c. Technical Adequacy

The significance of the generic issues (with the exception of cable tray support baseplate flexibility) is that TVA had already identified and taken actions to ensure their programs complied with the NRC requirements. These actions were identified in accordance with the CAQ program.

Technically, the original design of embedded plates (even though the original design did not meet the requirements of NRC IE Bulletin 79-02) are adequate with a 95-percent level of confidence. Sampling programs have not identified conditions that would hinder the safe operation of TVA plants.

6.0 CAUSES

The following are perceived causes for the seven issues in this subcategory.

6.1 Errors, omissions, or incorrect assumptions in calculations identified during 1984 but left uncorrected.

6.1.1 WBN

Cause:

The deficiencies identified in analysis calculations as well as the identification of incorrect plate numbers referenced on the FCRs were attributed to employee oversights.

Responsibility:

DNE and DNC to address employee effectiveness.

Generic: - (WBN, SQN, BLN, BFN)

Noncompliance with NRC IE Bulletin 79-02 and undocumented loads on embedded plates.

Cause:

The deficiencies documented on CAQs originated from DNE's failure to implement NRC's mandated requirements with respect to baseplate flexibility and minimum factors-of-safety in a timely manner.

Responsibility:

DNE has initiated the appropriate clarifications to DS-C1.7.1 and conducted training sessions for designers.

Cause:

Inadequate procedural requirements with respect to multiple attachments added without a design review of embedded plate capacity.

Responsibility:

DNE provided construction specification WBN N3C-928, SQN N2C-937, and is in the process of issuing BLN N4C-935.

Cause:

Inadequate procedural requirements with respect to the effect of construction tolerances on baseplate loads and stresses.

Responsibility:

DNE has revised appropriate drawing notes applicable to construction tolerances, revised G-43, and DS-C1.7.1 and retrained designers in the application of construction baseplate tolerances for the design and evaluation of supports.

Cause:

Inadequate procedural requirements with respect to the qualification of varied typical supports.

Responsibility:

DNC procedures do not contain a requirement to notify DNE by a support variance sheet (SVS) of any additional attachments made to supports after DNE had approved a previous SVS for the support.

DNE did not provide an adequate variance program as related to conduit supports.

Cause:

Inadequate procedural requirements with respect to attachments to building and miscellaneous steel (except embedded plates) without a FCR or SVS.

Responsibility:

DNE did not implement criteria requiring an FCR which would document the exact location of engineered supports attached to cable tray supports, building steel or miscellaneous steel on the applicable drawing. R1

Cause:

Inadequate design with respect to effects of loads on adjacent embedded plates and effects of a concrete edge on the embedded plate capacity.

Responsibility:

DNE to review embedded plate drawings and calculations and qualify embedded plates.

6.2 Anchor bolt (wedge bolt) allowable loads for unit 1 are greater than unit 2. (See paragraph 1.2.2 for detailed description.)

6.2.1 Generic

WBN

Cause:

Normalized loads could result in a factor-of-safety less than 4.

Responsibility:

DNE reduced the allowables for unit 2 to ensure a minimum factor-of-safety of 4.

SQN, BLN, BFN

6.2.1.1 No cause was assigned regarding the specific issue since investigations did not prove the concern generic to these sites.

6.3 Visual approval for minor loads on embedded plates (see paragraph 1.2.3 for detailed description).

6.3.1 Generic

WBN

Cause:

Procedures do not emphasize the necessity for assuring the correct embedded plate number is contained on the FCR and associated sketch. Also, employees failed to demonstrate the quality in their work that is necessary to ensure analysis is performed on the appropriate plate.

Responsibility:

DNE and DNC to provide mechanism to employees that will emphasize accuracy on FCRs.

Cause:

Procedure does not provide a standard acceptance criteria or examples for visual approval program.

Responsibility:

DNE to revise CEB-21.46 to incorporate the above.

SQN

Investigations proved that EP-4.03 Appendix A was site-specific to WBN. Therefore, no cause was assigned.

6.4 Minimum spacing criteria change (see paragraph 1.2.4 for detailed description).

6.4.1 Site-Specific- WBN

No cause was assigned regarding the specific issue since the changes were not made because of technical inadequacies.

6.5 Engineering disposition for exemptions of minimum spacing requirements (see paragraph 1.2.5 for detailed description)

In regards to the specific issue, procedures are in place to allow minimum space reduction. Because of the concern being evaluated as factual, a cause has been assigned.

6.5.1 Site-Specific - WBN

Cause:

Spacing requirements are given to DNC which provide a high confidence level for what can be installed without a design review of the embedded plate capacity. These are only guidelines and do not necessarily mean anything installed closer than specified would cause overloading.

Responsibility:

DNE controls spacing exemptions to avoid overloading of the embedded plate.

6.6 Hollow Sounding embedded plates (see paragraph 1.2.6 for detailed description)

6.6.1 Site-Specific - WBN

Cause:

The dead or hollow sound indicates that the steel plate is not bonded to the concrete and may not be in full, solid contact with the underlying concrete. The loss of bond or the lack of solid contact could be caused by:

- concrete placing void
- warpage of the embedded plate
- concrete shrinkage

Responsibility:

Small gaps under embedded plates do not have a significant effect on the structural performance of the embedded plates; therefore, a responsibility was not assigned.

6.7 No documentation to verify anchor load bearing capability when surface mounted plates are deleted (see paragraph 1.2.7 for detailed description).

6.7.1 Site-Specific- BLN

Cause:

Hanger drawings do not reflect the type 49 plate configuration as part of the support drawing therefore, no inspection is required or performed for the outer nuts on the cast-in-place anchors.

Responsibility:

DNC to assign unique numbers to the type 49 plates which will ensure that inspection of the shims and nuts are performed.

Cause:

Design drawings and specifications do not address requirements for restraining nuts of embedded bolts from movement or loosening during concrete pours.

Responsibility:

DNE to evaluate and correct as required.

Cause:

Employees failed to install nuts as required by the drawing.

Responsibility:

Management to ensure employees are aware of job requirements.

7.0 CORRECTIVE ACTIONS

7.1 Corrective Actions

7.1.1 Errors, omissions, or incorrect assumptions in design calculations identified during 1984 but left uncorrected, and noncompliance with NRC-IE Bulletin 79-02 with respect to baseplate flexibility. (addressed in Section 4.1)

WBN

SCR WBNCEB8623R1 has been initiated by DNE with respect to:

- errors, omissions, or incorrect assumptions in design calculations
- effects of loads on adjacent embedded plates
- effects of a concrete edge on an embedded plate
- baseplate flexibility for cable tray supports

Corrective Actions include:

- Initiation of a verification program for embedded plates used for anchorage of cable tray supports
- Review of cable tray supports on surface mounted baseplates which use expansion anchors to determine if baseplate flexibility and construction tolerances were adequately considered in the design
- Require new or revised FCRs on embedded plates which reference the wrong plate number or wrong drawing revision level
- Review documentation for identified embedded plates which do not have a required FCR
- Perform a complete embedded plate drawing review for:

a. Adjacent embedded plate deficiencies. Based on the population size, determine if a sampling program or complete review should be performed.

b. Embedded plates adjacent to a concrete edge. Perform a walkdown and evaluate the 40 worst cases.

