



**Commonwealth Edison**  
One First National Plaza, Chicago, Illinois  
Address Reply to: Post Office Box 767  
Chicago, Illinois 60690

March 15, 1982

Mr. James G. Keppler, Regional Administrator  
Directorate of Inspection and  
Enforcement - Region III  
U.S. Nuclear Regulatory Commission  
799 Roosevelt Road  
Glen Ellyn, IL 60137



Subject: LaSalle County Station Units 1 and 2  
Final Report on Pipe Support Base  
Plate Design Using Concrete Expansion  
Anchor Bolts  
NRC Docket Nos. 50-373 and 50-374

- References (a): Cordell Reed letter to J. Keppler dated July 5, 1979, Providing Response to I.E. Bulletin 79-02, Rev. 1.
- (b): D. Peoples letter to J. Keppler dated December 7, 1979, Providing Response to I.E. Bulletin 79-02, Rev. 2.
- (c): E. D. Swartz letter to J. Keppler dated August 26, 1981, Enclosing Summary Report Entitled "Static, Dynamic and Relaxation Testing of Expansion Anchors."

Dear Mr. Keppler:

The purpose of this letter is to transmit to you three (3) copies of the Final Report on Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts for LaSalle County Station. The final report is in response to NRC I.E. Bulletin 79-02, Revision 2, dated November 8, 1979, requiring all licensees and construction permit holders for nuclear power plants to review the design and installation procedures for concrete expansion anchor bolts used in pipe support base plates in seismic Category I systems.

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J. G. Keppler

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If there are any further questions in this matter, please contact this office.

Very truly yours,

*CW Schroeder 3/15/82*

C. W. Schroeder  
Nuclear Licensing Administrator

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Enclosures

cc: NRC Resident Inspector - LSCS  
Office of Insp. & Enf. - Wash.

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FINAL REPORT  
ON  
PIPE SUPPORT BASE PLATE DESIGNS  
USING CONCRETE EXPANSION ANCHOR BOLTS

(IN RESPONSE TO NRC IE BULLETIN 79-02, REV. 2 DATED NOV. 8, 1979)

LA SALLE COUNTY - UNITS 1 & 2

1.0 INTRODUCTION

This final report is in response to NRC IE Bulletin 79-02, Revision 2, dated November 8, 1979, requiring all licensees and construction permit holders for nuclear power plants to review the design and installation procedures for concrete expansion anchor bolts used in pipe support base plates in seismic category I systems.

1.1 PREVIOUS RESPONSES BY COMMONWEALTH EDISON COMPANY (CECO) TO NRC

The following responses have been previously sent by CECO to NRC. These responses will be referenced as required in this final report.

- (a) Cordell Reed letter to J. G. Keppler dated July 5, 1979, providing response to IE Bulletin 79-02 Rev. 1.
- (b) D. L. People's letter to J. G. Keppler, dated December 7, 1979, providing response to IE Bulletin 79-02 Rev. 2.
- (c) E. Douglas Swartz letter to J. G. Keppler dated August 26, 1981, enclosing Summary Report entitled "Static, Dynamic and Relaxation Testing of Expansion Anchors."

2.0 RESPONSE TO ACTION ITEMS

Item I

Verify that pipe support base plate flexibility was accounted for in the calculation of anchor bolt loads. In lieu of supporting analysis justifying the assumption of rigidity, the base plates should be considered flexible if the unstiffened distance between the member welded to the plate and the edge of the base plate is greater than twice the thickness of the plate. It is recognized that this criterion is conservative. Less conservative acceptance criteria must be justified and the justification submitted as part of the response to the Bulletin. If the base plate is determined to be flexible, then recalculate the bolt loads using an appropriate analysis. If possible, this is

to be done prior to testing of anchor bolts. These calculated bolt loads are referred to hereafter as the bolt design loads. A description of the analytical model used to verify that pipe support base plate flexibility is accounted for in the calculation of anchor bolt loads is to be submitted with your response to the Bulletin.

### Response

Pipe support base plate flexibility has been accounted for in the calculation of expansion anchor bolt loads. Our analytical work in the form of report, entitled "Evaluation of Analysis Procedures for the Design of Expansion Anchored Plates in Concrete" dated May 31, 1979, was sent to NRC per reference 1.1(a). It has been shown in that report, that, when the flexibility of the expansion anchored base plate assembly, in conjunction with the load versus displacement behavior of the expansion anchor, is accounted for in a finite element solution, the "prying action" forces are largely relieved.

The results of our analytical work described above, are substantiated by the results of flexible base plate tests performed under the direction of an independent testing laboratory. Copies of our Summary Report of these tests were sent to NRC per Reference 1.1(c). The results of these tests show that prying action is in the order of 15-20% of the applied load. This increase in load due to prying action is lower than originally anticipated due to the lower stiffness modulus of expansion anchors installed in concrete.

The effect of plate flexibility has been considered in the design of all pipe support base plates in LaSalle County Units 1&2.

### Item 2

Verify that the concrete expansion anchor bolts have the following minimum factor of safety between the bolt design load and the bolt ultimate capacity determined from static load tests (e.g., anchor bolt manufacturer's) which simulate the actual conditions of installation (i.e., type of concrete and its strength properties):

- a. Four - For wedge and sleeve type anchor bolts,
- b. Five - For shell type anchor bolts.

The bolt ultimate capacity should account for the effects of shear-tension interaction, minimum edge distance and proper bolt spacing.

If the minimum factor of safety of four for wedge type anchor bolts and five for shell type anchors cannot be shown then justification must be provided. The Bulletin factors

of safety were intended for the maximum support load including the SSE. The NRC has not yet been provided adequate justification that lower factors of safety are acceptable on a long term basis. Lower factors of safety are allowed on an interim basis by the provisions of Supplement No. 1 to IE Bulletin No. 79-02. The use of reduced factors of safety in the factored load approach of ACI 349-76 has not yet been accepted by the NRC.

### Response

Wedge type expansion anchors have been used exclusively in safety related areas for LaSalle County Units 1&2. All expansion anchored pipe base plate assemblies have been re-evaluated for a minimum factor of safety equal to 4.0 for the maximum support load including the SSE. Existing expansion anchored pipe base plates have been modified if required to provide a minimum factor of safety of 4.0.

