

Qualification of EGS Gen 3 QDC

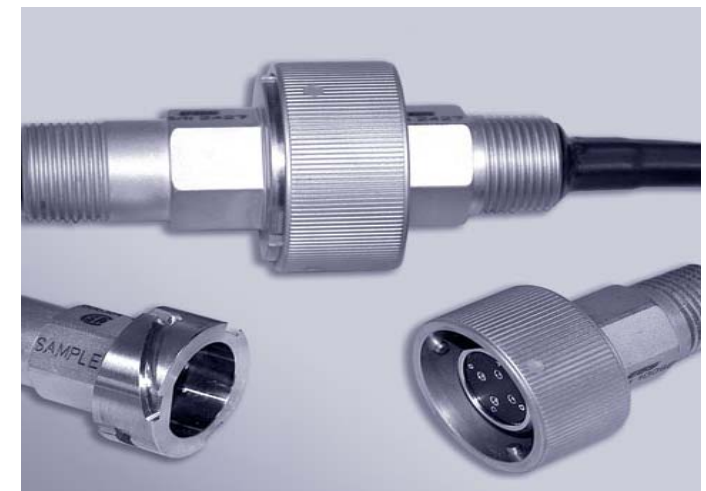
*Darryl M. Deist – Strategic Account Manager
April 2010*

**CURTISS
WRIGHT**
Flow Control Company
SCIENTECH

Equipment Description

What is an EGS QDC ?

The EGS Quick Disconnect Connector (QDC) is a value added device designed to provide an environmental seal of an electrical connection or equipment interface while also allowing for connect and reconnect functionality for ease of maintenance.





Why a New Qualification?

The purpose of the qualification program was to increase qualification levels to provide for a generic qualification intended to meet the requirements of all nuclear power reactors currently operating worldwide and the new generation of nuclear reactors such as the W AP1000 and the Areva EPR.





How did the QDC Change

- Redundant Elastomer Seals Added
- Reduced Wave Spring Force
- Enhanced Strain Relief
- Set Screw Material Changed
- Two Piece Housing Design
- Changed Epoxy Compounds
- Changed Insulator Material



What was used as guidance?

Qualification was based primarily on the guidance of IEEE Std 572-1985/2006 which provides specific direction for the "...implementation of IEEE 323-1983, the IEEE standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations, as it pertains to qualification of Class 1E Connection Assemblies..."





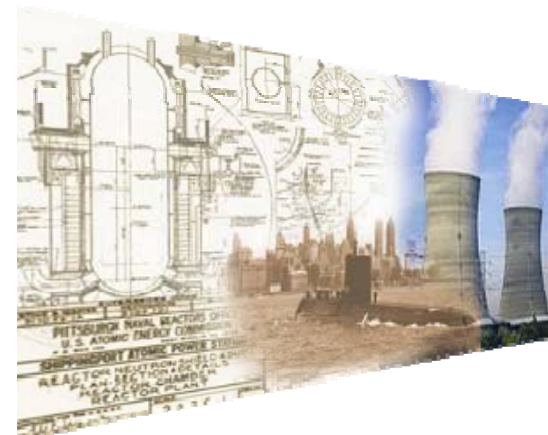
Other Standards used for Guidance

- 10CFR50.49
- IEEE 344-1975/1987/2004
- IEEE 382-1980/1996/2006 (Ref for vibration aging & seismic testing only)
- IEEE 323-1974/1983/2003
- IEEE 572-1985/2006
- REG GUIDE 1.10
- REG GUIDE 1.89
- REG GUIDE 1.156

Enhanced Environmental Parameters

New Qualification test provided enhanced parameters beyond previous testing.

- **1,226 Hours of Thermal Aging**
- **LOCA Pressure to 109 psia**
- **MSLB to $> 485^{\circ}$ F**
- **Post-LOCA Submergence @ 284° F/74 psia for 30 days**
- **Radiation Exposure $2.3E8$ rads**





