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ComEd

April 4, 1996

JSPLTR 96-0050

U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

ATTN: Document Control Desk

Subject: Dresden Station Structural Steel Issue Concerning the Piping and Heat Exchanger in the Low Pressure Coolant Injection (LPCI) System, Dockets 50-237 and 50-249

Reference: J. Perry letter to USNRC, dated March 4, 1996 on Dresden Station Structural Steel Issue Concerning the Piping and Heat Exchanger in the Low Pressure Coolant Injection System

The purpose of this letter is to: 1) update the status of the Unit 2 and Unit 3 Low Pressure Coolant Injection (LPCI) corner room structural steel, 2) provide additional detail and clarification of the Unit 2 and Unit 3 corner room steel comparisons, and 3) update the interaction coefficients.

For Unit 2, Dresden Station will install connection reinforcements and supplemental bracing to restore the structural steel members and connections to within UFSAR stress levels prior to start up from the current refuel outage (D2R14). The analysis and design of the reinforcements were independently reviewed by a joint team of a structural engineering consultants from Bechtel Power Corporation, San Francisco Office, and from Altran, Inc., Boston Office.

For Unit 3, the operability determination has been updated and is available at the site for review. It corroborates the earlier determination that the structural steel is operable. Additionally, the structural situation is not changing for the LPCI piping and supports. The operability determination for Unit 3 will remain valid through the remainder of the operating cycle (September, 1996). The Unit 3 installation will be performed prior to start up from the next refuel outage (D3R14).

A revised summary of the technical evaluation and the corresponding operability acceptance criteria, which includes additional details and clarification of the comparisons of the Unit 2 and Unit 3 corner room steel, and an update of the interaction coefficients is attached. To facilitate the review process, this attachment supersedes the attachment to the referenced letter.

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Should you have any questions concerning this issue please contact either me or Mr. Frank Spangenberg of my staff at (815) 942-2920 ext. 3800.

Sincerely,

FOR
J. S. Perry
Site Vice President
Dresden Nuclear Station

Attachment

cc: H. Miller, Regional Administrator, Region III
J. Stang, Project Manager, NRR
P. Hiland, Branch Chief, Region III
Clark Vanderniet, Senior Resident Inspector Dresden
D. Hills, LEAP, Region III
Illinois Department of Nuclear Safety

ATTACHMENT

SUMMARY OF TECHNICAL EVALUATION AND OPERABILITY ACCEPTANCE CRITERIA

Introduction:

The four LPCI Heat Exchangers (two per unit) are individually supported, in a vertical orientation in the south Corner Rooms of the Reactor Buildings. There is one heat exchanger for each Corner Room. Each of the four heat exchangers has four main piping subsystems connected to it, two from the service water and two from the LPCI piping. The heat exchangers are approximately 5 feet in diameter and 30 feet long and are attached to structural steel at the upper and lower third points. They are bolted to structural steel at EL. 502'-10 3/4", and are braced at EL. 492'-7". The structural steel is supported from the major reinforced concrete walls of the Reactor Building. Figures 1 and 2 show the steel framing layout. For reference purposes, the significant structural members used in the computer models for the operability evaluation have been indicated by a member number. The computer models consist of the significant structural members, the heat exchanger, and adjacent portions of major piping.

Similarity of Four Corner Rooms

After comparing the four corner rooms, it has been determined that the support steel for the Dresden Unit 2 southwest (D2SW) corner room is the most highly stressed and that our operability evaluation of the D2SW room steel will envelope any operability determinations that would be made for the Unit 2 southeast (D2SE) and both Unit 3 corners rooms (D3SE, D3SW). This determination is based on the following four points:

A. The four corner rooms are very similar in structural steel layout. Each supports a LPCI heat exchanger. Four main piping subsystems connect to each heat exchanger, two LPCI (supply and return) and two service water (supply and return). The heat exchangers are all the same size and weight and comprise the primary load to the structural steel.

B. The D2SW corner room steel has the largest number of pipe supports attached to the structural steel compared to the other three corner rooms as summarized below:

D2SW	24 pipe supports
D2SE	12 pipe supports
D3SW	16 pipe supports
D3SE	13 pipe supports

Therefore, the D2SW steel framing was selected as having a heavier loaded from the piping.

