DAIRYLAND Power COOPERATIVE · P.O. BOX 817 · 2615 EAST AV. SOUTH · LA CROSSE, WISCONSIN 54601
(608) 788-4000

January 20, 1983

In reply, please
refer to LAC-8821

DOCKET NO. 50-409

Director of Nuclear Reactor Regulation
ATTN: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

SUBJECT: DAIRYLAND POWER COOPERATIVE
LA CROSSE BOILING WATER REACTOR (LACBWR)
PROVISIONAL OPERATING LICENSE NO. DPR-45
SEP TOPIC III-7.B, DESIGN CODES, DESIGN
CRITERIA, AND LOAD COMBINATIONS

REFERENCE: 1. NRC Letter, Crutchfield to Linder, dated December 9, 1982

Gentlemen:

Reference 1, which enclosed your draft evaluation of SEP Topic III-7.B requested that we evaluate the factual correctness of the SER and accompanying TER-C5257-325, and propose a schedule for resolution of the open items.

The LACBWR structures considered as Seismic Category I in Section 8 and 9 of the TER should be changed to reflect the deletion of the following structures:

1. Crib House (Water Intake Structure)
2. Water Discharge Structure
3. Fuel Storage Building
4. 1B (New) Diesel Generator Building

The water intake and water discharge structures were eliminated as Seismic Category I structures in letters LAC-7246, Linder to Crutchfield, dated November 26, 1980, and LAC-7355, Linder to Crutchfield, dated February 2, 1981. These two letters provided justification for elimination of the Crib House and buried piping (water discharge) as necessary structures in either the seismic or LOCA events at LACBWR.

The "Fuel Storage Building" as listed in Reference 1, is apparently a misconception of what is handled in the LACBWR "Waste Treatment Building". No new or spent fuel is handled or stored in the Waste Treatment Building and there is no such structure called "Fuel Storage Building". The spent fuel pool load criteria is adequately identified in Reference 1. The structure "Waste Treatment Building" was classified as "Non-Seismic" under SEP Topic III-1, per NRC letter, Crutchfield to Linder, dated July 7, 1981. Therefore, the structure "Fuel Storage Building" can be eliminated from consideration.





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In the course of reviewing the requirement for the need of the 1B Diesel and associated switchgear, in the event of a Safe Shutdown Earthquake, we have determined that it is sacrificial and therefore, it and the Diesel Building is eliminated from Seismic Category classification.

Section V, Item 1 of Reference 1 requested that a review of the LACBWR Seismic Category I structures be made to determine if any of the structural elements for which a concern exists are, in fact, a part of the facility design. The impact of code changes on the relevent elements will be accomplished by July 30, 1983.

Section V, Item 2 of Reference 1 requested that an examination, on a sampling basis, of the margin of safety of all Seismic Category I structures for loads and load combinations (Sections 10.3 and 10.4 of Enclosure 1 to Reference 1) not covered by another SEP Topic and designated by Ax be done. This will be accomplished by July 30, 1983.

Section V, Item 2 of Reference 1 also requested that the Seismic Category I structures be reviewed. We have determined that only the following should be considered Category I structures:

Containment shell and penetrations (including pipe penetrations)
Reactor Containment Building
Control Room and Electrical Equipment Room
Turbine Building (portion housing Class I equipment)
Spent Fuel Storage Well
Stacks

Revised tables in Section 10 of enclosure to Reference 1 are enclosed that reflect this change.

Section V, Item 3 of Reference 1 requested that the Code Editions assumed on Page 77 of enclosure of Reference 1 be verified. We have determined that the code ACI-318-56 is correct, but the applicable Code should be AISC 1961 in the second column. The Containment Vessel was built to ASME Boiler and Pressure Vessel Code, 1962 issue, Sections II, Material Specifications; VIII, Unfired Pressure Vessels; IX, Welding Qualifications, and to the following Nuclear Code Cases:

a. 1270N, General Requirements for Nuclear Vessels
b. 1271N, Safety Devices
c. 1272N, Containment and Intermediate Containment Vessels

The Codes ACI 318-71 and AISC 1971 are applicable as they were used in the modification of the Spent Fuel Storage Well.

Section V, Item 3 of Reference 1 also requested that applicable information be provided in the blanks of load tables of Section 10.3 of enclosure, where no information exists. The relevant tables from Section 10.3 are enclosed with applicable information provided.

Section V, Item 3 of Reference 1 also requested that assumptions made for the load combination tables be verified for technical accuracy concerning applicability of the loads for each structure and their significance. Enclosed are pages from Section 10.4 of the enclosure of Reference 1 which have been revised. Various load combinations on these pages have been deleted because they are inapplicable to the LACBWR facility.