Test Sequence

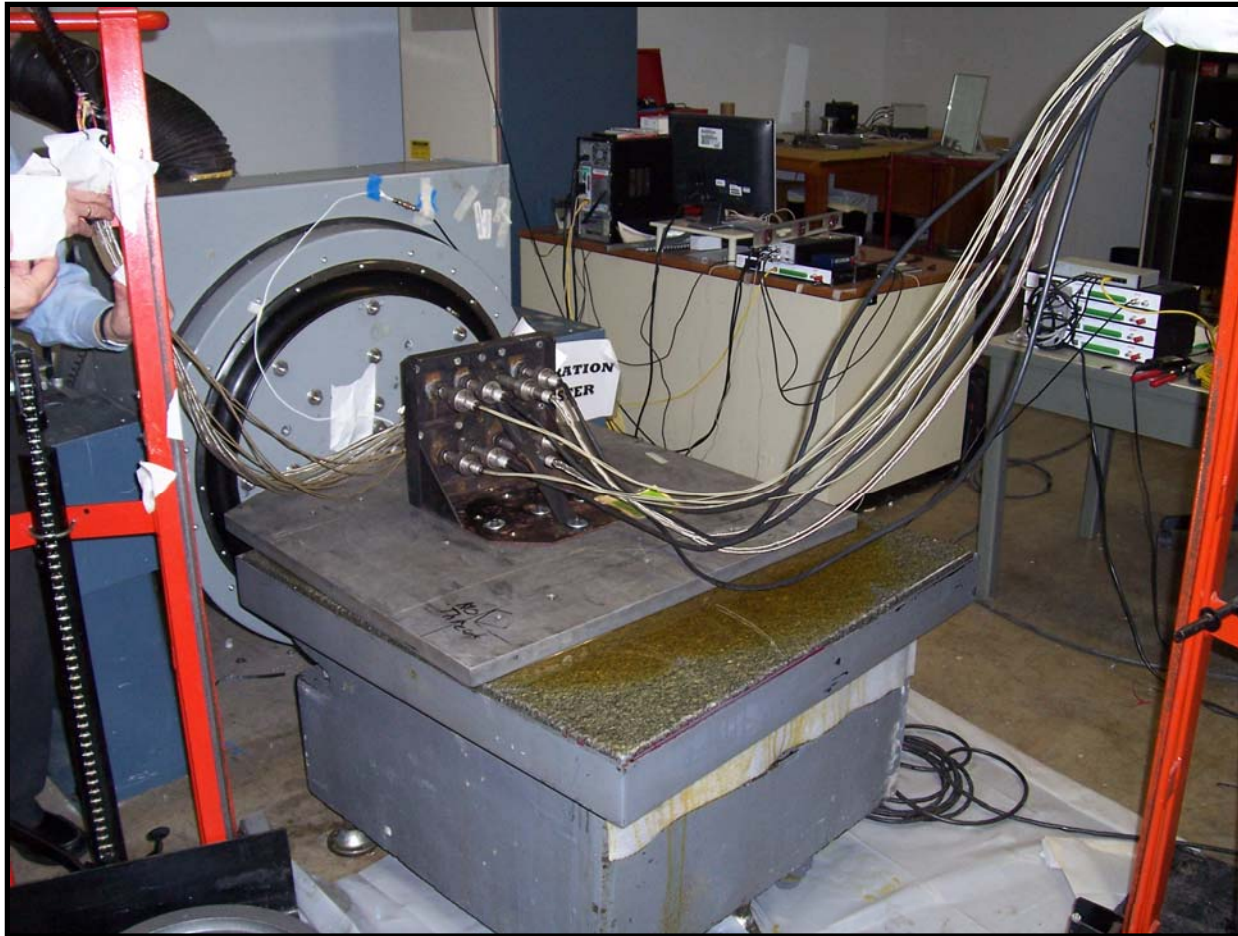
- Baseline
- Vibration Aging (IEEE382, 5-200 Hz Resonance >100Hz)
- Thermal Cycling (10 cycles, 30° C → 121° C → 30° C)
- Cycle Aging (160 connect/reconnect)
- Thermal Aging (1226 hrs @ 126° C, QL = 60 yrs @ 50° C + 35 days at 121° C)
- Functional Tests
- Radiation Aging (3E7 rads-air, 5E5 rad/hr)
- Thermal Cycling (10 cycles, 30° C to 121° C)

Test Sequence (continued)

