ENCLOSURE 1

WATTS BAR NUCLEAR PLANT

CATEGORY I CABLE TRAY AND CABLE TRAY SUPPORTS

Corrective Action Program Plan

Revision 0

WATTS BAR

TVA NUCLEAR

WATTS BAR NUCLEAR PLANT

CATEGORY I CABLE TRAY AND CABLE TRAY SUPPORTS CORRECTIVE ACTION PROGRAM PLAN

REVISION 0

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CATEGORY I CABLE TRAY AND CABLE TRAY SUPPORTS
CORRECTIVE ACTION PROGRAM PLAN

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CATEGORY I CABLE TRAY AND CABLE TRAY SUPPORTS
CORRECTIVE ACTION PROGRAM PLAN

1.0 INTRODUCTION

This Corrective Action Program (CAP) plan describes the program for resolving deficiencies, some of which have been determined to be significant, involving seismic Category I cable trays, cable tray fittings/hardware, and cable tray supports for the Watts Bar Nuclear Plant (WBN). The deficiencies have been identified in condition adverse to quality reports (CAQRs), Nuclear Regulatory Commission (NRC) violations, Employee Concerns, and in meetings with the NRC. The deficiencies are categorized as follows:

- Lack of documented design qualification for cable tray hardware.
- Installed configurations not complying with design output documents.
- Lack of documentation to verify previous reinspections.

1.1 Description of Deficiencies

1.1.1 NRC Violation

NRC Violation 390, 391/88-01-02 was written in April 1988, to document findings involving cable tray installation (Reference 1). In summary, the NRC Violation stated that contrary to the requirements of the design criteria and design output documents, cable tray fittings were not properly qualified for the as-built condition. Examples included cable tray hinge plates not qualified for the installed orientations, connectors located at greater than the maximum specified distance from the support, less than full-thread engagement in fitting bolts, and fittings installed but not shown on design drawings.

TVA responded to the NRC Violation in June 1988 (Reference 2). CAQR WBP880040 was issued to address the lack of documented qualification for fittings, connectors, and supports. CAQR WBP880167 was issued to address concerns related to discrepancies between as-built cable tray configurations and design drawings.

As a supplement to the NRC Violation, additional issues were identified as follows: the effect of loose tie wraps on cable tray qualification, support of cables in vertical trays, and the position retention qualification of cable tray covers. The cable tie wrap and cable tray cover issues have been addressed by CAQR WBP 880418. These CAQRs and the NRC Violation are described in Attachment 1. The support of cables in vertical trays is an electrical issue and is addressed in the Cable Issues CAP.

1.1.2 Employee Concerns

In the cable tray support area, an employee concern finding identified deficiencies in the disposition and closure of Nonconformance Report (NCR) 5737 R1. This nonconformance report, issued in August 1984, addressed the condition of as-built support configurations differing from the design drawings. This NCR was reported to the NRC under 10CFR50.55e. Support discrepancies identified during the NCR 5737 R1 walkdown included missing braces, incorrect member sizes, and support configuration dimensions that were not within tolerances.

The employee concern finding dealt with the scope, corrective action documentation, and closure of NCR 5737 R1. The employee concern finding and CAQR WBP 870528, which was written as a result of the concern, stated that not all safety-related supports were reverified during the NCR 5737 R1 walkdown and that proper inspection records were not maintained for those supports found to be adequate during the walkdown.

1.2 Root Causes

The root causes of the deficiencies listed in Section 1.0 exist in both engineering and construction activities. The following root causes address in order, these deficiencies:

° Lack of documented design qualification for cable tray hardware.

This deficiency was caused by the following:

- Inadequate control and documentation of engineering judgment which specified cable tray fittings in unqualified applications.

- Design criteria did not completely address some design attributes.

- Engineering did not completely implement the design criteria.

- Inadequate interdisciplinary review.

° Installed configurations not complying with design output documents.

This deficiency was caused by the following:

- A lack of emphasis on maintaining and controlling documentation of construction-identified field changes necessary for installation of cable trays and supports. This resulted in field changes that were not approved and documented or incorporated into design drawings.

- Failure to consider as essential and, accordingly, to require adequate installation and inspection documentation on miscellaneous attributes such as tray covers, fitting bolts, and fitting types.

° Lack of documentation to verify previous reinspections.

This deficiency was caused by failure to prepare and follow a procedure for the walkdowns used to obtain or reverify configuration attributes.

2.0 OBJECTIVE

The objective of the CAP is to assure that the WBN cable tray and cable tray support installations are structurally adequate and comply with the licensing requirements and design criteria. Revisions will be made to the design criteria and to the Final Safety Analysis Report (FSAR) to ensure compatibility of the design criteria with the FSAR commitments. Licensing commitment changes will be proposed only when technically justified.

