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

April 10, 2006

Mr. George A. Williams
Site Vice President
Grand Gulf Nuclear Station
P.O. Box 756
Port Gibson, MS 39150

SUBJECT: INSPECTION REPORT 050-00416/06-009; 072-00050/06-001

Dear Mr. Williams,

On March 21-24, 2006, the U.S. Nuclear Regulatory Commission observed pre-operational testing of dry fuel storage canister welding and weld testing at the Grand Gulf station. The inspection included direct observation of the welding and weld testing operations, review of selected records and procedures, and interviews with personnel. The enclosed inspection report documents the results of the inspection which were discussed with you and members of your staff on March 24, 2006. The inspection determined that your personnel, processes and equipment were adequate to perform the spent fuel canister closure welds required by the Holtec Certificate of Compliance and Final Safety Analysis Report. The welding and weld testing personnel were qualified, the work plans and procedures were comprehensive and functional, and the equipment was reliable. No violations were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure(s), and your response 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,

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

Docket Nos.: 50-416 / 72-050
License No.: NPF-29

Enclosure: NRC Inspection Report
050-00416/06-009; 072-00050/06-001

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**ENCLOSURE**

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

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|---|---|
| Docket Nos.: | 050-00416; 072-00050 |
| License No.: | NPF-29 |
| Report No: | 050-00416/06-009; 072-00050/06-001 |
| Licensee: | Entergy Operations, Inc. |
| Facility: | Independent Spent Fuel Storage Installation<br>Grand Gulf Nuclear Station<br>Entergy Operations, Inc.<br>P.O. Box 756<br>Port Gibson, MS 39150 |
| Dates: | March 21-24, 2006 |
| Inspector: | S.P. Atwater, Health Physicist |
| Accompanied By: | W. E. Bezanson, ATL (Contractor) |
| Approved By: | D.B. Spitzberg, Ph.D., Chief<br>Fuel Cycle and Decommissioning Branch |
| Attachments: | 1. Supplemental Information<br>2. Inspector Notes |

## EXECUTIVE SUMMARY

Grand Gulf Nuclear Station
NRC Inspection Report 050-00416/06-009; 072-00050/06-001

Grand Gulf commenced their Independent Spent Fuel Storage Installation (ISFSI) pre-operational testing program on March 21, 2006 with a dry run exercise of spent fuel canister closure welding, weld testing, and canister lid weld removal.

Condition 10.f of Certificate of Compliance (CoC) 72-1014 required the licensee to perform a dry run exercise of canister welding and weld testing of the dry fuel canister closure welds. The Nuclear Regulatory Commission (NRC) observed this segment of the dry run exercise and determined that the canister welding and weld testing requirements of Condition 10.f had been met. Condition 10.k of CoC 72-1014 required the licensee to demonstrate removing canister lid welds. The weld cutting operation was performed on March 27-28, 2006 and was not observed by the NRC. Subsequent to the inspection, the inspectors reviewed the videotape and lid cutting documentation and determined that the lid weld removal requirement of Condition 10.k had been met.

The following is a summary of the observations made during this inspection. Details related to the activities observed are provided in Attachment 2 to this report.

- The As Low As Reasonably Achievable (ALARA) practices simulated during this demonstration were adequate for cask welding and cutting operations. Pre-Job briefings, area postings, exposure limits, expected dose rates, alarming dosimeter setpoints, low dose rate areas, and adherence to the Radiation Work Permit were demonstrated to the maximum extent practical. A Foreign Materials Exclusion (FME) zone was established around the canister and an FME monitor was posted at the entrance to the cask area. A tool and material control log was used and the mock-up area was maintained clean during the demonstration (Attachment 2, ALARA).

- The Grand Gulf dry run exercise conducted from March 21-28, 2006 satisfied the Certificate of Compliance requirements for canister welding, weld testing and lid weld removal (Attachment 2, Dry Run Exercise).

- Welding Services, Inc. (WSI) provided the Non-Destructive Examination (NDE) inspector for the demonstration. The inspector's certification records were complete and documented that he had met the experience, training and visual acuity requirements for performing non destructive testing on the spent fuel canister closure welds. (Attachment 2, NDE Personnel Quals).

- The liquid penetrant and visual testing procedures were validated and qualified and contained the acceptance criteria and minimum procedure elements required by the American Society of Mechanical Engineers (ASME) code (Attachment 2, NDE Procedures - PT and VT).

- Helium leak testing was performed on the canister vent and drain port cover plate welds in accordance with the American National Standards Institute (ANSI) standard N14.5. The helium leak testing equipment met the minimum requirement for sensitivity and was calibrated to a traceable standard (Attachment 2, NDE Testing - MSLT).

- Liquid penetrant examinations were performed on all closure welds. The surfaces to be examined were cleaned thoroughly and all chemicals were free of contaminants. Excess penetrant was removed properly and final interpretation was made within the required time frames. The associated visual testing was performed using the correct eye position. Lighting intensity for both liquid penetrant and visual testing exceeded the minimum requirements (Attachment 2, NDE Testing - PT).

- The chemical composition of the weld wire spool and cut lengths used during the demonstration was consistent with the requirements of the ASME code (Attachment 2, Welding Materials).

- Welding Services, Inc. (WSI) provided the welders and welding operators for the demonstration. The WSI welding personnel were qualified in both manual and machine Gas Tungsten Arc Welding (GTAW) in accordance with the ASME code. The licensee had reviewed the welding personnel qualification records supplied by WSI and had approved them (Attachment 2, Welding Personnel Quals).

- The welding procedures for manual and machine GTAW contained the essential, non-essential and supplementary essential variables required by ASME Code Section IX, and had been properly qualified for use. The space under the lid was sampled for combustibles gases during all welding and grinding operations, up to completion of the lid to shell weld root pass and successful liquid penetrant examination. Tack welds were prepared as needed for incorporation into the final weld. Weld repairs were made in accordance with the ASME code and all welds types were consistent with the Holtec drawings (Attachment 2, Welding Procedures).

