



Entergy Nuclear South
Entergy Operations, Inc.
17265 River Road
Killona, LA 70057-3093
Tel 504 739 6660
Fax 504 739 6678
jkowale@entergy.com

Joseph A. Kowalewski
Vice President, Operations
Waterford 3

W3F1-2010-0089

January 4, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Response to Request for Additional Information Associated with
Technical Specification Table 3.4-1 Isolation Valve Addition
Waterford Steam Electric Station Unit 3
Docket No. 50-382
License No. NPF-38

- REFERENCES:
1. W3F1-2010-0019, Technical Specification Table 3.4-1 Isolation Valve Addition, February 22, 2010.
 2. NRC Letter, Request for Additional Information Re: Technical Specification Table 3.4-1 Isolation Valve Addition, June 28, 2010.
 3. W3F1-2010-0065, Response to Request for Additional Information Associated with Technical Specification Table 3.4-1 Isolation Valve Addition, August 12, 2010.
 4. NRC, Request for Additional Information on the LAR to Revise TS 3.4-1 Isolation Valve Addition, October 28, 2010 [ADAMS Accession Number ML103010180].

Dear Sir or Madam:

In letter W3F1-2010-0019 [Reference 1], Entergy Operations, Inc. (Entergy) proposed a change to Waterford Steam Electric Station Unit 3 (Waterford 3) Technical Specifications (TS) Table 3.4-1 Isolation Valve Addition.

During the submittal review process, the Nuclear Regulatory Commission (NRC) determined that a Request for Additional Information (RAI) was required [Reference 2]. Letter W3F1-2010-0065 [Reference 3] submitted the additional information. Letter W3F1-2010-0065 did not contain the requested Environmental Qualification (EQ) report due to the EQ report not being available at the time. The EQ report is contained

in Attachment 2 to this letter. An additional RAI [Reference 4] was received and its response is included in Attachment 1.

This letter contains no new commitments.

If you have any questions or require additional information, please contact William Steelman at 504-739-6685.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 4, 2011.

Sincerely,

A handwritten signature in black ink, appearing to be 'JAK/WJS', written in a cursive style.

JAK/WJS

Attachment 1: Response to Request for Additional Information

Attachment 2: LPL-EQA-35.1 Qualification Test Summary / Similarity Analysis /
Temperature Service

cc: Mr. Elmo E. Collins, Jr.
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
612 E. Lamar Blvd., Suite 400
Arlington, TX 76011-4125

NRC Senior Resident Inspector
Waterford Steam Electric Station Unit 3
P.O. Box 822
Killona, LA 70066-0751

U. S. Nuclear Regulatory Commission
Attn: Mr. N. Kalyanam
Mail Stop O-07D1
Washington, DC 20555-0001

Attachment 1 to

W3F1-2010-0089

Response to Request for Additional Information

NRC REQUEST FOR ADDITIONAL INFORMATION

In letter W3F1-2010-0019 [Reference 1], Entergy Operations, Inc. (Entergy) proposed a change to Waterford Steam Electric Station Unit 3 (Waterford 3) Technical Specifications (TS) Table 3.4-1 Isolation Valve Addition. During the submittal review process, the Nuclear Regulatory Commission (NRC) determined that a Request for Additional Information (RAI) was required. Letter W3F1-2010-0050 [Reference 2] submitted the additional information. After NRC review of letter W3F1-2010-0050, additional information was determined to be needed and another RAI [Reference 3] was generated. Letter W3F1-2010-0065 [Reference 4] submitted the additional information but W3F1-2010-0065 did not contain the requested Environmental Qualification (EQ) report due to the EQ report not being available at the time. The EQ report is contained in Attachment 2 to this letter. An additional RAI [Reference 4] was received and its response is provided below.

The following provides the responses to the remaining Waterford 3 NRC RAIs.

RAI 1 [Reference 3]

Letter W3F1-2010-0050 RAI 6.b response – We need a summary of the licensee's EQ calculation. All design information has to be completed before we can review the application. The vendor should have these calculations ready.

RAI 1 Response

Attachment 2 contains LPL-EQA-35.1 which contains the Qualification Test Summary / Similarity Analysis / Temperature Service for solenoid valves SI-4052A (RC LOOP 2 SDC SUCTION INSIDE CONTAINMENT BYPASS ISOL) and SI-4052B (RC LOOP 1 SDC SUCTION INSIDE CONTAINMENT BYPASS ISOL) that will be installed under EC14765.

Attachment 2 LPL-EQA-35.1 page Attachment XI.8 gives the report conclusions.

RAI 2 [Reference 5]

Please provide a summary evaluation of the impact of the proposed modification for the new solenoid valves on compliance with 10 CFR 50.63 Station Blackout.

RAI 2 Response

Station Blackout (SBO) evaluation for Waterford 3 was performed in accordance with 10CFR50.63 using the guidance in NUMARC 87-00 and Regulatory Guide 1.155. The plant specific evaluation for Waterford 3 demonstrates that equipment will be functional such that Waterford 3 can safely cope with an SBO for four hours. During the 4-hour SBO event, maintaining reactor core cooling for the plant is performed via natural circulation. Shutdown cooling will only be initiated after the 4-hour SBO event.

SI-4052A(B) is required to support shutdown cooling only and is not needed for natural circulation. Battery capacity calculations verified that the Class 1E batteries have sufficient capacity to support station blackout for four hours. Offsite power or Emergency Diesel Generator is credited for restoration of AC power to the plant ending the 4 hours SBO event. Once AC power is restored, the safety related battery chargers provide DC power to the DC buses and loads.

REFERENCES:

1. W3F1-2010-0019, Technical Specification Table 3.4-1 Isolation Valve Addition, February 22, 2010.
2. W3F1-2010-0050, Response to Request for Additional Information Associated with Technical Specification Table 3.4-1 Isolation Valve Addition, June 8, 2010 [ADAMS Accession Number ML101620417].
3. NRC Letter, Request for Additional Information Re: Technical Specification Table 3.4-1 Isolation Valve Addition, June 28, 2010.
4. W3F1-2010-0065, Response to Request for Additional Information Associated with Technical Specification Table 3.4-1 Isolation Valve Addition, August 12, 2010 [ADAMS Accession Number ML102300177].
5. NRC, Request for Additional Information on the LAR to Revise TS 3.4-1 Isolation Valve Addition, October 28, 2010 [ADAMS Accession Number ML103010180].

Attachment 2 to

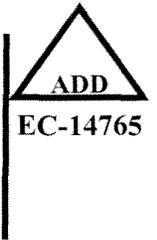
W3F1-2010-0089

**LPL-EQA-35.1 Qualification Test Summary / Similarity Analysis / Temperature
Service**

Attachment 2 Contains 17 Pages

Attachment XI

Qualification Test Summary / Similarity Analysis / Temperature Service Condition
Valcor Report MR526-6040-22-3
(Model V526-6040-22, P/N 214167301 for SI ISV4052A & SI ISV4052B)



**Qualification Test Summary / Similarity Analysis / Temperature Service Condition Valcor Report
MR526-6040-22-3 (Model V526-6040-22, P/N 214167301 for SI ISV4052A & SI ISV4052B)**

ADD

EC-14765

Test Sample Description

The following Valcor Solenoid Valves were submitted for qualification testing.

Model/Part No.	Tag No.	S/N	Description
V526-6180-1 P/N 356136301	0Q014-01-01-01 0Q014-01-01-02	1Q 2Q	Valcor 2", 1500# ASME III, Class 2 pilot assisted, normally open, 2-way position indicating, DC voltage solenoid operated valve. The solenoid coil assembly is a Valcor P/N V52653-6042-1 rated at 180°C (Class H), 125 VDC continuous duty.

The Model V526-6180-1 Solenoid Valve has a Class H 125 VDC coil which has an operating range of 100 - 140 VDC (no rectifier & zener diode assembly is used). Electrical power to operate the valve is applied to the solenoid through a conduit port located on the side of the solenoid assembly. The inrush and holding current is 1.5 amperes at 125 VDC & 70 °F. The valve de-energized position (fail position) is open; therefore the valve is energized to close. The disc assembly consists of a stellite which seals against an ASME SA-479 Type 316 hardface seat in the valve body. The test specimen contains 2 position indicating switches which are actuated by a magnet assembly that is attached to the plunger. The coil housing O-rings were constructed with silicone rubber. The assembly drawing for solenoid valve V526-6180-1 is shown on Dwg #356136301 (EMDRAC 5817-13985 sh1) which is included in references (h) and (i).

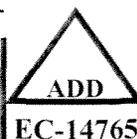
Solenoid Operated Valve V526-6180-1 was mounted and qualified in the stem-vertical position (QR 526-6180-1-1 section 3.6).

