UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

February 24, 2006

R. T. Ridenoure, Vice President
Omaha Public Power District
Fort Calhoun Station FC-2-4 Adm.
P.O. Box 550
Fort Calhoun, NE 68023-0550

SUBJECT: INSPECTION REPORT 050-00285/06-012; 072-00054/06-001

Dear Mr. Ridenoure:

An NRC inspection was conducted at the TriVis, Inc. facility in Pelham, AL on January 30 through February 2, 2006, as part of the Fort Calhoun Station Independent Spent Fuel Storage Installation (ISFSI) pre-operational testing program. The purpose of the inspection was to determine if TriVis personnel, processes, and equipment were adequate to perform canister sealing, vacuum drying, and cover gas backfilling operations as required by your ISFSI license. The enclosed inspection report documents the inspection findings, which were discussed with members of your staff on February 1-2, 2006.

The inspection determined that TriVis was conducting Fort Calhoun pre-operational testing activities in compliance with the Commission's rules and regulations and within the conditions of the Fort Calhoun ISFSI license. There were no violations identified. However, the majority of the procedures used during this inspection were in the final stages of completion and approval. As a result, several issues were identified that need further NRC review prior to Fort Calhoun initiating dry fuel loading activities. These issues are described in detail in the enclosed report and are identified as inspection findings.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction.

Should you have any questions concerning this inspection, please contact the undersigned at (817) 860-8191 or Mr. Scott Atwater at (817) 860-8286.

Sincerely,

RJ Evans for

D. Blair Spitzberg, Ph.D., Chief
Fuel Cycle and Decommissioning Branch

Docket Nos.: 50-285
72-054
License No.: DPR-40

Enclosure:
NRC Inspection Report 050-00285/06-012; 072-00054/06-001

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.:	050-00285; 072-00054
License:	DPR-40
Report No:	050-00285/06-012; 072-00054/06-001
Licensee:	Omaha Public Power District
Facility:	Fort Calhoun Station
Location:	P.O. Box 550 Fort Calhoun, NE 68023-0550
Dates:	January 30 through February 2, 2006
Inspector:	S.P. Atwater, Inspector
Accompanied By:	C.D. Morrell, NRC Contractor (ATL)
Approved By:	D.B. Spitzberg, Ph.D., Chief Fuel Cycle and Decommissioning Branch
Attachments:	1. Supplemental Information 2. Inspector Notes

EXECUTIVE SUMMARY

Fort Calhoun Station
NRC Inspection Report 050-00285/06-012; 072-00054/06-001

Certificate of Compliance (CoC) 72-1004, Amendment 8, Technical Specification 1.1.6.6 requires the licensee to perform pre-operational testing of the 32PT dry shielded canister sealing, vacuum drying and cover gas backfilling operations. This testing was conducted on January 30 through February 2, 2006 at the TriVis facility in Pelham, AL. Several issues were identified in NDE procedures, documentation of welds made by the Automated Welding System, Automated Welding System calibration, post testing calibration checks for instruments used to verify compliance with Technical Specifications, and welding procedures. These issues are described in detail in Attachment 2 to the report. They are identified as inspection findings and will require further NRC review prior to Fort Calhoun initiating dry fuel loading activities. The following provides a summary of the inspection results:

Pre-Operational Testing

- The pre-operational testing met the requirements of Technical Specifications for canister sealing, vacuum drying and helium backfilling. The helium leak rate through the closure welds was within the Technical Specification limit.

Non-Destructive Examination (NDE)

- The NDE examiners were properly qualified and certified to perform weld testing of the canister closure welds.

- The liquid penetrant procedure did not meet the ASME code requirements. The procedure did not identify the appropriate chemicals for standard temperature testing, require final interpretation to be made within 7-60 minutes of minimum developing time, document the nature and location of indications, or create a permanent record. Also, a high temperature liquid penetrant procedure had not been qualified. This issue is being tracked as an inspection finding.

- The visual testing procedure did not meet the ASME code requirements. The procedure contained instructions for direct visual testing and permitted remote visual testing using the Automated Welding System (AWS) camera. The procedure had not been validated for either direct or remote testing. This issue is being tracked as an inspection finding.

Quality Assurance

- Objective evidence that the Automated Welding System (AWS) welds were made in accordance with the weld specifications was not provided, as required by the ASME code. The AWS machine calibration requirements were not defined. This issue is being tracked as an inspection finding.

- Methods for performing post testing calibration checks on instruments used for verifying canister dryness and helium back pressure were not established at the time of the inspection. This issue is being tracked as an inspection finding.

Radiation Protection

- The pre-job safety briefings provided the workers with information they needed to work safely and to minimize radiation exposures. Radiological postings and access control measures met the requirements of 10 CFR Part 20.

Welding Personnel

- The welder and welding operator training, examination and certification process and rigor met the requirements of the ASME Code.

Welding Procedures

- The welding procedures were qualified in accordance with the ASME Code. The welders and welding operators completed all welds in accordance with the welding procedures.

- The weld repair procedures did not meet the requirements of the ASME Code. Provisions for documenting the nature and location of weld defects were not adequate. The weld repair process and documentation requirements were not clearly defined. This issue is being tracked as an inspection finding.

