U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-373; 50-374
License Nos:	NPF-11; NPF-18
Report No:	50-373/99020(DRS); 50-374/99020(DRS)
Licensee:	Commonwealth Edison Company
Facility:	LaSalle Nuclear Generating Station, Units 1 and 2
Location:	2605 N. 21st Road Marseilles, IL. 51341-9756
Dates:	May 6 through October 6, 1999
Inspector:	J. A. Gavula, Reactor Engineer
Approved by:	John M. Jacobson, Chief, Mechanical Engineering Branch Division of Reactor Safety

EXECUTIVE SUMMARY

LaSalle Nuclear Generating Station, Units 1 and 2
NRC Inspection Report 50-373/99020(DRS); 50-374/99020(DRS)

This inspection reviewed the scope and resolution of a limited number of problems identified within the licensee's corrective action program. The problems predominately pertained to piping and pipe support design issues. This was an announced inspection conducted by one regional inspector.

Engineering

- In the majority of the sample of problem identification forms selected during this inspection, the scope of the corrective actions and the associated technical evaluations adequately addressed the root causes of problems and adequately resolved the problem.

- Corrective actions to resolve problems with welds not meeting Code required minimum sizes only addressed two specifically identified cases and did not resolve the problem for the extent of the condition. This corrective action problem was treated as a non-cited violation.

- The basis for the assumed anchor bolt stiffness value used in calculations to address a piping support design issue was not adequately demonstrated. This design control problem was treated as a non-cited violation.

Report Details

III Engineering

E1 Conduct of Engineering

E1.1 Engineering Identification and Resolution of Problems

a. Inspection Scope (37550, 40500)

The inspector reviewed a selected sample of Problem Identification Forms (PIFs) and evaluated the scope of the corrective actions and the technical adequacy of the problem resolution.

b. Observations and Findings

In the majority of the selected sample, the scope of the corrective actions specified in the PIFs adequately addressed the root cause of the problem. There were limited instances where the corrective actions addressed the specific issue, but the overall extent of problem was not evaluated. In several of these instances, the listed corrective actions were considered insufficient because the extent of the problem was not determined or the corrective actions did not address the broader scope of the problem.

For example, PIF L-1999-01161 identified several administrative issues and one technical question in a structural analysis for pipe supports VG01-0016X and VG01-2021X. The administrative issues related to the lack of documentation within the calculation. The technical issue related to the validity of a 0.65 effective length factor (K-factor) used in the analysis. The corrective actions revised the associated calculation L-001966, to include the proper documentation for the design inputs and to technically justify the acceptability of the K-factor. These actions addressed the specific problem, but there were no corrective actions to address the broader issue for the lack of documentation and justification in the calculation. In discussing this issue further, the inspector was informed that additional actions had been taken to address the broader issue, but had not been documented in the PIF. The licensee had conducted a meeting with engineers performing comparable calculations to reiterate the requirements of Procedure NEP-12-02, "Preparation, Review, and Approval of Calculations," to clearly state assumptions and judgments in the body of calculations. Since the K-factor was subsequently shown to be acceptable, and the assumptions and judgments were adequately documented in most other reviewed calculations, the inspector considered this additional action to be sufficient to resolve the broader issue.

However, in PIF L-1999-00596, regarding incorrect fillet weld sizes being specified on pipe supports, the corrective actions only addressed the problem for the two identified instances. No actions were taken to determine the extent of the problem. The inspector reviewed a very limited sample of similarly configured pipe supports and identified that the size of the fillet welds specified on design drawings M09-LP01-2810X, M09-LP28-2803X, M09-RH04-2889V, and M09-RHB9-2803X was not in accordance with the

minimum weld size required by the construction code. In more than 10 percent of a limited sample, the specified fillet weld size was less than the minimum size required by the American Institute of Steel Construction's, "Manual of Steel Construction."

Based on the extensive nature of this problem, the failure to identify and resolve the generic aspect of the minimum fillet weld size was a violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action" (50-373/374-99020-01). This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy. This violation is in the licensee's corrective action program as PIF L1999 - 04753.

In addition to considering the scope of the corrective actions, the inspector reviewed the adequacy of the technical resolutions for identified problems. The technical resolution of the problems was found to be adequate, with one exception. In this case, the technical basis for resolving a potentially nonconservative design assumption was not adequately demonstrated.

The issue pertained to assumptions used in finite element analyses of pipe supports for the attachment of structural members to baseplates. In certain cases, design engineers assumed that the structural attachment points at baseplates were free to rotate. This is termed a "pinned" connection which assumes that only forces will be transferred across this attachment in contrast to a "fixed" connection which assumes that both forces and bending moments will be transferred. Assuming "pinned" connections for the purpose of analysis of framed structures is not uncommon; however, the reasonableness of the assumption depends in large measure on the flexibility of the structural support, the connection detail of the structural steel to the baseplate, and the flexibility of the baseplate and the baseplate anchor bolts. For the LaSalle application, the connections in question were constructed as fixed connections by full-welding the structural members to the baseplates thus eliminating the flexibility contribution of the structural steel to baseplate connection. The needed flexibility was to be derived from the limited flexibility of the frame, the baseplate and the baseplate anchor bolts. This apparent disparity between the design assumption and construction detail could potentially result in underestimating the loads induced in the baseplate anchor bolts. The relative stiffness of the structural frame compared to the flexibility of the baseplate and anchor bolts determines how much the anchor bolt loads may have been underestimated or overestimated.

The licensee recognized the potential generic applicability of this issue and used a statistical sampling approach to evaluate the general effect of the modeling assumption. Since the sample size was consistent with the "95/95 acceptance sampling" described in NUREG 1475, "Applying Statistics," the scope of the licensee's corrective action was determined to be acceptable. However, as described below, the technical justification for the design values for the flexibility of certain anchor bolts in the evaluation was not adequate.