- Revise calculations which contain errors and determine if errors are likely to have occurred in other calculations. If additional errors are likely, identify a condition adverse to quality, unless the deficiency is covered by an existing CAQ.

- Revise calculations that form the basis for the standard form used to screen the EP-FCRs that involved lightly loaded supports.

To prevent recurrence, N3C-928 will be revised to:

a. Cover spacing to adjacent plates and concrete edges.

b. Require a new or revised FCR on the embedded plate if the attachment of the support to the embedded plate was previously approved by an FCR and if any portion of an attached support is modified or relocated.

c. Require a location description on all embedded plate FCRs.

In addition, the following actions will also be taken:

a. CEB-21.46 will be changed to a project specific procedure and will be revised to assure that embedded plates with erroneous plate identifiers are identified and corrected.

b. Perform a review of the usage of the DNE embedded plate drawings which are revised as a result of embedded plate FCRs.

c. Retrain designers to revised procedural requirements.

Corrective actions are currently in work to resolve this SCR. (CATD 10400-WBN-2)

The line response to CATD 10400-WBN-2 was:

The four concerns (inaccurate calculations, effects of loads on adjacent embedded plates, effects of a concrete edge on an embedded plate, and cable tray support baseplate flexibility) are addressed in SCR WBNCEB8623R1. SCR WBNCEB8623R1 (completed through Part B) was issued on October 16, 1986.

The following corrective actions have been initiated to document attachments to embedded plates without design review or documentation:

* a. NCR W-403-P RO (initiated to respond to PIR WBN CEB8601 and PIR WBNCEB8602) documents attaching a new conduit to an already documented conduit support or the effects of insulating a conduit support. Procedures will be revised to require verification that the new addition has not altered the configuration of the support from the typical drawings and to verify any existing variances. DNE will disposition the acceptability of past installations. Procedural revisions will provide adequate requirements for future installations and insulations. (CATD 10400-WBN-3)

The line response to CATD 10400-WBN-3 was:

NCR W-403-P was written to address the situation when attaching a new conduit to an already documented conduit support or addition of free barrier insulation to a conduit support, there were no requirements in plant procedures to verify that new additions did not vary the configuration of the support or review for any existing variance on the support. QCI-3.09 R2, addendum 1, dated June 4, 1986, was written to require a work release to perform any rework or additions to any support already inspected and documented. MAI-13, R3, dated August 5, 1986, was to be revised to have existing supports evaluated when new conduits are added to them. MAI-2 is being issued and will address the evaluation of existing supports for load requirements when fire barrier insulation is to be added. NCR-W-403-P has been referred to DNE for the disposition of past installations. Reference OSIL-R-1472 for MAI-2 issuance.

• b. NCR 6735 R0 documents the failure to issue a new support variance sheet when additional attachments are made to an existing instrumentation support. DNC will perform the following:

-issue new SVS's for deficient supports

-Revise QCP 3.11-1 to require SVS for modifications

-Review all multiple supports that have been varied, reinspect and issue SVSs as needed.

Procedural revisions will provide adequate requirements for future installations. (CATD 10400-WBN-4)

The line response to CATD 10400-WBN-4 was:

CATD Number 10400-WBN-4 is addressed by NCR 6735R0. DNC has completed a 100-percent review of Instrumentation Support Variance Sheets and Embedded Plate Field Change Requests issued for unit 2 supports and identified two supports that had more attachments than approved by DNE. New Support Variance Sheets have been issued for these two supports and will be sent to DNE for approval. Also, a note was added to Section 7.5.1 in QCP 3.11-1, Revision 8 to clarify inspection requirements to prevent recurrence.

• c. SCR 6498-S Revision 0 documents the corrective action initiated by DNC for pipe supports with respect to documentation. DNC will review documentation for all hangers attached to an embedded feature. Any hanger attached to an embedded plate that does not have an attachment "G" (reference 4.11) documented shall be reinspected and documented. QCP-1.14 has been revised to require documenting the inspection of attachments to embedded features to prevent future recurrence. (CATD 10400-WBN-5)

The line response to CATD 10400-WBN-5 was:

NCR 6498 and SCR 6498-S were initiated to formally identify this problem for unit 2. NCR W-435-P was initiated to formally identify and resolve this problem on unit 1. All required actions will be tracked by these NCRs. Action for unit 2 will be completed by fuel load. Actions for unit 1 are complete.

• d. NCR 6564R0 DNC-IEU to review documentation for all instrument supports attached to an embedded feature that does not have an attachment "G" documented. Reinspection and documentation will be performed as necessary. To prevent recurrence, QCP-3.11-1 will be revised to require documentation for future attachments. (CATD 10400-WBN-6).

The line response to CATD 10400-WBN-6 was:

NCR 6564 was initiated to formally identify this problem for unit 2. NCR W-435-P was initiated to formally identify and resolve this problem on unit 1. All required actions will be tracked by these NCRs. Action for unit 2 will be completed by fuel load. Action for unit 1 is complete.

• e. SCR 6567-S R0 documents the corrective action by DNE to review documentation for structural and miscellaneous steel attachments. Any civil feature attached to an embed that does not have an attachment "G" shall be inspected and documented. DNC revised QCP-1.14 and QCI-1.40-6 to add the inspection requirement. (CATD 10400-WBN-7)

The line response to CATD 10400-WBN-7 was:

NCR 6567 and SCR 6567-S were initiated to formally identify this problem for unit 2. NCR W-435-P was initiated to formally identify and resolve this problem on unit 1. All required actions will be completed by fuel load. Actions for unit 1 are complete.

• f. NCR W-435-P R0 documents all attachments to embedded features for unit 1 (instrumentation sense line supports, process pipe supports, and structural steel) which have been installed without test documentation. The Modifications and Additions Unit (M&AU) will review unit 1 documentation. Attachments will be inspected and documented as required. Procedural revisions are in place to prevent recurrence. (CATD 10400-WBN-8).

The line response to CATD 10400-WBN-8 was:

NCR W-435-P was initiated to formally identify and resolve this problem. All required actions were complete.

• g. NCR 3659 documents attachments to building and miscellaneous steel (except embedded plates) without consideration of the effects of cumulative loads. A field review of attachments to building and miscellaneous steel, cable tray supports, and baseplates is being performed. DNC will provide DNE with marked structrual drawings showing attachment locations to potentially overstressed structures and identification of pipe support members. DNE will be notified of additional attachments to these structures after DNC transmittal of the as-constructed drawings. DNE will evaluate loading, generate necessary changes and perform a final walkdown with DNC to ensure that no additional unidentified attachments have been added. Drawing modifications were incorporated on ECN 3255 and DNC revised QCI-1.13 to incorporate this FCR requirement (CATD 10400-WBN-9).

The line response for CATD 10400-WBN-9 was:

The corrective action specified in NCR 3659R1, addressed the problem. The corrective action was as follows: (1) The Division of Nuclear Engineering (DNE) performed a field review to determine structural adequacy. (2). DNE identified some areas requiring additional work on ECN 3255. (3) The Division of Nuclear Construction (DNC) will complete required rework identified on ECN 3255. Procedural controls (QCI-1.13) have been established in DNC which require DNE approval of attachments to building and miscellaneous steel. This will prevent recurrence.