Attachment 1

Supplemental Information

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Bannister - Plant Manager
K. Erdman - ISFSI Manager
R. Haug - Radiation Protection Manager
L. Hougen - Health Physics Technician
R. Juzo - Radiation Protection (ALARA)
E. Matzke - Licensing
C. McMullen - Quality Control
R. Ruhge - Quality Assurance
B. Van Sant - Manager

TriVis

D. Bland - Project Manager
R. Brown - Loading Technician
J. Crowson - Loading Technician
P. Gillespie - Quality Assurance
A. Gunter - Loading Technician, Welder
S. Hamric - NDE Trainee
A. Heinz - NDE Examiner
D. Henley - Loading Technician
J. Kelley - Project Manager
M. Peters - Loading Technician, Welder

TransNuclear Personnel

J. Axline - Project Engineer
T. Chen - Quality Assurance Manager
U. Farrage - Project Manager

INSPECTION PROCEDURES USED

60854.1 Pre-operational Testing of ISFSIs at Operating Plants

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

72-054/0601-01	FIN	Revise the standard temperature liquid penetrant procedure. Develop and qualify a high temperature liquid penetrant procedure.
72-054/0601-02	FIN	Validate the visual testing procedure for both direct and remote testing.
72-054/0601-03	FIN	Develop a method for documenting that the Automated Welding System (AWS) welds are made in accordance with the weld specifications. Calibrate the AWS as specified by the manufacturer.
72-054/0601-04	FIN	Develop a method for performing post testing calibration checks on the vacuum and pressure instruments used for verifying canister dryness and helium back pressure.
72-054/0601-05	FIN	Develop a weld repair procedure that defines the process and provides the required documentation.

Closed

None

Discussed

None

LIST OF ACRONYMS USED

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
CFR	Code of Federal Regulations
CoC	Certificate of Compliance
FIN	NRC Inspection Finding
FSAR	Final Safety Analysis Report
GTAW	Gas Tungsten Arc Welding
HEPA	High Efficiency Particulate Airborne
HMSLD	Helium Mass Spectrometer Leak Detector
mmHg	Millimeter of Mercury (1 mmHg = 1 torr)
MRS	Monitored Retrievable Storage
NDE	Non-Destructive Examination
RWP	Radiological Work Permit
SSC	Systems, Structures, and Components
SNT	American Society for Non-Destructive Testing
WPS	Welding Procedure Specification

Attachment 2
FORT CALHOUN WELDING DEMONSTRATION
Inspector Notes

Category:	Drying/Helium Backfill **Topic:** Helium Backfill Final Pressure
Reference:	CoC #1004, Tech Spec 1.2.3a
Requirement	The canister is backfilled with helium to a pressure of 1.5 - 3.5 psig. Pressure must remain stable for 30 minutes after filling.
Finding:	This requirement was implemented. Following satisfactory completion of the second pump-down, the final helium backfill of the canister was performed. Procedure DFS-0002, Step 7.6.7 pressurized the canister to between 1.5 and 3.5 psig as required by Technical Specification 1.2.3a. During the demonstration, the canister was backfilled to 2.5 psig and pressure stabilized at 2.3 psig. The pressure was held stable for 30 minutes and Technical Specification 1.2.3a was met.
Documents Reviewed:	Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft

Category:	Drying/Helium Backfill **Topic:** Vacuum Drying Final Pressure
Reference:	CoC #1004, Tech Spec 1.2.2
Requirement	The canister must be vacuum dried to 3 mm Hg (3 torr) or less and held for 30 minutes or more. This level of dryness must be achieved in both the initial pump-down and the final pump-down.
Finding:	This requirement was implemented. Procedure DFS-0002, Step 7.3.49 started the pump-down to 50 torr or less. At 50 torr the canister was isolated and pressure was allowed to stabilize for 5 minutes. Step 7.3.60 continued the pump-down to 2.1 torr or less. At 2.0 torr the canister was isolated and pressure was again allowed to stabilize for 5 minutes. Step 7.3.66 started the 30 minute Technical Specification hold for the initial pump-down. During the first pump-down, the pressure remained at 2.0 torr for 30 minutes and Technical Specification 1.2.2 was met. Following the initial helium backfill, the second pump-down was performed. Procedure DFS-0002, Step 7.5.5 started the pump-down to 3.7 torr or less. At 3.7 torr the canister was isolated and pressure was allowed to stabilize for 5 minutes. Step 7.5.11 continued the pump-down to 2.1 torr or less. At 2.0 torr the canister was isolated and pressure was again allowed to stabilize for 5 minutes. Step 7.5.13 started the 30 minute Technical Specification hold for the second pump-down. During the second pump-down, the pressure remained at 2.0 torr for 30 minutes and Technical Specification 1.2.2 was met.
Documents Reviewed:	Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft

Category: Drying/Helium Backfill **Topic:** Vacuum Drying Times

Reference: CoC #1004, Tech Spec 1.2.17a

Requirement The time limit for vacuum drying is 36 hours with a decay heat load less than 8.4 kW. For decay heat loads of 8.4 kW to 24 kW, the time limit is 31 hours. If the canister cannot be vacuum dried to 3 mm Hg or less for 30 minutes or more within the time limit, the canister must be backfilled with helium to 0.1 atm or greater within the next 2 hours.

Finding: This requirement was implemented. A canister decay heat load of 12.7 kW was simulated for the vacuum drying demonstration. Technical Specification 1.2.17a limited vacuum drying time to 31 hours for a 12.7 kW canister. Procedure DFS-0002, Step 7.3.49 started the pump-down and initiated the 31 hour Technical Specification clock for vacuum drying time. Step 7.3.66 of the procedure started the 30 minute Technical Specification hold for the initial pump-down. The pressure remained at 2.0 torr for 30 minutes during the demonstration and Technical Specification 1.2.2 was met. The 31 hour vacuum drying clock was stopped at this point, yielding a total vacuum drying time of 1 hour and 36 minutes.

Procedure DFS-0002, Section 7.3.47 required pressurizing the canister to 2.0 psig if the required dryness could not be achieved within 2 hours of the drying time limit.