Acceptance Criteria

Pre- and Post Qualification Baseline Function Testing of serial numbers 1Q & 2Q valves was performed by Valcor with satisfactory results. Excessive output leakage was observed on both test valves during a Pneumatic Disc Test. The leakage was documented and monitored without increase throughout qualification testing. The Pneumatic Disc Test was revised to be performed with water, vice air and both qualification valves exhibited leakage within the required 50 cc/hr. The overall results are given below and can be found in QR 526-6180-1-1 Appendix F Sh. F1-2:

Test	Limits	Pre-Qual Test Results (1Q/2Q)	Post-Qual Test Results (1Q/2Q)
Dielectric (Solenoid)	2 mA MAX.	440 μ A / 480 μ A	180 μ A / 200 μ A
Dielectric (Switches)	2 mA MAX.	280 μ A / 260 μ A	100 μ A / 130 μ A
Insulation Resistance (IR)-Solenoid	20 M Ω MIN.	>10k M Ω / >20k M Ω	>20k M Ω / >20k M Ω

Insulation Resistance (IR)-Switches	20 MΩ MIN.	>6k MΩ / >10k MΩ	>20k MΩ / >20k MΩ
Position Indication (Normal)	MUST INDICATE	SAT / SAT	MISSING SWITCH
Position Indication (Energized)	MUST INDICATE	SAT / SAT	SAT / SAT
Hydrostatic Shell Test 4200 psig Water for 15 min.	NO LEAKS	SAT / SAT	SAT / SAT
Hydrostatic Disc Test 4100 psig Water for 5 min.	4 CC/HR MAX. LEAKAGE	.001 cc/min / .001 cc/min	.01 cc/min / .005 cc/min
Pull-In Voltage	57 VDC MAX.	40 VDC / 40 VDC	37 VDC / 37 VDC
Drop-Out Voltage	4 VDC MIN.	16 VDC / 11 VDC	15.8 VDC / 14 VDC
Response Time	Open/Close MAX. 2 sec	16 msec. / 25 msec. 50.2 msec / 62 msec.	N/A



Radiation Aging

Two model V526-6180-1 specimens (P/N 0Q014-01-01-01 & 0Q014-01-01-02) were sequentially radiation aged in the beginning of the qualification program based on the results of testing by the Nuclear Regulatory Commission (NRC) and reported by Sandia Laboratories in report SAND 79-0924C. Radiation exposure was performed by Steris-Isomedix Services under guidelines specified by Valcor. The test specimens were exposed for 106 hours to a Cobalt-60 gamma source and received a minimum total integrated radiation dose of 93.6 Mrads (9.36E+7) gamma with no anomalies and no degradation of non-metallics noted (QR 526-6180-1-1 section 3.13.3). The valve's performance characteristics (pull-in, drop-out, and leakage tests) were measured satisfactorily before and after the radiation exposure.

Thermal Aging

First a Heat Rise Test (Reference QR 526-6180-1-1 Appendix D) was performed in order to determine the maximum stabilized solenoid and o-ring temperatures that occur when the solenoid is continuously energized in its maximum operating ambient temperature. A total of ten thermocouples were installed as close as practical to the o-ring seals. The coil temperature was calculated based on the measurement of current changes. The fully instrumented test valves were mounted onto a steel plate to simulate actual mounting and heat transfer conditions. These assemblies were mounted in the chamber oriented with the valves in a vertical position, solenoid above the valve bodies, and on a 1-inch thick insulation board on the floor of the chamber. All thermocouples were connected to a temperature recorder and additional instrumentation to measure the applied voltage and current during the test. The test valve temperature was stabilized at 130°F with test fluid supplied to the valve at 306°F. A voltage of 125VDC was applied to the valve and the baseline current was measured. When thermal stabilization was reached, which is the point when the current did not change more than 1 mA in a 1-hour period, the current flow in the solenoid was measured. The coil winding temperature was calculated in accordance with the following equation:

$$T = \left(\frac{I_A}{I_F} - 1 \right) \left(\frac{1}{0.00218} \right) + T_A$$

Where:

- T = Calculated Coil Temperature: 317.9°F
- I_A = Current Flow at Ambient Temperature (1.32562 Amps)
- I_F = Current Flow at Stabilized Temperature (0.94059 Amps)
- T_A = Ambient Temperature (130.6°F)
- 0.00218 = Temperature Coefficient, Ohm/Ohm-°F

The thermal aging of the V526-6180-1 solenoid valves was performed to simulate the effects of a 40-year design life plus accident, except for elastomers and non-metallic items, which were qualified for a minimum of 10-year life plus accident. Following the Heat Rise Test, the measured temperatures were used to determine the thermal aging times of the various test specimen components. The final thermocouple temperatures became the Actual Part Operating Temperatures that were used to calculate qualified life. The solenoid coil shell assembly was thermally aged 690 hours @ 415°F (Reference QR 526-6180-1-1, Appendix D, Figure 1). The limiting components in the coil shell assembly are the Coil Magnet Wire, Coil Insulation, and Coil Lead Wire, which received an effective qualified life of 40.52 years. These three components had the lowest activation energy (eV) with a value of 2.096eV.

The coil materials of construction are identified in QR 526-6180-1-1 Appendix D, Figure 1 as:

PART	MATERIAL	ACTIVATION ENERGY (eV)
Coil Magnet Wire	Polyimide	2.096
Coil Insulation	Kapton	2.096
Insulating Tape	Fiberglass	2.156
Epoxy Potting	Stycast #2651	2.126
Coil Lead Wire	Kapton	2.096

The silicone o-rings, an elastomer, with activation energy of 1.150 eV were tested as part of a Coil-Shell Assembly test fixture which included an Electrical Conduit Seal Assembly (ECSA) connector manufactured by EGS attached to the solenoid housing. The o-rings received an effective qualified life of 15.64 years. The o-rings were thermally aged 855 hours @ 280°F (Reference QR 526-6180-1-1, Appendix D, Figure 2).

Cycle Aging

During Thermal Aging, Phase I of Cycle Aging was performed. Solenoid Operated Valve V526-6180-1 was cycled 8,289 times successfully (Reference QR 526-6180-1-1 section 3.13.4). The test specimens were cycled with 60 psig water at 125 VDC at a rate that did not exceed 10 cycles per minute.

Post-Thermal/Cycle Aging test results complied with test requirements and can be found in QR 526-6180-1-1 Appendix F, sheets 54 and 55. Test results are listed below:



Test	Post-Thermal/Cycle Aging Test Data 0Q014-01-01-01 / 0Q014-01-01-02
Apply Voltage to Solenoid Operator	125.418 / 125.072 VDC
Apply Pressure to Pressure Port 'A'	60.0 psig
Pull-In Voltage (Avg.)	43.340 / 54.146 VDC
Drop-Out Voltage (Avg.)	15.494 / 23.206 VDC
Leak Test	0.5 sccm / 0.4 sccm

Phase II of Cycle Aging was performed following Hot Cyclic Testing. An additional 8,250 cycles during Phase II Cycle Aging of the valve was performed at ambient temperature. The valve was cycled with 60 psig water a rate not exceeding 10 cycles per minute energizing the coil with 125 VDC. Operation of the valve was confirmed by the valve shuttling and water issuing from the outlet port when the valve is energized as well as observation of the position indication switches.

Seismic Testing

Complete successful seismic qualification testing is documented in QR 526-6180-1-1, Appendix F, Test report pages 091-189. A Resonance Search Test was performed within the range of 1-100Hz. A Vibration Aging Test was performed and tag numbers 0Q014-01-01-01 and 0Q014-01-01-02 were subjected to an amplitude of 0.75g over the frequency range of 5 Hz to 100 Hz to 5 Hz at a sweep rate of 2 octaves per minute for a minimum of 90 minutes in each orthogonal axis (see QR 526-6180-1-1, Appendix F pages 96-108). The SRV Alone Test was performed following Vibration Aging. Contact chatter was monitored throughout testing. Operability was monitored satisfactorily at 1, 5, 10 and 15 minutes during testing. An Operational Basis Earthquake (OBE) plus SRV excitations was performed in each of the X-Y and Z-Y directions using the Required Response Spectrum (RRS) method. The valve was cycled satisfactorily twice and operability was verified by a burst of flow from the outlet port. Safe Shutdown earthquake (SSE) in addition to SRV and LOCA excitations was also performed.

Post Seismic functional test results complied with test requirements and can be found in QR 526-6180-1-1 Appendix F, sheets 79 and 80. Test results are listed below:

Test	Post Seismic Results 0Q014-01-01-01 / 0Q014-01-01-02
Apply Voltage to Solenoid Operator	125.06 / 125.6 VDC
Pull-In Voltage (Avg.)	39.4 / 46.13 VDC
Drop-Out Voltage (Avg.)	19.87 / 19.56 VDC
Leak Test	.01 scfm / 5.2 sccm

LOCA Testing

Valcor model V52600-6042-1A was used to demonstrate, based on similarity, that LOCA requirements are exceeded (see MR526-6040-22-3 section 4.1.4). Two Valcor model V52600-6042-1A valves were exposed to a 30 day LOCA/MSLB test in which two initial transients were used. The first transient obtained a peak temperature/pressure of 413°F/73.7 psig in 31 seconds and the second transient obtained a peak temperature/pressure of 445°F/64 psig in 17.5 seconds. Chemical spray consisting of 3000 ppm boron pH of 11.5 adjusted with sodium hydroxide was applied during the first 24 hours of testing at a rate of 0.15 gpm/ft² (see Attachment X). The valves were successfully operated at nominal voltage, minimum voltage and maximum voltage throughout the LOCA/MSLB test.

The valves that are installed in containment have an electrical Quick Disconnect connector manufactured by EGS (QualTech NP) attached to the solenoid housing which prevents moisture/water from penetrating into instrument housings, junction boxes or the solenoid coil. The qualified connector is a 3/4" N.P.T., quick disconnect, 10 pin bayonet style with connector field wiring consisting of 16 AWG, Rockbestos, Firewall III SIS cable.

It is assumed per calculation ECS04-013, Small Break Loss of Coolant Accident (SBLOCA) Alternative Source Term (AST) Radiological Dose Consequences for 3716 MWt Extended Power Uprate (EPU) that the plant is placed on Shutdown Cooling and secondary releases through the ADV's are stopped at a time of 7.5 hours. The SI-4052A and SI-4052B solenoid valves, normally de-energized and closed, will be required for a very short duration (approx. 7-8 minutes maximum while placing SDC into service). The function while energized is to open to equalize the SDC pressure across SI-405A and SI-405B. Once the pressure is equalized and SI-405A & SI-405B commence to open, the equalization solenoid valves can close.