Section V, Item 3 of Reference 1 also requested that the ability of the containment to resist seismic and LOCA loads in the correct combinations be determined after completion of the containment seismic analysis. This will be addressed by July 30, 1983.

If you have any further questions, please contact us.

Very truly yours,

DAIRYLAND POWER COOPERATIVE

Frank Linder, General Manager

FL:HAT:ee

Enclosures

cc: J. G. Keppler, Regional Administrator, NRC-Region III
NRC Resident Inspector

COMPARISON OF DESIGN BASIS LOADS

STRUCTURE:
SPENT FUEL POOL
(IN CONTAINMENT BUILDING)

PLANT: LA CROSSE

| | Current Design Basis Loads | Is Load Applicable To This Structure | Is Load Included In Plant Design Basis? | SEP Topic Reviewing This Load | Does Load Magnitude Correspond To Present Criteria? | Does Deviation Exist In Load Basis? | Code Impact Scale Ranking | Comments |
|---|---|---|---|---|---|---|---|---|
| Gravity | D | Yes | Yes | - | Yes | No | - | |
| | L | Yes | Yes | - | Yes | No | - | |
| Pressure | P | - | - | - | - | - | - | |
| | $P_o$ | Yes | Yes | III-3.A | * | * | * | |
| | $P_a$ | Yes | Yes | III-3.B | * | * | * | |
| Thermal | $T_o$ | Yes | Yes | - | Yes | No | - | |
| | $T_a$ | Yes | Yes | III-3.B | * | * | * | |
| Pipe & Mech. | $R_o$ | Yes | Yes | - | Yes | No | - | |
| | $R_a$ | Yes | Yes | - | Yes | No | - | |
| Environmental | E' | Yes | Yes | III-6 | * | * | * | |
| | E | Yes | Yes | III-6 | * | * | * | |
| | W' | Yes 1. | Yes | III-2, III-4.A | * | * | * | |
| | W | Yes 1. | Yes | III-2, III-4.A | * | * | * | |
| Impulse | $Y_r$ | Yes | - | III-3.B | * | * | * | |
| | $Y_j$ | Yes | - | III-3.B | * | * | * | |
| | $Y_m$ | Yes | - | III-3.B | * | * | * | |

Ref.: SRP(1981) Section 3.8.4

Comments

* To be determined per results of SEP topics. Scale ranking shown for SEP topic items are independent judgments, based on information in the FSAR or other original design documents.

1. Concrete shell is counted on to resist tornado missiles and to prevent overturning under wind and tornado loads.

COMPARISON OF DESIGN BASIS LOADS

STRUCTURE:
CONTROL ROOM AND ELECTRICAL EQUIPMENT ROOM

PLANT: LA CROSSE

| | Current Design Basis Loads | Is Load Applicable To This Structure | Is Load Included In Plant Design Basis? | SEP Topic Reviewing This Load | Does Load Magnitude Correspond To Present Criteria? | Does Deviation Exist In Load Basis? | Code Impact Scale Ranking | Comments |
|---|---|---|---|---|---|---|---|---|
| Gravity | D | Yes | Yes | - | Yes | No | - | |
| | L | Yes | Yes | - | Yes | No | - | |
| Pressure | F | - | - | - | - | - | - | |
| | H | No | No | III-3.A | * | * | - | |
| | $P_a$ | No | No | III-3.B | * | * | - | |
| Thermal | $T_o$ | No | - | - | - | - | - | |
| | $T_a$ | No | - | III-5.B | * | * | - | |
| Pipe & Mech. | $R_o$ | No | - | - | - | - | - | |
| | $R_a$ | No | - | - | - | - | - | |
| Environmental | E' | Yes | Yes | III-6 | * | * | * | |
| | E | Yes | Yes | III-6 | * | * | * | |
| | W' | Yes 1. | Yes | III-2, III-4.A | * | * | * | |
| | W | Yes 1. | Yes | III-2, III-4.A | * | * | * | |
| Impulse | $Y_r$ | No | - | III-5.B | * | * | - | |
| | $Y_j$ | No | - | III-5.B | * | * | - | |
| | $Y_a$ | No | - | III-5.B | * | * | - | |

Ref.: SRP(1981) Section 3.8.4

Comments

* To be determined per results of SEP topics. Scale ranking shown for SEP topic items are independent judgments, based on information in the FSAR or other original design documents.