3.0 SCOPE

The scope of the cable tray portion of this program involves the structural qualification of the tray connectors and fittings, tray covers, and tray configurations of safety-related cable trays required for unit 1 operation, including vertical trays, horizontal trays rotated 90 degrees, and horizontal trays qualified for the maximum design conditions.

The scope of the cable tray support portion of this program involves the cable tray supports required for unit 1 operation.

4.0 PROGRAM DESCRIPTION

4.1 Program Phases, Major CAP Elements, and Evaluations

TVA will perform an engineering evaluation of safety-related cable tray and cable tray support installations required for unit 1 operation. Known deficiencies, which will be resolved under this CAP, are listed in Attachment 1. A flowchart and fragnet for the work are illustrated in Attachments 2 and 3, respectively.

The CAP plan consists of the following actions:

° Develop a complete design basis for cable tray, cable tray fittings/hardware and cable tray supports.

° Develop design output consistent with the complete design basis.

° Revise construction, maintenance, and quality assurance (QA) procedures and train affected personnel.

- Develop and implement a critical case evaluation of existing cable tray installations. The number of critical cases to be evaluated will depend on the assessment of walkthrough data.

- Evaluate the disposition of NCR 5737 R1.

4.1.1 Develop a Complete Design Basis

The existing Category I cable tray support design criteria (Reference 3) will be reviewed for completeness, technical adequacy, and agreement with the FSAR and other licensing commitments. The design criteria and FSAR will be revised as required to establish a complete and technically adequate design basis. Licensing commitment changes will be proposed when technically justified.

The criteria will be revised to address the use of cable tray connectors and fittings. Allowable cable tray spans for cable tray configurations will be established. Calculations have been identified which are required to support the above design criteria. These calculations are identified in Section 8.4 of Reference 3. Development of the calculations will support the WBN essential calculation activity described in the Design Baseline and Verification Program (DBVP).

4.1.2 Develop Design Output Consistent with the Complete Design Basis

Cable tray details will be revised or added to the design drawings as necessary to bring them into compliance with the revised design criteria.

4.1.3 Revise Implementing Procedures

Construction, maintenance, and QA implementing procedures will be reviewed and revised as necessary to adequately address applicable design output requirements, including requirements for tray covers, connectors, and fittings.

4.1.4 Develop and Implement a Critical Case Evaluation of Existing Cable Tray Installations

Because of the problems identified in the design, construction, and inspection of cable trays, TVA will perform a critical case evaluation of installed safety-related cable trays required for unit 1 operation.

Definition of Critical Cases

Existing design output documents specify the routing of the cable trays and were used for the original construction. However, the exact location of cable tray offsets and

fittings are not shown in all cases. A screening of output documents showing cable tray location and orientation will be performed to identify designs for critical case consideration.

An engineering walkthrough will be performed consisting of a review of installed safety-related cable trays, cable tray connectors and fittings, and tray covers by engineering personnel who will focus on those attributes essential to cable tray qualification. Parameters such as cable tray spans and fitting or connector locations will usually be screened based on visual examination. Actual measurements will be taken when necessary. The engineering walkthrough will be performed by teams of engineering personnel familiar with the cable tray design basis for WBN. These teams of engineering personnel will be trained to identify critical cases based on the following:

- Installed cable tray spans, configurations and orientations for which the engineering screening identified design criteria deviations.
- Location (with respect to adjacent supports) and type of cable tray connectors and fittings.
- Cable tray cover location and orientation.

Random, independent reviews of the engineering walkthroughs will be performed to assure adequacy of the critical case selections. The review will be performed by engineering personnel qualified to the same requirements as members of the original walkthrough team.

In addition to the evaluation of critical cases discussed above, obviously unacceptable installations such as missing fittings or bolts, will be documented and corrected.

Implementation of Critical Case Evaluations

Critical cases identified and sketched by walkthrough teams will be grouped and categorized and further reviewed to determine the final critical cases for evaluation which envelop the total population of cable trays. The as-built configuration for the final critical cases will be verified by Nuclear Quality Assurance (NQA). It is expected that most of the final critical cases will be evaluated analytically, although testing may be utilized.

Subsequent to the evaluation of the final critical cases, these critical cases that do not meet the design criteria will be reviewed and unacceptable attributes will be identified. Those particular attributes will then be reviewed for the entire population with field modifications implemented as required.

For further details of the critical case evaluation program, see Exhibit A.

