TU ELECTRIC

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William G. Counsil
Executive Vice President

May 20, 1988

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
CABLE PULLING OPERATIONS AND CABLE SPLICES AT
COMANCHE PEAK

REF: NRC letter from C. I. Grimes to W. G. Counsil dated
April 15, 1988

Gentlemen:

On April 20, 1988, we received the referenced letter requesting docketed responses to NRC Staff questions on March 16 and 17, 1988, concerning past cable pulling operations and cable splices at CPSES. Attachment A is TU Electric's response concerning past cable pulling operations. Attachment B is TU Electric's response concerning past cable splices at CPSES.

Very truly yours,

W. G. Counsil

WJH/grr
Attachments

c - Mr. R. D. Martin, Region IV
Resident Inspectors, CPSES (3)

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CABLE PULLING

Question:

With regard to cable pulling operations at Comanche Peak, explain how TU Electric has obtained confidence that their past cable pulling operations were performed satisfactorily from a workmanship and inspection standpoint. Include in the discussion differences in installation and inspection procedures and personnel training and qualification practices.

Response:

TU Electric has concluded that past cable pulling operations at Comanche Peak Steam Electric Station (CPSES) were performed satisfactorily with respect to workmanship, inspections, and design criteria. This conclusion is based on 1) a detailed historical review of program requirements, 2) actions to resolve deficiencies for SDAR CP-86-71, 3) review of craft training and interviews with responsible personnel, and 4) evaluations of installed cable.

A detailed review was performed of historical revisions to Cable Pulling Instruction 35-1195-EEI-7, Electrical Cable Installation Inspection Procedure QI-QP-11.23-26, and Electrical Installation Specification 2323-ES-100. This review concluded that critical installation and inspection requirements were appropriately proceduralized prior to installation of Class 1E cables at CPSES. Subsequent changes to these documents enhanced the cable pulling program or provided additional instruction to the craft as specific conditions were encountered in the field.

As an example of the procedural requirements, engineering authorization was required for each Class 1E cable pull by signature on the cable pull card. This authorization required a walkdown of the cable pull route, and a tension and sidewall bearing pressure evaluation (either by a routing configuration comparison to an engineered cable pull chart or by a specific engineering calculation).

Additionally, Quality Control inspectors witnessed Class 1E cable pulling activities, including: verification of raceway readiness for cable installation, witnessing of raceway cleaning and lubrication, and witnessing of Class 1E cables being installed, removed or reworked.

Significant Deficiency Analysis Report (SDAR) CP-86-71 and Corrective Action Report CAR-093 identified an error in the previously engineered cable pull chart which did not specifically address the application of this chart for vertical cable pulls and cable installation in conduit with cable installed (pull-bys).

The evaluation of SDAR CP-86-71 encompassed a complete review of the cable installation program and an evaluation of the adequacy of installed cables at CPSES. A comprehensive report detailing our evaluation of SDAR CP-86-71 is contained in Specific Technical Issue Report STIR-CPE-E-002.

Corrective action for SDAR CP-86-71 included the development of revised Cable Pulling Charts. The revised cable pulling charts have been incorporated into Electrical Installation Specification 2323-ES-100.

The evaluation of SDAR CP-86-71 and CAR-093 has been completed and it was determined that this was not a significant deficiency. TU Electric's final report on this issue was submitted February 12, 1988, by letter TXX-88208.

In addition to the foregoing reviews, interviews were conducted with personnel responsible for cable pulling during the bulk of Class 1E cable installation, the craft training program was reviewed, and Unit 1 Non-conformance Reports (NCRs) related to cable pulling were reviewed. Cable was pulled by specialized crews provided with on-the-job training. Starting in 1985, the training was supplemented with formal classroom instruction. The results of this part of the evaluation demonstrated that the cable pulling practices at CPSES met the industry requirements from its inception, construction personnel were adequately trained to pull cable, and QC adequately documented non-conformances related to cable pulling.

Evaluation of installed cables at CPSES included pulling tension calculations for a random sample of 60 conduits with vertical components, identification and review of 181 worst-case pull-by conduits (using specific conduit information obtained through engineering walkdowns), calculation of pull tensions for worst-case pull-bys not meeting revised cable pull charts, and testing in accordance with IEEE-690 of the cables in six of the worst-case pull-by conduits (total of 756 conductors). The results of these evaluations establish: 1) the acceptability of cables installed in conduits with vertical components, and 2) the acceptability of cable installations in conduits with pre-existing cables.