• h. SCR WBNCEB8650 documents a Modifications (unit 1) deficiency with the FCR requirement for attaching to steel after system transfer from construction. M&AU has reviewed their installations and corrected the one identified deficient support. DNE incorporated the FCR requirement in the drawing general notes according to ECN 6450 to prevent recurrence (CATD 10400-WBN-10).

The line response to CATD 10400-WBN-10 was:

SCR WBNCEB8650 and ECN 6420 were initiated to formally identify and resolve this problem. All required actions are complete.

SQN

No problems were identified concerning errors, omissions, or incorrect assumptions in design calculations being identified and not corrected.

Significant NCR SQNCEB8404 R1 addresses the potential that baseplate flexibility and construction tolerances may not have been adequately considered in the determination of loads in expansion anchors for pipe supports. The following corrective actions have been completed:

a. A sampling program was initiated and provided adequate results with respect to baseplate flexibility and factors-of-safety.

b. SQN construction tolerances were compared to the sampling program performed for WBN. Based on the positive results for WBN and more conservatism in SQN design, SQN tolerances are adequate.

To prevent recurrence of similar problems the following actions have been completed:

a. The May 1982 memorandum was revised to refer designers to requirements of Civil Design Standard DS-C1.7.1.

b. DS-C1.7.1 was revised to clarify limitations and applicability of rigid plate analysis.

c. The 47A050 notes were revised to ensure that fabrication and installation tolerances as applied to baseplates do not result in unacceptable increases in baseplate stresses or anchor bolt loads.

d. G-43 was revised to change the allowable tolerances for fabrication dimensions for baseplates.

e. Amplification factors for construction tolerances for WBN were investigated for applicability to SQN. DS-C1.7.1 was revised to provide a method for accounting for effects of construction tolerances on calculated anchor bolt loads and baseplate stresses.

This NCR is in the process of being closed. (CATD C011301-SQN-07)

SCR SQNCEB8502 addresses programmatic deficiencies with the design and installation of seismically designed conduit supports as shown on the 47A056 drawing series for typical supports. The corrective action will consist of a random sampling program of 60 supports that have approved variances. These supports will be evaluated to determine their adequacy. A preliminary evaluation has been performed and it has been concluded that an inaccurate configuration used in the approved variance would not prevent the conduit from performing its design function. The action required to prevent recurrence is pending further evaluation. (CATD Number C011301-SQN-06)

SCR SQNCEB8607 documents the consideration of the concrete edge on the embedded plate capacity. The following corrective actions will be initiated:

a. A 100-percent review of all Type II embedded plates is being performed by the SQN Civil Design Analysis Group.

b. An analysis of the "worst case" sample of 40 embeds installed adjacent to concrete edges will be performed before the restart of SQN. The evaluation of the results by DNE will determine if the Type II embedded plates will need to be upgraded to a higher factor-of-safety. No action required to prevent recurrence has been established at this time. (CATD C011301-SQN-04)

SCR SQNCEB8622 R1, documents deficiencies which may affect the qualification of embedded plates. The following corrective action has been initiated:

a. An evaluation has been performed to identify the thirty worst case supports which will be contained in SQN Civil Calculation SCG1S52X10.

b. A field survey (SMI-317-0-36) was performed on the thirty supports to obtain "as-constructed" information regarding the identified deficiencies.

c. The supports will be evaluated for compliance with the design basis and applicable criteria required for interim operation.

d. After start-up, additional cable tray supports will be analyzed to provide a 95 percent confidence level for existing designs.

e. Any failures identified in the evaluation of the worst case supports will require further evaluation.

To prevent recurrence the design criteria which governs the design of cable tray supports has been revised by DIM-SQN-DC-V-1.3.4-2 and SQN-DC-V-1.3.4-3.
(CATD C011301-SQN-05)

PIR SQNCEB8658 documents that some platform calculations do not include qualification for field routed attachments. These calculations do not include documentation to show that the latest revision of pipe supports for rigorously analyzed piping supports have been considered. Also, some field changes affecting platform configuration have not been incorporated into design calculations and drawings (CATD C011301-SQN-08).

The line response to CATD C011301-SQN-08 was: |R2

Performance of the action(s) required by PIR-SQNCEB-8658 are sufficient to address this item. |R2

CAQR-SQF870101, revision 0, documents the qualification and use of Rawl self-drilling anchors at SQN. (CATD C011301-SQN-09). |R2

The line response to CATD C011301-SQN-09 was: |R2

Assignment and performance of corrective action and subsequent closure of CAQR-SQF870101 will address this deficiency. Note: This CATD issued for tracking purposes only. This is not a restart item. |R2

BLN

No problems were identified concerning errors, omissions, or incorrect assumptions in design calculations that were identified during 1984 and not corrected.

PIR BLNCEB8518 was initiated to address a potential violation of a free edge requirement on drawings. After evaluation, the PIR was upgraded to a significant condition report SCR BLNCEB8518. The following corrective actions are in process:

a. Issuance of Construction Specification N4C-935, "Locating Attachments on Embedded Plates and Strip Inserts."

b. Removal of the free area requirements from the conduit support drawings after the issuance of N4C-935.

c. Utilize the 48 supports used in the resolution of NCR GENCEB8208 and an additional 12 samples to evaluate the effects of the free area requirement. Zero failures out of the sample of 60 will provide a 95 percent confidence level that less than 5 percent of the population is defective.

The issuance of N4C-935 will preclude deficiencies in future installations. (CATD 10400-BLN-1)

The line management response to CATD 10400-BLN-01 was:

The final corrective action for this concern will be handled per SCR BLNCEB8518 in accordance with NEP 9.1. This item adequately addresses the concern noted. This SCR has been entered into TROI for tracking to completion.

PIR BLNCEB8610 was initiated to investigate the additional attachments made to supports after DNE has approved the actual loading. The following will be performed:

a. DNE will review conduit and instrumentation support calculations and pertinent documentation to determine if supports were approved by using loading that was less than the maximum allowable design loads.

b. Where it is determined that less than the maximum allowable design loading was used to qualify the support and drawings do not reflect these restrictions, revise drawings such that no additional loading can be applied without prior approval of DNE.

Pending the results of the evaluation and if it is determined the PIR needs upgrading to significant, an action required to prevent recurrence will be addressed at that time. (CATD 10400-BLN-2)

The line response to CATD 10400-BLN-2 was:

The final corrective action for this concern will be handled per PIR BLNCEB8610 in accordance with NEP 9.1. This item adequately addresses the concern noted. This PIR has been entered into TROI for tracking to completion.

PIR BLNCEB8612 documents the need to evaluate the capacity of embedded plates installed with an edge adjacent to a concrete edge. The following corrective actions will be performed:

a. Embedded plate drawings and calculations for plates located adjacent to a concrete edge will be evaluated.

b. Verification that the edge distance capacity reduction was considered in the structural design of attachments where required.

c. Calculations will be prepared to verify structural adequacy where required and modifications to structural details will be made if the design requirements cannot be met.

If the evaluation from the corrective actions identify a significant condition adverse to quality, an action required to prevent recurrence will be addressed at that time. (CATD 10400-BLN-3)

The line response to CATD 10400-BLN-3 was:

The final corrective action for this concern will be handled per PIRBLNCEB8612 in accordance with NEP 9.1. This item adequately addresses the concern noted. This PIR has been entered into TROI for tracking to closure.