C. Three main structural steel beams support the heat exchangers in each corner room. The three main beams in the Unit 2 corner rooms have less capacity compared to the corresponding beams in the Unit 3 corner rooms:

Corner Room	Beam Sizes
D2SW, D2SE	21WF55, 21WF55, 24WF68
D3SW, D3SE	21WF68, 21WF68, 24WF84

The properties of the beams are listed below:

D2SW, D2SE	D3SW, D3SE
21WF55	21WF68
$A = 16.2\ in^2$	$A = 20\ in^2$
$Sx = 110\ in^3$	$Sx = 140\ in^3$
$Sy = 11.8\ in^3$	$Sy = 15.7\ in^3$
24WF68	24WF84
$A = 20\ in^2$	$A = 24.7\ in^2$
$Sx = 153\ in^3$	$Sx = 197\ in^3$
$Sy = 15.6\ in^3$	$Sy = 21\ in^3$

D. The structural steel framing beams which support the LPCI heat exchangers in the Unit 2 and Unit 3 corner rooms do not all have a common top-of-steel elevation. The 21WF55 beams in Unit 2, 21WF68 beams in Unit 3, and the associated members that support grating are set at elevation 502'-10¾". The 24WF68 beams (Unit 2) and 24WF84 beams (Unit 3) spanning east-west at 19'-3" north of Column Row N are set at top-of-steel elevation 505'-6".

The embedded plates to which the structural steel attaches were installed at different elevations from Unit 2 to Unit 3. In Unit 2, the 2'-3" high embedded plates are set at top-of-plate elevation 504'-9" (per drawing B-282, Detail A). The embedded plates in Unit 3 are set at top-of-plate elevation 503'-5" (per drawing B-712, Detail A). For the structural steel set at top-of-steel elevation 502'-10¾", the top-of-plate elevations result in connections which are eccentric with respect to the embedded plate in Unit 2. For Unit 3, the corresponding connections frame directly into the embedded plate.

Based on these top-of-steel and top-of-plate elevations, the connection eccentricity (from centerline of embedded plate) for the 24WF68 beams in Unit 2 is approximately 10½". The connection eccentricity (from centerline of the embedded plate) for the Unit 3 24WF84 beams is 26½". In Unit 3, however, the 24WF end connections have different details or expansion anchors located such that the bending effect present in the Unit 2 24WF connection is significantly reduced or eliminated. (See drawing B-712, Sections D-D and D1-D1 and Detail J.) For this reason the connections for the 24WF beams in Unit 3 will be less critical than the corresponding connections in Unit 2.

In the Unit 2, the southwest corner room steel will be the most highly stressed under SSE because it has twice as many pipe supports attached to it in comparison to the southeast corner room. Based on the above comparisons, the Unit 2 corner room steel will be more highly stressed under an SSE event than the Unit 3 corner room steel.

A computer analysis was performed on the piping and heat exchanger to more accurately determine the loads on the structural steel. The resulting loads were then applied to a model containing the structural steel framing. The "worst case" beams and connections which were reviewed in detail are:

Members: 1,31,33

Connections: 1R, 4L, 11R, 11L, 33L, and 33R

Note: "L" and "R" on the connection designation refers to the right and left end connections of the subject beam/member. See Figures 1 and 2 for the framing layout.

Original Design Basis

The original design basis for the structural steel is described in Section 3.8.4 of the Dresden UFSAR. Loading combinations are further described in Section 3.8.4.1.4, and summarized in Table 3.8-11. It should be noted that under SSE load combinations, the allowable stresses are limited to those that assure "safe shutdown of the plant can be achieved."

Operability Acceptance Criteria Summary

This Operability Criteria uses guidance from the Dresden UFSAR, NUREG-0800, and Regulatory Guide 1.61. The specific criteria and guidelines used are defined below.

The operability analysis has been performed for the SSE loading combinations using the methods and allowables shown below

Key: Fy: Yield Strength of the component
Fu: Ultimate Tensile Strength of the component
Fcr: Critical buckling stress of a member.

Note: Fy includes a 1.1 adjustment factor based on typical material mill test reports, when appropriate

I. Allowable Stresses (Consistent with NUREG-0800, UFSAR 3.8.4)

I.1 Structural Steel Rolled Members:

Bending: 1.6 * AISC allowables, using plastic section modulus, with stress not exceeding 0.95 Fy. For this to be used, the section shall satisfy the compact section criteria and the lateral bracing requirements per the AISC Code.