It has been determined that the Valcor model V526-6040-22 is qualified for a LOCA/MSLB event at Waterford 3 based on similarity of construction and LOCA testing for qualification test sample V52600-6042-1A exceeding the plant requirements as shown with the superimposed LOCA temperature and pressure curves found in Appendix III of MR526-6040-22-3. Comparisons of the LOCA/MSLB Test Temperature and Pressure Profiles for Report QR526-6042-1A can also be found in this EQA (see Fig 4a & 4b).

Final Inspection

The test specimens were visually inspected at Trentec (testing facility) for evidence of damage, deterioration or deformation that might hinder proper valve operation. The final inspection was satisfactory and the results can be found in QR 526-6180-1-1, Appendix F on Page 011. All the lead wires were brittle, which was expected as they were effectively 40 years old (minimum).

Similarity Analysis

Table I

Valve Similarities

Valve No.	Model	Nominal Size (in)	Type	Seal Material	Body Material	Bonnet Material	Flow Capacity (Cv) (Min)	Pressure Class (Note1)	Design Temp (°F)
V526-6040-22 (Installed at WF3 SI-4052A & B)		3/4	Pilot Operated	Stellite 6B	ASME SA182 – Grade F316	ASME SA479 – Type 316	4.0	1680	650
V526-6180-1 (Test Valve)		2	Pilot Operated	Stellite 6B	ASME SA516 – Grade 70	ASME SA479 – Type XM-19	10.0	1500	576
V526-6042-1A (Test Valve – LOCA)		1	Pilot Operated	Stellite 6B	ASME SA240 – Type 316	ASME SA479 – Type 316	2.0	2500	680

ADD

EC-14765

Notes:

1. All valves have body nozzles that are Class 2500 capable. Only the nozzle bores and weld end preparations vary with changes in nominal size per MR526-6040-22-3 section 4.0.

Table II

Comparison of Non-Metallic Parts

Part Name	Valve V526-6040-22 Part Number	Valve V526-6180-1 Part Number	Valve V526-6042-1A Part Number
Coil-Shell Assembly	V52653-6042-1	V52653-6042-1	V52653-6042-1
Switch Assembly	S1140-6-1 & S1140-6-5	S1140-6-1	S1140-6-1
Terminal block	S1140-14-6 & S1140-14-7	S1140-14-6 & S1140-14-7	S1140-14-6 & S1140-14-7
Leadwire (QDC/ECSA)	V135-245 (Part of QDC/ECSA)	V135-227 (Part of QDC/ECSA)	S1140-36-14 (Part of QDC/ECSA)
Electrical Connection Seal	N/A	N/A	S101BD25
Leadwire (Bracket Terminal Block Assembly)	S1349-2	S1349-2	S1349-2
Leadwire (Switch Assembly)	S1517-2	S1517-2	S1517-2
O-Ring (Cover to Housing)	S101CS156	S101CS156	S101CS156 ^{Note 1}
O-Ring (Housing to Coil Shell)	S101CS156	S101CS156	N/A
Packing / O-Ring (Coil Shell to Bonnet)	S1140-49-1 & S1140-49-2	S1140-49-1 & S1140-49-2	S1140-49-1 & S1140-49-2 ^{Note 1}
Seal (Body to Bonnet)	V52618-6102-12 (K-Seal)	V52618-6102-12 (K-Seal)	Seal Weld
Seal	Metallic Disc/Seal	Metallic Disc/Seal	Metallic Disc/Seal

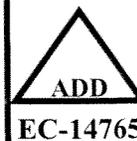
Part Name	Valve V526-6040-22 Part Number	Valve V526-6180-1 Part Number	Valve V526-6042-1A Part Number
Zener Diode	N/A	S1140-9-1	S1140-9-1
Rectifier	N/A	N/A	S1140-8-1
Heat Shrink Tubing (Switch Assembly)	S1318-5 & S1318-3	S1318-5 & S1318-3	S1318-5 & S1318-3
Protective Tubing (Switch Assembly)	S1325-2	S1325-2	S1325-2

Notes:

1. Per QR 526-6042-1A, the P/N V52600-6042-1A qualification test valves were modified to change: 1) the o-ring compounds from EPR to silicone, and 2) the o-ring seal at the solenoid/bonnet interface was replaced by a graphite seal. The o-ring material and graphite seal changes were made based upon thermal test data.

The basis for similarity is discussed below:

- The coil shell assemblies, P/N V52653-6042-1, used in the construction of the Valcor solenoid valves model V526-6040-22 installed at W3 for RC Loops 1 & 2 SDC Pressure Equalization / Containment Isolation Lines (SI ISV4052A & SI ISV4052B) are identical to the tested Valcor Solenoid Valve Model V526-6180-1 (See Ref. i - Section 4.1). As can be seen from Table II above, non metallic materials used in the solenoid construction of the above two valves including the Terminal Block, Leadwire (Bracket Terminal Block Assembly / Switch Assembly), O-Ring (Cover to Housing / Housing to Coil Shell, Heat Shrink and Protective Tubing are all identical between the two SOV valves.
- The differences in the solenoid valves include four position indicating switches in the model V526-6040-22 to two switches in the tested model V526-6180-1, however the switches are the same part number, P/N S1140-6-1. The valve installed at Waterford 3 has a P/N S1140-6-5 switch assembly, which is made of the same material as the S1140-6-1, only has a different sensitivity. The electrical connections are both made by EGS (QualTech NP) with similar materials (See Ref. i – Sections 3.1 and 4.1.1). A zener diode which is not applicable in the model V526-6040-22 was included in the Thermal Aging Testing and LOCA testing test valves. The electrical portion was tested and qualified per Ref. h and the above noted differences will have no affect on qualification.
- The metallic materials of construction are not affected by thermal aging or radiation exposure, however they can be affected by LOCA chemical spray and saturated steam environments if they are not inherently corrosion resistant. The ASME SA-516 Grade 70 Body on the model V526-6180-1 has been coated to prevent corrosion. The only other metallic item exposed to LOCA environment is the solenoid coil shell that is gray iron plated with nickel on both the tested and Waterford 3 installed valves. The materials on the model V526-6180-1 valve successfully completed LOCA test without incurring any corrosion on any metallic components (See Ref. i – Section 4.1.1.1). The electrical portion was tested and qualified per Ref. h and metallic differences will have no affect on qualification.
- The assemblies of the tested and installed Waterford 3 valves are similar except variations in size and seal disc configuration, which is due to flow, temperature and pressure ratings as shown in Table I above. The model V526-6040-22 is designed as Normally Closed while the tested model V526-6180-1



is Normally Open. The design and fabrication of both assemblies are in accordance with the requirements of the ASME Boiler and Pressure Vessel Code Section III. The variation in nominal size and Normally Open/Closed configurations have a negligible effect on seismic qualification since only the bore of the body nozzle varies with the change in nominal size. Both valves have body nozzle diameters that are suitable for a Pressure temperature rating of Class 2500. However, the bore is defined depending on the nominal size required (See Ref. i - Section 4.2.3).

- A detailed similarity evaluation was performed by Valcor (Ref. h & i).

Conclusion

- The material, design and construction between the Valcor V526-6040-22 and the V526-6180-1 and V526-60402-1A are similar as indicated in reports MR526-6040-22-3 and QR526-6180-1-1. The differences in valve body materials, valve size, valve rating or flow capacity are metallic differences only. This will have no affect on qualification.
- The Waterford 3 combined normal plus accident radiation environment is 3.331E+7 gamma (see Section II) and Valcor radiation aged successfully the solenoid valves to 9.36E+7 gamma with no anomalies and no degradation noted, therefore the valves have demonstrated a qualification level of 2.81 times above the requirement.
- The solenoid assembly and O-ring seals are of the same materials and method of manufacture as the solenoid assemblies and o-ring seals qualified for 40 years in QR526-6180-1-1. Other seals have identical metallic materials which are unaffected by thermal and radiation aging.
- Valcor successfully cycled the valves 8,289 times during thermal aging which significantly exceeds the 1 cycle every 18 month requirement while entering shutdown cooling (See Ref. i - Section 4.2.4).
- Based on qualification test reports QR 526-6180-1-1, QR 526-6042-1, similarities presented in MR 526-6040-22 and discussion above, the following SOV is qualified for service at Waterford 3 in SDC lines (SI-4052A & SI-4052B).

Model No.	Part No.	EMDRAC Dwg
V526-6040-22	214167301	5817-13985 sh1

- The qualified life on the valve subassembly (V52660-6040-22) is 40 years. The qualified life of the valve solenoid assembly (V105-394-21-14) is 40 years with the exception of the O-rings. The qualified life of the Solenoid Assembly O-rings is 10 years.

Temperature Service Condition – (SI ISV4052A & SI ISV4052B)

Normally de-energized (NCFCND) inside RCB with fluid (water) = 300°F



Comp ID	Status	Fluid	External	Internal
SI ISV4052A	DEEN	WATER	120°F / 414°F	300°F / 400°F
SI ISV4052B	DEEN	WATER	120°F / 414°F	300°F / 400°F

These two SOVs are located in the RCB and are normally closed in the de-energized position. These SOVs create a bypass around the valve SI-405A(B) to minimize the void formed during the operation cycle downstream of SI-405A(B) before SI-405A(B) is opened during shutdown cooling operation. The valves will also function as containment isolation.

The new solenoid valve, SI-4052A(B), will be opened for approximately 7 minutes before opening SI-405A(B). This sequence will allow RCS water from upstream of SI-405A(B) to compress the void between SI-405A(B) and SI-407A(B) before SI-405A(B) is opened; thus minimizing a pressure transient when SI-405A(B) is opened.