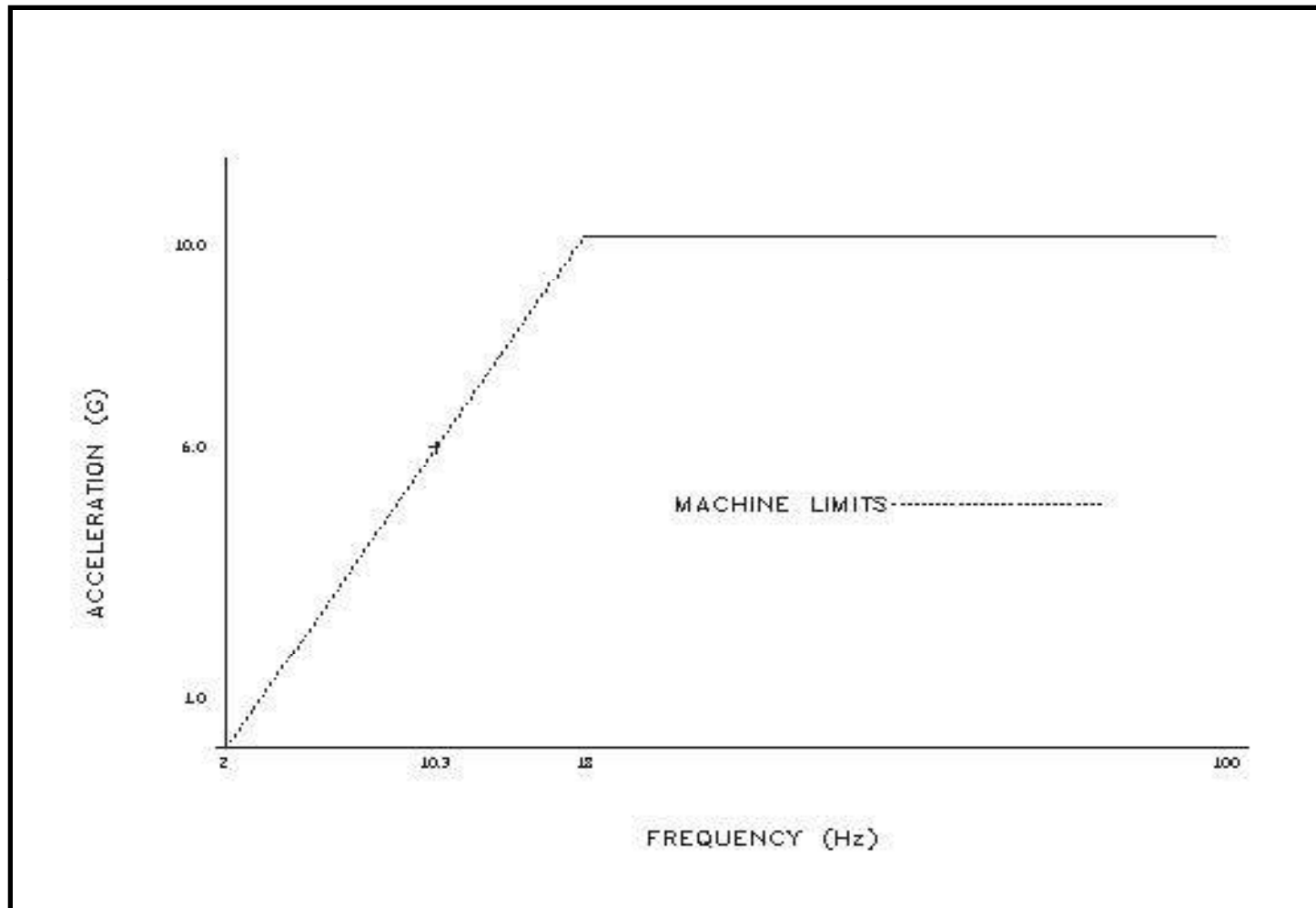
- Seismic
 - OBE Sine Sweep 10g (2→100→2 Hz)
 - SSE Sine Beat 10g (2→64 Hz)
 - RMF triax SSE 7g ZPA
- Functional Tests
- LOCA Radiation (2.0 E8 rads)
- Functional Tests
- LOCA (495° F @109 psia)
- Submergence Simulation (30 Days 284° F/74.5 psia)
- MSIV/MSLB Simulation
- Post Test Inspection



