APR 01 1999
STA# 4

4 ENGINEERING DATA TRANSMITTAL

Page 1 of 1
1. EDT 626283

2. To: (Receiving Organization) Distribution		3. From: (Originating Organization) SNF Project		4. Related EDT No.: N/A				
5. Proj./Prog./Dept./Div.: Spent Nuclear Fuel Project		6. Design Authority/ Design Agent/Cog. Engr.: C. Van Katwijk		7. Purchase Order No.: N/A				
8. Originator Remarks: N/A				9. Equip./Component No.: N/A				
				10. System/Bldg./Facility: Spent Nuclear Facility				
11. Receiver Remarks: 11A. Design Baseline Document? ☐ Yes ☒ No				12. Major Assm. Dwg. No.: N/A				
				13. Permit/Permit Application No.: N/A				
				14. Required Response Date: N/A				
15. DATA TRANSMITTED								
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Design- Nator	(G) Reason for Trans- mittal	(H) Orig- inator Dispo- sition	(I) Receiv- er Dispo- sition
1	SNF-3934		0	Worcester 1" Solenoid-Actuated Gas- Operated DI/HE System Ball Valves	Q	2	1	N/A

16. KEY											
Approval Designator (F)		Reason for Transmittal (G)				Disposition (H) & (I)					
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)				1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged					
17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G) Rea- son	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Rea- son	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
2	I	Designated Engineer	C. Van Katwijk								
2	I	Design Authority	J. J. Irwin								
2	I	QA	T. D. Hays	2-18-99							

18. C. Van Katwijk Signature of EDT Originator Date 2-9-99	19. T. Choho Authorized Representative for Receiving Organization Date 2/22/99	20. J. J. Irwin Design Authority/ Cognizant Manager Date 2/11/99	21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
---	---	---	---

S

Worcester 1" Solenoid – Actuated Gas-Operated DI/HE System Ball Valve

Carl Van Katwijk
Numatec Hanford Co, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 626283	UC: 620
Org Code: 2G300	Charge Code: 105559/A000
B&R Code: 39EW40400	Total Pages: 14

Key Words: Solenoid – Actuated Gas-Operated DI/HE

Abstract: Worcester 1" Solenoid Actuated Gas Operated DI/HE System Ball Valve
CGI-SNF-D-25-P4-042

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Release Approval

4/1/99
Date

Release Stamp

Approved for Public Release

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Title: **WORCESTER 1" SOLENOID-ACTUATED GAS-OPERATED DI/HE
SYSTEM BALL VALVE**

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Section 1 Part Information

Item No.: NA	Manufacturer:	Supplier:
Mfg. Part/Model No.:	Supplier's P/N:	
Part Description:		
End Use Description:		

Section 2a Component Information

Equipment No.: DI/He-GOV/SOV-1*11, 1*17	Specification No.: W-441- P4, Rev. 2	Manufacturer: Worcester Controls	Past P.O. No.: NA
Manufacturer's Part/ Model No.: 1"5966RTBW4 with 15I39SWM2120PBC	Equipment Supplier (if different from manufacturer): TBD		Equip. Supplier's Part No.: NA

Component Description: **1" Gas-operated full-port ball valve incorporates a solenoid and limit switches as integral parts of the actuator. The valve is normally open and fails safe to the closed position. The associated valve position switch is class GS.**

Section 2b Commercial Availability of the Item

1. Is the Item available from a catalogue from a qualified NQA1 supplier or ISO 9000 supplier (coordinate with project CGI interface Engineer or BTR)?

☐ YES (go to #2 below)

☒ NO (go to procedure step 5.3.2, proceed to dedicate Item)

2. List of Candidate qualified suppliers or ISO 9000 suppliers
company name & type contact name phone

NA

3. Recommended Procurement Strategy (coordinate with project CGI interface Engineer or BTR): **NA**

Section 2c CGI Determination

1. Question #1: Is the Item subject to design or specification requirements that are unique to nuclear facilities or activities?

☐ YES (the Item is not commercial grade)

☒ NO (continue)

2. Question #2: Is the Item used in applications other than nuclear facilities or activities?

☐ NO (the item is not commercial grade)

☒ YES (continue)

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3. Question #3: Is the Item ordered from manufacturer/supplier on the basis or specifications set forth in the manufacturers catalog?

☐ NO (the Item is not commercial grade)

☒ YES (continue)

☒ All three criteria have been satisfied. The Item meets the definition of commercial grade.