- Inspection Follow-Up Item 72-050/0501 was opened in Inspection Report 72-050/05-01 dated August 16, 2005 and was closed during this inspection. The 28 day compressive strength testing was completed on August 19, 2005 and the results were satisfactory (Attachment 2, Wrap-Up/Close-Out).

**ATTACHMENT 1**

**Supplemental Information**

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

R. Benson - Radiation Protection Supervisor
M. Bonds - Quality Assurance
R. Clemens - Radiation Protection Supervisor
M. Cross - EP&C Supervisor
D. Hall - Radiation Protection Supervisor
M. Langston - Quality Control
D. Ellis - Senior Project Manager
B. Lee - EP&C Supervisor
M. Locke - Engineering Projects
D. Magee - Dry Fuel Services Supervisor
S. Martin - Engineering Projects Manager
M. Meister - Quality Control
J. Owens - NSA Licensing
J. Snyder - Quality Control
B. Warren - Senior Staff Engineering
D. Watt - Site Welding Superintendent
D. Wiles - Engineering Director
G. Williams - Vice President Operations
R. Wilson - Radiation Protection Manager

Vendor Personnel

C. Deady - WSI Welding Supervisor
B. Chapman - Welder and Welding Operator
D. Hawkins - Welder and Welding Operator
R. Leimenstoll - NDE level III
W. South - Welder and Welding Operator

INSPECTION PROCEDURES USED

| | |
|---|---|
| 60854.1 | Pre-Operational Testing of ISFSIs at Operating Plants |
| 92701 | Follow-Up |

## LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

None

Closed

| | | |
|---|---|---|
| 72-050/05-01 | IFI | Completion of ISFSI pad 28-day strength testing |

Discussed

None

## LIST OF ACRONYMS USED

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|---|---|
| ALARA | As Low As Reasonably Achievable |
| ANSI | American National Standards Institute |
| ASME | American Society of Mechanical Engineers |
| CoC | Certificate of Compliance |
| FME | Foreign Materials Exclusion |
| FSAR | Final Safety Analysis Report |
| GTAW | Gas Tungsten Arc Welding |
| HMSLD | Helium Mass Spectrometer Leak Detector |
| ISFSI | Independent Spent Fuel Storage Facility |
| MSLT | Mass Spectrometer Leak Testing |
| NDE | Non-Destructive Examination |
| NRC | U.S. Nuclear Regulatory Commission |
| PQR | Procedure Qualification Record |
| PT | Liquid Penetrant Testing |
| RWP | Radiation Work Permit |
| SNT-TC-1A | American Society for Non-Destructive Testing - Technical Council - 1A |
| VT | Visual Testing |
| WOPQ | Welding Operator Performance Qualification |
| WPQ | Welder Performance Qualification |
| WPS | Welding Procedure Specification |
| WSI | Welding Services Inc. |

# Attachment 2
# GRAND GULF WELDING DEMONSTRATION
# Inspector Notes

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**Category:** ALARA **Topic:** Pre-Job Briefings

**Reference:** FSAR 1014, Sect 10.1.1

**Requirement** Pre-job ALARA briefings should be held with workers and radiological protection personnel prior to work on or around the system.

**Finding:** This requirement was implemented. Pre-job briefings, area postings, exposure limits, expected dose rates, alarming dosimeter setpoints, low dose waiting areas, and adherence to the Radiation Work Permit were demonstrated to the maximum extent practical. The concept of ALARA was emphasized throughout the demonstration.

An FME zone was established around the canister until it was sealed. FME boundary signs were posted on the outside surface of the transfer cask. An FME monitor was posted at the entrance to the cask area and a Tool and Material Control Log was maintained. Cleanliness and good housekeeping practices were maintained during the demonstration.

**Documents Reviewed:** Radiation Work Permit (RWP) 2006-2001, "MPC Lid Installation and Removal", Revision 0
Procedure 01-S-07-44, Revision 7, Attachment III, "Tools and Material Control Log"

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**Category:** Dry Run Exercise **Topic:** Canister Loading

**Reference:** CoC 1014, Condition 10.f

**Requirement** A dry run exercise of canister closure shall be conducted by the licensee prior to the first use of the system to load spent fuel assemblies.

**Finding:** This requirement was implemented. The dry run exercise of canister closure was conducted on March 22-24, 2006 in the Rotor Storage Building at the Grand Gulf Station. The dry run exercise used a canister and transfer cask mockup and was controlled under Work Order 74512, Procedure 20-S-01-135, Weld Traveler 102450-002 and RWP 2006-2001.

Canister closure consisted of welding the canister lid to the shell, welding the vent and drain port cover plates to the canister lid, and welding the closure rings to the canister lid over the vent and drain port covers. All welds, including tack welds, were inspected using the visual testing (VT) and liquid penetrant (PT) testing methods. In addition, the vent and drain port cover plate welds were leak tested using the mass spectometer (MSLT) method. All welding and weld testing was performed in accordance with the ASME Boiler and Pressure Vessel Code as required by the Holtec Certificate of Compliance (CoC). The canister welding and weld testing segments of CoC Condition 10.f were completed during this demonstration.

**Documents Reviewed:** Work Order 74512, "DFS - Testing", dated March 16, 2006
Procedure 20-S-01-135, "Dry Fuel Cask Lid Mockup Welding, Helium leak Testing and Lid Removal", Revision Final

Weld Traveler No. 102450-002, "Work Traveler for Installation of MPC Lid to MPC Shell, Drain /Vent Cover to MPC Lid, Set Screws to Drain/Vent Port Covers and Closure Rings", Revision 0
Radiation Work Permit (RWP) 2006-2001, "MPC Lid Installation and Removal", Revision 0

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**Category:** Dry Run Exercise **Topic:** Canister Unloading

**Reference:** CoC 1014 Condition 10.k

**Requirement** A dry run exercise of removing canister closure welds shall be conducted by the licensee prior to the first use of the system to load spent fuel assemblies.

