

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
REGION IV

Report No. 99900525/79-02

Program No. 51200

Company: Gilbert/Commonwealth Companies
525 Lancaster Avenue, P. O. Box 1598
Reading, Pennsylvania 19603

Inspection at: Jackson, Michigan

Inspection Conducted: June 19-22, 1979

Inspector: *D. G. Anderson* 6/29/79
D. G. Anderson, Principal Inspector Date
Vendor Inspection Branch

Approved by: *C. J. Hale by D. G. Anderson* 6/29/79
C. J. Hale, Chief, Program Evaluation Section Date
Vendor Inspection Branch

Summary

Inspection on June 19-22, 1979 (99900525/79-02)

Areas Inspected: Implementation of Title 10 CFR 50, Appendix B, including design inspection and action on previous inspection findings. The inspection involved twenty-nine (29) inspection-hours on site by one (1) USNRC inspector.

Results: In the two (2) areas inspected, no deviations or unresolved items were identified.

7909100/136

917 351

DETAILS SECTION
(Prepared by D. G. Anderson)

A. Persons Contacted

M. B. deEstrada, Structural Engineer
 *W. E. Kessler, Project Manager
 *R. A. Lang, Project Licensing Engineer
 *A. D. Nayakwadi, Supervising Piping Engineer
 J. C. Norman, Manager, Computer Operations
 B. S. Russell, Manager, Applications Programming
 V. J. Shah, Senior Mechanical Engineer
 *P. Thacker, Project Quality Coordinator
 C. R. Witherell, Structural Engineer

*Indicates attendance at the exit meeting.

B. Action on Previous Inspection Findings

(Closed) Deviation (Report No. 77-01): The Engineering and Construction Budget Management Manual for the Erie Nuclear Plant had been issued without approval by Ohio Edison. The inspector assured that the corrective action and action to prevent recurrence as addressed in the Gilbert/Commonwealth letter of response dated September 23, 1977 had been completed. The inspector reviewed subsequent revisions to the manual and assured that each had been approved by Ohio Edison as required.

(Closed) Deviation (Report No. 77-01): The Design Verification Schedule had not been updated as required. The inspector assured that the Design Verification Schedule had been updated as indicated in the Gilbert/Commonwealth letter of response dated September 23, 1977. The inspector also reviewed a memorandum dated September 21, 1977 to all supervising engineers on the Erie Nuclear Project which addressed the necessity for maintaining the Design Verification Schedule current.

C. Design Inspection

1. Objectives

The objectives of this area of the inspection were to select a single component, system, structure, or major part of one of these and verify that:

- a. Design inputs are identified and include all applicable requirements; documented; reviewed and approved; specified on a timely basis and in necessary detail; prepared, processed,

917
352

and controlled in accordance with applicable procedures; accurate in specifying design requirements, particularly design codes and standards; and distributed to those responsible for preparing production designs and associated documents.

- b. Design calculations, and their review and approval, have been performed as prescribed by procedures.
- c. Final design documents have accurately transcribed design input in accordance with procedures.
- d. Internal and external design interface responsibilities and activities have been performed in accordance with procedures.
- e. Verification of the design has been properly and effectively performed as prescribed by procedures, including design review (including checking), alternate calculations, and qualification testing where applicable.
- f. Changes to the design, through all design activities from input to output, have been performed in accordance with procedure requirements.
- g. Design corrective actions have been applied, as necessary, to the design for applicable activities in accordance with procedures.
- h. The design document control system is effective for the item design documents in accordance with procedures.
- i. Procurement documents have been properly prepared for the item in accordance with procedures and include the necessary documents.

