

Inspection Summary:

Inspection Conducted: June 8 through July 6, 1988 (Report 50-445/88-42; 50-446/88-38)

Areas Inspected: Unannounced, resident safety inspection of applicant's actions on Comanche Peak Response Team (CPRT) issue-specific action plans (ISAPs), Technical Review Team technical concerns and allegations, cable and flexible conduit slack, Post Construction Hardware Verification Program (PCHVP), and general plant tours.

Results: Within the areas inspected, a weakness and unresolved item was identified concerning field verification method (FVM)-075 (paragraph 5). An additional unresolved item was identified regarding concrete attachment spacing violations (paragraph 6). No violations or deviations were identified.

DETAILS1. Persons Contacted

J. Arros, TERA
 M. R. Clem, CAP Structural, Stone and Webster Engineering Corporation (SWEC)
 *W. G. Council, Executive Vice President, TU Electric
 N. D. Hammett, Engineering Assurance, Brown & Root
 *T. L. Heatherly, Licensing Compliance Engineer, TU Electric
 C. R. Hooten, Civil Engineering Manager, TU Electric
 *S. D. Karpyak, CPRT, TU Electric
 *O. W. Lowe, Director of Engineering, TU Electric
 *J. W. Muffett, Manager of Civil Engineering, TU Electric
 *D. M. Reynerson, Director of Construction, TU Electric
 E. O. Tomlinson, CAP Structural, SWEC

The NRC inspectors also interviewed other applicant employees during this inspection period.

*Denotes personnel present at the July 6, 1988, exit meeting.

2. Applicant Action on CPRT Issue-Specific Action Plans (ISAPs)

The following CPRT ISAP activities were inspected during this report period:

Rebar in the Fuel Handling Building (ISAP II.e)(46055)

The following activities for ISAP II.e were reviewed by the NRC inspector during this report period:

a. Review of All Cases Where Rebar Cutting was Requested (NRC Reference 02.e.03.00)

In order to determine the location of possible unauthorized rebar cuts, CPRT analyzed all cases (through September 3, 1987) from Units 1 and 2 where rebar cutting was requested for the installation of Hilti bolts. This effort was based on the premise that unauthorized rebar cutting always occurred in association with an authorized rebar cut. This premise was supported by facts presented in STIR-CPRT-S-004, Revision 1. The alleger maintained a diary which, according to the alleger, represented an accurate chronology of authorized and unauthorized rebar cuts. A comparison between this diary and approved engineering documents revealed that all locations where cutting was performed had at least one authorization for cutting. The NRC inspector reviewed documents supporting

this effort and concluded that the premise stated above was well supported.

CPRT identified a total of 189 authorizations for rebar cutting regarding Hilti installations. The next step entailed the review of design drawings to determine whether there was rebar beneath the bar authorized for cutting that would have been cut if the holes were drilled deeper than implied by the authorization. CPRT determined that in 62 of the 189 cases, underlying rebar was specified in the design. In all 62 cases, CPRT assumed that the potential unauthorized cut was made and that the cut completely severed the rebar or otherwise rendered it completely ineffective. CPRT evaluated the structural adequacy of the 62 cases and without exception determined that the structures were adequate despite the postulated additional rebar cuts.

The NRC inspector selected 2 of the 62 cases noted above and reviewed the associated authorizations, calculations, and nonconformance reports.

The documents reviewed were:

Design Change Authorization (DCA) 5854
Calculation SAB-1367, Set 7, Revision 0
Nonconformance Report C-86-103173

Component Modification Card (CMC) 2085
Calculation SAB-1367, Set 4, Revision 0
Nonconformance Report C-86-103173

Based on the review of these documents and discussions with CPRT engineers, the NRC inspector determined that the two selected cases were adequately analyzed. The overall effort by CPRT provided convincing evidence that rebar cutting to install Hilti bolts did not compromise the structural adequacy of the plant.