Documents Reviewed: Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft

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Category: NDE Personnel Quals **Topic:** Certification Records

Reference: SNT-TC-1A, Section 9

Requirement Certification records should contain the name of the certified individual, the certification level and method, the individual's educational background and NDE experience, a statement of satisfactory completion of training per the employer's written practice, visual examination results, evidence of successful completion of examinations including grades, date of certification, and the signature of the employer.

Finding: This requirement was implemented. The NDE Examiner certification package consisted of a Certification Record, Visual Acuity Record, and resume of the NDE examiner. The Certification Record contained the name of certified individual, certification level and method, examination grades, date of certification, and signature of employer. The Certification Record stated that the individual was certified in accordance with the written practice, which contained the minimum training requirements. The Visual Acuity Record contained the results of the near distance and far distance acuity tests, and the color differentiation test. The resume contained the educational background and NDE experience of the individual.

Documents Reviewed: Leak Testing Specialists (LTS) Procedure NDE-QUAL-LTS, "Written Practice for the Qualification and Certification of Nondestructive Examination (NDE) Personnel," Revision 3
LTS Certification Records
LTS Visual Acuity Records
NDE Examiner Resumes

Category: NDE Personnel Quals **Topic:** Level III Candidates

Reference: SNT-TC-1A, Section 6

Requirement A Level III candidate who has completed less than 2 years of engineering or science study must have 4 years of experience comparable to a Level II. A Level III candidate who has completed 2 years of engineering or science study must have 2 years of experience comparable to a Level II. A Level III candidate who has completed 4 years of engineering or science study must have 1 year of experience comparable to a Level II.

Finding: This requirement was implemented as documented in the Leak Testing Specialists (LTS) written practice. Table C of the written practice contained the minimum training and experience requirements for Level III certification. The minimum requirements were consistent with the SNT-TC-1A criteria.

Documents Reviewed: Leak Testing Specialists, Inc., Procedure NDE-QUAL-LTS, "Written Practice for the Qualification and Certification of Nondestructive Examination (NDE) Personnel," Revision 3

Category: NDE Personnel Quals **Topic:** Recertification

Reference: SNT-TC-1A, Section 9

Requirement Maximum recertification intervals are 3 years for Levels I and II, and 5 years for Level III. Recertification may be granted without testing provided there is documented continuing satisfactory performance. "Continuing" must be defined in the written practice. Without documented continuing satisfactory performance, reexamination is required for those sections deemed necessary by the Level III examiner.

Finding: This requirement was implemented. Section 2.0 of the Leak Testing Specialists (LTS) written practice stated that NDE Level I and II personnel shall be recertified by re-examination at intervals not to exceed 3 years. NDE Level III personnel shall be recertified at intervals not to exceed 5 years by evidence of continuing satisfactory performance or by re-examination. Section 4.0 of the LTS written practice stated that an individual's certification shall be suspended if he has not performed the method in which he is certified within the past 12 months. The Certification Records for the LTS personnel contained both the certification and recertification dates. The recertification date for the Level II examiner was 3 years from initial certification and the recertification date for the Level III examiner was 5 years from initial certification.

Documents Reviewed: Leak Testing Specialists (LTS) Procedure NDE-QUAL-LTS, "Written Practice for the Qualification and Certification of Nondestructive Examination (NDE) Personnel," Revision 3
LTS Certification Records

Category: NDE Personnel Quals **Topic:** Visual Acuity

Reference: SNT-TC-1A, Section 8.2

Requirement The NDE examiner should have natural or corrected near-distance acuity in at least one eye capable of reading Jaeger Number 1 at a distance of not less than 12 inches on a standard Jaeger test chart, or capable of perceiving a minimum of 8 on an Ortho-Rater test pattern. This should be verified annually. The NDE examiner should demonstrate the capability of distinguishing and differentiating contrast among colors used in the

applicable method. This should be verified every 3 years.

Finding: This requirement was implemented as documented in the Leak Testing Specialist's, Inc. (LTS) Visual Acuity Records for the NDE examiners. LTS used the Jaeger Number 1 chart for near distance acuity, the Snellen Test chart for far distance acuity, and the Ishihara Test for color differentiation. Both NDE examiners received an annual vision test and both examiners were due for their next test in September 2006.

Documents Reviewed: Leak Testing Specialists, Inc. NDE examiner Visual Acuity Records

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Category: NDE Personnel Quals **Topic:** Written Practice

Reference: SNT-TC-1A, Section 5

Requirement The employer shall establish a written practice for control and administration of NDT personnel training, examination and certification. The written practice should describe the responsibility of each level of certification for determining the acceptability of material or components. The written practice shall describe the training experience and examination requirements for each level of certification.

Finding: This requirement was implemented as documented in the Leak Testing Specialists, Inc. written practice. Section II of the written practice described the responsibilities and capabilities of each level of certification for determining the acceptability of material or components. Tables A, B, and C of the written practice contained the minimum training and experience requirements for each level of NDE certification. Section IV of the written practice contained the examination requirements for each level of certification.

Documents Reviewed: Leak Testing Specialists, Inc., Procedure NDE-QUAL-LTS, "Written Practice for the Qualification and Certification of Nondestructive Examination (NDE) Personnel," Revision 3

Category: NDE Procedures - HT **Topic:** Helium Leak Rate Limit

Reference: CoC #1004, Tech Spec 1.2.4a

Requirement The helium leak rate through the inner top cover seal weld shall be no greater than 1.0 X 10(-7) ref-cc/sec.

Finding: This requirement was implemented. Three helium leak tests were performed during canister sealing operations. The first test measured helium leakage through the inner top cover-to-shell weld. For this test, Procedure DFS-0002, Step 7.4.9 specified a maximum acceptable leak rate of 1.0 X 10(-5) ref-cc/sec using the detector probe method. The detector probe was passed around the circumference of the weld, stopping every 90 degrees to check instrument response to a leakage standard. The instrument response was normal and the actual helium leak rate measured during the demonstration was below 1.0 X 10(-5) ref-cc/sec. This test was not required by Technical Specifications. It was performed for information only, to provide early warning of a leak.