2. Method of Accomplishment

The preceding objectives were accomplished as follows:

- a. A review of the Preliminary Safety Analysis Report for Ohio Edison/Erie Nuclear Plants, Units 1 and 2, Section 17.3, Design Control, which identifies the requirements imposed upon Gilbert/Commonwealth related to the design process. The design process related to the Erie Nuclear Project is defined, implemented, and enforced according to the following procedures:

917 353

Design Control Procedures, DCP# 1.05, Classification of Structures, Systems, and Components; DCP# 1.10, Design Input; DCP# 1.15, Layout Drawings; DCP# 1.20, Calculations; DCP# 1.25, Fluid System and Instrument Loop Diagrams; DCP# 1.30, Drawings; DCP# 1.35, System Logic Diagrams; DCP# 1.40, One Line and Relay Diagrams; DCP# 1.45, System Design Description; DCP# 1.50, Production Computer Program Documentation and Certification; DCP# 1.55, Design Specifications for Nuclear Power Plant Components; DCP# 2.05, Design Verification; DCP# 2.10, Engineering Change Notices; DCP# 3.15, Project Records Control; DCP# 4.10, Technical Specifications and Bills of Material; DCP# 5.10, Project Management Manual; DCP# 5.30, Technical Support Services; and DCP# 6.05, Safety Analysis Reports. The inspector also determined that the following document contains certain exceptions to the DCP's which can be considered as project unique procedural requirements:

Engineering and Construction Budget Management Manual, Ohio Edison Company, Erie Nuclear Plant, Units 1 and 2, Commonwealth Associates, Inc. Revision 6, 2/28/79.

- b. The inspector verified that design inputs for the feedwater system and the auxiliary feedwater system are contained in the following documents;

0-000-10-004, Project Design Criteria, Erie Nuclear Plant, Units 1 and 2. In particular, seismic loads are contained in section 2.6.2.3.1.

0-421-41-01-0, System Design Description, Auxiliary Feedwater System, Ohio Edison Company/Erie Nuclear Plant, Units 1 and 2.

EN-WGI/COM-135, Earthquake Return Frequency Analysis, Woodward/Clyde Consultants, 6/23/76.

0-420-41-01-0, System Design Description, Feedwater System, Ohio Edison Company, Erie Nuclear Plant, Units 1 and 2.

0-444-41-01-0, System Design Description, Condensate Storage and Makeup System, Ohio Edison Company, Erie Nuclear Plant, Units 1 and 2.

- c. The inspector verified that the following design calculations had been performed and verified according to procedures:

917 354

(1) Calculations

- 0-000-22-20-0-04, Design basis for the seismic analysis of the auxiliary building complex, 1/28/77.
- 0-140-22-09-0-01, Response spectra for the auxiliary building complex, 6/13/77.
- 0-140-22-04-0-03, Final seismic model for the auxiliary building, 3/16/77.
- 0-140-22-09-0-04, Floor response curves for the auxiliary building complex, 2/16/77.
- 0-140-22-06-0-03, Seismic analysis for the auxiliary building, 2/9/77.
- 0-140-22-06-0-01, Dynamic analysis for the auxiliary building complex, 4/11/77.

(2) Computer Programs

DYNAL-A Fortran IV Computer code which uses the superposition of normal nodes technique to obtain system responses of a structure. The following are DYNAL accessory codes:

- 0-130-22-08-0-01, SPRINGS-A Fortran IV computer program to compute reduction factors for the soil springs used in seismic analysis.
- 0-130-22-05-0-01, NRC-A Fortran IV computer code which calculates spectral accelerations bases on the ERIE Nuclear Plant design response spectra to meet Regulatory Guide 1.60 requirements.
- 0-130-22-05-0-01, DAMPER-A Fortran IV computer code which calculates the weighted modal damping using an adaption of the Roesset method.
- 0-130-22-08-0, SORTER-A Fortran IV computer code which sorts modes and determines the extent to which natural frequencies be included in response spectrum computation.
- 0-130-22-09-0, UPLIFT-A Fortran IV computer code which evaluates the uplift and maximum soil pressure of a circular slab/soil system due to seismic loads.

TPIPE-A special purpose computer program capable of performing static and dynamic linear elastic analyses of power related piping systems. The dynamic analysis option includes (1) frequency extraction, (2) response spectrum, (3) time history modal superposition, and (4) time history direct integration methods.