**Finding:** This requirement was implemented. The dry run exercise to remove the canister lid welds was conducted on March 27-28, 2006 in the Rotor Storage Building at the Grand Gulf Station. The dry run exercise used a canister and transfer cask mockup and was controlled under Work Order 74512, Procedure 20-S-01-135, and RWP 2006-2001.

The canister lid welds would be removed during an unloading sequence to return the spent fuel assemblies to the spent fuel pool. The dry run exercise consisted of boring through the closure rings and vent and drain port cover plates to expose the vent and drain ports. The closure ring welds and canister shell were then machined down to below the canister lid to shell weld to free the lid. The canister lid weld removal segment of the Holtec Certificate of Compliance (CoC) Condition 10.k was completed during this demonstration.

**Documents Reviewed:**
Work Order 74512, "DFS - Testing", dated March 16, 2006
Welding Services Inc (WSI) Procedure 102450, "Machining Traveler"
Procedure 20-S-01-135, "Dry Fuel Cask Lid Mockup Welding, Helium leak Testing and Lid Removal", Revision Final
Radiation Work Permit (RWP) 2006-2001, "MPC Lid Installation and Removal", Revision 0

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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 assigned to the demonstration was certified to Level III in VT, PT, and MSLT. His WSI Certificate of Qualification contained all the information required by SNT-TC-1A.

**Documents Reviewed:**
Procedure QAP 2.7, Revision 11, Attachments 12.5 and 12.6 "WSI Certificate of Qualification"
Procedure QAP 2.7b, Revision 1, Attachments 10.4 and 10.5, "WSI Certificate of Qualification"

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**Category:** NDE Personnel Quals **Topic:** Experience and Training - PT Level I & II

**Reference:** SNT-TC-1A, Section 6, Table 6.3.1

**Requirement** A PT Level I candidate who is a high school graduate or equivalent, or who is has completed 2 years of engineering or science study, must have 4 hours of training and 1 month of work time experience.
A PT Level II candidate who is a high school graduate or equivalent, must have 8 hours of training and 2 months of work time experience.
A PT Level II candidate who has completed 2 years of engineering or science study must have 4 hours of training and 2 months of work time experience.

**Finding:** This requirement was implemented. Procedure QAP 2.7 was the Welding Services Inc. (WSI) written practice for NDE examiners performing the Liquid Penetrant (PT) testing method. Section 6 and Attachment 12.1 of the written practice specified the minimum education, training and experience requirements for each level of certification. The requirements for PT Level I and II certification were consistent with SNT-TC-1A.

The NDE examiner assigned to the demonstration was certified to Level III in Liquid Penetrant (PT) Testing. His WSI Certificate of Qualification documented that he had met all of the experience requirements for Levels I, II and III certification.

**Documents Reviewed:** Procedure QAP 2.7, "Selection, Training, Qualification and Certification of Non-Destructive Testing Personnel", Revision 11
Welding Services Inc. (WSI) Certificate of Qualification

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**Category:** NDE Personnel Quals **Topic:** Experience and Training - Level III

**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. Procedure QAP 2.7 was the Welding Services Inc. (WSI) written practice for NDE examiners performing the liquid penetrant testing method. Procedure QAP 2.7a was the written practice for NDE examiners performing helium leak testing using the mass spectrometer. Procedure QAP 2.7b was the written practice for NDE examiners performing the visual testing method.

The written practices for liquid penetrant testing and visual testing contained the experience requirements for Level III certification, consistent with SNT-TC-1A. However, the written practice for helium leak testing did not specify Level III experience requirements.

The NDE examiner assigned to the demonstration was certified to Level III in all NDE methods used. His WSI Certificate of Qualification documented that he had met all of the experience requirements for Level III certification in the liquid penetrant, visual testing and helium leak testing methods.

**Documents Reviewed:** Procedure QAP 2.7, "Selection, Training, Qualification and Certification of Non-Destructive Testing Personnel", Revision 11
Procedure QAP 2.7a, "Selection, Training, Qualification and Certification of Helium Mass Spectrometer Leak Detection Non-Destructive Inspection (NDT) Personnel", Revision 1
Procedure QAP 2.7b, "Selection, Training, Qualification and Certification of Visual Inspection Personnel", Revision 1
Welding Services Inc. (WSI) Certificate of Qualification

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**Category:** NDE Personnel Quals **Topic:** Experience and Training - MSLT Level I & II

**Reference:** SNT-TC-1A, Section 6, Table 6.3.1

**Requirement** An MSLT Level I candidate who is a high school graduate or equivalent must have 40 hours of training and 4 months of work time experience.
An MSLT Level I candidate who has completed 2 years of engineering or science study must have 28 hours of training and 4 months of work time experience.
An MSLT Level II candidate who is a high school graduate or equivalent, must have 24 hours of training and 6 months of work time experience.
An MSLT Level II candidate who has completed 2 years of engineering or science study must have 16 hours of training and 6 months of work time experience.

**Finding:** This requirement was implemented. Procedure QAP 2.7a was the Welding Services Inc. (WSI) written practice for NDE examiners performing leak testing using the helium mass spectrometer (MSLT). Section 5 of the written practice specified the minimum education, training and experience requirements for each level of certification. The requirements for MSLT Level I and II certification were consistent with SNT-TC-1A.

The NDE examiner assigned to the demonstration was certified to Level III in helium mass spectrometer leak testing (MSLT). His WSI Certificate of Qualification documented that he had met all of the experience requirements for Levels I, II and III certification.

