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Your ref: Project No. 0794
Our ref: DCP_NRC_003236

February 18, 2013

Subject: Westinghouse Response to Requests for Additional Information (RAIs) on
WCAP-17577, Rev. 1

Westinghouse Electric Company, LLC is submitting responses to Requests for Additional Information (RAIs) received on WCAP-17577, "Topical Report on ASME Section III Piping Fatigue Analysis Utilizing the WESTEMSTM Computer Code," (Reference 1) to the Document Control Desk. The responses are submitted in support of the NRC review and safety evaluation of this topical report. This transmittal meets the milestone date for RAI responses to be received in order for the NRC to complete the safety evaluation of the use of WESTEMSTM for performing fatigue analysis on the AP1000® Class 1 piping in accordance with the schedule outlined in the acceptance letter (Reference 2).

This submittal contains proprietary information of Westinghouse Electric Company LLC. In conformance with the requirements of 10 CFR Section 2.390, as amended, of the Commission's regulations, we are enclosing with this submittal one copy of the Application for Withholding, AW-13-3603 (non-proprietary, Enclosure 1), and one copy of the associated Affidavit (non-proprietary, Enclosure 2) with Proprietary Information and Copyright Notices. The affidavit sets forth the basis on which the information identified as proprietary may be withheld from public disclosure by the Commission. Pursuant to 10 CFR 50.30(b), Response to RAI-WSTM-007-P (proprietary) and RAI-WSTM-007 (non-proprietary) are submitted as Enclosures 4 and 5. Response to RAI-WSTM-004 and RAI-WSTM-010 are non-proprietary and submitted as Enclosures 3 and 6, respectively. Correspondence with respect to the affidavit or Application for Withholding should include our reference number AW-13-3603 and should be addressed to James A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company, LLC, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

The following RAI responses are submitted via this transmittal:

RAI-WSTM-004
RAI-WSTM-007-P
RAI-WSTM-007-NP
RAI-WSTM-010

Questions or requests for additional information related to the content of these RAIs should be directed to Westinghouse. Please direct questions to the undersigned.

D108
MRO

Very truly yours,



Paul A. Russ
Director, US Licensing

/Enclosures

1. AW-13-3603 "Application for Withholding Proprietary Information from Disclosure," dated February 18, 2013
2. AW-13-3603, Affidavit, Proprietary Information Notice, Copyright Notice dated February 18, 2013
3. Response to RAI-WSTM-004 (Non-proprietary)
4. Response to RAI-WSTM-007 (Proprietary)
5. Response to RAI-WSTM-007 (Non-proprietary)
6. Response to RAI-WSTM-010 (Non-proprietary)

cc: B. Baval - U.S. NRC
M. Tonacci - U.S. NRC
P. Russ - Westinghouse
J. McInerney - Westinghouse

ENCLOSURE 1

AW-13-3603

APPLICATION FOR WITHHOLDING
PROPRIETARY INFORMATION FROM DISCLOSURE



Westinghouse Electric Company
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Your ref: Project No. 0794
Our ref: AW-13-3603

February 18, 2013

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Transmittal of WCAP-17577, "Topical Report on ASME Section III Piping Fatigue Analysis Utilizing the WESTEMS™ Computer Code," for Safety Evaluation

The Application for Withholding is submitted by Westinghouse Electric Company LLC (Westinghouse), pursuant to the provisions of Paragraph (b) (1) of Section 2.390 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and is customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10 CFR Section 2.390, Affidavit AW-13-3603 accompanies this Application for Withholding, setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to this Application for Withholding or the accompanying affidavit should reference AW-13-3603 and should be addressed to James A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania, 16066.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Robert B. Sisk'.

Robert B. Sisk
Manager, International Licensing

AW-13-3603
February 18, 2013

ENCLOSURE 2

AFFIDAVIT

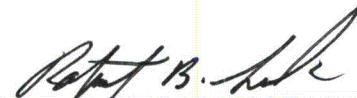
AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

SS

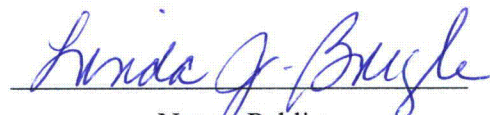
COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared Robert B. Sisk, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:



Robert B. Sisk
Program Manager Korea/UAE

Sworn to and subscribed
before me this 18th day
of February 2013.


Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Linda J. Bugle, Notary Public
City of Pittsburgh, Allegheny County
My Commission Expires June 18, 2013
Member, Pennsylvania Association of Notaries

- (1) I am Program Manager Korea/UAE, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse "Application for Withholding" accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

 - (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
- (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
- (b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.
- (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

- (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.
 - (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
 - (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.
- (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
- (v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in attachment to DCP_NRC_003236, Westinghouse Response to Requests for Additional Information (RAIs) on WCAP-17577, Rev. 1.”

This information is part of that which will enable Westinghouse to:

- (a) Manufacture and deliver products to utilities based on proprietary designs.
- (b) Advance the AP1000 Design and reduce the licensing risk for the application of the AP1000 Design Certification
- (c) Determine compliance with regulations and standards

(d) Establish design requirements and specifications for the system.

Further this information has substantial commercial value as follows:

- (a) Westinghouse plans to sell the use of similar information to its customers for purposes of plant construction and operation.
- (b) Westinghouse can sell support and defense of safety systems based on the technology in the reports.
- (c) The information requested to be withheld reveals the distinguishing aspects of an approach and schedule which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar digital technology safety systems and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.390 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

ENCLOSURE 3

Response to RAI-WSTM-004

(Non-Proprietary)

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: WSTM-004
Revision: 0

Question:

In Section 3.1, the 4th paragraph on Page 3-2 of the TR discusses validation testing of a Westinghouse computer code. The TR states that when testing is complete and the validation documentation package is prepared, it is independently verified in accordance with Westinghouse procedures to ensure that test cases are correct and that they have been executed correctly.

The staff noted that there are different benchmark problems between WESTEMS Version 4.5, 4.5.1, 4.5.2 and 4.5.6. The staff also notes that the benchmark problem has been changed from the previous code version. Identify procedures are in place and describe how these procedures ensure that the changes made in the later program version do not affect the functionality of the code which is not tested by a different test problem?

For example of functionality, gross structural discontinuity or material discontinuity effect was considered in Equations (10), (11) and (13) of NB-3653 of ASME Code Section III. The NB-3600 regression test problem should select a model with structural discontinuity or material discontinuity to demonstrate the validation for the discontinuity effect. However, the latest version 4.5.6 regression test problem was a uniform pipe size with a single material type model to demonstrate its validation. Therefore, the latest benchmark regression testing problem may not demonstrate the discontinuity effect. Please discuss how a uniform pipe size with a single material type would provide an adequate validation of the methodology.

Westinghouse Response:

This request can be summarized as two basic questions:

- a) Do changes to the validation problems used for various versions meet the Quality Assurance requirements for validation?
- b) Does the validation of version 4.5.6 include the gross structural discontinuity effect in the NB-3653 equations?

The answers to each are provided below:

- a) Westinghouse Level II Procedure NSNP 3.6.2, Validation of Computer Software, defines the requirements for computer program validation. With respect to test case definition, it includes the following:

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

"During the planning process a sufficient number of test cases shall be developed to address all the requirements in the Software Requirements Specification or Software Change Specification to ensure that the program is tested over the entire range of anticipated inputs. Test cases should also address, as necessary, such topics as logic branches and testing of nonstandard hardware interfaces. Regression testing shall be included, as appropriate, to ensure that no unintended side effects were introduced. Link test cases to requirements for traceability."

"When program modifications are performed, the Validation Group is also responsible for performing sufficient regression testing to ensure that no unintended side effects were introduced while modifying the program."

Westinghouse Level II Procedure WEC 3.6.1, Computer Software Development Process, defines regression testing as: "Selective testing to verify that modification(s) to the source code have not caused unintended or adverse effects."

Updates and maintenance to the WESTEMS™ program are made according to Westinghouse Level II Procedure NSNP 3.6.7, "Maintenance of Configured Computer Programs." This procedure requires a change specification that describes the changes to the program functional requirements and the software design changes to accomplish them. As described above, validation of the changes in the new program version requires definition of test problems for the specific changes, plus regression testing to verify that the modifications made have not caused unintended or adverse effects on other program functions. The regression tests are therefore selected based on the extent of the changes made for a given program version.

The Westinghouse procedures for software control do not require that the validation tests between versions are the same problems. They do require that the tests created or selected test the program functional requirements. In fact, for program modifications that add new capabilities, new test problems must normally be created. The procedures require the validator to define the test problems and the verifier to verify their correctness, completeness, and consistency with the change specification.

The table below provides a summary of the validation problems used for different versions of the WESTEMS™ program with respect to the NB-3600 fatigue evaluation requirements and changes made. The tests performed were sufficient to test the program changes and any potential effects on the balance of functional requirements. For tests where direct comparison cannot be made to the results from a previous version due to functional requirement changes, alternate methods were used to validate and verify the results.

