

TEST REPORT

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RENDERED TO

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 The AREVA logo features a stylized red letter 'A' above the word "AREVA" in red, sans-serif font.	AREVA NP Inc.
	58-9224203-000

PRODUCTS EVALUATED: Quantum Silicones QSil 5558MC Silicone Elastomer

EVALUATION PROPERTY: Fire and Pressure Resistance (Fire-Pressure Test 1)

Report of Testing various fire stop systems when exposed to the fire and positive pressure conditions of ASTM E814-94b Standard Test Method for Fire Tests of Penetration Firestop Systems, and in accordance with AREVA NP Inc. Document No. 51-9208264-000, Detailed Test Plan for Conducting MOX Fire-Pressure Test 1.

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1 Table of Contents

ITEM	PAGE
1 Table of Contents	2
2 Introduction	3
3 Test Samples	3
4 Testing and Evaluation Methods	4
5 Testing and Evaluation Results	15
6 Conclusions	17
Appendices	
Appendix A: Assembly Drawings	19
Appendix B: Thermocouple Layout	27
Appendix C1: Temperature Data	30
Appendix C2: Pressure Data	36
Appendix D1: Photographs - Fire	55
Appendix D2: Photographs - Pressure	66
Appendix E: Test Plan	76
Appendix F: Commercial Grade Dedication-Related Documents	109
Appendix G: Quality Documents	111
Revision Summary / Last Page of Report	132

2 Introduction

Intertek Testing Services NA (Intertek) has conducted testing for AREVA NP Inc., on the fire and pressure resistance capabilities of Quantum Silicones QSil 5558MC Silicone Elastomer (QSil 558MC) through a 12" thick concrete deck, for compliance with the applicable requirements of and in accordance with AREVA NP Inc. Document No. 51-9208264-000, *Detailed Test Plan for Conducting MOX Fire-Pressure Test 1*. This test took place on December 10, 2013.

This project was undertaken to evaluate the ability of select penetration seal designs to withstand various pressure levels after being subjected to a fire exposure (fire test).

NOTE: The test assembly used in this fire-pressure test was the same test assembly that was constructed and tested in Pressure Test 5A without any changes. Refer to AREVA Doc. 58-9224198-000 or Intertek Test Report No. 101276459SAT-010 for details on Pressure Test 5A.

3 Test Samples

3.1. SAMPLE SELECTION

The sealant materials were not independently selected for testing; they were supplied by AREVA NP Inc., and were received in two shipments, June 19 and October 4, 2013, respectively. The samples were received with Certificates of Conformance and are considered traceable. Basic information on sealant materials is presented in the table below.

Sealant Material	Lot /Batch#	Expiration Date
QSil 5558 MC	130606	6/14/2014
QSil 5558 MC	130912	9/30/2014

Information regarding receiving dates and origin of all the materials in the assembly can be found in Appendix F: Quality Documents of Pressure Test 5A (Intertek Test Report 101276459SAT-010; AREVA document 58-9224201-000). All samples were received in good condition at the Evaluation Center.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The test assembly for Fire-Pressure Test 1 was first tested as Pressure Test 5A, and then tested again as Seismic Pressure Test 2A, before finally being repurposed for Fire-Pressure Test 1.

A detailed description and drawings of the concrete deck and penetrations can be found in AREVA NP Inc. Document No. 51-9208264-000, *Detailed Test Plan for Conducting MOX Fire-Pressure Test 1* which is contained in Appendix E. The installation and documentation of penetration seal assemblies contained within the test slab was performed by AREVA under AREVA's Quality Assurance Program (Reference 12.3 in the test plan found in Appendix E).

The opening sealed and tested in Fire-Pressure Test 1 was a 48" x 34" blockout containing nine different cable types as penetrating items. The penetrating items for this blockout included the

following items found in Shaw AREVA MOX Services Drawings DCS01-ZMJ-DS-NTE-N-65107-2 Sheets 84-116, “*Technical Engineering Information*” [Test Plan Reference 12.10]:

- (1) 0.32” diameter cable with 15 mil CSPE jacket, product mark no. wfb-7
- (1) 0.50” diameter cable with 45 mil CSPE jacket, product mark no. wfa-1
- (1) 1.54” diameter cable with 80 mil CSPE jacket, product mark no. wfa-13
- (1) 0.248” diameter cable with 15 mil XLPE jacket, product mark no. whe-2
- (1) 0.33” diameter cable with 60 mil XLPE jacket, product mark no. wbe-1
- (1) 0.25” diameter cable with 7 mil Modified XLPO jacket, product mark no. whe-8
- (1) 0.44” diameter cable with 9 mil Modified XLPO jacket, product mark no. wbh-1
- (1) 0.53” diameter cable with 35 mil LSZH - XLPO jacket, product mark no. wfa-26
- (1) 1.02” diameter cable with 65 mil LSZH - XLPO jacket, product mark no. wfe-6

The cables penetrated through the opening, made a “u” shaped bend on one side of the seal and penetrated through the opening again. In effect the cables were looped with both ends of each cable terminating on the same side of the opening and forming a “u” shape through the seal. Using this configuration prevented any pressure leakage due to air travel through the cables.

The opening was sealed with an eight (8) inch thick Quantum Silicones QSil 5558MC Silicone Elastomer (QSil 5558MC) penetration seal with no permanent damming installed around the various penetrating commodities.

Additionally, an approximate 2-1/2” diameter hole was bored through the seal and then repaired (resealed) using QSil 5558MC material to simulate a field repair of the penetration seal.

4 Testing and Evaluation Methods

Fire-pressure tests are unique in that a fire-pressure test consists of two separate tests; a modified fire test, followed by a pressure test.

The Test Plan in Appendix E defines the test methods, acceptance criteria and test report documentation requirements for conducting MOX Fire-Pressure Test 1. Additionally, this detailed test plan defines the roles and responsibilities of MOX Services, AREVA, the selected testing laboratory, and any other subcontracted entity engaged in support of fire-pressure testing efforts.

The detailed test plan also describes the procurement plan for materials associated with Fire-Pressure Test 1 and identifies the entities responsible for procuring the various components of the test assemblies based on the quality level assigned to each component.

The Test Plan also establishes minimum quality requirements for the penetration seal materials used in the test assemblies and links quality requirements in the AREVA QA program to customer/project quality requirements.

4.1. INSTRUMENTATION FOR FIRE TESTING

Six (6) 24 GA, Type K, fiberglass jacketed thermocouples were as depicted on the drawings contained in Appendix B. The output of the thermocouples was monitored by a 300-channel Yokogawa, Inc., Darwin Data Acquisition Unit. The computer was programmed to save data every 30 seconds. Following the test, those files were imported into MS Excel for tabular and graphical display (presented in Appendix C1).

4.2. TEST STANDARD FOR FIRE TESTING

ASTM E814-94b, Standard Test Method for Fire Tests of Through-Penetration Fire Stops

The test was conducted in accordance with an older version of the standard, per the client's request. The acceptance criteria identified in ASTM E814-94b, Standard Test Method for Fire Tests of Through-Penetration Fire Stops are identified below.

A fire stop (penetration seal) shall be considered as meeting the requirements for an F-rating when it remains in the opening during the fire test and hose stream test within the following limitations:

- a) The fire stops (penetration seals) shall have withstood the fire test for the rating period without permitting the passage of flame through openings, or the occurrence of flaming on any element of the unexposed side of the fire stops (penetration seals)
- b) During the hose stream test, the fire stops (penetration seals) shall not develop any opening that would permit a projection of water from the stream beyond the unexposed side.

4.2.1 Deviation from Standard Method

Engineering thermocouples were installed on each fire stop system generally in accordance with the test standard, but not in all cases. Therefore, thermocouple data is presented for information purposes and was not used to determine compliance for T-ratings.

The test plan did not require a hose stream test, so none was conducted. As such, F-ratings were not applicable for this test.

4.3. TEST APPARATUS FOR PRESSURE TESTING

In the absence of any consensus codes or standards related to the pressure testing of penetration seal assemblies, the MOX Penetration Seal Program has developed a standardized method for conducting pressure testing of MOX penetration seal designs. In support of this effort, Intertek assisted in the design and construction of a pressure test apparatus to be use in the conduct of MOX penetration seal pressure tests.

The pressure chamber apparatus consists of two hemispherical 72" diameter steel pressure vessels, calibrated equipment and a data acquisition system. The apparatus accurately maintains the desired air pressure, using one of two sensitive, manually adjustable pressure regulators; a

high (0-15 psi) and a low (0-2 psi) range. The sealed collection chamber feeds any leakage air back to the test device, where it is channeled through one of two calibrated flow meters, once again, a high (0-200 L/min) and a low (0-20 L/min) range. A calibrated electronic pressure transducer (0-5 psi) measures the differential pressure between the two chambers and the data acquisition software determines the net pressure drop across the test seal and the leakage through the seal. The chambers are interchangeable and the direction can be reversed very quickly so both can serve as the pressure or the collection chamber.

The primary components described above include the following devices:

Pressure Chamber	2-piece hemispherical 72" diameter steel vessel
	3 connection ports per piece
	16 flange attachment points per piece
	Flange attachment via 3/8" diameter holes @ 22-1/2° spacing



Pressure Cart	Stainless steel rolling cart with control equipment and associated Data Acquisition System
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Regulator (low) Control Air, Inc., Amherst, NH
Type 700
0-2 psi

Regulator (high) Control Air, Inc., Amherst, NH
Type 700
0-15 psi



Mass Flow Meter Omega Engineering, Inc., Stamford, CT
Model No. FMA-872A-V-NIST
Serial No. 4270050001001
0-20 lpm



Mass Flow Meter Omega Engineering, Inc., Stamford, CT
Model No. FMA-875A-V-NIST
Serial No. 4270050003001
0-200 lpm



Pressure Transducer Omegadyne Inc., Sunbury, OH
Model No. PX409-005 DWUV
Serial No. 406707
Pressure Range: 0-5 psi
Input 0-100mVdc



Power Supply Omega Engineering, Inc., Stamford, CT

Model No. PSS-10

+10V @ 400 mA

Input 115 VAC

50/60 Hz

Multifunction DAQ

National Instruments,

Model No. NI USB-6210

16 Input, 16-bit, 250 kS/s, Multifunction I/O

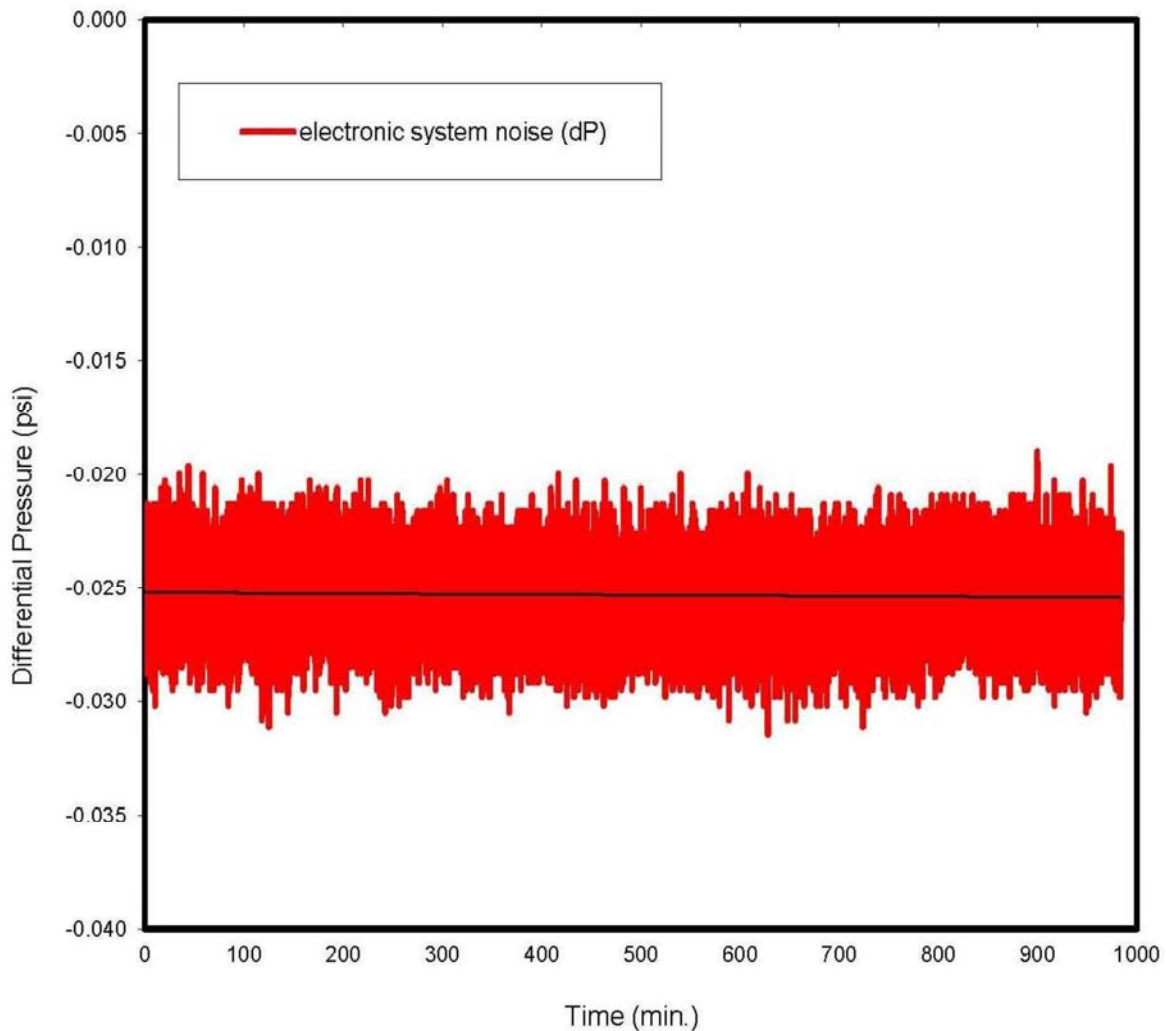


Dedicated CPU HP Compaq Pro-6300 Microtower
Serial No. MXL3090LN6
OS Windows 7 Pro



During initial system start-up testing and verification, it was discovered that the data acquisition system (DAQ) was so sensitive that “signal noise” resulted in data fluctuations for reported differential pressure even when the system was at equilibrium (i.e., both high side and low side pressure chambers were at atmospheric conditions). After collecting data for 16 hours overnight, the average fluctuation was -0.025 psi.

16-hr Average Electronic Noise (dP = -0.0253 psi)



For this test, the Test Plan required pressure was applied and maintained using the DAQ reported differential pressure without consideration for any “signal noise”. Since the “signal noise” always reported some level of negative pressure at the beginning of the test, this method assured that the tests were conducted with additional margin, as the actual differential pressure that the test specimen was subjected to was equal to the DAQ reported differential pressure plus the additional pressure needed to overcome the negative “signal noise” reported at the beginning of the test when both pressure chambers were at atmospheric conditions.

4.4. TEST STANDARD FOR PRESSURE TESTING

AREVA NP Inc. Document No. 51-9208264-000, *Detailed Test Plan for Conducting MOX Fire-Pressure Test 1.*

The requirements for fire rated penetration seals are discussed in DCS01-BRA-DS-TRD-B-01365-0, *Technical Requirements Document for MFFF Penetration Seals* [Test Plan Reference 12.5]. These requirements include the need for fire barrier penetration seals to be F-rated, commensurate with the hourly rating of the fire barrier in which they are installed. Additionally, these requirements also discuss the need for fire barrier penetration seals to withstand different forms of pressure concurrent with a fire (i.e., fire induced pressures and pressures from clean agent system discharge).

The MOX qualification strategy for concurrent fire and pressure conditions was to fire test penetration seals following consensus codes and standards committed to by the MOX project (ASTM E 814-94b [Test Plan Reference 12.9]), while invoking the “standard pressure condition” from standard test method ASTM E 814-94b for maintaining furnace pressure (i.e., furnace pressure at 0.01 in. wg greater than the pressure on the unexposed side of the test assembly).

Separate penetration seal assemblies will be pressure tested using detailed test plans for conducting pressure tests.

Finally, some additional test assemblies, such as the assembly to be tested under this Test Plan, underwent a limited duration fire test (30 minute duration) with the fire tested specimens then subjected to subsequent pressure tests.

The results of fire testing, pressure testing and combination limited duration fire tests followed by pressure testing of the same assembly served as the overall qualification for penetration seals required for concurrent fire and pressure conditions.

Based on the above, the specific acceptance criteria to be used for combination fire-pressure testing were as follows:

1. During the limited duration fire endurance portion of the test, the fire stops (penetration seals) shall have withstood the fire test for the limited 30 minute duration without permitting the passage of flame through openings, or the occurrence of flaming on any element of the unexposed side of the fire stops (penetration seals).
2. After the limited duration fire test, any residual flaming on the exposed side of the test assembly shall be extinguished with water. Following flame extinguishment, the fire stops (penetration seals) shall remain in place such that the unexposed side of the penetration remains completely sealed.
3. During the pressure test, the fire stops (penetration seals) are allowed to leak. However, the fire stops (penetration seals) shall remain in place (i.e., shall not become dislodged from the opening or otherwise catastrophically fail).

The anticipated fire-induced differential pressures, as they apply to MFFF penetration seal designs, are discussed in DCS01-BRA-DS-TRD-B-01365-0 [Test Plan Reference 12.5] and in calculation DCS01-ASI-DS-CAL-R-10552 [Test Plan Reference 12.6]. Most areas of the facility

are bounded by a fire induced differential pressure of +/- 7.0 inches w.g. Plant areas with higher fire induced differential pressures are identified in calculation DCS01-ASI-DS-CAL-R-10552 [Test Plan Reference 12.6]. The maximum fire-induced differential pressure in any plant area is -14.7 inches w.g.

The pressure levels specified in the table below are to be used in the pressure test portion of this fire-pressure test. The 10 inch w.g. pressure is intended to bound the +/- 7.0 inches w.g. with margin. The 20 inches w.g. pressure is intended to bound the maximum fire-induced compartment pressure of -14.7 inches w.g. with margin.

A hold time of 5 minutes has been established for each pressure level to ensure that sufficient time at pressure is maintained to; 1) confirm that no leakage occurs at that pressure, or 2) stabilize make up air to maintain the pressure and identify the apparent location of the leak.

Differential Pressure Test Levels

Test Stage	Differential Pressure (inch w.g.)	Required Hold Time (minutes)	Acceptance Criteria	Basis for the Selected Differential Pressure
1	10.0	5	Seal Remains In Place	Testing at this differential pressure bounds the +/- 7.0 inches w.g. pressure used as the screening pressure cutoff for fire induced pressures [Test Plan Reference 12.6].
2	20.0	5	Seal Remains In Place	Testing at this differential pressure bounds the —maximum compartment fire-induced pressure of -14.7 inches w.g. pressure per the fire-induced pressure calculation [Test Plan Reference 12.6].

The test assembly was attached to the pressure test apparatus and subjected to the pressures identified in the above table as described below.

For Test Stages 1 and 2 the side of the test deck applied to the pressure was the same side that was exposed to fire. The pressure was applied as described below.

The test assembly was attached to the pressure test apparatus and subjected to air pressure at the select pressure levels identified in table, beginning with the Stage 1 pressure of 10.0 inches w.g. Once this pressure was obtained, the pressure was maintained for the hold time specified. Any leakage observed during the hold time was noted.

Once the designated hold time had been achieved, the pressure was increased to the next pressure level identified in the table (Stage 2, 20.0 inches w.g.) and held for the designated hold time. Any leakage observed during this hold time was noted.

If at any pressure level (or test stage) the penetration seal became dislodged from the opening or otherwise catastrophically failed, the pressure test was terminated and the time to failure and pressure at which the failure occurred was recorded.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

5.1.1. Fire Test

The test assembly was placed on the laboratory's small-scale (7' x 7') horizontal furnace on December 10, 2013. Scott Groesbeck from AREVA was present to witness the test. The ambient temperature at the start of the test was 54°F, with a relative humidity of 45%.

The furnace was fired at 10:20 a.m. and the standard time/temperature curve in ASTM E814-94b was followed for a period of 30 minutes. After the first 5 minutes, the pressure differential between the inside of the furnace (measured at a point 12" below the concrete slab) and the laboratory ambient air was maintained at a nominal 0.00 inches of water column, which resulted in a positive pressure of 0.01" WC at the bottom of the test slab. Approximately 9 minutes into the test, the concrete began to spall due to trapped steam in the test deck. After the test, it was observed that up to 4" of concrete was lost at the edges of the opening. There was no hose stream test required for this fire-pressure test. However, water was applied with a standard garden hose to extinguish residual flaming as allowed by the test plan. The assembly was allowed to cool for several hours prior to conducting the subsequent pressure test.

Following the fire test, it was observed that the bottom side of the seal had charred to a depth of ~1/2". Additionally, all cable jacket material had been consumed up to the bottom side of the seal, leaving only the copper conductors. The top side of the seal appeared unchanged.

Listings of the furnace control temperatures and specimen unexposed surface temperatures may be found in Appendix C1. Photographic documentation of the test has been included in Appendix D1.