The shear-tension interaction in the expansion anchors has been accounted for in the following manner:

In most cases, the total applied tension and shear is considered to be carried by the expansion anchors in accordance with the following interaction equation:

$$\left( \frac{T}{T_{\max}} \right)^{5/3} + \left( \frac{V}{V_{\max}} \right)^{5/3} \leq 1.0$$

where:

- T = Actual tension load in the anchor
- V = Actual shear load in the anchor
- $T_{\max}$  = Allowable tension in the anchor
- $V_{\max}$  = Allowable shear in the anchor

In some cases, expansion anchored plate assemblies have been designed using a more conservative straight line interaction based on the shear friction concepts using a coefficient of friction  $\mu$  equal to 0.7. The resulting interaction equation is:

$$T + \frac{V}{0.7} \leq T_{\max}$$

or  $T + 1.4V \leq T_{\max}$

The straight line interaction approach is considerably more conservative compared to the elliptical interaction formula described above.

### Item 3

Describe the design requirements if applicable for anchor bolts to withstand cyclic loads (e.g., seismic loads and high cycle operating loads).

## Response

The dynamic/cyclic loads for which the pipe support base plates have been designed are obtained either from a response spectrum or time history method of analysis, and therefore, properly account for any dynamic load consideration. The concrete expansion anchor design allowables are based upon maintaining a minimum factor of safety 4.0 between the dynamic/cyclic design loads for OBE & SSE events and the bolt ultimate capacity.

Commonwealth Edison Company has completed a comprehensive dynamic test program to verify the dynamic behavior of expansion anchors. These tests verified that expansion anchors installed in reinforced concrete and in concrete block walls maintained a minimum factor of safety 4.0 under cyclic loading. These tests also showed that preload is not a determining factor as far as capacity of the anchor is concerned.

Three (3) copies of our Summary Report entitled "Static, Dynamic and Relaxation Testing of Expansion Anchors in Response to NRC IE Bulletin 79-02" were sent to NRC per Reference 1.1(c).

### Item 4

Verify from existing QC documentation that design requirements have been met for each anchor bolt in the following areas:

- (a) Cyclic loads have been considered (e.g., anchor bolt preload is equal to or greater than bolt design load). In the case of the shell type, assure that it is not in contact with the back of the support plate prior to preload testing.
- (b) Specified design size and type is correctly installed (e.g., proper embedment depth).

If sufficient documentation does not exist, then initiate a testing program that will assure that minimum design requirements have been met with respect to sub-items (a) and (b) above. A sampling technique is acceptable. One acceptable technique is to randomly select and test one anchor bolt in each base plate (i.e., some supports may have more than one base plate). The test should provide verification of sub-items (a) and (b) above. If the test fails, all other bolts on that base plate should assure that each Seismic Category I system will perform its intended function.

### Response

Wedge type expansion anchors have been used exclusively in safety related areas for LaSalle County Units 1 and 2. Embedded lengths of both 4 1/2 anchor diameters and 8 anchor diameters have been used for the wedge type anchors. All expansion anchors have been installed at LaSalle County Units 1 and 2 in accordance with approved QA/QC procedures. These procedures require, as a minimum, verification of the following items:

- (a) Installation torque
- (b) Test torque (a verification of proper installation torque)
- (c) Embedment length
- (d) Anchor size

The design of the expansion anchors for LaSalle County Units 1 and 2 has assured that the expansion anchor preload is greater than or equal to the design load. However, the results of our tests described under Item 3 show that loss of preload in an anchor does not affect the static ultimate load capacity of the anchor, nor is preload required in an anchor to withstand cyclic loading.

Documentation of existing expansion anchor installations at LaSalle County Units 1 and 2 is available for review by NRC.

### Item 5

Determine the extent that expansion anchor bolts were used in concrete block (masonry) walls to attach piping supports in Seismic Category 1 systems (or safety related systems as defined by Revision 1 of IE Bulletin No. 79-02). If expansion anchor bolts were used in concrete block walls:

- a. Provide a list of the systems involved, with the number of supports, type of anchor bolt, line size, and whether these supports are accessible during normal plant operation.
- b. Describe in detail any design consideration used to account for this type of installation.
- c. Provide a detailed evaluation of the capability of the supports, including the anchor bolts, and block wall to meet the design loads. The evaluation must describe how the allowable loads on anchor bolts in concrete block walls were determined and also what analytical

method was used to determine the integrity of the block walls under the imposed loads. Also describe the acceptance criteria, including the numerical values, used to perform this evaluation. Review the deficiencies identified in the Information Notice on the pipe supports and walls at Trojan to determine if a similar situation exists at your facility with regard to supports using anchor bolts in concrete block walls.

- d. Describe the results of testing of anchor bolts in concrete block walls and your plans and schedule for any further action.

#### Response

- a. Our initial response to this Bulletin per Reference 1.1(b) indicated that safety related pipe supports using expansion anchors have not been attached to concrete masonry walls. Presently, three HVAC sensing lines (OVE 01A, OVE 02A and OVE 04A), 3/8"Ø and running in a 1 1/4"Ø conduit have been allowed to be attached to a masonry wall at three points using thru bolts and not expansion anchors. Other piping attachment to concrete masonry walls basically involves non-safety, small bore Class-D piping (line size 2 1/2"Ø and under) such as instrument air lines, HVAC and process sensing lines. Piping supports may be allowed for attachment to masonry walls when no other feasible supporting structure is available in the vicinity. In such cases, the adequacy of both the masonry wall and the expansion anchored assembly, is reviewed before the attachment is approved.

The safety related pipe supports attached to the masonry wall as described above are accessible during normal plant operation.

- b. The use of expansion anchors in concrete masonry walls has been restricted to solid and grouted concrete masonry walls, and to the attachment of small loads, typically less than 500 pounds. Items falling under this category, for example, are small bore piping, instrumentation lines, conduits and electrical junction boxes. Heavier loads have not been permitted to be attached to concrete masonry walls, nor have expansion anchors been used in hollow concrete masonry walls.

Items actually attached to concrete masonry walls have been verified by field survey, and a final load check has been conducted to assure the adequacy of the masonry walls to carry the applied loads.

- c. The allowable design loads for expansion anchors in concrete masonry walls have been determined by static

tests conducted at various units currently under construction. Also, tests have been performed under the direction of an independent testing laboratory, as explained in response to Item 1. The anchors in these tests were installed in solid concrete masonry units and in the masonry mortar joints. The allowable loads for expansion anchors installed in solid concrete masonry have, thereby, been established as approximately one-half of the corresponding allowables in plain concrete. The expansion anchors provide a minimum factor of safety equal to 4.0 against ultimate test loads for the maximum support load including the SSE after accounting for the effects of plate and anchor flexibility.

The following concrete masonry units are used at LaSalle County Units 1 and 2.

