



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

November 16, 1978

NRC PUBLIC DOCUMENT ROOM

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Washington, D. C. 20555

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Atomic Safety and Licensing Appeal Board  
U.S. Nuclear Regulatory Commission  
Washington, D. C. 20555

In the Matter of  
FLORIDA POWER & LIGHT COMPANY  
(St. Lucie Nuclear Power Plant, Unit 2)  
Docket No. 50-389



Gentlemen:

Enclosed are recent memoranda discussing certain problems experienced in connection with pipe support base plate design. The NRR staff has informed us that the problems discussed in Mr. Stello's memorandum dated September 28, 1978 are applicable to the St. Lucie facility, and that DSS is presently reviewing this aspect of piping design analysis on a case-by-case basis under SRP section 3.9.3 - ASME Codes 1, 2 and 3 Components, Component Supports and Core Support Structures. If the Board or any of the parties wish additional information, please let us know.

Sincerely,  
*W.D. Paton*  
William D. Paton  
Counsel for NRC Staff

Enclosures as Stated

cc (w/encls.):

- Edward Luton, Esq.
- Michael Glaser, Esq.
- Dr. David L. Hetrick
- Martin Harold Hodder, Esq.
- Dr. Frank Hooper
- Dr. Marvin M. Mann
- Harold F. Reis, Esq.
- Norman A. Coll, Esq.
- Mr. Samuel J. Chilk
- Atomic Safety and Licensing Board Panel

Atomic Safety and Licensing Appeal Board  
Docketing and Service Section

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

SEP 28 1978

MEMORANDUM FOR: Milton J. Grossman, Hearing Division  
Director and Chief Counsel, OELD

FROM: Victor Stello, Jr., Director  
Division of Operating Reactors, NRR

SUBJECT: BOARD NOTIFICATION - PIPE SUPPORT BASE  
PLATE DESIGN

The attached memorandum to Roger Mattson, dated June 28, 1978, presents information concerning failures of safety-related pipe supports at Millstone 1 and design deficiencies on similar equipment at Shoreham Unit 1. As indicated in the attachment, two factors appeared to contribute to failure of anchor-bolt connections of pipe supports. These are, 1) the design assumption that base plates perform structurally as rigid load-bearing members when they may be flexible members, and 2) incorrect anchor bolt torquing.

Recent audits of Architectural Engineering firms and assessments of the actions taken at Millstone, as noted in the attachment, provided the following general information:

1. During the last few years, the A/Es have changed their design and installation procedures for concrete embedded pipe supports.
2. Past and current design and installation procedures vary among the A/Es.
3. In the past many of the pipe support designs have been contracted, and were done with methods not known by the principal A/Es.

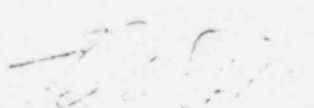
We have concluded that the more detailed information required must be obtained from each operating facility. We are preparing a generic

letter to each operating facility requesting detailed design, installation, and testing information of concrete-embedded anchor-bolted pipe supports of safety-related equipment.

We recommend that this information be provided to the following Boards:

1. Monticello (FTL)
2. Indian Point 1,2,3 (Seismic Design)

We will provide an assessment of this issue upon completion of our evaluations.

  
Victor Stello, Jr., Director  
Division of Operating Reactors  
Office of Nuclear Reactor  
Regulation

Enclosure:  
June 28, 1978 memo, Stello to Mattson

cc w/enclosure:  
D. Vassallo  
V. Stello  
R. Mattson  
R. Bevan  
L. Olshan  
L. Nichols  
V. Noonan  
A. Schwencer  
T. Ippolito  
J. Fair



WASHINGTON, D. C. 20555

JUN 02 1978

MEMORANDUM FOR: B. K. Grimes, Assistant Director  
for Engineering and Projects, DOR

D. G. Eisenhut, Assistant Director  
for Systems and Projects, DOR

FROM: Acting Branch Chief,  
Engineering Branch, DOR

SUBJECT: PIPE SUPPORT BASE PLATE PROBLEM

The Engineering Branch, Division of Operating Reactors, has contacted Bechtel, Bergen - Paterson, Gilbert, and Stone & Webster in regard to their past and current design procedures for support base plates utilizing drilled anchor bolts. Bechtel and Stone & Webster indicated that they became aware of base plate flexibility effects on anchor bolt pull-out loads within the past couple of years and are now considering this in current designs. Gilbert and Bergen - Paterson indicated they are using rigid plate assumptions for calculating bolt loads.

Review of the support redesigns at Millstone shows a considerable increase in base plate thickness and anchor bolt sizes over the previous design. The original designs by Bergen - Paterson did not meet the current rigidity requirements used by Stone & Webster. Design deficiency reports by Long Island Lighting Company on Shoreham show that consideration of base plate flexibility has increased the pull-out loads on some bolts, and inspection of the supports has shown that approximately 55 percent of the anchor bolts had incorrect embedment lengths.

Currently, I&E is considering whether Stone & Webster should be investigated for a Part 21 deviation and will be further investigating this matter.

