UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 17 1982

Docket Nos. 50-206, 361, 362

MEMORANDUM FOR: Thomas M. Novak, Assistant Director
for Licensing
Division of Licensing

FROM: William V. Johnston, Assistant Director
for Materials & Qualifications Engineering
Division of Engineering

SUBJECT: ALLEGATIONS BY EARL KENT CONCERNING ADEQUACY OF WELDMENTS AT SAN ONOFRE UNITS 1, 2, AND 3

Plant Name: San Onofre Nuclear Generating Station Units 1, 2 and 3
Licensing Stage: Unit 1 operating, Unit 2 and 3, OL
Docket Numbers: 50-206, 361, 362
Reviewer: D. E. Smith
Responsible Branch & Project Manager: LB #3; H. Rood
Description of Task: Safety Evaluation Report of statements by Mr. E. Erol Kent on the adquacy of the weldments at these plants
Dates Reviewed: 10/26/82 to 11/8/82
Review Status: Complete

The Materials Application Section, Materials Engineering Branch, Division of Engineering has completed its review of Mr. E. Earl Kent's statement of concerns in regard to the adequacy of the welds at these units at the San Onofre site. The review has included; (1) interviewing the people who accompanied Mr. Kent on a walk through tour of the plants for him to point to specific welds which demonstrated his concerns, (2) repeating the tour and inspecting those welds which he pointed out were of concern to him, (3) review of the documents provided by the applicant demonstrating compliance with the applicable codes.

Region V in their letter of October 29, 1982 requested the Office of Nuclear Reactor Regulation's (NRR) support on specific allegations by Mr. Kent. This safety evaluation report is our response to this request.

We conclude that there is no merit in the allegations made by Mr. Kent, and recommend that no further action be taken. The Bechtel Power Corporation (BPC) provided documentation to refute the allegations by Mr. Kent. This documentation was gathered

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and assembled without BPC having the specific allegations by Mr. Kent as expressed in his statement. The documentation was thorough, and refuted all of the allegations.

William V. Johnston

William V. Johnston, Assistant Director
Materials & Qualifications Engineering
Division of Engineering

Attachment

cc: R. Vollmer
W. Johnston
E. Sullivan
S. Pawlicki
B. D. Liaw
C. Cheng
W. Hazelton
R. Klecker
H. Rood
F. Miraglia
R. Bosnak
F. Schauer
D. Smith

ATTACHMENT

SOUTHERN CALIFORNIA EDISON

SAN ONOFRE NUCLEAR GENERATING STATION

UNITS 1, 2 AND 3

DOCKET NOS. 50-206, 361, 362

SAFETY EVALUATION REPORT

MATERIALS ENGINEERING BRANCH

MATERIALS APPLICATIONS SECTION

References

(a) USNRC Region V Memo of October 29, 1982 from J. L. Crews to D. G. Eisenhut, Subject: Request for Technical Assistance, Allegations by E. Earl Kent (San Onofre).

(b) Earl Kent's statement of concerns dated October 16, 1982.

Reference (a) requested NRR technical assistance in resolving items (2), (5), (6) and (8) of Mr. Kent's statement (reference (b)). Our evaluations of these items are as follows:

Allegation Item (2)

"Bechtel designers use fillet welds in connections of beams in pipe supports and tray hangers and often do not weld all around the joint to restrain forces in all directions. I feel this is code violation. No proto-type tests, to my personal knowledge, were conducted to verify the adequacy of these welds. Therefore,

the actual structural strength of the electrical tray hanger/tube steel welds used or the actual material at SONGS may not be truly known. This also applies to pipe supports. I also feel that the partial joint strength (less than full joint integrity) and failure to weld all around the joint is a generic problem. Unfortunately, and in my opinion, the codes do not always demand full strength welding, whether all around or not.

Evaluation

The loads to be withstood by structures fabricated in accordance with American Institute of Steel Construction (AISC) Steel Construction Manual are defined as follows:

"1.3.6 Other forces

Structures in localities subject to earthquakes, hurricanes and other extraordinary conditions shall be designed with due regard for such conditions."