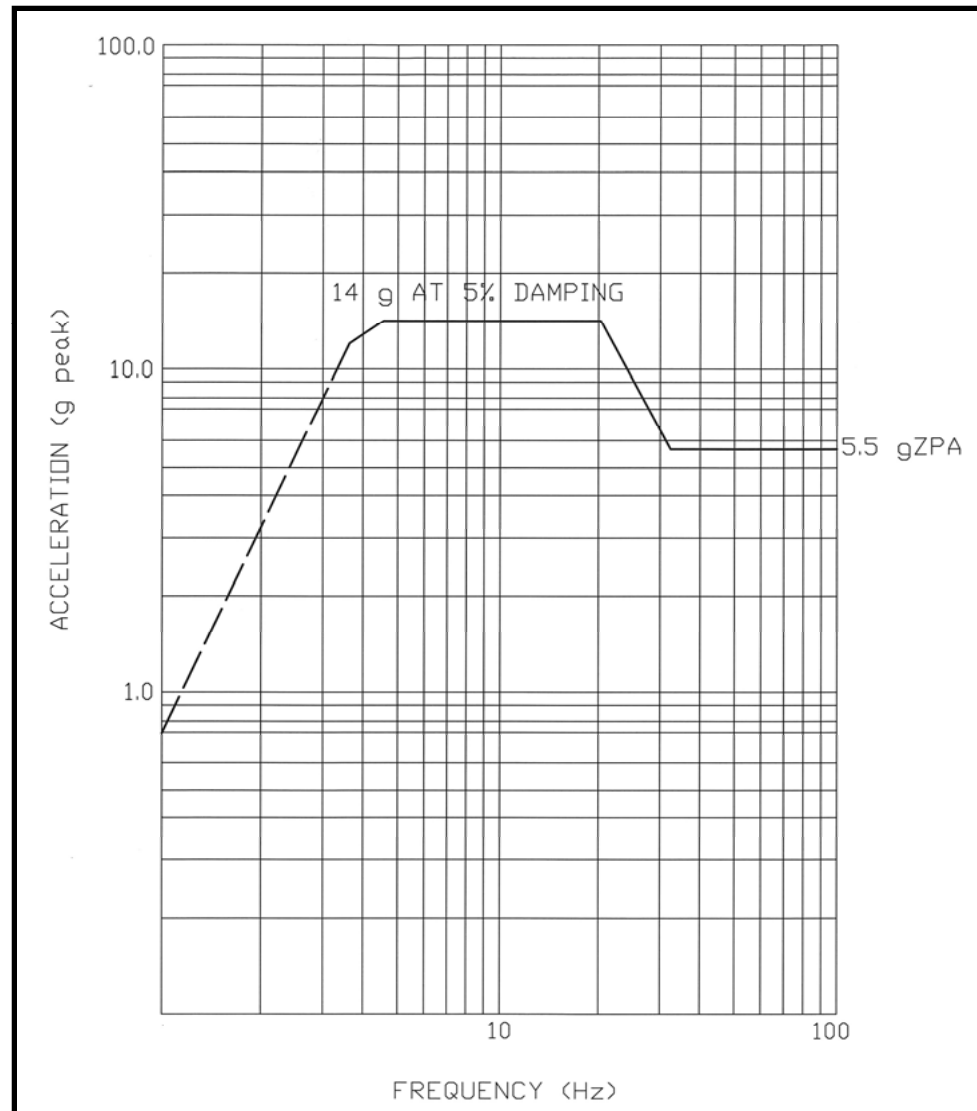
Seismic Testing



Seismic RIM OBE RRS



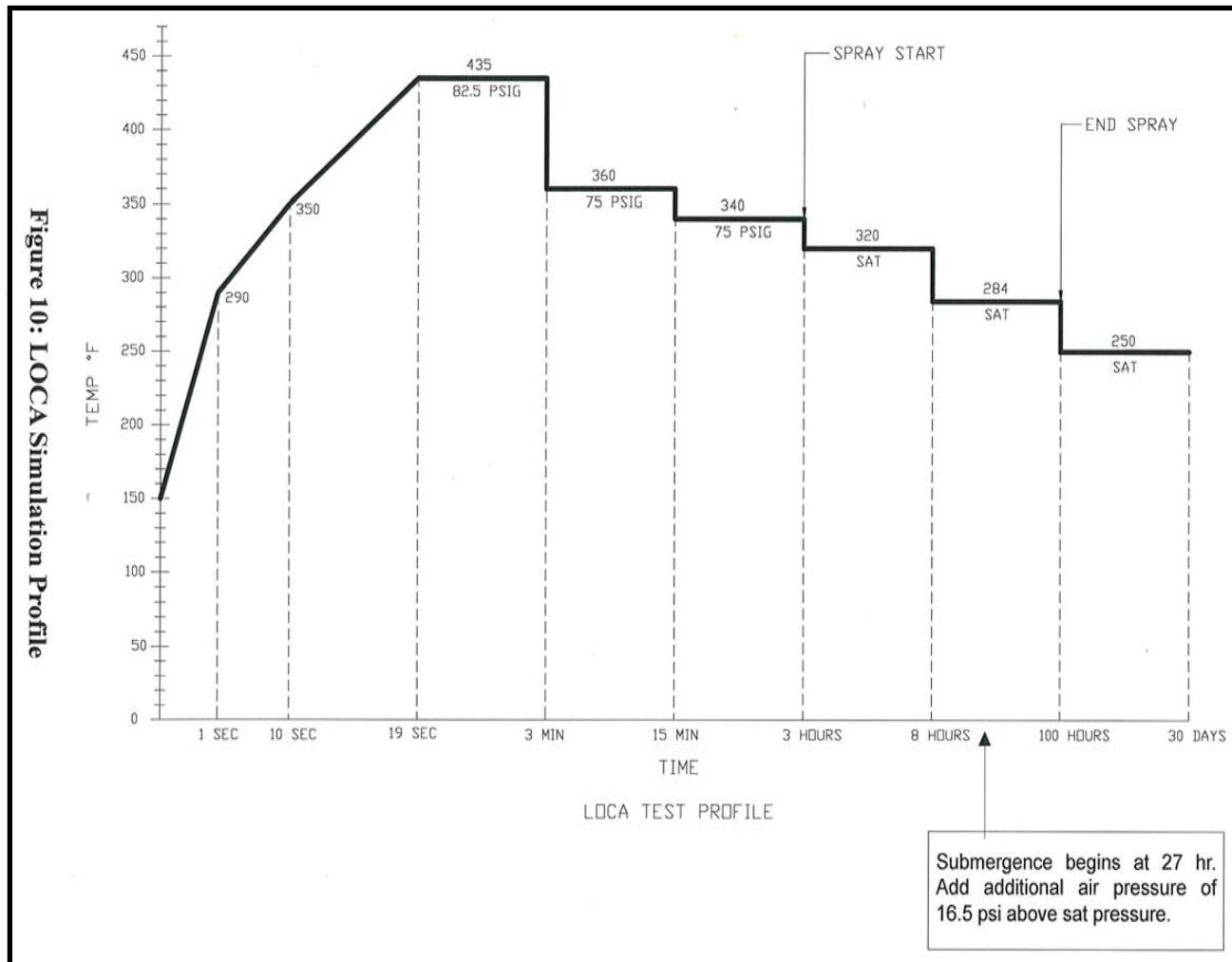
Seismic RMF RRS



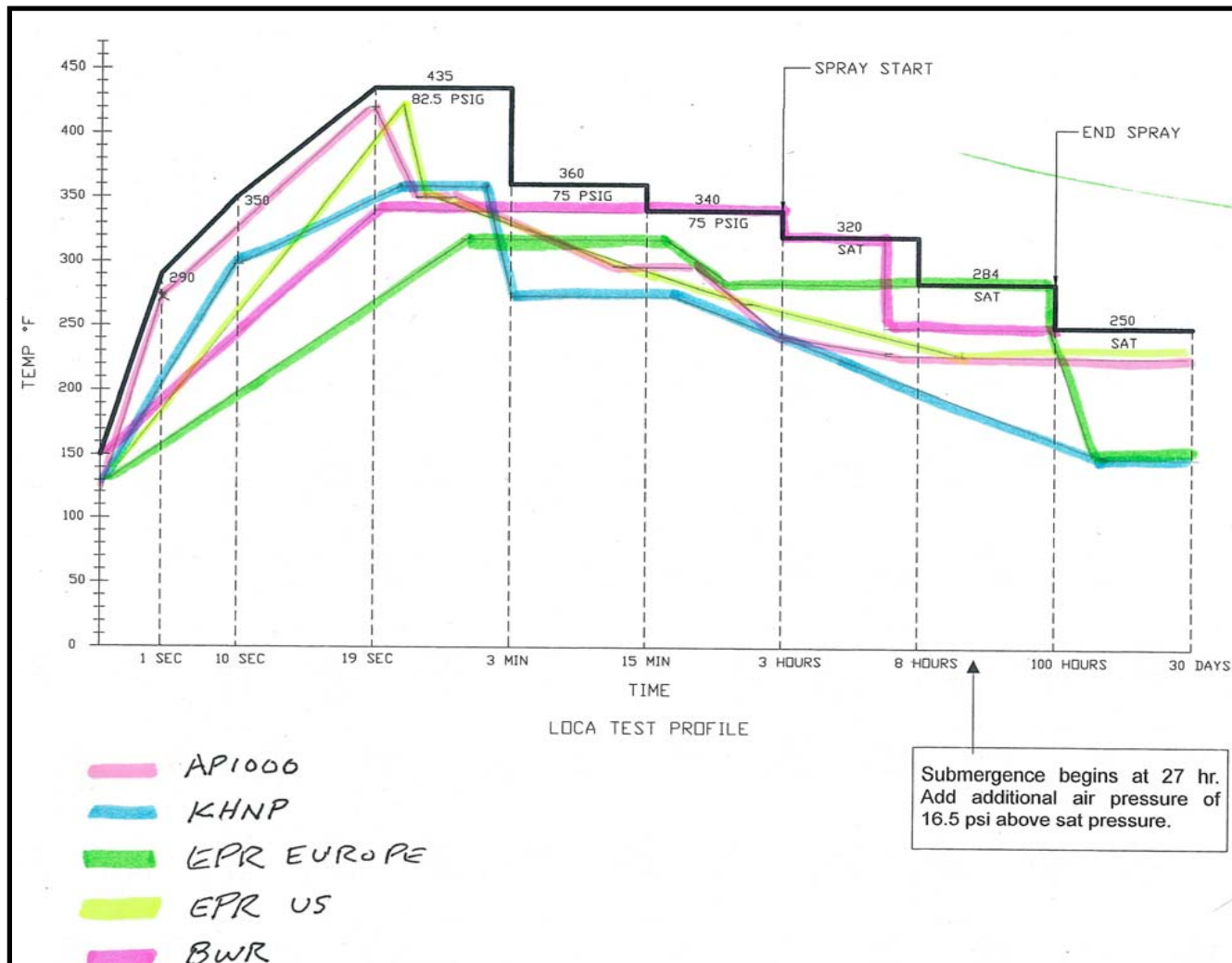
QDC Pre - LOCA