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Version	Change Spec	Validation	NB-3600 Requirements affected	NB-3600 Test Problem Model(s)
4.5	CN-PAFM-06-159	CN-PAFM-06-161	All – initial NB-3600 module	Letdown Valve (with ta/tb) -for through-wall temperature solution SGIE (ta only) – for ASME solutions without tb RHR Hot Leg Nozzle (with ta/tb) – for ASME solutions with tb
4.5.1	CN-PAFM-07-65	CN-PAFM-07-153	1-D heat transfer model temperature solution NB-3600 heat transfer solution implementation. NB-3600 input	1-D heat transfer solution tested with a separate test problem; solved in a separate routine used in various modules, including NB-3600. 2 regression test problems with SGIE model for impact of 1-D heat transfer change – tested two different peak selection options; test runs made in both 4.5 and 4.5.1 versions for comparison. 2 test problems

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Version	Change Spec	Validation	NB-3600 Requirements affected	NB-3600 Test Problem Model(s)
			options: data compression, and removed one option; Output print error correction	with SGIE model with input data compression; test runs made in both 4.5 and 4.5.1.
4.5.2	CN-PAFM-08-106	CN-PAFM-08-119, Rev 0	NB-3600 output printing error correction Run-time error Regression test	RVON existing analysis model – only for reviewing print error correction Analysis model where error occurred in 4.5.1 to show correction and run to finish. Letdown valve (with ta/tb) 212500 from Install Test Project; test runs made in both 4.5.1 and 4.5.2 versions for comparison.
		CN-PAFM-08-119, Rev 1	Same as above; new problem added for NB-3600 basic functions and future regression testing	3-inch valve transition model (with ta/tb) created for new independent validation of 4.5.2. Performed independent validation (with mostly manual calculations) of NB-3600 fatigue analysis functions

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Version	Change Spec	Validation	NB-3600 Requirements affected	NB-3600 Test Problem Model(s)
				and outputs.
4.5.3	CN-PAFM-11-3	CN-PAFM-11-2	<p>Outside node algebraic stress correction</p> <p>Stress ratchet Sy correction</p> <p>Peak time print correction</p> <p>Eq. 13 allowable temperature correction</p> <p>Number of peak times limit increased</p> <p>SRSS option default change</p> <p>Print original peaks added</p> <p>Regression test fatigue result comparison</p>	<p>Letdown valve (with ta/tb) 212500 from Install Test Project</p> <p>Letdown valve (with ta/tb) 212500 from Install Test Project</p> <p>Letdown valve (with ta/tb) 212500 from Install Test Project</p> <p>N/A – code review</p> <p>N/A – code review</p> <p>GUI test with new model creation</p> <p>Letdown valve (with ta/tb) 212500 from Install Test Project</p> <p>Letdown valve (with ta/tb) 212500 from Install Test Project</p>
4.5.4	Plant specific monitoring single	Plant specific monitoring single	None	N/A

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Version	Change Spec	Validation	NB-3600 Requirements affected	NB-3600 Test Problem Model(s)
	application	application. NB-3600 not applicable or validated.		
4.5.5	CN-PAFM-12-4	CN-PAFM-12-14	Regression test fatigue result comparison	Letdown valve (with ta/tb) 212500 from Install Test Project
4.5.6	CN-PAFM-12-56	CN-PAFM-12-20	Peak & Valley and all subsequent ASME stress and fatigue calculations Regression test for the balance of NB-3600 functional requirements	3-inch valve transition model (with ta/tb) created for new independent validation of 4.5.2. Validated against manual calculations. 3-inch valve transition model (with ta/tb) used for independent validation of 4.5.2. Matched results of 4.5.2.

- b) With respect to testing of a gross discontinuity, the version 4.5.6 validation problem included the discontinuity of the 3-inch valve transition model, as described in Westinghouse calculation note CN-PAFM-12-20, and summarized in Section 5.1 and Table 5-2 of WCAP-17577, Rev. 1. The valve transition validation problem model included a pipe thickness (ta) of 0.438 in. and a transition section thickness (tb) of 0.65 in.

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Topical Report (TR) Revision:

None

Supporting References Revision:

None

ENCLOSURE 5

Response to RAI-WSTM-007

(Non-Proprietary)

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: WSTM-007-NP
Revision: 0

Question:

In Figure 4-4 of WESTEMS TR, the time constant check process is for eliminating redundant peaks/valleys. The staff is requesting the applicant clearly define how the time constant is determined and provide clear justification/criteria for this elimination. Since the time constant is applied to all transients in the analysis, any wrong definition will cause the actual peaks/valleys to be deleted. For example, a standard reactor coolant pressure boundary component subject to 30 or more transients. Use one constant time number to fit 30 transients does not appear to be justified. This information should be summarized in the topical report.