**Documents Reviewed:** Procedure QAP 2.7a, "Selection, Training, Qualification and Certification of Helium Mass Spectrometer Leak Detection Non-Destructive Inspection (NDT) Personnel", Revision 1
Welding Services Inc. (WSI) Certificate of Qualification

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**Category:** NDE Personnel Quals **Topic:** Experience and Training - VT Level I & II

**Reference:** SNT-TC-1A, Section 6, Table 6.3.1

**Requirement** Level I: A VT candidate who is a high school graduate or equivalent, must have 8 hours of training and 1 month of work time experience. A VT candidate who has completed 2 years of engineering or science study, must have 4 hours of training and 1 month of work time experience.
Level II: A VT candidate who is a high school graduate or equivalent, must have 16 hours of training and 2 months of work time experience. A VT candidate who has completed 2 years of engineering or science study, must have 8 hours of training and 2 months of work time experience.

**Finding:** This requirement was implemented. Procedure QAP 2.7b was the Welding Services Inc. (WSI) written practice for NDE examiners performing the visual testing (VT) method. Section 5 of the written practice specified the minimum education, training and experience requirements for each level of certification. The requirements for VT Level I and II certification were consistent with SNT-TC-1A.

The NDE examiner assigned to the demonstration was certified to Level III in Visual Testing (VT). His WSI Certificate of Qualification documented that he had met all of the experience requirements for Levels I, II and III certification.

**Documents Reviewed:** Procedure QAP 2.7b, "Selection, Training, Qualification and Certification of Visual Inspection Personnel", Revision 1
Welding Services Inc. (WSI) Certificate of Qualification

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**Category:** NDE Personnel Quals **Topic:** Eye Examination

**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. Procedure QAP 2.7b required all levels of VT certification to undergo annual vision testing for near distance acuity and color differentiation. Procedure QAP 2.7 required all levels of PT certification to undergo annual vision testing for near distance acuity and color differentiation. Procedure QAP 2.7a required all levels of MSLT certification to undergo annual vision testing for near distance acuity. All vision testing requirements were consistent with SNT-TC-1A.

The NDE examiner assigned to the demonstration was certified to Level III in VT, PT, and MSLT. His WSI Vision Examination Record documented that he had successfully completed vision testing for near distance acuity and color differentiation on January 6, 2006.

**Documents Reviewed:** Procedure QAP 2.7, "Selection, Training, Qualification and Certification of Non-Destructive Testing Personnel", Revision 11
Procedure QAP 2.7a, "Selection, Training, Qualification and Certification of Helium Mass Spectrometer Leak Detection Non-Destructive Inspection (NDT) Personnel", Revision 1
Procedure QAP 2.7b, "Selection, Training, Qualification and Certification of Visual Inspection Personnel", Revision 1
WSI Vision Examination Record

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**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. Procedure QAP 2.7b required VT Level I and II examiners to re-certify every 3 years, and VT Level III examiners to re-certify every 5 years, both by examination. Procedure QAP 2.7 required PT Level I and II examiners to re-certify every 3 years and Level III PT examiners to re-certify every 5 years, both by examination. Procedure QAP 2.7a required MSLT Level I and II examiners to re-certify every 3 years and Level III MSLT examiners to re-certify every 5 years, both by examination.

All levels of NDE certification were required to re-certify by examination if interrupted service exceeded 6 months for VT or 12 months for PT and MSLT. The NDE examiner assigned to the demonstration was certified to Level III in VT, PT, and MSLT. His WSI Certificate of Qualification documented that he was current in all certifications.

**Documents Reviewed:** Procedure QAP 2.7, "Selection, Training, Qualification and Certification of Non-Destructive Testing Personnel", Revision 11
Procedure QAP 2.7a, "Selection, Training, Qualification and Certification of Helium Mass Spectrometer Leak Detection Non-Destructive Inspection (NDT) Personnel", Revision 1
Procedure QAP 2.7b, "Selection, Training, Qualification and Certification of Visual Inspection Personnel", Revision 1
Welding Services Inc. (WSI) Certificate of Qualification

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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 NDE 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. Procedure QAP 2.7 was the Welding Services Inc. (WSI) written practice for NDE examiners performing the liquid penetrant, magnetic particle and ultrasonic testing methods. Procedure QAP 2.7a was the WSI written practice for NDE examiners performing helium leak testing using the mass spectrometer. Procedure QAP 2.7b was the WSI written practice for NDE examiners performing the visual testing method.

All three of the written practices: a) defined the capabilities of each level of certification for determining the acceptability of material or components; b) specified the minimum education, training and experience requirements for each level of certification; and c)

contained the minimum examination requirements for each level of certification.

**Documents Reviewed:** Procedure QAP 2.7, "Selection, Training, Qualification and Certification of Non-Destructive Testing Personnel", Revision 11
Procedure QAP 2.7a, "Selection, Training, Qualification and Certification of Helium Mass Spectrometer Leak Detection Non-Destructive Inspection (NDT) Personnel", Revision 1
Procedure QAP 2.7b, "Selection, Training, Qualification and Certification of Visual Inspection Personnel", Revision 1

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**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; and (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 QAP 9.6, Section 7.0 and Attachment 11.2 contained the acceptance criteria specified by ASME Section III, Article NB-5352. During the demonstration no unacceptable indications were identified.

**Documents Reviewed:** Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10

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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 QAP 9.6, Section 6.0 contained all of the elements required by ASME Section V, Article 6, T-621.

**Documents Reviewed:** Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10

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

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

**Requirement** When performing liquid penetrant examinations outside the range of 50 to 125 degrees F, the examiner may use a standard temperature procedure or a non-standard temperature procedure. In either case, the examination procedure requires qualification at the

proposed higher or lower temperature. This shall require the use of a quench cracked aluminum block, also designated as a liquid penetrant comparator block.

**Finding:** This requirement was implemented. Procedure QAP-9.16 was developed for use on metals between 100 and 300 degrees F. Step 2.3 of the procedure stated that the procedure had been qualified in accordance with ASME Code, Section V, Article 6. The qualification record was located in the Welding Services Inc (WSI) corporate office.