PIR BLNCEB8616 documents for cable tray supports the effects of baseplate flexibility on the welded stud capacity which may not have the factor-of-safety required by DS-C1.7.1.

The information compiled from the samples through the disposition of PIR BLNCEB8518, the FCRs resulting from Construction Specification N4C-935, and utilization of the previous sample results provided through the disposition of GEN CEB8208 will be utilized to verify the existing designs.

An action required to prevent recurrence will be established if conditions adverse to quality are identified in the review of corrective actions. (CATD 10400-BLN-4)

The line response to CATD 10400-BLN-4 was:

The final corrective action for this concern will be handled per PIR BLNCEB8616 in accordance with NEP 9.1. This item adequately addresses the concern noted. This PIR has been entered into TROI for tracking to completion.

BFN

No problems were identified concerning errors, omissions, or incorrect assumptions in design calculations that were identified and not corrected.

NCR GENQAB8203 documents a potential for inadequate minimum spacing in that expansion anchors can be installed which do not meet the minimum spacing requirements when combined action of multiple attachments are considered. BFN has not evaluated the occurrences where expansion anchors may violate G-32 requirements. (CATD Number 10400-BFN-1)

The line response to CATD 10400-BFN-1 was:

NCR GENQAB8203, revision 2 requires a sample program to be performed on supports with G-32 anchor spacing violations. The sample shall not include anchors installed before February 1981 (issue date of G-32, R6). The anchors will be evaluated to determine factors-of-safety with respect to D.S-C.1.7.1 requirements. This exercise is to be completed before unit 2 restart.

SCR BFNCEB8520 documents the qualification of some baseplates and concrete anchors in the typical support details of Design Criteria BFN-50-712 which cannot be verified. Also, according to NCR BFNMEB8406 R1, some supports for field routed schedule 160 piping could be undersized based on their selection using the tables for schedule 40 and 80 piping in BFN-50-712. (CATD Number 10400-BFN-2, 10400-BFN-3).

The following corrective actions were recommended in the applicable engineering report:

a. Perform a walkdown review of a representative sample of existing 2-inch and smaller seismic class 1 field-routed pipe support installations. From this walkdown, identify any instances of configurations which cannot be defended on the basis of actual earthquake experience data.

b. As required from the walkdown review, perform an engineering evaluation of the support installations and, if required, take corrective action.

c. Prepare DNE output documents as needed for new field-routed pipe support installations.

An action required to prevent recurrence has not been established at this time.

The line response to CATD 10400-BFN-02 and CATD 10400-BFN-03 was:

A Small Bore Qualification Program has been initiated to requalify the small bore piping and supports required to remain functional following a DBE. Prior to unit 2 startup, the small bore piping in unit 2 and those considered common to unit 2 will be qualified. The small bore piping and supports in units 1 and 3 that are not considered common to unit 2 will be qualified prior to restart of the respective unit. This activity will resolve SCR BFNCEB8520.

SCR BFNCEB8614 documents that the amplification of calculated anchor bolt loads and baseplate stress increases when construction tolerances are used but not accounted for in the original design.

The corrective action will be determined by Nuclear Power. (CATD Number 10400-BFN-4)

In order to prevent recurrence, the following actions will be taken:

a. The 47B435 notes will be reviewed to ensure that tolerances will be applied as the designer intended.

b. DS-C1.7.1 will need revising to specify methods for amplification of calculated anchor bolt loads and base plate stress to account for field tolerances.

c. Conduct training on the methods of tolerance consideration in DS-C1.7.1.

The line management response to CATD 10400-BFN-04 was:

Performance of the disposition and subsequent closure of SCR BFNCEB8614 R0 would address this issue.

SCR BFNCEB8617 documents the effects of a concrete edge on the embedded plate capacity. Corrective action will be determined by Nuclear Power. (CATD 10400-BFN-5)

In order to prevent recurrence, DS-C1.7.1 and G-32 have been revised to address the design and installation of embedments with specific requirements for edge distances.

The line response to CATD 10400-BFN-05 was:

The on-going walkdown program will verify that the proximity of embedded plates to concrete free edges has been considered in the inspection and evaluation of supports. Present programs include the 79-14 Programs, Conduit Requalification Program, Torus-Attached Piping Support Program, Control Rod Drive Piping Support Program and Control Rod Drive Hydraulic Insertion and Withdrawal Piping Program. Future walkdown programs, when it is applicable, will include requirements that free edges on embedded plates be considered during inspection and evaluation. This will be accomplished by the issuance of a general walkdown procedure as a Project Instruction. This condition does exist at BFN and has been documented by SCR BFNCEB8617 R0.

The Engineering Category evaluation of the baseplate flexibility issue at BFN revealed a specific support (RHR R159, unit 3) where flexible plate analysis was not performed as required by DS-C1.7.1. (CATD 10400-BFN-06)

b. The engineering procedure will be revised to list some standard acceptance criteria. Listing of examples will be made, however, the visual examination will allow other items to be accepted if justification is given on the FCR form.

CATD 10400-WBN-2 addresses the corrective actions to be taken.

SQN

No guidelines exist for attachments to embeds that are treated as a minor load. (CATD C011301-SQN-2).

The line response to CATD C011301-SQN-2 was:

DNE-CEB will develop criteria to provide procedural control of the current preliminary approval program for attachments to embeds. This procedure will also:

- Provide general guidelines for identifying minor load attachments to embeds.

- Require minor loads to be included in the final calculation process.

- Identify the methodology used to determine the final loading for each embed evaluated.

Also, revising N2C-937 to delete Section 2.5.2 (Visual Approval of FCRs) will be withdrawn as one of the ECTG recommendations.

Programmatic inadequacies were identified concerning the lack of consistency in the interpretation and application of design criteria at the site and engineering level. The current method for evaluation of attachments to embedded plates needs to be expanded and controlled procedurally. (CATD C011301-SQN-3).

The line response to CATD CO11301-SQN-3 was:

1. DNE-CEB does not see the need to collect data other than that required to approve the attachment under evaluation. By collecting data in the immediate area of the subject attachment, enough data is obtained to consider the effect of the subject attachment on the embedded plate including the effects of multiple attachments, G-32 violations, and location of the attachment on the plate.

The current design method which utilizes data in the proximity of the attachment effectively establishes a baseline concept because the results of previous qualifications are tracked for each embedded plate as the qualifications are complete. Therefore, no action is required.

2. All attachments receiving preliminary approval will eventually be included in the calculation process.

7.1.4 Minimum Spacing Criteria Change (addressed in section 4.4)

No corrective actions are required for the specific issue since the changes were not made for technical reasons, inadequate requirements, or load bearing capacity for embeds.

7.1.5 Engineering disposition for exemptions of minimum spacing requirements (addressed in section 4.5)

The specific concern was deemed factual. However, no corrective actions are required because of the fact that minimum spacing requirements are procedurally controlled to avoid overloading of the embedded plate.

7.1.6 Hollow sounding embedded plates (addressed in section 4.6)

The specific issue was deemed factual. However, as noted in section 4.6., small gaps under embedded plates do not have a significant effect on the structural performance of the embedded plate. Management has failed to recognize the employees' need to understand the significance of the hollow sound. (CATD 10400-WBN-1)

The line response to CATD 10400-WBN-1 was:

The Project Manager, WBN DNE will issue a memorandum to all M-scale managers summarizing the ESCP Report Number 10400 findings on "hollow" sounding embedded plates. These managers will be instructed to ensure that all their employees get this information in the Employee Involvement Meetings.

