTS	X		IN							
FM STICKER	LABELED "CLASS I DIV 1 GROUP B"	X		IN							
ACCURACY	VERIFY CALIBRATION CERTIFICATE PROVIDED	X		IN							
PHYSICAL DAMAGE	VERIFY NO PHYSICAL DAMAGE	X		IN							
PANEL/PIPE MOUNT	VERIFY MOUNTING BRACKET PROVIDED	X		IN							
2. DISPOSITION OF UNVERIFIED OR FAILED CRITICAL CHARACTERISTICS											
Critical Characteristic				Disposition							

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3. SIGNATURE INDICATES ALL CRITICAL CHARACTERISTICS VERIFIED SATISFACTORY OR ACCEPTABLY DISPOSITIONED AND COMMERCIAL GRADE DEDICATION IS SATISFACTORY AND COMPLETE.

BUYER VERIFICATION	
Testing Agency Approval: _____	Design Authority: _____
Testing Agency QA Engineer: _____	QA Engineer: _____
Date: _____	Date: _____

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SECTION 6 CONTACTS / PHONE NUMBERS		
	Name	Phone
Design Authority	K.E. ARD	() 376-8712
QA	K.C. CONRAD	() 373-7536
QC	C.R. NOBLE	() 376-7123
Cog - Engineer		()
CGI Engineer	M.A. FRIEDRICH	() 376-7408
Procurement Engineer	F.A. GAUTHIER	() 373-0720
Other		()
SECTION 7 SUPPORTING DOCUMENTATION FOR THIS CHECKLIST		
Initial Procurement Documents		For Critical Characteristics
☐ Drawings:		
☐ Manuals (specify type & number):		
☐ Design Calculations		
☐ Installation Instructions		
☐ Operation Instructions		
☐ Calibration Instructions		
☐ Manufacturer's Recommended Spare Parts List		
☐ Other:		
Procurement Documents		
☐ Certificate of Conformance/Compliance		
☐ Seismic Qualification Certificate		
☐ Environmental Qualification Certificate		
☐ Test Report (s):		
☐ Inspection Report (s):		
☐ CMTRs for ASME Pressure Retaining Materials		
☐ Valve Seat Leakage Report		
☐ Weld Records		
☐ Material Traceability Record		
☐ Other:		

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Title: RUPTURE DISK FOR CASK/MCO HELIUM PURGE SYSTEM		

Section 1 Part Information															
Item No.: CLS-V-8	Manufacturer: Continental Disk	Supplier: Liberty Automation													
Mfg. Part/Model No.: N/A	Supplier's P/N: Tight Seal Assembly T-64; Disk CDCV-G														
Part Description: Rupture Disk Holder and Disk															
End Use Description: Ensures Cask Design Pressure is not Exceeded															
Section 2a Component Information															
Equipment No.: CLS-V-8	Specification No.: Dwg H-1-84492 Sh-1	Manufacturer: Continental Disc	Past P.O. No.: N/A												
Procurement and/or Model No.: N/A	Equipment Supplier (if different from manufacturer): Liberty Automation		Equip. Supplier's Part No.: Tight Seal Assembly T-64 and Disk CDCV-G												
Component Description: RUPTURE DISK															
Section 2b Commercial Availability of the Item															
<p>1. Is the Item available from a catalogue of a qualified NQA1 supplier? (coordinate with project CGI interface Engineer or BTR)</p> <p>☐ YES (go to #2 below)</p> <p>☒ NO (go to procedure step 5.3.2, proceed to dedicate Item.)</p> <p>If not available from a qualified NQA1 supplier, is it available from an ISO 9000 supplier? (coordinate with project CGI interface Engineer or BTR)</p> <p>☐ YES (go to #2 below, then go to procedure step 5.3.2, proceed to dedicate Item)</p> <p>☒ NO (go to procedure step 5.3.2, proceed to dedicate Item.)</p>															
<p>2. List of Candidate qualified suppliers or ISO 9000 suppliers</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 40%;">company name & type</td> <td style="width: 30%;">contact name</td> <td style="width: 30%;">phone</td> </tr> <tr> <td colspan="3">NA</td> </tr> <tr> <td colspan="3">_____</td> </tr> <tr> <td colspan="3">_____</td> </tr> </table>				company name & type	contact name	phone	NA			_____			_____		
company name & type	contact name	phone													
NA															

