

December 19, 1990

Mr. Edward Griffing, Manager  
Technical Division  
Nuclear Management and Resources Council  
1776 Eye Street, N.W.  
Suite 300  
Washington, D.C. 20006-2496

Dear Mr. Griffing:

The enclosed summaries describe the staff's conclusions concerning the 95 comments/responses for the PWR Containment Structures Industry Report (IR).

Enclosure 1 identifies the 14 items to be addressed by NUMARC. Enclosure 2 summarizes the information/clarifications for the 81 items that were agreed upon by the staff and NUMARC for incorporation into the revised IR. These are in addition to the original NUMARC responses.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten correspondents; therefore, OMB clearance is not required under P.L. 96-511.

If you have any questions concerning this summary, please contact me or P.T. Kuo at 492-3147.

Sincerely,

Original signed by:  
John W. Craig, Director  
License Renewal Project Directorate  
Division of Advanced Reactors  
and Special Projects  
Office of Nuclear Reactor Regulation

Enclosures: As stated

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PWR Containment Structures Industry Report  
Summary of 14 Open Items

Item	Summary of Concerns
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## G-3                    Fatigue of bellow assemblies

Submittal of the study performed by Mr. Frank Gregor should provide the information necessary to evaluate the data and the conclusions in the IR. Based on the information presented at the NUMARC/NRC meeting, the staff concludes that after reviewing and evaluating the report information, and pending revision to the IR, this item should be closed.

## G-4                    Thermal cyclic load of penetration sleeve anchors

Compared to the thermal cyclic loads on liner anchors, the penetration sleeve anchorages are subject to (1) larger variation in temperature and (2) larger loads due to the piping motion under temperature changes. The IR should provide more discussion of the issue and identify the need to examine these areas during a plant inspection/walkdown.

## G-7                    Plant inspection/walkdown

An initial plant inspection/walkdown should be part of an integrated plant assessment to define the "as-is" state of a plant. NUMARC/EPRI indicated that they would prepare a short write-up of key thoughts and positions on the subject as the basis for discussion with the staff.

## S-7                    Containment assessment

NUMARC's response did not address the concern that adequate assessment should be performed on all containments for the purpose of identifying existing degradation mechanisms.

## S-10                   Freeze-thaw damages

The staff agrees with NUMARC's response, but a statement should be added that plants built prior to 1983 may be more susceptible to this degradation mechanism because of the cement type or class used. ACI-318 and ACI-349 were changed in 1983 which resulted in a concrete type better able to withstand these phenomena.

S-12 Alkali-aggregate reaction

The staff disagrees with the contention that the alkali-aggregate reaction expansion will take place only in the early years of a structure's life and not later in its life. For a detailed review of this phenomenon, refer to ACI 201.2R-77, "Guide to Durable Concrete," Chapter 5 - Chemical Reactions of Aggregates, especially subparagraph 5.2.1 which states that, "Several of these rocks...appear to react slowly even with high alkali cement, the reactivity not having been recognized until the structures were over 20 years old."

S-20 Interfaces of shield and containment structures

NUMARC's response to the original comment is adequate. However, a new concern was identified during the discussion with NUMARC that some of the interface structures or areas may not get addressed in either of the IRs (PWR Containment and Class 1 Structures). Examples are reactor cavity, sump lines, top of concrete fill and NSSS support anchorages through the fill concrete and containment basemat. The IR should be clarified to include these structural areas.

S-26 Containment configurations technical envelope

Clarification is needed to identify design criteria to define "typical" cases described in the report. Since the report is general, it appears that licensees will have significant latitude when determining whether or not they conform to the "typical" design described in the IR.

S-42 Concrete chloride content

NUMARC's response, in general, is adequate. It falls short, however, of advising the users to take any action if either the chloride level was not monitored or the amount of chloride was higher than the allowable in recently published codes (ASME Section III, Div. 2). A plant inspection/walkdown should be required to look for signs of rebar corrosion.

S-61 Concrete strength and grease leakage

The response to this comment is not entirely correct. Tendon ducts have been found to leak. It is correct that Regulatory Guide 1.35 inspections should discover leakage of grease or other tendon problems. The inspection procedures should be identified in the IR. To assess the potential for age-degradation of concrete compressive strength and bonding with rebars, the IR should also address the long-term effect associated with significant grease leakage into concrete.

S-63 Settlement of containment

NUMARC's response partially addressed the concern. The IR should discuss the need for examining the clearances between structures and movements of the attached piping during plant inspection/walkdown to identify degradation due to settlement.

S-67 Synergistic effect

The response to this issue is not adequate. The IR should systematically address the issues raised in this aspect of the comment.

S-68 Below assemblies

Same comment as G-3 above.

S-70 Plant inspection/walkdown

Same comment as G-7 above.