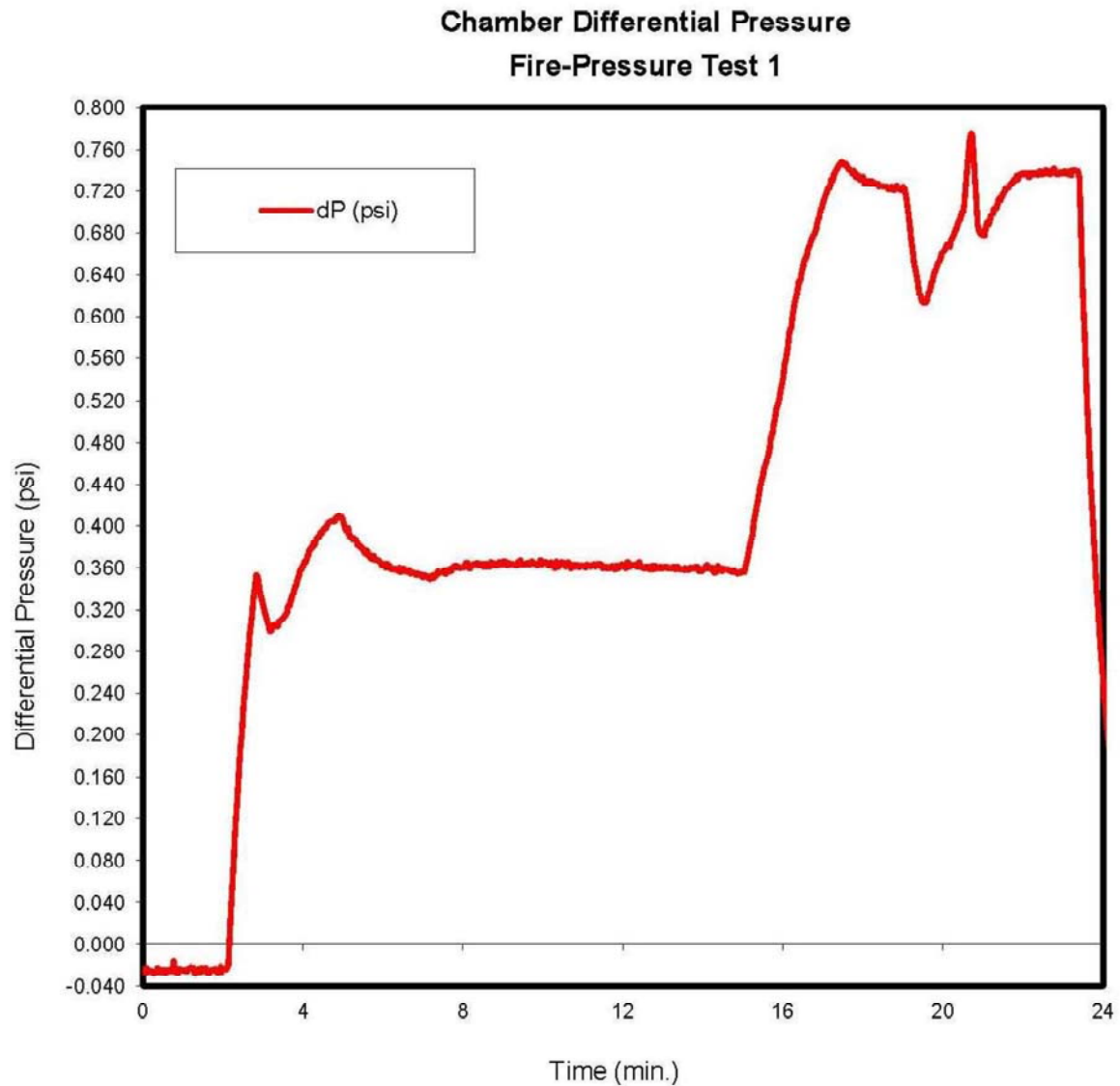
5.1.2. Pressure Test

The test plan stated that the pressure bonnet was to be attached on the side of the test assembly that had been exposed to fire during the fire test. However, due to the excessive amount of concrete spalling during the fire test, it was not possible to attach the pressure bonnet to the exposed side of the test deck. With concurrence from the AREVA Test Engineer, the decision was made to attach the pressure bonnet to the top side (unexposed side) of the test assembly. The deck was fixed to the pressure chamber using (16) 5/16" x 2-1/2" long sleeve anchors (Red Head) through 16 pre-drilled holes. Silicone II caulk (GE) was used to create a pressure tight seal between the pressure chamber and the test deck.

The test was initiated at 4:18 p.m. on December 10, 2014. Scott Groesbeck representing AREVA NP Inc. was present to witness the test. The ambient temperature at the start of the test was 55°F, with a relative humidity of 34%.

The test procedure followed that presented in Section 9.0 of the Test Plan. During both stages of the pressure test, a soapy-water solution was applied to the non-pressurized side of the seal assembly. No leakage was detected. The graph and table on the following page(s) provide a summary of results and observations for the two pressure stages.

Listings of the pressure data may be found in Appendix C2. Photographic documentation of the test has been included in Appendix D2.



Test Results and Observations

Test Stage	Differential Pressure inch w.g. (psi)	Required Hold Time (minutes)	Acceptance Criteria	PASS/ FAIL
1	10 (0.361)	5	Seal Remains In Place	PASS
2	20 (0.723)	5	Seal Remains In Place	PASS

5.1.3. POST TEST EXAMINATION

Following completion of the pressure test, visual post-test examinations were performed. These examinations included, but were not limited to, the following:

- Integrity of seal and conditions on the exposed side of the penetration
 - No visual changes were observed from the conditions noted following the fire test (noted in section 5.1.1).
- Integrity of seal and conditions on the unexposed side of the penetration
 - No visual changes were observed.
- Location of any penetration seal degradation
 - No visual changes were observed from the conditions noted following the fire test (noted in section 5.1.1).
- Condition of seal to barrier interface
 - No visual changes were observed.
- Condition of seal to penetrating item interfaces
 - No visual changes were observed.

6 Conclusion

Intertek Testing Services NA (Intertek) has conducted testing for AREVA NP Inc., on the fire and pressure resistance capabilities of Quantum Silicones QSil 5558MC Silicone Elastomer (QSil 558MC) through a 12" thick concrete deck, for compliance with the applicable requirements of and in accordance with AREVA NP Inc. Document No. 51-9208264-000, *Detailed Test Plan for Conducting MOX Fire-Pressure Test 1*. This evaluation took place on December 10, 2013.

This project was undertaken to evaluate the ability of select penetration seal designs to withstand various pressure levels after being subjected to a fire exposure (fire test).

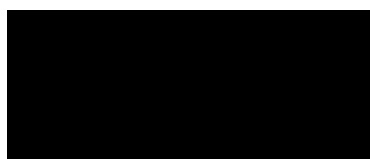
The tested configurations did not burn through when exposed to the fire and positive pressure conditions as outlined in ASTM E814-94b, Standard Test Method for Fire Tests of Through-

Penetration Fire Stops. In addition, The seals met the acceptance criteria (remained in place) through all pressure stages as defined in the Test Plan. These results apply only to the configurations and materials tested.

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK TESTING SERVICES NA

Reported by:



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Staff Engineer

Reviewed by:



Joseph Zatopek
Engineering Team Leader, Fire Resistance

Reviewed by:



Michael A. Brown
Quality Supervisor

APPENDIX A

Assembly Drawings

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

APPENDIX A: TEST DECK/TEST SLAB DRAWINGS

The test deck (test slab) for Fire-Pressure Test 1 is depicted on page A-2.

Page A-1

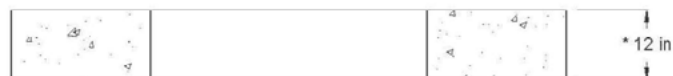
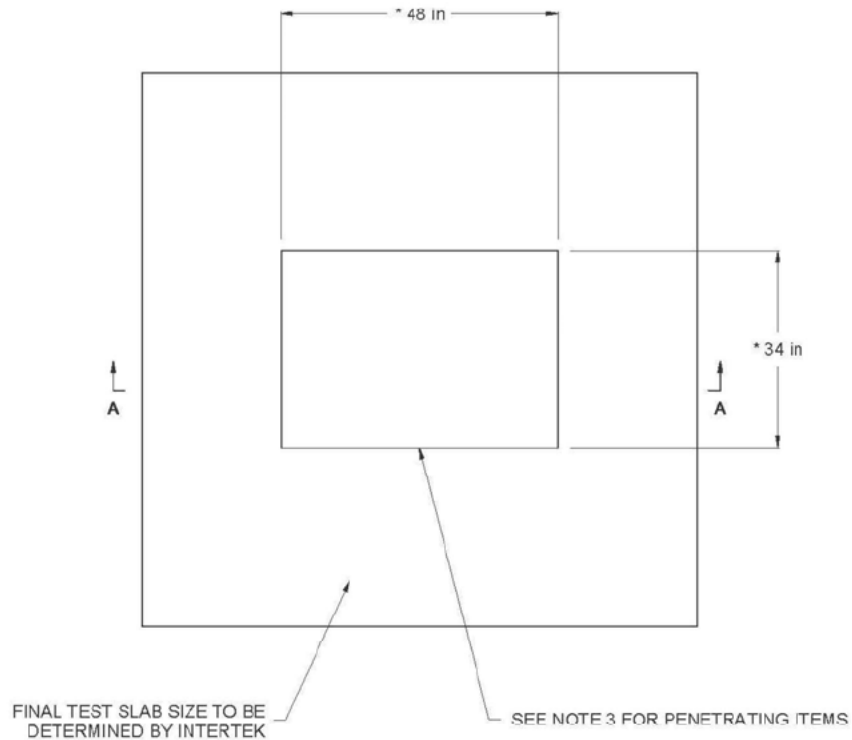
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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Fire-Pressure Test 1 Test Deck



SECTION A-A

NOTES:

1. TOLERANCE ON ALL SLAB DIMENSIONS IS $\pm 1/4"$
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC (OR APPROVED DESIGNER).
3. SEE APPENDIX B FOR PENETRATING ITEMS AND PENETRATION SEAL DESIGN.

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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

APPENDIX B: TEST PENETRATION DRAWINGS

This appendix contains drawings for Test Penetrants C1 thru C9. These drawings identify penetrating cable locations within the test penetration, as well as, the penetration seal design. Table B1 of this appendix provides the cable types to be used in each location.

Page B-1



Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Technical drawing of a bridge deck cross-section. The total width is 48.00 in. The deck is divided into lanes C1 through C9. The width of each lane is 5.00 in. The total width of the lanes is 45.00 in. The remaining 3.00 in is divided into two 1.50 in sections on either side. The drawing shows a repair made using QSil 5558MC (1 location) and a repair made using QSil 5558MC (1 location). The repair is located in the lane between C8 and C9. The drawing also shows a repair made using QSil 5558MC (1 location) and a repair made using QSil 5558MC (1 location). The repair is located in the lane between C8 and C9. The drawing also shows a repair made using QSil 5558MC (1 location) and a repair made using QSil 5558MC (1 location). The repair is located in the lane between C8 and C9.

Section Views are on
Pages B-3, and B-4.

1. TOLERANCE ON ALL SLAB DIMENSIONS IS +/- 1/4"
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC.
3. REPAIR HOLE IS DEPICTED AS 2" DIAMETER DRILL/CORE BORE, HOWEVER, ACTUAL SIZE AND METHOD OF HOLE CREATION WILL BE DETERMINED AT THE TIME OF INSTALLATION AND NOTED IN THE INSTALLATION RECORDS.

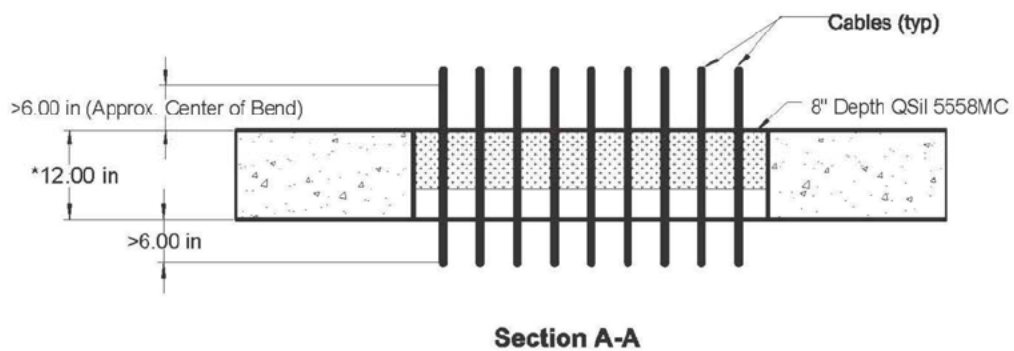
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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Fire-Pressure Test 1



NOTES:

1. TOLERANCE ON ALL SLAB DIMENSIONS IS +/- 1/4"
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC.

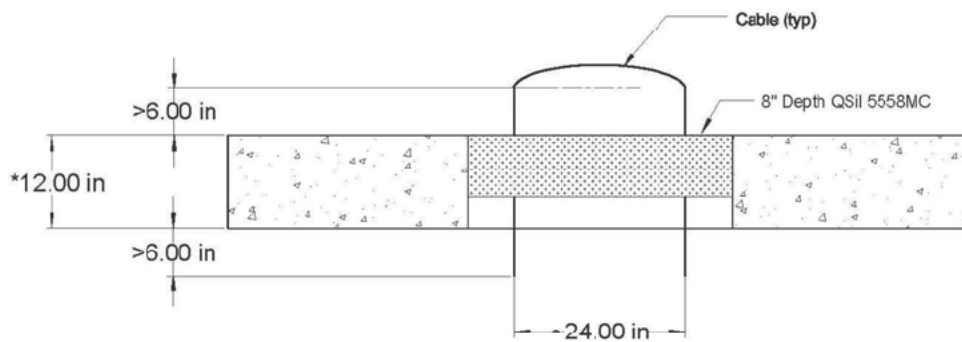
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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Fire-Pressure Test 1



Section B-B

NOTES:

1. TOLERANCE ON ALL SLAB DIMENSIONS IS +/- 1/4"
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Table B-1: Cable Descriptions

Cable Identification	Mark No.	Cable Description
C1	wfb-7	1/C 8 AWG 7/S TC 45 MILS XLPE, 15 MILS CSPE FIREWALL III® 600V
C2	wfa-1	2/C 10 AWG 7/S TC 30 MILS XLPE, 45 MILS CSPE JKT FIREWALL® III 600V
C3	wfa-26	3/C 10 AWG 7/S TC, 20 MILS XLPE, 1 #10 AWG CU GW, O/A TINNED COPPER BRAID SHIELD, 35 MIL ZH-XLPO JKT X-LINK® 600V
C4	whe-2	5/C 22 AWG 7/.010 SILVER PLATED ALLOY 20 MILS XLPE 15 MILS XLPE JACKET 600V
C5	wfe-6	3/C 2 AWG 7/S TC 35 MILS XLPE, 1-#6 AWG CU GW, 65 MIL ZH-XLPO JKT X-LINK® 600V
C6	whe-8	COAX CABLE WITH RG TYPE 59/U, or equal / 22 AWG FOR 62 OHMS (RSS-6-104/LE) Except Not UL Listed & Meets ICEA S-19-81 Paragraph 6.19.6 (IEEE-383 Paragraph 2.56)
C7	wbh-1	Coax Cable 16 AWG for 75 ohms (RSS-6-110A/LE) Excepts meets ICEA S-19-81 paragraph 6.16.6 (IEEE-383 Paragraph 2.56)
C8	wfa-13	37/C 10 AWG 7/S TC 30 MILS XLPE, 80 MIL CSPE JKT FIREWALL® III 600V
C9	wbe-1	1/C 6 AWG 7/S TC Class B Strand 60 MILS XLPE FIREWALL® SIS 600V Type SIS/XHHW-2 (UL) Listed Colored Grey

APPENDIX B

Thermocouple Layout

Thermocouple Layout, Fire-Pressure Test 1

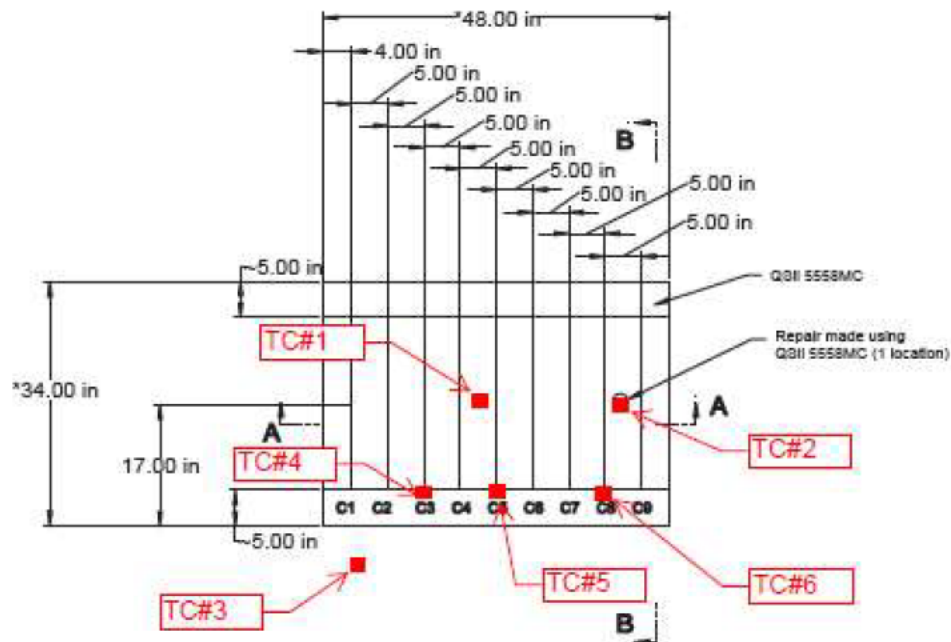
Pen. No.	TC No.	TC Location	Mark No.
SLAB	TC#3	Surface - Test Slab	
Pen 1	TC#1	Surface - QSil 5558MC	
Pen 1	TC#2	Surface - QSil 5558MC (Repaired Area)	
Pen 1	TC#4	Penetrant - 3/C #10 Cable 1" Up	WFA-26
Pen 1	TC#5	Penetrant - 3/C #2 Cable 1" Up	WFE-6
Pen 1	TC#6	Penetrant - 37/C #10 Cable 1" Up	WFA-13



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Fire-Pressure Test 1



Cable descriptions are provided
in Table B-1.

Section Views are on
Pages B-3, and B-4.

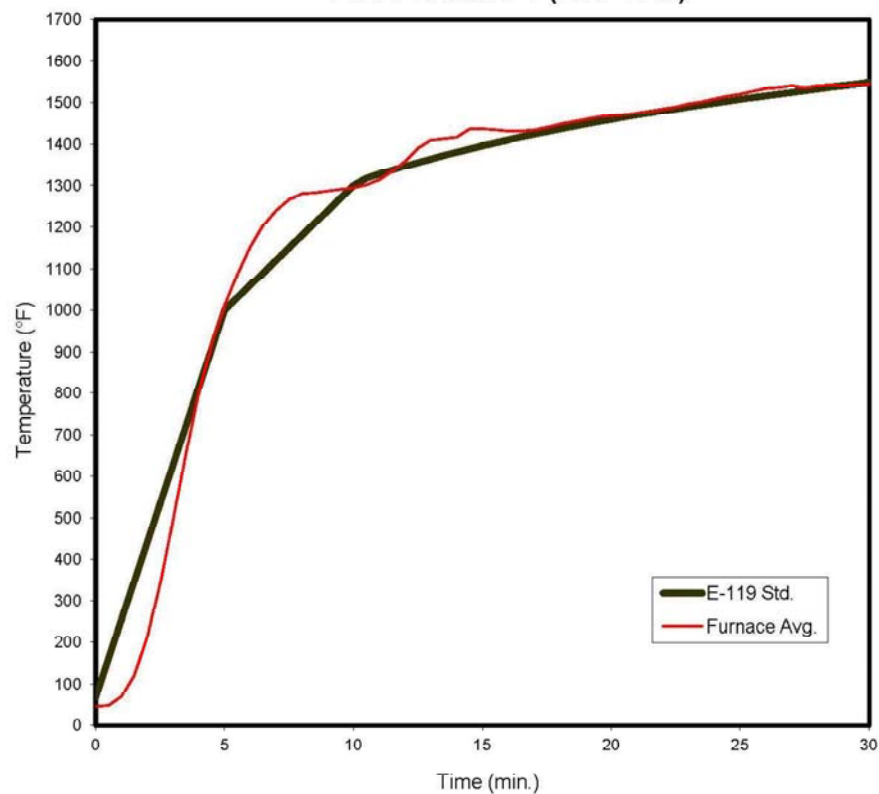
NOTES:

1. TOLERANCE ON ALL SLAB DIMENSIONS IS +/- 1/4"
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC.
3. REPAIR HOLE IS DEPICTED AS 2" DIAMETER DRILL/CORE BORE, HOWEVER, ACTUAL SIZE AND METHOD OF HOLE CREATION WILL BE DETERMINED AT THE TIME OF INSTALLATION AND NOTED IN THE INSTALLATION RECORDS.