1. Masonry Units - ASTM C145, Type N-1 blocks, having a minimum net compressive strength equal to 1800 psi.
2. Mortar - ASTM C270, Type M, having a minimum compressive strength equal to 2500 psi at 28 days.

The concrete masonry walls have been designed using elastic techniques. The allowable stresses in concrete masonry walls are in accordance with the National Concrete Masonry Association (NCMA) specifications for non-reinforced concrete masonry. These stresses are:

<u>Allowable Stress</u>	<u>Type M Mortar</u>
Shear	34 psi
Tension in flexure normal to bed joints	39 psi
Tension in flexure parallel to bed joints	78 psi

These allowable stresses are based upon a factor of safety equal to approximately 3.0 against ultimate stress.

No overstress has been permitted for OBE load combination. An overstress factor of 1.67 has been permitted for SSE load combination.

A complete description of the concrete masonry wall design criteria is provided in CECO's response to NRC IE Bulletin 80-11.

Commonwealth Edison Company has reviewed the deficiencies identified in the information notice concerning the adequacy of concrete masonry walls to

support attached items at the Trojan Plant, and has determined that a similar situation does not exist at LaSalle County Units 1&2.

- d. Tests have been performed on the capacity of expansion anchors in concrete masonry walls on several plants currently under construction. Also, Commonwealth Edison Company had committed in response to this Bulletin to participate in a comprehensive static and dynamic test program to substantiate the behavior of expansion anchors in concrete masonry walls. These tests have since been completed. The tests showed that expansion anchors installed in concrete masonry walls maintained a minimum factor of safety 4.0 under cyclic loading and that preload is not a determining factor as far as capacity of the anchor is concerned. A summary report on these tests was sent to NRC per Reference 1.1(C).

#### Item 6

Determine the extent that pipe supports with expansion anchor bolts used structural steel shapes instead of base plates. The systems and lines reviewed must be consistent with the criteria of IE Bulletin No. 79-02, Revision 1. If expansion anchor bolts were used as described above, verify that the anchor bolt and structural steel shapes in these supports were included in the actions performed for the Bulletin. If these supports cannot be verified to have been included in the Bulletin actions:

- (a) Provide a list of the systems involved, with the number of supports, type of anchor bolt, line size, and whether the supports are accessible during normal plant operation.
- (b) Provide a detailed evaluation of the adequacy of the anchor bolt design and installation. The evaluation should address the assumed distribution of loads on the anchor bolts. The evaluation can be based on the results of previous anchor bolt testing and/or analysis which substantiates operability of the affected system.
- (c) Describe your plans and schedule for any further action necessary to assure the affected systems meet Technical Specifications operability requirements in the event of an SSE.

#### Response

In LaSalle County Units 1 and 2, the design of safety related pipe supports with expansion anchors generally involved the use of base plates. In a few cases structural

steel shapes with expansion anchors are used instead of base plates, to support relatively light loads. In all cases where this design is encountered, the entire support has been treated in accordance with the criteria set forth in this bulletin.

#### Item 7

For those licensees that have had no extended outages to perform the testing of the inaccessible anchor bolts, the testing of anchor bolts in accessible areas is expected to be completed by November 15, 1979. The testing of the inaccessible anchor bolts should be completed by the next extended outage. For those licensees that have completed the anchor bolt testing in inaccessible areas, the testing in accessible areas should continue as rapidly as possible, but no longer than March 1, 1980. The analysis for the Bulletin items covering base plate flexibility and factors of safety should be completed by November 15, 1979. Provide a schedule that details the completion dates for IE Bulletin No. 79-02, Revision 2, items 1, 2, and 4.

#### Response

Testing of installed expansion anchors at LaSalle County Units 1 and 2 is not required since documentation of expansion anchor installation with approved QA/QC procedures is available.

#### Item 8

Maintain documentation of any sampling inspection of anchor bolts required by item 4 on site and available for NRC inspection. All holders of operating licenses for power reactor facilities are requested to complete items 5, 6, and 7 within 30 days of the date of issuance of Revision No. 2. Also describe any instances not previously reported, in which you did not meet the revised (R2) sections of items 2 and 4 and, if necessary, your plans and schedule for resolution. Report in writing within 30 days of the date of this revision issuance, to the Director of the appropriate Regional Office, completion of your review. For action not yet complete, a final report is to be submitted upon completion of your action. A copy of your report(s) should be sent to the United States Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Reactor Operations Inspection, Washington, D.C. 20555. These reporting requirements do not preclude nor substitute for the applicable requirements to report as set forth in the regulations and license.

#### Response

Documentation of expansion anchor installation and verification is maintained onsite at LaSalle County Units 1 and 2

and is available for NRC Inspection. Requirements of the revised (R2) sections of Items 2 and 4 have been met as noted in the response to these items in this report.

#### Item 9

All holders of construction permits for power reactor facilities are requested to complete Items 5 and 6 for installed pipe supports within 60 days of date of issuance of Revision 2. For pipe supports which have not yet been installed, document your action to ensure that Items 1 through 6 will be satisfied. Maintain documentation of these actions on-site available for NRC inspection. Report in writing within 60 days of date of issuance of Revision 2, to the director of the appropriate NRC Regional Office, completion of your review and describe any instances not previously reported in which you did not meet the revised (R2) sections of Items 2 and 4 and, if necessary, your plans and schedule for resolution. A copy of your report should be sent to the United States Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Reactor Construction Inspection, Washington, D.C. 20555.

#### Response

No response is required.

### 3.0

#### CONCLUSION

As explained in the responses to individual items of the Bulletin in Section 2.0 of this report, the design and installation of all safety related pipe supports with expansion anchors, at LaSalle County Units 1&2, is in conformance with the requirements of NRC IE Bulletin 79-02, Rev. 2.

FINAL REPORT  
ON  
PIPE SUPPORT BASE PLATE DESIGNS  
USING CONCRETE EXPANSION ANCHOR BOLTS

(IN RESPONSE TO NRC IE BULLETIN 79-02, REV. 2 DATED NOV. 8, 1979)

LA SALLE COUNTY - UNITS 1 & 2

1.0 INTRODUCTION

This final report is in response to NRC IE Bulletin 79-02, Revision 2, dated November 8, 1979, requiring all licensees and construction permit holders for nuclear power plants to review the design and installation procedures for concrete expansion anchor bolts used in pipe support base plates in seismic category I systems.

1.1 PREVIOUS RESPONSES BY COMMONWEALTH EDISON COMPANY (CECO) TO NRC

The following responses have been previously sent by CECO to NRC. These responses will be referenced as required in this final report.