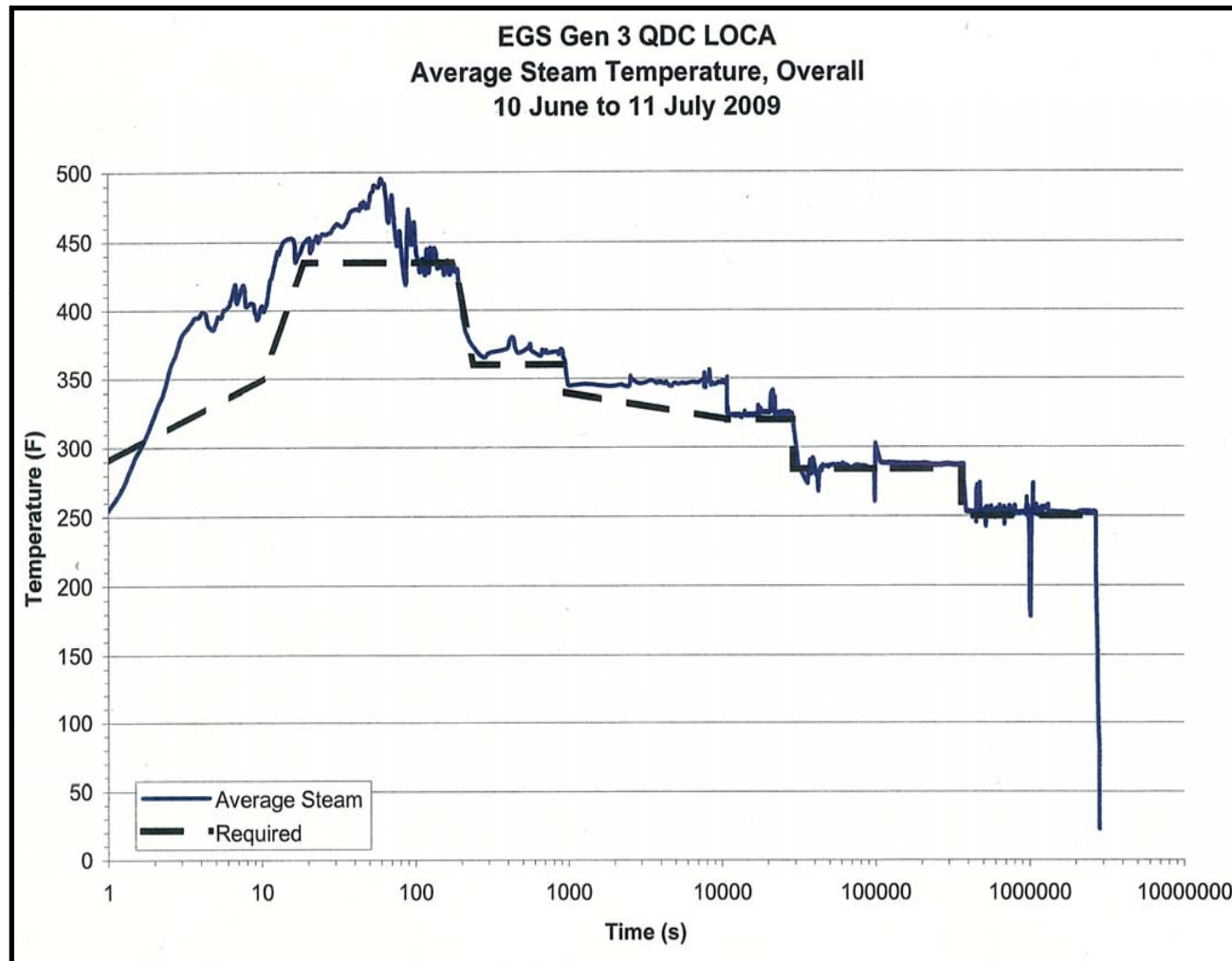
Required LOCA Profile



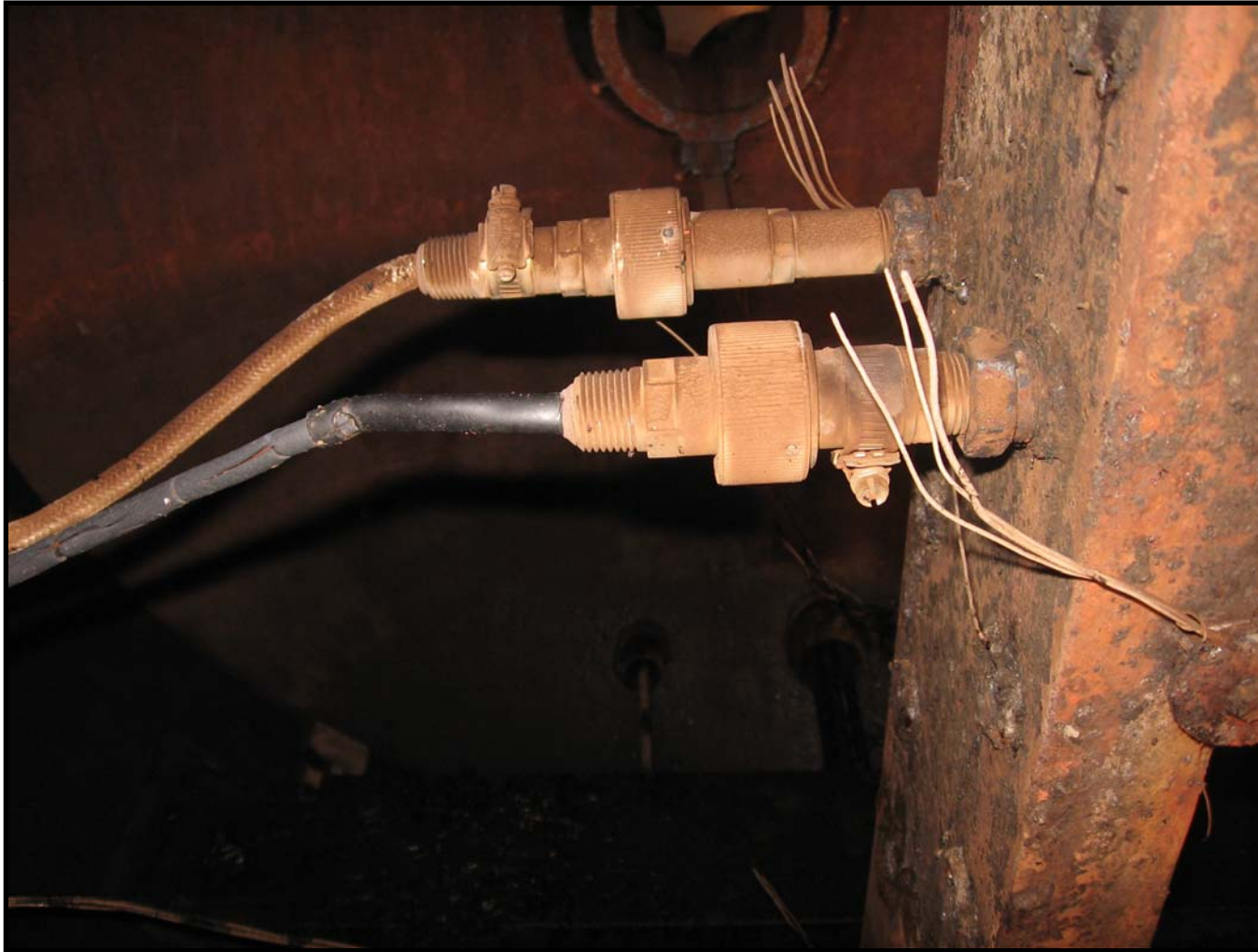
Composite Generic LOCA



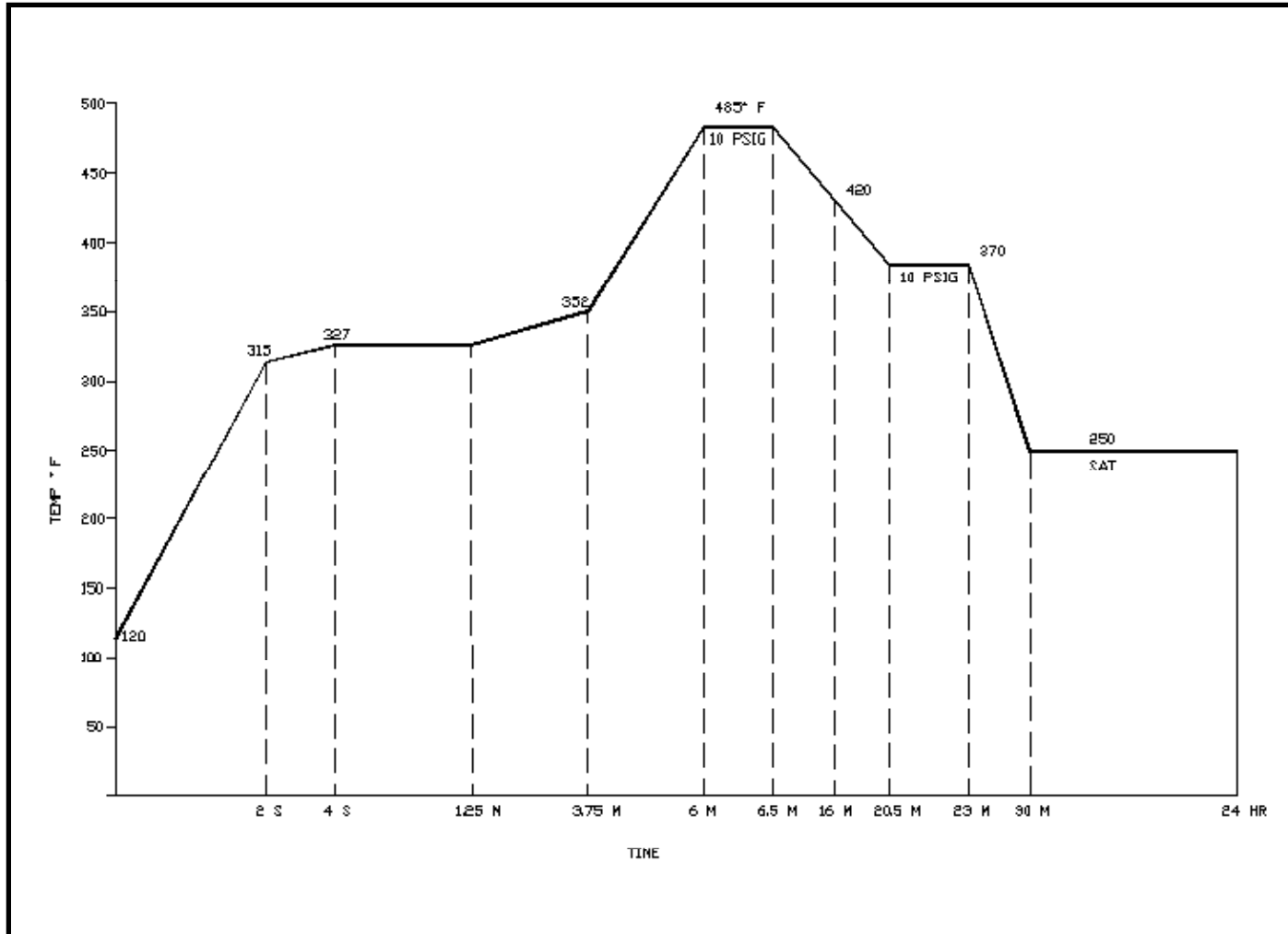
Actual LOCA Profile



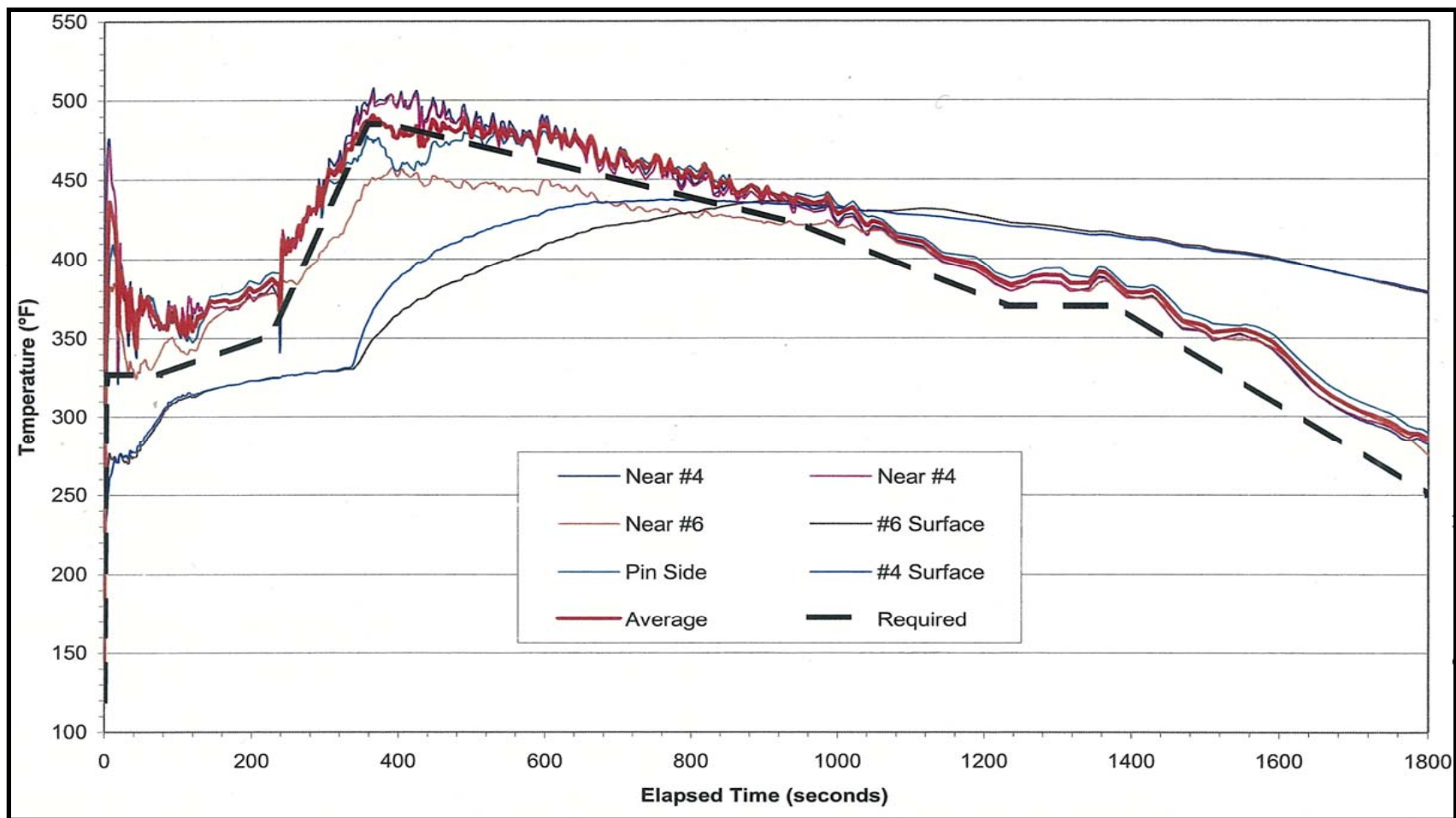
QDC Post - LOCA



Required MSLB



Actual MSLB



QDC Post - LOCA



Summary

- **Initial Test Complete and Report Issued;
Test Report for Nuclear Environmental Qualification of
1/2" Generation 3 EGS QDC Electrical
Connector EGS-TR-23009-14**
- **Supplemental Test Begins May 2010 to cover revised
Westinghouse MSIV requirement of 500° F utilizing
aged spares which were removed from program after
LOCA radiation.**

*** If specimens survive, will continue LOCA +
submergence (min 30 days submergence)**

**** Alternately run new test program**



Contact Information

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Prompt For Ambiguous Answers