The actions discussed above provide assurance that Class 1E cable was adequately installed.

CABLE SPLICES

Question:

With regard to cable splice operations at Comanche Peak, explain how TU Electric has obtained confidence that their past cable splice operations were performed satisfactorily from a workmanship and inspection standpoint. Include in the discussion differences in installation and inspection procedures and personnel training and qualification practices.

Response:

TU Electric has ensured the adequacy of cable splices installed at Comanche Peak Steam Electric Station (CPSES) by:

1. Establishing adequate installation and inspection procedures
2. Training of personnel
3. Qualification of splice materials
4. Walkdown, inspection, evaluation, testing, and rework, if necessary to assure the adequacy of installed cable splices.

Comanche Peak Response Team (CPRT) Issue Specific Action Plan (ISAP) evaluations determined that previous installation and inspection procedures governing cable splices did not contain specific instructions for AMP Pre-Insulated Environmentally Sealed (PIES) splice installation and inspection (an ISAP I.a.2 and I.a.3 issue) and were not complete with regard to Raychem splice inspection (an ISAP I.a.1 issue) to assure the adequacy of existing splices. TU Electric also identified to the NRC a reportable condition regarding traceability of 1E cable splice extension wire (pigtail extensions) (SDAR CP-86-38; TXX-88058 dated January 11, 1988).

Other aspects of the previous cable splice program were adequate. For example, adequate installation instructions were provided for the use of Raychem sleeving and onsite training was provided by Raychem Corporation. However, considering the results of the investigations, TU Electric initiated the following corrective actions to assure the adequacy of cable splices at CPSES.

Existing cable splices are validated through field verification and/or engineering evaluations.

Field verification of existing Class 1E cable splices is performed to determine actual field conditions. The field data is then evaluated by engineering for acceptability. Unacceptable splices are reworked. These field verifications are performed in accordance with CPRT ISAPs I.a.1, I.a.2, and I.a.3 and Field Verification Methods FVM-021, -022, -064 and -090. These plans and methods address the installation of splices internal to panels, cable reduction splices at equipment, splices at local mounted devices, Raychem heat shrink sleeving, and PIES splices, including that PIES splices are only used in mild environment areas.

Engineering evaluations of cable splice data are documented in Specific Technical Issue Report STIR-CPRT-EE-001, ISAP I.a.1, I.a.2, and I.a.3 Results Reports, procedure ECE-9.04-05 evaluations, and Non-conformance Reports.

Electrical Installation Specification 2323-ES-100 requires engineering approval of splices, provides splice installation and inspection requirements, and identifies approved splicing materials. Construction and Quality Control Procedures provide detailed instructions consistent with 2323-ES-100. Splices are shown in design documents.

Personnel are trained on splicing requirements as defined in the Electrical Installation Specification and applicable procedures.

Splice applications are limited in use as authorized by engineering in selected raceways (including field junction boxes and condulets), junction/terminal boxes furnished as an integral part of an equipment, and within equipment enclosures.

The analysis for cable splices in raceways required by Regulatory Position C.9 of NRC Regulatory Guide 1.75, Rev. 1 is provided in Appendix 8A of the CPSES FSAR, which is being updated to include other splice applications per discussions with the NRC Staff on March 16 and 17, 1988. The analysis demonstrates that the limited types and locations of cable splices used at CPSES do not degrade Class 1E circuits. Parameters considered in the analysis include flame retardancy, qualification of materials, installation and inspection controls, and connection ratings.

Materials used in Class 1E splice connections are qualified and documented in CPSES qualification packages. Acceptability of taping is evaluated on a case-by-case basis and permitted only when the tape is qualified for the application.

Splices are not allowed in vendor equipment unless specifically allowed in engineering approved vendor documentation. Splices in vendor equipment without such documentation are documented as nonconforming conditions and dispositioned by engineering.

In summary, revisions to the Electrical Installation Specification and associated installation and inspection procedures provide acceptable control of cable splice installations. The corrective action programs discussed above identify, evaluate and rework splices (as required) to assure the adequacy of previously installed cable splices at CPSES.