4.1.5 Evaluate the Disposition of NCR 5737 R1

NCR 5737 R1, written in 1984, identified some nonconformances involving as-built support configurations versus as-designed drawings. Approximately 2700 cable tray supports were walked down for the purpose of reverification. Approximately 690 discrepancies were identified which required drawing changes. Of those, approximately 90 discrepancies required field work in order to assure the configurations met design requirements. The evaluation of the disposition of NCR 5737 R1 consists of the following:

° Review NCR 5737 R1 Cable Tray Support Walkdown Data

A review of the NCR 5737 R1 walkdown data will be performed. As a result of this review, lists will be developed identifying which supports were reinspected during the disposition to NCR 5737 R1 and those supports which were not addressed. Since there is not adequate documentation to support the NCR 5737 R1 walkdown, those supports that were reinspected will be used as a basis to perform an overinspection. This overinspection will be a sample reinspection of completed and previously inspected installations to verify conformance to design output documents.

° Overinspection of Supports

Due to the lack of inspection documentation for the population of 2700 supports, approximately 60 of these supports will be selected for configuration overinspection. The selection of supports will be identified and the program implemented in accordance with approved Nuclear Engineering (NE) procedures consistent with Nuclear Construction Issues Group (NCIG)-02, such as Watts Bar Engineering Procedure WBEP 3.15. The objective of this overinspection is to verify the adequacy of the original walkdown by demonstrating with a 95 percent confidence that at least 95 percent of the population meets the design criteria. The inspection documentation of these supports will be updated to provide a reference in their records to this program.

° Perform Evaluation of Supports Not Addressed During NCR 5737 R1 Disposition

Approximately 1000 supports which were not addressed during the NCR 5737 R1 walkdown will require an engineering walkthrough and critical case evaluation similar to that described in Section 4.1.4. This

walkthrough and critical case evaluation will consist of a review of the installed configuration and will focus on those attributes essential to cable tray support qualification. Additionally, those discrepancies which required rework under the original NCR 5737 R1 disposition will be reviewed and categorized into specific attributes. The engineering personnel performing the walkthrough and critical case evaluation will be trained to and be familiar with the cable tray support design bases and those attributes which caused the previous rework.

Subsequent to the evaluation of the final critical cases, these critical cases that do not meet the design criteria will be reviewed and unacceptable attributes will be identified. Those particular attributes will then be reviewed for the entire population with field modifications implemented as required.

For further details of the critical case evaluation program, see Exhibit A.

4.2 Recurrence Control

The recurrence control measures for the deficiencies described in Section 1.1 are described below.

° Lack of documented design qualification for cable tray hardware

- Nuclear Engineering Procedure (NEP) 3.1, "Calculations" is in place requiring documentation to support engineering judgments.

- Revision and maintenance of the Design Basis Document is addressed by NEP 3.2.

- Training to the revised design criteria and strengthened engineering procedures (NEPs), which require an independent design verification of methods used.

- Interface review requirements have been strengthened through issue of the NEPs and increased emphasis on procedural training.

° Installed configurations not complying with design output documents:

- Procedures are now in place which allow the plant configuration to be changed only on the basis of Nuclear Engineering (NE) approved drawings. Nuclear Construction (NC) must submit a request and obtain written approval from NE before deviating from previously approved NE output documents.

- For the construction issues, affected implementing procedures will be revised to add inspection requirements to verify that correct fittings and connectors are installed consistent with design output documents. Personnel will be trained to the requirements of the revised procedures.

° Lack of documentation to verify previous reinspections:

- Procedures are now in place for the performance of walkdowns. Walkdowns will be performed in accordance with Administrative Instruction (AI) 1.16 (WBN Walkdown Procedure). Any request for walkdown by NE must be handled through walkdown procedures.

4.3 Licensing Assessment

The FSAR will be revised to address the qualification of the cable tray and associated hardware. A technically justified FSAR revision will be submitted to NRC to update damping values. Development of these updated damping values will be done under the Seismic Analysis CAP. Also, FSAR Section 3.7.3.5.1 states that the peak spectral acceleration will be used if the component is rigid. The use of spectral accelerations will be clarified.

Any other changes identified in the licensing documents will be handled as specified in Section 4.1.1 in accordance with the requirements of the DBVP.

5.0 PROGRAM INTERFACES

For the purposes of this CAP, two types of program interfaces are considered: production and programmatic. Production interfaces are those interfaces with other programs where one program's output impacts the scope of another program, but does not impact program methodology. Programmatic interfaces with other programs are those interfaces where one program's methodology or progress is contingent upon or at risk with respect to the results of another program.