PWR Containment Structures Industry Report  
Summary of 81 Items Which Are Resolved Pending Review of the Revised IR

Item	Additional Information and/or Clarifications Agreed Upon
G-1	Position on inaccessible areas provided thru Item G-5.
G-2	Revise the IR as stated in the response and expanded in the meeting and the teleconference.
G-5	Expand discussion in Section 6 on the management of age-related degradation for inaccessible areas.
G-6	Expand discussion in Section 6 on managing rebar corrosion with respect to aggressive aqueous solution.
G-8	Clearly state in Section 6 that the basis for closing the liner and steel fatigue issues for inaccessible areas is contingent upon the licensee's endorsing and implementing an effective IWE program.
G-9	Revise IR as stated.
G-10	Rate of degradation for accessible areas is understood tacitly not to be a concern.
G-11	Clarify criteria to be implemented as part of IWE.
G-12	Expand presentation of technical envelopes (limits, bounding parameters, and assumptions) and aging performance criteria.
G-13	Inaccessible areas not covered by IWE will be discussed in Section 6.

- G-14 IR will specify the need to establish tendon capacity curves for the license renewal period.
- G-15 Same resolution as G-8 and G-13 combined.
- G-16 Same resolution as G-8 and G-13 combined.
- G-17 To be addressed as discussed.
- S-1 Standardized wording will be used in the IR.
- S-2 Use ASME code terminologies.
- S-3 Revise IR wording.
- S-4 Clarify IR process.
- S-5 Revise the IR to incorporate bounding limits and evaluation criteria for all degradation mechanisms.
- S-6 Closed (no credit taken for corrosion allowance).
- S-8 For plant inspection concerns see resolution for G-8.
- S-9 To be addressed as part of S-61, which remains open.
- S-11 Revise IR wording.
- S-13 Revise IR presentation.
- S-14 Will be discussed in the 11/14/90 generic fatigue issues meeting.
- S-15 Closer (irrelevant IR statement).
- S-16 Same concern as S-59; will incorporate a discussion on galvanic corrosion of dissimilar metals.
- S-17 Illustrations and tables are meant to be descriptive only; misleading information will be removed.
- S-18 Discussion of outlier degradation mechanisms will be on a plant-specific basis.
- S-19 Standard ASME code description on temperature effects on concrete will be incorporated.

- S-21 Closed (localized liner thermal fatigue).
- S-22 Closed (pile foundation).
- S-23 Revise the IR to move the closure of the issue of ground water rebar corrosion to Section 6.
- S-24 Closed (liner and containment shell coating).
- S-25 Same resolution as S-23.
- S-27 Closed (cathodic protection system).
- S-28 Remove text reference to "concept of constant risk."
- S-29 Closed (time-dependent concrete strength gain).
- S-30 Comments withdrawn.
- S-31 Incorporate the response on design margin in the IR revision.
- S-32 Revise IR to avoid far-reaching conclusion based only on brief discussion.
- S-33 The prestressed concrete design inadequacies issue is not age-related.
- S-34 IR will be revised to avoid the implication that the SNL scaled model experiments have addressed age-related degradation mechanisms.
- S-35 Closed (pile foundation).
- S-36 Concerns will be addressed with the implementation of effective programs.
- S-37 Same resolution as S-36.
- S-38 Closed (intended application of the Section 4.1 information).
- S-39 Concerns will be addressed with the implementation of plant inspection/walkdown as part of an integrated plant assessment for license renewal application.
- S-40 Closed (need for assessing plant-specific age-related degradation).

- S-41 Closed (concrete sulfate resistance).
- S-43 Will research literature and provide edition dates.
- S-44 Closed (manifestation of age-degradation at high temperature).
- S-45 Closed (high temperature effect on concrete strength degradation at penetrations; tendon prestressing loss management).
- S-46 Concerns will be addressed with the implementation of plant inspection/walkdown, as part of integrated plant assessment for license renewal application.
- S-47 Same resolution as G-14.
- S-48 Figure 4.12 is a wrong entry. The IR will be revised to provide discussion on acceptable temperature cut-off as related to the Reg Guide 1.35 tendon surveillance requirements.
- S-49 Closed (bond strength at elevated temperature).
- S-50 Closed (prestressing tendon corrosion).
- S-51 Same resolution as S-46.
- S-52 Closed (prestressing loss as a credible age-related degradation mechanism).
- S-53 Closed (irradiation damage of containment prestressing tendons).
- S-54 Incorporate response or equivalent into the IR.
- S-55 Same resolution as S-46.
- S-56 Closed (pile foundation).
- S-57 Closed (pile foundation).
- S-58 Closed (vibration-induced cracks in concrete pedestal supports).



- S-59 Discuss galvanic corrosion of dissimilar metals.
- S-60 Closed (rebar corrosion).
- S-62 Remove Figure 4.12, which applies only to BWRs.
- S-64 Same resolution as G-8.
- S-65 Concerns will be addressed with the implementation of effective programs.
- S-66 Issues will be resolved with the implementation of Subsection IWE.
- S-69 Concerns will be addressed with the implementation of plant inspection/walkdown, as part of an integrated plant assessment for license renewal application.
- S-71 Concerns will be addressed with the implementation of plant inspection/walkdown, as part of an integrated plant assessment for license renewal application.
- S-72 Closed (waterproof membranes).
- S-73 Figure 6.1 will be either revised or removed to be consistent with the write-up for Class I structures.
- S-74 Closed (waterproof membranes).
- S-75 Closed (ground water control).
- S-76 Closed (cathodic protection systems).
- S-77 Concerns will be addressed with the implementation of effective programs.
- S-78 Same resolution as S-43.