- d. The following final design documents were reviewed for incorporation of input:

Preliminary Safety Analysis Report, Ohio Edison Company, Erie Nuclear Project, Units 1 and 2, Chapter 3.7, Seismic Design.

Drawings:

ENB-0-421-41-05-001, Auxiliary Feedwater System Schematic, 3/6/78.
 ENB-0-421-51-03-001, 002, 003, Auxiliary Feedwater System Logic, 3/6/78.
 ENG-1-420-41-02-001, 002, Fluid System Diagram-Feedwater System, 10/24/78.
 ENB-1-444-51-02-001, 002, 003, Instrument Loop Diagram Condensate Storage and Makeup System, 2/13/78.
 ENG-1-444-41-02-001, Fluid System Diagram-Condensate Storage and Makeup System, 10/23/78.
 ENG-1-444-51-09-001, 002, Logic Diagram-Condensate Storage System, 2/13/78.
 ENG-1-423-41-02-001, Fluid System Diagram-Steam Generator Feedwater Pump Turbine Steam Supply, 9/27/78.
 ENB-1-421-51-02-001, 002, Instrument Loop Diagram-Auxiliary Feedwater System, 9/12/77.
 ENG-1-421-41-02-001, Fluid System Diagram, Auxiliary Feedwater System, 10/19/78.
 ENG-1-421-51-09-001, 002, 003, Logic Diagram-Auxiliary Feedwater System, 4/3/78.
 ENJ-1-421-41-26-001, 002, 004, 005, Auxiliary Feedwater System-Auxiliary Area Pump Room, Reactor Building, and Sections.

- e. The inspector verified that for the Erie Nuclear Project that internal and external interfaces are identified in the Engineering and Construction Budget Management Manual and design documents are transmitted to these interfaces through the following:

Letters of Transmittal:

EN/COM/OEC-2233, Auxiliary Feedwater System-System Design Description, 3/9/78.
 EN/COM/OEC-1678, Feedwater System, System Design Description, 7/15/77.
 EN/COM/OEC-2468, Condensate Storage and Makeup System-System Design Description, 5/9/78
 EN/COM/OEC-2357, Auxiliary Feedwater Pumps, Motors, and Turbines-Specification, 6/1/78.

917 354

EN/COM/OEC-2885, Two and One-half inch and larger Carbon and Stainless Steel Valves-Specification, 8/16/78.
 EN/COM/OEC-3054, Steam Generator Feedwater Pumps and Steam Generator Booster Feedwater Pumps-Specification, 9/22/78.
 EN/COM/OEC-2754, Feedwater Heaters-Specification, 7/12/78.
 EN/COM/OEC-3481, Amendments to the Preliminary Safety Analysis Report-Erie Nuclear Plant, Units 1 and 2, 6/13/79.

- f. For each calculation and computer program run identified in C.2.c.(1) and (2) above, the following documentation supported design verification activities related to each:

Calculations:

- (1) Design Verification Record and Cover Page.
- (2) Design Verification Summary.

Computer Programs:

- (1) User Manual.
- (2) Program Listing.
- (3) Verification of line by line review of the Fortran listing, or
- (4) Comparison with other codes in the public domain.

Supporting Documentation:

GAI Report No. 1829, DYNAL Program Verification Manual, 3/1/74.
 DYNAL compared with MRI/STARDYNE Computer Program Verification Summary, 3/1/74, DYNAL Verification Run dated 3/28/77.

SPRINGS Verification indicated on listing dated 2/11/77.

TPIPE Program Verification Manual containing twenty-six (26) benchmark problems and comparison of output with output from ANSYS, PIPSD, and SAPIPE on twenty-nine (29) computer runs, 5/15/78.

Calculation 1-421-42-13-0-05, Pipe Stress Analysis-Auxiliary Feedwater System, package contains Drawing ENJ-1-421-41-25-002, Piping Isometric-Auxiliary Feedwater System, Auxiliary Building, and Reactor Building, 4/11/78.

NRC Verification listing and computer runs, 8/16/76.

DAMPER Verification of Listing, 8/12/76.