5.1 Production Interfaces

There are WBN cable related activities being addressed primarily under the Cable Issues, Electrical Issues, and Fire Protection CAPs which have the potential to impact cable tray and cable tray support installation by requiring modifications. These activities are:

° Separation requirements

° Added firewrap

° Vertical support of cable inside tray

° Ampacity

- Cable proximity to hot pipes

- Computerized Cable Routing System (CCRS) Data Base - Cable Issues CAP. This data base could identify overloaded trays, which will be evaluated as part of the subject CAP.

5.2 Programmatic Interfaces

- DBVP - The cable tray support design criteria is a portion of the DBD output by DBVP.

- Seismic Analysis CAP - Will provide input into this CAP with respect to seismic parameters.

- QA Records - The documentation resulting from this program will be used to demonstrate the adequacy of the existing configurations.

6.0 PROGRAM IMPLEMENTATION

This CAP plan will be implemented by NE, NC, and NQA. Additionally, Nuclear Maintenance (NM) will be affected by revised NE output. The specific responsibilities are as listed below:

- NE is responsible for issuing revised design criteria, calculations, revised design output, evaluation procedures, identification and evaluation of critical cases, qualification testing, and overall coordination of program, including the final report.

- NC is responsible for revising any procedures required to implement NE output, obtaining information required by construction walkdown procedures, and performing any required modifications.

- NQA and Engineering Assurance (EA) will perform audits and reviews to ensure the effectiveness of program activities and deliverables. Additionally, NQA is responsible for dimensional verification of final critical case sketches made during cable tray engineering walkthrough, and revising any procedures required to implement revised NE output. NQA is responsible for evaluating acceptability of existing inspection documentation as requested by NE on specific essential attributes.

- NM is responsible for revising any NM procedures required to implement revised NE output.

7.0 PROGRAM DOCUMENTATION

The CAP plan activities will be performed in accordance with approved instructions or procedures. Field data, including cable tray, tray fitting, and connector attributes and cable tray support attributes will be gathered and documented in accordance with approved engineering procedures. Calculations or testing generated as a portion of this program will be performed and documented in accordance with TVA's NEPs.

Any items in the evaluation program that do not meet the design criteria (e.g., cannot be qualified in as-installed configuration) will be identified, tracked and resolved through the CAQ process. Modifications will be handled through the Design Change Notice (DCN) process. A final report will be issued upon completion of the CAP activities.

8.0 CONCLUSION

This program will assure the structural adequacy and compliance with design criteria and licensing requirements of existing safety-related cable tray and cable tray supports required for unit 1 operation. As part of the evaluation, the design criteria will be reviewed and revised as necessary to ensure they are technically adequate and in compliance with licensing requirements. Technically justified changes to the licensing commitments will be proposed where required and the FSAR will be revised accordingly. Additionally, design output will be revised or developed to comply with design criteria and to adequately translate design requirements to NC. Any specific attributes not meeting the design criteria will be modified as necessary. Upon completion of this CAP, WBN safety-related cable tray and cable tray supports will meet licensing requirements and program improvements will be in place to ensure the adequacy of new or modified cable tray and cable tray supports.

9.0 REFERENCES

1. Region II Inspection Reports Nos. 50-390/88-01 and 50-391/88-01, transmitted in a letter from Kenneth P. Barr to S. A. White dated April 29, 1988.

2. R. Gridley's letter to NRC dated August 23, 1988, titled "Reply to a Notice of Violation 390, 391/88-01-01, Failure to Follow Procedures, and Violation 390, 391/88-01-02, Cable Tray Installation" (L44 880823 803).