7.1.7 Embedded plates with 1 or 2 welded studs and cast-in-place anchors supporting loads for which no documentation exists to verify their ability to support the loads (addressed in section 7.7)

NCR 5007 was initiated to document the deficiency of improperly installed and/or missing anchor bolt nuts. The following corrective actions will be performed:
(CATD 10400-BLN-5)

a. BLN-CEU will assign unique identifiers to type 49 plates to include in the Civil Documentation Program. These identifiers will ensure all shims and nuts installed inspected.

b. DNE will evaluate the list of type 49 plates submitted by DNC for possible overload conditions.

The line response to CATD 10400-BLN-5 was:

The final corrective action plan for this concern has not yet been determined due to manpower limitations on Bellefonte The final corrective action will be handled per NCR BLN 5007 in accordance with NEP 9.1. This item adequately addresses the concern noted. NCR BLN 5007 has been entered into TROI for tracking to completion.

NCR 5016 documents lack of design drawings and specifications to address restraining nuts of embedded bolts from movement or loosening during concrete pours. The following corrective actions will be performed:

a. DNE to evaluate "use-as-is" on past installations. This is based on BLN's standard construction practices of setting anchor bolts and anchor bolt assemblies to provide support with a false work template to prevent movement or loosening during concrete pours. Whenever practical, the nuts on the exposed end on the anchor bolts are tightened against the concrete forms to lock the bolts and nuts in position. If it is not practical to use the exposed nuts to lock the anchors in position, the embedded nuts are caged or clipped within the false work.

b. For future installations, it is recommended that a drawing note similar to the following be added to the applicable documents:

"The embedded nuts of anchor bolts are to be restrained from turning or loosening during concrete pours by lock-nut, wire, staking of threads, welding if allowed, or false work template cage or clips unless otherwise specified by design drawings." (CATD 10400-BLN-6)

The line response to CATD 10400-BLN-6 was:

The final corrective action plan for this concern has not yet been determined due to manpower limitations on Bellefonte. The final corrective action will be handled per NCR BLN 5016 in accordance with NEP 9.1. This item adequately addresses the concern noted. NCR 5016 has been entered into TROI for tracking of resolution.

8.0 ATTACHMENTS

8.1 Attachment A - List of Concerns Indicating Safety Relationship and Generic Applicability

8.2 Attachment B - List of Evaluators

8.3 Attachment C - List of Concerns by Issue

ATTACHMENT A

REFERENCE -ECPS131J-ECPS131C
FREQUENCY -REQUEST
ONP - ISSS - RWM

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
LIST OF EMPLOYEE CONCERN INFORMATION

RUN TIME - 12:09:48
RUN DATE - 10/03/86

CATEGORY: CO CONSTRUCTION SUBCATEGORY: 104 EMBEDS

CONCERN NUMBER	CAT	SUB CAT	PLT LOC	GENERIC APPL B F	B L	S Q	W B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN DESCRIPTION	REFERENCE SECTION # CATEGORY - CO SUBCATEGORY - 104
HI-85-071-002 T50247	CO IH	104 000	WBN	N REPORT	N	N	Y		SR	PERSONNEL WERE TOLD NOT TO REPORT HOLLOW EMBED PLATES ENCOUNTERED IN THE COURSE OF THEIR WORK, OR THEY WOULD LOSE THEIR JOBS. DETAILS KNOWN TO QTC, WITHELD DUE TO CONFIDENTIALLY. NO FURTHER INFORMATION MAY BE RELEASED. CONSTRUCTION DEPARTMENT CONCERN. CI HAS NO FURTHER INFORMATION.	Evaluation Process: Section 3.2.6 Findings: Section 4.6.1
HI-85-077-N18	CO	104	WBN	Y K-FORM	Y	Y	Y		SR	NRC INDENTIFIED THE FOLLOWING CONCERN FROM REVIEW OF THE QTC FILE: "UNDOCUMENTED LOADS ON EMBEDDED PLATES."	Evaluation Process: Section 3.2.1 Findings: Section 4.2.1
IN-85-031-001 T50054	CO	104	WBN	Y K-FORMS	Y	Y	Y	IN-85-031-001	SS	IN REVIEWING PREVIOUSLY APPROVED DESIGN CALCULATIONS FOR STRUCTURAL STEEL ACCESS PLATFORMS LOCATED IN IN THE REACTOR BUILDINGS UNIT 1&2 CI HAS AT TIMES FOUND ERRORS, OMISSIONS OR INCORRECT ASSUMPTIONS WHICH COULD HAVE AN AFFECT ON QUALITY/SAFETY. WHEN CI MADE REQUEST TO SUPERVISOR (NAME KNOWN) TO CORRECT ERRORS, CI WAS TOLD THAT THERE WAS NO TIME OR MAN-HOURS AVAILABLE TO MAKE CORRECTIONS. CI STATED THAT SOME CALCULATION WENT UNCORRECTED. THIS OCCURRED DURING ALL OF 1984. CI COULD NOT PROVIDE ANY SPECIFIC DETAILS. (SQN ISSUES ONLY ADDRESSED IN RPT C011301-SQN)	Evaluation Process: Section 3.2.1 Findings: Section 4.2.1

CATEGORY: CO CONSTRUCTION SUBCATEGORY: 104 EMBEDS

CONCERN NUMBER	CAT	SUB CAT	PLT LOC	GENERIC APPL B B S W F L Q B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN DESCRIPTION	REFERENCE SECTION # CATEGORY - CO SUBCATEGORY - 104
IN-85-033-001 T50064	CO	104	WBN	N N Y Y REPORT	I-85-265-WBN	SR	EN DES PROCEDURE EP 4.03 APP. 4 IS INADEQUATE. EP 4.03 APP. 4 ALLOWS ACCEPTANCE OF MINOR LOADS TO EMBEDDED PLATES BY PERFORMING VISUAL INSPECTION OF ATTACHMENTS TO EMBEDDED PLATES. SINCE PROCEDURE EP 4.03 APP. 4 DOES NOT DEFINE WHAT A MINOR LOAD IS, THERE IS NO LIMIT TO WHAT CAN BE ACCEPTED BY VISUAL INSPECTION. EXAMPLE: FCR EP-3784 ILLUSTRATES PROBLEM WITH PROGRAM OF VISUAL INSPECTION. NO FOLLOW-UP REQUIRED.	Evaluation Process: Section 3.2.3 Findings: Section 4.2.3
IN-85-103-001 T50004	CO	104	WBN	Y Y Y Y K-FORMS	I-85-111-WBN	SS	TVA IS NOT IN COMPLIANCE WITH NRC BULLETIN 79-02 (SUPPORT OF RIGID PLATE ASSUMPTIONS IN ANALYSIS) IN THAT BASE PLATE FLEX IS NOT A DESIGN CONSIDERATION. NO ADDITIONAL CONTACT REQUIRED. (SQN ISSUES ADDRESSED ONLY IN RPT C011301-SQN)	Evaluation Process: Section 3.2.1 Findings: Section 4.2.1