Based on a conservative energization time of 24 hours every 18 months, the following energized percentage times can be calculated:

- Valve de-energized - 99.8%
- Valve energized – 0.2%

Since the model V526-6040-22 is a pilot-operated SOV which uses the process fluid to assist in valve positioning, its coil generates less heat than equivalently sized direct-acting SOVs. The valve is a hard-seated solenoid valve with position indication. During normal plant operation the valve will be de-energized (no voltage applied to the solenoid) and the main seal, consisting of a disc assembly, which seals against a metal seat in the body isolates the outlet port from the inlet port. Since the valves are infrequently energized and for short periods of time, no significant self heating will occur.

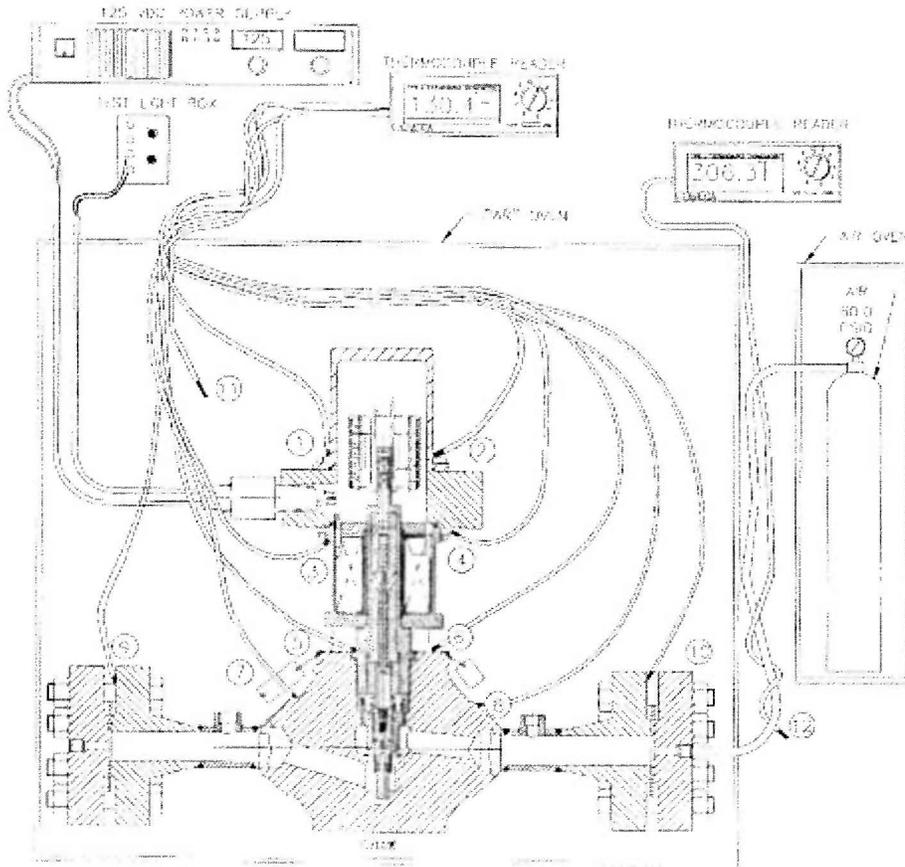
Valcor has calculated a coil temperature of 318°F based on a heat rise of 12°F as indicated during a heat rise test performed (QR526-6180-1-1 Appendix 'D'). The valve was continuously energized with 125 VDC, operated in an ambient temperature of 130°F and supplied with a fluid (water) temperature of 306°F. A conservative service temperature (solenoid coil temperature) of 400°F (including 350°F SDC temperature + heat rise + additional margin) is used to calculate qualified life while the valve is energized based on shutdown cooling entry temperature of 350°F plus 12°F heat rise plus 10% margin. DC-powered solenoid valves may experience higher voltage when the station batteries are being maintained or charged. Float voltage levels are typically around 132 VDC and the equalizing voltage can be as high as 140 VDC for a 125 VDC system. Increasing the voltage increases the current drawn by the coil, which creates additional ohmic heating. This effect is considered in the margin included for the service temperature.

During periods while SI-4052A(B) will be closed (de-energized) and isolated from the RCS during normal plant operations, the service temperature is conservatively assumed to be 300°F. This temperature was

chosen based on containment ambient temperature of 120°F plus some allowance for some minor seat leakage through SI-401A(B).

The service temperature of the elastomers, O-rings being the life limiting component, (Dwg. 214167301 items 27 and 43) is calculated based on thermocouple temperatures that were recorded during the heat rise test and shown below in Figure "A". The service temperatures for the O-rings are much lower based on the elastomer location within the valve and the thermal conduction paths from the coil. The locations are depicted below as thermocouple locations 1-4. A conservative service temperature chosen for the O-rings is 240°F while the valve is open and 180°F while the valve is closed.

Figure A: Heat Rise Test Thermocouple Position and Final Temperatures



Thermocouple	1	2	3	4	5	6	7	8	9	10	11	12
Celsius (°C)	75.6	78.2	76.3	82.3	90.1	92.6	58.4	58.2	51.6	55.0	34.3	152.39
Fahrenheit (°F)	159.08	172.76	169.34	180.14	194.18	198.68	137.12	136.76	130.28	131.00	133.78	306.3

QR 526 6180-1-1
Appendix D
Sheet D1-2

QUALIFIED LIFE CALCULATION

Item Description: V526-6040-22: SI-4052A(B) Solenoid Coil

41

CALCULATION INPUTS

Activation Energy: 2.096

SERVICE CONDITIONS

<u>Service Temperature</u>	<u>Percent of Service Life</u>
400F	0.2%
300F	99.8%

AGING CONDITIONS

<u>Aging Temperature</u>	<u>Aging Time</u>
212.78C	690 Hours

CALCULATION RESULTS: 58.6746 Years

Prepared By: Miguel Santo Date: 12/14/10
Reviewed By: Jacob Choy Date: 12/15/10

ADD
EC-14765

QUALIFIED LIFE CALCULATION

Item Description: V526-6040-22: SI-4052A(B) O-rings

42

CALCULATION INPUTS

Activation Energy: 1.15

SERVICE CONDITIONS

Service Temperature
240F
180F

Percent of Service Life
0.2%
99.8%

AGING CONDITIONS

Aging Temperature
280F

Aging Time
855 Hours

CALCULATION RESULTS: 14.9875 Years

Prepared By: *Miguel Bant*

Date: 12/14/10

Reviewed By: *Just Chyzer*

Date: 12/15/10

ADD
EC-14765

DESIGN/PERFORMANCE

1. FLUID: BORATED WATER
2. DESIGN & OPERATIONAL CONDITIONS:
 - PRIMARY PRESSURE RATING: CLASS 1500 (4032 PSIG AT 100°F)
 - PRESSURE BOUNDARY DESIGN: 2485 PSI AT 850°F
 - NORMAL OPERATIONAL DESIGN: 362 PSI AT 350°F
3. FLOW: $C_v=4.0$ MINIMUM
4. HYDROSTATIC CONDITIONS:
 - SEAL LEAKAGE: ZERO AT 6050 PSIG AT 70°F
 - DISC LEAKAGE: 1.45 CC/MIN. MAX WATER AT 4436 PSIG AT 70°F
5. SOLENOID OPERATOR:
 - COIL INSULATION: CLASS H
 - ENCLOSURE RATING: NEMA 4
 - VOLTAGE: 90-140VDC
 - CURRENT INRUSH: 1.5 AMP MAX. AT 125 VDC & 70°F
 - HOLDING: 1.5 AMP MAX. AT 125 VDC & 70°F
 - DUTY: CONTINUOUS AT 125 VDC MAX.
6. FAILURE POSITION: CLOSED
7. WEIGHT: 70 LBS. MAX.
8. INSTALLATION: HEAT TRANSFER DUE TO IN-LINE WELDING SHALL BE MINIMIZED SUCH THAT MAX. BODY TEMPERATURE WITHIN 1.0" OF WELD SHALL NOT EXCEED 400°F
9. RADIATION ENVIRONMENT:
 - GAMMA INTEGRATED DOSAGE OF 5.1×10^7 RADS
10. CODE COMPLIANCE:
 - ASME SECT. III 1977 EDITION INCLUDING SUMMER 1977 ADDENDA CLASS 1
11. POSITION INDICATION:
 - MAGNETIC REED SWITCH
 - SWITCHING VOLTAGE: 125 VDC OR 125 VAC
 - SWITCHING CURRENT: 0.50 AMPS MAX.
 - SWITCHING CAPABILITY: 60 WATTS MAX.
12. CUSTOMER DOCUMENTS:
 - a) ENTREGY NUCLEAR OPERATIONS, INC.
 - WATERFORD 3 NUCLEAR
 - ENTREGY P.O. NO. 10082568
 - ENTREGY ENGINEERING DESIGN SPEC. NO. L01 1694.110A
 - VALCOR® J/O N183688
 - b) TAG NUMBERS:
 - SI ISV 4052A
 - SI ISV 4052B

10 LEADWIRES, 360° LONG MIN. 18 AWG
ROCKWELTOS FIREWALL III SIS

OWNER IS RESPONSIBLE FOR MAINTAINING THE SEALS, ITEMS 7, 27 & 43 AND FOR SEALING THE CONDUIT CONNECTION AND PREVENTING THE ENTRANCE OF MOISTURE THRU THE CONDUIT TO MAINTAIN THE VALIDITY OF THE TEST-SEE QUALIFICATION AND THE REQUIREMENTS OF THE NEMA 4 ENCLOSURE.