The Engineering Branch considers the problem at Millstone where several support plates were pulled out to be a combination of base plate flexibility and anchor bolt design problems. Since the anchor bolts were never tested for cyclic loadings, and the lines at Millstone experienced flow induced vibrations, the capability of the anchor bolts to withstand cyclic loadings should be addressed.

S. K. Grimes  
D. G. Eisenhut

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Based on the above information, the Engineering Branch recommends that this be considered a generic item for all operating plants, and a vendor inspection program be implemented with I&E to review the vendor design procedures used for analyzing support base plates utilizing drilled anchor bolts along with the field installation procedures utilized in installing the anchor bolts. Also, the load rating techniques used by the anchor bolt manufacturers for cyclic loadings should be reviewed. The Engineering Branch has talked with I&E and consider the vendor inspection program to be the most efficient method of completing the necessary review. The Engineering Branch estimates approximately 15 man-weeks will be required to review design procedures used by vendors and A/E firms. The Engineering Branch will set up a meeting with both AD's to determine the interface between the Engineering Branch and I&E required to implement the review.

The Engineering Branch is in the process of preparing a feedback memo to DSS on the base plate problem which is expected to be completed by June 9, 1978.

Original signed by:

V. S. Noonan, Acting Branch Chief  
Engineering Branch  
Division of Operating Reactors

cc: V. Stello, Jr., DOR  
W. Rutherford, IE  
U. Potopous, IE  
R. Mattson, DSS  
J. P. Knight, DSS  
R. Bosnak, DSS



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

*T. Nichols*

JUN 28 1978

MEMORANDUM FOR: R. J. Mattson, Director  
Division of Systems Safety

FROM: Victor Stello, Jr., Director  
Division of Operating Reactors

SUBJECT: OPERATING EXPERIENCE MEMORANDUM NO. 13  
PIPE SUPPORT BASE PLATE PROBLEM

PROBLEM

Recently during inservice inspections at Millstone Unit 1, structural failures of rigid pipe supports for class 2 safety equipment were observed. These inspections, recently implemented at Millstone, were conducted in accordance with Section XI of the ASME Code, as endorsed by regulation, 10 CFR 50.55 a(g), in February 1976.

Several base-plate anchor bolts of pipe supports in the Core Spray and the Low Pressure Coolant Injection Systems at Millstone were not properly embedded; and, in some cases the anchor bolts were completely pulled out and no supporting function was provided.

Deficiency reports, in accordance with 10 CFR 50.55(e), filed by Long Island Lighting Company, on Shoreham Unit 1, indicate that design of base plates with drilled anchor bolts using rigid plate assumptions has resulted in underestimation of loads on some anchor bolts. Inspection of anchor bolt installations at Shoreham has shown over fifty percent of the bolt installations were deficient. Supports for both piping systems and electrical raceways have been reported as deficient at Shoreham.

PRESUMED CAUSE

It is currently believed that two interacting factors contribute to the failure of the supports. First, the design assumption that the base plates perform structurally as rigid instead of flexible members may provide low estimates of imposed loads on the supports. Secondly, incorrect anchor bolt embedment may also contribute to insufficient support.

The attached memorandum from V. Noonan to B. Grimes, dated June 2, 1978, provides additional information.

### SAFETY SIGNIFICANCE

Depending on equipment layout, improperly designed or installed anchor supports could:

1. result in loss of support function in some cases; and,
2. result in high stressing of piping systems during a seismic event or during a significant flow transient.

### REPAIR

Millstone with assistance from Teledyne Engineering has completed design modifications and repairs. These changes include increased base plate thickness and larger anchor bolts for failed supports;

Shoreham in conjunction with Stone and Webster is evaluating both piping and electrical type supports. The review is scheduled to be completed by December, 1978.

### DOR ACTION

The Engineering Branch will review the design procedures used on operating plants to determine anchor bolt loads, the techniques used to determine load ratings for anchor bolts, and the installation procedures.

This review will be done through an A/E vendor inspection audit in conjunction with IE. These A/E audits will be started during early July, 1978.

We anticipate that criteria will be developed for design and installation of base plate-anchor bolt assemblies, and those operating plants requiring corrective action will be identified.

Additionally EB staff will further assess the occurrence and corrective actions taken at Millstone.


### RECOMMENDATIONS

We recommend that this problem be addressed on all CP and OL reviews. At this time it appears that considerations should be given to the analytical methods used to determine whether or not base plates behave as flexible or rigid members. This in turn may effect the anchor bolt size and embedment to properly cope with loads imposed on the supports.

It may be appropriate to require that applicants provide for review their:

1. methods for determining base plate thickness and anchor bolt loads;
2. criteria for anchor bolt installation; and,
3. criteria for load rating techniques for anchor bolts, including cyclic loads.

We shall coordinate our meetings, discussions and evaluations of this issue with your staff. Supplemental information will be provided.

  
Victor Stello, Jr., Director  
Division of Operating Reactors

PRINCIPAL DOR PERSONNEL

Reviewer: J. Fair

Enclosure:  
Memorandum dated 6/2/78

cc: w/enclosure

E. G. Case

S. Hanauer

R. S. Boyd

H. R. Denton

F. Schroeder

DSS AD's

DOR AD's

DOR BC's

DOR SL's

J. Fair

✓ L. Nichols

W. Rutherford

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