APPENDIX C 1

Temperature Data

AREVA NP Inc.
Project No. G101266224SAT-007
Furnace Interior Temperatures
December 10, 2013
Fire-Pressure 1 (Fire Test)



AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	E119 Std Average (°F)	Furnace Average (°F)	Furnace Probe #1 (°F)	Furnace Probe #2 (°F)	Furnace Probe #3 (°F)	Furnace Probe #4 (°F)	Furnace Pressure in. WC	Volt #16 (°F)	TC #1 (°F)	TC #2 (°F)	TC #3 (°F)
0	68	45	45	44	45	44	0.000	2.491	53	55	49
0.5	161	48	47	46	48	50	0.000	2.491	53	55	49
1	254	69	62	57	68	87	0.000	2.488	53	55	49
1.5	348	121	103	89	111	181	0.000	2.485	53	55	49
2	441	212	183	149	179	335	0.000	2.486	53	55	49
2.5	534	340	301	237	272	548	0.000	2.489	53	55	49
3	627	494	462	351	388	776	0.000	2.49	53	55	49
3.5	720	652	644	489	522	953	0.000	2.487	53	55	49
4	814	800	821	635	658	1086	0.000	2.488	53	55	49
4.5	907	920	960	767	777	1174	0.000	2.486	53	55	49
5	1000	1011	1065	872	873	1235	0.000	2.488	53	55	49
5.5	1030	1086	1146	957	956	1286	0.000	2.489	53	55	49
6	1060	1152	1213	1030	1034	1331	0.000	2.491	53	55	49
6.5	1090	1204	1263	1091	1098	1363	0.000	2.49	53	55	49
7	1120	1241	1297	1138	1146	1382	0.000	2.486	53	55	49
7.5	1150	1266	1321	1173	1178	1393	0.000	2.488	53	55	49
8	1180	1280	1331	1195	1198	1396	0.000	2.489	53	55	49
8.5	1210	1282	1335	1206	1208	1380	0.000	2.49	53	55	49
9	1240	1287	1338	1215	1217	1377	0.000	2.483	53	55	49
9.5	1270	1291	1340	1221	1224	1378	0.000	2.486	53	55	49
10	1300	1295	1345	1228	1226	1379	0.000	2.49	53	55	49
10.5	1317	1301	1353	1235	1230	1386	0.000	2.487	53	55	49
11	1328	1314	1366	1245	1241	1402	0.000	2.49	53	55	49
11.5	1337	1334	1383	1265	1263	1423	-0.001	2.493	53	55	49
12	1347	1359	1404	1302	1299	1432	-0.001	2.492	53	55	50
12.5	1356	1390	1430	1345	1334	1452	0.000	2.49	53	55	50
13	1364	1409	1450	1363	1353	1471	0.000	2.488	53	55	50
13.5	1373	1413	1459	1365	1352	1476	0.000	2.486	53	55	50
14	1381	1416	1465	1367	1353	1480	0.000	2.485	53	55	50
14.5	1388	1436	1472	-32767	1352	1484	0.000	2.49	53	55	50
15	1396	1437	1475	-32767	1348	1487	0.000	2.486	53	55	50
15.5	1403	1434	1474	-32767	1344	1484	0.000	2.486	53	55	50
16	1410	1431	1471	-32767	1341	1482	0.000	2.488	53	55	50
16.5	1417	1431	1471	-32767	1342	1481	0.000	2.488	53	55	50
17	1424	1434	1473	-32767	1343	1485	0.000	2.491	53	56	50
17.5	1430	1440	1478	-32767	1348	1494	0.000	2.49	53	55	50
18	1436	1448	1486	-32767	1354	1503	0.000	2.485	54	55	50
18.5	1442	1453	1492	-32767	1360	1508	0.000	2.487	54	55	50
19	1448	1459	1498	-32767	1365	1515	0.000	2.487	54	55	50
19.5	1454	1465	1503	-32767	1370	1523	0.000	2.487	54	56	50
20	1459	1468	1507	-32767	1373	1525	0.000	2.489	54	56	50
20.5	1465	1471	1511	-32767	1374	1528	0.000	2.49	54	56	50

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	E119 Std Average (°F)	Furnace Average (°F)	Furnace	Furnace	Furnace	Furnace	Furnace Pressure in. WC	Volt #16 (°F)	TC #1 (°F)	TC #2 (°F)	TC #3 (°F)
			Probe #1 (°F)	Probe #2 (°F)	Probe #3 (°F)	Probe #4 (°F)					
21	1470	1475	1516	-32767	1375	1534	0.000	2.486	54	56	50
21.5	1475	1479	1521	-32767	1378	1537	0.000	2.486	54	56	50
22	1480	1484	1526	-32767	1384	1542	0.000	2.49	54	56	50
22.5	1485	1490	1531	-32767	1391	1549	0.000	2.491	54	56	50
23	1490	1498	1539	-32767	1398	1556	0.000	2.487	54	56	50
23.5	1495	1503	1542	-32767	1405	1561	-0.001	2.492	54	56	50
24	1499	1509	1548	-32767	1413	1567	0.000	2.489	54	56	50
24.5	1504	1516	1555	-32767	1419	1575	0.000	2.488	54	56	50
25	1508	1521	1558	-32767	1427	1577	0.000	2.486	54	56	50
25.5	1513	1528	1562	-32767	1438	1583	0.000	2.487	54	56	50
26	1517	1534	1568	-32767	1446	1589	0.000	2.482	54	56	50
26.5	1521	1537	1569	-32767	1449	1592	0.000	2.486	54	56	50
27	1525	1541	1572	-310	1455	1595	0.000	2.486	54	56	50
27.5	1529	1536	1570	-32767	1451	1588	0.000	2.487	54	56	50
28	1533	1541	1574	-32767	1450	1598	0.000	2.489	54	56	50
28.5	1537	1542	1577	28	1451	1599	0.000	2.489	54	56	50
29	1541	1541	1574	-12	1452	1596	0.000	2.49	54	56	50
29.5	1545	1543	1574	-32767	1455	1600	0.000	2.486	54	57	50
30	1549	1544	1572	79	1457	1602	-0.001	2.492	55	57	50

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	TC #4 (°F)	TC #5 (°F)	TC #6 (°F)
0	54	55	57
0.5	54	54	56
1	53	54	56
1.5	54	54	56
2	53	55	56
2.5	54	55	56
3	54	55	57
3.5	55	56	57
4	56	57	57
4.5	57	58	57
5	59	60	57
5.5	60	62	57
6	61	63	58
6.5	63	65	59
7	64	67	59
7.5	66	70	60
8	68	72	61
8.5	70	75	62
9	71	78	63
9.5	73	81	64
10	75	85	65
10.5	77	89	66
11	79	93	67
11.5	80	96	69
12	82	100	70
12.5	84	104	71
13	86	108	73
13.5	87	112	75
14	89	117	76
14.5	91	121	78
15	92	126	80
15.5	94	131	81
16	96	136	83
16.5	97	141	85
17	99	146	87
17.5	100	152	90
18	102	159	92
18.5	103	165	94
19	105	171	96
19.5	106	177	99
20	108	181	101
20.5	109	185	104

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	TC #4 (°F)	TC #5 (°F)	TC #6 (°F)
21	110	189	107
21.5	112	192	109
22	113	195	112
22.5	114	199	115
23	116	203	118
23.5	117	207	121
24	118	212	125
24.5	119	216	129
25	121	220	133
25.5	122	224	137
26	123	228	141
26.5	125	232	146
27	126	236	150
27.5	127	239	155
28	128	243	162
28.5	129	246	168
29	130	249	175
29.5	131	253	180
30	132	255	184

APPENDIX C 2

Pressure Data

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
0	-0.0229	0.0095	0.001	0.0105
0.0333	-0.0269	0	0.001	0.001
0.0667	-0.0272	0.0227	0	0.0227
0.1	-0.0223	0	0.001	0.001
0.1333	-0.0262	0	0	0
0.1667	-0.0246	0	0	0
0.2	-0.0249	0	0	0
0.2333	-0.0259	0	0	0
0.2667	-0.0285	0.0227	0	0.0227
0.3	-0.0269	0.0095	0	0.0095
0.3333	-0.0265	0.0095	0.001	0.0105
0.3667	-0.0223	0	0	0
0.4	-0.0265	0	0	0
0.4333	-0.0242	0.0095	0	0.0095
0.4667	-0.0269	0	0	0
0.5	-0.0236	0.0095	0	0.0095
0.5333	-0.0249	0.0095	0	0.0095
0.5667	-0.0275	0	0	0
0.6	-0.0239	0.0227	0.001	0.0237
0.6333	-0.0242	0	0.001	0.001
0.6667	-0.0236	0.0095	0.0023	0.0118
0.7	-0.0259	0	0	0
0.7333	-0.0249	0	0	0
0.7667	-0.0163	0	0	0
0.8	-0.0249	0	0.001	0.001
0.8333	-0.0269	0	0.001	0.001
0.8667	-0.0275	0	0	0
0.9	-0.0226	0	0	0
0.9333	-0.0252	0	0	0
0.9667	-0.0239	0	0.001	0.001
1	-0.0239	0.0095	0	0.0095
1.0333	-0.0242	0	0.001	0.001
1.0667	-0.0259	0	0	0
1.1	-0.0255	0.0095	0	0.0095
1.1333	-0.0232	0	0	0
1.1667	-0.0232	0	0	0
1.2	-0.0216	0.0095	0	0.0095
1.2333	-0.0239	0	0.0023	0.0023
1.2667	-0.0223	0	0.001	0.001
1.3	-0.0279	0	0	0
1.3333	-0.0246	0	0	0
1.3667	-0.0232	0.0095	0.001	0.0105
1.4	-0.0239	0	0.0023	0.0023
1.4333	-0.0262	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
1.4667	-0.0223	0	0	0
1.5	-0.0252	0.0095	0	0.0095
1.5333	-0.0242	0.0095	0.001	0.0105
1.5667	-0.0223	0	0	0
1.6	-0.0272	0	0.001	0.001
1.6333	-0.0249	0	0	0
1.6667	-0.0272	0.0095	0	0.0095
1.7	-0.0236	0	0	0
1.7333	-0.0246	0	0	0
1.7667	-0.0242	0.0095	0.001	0.0105
1.8	-0.0229	0.0095	0	0.0095
1.8333	-0.0252	0	0	0
1.8667	-0.0272	0	0	0
1.9	-0.0246	0	0	0
1.9333	-0.0216	0	0	0
1.9667	-0.0262	0	0.001	0.001
2	-0.0239	0.0095	0	0.0095
2.0333	-0.0232	0.0095	0	0.0095
2.0667	-0.0242	0	0.001	0.001
2.1	-0.0223	0	0	0
2.1333	-0.019	0.0095	0.001	0.0105
2.1667	0.008	0	0	0
2.2	0.0327	0.0227	0	0.0227
2.2333	0.0544	0.0095	0.001	0.0105
2.2667	0.0794	0.0227	0	0.0227
2.3	0.1061	0	0	0
2.3333	0.1239	0	0	0
2.3667	0.1463	0	0	0
2.4	0.1667	0	0	0
2.4333	0.1858	0.0095	0.001	0.0105
2.4667	0.1996	0	0	0
2.5	0.22	0	0	0
2.5333	0.2364	0	0	0
2.5667	0.2503	0	0	0
2.6	0.2667	0	0	0
2.6333	0.2792	0	0	0
2.6667	0.2947	0	0	0
2.7	0.3065	0	0	0
2.7333	0.3177	0	0	0
2.7667	0.3322	0.0095	0	0.0095
2.8	0.3414	0	0	0
2.8333	0.353	0	0	0
2.8667	0.351	0	0	0
2.9	0.3434	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
2.9333	0.3342	0.0095	0	0.0095
2.9667	0.3306	0	0.0023	0.0023
3	0.324	0.0095	0	0.0095
3.0333	0.3197	0	0	0
3.0667	0.3154	0.0095	0.0023	0.0118
3.1	0.3105	0	0	0
3.1333	0.3056	0	0	0
3.1667	0.2996	0	0.001	0.001
3.2	0.299	0.0095	0	0.0095
3.2333	0.3029	0	0.001	0.001
3.2667	0.3036	0.0095	0	0.0095
3.3	0.3062	0	0	0
3.3333	0.3059	0	0	0
3.3667	0.3039	0.0095	0	0.0095
3.4	0.3092	0.0095	0.001	0.0105
3.4333	0.3089	0	0.001	0.001
3.4667	0.3112	0.0095	0	0.0095
3.5	0.3121	0.0095	0.001	0.0105
3.5333	0.3141	0.0095	0	0.0095
3.5667	0.3151	0.0095	0	0.0095
3.6	0.3184	0	0.001	0.001
3.6333	0.3237	0.0095	0.001	0.0105
3.6667	0.324	0	0	0
3.7	0.3296	0.0095	0	0.0095
3.7333	0.3332	0.0095	0	0.0095
3.7667	0.3362	0	0	0
3.8	0.3421	0.0095	0.001	0.0105
3.8333	0.3437	0.0095	0	0.0095
3.8667	0.3483	0.0227	0.0023	0.025
3.9	0.353	0	0.001	0.001
3.9333	0.3582	0.0095	0.001	0.0105
3.9667	0.3592	0	0	0
4	0.3615	0	0.001	0.001
4.0333	0.3655	0	0	0
4.0667	0.3648	0.0095	0	0.0095
4.1	0.3701	0	0.001	0.001
4.1333	0.372	0	0	0
4.1667	0.3767	0	0.001	0.001
4.2	0.3783	0	0	0
4.2333	0.379	0.0095	0	0.0095
4.2667	0.3832	0	0	0
4.3	0.3813	0	0	0
4.3333	0.3882	0	0	0
4.3667	0.3892	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
4.4	0.3895	0	0	0
4.4333	0.3938	0	0	0
4.4667	0.3931	0	0	0
4.5	0.3957	0	0	0
4.5333	0.3974	0	0	0
4.5667	0.3977	0	0	0
4.6	0.3997	0	0	0
4.6333	0.4027	0	0	0
4.6667	0.403	0	0.001	0.001
4.7	0.4043	0.0095	0	0.0095
4.7333	0.4043	0	0	0
4.7667	0.4043	0	0	0
4.8	0.4043	0	0	0
4.8333	0.4079	0.0095	0	0.0095
4.8667	0.4073	0.0095	0.001	0.0105
4.9	0.4099	0	0	0
4.9333	0.4079	0	0.001	0.001
4.9667	0.4079	0	0.001	0.001
5	0.405	0.0095	0	0.0095
5.0333	0.4	0.0095	0	0.0095
5.0667	0.3964	0.0095	0	0.0095
5.1	0.3954	0.0095	0.001	0.0105
5.1333	0.3974	0.0095	0	0.0095
5.1667	0.3901	0.0095	0.001	0.0105
5.2	0.3898	0	0	0
5.2333	0.3865	0	0.001	0.001
5.2667	0.3882	0	0	0
5.3	0.3872	0.0095	0	0.0095
5.3333	0.3862	0	0.001	0.001
5.3667	0.3806	0.0095	0	0.0095
5.4	0.3816	0.0095	0	0.0095
5.4333	0.3799	0	0	0
5.4667	0.3786	0	0	0
5.5	0.3773	0	0.001	0.001
5.5333	0.374	0	0	0
5.5667	0.376	0.0095	0.001	0.0105
5.6	0.3757	0.0095	0	0.0095
5.6333	0.3714	0	0	0
5.6667	0.3717	0	0.001	0.001
5.7	0.3688	0	0	0
5.7333	0.3694	0	0.001	0.001
5.7667	0.3711	0	0	0
5.8	0.3671	0.0095	0	0.0095
5.8333	0.3671	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
5.8667	0.3671	0	0.001	0.001
5.9	0.3668	0	0.001	0.001
5.9333	0.3648	0	0.001	0.001
5.9667	0.3625	0	0	0
6	0.3632	0	0	0
6.0333	0.3638	0	0.001	0.001
6.0667	0.3602	0.0095	0.001	0.0105
6.1	0.3641	0	0.001	0.001
6.1333	0.3622	0	0.001	0.001
6.1667	0.3615	0	0	0
6.2	0.3586	0.0227	0.001	0.0237
6.2333	0.3595	0.0227	0.001	0.0237
6.2667	0.3582	0.0095	0	0.0095
6.3	0.3589	0.0095	0.001	0.0105
6.3333	0.3589	0	0	0
6.3667	0.3572	0	0	0
6.4	0.3599	0.0095	0	0.0095
6.4333	0.3559	0	0.001	0.001
6.4667	0.3566	0.0095	0.001	0.0105
6.5	0.3595	0	0.001	0.001
6.5333	0.3572	0	0.001	0.001
6.5667	0.3572	0	0	0
6.6	0.3576	0	0	0
6.6333	0.3556	0	0	0
6.6667	0.3576	0.0095	0	0.0095
6.7	0.3543	0	0	0
6.7333	0.3559	0	0	0
6.7667	0.3553	0.0095	0	0.0095
6.8	0.3539	0.0095	0	0.0095
6.8333	0.3526	0	0.001	0.001
6.8667	0.3549	0.0227	0	0.0227
6.9	0.3539	0	0	0
6.9333	0.3539	0	0.001	0.001
6.9667	0.352	0	0	0
7	0.3503	0.0095	0.001	0.0105
7.0333	0.3533	0	0	0
7.0667	0.3516	0	0.001	0.001
7.1	0.3523	0	0	0
7.1333	0.3507	0	0	0
7.1667	0.349	0.0095	0.001	0.0105
7.2	0.3507	0.0095	0	0.0095
7.2333	0.3526	0	0.001	0.001
7.2667	0.35	0	0	0
7.3	0.3533	0	0.001	0.001

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
7.3333	0.352	0	0	0
7.3667	0.3566	0	0	0
7.4	0.3546	0	0	0
7.4333	0.3556	0	0	0
7.4667	0.3559	0	0.001	0.001
7.5	0.3566	0	0	0
7.5333	0.3576	0	0	0
7.5667	0.3539	0	0.0023	0.0023
7.6	0.3566	0.0095	0	0.0095
7.6333	0.3562	0	0.001	0.001
7.6667	0.3589	0	0.001	0.001
7.7	0.3569	0.0095	0.001	0.0105
7.7333	0.3589	0	0	0
7.7667	0.3609	0	0	0
7.8	0.3618	0	0	0
7.8333	0.3605	0.0095	0	0.0095
7.8667	0.3615	0.0227	0	0.0227
7.9	0.3602	0	0.001	0.001
7.9333	0.3599	0.0095	0.001	0.0105
7.9667	0.3605	0	0	0
8	0.3602	0	0	0
8.0333	0.3612	0	0	0
8.0667	0.3641	0	0	0
8.1	0.3651	0.0095	0	0.0095
8.1333	0.3628	0.0095	0	0.0095
8.1667	0.3592	0	0	0
8.2	0.3625	0	0	0
8.2333	0.3618	0.0095	0.001	0.0105
8.2667	0.3638	0	0	0
8.3	0.3628	0.0095	0	0.0095
8.3333	0.3645	0.0095	0	0.0095
8.3667	0.3645	0.0095	0	0.0095
8.4	0.3618	0.0095	0	0.0095
8.4333	0.3628	0.0095	0.001	0.0105
8.4667	0.3638	0.0095	0	0.0095
8.5	0.3612	0	0	0
8.5333	0.3638	0.0095	0	0.0095
8.5667	0.3638	0	0.001	0.001
8.6	0.3612	0	0.001	0.001
8.6333	0.3638	0	0	0
8.6667	0.3609	0	0.0023	0.0023
8.7	0.3655	0.0095	0	0.0095
8.7333	0.3648	0	0	0
8.7667	0.3638	0.0227	0	0.0227

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
8.8	0.3622	0	0.001	0.001
8.8333	0.3635	0	0.0023	0.0023
8.8667	0.3622	0	0	0
8.9	0.3655	0	0	0
8.9333	0.3655	0	0	0
8.9667	0.3632	0	0	0
9	0.3635	0	0.001	0.001
9.0333	0.3665	0	0	0
9.0667	0.3641	0	0	0
9.1	0.3622	0	0	0
9.1333	0.3648	0.0095	0	0.0095
9.1667	0.3632	0	0.001	0.001
9.2	0.3641	0	0.001	0.001
9.2333	0.3638	0	0.001	0.001
9.2667	0.3628	0	0.001	0.001
9.3	0.3628	0	0	0
9.3333	0.3618	0.0095	0	0.0095
9.3667	0.3658	0	0.001	0.001
9.4	0.3648	0	0	0
9.4333	0.3671	0.0095	0	0.0095
9.4667	0.3632	0	0.001	0.001
9.5	0.3625	0	0	0
9.5333	0.3635	0.0095	0	0.0095
9.5667	0.3628	0	0	0
9.6	0.3648	0.0095	0.001	0.0105
9.6333	0.3632	0	0	0
9.6667	0.3628	0	0	0
9.7	0.3655	0	0	0
9.7333	0.3661	0	0	0
9.7667	0.3641	0	0	0
9.8	0.3635	0.0095	0.001	0.0105
9.8333	0.3641	0	0.001	0.001
9.8667	0.3622	0	0	0
9.9	0.3632	0.0095	0	0.0095
9.9333	0.3674	0.0095	0.001	0.0105
9.9667	0.3632	0	0.001	0.001
10	0.3661	0	0.001	0.001
10.0333	0.3648	0	0	0
10.0667	0.3651	0	0.001	0.001
10.1	0.3645	0.0095	0	0.0095
10.1333	0.3618	0	0	0
10.1667	0.3628	0	0	0
10.2	0.3651	0.0095	0	0.0095
10.2333	0.3622	0	0.001	0.001