REVISIONS			
ECO	LTR	DESCRIPTION	DATE APPROVED
77	A	PREPARED FOR APPROVAL	

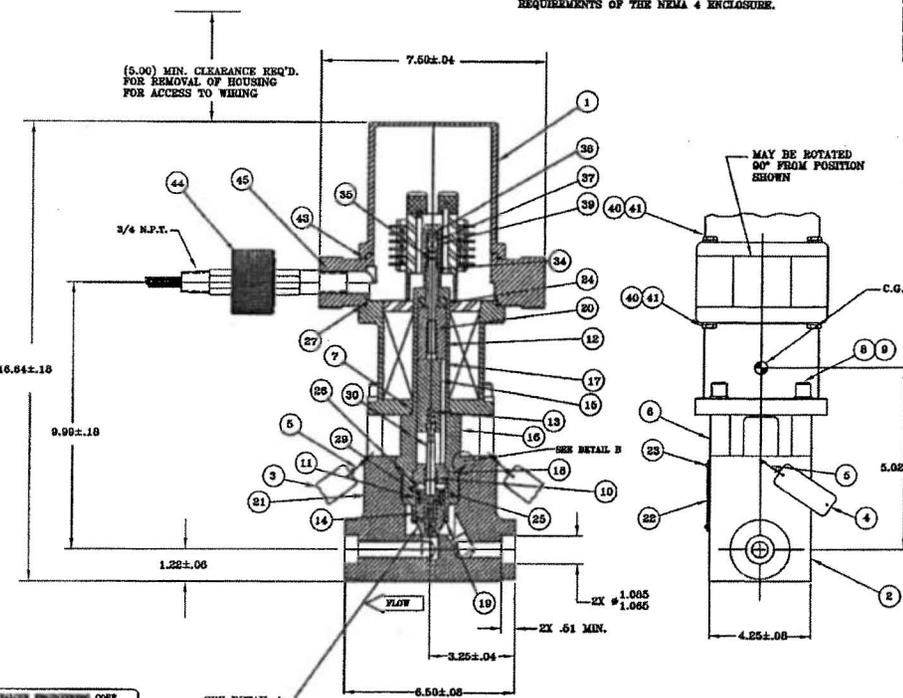
FOR REFERENCE ONLY

SEP 14 2010

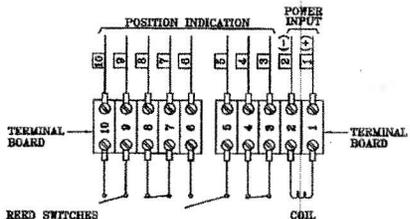
5817-13985 SH.1

* PRESSURE RETAINING PARTS

ITEM	DESCRIPTION	MATERIAL
45	P-1 THERMAL SEALANT	
44	COMPRESSOR BBS (QDC)	
43	O-RING	SILICONE
42	X-SEAL	INCONEL X-700
41	LOCKWASHER	300 SERIES ST. STL.
40	SCREW, SEC. HD.	300 SERIES ST. STL.
39	CUP	ASTM A560 TYPE 316
38	SEAL	STELLITE 60
37	WASHER	HEMCO 10
36	FLANG	ASTM A560 TYPE 316
35	SPRING PIN	INCONEL X-700
34	ROD	ASTM A276 TYPE 316
33	HELICOLL	300 SERIES ST. STL.
32	POPPET	ASTM A276 TYPE 316
31	SEAL	STELLITE 60
30	ROD	ASTM A276 TYPE 316
29	HELICOLL	300 SERIES ST. STL.
28	DISC	ASME SA-470 TYPE 316
27	O-RING	SILICONE
26	SPRING PLAT HD.	ASTM A276 TYPE 316
25	SPRING	ASTM A276 TYPE 316
24	SCREW, DRIVER	300 SERIES ST. STL.
23	NAMEPLATE	302 OR 304 ST. STL.
22	BODY	ASME SA-182 GRADE F316
21	WASHER (SPRING)	ELGILOY
19	SPRING (FLANGER)	ASTM A478 TYPE S21900
18	SPRING	ASTM A276 TYPE 316
17	PISTON	ASTM A560 TYPE 316
16	WASHER	ASME SA-470 TYPE XM-19
15	FLANGER	430/VALCOR STD. SISI
14	SPRING RING	410 ST. STL.
13	SPRING (FLANGER)	ELGILOY
12	SPRING	430/VALCOR STD. SISI
11	SPRING (DISC)	300 SERIES ST. STL.
10	SCREW, CAP. SEC. HD.	300 SERIES ST. STL.
9	LOCKWASHER	300 SERIES ST. STL.
8	SPACER	300 SERIES ST. STL.
7	LOCKWASHER	300/304 ST. STL.
6	WASHER YAG	300 SERIES ST. STL.
5	WELD CAUTION TAG	300 SERIES ST. STL.
4	WASHER YAG	300 SERIES ST. STL.
3	WASHER YAG	300 SERIES ST. STL.
2	WASHER YAG	300 SERIES ST. STL.
1	WASHER YAG	300 SERIES ST. STL.



10 PIN EGS QDC



ELECTRICAL SCHEMATIC
SHOWN WITH VALVE IN
THE CLOSED POSITION

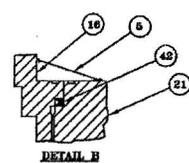
VALVE ENGINEERING CORP.
TYPE 4
-14
SOLENOID NAMEPLATE INFO.

CAUTION
DO NOT WELD BEHIND THIS TAG
UNLESS YOU KNOW THE SIZE & TYPE OF WELD
WELD CAUTION TAG
INFORMATION

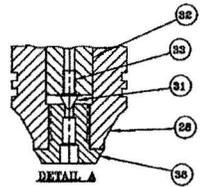
VALVE TAG NUMBER
AS APPLICABLE
PER J/O
VALVE TAG INFORMATION

CERTIFIED BY
VALCOR ENG. CORP.
2485 PSI AT 650°F
P/N 214167301
2" N
R1624
4032 PSI AT 180°F
ASME SA182-F316
3/4" SCHD 168
CLASS 1500
RC.
VALCOR

NAMEPLATE INFORMATION



DETAIL B



DETAIL A

CANDIDATE VALVE

NUCLEAR HARDWARE

WARNING: This document contains technical data whose export is restricted by the Arms Export Control Act (Title 22, U.S.C., Sec. 2051, et seq.) or the Export Administration Act of 1979, as amended. This 22, U.S.C. App. 2481, et seq. Violation of these export laws are subject to severe criminal penalties.

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MR526-6040-22-3
APPENDIX II
SHEET AII-1

SIGNATURES	DATE	VALCOR ENGINEERING CORPORATION	D.C.
H. KARCH	7/21/10	VALVE, SOLENOID, POSITION IN, NUCLEAR SERVICE	
		3/4" SCHD 160 CLASS 1500	
		VALVE, SOLENOID, POSITION IN, NUCLEAR SERVICE	
		REL: V526-6040-22	N.C.
		DWG. NO. & PART NO.	
		214167301	
		NO. 7006-1136	SHT 1 OF 1

V.10

ADD
EC-14765

DESIGN/PERFORMANCE DATA:

SEE SHEET 2

KCSA FIELD WIRING:
7 CONDUCTORS, 3 METERS (10 FEET) LONG
MIN. LENGTH: 1 AWG BUCKING/FIREWALL SR
(SILICONS) ELECTRICAL WIRING (200°C RATED)

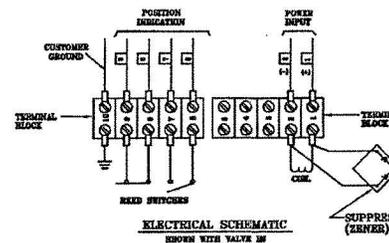
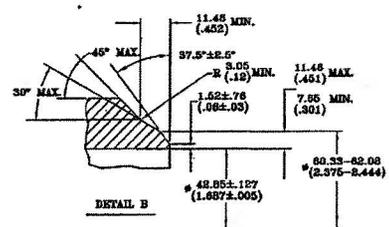
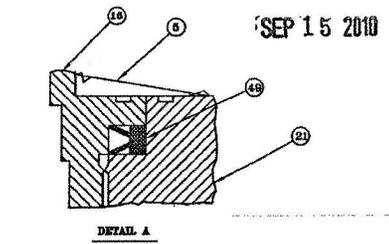
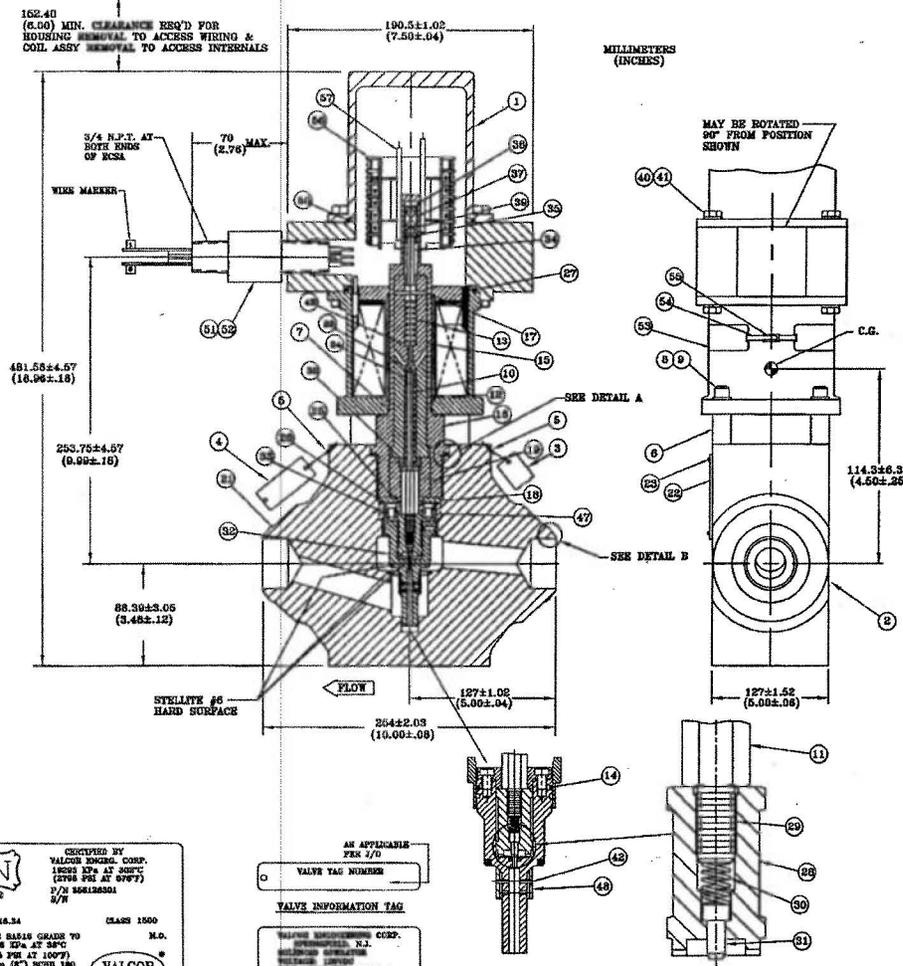
OWNER IS RESPONSIBLE FOR MAINTAINING
THE SEALS, ITEMS 7, 27 & 50 AND THE KCSA
TO ENSURING SEAL TO MAINTAIN THE VALIDITY
OF THE IEEE-383 QUALIFICATION AND THE
REQUIREMENTS OF THE NEMA 4 ENCLOSURE.

