Consumers Power Company

James W Cook
Vice President - Projects, Engineering and Construction

General Offices: 1945 West Parnall Road, Jackson, MI 49201 • (517) 788-0453

May 20, 1983

82-12 #3

Mr J G Keppler, Regional Administrator
US Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND NUCLEAR COGENERATION PLANT
DOCKET NOS 50-329 AND 50-330
SHEAR LUG DESIGN FOR EMBEDS
FILE: 0.4.9.68 SERIAL: 22207

Reference: J W Cook letter to J G Keppler, Same Subject

1) Serial 19106, dated December 3, 1982
2) Serial 20721, dated March 1, 1983

This letter, as were the referenced letters, is an interim 50.55(e) report regarding the design of embedments in concrete that use shear lugs located in tension zones. The attachment to this letter provides a description of the investigation and the corrective actions being taken with regard to this subject.

Another report, either interim or final, will be sent on or before November 22, 1983.

James W. Cook

JWC/WRB/cd

Attachment: (1) MCAR-63, Interim Report 3, dated May 3, 1983

CC: Document Control Desk, NRC
Washington, DC

RJCook, NRC Resident Inspector
Midland Nuclear Plant

IE27

CC: CBechhoefer, ASLB Panel
FPCowan, ASLB Panel
JHarbour, ASLB Panel
AS&L Appeal Panel
MMCherry, Esq
MSinclair
BStamiris
CRStephens, USNRC
WDPaton, Esq, USNRC
FJKelley, Esq, Attorney General
SHFreeman, Esq, Asst Attornel General
WHMarshall
GJMerritt, Esq, TNK&J
INPO Records Center

Bechtel Associates Professional Corporation

SUBJECT: MCAR 63 (Issued 11/10/82)
Design of Steel Embedments That Use Shear Lugs
Located in Tension Zones

INTERIM REPORT 3

DATE: May 3, 1983

PROJECT: Consumers Power Company
Midland Plant Units 1 and 2
Bechtel Job 7220

Introduction

This report addresses a concern with the design of steel embedments in concrete that use shear lugs located in tension zones.

Background

The American Concrete Institute (ACI) 349 Code, Appendix B, issued August 1979, specifies that shear lugs in embedment designs shall be considered effective only in compression zones. Midland embedment designs completed and installed before this date considered shear lugs to accommodate shear loads and tension bars to accommodate tension loads. Other than ACI 349, Appendix B, no known design code or industry standard issued before ACI 349, Appendix B, restricts the design of embedments using shear lugs.

For embedments within the scope of this MCAR, the Midland Final Safety Analysis Report, Section 3.8, is committed to design reinforced concrete according to ACI 318-63 and 318-71, and structural steel according to the AISC 1969 edition; however, these codes do not specifically address all aspects of embedment design.

Investigative Action

An evaluation to determine which of the embedments identified have shear lugs located in tension zones has been essentially completed for the existing loads.

To determine if the embedments installed in the Midland plant are capable of performing their safety function, a testing program is being prepared at the University of Michigan. The purpose of the testing program is to determine the effectivity of shear lugs located in tension zones. The investigative action is expected to be completed in approximately 6 months.

Probable Cause

The apparent root cause is that before issuance of ACI 349, Appendix B, this possible behavior of shear lugs in tension zones was not recognized by codes or industry standards.

Corrective Action

To enable new designs and modifications to existing designs to be completed, an interim embedment design criterion is being developed for use before completion of the testing program. After completion of investigative actions, the embedment criterion will be finalized for all design and evaluation. However, no final corrective action has been established at this time.

Analysis of Safety Implications

The concern is that shear lugs located in tension zones may not be fully effective and that this may result in a nonconservative design. The design may be nonconservative to the extent that it may not be capable of performing its required safety function.

Reportability

This concern is considered potentially reportable in accordance with Title 10 of the Code of Federal Regulations, Part 50.55(e).

Bechtel Associates Professional Corporation

Submitted by: S. J. Sobkowski
S.L. Sobkowski
Civil/Structural Group Supervisor

Approved by: E M Hughes
E.M. Hughes
Project Engineer

Concurrence by: T.E. Johnson
T.E. Johnson
Civil Discipline Chief

Concurrence by: E. H. Smith
E.H. Smith
Engineering Manager

Concurrence by: for M.A. Dietrich
M.A. Dietrich
Project Quality Assurance Engineer