3. Design Criteria WB-DC-20-21.1, "Category I Cable Tray Supports," Revision 4.

WBN CORRECTIVE ACTION PROGRAM PLAN - CRITICAL CASE EVALUATION PROGRAM TABLE

GENERIC CRITICAL CASE EVALUATION PROGRAM	PROGRAM PREPARATION		PHASE I - ENGINEERING OVERVIEW		PHASE III - ENGINEERING EVALUATION (level-I)	(level-II)	(level-III)	PROGRAM CLOSURE
	1) Review & revise design reqmt's 2) Establish pre-screen attributes, including CAQ issues. 3) Qualify existing details to revised design requirements	4) Define population 5) Prescreen for reworks, acceptables & the questionables, using attributes	1) Develop evaluation plans 2) Prepare proced. 3) Training	4) Walkthrough to record critical cases with justification. 5) Review documents to identify critical cases with justification. 6) Walkthrough the selected critical cases which cover all the attributes. 7) Sketch data for the critical cases.	1) Grouping by comparison & categorization 2) Screen the case groups for final critical cases 3) Collect as-built data for the final critical cases with QC concurrence.	1) Final critical cases detailed analysis 2) Final critical cases actual testing	1) Review analysis or test results for acceptables 2) Determine the approach to fix un-resolved cases 3) Implement corrective action	Develop Final Report.
CABLE TRAYS CRITICAL CASE EVALUATION	1) YES. Complete Design Basis CAP Sect. 4.1 2) YES. Prescreening will be used. CAP Sect. 4.1.3 3) YES. Existing design will be revised. CAP Sect. 4.1.2	4) YES. Scope defined CAP Sect. 3.0 5) YES. CAP Sect. 4.1.3	1) YES. CAP Sect. 4.1.3 2) YES. Walkthrough Procedure 3) YES. CAP Sect. 4.1.3	4) YES. CAP Sect. 4.1.3 5) YES. CAP Sect. 4.1.3 6) YES. CAP Sect. 4.1.3 7) YES. Sketch critical cases. CAP Sect. 4.1.3	1) YES. Tray runs and fittings types and groups. CAP Sect. 4.1.3 2) YES. Enveloped cases CAP Sect. 4.1.3 3) YES. CAP Sect. 4.1.3	1) YES, by analysis CAP Sect. 4.1.3 2) YES, if required. CAP Sect. 4.1.3	1) YES, CAP Sect. 4.1.3 2) YES, CAP Sect. 4.1.3 3) YES, CAP Sect. 4.1.3	YES, CAP Sect. 7.0

EXHIBIT A

WBN CORRECTIVE ACTION PROGRAM PLAN - CRITICAL CASE EVALUATION PROGRAM TABLE

GENERIC CRITICAL CASE EVALUATION PROGRAM	PROGRAM PREPARATION		PHASE I - ENGINEERING OVERVIEW		PHASE III - ENGINEERING EVALUATION (level-I)	(level-II)	(level-III)	PROGRAM CLOSURE
	1) Review & revise design reqmt's 2) Establish pre-screen attributes, including CAQ issues. 3) Qualify existing details to revised design requirements	4) Define population 5) Prescreen the population for critical attributes	1) Develop evaluation plans 2) Prepare proced. 3) Training	4) Walkthrough to record critical cases with justification. 5) Review documents to identify critical cases with justification. 6) Walkthrough the selected critical cases which cover all the attributes. 7) Sketch data for the critical cases.	1) Grouping by comparison & categorization 2) Screen the case groups for final critical cases 3) Collect as-built data for the final critical cases with QC concurrence.	1) Final critical cases detailed analysis 2) Final critical cases actual testing	1) Review analysis or test results for acceptables 2) Determine the approach to fix un-resolved cases 3) Implement corrective action	Develop Final Report.
CABLE TRAY SUPPORTS CRITICAL CASE EVALUATION	1) YES. Complete Design Basis CAP Sect. 4.1 2) YES. Prescreening will be used. CAP Sect. 4.1.5 3) YES. Existing design will be revised. CAP Sect. 4.1.2	4) YES. Scope defined CAP Sect. 4.1.5 5) YES. CAP Sect. 4.1.5	1) YES. CAP Sect. 4.1.5 2) YES. Walkthrough Procedure 3) YES. CAP Sect. 4.1.5	4) YES. CAP Sect. 4.1.5 5) YES. CAP Sect. 4.1.5 6) YES. CAP Sect. 4.1.5 7) YES. Sketch critical cases. CAP Sect. 4.1.5	1) YES. CAP Sect 4.1.5 2) YES. Enveloped cases CAP Sect. 4.1.5 3) YES. CAP Sect. 4.1.5	1) YES, by analysis CAP Sect. 4.1.5 2) YES, if required. CAP Sect. 4.1.5	1) YES, CAP Sect. 4.1.5 2) YES, CAP Sect. 4.1.5 3) YES, CAP Sect. 4.1.5	YES, CAP Sect. 7.0