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2.0 RESPONSE TO ACTION ITEMS

Item I

Verify that pipe support base plate flexibility was accounted for in the calculation of anchor bolt loads. In lieu of supporting analysis justifying the assumption of rigidity, the base plates should be considered flexible if the unstiffened distance between the member welded to the plate and the edge of the base plate is greater than twice the thickness of the plate. It is recognized that this criterion is conservative. Less conservative acceptance criteria must be justified and the justification submitted as part of the response to the Bulletin. If the base plate is determined to be flexible, then recalculate the bolt loads using an appropriate analysis. If possible, this is

to be done prior to testing of anchor bolts. These calculated bolt loads are referred to hereafter as the bolt design loads. A description of the analytical model used to verify that pipe support base plate flexibility is accounted for in the calculation of anchor bolt loads is to be submitted with your response to the Bulletin.

#### Response

Pipe support base plate flexibility has been accounted for in the calculation of expansion anchor bolt loads. Our analytical work in the form of report, entitled "Evaluation of Analysis Procedures for the Design of Expansion Anchored Plates in Concrete" dated May 31, 1979, was sent to NRC per reference 1.1(a). It has been shown in that report, that, when the flexibility of the expansion anchored base plate assembly, in conjunction with the load versus displacement behavior of the expansion anchor, is accounted for in a finite element solution, the "prying action" forces are largely relieved.

The results of our analytical work described above, are substantiated by the results of flexible base plate tests performed under the direction of an independent testing laboratory. Copies of our Summary Report of these tests were sent to NRC per Reference 1.1(c). The results of these tests show that prying action is in the order of 15-20% of the applied load. This increase in load due to prying action is lower than originally anticipated due to the lower stiffness modulus of expansion anchors installed in concrete.

The effect of plate flexibility has been considered in the design of all pipe support base plates in LaSalle County Units 1&2.

#### Item 2

Verify that the concrete expansion anchor bolts have the following minimum factor of safety between the bolt design load and the bolt ultimate capacity determined from static load tests (e.g., anchor bolt manufacturer's) which simulate the actual conditions of installation (i.e., type of concrete and its strength properties):

- a. Four - For wedge and sleeve type anchor bolts,
- b. Five - For shell type anchor bolts.

The bolt ultimate capacity should account for the effects of shear-tension interaction, minimum edge distance and proper bolt spacing.

If the minimum factor of safety of four for wedge type anchor bolts and five for shell type anchors cannot be shown then justification must be provided. The Bulletin factors

of safety were intended for the maximum support load including the SSE. The NRC has not yet been provided adequate justification that lower factors of safety are acceptable on a long term basis. Lower factors of safety are allowed on an interim basis by the provisions of Supplement No. 1 to IE Bulletin No. 79-02. The use of reduced factors of safety in the factored load approach of ACI 349-76 has not yet been accepted by the NRC.

### Response

Wedge type expansion anchors have been used exclusively in safety related areas for LaSalle County Units 1&2. All expansion anchored pipe base plate assemblies have been re-evaluated for a minimum factor of safety equal to 4.0 for the maximum support load including the SSE. Existing expansion anchored pipe base plates have been modified if required to provide a minimum factor of safety of 4.0.

The shear-tension interaction in the expansion anchors has been accounted for in the following manner:

In most cases, the total applied tension and shear is considered to be carried by the expansion anchors in accordance with the following interaction equation:

$$\left( \frac{T}{T_{\max}} \right)^{5/3} + \left( \frac{V}{V_{\max}} \right)^{5/3} \leq 1.0$$

where:

- T = Actual tension load in the anchor
- V = Actual shear load in the anchor
- $T_{\max}$  = Allowable tension in the anchor
- $V_{\max}$  = Allowable shear in the anchor

In some cases, expansion anchored plate assemblies have been designed using a more conservative straight line interaction based on the shear friction concepts using a coefficient of friction  $\mu$  equal to 0.7. The resulting interaction equation is:

$$T + \frac{V}{0.7} \leq T_{\max}$$

or  $T + 1.4V \leq T_{\max}$

The straight line interaction approach is considerably more conservative compared to the elliptical interaction formula described above.

### Item 3

Describe the design requirements if applicable for anchor bolts to withstand cyclic loads (e.g., seismic loads and high cycle operating loads).

## Response

The dynamic/cyclic loads for which the pipe support base plates have been designed are obtained either from a response spectrum or time history method of analysis, and therefore, properly account for any dynamic load consideration. The concrete expansion anchor design allowables are based upon maintaining a minimum factor of safety 4.0 between the dynamic/cyclic design loads for OBE & SSE events and the bolt ultimate capacity.

Commonwealth Edison Company has completed a comprehensive dynamic test program to verify the dynamic behavior of expansion anchors. These tests verified that expansion anchors installed in reinforced concrete and in concrete block walls maintained a minimum factor of safety 4.0 under cyclic loading. These tests also showed that preload is not a determining factor as far as capacity of the anchor is concerned.

Three (3) copies of our Summary Report entitled "Static, Dynamic and Relaxation Testing of Expansion Anchors in Response to NRC IE Bulletin 79-02" were sent to NRC per Reference 1.1(c).

## Item 4

Verify from existing QC documentation that design requirements have been met for each anchor bolt in the following areas:

- (a) Cyclic loads have been considered (e.g., anchor bolt preload is equal to or greater than bolt design load). In the case of the shell type, assure that it is not in contact with the back of the support plate prior to preload testing.
- (b) Specified design size and type is correctly installed (e.g., proper embedment depth).

If sufficient documentation does not exist, when initiate a testing program that will assure that minimum design requirements have been met with respect to sub-items (a) and (b) above. A sampling technique is acceptable. One acceptable technique is to randomly select and test one anchor bolt in each base plate (i.e., some supports may have more than one base plate). The test should provide verification of sub-items (a) and (b) above. If the test fails, all other bolts on that base plate should assure that each Seismic Category I system will perform its intended function.

## Response

Wedge type expansion anchors have been used exclusively in safety related areas for LaSalle County Units 1 and 2. Embedded lengths of both 4 1/2 anchor diameters and 8 anchor diameters have been used for the wedge type anchors. All expansion anchors have been installed at LaSalle County Units 1 and 2 in accordance with approved QA/QC procedures. These procedures require, as a minimum, verification of the following items:

- (a) Installation torque
- (b) Test torque (a verification of proper installation torque)
- (c) Embedment length
- (d) Anchor size

The design of the expansion anchors for LaSalle County Units 1 and 2 has assured that the expansion anchor preload is greater than or equal to the design load. However, the results of our tests described under Item 3 show that loss of preload in an anchor does not affect the static ultimate load capacity of the anchor, nor is preload required in an anchor to withstand cyclic loading.