The second test measured helium leakage through the canister vent and siphon port cover plate welds. For this test, Procedure DFS-0002, Step 7.7.25 specified a maximum acceptable leak rate of 1.0 X 10(-7) ref-cc/sec using the hood method. The test cap was placed over each cover plate and held for 2 minutes. The actual leak rate measured during the demonstration was 4.6 X 10(-8) ref-cc/sec.

The third test measured helium leakage through the inner top cover-to-shell weld, the inner top cover-to-vent and siphon block weld, and through the vent and siphon port cover plate welds. For this test, Procedure DFS-0002, Step 7.8.20 and Technical Specification 1.2.4a specified a maximum leak rate of 1.0 X 10(-7) ref-cc/sec. The actual measured leak rate during the demonstration was 1.2 X 10(-8) ref-cc/sec.

Documents Reviewed: Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft

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Category: NDE Procedures - HT **Topic:** HMSLD Minimum Sensitivity

Reference: ANSI N14-5, Section 8.4

Requirement The helium mass spectrometer leak detector (HMSLD) shall have a minimum sensitivity of 1/2 the acceptance leak rate. For example, a package with a leaktight acceptance criteria of 1.0 X 10(-7) ref-cc/sec requires a minimum HMSLD sensitivity of 5.0 X 10(-8) ref-cc/sec. This sensitivity requirement applies to both the hood and detector probe methods. The HMSLD shall be calibrated to a traceable standard.

Finding: This requirement was implemented. Section 5.0 of the helium mass spectrometer leak test procedure started up the HMSLD and checked the instrument calibration. Using a temperature corrected leak standard, minimum sensitivity of the HMSLD was determined to be 1.2 X 10(-8) ref-cc/sec. This was within the ANSI requirement of 5.0 X 10(-8) ref-cc/sec.

The HMSLD used during the demonstration was a Varian 959 MacroTorr unit. Two leak standards were provided by Vacuum Technology Incorporated (VTI). The VTI certification documents indicated that leak standard CL-HE-5 was calibrated on May 15, 2005 and leak standard CL-HE-25 was calibrated on April 7, 2003. At the time of the demonstration, both leak standards were within their 3 year calibration interval.

Documents Reviewed: Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft
Procedure MSLT-DSC-TriVis, "Helium Mass Spectrometer Leak Test Procedure," Revision Ft C-0

Category: NDE Procedures - PT **Topic:** Acceptance Criteria

Reference: ASME Section III, Article NB-5352

Requirement Only indications with major dimensions greater than 1/16 inch should be considered relevant. The following relevant indications are unacceptable: 1) any cracks or linear indications. Linear indications have a length at least 3 times greater than the width; 2) rounded indications with dimensions greater than 3/16 inch (4.8 mm); 3) more than four rounded indications in a line, separated by 1/16 inch (1.6 mm) or less edge to edge; 4) more than ten rounded indications in any 6 square inch area in the most unfavorable location relative to the indications being evaluated.

Finding: This requirement was implemented. Procedure QP-9.202, Step 6.6.4 required that indications with major dimensions greater than 1/16" be considered relevant. Section 7.0 of the procedure established acceptance criteria that was consistent with the ASME

code. During the demonstration, the NDE examiner inspected the tack welds, root passes, in-process repairs, and final welds in accordance with the procedure.

Documents Reviewed: Procedure QP-9.202, "Liquid Penetrant Examination of ASME Welds and Components," Revision Draft

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Category: NDE Procedures - PT **Topic:** Light Intensity

Reference: ASME Section V, Article 6, T-676.3

Requirement For color contrast penetrants, a minimum light intensity of 50 foot-candles (500 lux) is required to ensure adequate sensitivity during examination and evaluation of indications.

Finding: This requirement was implemented. Procedure QP-9.202, Step 4.2.1 required a minimum light intensity 100 foot-candles, to be verified with a calibrated light meter. During the demonstration, the NDE examiner used a calibrated light meter to verify that the minimum light intensity was established.

Documents Reviewed: Procedure QP-9.202, "Liquid Penetrant Examination of ASME Welds and Components," Revision Draft

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Category: NDE Procedures - PT **Topic:** Minimum Elements

Reference: ASME Section V, Article 6, T-621

Requirement Each liquid penetrant (PT) procedure shall include the: (1) materials, shapes or sizes to be examined; (2) type of each penetrant, remover, emulsifier, and developer; (3) pre-examination cleaning and drying, including the cleaning materials used and minimum time allowed for drying; (4) applying the penetrant, the length of time the penetrant will remain on the surface (dwell time), and the temperature of the surface during examination; (5) removing excess penetrant and drying the surface before applying the developer; (6) length of developing time before interpretation; and (7) post-examination cleaning.

Finding: This requirement was implemented. Procedure QP-9.202 included all of the procedure elements required by the ASME code.

Documents Reviewed: Procedure QP-9.202, "Liquid Penetrant Examination of ASME Welds and Components," Revision Draft

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Category: NDE Procedures - PT **Topic:** Non Standard Temperature

Reference: ASME Section V, Article 6, T-653

Requirement When it is not practical to conduct a liquid penetrant examination within the range of 50 to 125 degrees F, the examination procedure at the proposed higher or lower temperature range requires qualification. This shall require the use of a quench cracked aluminum block which in this article is designated as a liquid penetrant comparator block.