**Documents Reviewed:** Procedure QAP-9.16, "High Temperature Liquid Penetrant Inspection Procedure, Using Color Visible/Solvent Removal Penetrant Technique", Revision 2

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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 implemented. Procedure QAP 9.6, Section 8.0 and Attachment 11.1 documented the record of weld integrity. The canister mockup shell base metal repair performed under condition report CR-GGN-2006-01157 was documented in a weld map and subsequent liquid penetrant testing found no indications.

**Documents Reviewed:** Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10
Condition Report CR-GGN-2006-01157

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

**Reference:** Holtec FSAR 1014, Section 9.1.1.4

**Requirement** Confinement boundary welds shall be visually examined in accordance with ASME Code Section V, Article 9 with acceptance criteria per ASME Code Section III, Subsection NF, Article NF-5360. Article NF-5360 includes arc strikes and blemishes, cracks, craters, fusion, overlap, porosity, weld lengths, weld thickness, slag, and undercut.

**Finding:** This requirement was implemented. During the demonstration, visual testing (VT) was performed on the lid to shell welds, vent and drain port cover plate welds and closure ring welds. The visual testing included all tack welds, intermediate passes and final passes. Undercut was identified in three areas on the canister mockup shell following the lid to shell root pass. The licensee generated condition report CR-GGN-2006-01157 to repair the base metal. The undercut in the shell metal was built out using the manual GTAW process. Once the metal thickness was restored, the lid to shell welding continued with the machine GTAW process. All other visual testing results were within the acceptance criteria established in Article NF-5360.

At the time of the demonstration, Procedure QAP 9.3 did not reference ASME Code Section III, Article NF-5360, and it did not contain the acceptance criteria for craters, porosity or weld lengths. A procedure revision was generated to correct this condition.

**Documents Reviewed:** Procedure QAP 9.3, "Workmanship and Visual Inspection Criteria for ASME Welding", Revision 17
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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 QAP 9.3, contained all of the visual testing procedure elements required by the ASME code.

**Documents Reviewed:** Procedure QAP 9.3, "Workmanship and Visual Inspection Criteria for ASME Welding", Revision 17

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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 fully implemented at the time of the demonstration. Procedure QAP 9.3 had been validated and the validation record was located at the Welding Services Inc. corporate office. However the record was not contained in or referenced by the procedure. A procedure revision was generated to correct this condition.

**Documents Reviewed:** Procedure QAP 9.3, "Workmanship and Visual Inspection Criteria for ASME Welding", Revision 17

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**Category:** NDE Testing - MSLT **Topic:** Canister Vent and Drain Port Cover Plate Welds

**Reference:** FSAR 1014, Section 9.1.3

**Requirement** Perform a helium leakage rate test of vent and drain port cover plate welds in accordance with the Mass Spectrometer Leak Detector (MSLD) manufacturer's instructions and ANSI N14.5 (1997). The ANSI N14.5 definition of leak tight is 1.0 X 10(-7) ref-cc/sec (air) or 2.0 X 10(-7) ref-cc/sec (helium).

**Finding:** This requirement was implemented. During the demonstration, the Helium Mass Spectrometer Leak Detection (HMSLD) system minimum system sensitivity was verified to be 1.0 X 10(-9) ref-cc/sec in the hood mode. The actual leak rate measured

on the vent and drain port cover plate welds was less than minimum sensitivity.

**Documents Reviewed:** Procedure QAP 9.14F, "Procedure For Leak Testing of Holtec Multi-Purpose Canister (MPC) Vent and Drain Port Cover Welds", Revision 3

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**Category:** NDE Testing - MSLT **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. Procedure QAP 9.14F, Section 4.0 required helium leak testing to be performed using a mass spectrometer with a minimum instrument sensitivity of 1.0 X 10(-9) ref-cc/sec. The Helium Mass Spectrometer Leak Detection (HMSLD) system used during the demonstration was a Varian 956. The calibration standard was provided by Vacuum Technologies Inc. The calibration standard had a leak rate of 2.9 X 10(-7) ref-cc/sec and was next due for calibration on March 10, 2007. During the demonstration, the HMSLD minimum system sensitivity was verified to be 1.0 X 10(-9) ref-cc/sec in the hood mode.

**Documents Reviewed:** Procedure QAP 9.14F, "Procedure For Leak Testing of Holtec Multi-Purpose Canister (MPC) Vent and Drain Port Cover Welds", Revision 3

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**Category:** NDE Testing - PT **Topic:** Canister Lid To Shell Weld

**Reference:** CoC 1014, App B, Table 3-1

**Requirement** The results of liquid penetrant testing (PT) on the canister lid to shell welds meet the acceptance criteria of ASME Section III, Article NB-5350. This includes the root pass, each 3/8" intermediate pass, final pass, and the post hydrostatic test.

**Finding:** This requirement was implemented. Liquid penetrant testing was performed on the canister lid to shell root pass, 3/8" intermediate passes, and final pass in accordance with Procedure QAP 9.6. The testing results were within the acceptance criteria of ASME Section III, Article NB-5350. Hydrostatic testing was outside the scope of this demonstration and was not performed. The post hydrostatic liquid penetrant testing is redundant and will not be demonstrated.

**Documents Reviewed:** Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10

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**Category:** NDE Testing - PT **Topic:** Canister Vent and Drain Port Cover Plate Welds

**Reference:** CoC 1014, App B, Table 3-1

**Requirement** Verify the results of liquid penetrant testing on the vent and drain port cover plate welds meet the acceptance criteria of ASME Section III, Article NB-5350. This includes the root and final pass.

**Finding:** This requirement was implemented. Liquid penetrant testing was performed on the vent and drain port cover plate root pass and final pass in accordance with Procedure QAP

9.6. The testing results were within the acceptance criteria of ASME Section III, Article NB-5350.

**Documents Reviewed:** Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10

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**Category:** NDE Testing - PT **Topic:** Cleaning

**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 QAP 9.6, Step 5.10 contained the instructions for surface cleaning and drying. The instructions were consistent with ASME Section V, Article 6, T-642 (b) and were followed during the demonstration.