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
10.2667	0.3625	0	0.001	0.001
10.3	0.3599	0	0.0023	0.0023
10.3333	0.3661	0	0.001	0.001
10.3667	0.3641	0.0095	0.001	0.0105
10.4	0.3615	0	0	0
10.4333	0.3645	0	0	0
10.4667	0.3658	0	0	0
10.5	0.3632	0	0	0
10.5333	0.3645	0	0	0
10.5667	0.3612	0	0.001	0.001
10.6	0.3625	0	0	0
10.6333	0.3655	0.0095	0	0.0095
10.6667	0.3641	0	0	0
10.7	0.3595	0	0.001	0.001
10.7333	0.3622	0	0	0
10.7667	0.3628	0	0	0
10.8	0.3612	0.0227	0.0023	0.025
10.8333	0.3632	0	0.001	0.001
10.8667	0.3622	0	0.001	0.001
10.9	0.3605	0	0	0
10.9333	0.3618	0.0095	0	0.0095
10.9667	0.3625	0	0.001	0.001
11	0.3615	0	0	0
11.0333	0.3622	0	0	0
11.0667	0.3602	0.0095	0	0.0095
11.1	0.3635	0	0.001	0.001
11.1333	0.3622	0	0	0
11.1667	0.3622	0	0.001	0.001
11.2	0.3612	0	0	0
11.2333	0.3622	0	0	0
11.2667	0.3635	0	0.001	0.001
11.3	0.3612	0.0227	0	0.0227
11.3333	0.3635	0.0095	0.001	0.0105
11.3667	0.3635	0	0.0023	0.0023
11.4	0.3622	0.0095	0	0.0095
11.4333	0.3638	0	0	0
11.4667	0.3618	0	0.001	0.001
11.5	0.3599	0	0	0
11.5333	0.3602	0	0	0
11.5667	0.3612	0	0	0
11.6	0.3592	0	0	0
11.6333	0.3605	0	0	0
11.6667	0.3592	0.0095	0.001	0.0105
11.7	0.3612	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
11.7333	0.3615	0	0.001	0.001
11.7667	0.3609	0	0.001	0.001
11.8	0.3582	0	0	0
11.8333	0.3622	0	0	0
11.8667	0.3592	0.0095	0	0.0095
11.9	0.3605	0.0095	0	0.0095
11.9333	0.3625	0	0.001	0.001
11.9667	0.3635	0	0	0
12	0.3612	0.0095	0	0.0095
12.0333	0.3632	0	0.001	0.001
12.0667	0.3599	0.0095	0	0.0095
12.1	0.3651	0.0095	0.001	0.0105
12.1333	0.3651	0	0	0
12.1667	0.3609	0	0.0023	0.0023
12.2	0.3618	0	0	0
12.2333	0.3622	0.0095	0.001	0.0105
12.2667	0.3632	0.0095	0	0.0095
12.3	0.3625	0	0	0
12.3333	0.3609	0	0	0
12.3667	0.3625	0.0095	0	0.0095
12.4	0.3655	0	0	0
12.4333	0.3622	0	0	0
12.4667	0.3605	0	0	0
12.5	0.3599	0	0.001	0.001
12.5333	0.3592	0.0095	0	0.0095
12.5667	0.3609	0.0095	0	0.0095
12.6	0.3602	0	0	0
12.6333	0.3609	0	0.0023	0.0023
12.6667	0.3586	0	0.001	0.001
12.7	0.3586	0.0095	0.001	0.0105
12.7333	0.3618	0	0	0
12.7667	0.3586	0.0095	0	0.0095
12.8	0.3618	0	0	0
12.8333	0.3595	0	0	0
12.8667	0.3602	0.0095	0.001	0.0105
12.9	0.3595	0	0	0
12.9333	0.3609	0	0.001	0.001
12.9667	0.3599	0	0	0
13	0.3595	0	0	0
13.0333	0.3605	0	0.001	0.001
13.0667	0.3612	0.0095	0.001	0.0105
13.1	0.3605	0.0095	0.001	0.0105
13.1333	0.3592	0	0	0
13.1667	0.3595	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
13.2	0.3592	0.0227	0	0.0227
13.2333	0.3602	0	0	0
13.2667	0.3612	0	0	0
13.3	0.3589	0	0.0023	0.0023
13.3333	0.3612	0	0	0
13.3667	0.3609	0	0	0
13.4	0.3586	0	0.001	0.001
13.4333	0.3586	0	0	0
13.4667	0.3582	0.0095	0	0.0095
13.5	0.3586	0	0	0
13.5333	0.3579	0	0	0
13.5667	0.3599	0	0.001	0.001
13.6	0.3589	0.0095	0	0.0095
13.6333	0.3579	0.0095	0	0.0095
13.6667	0.3599	0	0.001	0.001
13.7	0.3595	0	0.001	0.001
13.7333	0.3602	0	0.001	0.001
13.7667	0.3592	0	0	0
13.8	0.3595	0	0	0
13.8333	0.3612	0	0	0
13.8667	0.3602	0.0095	0	0.0095
13.9	0.3569	0	0	0
13.9333	0.3562	0.0095	0	0.0095
13.9667	0.3576	0.0095	0.001	0.0105
14	0.3582	0	0.001	0.001
14.0333	0.3589	0	0	0
14.0667	0.3612	0	0	0
14.1	0.3628	0	0	0
14.1333	0.3592	0	0.001	0.001
14.1667	0.3599	0	0	0
14.2	0.3605	0.0095	0	0.0095
14.2333	0.3592	0.0095	0	0.0095
14.2667	0.3562	0.0227	0.001	0.0237
14.3	0.3549	0	0	0
14.3333	0.3566	0.0227	0.001	0.0237
14.3667	0.3615	0	0.001	0.001
14.4	0.3579	0	0.001	0.001
14.4333	0.3592	0.0095	0	0.0095
14.4667	0.3566	0	0.001	0.001
14.5	0.3589	0.0095	0	0.0095
14.5333	0.3586	0.0095	0	0.0095
14.5667	0.3582	0	0	0
14.6	0.3582	0	0	0
14.6333	0.3579	0	0.001	0.001

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
14.6667	0.3572	0.0095	0	0.0095
14.7	0.3566	0	0.001	0.001
14.7333	0.3556	0	0	0
14.7667	0.3579	0	0	0
14.8	0.3556	0	0.0023	0.0023
14.8333	0.3559	0.0095	0	0.0095
14.8667	0.3543	0	0	0
14.9	0.3562	0	0	0
14.9333	0.3549	0	0	0
14.9667	0.3566	0	0.001	0.001
15	0.3566	0	0.0023	0.0023
15.0333	0.3559	0	0	0
15.0667	0.3622	0	0.001	0.001
15.1	0.3671	0.0095	0	0.0095
15.1333	0.3734	0	0.001	0.001
15.1667	0.3796	0	0	0
15.2	0.3859	0	0	0
15.2333	0.3925	0	0	0
15.2667	0.403	0.0095	0	0.0095
15.3	0.4092	0.0095	0	0.0095
15.3333	0.4194	0.0095	0	0.0095
15.3667	0.4234	0.0227	0.001	0.0237
15.4	0.4306	0	0.001	0.001
15.4333	0.4382	0.0095	0.0023	0.0118
15.4667	0.4451	0.0095	0.001	0.0105
15.5	0.4487	0	0	0
15.5333	0.456	0	0.001	0.001
15.5667	0.4589	0	0.001	0.001
15.6	0.4639	0.0095	0	0.0095
15.6333	0.4682	0.0095	0	0.0095
15.6667	0.4754	0	0	0
15.7	0.4859	0	0	0
15.7333	0.4876	0	0	0
15.7667	0.4991	0	0	0
15.8	0.503	0	0.001	0.001
15.8333	0.5129	0	0	0
15.8667	0.5155	0.0095	0.001	0.0105
15.9	0.5208	0	0	0
15.9333	0.5281	0.0095	0	0.0095
15.9667	0.534	0	0	0
16	0.5415	0	0	0
16.0333	0.5541	0	0	0
16.0667	0.5587	0.0095	0	0.0095
16.1	0.5662	0	0.001	0.001

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
16.1333	0.5771	0	0	0
16.1667	0.587	0	0.001	0.001
16.2	0.5889	0.0095	0.001	0.0105
16.2333	0.6015	0	0	0
16.2667	0.6077	0	0	0
16.3	0.6146	0.0095	0.0023	0.0118
16.3333	0.6205	0	0	0
16.3667	0.6271	0.0095	0.001	0.0105
16.4	0.634	0.0227	0	0.0227
16.4333	0.635	0	0	0
16.4667	0.6429	0	0	0
16.5	0.6479	0	0	0
16.5333	0.6551	0	0	0
16.5667	0.6558	0	0	0
16.6	0.6594	0.0095	0	0.0095
16.6333	0.6656	0.0095	0	0.0095
16.6667	0.6683	0	0	0
16.7	0.6732	0	0	0
16.7333	0.6758	0	0	0
16.7667	0.6785	0	0	0
16.8	0.6804	0.0227	0.001	0.0237
16.8333	0.6847	0	0.001	0.001
16.8667	0.6916	0	0.001	0.001
16.9	0.6943	0.0095	0.001	0.0105
16.9333	0.7015	0	0.001	0.001
16.9667	0.7051	0.0227	0.0023	0.025
17	0.7101	0	0.001	0.001
17.0333	0.7124	0	0	0
17.0667	0.716	0.0095	0	0.0095
17.1	0.7199	0	0.001	0.001
17.1333	0.7236	0.0227	0.001	0.0237
17.1667	0.7229	0.0095	0.001	0.0105
17.2	0.7318	0	0	0
17.2333	0.7298	0.0095	0	0.0095
17.2667	0.7354	0	0	0
17.3	0.7384	0.0095	0	0.0095
17.3333	0.74	0.0095	0	0.0095
17.3667	0.7417	0	0	0
17.4	0.7453	0	0	0
17.4333	0.7466	0.0095	0	0.0095
17.4667	0.7482	0.0095	0.001	0.0105
17.5	0.7459	0.0095	0	0.0095
17.5333	0.745	0	0	0
17.5667	0.7463	0	0.001	0.001

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
17.6	0.7433	0	0.001	0.001
17.6333	0.7407	0	0.001	0.001
17.6667	0.7403	0	0.0023	0.0023
17.7	0.739	0	0	0
17.7333	0.7371	0.0095	0	0.0095
17.7667	0.7394	0.0095	0.001	0.0105
17.8	0.7354	0.0095	0.001	0.0105
17.8333	0.7334	0	0.001	0.001
17.8667	0.7348	0	0	0
17.9	0.7334	0.0095	0	0.0095
17.9333	0.7308	0	0.001	0.001
17.9667	0.7338	0	0	0
18	0.7341	0	0.0023	0.0023
18.0333	0.7272	0.0095	0	0.0095
18.0667	0.7305	0.0095	0	0.0095
18.1	0.7292	0.0095	0	0.0095
18.1333	0.7298	0	0	0
18.1667	0.7269	0	0	0
18.2	0.7305	0.0095	0.001	0.0105
18.2333	0.7295	0.0095	0.001	0.0105
18.2667	0.7269	0	0.001	0.001
18.3	0.7282	0	0	0
18.3333	0.7265	0.0095	0	0.0095
18.3667	0.7278	0	0	0
18.4	0.7239	0	0	0
18.4333	0.7249	0	0	0
18.4667	0.7245	0	0.001	0.001
18.5	0.7252	0	0	0
18.5333	0.7236	0	0	0
18.5667	0.7245	0.0095	0	0.0095
18.6	0.7242	0	0	0
18.6333	0.7213	0	0.001	0.001
18.6667	0.7213	0	0	0
18.7	0.7242	0	0	0
18.7333	0.7242	0	0	0
18.7667	0.7203	0.0095	0	0.0095
18.8	0.7213	0	0.001	0.001
18.8333	0.7255	0.0227	0	0.0227
18.8667	0.7226	0.0227	0	0.0227
18.9	0.7229	0.0095	0.001	0.0105
18.9333	0.7203	0	0	0
18.9667	0.7232	0	0.001	0.001
19	0.7245	0.0095	0	0.0095
19.0333	0.7226	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
19.0667	0.716	0	0	0
19.1	0.7078	0.0095	0	0.0095
19.1333	0.6985	0	0	0
19.1667	0.6857	0.0095	0	0.0095
19.2	0.6748	0	0.001	0.001
19.2333	0.665	0	0.0023	0.0023
19.2667	0.6528	0	0	0
19.3	0.6465	0.0095	0	0.0095
19.3333	0.6403	0.0095	0	0.0095
19.3667	0.6324	0	0.001	0.001
19.4	0.6232	0	0	0
19.4333	0.6209	0	0.0023	0.0023
19.4667	0.6153	0.0095	0	0.0095
19.5	0.613	0	0	0
19.5333	0.6143	0	0.001	0.001
19.5667	0.6133	0	0	0
19.6	0.6159	0.0095	0.001	0.0105
19.6333	0.6242	0	0.001	0.001
19.6667	0.6248	0	0.0023	0.0023
19.7	0.6324	0	0.001	0.001
19.7333	0.634	0.0095	0.001	0.0105
19.7667	0.6403	0	0.001	0.001
19.8	0.6439	0	0	0
19.8333	0.6469	0.0095	0.001	0.0105
19.8667	0.6521	0.0095	0	0.0095
19.9	0.6525	0	0.001	0.001
19.9333	0.6558	0.0095	0	0.0095
19.9667	0.6607	0	0	0
20	0.6617	0	0	0
20.0333	0.6633	0.0095	0.001	0.0105
20.0667	0.666	0	0	0
20.1	0.6693	0	0.001	0.001
20.1333	0.6676	0	0	0
20.1667	0.6666	0	0	0
20.2	0.6735	0.0095	0	0.0095
20.2333	0.6752	0	0	0
20.2667	0.6781	0	0	0
20.3	0.6824	0	0	0
20.3333	0.6837	0	0.001	0.001
20.3667	0.6887	0.0095	0	0.0095
20.4	0.6916	0.0095	0	0.0095
20.4333	0.6923	0.0095	0	0.0095
20.4667	0.6999	0	0.001	0.001
20.5	0.6999	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
20.5333	0.7091	0.0095	0	0.0095
20.5667	0.7278	0.0095	0	0.0095
20.6	0.7427	0	0.001	0.001
20.6333	0.7561	0	0.001	0.001
20.6667	0.7683	0	0.001	0.001
20.7	0.7756	0.0095	0.001	0.0105
20.7333	0.7719	0	0.001	0.001
20.7667	0.7525	0	0	0
20.8	0.7278	0.0095	0.001	0.0105
20.8333	0.7084	0	0	0
20.8667	0.6867	0	0	0
20.9	0.6814	0	0	0
20.9333	0.6798	0	0	0
20.9667	0.6781	0	0	0
21	0.6781	0	0	0
21.0333	0.6775	0	0	0
21.0667	0.6857	0.0095	0.001	0.0105
21.1	0.6897	0	0	0
21.1333	0.6877	0	0.001	0.001
21.1667	0.6913	0	0	0
21.2	0.6966	0	0.001	0.001
21.2333	0.6972	0	0.001	0.001
21.2667	0.7032	0	0	0
21.3	0.7035	0.0095	0	0.0095
21.3333	0.7038	0	0	0
21.3667	0.7094	0.0095	0	0.0095
21.4	0.7127	0	0	0
21.4333	0.7114	0.0095	0	0.0095
21.4667	0.7143	0.0095	0	0.0095
21.5	0.7173	0	0.001	0.001
21.5333	0.7183	0	0	0
21.5667	0.7232	0	0	0
21.6	0.7229	0.0095	0	0.0095
21.6333	0.7229	0	0	0
21.6667	0.7262	0	0	0
21.7	0.7278	0	0	0
21.7333	0.7278	0.0095	0	0.0095
21.7667	0.7311	0	0.001	0.001
21.8	0.7301	0.0095	0	0.0095
21.8333	0.7344	0.0227	0	0.0227
21.8667	0.7311	0.0095	0	0.0095
21.9	0.7348	0	0	0
21.9333	0.7361	0	0	0
21.9667	0.7364	0.0095	0	0.0095

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
22	0.7377	0	0.001	0.001
22.0333	0.7371	0.0095	0	0.0095
22.0667	0.7367	0.0095	0.001	0.0105
22.1	0.7374	0	0	0
22.1333	0.7334	0	0.001	0.001
22.1667	0.7344	0.0095	0.001	0.0105
22.2	0.7374	0.0227	0.001	0.0237
22.2333	0.7374	0.0095	0	0.0095
22.2667	0.7377	0	0.001	0.001
22.3	0.7364	0	0	0
22.3333	0.7367	0	0.0023	0.0023
22.3667	0.7357	0.0095	0	0.0095
22.4	0.738	0	0	0
22.4333	0.7394	0.0095	0	0.0095
22.4667	0.7361	0	0	0
22.5	0.7377	0	0	0
22.5333	0.7374	0	0.001	0.001
22.5667	0.74	0	0.001	0.001
22.6	0.7374	0.0095	0	0.0095
22.6333	0.7387	0.0227	0	0.0227
22.6667	0.7361	0.0095	0.001	0.0105
22.7	0.738	0	0	0
22.7333	0.7394	0	0.001	0.001
22.7667	0.7413	0	0	0
22.8	0.7377	0.0095	0.001	0.0105
22.8333	0.7377	0	0.001	0.001
22.8667	0.7361	0	0	0
22.9	0.738	0	0.0023	0.0023
22.9333	0.738	0	0	0
22.9667	0.7377	0	0.001	0.001
23	0.7374	0	0	0
23.0333	0.739	0.0227	0	0.0227
23.0667	0.738	0	0	0
23.1	0.7367	0.0095	0	0.0095
23.1333	0.7384	0.0095	0	0.0095
23.1667	0.7394	0.0095	0.001	0.0105
23.2	0.7357	0.0095	0	0.0095
23.2333	0.7403	0.0095	0	0.0095
23.2667	0.7394	0.0095	0	0.0095
23.3	0.74	0	0.001	0.001
23.3333	0.7387	0	0.001	0.001
23.3667	0.739	0	0.001	0.001
23.4	0.7338	0	0.001	0.001
23.4333	0.6949	0	0	0

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

Time (min)	Ch 1 dP (psi)	Ch 2 High Flow (LPM)	Ch 3 Low Flow (LPM)	Total Flow (LPM)
23.4667	0.6564	0	0.001	0.001
23.5	0.6179	0	0	0
23.5333	0.5847	0	0	0
23.5667	0.5524	0.0095	0	0.0095
23.6	0.5175	0	0.001	0.001
23.6333	0.4872	0.0095	0.001	0.0105
23.6667	0.4576	0	0.001	0.001
23.7	0.4343	0	0	0
23.7333	0.4109	0	0.001	0.001
23.7667	0.3859	0	0	0
23.8	0.3668	0	0	0
23.8333	0.3424	0.0095	0.001	0.0105
23.8667	0.323	0	0	0
23.9	0.3033	0	0.001	0.001
23.9333	0.2842	0	0	0
23.9667	0.2671	0.0095	0.001	0.0105
24	0.2513	0	0	0
24.0333	0.2341	0.0095	0.001	0.0105
24.0667	0.2213	0	0	0
24.1	0.2045	0	0	0
24.1333	0.193	0.0095	0	0.0095
24.1667	0.1821	0	0	0
24.2	0.1683	0	0.001	0.001
24.2333	0.1604	0	0	0
24.2667	0.1449	0	0	0
24.3	0.1338	0	0.001	0.001
24.3333	0.1272	0	0	0
24.3667	0.1147	0	0.001	0.001
24.4	0.1054	0	0	0
24.4333	0.0989	0.0095	0	0.0095
24.4667	0.0883	0	0.001	0.001
24.5	0.0804	0.0095	0	0.0095
24.5333	0.0755	0	0	0
24.5667	0.0669	0	0	0
24.6	0.0627	0	0	0
24.6333	0.0567	0	0.001	0.001
24.6667	0.0478	0	0.001	0.001
24.7	0.0452	0	0	0
24.7333	0.0406	0	0	0
24.7667	0.0327	0.0095	0	0.0095
24.8	0.0317	0	0.001	0.001
24.8333	0.0248	0	0.001	0.001
24.8667	0.0232	0.0095	0	0.0095
24.9	0.0172	0	0.001	0.001

AREVA NP, Inc.