In reviewing analyses for detailed baseplate evaluations, the inspector questioned the relatively low stiffness value of 21,330 pounds per inch for 3/4-inch diameter concrete expansion anchors. In response, the licensee provided the load-displacement curve

from prior anchor bolt tests that was the basis for the stiffness value given in Structural Design Standard SDS E-11.0, "Hilti Kwik Bolt Design." An approximate representation of the load-displacement plot provided by the licensee is given in Figure 1 below. The anchor bolt stiffness value of 21,330 pounds per inch was roughly derived by using the anchor bolt displacement at the ultimate load. However, as can be seen in Figure 1, the initial portion of the load-displacement plot is a significantly steeper line compared to the assumed line, indicating a much stiffer behavior. Since allowable anchor bolt loads are defined as one-fourth of the ultimate load, the anchor bolt will not exhibit the flexibility assumed in the licensee's calculations unless the anchor bolt load substantially exceeds the allowable load. In some applications, significantly underestimating the anchor bolt stiffness will result in underestimating the anchor bolt load, potentially affecting the design adequacy of the support. The failure to verify the adequacy of design is a violation of 10 CFR 50, Appendix B, Criterion III, "Design Control" (50-373/374-99020-02). This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy. This violation is in the licensee's corrective action program as PIF L1999 - 04779.

c. Conclusions

The scope of the corrective actions and the associated technical evaluations for the reviewed Problem Identification Forms adequately addressed the root cause of the problem and adequately resolved the problem, in the majority of the sample selected during this inspection. This design control problem was treated as a non-cited violation. However, in one instance the corrective actions to resolve problems with welds not meeting Code required minimum sizes only addressed two specifically identified cases and did not resolve the problem for the extent of the condition. This corrective action problem was treated as a non-cited violation. In another case, the technical basis for assumed anchor bolt stiffness values used in calculations to address a piping support design issue was not adequately demonstrated. This design control problem was treated as a non-cited violation.

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on October 6, 1999. The licensee acknowledged the findings presented. The licensee did not identify any items discussed as proprietary.

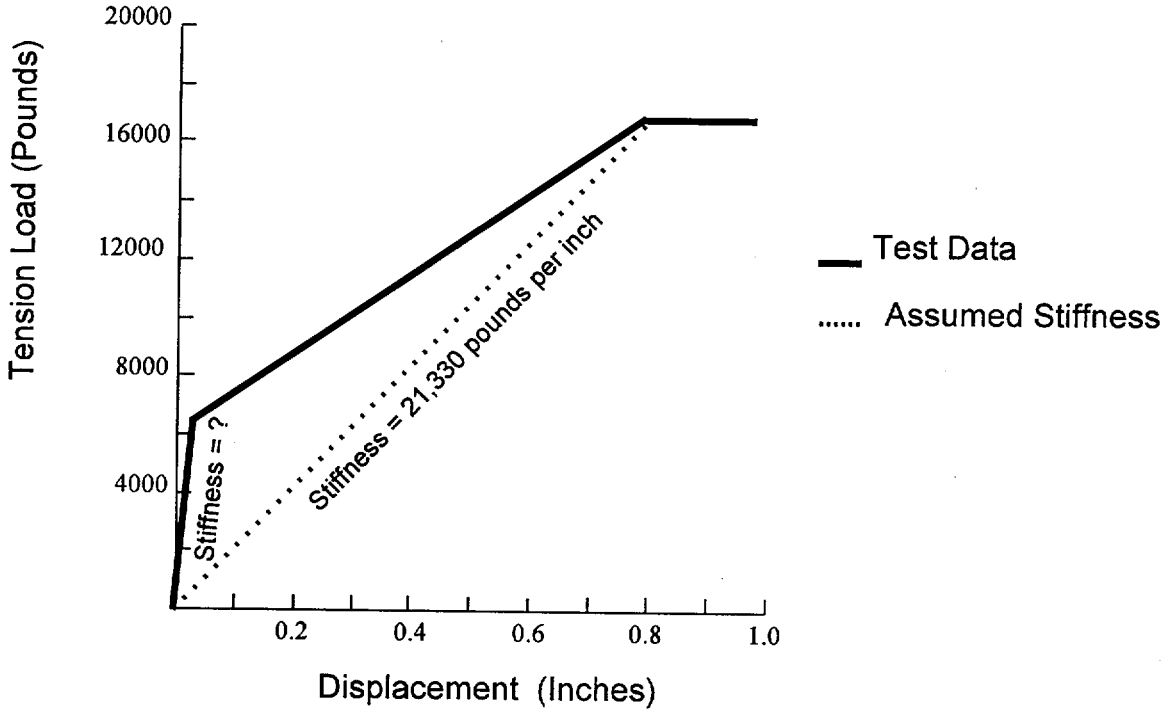

Figure 1. Representative Load vs Displacement Plot for 3/4-inch Concrete Expansion Anchor

PARTIAL LIST OF PERSONS CONTACTED

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INSPECTION PROCEDURES USED

IP 40500:	Effectiveness of Licensee Controls in Identifying, Resolving and Preventing Problems
IP37550:	Engineering

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

373/374-99020-01	NCV	Inadequate corrective action for minimum fillet weld size.
373/374-99020-02	NCV	Inadequate design control for anchor bolt stiffness value.

Closed

373/374-99020-01	NCV	Inadequate corrective action for minimum fillet weld size.
373/374-99020-02	NCV	Inadequate design control for anchor bolt stiffness value.

Discussed

None

LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
DRS	Division of Reactor Safety
NCV	Non-Cited Violation
PIF	Problem Identification Form