Section 2d Reason for Dedication

The above described Item is being Dedicated for use in the application cited for the following reason(s).

☒ Item is being purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Class application.

☐ Item is being purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Significant application.

☐ Item was purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Class application.

☐ Item was purchased from a non ESL manufacturer supplier as commercial grade to be used in a Safety Significant application.

☐ Other ('like-for-like', similar, substitution, replacement evaluation)

Section 3 Failure Effects Evaluation

A. Part/Component Safety Function:

1. Prevent H₂ Explosion.

2. Remain intact and functional during any event that might threaten the valve integrity. Maintain intact pressure boundary/confinement. Post accident valve indication monitoring.

3. Maintain critical function during and after Seismic event.

B. Part/Component Functional Mode:

Safety Function #1:

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

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

Safety Function #2:

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

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

Safety Function #3:

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

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

C. Host Component Safety Function (if applicable):

1. NA

2.

3.

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

1. **Electrical fault in the solenoid. Valve fails closed (fail-safe).**
2. **Loss of air pressure to the pneumatic actuator. Valve fails closed (fail safe).**
3. **Loss of control signal to solenoid. Valve fails closed (fail safe).**
4. **Failure of the valve to open on demand or failure of the valve body would prevent a hydrogen purge flow of Helium to the MCO.**
- 5.

Section 4 Environmental & Natural Phenomena Hazard Design

Environmental Qualification Required:

Yes ☐No ☒**Environmental Condition B**

If yes: Environmental Qualification Requirements

Limiting Environmental Conditions:

Required Safety Functions:

Qualification Period:

Natural Phenomena Hazard (NPH) Design Required:

Yes ☒No ☐

If yes: NPH Design Requirements

Performance Category: **PC-3**NPH Design Req'ts.: **Seismic Condition A.**Required Safety Functions: **Boundary/Confinement,**
Prevent H₂ Explosion.

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Section 5 Component Functional Classification

☒ Safety Class (SC)☐ General Service☐ Safety Significant (SS)

If part/component classification is different from host component/system, document basis.

Section 6 (Reserved)

Section 7 (Reserved)

Section 8 References (for Functional Classification)

National Codes/Standards:

ASME B31.1**B16 SERIES**

Safety Analysis Report (SAR):

HNF-SD-SNF-SAR-002,**Rev. 4A**Drawings: **H-1-82161, Rev. 2****HNF-SD-SNF-SEL-002, Rev. 4**Vendor Manual/Manufacturer/Supplier Information: **Worcester PB451-22**

Other:

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Section 9 Critical Characteristics

Critical Characteristics Verification Document: Vendor Specifications, HNF-SD-SNF-SEL-002, Rev. 4	Acceptance Criteria/Tolerances	Acceptance Method	ID	Function
1. Item Identification Critical Characteristics (necessary for reasonable assurance that the Item delivered is the Item specified)				
Manufacturer	Worcester Controls	1, IN	X	
Valve Part Number	1"5966RTBW4	1, IN	X	
Actuator Part Number (Includes SOV)	15I39SWM2120PBC	1, IN	X	
Nameplate Data of Valve	Per Vendor Manual. Shall include "R6" in upper right corner.	1, IN	X	
Nameplate Data of Actuator (Includes SOV)	Per Vendor Manual	1, IN	X	
2. Physical Critical Characteristics (for reasonable assurance that the Item delivered is the Item specified)				
Valve Body Material	Stainless Steel	1, T	X	
Configuration/Mounting	Integral Actuator/Valve Assembly. Black recessed override button	1, IN	X	
Process Connection	1" butt weld	1, IN	X	
3. Performance Critical Characteristics (for reasonable assurance that the Item will perform its intended safety function(s))				
GOV Pressure Boundary	Pressure test at 165 psig (Zero leakage) Note 3	1, T		X
Internal Pressure	150 psig and full vacuum	1, T		X
GOV Seat Leakage	Pressure test to 150 psig (bubble-tight standards < 10 ⁻⁴ cc He/sec)	1, T		X
GOV Fail Safe Position	Valve fails closed on loss of air pressure, control signal, or electrical power to the solenoid. Stroke time less than 1 second, nominal.	1, T		X
Insulation Resistance	Greater than 10 Megohm resistance	1, T		X
Solenoid Inrush Current	Nominal 0.4 amp @ 120VAC	1, T		X
Solenoid Holding Current	Nominal 0.2 amp @ 120VAC	1, T		X
Current Carrying Capability Of Contacts	Nominal 5 amps @ 120 VDC, less than 0.5 V drop across contacts	1, T		X
Environmental	Note 1			
Seismic Condition A	Note 2	1, T		X