Project No. G101266224SAT-007

December 10, 2013

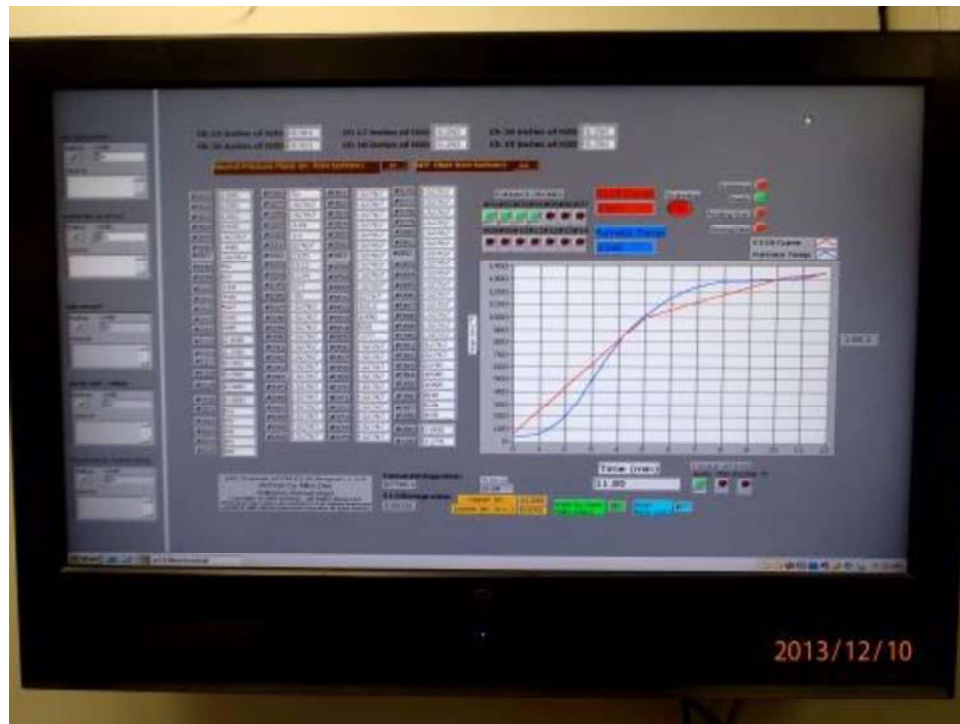
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24.9333	0.0153	0.0095	0	0.0095
24.9667	0.0116	0	0	0
25	0.0064	0	0.001	0.001
25.0333	0.0028	0	0.001	0.001
25.0667	0.0037	0	0.001	0.001
25.1	0.0037	0	0	0
25.1333	-0.0002	0	0	0
25.1667	-0.0051	0	0	0
25.2	-0.0055	0	0	0
25.2333	-0.0061	0	0	0
25.2667	-0.0078	0	0.0023	0.0023

APPENDIX D 1

Photographs: Fire Test

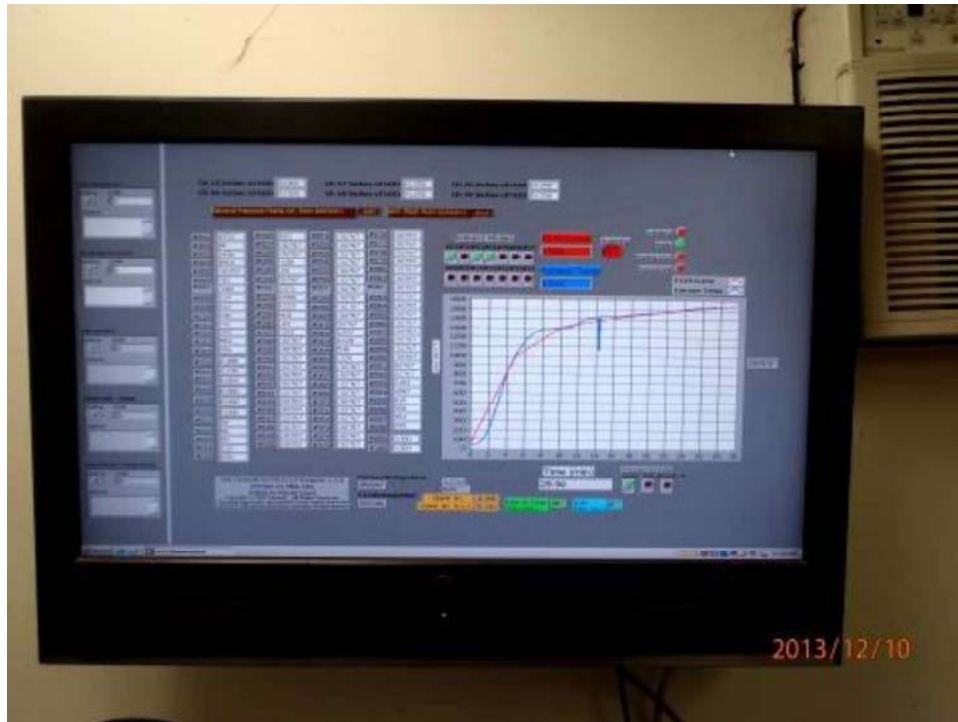














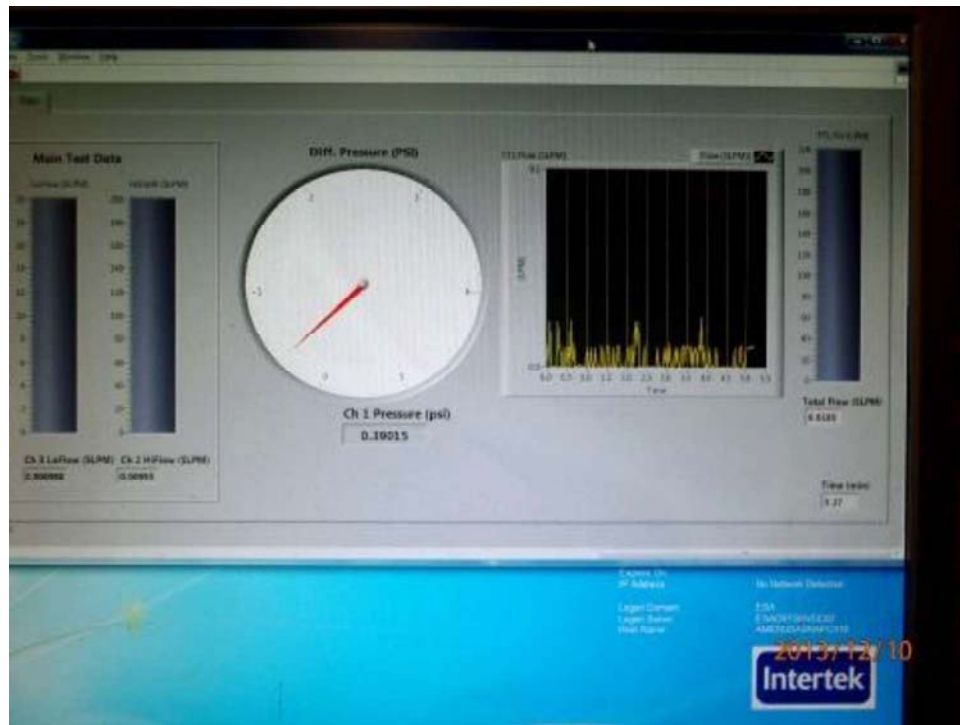






APPENDIX D 2

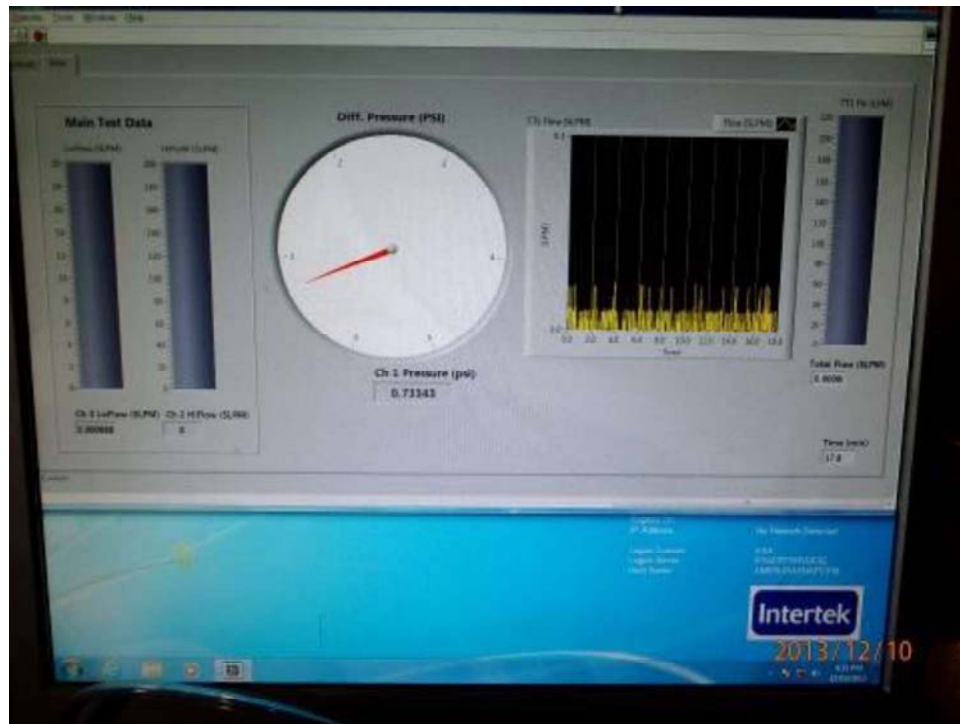
Photographs: Pressure Test



















APPENDIX E

Test Plan

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20004-020 (10/21/2013)



AREVA NP Inc.

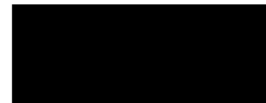
Engineering Information Record

Document No.: 51 - 9208264 - 000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1



Mike Dey
Staff Engineer



Michael A. Brown
Quality Supervisor

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20004-020 (10/21/2013)
Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Safety Related? ☒ YES ☐ NO
Does this document establish design or technical requirements? ☐ YES ☒ NO
Does this document contain assumptions requiring verification? ☐ YES ☒ NO
Does this document contain Customer Required Format? ☐ YES ☒ NO

Signature Block

Name and Title/Discipline	Signature	P/LP, R/LR, A-CRF, A	Date	Pages/Sections Prepared/Reviewed/ Approved or Comments
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Derrick Risner Eng I / PEYF1-A	[Redacted]	R	12-9-13	All
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Note: P/LP designates Preparer (P), Lead Preparer (LP)
R/LR designates Reviewer (R), Lead Reviewer (LR)
A-CRF designates Project Manager Approver of Customer Required Format (A-CRF)
A designates Approver/RTM - Verification of Reviewer Independence

Project Manager Approval of Customer References (N/A if not applicable)

Name (printed or typed)	Title (printed or typed)	Signature	Date
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[Redacted]	
MOX Services concurrence: Richard Warren / Sr. Fire Protection Engineer	09Dec13
Name / Title	Date

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20004-020 (10/21/2013)
Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Record of Revision

Revision No.	Pages/Sections/ Paragraphs Changed	Brief Description / Change Authorization
000	All	Initial Issue. This document contains the main body of the report (pages 1-18), Appendix A (2 pages), Appendix B (5 pages), Appendix C (5 pages), and Appendix D (2 pages) for a total of 32 pages.

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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Table of Contents

	Page
SIGNATURE BLOCK	2
RECORD OF REVISION	3
LIST OF TABLES	6
ACRONYMS	7
BACKGROUND	8
1.0 PURPOSE	8
2.0 OBJECTIVE	8
2.1 Test Deck Description	8
2.2 Test Description	9
2.3 Critical Characteristics and Limiting Parameters Being Tested	9
3.0 ACCEPTANCE CRITERIA	9
4.0 RESPONSIBILITIES	10
4.1 MOX Services	10
4.2 AREVA	10
4.3 Testing Laboratory (Intertek Testing Services NA, Inc.)	11
4.4 Other Subcontracted Entities	11
5.0 PROCUREMENT PLAN	11
5.1 Penetration Seal Materials	11
5.2 Test Deck/Test Slab	12
5.3 Penetrating Items	13
6.0 SPECIAL PRECAUTIONS	13
6.1 Precautions for Construction of Test Assemblies	13
6.2 Precautions for Installation of Seal Assemblies	13
6.3 Precautions for Conducting Pressure Test	13
7.0 PREREQUISITES	13
7.1 General Test Configuration Requirements	13
7.2 Safety Related Materials	13
7.3 Dimensioned Drawings	14
7.4 Test Configuration	14
8.0 TEST ASSEMBLY CONSTRUCTION	14
8.1 Test Slab Construction	14
8.2 Penetration Seal Installation	14
8.3 Pre-Test Verifications	14
9.0 PROCEDURE	14

Page 4

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Table of Contents
(continued)

	Page
9.1 Fire Endurance Test.....	14
9.2 Hose Stream Test	15
9.3 Pressure Test Apparatus.....	15
9.4 Pressure Test Process	15
9.5 Post Test Examination	16
10.0 DATA SYSTEMS	17
11.0 TEST REPORT	17
12.0 REFERENCES.....	17
APPENDIX A : TEST DECK/TEST SLAB DRAWINGS.....	A-1
APPENDIX B : TEST PENETRATION DRAWINGS.....	B-1
APPENDIX C : BILL OF MATERIALS.....	C-1
APPENDIX D : DESIGN VERIFICATION CHECKLIST	D-1

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

List of Tables

Page

TABLE 9-1: DIFFERENTIAL PRESSURE TEST LEVELS 16

Page 6

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

ACRONYMS

CGD	Commercial Grade Dedication
CGI	Commercial Grade Item
IROFS	Items Relied On For Safety
MOX	Mixed Oxide
MFFF	Mixed Oxide Fuel Fabrication Facility
QL	Quality Level
SSC	Structures, Systems and Components
w.g.	Water Gauge

Penetration Seal Materials

QSil 5558MC Quantum Silicones QSil 5558MC Silicone Elastomer

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

BACKGROUND

AREVA NP (AREVA) is assisting Shaw AREVA MOX Services (MOX Services) in the development and implementation of a penetration seal program for the Mixed Oxide Fuel Fabrication Facility (MFFF). One aspect of the MOX penetration seal program includes conducting various types of qualification tests of penetration seal assemblies to substantiate the performance capabilities of specific penetration seal designs. Fire-Pressure testing is one type of qualification testing that needs to be performed in order to demonstrate that MOX penetration seal designs can withstand anticipated fire-induced pressures without catastrophic failure resulting in open penetrations. Other types of qualification testing, such as fire testing, pressure testing, and testing for seismic qualification of penetration seal assemblies, are addressed by other test plans.

1.0 PURPOSE

The purpose of this test plan is to define the test assembly, test methods and acceptance criteria for conducting a fire-pressure test in support of the MOX penetration seal program. Fire-pressure tests are unique in that a fire-pressure test is comprised of two separate tests; a modified fire test, followed by a pressure test.

This test plan defines the test methods, acceptance criteria and test report documentation requirements for conducting MOX Fire-Pressure Test 1. Additionally, this detailed test plan defines the roles and responsibilities of MOX Services, AREVA, the selected testing laboratory, and any other subcontracted entity engaged in support of fire-pressure testing efforts.

This detailed test plan also describes the procurement plan for materials associated with Fire-Pressure Test 1 and identifies the entities responsible for procuring the various components of the test assemblies based on the quality level assigned to each component.

This test plan also establishes minimum quality requirements for the penetration seal materials used in the test assemblies and links quality requirements in the AREVA QA program to customer/project quality requirements.

2.0 OBJECTIVE

The primary objective of this test plan is to evaluate the ability of a select penetration seal design to withstand various pressure levels after being subjected to a fire exposure (fire test). To accomplish this, the test assembly will be subjected to a fire exposure as described in Sections 9.1 and 9.2, and then the same test assembly will be subjected to a pressure test as described in Sections 9.3 and 9.4.

The specific configuration to be tested is described below. Critical characteristics and the associated limiting parameters that will be substantiated by a successful test are also provided.

Note: The test assembly to be used for MOX Fire-Pressure Test 1 is to be the same test assembly that was constructed and used for MOX Pressure Test 5A [Reference 12.7], and subsequently tested again in Seismic Pressure Test 2A [Reference 12.8]. Since MOX Pressure Test 5A and Seismic Pressure Test 2A have already been successfully completed without significant damage to the test assembly, no changes or modifications need to be made to the test assembly.

2.1 Test Deck Description

The test deck will consist of a 12" thick concrete slab measuring approximately 96" x 96" (8' x 8') [Note: Final test slab size to be determined by Intertek and documented in the final test report]. Within this slab will be one (1) precast 48" x 34" opening without any liner material (bare concrete). The test deck will be horizontally oriented during both the fire endurance test and the subsequent pressure test.

Drawings showing the general layout of the test deck (test slab) for this fire-pressure test can be found in Appendix A.

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

2.2 Test Description

The opening to be sealed and tested in Fire-Pressure Test 1 is a 48" x 34" blockout containing nine different cable types as penetrating items. The penetrating items for this blockout will include the following items found in Shaw AREVA MOX Services Drawings DCS01-ZMJ-DS-NTE-N-65107-2 Sheets 84-116, "Technical Engineering Information" [Reference 12.10]:

- (1) 0.32" diameter cable with 15 mil CSPE jacket, product mark no. wfb-7
- (1) 0.50" diameter cable with 45 mil CSPE jacket, product mark no. wfa-1
- (1) 1.54" diameter cable with 80 mil CSPE jacket, product mark no. wfa-13
- (1) 0.248" diameter cable with 15 mil XLPE jacket, product mark no. whe-2
- (1) 0.33" diameter cable with 60 mil XLPE jacket, product mark no. wbe-1
- (1) 0.25" diameter cable with 7 mil Modified XLPO jacket, product mark no. whe-8
- (1) 0.44" diameter cable with 9 mil Modified XLPO jacket, product mark no. wbh-1
- (1) 0.53" diameter cable with 35 mil LSZH - XLPO jacket, product mark no. wfa-26
- (1) 1.02" diameter cable with 65 mil LSZH - XLPO jacket, product mark no. wfe-6

The cables will penetrate through the opening, make a "u" shaped bend on one side of the seal and penetrate through the opening again. In effect the cables will be looped with both ends of each cable terminating on the same side of the opening and forming a "u" shape through the seal. Using this configuration will prevent any pressure leakage due to air travel through the cables.

The opening will be sealed with an eight (8) inch thick Quantum Silicones QSiil 5558MC Silicone Elastomer (QSiil 5558MC) penetration seal with no permanent damming installed around the various penetrating commodities.

Note: Once the seal has been installed and allowed to cure, a hole will be drilled (or otherwise cut) through the silicone elastomer at the location depicted in Appendix B. The hole shall be sealed using QSiil 5558MC seal material in accordance with Document 01-9198306 (latest revision), "Installation Instruction Manual for MOX Penetration Seal Test Program" [Reference 12.4]. This "field patched" hole is being included in this test plan to evaluate the fire-pressure resistance of seal repairs using the same elastomer as the base seal.

2.3 Critical Characteristics and Limiting Parameters Being Tested

Fire-Pressure Test 1 is being conducted to demonstrate that an eight (8) inch thick Quantum Silicones QSiil 5558MC Silicone Elastomer (QSiil 5558MC) penetration seal with cable penetrants and no permanent damming can withstand anticipated fire-induced pressures.

3.0 ACCEPTANCE CRITERIA

The requirements for fire rated penetration seals are discussed in DCS01-BRA-DS-TRD-B-01365-0, *Technical Requirements Document for MFFF Penetration Seals* [Reference 12.5]. These requirements include the need for fire barrier penetration seals to be F-rated, commensurate with the hourly rating of the fire barrier in which they are installed. Additionally, these requirements also discuss the need for fire barrier penetration seals to withstand different forms of pressure concurrent with a fire (i.e., fire induced pressures and pressures from clean agent system discharge).

The MOX qualification strategy for concurrent fire and pressure conditions is to fire test penetration seals following consensus codes and standards committed to by the MOX project (ASTM E 814-94b [Reference 12.9]), while invoking the "standard pressure condition" from standard test method ASTM E 814-94b for maintaining

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

furnace pressure (i.e., furnace pressure at 0.01 in. wg greater than the pressure on the unexposed side of the test assembly).

Separate penetration seal assemblies will be pressure tested using detailed test plans for conducting pressure tests.

Finally, some additional test assemblies, such as the assembly to be tested under this test plan, will undergo a limited duration fire test (30 minute duration) with the fire tested specimens then subjected to subsequent pressure tests.

The results of fire testing, pressure testing and combination limited duration fire tests followed by pressure testing of the same assembly will serve as the overall qualification for penetration seals required for concurrent fire and pressure conditions.

Based on the above, the specific acceptance criteria to be used for combination fire-pressure testing shall be as follows:

1. During the limited duration fire endurance portion of the test, the fire stops (penetration seals) shall have withstood the fire test for the limited 30 minute duration without permitting the passage of flame through openings, or the occurrence of flaming on any element of the unexposed side of the fire stops (penetration seals).
2. After the limited duration fire test, any residual flaming on the exposed side of the test assembly shall be extinguished with water. Following flame extinguishment, the fire stops (penetration seals) shall remain in place such that the unexposed side of the penetration remains completely sealed.
3. During the pressure test, the fire stops (penetration seals) are allowed to leak. However, the fire stops (penetration seals) shall remain in place (i.e., shall not become dislodged from the opening or otherwise catastrophically fail).

4.0 RESPONSIBILITIES

The following roles and responsibilities apply to this test plan.

4.1 MOX Services

- 4.1.1 Provide review and concurrence of this detailed fire-pressure test plan.
- 4.1.2 Provide concurrence for any revisions made to this test plan during test specimen construction activities.
- 4.1.3 Provide some of the materials for test assembly construction from MOX Services surplus or scrap (if available)
- 4.1.4 Witness the fire-pressure test if desired.

4.2 AREVA

- 4.2.1 Develop and revise (if necessary) this detailed fire-pressure test plan.
- 4.2.2 Provide management and oversight of all aspects of the MOX penetration seal test program.
- 4.2.3 Select the testing facility and establish sub-contract agreements. The testing laboratory selected for performance of this test is Intertek Testing Services NA, Inc., Elmendorf, TX.

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

- 4.2.4 Provide engineering instructions to the testing laboratory for performance of the test including test parameters, acceptance criteria, requirements for documenting the test results in a final test report, etc.
- 4.2.5 Procure all primary penetration seal materials, devices and components (i.e., any materials, devices and components intended to replicate future Safety Related (QL-1) designs to be installed in the MOX facility) as designated in the procurement plan section (Section 5.0) of this test plan.
- 4.2.6 Notify MOX Services at least 10 days prior to test date to facilitate MOX Services decision to witness the test.
- 4.2.7 Witness test.
- 4.2.8 Perform post-test examinations.
- 4.2.9 Review, approve and issue final test reports.