1. Concrete walls are counted on to resist tornado missiles and to prevent overturning under wind and tornado loads.

COMPARISON OF DESIGN BASIS LOADS

STRUCTURE:
NEW DIESEL GENERATOR BUILDING

PLANT: LA CROSSE

| | Current Design Basis Loads | Is Load Applicable To This Structure | Is Load Included In Plant Design Basis? | SEP Topic Reviewing This Load | Does Load Magnitude Correspond To Present Criteria? | Does Deviation Exist In Load Basis? | Code Impact Scale Ranking | Comments |
|---|---|---|---|---|---|---|---|---|
| Gravity | D | Yes | Yes | —— | — | No | — | |
| | L | Yes | Yes | —— | — | No | $A_x$ | 1. |
| Pressure | $P'$ | No | — | —— | — | — | — | |
| | H | Yes | —— | III-3.A | * | * | * | |
| | $P_a$ | No | — | III-5.B | * | * | * | |
| Thermal | $T_o$ | Negl. | — | —— | — | — | — | |
| | $T_a$ | No | — | III-5.B | * | * | * | |
| Pipe & Mech. | $R_o$ | No | — | —— | — | No | — | |
| | $R_a$ | No | — | —— | — | No | — | |
| Environmental | E' | Yes | Yes | III-6 | * | * | * | |
| | E | Yes | Yes | III-6 | * | * | * | |
| | W' | Yes | No | III-2, III-4.A | * | * | $A_x$ | |
| | W | Yes | Yes | III-2, III-4.A | * | * | * | 2. |
| Impulse | $Y_r$ | No | — | III-5.B | * | * | * | |
| | $Y_j$ | No | — | III-5.B | * | * | * | |
| | $Y_m$ | No | | III-5.B | * | * | * | |

Ref.: SRP(1981) Section 3.8.4

Comments

* To be determined per results of SEP topics. Scale ranking shown for SEP topic items are independent judgments, based on information in the FSAR or other original design documents.

1. Roof loads have been increased per SEP Topic II-2.A and may increase per SEP Topic II-3.B for parapet roofs.

2. Licensee reports that this structure was designed for a maximum wind speed of 111 mph and a pressure drop of 0.25 psi.

STRUCTURE: CRIB HOUSE (WATER INTAKE STRUCTURE) AND WATER DISCHARGE STRUCTURE

COMPARISON OF DESIGN BASIS LOADS

PLANT: LA CROSSE

| | Current Design Basis Loads | Is Load Applicable To This Structure | Is Load Included In Plant Design Basis? | SEP Topic Reviewing This Load | Does Load Magnitude Correspond To Present Criteria? | Does Deviation Exist In Load Basis? | Code Impact Scale Ranking | Comments |
|---|---|---|---|---|---|---|---|---|
| Gravity | D<br>L | | | | | | | |
| Pressure | T<br>H<br>$P_a$ | | | III-3.A<br>III-5.B | *<br>* | *<br>* | | |
| Thermal | $T_o$<br>$T_a$ | | | III-5.B | * | * | | |
| Pipe & Mech. | $R_o$<br>$R_a$ | | | | | | | |
| Environmental | E'<br>E<br>W'<br>W | | | III-6<br>III-6<br>III-2, III-4.A<br>III-2, III-4.A | *<br>*<br>*<br>* | *<br>*<br>*<br>* | | |
| Impulse | $Y_r$<br>$Y_j$<br>$Y_m$ | | | III-5.B<br>III-5.B<br>III-5.B | *<br>*<br>* | *<br>*<br>* | | |

Ref.; SRP(1981) Section 3.8.4

Comments

* To be determined per results of SEP topics. Scale ranking shown for SEP topic items are independent judgments, based on information in the FSAR or other original design documents.

STRUCTURE:

FUEL STORAGE BUILDING

COMPARISON OF DESIGN BASIS LOADS

PLANT: LA CROSSE

| | Current Design Basis Loads | Is Load Applicable To This Structure? | Is Load Included In Plant Design Basis? | SEP Topic Reviewing This Load | Does Load Magnitude Correspond To Present Criteria? | Does Deviation Exist In Load Basis? | Code Impact Scale Ranking | Comments |
|---|---|---|---|---|---|---|---|---|
| Gravity | D<br>$L_r$ | | | | | | | |
| Pressure | F<br>H<br>$P_a$ | | | III-3.A<br>III-5.3 | *<br>* | *<br>* | | |
| Thermal | $T_o$<br>$T_a$ | | | III-5.3 | * | * | | |
| Pipe & Mech. | $R_o$<br>$R_a$ | | | | | | | |
| Environmental | E'<br>E<br>W'<br>W | | | III-6<br>III-6<br>III-2, III-4.A<br>III-2, III-4.A | *<br>*<br>*<br>* | *<br>*<br>*<br>* | | |
| Impulse | $Y_r$<br>$Y_j$<br>$Y_a$ | | | III-5.3<br>III-5.3<br>III-5.3 | *<br>*<br>* | *<br>*<br>* | | |

Ref.: SRP(1981) Section 3.8.4

Comments

* To be determined per results of SEP topics. Scale ranking shown for SEP topic items are independent judgments, based on information in the FSAR or other original design documents.