CATEGORY: CO CONSTRUCTION SUBCATEGORY: 104 EMBEDS

CONCERN NUMBER	CAT	SUB CAT	PLT LOC	GENERIC APPL B F	B L	S Q	W B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN DESCRIPTION	REFERENCE SECTION # CATEGORY - CO SUBCATEGORY - 104
IN-85-109-X04 T50057	CO	104	WBN	Y	Y	Y	Y	REPORT	SR	CONCRETE ANCHOR BOLT (WEDGE BOLTS) IN UNIT 1 & 2. THE ALLOWABLE BOLT LOADS FOR UNIT 1 ARE GREATER THAN UNIT 2. THE DESIGN PHILOSOPHY TO DETERMINE THE ACTUAL ALLOWABLES ON ANCHOR BOLTS HAS CHANGED. FOR UNIT 1, THE DESIGN GROUP DID NOT CONSIDER FLEXIBLE PLATE THEORY, INSTEAD THEY CONSIDERED THE BASE PLATE AS RIGID. CI QUESTIONS THESE TWO DIFFERENT ALLOWABLES.	Evaluation Process: Section 3.2.2 Findings: Section 4.2.2
IN-85-110-001 T50074	CO EN EN	104 205 221	WBN	N	N	N	Y	K-FORMS	SR	POTENTIAL FOR FAILURE OF CONCRETE ANCHORS SUPPORTING CRITICAL PIPE SUPPORTS OF PRIMARY SAFETY SYSTEMS INSIDE THE PRIMARY CONTAINMENT (EG: SAFETY INJECTION SYSTEM, MAIN STEAM SYSTEM, ETC.) IN WBNP UNIT 1 DUE TO LACK OF PROPER EVALUATION AND DOCUMENTATION (DESIGN CALCS.) OF THEIR LOAD CARRYING CAPABILITIES DESIGN CALCULATIONS FOR HOST ENGINEERED PIPE SUPPORTS FROM BERGEN-PATTERSON AND EDS HAVE BEEN INTENTIONALLY DESTROYED PER TVA DIRECTION.	Evaluation Process: Section 3.2.1 Findings: Section 4.2.1

CATEGORY: CO CONSTRUCTION SUBCATEGORY: 104 EMBEDS

CONCERN NUMBER	CAT	SUB CAT	PLT LOC	GENERIC APPL B B S W F L Q B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN DESCRIPTION	REFERENCE SECTION # CATEGORY - CO SUBCATEGORY - 104
IN-85-410-003 T50164	CO	104	WBN	N N N Y REPORT	I-85-692-WBN	SR	CI EXPRESSED A CONCERN THAT SOME EMBEDDED PLATES AT WBNP ARE HOLLOW (DO NOT HAVE ANY CONCRETE IN CONTACT BEHIND THEM). DETAILS KNOWN TO TQC, WITHELD DUE TO CONFIDENTIALTY. CONSTRUCTION DEPT CONCERN. CI HAS NO FURTHER INFORMATION. NO FOLLOWUP REQUIRED.	Evaluation Process: Section 3.2.6 Findings: Section 4.2.6
IN-85-439-002 T50167	CO	104	WBN	N N N Y REPORT	I-85-665-WBN	SR	"HOLLOW" EMBED PLATES-EMBED PLATES THAT, WHEN LIGHTLY TAPPED WITH A HAMMER OR FINGER, SOUND HOLLOW. THIS IS DUE TO THE FACT THAT THERE IS A SPACE BETWEEN THE PLATE AND THE CONCRETE. INDIVIDUAL STATED THAT THESE PLATES EXIST "ALL OVER THE PLACE" IN BOTH UNITS 1 & 2. INDIVIDUAL ALSO STATES THAT THE WORD HAS COME DOWN FROM MANAGEMENT (KNOWN) THAT IF ANYONE IS CAUGHT "TAPPING" EMBED PLATES THEY WOULD BE FIRED. "IF IT DOESN'T FALL LEAVE IT." EG: (1) AUX BUILDING, 713' EL VERY CLOSE TO DOUBLE DOORS, 10' HIGH ON WALL - NEAR A AND T LINES IN UNIT 1 BEFORE DOORS. (2) GO THROUGH DOORS, LOOK RIGHT, 15'-20' FROM DOOR 12'-14' UP WALL. (3) AUX BUILDING, 726 EL. AT A-13 AND U LINES. HOLLOW EMBEDS AND CONCRETE ABOVE LEDGE. CI HAD NO FURTHER INFORMATION (CONSTRUCTION DEPT. CONCERN).	Evaluation Process: Section 3.2.6 Findings: Section 4.2.6

CATEGORY: CO CONSTRUCTION SUBCATEGORY: 104 EMBEDS

CONCERN NUMBER	CAT	SUB CAT	PLT LOC	GENERIC APPL B F	B L	S Q	W B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN DESCRIPTION	REFERENCE SECTION # CATEGORY - CO SUBCATEGORY - 104
IN-85-595-002 T50056	CO	104	WBN	N K-FORM	N	N	Y		SR	PROCEDURAL REQUIREMENTS FOR INSTALLATION OF EMBEDS AND REHEADS BECAME MORE STRINGENT IN 1982 FROM NOT LESS THAN 18" TO 24"; AND 8 TIMES O OF REDHEAD TO 10 TIMES O OF REDHEAD. WORK PRIOR TO 1982 (AND THE PROCEDURE REVISION) DID NOT REQUIRE A REWORK OR RE-EVALUATION.	Evaluation Process: Section 3.2.4 Findings: Section 4.2.4
IN-85-672-005 T50248	CO	104	WBN	N K-FORMS	N	N	Y		SR	OVERLOADING OF EMBED PLATES IS SUPPOSEDLY UNSAFE AT CERTAIN DISTANCES, BUT IF THE CONDITION IS DOCUMENTED "ON PAPER" (ENGINEERING DISPOSITION?) IT IS ACCEPTABLE. IF CERTAIN DISTANCES SHOULD BE MAINTAINED THE REQUIREMENTS SHOULD BE ENFORCED NOT SUBJECT TO ENGINEERING MODIFICATION. NO FURTHER MODIFICATION IN FILE. CI DECLINED TO PROVIDE FURTHER INFORMATION. NO FOLLOWUP REQUIRED.	Evaluation Process: Section 3.2.5 Findings: Section 4.2.5
IN-85-678-001 T50068	CO	104	WBN	N REPORT	N	N	Y		SR	EMBEDMENT PLATES IN RB II THAT HOLD THE POLAR CRANE IN PLACE, IS PLACED ON CONCRETE THAT HAS A HOLLOW SOUND. C/I ACCIDENTALLY DISCOVERED THIS DURING A ROUTINE INSPECTION IN 1982. LOCATION: N X NW QUADRANT OF RB II. NO FOLLOW-UP REQUIRED.	Evaluation Process: Section 3.2.6 Findings: Section 4.2.6