Axial Load: 1.6 * AISC allowables, not to exceed 0.95 Fy

Shear: Shear stresses shall not exceed $0.95 * Fy/(3)^{1/2}$

I.2 Plate Material:

Bending about weak axis:	0.95 * Fy, based on the plastic section modulus
Bending about the major axis:	0.95 * Fy, based on the plastic section modulus, or
	0.95 * Fcr, based on the elastic section modulus, whichever governs
Shear:	0.95 * $Fy/(3)^{1/2}$

I.3 Bolts:

1.6 * AISC Allowables

I.4 Welds:

1.6 * AISC allowables

Base metal shear in welds other than fillet welds shall not exceed
0.95 * $Fy/(3)^{1/2}$ of the base metal

II. Damping

The damping values contained in Regulatory Guide 1.61 are used for operability determinations. Use of the Regulatory Guide damping for operability evaluations is consistent with the SER on the "Dresden/Quad Cities Piping System Operability Criteria" dated September 27, 1991 which allows Regulatory Guide damping for piping operability evaluations.

Summary of Operability Results

Comparing the acceptance criteria to the analysis results for the "worst case" beams/connections resulted in the following Interaction Coefficients (IC's) (actual/acceptable):

Beam	IC
1	0.99
31	0.28
33	0.66

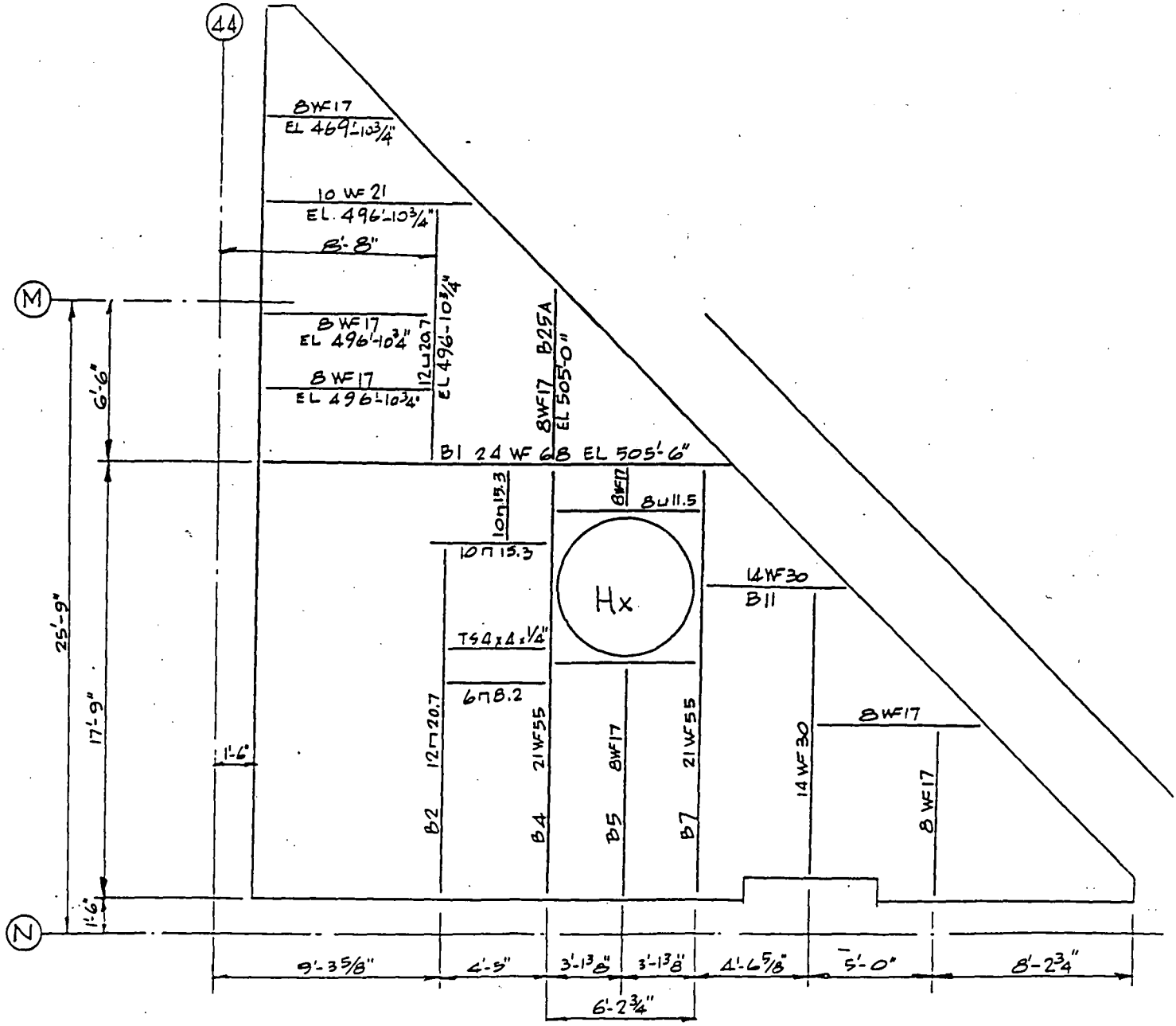
Connections	IC
1R	0.99
4L	0.93
11R	0.91
11L	0.72
33L	0.81
33R	0.97

