

APR 15 1974

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Docket No. 50-247

Donald J. Skovholt, Assistant Director  
for Operating Reactors  
Directorate of Licensing

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. -  
INDIAN POINT STATION, UNIT #2 - "FEEDWATER LINE INCIDENT"  
REPORT DATED JANUARY 14, 1974 (TAR-805)  
STRUCTURAL EVALUATION OF THE LINER DAMAGE

Plant Name: Indian Point 2

Docket No.: 50-247

Licensing Stage: Operating Reactor

Branch and Project Leader Requesting Assistance: ORB #1; R. W. Woodruff

Requested Completion Date: April 15, 1974

Technical Review Branches Involved: Structural Engineering  
Reactor Systems  
Mechanical Engineering  
Electrical Control Instrumentation &  
Systems

Description of Request: Memo dated February 1, 1974 (ORB-1-75; TAR-805)

Review Status: Complete

In accordance with your request the Structural Engineering Branch, Directorate of Licensing, has reviewed and evaluated structural sections of the applicant's report: "Feedwater Line Incident" dated January 14, 1974. An evaluation of the structural damage to the liner described in the report is enclosed. The applicant's conclusion is that the damage to the liner has not impaired its integrity and that it can perform its function with an adequate margin of safety. We concur with this conclusion.

*151*

R. R. Maccary, Assistant Director  
for Engineering  
Directorate of Licensing

Enclosure:  
Structural Evaluation for  
Indian Point #2 Liner

cc (Next Page)

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DATE >	4/15/74	4/15/74	4/15/74				

Donald J. Skovholt

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APR 15 1974

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CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

INDIAN POINT STATION, UNIT #2

DOCKET NO. 50-247

"FEEDWATER LINE INCIDENT REPORT" DATED JANUARY 14, 1974

STRUCTURAL EVALUATION OF THE LINER DAMAGE

Introduction

On January 14, 1974 Consolidated Edison Co. transmitted to the AEC the subject report describing a feedwater pipe break incident which occurred at Indian Point Unit #2 on November 13, 1973 and damaged the liner.

Summary of the Report

- a. The subject report provides a qualitative and quantitative analysis of the effects of jet forces on the cylindrical part of the liner. The approach is purely analytical. The report presents a complete analysis of the problem. Its conclusions are confirmed by the results of the following tests:
- b. Magnetic Particle Inspection
- c. Bending tests of the liner material
- d. Ultrasonic Testing
- e. Pressure and leakage test of the structure

The applicant's conclusion is that the liner has not been damaged and can fulfill its function with an adequate margin of safety.

Summary of Regulatory Evaluation

Description of the liner - The liner was fabricated by welding together Type 442 carbon steel plates. The weld seams are covered with channels which are normally pressurized. In the vicinity of the damage, the liner varies in thickness from 3/8-inch to 3/4-inch with the heavier plates used in the area of the piping penetrations and the lighter plates used at higher elevations. A polyvinylchloride thermal insulation extends to Elevation 63'-8-1/2". The liner is attached to the concrete by studs.

The studs were fabricated from 1/2-inch rods and are 7 inches long with a 90° - 2-inch hook.

In the lower part of the containment, which is insulated, the studs are spaced at 28" vertically and 24" horizontally. In the upper part the spacing is 14" vertically and 24" horizontally. This spacing was chosen to preclude elastic bulging of the liner due to thermal expansion and is in accordance with the original design criteria, previously approved. During construction, by mistake, two rows of studs were omitted in the part of the liner located above the insulated area, but the new insulation will cover this area of the liner, and therefore establish a condition similar to the lower part.

#### Description of the Damage

The visible damage to the liner can be described as a band of bulges located approximately 18 feet above and to the right of the broken feedwater line penetration. The band is roughly 50 feet (horizontal) by 3 feet (vertical). The most pronounced bulge has a maximum deflection of approximately 1-1/4". In the whole damaged area the liner is 3/8" thick, and the studs are arranged in a 24" (horizontal) by 28" (vertical) pattern. It appears that in the damaged area nine studs are broken.

#### Applicants Study and Tests

- a. The applicant performed two finite-element studies of the bulged liner. The purpose of this investigation was to determine the strains in the deformed liner generated by LOCA, earthquake and test pressure loads and to establish the necessary extent of the new insulation. The computed strains are of the same order of magnitude as the strains permitted by the ASME/ACI draft code, and therefore acceptable to us.

- b. The applicant performed a magnetic particle examination of the bulges. This examination established that at present no cracks exist in the liner.
- c. A sample of the same grade steel as used in the liner was tested under static and cyclic loads. A 6" by 28" plate, which included a vertical weld, was initially bent and then straightened and cyclically tested. After the test, the sample was subjected to a magnetic particle examination. This test indicates, that the liner will function adequately under vertical elongation due to LOCA.
- d. The applicant performed an ultra-sonic inspection to determine whether studs were broken behind the liner plate and whether the liner plate was damaged at the connection with the studs. The results of these tests indicate that probably nine studs were broken and that the liner plates were not damaged.
- e. Full design pressure and three leakage tests have been performed by the applicant. Cameras recorded the displacement of the liner during these tests. The leakage rate computed from these tests is below the design leakage rate previously approved.

The Structural Engineering Branch, Directorate of Licensing, has reviewed the parts of the subject report covering the damaged liner: the criteria for the allowable strains, the methods of analysis and testing, and the applicant's conclusions.

#### Regulatory Position

The applicant's conclusions are that the deformations of the liner due to the pipe break did not damage the liner and that the liner capacity to fulfill its functions in the case of LOCA is not impaired. We concur

with this conclusion. It is however our opinion that because of this occurrence, increased attention should be given to the surveillance of the liner during the life of the plant and that the frequency of the leakage tests required by the technical specification should be increased. This problem should be discussed with the applicant, and the technical specification changed accordingly.