COMPARISON OF LOADING COMBINATION CRITERIA

CONCRETE STRUCTURES

PLANT: LA CROSSE

STRUCTURE:

SPENT FUEL POOL

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Seale Ranking |
|---|---|---|---|---|---|---|---|
| 1 | 1.4D + 1.7L | | | | | | |
| 2 | 1.4D + 1.7L | | | | 1.9E | | |
| 3 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | .75 x 1.7 $R_{o1}$ | | | |
| 4 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | .75 x 1.7 $R_{o1}$ | .75 x 1.9E | | |
| 5 | D + L | $T_o$ | | $R_o$ | E' | | |
| 6 | D + L | $T_o$ | | $R_o$ | $Y_r$ | | |
| 7 | D + L | $T_A$ | 1.5 $P_a$ | $R_a$ | | | |
| 8 | D + L | $T_A$ | 1.25 $P_a$ | $R_a$ | 1.25E | $Y_r + Y_j + Y_a$ | |
| 9 | D + L | $T_A$ | $P_a$ | $R_a$ | E' | $Y_r + Y_j + Y_a$ | $A_x$ |

Ref.: SRP (1981) SEC 3.8.3 Concrete and Steel Internal Structures of Containment

Notes

1. Ultimate strength method required by ACI-349 ~~(1977)~~. (1976)
2. Method used in design { ~~working stress~~ / ultimate strength
3. Loads deemed inapplicable or negligible struck from loading combinations.
4. Encircled loads are those actually considered in the design. When load factors different from those currently required were used, the factor used is also encircled.
5. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 10, 11 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

CONCRETE STRUCTURES

PLANT: LA CROSSE

STRUCTURE: CONTROL ROOM AND ELECTRICAL EQUIPMENT ROOM

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Scale Limiting |
|---|---|---|---|---|---|---|---|
| 1 | 1.4D + 1.7L | | | | | | |
| 2 | 1.4D + 1.7L | | | | 1.9E | | |
| 3 | 1.4D + 1.7L | | | | 1.7W | | |
| 4 | .75 (1.4D + 1.7L) | ~~.75 × 1.7 $T_o$~~ | | ~~.75 × 1.7 $R_o$~~ | | | |
| 5 | .75 (1.4D + 1.7L) | ~~.75 × 1.7 $T_o$~~ | | ~~.75 × 1.7 $R_o$~~ | .75 × 1.9E | | |
| 6 | .75 (1.4D + 1.7L) | ~~.75 × 1.7 $T_o$~~ | | ~~.75 × 1.7 $R_o$~~ | .75 × 1.7W | | |
| 7 | 1.2D | | | | 1.9E | | |
| 8 | 1.2D | | | | 1.7W | | |
| 9 | D + L | ~~$T_o$~~ | | ~~$R_o$~~ | E' | | $A_s$ |
| 10 | D + L | ~~$T_o$~~ | | ~~$R_o$~~ | $W_c$ | | $A_s$ |
| 11 | D + L | ~~$T_a$~~ | ~~1.5 $P_a$~~ | ~~$R_a$~~ | | | |
| 12 | D + L | ~~$T_a$~~ | ~~1.25 $P_a$~~ | ~~$R_a$~~ | 1.25E | ~~$Y_p - Y_r - Y_s$~~ | |
| 13 | D + L | ~~$T_a$~~ | ~~$P_a$~~ | ~~$R_a$~~ | E' | ~~$Y_p - Y_r - Y_s$~~ | |

Ref.: SRP (1981) Sect. 3.8.4 Other Category I structures (concrete)

Notes

1. Ultimate strength method required by ACI-349 ~~(1977)~~. (1976)
2. Methods used in design { ~~working stress~~ / ultimate strength
3. Loads deemed inapplicable or negligible struck from loading combinations.
4. Encircled loads are those actually considered in the design. When load factors different from those currently required were used, the factor used is also encircled.
5. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 9 & 10 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

STEEL STRUCTURES (Elastic Analysis)

PLANT: LA CROSSE

STRUCTURE: CONTROL ROOM AND ELECTRICAL EQUIPMENT ROOM

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Seals |
|---|---|---|---|---|---|---|---|
| 1 | D + L | | | | | | |
| 2 | D + L | | | | E | | |
| 3 | D + L | | | | W | | |
| 4 | D + L | $T_o$ | | $R_o$ | | | |
| 5 | D + L | $T_o$ | | $R_o$ | E | | |
| 6 | D + L | $T_o$ | | $R_o$ | W | | |
| 7 | D + L | $T_o$ | | $R_o$ | E' | | $A_x$ |
| 8 | D + L | $T_o$ | | $R_o$ | $A_t$ | | $A_x$ |
| 9 | D + L | $T_o$ | $P_a$ | $R_a$ | | | |
| 10 | D + L | $T_o$ | $P_a$ | $R_a$ | E | Y, Y, Y | |
| 11 | D + L | $T_o$ | $P_a$ | $R_a$ | E' | Y, Y, Y | |