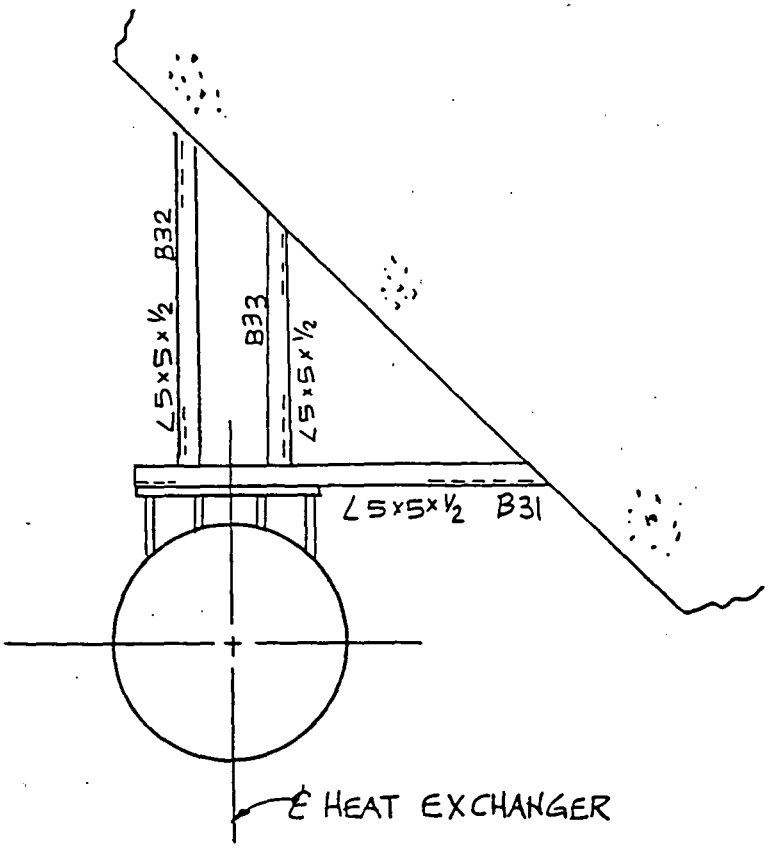
Note: IC's less than 1.0 indicate acceptable values.

By virtue of the IC values reported above being less than or equal to 1.0, the technical justification and referenced calculations demonstrate that the corner room structural steel is operable.

DRESDEN STATION UNIT-2
SOUTHWEST CORNER ROOM

FIGURE 1





DRESDEN STATION UNIT-2
LPCI HEAT EXCHANGER
LOWER BRACING

FIGURE 2

bcc: File/Numerical
DCD - Licensing
E. Connell
S. Eldridge
D. Farrar
R. Gavankar
R. Janowiak
I. Johnson
K. Koesser
R. Kundelkar
T. Loch
J. Minichiello
C. Petropoulos (S&L)
B. Rybak
K. Schechter
R. Scoville
B. Slimp
F. Spangenberg
Reg. Assurance, Seismic/Structural Issues
Reg. Assurance, CHRON