CATEGORY: CO CONSTRUCTION SUBCATEGORY: 104 EMBEDS

CONCERN NUMBER	CAT	SUB CAT	PLT LOC	GENERIC APPL B B S W F L Q B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN DESCRIPTION	REFERENCE SECTION # CATEGORY - CO SUBCATEGORY - 104
IN-85-693-006 T50251	CO	104	WBN	N N N Y K-FORM		SR	UNIT 1, NSB LABORERS ARE NOT QUALIFIED TO PERFORM CONCERT/ GOUT WORK, E. G., HOLLOW SOUNDING EMBED PLATES - SEPARATED FROM CONCRETE WALL DUE TO WELDING AREA/VOIDS BEHIND PLATES ARE NOT CHIPPED OUT AND GROUTED PROPERLY RBI, CAVITY WALL, AZ 222, EL. 728 MISSILE LEDGE, ATTACHMENT PLATE. CONSTRUCTION DEPARTMENT CONCERN. CI HAS NO FURTHER INFORMATION.	Evaluation Process: Section 3.2.6 Findings: Section 4.2.6
IN-85-693-007 T50273	CO	104	WBN	N N N Y K-FORM		SR	HOLLOW EMBED PLATES. REACTOR #2 ON THE INSIDE CRANE WALL, AZ 135 DEGREES, ELEV. 730, BY A STRIP HEATER. CI HAS NO FURTHER INFORMATION. CONSTRUCTION DEPARTMENT CONCERN.	Evaluation Process: Section 3.2.6 Findings: Section 4.2.6
IN-86-305-001 T50160	CO	104	WBN	N N N Y K-FORMS	I-85-666-WBN	SR	FAN BASES ON THE 2ND STORY OF DIESEL GENERATOR BUILDING #5 HAVE A "HOLLOW" SOUND WHEN TAPPED. ALL THE FAN PADS IN IN THE BUILDING HAVE THE SAME "HOLLOW" SOUND, WHICH IS INDICATIVE OF A LACK OF CONCRETE BONDING. CONSTRUCTION DEPT. CONCERN. MID-1984. CI HAS NO FURTHER INFORMATION. NO FOLLOW-UP REQUIRED.	Evaluation Process: Section 3.2.6 Findings: Section 4.2.6

ATTACHMENT A

REFERENCE -ECPS131J-ECPS131C
FREQUENCY -REQUEST
ONP - ISSS - RWM

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
LIST OF EMPLOYEE CONCERN INFORMATION

RUN TIME - 12:09:48
RUN DATE - 10/03/86

CATEGORY: CO CONSTRUCTION SUBCATEGORY: 104 EMBEDS

CONCERN NUMBER	CAT	SUB CAT	PLT LOC	GENERIC APPL B F B L S Q W B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN DESCRIPTION	REFERENCE SECTION # CATEGORY - CO SUBCATEGORY - 104
OE-QMS-8	CO EN	104 222	NPS	Y Y Y Y REPORT		SS	TWO AREAS REGARDING DESIGN METHODS FOR PIPE SUPPORTS ARE NOT RECEIVING PROPER CONSIDERATION: (1) EFFECT OF BASEPLATE FLEXIBILITY ON ANCHOR LOADS. (2) DETAILING METHODS FOR WELDS. (SQN ISSUES ONLY ADDRESSED IN RPT C011301-SQN)	Evaluation Process: Section 3.2.1 Findings: Section 4.2.1
WBM-86-009-001 T50273	CO CO	104 111	WBN	N N N Y K-FORM		SR	CI IS CONCERNED THAT POST APPLIED BASE PLATES FOR ANSI B31.1, INSTRUMENTS AND CABLE TRAY SUPPORTS HAVE BEEN "FIELD" MODIFIED AND/OR HAVE HAD ADDITIONAL LOADS ADDED WITHOUT GENERATION OF AS BUILT DRAWINGS AND THE SUBSEQUENT REQUIRED REVIEW BY EN DES OF THESE MODIFICATIONS AND/OR ADDITIONALLY APPLIED LOADS, AS REQUIRED BY AN SI N45.2.11. CI HAS NO FURTHER INFORMATION.	Evaluation Process: Section 3.2.1 Findings: Section 4.2.1

CATEGORY: CO CONSTRUCTION SUBCATEGORY: 104 EMBEDS

CONCERN NUMBER	CAT	SUB CAT	PLT LOC	GENERIC APPL B B S W F L Q B	QTC/NSRS INVESTIGATION REPORT	P S R	CONCERN DESCRIPTION	REFERENCE SECTION # CATEGORY - CO SUBCATEGORY - 104
XX-85-097-001 T50257	CO	104	BLN	N Y N N REPORT		SR	BELLEFONTE - SEVERAL PIPE SUPPORT HANGERS ON THE EAST-WEST FLAT WALLS INSIDE CONTAINMENT RB #1 AT BELLEFONTE ARE ATTACHED TO EMBEDDED PLANTS ORIGINALLY DESIGNED FOR HIGH PRESSURE IF THESE EMBEDS HAVE ONLY 1 OR 2 WELDED STUDS TO HOLD THE PLATE TO THE CONCRETE. HOWEVER THERE ARE LAST-IN-PLACE ANCHORS THROUGH THE PLATES. THERE IS NO DOCUMENTATION ON THESE ANCHORS EVER BEING UTILIZED TO HELP SUPPORT THE LOADS. NO ADDITIONAL INFORMATION IS AVAILABLE IN THE FILE. CONSTRUCTION DEPARTMENT CONCERN.	Evaluation Process: Section 3.2.7 Findings: 4.2.7

18 CONCERNS FOR CATEGORY CO SUBCATEGORY 104

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

Attachment B

List of Evaluators

Watts Bar Nuclear Plant

Lead Evaluator: Julie Cromer
Evaluator: Gary L. Portwood
Alternate: Martin Bailey

Sequoyah Nuclear Plant

Gary L. Portwood

Bellefonte Nuclear Plant

James A. Chesney
Gary L. Portwood

Browns Ferry Nuclear Plant

James A. Chesney
Donald R. Owen
Gary L. Portwood

Attachment C

List of Concerns by Issue

ISSUES	CONCERNS
Design of Plates: (a) Incorrect calculations (b) Noncompliance with 79-02	IN-85-031-001 IN-85-103-001 OE-QMS-8
(c) Undocumented loads on embedded plates	WBM-86-009-001 HI-85-077-N18 IN-85-110-001
Bolt Load Allowables Greater for Unit 1 than Unit 2	IN-85-109-X04
Visually approved FCRs	IN-85-033-001
Changes in procedural Requirements	IN-85-595-002
Minimum Spacing Requirements	IN-85-672-005
Hollow Sounding Embedded Plates	HI-85-071-002 IN-85-410-003 IN-85-439-002 IN-85-678-001 IN-85-693-006 IN-85-693-007 IN-85-305-001
Load Capability for Anchors	XX-85-097-001

Executive Summary Table #1

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Lack of verification of welded studs	X		BLN-Factual	Employees failed to install nuts as required by drawings.	DNE will evaluate a list of type 49 plates submitted by DNC for possible overload conditions. DNC-BLN will assign unique identifiers to type 49 plates to ensure all shims and nuts are properly installed and inspected.	Failure to install outer nuts on the cast-in-place anchors will place loading on the welded studs. This could lead to over-stressing the welded stud.	

