

Nuclear Power Plant



Cable Update

ICC, Nashville, TN

March 23, 2010

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Overview

1. P1682 – Qualification of Fiber Optic Cables
2. New gel-free fiber optic cables
3. Seismic testing of fiber optic cable assemblies

P1682 Update

P1682 Trial Use Standard for Qualifying Fiber Optic Cables, Connections, and Optical Fiber Splices for Use in Safety Systems of Nuclear Power Generating Stations

History

- PAR Approved 11 Nov 2005
- WG formed Fall 2005
- First meeting 13 Mar 2006
- PAR Extension Approved thru 12/2012

Project Status

- Working group in basic agreement
- Current membership: 22 (4 Utility, 6 A/E & Labs, 12 Supplier)
- After approval, expect to prepare a “white paper” outlining topics discussed during writing

Tentative (and Optimistic) Timeline

- WG Ballot Complete April 2010
- SC2 preview 4/20/10 – Las Vegas
- Ballot of SC2 and Sub D Spring – Summer 2010
- Resolution of SC2/ICC comments during summer – fall 2010
- Preview at NPEC either July 2010 or Jan 2011
- Official ballot 2011

Gel Free Cables for NPP

- Loose tube cables generally preferred outdoors
 - Need flame retardant design to run in plant without a transition point
- Historically, loose tube cables contain a gel within the loose tube itself
 - Prevents water hosing down the tube
 - Provides some lubrication to the fiber(s)
 - But, causes termination issues

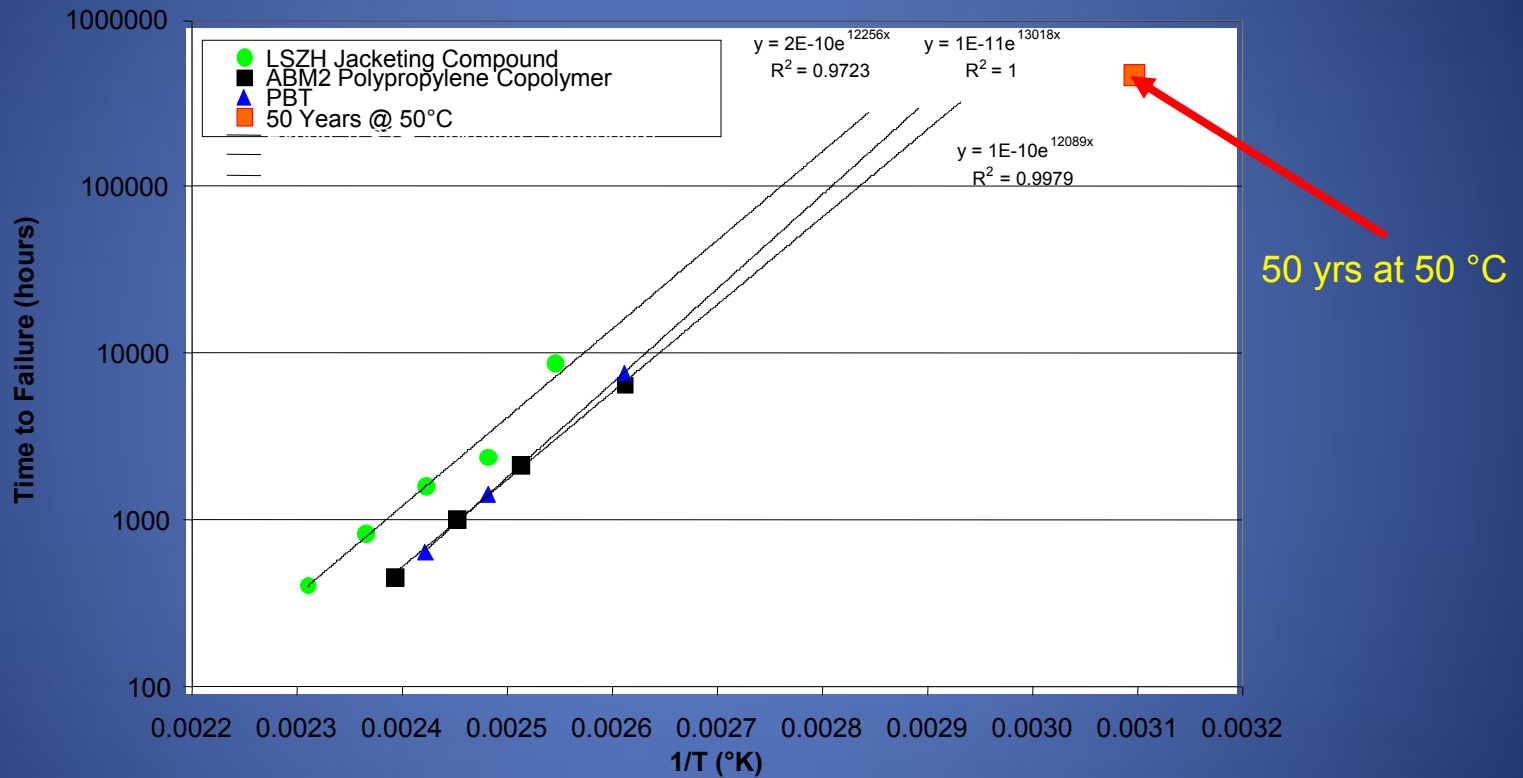
Gel-Free Design

- Gel is eliminated and replaced with a water blocking thread
- Cable is also water blocked by water swellable tape under cable jacket. Meets all industry standards

- Low Smoke Zero Halogen Design
 - Thermoplastic loose tube material
 - Overall LSZH jacket
- ANSI/ICEA S-83-596, TIA/EIA-568B, Telcordia GR409, RoHS
- OFNR, 383 and 1202 flame test
- 2-288 fibers

Long term life: Arrhenius data

Jacketing and Buffering materials



Arrhenius extrapolation predicts a lifetime of over 50 years at 50°C for all materials tested and in use to date.