"1.3.7 Minimum Loads

In the absence of any applicable building code requirements, the loads referred to in Sect. 1.3.1, 1.3.2, 1.3.5 and 1.3.6 above shall be not less than those recommended in the USA Standard Building Code Requirements for Minimum Design Loads in Buildings and Other Structures, USASI A58.1, latest edition.

The allowable stresses are as follows:

"Section 1.5 Allowable Stresses*

Except as provided in Sects. 1.6, 1.7, 1.10, 1.11 and in Part 2, all components of the structure shall be so proportioned that the stress, in kips per square inch, shall not exceed the following values, except as they are rounded off in Appendix A"

We reviewed the documentations provided by the applicant and concluded that the applicable sections, of the AISC Steel Construction, Manual have been followed. The allowable stresses of the weld metal determine the size of a given fillet weld in a given configuration.

The codes acknowledge that there are many failure modes other than tensile overload. These other failure modes can occur, depending upon configurations, at much lower stress levels than tensile overload. Accordingly, the codes are fashioned to address all the various failure modes to assure safe fabrications. The designer sizes parts and welds to meet code requirements.

His statement concerning composition of materials, weld and base metal, of electric tray hanger/tube steel welds not being known or of unknown strength, is unsubstantiated. We believe the quality Control by all parties concerned, and

the audits conducted by the region are adequate to address this concern. The BPC documentation on design of individual joints to the particular application code was through.

We see no merit in this allegation.

Allegation Item 5

"I am of the opinion that weld end returns are not required on Bechtel drawings. This is in violation of AWS-D1.1, Section 8, 1974 Edition, paragraphs 8.8.6, 8.8.6.1, and 8.8.6.2. These conditions exist on details in many structural applications. A two-page Bechtel Power Corporation table establishes that certain pipe supports and other items must conform to AWS-D1.1 requirements."

Evaluation

In the walk through inspection tour, end returns were observed on some structural welding. A review of drawings showed Bechtel had specified end returns. The use of end returns was determined by the loads (including design base earthquake) causing a prying apart of fillet welds.

There were places where end returns were not present. The applicable version of AWS D1.1 for these plants has the following requirements for end returns;

"8.8.6 End Returns (Boxing)

8.8.6.1 Side or end fillet welds terminating at ends or sides, respectively, or parts or members shall, wherever practicable, be returned continuously around the corners for a distance at least twice the nominal size of the weld except as provided in 8.8.5.

8.8.6.2 End returns shall be indicated on the drawings."

The engineering reason for end returns is addressed in the American Institute for Steel Construction's (AISC) Steel Construction Manual, 7th Edition.

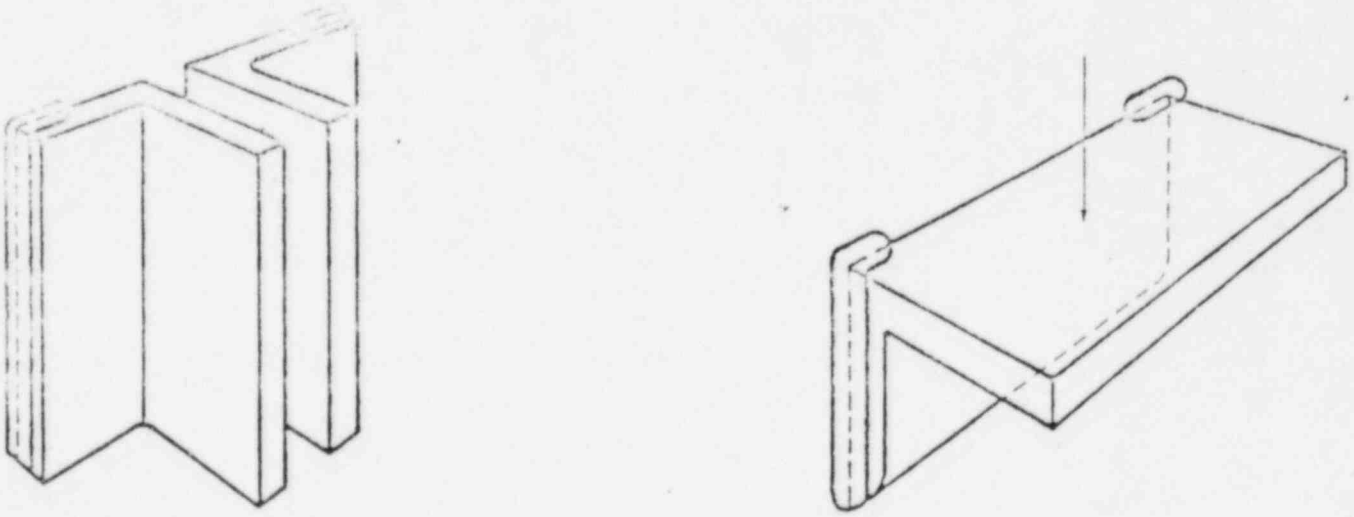
The Steel Construction Manual is applicable to San Onofre 2 & 3, it invokes the AWS D1.1, and it has the following wording concerning end returns:

"1.17.10 End Returns of Fillet Welds

Side or end fillet welds terminating at ends or sides, respectively, of parts or members shall, wherever practicable, be

returned continuously around the corners for a distance not less than twice the nominal size of the nominal size of the weld. This provision shall apply to side and top fillet welds connection brackets, beam seats a similar connections, on the plane about which bending moments are computed. End returns shall be indicated on the design and detail drawings."

The engineering reason for end returns is to reduce the prying open of welds by applied load moments. This is a calculatable stress and accordingly, the design engineer can make judgements as to the need for end returns on individual pipe supports and electrical cable tray hangers. If there is no advantage to requiring end returns, the design engineer is not obligated to require them. The 1981 edition of AWS D1.1 has a commentary section which addresses end returns, as follows:



(A) Boxing of header angles

(B) Boxing around top of seat angle connections

Fig. C8.8.6—Examples of end returns (boxing)

"8.8.6 In earlier testing of flexible beam-to-column connections in which the welds were subjected to combined shear and bending, it was found that end returns (hooking the weld) around the top of seat angle connections (see Detail B of Fig. C8.8.6) did not necessarily increase the strength of the connection. In the case of header angles, as shown in Detail A, end returns (boxing) tend to delay the initial tearing of welds under ultimate failure conditions.

This commentary makes note that the ultimate, static load (which is applicable to cable tray hangers and pipe supports at these plants) are not increased by end returns.

In conclusion, the Bechtel Power Corporation showed knowledge of the end return requirements, and used them when there was a design need. Accordingly, this allegation is viewed as not having any merit.

Allegation Item 6

"Bechtel Construction Specification CS-P207, Revision 7, dated April 18, 1980, paragraphs 5.6 and 5.7, contains visual examination criteria used by Bechtel for pipe supports and reference the ASME B&PV Code, Section III, Subsection NF. I may have told John O'Dell, investigative reporter for the Los Angeles

Times, that I believe the visual criteria of CS-P207 are not in accordance with the above code requirements, particularly in CS-P207 paragraphs 5.6.1.3 (porosity and slag), weld convexity height acceptance criteria, 5.6.1.9 (underfilled) groove weld craters), 5.6.1.11 (arc strike acceptance criteria), and 5.7.2 (allowing groove welds with fillet caps to be welded as fillet welds)."

Evaluation

The acceptance standards for visual examination welds of the Winter 74 Edition of the ASME Code Section III, Subsection NF is as follows:

"NF-5360 ACCEPTANCE STANDARDS FOR VISUAL EXAMINATION OF WELDS

(a) Only indications with major dimensions greater than 1/16 in. shall be considered relevant.

(b) Unless otherwise specified in this Subsection, cracks or other linear indications are unacceptable.