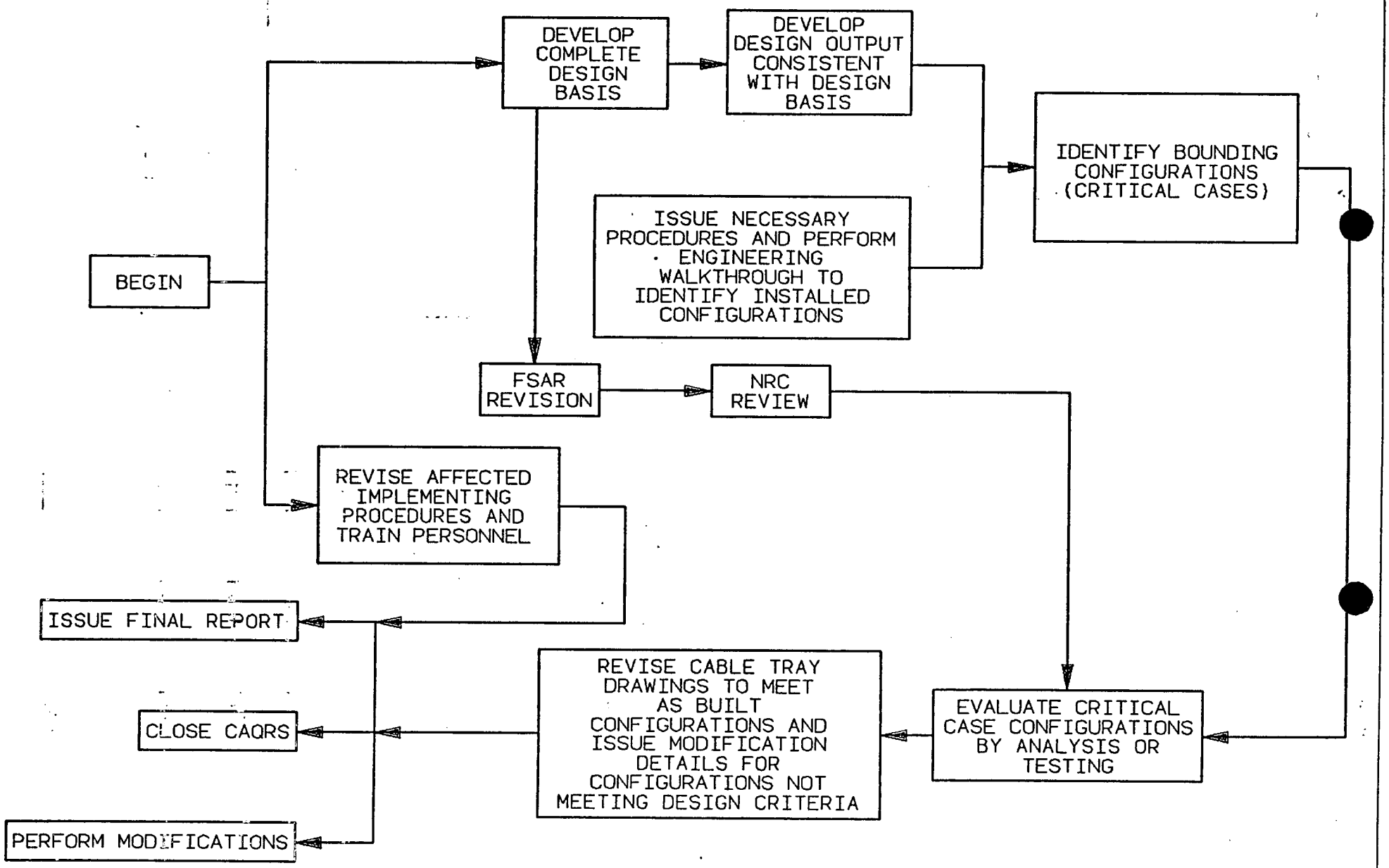
EXHIBIT A

Attachment 1

BASIS OF CAP

Report Number	Problem Description	Reference
CAQR WBP 870528	Adequate documentation was not maintained for the closure of NCR 5737 R1. Not all Cable Tray supports were walked down to compare as-built configurations with issued drawings during response to NCR 5737 R1.	Employee Concern IN-85-865-002 CATD 11103-WBN-08
CAQR WBP 880040	ZNB and ZNK (i.e.,fittings and offset type fittings, respectively) have not been qualified for various field configurations.	NRC Violation 390, 391/88-01-02
CAQR WBP 880167 (50.55[e])	Missing bolts or nuts at cable tray fitting locations and the installed configurations of cable trays do not match design drawings.	NRC Violation 390, 391/88-01-02 WBRD-50-390/85-51 WBRD-50-391/86-06
CAQR WBP 880418	No documentation exists to qualify cable tie wraps for horizontal cable trays mounted on their side. No documentation exists to qualify the installation of cable tray covers during a seismic event.	NRC Violation 390, 391/88-01-02
CAQR WBP 870818	Cable trays, piping, HVAC ducts and conduits have not been evaluated for differential movement between buildings.	
SCR SQN CEB 8622	Cable tray support design issues identified at SQN. Verify the potential generic condition evaluation performed for WBN.	

