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Mills
82-750-000

NELSON ELECTRIC
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December 15, 1982

John Collins
Regional Administrator
U.S NUCLEAR REGULATORY COMMISSION
Region IV
611 Ryan Plaza Drive
Arlington, TX 76011

Dear Sir,

On December 1, 1982, I provided your office with written notification of a potential defect pertinent to nuclear orders wherein 10 CFR Part 21 was applicable.

Within that letter, it was stated that whenever a detailed report of the failure mode became prevalent, it would be forwarded to your office as well as to the affected nuclear facilities.

On December 14, 1982, I received the detailed failure analysis report from Nelson Electric's Director of Engineering. The report's analysis data was obtained through a coordinated investigating effort involving our Engineering department and an outside analytical laboratory in Tulsa, Oklahoma.

To extrapolate on the information supplied to you in my letter of notification, utilizing subsequent information prevalent within the failure analysis report, the following is offered:

I. Problem

The potentially defective part is a stamped tubing sleeve, (GA-1213 and GA-1234) that is used to house a hot-cold electrical splice in our Inconel M.I. heating cable assemblies.

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We developed a reject pattern in our inspection of this sleeve which indicated water entry during our water soak testing. (The normal reject mode for this fitting is not water leakage but dielectric spacing error.)

II. Problem Analysis

These sleeves were found to have too high a residual stress present in their finished condition. The high residual stress reacted with the silver solder at the brazing temperatures (1300° - 1600°F) to create a stress crack in the sleeve material (Inconel 600).

The individual cable assembler's techniques of preheating the fitting, fluxing and silvering the sleeve vary. Hence many of the assemblies never received the right combination of time and temperature during the brazing operation to cause the stress crack to develop. These fittings are not in danger of future cracking since the operational temperatures (400° - 500°F) are well below the reaction temperature range (1300° - 1600°F).

We reviewed the entire production cycle of each batch of sleeves since the prototype work was done. The source of the higher than normal stresses that caused the cracking appears to have come from a batch of Inconel strip (used to make the tube) that was not dead soft annealed.

III. Corrective Action Taken - Immediate

A. Nelson Electric has scheduled a Field Service Engineer into each nuclear facility affected to check questionable circuits. It is anticipated this effort will be completed by the end of January, 1983.

B. This part, used on products fabricated but unshipped, will undergo dye penetrant examination to verify no stress cracks are prevalent on hot-cold splice sleeves of M.I. heating cable assemblies.

C. Existing inventory of this splice sleeve fitting has been purged and will be properly annealed and pickled before being released for use on finished cable assemblies.

IV. Corrective Action Taken to Preclude Recurrence

To preclude recurrence of this type of deficiency on future runs, Nelson Electric has included an annealing step for the fittings within its fabrication cycle, after the stamping process.

V. Conclusion

This analysis and investigation of the potential problem proved it to be confined to a particular batch of material used for a brief and determined period of time. Our traceability and record keeping systems enabled us to determine which heater cable assemblies requiring corrective action had shipped to the job sites. We were also able to take appropriate in-house corrective action measures. The magnitude of the problem was not to the parameters it was originally thought to be.

We will continue to monitor company performance for adherence to established quality program requirements and report any applicable noncompliance to the Nuclear Regulatory Commission as pertinent to 10 CFR Part 21.

Should any further information be desired or additional actions be required, please contact this office.

Bill Karr
Director of Quality Assurance

cc: Dir. Office of Insp. and Enforcement - NRC (3) copies
St. Lucie, Unit 2 - Florida Power & Light - Jeff Austin (1)
Susquehanna, Unit 2 - Penn Power & Light - Phil Brady (1)
Sidal Aluminum Corp - Joe Rice (1)