No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

b. Assess Work of Construction Crew (NRC Reference 02.e.04.00)

The CPRT Action Plan, Revision 3, Section 4.1, dated January 24, 1986, contained the following commitment:

"The Hilti bolt installation work performed by the construction crew that installed the subject 'Hilti'

bolts, will be reviewed over a period of eight months . . . surrounding the subject installation."

An ISAP II.e action plan wording change request dated September 3, 1987, Revision 3, stated, in part:

"Subsection 4.1 - deleted the task of reviewing the rebar cutting by the crew that installed the Hilti bolts in the subject case, because the objectives of this task were fully encompassed by the review performed of the evaluations of Hilti installations where rebar cutting was requested and potential for cutting additional rebar existed."

The NRC inspector concurred that the review of all cases where rebar cutting was requested (NRC Reference 02.e.03.00) satisfied the intent of NRC Reference 02.e.04.00.

No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

c. Review Pipe Supports with Shear Lugs Installed by Core Drilling (NRC Reference 02.e.05.00)

CPRT investigated work processes other than Hilti bolt installation which might have resulted in unauthorized rebar cuts. This review determined that rebar cutting may have occurred as a result of drilling holes through pipe support baseplates in order to install shear lugs. CPRT reviewed all pipe support drawings and identified 24 supports utilizing shear lugs. Only one of these supports possessed QA documentation attesting that rebar cuts were not made. CPRT evaluated the remaining 23 pipe supports assuming that the maximum possible number of rebars were cut. In all cases, CPRT's analysis demonstrated that the structure met the design criteria.

The NRC inspector selected the following two calculations for an independent review:

SAB-1365, Set 12
SSB-2368, Set 4

Based on the review of these calculations, referenced documents, and discussions with CPRT engineers, the NRC inspector determined that the two selected cases were adequately analyzed. The overall effort by CPRT provided reasonable assurance that rebar potentially cut to install shear lugs did not compromise the structural adequacy of the plant.

No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

3. Assessment of Open Issues Associated with the Technical Review Team (TRT) Technical Concerns and Allegations (99014)

The following open issues referenced in Letter TXX-88294 dated March 25, 1988, from W. G. Council to the NRC regarding the review of TRT technical concerns and allegations were inspected during this report period:

- II.A.4.b. Provide an assessment of unidentified rebar omission cases and their implication on the structural safety of the plant.
- II.H.4 TU Electric should identify actions taken or planned to be taken to address the general concern of misplaced steel.

The applicant's actions for these two similar concerns were incorporated into ISAP II.a and specific technical issue report (STIR)-CPRT-S-003. The NRC review of ISAP II.a is documented in NRC Inspection Report 50-445/88-15, 50-446/88-11. The NRC inspector reviewed STIR-CPRT-S-003 during this report period. CPRT concluded that the administrative controls and resulting placement of rebar in safety-related concrete structures within the plant were adequate to meet design standards. The NRC inspector concurred within this conclusion based on: (1) a review of structural calculations demonstrating design adequacy where rebar placement deviated in some way from design, (2) a review of CPRT's analysis of concrete pour cards, NCRs, and visual inspections performed to determine the scope of the issue, and (3) a review of procedures controlling the placement of rebar and the issuance of design changes in the field. Consequently, these open issues are considered closed.

4. Cable and Flexible Conduit Slack (51065)

The NRC inspector reviewed the issue of cable and flexible conduit slack in transition areas. This review consisted of discussions with applicant representatives as well as a review of project procedures and calculations. During the discussions, several questions were raised concerning methodologies and assumptions documented in the two project instructions, Cable Slack (Job No. 0210-045) and Flexible Conduit (Job No. 0210-049). Among the issues discussed were the assumption of negligible friction forces in straight horizontal cable runs, the assumption that slack-free cabling within a transition is not prestressed, the lack of incorporation of thermal deflections in computing building

motions, and the issue of cable necking under stress. The answers provided by the applicant were sufficient to resolve these issues and provided assurance that these questions and others had already been seriously considered during the analysis. The NRC staff concluded that the methods and assumptions were conservative on the whole and provided a legitimate engineering basis for analyzing this issue.