**Documents Reviewed:** Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10

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**Category:** NDE Testing - PT **Topic:** Contaminants

**Reference:** ASME Section V, Article 6, T-641

**Requirement** The user shall obtain certification of contaminant content for all liquid penetrant agents used on austenitic stainless steels. The certifications shall include the manufacturers batch number and sample results. Sub-article T-641(b) limits the total halogen (chlorine plus fluorine) content of each agent (penetrant, cleaner and developer) to 1.0 weight percent (wt.%) when used on austenitic stainless steels.

**Finding:** This requirement was implemented. During the demonstration, Welding Services Inc. was using Sherwin DR-60 cleaner/remover (batch # 926-J4), DP-40 penetrant (batch # 01-J1) and D-100 developer (batch # 01-H6). The certification documentation for each of the liquid penetrant products being used indicated the total halogen (chlorine plus fluorine) content was less than 1.0 weight percent.

**Documents Reviewed:** Sherwin Dubl-Chek certification records

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**Category:** NDE Testing - PT **Topic:** Excess Penetrant Removal

**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.

**Finding:** This requirement was implemented. The instructions for removing excess penetrant were contained in Step 6.5.4 of Procedure QAP 9.6. The instructions were consistent with the ASME Section V, Article 6, T-673.3 requirements and were followed during the demonstration.

**Documents Reviewed:** Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10

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| **Category:** | NDE Testing - PT **Topic:** Final Interpretation |
| **Reference:** | ASME Section V, Article 6, T-676.1 |
| **Requirement** | Final interpretation shall be made after allowing the penetrant to bleed-out for 7-60 minutes under standard temperatures (50 and 125 degrees F). The 7-60 minute clock starts immediately after application of a dry developer. For wet developer, the clock starts when the coating is dry. |
| **Finding:** | This requirement was implemented. Procedure QAP 9.6, Step 6.8.1 specified a 10-60 minute bleed-out time. During the demonstration, the final interpretations were made within the allowable time limits. |
| **Documents Reviewed:** | Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10 |

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| **Category:** | NDE Testing - PT **Topic:** Lighting |
| **Reference:** | ASME Section V, Article 6, T-676.3 |
| **Requirement** | For color contrast penetrants, a minimum light intensity of 50 foot-candles is required to ensure adequate sensitivity during examination and evaluation of indications. |
| **Finding:** | This requirement was implemented. Procedure QAP 9.6, Step 6.8 required a minimum light intensity of 100 footcandles for liquid penetrant examinations. During the demonstration, the light intensity was approximately 300 footcandles, as measured with a digital Greenlee light meter with a calibration due date of February 6, 2007. |
| **Documents Reviewed:** | Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10 |

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| **Category:** | NDE Testing - VT **Topic:** Eye Position and Lighting |
| **Reference:** | ASME Section V, Article 9, T-952 |
| **Requirement** | Direct visual examinations shall be conducted with the eye within 24" (610 mm) of the surface, at an angle not less than 30 degrees. The light intensity must be at least 100 footcandles. |
| **Finding:** | This requirement was implemented. Procedure QAP 9.3, Section 6.1 contained the ASME code requirements for eye position and lighting. During the demonstration, visual testing was performed using the correct eye position. The light intensity was approximately 300 footcandles, as measured with a digital Greenlee light meter with a calibration due date of February 6, 2007. |
| **Documents Reviewed:** | Procedure QAP 9.3, "Workmanship and Visual Inspection Criteria for ASME Welding", Revision 17 |

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| **Category:** | Welding Materials **Topic:** Applicable Code |
| **Reference:** | Holtec FSAR #1014, Section 7.1.1 |
| **Requirement** | The HI-STORM 100 canister is designed, fabricated and tested in accordance with ASME Code Section III, Division 1, Subsection NB, 1995 edition with addenda through 1997, to the maximum extent practicable. |
| **Finding:** | This requirement was implemented. The Weldstar Certificate of Compliance stated that the welding spool wire and cut lengths met the requirements of ASME code edition 1989 |

with no addenda through and including edition 1995 with addenda through 1997.

**Documents Reviewed:** Grand Gulf Purchase Order No. 10118782
Weldstar Certificate of Compliance dated March 2, 2006.

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**Category:** Welding Materials **Topic:** Minimum Delta Ferrite Content

**Reference:** ASME Section III, Article NB-2433; Reg Guide 1.31

**Requirement** A delta ferrite determination must be made for A-No.8 consumable inserts, bare electrode, rod, or wire filler metal. Exceptions: 1) A-No.8 metal used for weld metal cladding; 2) SFA-5.4 and SFA-5.9 metal; 3) Type 16-8-2 metal. The minimum acceptable delta ferrite content is 5 FN and it must be stated in the certification records.

**Finding:** This requirement was implemented. The ARCOS Certificate of Compliance certified that the delta ferrite content of the weld wire spool was 10FN and the delta ferrite content of the cut lengths was 8FN.

**Documents Reviewed:** Grand Gulf Purchase Order No. 10118782
ARCOS Industries Certificate of Compliance dated February 28, 2006.

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**Category:** Welding Materials **Topic:** Spool Wire Splicing

**Reference:** ASME, Section III, Articles NB-2420; NC-2420

**Requirement** A maximum of one splice per spool is allowed. When the producing mill allows splicing, a chemical analysis shall be performed on each end of the spool. If the producing mill prohibits splicing, the chemical analysis is only required on one end of the spool.

**Finding:** This requirement was implemented. The weld wire spool supplied by ARCOS had not been spiced. The ARCOS Certificate of Compliance contained the chemistry analysis for one end of the spool and there was only one lot number.