4.3 Testing Laboratory (Intertek Testing Services NA, Inc.)

- 4.3.1 Notify AREVA at least 5 days prior to the start of test assembly construction activities.
- 4.3.2 Construct test decks in accordance with this test plan and AREVA direction.
- 4.3.3 Procure test deck materials and any other test assembly components identified under the Testing Laboratory scope in the procurement plan section (Section 5.0) of this test plan.
- 4.3.4 Procure testing equipment necessary for pressure testing services in accordance with this test plan and verify that the testing equipment is properly calibrated.
- 4.3.5 Provide fire and pressure testing services in accordance with this test plan.
- 4.3.6 Assist AREVA, as necessary, in conducting detailed post-test destructive examinations of the test assemblies.
- 4.3.7 Dispose of test assemblies upon completion of the tests.
- 4.3.8 Generate final test reports in accordance with test plan requirements (Section 11.0).

4.4 Other Subcontracted Entities

There are no other Subcontractors for this pressure test plan.

5.0 PROCUREMENT PLAN

This penetration seal fire-pressure test plan involves many elements beyond the penetration seal material being qualified. Some of these elements include the test deck or test slab, various fasteners for securing laboratory instrumentation to the test assembly, etc. Not all elements of the test assembly are required to be procured to the same quality level as the penetration seal material, which must be capable of satisfying the quality requirements of the end product (i.e., QL-1 qualified penetration seal assemblies for plant applications). The following procurement plan takes into consideration the required quality level of the various materials required for this penetration seal pressure test and prescribes an approach for material procurement which considers cost, schedule and quality requirements.

5.1 Penetration Seal Materials

The vast majority of penetration seals that will be installed throughout the MFFF are designated QL-1. MOX Services defines QL-1 in PP9-1, *SSC Quality Levels & Marking Design Documents* [Reference 12.1] as follows:

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

QL-1 SSCs are typically IROFS (all IROFS are QL-1 and may be either SSCs or Administrative Controls) credited in the Integrated Safety Analysis with a required function to prevent or mitigate design basis events such that high-consequence events are made highly unlikely; intermediate-consequence events are made unlikely; or to prevent criticality. For example, the failure of an IROFS item could cause:

1. Loss of a primary confinement feature leading to release of material resulting in exceeding 10CFR70.61 performance requirements;
2. Failure to satisfy the double contingency principle for the prevention of a criticality accident; or
3. Loss of other safety function required to meet 10CFR70.61 performance requirements.

This definition correlates with the following definition of "Nuclear Safety Related" in AREVA Administrative Procedure (AP) 1702-25, *Assignment of Nuclear Safety Classification to Products and Services* [Reference 12.2]:

Definition of "Nuclear Safety Related"

Company products and services are considered to be nuclear safety related if they involve the evaluation, specification, design or change in design, operation, or performance of structures, systems, and components which must function directly, or must support other systems which function, to ensure any of the following:

- The integrity of the reactor coolant pressure boundary
- The capability to shut down the reactor and maintain it in a safe shutdown condition
- The capability to prevent or mitigate the consequences of accidents which could result in potential offsite radiation exposures greater than accepted limits.

On this basis, permanent penetration seal materials used in this test program shall be procured by AREVA or supplied by MOX Services and suitably base-lined so that future procurements of the same commercial materials can undergo the commercial grade dedication process in support of Nuclear Safety Related (i.e., MOX QL-1) plant installations. Only the primary seal material specified as a part of the final seal design and which are left in place during testing become an integral part of the seal assembly and need to be base-lined for future dedication of similarly procured materials.

The quality level of the penetration seal materials procured for this test plan is **Non-Safety**.

Note: Commercial Grade Dedication (CGD) must be performed for Commercial Grade Items (CGIs) used in Safety Related applications when procured from suppliers where specific quality controls for nuclear applications cannot be imposed in a practical manner in accordance with 56-9141754-001, *AREVA NP Inc. Quality Assurance Program* [Reference 12.3]. However, none of the seal materials to be procured and used in the test program are intended or approved for installation in the MOX facility. Therefore, CGD of penetration seal materials used for test purposes is not required.

For this fire-pressure test, the following materials shall be procured by AREVA and base-lined for future dedication activities.

1. Quantum Silicones QSil 5558MC Silicone Elastomer (QSil 5558MC)

5.2 Test Deck/Test Slab

The test deck will be used to simulate a fire barrier in which the penetration seal assemblies may be installed. The test deck is not considered an integral part of the penetration seal assembly being tested and therefore is not intended to replicate MOX-specific plant conditions and not considered integral in bounding the performance of the penetration seal assemblies (e.g., concrete blend, compressive strength, rebar size and spacing). The test deck will be comprised of normal weight reinforced concrete.

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

The openings cast into the test deck will simulate certain features consistent with MOX penetrations (e.g., painted or coated interior finishes, beveled edges, etc.) as defined by the test plan drawings contained in Appendix A.

The testing laboratory shall be responsible for procuring all materials and components associated with the construction of the test deck, unless otherwise specified below. The test deck shall comply with the requirements of the approved test plan drawings contained in Appendix A, and in accordance with the testing facility's Quality Assurance Program.

The quality level of the test deck is **Non-safety**.

5.3 Penetrating Items

Penetrating items (e.g., cables) will be used in this pressure test to simulate MOX-specific plant commodities during the pressure test but are not considered an integral part of the penetration seal assembly being tested. Therefore, the quality level of the penetrating items is **Non-safety**.

Penetrating items for this pressure test will come from MOX Services. MOX Services supplied items are identified on the MOX Services Bill of Materials in Section C.2 of Appendix C.

6.0 SPECIAL PRECAUTIONS

6.1 Precautions for Construction of Test Assemblies

Observe testing facilities safe work practices for construction, lifting, and moving of test assemblies.

6.2 Precautions for Installation of Seal Assemblies

Observe specific precautions recommended by seal material manufacturers as noted on product literature and material safety data sheets contained in AREVA NP Inc. Document 01-9198306, *Installation Instruction Manual for MOX Penetration Seal Test Program* [Reference 12.4].

6.3 Precautions for Conducting Pressure Test

Proper safety precautions shall be exercised to preclude personnel from direct exposure to loss of pressure events, unexpected disengaging of testing equipment from the test deck, and all other related hazards.

7.0 PREREQUISITES

7.1 General Test Configuration Requirements

The test assembly, including slab layout and penetration seal configurations shall be as specified by AREVA and in accordance with the drawings and information contained in Appendix A of this test plan, and AREVA NP Inc. Document 01-9198306, *Installation Instruction Manual for MOX Penetration Seal Test Program* [Reference 12.4].

7.2 Safety Related Materials

Penetration seal materials that are purchased **Non-Safety** for this test program but are to be base-lined for future Nuclear Safety Related via the Commercial Grade Dedication process are indicated on the AREVA Bill of Materials (Appendix C.1).

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

7.3 Dimensioned Drawings

All test articles shall conform to the dimensioned drawings supplied by AREVA and contained in Appendix A and B of this test plan. Any differences between designed and constructed/tested assemblies shall be noted in final drawings contained within the test report.

7.4 Test Configuration

All test articles shall be securely fastened to the test apparatus by the laboratory. All openings shall be sealed in accordance with test plan instructions, drawings (Appendix A and B) and AREVA Document 01-9198306 [Reference 12.4].

8.0 TEST ASSEMBLY CONSTRUCTION

8.1 Test Slab Construction

The Testing Laboratory shall construct the test slab, including location and size of openings and placement of penetrating items, in accordance with the drawings contained in Appendix A of this Test Plan.

AREVA QC (or approved designee) shall conduct an inspection of the test slab for compliance with the approved Test Plan drawings prior to installation of individual penetration seal test assemblies. Any differences between the approved Test Plan drawings and the as-built test slab configuration shall be corrected (if deemed necessary by the AREVA Test Engineer) or noted by the QC Inspector (if correction is not required). Completion of this verification shall be documented as required by AREVA NP Inc. Document 01-9198306, *Installation Instruction Manual for MOX Penetration Seal Test Program* [Reference 12.4].

8.2 Penetration Seal Installation

AREVA (or approved designee) shall install the penetration seal test assemblies in accordance with the drawings contained in Appendix A and B of this Test Plan and in accordance with AREVA NP Inc. Document 01-9198306, *Installation Instruction Manual for MOX Penetration Seal Test Program* [Reference 12.4].

QA/QC verification of penetration seal installations shall be documented as required by AREVA NP Inc. Document 01-9198306, *Installation Instruction Manual for MOX Penetration Seal Test Program* [Reference 12.4].

8.3 Pre-Test Verifications

Prior to conducting the fire-pressure test for each test assembly, the AREVA Test Engineer shall sign-off indicating that the test article (test penetration) is complete and ready for testing as required by AREVA NP Inc. Document 01-9198306, *Installation Instruction Manual for MOX Penetration Seal Test Program* [Reference 12.4].

9.0 PROCEDURE

9.1 Fire Endurance Test

The fire endurance test portion of the fire-pressure test shall comply with the pertinent requirements of *ASTM E 814-94b* [Reference 12.9]. Specifically:

- The fire environment within the furnace shall be in accordance with the standard time temperature curve shown in Fig. 1 of *ASTM E 814-94b* for 30 minutes.

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

- The furnace temperature shall be the average temperature from readings taken from thermocouples symmetrically distributed within the test furnace to show the temperature near all parts of the test assembly. Placement of furnace thermocouples shall comply with *ASTM E 814-94b* requirements.
- Furnace temperature shall be recorded at intervals not exceeding 5 minutes during the test.
- The accuracy of the furnace control shall comply with the requirements of *ASTM E 814-94b*.
- Temperatures monitored by engineering thermocouples shall be read and recorded at intervals of 5 minutes or less.
- The furnace pressure shall comply with the Standard Pressure Condition provisions of *ASTM E 814-94b* (i.e., furnace pressure at least +0.01 inches wg with respect to the unexposed side of the test assembly).

Engineering thermocouples shall be installed as determined during test assembly construction and their locations shall be documented in the final test report. Since the penetrations being tested only require an F rating, engineering thermocouple data is not tied to any test acceptance criteria. Engineering thermocouple data will be used for analysis purposes, such as designing test assemblies for subsequent fire tests or evaluating penetration seal installations that fall outside the parameters of fire tested configurations.

9.2 Hose Stream Test

There is no formal hose stream required for this fire-pressure test.

Following the 30 minute fire endurance portion of the test, the test assembly shall be promptly removed from the furnace chamber and any residual flaming on the exposed side of the test assembly shall be extinguished with water. Depending upon the amount of flaming, a garden hose may be sufficient to extinguish the flames. In the event a larger diameter hose is needed, a hose equipped with an adjustable spray nozzle should be used. Care shall be taken not to impart an excessive amount of force on the test assembly during extinguishment of any residual flaming.

9.3 Pressure Test Apparatus

The pressure test apparatus to be used for the pressure portion of this fire-pressure test shall be one of the two pressure bonnets constructed and used for MOX pressure and seismic pressure tests. One of the hemispherical 72" diameter steel pressure vessels shall be attached to the exposed side of the test assembly. The pressure bonnet shall be used to induce the testing pressures above atmospheric pressure based on Table 9-1. A spray bottle with a soapy-water solution shall be used to detect leakage on the exposed side of the test assembly. Hold times and acceptance criteria shall be as defined in Table 9-1.

9.4 Pressure Test Process

The anticipated fire-induced differential pressures, as they apply to MFFF penetration seal designs, are discussed in DCS01-BRA-DS-TRD-B-01365-0 [Reference 12.5] and in calculation DCS01-ASI-DS-CAL-R-10552 [Reference 12.6]. Most areas of the facility are bounded by a fire induced differential pressure of +/- 7.0 inches w.g. Plant areas with higher fire induced differential pressures are identified in calculation DCS01-ASI-DS-CAL-R-10552 [Reference 12.6]. The maximum fire-induced differential pressure in any plant area is -14.7 inches w.g.

The pressure levels specified in Table 9-1 are to be used in the pressure test portion of this fire-pressure test. The 10 inch w.g. pressure is intended to bound the +/- 7.0 inches w.g. with margin. The 20 inches w.g. pressure is intended to bound the maximum fire-induced compartment pressure of -14.7 inches w.g. with margin.

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

A hold time of 5 minutes has been established for each pressure level to ensure that sufficient time at pressure is maintained to; 1) confirm that no leakage occurs at that pressure, or 2) stabilize make up air to maintain the pressure and identify the apparent location of the leak.

Table 9-1: Differential Pressure Test Levels

Test Stage	Differential Pressure (inch w.g.)	Required Hold Time (minutes)	Acceptance Criteria	Basis for the Selected Differential Pressure
1	10.0	5	Seal Remains In Place	Testing at this differential pressure bounds the +/- 7.0 inches w.g. pressure used as the screening pressure cutoff for fire induced pressures [Reference 12.6].
2	20.0	5	Seal Remains In Place	Testing at this differential pressure bounds the - maximum compartment fire-induced pressure of -14.7 inches w.g. pressure per the fire-induced pressure calculation [Reference 12.6].

The test assembly shall be attached to the pressure test apparatus and subjected to the pressures identified in Table 9-1 as described below. For Test Stages 1 and 2 the side of the test deck which was not exposed to the furnace during the fire test be pressurized in accordance with Sections 9.4.1 through 9.4.4 below.

- 9.4.1 The test assembly shall be attached to the pressure test apparatus and subjected to air pressure test stages at the select pressure levels identified in Table 9-1, beginning with the Stage 1 pressure of 10.0 inches w.g. Once this pressure has been obtained, the pressure shall be maintained for the hold time specified in Table 9-1. Any leakage observed during the hold time shall be noted.
- 9.4.2 Once the designated hold time has been achieved, the pressure shall be increased to the next pressure level identified in Table 9-1 (Stage 2, 20.0 inches w.g.) and held for the designated hold time. Any leakage observed during this hold time shall be noted.
- 9.4.3 Following completion of Stage 2 pressure testing, the test may continue at the discretion of the AREVA test engineer and the testing laboratory manager in charge. Subsequent pressures and hold times shall be recorded as directed by the AREVA test engineer.
- 9.4.4 If at any pressure level (or test stage) the penetration seal becomes dislodged from the opening or otherwise catastrophically fails, the pressure test shall be terminated and the time to failure and pressure at which the failure occurred shall be recorded.

9.5 Post Test Examination

Following completion of the pressure test, visual and destructive (if deemed necessary) post-test examinations shall be performed. These examinations shall include, but not necessarily be limited to, the following:

Visual observations of penetration seal condition including:

- Integrity of seal and conditions on both sides of the penetration
- Location of any penetration seal degradation
- Condition of seal to barrier interface

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

- Condition of seal to penetrating item(s) interface (if applicable)

Once visual observations are complete, destructive examinations may be used to obtain additional information or gain extra insights into seal performance during the pressure test.

10.0 DATA SYSTEMS

During the pressure test, the various data systems connected to the test apparatus (blowers, anemometers, manometers, etc.) shall be controlled and monitored by the testing laboratory. Data recorded for these components shall be compiled and contained in the pressure test report.

11.0 TEST REPORT

The testing laboratory shall submit a report on the results of both the fire and pressure test portions of this fire-pressure test. The test report shall contain the collected data and required quality control documentation. The final test report shall be prepared in sufficient detail to summarize the total testing activity. The final report shall include as a minimum:

- Date of tests (fire and pressure)
- Location of tests
- Description of test apparatus and test articles
- Calibration documentation for all data systems connected to the test apparatus
- Test procedures used
- Acceptance criteria
- Provide quality control records
- Results of the fire and pressure tests
- Color digital photographs of the test project

12.0 REFERENCES

References identified with an (*) are maintained within the MOX Records System and are not retrievable from AREVA Records Management. These are acceptable references per AREVA Administrative Procedure 0402-01, Attachment 8. See page 2 for Project Manager Approval of customer references.

- 12.1 *Shaw AREVA MOX Services Procedure PF9-1, Revision 14, *SSC Quality Levels & Marking Design Documents*
- 12.2 AREVA NP Inc. Procedure 1702-25, Revision 018, *Assignment of Nuclear Safety Classification to Products and Services*
- 12.3 AREVA NP Inc. Document 56-9141754-001, *AREVA NP Inc. Quality Assurance Program*
- 12.4 AREVA NP Inc. Document 01-9198306 (latest revision), *Installation Instruction Manual for MOX Penetration Seal Test Program*
- 12.5 *Shaw AREVA MOX Services Document DCS01-BRA-DS-TRD-B-01365-0, *Technical Requirements Document for MFFF Penetration Seals*

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

- 12.6 *Shaw AREVA MOX Services Calculation DCS01-ASI-DS-CAL-R-10552-0, *Fire Induced Room Pressure Analysis*
- 12.7 AREVA NP Inc. Document 51-9213537 (latest revision), *Detailed Test Plan for Conducting MOX Pressure Test 5A*
- 12.8 AREVA NP Inc. Document 51-9215423 (latest revision), *Detailed Test Plan for Conducting Seismic Pressure Test 2A*
- 12.9 ASTM E 814-94b, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*, American Society for Testing and Materials
- 12.10 *Shaw AREVA MOX Services Drawings DCS01-ZMJ-DS-NTE-N-65107-2 Sheets 84-116, "*Technical Engineering Information*"

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

APPENDIX A: TEST DECK/TEST SLAB DRAWINGS

The test deck (test slab) for Fire-Pressure Test 1 is depicted on page A-2.

Page A-1

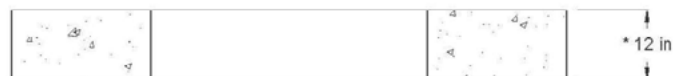
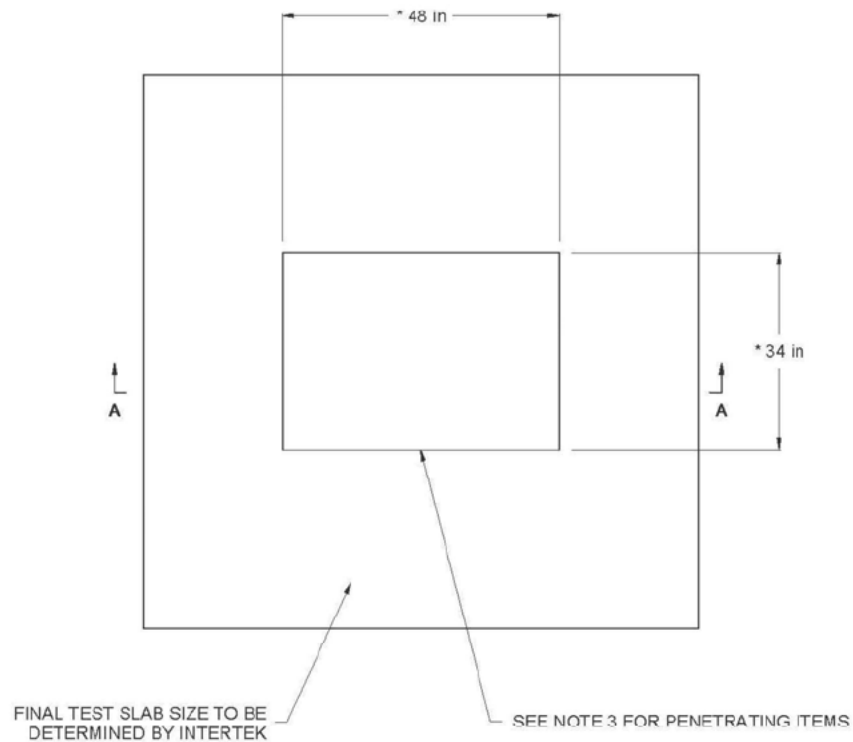
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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Fire-Pressure Test 1 Test Deck



SECTION A-A

NOTES:

1. TOLERANCE ON ALL SLAB DIMENSIONS IS $\pm 1/4"$
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC (OR APPROVED DESIGNEE).
3. SEE APPENDIX B FOR PENETRATING ITEMS AND PENETRATION SEAL DESIGN.

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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

APPENDIX B: TEST PENETRATION DRAWINGS

This appendix contains drawings for Test Penetrants C1 thru C9. These drawings identify penetrating cable locations within the test penetration, as well as, the penetration seal design. Table B1 of this appendix provides the cable types to be used in each location.

Page B-1



Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

[illegible]

Section Views are on
Pages B-3, and B-4.

1. TOLERANCE ON ALL SLAB DIMENSIONS IS +/- 1/4"
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC.
3. REPAIR HOLE IS DEPICTED AS 2" DIAMETER DRILL/CORE BORE, HOWEVER, ACTUAL SIZE AND METHOD OF HOLE CREATION WILL BE DETERMINED AT THE TIME OF INSTALLATION AND NOTED IN THE INSTALLATION RECORDS.

