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July 11, 1984

Mr. Robert Gilbert
Project Manager
Operating Reactors Branch No. 5
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington D.C. 20555

Subject: Dresden Station Unit 2
Systematic Evaluation Program, IPSAR
Section 4.10, Topic III-7.B Design Codes,
Design Criteria and Load Combinations
NRC Docket No. 50-237

Reference (a): D. M. Crutchfield letter to D. L. Farrar
dated March 9, 1984.

Dear Mr. Gilbert:

Following a review of the referenced evaluation report a telephone discussion was held on May 2, 1984 with members of your staff. During this conversation each of the reported items requiring further clarification were reviewed. Attachment (1) is provided as a reply to the questions raised during our discussion. An additional question, not included in the Evaluation Report, was also asked. This question involved the Code of Construction of expansion bellows at Dresden and our reply is provided by Attachment (2).

If there are further questions concerning this matter please address them to this office.

One (1) signed original and forty (40) copies of this transmittal is provided for your use.

Sincerely,

B. Rybak
Nuclear Licensing
Administrator

lm

cc: Region III Resident Inspector, Dresden (w/a)
Mr. Don Chery, SEP Project Manager (w/a)

Attachments: (1) Response to NRC/FRC Technical Evaluation Report
(2) Code of Construction for expansion bellows

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ATTACHMENT 1

SEP TOPIC III-7.B

RESPONSE TO

NUCLEAR REGULATORY COMMISSION/FRANKLIN RESEARCH CENTER

(NRC/FRC)

REQUESTS OF TER-C5506-425

DATED NOVEMBER 15, 1983

COMMONWEALTH EDISON COMPANY
SARGENT & LUNDY ENGINEERS

PROJECT NO. 5667-00

JUNE 1984

SARGENT & LUNDY
ENGINEERS
CHICAGO

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C. Response to Request 3 - Clarification of the nature of loads used with respect to current criteria
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VI. Comments on Appendix A of TER-C5257-321

I. Reassessment Activities - Introduction

In response to the NRC/FRC inquiries regarding the code comparison review completed as a result of SEP Topic III.7-B, CECo/S&L is providing background information concerning the extensive structural reassessment activities which have been implemented as a result of various NRC bulletins, programs, and other SEP Topics. Therefore, the following summary is provided to clarify the extent of the above-mentioned activities.

A. Mark I Program

Various piping systems in the drywell, vent line, and torus and their supporting structures were evaluated to meet the Structural Acceptance Criteria established by the Mark I program. This criteria represented qualification of structures to the current AISC code and the 1977 summer addenda of the ASME code for loads established by the NRC's Safety Evaluation Report, NUREG-0661. The Plant Unique Analysis Reports (PUAR) for Dresden documents the adequacy of existing design of the structures.

B. IE Bulletin 79-02 - Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts

This bulletin specified the margin of safety and identified requirements to which existing expansion anchored plates should be designed and inspected. CECo/S&L undertook a major inspection/modification program and established conformance to the bulletin's requirements as well as ACI 349, Appendix B. The reassessment involved approximately 1,000 pipe support base plates at the Dresden Station.

C. IE Bulletin 79-14 - Seismic Analysis for As-Built Safety Related Piping Systems

This bulletin required seismic reanalysis to as-built configuration of piping systems. Included in the reassessment was, not only the piping stress verification, but a reassessment of the integrity of the supporting structures. In addition, this reassessment involved a verification of revised loads in conjunction with the 79-02 bulletin and a verification of combined loadings resulting from the Mark I program. Modifications were provided to meet the currect ACI and AISC codes, as required. The reassessment included areas in the Reactor Building, both inside and outside the drywell, as well as various areas in the Turbine Building. Approximately 2,000 support loads were qualified to current codes.

D. Electrical Equipment Anchors (I.E. 80-21)

In conjunction with the NRC IE information notice 80-21, "Anchorage and Support of Safety Related Electrical Equipment," all safety related electrical equipment, anchorage, and supporting structures were assessed and qualified to current codes, or modified as required to meet current codes. The extent of this assessment involved approximately 150 pieces of equipment.

E. Evaluation of Turbine Main Floor for Additional Equipment Loads

The Dresden Station turbine room main floor which involves a major portion of the structural steel support for the turbine building was re-evaluated for additional loading.

During this re-evaluation, structural members were re-qualified to existing codes, including various connection investigations where beam copes were involved. This process also resulted in the verification of adequacy of existing structures to currect codes for the original loading.

F. Other SEP Topics

1. Topic II-2A - Severe Weather Phenomena

The roofs of the buildings were evaluated for normal snow load as well as the maximum probable precipitation. Changes to the parapets will be implemented since the capacity of the roofs is sufficient for the load due to the maximum probable precipitation.