*PRESSURE RETAINING PARTS
S=SAFETY RELATED (CLASS S)
N=NON-SAFETY RELATED (CLASS C)

FOR REFERENCE ONLY

SEP 15 2010

REVISIONS			
ECO	LTR	DESCRIPTION	DATE APPROVED
77	A	PRELIMINARY FOR APPROVAL	
4470M	B*	REVISIONS TO MAX. CLEARANCE REQ'D FOR HOUSING REMOVAL TO ACCESS WIRING & COIL ASSY REMOVAL TO ACCESS INTERNALS	
48363	D	REV SHEET 1 FOR REVISED DESIGN	



ITEM	DESCRIPTION	MATERIAL
57	HEAD SWITCH	ALUMINUM, KVOXY FINISH
58	TERMINAL BLOCK	BLACK PULVERULE, TYPE 88 ST. STL
59	BUCKLE	CR80 EDI
60	WASHER	CR80 EDI
61	NAMEPLATE, SOLENOID	303/304 ST. STL. PER QQ-8-768
62	P-1 THERMAD SEALANT	3M, TABLE 3
63	ELECTRICAL CONDUIT SEAL ASSY (SEAL)	TABLE 2
64	O-RING	SILICONE (PARKEER 8904-70)
65	K-SEAL	INCONEL X-760
66	WASHER	ASTM A478 TYPE 318
67	WASHER	ASTM A478 GR. UNS1800
68	SPRING (SHOWN) (SHOWN)	ALUMINUM, KVOXY FINISH
69	SPRING PIN	ASTM A478 TYPE 318
70	LOCKWASHER	INCONEL X-760
71	LOCKWASHER	303/304 ST. STL. UNS 1800/1800
72	WASHER	303/304 ST. STL.
73	CUP	ASTM A478 TYPE 318
74	SPACER	ASTM A478 TYPE 318
75	WASHER	303/304 ST. STL.
76	PIG	ASTM A478 TYPE 318
77	SPRING PIN	INCONEL X-760
78	WASHER	ASTM A478 TYPE 318
79	WASHER	303/304 ST. STL. AMS 7840
80	DISC	ASTM A478 TYPE 318
81	SEAL	STELLITE 60
82	SPRING	HELLOY
83	WASHER	303/304 ST. STL. AMS 7840
84	POFFET	ASTM A478 TYPE 318
85	O-RING	PARKEER (PARKEER 8904-70)
86	SCREW, CAP. SOC. HD.	303/304 ST. STL. AMS 7840
87	PLATE	ASTM A478 TYPE 318
88	WASHER	303/304 ST. STL. AMS 7840
89	WASHER	303/304 ST. STL.
90	NAMEPLATE	303/304 ST. STL. PER QQ-8-768
91	BODY (PAINT PER 81425)	ASTM A478 TYPE 318
92	SPACER	ASTM A478 TYPE 318
93	WASHER	ASTM A478 TYPE 318
94	WASHER	ASTM A478 TYPE 318
95	SPRING PIN	INCONEL X-760
96	PISTON	1025/1140 TYPM 318
97	PISTON	430/VALCOR STD. 8181/QQ-8-785
98	PISTON	410 ST. STL./AMS 6818
99	PISTON	HELLOY
100	STOP	440/VALCOR STD. 8181/QQ-8-785
101	STOP	ASTM A478/A479 TYPE 318
102	STOP	HELLOY
103	SCREW, CAP. SOC. HD.	303/304 ST. STL. ASTM F543
104	LOCKWASHER	303/304 ST. STL. UNS 1800/1800
105	WASHER	303/304 ST. STL.
106	LOCKWASHER	303/304 ST. STL. PER QQ-8-423
107	WASHER	303/304 ST. STL. PER QQ-8-768
108	WASHER	303/304 ST. STL. PER QQ-8-768
109	WASHER	303/304 ST. STL. PER QQ-8-768
110	WASHER	303/304 ST. STL. PER QQ-8-768
111	SOLENOID ASSY	SEE TABLE 1

CLASSIFIED BY
VALCOR ENGR. CORP.
18028 12A AT 303°C
(2748 PSI AT 510°F)
S/N 86182801
S/N

CLASS 1800

ASME B31.4 GRADE 70
3000 PSI AT 30°C
(5176 PSI AT 100°F)
50000 (8" SCED 180)

VALCOR

AS APPLICABLE
PER 3/0

VALVE TAG NUMBER

VALVE INFORMATION TAG

VALVE IDENTIFICATION CORP.
VALVE IDENTIFICATION CORP.
VALVE IDENTIFICATION CORP.
VALVE IDENTIFICATION CORP.
TYPE 4
7/7 788-88-00-28

NAMEPLATE INFORMATION (ITEM 22)

SOLENOID NAMEPLATE INFO. (ITEM 55)

PARENT VALVE

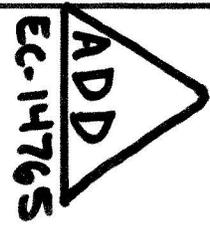
NUCLEAR HARDWARE

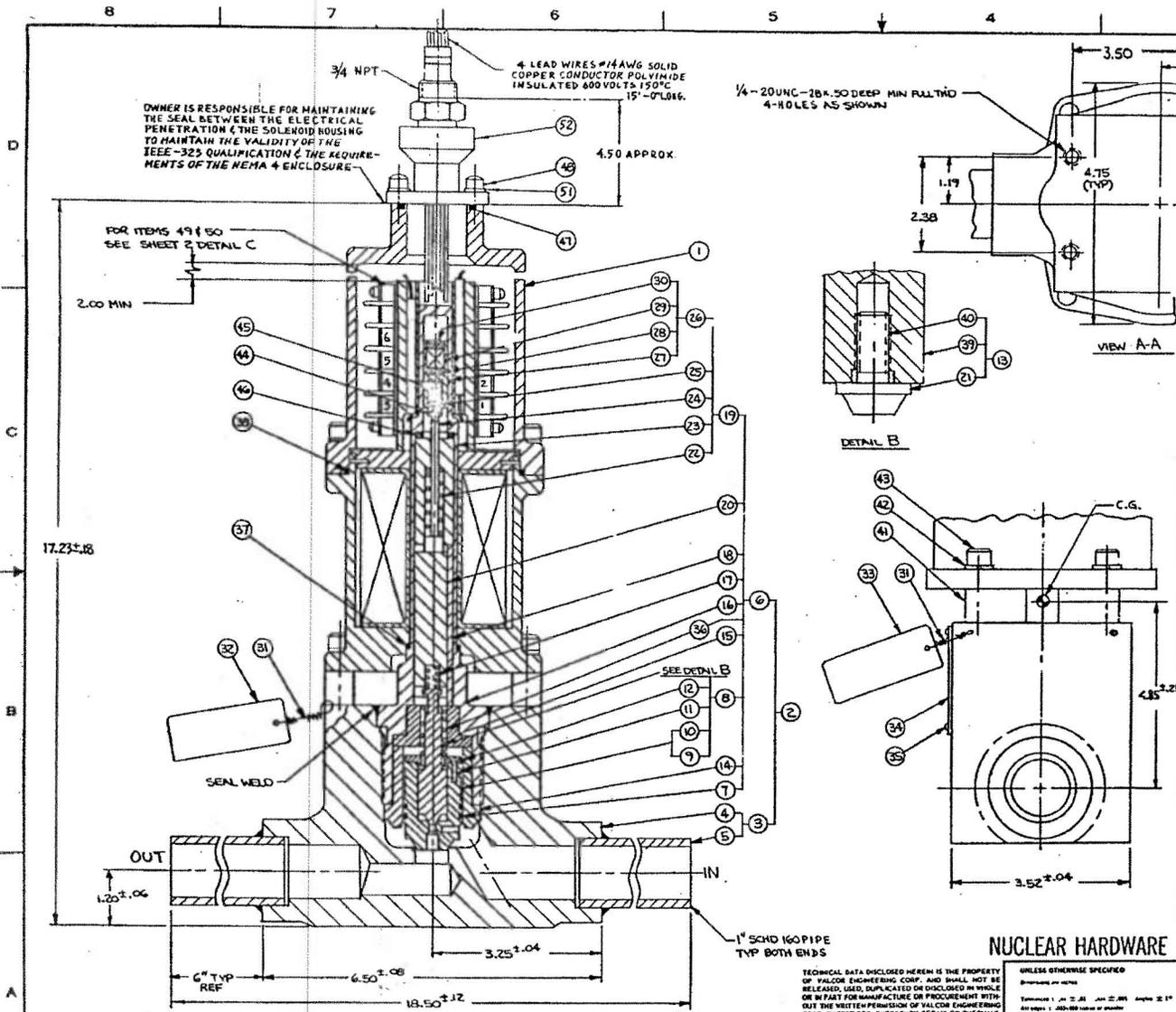
PURCHASER'S DRAWING NO.
62-3876-06-02025 0001