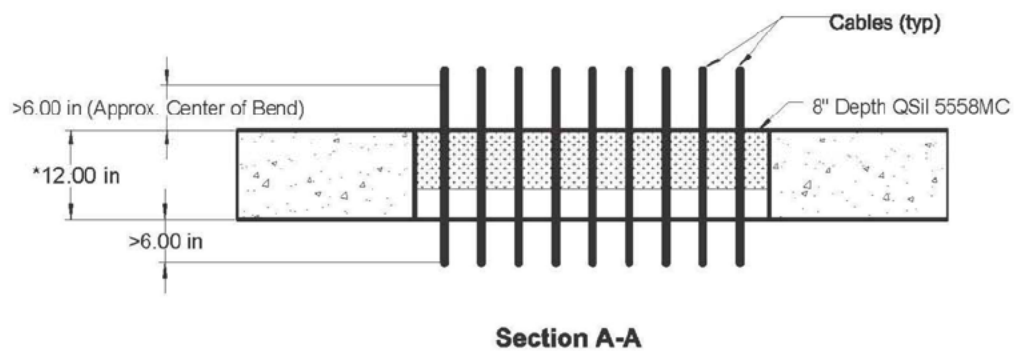
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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Fire-Pressure Test 1



NOTES:

1. TOLERANCE ON ALL SLAB DIMENSIONS IS $\pm 1/4$ "
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC.

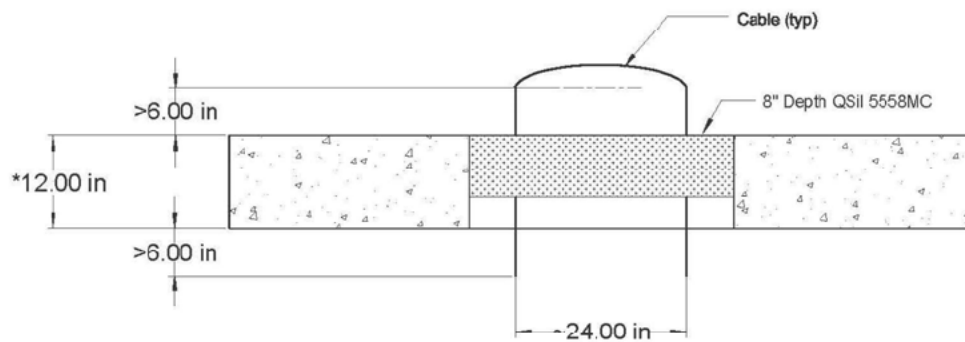
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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Fire-Pressure Test 1



Section B-B

NOTES:

1. TOLERANCE ON ALL SLAB DIMENSIONS IS +/- 1/4"
2. * INDICATES DIMENSIONS TO BE VERIFIED BY AREVA QC

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Table B-1: Cable Descriptions

Cable Identification	Mark No.	Cable Description
C1	wfb-7	1/C 8 AWG 7/S TC 45 MILS XLPE, 15 MILS CSPE FIREWALL III@ 600V
C2	wfa-1	2/C 10 AWG 7/S TC 30 MILS XLPE, 45 MILS CSPE JKT FIREWALL@ III 600V
C3	wfa-26	3/C 10 AWG 7/S TC, 20 MILS XLPE, 1-#10 AWG CU GW, O/A TINNED COPPER BRAID SHIELD, 35 MIL ZH-XLPO JKT X-LINK@ 600V
C4	whe-2	5/C 22 AWG 7/.010 SILVER PLATED ALLOY 20 MILS XLPE 15 MILS XLPE JACKET 600V
C5	wfe-6	3/C 2 AWG 7/S TC 35 MILS XLPE, 1-#6 AWG CU GW, 65 MIL ZH-XLPO JKT X-LINK@ 600V
C6	whe-8	COAX CABLE WITH RG TYPE 59/U, or equal / 22 AWG FOR 62 OHMS (RSS-6-104/LE) Except Not UL Listed & Meets ICEA S-19-81 Paragraph 6.19.6 (IEEE-383 Paragraph 2.56)
C7	wbh-1	Coax Cable 16 AWG for 75 ohms (RSS-6-110A/LE) Excepts meets ICEA S-19-81 paragraph 6.16.6 (IEEE-383 Paragraph 2.56)
C8	wfa-13	37/C 10 AWG 7/S TC 30 MILS XLPE, 80 MIL CSPE JKT FIREWALL@ III 600V
C9	wbe-1	1/C 6 AWG 7/S TC Class B Strand 60 MILS XLPE FIREWALL@ SIS 600V Type SIS/XHHW-2 (UL) Listed Colored Grey

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Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

APPENDIX C: BILL OF MATERIALS

This appendix contains the Bill of Materials for this fire test. The Bill of Materials in Section C.1 identifies materials to be provided by AREVA. The Bill of Materials in Section C.2 identifies materials to be provided by MOX Services. The Bill of Materials in Section C.3 identifies materials to be provided by Intertek.

Page C-1

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

C.1 Table Bill of Materials for AREVA Supplied Items

Bill of Material for AREVA Supplied Items					
Item	Description	Part Number	Quantity	Units	Total
1	Quantum Silicones QSiil 5558MC (50lb part A, 50lb part B, 100lb set)	N/A	8	Set	8 Sets

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

C.2 Bill of Materials for MOX Services Supplied Items

Bill of Material for MOX Services Supplied Items					
Item	Description	Part Number	Quantity	Units	Total
1	1/C 8 AWG 7/S TC 45 MILS XLPE, 15 MILS CSPE FIREWALL III® 600V	wfb-7	8	Ft.	8 Ft.
2	2/C 10 AWG 7/S TC 30 MILS XLPE, 45 MILS CSPE JKT FIREWALL® III 600V	wfa-1	8	Ft.	8 Ft.
3	37/C 10 AWG 7/S TC 30 MILS XLPE, 80 MIL CSPE JKT FIREWALL® III 600V	wfa-13	8	Ft.	8 Ft.
4	5/C 22 AWG 7/.010 SILVER PLATED ALLOY 20 MILS XLPE 15 MILS XLPE JACKET 600V	whe-2	8	Ft.	8 Ft.
5	1/C 6 AWG 7/S TC Class B Strand 60 MILS XLPE FIREWALL® SIS 600V Type SIS/XHHW-2 (UL) Listed Colored Grey	wbe-1	8	Ft.	8 Ft.
6	COAX CABLE WITH RG TYPE 59/U, or equal / 22 AWG FOR 62 OHMS (RSS-6-104/LE) Except Not UL Listed & Meets ICEA S-19-81 Paragraph 6.19.6 (IEEE-383 Paragraph 2.56)	whe-8	8	Ft.	8 Ft.
7	Coax Cable 16 AWG for 75 ohms (RSS-6-110A/LE) Excepts meets ICEA S-19-81 paragraph 6.16.6 (IEEE-383 Paragraph 2.56)	wbh-1	8	Ft.	8 Ft.

Page C-3

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

Bill of Material for MOX Services Supplied Items					
Item	Description	Part Number	Quantity	Units	Total
8	3/C 10 AWG 7/S TC, 20 MILS XLPE, 1-#10 AWG CU GW, O/A TINNED COPPER BRAID SHIELD, 35 MIL ZH-XLPO JKT X-LINK® 600V	wfa-26	8	Ft.	8 Ft.
9	3/C 2 AWG 7/S TC 35 MILS XLPE, 1-#6 AWG CU GW, 65 MIL ZH-XLPO JKT X-LINK® 600V	wfe-6	8	Ft.	8 Ft.

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

C.3 Bill of Materials for Intertek Supplied Items

Bill of Material for Intertek Supplied Items*					
Item	Description	Part Number	Quantity	Units	Total
	None				

* This BOM applies to Intertek Supplied Items other than materials required to construct the test slab. Construction of the test slab, including procurement of any materials required for the test slab, is the responsibility of Intertek.

Controlled Document



Document No.: 51-9208264-000

Detailed Test Plan for Conducting MOX Fire-Pressure Test 1



APPENDIX D: DESIGN VERIFICATION CHECKLIST

22410-8 (02/25/2013) Page 1 of 2

AREVA		DESIGN VERIFICATION CHECKLIST			
Document Identifier 51 - 9208264 - 000					
Title Detailed Test Plan for Conducting Fire Pressure Test 1					
1.	Were the inputs correctly selected and incorporated into design or analysis?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
2.	Are assumptions necessary to perform the design or analysis activity adequately described and reasonable? Where necessary, are the assumptions identified for subsequent re-verifications when the detailed design activities are completed? <i>Note: If there are no assumptions (of any type), then N/A shall be checked.</i>	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A	
3.	Are the appropriate quality and quality assurance requirements specified? Or, for documents prepared per AREVA NP Inc. procedures, have the procedural requirements been met?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
4.	If the design or analysis cites or is required to cite requirements or criteria based upon applicable codes, standards, specific regulatory requirements, including issue and addenda, are these properly identified, and are the requirements/criteria for design or analysis met?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
5.	Have applicable construction and operating experience been considered?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
6.	Have the design interface requirements been satisfied?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
7.	Was an appropriate design or analytical method used?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
8.	Is the output reasonable compared to inputs?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
9.	Are the specified parts, equipment and processes suitable for the required application?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
10.	Are the specified materials compatible with each other and the design environmental conditions to which the material will be exposed?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
11.	Have adequate maintenance features and requirements been specified?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A	
12.	Are accessibility and other design provisions adequate for performance of needed maintenance and repair?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A	
13.	Has adequate accessibility been provided to perform the in-service inspection expected to be required during the plant life?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A	
14.	Has the design properly considered radiation exposure to the public and plant personnel?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A	
15.	Are the acceptance criteria incorporated in the design documents sufficient to allow verification that design requirements have been satisfactorily accomplished?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
16.	Have adequate preoperational and subsequent periodic test requirements been appropriately specified?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A	
17.	Are adequate handling, storage, cleaning and shipping requirements specified?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
18.	Are adequate identification requirements specified?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	
19.	Is the document prepared and being released under the AREVA NP Inc. Quality Assurance Program? If not, are requirements for record preparation review, approval, retention, etc., adequately specified?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A	



Detailed Test Plan for Conducting MOX Fire-Pressure Test 1

22410-8 (02/25/2013) Page 2 of 2		
<div><h1>DESIGN VERIFICATION CHECKLIST</h1></div>		
Document Identifier	51	- 9208264 - 000
Comments on the preceding responses:		
<div></div>		
Verified By:	Derrick V Risner	
(First, MI, Last)	Printed / Typed Name	Signature
		12/09/2013
		Date

APPENDIX F

Commercial Grade Dedication-Related Documents

The vast majority of penetration seals that will be installed throughout the MFFF will be designated as quality level QL-1. For this reason, permanent penetration seal materials used in this test program were procured by AREVA or supplied by MOX Services and suitably base-lined so that future procurements of the same commercial materials can undergo the Commercial Grade Dedication process in support Nuclear Safety Related (i.e., MOX QL-1) plant installations.

Only the primary seal material(s) that were specified as a part of the final penetration seal design and left in place during the test needed to be base-lined for future dedication of similarly procured materials. For this test, the following AREVA documents contain information associated with materials that underwent the base-lining process. These documents establish material critical characteristics as a baseline for future Commercial Grade Dedication.

- AREVA Document 51-9212663-000, "Quantum Silicones QSil 5558MC Silicone Elastomer Critical Characteristics"

These documents are available from the AREVA Records Management System or the MOX Records Management System.

APPENDIX G

Quality Documents

The test assembly used in Fire-Pressure Test 1 was the same assembly tested in Pressure Test 5A. For Quality Records of installation, Certificates of Conformance of the sealant materials, and QA Receiving Documents of the penetration materials for this assembly, please see the Appendices in Pressure Test 5A (Intertek Report No. 101276459SAT-010; AREVA document 58-9224198-000).

LIST OF CALIBRATED EQUIPMENT: FIRE TEST

Description	Serial No.	Calibration Due Date
Thermo-Hygrometer	130548237	9/19/2015
Data Acquisition System	48JF0082	3/11/2014
Pressure Transducer	3588750	3/26/2014
Stop watch	122601005	10/23/2014



Calibration
Certificate No. 1750.01
Traceable®

Calibration complies with ISO/IEC
17025, ANSI/NCSL Z540-1, and 9001

Build B
1-10-2014



Cert. No.: 4096-5373559

Traceable® Certificate of Calibration for Digital Humidity/Temp. Meter

Manufactured for and distributed by: Fisher Scientific, 300 Industry Drive, Pittsburgh, PA 15275-1001

Instrument Identification:

Model Numbers: 11-661-13, FB61254, 245C5 S/N: 130548237 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Chilled Mirror Hygrometer	31874/H2048MCR	6/14/15	11081
Digital Thermometer	41334977/41335007	9/26/13	4000-4643062

Certificate Information:

Technician: 104 Procedure: CAL-17 Cal Date: 9/19/13 Cal Due: 9/19/15
Test Conditions: 23.0°C 51.0 %RH 1013 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH		N.A.		42.95	42	Y	39	47	1.30	3.1:1
°C		N.A.		24.218	24	Y	23	25	0.590	1.7:1

This instrument was calibrated in compliance with ISO/IEC 17025:2005 and ANSI/NCSL Z540-1-1994 Part 1.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable to NIST and through NIST to the International System of Units (SI).

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY



Quality Manager, Security Manager



Asst. Dir., Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Humidity/Temp. Meter should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Humidity/Temp. Meters change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

This device was calibrated using a single test point. Should additional test points be required, please contact Control Company for factory calibration and re-certification traceable to National Institute of Standards and Technology.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2008-HOU-RVA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

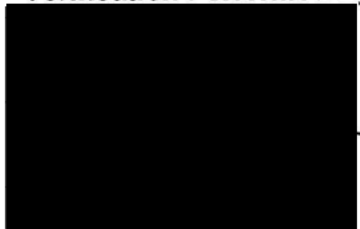
Intertek

**16015 Shady Falls Road
Elmendorf, TX 78112
210-635-8100 210-635-8101 fax**

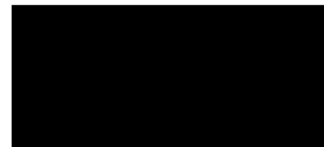
Certificate of Verification

Verification Date:	9/11/2013
Re-verification Date:	3/11/2014
Manufacturer:	Yokogawa
Model No.:	300 Channel DAU
Serial No.:	48JF0082
Equipment Description:	300 Channel Data Acquisition System
Calibration Sources:	Tegam SN: T-156701, due 6/13/2014.
Performance:	See the attached sheet

Verification Performed By:




Verification Approved By:



Project Engineer

This Data Acquisition System was verified following the Draft "Work Instruction for Verifying Yokogawa Darwin Data Acquisition Systems" dated 8/28/2013




SSC LAB DIVISION

CERTIFICATE NO: 54676-0009

Page 1 of 1

CERTIFICATE OF CALIBRATION



Certificate # AC-1756

SSC LAB DIVISION certifies that this instrument conforms to original manufacturers specifications or to tolerances indicated below and has been calibrated using standards with accuracies traceable to a National Measurement Institute, or to accepted values of natural physical constants, or have been derived by ratio techniques. This certificate complies with ISO / IEC 17025:2005 & ANSI/NCSLI Z540-1. Unless otherwise stated, the M & T E for which this certificate is issued, based on interpretation of data, was found to meet the required specification. The expanded measurement uncertainty is reported at k=2, 95% confidence level.

Customer:	INTERTEK	Date Received:	02/21/2013
Location:	16015 SHADY FALLS RD. ELMENDORF TX 78112	Date of Issue/Calibration:	03/26/2013
PO #:02192013		Next Calibration Due:	03/26/2014
		Metrologist:	Sean Rainey
Manufacturer:	SETRA	Model:	2641R25WB2ST1C
Nomenclature:	TRANSDUCER- PRESSURE	Serial Number:	3588750
Range:	± 0.25"WC	Equipment ID:	3588750


Calibration Data	Temp	68°F ± 1°F	Humidity	<50%RH
Calibration Accuracy ± 1% FS	Note:A=Reading plus Uncertainty exceeds tolerance limits.			

Note: if the AS LEFT column is blank, no adjustments were required.

Note: Many factors may cause out of calibration conditions prior to due date. The Calibration interval has been specified by the Customer. Current procedures and methods utilized by SSC Lab Division are approved by the Customer.

APPLIED	AS FOUND	AS LEFT	UNCERTAINTY	PROCEDURE #
2.5 V 0" W.C.	2.507	2.507	± 0.035 VDC	NA17-20MX-157 1 AUG 2011
0 V -0.25" W.C.	0.001	0.001	± 0.035 VDC	
5 V 0.25" W.C.	5.019	5.019	± 0.035 VDC	

Standard(s)	Description	Calibration Date	Expiration Date	Traceability Number
SSC30LD029	CALIBRATOR- PRESSURE	5/4/2011	5/4/2013	50650-0010
SSC30LD113	TRANSDUCER- PRESSURE	10/15/2012	10/15/2014	CAL122077


 Cindy Glover
 Production Supervisor

Comments: _____

This certificate may not be reproduced, except in full, without the written consent of SSC Lab Division.
SSC Lab Division, 7715 Distribution Dr., Little Rock, AR 72209

Form 5.10.2-1



Calibration
Certificate No. 1750.01

Calibration complies with ISO 9001
ISO/IEC 17025 AND ANSI/NCSL Z540-1



Cert. No.: 1042-4689088

Traceable® Certificate of Calibration for Waterproof Stopwatch

Manufactured for and distributed by: Fisher Scientific, 300 Industry Drive, Pittsburgh, PA 15275-1001

Instrument Identification:

Model Numbers: 0666256, FB70240 S/N: 122601005 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Non-contact Frequency Counter	26.6 2025	3/06/13	1000313632

Certificate Information:

Technician: 67 Procedure: CAL-01 Cal Date: 10/23/12 Cal Due: 10/23/14
Test Conditions: 22.5°C 45.0 %RH 1015 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
Sec/24hr		N.A.		0.000	-0.600	Y	-8.640	8.640	0.130	>4:1

This Instrument was calibrated using instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio;
Accuracy=±(Max-Min)/2; Min = Nominal/Rounded - Tolerance; Max = Nominal/Rounded + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Walter Berry, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Waterproof Stopwatch should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Waterproof Stopwatches change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2008-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).



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REPORT OF CALIBRATION

To: INTERTEK TESTING SERVICES

Date of Calibration: 2/14/2013

Job #: P99193-SJ

Item #: 1

Spool #: S0134186

Footage: 1100

Part #: PW30080 G/G-24-KK SP

Customer PO: USA20-0000215766Q

16015 SHADY FALLS ROAD
ELMENDORF, TX
76112

All Temperatures in this report are based on the International Temperature Scale of 1990 (ITS-90) with reference junctions maintained at 0°C (32°F). The product listed above was calibrated utilizing techniques consistent with the guidelines set forth in ANSI/NCCL Z540-1, ASTM E220-07A, ASTM E230-03, ANSI MC98.1, and AMS-2750 rev D, and are in compliance. Calibration results are traceable to the National Institute of Standards and Technology (NIST) and meet the deviation tolerances for acceptable calibration, if authorized below.

Nominal Value	UUT/Inside	Correction	UUT/Outside	Correction	Average In/Out	Special
Set Point	Test Sensor	Factor Inside	Test Sensor	Factor Outside	Correction Factor	Tolerance
°F	°F	°F	°F	°F	°F	°F
200.0	200.0	0.0	200.0	0.0	0.0	2.0
400.0	400.1	-0.1	400.0	0.0	-0.1	2.0
600.0	599.6	0.4	599.4	0.6	0.5	2.4
800.0	800.5	-0.5	800.3	-0.3	-0.4	3.2
1000.0	1001.2	-1.2	1000.9	-0.9	-1.1	4.0

The calibration results apply to the item(s) listed. Calibration is ISO/IEC 17025:2005 Accredited unless calibration points and/or profile falls outside of the stated Scope of Accreditation. *Correction factor is used to adjust measurement instrumentation readings to match NIST reference values. ISO 9001:2008 certified by LRQA. Certificate Number: UQA0111712.

Measurement uncertainty is expressed as an expanded uncertainty at 95% confidence level K=2 and is +/- 0.5°C from 196°C to 0°C, +/- 1.3°C to 1100°C and +/- 2.0°C from 1100°C to 1460°C

THIS IS TO CERTIFY THE MATERIAL FURNISHED ON THIS SHIPMENT IS IN SATISFACTORY CONDITION, AND IN CONFORMANCE WITH THE REQUIREMENTS, SPECIFICATIONS, & DRAWINGS OF THE ABOVE REFERENCED CUSTOMER PURCHASE ORDER. SAMPLING WAS PERFORMED PER CUSTOMERS REQUEST. AS APPLICABLE, INSPECTION AND TEST RECORDS ARE ON FILE AND AVAILABLE FOR CUSTOMER REVIEW

DIGITAL MULTIMETER
MODEL: AGILENT: 3458A
SERIAL NUMBER: US28032293
CALIBRATION DUE DATE: APRIL 30, 2014
Room Temperature: 72°F (±5°F)
Relative Humidity: < 60%

Calibrated by: AM

REFERENCE STANDARD THERMOCOUPLE TYPE K

NIST TRACEABILITY AVAILABLE UPON REQUEST
TEST # 279113

Approved By: Dante Pedones Cal. Lab. Manager



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REPORT OF CALIBRATION

To: INTERTEK TESTING SERVICES

Date of Calibration: 2/14/2013

Job #: P99193-SJ

Item #: 1

Spool #: S0134189

Footage: 1000

Part #: PW30080 G/G-24-KK SP

Customer PO: USA20-0000215766Q

16015 SHADY FALLS ROAD
ELMENDORF, TX
78112

All Temperatures in this report are based on the International Temperature Scale of 1990 (ITS-90) with reference junctions maintained at 0°C (32°F). The product listed above was calibrated utilizing techniques consistent with the guidelines set forth in ANSI/NCSL Z540-1, ASTM E220-07A, ASTM E230-03, ANSI MC96.1, and AMS-2750 rev D, and are in compliance. Calibration results are traceable to the National Institute of Standards and Technology (NIST) and meet the deviation tolerances for acceptable calibration, if authorized below.