Documentation of existing expansion anchor installations at LaSalle County Units 1 and 2 is available for review by NRC.

## Item 5

Determine the extent that expansion anchor bolts were used in concrete block (masonry) walls to attach piping supports in Seismic Category 1 systems (or safety related systems as defined by Revision 1 of IE Bulletin No. 79-02). If expansion anchor bolts were used in concrete block walls:

- a. Provide a list of the systems involved, with the number of supports, type of anchor bolt, line size, and whether these supports are accessible during normal plant operation.
- b. Describe in detail any design consideration used to account for this type of installation.
- c. Provide a detailed evaluation of the capability of the supports, including the anchor bolts, and block wall to meet the design loads. The evaluation must describe how the allowable loads on anchor bolts in concrete block walls were determined and also what analytical

method was used to determine the integrity of the block walls under the imposed loads. Also describe the acceptance criteria, including the numerical values, used to perform this evaluation. Review the deficiencies identified in the Information Notice on the pipe supports and walls at Trojan to determine if a similar situation exists at your facility with regard to supports using anchor bolts in concrete block walls.

- d. Describe the results of testing of anchor bolts in concrete block walls and your plans and schedule for any further action.

#### Response

- a. Our initial response to this Bulletin per Reference 1.1(b) indicated that safety related pipe supports using expansion anchors have not been attached to concrete masonry walls. Presently, three HVAC sensing lines (OVE 01A, OVE 02A and OVE 04A), 3/8"Ø and running in a 1 1/4"Ø conduit have been allowed to be attached to a masonry wall at three points using thru bolts and not expansion anchors. Other piping attachment to concrete masonry walls basically involves non-safety, small bore Class-D piping (line size 2 1/2"Ø and under) such as instrument air lines, HVAC and process sensing lines. Piping supports may be allowed for attachment to masonry walls when no other feasible supporting structure is available in the vicinity. In such cases, the adequacy of both the masonry wall and the expansion anchored assembly, is reviewed before the attachment is approved.

The safety related pipe supports attached to the masonry wall as described above are accessible during normal plant operation.

- b. The use of expansion anchors in concrete masonry walls has been restricted to solid and grouted concrete masonry walls, and to the attachment of small loads, typically less than 500 pounds. Items falling under this category, for example, are small bore piping, instrumentation lines, conduits and electrical junction boxes. Heavier loads have not been permitted to be attached to concrete masonry walls, nor have expansion anchors been used in hollow concrete masonry walls.

Items actually attached to concrete masonry walls have been verified by field survey, and a final load check has been conducted to assure the adequacy of the masonry walls to carry the applied loads.

- c. The allowable design loads for expansion anchors in concrete masonry walls have been determined by static

tests conducted at various units currently under construction. Also, tests have been performed under the direction of an independent testing laboratory, as explained in response to Item 1. The anchors in these tests were installed in solid concrete masonry units and in the masonry mortar joints. The allowable loads for expansion anchors installed in solid concrete masonry have, thereby, been established as approximately one-half of the corresponding allowables in plain concrete. The expansion anchors provide a minimum factor of safety equal to 4.0 against ultimate test loads for the maximum support load including the SSE after accounting for the effects of plate and anchor flexibility.

The following concrete masonry units are used at LaSalle County Units 1 and 2.

1. Masonry Units - ASTM C145, Type N-1 blocks, having a minimum net compressive strength equal to 1800 psi.
2. Mortar - ASTM C270, Type M, having a minimum compressive strength equal to 2500 psi at 28 days.

The concrete masonry walls have been designed using elastic techniques. The allowable stresses in concrete masonry walls are in accordance with the National Concrete Masonry Association (NCMA) specifications for non-reinforced concrete masonry. These stresses are:

<u>Allowable Stress</u>	<u>Type M Mortar</u>
Shear	34 psi
Tension in flexure normal to bed joints	39 psi
Tension in flexure parallel to bed joints	78 psi

These allowable stresses are based upon a factor of safety equal to approximately 3.0 against ultimate stress.

No overstress has been permitted for OBE load combination. An overstress factor of 1.67 has been permitted for SSE load combination.

A complete description of the concrete masonry wall design criteria is provided in CECO's response to NRC IE Bulletin 80-11.

Commonwealth Edison Company has reviewed the deficiencies identified in the information notice concerning the adequacy of concrete masonry walls to

support attached items at the Trojan Plant, and has determined that a similar situation does not exist at LaSalle County Units 1&2.

- d. Tests have been performed on the capacity of expansion anchors in concrete masonry walls on several plants currently under construction. Also, Commonwealth Edison Company had committed in response to this Bulletin to participate in a comprehensive static and dynamic test program to substantiate the behavior of expansion anchors in concrete masonry walls. These tests have since been completed. The tests showed that expansion anchors installed in concrete masonry walls maintained a minimum factor of safety 4.0 under cyclic loading and that preload is not a determining factor as far as capacity of the anchor is concerned. A summary report on these tests was sent to NRC per Reference 1.1(C).

#### Item 6

Determine the extent that pipe supports with expansion anchor bolts used structural steel shapes instead of base plates. The systems and lines reviewed must be consistent with the criteria of IE Bulletin No. 79-02, Revision 1. If expansion anchor bolts were used as described above, verify that the anchor bolt and structural steel shapes in these supports were included in the actions performed for the Bulletin. If these supports cannot be verified to have been included in the Bulletin actions:

- (a) Provide a list of the systems involved, with the number of supports, type of anchor bolt, line size, and whether the supports are accessible during normal plant operation.
- (b) Provide a detailed evaluation of the adequacy of the anchor bolt design and installation. The evaluation should address the assumed distribution of loads on the anchor bolts. The evaluation can be based on the results of previous anchor bolt testing and/or analysis which substantiates operability of the affected system.
- (c) Describe your plans and schedule for any further action necessary to assure the affected systems meet Technical Specifications operability requirements in the event of an SSE.

#### Response

In LaSalle County Units 1 and 2, the design of safety related pipe supports with expansion anchors generally involved the use of base plates. In a few cases structural

steel shapes with expansion anchors are used instead of base plates, to support relatively light loads. In all cases where this design is encountered, the entire support has been treated in accordance with the criteria set forth in this bulletin.