Ref: SRP (1981) SECT. 3.8.4 Other Category I structures (steel)

Notes

1. Encircled loads are those actually considered in the design. When load factors are different from those currently required were used, the factor used is also encircled.

2. Loads deemed inapplicable or negligible struck from loading combinations.

3. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 7 & 8 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

CONCRETE STRUCTURES

PLANT: LA CROSSE

STRUCTURE: NEW DIESEL GENERATOR BUILDING

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Seale Ranking |
|---|---|---|---|---|---|---|---|
| 1 | 1.4D + 1.7L | | | | | | |
| 2 | 1.4D + 1.7L | | | | 1.9E | | |
| 3 | 1.4D + 1.7L | | | | 1.7W | | |
| 4 | .75 (1.4D + 1.7L) | ~~1.7 x 1.1 $T_o$~~ | | ~~1.7 x 1.1 $R_a$~~ | | | 2 |
| 5 | .75 (1.4D + 1.7L) | ~~1.7 x 1.1 $T_o$~~ | | ~~1.7 x 1.1 $R_a$~~ | (.75 x 1.9E) | | 2.5 |
| 6 | .75 (1.4D + 1.7L) | ~~1.7 x 1.1 $T_o$~~ | | ~~1.7 x 1.1 $R_a$~~ | (.75 x 1.7W) | | 2.5 |
| 7 | 1.2D | | | | 1.9E | | |
| 8 | 1.2D | | | | 1.7W | | |
| 9 | (D + L) | $T_o$ | | $R_a$ | (E') | | $A_1$ |
| 10 | D + L | $T_o$ | | $R_a$ | $W_c$ | | $A_2$ |
| 11 | D + L | $T_o$ | ~~1.7 $P_a$~~ | $R_a$ | | | |
| 12 | D + L | $T_o$ | ~~1.7 $P_a$~~ | $R_a$ | 1.25E | $T_o + R_a + P_a$ | |
| 13 | D + L | $T_o$ | $P_a$ | $R_a$ | E' | $T_o + R_a + P_a$ | |

Ref.: SRP (1981) Sect. 3.8.4 Other Category I structures (concrete)

Notes

1. Ultimate strength method required by ACI-349 (1977).
2. Methods used in design { ~~working stress~~ / ultimate strength ✓
3. Loads deemed inapplicable or negligible struck from loading combinations.
4. Encircled loads are those actually considered in the design. When load factors different from those currently required were used, the factor used is also encircled.
5. These load cases were also investigated with a live load absent and a dead load reduced by 10%.
6. Note that the 0.75 coefficient was not applied to the dead and live load but was applied to all other terms.
7. Load combinations indicated by dashed lines are taken from:
   Seismic Review Table, Department of Nuclear Energy
   Brookhaven National Lab., NUREG/CR-1429 dated May 1980.
8. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 9 & 10 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

STEEL STRUCTURES (Elastic Analysis)

PLANT: LA CROSSE

| STRUCTURE: NEW DIESEL GENERATOR BUILDING |
|---|

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Seismic |
|---|---|---|---|---|---|---|---|
| 1 | D + L | | | | | | |
| 2 | D + L | | | | E | | |
| 3 | D + L | | | | | | |
| 4 | (D) + (L) | $T_a$ | | $R_a$ | | | |
| 5 | (D) + (L) | $T_o$ | | $R_o$ | (E) | | |
| 6 | D + L | $T_a$ | | $R_a$ | | | |
| 7 | (D) + (L) | $T_o$ | | $R_o$ | (E') | | $A_x$ |
| 8 | D + L | $T_a$ | | $R_a$ | E' | | $A_x$ |
| 9 | D + L | $T_a$ | $P_a$ | $R_a$ | | | |
| 10 | D + L | $T_a$ | $P_a$ | $R_a$ | E | $Y_r + Y_j + Y_m$ | |
| 11 | D + L | $T_a$ | $P_a$ | $R_a$ | E' | $Y_r + Y_j + Y_m$ | |

Ref: SRP (1981) SECT. 3.8.4 Other Category I structures (steel)

Notes

1. Encircled loads are those actually considered in the design. When load factors are different from those currently required were used, the factor used is also encircled.