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4. Notes and Legend:

1. This valve has coro-lube (nickel-acetate), acetal resin and NEMA Enclosed Solenoids, these materials are not subject to degradation at 40°F and 60% RH or 115°F and 22% RH and are suitable for Condition B Application.
2. Maintain critical function during and after Seismic event. W-441-P4, Rev. 2 Appendix L, page L-2 provides a seismic testing plan for this safety class, Seismic Condition A valve at a Seismic Spectra TBD.
3. Pressure test at 110% of design accident condition pressure of 150 psig.

Acceptance Method:

1. Special Test and Inspection
1, IN for Inspection
1, T for Test
2. Commercial Grade Survey
3. Source Verification
4. Vendor/Item History

Section 10 Initial Review and Approval

Approvals:

Designated Engineer: [Signature] 12/21/98
Design Authority: [Signature] 12/21/98
QA Engineer: [Signature]

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SYSTEM BALL VALVE

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WORKSHEET 1 DETERMINATION OF FAILURE MECHANISMS/MODES

SECTION 1

Typical Failure Mechanisms	Definition	Applicable to Component under Evaluation	
Fracture	Separation of a solid accompanied by little or no macroscopic plastic deformation.	Yes []	No [X]; If Yes, indicate failure Mode _____
Corrosion	The gradual deterioration of a material due to chemical or electrochemical reactions, such as oxidation, between the material and its environment.	Yes []	No [X]; If Yes, indicate failure Mode _____
Erosion	Destruction of materials by the abrasive action of moving fluids, usually accelerated by the presence of solid particles carried with the fluid.	Yes []	No [X]; If Yes, indicate failure Mode _____
Open Circuit	An electrical circuit that is unintentionally broken so that there is no complete path for current flow.	Yes [X]	No []; If Yes, indicate failure Mode _____
Short Circuit	An abnormal connection by which an electrical current is connected to ground, or to some conducting body, resulting in excessive current flow.	Yes [X]	No []; If Yes, indicate failure Mode Open or short in Motor Actuator Circuit
Blockage	Clogging of a filtering medium resulting in the inability to perform its purification function or blockage of flow.	Yes []	No [X]; If Yes, indicate failure Mode _____
Seizure	Binding of a normally moving item through excessive pressure, temperature, friction, jamming.	Yes [X]	No []; If Yes, indicate failure Mode _____
Unacceptable Vibration	Mechanical oscillations produced are beyond the defined permissible limits due to unbalancing, poor support, or rotation at critical speeds.	Yes []	No [X]; If Yes, indicate failure Mode _____
Loss of Properties	A loss of mechanical and physical properties of a material due to exposure to high temperatures, radiation exposure.	Yes []	No [X]; If Yes, indicate failure Mode _____
Excess Strain	Under the action of excessive external forces the material of the part has been deformed or distorted.	Yes []	No [X]; If Yes, indicate failure Mode _____
Mechanical Creep	From prolonged exposure to high temperature and stress, the object will show a slow change in its physical (shape and dimension) and mechanical characteristics.	Yes []	No [X]; If Yes, indicate failure Mode _____
Ductile Fracture	Fracture characterized by tearing of metal accompanied by appreciable gross plastic deformation.	Yes []	No [X]; If Yes, indicate failure Mode _____