#### Item 7

For those licensees that have had no extended outages to perform the testing of the inaccessible anchor bolts, the testing of anchor bolts in accessible areas is expected to be completed by November 15, 1979. The testing of the inaccessible anchor bolts should be completed by the next extended outage. For those licensees that have completed the anchor bolt testing in inaccessible areas, the testing in accessible areas should continue as rapidly as possible, but no longer than March 1, 1980. The analysis for the Bulletin items covering base plate flexibility and factors of safety should be completed by November 15, 1979. Provide a schedule that details the completion dates for IE Bulletin No. 79-02, Revision 2, items 1, 2, and 4.

#### Response

Testing of installed expansion anchors at LaSalle County Units 1 and 2 is not required since documentation of expansion anchor installation with approved QA/QC procedures is available.

#### Item 8

Maintain documentation of any sampling inspection of anchor bolts required by item 4 on site and available for NRC inspection. All holders of operating licenses for power reactor facilities are requested to complete items 5, 6, and 7 within 30 days of the date of issuance of Revision No. 2. Also describe any instances not previously reported, in which you did not meet the revised (R2) sections of items 2 and 4 and, if necessary, your plans and schedule for resolution. Report in writing within 30 days of the date of this revision issuance, to the Director of the appropriate Regional Office, completion of your review. For action not yet complete, a final report is to be submitted upon completion of your action. A copy of your report(s) should be sent to the United States Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Reactor Operations Inspection, Washington, D.C. 20555. These reporting requirements do not preclude nor substitute for the applicable requirements to report as set forth in the regulations and license.

#### Response

Documentation of expansion anchor installation and verification is maintained onsite at LaSalle County Units 1 and 2

and is available for NRC Inspection. Requirements of the revised (R2) sections of Items 2 and 4 have been met as noted in the response to these items in this report.

#### Item 9

All holders of construction permits for power reactor facilities are requested to complete Items 5 and 6 for installed pipe supports within 60 days of date of issuance of Revision 2. For pipe supports which have not yet been installed, document your action to ensure that Items 1 through 6 will be satisfied. Maintain documentation of these actions on-site available for NRC inspection. Report in writing within 60 days of date of issuance of Revision 2, to the director of the appropriate NRC Regional Office, completion of your review and describe any instances not previously reported in which you did not meet the revised (R2) sections of Items 2 and 4 and, if necessary, your plans and schedule for resolution. A copy of your report should be sent to the United States Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Reactor Construction Inspection, Washington, D.C. 20555.

#### Response

No response is required.

### 3.0

#### CONCLUSION

As explained in the responses to individual items of the Bulletin in Section 2.0 of this report, the design and installation of all safety related pipe supports with expansion anchors, at LaSalle County Units 1&2, is in conformance with the requirements of NRC IE Bulletin 79-02, Rev. 2.

FINAL REPORT  
ON  
PIPE SUPPORT BASE PLATE DESIGNS  
USING CONCRETE EXPANSION ANCHOR BOLTS

(IN RESPONSE TO NRC IE BULLETIN 79-02, REV. 2 DATED NOV. 8, 1979)

LA SALLE COUNTY - UNITS 1 & 2

1.0 INTRODUCTION

This final report is in response to NRC IE Bulletin 79-02, Revision 2, dated November 8, 1979, requiring all licensees and construction permit holders for nuclear power plants to review the design and installation procedures for concrete expansion anchor bolts used in pipe support base plates in seismic category I systems.

1.1 PREVIOUS RESPONSES BY COMMONWEALTH EDISON COMPANY (CECO) TO NRC

The following responses have been previously sent by CECO to NRC. These responses will be referenced as required in this final report.

- (a) Cordell Reed letter to J. G. Keppler dated July 5, 1979, providing response to IE Bulletin 79-02 Rev. 1.
- (b) D. L. People's letter to J. G. Keppler, dated December 7, 1979, providing response to IE Bulletin 79-02 Rev. 2.
- (c) E. Douglas Swartz letter to J. G. Keppler dated August 26, 1981, enclosing Summary Report entitled "Static, Dynamic and Relaxation Testing of Expansion Anchors."

2.0 RESPONSE TO ACTION ITEMS

Item I

Verify that pipe support base plate flexibility was accounted for in the calculation of anchor bolt loads. In lieu of supporting analysis justifying the assumption of rigidity, the base plates should be considered flexible if the unstiffened distance between the member welded to the plate and the edge of the base plate is greater than twice the thickness of the plate. It is recognized that this criterion is conservative. Less conservative acceptance criteria must be justified and the justification submitted as part of the response to the Bulletin. If the base plate is determined to be flexible, then recalculate the bolt loads using an appropriate analysis. If possible, this is

to be done prior to testing of anchor bolts. These calculated bolt loads are referred to hereafter as the bolt design loads. A description of the analytical model used to verify that pipe support base plate flexibility is accounted for in the calculation of anchor bolt loads is to be submitted with your response to the Bulletin.

#### Response

Pipe support base plate flexibility has been accounted for in the calculation of expansion anchor bolt loads. Our analytical work in the form of report, entitled "Evaluation of Analysis Procedures for the Design of Expansion Anchored Plates in Concrete" dated May 31, 1979, was sent to NRC per reference 1.1(a). It has been shown in that report, that, when the flexibility of the expansion anchored base plate assembly, in conjunction with the load versus displacement behavior of the expansion anchor, is accounted for in a finite element solution, the "prying action" forces are largely relieved.

The results of our analytical work described above, are substantiated by the results of flexible base plate tests performed under the direction of an independent testing laboratory. Copies of our Summary Report of these tests were sent to NRC per Reference 1.1(c). The results of these tests show that prying action is in the order of 15-20% of the applied load. This increase in load due to prying action is lower than originally anticipated due to the lower stiffness modulus of expansion anchors installed in concrete.

The effect of plate flexibility has been considered in the design of all pipe support base plates in LaSalle County Units 1&2.

#### Item 2

Verify that the concrete expansion anchor bolts have the following minimum factor of safety between the bolt design load and the bolt ultimate capacity determined from static load tests (e.g., anchor bolt manufacturer's) which simulate the actual conditions of installation (i.e., type of concrete and its strength properties):

- a. Four - For wedge and sleeve type anchor bolts,
- b. Five - For shell type anchor bolts.

The bolt ultimate capacity should account for the effects of shear-tension interaction, minimum edge distance and proper bolt spacing.

If the minimum factor of safety of four for wedge type anchor bolts and five for shell type anchors cannot be shown then justification must be provided. The Bulletin factors

of safety were intended for the maximum support load including the SSE. The NRC has not yet been provided adequate justification that lower factors of safety are acceptable on a long term basis. Lower factors of safety are allowed on an interim basis by the provisions of Supplement No. 1 to IE Bulletin No. 79-02. The use of reduced factors of safety in the factored load approach of ACI 349-76 has not yet been accepted by the NRC.