<p>3. Recommended Procurement Strategy (coordinate with project CGI interface Engineer or BTR):</p> <p>NA</p>															
Section 2c CGI Determination

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1. Question #1: Is the Item subject to design or specification requirements that are unique to nuclear facilities or activities? ☐ YES (the Item is not commercial grade) ☒ NO (continue)
2. Question #2: Is the Item used in applications other than nuclear facilities or activities? ☐ NO (the item is not commercial grade) ☒ YES (continue)
3. Question #3: Is the Item ordered from manufacturer/supplier on the basis or specifications set forth in the published product information (e.g. manufacturer's catalog)? ☐ NO (the Item is not commercial grade) ☒ YES (continue)
☒ All three criteria have been satisfied. The Item meets the definition of commercial grade.
Section 2d Reason for Dedication The above described Item is being Dedicated for use in the application cited for the following reason(s):
☐ Item is being purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Class application.
☒ Item is being purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Significant application.
☐ Item was purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Class application.
☐ Item was purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Significant application.
☐ Other ('like-for-like', similar, substitution, replacement evaluation)
Section 3 Failure Effects Evaluation
A. Part/Component Safety Function:
1. ENSURES CASK DESIGN PRESSURE IS NOT EXCEEDED
2.
3.

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B.	Part/Component Functional Mode: Safety Function #1: ☒ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function ☐ Passive – Change of state is not required for the component to perform its safety function Safety Function #2: ☐ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function. ☐ Passive – Change of state is not required for the component to perform its safety function Safety Function #3: ☐ Active – Mechanical or Electrical change of state is required to occur for the component to perform its safety function. ☐ Passive – Change of state is not required for the component to perform its safety function
C.	Host Component Safety Function (if applicable): N/A
D.	Failure Mode(s) and the effects on component or system safety function (see Worksheet 1):
1.	FRACTURE CAUSES DISK TO FAIL
2.	CORROSION CAUSES DISK TO BURST AT A LOWER PRESSURE
3.	
4.	
5.	
Section 4 Environmental & Natural Phenomena Hazard Design	
Environmental Qualification Required: Yes ☐ No ☒	If yes: Environmental Qualification Requirements Limiting Environmental Conditions: Required Safety Functions: Qualification Period:
Natural Phenomena Hazard (NPH) Design Required: Yes ☐ No ☒	If yes: NPH Design Requirements Performance Category: NPH Design Req'ts.: Required Safety Functions:
Section 5 Component Functional Classification	
☐ Safety Class (SC) ☐ General Service (GS) ☒ Safety Significant (SS) If part/component classification is different from host component/system, document basis. N/A	
Section 6 (Reserved)	
Section 7 (Reserved)	
Section 8 References (for Functional Classification)	

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National Codes/Standards: NFPA 70 ASME SECTION VIII DIVISION 1	Safety Analysis Report (SAR): WHC-SD-WM-SAR-062 REV. 3K	Drawings: H-1-84492 SH 1
Vendor Manual/Manufacturer/Supplier Information: RUPTURE DISK CATALOG CUTS		
Other: HNF-SD-SNF-FRO-025, REV.3 SNF-4889, REV. 0		