2. Loads deemed inapplicable or negligible struck from loading combinations.

3. Load combinations indicated by dashed lines are taken from:
   Seismic Review Table, Department of Nuclear Energy
   Brookhaven National Lab., NUREG/CR-1429 dated May 1980.

4. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 7 & 8 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

CONCRETE STRUCTURES

PLANT: LA CROSSE

STRUCTURE: CRIB HOUSE AND DISCHARGE STRUCTURE

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Seismic Ranking |
|---|---|---|---|---|---|---|---|
| 1 | 1.4D + 1.7L | | | | | | |
| 2 | 1.4D + 1.7L | | | | 1.7E | | |
| 3 | 1.4D + 1.7L | | | | 1.7W | | |
| 4 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | .75 x 1.7 $R_o$ | | | |
| 5 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | .75 x 1.7 $R_o$ | .75 x 1.7E | | |
| 6 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | .75 x 1.7 $R_o$ | .75 x 1.7W | | |
| 7 | 1.2D | | | | 1.2E | | |
| 8 | 1.2D | | | | 1.2W | | |
| 9 | D + L | $T_o$ | | $R_o$ | E' | | $A_x$ |
| 10 | D + L | $T_o$ | | $R_o$ | W' | | $A_x$ |
| 11 | D + L | $T_1$ | 1.5 $P_a$ | $R_a$ | | | |
| 12 | D + L | $T_a$ | 1.25 $P_a$ | $R_a$ | 1.25E | $Y_r + Y_1 + Y_2$ | |
| 13 | D + L | $T_a$ | $P_a$ | $R_a$ | E' | $Y_r + Y_1 + Y_2$ | |

Ref.: SRP (1981) Sect. 3.8.4 Other Category I structures (concrete)

Notes

1. Ultimate strength method required by ACI-349 (1977).
2. Methods used in design { working stress / ultimate strength }
3. Loads deemed inapplicable or negligible struck from loading combinations.
4. Encircled loads are those actually considered in the design. When load factors different from those currently required were used, the factor used is also encircled.
5. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 9 & 10 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

STEEL STRUCTURES (Elastic Analysis)

PLANT: LA CROSSE

STRUCTURE: CRIB HOUSE AND DISCHARGE HOUSE

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Scale |
|---|---|---|---|---|---|---|---|
| 1 | D + L | | | | | | |
| 2 | D + L | | | | E | | |
| 3 | D + L | | | | E' | | |
| 4 | D + L | $T_o$ | | $R_o$ | | | |
| 5 | D + L | $T_o$ | | $R_o$ | E | | |
| 6 | D + L | $T_o$ | | $R_o$ | E' | | |
| 7 | D + L | $T_o$ | | $R_o$ | E' | | $A_x$ |
| 8 | D + L | $T_o$ | | $R_o$ | E' | | $A_x$ |
| 9 | D + L | $T_a$ | $P_a$ | $R_a$ | | | |
| 10 | D + L | $T_a$ | $P_a$ | $R_a$ | E | $Y_j + Y_r + Y_m$ | |
| 11 | D + L | $T_a$ | $P_a$ | $R_a$ | E' | $Y_j + Y_r + Y_m$ | |

Ref: SEP (1981) SECT. 3.8.4 Other Category I structures (steel)

Notes

1. Encircled loads are those actually considered in the design. When load factors are different from those currently required were used, the factor used is also encircled.

2. Loads deemed inapplicable or negligible struck from loading combinations.

3. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 7 & 8 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

CONCRETE STRUCTURES

PLANT: LA CROSSE

STRUCTURE: TURBINE BUILDING (PORTION HOUSING CLASS I EQUIP.)

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Scale Ranking |
|---|---|---|---|---|---|---|---|
| 1 | 1.4D + 1.7L | | | | | | |
| 2 | 1.4D + 1.7L | | | | 1.9E | | |
| 3 | 1.4D + 1.7L | | | | 1.7W | | |
| 4 | .75 (1.4D + 1.7L) | ~~.75 x 1.7 $T_o$~~ | | (.75 x 1.7 $R_a$) | | | 6 |
| 5 | .75 (1.4D + 1.7L) | ~~.75 x 1.7 $T_o$~~ | | (.75 x 1.7 $R_a$) | (.75 x 1.9E) | | 5,6 |
| 6 | .75 (1.4D + 1.7L) | ~~.75 x 1.7 $T_o$~~ | | (.75 x 1.7 $R_a$) | (.75 x 1.7W) | | 5,6 |
| 7 | 1.2D | | | | 1.9E | | |
| 8 | 1.2D | | | | 1.7W | | |
| 9 | (D) + (L) | $T_o$ | | ~~$R_a$~~ | (E) | | $A_x$ |
| 10 | D + L | ~~$T_o$~~ | | ~~$R_a$~~ | $W_c$ | | $A_x$ |
| 11 | D + L | ~~$T_o$~~ | ~~1.5 $P_a$~~ | ~~$R_a$~~ | | | |
| 12 | D + L | ~~$T_o$~~ | ~~1.25 $P_a$~~ | ~~$R_a$~~ | 1.25E | $Y_r + Y_j + Y_m$ | |
| 13 | D + L | ~~$T_o$~~ | ~~$P_a$~~ | ~~$R_a$~~ | E' | $Y_r + Y_j + Y_m$ | $A_x$ |