Finding: This requirement was not implemented. Procedure QP-9.202, Step 1.3 stated that the liquid penetrant procedure was qualified for use between 60 and 125 degrees F. Although the minimum temperature of 60 degrees F was 10 degrees higher then the 50 degrees F specified by the ASME code, it was more conservative and therefore acceptable. However, Step 1.4 stated that the liquid penetrant procedure was qualified

by demonstration for use between 60 and 340 degrees F by following the requirements of ASME Boiler and Vessel Code, Section V. The ASME code required the procedure to be qualified using a liquid penetrant comparator block. No documentation was identified to indicate that the procedure had been qualified for high temperature testing. This issue is being tracked as inspection finding 72-054/0601-01.

Also, final interpretation must be made within 7-60 minutes after the minimum developing time as specified in ASME Section V Article 6, T-676.1. Procedure QP-9.202 contained developer dwell times for high temperature testing but not for standard temperature testing. Procedure QP-9.202 did not require final interpretation to made within 7-60 minutes after the minimum developing time. This issue is being tracked as inspection finding 72-054/0601-01.

Documents Reviewed: Procedure QP-9.202, "Liquid Penetrant Examination of ASME Welds and Components," Revision Draft

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Category: NDE Procedures - PT **Topic:** Permanent Record

Reference: ASME Section V, Article 6, T-676

Requirement The inspection process, including findings (indications), shall be made a permanent part of the user's records by video, photographic, or other means which provide an equivalent retrievable record of weld integrity. The video or photographic records should be taken during the final interpretation period.

Finding: This requirement was not implemented. Procedure QP-9.202 did not require the use of video, photographic or other means to provide a retrievable record of weld integrity. Neither did the procedure require that findings be documented on the final examination report and entered into a permanent record. The NDE Examination Report in the back of Procedure QP-9.202 did not contain adequate provisions for documenting the nature and location of indications. This issue is being tracked as inspection finding 72-054/0601-01.

Documents Reviewed: Procedure QP-9.202, "Liquid Penetrant Examination of ASME Welds and Components," Revision Draft

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Category: NDE Procedures - PT **Topic:** Removing Excess Penetrant

Reference: ASME Section V, Article 6, T-673.3

Requirement Excess solvent removable penetrants shall be removed by wiping with a cloth or absorbent paper until most traces of the penetrant have been removed. The remaining traces shall be removed by lightly wiping the surface with a cloth or absorbent paper moistened with solvent. Care shall be taken to avoid the use of excess solvent. Flushing the surface with solvent, following application of the penetrant and prior to developing, is prohibited.

Finding: This requirement was implemented. The instructions for removing excess penetrant provided in Section 6.3 of Procedure QP-9.202 were consistent with the ASME code. Although the procedure did not specifically prohibit flushing the surface with solvent, the instructions were detailed enough to preclude flushing. During the demonstration, the NDE examiner removed excess penetrant in accordance with the procedure.

Documents Reviewed:	Procedure QP-9.202, "Liquid Penetrant Examination of ASME Welds and Components," Revision Draft

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Category:	NDE Procedures - PT **Topic:** Surface Preparation
Reference:	ASME Section V, Article 6, T-642 (b)
Requirement	Prior to each liquid penetrant examination, the surface to be examined and all adjacent areas within one inch must be dry and clean.
Finding:	This requirement was implemented. Procedure QP-9.202, Step 6.1.1 required the surface to be examined and all areas adjacent within one inch to be dry and clean prior to examination. During the demonstration, the NDE examiner prepared the surface to be examined in accordance with the procedure.
Documents Reviewed:	Procedure QP-9.202, "Liquid Penetrant Examination of ASME Welds and Components," Revision Draft

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Category:	NDE Procedures - VT **Topic:** Eye Position and Lighting
Reference:	ASME Section V, Article 9, T-952
Requirement	Visual examinations shall be conducted with the eye within 24 inches (610 mm) of the surface, at an angle not less than 30 degrees. The light intensity must be at least 100 foot-candles.
Finding:	This requirement was implemented. Procedure QP-9.201 contained instructions for eye position and lighting that were consistent with the ASME code. During the demonstration, the NDE examiner used a calibrated light meter to verify a minimum light intensity of 100 foot-candles. During the demonstration, the NDE examiner performed the visual testing with his eye within 24" (610 mm) of the surface at an angle not less than 30 degrees.
Documents Reviewed:	Procedure QP-9.201, "Visual Weld Examination of Dry Cask Assembly," Revision Draft

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Category:	NDE Procedures - VT **Topic:** Minimum Elements
Reference:	ASME Section V, Article 9, T-921.1
Requirement	Each Visual Testing (VT) procedure shall include the: (1) technique used; (2) surface conditions; (3) surface preparation and cleaning; (4) method or tool(s) required for surface preparation; (5) direct or indirect viewing method; (6) special illumination; (7) equipment to be used; (8) sequence of performing examination; (9) data to be documented; (10) report forms to be completed; (11) personnel qualifications; and (12) procedure qualification reference.
Finding:	This requirement was implemented. Procedure QP-9.201 included all of the procedure elements required by the ASME code.
Documents Reviewed:	Procedure QP-9.201, "Visual Weld Examination of Dry Cask Assembly," Revision Draft

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Category: NDE Procedures - VT **Topic:** Procedure Validation

Reference: ASME Section V, Article 9, T-941

Requirement The visual testing (VT) procedure shall contain, or reference, a report of what method was used to demonstrate that the examination procedure was adequate. In general, a fine line 1/32 inch (0.8 mm) or less in width, an artificial imperfection or a simulated condition, located on the surface or a similar surface to that to be examined, may be considered as a method for procedure demonstration. The condition or artificial imperfection should be in the least discernible location on the area surface to be examined to validate the procedure.