WATTS BAR NUCLEAR PLANT
CABLE TRAY FLOW CHART



ATTACHMENT 2

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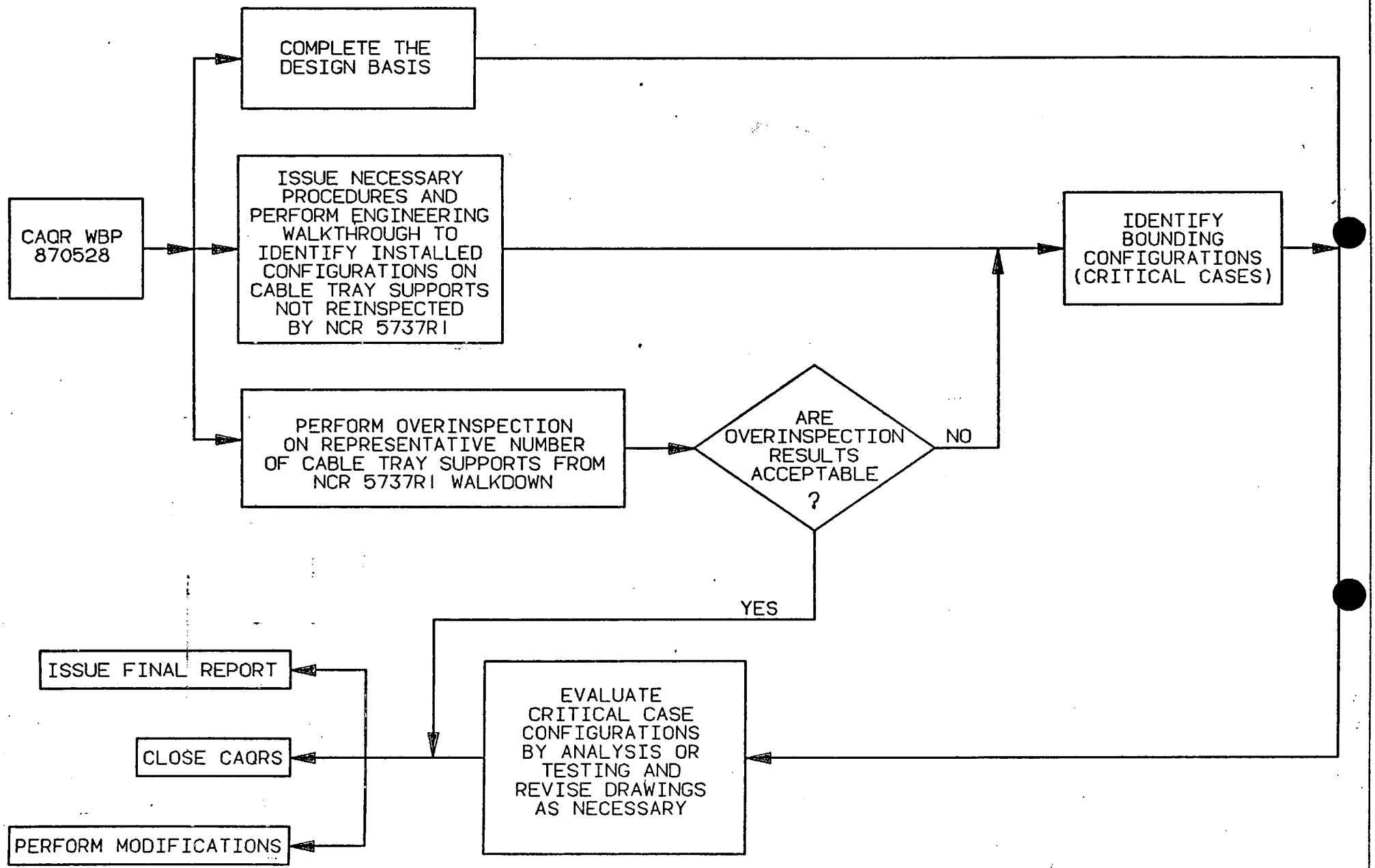
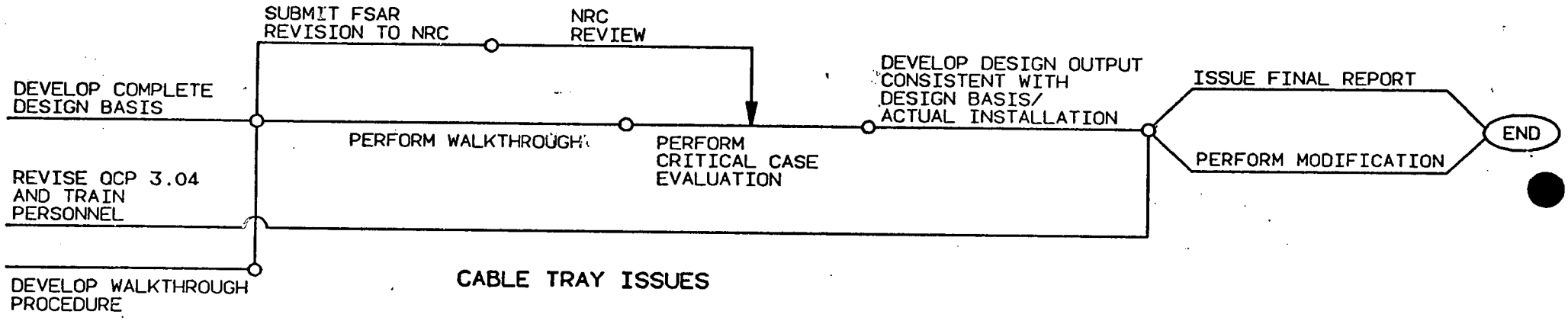
WATTS BAR NUCLEAR PLANT
CABLE TRAY SUPPORT FLOW CHART



