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TEST REPORT

Radiation Analysis of the Barton Model 288A Differential Pressure Indicating Switch for the Texas Utilities Generating Company.

Prepared by:

T. J. Riedl
Class 1E Systems

Approved by:

C. G. Morris by DEL
C. G. Morris, Manager
Class 1E Systems

8408160340 840810
PDR ADOCK 05000445
A PDR

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1.0 SCOPE

This report summarizes available information concerning the effects of gamma radiation on the material mechanical properties of the Barton Model 288A D/P Indicating Switch and justifies that for a gamma dose of 1.61×10^6 rads there are no observable radiation effects which impact the materials' mechanical properties.

2.0 SUMMARY

An evaluation was performed on the effects of gamma radiation on material mechanical properties of the Barton Model 288A D/P Indicating Switch.

The organic materials of the Switch were identified and evaluated for radiation induced degradation of the materials' mechanical properties when exposed to a TID of 1.61×10^6 rads. The higher level of radiation ($> 10^4$ rads) for this unit, which is located outside containment, is caused by the recirculation of reactor coolant through nearby piping following an accident.

The inorganics and metallics of the Switch were considered to be little affected by the radiation environment and are more radiation resistant than the organic materials. A list of the organic materials and corresponding part numbers for the Barton 288A D/P Switch is shown in Table 1.

The radiation resistance characteristics of these materials is shown in Table 2.

All materials show a higher level of radiation tolerance than the required 1.61×10^6 rads. Buna-N, for which damage begins at 7×10^5 rads, is used as a gasket for the bezel assembly and is considered not to effect the performance of the Switch. Based on this information, degradation of the performance of these materials would not be expected as a result of an exposure to a total integrated dose of 1.61×10^6 rads.

3.0 CONCLUSION

In summary it can be concluded that the Barton Model 288A D/P Indicating Switch is qualified to a radiation environment of 1.61×10^6 rads for the Comanche Peak Steam Electric Station.

TABLE 1

PART NO.	DESCRIPTION	MATERIAL
0228.0025B	HI ALARM	PHENOLIC
0228.0024B	LO ALARM	PHENOLIC
0038.0033T	TERMINAL BLOCK	PHENOLIC
0226.0028C	STOP, SNUBBER	30 SHORE NEOPRENE
0277.0026C	BEZEL GASKET	60 SHORE BUNA-N
0001.0039R	O-RING FLANGE GASKET	VITON
	INSULATION, WIRE	VINYL (TEFZEL)

TABLE 2

Phenolics

Unfilled phenolics exhibit excellent physical and electrical tolerance to radiation. Fillers have great influence, both positive and negative, on the composite materials. Cellulose fillers are among the most sensitive materials. Two studies concur that cellulose filled phenolics will suffer a 20-25% decrease in elongation, tensile strength and impact strength at a dose of $5x10^6$ rads. Electrical measurements made in another study indicate that electrical properties are not significantly changed to $2x10^7$ rads. Mineral filled phenolics show excellent radiation stability, and are among the more radiation resistant plastics. They are unaffected by a radiation exposure of $3.9x10^8$ rads. Mineral and flock filled phenolics will have radiation resistance between the limits of cellulose filled and mineral filled phenolics.

Buna-N (Nitrile Rubber)

Nitrile, as in the case of most rubbers, exhibits good to excellent radiation tolerance. Damage begins at $7x10^5$ rads. The 50% damage level for tensile strength, elongation, set at break, compression set and shore hardness is reached between doses of $1x10^7$ rads and $3x10^8$ rads.

Viton

Fluoropolymers are safely used to a dose of $1x10^6$ rads for dynamic stress and $1x10^7$ rads for static stress applications.

Vinyl (TEFZEL)

Tefzel insulation exhibits a decrease in elongation of approximately 25% at $2x10^7$ rads and 50% at $3x10^7$ rads.

Neoprene (Gasket)

Neoprene has been extensively examined in irradiation studies. The results indicate that damage begins at around $2x10^6$ rads. The 50% damage level for tensile strength, elongation, set at break, compression set and shore hardness is reached between doses of $1x10^7$ rads and $1x10^8$ rads.