The applicant concluded that both air drop cable and flexible conduit transitions were adequate as installed to withstand design seismic loads without disruption of rated service. These conclusions were supported by both postulated worst-case and specific calculations. The NRC staff reviewed the methods and assumptions used in the following Impell calculations and spot checked computational accuracy.

CSC-007	Revision 3	Sample Results Evaluation
CSC-003	Revision 3	Stage I Screening, Cable Slack Issue
CSC-004	Revision 2	Summary of Cable Slack Issues
TT-A-37	Revision 1	Cable Slack Evaluation
TT-A-38	Revision 1	Cable Slack Evaluation
BB-S-113	Revision 0	Cable Slack Evaluation
BB-A-61	Revision 0	Cable Slack Evaluation
BB-A-17	Revision 0	Cable Slack Evaluation
FC-001	Revision 3	Generic Evaluation of Flexible Conduits
FC-006	Revision 1	Evaluation of Flexible Conduit Transitions Requiring Special Consideration
FC-005	Revision 1	Flexible Conduit Slack Trend Evaluation
CE-A-350	Revision 0	Flexible Conduit Slack Evaluation
CE-S-88	Revision 0	Flexible Conduit Slack Evaluation

In all cases, the calculations appeared to be correct and the results were consistent with the overall conclusions.

Based on the above review, the NPC inspector concluded that the applicant had provided reasonable assurance that safety-related cable and flexible conduit transition slack in Unit 1 and common areas is adequate to withstand design seismic loadings.

5. Post Construction Hardware Verification Program (PCHVP)

Concrete Attachments (CPE-SWEC-FVM-CS-075)(46053)

Field Verification Method CPE-SWEC-FVM-CS-075(FVM-075) was developed to identify concrete attachment spacing violations based on requirements presented in Specification 2323-SS-30.

The NRC inspector performed field inspections of the following completed as-built drawing packages generated from field walkdowns supporting FVM-075.

75-3-CAB8310215-W-19, Auxiliary building, Room 215
 75-1-DCB8080033-C-01, Reactor building, Unit 1,
 808' Elevation
 75-1-1CB8610014-W-06, Reactor building, Unit 1,
 860' Elevation

Each package contained sketches detailing and dimensioning concrete attachments within a specific wall or ceiling surface area. Dimensions were given to $\pm 1/8$ " except in several "congested" areas where tolerances were relaxed to $\pm 1/4$ ".

The NRC inspector reviewed several sketches from each package checking for the representation of observed attachments and the accuracy of spot checking recorded dimensions. No discrepancies were identified for packages No. 75-3-CAB8310215-W-19 and 75-1-1CB8610014-W-06.

In package No. 75-1-DCB8080033-C-01, drawing No. 10, the NRC inspector noted that an unused Richmond insert was not represented on the sketch. The position of unused Richmond inserts is needed to verify Specification SS-30 spacing requirements. The insert was partially obscured by an angle bracket but was readily identifiable by its visible internal threads. SWEC officials admitted that this Richmond insert had been inadvertently omitted from the sketch.

The NRC inspector conferred with the manager of civil engineering to present concerns regarding the adequacy of FVM-075 to identify Specification SS-30 concrete attachment spacing violations. These concerns were: (1) the omission of salient features (i.e., the Richmond insert referenced above); (2) the apparent disregard of features which are painted over or otherwise obscured including items covered by baseplates; (3) the fact that measurement accuracy in some areas is no better than $\pm 1/4$ ", and that since each attachment is dimensioned independently, errors between two attachments could approach $\pm 1/2$ " (a significant error for some spacing requirements); and (4) the fact that the walkdown sketches are significantly not-to-scale and provide few visual cues for the evaluating engineer. The NRC inspector concluded that considerable effort would be required to determine if concrete attachment spacing requirements were met using the present walkdown sketches. These sketches do not directly show the distances between anchor bolts requiring the engineer evaluating the spacing adequacy to calculate the as-built spacing from other dimensional relationships. Combined with the possible $\pm 1/2$ " errors discussed above, this method of

verifying spacing of anchor bolts, etc., could result in frequent mistakes.