Seismic Testing of Fiber Optic Cable Assemblies

- Completed Nov 2009 @ Trentec, OH
- Seismic forces exceeded all known profiles for US nuclear power plants
- Five (5) OBE and One (1) SSE tests, each approx 40 seconds

Assemblies Tested

- 1- and 2-fiber 62.5/125 breakout cable (LSZH, IEEE-383, OFNR), Radiant ST connectors (epoxy and polish), Fibraconn fiber optic enclosure
- Connectors under test: 6 connectors and 3 adapters
- Connectors outside test: 6 connectors and 2 adapters

Fixture Set Up on Table



BACK

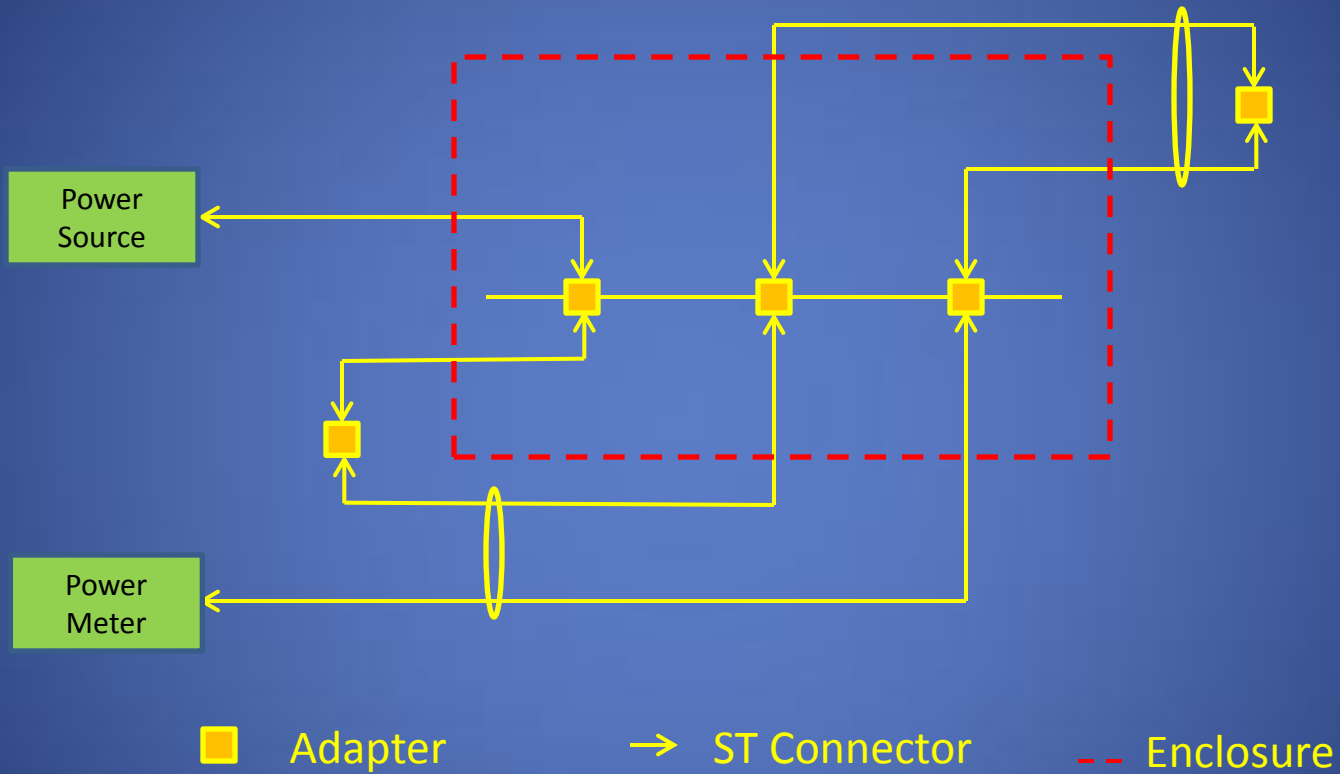


FRONT

Fiber Termination Box



Circuit Setup



Test results

- Initial loss thru cable, 12 connectors and 5 bulkhead adapters= 0.94 db at 850 nm.
- Attenuation continuously measure and recorded every 7 sec.
- Max attenuation in any test=0.96 db (first OBE test, 7 seconds into test)
- After completion of 5 OBE and 1 SSE test sequences, the overall attenuation of the concatenated assemblies= 0.83 db