SCRTER Verification listing and computer runs, 1/31/75.

UPLIFT Verification of Listing, 2/26/75.

The inspector noted that PMB Systems Engineering (consultant custodian for TPIPE) had identified the following errors in the TPIPE computer code and had addressed these errors to Gilbert/Commonwealth by written memorandum:

- (1) Response spectrum analysis/nonglobal dynamic springs, 7/5/77.
- (2) Incorrect static reaction calculations, 1/19/78.
- (3) Inconsistent member and force sign convention, 1/19/78.
- (4) Incorrect time integration and heat transfer coefficients, 1/19/78.
- (5) Modal superposition time history analysis affecting resequenced order of nodes and ground motion excitation, 5/7/79.

- g. The inspector reviewed the following design changes to assure that they were reviewed and approved and that corrective action had been implemented where appropriate:

Engineering Change Notices:

ECN# 007, Foundation change in the auxiliary building, including Calculation 0-140-22-05-0-98, Evaluation of changes in the auxiliary building, 6/22/79, and Drawing# ENG-0-100-22-13-003, Auxiliary Building.

ECN# 009, Foundation change in the auxiliary building, including Drawing# ENJ-0-007-70-00-020, Structural layout drawing-Units 1 and 2, Diesel generator buildings and south auxiliary areas, and DYNAL computer runs dated 8/18/78-Evaluation of changes in the auxiliary building for seismic loads.

- h. The inspector verified that the document control system for the manuals, procedures, PSAR, system design descriptions, project design criteria, and computer code documentation are maintained under a numbering system which compares with the assignment listing as required by procedures. This assures that revisions to these documents are promptly transmitted to the assigned individual.
- i. The inspector verified that the following procurement documents are prepared and transmitted according to procedure:

Specifications:

0-421-41-30-3S, Auxiliary Feedwater pumps, motors, and turbines, 4/26/78.

0-018-41-31-3S, Two and one-half inch and larger carbon and stainless steel valves (600-1500 pound), 4/21/78.

0-444-41-30-3S, Condensate Storage Tanks, 4/26/78.

0-011-41-31-3S, Feedwater Isolation Valves, 1/25/79.

917 358

O-420-41-33-3S, Steam Generator Feedwater Pump Turbines, 10/18/78.

O-420-41-30-3S, Steam Generator Feedwater Pumps and Steam Generator Booster Feedwater Pumps, 8/25/78.

O-420-41-34-3S, Feedwater Heaters, 5/25/78.

3. Findings

In this area of the inspection, no deviations or unresolved items were identified.

D. Exit Meeting

An exit meeting was conducted with Gilbert/Commonwealth management personnel at the conclusion of the inspection on June 22, 1979. Those individuals indicated by an asterisk in the Details Section of this report were in attendance. In addition, the following were present:

R. E. Bailey, Manager, Design Control
 N. R. Barker, Quality Assurance Division, General Manager
 M. J. Brooks, Supervisor, Production Control
 J. E. Davis, Administrative Manager
 H. E. Herbert, Data Processing Librarian
 P. S. Ingebo, Manager, Corporate Services
 A. A. Jaeger, Project Administrator
 D. D. Millican, Manager, Records Management
 R. W. Potts, Manager of Engineering
 D. E. Price, Associate Engineer, Ohio Edison
 F. T. Schartz, Manager, Quality Assurance Department
 R. D. Thomas, Project Design Engineer
 T. W. White, Project Quality Coordinator

The inspector discussed the two (2) previous deviations (Inspection 99900525/77-01) which were closed during this inspection. The inspector outlined the scope of this inspection and indicated that no further findings were identified during the inspection. The inspector also indicated that based upon previous computer code inspections with NRR/HQ personnel, that organizations performing design activities can expect increased emphasis of inspection in the area of computer code development, use, verification, and certification. Gilbert/Commonwealth was encouraged to review their existing procedures for computer code application to assure that the elements of ANSI N45.2.11 were included. Management representatives of Gilbert/Commonwealth acknowledged the statements of the inspector.