Finding: This requirement was not implemented. Procedure QP-9.201 did not contain, or reference, a report used to validate the procedure. During the demonstration, the NDE examiner did not use a gray (fine) line card for discerning imperfections.

Procedure DFS-0002, Steps 7.2.11 and 7.2.13 allowed use of the Automated Welding System (AWS) camera for visual inspection of tack welds. An additional procedure validation would be required for remote visual testing. This issue is being tracked as inspection finding 72-054/0601-02.

Documents Reviewed: Procedure QP-9.201, "Visual Weld Examination of Dry Cask Assembly," Revision Draft
Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft

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Category: Pre-Operational Testing **Topic:** Cask Loading

Reference: CoC #1004, Tech Spec 1.1.6.6

Requirement A dry run of the canister sealing, vacuum drying and cover gas backfilling operations shall be held.

Finding: This requirement was implemented. Canister sealing, vacuum drying and cover gas backfilling operations were demonstrated using Procedure DFS-0002, Radiological Work Permit (RWP) 06-3005, and two canister mock-ups.

The dry run began with the inner top cover in place in the canister and the Automated Welding System (AWS) installed on top of the cover. The demonstration included automated welding of the inner top cover to the canister shell and to the vent and siphon port block, bulk water removal from the canister, canister vacuum drying, canister backfilling with helium, manual welding of the vent and siphon port cover plates, automated welding of the outer top cover to the canister shell, and manual welding of the outer top cover test port.

During the demonstration, the space below the shield plug was monitored for hydrogen, non-destructive (NDE) examinations were performed on all welds, and helium leak testing was performed on the inner top cover-to-shell weld, inner top cover-to-vent and siphon port block weld, and the vent and siphon port cover plate welds.

Documents Reviewed: Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft
Radiological Work Permit (RWP) 06-3005, "Dry Cask Storage," Revision 0

Category:	Quality Assurance **Topic:** Activities Affecting Quality
Reference:	10 CFR 72.144(b)
Requirement	The licensee shall provide control over activities affecting the quality of the Systems, Structures, and Components (SSCs) covered by the Quality Assurance program to an extent commensurate with the approved design of each ISFSI, MRS, or spent fuel storage cask. The licensee shall ensure that activities affecting quality are accomplished under suitably controlled conditions, such as the use of appropriate equipment.
Finding:	This requirement was not implemented. Procedure DFS-0002 directed that all welding be performed in accordance with the Welding Procedure Specifications (WPS). However the WPS to be used for each weld was not identified. Procedure GWS-3 did not provide objective evidence that the Automated Welding System (AWS) welds were made in accordance with the WPS. The AWS welding parameters were not tracked during the welding and the software did not provide a record. The calibration requirements for the AWS were not defined. This issue is being tracked as inspection finding 72-054/0601-03.
Documents Reviewed:	Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft

Category:	Quality Assurance **Topic:** Control of Measuring and Test Equipment
Reference:	10 CFR 72.164
Requirement	The licensee shall establish measures to ensure that tools, gauges, instruments and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specific periods to maintain accuracy within necessary limits.
Finding:	This requirement was not implemented. Procedure DFS-0002, Step 7.5.18 required a post-test calibration check on the vacuum instruments to confirm that Technical Specification 1.2.2 for canister dryness was met. Procedure DFS-0002, Step 7.6.22 required a post-test calibration check on the compound pressure gauge to confirm that Technical Specification 1.2.3.a for canister cover gas pressure was met. At the time of the demonstration, TriVis had not yet developed a method for performing post testing calibration checks on these instruments. This issue is being tracked as inspection finding 72-054/0601-04.
Documents Reviewed:	Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft

Category:	Radiation Protection **Topic:** Operational Restrictions
Reference:	10 CFR 72.104(b)
Requirement	Operational restrictions shall be established to meet ALARA objectives for direct radiation levels associated with ISFSI operations.
Finding:	This requirement was implemented through the canister sealing procedure, radiological work permit and pre-job briefings. Procedure DFS-0002, Step 5.10 required personnel to observe proper radiation protection practices to maintain personnel exposure as low as reasonably achievable (ALARA), and to limit the spread of contamination.

Pre-job briefings were conducted using checklists. The industrial safety briefing included job scope and sequence, industrial safety hazards, use of personal protective equipment, roles and responsibilities, peer checking, and procedure adherence. The radiological safety briefing included area postings, radiation protection coverage, exposure control methods (time, distance and temporary shielding), expected dose rates, electronic alarming dosimeter setpoints, low dose waiting area, contamination levels and use of gloves, clothing requirements, airborne monitoring with portable air samplers and stop-work authority.

During the demonstration, radiation area postings were in place, access control was exercised, and personnel were advised of hazards. A radiation detector was installed on the Vacuum Drying System collection tank drain line to monitor for high radiation levels during canister bulk water removal.

Documents Reviewed: Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft
Radiological Work Permit (RWP) 06-3005, "Dry Cask Storage," Revision 0

Category: Welding Personnel Quals **Topic:** Welder Performance Qualification

Reference: ASME Section IX, Parts QW-301.4, 356, 452.1 & 6

Requirement The record of welder performance qualification (WPQ) tests shall include the essential variables listed in QW-350, the type of test and test results, and the ranges qualified in accordance with QW-452. The essential variables for manual GTAW welding are: (1) Backing; (2) Base metal P-number; (3) Filler metal F number; (4) Consumable inserts; (5) Filler metal form; (6) Maximum weld deposit thickness; (7) Welding positions; (8) Welding progression; (9) inert gas backing; and (10) Current type and polarity. Two side bend tests are required for groove weld test coupons 3/8 inch thick or greater. Groove weld tests qualify fillet welds.