Section 2. Additional Failure Modes Applicable to the Component Under Evaluation

1.	Loss of Air Pressure
2.	
3.	
4.	
5.	

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CHECKLIST 1

ACCEPTANCE METHOD 1

SPECIAL TEST/INSPECTION VERIFICATION

SECTION 1			
Item Description: DI/He Solenoid/Air Actuated 1" Ball Valve		Equip #: DI/He-GOV/SOV-1*11, 1*17 Model #: 1" 5966RTBW4 with 15139SWM2120PBC	
System #: 25			
Manufacturer (Address/Phone): Worcester Controls P.O. BOX 538 33 Locke DR Marlborough, MA 01752 (508) 481-4800 P.O. #		Supplier (Address/Phone):	
SECTION 2 CRITICAL CHARACTERISTICS TO BE VERIFIED BY METHOD 1			
Insp	Test	Post-Test	
☒	☐	☐	1. Manufacturer
☒	☐	☐	2. Valve Part Number
☒	☐	☐	3. Actuator Part Number (Includes SOV)
☒	☐	☐	4. Nameplate Data of Valve
☒	☐	☐	5. Nameplate Data of Actuator (Includes SOV)
☐	☒	☐	6. Valve Body Material
☒	☐	☐	7. Configuration/Mounting
☒	☐	☐	8. Process Connection
☐	☒	☐	9. Insulation Resistance
☐	☒	☐	10. GOV Pressure Boundary
☐	☒	☐	11. Internal Pressure
☐	☒	☐	12. GOV Seat Leakage
☐	☒	☐	13. GOV Fail Safe Position
☐	☒	☐	14. Solenoid Inrush Current
☐	☒	☐	15. Solenoid Holding Current
☐	☒	☐	16. Current Carrying Capability Of Contacts
☐	☒	☐	17. Seismic Condition A

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SECTION 3 BY INSPECTION

* See Attachment G of Desk Instruction for Sampling Instructions

Characteristic: **Manufacturer**

Sample Size*: **All Items**

Acceptance Criteria: **Worcester Controls**

Receipt Inspection Plan / Report #: _____

References (see Section 7): _____

Characteristic: **Valve Part Number**

Sample Size*: **All Items**

Acceptance Criteria: **1"5966RTBW4**

Receipt Inspection Plan / Report #: _____

References (see Section 7): _____

Characteristic: **Actuator Part Number (Includes SOV)**

Sample Size*: **All Items**

Acceptance Criteria: **15I39SWM2120PBC**

Receipt Inspection Plan / Report #: _____

References (see Section 7): **Manual PB 302-26, PB 451-22, PB 303-1**

Characteristic: **Nameplate Data of Valve**

Sample Size*: **All Items**

Acceptance Criteria: **Per Vendor Manual**

Receipt Inspection Plan / Report #: _____

References (see Section 7): **Manual PB 302-26, PB 451-22, PB 303-1**

Characteristic: **Nameplate Data of Actuator (Includes SOV)**

Sample Size*: **All Items**

Acceptance Criteria: **Per Vendor Manual. Shall include "R6" upper right corner.**

Receipt Inspection Plan / Report #: _____

References (see Section 7): **Manual PB 302-26, PB 451-22, PB 303-1**

Characteristic: **Configuration/Mounting**

Sample Size*: **All Items**

Acceptance Criteria: **Integral Actuator/Valve Assembly. Black recessed override button.**

Receipt Inspection Plan / Report #: _____

References (see Section 7): _____

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Characteristic: **Process Connection**

Sample Size*: **All Items**

Acceptance Criteria: **1" Butt Weld**

Receipt Inspection Plan / Report #: _____

References (see Section 7): _____

SECTION 4 BY SPECIAL TEST

* See Attachment G of Desk Instruction for Sampling Instructions

Test To Be Performed by:

☐ Purchaser

☐ Supplier/Manufacturer**

☐ Other

Number of Items to be Tested:

Test/Inspection Location:

Characteristic for Test: **Valve Body Material**

Acceptance Criteria: **Stainless Steel**

Sample Size*: **Normal Sampling Size**

Actual Test Value:

Test Plan and Report #: _____ References (see Section 7): _____

Characteristic for Test: **Insulation Resistance**

Acceptance Criteria: **Greater than 10 Megohm resistance**

Sample Size*: **Normal Sampling Size**

Actual Test Value:

Test Plan and Report #: _____ References (see Section 7): _____

Characteristic for Test: **GOV Pressure Boundary**

Acceptance Criteria: **Pressure test at 165 psig (Zero leakage)**

Sample Size*: **Normal Sampling Size**

Actual Test Value:

Test Plan and Report #: _____ References (see Section 7): _____

Characteristic for Test: **Internal Pressure**

Acceptance Criteria: **150 psig and full vacuum)**

Sample Size*: **Normal Sampling Size**

Actual Test Value:

Test Plan and Report #: _____ References (see Section 7): _____

Characteristic for Test: **GOV Seat Leakage**

Acceptance Criteria: **Pressure test to 150 psig (bubble-tight standards < 10⁻⁴cc He/sec)**

Sample Size*: **Normal Sampling Size**

Actual Test Value:

Test Plan and Report #: _____ References (see Section 7): _____

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Characteristic for Test: GOV Fail Safe Position**Acceptance Criteria: Valve fails closed on loss of air pressure, control signal, or electrical power to the solenoid. Stroke time less than 1 second, nominal.****Sample Size*: Normal Sampling Size****Actual Test Value:****Test Plan and Report #:** _____ **References (see Section 7):** _____**Characteristic for Test: Solenoid Inrush Current****Acceptance Criteria: Nominal 0.4 amp @ 120VAC****Sample Size*: Normal Sampling Size****Actual Test Value:****Test Plan and Report #:** _____ **References (see Section 7):** _____**Characteristic for Test: Solenoid Holding Current****Acceptance Criteria: Nominal 0.2 amp @ 120VAC****Sample Size*: Normal Sampling Size****Actual Test Value:****Test Plan and Report #:** _____ **References (see Section 7):** _____**Characteristic for Test: Current Carrying Capability Of Contacts****Acceptance Criteria: Nominal 5 amps @ 120 VDC, less than 0.5 V drop across contacts****Sample Size*: Normal Sampling Size****Actual Test Value:****Test Plan and Report #:** _____ **References (see Section 7):** _____**Characteristic for Test: Seismic Condition A****Acceptance Criteria: Maintain critical function during and after Seismic event.****Sample Size*: Normal Sampling Size****Actual Test Value:****Test Plan and Report #:** _____ **References (see Section 7):** _____****If Supplier/Manufacturer or Other, Refer to CGI Checklist-2 for Support Information**

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Section 5 Test / Inspection Summary (Acceptance Method 1)

1. SUMMARY OF VERIFIED CRITICAL CHARACTERISTICS, THEIR VERIFICATION METHODS, AND RESULTS

ITEM DESCRIPTION:

Critical Characteristics				Verification Results							
Critical Characteristics	Acceptance Criteria/Tolerances	ID	Function	Method T/IN	Procedure or RR#	Check-list ID	Number Tested	Number Failed	Verifying Organization	Printed Name Signature	Date
Manufacturer	Worcester Controls	X									
Valve Part Number	1"5966RTBW4	X									
Actuator Part Number (Includes SOV)	15I39SWM2120PBC	X									
Nameplate Data of Valve	Per Vendor Manual	X									
Nameplate Data of Actuator (Includes SOV)	Per Vendor Manual. Shall include "R6" in upper right corner.	X									
Valve Body Material	Stainless Steel	X									
Process Connection	1" butt weld	X									
Configuration/Mounting	Integral Actuator/Valve Assembly. Black recessed override button.	X									
Insulation Resistance	Greater than 10 Megohm resistance		X								
GOV Pressure Boundary	Pressure test at 165 psig (Zero leakage)		X								
Internal Pressure	150 psig and full vacuum		X								
GOV Seat Leakage	Pressure test to 150 psig (bubble-tight standards < 10 ⁻⁴ cc He/sec)		X								

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GOV Fail Safe Position	Valve fails closed on loss of air pressure, control signal, or electrical power to the solenoid. Stroke time less than 1 second, nominal.		X								
Solenoid Inrush Current	Nominal 0.4 amp @ 120VAC		X								
Solenoid Holding Current	Nominal 0.2 amp @ 120VAC		X								
Current Carrying Capability Of Contacts	Nominal 5 amps @ 120 VDC, less than 0.5 V drop across contacts		X								
Environmental	NA										
Seismic Condition A	Maintain critical function		X								

2. DISPOSITION OF UNVERIFIED OR FAILED CRITICAL CHARACTERISTICS

Critical Characteristic	Disposition

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

Testing Agency Approval: _____ Date _____

Testing Agency QA Engineer: _____ Date _____

Design Authority: _____ Date _____

QA Engineer: _____ Date _____

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Section 6 Contacts/Phone Numbers

Name	Phone
Design Authority	()
QA	()
QC	()
Cog - Engineer	()
CGI Engineer	()
Procurement Engineer	()
Other	()

Section 7 Supporting Documentation for this Checklist

Initial Procurement Documents	For Critical Characteristics
☐ Drawings:	
☐ Manuals (specify type & number):	
☐ Design Calculations	
☐ Installation Instructions	
☐ Operation Instructions	
☐ Calibration Instructions	
☐ Manufacturer's Recommended Spare Parts List	
☐ Other:	
Procurement Documents	
☐ Certificate of Conformance/Compliance	
☐ Seismic Qualification Certificate	
☐ Environmental Qualification Certificate	
☐ Test Report (s):	
☐ Inspection Report (s):	
☐ CMTRs for ASME Pressure Retaining Materials	
☐ Valve Seat Leakage Report	
☐ Weld Records	
☐ Material Traceability Record	
☐ Other:	