MR526-6040-22-3
APPENDIX II
SHEET AII-2

SIGNATURES	DATE	LIST OF MATERIALS
B. LARSON	8/27/09	VALCOR ENGINEERING CORPORATION SPRINGFIELD, NEW JERSEY
D. KARCH	7/10/09	60mm (2") SCED 180 CLASS 1500 N.O. VALVE, SOLENOID, POSITION INDICATION, NUCLEAR SERVICE
J. YEGIA	7/28/09	D.C. MODEL: Y526-6180-1 KCSA
M. PALMER	7/28/09	SIZE CODE IDENT. NO. DWG. NO. & PART NO.
J. YONGA FOR R.W. MATTHEW	7/28/09	D 96487 356136301
S.A. J. BROWN	7/28/09	SCALE -/- [COMP. NO. 7000-0078-0] SHI 1/8

V. II





OWNER IS RESPONSIBLE FOR MAINTAINING THE SEAL BETWEEN THE ELECTRICAL PENETRATION & THE SOLENOID HOUSING TO MAINTAIN THE VALIDITY OF THE IEEE-325 QUALIFICATION & THE REQUIREMENTS OF THE NEMA 4 ENCLOSURE

FOR ITEMS 49 & 50 SEE SHEET 2 DETAIL C

1/4" - 20 UNC - 28 x .30 DEEP MIN FULL THD 4 HOLES AS SHOWN

view A-A

DETAIL B

NUCLEAR HARDWARE

TECHNICAL DATA DISCLOSED HEREIN IS THE PROPERTY OF VALCOR ENGINEERING CORP. AND SHALL NOT BE RELEASED, USED, DUPLICATED OR DISCLOSED IN WHOLE OR IN PART FOR MANUFACTURE OR PROCUREMENT WITHIN THE UNITED STATES OF AMERICA BY ANY PERSON OR ENTITY, EXCEPT FOR EMERGENCY REPAIR OR OVERHAUL WORK, WHERE THE ITEM OR PROCESS CONCERNED IS NOT PERFORMANCE OF THE WORK PROVIDED THAT RELEASE, USE, DUPLICATION, AND DISCLOSURE HEREOF SHALL BE SUBJECT TO THE FOREGOING LIMITATION. THIS LEGEND SHALL BE MAILED ON ANY REPRODUCTION HEREOF IN WHOLE OR IN PART

UNLESS OTHERWISE SPECIFIED
Dimension in inches
Tolerances: 1. All 2. All 3. All 4. All 5. All 6. All 7. All 8. All 9. All 10. All 11. All 12. All 13. All 14. All 15. All 16. All 17. All 18. All 19. All 20. All 21. All 22. All 23. All 24. All 25. All 26. All 27. All 28. All 29. All 30. All 31. All 32. All 33. All 34. All 35. All 36. All 37. All 38. All 39. All 40. All 41. All 42. All 43. All 44. All 45. All 46. All 47. All 48. All 49. All 50. All 51. All 52. All 53. All 54. All 55. All 56. All 57. All 58. All 59. All 60. All 61. All 62. All 63. All 64. All 65. All 66. All 67. All 68. All 69. All 70. All 71. All 72. All 73. All 74. All 75. All 76. All 77. All 78. All 79. All 80. All 81. All 82. All 83. All 84. All 85. All 86. All 87. All 88. All 89. All 90. All 91. All 92. All 93. All 94. All 95. All 96. All 97. All 98. All 99. All 100. All 101. All 102. All 103. All 104. All 105. All 106. All 107. All 108. All 109. All 110. All 111. All 112. All 113. All 114. All 115. All 116. All 117. All 118. All 119. All 120. All 121. All 122. All 123. All 124. All 125. All 126. All 127. All 128. All 129. All 130. All 131. All 132. All 133. All 134. All 135. All 136. All 137. All 138. All 139. All 140. All 141. All 142. All 143. All 144. All 145. All 146. All 147. All 148. All 149. All 150. All 151. All 152. All 153. All 154. All 155. All 156. All 157. All 158. All 159. All 160. All 161. All 162. All 163. All 164. All 165. All 166. All 167. All 168. All 169. All 170. All 171. All 172. All 173. All 174. All 175. All 176. All 177. All 178. All 179. All 180. All 181. All 182. All 183. All 184. All 185. All 186. All 187. All 188. All 189. All 190. All 191. All 192. All 193. All 194. All 195. All 196. All 197. All 198. All 199. All 200. All 201. All 202. All 203. All 204. All 205. All 206. All 207. All 208. All 209. All 210. All 211. All 212. All 213. All 214. All 215. All 216. All 217. All 218. All 219. All 220. All 221. All 222. All 223. All 224. All 225. All 226. All 227. All 228. All 229. All 230. All 231. All 232. All 233. 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All 345. All 346. All 347. All 348. All 349. All 350. All 351. All 352. All 353. All 354. All 355. All 356. All 357. All 358. All 359. All 360. All 361. All 362. All 363. All 364. All 365. All 366. All 367. All 368. All 369. All 370. All 371. All 372. All 373. All 374. All 375. All 376. All 377. All 378. All 379. All 380. All 381. All 382. All 383. All 384. All 385. All 386. All 387. All 388. All 389. All 390. All 391. All 392. All 393. All 394. All 395. All 396. All 397. All 398. All 399. All 400. All 401. All 402. All 403. All 404. All 405. All 406. All 407. All 408. All 409. All 410. All 411. All 412. All 413. All 414. All 415. All 416. All 417. All 418. All 419. All 420. All 421. All 422. All 423. All 424. All 425. All 426. All 427. All 428. All 429. All 430. All 431. All 432. All 433. All 434. All 435. All 436. All 437. All 438. All 439. All 440. All 441. All 442. All 443. All 444. All 445. All 446. All 447. All 448. All 449. All 450. All 451. All 452. All 453. All 454. All 455. 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All 567. All 568. All 569. All 570. All 571. All 572. All 573. All 574. All 575. All 576. All 577. All 578. All 579. All 580. All 581. All 582. All 583. All 584. All 585. All 586. All 587. All 588. All 589. All 590. All 591. All 592. All 593. All 594. All 595. All 596. All 597. All 598. All 599. All 600. All 601. All 602. All 603. All 604. All 605. All 606. All 607. All 608. All 609. All 610. All 611. All 612. All 613. All 614. All 615. All 616. All 617. All 618. All 619. All 620. All 621. All 622. All 623. All 624. All 625. All 626. All 627. All 628. All 629. All 630. All 631. All 632. All 633. All 634. All 635. All 636. All 637. All 638. All 639. All 640. All 641. All 642. All 643. All 644. All 645. All 646. All 647. All 648. All 649. All 650. All 651. All 652. All 653. All 654. All 655. All 656. All 657. All 658. All 659. All 660. All 661. All 662. All 663. All 664. All 665. All 666. All 667. All 668. All 669. All 670. All 671. All 672. All 673. All 674. All 675. All 676. All 677. All 678. All 679. All 680. All 681. All 682. All 683. All 684. All 685. All 686. All 687. All 688. All 689. All 690. All 691. All 692. All 693. All 694. All 695. All 696. All 697. All 698. All 699. All 700. All 701. All 702. All 703. All 704. All 705. All 706. All 707. All 708. All 709. All 710. All 711. All 712. All 713. All 714. All 715. All 716. All 717. All 718. All 719. All 720. All 721. All 722. All 723. All 724. All 725. All 726. All 727. All 728. All 729. All 730. All 731. All 732. All 733. All 734. All 735. All 736. All 737. All 738. All 739. All 740. All 741. All 742. All 743. All 744. All 745. All 746. All 747. All 748. All 749. All 750. All 751. All 752. All 753. All 754. All 755. All 756. All 757. All 758. All 759. All 760. All 761. All 762. All 763. All 764. All 765. All 766. All 767. All 768. All 769. All 770. All 771. All 772. All 773. All 774. All 775. All 776. All 777. All 778. All 779. All 780. All 781. All 782. All 783. All 784. All 785. All 786. All 787. All 788. All 789. All 790. All 791. All 792. All 793. All 794. All 795. All 796. All 797. All 798. All 799. All 800. All 801. All 802. All 803. All 804. All 805. All 806. All 807. All 808. All 809. All 810. All 811. All 812. All 813. All 814. All 815. All 816. All 817. All 818. All 819. All 820. All 821. All 822. All 823. All 824. All 825. All 826. All 827. All 828. All 829. All 830. All 831. All 832. All 833. All 834. All 835. All 836. All 837. All 838. All 839. All 840. All 841. All 842. All 843. All 844. All 845. All 846. All 847. All 848. All 849. All 850. All 851. All 852. All 853. All 854. All 855. All 856. All 857. All 858. All 859. All 860. All 861. All 862. All 863. All 864. All 865. All 866. All 867. All 868. All 869. All 870. All 871. All 872. All 873. All 874. All 875. All 876. All 877. All 878. All 879. All 880. All 881. All 882. All 883. All 884. All 885. All 886. All 887. All 888. All 889. All 890. All 891. All 892. All 893. All 894. All 895. All 896. All 897. All 898. All 899. All 900. All 901. All 902. All 903. All 904. All 905. All 906. All 907. All 908. All 909. All 910. All 911. All 912. All 913. All 914. All 915. All 916. All 917. All 918. All 919. All 920. All 921. All 922. All 923. All 924. All 925. All 926. All 927. All 928. All 929. All 930. All 931. All 932. All 933. All 934. All 935. All 936. All 937. All 938. All 939. All 940. All 941. All 942. All 943. All 944. All 945. All 946. All 947. All 948. All 949. All 950. All 951. All 952. All 953. All 954. All 955. All 956. All 957. All 958. All 959. All 960. All 961. All 962. All 963. All 964. All 965. All 966. All 967. All 968. All 969. All 970. All 971. All 972. All 973. All 974. All 975. All 976. All 977. All 978. All 979. All 980. All 981. All 982. All 983. All 984. All 985. All 986. All 987. All 988. All 989. All 990. All 991. All 992. All 993. All 994. All 995. All 996. All 997. All 998. All 999. All 1000.