Section 9 Critical Characteristics				
Critical Characteristics Verification Document	Acceptance Criteria/Tolerances	Acceptance Method	ID	Function
1. Item Identification Critical Characteristics (necessary for reasonable assurance that the Item delivered is the Item specified)				
PACKING LIST	PACKING LIST AGREES WITH PURCHASE DOCUMENTS AND ENGINEERING DRAWINGS	1, IN	X	
ASME STAMP	STAMP ON DISK AND HOLDER STATES SECTION VIII DIV 1	1, IN	X	
2. Physical Critical Characteristics (for reasonable assurance that the Item delivered is the Item specified)				
Critical Characteristics Verification Document	Acceptance Criteria/Tolerances	Acceptance Method	ID	Function
PHYSICAL DAMAGE	NO PHYSICAL DAMAGE, SCRATCHES, OR DENTS	1, IN	X	
TEST DATA	VERIFY ASME SECTION VIII DIVISION 1 PRESSURE TEST REPORT	1, IN	X	
CATALOG CUTS	VERIFY ITEM TO CATALOG CUTS	1, IN	X	

3. Performance Critical Characteristics (for reasonable assurance that the Item will perform its intended safety function(s))				

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Section 10 Initial Review and Approval	
Approvals:	
Designated Engineer:	<u>Mark Friedlich</u> 3/6/00
Design Authority:	<u>D. J. Coolan</u> 3/10/00
QA Engineer:	<u>K. Conner</u> 3/1/00

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WORKSHEET 1 DETERMINATION OF FAILURE MECHANISMS/MODES		
Section 1		
Typical Failure Mechanisms	Definition	Applicable to Component under Evaluation
Fracture	Separation of a solid accompanied by little or no macroscopic plastic deformation.	Yes ☒ No ☐ ; If Yes, indicate failure Mode <u>device will not work</u>
Corrosion	The gradual deterioration of a material due to chemical or electrochemical reactions, such as oxidation, between the material and its environment.	Yes ☒ No ☐ ; If Yes, indicate failure Mode <u>burst pressure would be reduced</u>
Erosion	Destruction of materials by the abrasive action of moving fluids, usually accelerated by the presence of solid particles carried with the fluid.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Open Circuit	An electrical circuit that is unintentionally broken so that there is no complete path for current flow.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Short Circuit	An abnormal connection by which an electrical current is connected to ground, or to some conducting body, resulting in excessive current flow.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Blockage	Clogging of a filtering medium resulting in the inability to perform its purification function or blockage of flow.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Seizure	Binding of a normally moving item through excessive pressure, temperature, friction, jamming.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Unacceptable Vibration	Mechanical oscillations produced are beyond the defined permissible limits due to unbalancing, poor support, or rotation at critical speeds.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Loss of Properties	A loss of mechanical and physical properties of a material due to exposure to high temperatures, radiation exposure.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Excess Strain	Under the action of excessive external forces the material of the part has been deformed or distorted.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Mechanical Creep	From prolonged exposure to high temperature and stress, the object will show a slow change in its physical (shape and dimension) and mechanical characteristics.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Ductile Fracture	Fracture characterized by tearing of metal accompanied by appreciable gross plastic deformation.	Yes ☐ No ☒ ; If Yes, indicate failure Mode _____
Section 2 Additional Failure Modes Applicable to the Component Under Evaluation		
1. _____		
2. _____		
3. _____		
4. _____		
5. _____		

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CHECKLIST 1**ACCEPTANCE METHOD 1****SPECIAL TEST/INSPECTION VERIFICATION**

SECTION 1			
Item Description: RUPTURE DISK		Equip #: CLS-V-8	
System #: HELIUM PURGE		Procurement and/or Model #:	
Manufacturer (Address/Phone): CONTINENTAL DISC CORPORATION 3160 W. HEARTLAND DRIVE LIBERTY, MISSOURI 64068 1-816-792-1500		Supplier (Address/Phone): LIBERTY AUTOMATION P.O. BOX 24848 SEATTLE, WASHINGTON 98124 1-206-682-8700	
SECTION 2 CRITICAL CHARACTERISTICS TO BE VERIFIED BY METHOD 1			
Insp	Test	Post-Test	
☒	☐	☐	1. PACKING LIST
☒	☐	☐	2. ASME STAMP
☒	☐	☐	3. PHYSICAL DAMAGE
☒	☐	☐	4. ASME SECTION VIII DIVISION 1 CODE REPORT
☒	☐	☐	5. CATALOG CUTS
☐	☐	☐	6.
☐	☐	☐	7.
☐	☐	☐	8.