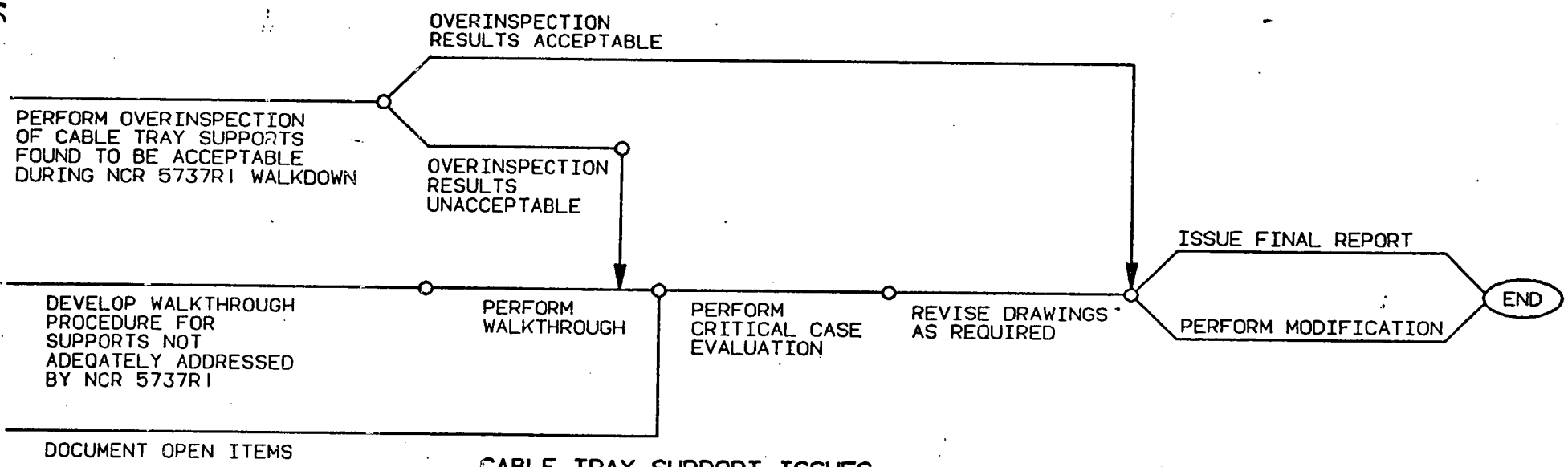
ATTACHMENT 2

PG 2 OF 2

WATTS BAR NUCLEAR PLANT
CABLE TRAY AND CABLE TRAY SUPPORTS
FRAGNET



CABLE TRAY ISSUES



CABLE TRAY SUPPORT ISSUES

ATTACHMENT 3

ENCLOSURE 2

For the Watts Bar Nuclear Plant, TVA commits to:

1. Develop a complete design basis for cable tray, cable tray fittings and hardware, and cable tray supports.

2. Develop design output consistent with the complete design basis.

3. Develop and implement a critical case evaluation of existing cable tray installations. The number of critical cases to be evaluated will depend on the assessment of walkthrough data.

4. Revise quality assurance (QA) procedures and train affected personnel.

5. Revise maintenance procedures and train affected personnel.

6. Revise construction procedures and train affected personnel.

7. Evaluate the disposition of NCR 5737, revision 1.

8. The Final Safety Analysis Report (FSAR) will be revised to address the qualification of the cable tray and associated hardware.

9. A technically justified FSAR revision will be submitted to NRC to update damping values.