2. Topic III-2 - Wind and Tornado Loadings

The structures were evaluated for wind and tornado loads in accordance with Regulatory Guide 1.76. The structures were found to be adequate for the current wind load requirements. The structures were found to be adequate for a probable tornado load with a probability per year of 1.7 times 10^{-6}. The design and modifications of structures to comply with a tornado and wind load in accordance with the Regulatory Guide were not deemed necessary. The evaluation was done based on a report, "Tornado and Straight Wind Hazard Probability for the Dresden Site," prepared by the Texas Technical University Institute for Disaster Research.

3. Topic III-4A - Tornado Missiles

Structural and mechanical components not designed for or protected from tornado missiles were reviewed. The probability of these local areas being hit by tornado missiles was studied using the "Tormis" computer code developed by EPRI. It was found that the probability of tornado missile damage to the local areas in question was sufficiently low and no design modifications were contemplated.

G. Summary Statement

As a result of the various reassessment programs, NRC bulletins, and other SEP Topics, it can be clearly demonstrated that major components of the Dresden structures were re-evaluated and qualified to existing codes during the past several years. Due to the extent of the re-evaluations, a strong case can be established for the conformance of essentially all existing structures to current codes.

II. AISC Code Requirements

A. Section 1.5.1.2.2 - Clarification of statement regarding acceptability of coped beam connections

In addition a cursory review of shop drawings for beams with major copes indicated acceptability of the connections. The connections for structural members referred to in Sections IA, IC, and IE of this document were qualified to existing code requirements.

B. Section 1.9.1.2 - Clarification of not exceeding limits of subject AISC Section

Original design configurations excluded the use of the structural-T as a compression member. When structural T's were used in modifications listed in Section I of this document, the current AISC Code was used for design, and b/t limits were not exceeded.

C. Section 1.14.2.2 - Clarifiation of whether tensile members fall into revised limitations of the code

Primary tension members for Category I structures have been reviewed and do not fall within any additional limitations of this AISC section.

D. Sections 1.15.5.2 through 1.15.5.4 - Clarification of the nature of Crib House Moment Connections

CECo/S&L has reassessed the moment connections in the crib house and has verified that they meet the requirements of the current AISC code.

E. Section 2.9 - Clarification of the use of plastic design methods

All design and re-evaluation performed to this date has been done using only the elastic design approach.

III. ACI Code Requirements

A. Section 7.10.3 - Clarification of no column stress reversal

Calculations for the concrete Category I structures have been reviewed. All lateral load has been resisted by shear walls. Due to this fact and the fact that the maximum SSE vertical acceleration is 0.14g, there is no uplift load imposed on the concrete columns at Dresden. Therefore, there is no concern for stress reversal in the concrete columns at Dresden.

B. Section 11.15 - Clarification of special provisions affecting structures other than shear walls

As mentioned in CECo/S&L previous response: "Shear walls have been shown to be adequate per report by the Senior Seismic Review Team, NUREG/CR-0891, Section 4.5.1." In addition, CECo/S&L can verify that the code provisions in Section 11.15 affect no other structure other than shear walls at Dresden. CECo/S&L Review of structural drawings indicates that corbels were not used in construction at Dresden.

C. Section 11.15.7 - Clarification of assessment for punching shear stress

During the course of review of all additional loading imposed on the various structures, as noted in Section I of this document, a punching shear check had been performed as part of the review for structural integrity. Due to the extent of the review involved, CECo/S&L considers this to be sufficient cause to say that Section 11.15.7 requirements have been satisfied.

D. Appendix A - Clarification of design parameters used for temperature affects

1. Category I structures that are significantly influenced by the effects of temperature have been designed for the following requirements.

a. The containment wall (Reactor Shield Shell) was designed for a maximum operating temperature of 135°F inside of the drywell and an exterior ambient temperature of 70°F.

b. The fuel pool walls were designed for a maximum operating water temperature of 150°F and an exterior ambient temperature of 70°F. The maximum gradient considered was 80°F.

c. Loads due to thermal effects were combined with dead load, seismic loads, and other operating loads for the most severe loading combination and verified as being within the normal allowable stresses per the Dresden FSAR. The design was based on uncracked section properties, and is, therefore, conservative compared to the requirements of Appendix A. The models used for the analyses included consideration of member stiffness and rigidity.

2. All Category I structures that are influenced solely by normal environmental thermal effects have been provided with sufficient reinforcing steel to meet minimum ACI temperature requirements. An example for such a structure is the exterior walls of the Reactor Building. These wall have experienced the temperature changes for which they should have been designed due to the exterior temperature variations between summer and winter for the past approximately 15 years. An inspection could verify that those walls are in excellent condition and do not show any degradation. It can be projected that they will remain functional for the remainder of the 40 year life span.