Finding: This requirement was implemented. The qualification records for the TriVis welders were reviewed and found to be complete. The welder performance qualification (WPQ) test contained all the essential variables required by QW-356. The test consisted of joining two 6 inch diameter schedule 80 pipes with a groove weld in accordance with WPS SS-8-A-TN. The completed pipe coupon was 6 inches in length. Four 3/8 inch thick specimens were cut from the center of the test coupon for bend testing. An independent testing laboratory performed side bend testing on all four specimens and the results were satisfactory.

Documents Reviewed: Procedure WAP-2, Attachment 4, "Control of Welder and Welding Operator Qualification," Revision 1
Laboratory Testing Inc. Certified Test Reports
Welding Procedure Specification SS-8-A-TN, "GTAW/SMAW - Manual," Revision 0

Category: Welding Personnel Quals **Topic:** Welding Operator Performance Qualification

Reference: ASME Section IX; Parts QW-301.4, 361.2, 452.1, 6

Requirement The record of welding operator performance qualification (WOPQ) tests shall include the essential variables listed in QW-360, the type of test and test results, and the ranges

qualified in accordance with QW-452. The essential variables for machine welding are: (1) welding process; (2) direct or remote visual control; (3) automatic arc voltage control (GTAW); (4) automatic joint tracking; (5) position qualified; (6) consumable inserts; (7) backing; and (8) single or multiple passes per side. Two side bend tests are required for groove weld test coupons 3/8 inch thick or greater. Groove weld tests qualify fillet welds.

Finding: This requirement was implemented. The qualification records for the TriVis welding operators were reviewed and found to be complete. The welding operator performance qualification (WOPQ) test contained all the essential variables required by QW-361.2. The test consisted of a groove weld and a fillet weld, both made in accordance with WPS SS-8-M-TN. A 3/4 inch thick stainless steel plate was joined to a 1 inch thick stainless steel plate with a groove weld. The two plates were in the horizontal position with a backing bar under the joint. Once the groove weld was complete, a fillet weld was made to join the top of the 1 inch plate to the surface to the weld metal at the 3/4 inch plate level. Two 3/8 inch thick specimens and two 1 inch thick specimens were cut from the center of the test coupon for bend testing. An independent testing laboratory performed side bend testing on all four specimens and the results were satisfactory.

Documents Reviewed: Procedure WAP-2, Attachment 4, "Control of Welder and Welding Operator Qualification," Revision 1
Laboratory Testing Inc. Certified Test Reports
Welding Procedure Specification SS-8-M-TN, "GTAW - Machine - Cold Wire," Revision 0

Category: Welding Procedures **Topic:** Explosive Gas Monitoring - NUHOMS

Reference: NUHOMS FSAR #1004, Section M.3.4.1

Requirement The space between the water and shield plug is monitored for hydrogen concentration before and during welding. If the hydrogen concentration exceeds 2.4 percent, welding operations are suspended and the canister is purged with an inert gas.

Finding: This requirement was implemented. Procedure DFS-0002, Step 7.2.1 established an argon purge of the canister cavity. The argon entered the siphon port, flowed down through the siphon tube into the bottom of the canister, up through the canister into the vent port just below the shield plug, and out the vent port to an elephant trunk connected to a High Efficiency Particulate Airborne (HEPA) filter.

Procedure DFS-0002, Step 7.2.5 required sampling of the purge outlet after one bottle of argon had been purged through the canister. Additionally, Step 7.2.7 sampled the inner top cover-to-shell gap. Both of these steps ensured the hydrogen concentration below the welding area was less than 2.4 percent prior to initiating welding operations.

Procedure DFS-0002, Step 7.2.6 attached the hydrogen detector to the canister for continuous hydrogen monitoring of the weld area during welding and until the start of vacuum drying operations. If the hydrogen concentration reached 2.4 percent, Step 7.2.6 required welding operations to cease and an argon purge to be established to reduce the hydrogen concentration to below 2.4 percent.

Documents Reviewed:	Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations," Revision Draft

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Category:	Welding Procedures **Topic:** GTAW Essential Variables
Reference:	ASME Section IX, Part QW-256
Requirement	The welding procedure specification for Gas Tungsten Arc Welding (GTAW) shall describe the following essential variables: (1) Base metal thickness range; (2) Base metal P number; (3) Filler metal F number; (4) Filler metal A number; (5) Filler metal product form (flux, metal, powder); (6) Maximum weld deposit thickness; (7) Minimum preheat temperature; (8) PWHT conditions; (9) Shielding gas mixture; and (10) Trailing Shielding gas mixture and flow rate.
Finding:	This requirement was implemented. Welding Procedure Specifications SS-8-M-TN and SS-8-A-TN contained all of the essential variables required by the ASME code.
Documents Reviewed:	Welding Procedure Specification SS-8-M-TN, "GTAW - Machine - Cold Wire," Revision 0 Welding Procedure Specification SS-8-A-TN, "GTAW/SMAW - Manual," Revision 0

Category:	Welding Procedures **Topic:** GTAW Non Essential Variables (1-14)
Reference:	ASME Section IX, Part QW-256
Requirement	The welding procedure specification for Gas Tungsten Arc Welding (GTAW) must describe the following non-essential variables: (1) Joint design; (2) Backing; (3) Backing material; (4) Root spacing; (5) Retainers; (6) Filler metal size; (7) Consumable inserts; (8) Filler metal SFA specification number; (9) Filler metal AWS classification number; (10) Welding positions; (11) Welding progression; (12) Trailing Shielding gas composition and flow rate; (13) Pulsing current; (14) Current type and polarity;
Finding:	This requirement was implemented. Welding Procedure Specifications SS-8-M-TN and SS-8-A-TN contained all of the non-essential variables required by the ASME code.
Documents Reviewed:	Welding Procedure Specification SS-8-M-TN, "GTAW - Machine - Cold Wire," Revision 0 Welding Procedure Specification SS-8-A-TN, "GTAW/SMAW - Manual," Revision 0