### Response

Wedge type expansion anchors have been used exclusively in safety related areas for LaSalle County Units 1&2. All expansion anchored pipe base plate assemblies have been re-evaluated for a minimum factor of safety equal to 4.0 for the maximum support load including the SSE. Existing expansion anchored pipe base plates have been modified if required to provide a minimum factor of safety of 4.0.

The shear-tension interaction in the expansion anchors has been accounted for in the following manner:

In most cases, the total applied tension and shear is considered to be carried by the expansion anchors in accordance with the following interaction equation:

$$\left( \frac{T}{T_{\max}} \right)^{5/3} + \left( \frac{V}{V_{\max}} \right)^{5/3} \leq 1.0$$

where:

- T = Actual tension load in the anchor
- V = Actual shear load in the anchor
- $T_{\max}$  = Allowable tension in the anchor
- $V_{\max}$  = Allowable shear in the anchor

In some cases, expansion anchored plate assemblies have been designed using a more conservative straight line interaction based on the shear friction concepts using a coefficient of friction  $\mu$  equal to 0.7. The resulting interaction equation is:

$$T + \frac{V}{0.7} \leq T_{\max}$$

or  $T + 1.4V \leq T_{\max}$

The straight line interaction approach is considerably more conservative compared to the elliptical interaction formula described above.

### Item 3

Describe the design requirements if applicable for anchor bolts to withstand cyclic loads (e.g., seismic loads and high cycle operating loads).

## Response

The dynamic/cyclic loads for which the pipe support base plates have been designed are obtained either from a response spectrum or time history method of analysis, and therefore, properly account for any dynamic load consideration. The concrete expansion anchor design allowables are based upon maintaining a minimum factor of safety 4.0 between the dynamic/cyclic design loads for OBE & SSE events and the bolt ultimate capacity.

Commonwealth Edison Company has completed a comprehensive dynamic test program to verify the dynamic behavior of expansion anchors. These tests verified that expansion anchors installed in reinforced concrete and in concrete block walls maintained a minimum factor of safety 4.0 under cyclic loading. These tests also showed that preload is not a determining factor as far as capacity of the anchor is concerned.

Three (3) copies of our Summary Report entitled "Static, Dynamic and Relaxation Testing of Expansion Anchors in Response to NRC IE Bulletin 79-02" were sent to NRC per Reference 1.1(c).

### Item 4

Verify from existing QC documentation that design requirements have been met for each anchor bolt in the following areas:

- (a) Cyclic loads have been considered (e.g., anchor bolt preload is equal to or greater than bolt design load). In the case of the shell type, assure that ~~it is not~~ in contact with the back of the support plate prior to preload testing.
- (b) Specified design size and type is correctly installed (e.g., proper embedment depth).

If sufficient documentation does not exist, then initiate a testing program that will assure that minimum design requirements have been met with respect to sub-items (a) and (b) above. A sampling technique is acceptable. One acceptable technique is to randomly select and test one anchor bolt in each base plate (i.e., some supports may have more than one base plate). The test should provide verification of sub-items (a) and (b) above. If the test fails, all other bolts on that base plate should assure that each Seismic Category I system will perform its intended function.

## Response

Wedge type expansion anchors have been used exclusively in safety related areas for LaSalle County Units 1 and 2. Embedded lengths of both 4 1/2 anchor diameters and 8 anchor diameters have been used for the wedge type anchors. All expansion anchors have been installed at LaSalle County Units 1 and 2 in accordance with approved QA/QC procedures. These procedures require, as a minimum, verification of the following items:

- (a) Installation torque
- (b) Test torque (a verification of proper installation torque)
- (c) Embedment length
- (d) Anchor size

The design of the expansion anchors for LaSalle County Units 1 and 2 has assured that the expansion anchor preload is greater than or equal to the design load. However, the results of our tests described under Item 3 show that loss of preload in an anchor does not affect the static ultimate load capacity of the anchor, nor is preload required in an anchor to withstand cyclic loading.

Documentation of existing expansion anchor installations at LaSalle County Units 1 and 2 is available for review by NRC.

## Item 5

Determine the extent that expansion anchor bolts were used in concrete block (masonry) walls to attach piping supports in Seismic Category 1 systems (or safety related systems as defined by Revision 1 of IE Bulletin No. 79-02). If expansion anchor bolts were used in concrete block walls:

- a. Provide a list of the systems involved, with the number of supports, type of anchor bolt, line size, and whether these supports are accessible during normal plant operation.
- b. Describe in detail any design consideration used to account for this type of installation.
- c. Provide a detailed evaluation of the capability of the supports, including the anchor bolts, and block wall to meet the design loads. The evaluation must describe how the allowable loads on anchor bolts in concrete block walls were determined and also what analytical

method was used to determine the integrity of the block walls under the imposed loads. Also describe the acceptance criteria, including the numerical values, used to perform this evaluation. Review the deficiencies identified in the Information Notice on the pipe supports and walls at Trojan to determine if a similar situation exists at your facility with regard to supports using anchor bolts in concrete block walls.

- d. Describe the results of testing of anchor bolts in concrete block walls and your plans and schedule for any further action.

Response

- a. Our initial response to this Bulletin per Reference 1.1(b) indicated that safety related pipe supports using expansion anchors have not been attached to concrete masonry walls. Presently, three HVAC sensing lines (OVE 01A, OVE 02A and OVE 04A), 3/8"Ø and running in a 1 1/4"Ø conduit have been allowed to be attached to a masonry wall at three points using thru bolts and not expansion anchors. Other piping attachment to concrete masonry walls basically involves non-safety, small bore Class-D piping (line size 2 1/2"Ø and under) such as instrument air lines, HVAC and process sensing lines. Piping supports may be allowed for attachment to masonry walls when no other feasible supporting structure is available in the vicinity. In such cases, the adequacy of both the masonry wall and the expansion anchored assembly, is reviewed before the attachment is approved.

The safety related pipe supports attached to the masonry wall as described above are accessible during normal plant operation.

- b. The use of expansion anchors in concrete masonry walls has been restricted to solid and grouted concrete masonry walls, and to the attachment of small loads, typically less than 500 pounds. Items falling under this category, for example, are small bore piping, instrumentation lines, conduits and electrical junction boxes. Heavier loads have not been permitted to be attached to concrete masonry walls, nor have expansion anchors been used in hollow concrete masonry walls.