E. Appendix B - Clarification of the extent of 79-14 Bulletin with regard to embedments

During the course of 79-14 work, a verification that existing embedments meet the requirements of Appendix B was performed. As a result, embedments subjected to all loads from activities described in Section I of this document were either verified as meeting Appendix B requirements or modified to meet those requirements.

IV. ASME Code Requirements

A. Section NE-3331 - Clarification of the basis for non-applicability

Section NE-3331 addresses general requirements for openings and reinforcement. Of special concern are the

provisions for fatigue analysis. The original design of the drywell and torus shell shows that the design for the reinforcement was done by a formula. The reinforcement provided would qualify to the reinforcement required using the present ASME code. Based on the general experience of today, designing of containments, in accordance with Subsection NE, it can be argued that the containments have to be designed only for a small number of cycles. It could be shown that the actual stresses would fall within the limitations of paragraph NE-3321.5, analysis for cyclic operation. It could also be shown that the actual stresses would fall within the limitations of paragraphs NE-3221.1, .2, .3, and .4. It should also be noted that the penetrations do not experience mechanical loads other than bellow deformation loads.

V. Loads and Load Combinations (TER-C5506-425, Section 5.2)

A. Response to Request 1 - Clarification of comments on Load Combination Tables

By evaluating critical load combinations, it was the intent of CECo/S&L to show agreement with FRC's assessment of the load combinations that were considered in the design of Dresden 2. CECo/S&L agree with the designated possible loading conditions and attempted to show those conditions which were critical and those conditions which governed.

B. Response to Request 2 - Clarification of the extent of pipe break consideration

CECo/S&L would like to clarify that loads associated with pipe break and its effects were not considered in the original design, but were part of a modification to reassess for high energy pipelines. Pipe whip restraints were added, and the structure was reassessed for integrity and found to be acceptable. Specific loads noted as "considered" were meant to denote the loads for which the particular structure was designed or assessed and found to be adequate.

C. Response to Request 3 - Clarification of the nature of loads used with respect to current criteria

Loads used in the original design for specific combinations are consistent with the Dresden FSAR. Any reassessment that was performed considered new loads that were consistent with current criteria, such as:

1. Snow/Rain Load covered by SEP Topic II-2.A
2. Tornado Wind Load covered by SEP Topic III-2
3. Tornado Missiles covered by SEP Topic III-4.A

Seismic Category I structures were designed to resist both wind and earthquake loading without a one-third overstress. This is consistent with the FSAR.

D. Response to Request 4 - Clarification of the designation of governing load combination

Load combinations indicated as "governing" were intended to provide information as to which load combination S&L considered to be the governing combination for primary members. It has been verified that those load combinations considered in the actual design were the governing case for each component of the structure. Due to the nature of the original loads and load combinations, it is generally clear which combination would govern for all members.

E. Response to Request 5 - Clarification of pipe loads that were considered

The comment which CECo/S&L made regarding the R_o (pipe reaction) load was intended to illustrate the original design load, which considered uniform piping loads. These conservative uniformly distributed loads were intended to establish an equivalent condition to individual pipe reactions for initial design. During reassessment of as-built piping systems (79-14 bulletin work) however, individual piping loads were assessed, and supporting structures were locally qualified for these loads. These loads did include seismic and thermal effects.

F. Response to Request 6 - Clarification of loads and load combinations used for concrete working stress design

Load combinations used are consistent with Section 12 of the Dresden FSAR for the working stress design. CECo/S&L intended to indicate, by Note 4 on Table 2 of the previous response, that those factored load combinations shown were simply not applicable and not used in the original design.

As indicated in case study 3 of Appendix C in TER-C5257-321, the working stress method of design can be shown to be more conservative than the ultimate strength method of design. S&L has designed a number of structures similar to the Category I structures at Dresden using both methods. Based on Sargent & Lundy experience and comparison of the two design approaches for the same type of structures, it is the judgment of S&L that the intent of the ultimate strength combinations is definitely met or exceeded by previous working stress designs used at Dresden.

VI. Comments on Appendix A of TER-C5257-321

CECo/S&L have reviewed Appendix A of TER-C5257-321 and agree with the FRC comments with the following clarification on items 1.5.1.4.1 and 1.9.2.3 of Appendix A-1: Hollow circular sections subject to bending are not used at Dresden Unit 2 Category I structures; therefore, they are not applicable. Vertical bracing tension-compression members do exist in the Reactor Building.

Attachment 2

Subject: Code of Construction for Expansion Bellows

The expansion joints were originally purchased from Pathways Bellows, Inc. under Grinnell Corporation Purchase Order W8509, dated September 25, 1968. As such, the Code of Construction for the expansion joints would be Section III of the ASME Boiler and Pressure Vessel Code, 1968 Edition.

Reference: Nutech Engineers, Inc. COM-81-007 Rev. A Section 2.2