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SECTION 3 VERIFIED BY INSPECTION
* See Attachment G of Desk Instruction for Sampling Size
Characteristic: PACKING LIST Sample Size*: N/A Acceptance Criteria: PACKING LIST AGREES WITH PURCHASE DOCUMENTS As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____
Characteristic: ASME STAMP Sample Size*: N/A Acceptance Criteria: LABELED SECTION VIII DIV 1 As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____
Characteristic: PHYSICAL DAMAGE Sample Size*: N/A Acceptance Criteria: VERIFY NO PHYSICAL DAMAGE As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____
Characteristic: TEST REPORT Sample Size*: Acceptance Criteria: VERIFY RECEIPT OF SECTION VIII DIVISION 1 TEST REPORT As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____
Characteristic: CATALOG CUTS Sample Size*: Acceptance Criteria: VERIFY CATALOG CUTS AGREE WITH RUPTURE DISK As Found: _____ Passed: Y / N (Circle) Receipt Inspection Plan / Report #: _____ References (see Section 8): _____

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Section 5 Test / Inspection Summary (Acceptance Method 1)											
1. SUMMARY OF VERIFIED CRITICAL CHARACTERISTICS, THEIR VERIFICATION METHODS, AND RESULTS											
ITEM DESCRIPTION:		Verification Results									
Critical Characteristics	Acceptance Criteria/Tolerances	ID	Function	Method T/N	Procedure or RR#	Check-list ID	Number Tested	Number Failed	Verifying Organization	Printed Name Signature	Date
PACKING LIST	VERIFY PACKING LIST MATCHES PROCUREMENT DOCUMENTS	X		IN							
ASME STAMP	LABELLED "SECTION VIII DIV 1"	X		IN							
PHYSICAL DAMAGE	VERIFY NO PHYSICAL DAMAGE	X		IN							
TEST DATA	VERIFY RECEIPT OF ASME SECTION VIII DIVISION 1 TEST REPORT	X		IN							
CATALOG CUTS	VERIFY ITEMS TO CATALOG CUTS	X		IN							
2. DISPOSITION OF UNVERIFIED OR FAILED CRITICAL CHARACTERISTICS											
Critical Characteristic		Disposition									

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3. SIGNATURE INDICATES ALL CRITICAL CHARACTERISTICS VERIFIED SATISFACTORY OR ACCEPTABLY DISPOSITIONED AND COMMERCIAL GRADE DEDICATION IS SATISFACTORY AND COMPLETE.

BUYER VERIFICATION			
Testing Agency Approval: _____	_____	Design Authority: _____	_____
Testing Agency QA Engineer: _____	_____	QA Engineer: _____	_____
	Date _____	Date _____	Date _____

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SECTION 6 CONTACTS / PHONE NUMBERS		
	Name	Phone
Design Authority	K.E. ARD	() 376-8712
QA	K.C. CONRAD	() 373-7536
QC	C.R. NOBLE	() 376-7123
Cog - Engineer		()
CGI Engineer	M.A. FRIEDRICH	() 376-7408
Procurement Engineer	F.A. GAUTHIER	() 373-0720
Other		()
SECTION 7 SUPPORTING DOCUMENTATION FOR THIS CHECKLIST		
Initial Procurement Documents	For Critical Characteristics	
☐ Drawings:		
☐ Manuals (specify type & number):		
☐ Design Calculations		
☐ Installation Instructions		
☐ Operation Instructions		
☐ Calibration Instructions		
☐ Manufacturer's Recommended Spare Parts List		
☐ Other:		
Procurement Documents		
☐ Certificate of Conformance/Compliance		
☐ Seismic Qualification Certificate		
☐ Environmental Qualification Certificate		
☐ Test Report (s):		
☐ Inspection Report (s):		
☐ CMTRs for ASME Pressure Retaining Materials		
☐ Valve Seat Leakage Report		
☐ Weld Records		
☐ Material Traceability Record		
☐ Other:		