STANDARDIZED NUCLEAR UNIT POWER PLANT SYSTEM
PARENT VALVE

TAG NUMBERS
0-53-HV-3
0-53-HV-4
0-53-HV-5
0-53-HV-12
0-53-HV-128

REV	DATE	DESCRIPTION	BY	APP
REV A	11-26-76	OWNER'S DESIGN APPROVED	S.L. KATZ	
REV B	12-22-76	REVISIONS: NO CHANGE	H. REINHOLDS	
REV C	12-22-76	REVISED ELECTRICAL SCHEMATIC; 4 LEAD WIRES; 18 GA. COPPER CONDUCTOR POLYIMIDE INSULATED 600 VOLTS 150°C; 15'-0" L.O.D.	H. REINHOLDS	
REV D	12-22-76	REVISED ELECTRICAL SCHEMATIC; 4 LEAD WIRES; 18 GA. COPPER CONDUCTOR POLYIMIDE INSULATED 600 VOLTS 150°C; 15'-0" L.O.D.	H. REINHOLDS	
REV E	12-22-76	REVISED ELECTRICAL SCHEMATIC; 4 LEAD WIRES; 18 GA. COPPER CONDUCTOR POLYIMIDE INSULATED 600 VOLTS 150°C; 15'-0" L.O.D.	H. REINHOLDS	

FOR REFERENCE ONLY
SEP 16 2010

ITEM	PART NO.	DESCRIPTION	MATERIAL	FINISH
52	SI140-34-14	CONDUCTOR SEAL ASSY	CONAX CORP	
51	MS 35337-81	LOCKWASHER	302 ST. STL.	
50	VS175-529	RECTIFIER ASSY		
49	VS175-529	ZENER ASSY		
48	SS1F1018	SCREW	300 SERIES STL	
47	SI01025	O-RING	EPR	
46	VS175-504	SPACER	ASTM A216 TYPE 316	PASSIVATE
45	VS175-510	SPRING PIN	420 SS	PASSIVATE
44	VS175-510	COIL PLATE	CRS 300 S.S. 316	PASSIVATE
43	VS175-510	SCREW SOCKET HD. CAP	300 SERIES SS	PASSIVATE
42	MS3537-81	LOCKWASHER	302 OR 316	PASSIVATE
41	VS175-510	SPACER	300 SERIES SS	PASSIVATE
40	VS175-510	HELI-COIL	300 SERIES SS	PASSIVATE
39	VS175-510	POPET	CRS 300 S.S. 316	PASSIVATE
38	VS175-510	O-RING	EPR	
37	VS175-510	O-RING	EPR	
36	VS175-510	SPRING	CRS 300 S.S. 316	PASSIVATE
35	VS175-510	SCREW DRIVE	CRS 300 S.S. 316	PASSIVATE
34	VS175-510	NAMEPLATE	CRS 300 S.S. 316	PASSIVATE
33	VS175-510	INSTRUMENT IDENT. TAG	CRS 300 S.S. 316	PASSIVATE
32	VS175-510	WELD ON IDENT. TAG	CRS 300 S.S. 316	PASSIVATE
31	VS175-510	POPET	CRS 300 S.S. 316	PASSIVATE
30	VS175-510	PLATE	CRS 300 S.S. 316	PASSIVATE
29	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
28	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
27	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
26	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
25	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
24	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
23	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
22	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
21	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
20	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
19	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
18	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
17	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
16	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
15	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
14	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
13	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
12	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
11	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
10	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
9	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
8	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
7	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
6	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
5	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
4	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
3	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
2	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
1	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE

ITEM	PART NO.	DESCRIPTION	MATERIAL	FINISH
52	SI140-34-14	CONDUCTOR SEAL ASSY	CONAX CORP	
51	MS 35337-81	LOCKWASHER	302 ST. STL.	
50	VS175-529	RECTIFIER ASSY		
49	VS175-529	ZENER ASSY		
48	SS1F1018	SCREW	300 SERIES STL	
47	SI01025	O-RING	EPR	
46	VS175-504	SPACER	ASTM A216 TYPE 316	PASSIVATE
45	VS175-510	SPRING PIN	420 SS	PASSIVATE
44	VS175-510	COIL PLATE	CRS 300 S.S. 316	PASSIVATE
43	VS175-510	SCREW SOCKET HD. CAP	300 SERIES SS	PASSIVATE
42	MS3537-81	LOCKWASHER	302 OR 316	PASSIVATE
41	VS175-510	SPACER	300 SERIES SS	PASSIVATE
40	VS175-510	HELI-COIL	300 SERIES SS	PASSIVATE
39	VS175-510	POPET	CRS 300 S.S. 316	PASSIVATE
38	VS175-510	O-RING	EPR	
37	VS175-510	O-RING	EPR	
36	VS175-510	SPRING	CRS 300 S.S. 316	PASSIVATE
35	VS175-510	SCREW DRIVE	CRS 300 S.S. 316	PASSIVATE
34	VS175-510	NAMEPLATE	CRS 300 S.S. 316	PASSIVATE
33	VS175-510	INSTRUMENT IDENT. TAG	CRS 300 S.S. 316	PASSIVATE
32	VS175-510	WELD ON IDENT. TAG	CRS 300 S.S. 316	PASSIVATE
31	VS175-510	POPET	CRS 300 S.S. 316	PASSIVATE
30	VS175-510	PLATE	CRS 300 S.S. 316	PASSIVATE
29	VS175-510	FLANG	CRS 300 S.S. 316	PASSIVATE
28				

FIGURE 4a: LOCA/MSLB Comparision Profiles (Reference F: Report QR526-6042-1A)
Reference Calculation EC-S90-014-R01

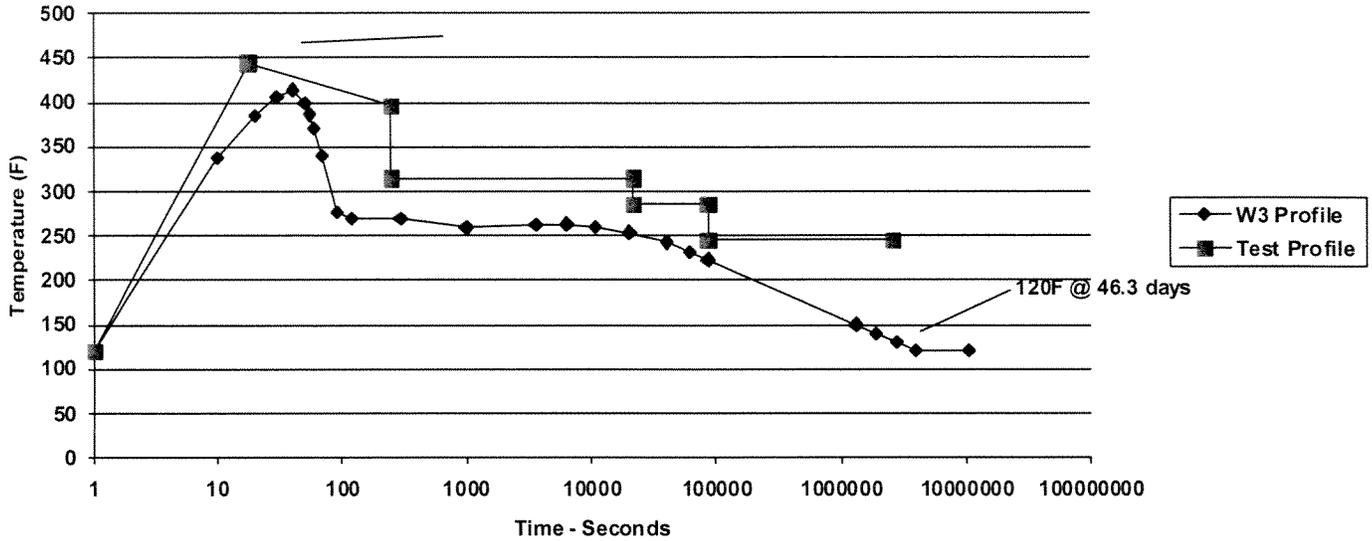


FIGURE 4b: LOCA/MSLB Comparision Profiles (Reference F: Report QR526-6042-1A)