Category:	Welding Procedures **Topic:** GTAW Non Essential Variables (15-27)
Reference:	ASME Section IX, Part QW-256
Requirement	The welding procedure specification for Gas Tungsten Arc Welding (GTAW) must also describe the following non-essential variables: (15) Amperage range; (16) Voltage range; (17) Tungsten size; (18) String or weave bead; (19) Orifice or gas cup size; (20) Method of initial and interpass cleaning; (21) Method of back gouging; (22) Oscillation width; (23) Multiple or single pass per side; (24) Multiple or single electrodes; (25) Electrode spacing; (26) Travel mode and speed; and (27) Peening.
Finding:	This requirement was implemented. Welding Procedure Specifications SS-8-M-TN and SS-8-A-TN contained all of the non-essential variables required by the ASME code.

Documents Reviewed: Welding Procedure Specification SS-8-M-TN, "GTAW - Machine - Cold Wire," Revision 0
Welding Procedure Specification SS-8-A-TN, "GTAW/SMAW - Manual," Revision 0

Category: Welding Procedures **Topic:** GTAW Supplementary Variables

Reference: ASME Section IX, Part QW-256

Requirement The welding procedure specification for Gas Tungsten Arc Welding (GTAW) must describe the following supplementary essential variables, when required: (1) Base metal group number; (2) Base metal thickness range; (3) Welding positions; (4) Maximum interpass temperature; (5) PWHT conditions; (6) Current type and polarity); (7) Multiple or single pass per side; and (8) Multiple or single electrodes.

Finding: This requirement was implemented. Welding Procedure Specifications SS-8-M-TN and SS-8-A-TN contained all of the supplementary essential variables required by the ASME code.

Documents Reviewed: Welding Procedure Specification SS-8-M-TN, "GTAW - Machine - Cold Wire," Revision 0
Welding Procedure Specification SS-8-A-TN, "GTAW/SMAW - Manual," Revision 0

Category: Welding Procedures **Topic:** Procedure Qualification Record (PQR)

Reference: ASME Section IX, Part QW-200.2

Requirement Each manufacturer or contractor shall prepare a Procedure Qualification Record (PQR) for each procedure. The completed PQR shall document all essential and, when required, all supplementary essential variables of QW-250 through QW-280 for each welding process used during the welding of the test coupon. Non essential variables may be documented at the contractor's option. The PQR shall be certified accurate by the manufacturer or contractor.

Finding: This requirement was implemented. Procedure Qualification Record No. 1 documented all of the essential and supplementary essential variables used during the welding of the test coupon. The PQR was certified by the contractor.

Documents Reviewed: Procedure Qualification Record No.1, "Welding Procedure Specification SS-8-M-TN for GTAW," Revision 0

Category: Welding Procedures **Topic:** Tack Welds

Reference: ASME Section III, Article NB-4231.1

Requirement Tack welds used to secure alignment shall either be removed completely when they have served their purpose, or their stopping and starting ends shall be properly prepared by grinding or other suitable means so that they may be satisfactorily incorporated into the final weld. When tack welds are to become part of the finished weld, they shall be visually examined and defective tack welds shall be removed.

Finding: This requirement was implemented. The instructions for tack welds provided in Step 8.5.4 of Procedure GWS-3 were consistent with the ASME code. During the demonstration, machine tack welds were completed on the inner and outer top cover

plates and manual tack welds were completed on the vent and siphon port cover plates. All tack welds were visually examined and the stopping and starting ends did not need preparation for incorporation into the final welds.

Documents Reviewed: Procedure GWS-3, "General Welding Standard," Revision 0

Category: Welding Procedures **Topic:** Weld Repairs - Base Metal Defects

Reference: ASME Section III, Article NB-4132

Requirement Weld repairs exceeding in depth the lesser of 3/8 inch (10 mm) or 10 percent of the section thickness, shall be documented on a report which shall include a chart which shows the location and size of the prepared cavity, the welding material identification, the welding procedure, the heat treatment, and the examination results of the weld repair.

Finding: This requirement was not implemented. During welding of the root pass between the inner top cover and canister shell, a start/stop condition resulted in a relevant indication. The indication was removed using a very aggressive burr grinder, which resulted in an overgrind. TriVis elected to repair the weld. Procedure GWS-3, Step 8.9.3 required weld repairs to be classified as major or minor, and major weld repairs to be documented in Attachment 9.11.

TriVis did not classify the weld repair as major and did not document the repair in Attachment 9.11 as required. TriVis performed the major weld repair using the Weld Procedure Specification (WPS) for Manual Gas Tungsten Arc Welding (GTAW) with acceptance criteria from the WPS for Machine GTAW. TriVis documented the weld repair in Attachment 9.3 and the documentation did not match either Welding Procedure Specification. The weld repair process and documentation requirements were not clearly defined. This issue is being tracked as inspection finding 72-054/0601-05.

Documents Reviewed: Procedure GWS-3, "General Welding Standard," Revision 0

Category: Welding Procedures **Topic:** Weld Repairs - Surface Defects

Reference: ASME Section III, Article NB-4452

Requirement Surface defects may be removed by grinding or machining without weldout provided the minimum section thickness is maintained, the depression is blended and liquid penetrant testing is performed to ensure the defect is removed.

Finding: This requirement was implemented. Procedure GWS-3, Step 8.9.2 provided instructions for removing surface defects that were consistent with the ASME code.

Documents Reviewed: Procedure GWS-3, "General Welding Standard," Revision 0