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Characteristic: _____	
Sample Size*: _____	
Acceptance Criteria: _____	
As Found: _____ Passed: Y / N (Circle)	
Receipt Inspection Plan / Report #: _____	
References (see Section 8): _____	
SECTION 4 VERIFIED BY SPECIAL TEST	
* See Attachment G of Desk Instruction for Sampling Size	
Test To Be Performed by:	Number of Items to be Tested:
☐ Purchaser	Test/Inspection Location: TESTING PERFORMED AT
☐ Supplier/Manufacturer**	SUPPLIERS FACILITY
☒ Other	
Characteristic for Test: BURST PRESSURE VERIFICATION OF RUPTURE DISK	
Acceptance Criteria: PERFORM AN ASME SECTION VIII DIVISION 1 BURST PRESSURE TEST ON RUPTURE DISK. TEST BURST PRESSURE SHALL BE 65 PSIG +/- 10%. SUBMIT TO BUYER A CERTIFIED TEST REPORT PER THE REQUIREMENTS OF ASME SECTION VIII, DIVISION 1.	
Sample Size*: MINIMUM OF ONE BURST TEST FOR DISK LOT	
Actual Test Value: _____	
Test Plan and Report #: _____	References (see Section 8): _____

** If Supplier/Manufacturer or Other, Refer to CGI Checklist-2 for Support Information

14

Screw Type Assemblies

2-2206-2

Continental Disc Corporation

Performance Under Pressure®

Continental Disc Corporation's Tite-Seal and Screw Type assemblies are complete rupture disc and holder units specifically designed for use on various types of pressurized "mini systems" such as:

- Air conditioning systems
- Refrigeration units
- Hydraulic accumulators
- Gas cylinders
- Portable compressed air systems
- Laboratory equipment

Tite-Seal and Screw Type assemblies provide dependable, instantaneous overpressure relief for protecting systems, equipment and vessels from potentially damaging excess pressure conditions.

Tite-Seal Assembly

The Tite-Seal assembly is a sealed, disposable unit for use in systems where pressures do not exceed 3,000 psig (207 barg). The Tite-Seal assembly features a rupture disc sealed between brass fittings. After relieving an overpressure condition, changeout is easily performed by replacing the entire assembly. CDC's Tite-Seal assembly can be supplied with a Standard or Composite rupture disc to accommodate various application requirements.

Screw Type Assembly

Continental's Screw Type assembly is a reusable unit for use in systems with pressures up to 20,000 psig (1379 barg). A Standard or Composite rupture disc is supplied separately from the Screw Type holder. After an overpressure condition occurs, changeout is accomplished by disassembling the Screw Type holder and replacing only the burst rupture disc.

Various pressure ratings, materials and holder configurations are available to customize the Screw Type assembly to your specific application.

TITE-SEAL ASSEMBLY

SCREW TYPE ASSEMBLY

COMPOSITE* TYPE RUPTURE DISC

What is a Composite Type Rupture Disc?

A Composite type rupture disc is a differential pressure relief device used to protect pressurized systems, equipment and vessels from a potentially damaging overpressure condition. Continental's Composite rupture discs are designed to provide instantaneous, full-opening pressure relief.

Continental Disc offers two Composite type rupture disc design styles, a Preformed style, like the CDC or PLV rupture disc, and a flat style, like CDC's Enviro-Seal rupture disc.