A majority of the concrete attachments in the plant were installed prior to the issuance of the currently effective concrete attachment spacing requirements of Specification SS-30. FVM-075 was designed to reconcile the as-built condition of these previous installations to the current specifications. The concerns expressed above establish reasonable doubt that FVM-075 will effectively meet this goal and are considered to constitute a weakness in this field verification method.

This issue is identified as an unresolved item (445/8842-U-01). The NRC will continue to review the implementation of FVM-075 and further action by the applicant to resolve this matter.

6. Plant Tours (92700)

The NRC inspectors made frequent tours of Unit 1, Unit 2, and common areas of the facility to observe and inspect housekeeping, equipment protection, in-process work activities, compliance with construction procedures and specifications, etc. The NRC inspectors identified the following concerns regarding Hilti bolt spacing:

- a. A 1 1/4" super Hilti bolt used for support FW-1-097-034-C62R in the Unit 1 Reactor building was installed 5 3/4" from a 12" wall penetration. The current minimum spacing requirement specified in Table 7.4 of DCA 66318, Revision 1 to Specification 2323-SS-30, Revision 3, "Structural Embedments," is 7 1/2".
- b. A 3/4" Hilti bolt used for conduit support C23012547-03 in the Auxiliary building was installed 3 3/4" from a free concrete edge. The current minimum spacing requirement between a 3/4" Hilti bolt and a free concrete edge is specified in Table 7.2 of DCA 66318, Revision 1 to Specification 2323-SS-30, Revision 3, "Structural Embedments," as 10 1/2".
- c. A 1" Hilti bolt used for support H-SI-1-RB-032-002-2 in the Unit 1 Reactor building was installed 2 1/2" from the center of an unused 1 1/2" Richmond insert. The current minimum spacing requirement between an unused Richmond insert and a used Hilti bolt is specified on page 5 of DCA 56909, Revision 3, to Specification 2323-SS-30, Revision 3, "Structural Embedments," as ". . . a minimum of 2 times the larger diameter of either anchor" or 3 inches in this case.

- d. A 1" Hilti bolt used for support RC-1-115-023C66R in the Unit 1 Reactor building was installed 2 1/4" from the center of an unused 1 1/2" Richmond insert. Similar to case 3 above, the current minimum requirement is 3 inches.

The NRC inspectors investigated the Hilti bolt spacing requirements in effect during construction and/or modification of the above supports. Preliminary results indicate that the above conditions met the appropriate historical spacing requirements. Specification SS-30, Revision 0, and Construction Procedure CEI-20, Revisions 7-8, in effect during the construction and modification of support FW-1-097-034-C62R, do not address spacing requirements between Hilti bolts and wall penetrations. CEI-20, Revisions 7-8, state, in part, "Hilti bolts may be installed as close as practical to unused Richmond Screw Anchors which have been plugged" Procedures and specifications regarding Hilti bolt to free concrete edge spacing in effect at the time support C23012547-03 was installed have not yet been reviewed by the NRC inspectors. The resolution of the above four discrepancies with current spacing requirements and the identification of the historical requirements is an unresolved item (445/8842-U-02). See also the related unresolved item (445/8842-U-01) addressed in paragraph 5 of this report.

7. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. Two unresolved items disclosed during the inspection are discussed in paragraphs 5 and 6.

8. Exit Meeting (30703)

An exit meeting was conducted July 6, 1988, with the applicant's representatives identified in paragraph 1 of this report. No written material was provided to the applicant by the inspectors during this reporting period. The applicant did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection. During this meeting, the NRC inspectors summarized the scope and findings of the inspection.