**Documents Reviewed:** Grand Gulf Purchase Order 10118782
ARCOS Industries Certificate of Compliance dated February 28, 2006.

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**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 Welder Performance Qualification (WPQ) for each welder contained all of the elements required for manual GTAW. The coupons were tested under transverse side bending in accordance with QW-161.1 and QW-462.2. The results of all tests were acceptable.

**Documents Reviewed:** Welding Services Inc. (WSI) ASME Section IX Welder Performance Qualification records

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**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 Welder Performance Qualification (WPQ) for each welder contained all of the elements required for machine GTAW. The coupons were tested under either transverse side bending in accordance with QW-161.1 and QW-462.2 or radiographic examination in accordance with QW-191 and QW-302.2. The results of all tests were acceptable.

**Documents Reviewed:** Welding Services Inc. (WSI) ASME Section IX Welder Performance Qualification records

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

**Reference:** ASME Section IX, Part QW-322.1

**Requirement** The performance qualification of a welder or welding operator, for any process, shall expire when he has not welded with that process for six months or more.

**Finding:** This requirement was implemented. At the time of the inspection, all welders and welding operators were current in both manual GTAW and machine GTAW. The Welder Maintenance Logs documented the welding histories of all welders and welding operators and established expiration dates 6 months from the last performance of each welding process.

**Documents Reviewed:** Welding Services Inc. ASME IX Process Expiration Reports dated February 16, 2006 and March 08, 2006
Welding Services Inc. Welder Maintenance Logs

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**Category:** Welding Procedures **Topic:** Applicable Code

**Reference:** Holtec FSAR 1014, Section 9.1.1.3

**Requirement** All ASME code welding shall be performed using welding procedures that have been qualified in accordance with ASME Code Section IX and the applicable subsection (e.g., NB, NG, or NF).

**Finding:** This requirement was implemented. Step 2.4 of the Weld Traveler required all welding to be performed using welding procedures WPS-08–08-T-901 and WPS-08–08-TS-001. Both welding procedures had been qualified in accordance with ASME Code Section IX.

**Documents Reviewed:** Weld Traveler No. 102450-002, "Work Traveler for Installation of MPC Lid to MPC Shell, Drain /Vent Cover to MPC Lid, Set Screws to Drain/Vent Port Covers and Closure Rings", Revision 0
Weld Procedure Specification WPS-08-08-TS-001, Revision 2
Weld Procedure Specification WPS-08-08-T-901, Revision 0

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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. The Welding Procedure Specifications (WPS) governed both manual and machine Gas Tungsten Arc Welding (GTAW). The WPSs contained the essential variables required by ASME Section IX, Part QW-256.

**Documents Reviewed:** Weld Procedure Specification WPS-08-08-TS-001, Revision 2
Weld Procedure Specification WPS-08-08-T-901, Revision 0

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**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. The Welding Procedure Specifications (WPS) governed both manual and machine Gas Tungsten Arc Welding (GTAW). The WPSs contained the non-essential variables required by ASME Section IX, Part QW-256.

**Documents Reviewed:** Weld Procedure Specification WPS-08-08-TS-001, Revision 2
Weld Procedure Specification WPS-08-08-T-901, Revision 0

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**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. Both Weld Procedure Specifications described the non-essential variables listed in ASME Section IX, Part QW-256. During tack welding of the lid to the shell, the welding operator exceeded the amperage range specified in WPS-08-08-TS-001. A stand down was immediately initiated by Welding Services Inc. (WSI) and the licensee to review the condition. The licensee generated condition report CR-GGN-2006-01154 to document the occurrence and to identify the corrective actions needed to prevent recurrence. No further procedure violations were identified.

**Documents Reviewed:** Weld Procedure Specification WPS-08-08-TS-001, "Manual GTAW", Revision 2
Weld Procedure Specification WPS-08-08-T-901, "Machine GTAW", Revision 0
Condition Report CR-GGN-2006-01154

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**Category:** Welding Procedures **Topic:** GTAW Supplementary Essential 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. The Welding Procedure Specifications (WPS) governed both manual and machine Gas Tungsten Arc Welding (GTAW). The WPSs contained the supplementary essential variables required by ASME Section IX, Part QW-256.

**Documents Reviewed:** Weld Procedure Specification WPS-08-08-TS-001, Revision 2
Weld Procedure Specification WPS-08-08-T-901, Revision 0

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**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. The Procedure Qualification Records (PQRs) supported their associated Welding Procedure Specifications for manual and machine Gas Tungsten Arc Welding (GTAW). The PQRs documented all of the essential and supplementary essential variables for the manual and machine GTAW welding processes used during welding of the test coupons. The PQRs had been certified accurate by Welding Services Inc., and had been approved by the Grand Gulf Site Welding Engineer.

**Documents Reviewed:** Weld Procedure Specification WPS-08-08-TS-001, Revision 2
Weld Procedure Qualification PQR-08-08-TS-001, Revision 0
Weld Procedure Specification WPS-08-08-T-901, Revision 0
Weld Procedure Qualification PQR-08-08-T-901, Revision 0

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| **Category:** | Welding Procedures **Topic:** Sampling For Combustible Gases |
| **Reference:** | CoC 1014, App B, 3.8; FSAR 1014, Table 8.0.1 |
| **Requirement** | During the canister lid-to-shell welding operations, combustible gas monitoring of the space under the canister lid is required, to ensure that there is no combustible mixture present in the welding area. The space below the canister lid shall be evacuated or purged prior to and during these activities. |
| **Finding:** | This requirement was implemented. Procedure 20-S-01-135 Section 8.1.3 established an air flow through the canister using an explosion proof (air eductor type) vacuum system. The vacuum system evacuated the area below the canister lid through the vent port. Replacement air entered the canister around the lid to shell gap.<br><br>Procedure 20-S-01-135 Section 8.1.3 initiated combustible gas monitoring of the space under the canister lid prior to welding the canister lid to the shell during a loading sequence. Section 8.2.3 of the procedure initiated combustible gas monitoring prior to removing the canister lid during an unloading sequence. During the demonstration, the combustible gas evacuation and sampling operations were performed in accordance with the procedure.<br><br>The combustible gas monitor used during the demonstration was an Industrial Scientific SP 402 Sampling Pump Model TMX412 with a calibration due date of April 30, 2006. The monitor drew a 0.5 liter per minute (lpm) continuous sample through the vent port using its own internal pump. |
| **Documents Reviewed:** | Procedure 20-S-01-135, "Dry Fuel Cask Lid Mockup Welding, Helium leak Testing and Weld Removal", Revision Final |