Preformed Composite Rupture Disc

A Preformed Composite rupture disc consists of two or more components of metallic or nonmetallic materials. These components generally include a metallic top section, a metallic or nonmetallic seal member and an optional vacuum support.

Preformed Composite Rupture Disc Features:

- Excellent performance in low pressure applications.
- Operation to 80% of the rupture disc's rated burst pressure.
- For use in gaseous or liquid service medias.
- Made from a variety of corrosion resistant materials.
- Non-fragmenting design when used with a nonmetallic seal.
- Ideal for use under a safety relief valve to isolate the valve from process media.
- Provided with Continental's unique 3-Dimensional Flow Direction Tag as a standard.

Patented Seven-Hole Design

Continental's Preformed Composite rupture discs also feature our patented seven-hole pattern, positioned at the apex of the rupture disc's top section. This unique configuration, in combination with the pre-cut sections along the dome, provide non-fragmenting characteristics when used with a nonmetallic or Teflon® seal. By using this seven-hole design, thicker, more durable materials can be used to manufacture the rupture disc while still achieving the high 80% operating to burst pressure ratio.

Various seal material options, such as Teflons and exotic metallics, help insure excellent corrosion resistance. Continental's nonmetallic seals are essential to minimize fragmentation. When ordering, please specify if your application requires a non-fragmenting rupture disc.

Recommended Operating Conditions

Continental's Preformed Composite rupture discs can be used in a variety of applications, including equipment operating at up to 80% of the rupture disc's rated (stamped) burst pressure and systems having either liquid or gas process.

Under ideal operating conditions, such as static pressure and a temperature well below the maximum recommended for the rupture disc material used, Preformed Composite rupture discs may be subjected to operating pressures exceeding 80% of the rated (stamped) burst pressure. Contact the factory for additional information about the use of a Composite rupture disc above this 80% operating ratio.

Sizes and Materials

Sizes ranging from 1" to 36" (25mm to 900mm) are available with burst pressures from 1.5 psig to 1440 psig (0.10 barg to 100 barg). Because of the availability of a variety of seal materials, these rupture discs can be used in service temperatures of up to 1000°F (542°C) and can resist most corrosive and atmospheric conditions. The metallic top section can be manufactured from various materials to meet the needs of each individual application.

*Composite rupture discs incorporate United States patent no. 3,445,032.

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COMPOSITE TYPE RUPTURE DISC

Each application has its own unique operating characteristics. Many variables such as pulsations, cycling and operating to burst pressure ratio must be considered in order to achieve maximum service life from the rupture disc.

Versatile operating characteristics, along with numerous customizable options like protective liners, protective rings, vacuum or backpressure support, gaskets and Continental's exclusive B.D.I.* (Burst Disc Indicator) Alarm System provide a comprehensive selection to match Preformed Composite rupture discs with a wide range of system protection applications.

Seating Configurations

Preformed Composite Rupture Discs are available in a 30° angular "Light Lip" seat for normal operating pressures and a "Flat Seat" design for superior metal to metal sealing. Size, burst pressure of the rupture disc and flange class determine the recommended seat design. Refer to Table I for details.

Table I - Recommended usage for Heavy-Lip Seating Design

White bar indicates "psig" • Grey bar indicates "barg"

Nominal Size	Flange Class			Rupture Disc Rating psig / barg
	ANSI	DIN	JIS	
1 in	1500			3600 - UP
25mm		250	-	248 - UP
1 1/2 in	900			2160 - UP
40mm		160	-	149 - UP
2 in	900			2160 - UP
50mm		160	-	149 - UP
3 in	1500			3600 - UP
80mm		250	-	248 - UP
4 in	1500			3600 - UP
100mm		250	-	248 - UP

NOTE: All other sizes and classes will be provided with "Light Lip" design.