Items actually attached to concrete masonry walls have been verified by field survey, and a final load check has been conducted to assure the adequacy of the masonry walls to carry the applied loads.

- c. The allowable design loads for expansion anchors in concrete masonry walls have been determined by static

tests conducted at various units currently under construction. Also, tests have been performed under the direction of an independent testing laboratory, as explained in response to Item 1. The anchors in these tests were installed in solid concrete masonry units and in the masonry mortar joints. The allowable loads for expansion anchors installed in solid concrete masonry have, thereby, been established as approximately one-half of the corresponding allowables in plain concrete. The expansion anchors provide a minimum factor of safety equal to 4.0 against ultimate test loads for the maximum support load including the SSE after accounting for the effects of plate and anchor flexibility.

The following concrete masonry units are used at LaSalle County Units 1 and 2.

1. Masonry Units - ASTM C145, Type N-1 blocks, having a minimum net compressive strength equal to 1800 psi.
2. Mortar - ASTM C270, Type M, having a minimum compressive strength equal to 2500 psi at 28 days.

The concrete masonry walls have been designed using elastic techniques. The allowable stresses in concrete masonry walls are in accordance with the National Concrete Masonry Association (NCMA) specifications for non-reinforced concrete masonry. These stresses are:

<u>Allowable Stress</u>	<u>Type M Mortar</u>
Shear	34 psi
Tension in flexure normal to bed joints	39 psi
Tension in flexure parallel to bed joints	78 psi

These allowable stresses are based upon a factor of safety equal to approximately 3.0 against ultimate stress.

No overstress has been permitted for OBE load combination. An overstress factor of 1.67 has been permitted for SSE load combination.

A complete description of the concrete masonry wall design criteria is provided in CECO's response to NRC IE Bulletin 80-11.

Commonwealth Edison Company has reviewed the deficiencies identified in the information notice concerning the adequacy of concrete masonry walls to

support attached items at the Trojan Plant, and has determined that a similar situation does not exist at LaSalle County Units 1&2.

- d. Tests have been performed on the capacity of expansion anchors in concrete masonry walls on several plants currently under construction. Also, Commonwealth Edison Company had committed in response to this Bulletin to participate in a comprehensive static and dynamic test program to substantiate the behavior of expansion anchors in concrete masonry walls. These tests have since been completed. The tests showed that expansion anchors installed in concrete masonry walls maintained a minimum factor of safety 4.0 under cyclic loading and that preload is not a determining factor as far as capacity of the anchor is concerned. A summary report on these tests was sent to NRC per Reference 1.1(C).

#### Item 6

Determine the extent that pipe supports with expansion anchor bolts used structural steel shapes instead of base plates. The systems and lines reviewed must be consistent with the criteria of IE Bulletin No. 79-02, Revision 1. If expansion anchor bolts were used as described above, verify that the anchor bolt and structural steel shapes in these supports were included in the actions performed for the Bulletin. If these supports cannot be verified to have been included in the Bulletin actions:

- (a) Provide a list of the systems involved, with the number of supports, type of anchor bolt, line size, and whether the supports are accessible during normal plant operation.
- (b) Provide a detailed evaluation of the adequacy of the anchor bolt design and installation. The evaluation should address the assumed distribution of loads on the anchor bolts. The evaluation can be based on the results of previous anchor bolt testing and/or analysis which substantiates operability of the affected system.
- (c) Describe your plans and schedule for any further action necessary to assure the affected systems meet Technical Specifications operability requirements in the event of an SSE.

#### Response

In LaSalle County Units 1 and 2, the design of safety related pipe supports with expansion anchors generally involved the use of base plates. In a few cases structural

steel shapes with expansion anchors are used instead of base plates, to support relatively light loads. In all cases where this design is encountered, the entire support has been treated in accordance with the criteria set forth in this bulletin.

#### Item 7

For those licensees that have had no extended outages to perform the testing of the inaccessible anchor bolts, the testing of anchor bolts in accessible areas is expected to be completed by November 15, 1979. The testing of the inaccessible anchor bolts should be completed by the next extended outage. For those licensees that have completed the anchor bolt testing in inaccessible areas, the testing in accessible areas should continue as rapidly as possible, but no longer than March 1, 1980. The analysis for the Bulletin items covering base plate flexibility and factors of safety should be completed by November 15, 1979. Provide a schedule that details the completion dates for IE Bulletin No. 79-02, Revision 2, items 1, 2, and 4.

#### Response

Testing of installed expansion anchors at LaSalle County Units 1 and 2 is not required since documentation of expansion anchor installation with approved QA/QC procedures is available.

#### Item 8

Maintain documentation of any sampling inspection of anchor bolts required by item 4 on site and available for NRC inspection. All holders of operating licenses for power reactor facilities are requested to complete items 5, 6, and 7 within 30 days of the date of issuance of Revision No. 2. Also describe any instances not previously reported, in which you did not meet the revised (R2) sections of items 2 and 4 and, if necessary, your plans and schedule for resolution. Report in writing within 30 days of the date of this revision issuance, to the Director of the appropriate Regional Office, completion of your review. For action not yet complete, a final report is to be submitted upon completion of your action. A copy of your report(s) should be sent to the United States Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Reactor Operations Inspection, Washington, D.C. 20555. These reporting requirements do not preclude nor substitute for the applicable requirements to report as set forth in the regulations and license.

#### Response

Documentation of expansion anchor installation and verification is maintained onsite at LaSalle County Units 1 and 2

and is available for NRC Inspection. Requirements of the revised (R2) sections of Items 2 and 4 have been met as noted in the response to these items in this report.

#### Item 9

All holders of construction permits for power reactor facilities are requested to complete Items 5 and 6 for installed pipe supports within 60 days of date of issuance of Revision 2. For pipe supports which have not yet been installed, document your action to ensure that Items 1 through 6 will be satisfied. Maintain documentation of these actions on-site available for NRC inspection. Report in writing within 60 days of date of issuance of Revision 2, to the director of the appropriate NRC Regional Office, completion of your review and describe any instances not previously reported in which you did not meet the revised (R2) sections of Items 2 and 4 and, if necessary, your plans and schedule for resolution. A copy of your report should be sent to the United States Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Reactor Construction Inspection, Washington, D.C. 20555.

#### Response

No response is required.

### 3.0 CONCLUSION

As explained in the responses to individual items of the Bulletin in Section 2.0 of this report, the design and installation of all safety related pipe supports with expansion anchors, at LaSalle County Units 1&2, is in conformance with the requirements of NRC IE Bulletin 79-02, Rev. 2.