Nominal Value	UUT/Inside	Correction	UUT/Outside	Correction	Average In/Out	Special
Set Point	Test Sensor	Factor Inside	Test Sensor	Factor Outside	Correction Factor	Tolerance
°F	°F	°F	°F	°F	°F	°F
200.0	199.9	0.1	199.9	0.1	0.1	2.0
400.0	400.1	-0.1	400.0	0.0	-0.1	2.0
600.0	599.6	0.4	599.7	0.3	0.4	2.4
800.0	800.3	-0.3	800.3	-0.3	-0.3	3.2
1000.0	1000.8	-0.8	1000.9	-0.9	-0.9	4.0

The calibration results apply to the item(s) listed. Calibration is ISO/IEC 17025:2005 Accredited unless calibration points and/or profile falls outside of the stated Scope of Accreditation. *Correction factor is used to adjust measurement instrumentation readings to match NIST reference values. ISO 9001:2008 certified by LRQA. Certificate Number: UQA0111712.

Measurement uncertainty is expressed as an expanded uncertainty at 95% confidence level K=2 and is +/- 0.5°C from 196°C to 0°C, +/- 1.3°C to 1100°C and +/- 2.0°C from 1100°C to 1400°C.

THIS IS TO CERTIFY THE MATERIAL FURNISHED ON THIS SHIPMENT IS IN SATISFACTORY CONDITION, AND IN CONFORMANCE WITH THE REQUIREMENTS, SPECIFICATIONS, & DRAWINGS OF THE ABOVE REFERENCED CUSTOMER PURCHASE ORDER. SAMPLING WAS PERFORMED PER CUSTOMERS REQUEST. AS APPLICABLE, INSPECTION AND TEST RECORDS ARE ON FILE AND AVAILABLE FOR CUSTOMER REVIEW

DIGITAL MULTIMETER
MODEL: AGILENT: 3458A
SERIAL NUMBER: US28032293
CALIBRATION DUE DATE: APRIL 30, 2014
Room Temperature: 72°F (±5°F)
Relative Humidity: < 60%

Calibrated by: AM

REFERENCE STANDARD THERMOCOUPLE TYPE K

NIST TRACEABILITY AVAILABLE UPON REQUEST
TEST # 279113

Approved By: Dante Bediones Cal. Lab. Manager

LIST OF CALIBRATED EQUIPMENT: Pressure Test

Description	Serial No.	Calibration Due Date
Thermo-Hygrometer	130548237	9/19/2015
Data Acquisition System	18041FE	1/16/2014*
Pressure Transducer	406707	7/16/2014*
Mass Flowmeter	4270050001001	2/1/2014*
Mass Flowmeter	4270050003001	2/7/2014*
Stop watch	122601005	10/23/2014

* See Intertek Corrective Action Request (CAR) 51-AMER-SAT-2014-INT and AREVA Contract Variation Approval Request (CVAR) 87-9224669-000



Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC
17025, ANSI/NCSL Z540-1, and 9001

Build B
PHOTOGRAPH



Cert. No.: 4096-5373559

Traceable® Certificate of Calibration for Digital Humidity/Temp. Meter

Manufactured for and distributed by: Fisher Scientific, 300 Industry Drive, Pittsburgh, PA 15275-1001

Instrument Identification:

Model Numbers: 11-661-13, FB61254, 245C5 S/N: 130548237 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Chilled Mirror Hygrometer	31874/H2048MCR	6/14/15	11081
Digital Thermometer	41334977/41335007	9/26/13	4000-4643082

Certificate Information:

Technician: 104 Procedure: CAL-17
Test Conditions: 23.0°C 51.0 %RH 1013 mBar

Cal Date: 9/19/13

Cal Due: 9/19/15

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH		N.A.		42.95	42	Y	39	47	1.30	3.1:1
°C		N.A.		24.218	24	Y	23	25	0.590	1.7:1

This instrument was calibrated in compliance with ISO/IEC 17025:2005 and ANSI/NCSL Z540-1-1994 Part 1.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable to NIST and through NIST to the International System of Units (SI).

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

[Redacted Signature]
Nicol Rodriguez, Quality Manager

[Redacted Signature]
Aaron Jones, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Humidity/Temp. Meter should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Humidity/Temp. Meters change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

This device was calibrated using a single test point. Should additional test points be required, please contact Control Company for factory calibration and re-certification traceable to National Institute of Standards and Technology.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RYA
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Certificate of Calibration

Certificate Number:	2994344	Date:	28-MAY-2014
Serial Number:	18041FE	Part Number:	194710E-04L
Description:	CCA,USB-6210		
Calibration Date:	08-DEC-2012	Shelf Life:	0 Days
Calibration Due Date*:	-	Recommended Calibration Interval:	12 Months
Temperature:	22.26 °C	Humidity:	40.7% RH

Standards Used

Manufacturer	Model	Tracking Number	Calibration Date	Calibration Due
NATIONAL INSTRUMENTS	PXI-4070	6712	26-JUN-12	26-JUN-13
NATIONAL INSTRUMENTS	PXI-6259	6871	27-JUN-12	27-JUN-13
NATIONAL INSTRUMENTS	PXI-5421	7591	25-JUN-12	25-JUN-13
VAISALA	HMT331	7885	24-MAY-12	24-MAY-13

National Instruments certifies that at the time of test, the above product was calibrated in accordance with applicable National Instruments procedures. The procedures are designed to ensure that the product listed above meets or exceeds National Instruments specifications.

We further certify that the environment in which this product was calibrated is maintained within the operating specifications of the instrument(s) standards. The measurement standards used during calibration are traceable to NIST and/or other International Measurement Institutes (NMIs) that are signatories of the International Committee of Weights and Measure (CIPM) Mutual Recognition Agreement (MRA).

The information shown on this certificate applies only to the instrument identified above and this certificate may not be reproduced, except in full, without prior written consent of National Instruments.

*Optional field, **Calibration Due Date**, may be established by combining the **Recommended Calibration Interval**, **Calibration Date** and, when applicable, accounting for **Shelf Life**. Shelf life defines how long an instrument may be stored, after calibration, without impact to its specifications.

The instrument's Calibration Due Date can be calculated using the following methods:

- If date placed in service is within **Calibration Date + Shelf Life**: **Calibration Due Date** = date placed in service + **Recommended Calibration Interval**
- If date placed in service is outside **Calibration Date + Shelf Life**: **Calibration Due Date** = **Calibration Date + Shelf Life + Recommended Calibration Interval**

For questions or comments, please contact National Instruments Technical Support.



Andrew Krupp
Vice President, Quality and Continuous Improvement

OMEGADYNE INC. CERTIFICATE OF CALIBRATION

Model Number: PX409-005DWUV
Serial Number: 406707
Date: 7/15/2011
Job: R3274

Capacity: 5.00 PSID
Excitation: 10.00 Vdc
Technician: KAPOME

Pressure Connection: 1/4-18 NPT Male

WIRING CODE
Electrical Connection: Integral Cable 4-Cond
BLACK = - EXCITATION
WHITE = + SIGNAL
GREEN = - SIGNAL
RED = + EXCITATION

CALIBRATION WORKSHEET

NOTES

Pressure PSID	OUTPUT mVdc
0.00	0.007
2.50	50.008
5.00	100.016
2.50	50.007
0.00	0.007

NIST Traceable Number(s): C-1954, C-1289

Omegadyne Inc. certifies that the above instrumentation has been calibrated and tested to meet or to exceed the published specifications. This calibration was performed using instrumentation and standards that are traceable to the National Institute of Standards and Technology. This document also ensures that all testing performed complies with MIL-STD 45662-A, ISO 10012-1, and ANSI/NCSL Z540-1-1994 requirements. After Final Calibration our products are stored in an environmentally controlled stock room and are considered in bonded storage. Depending on environmental conditions and severity of use, factory calibration is recommended every one to three years after the initial service installation date.

Accepted and Certified By

7/15/2011
Date



CERTIFICATE OF ACCURACY

This is to certify that meter serial number 4270050001001 is certified to an accuracy of +/- 1 % of 20 SCFM of N₂ and has been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (N.I.S.T.) according to our procedures.

All traceable certifications and related procedures for the equipment used are on file.

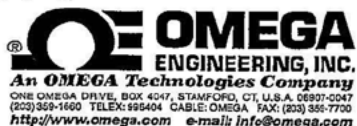
Barometer Number: N/A
Vol-U-Meter Number: Base 1920
cell 1898
Type of Gas: N₂
Gas Used for Calibration: N₂
Pressure Gauge Number: 1122
Timer Number: N/A
Thermometer Number: N/A
Voltmeter: NA
Calibrated By: [REDACTED]
Date Calibrated: 02-1-13

Uncertainty of measurements: +/- 0.3 % of reading

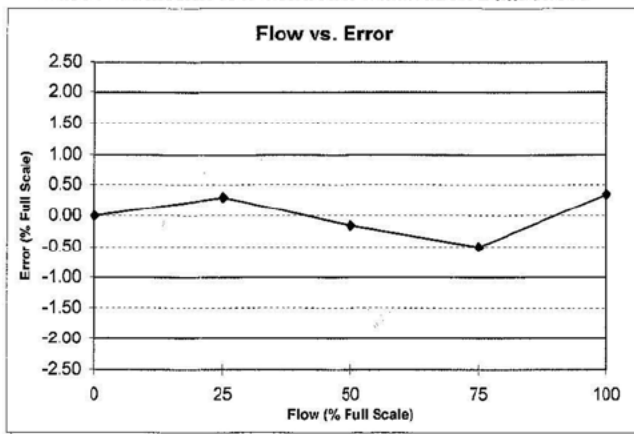
Calibrations were performed under a controlled Quality System Manual, which incorporates the requirements of ISO Guide 25, ISO 10012-1, ISO 9001 (1994) and ISO 13485. The released ISO 13485 registration (Medical Devices – Quality Management Systems – System Requirements for Regulatory Purposes) includes Design Controls and Metrology Systems.

0122220B

FM-1011 REV B



Mass Flowmeter/Flow Controller Calibration Data Sheet



Calibration Data

Setpoint (SLPM)	Flow Signal (Volts)	Device Flow (SLPM)	Actual Flow (SLPM)	% FS Error *
00.00	0.000	00.00	00.00	0.00
05.00	1.253	05.01	05.07	0.30
10.00	2.502	10.01	09.98	-0.16
15.00	3.752	15.01	14.91	-0.50
20.00	5.000	20.00	20.07	0.35

* % Full Scale (FS) Error = (100)(Actual Flow - Device Flow) / Full Scale Flow

DATE 2/1/2013
TIME 7:59:59 AM
Shop Order No. 427005
Serial No. 4270050001001

GAS

Nameplate (Actual) Nitrogen
Surrogate (Calibration) Nitrogen (N2)

STANDARD CONDITIONS

Std. Pressure 101.32 kPa (760 Torr)
Std. Temperature 21.1 °C

PRESSURE

Inlet (P₁) 20 PSIG
Outlet (P₂) N/A

TEMPERATURE

Calib. Temperature 21.9 °C
Oper. Temperature 70 °F

Max. Flow Rate 20 SLPM
Gas Factor 1

Calibrator MT
Flow Standard PICO 1898-1
Unit Accuracy 1.0 FS & 0.0 Rate
Calib. Attitude Horizontal (base down)

LEAK TEST DATA

Inboard (Externally Pressurized) Helium Leak Rate: < 1 x 10⁻⁸ atm cc/sec
Vacuum Pressure: < 5 milli Torr

Tested By: [Redacted] Date: 2-1-13

FM-1119 Rev. K



CERTIFICATE OF ACCURACY

This is to certify that meter serial number 4270050003001 is certified to an accuracy of +/- 1 % of 200 slm of N₂ and has been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (N.I.S.T.) according to our procedures.

All traceable certifications and related procedures for the equipment used are on file.

Barometer Number:	<u>1667</u>
Vol-U-Meter Number:	<u>613</u>
Type of Gas:	<u>N₂</u>
Gas Used for Calibration:	<u>N₂</u>
Pressure Gauge Number:	<u>1950</u>
Timer Number:	<u>1876</u>
Thermometer Number:	<u>985</u>
Voltmeter:	<u>NA</u>
Calibrated By:	<u>[REDACTED]</u>
Date Calibrated:	<u>2-7-13</u>

Uncertainty of measurements: +/- 0.3 % of reading

Calibrations were performed under a controlled Quality System Manual, which incorporates the requirements of ISO Guide 25, ISO 10012-1, ISO 9001 (1994) and ISO 13485. The released ISO 13485 registration (Medical Devices – Quality Management Systems – System Requirements for Regulatory purposes) includes Design Controls and Metrology Systems.

0122220B

FM-1011 REV B



MASS FLOWMETER/FLOW CONTROLLER CALIBRATION DATA SHEET

SPECIFICATIONS

MODEL #: FMA-875A-V-NIST SERIAL #: 4270050003001
FLOW RANGE: 200 SLPM OPERATING TEMPERATURE: 70 F
NAMEPLATE (PROCESS) GAS: N2 SURROGATE (CALIBRATION) GAS: N2
STANDARD TEMPERATURE: 21.1 C STANDARD PRESSURE: 101.32 kPa (760 Torr)
P1 (INLET PRESSURE): 20 PSIG P2 (OUTLET PRESSURE): N/A
CALIBRATION TEMPERATURE: 18.7°C CALIBRATION ATTITUDE (calibration attitude checked):
☒ Horizontal (base down) ☐ Horizontal (upside down)
☐ Horizontal (front down) ☐ Horizontal (back down)
☐ Vertical (inlet up) ☐ Vertical (inlet down)
CALIBRATION ACCURACY: \pm 1 % OF FULL SCALE FLOW

CALIBRATION DATA

% FULL SCALE (Nominal)	FLOW SIGNAL OUTPUT (signal type checked) <input checked="" type="checkbox"/> Vdc <input type="checkbox"/> mAdc	STANDARD VOLUMETRIC FLOW (Units: SLPM)		ERROR * (% Full Scale)
		DEVICE	MEASURED	
100	5.000	200.000	200.079	.5395
75	3.750	150.000	149.317	-.3415
50	2.500	100.000	100.488	.2440
25	1.250	50.000	50.852	.4260
0	0.00	0.000	0.000	-----

* % FULL SCALE ERROR = (100) (MEASURED FLOW - DEVICE FLOW) ÷ FULL SCALE FLOW

CALIBRATED BY: [REDACTED] DATE: 2-7-13

LEAK TEST DATA

INBOARD (EXTERNALLY-PRESSURIZED) HELIUM LEAK RATE: $<1 \times 10^{-8}$ atm cc/sec

VACUUM PRESSURE: <5 millitorr

TESTED BY: [REDACTED] DATE: 2-1-13

FM-355-OE Rev. 0



Calibration
Certificate No. 1750.01

Calibration complies with ISO 9001
ISO/IEC 17025 AND ANSI/NCSL Z540-1

Cert. No.: 1042-4689088

Traceable® Certificate of Calibration for Waterproof Stopwatch

Manufactured for and distributed by: Fisher Scientific, 300 Industry Drive, Pittsburgh, PA 15275-1001

Instrument Identification:

Model Numbers: 0666256, FB70240 S/N: 122601005 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Non-contact Frequency Counter	26.6 2025	3/06/13	1000313632

Certificate Information:

Technician: 67 Procedure: CAL-01 Cal Date: 10/23/12 Cal Due: 10/23/14
Test Conditions: 22.5°C 45.0 %RH 1015 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
Sec/24hr		N.A.		0.000	-0.600	Y	-8.640	8.640	0.130	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = Nominal(Rounded) - Tolerance; Max = Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Wallace Urry, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Waterproof Stopwatch should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Waterproof Stopwatches change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com


Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2008-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

TEST ARTICLE ATTRIBUTE CHECKLIST

PROJECT NO: 6101266224-007 CLIENT: AREVA

Project Description FIRE PRESSURE #1

	SAT	UNSAT
I. ASSEMBLY		
Proper materials used	X	
Material documentation complete	X	
Configuration/dimensions in accordance w/ approved drawings	X	
Description of assembly: <u>per AREVA FIRE PRESSURE #1</u>		
II. ELECTRICAL CABLE		
Correct material used	X	
Material documentation complete	X	
Correct cable lay-in and fill requirements	X	
Description of electrical cable: <u>per test plan</u>		
III. THERMOCOUPLES		
Correct thermocouple type, certs received	X	
Thermocouples positioned in accordance with test plan	X	
Adequately labeled and secured	X	
Quality Assurance verification done	X	
Description of thermocouples:		
IV. FIRE BARRIER		
Name or type of material <u>ASTI</u>	X	
INTERTEK received material documentation provided by Client	X	
Materials provided by INTERTEK properly documented	X	
Materials installed by INTERTEK in accordance with test plan	X	
INTERTEK Quality Assurance responsibilities determined	X	
QA responsibilities of Client installation determined	X	
Moisture check required		
Special requirements		
V. FINAL PREBURN VERIFICATION		
Final visual inspection & approval (initials) INTERTEK <u>[redacted]</u> Client <u>[redacted]</u>		
CALIBRATION DOCUMENTATION (S/N and calibration due date)		
Data Acquisition Equipment: <u>SEE TEST DATA PACKAGE</u>		
Other Measurement Devices: <u>SEE TEST DATA PACKAGE</u>		
Temperature <u>54</u> Humidity <u>45</u> Date <u>12-10-13</u> Time of Test start <u>10:20</u>		
INTERTEK pre-burn checklist performed by <u>[redacted]</u>		
Client representative present to witness test <u>[redacted]</u>		
Note: Verification to be made using initials by INTERTEK Quality Assurance or test personnel.		

<div>  TEST ACTIVITIES EVENT LOG </div>		
Note: This Log is used to document the date and note the significant events during the completion of Test Project # G101266224SAT-007 (Fire Pressure Test #1) for AREVA NP Inc.		
ITEM	DATE	INIT'L
Verified opening sizes per the test plan	5/29/13	MD
Concrete poured by Alamo Concrete	5/29/13	MD
Concrete conditioned	6/3/13	MD
Critical attributes of test deck and test samples verified	6/17/13	MD
Begin pouring seals	6/19/13	MD
Finish pouring seals	6/24/13	MD
Completed seal assembly verified against the test plan	6/24/13	MD
Pressure Test #1 conducted	7/16/13	MD
Repurpose test deck for Pressure Test #5	7/17/13	MD
Critical attributes of test deck and test samples verified	7/18/13	MD
Holes cored, cables installed, seals poured	7/18/13	MD
Completed seal assembly verified against the test plan	7/19/13	MD
Pressure Test #5 conducted	7/29/13	MD
Repurpose test deck for Pressure Test #5A		
Critical attributes of test deck and test samples verified	11/7/13	MD
Begin pouring seals	11/7/13	MD
Finish pouring seals	11/12/13	MD
Completed seal assembly verified against the test plan	11/15/13	MD
Pressure Test #5A conducted	11/21/13	MD
Seismic Pressure Test #2A conducted	11/21/13	MD
Repurpose test deck for Fire-Pressure Test #1	11/21/13	MD
Thermocouples installed and locations verified against the test plan	12/9/13	MD
Fire-Pressure #1 (Fire Test) conducted	12/10/13	MD
Fire-Pressure #1 (Pressure Test) conducted	12/10/13	MD

Certificate of Conformance

Client Name: AREVA NP Inc.
Project No: G101266224SAT-007

Date: September 4, 2014

Intertek Testing Services NA (Intertek) has conducted testing for AREVA NP Inc., on the fire and pressure resistance capabilities of Quantum Silicones QSil 5558MC Silicone Elastomer (QSil 558MC) through a 12" thick concrete deck, for compliance with the applicable requirements of and in accordance with AREVA NP Inc. Document No. 51-9208264-000, *Detailed Test Plan for Conducting MOX Fire-Pressure Test 1*. This test took place on December 10, 2013.

The materials, processes), and deliverable(s) in this project were managed under and conform to the test laboratory's 10CFR 50 Appendix B Quality Assurance Program.



Michael A. Brown
Quality Supervisor

September 4, 2014

Date

Intertek Testing Laboratory
16015 Shady Falls Road, Elmhurst TX 78112
210-635-8100

Quality Assurance Statement

Intertek is devoted to engineering, inspection, quality assurance and testing of building materials, products and assemblies. Intertek has developed and implemented a Quality Assurance Program designed to provide its clients with a planned procedure of order and document processing for inspection and testing services it provides to assure conformity to requirements, codes, standards and specifications. The Program is designed to meet the intent of ANSI 45.2 Quality Assurance Program Requirements for Nuclear Power Plants, and complies with the requirements of the ASME Code, SPPE, Military Standards and other less stringent programs. It is the Laboratory's intention to adhere strictly to this Program, to assure that the services offered to its clients remains of the highest quality and accuracy possible.

All QA Surveillance documents remain on file at the Laboratory, and are available for inspection by authorized personnel in the performance of an on-site QA Audit. All materials, services and supplies used herein were obtained with appropriate QA Certifications of Compliance.

REVISION SUMMARY

DATE	SUMMARY
September 4, 2014	Original Issue Date