Corrosion Protection

The design of Continental's Preformed Composite Rupture Discs allow the use of highly corrosion resistant seal materials. This is possible because the burst pressure rating of the rupture disc is determined by the slotted metal top section. Therefore, the seal or liner can be made of thin materials of anything from Teflon to Silver or Gold and still provide a wide range of burst pressures...economically.

Protective Rings

Protective rings may be used on rupture discs made of thin materials or where delicate seals are used. These rings provide rigidity for easier handling and also help protect the rupture disc from foreign materials in the seating area, where a rupture disc holder may have become pitted or corroded from extended use.

Vacuum Support. Backpressure Support

In some burst pressures and materials, it is necessary to support a rupture disc when system backpressure occurs. Vacuum supports for Preformed Composite rupture discs, manufactured for and directly attached to the rupture disc, are available to withstand a full system vacuum to 14.7 psig (1.01 barg). For backpressures in excess of full vacuum, Continental can supply a Backpressure Support specifically designed for your operating conditions.

When ordering a Preformed Composite Rupture Disc that will be subjected to a vacuum condition, clearly specify the conditions that the rupture disc will encounter. CDC will supply the applicable support.

Three-Dimensional Flow Direction Tag**

Continental's Innovative Three-Dimensional Flow Direction Tag provides instant visual verification that the rupture disc has been correctly oriented into the system. The 3-D tag extends beyond the holder to insure clear visibility for easier installation and inspection after the rupture disc has been installed.

** Tags, as a standard, are attached to all rupture discs above the 1 1/2" nominal size. For rupture discs below this size, a tag may be attached upon request for all designs other than those for Union Type holders.

* Burst Disc Indicator (B.D.I.) Alarm System incorporates U.S. patent no. 3,430,6 and 4,408,194; Australia patent no. 539,415; Germany patent no. 3,174,227 D; Belgium, France and United Kingdom patent no. EP 0 033 867; Canada patent no. 1,199,990; Japan patent no. 203,2464. Other patents pending.

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COMPOSITE TYPE RUPTURE DISC

Preformed Composite
Rupture Disc Types

Continental Disc manufactures several Preformed Composite Rupture Discs to fit numerous applications.

CDC Type

The CDC type rupture disc is the basic Preformed Composite rupture disc design consisting of a slotted metallic top section and a Teflon or metallic seal on the top section's process side. This basic design provides corrosion protection and excellent performance in low pressure applications where no back-pressure or vacuum is expected.

CDCV Type

The CDCV type rupture disc is the same design as the CDC type rupture disc, with the addition of a vacuum support installed on the process side of the seal. This design provides process side corrosion protection and support for full vacuum conditions.

PL and PLV Type

The PL type rupture disc is similar to the CDC type, with the addition of a corrosion resistant Teflon liner placed on the outlet side of the top section.

The PLV type rupture disc is the same design as the PL type rupture disc, but with the addition of a vacuum support. The vacuum support on this design, however, is located on the outlet side of the top section. The outlet liner is positioned above the vacuum support, protecting the metallic top section and the vacuum support from corrosive elements in the atmosphere.

ALARM SYSTEM

B.D.I. (Burst Disc Indicator)
Alarm System

In situations where immediate notification of pressure relief is critical, Continental's patented B.D.I. (Burst Disc Indicator) Alarm System should be used to automatically notify system operators that a rupture disc has burst.

The heart of the B.D.I. Alarm System is the B.D.I. Alarm Strip, a closed-path electrical strip adhered to a Teflon membrane, which installs in conjunction with the rupture disc. When the rupture disc bursts, the alarm strip is severed, disrupting the electrical current supplied from a connected monitoring device. This "open-circuit" creates a signal to initiate alarms or equipment controlled by the monitoring device.

The B.D.I. Alarm Strip is computer compatible, resistant to corrosives, and operational over a wide range of temperatures.