Specific defects are not addressed in Subsection NF, and the requirements of Bechtel's CS-P207 provides additional detailed guidance to their (Bechtel's) personnel in making judgments of fabrications. Therefore, Mr. Kent's statement concerning CS-P207 Rev. 7 not being in accordance with ASME Subsection NF is not accurate because the CS-P207 Rev. 7 requirements are beyond the acceptance criterion of Subsection NF.

In regard to the implications of allegations concerning 5.6.1.3, 5.6.1.9 and 5.6.1.11, Mr. Kent apparently has mistakenly applied the requirements of one code (AWS D 1.1) to ASME, Section III, Subsection NF. Therefore, his allegation has no merit. In regards to the allegation concerning 5.7.2, this paragraph is applicable to American National Standards Institute B 31.1, "Power Piping" Code which at San Onofre 2 and 3 is used only on non-nuclear safety related piping. The use of fillet welds in lieu of full penetration welds is a common design option. Other code requirements, usually maximum stress limits, determine the actual sizes of the particular weld geometries used. Accordingly, this allegation is viewed as not having any merit. In addition, as this section of the Bechtel Construction Specification concerns non-nuclear safety related piping, it is not in the jurisdiction of the NRC.

The comparison of one code, such as AWS D 1.1 with another, such as ASME Section III, Subsection NF on a pragraph by paragraph basis is not appropriate. These codes are oriented towards different purposes, and are based upon different philosophies of design, and written by different groups of people. It is the whole code which must be compared, and their requirements as applicable for their purpose. Both codes employ conservatisms, in different areas and have different approaches. None of Mr. Kent's allegations on the inadequacy of any particular code has merit. Therefore, it is our judgment BPC's Construction Specifications CS-P207, Rev. 7 meets appropriate code requirements.

Allegation Item 8

"Bechtel has not in my opinion complied with the requirements of AWS-D1.1 (1974 Edition), paragraphs 8.12.1.5.(2).(b) and 8.15.1.3, regarding filling of open weld craters on tray hangers and other items to full cross section of the weld."

Evaluation

Paragraph 5.12.1.5 (2) (b) concerns inspections of qualifications weldments and has no relevancy to inspection of production weldments. Paragraph 8.15.1.3 reads as follows: "All craters are filled to the full cross section of the welds".

In Mr. Kent's walk through tour, he pointed to only one weld which he maintained had a crater. In the judgement of the people who accompanied Mr. Kent, the crater was filled to the theoretical throat dimension of the weld. This means the full joint strength of the weld would be obtained. This particular weld had been painted. The alleged crater occurred outside of the strength part of the weld between a flat mounting plate and a cornered square piece of structural tubing. The weld terminated at both ends where the round corner of the tubing was departing from the flat plane of plate. This same painted weld was also noted by Mr. Kent to have porosity. The porosity was in the paint.

Of the thousands of welds available for Mr. Kent's tour, he "found" only one weld which in his opinion, did not meet the crater filling requirements of 8.15.1.3. The extent of filling required is outlined in paragraph 3.6.1, which requires that the weld have the minimum throat thickness of the diagrammatic weld in the drawing. Such had been obtained on the one weld he maintained did not have adequate crater fill.

The BPC Construction Specification, CS-P207 Rev. 7, covers underfilled craters as follows:

"5.6.1.9 Underfilled groove weld craters shall be accepted provided the depth of underfill is 1/16 inch or less. Underfilled single-pass fillet weld craters shall be accepted provided the crater length is less than 10 percent of the weld length. On multipass fillet welds, crater depth 1/16 inch or less shall be accepted."

At the November 3, 1982 meeting at San Onofre, BPC personnel informed this reviewer that the 1/16 limit was measured with pit gauges as a standard quality control procedure.

Accordingly, we find this allegation has no merit.

Overall Evaluation

The other allegations by Mr. Kent were evaluated by Region V personnel. The documentation provided by BPC tnrough the applicant addressed all of the allegations. The thorough review by Region V as augmented by San Onofre personnel demonstrated the allegations by Mr. Kent had no merit.