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| **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 canister lid to shell tack welds were completed by Welding Services Inc. (WSI) using the manual GTAW process. Some minor grinding was required on some of the tack weld stopping and starting ends, for incorporation into the root pass. The canister lid to shell tack welds were satisfactorily incorporated into the root pass. |
| **Documents Reviewed:** | Weld Traveler No. 102450-002, "Work Traveler for Installation of MPC Lid to MPC Shell, Drain /Vent Cover to MPC Lid, Set Screws to Drain/Vent Port Covers and Closure Rings", 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 implemented. During the performance of the lid to shell root pass, base metal defects were identified in three areas of the canister mockup shell. The defects were greater than the 10% allowed by the code. The Grand Gulf Site Welding Engineer issued condition report CR-GGN-2006-01157 to document the defects and to provide a written program for repairing them. The defects were ground clean and prepared for re-welding. Prior to the repair, the excavated areas were visually examined in accordance with Procedure QAP 9.3 and examined by liquid penetrant in accordance with Procedure QAP 9.6. The base metal repair was performed using the manual GTAW process in accordance with WPS 08-08-TS-001. After the repair was completed, the repaired areas were again visually examined and subjected to a liquid penetrant examination. The examination results were satisfactory and the repair was accepted by the licensee.

**Documents Reviewed:** Procedure QAP 9.6, " Liquid Penetrant Inspection Procedure", Revision 10
Procedure QAP 9.3, "Workmanship and Visual Inspection Criteria for ASME Welding", Revision 17
Weld Traveler No. 102450-002, "Work Traveler for Installation of MPC Lid to MPC Shell, Drain /Vent Cover to MPC Lid, Set Screws to Drain/Vent Port Covers and Closure Rings", Revision 0
Weld Procedure Specification WPS-08-08-TS-001
Condition Report CR-GGN-2006-01157

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

**Reference:** ASME Section III, Article NB-4452; NB-2538.c

**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. Areas ground to remove oxide scale or other mechanically caused impressions for appearance or to facilitate proper ultrasonic testing need not be examined by the magnetic particle or liquid penetrant test method.

**Finding:** This requirement was implemented. Some minor surface defects were identified during the lid to shell root pass, 3/8 inch intermediate pass and final weld. The defects included weld starts and stops and some minor undercut. The defects were ground out and the required visual and liquid penetrant examinations were performed satisfactorily.

**Documents Reviewed:** Weld Traveler No. 102450-002, "Work Traveler for Installation of MPC Lid to MPC Shell, Drain /Vent Cover to MPC Lid, Set Screws to Drain/Vent Port Covers and Closure Rings", Revision 0

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| **Category:** | Welding Procedures | **Topic:** | Weld Types |
| **Reference:** | FSAR 1014, Table 7.1.2 | | |
| **Requirement** | The canister confinement boundary weld types shall be as follows:<br>Lid to shell - Partial Penetration Groove<br>Vent and drain port cover plates to lid - Partial Penetration Groove<br>Closure ring to shell - Fillet<br>Closure ring to lid - Partial Penetration Groove<br>Closure ring to closure ring - Partial Penetration Groove | | |
| **Finding:** | This requirement was implemented. The weld joint designs described in the Holtec drawings were consistent with the Holtec Final Safety Analysis Report (FSAR). The welds were made using the welding procedures and were consistent with the Holtec drawings. | | |
| **Documents Reviewed:** | Holtec Drawings 2524, Sheets 1, 2, 3, 6, and 7, Revision 5.<br>Weld Traveler No. 102450-002, "Work Traveler for Installation of MPC Lid to MPC Shell, Drain /Vent Cover to MPC Lid, Set Screws to Drain/Vent Port Covers and Closure Rings", Revision 0<br>Weld Procedure Specification WPS-08-08-TS-001, Revision 2<br>Weld Procedure Specification WPS-08-08-T-901, Revision 0 | | |

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| **Category:** | Wrap-Up/Close-Out | **Topic:** | ISFSI Pad Concrete Strength Testing |
| **Reference:** | ACI 318, Sect 5.6.2.3 | | |
| **Requirement** | The strength level of an individual class of concrete shall be considered satisfactory if every arithmetic average of any three consecutive strength tests equals or exceeds 3000 psi AND no individual strength test (average of 2 cylinders) falls below 2500 psi. | | |
| **Finding:** | Inspection Follow-Up Item 72-050/05-01 was generated during the ISFSI pad construction to track completion of the 28 day compressive strength testing. The 28 day compressive strength testing was performed on August 19, 2005. Every arithmetic average of any three consecutive strength tests exceeded the required 28 day concrete compressive strength of 3000 psi. No individual strength test (average of 2 cylinders) fell to less than 2500 psi. The break tester was manufactured by Forney and controlled under M&TE #Q-040. The calibration due date was February 17, 2006. This Inspection Follow-Up Item has been closed. | | |
| **Documents Reviewed:** | Grand Gulf Testing Results "ISFSI Slab West End 1st Pour July 21, 2005" | | |

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CLCain
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GBMiller
JJPearson
ER Ziegler
SPAtwater
RLKellar
KMKennedy
KEGardin
FCDB File

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SUNSI Review Completed: SPA

ADAMS: ✖Yes ☐ No Initials: __spa___
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