Continental Disc also offers a full-line of B.D.I. Alarm Monitors providing several beneficial features including visual and/or auditory alarm signals as well as multichannel modular, Factory Mutual approved and intrinsically Safe designs. (Refer to CDC Bulletin #1001)

SPECIFICATIONS

Manufacturing Range

The manufacturing range is defined as the allowable pressure range within which a rupture disc is rated. It is based upon the customer specified burst pressure. The manufacturing ranges for Continental's Preformed Composite rupture discs are outlined in Table II. Special reduced manufacturing ranges are available on request including 25%, 50% and 75%. Please consult your CDC representative or the factory for additional information.

Burst Tolerance

In accordance with ASME Code, a tolerance is applied to the rated burst pressure of a rupture disc. The rated or stamped burst pressure is established after the rupture disc has been manufactured by testing a minimum of two rupture discs and averaging the pressure at which each rupture disc bursts. This average is the rated (stamped) burst pressure. A tolerance is then applied to this pressure to determine the maximum expected variation from the rupture disc's rated (stamped) burst pressure.

As per ASME Code, the Preformed Composite rupture disc is designed with a burst tolerance of ± 2 psig for pressures under 40 psig @ 72°F (2.8 barg @ 22°C), and $\pm 5\%$ for pressures 40 psig and above. The burst tolerance applies only to the rated (stamped) burst pressure.

Recommended Temperatures

In general, burst pressures will decrease as operating temperatures increase. Table III shows the maximum temperatures for commonly used rupture disc materials, seals and liners.

Table II - Manufacturing Range / Burst Tolerance

LDC CDC CDCV PL PLV	Specified Burst Pressure		Manufacturing Range		Rated (Stamped) Burst Tolerance
	psig	barg	% Under	% Over	
	2 - 5	0.138 - 0.345	-40	+40	±2 psig (0.138 barg)
	6 - 8	0.414 - 0.552	-40	+40	
	9 - 12	0.621 - 0.815	-30	+30	
	13 - 14	0.896 - 0.965	-10	+20	
	15 - 19	1.03 - 1.31	-10	+20	
	20 - 39	1.38 - 2.69	-4	+14	±5%
	40 - 50	2.76 - 3.45	-4	+14	
	51 - 100	3.52 - 6.90	-4	+10	
	101 - 500	6.96 - 34.48	-4	+7	
	501 - UP	34.54 - UP	-3	+8	

Table III - Maximum Temperature for Rupture Disc Materials, Liners and Coatings

Temperature Rating		
Materials	°F	°C
Aluminum / Silver	260	127
Nickel / Monel	800	427
316SS	900	482
Inconel	1000	538
FEP Teflon Seal or Lining	400	204
TFE or PFA Seal or Lining	500	260

GAS BOTTLE RACK ISOMETRIC

SECTION H-H

1 GAS BOTTLE RACK WELDMENT
SCALE: 1 1/2" = 1'-0"

NOTE: ITEM NUMBER 17 NOT SHOWN
17

NOTES: (UNLESS OTHERWISE SPECIFIED)
ALL DIMENSIONS ARE IN INCHES. TOLERANCES: FRACTIONAL: ±1/8; ANGULAR: ±7°.

- [illegible]

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	REMARKS
1	1	EA	GAS BOTTLE JACK W/CLAMP	
2	2	EA	RACK BUSH-ASSEMBLY	
3	3	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
4	4	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
5	5	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
6	6	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
7	7	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
8	8	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
9	9	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
10	10	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
11	11	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
12	12	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
13	13	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
14	14	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
15	15	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
16	16	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
17	17	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
18	18	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
19	19	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
20	20	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
21	21	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
22	22	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"	
23	23	EA	ANGLE 3 x 1/2 x 3/8 = 4'-11"

U.S. DEPARTMENT OF ENERGY
Nuclear Operations Office

7506	H-1-84493	Q
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		EDT No. 629208
		ECN No. N/A

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