Stevenson & Associates

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February 13, 2001

00Q4186-LSC-005

Mr. Paul Schoepf
American Electric Power
500 Circle Drive
Buchanan, MI 49107

Subject: Contract C-10221 Release 00-06
Missile Shield Analysis - Effect of Reduced Rebar Strength

Dear Mr. Schoepf:

Per your request, we have calculated the missile shield margin using a load combination of D + P + E', f_c' = 4,424 ksi, and two different values of f_y: 50.6 ksi and 54.6 ksi. The concrete strength (f_c') and rebar strength (f_y) are based on the information contained in DIT No. B-01954-00.

- The ultimate moment capacity of the missile shield is 10,525 k-ft using f_y = 50.6 ksi, and 11,262 k-ft using f_y = 54.6 ksi. The calculations are based on the following criteria:
  - Seven (7) #8 reinforcing bars and fifty-two (52) #11 bars on the tension side and thirty-four (34) #11 bars on the compression side are included as structural reinforcements.
  - Due to absence of specification, the ACI minimum clear spacing requirement of 1" between rebar layers has been used (see ACI 318-63 Section 804).
  - Credit has been taken for the edge framing steel acting as longitudinal reinforcement. The edge steel is anchored with a 1/2" Nelson stud every 12" - this is sufficient to meet the requirements of AISC 7th Edition Section 1.11 for composite action (note that f_y = 36 ksi is used for the edge steel).

- For the load combination of D + P + E', with P = 79.2 psi, the moment demand on the missile shield is 10,429 k-ft. In this part of the computation, the seismic component (the acceleration value) is calculated using the response spectrum method instead of scaling the value from existing calculations of floor response spectra (Calculation No. SD-991008-001). The use of response spectrum analysis has resulted in a vertical acceleration (2/3 of the calculated maximum horizontal) of 0.18g versus a value of 0.35g that would have been obtained if the floor response spectra were used.

- The margin (capacity/demand) is 10,525 / 10,429 = 1.009 using f_y = 50.6 ksi, and 11262 / 10429 = 1.080 using f_y = 54.6 ksi.

Please contact the undersigned with any questions or comments

Sincerely,

Stephen Anagnostis
Project Manager

John J. O'Sullivan
Technical Reviewer

B-6

AEP DESIGN INFORMATION TRANSMITTAL (DIT)

DIT Form, Part I

☒ SAFETY-RELATED ☐ NON-SAFETY-RELATED	Originating Organization ☒ AEP ☐ Other (specify)	DIT No. B-01954-00
D.C. Cook Unit ☐1 ☐2 ☒BOTH System Designation: CNTMT		Page 1 of 2 To Steve Anagnostis - S&A

Subject: As-Built Reinforcing Bar and Concrete Strength for Analysis of Unit 1 and 2 Containment Missile Shields

Paul G. Schoepf Preparer	Paul G. Schoepf Preparer's Signature	Project Manager Position	2/13/01 Date
Paul W. Leonard Reviewer	Reviewer's Signature	Engineer Position	2/13/01 Date
Ronald J. Smith Approver	Approver's Signature	Manager Position	2-13-01 Date

Status of Information: ☒ Approved for Use ☐ Unverified

Method and Schedule of Verification for Unverified DIT:

_____ CR #

Holds Associated with Unverified DITs: None

Description of Information: As-Built concrete strength and reinforcing bar strength information is provided in this DIT. The as-built concrete strength to be used for analysis of the missile shields is 4,424 psi. The reinforcing bar yield strengths to be used are 50,600 psi minimum and 54,600 psi average.

Purpose of Issuance (Including any Precautions or Limitations): The purpose of issuance of this DIT is to provide Stevenson & Associates with inputs to be used in the operability analysis of the missile shields of each unit. Since the rebar yield strength data represents actual (as-tested) material strengths from Material Receipt data, it should be clearly identified as such (compared to specified strengths of 40 ksi).

Source of Information: Engineering Judgement Used? ☒ Yes ☐ No

Concrete strength information is taken from an NRC document entitled "Safety Assessment of Indiana Michigan Power Company's Operability Evaluations of Containment and Ice Condenser Structures, and Fan-Accumulator Room Walls in Containment for D.C. Cook Unit 1", dated November 28, 2000. This document identified 4,424 psi as concrete strength acceptable to the NRC for D.C. Cook Unit 1. NRC Letter N2000081, dated 06/09/00 presented similar discussions for Unit 2, including higher concrete strength values. Therefore, a value of 4,424 psi is conservatively to be used in the evaluation of containment structures for both Unit 1 and Unit 2.

Reinforcing bar strength and elongation information is taken from material receipt data. The recommended value of yield strength reflects the minimum of the averages of the actual test data for rebar actually installed in the missile shields of each unit (54,838 and 54,618 psi for Unit 1 and Unit 2 respectively). Page 2 of this DIT contains a tabulation of the available rebar material test data and its source, including heat nos. and bar size. The minimum and average of the data are shown

Distribution: Copy to Requestor: Steve Anagnostis – S&A
Copy to DIT Administrator File
Original to NRM (Transmitted by DIT Administrator)

Note: This or other similar form may be used, provided the content is consistent with the currently approved 12 EHP 5040.DES.001, Attachment 6

AEP DESIGN INFORMATION TRANSMITTAL (DIT)

DIT Form, Part 2

AEP Design Information Transmittal	DIT No. B-01954-00 Page 2 of 2

UNIT 1					
Heat	Bar	Yield Point, psi	Tensile Strength, psi	Elong. in 8 ins. (%)	
C34105	#11	53,205	89423	16	
B37160	#11	54,487	83333	17	
C35157	#8	57,468	85316	16	
A36448	#5	54,193	79677	19	See Note 1
[redacted]					
Average =		54,838	84,437		
UNIT 2					
Heat	Bar	Yield Point, psi	Tensile Strength, psi	Elong. in 8 ins. (%)	
B36171	#11	54,487	89423	16	
A37151	#11	50,641	84615	17	
B37340	#11	51,602	83012	20	
A36334	#11	55,769	85576	19	
C35157	#8	57,468	85316	16	
C34982	#5	57,741	79354	21	
[redacted]					
Average =		54,618	83,315		

Value used in Calculations

This is a CMTR Value & is not ASME Code (40,000 ksi)

Notes:

1) - Material receipt page has Heat recorded as A36438, corrected to A36448.

Source:

Material receipts RS-1C-93 and RS-2C-93 for Units 1 and 2, respectively.
Containment Building Missile Shields

Note: This or other similar form may be used, provided the content is consistent with the currently approved 12 EHP 5040.DIS.001, Attachment 6