Ref.: SRP (1981) Sect. 3.8.4 Other Category I structures (concrete)

Notes

1. Ultimate strength method required by ACI-349 ~~(1977).~~ (1976)
2. Methods used in design { ~~working stress~~ / ultimate strength ✓
3. Loads deemed inapplicable or negligible struck from loading combinations.
4. Encircled loads are those actually considered in the design. When load factors different from those currently required were used, the factor used is also encircled.
5. These load cases were also investigated with a live load absent and a dead load reduced by 10%.
6. Note that the 0.75 coefficient was not applied to the dead and live load, but was applied to all other terms.
7. Load combinations indicated by dashed lines are taken from: Seismic Review Table, Department of Nuclear Energy Brookhaven National Lab., NUREG/CR-1429 dated May 1980.
8. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 10, 13 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

STEEL STRUCTURES (Elastic Analysis)

PLANT: LA CROSSE

STRUCTURE: TURBINE BUILDING (PORTION HOUSING CLASS 1 EQUIPMENT)

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Seismic |
|---|---|---|---|---|---|---|---|
| 1 | D + L | | | | | | |
| 2 | D + L | | | | E | | |
| 3 | D + L | | | | W | | |
| 4 | (D) + (L) | T | | $R_a$ | | | |
| 5 | (D) + (L) | T | | $R_a$ | (E) | | |
| | D + L | T | | $R_o$ | W | | |
| 7 | (D) + (L) | T | | $R_a$ | (E') | | $A_x$ |
| 8 | D + L | T | | $R_o$ | E' | | $A_x$ |
| 9 | D + L | T | P | $R_o$ | | | |
| 10 | D + L | T | P | $R_o$ | E' | $Y_1$ $Y_2$ $Y_3$ | |
| 11 | D + L | T | P | $R_o$ | E' | $Y_1$ $Y_2$ $Y_3$ | $A_x$ |

Ref: SEP (1981) SECT. 3.8.4 Other Category I structures (steel)

Notes

1. Encircled loads are those actually considered in the design. When load factors are different from those currently required were used, the factor used is also encircled.

2. Loads deemed inapplicable or negligible struck from loading combinations.

3. Load combinations indicated by dashed lines are taken from:
   Seismic Review Table, Department of Nuclear Energy
   Brookhaven National Lab., NUREG/CR-1429 dated May 1980.

4. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 8, 11 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

CONCRETE STRUCTURES

PLANT: LA CROSSE

STRUCTURE: FUEL STORAGE BUILDING

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Seals Leaking |
|---|---|---|---|---|---|---|---|
| 1 | 1.4D + 1.7L | | | | | | |
| 2 | 1.4D + 1.7L | | | | 1.9E | | |
| 3 | 1.4D + 1.7L | | | | 1.7W | | |
| 4 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | .75 x 1.7 $R_o$ | | | |
| 5 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | .75 x 1.7 $R_o$ | .75 x 1.9E | | |
| 6 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | .75 x 1.7 $R_o$ | .75 x 1.7W | | |
| 7 | 1.2D | | | | 1.9E | | |
| 8 | 1.2D | | | | 1.7W | | |
| 9 | D + L | $T_o$ | | $R_o$ | E' | | $A_x$ |
| 10 | D + L | $T_o$ | | $R_o$ | W' | | $A_x$ |
| 11 | D + L | $T_a$ | 1.5 $P_a$ | $R_a$ | | | |
| 12 | D + L | $T_a$ | 1.25 $P_a$ | $R_a$ | 1.25E | $Y_r + Y_j + Y_m$ | |
| 13 | D + L | $T_a$ | $P_a$ | $R_a$ | E' | $Y_r + Y_j + Y_m$ | |

Ref.: SRP (1981) Sect. 3.8.4 Other Category I structures (concrete)

Notes:

1. Ultimate strength method required by ACI-349 (1977).
2. Methods used in design { working stress / ultimate strength }
3. Loads deemed inapplicable or negligible struck from loading combinations.
4. Encircled loads are those actually considered in the design. When load factors different from those currently required were used, the factor used is also encircled.
5. For purposes of the SEP Review, demonstration that structural integrity is maintained for load cases 9, 10 (per current criteria) may be considered as providing reasonable assurance that this structure meets the intent of current design criteria.