e. Log Sheets for Attachments to Embedded Plate

1. Plate Number 48N1219MK16WPL1

2. Plate Number 48NB74MK5PL1

3. Plate Number 48N1221MK21WPL3

4. Plate Number 48N1219MK7WPL5

3.2.4 Minimum Spacing Criteria Change as stated in paragraph 1.2.4:

a. General Construction Specification G-32, R5-R11, "Bolt Anchorages Set in Hardened Concrete"

b. Civil Design Standard DS-C1.7.1, R0, "General Anchorages to Concrete"

c. Nonconforming Condition Report NCR WBNCEB8203, R0, R1

d. Construction Specification N3C-928, R0-R2, "Locating Attachments on Embedded Plates"

e. Field Change Requests, FCR-H-9521

f. Informal memorandum to J. Cromer from M. A. Cones, dated September 22, 1986

g. Informal memorandum to M. U. Rudolphi from R. O. Hernandez

h. Specification Revision Notices (SRN)

1. SRN-G-32-1

2. SRN-G-32-3

3. SRN-G-32-4

i. WBN QCP-1.14, R9, 12, 18, "Inspection and Testing of Bolt Anchors Set in Hardened Concrete and Control of Attachments to Embedded Plates"

Inaccurate configuration utilized in the approval of field change requests. The implementation of the variance program as applied to conduit supports does not provide assurance that the support configuration evaluated and documented by design is consistent with the as-constructed configuration.

Variances as submitted by constructing organizations, identify only the current change. Previous variances or configuration changes to a specific support are not normally identified. Failure to consider previous variances to a specific support results in evaluation and documentation of an inaccurate configuration.

Embedded plates have been installed with the plate edge adjacent to a concrete edge. The effect of the concrete edge on the embedded plate capacity may not have been considered in the design evaluation of the plate. This is documented on SCR SQNCEB8607.

This deficiency is known to have occurred for the embedded plates for four feedwater deadweight supports in the Reactor Building. Cracking of the concrete because of the proximity of the anchors to the concrete edge was observed and repairs were made.

During the evaluation of the above conditions, the following were identified:

a. The original design of some cable tray supports may not have used the correct response spectra or considered effects of loads from other attachments, weight of insulation, torsional loads, or 75 pound/foot loading on the top tray.

b. When baseplate flexibility, installed location of supports on the embedded plate and the effect of closely spaced anchors are considered, the embedded plate may not be qualified.

c. The effect of overloaded trays (SCR SQNEEB8650) when combined with all identified design and "as-constructed" deficiencies may overstress the cable tray support or the baseplate to which it is attached. Particularly, AWS punching shear allowables at tube to tube connections may be exceeded.

The occurrence of placing voids behind plates on vertical surfaces is considered unlikely. The congestion behind the plate is not significantly worse than for most portions of a wall or column and is better than many locations such as the areas around penetrations. Placing voids or "honeycomb" are sometimes encountered at horizontal construction joints, but large random surface voids which are visible on the surface when the forms are removed are uncommon. Placing voids at the horizontal joint are generally less than 2 inches in height and extend for several feet. Therefore, if those voids occurred behind embedded plates they would have been visible beyond the plate and would have been repaired or would have been very limited in width.

b. Warpage of Embedded Plates

When a feature is welded to an embedded plate, the temperature differences between localized areas of the plate are very high and a large temperature gradient occurs across the thickness of the plate. The in-plane temperature difference and temperature gradient will result in some localized yielding of the plate and will result in a loss of bond between the plate and the concrete.

The larger the attachment and the larger the size of the weld; the higher the temperature, the temperature gradient, and the area of the plate that will be affected. The welding procedure and sequence of welding also affects the temperature of the plate. A common occurrence during welding to embedded plates is minor spalling of the concrete at the plate perimeter because of the in-plane expansion of the plate.

After completion of welding, the subsequent cooling of the plate to ambient temperature, results in residual stresses which will remain in portions of the plate. The plate is restrained from free contraction by the anchors. These residual stresses could result in additional loss of bond and frequently result in some minor warpage of the plate. Generally, the plate deformations are not visually apparent.

The warping of the plates because of welding is the probable cause for most occurrences of "hollow" sounding embedded plates. However, the gap between the concrete and the plate would be very small unless the plates were visually warped.

The line response to CATD 10400-BFN-06 was: |R2

Since 1981, BFEP has had an internal requirement to consider plate flexibility in piping support design. This memorandum was incorporated in the General Reference Calculation in July 1984 (BWP 840713 103). Since various calculation reviews by TVA as well as a review by Bechtel did not identify other supports with this deficiency, it is TVA's position that the base plate flexibility concern on RHR Support R159 (U3) is an isolated case caused by designer error. Since no generic implications exist, BFN will perform appropriate flexible plate analysis on the RHR Support R159. No additional calculation review is required. Piping supports installed in 1980 and before will be analyzed under one of the programs described in the Nuclear Performance Plan, Volume 3, Section III. The recurrence control measures described below will |R2
prevent repetition of this deficiency when calculations are generated or revised for these programs. To ensure that the personnel involved in support design at BFN are fully aware of flexible plate design requirements a memorandum (with training roster) will be distributed to all BFEP piping support designers by July 31, 1987, instructing them of the requirements of using flexible plate analysis. Requirements for flexible plate design are included in the TVA Civil Design Standard DS-C1.7.1, titled "General Anchorage to Concrete", and will be incorporated in the Pipe Support Design Handbook, currently under review before initial issue. When completed, these actions are expected to prevent future occurrence of this deficiency. NOTE: CAQR-BFP870514 has been initiated to document and correct the identified discrepancy on RHR support R159.

7.1.2 Concrete anchor bolt (wedge bolt) allowables are greater for unit 1 than for unit 2 (addressed in section 4.2)

No corrective actions are required for the specific issue.

7.1.3 Visual approval for minor loads on embedded plates (addressed in section 4.3)

WBN

The following enhancements will be made with respect to the visual program:

a. Engineering and construction procedures will be revised to emphasize the necessity of assuring the correct plate number is on the FCR.

Attachment C

Subcategory 10400

Subcategory Title: Embedments

	Employee Concern Number	NSRS or QTC Report Number (If Issued)	Line Response (Organization-If Issued)
*	HI-85-071-002		
	HI-85-077-N18		
	IN-85-031-001		
**	IN-85-033-001	I-85-265-WBN	
	IN-85-103-001	I-85-111-WBN	
	IN-85-109-X04		
***	IN-85-110-001		
	IN-85-410-003	I-85-692-WBN	
	IN-85-439-002	I-85-665-WBN	
	IN-85-595-002		
	IN-85-672-005		
	IN-85-678-001		
	IN-85-693-006		
	IN-85-693-007		
	IN-86-305-001	I-85-666-WBN	
****	OE-QMS-8		
	WBM-86-009-001		
*****	XX-85-097-001		

* Technical issue concerning hollow sounding embedded plates is addressed in this subcategory. Nontechnical aspects are addressed in subcategory report IH-00000-Intimidation and Harrassment.

** WBN concern evaluated for generic implications to SQN only.

*** Lack of proper evaluation and documentation (design calculations) are addressed in this subcategory. Destruction of Bergen-Paterson and EDS Nuclear calculations by TVA is addressed in subcategory EN 20500-Control of Design Calculations and EN22100-Pipe Support Designs.

**** Effects of baseplate flexibility on anchor loads is addressed in this subcategory report. Detail methods for welds is addressed in subcategory report EN22200-Pipe Support Weld Design.

***** BLN initiated concern. Generic implications for other plants was not applicable.