

Environmental Zone 1 Qualification

ENVIRONMENTAL ZONE 1 QUALIFICATION

Glenair recently reached an important milestone with the qualification of a cable assembly program for a major global nuclear client. Included in these assemblies were our Mighty Mouse NG plug/receptacle connectors, EPDM O-Rings, and Glenair's proprietary epoxy resin.

Testing followed "CEI 60780:1998 Nuclear Power Plants – Electrical Equipment Of The Safety System – Qualification".

Dry heat thermal aging totaling 1 month at 120 °C as per EN 60068-2-2:2007, 24h dampheat at 95% RH as per 60068-2-78:2013,

Irradiation 67 kGy of 60Co as per EN 60544-2:2012,

Seismic testing as per CEI 60980:1989 and CEI 60068-2-57:2013,

Watertightness for 24h under 2 bar as per EN 60068-2-18:2001.

Testing required a 52-year lifespan condition, final electrical testing confirmed that the assemblies would perform their job flawlessly over the required period.

132 °C for 770h, representing a 60 year-long lifespans, and watertightness testing at 8 bar for 24h, as per IEEE 572:2006 /MIL-DTL-5015H / VG95328-1:12/96.

Upcoming product qualification will have our connectors undergo the following:

60-Year Equivalent conditions inside Zone 1 harsh environment.

Thermal cycling between 30 °C and 121 °C

Mechanical aging, thermal aging at 120 °C

Normal Service and DBA radiation aging totaling 4,12 E+07 rads of Gamma Dose

Vibration Aging and Seismic Testing as per IEEE 344, IEEE 323 and IEEE 382

Containment Pressure Test at 4,7 bar for 24 h

Design Basis Accident (DBA) and Post DBA Test -with such extremes as max. Temp 216,7 °C

Max, 30h-long chemical spray

1-year long immersion in water.



AP1000 Environmental Zone 1 Qualification



Test	Zone 1 Requirements
Vibration aging	90 minutes of vibration each orthogonal axis, no discontinuity of 1 ms or greater, sinusoidal motion 0,75 g from 5 Hz to 100 Hz to 5 Hz
Thermal cycling	13 cycles between 30 °C [86 °F] and 121 °C [250 °F]
Mechanical cycle aging	500 mating/un-mating cycles
Environmental Requirements (Temperature and Pressure)	Normal Operating Conditions: Normal Temperature: (10 - 48,9 °C) [50 -120 °F] Normal Pressure: -0.001 +0.007 Mpa [-0.2 +1.0 psig]
	Group 1 Abnormal Operating Conditions, 18 4-h events: Abnormal Temperature: (10 - 65,6 °C) [50 -150 °F] Abnormal Pressure: Atmospheric
	Group 2 Abnormal Events Operating Conditions, 1-5 30-day events: Abnormal Temperature : (10 - 121 °C) [50 - 250 °F] Abnormal Pressure: ≤ 0.124 Mpa [≤18 psig]
Normal Service Radiation	60-Year Equivalent Gamma Total Integrated Dose= 4,12 E+07 rads [412 kGy]
Seismic test	In accordance with IEEE 344 and IEEE 382, max peak value 6,5g
Thermal Aging	Qualified Life 60 years
Containment pressure test	4,7 bar [68 psig] for 24 hours
DBA (LOCA) Test	DBA Operating Conditions in 1-year-long event: Maximum Accident Temperature (for aprox. 3 s): 216.7 °C [422°F] Maximum Accident Pressure (for aprox. 3 s): 406.8 kPa [59 psig] Post Accident Gamma Total Integrated Dose for 1 year = 3,7 E+07 rads [370 kGy] Post Accident Beta Total Integrated Dose for 1 year = 2,6 E+08 rads [2600 kGy] Chemical Spray 30 hours Post DBA 30 days in chemical spray fluid
Post DBA test	1-year long immersion as per IEEE 383:09-2015, water at 85,2 °C [185,38 °F] pressure 0,11 Mpa [16,62 psig]