COMPARISON OF LOADING COMBINATION CRITERIA

CONCRETE STRUCTURES

PLANT: LA CROSSE

STRUCTURE: STACKS

| Combined Loading Cases | Gravity Dead, Live | Thermal | Pressure | Mechanical | Natural Phenomena | Impulsive Loading | Scale Ranking |
|---|---|---|---|---|---|---|---|
| 1 | 1.4D + 1.7L | | | | | | |
| 2 | 1.4D + 1.7L | | | | 1.9E | | |
| 3 | 1.4D + 1.7L | | | | 1.7W | | |
| 4 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | ~~.75 x 1.7 $R_1$~~ | | | |
| 5 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | ~~.75 x 1.7 $R_1$~~ | .75 x 1.9E | | |
| 6 | .75 (1.4D + 1.7L) | .75 x 1.7 $T_o$ | | ~~.75 x 1.7 $R_1$~~ | .75 x 1.7W | | |
| 7 | 1.2D | | | | 1.9E | | |
| 8 | 1.2D | | | | 1.7W | | |
| 9 | D + L | $T_o$ | | $R_A$ | E' | | $A_x$ |
| 10 | D + L | $T_o$ | | $R_o$ | $W_t$ | | $A_x$ |
| 11 | D + L | $T_A$ | ~~1.5 $P_A$~~ | $R_A$ | | | |
| 12 | D + L | $T_A$ | ~~1.25 $P_A$~~ | $R_A$ | 1.25E | $Y_A + Y_B + Y_C$ | |
| 13 | D + L | $T_A$ | $P_A$ | $R_A$ | E' | $Y_A + Y_B + Y_C$ | |

Ref.: SRP (1981) Sect. 3.8.4 Other Category I structures (concrete)

Notes

1. Ultimate strength method required by ACI-349 ~~(1977)~~. (1976)
2. Methods used in design { ~~working stress~~ / ultimate strength ✓
3. Loads deemed inapplicable or negligible struck from loading combinations.
4. Encircled loads are those actually considered in the design. When load factors different from those currently required were used, the factor used is also encircled.
5. These load cases were also investigated with a live load absent and a dead load reduced by 10%.
6. Note that the 0.75 coefficient was not applied to the dead and live load, but was applied to all other terms.
7. Load combinations indicated by dashed lines are taken from:

   Seismic Review Table, Dept. of Nuclear Energy
   Brookhaven National Lab., NUREG/CR-1429 dated May 1980
8. The principal loads on the stack are D, E, E', W and $W_t$. Reanalysis of the stack for these loadings is being carried out within the SEP Program. Therefore, no action need be taken by licensee in response to this item.

SUMMARY

NUMBER OF CODE CHANGE IMPACTS FOR
LACROSSE CATEGORY I STRUCTURES

1961

| SCALE RANKING \ APPLICABLE CODE COMPARISON | | ACI 318-56 VS. ACI 349-76 | AISC ~~1953~~ VS. AISC 1980 | ASME B & PV SECT. VIII 1962 VS. SECT. III SUBSECT NE, CLASS MC.1980 | ACI 318-71 VS. ACI 349-76 | AISC 1971 VS. AISC 1980 |
|---|---|---|---|---|---|---|
| Total Changes Found | | 113 | 50 | 22 | 70 | 18 |
| Do Not Require Further Investigation | A or $A_x$ Not Applicable to La Crosse | 3 + 4 * | 13 | 1 + 3* | 1 + 4* | 8 |
| | B | 84 | 13 | 7 | 59 | 5 |
| | C | 12 | 8 | 3 | 3 | 1 |
| To Be Further Investigated | A | 10 | 16 | 8 | 3 | 4 |
| | $A_x$ | 0 | 0 | 0 | 0 | 0 |

SCALE RATINGS:

Scale A Change - The new criteria have the potential to substantially impair margins of safety as perceived under the former criteria.

Scale $A_x$ Change - The impact of the code change on margins of safety is not immediately apparent. Scale $A_x$ code changes require analytical studies of model structures to assess the potential magnitude of their effect upon margins of safety.

Scale B Change - The new criteria operate to impair margins of safety but not enough to cause engineering concern about the adequacy of any structural element.

Scale C Change - The new criteria will give rise to larger margins of safety than were exhibited under the former criteria.

*These changes are related to loads and load combinations. Loading criteria are addressed in Section 10. Consequently, to avoid duplication, such items are not counted in the above tabulation of code changes to be addressed under Section 11.