Westinghouse Response:

The following response addresses three basic areas of this request:

- justification for using the time constant when it meets the related criteria
- the user instructions that define how the time constant is determined for an analysis, including criteria for valid use of the time constant in elimination of redundant peaks
- user instructions describing limitations of using the time constant, especially in analyses with large numbers of transients.

It is important to clarify, that the function of the time constant in a WESTEMS™ NB-3200 analysis is different from that of the time constant in a WESTEMS™ NB-3600 analysis. Therefore, NB-3600 and NB-3200 are addressed separately, since the time constant is used differently in each case.

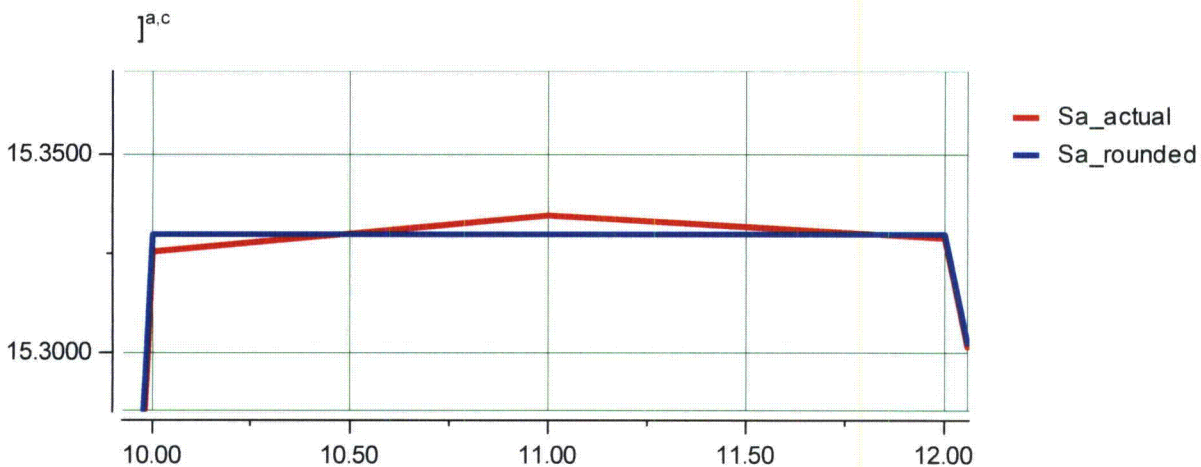
NB-3600:

Justification for using the time constant:

The peak exclusion time constant is provided in a WESTEMS™ NB-3600 analysis as an option to control one type of redundant peak described in Section 4.1.5 of the Topical Report. [

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)



[

$J^{a,c}$ Since, in this example, these times all actually represent one equivalent stress state that maximizes the range, the algorithm introduces a redundancy by retaining both times.

For this case, for the single load excursion that produced the stress state, the methods of the ASME Code would require only one peak time to be selected to represent the stress range extreme produced by the defined load excursion. Characteristics of the software algorithm result in two, nearly identical, stress states to be chosen as peaks for the same event in this case. [

$J^{a,c}$ By including both peak times for this case, the program considers twice the

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

number of design cycles for this stress state in the fatigue analysis. When this situation occurs, it is justified to remove one of the two redundant peaks by applying an appropriate time constant, when the peak removed is demonstrated to produce a smaller alternating stress range than the peak retained. The resulting fatigue stress ranges and cumulative usage factor continue to meet the design criteria and requirements of the ASME Code.

The peak exclusion time constant [

] ^{a,c}

Instructions for determining the time constant:

[

] ^{a,c}

This process is covered at a high level in Section 5.1.3.3 of the WESTEMS™ NB-3600 fatigue analysis procedure.

User instructions describing limitations of using the time constant:

Section 10.3.2 of the WESTEMS™ User Manual discusses 'User Input and Controls Related to Peak and Valley Selection.' It includes a subsection on [

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

] ^{a,c}

This is also discussed in Section 4.1.5 of the Topical Report.

[

] ^{a,c} Procedural guidelines also make the analyst aware of this aspect and independent verification requirements (PSDR-QP-4.7, Section 6.0) ensure that the time constant input does not [

] ^{a,c}

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

NB-3200:

Justification for using the time constant:

ASME fatigue usage is based on alternating stress, S_a , which is determined from the Total stress range and the K_e penalty factor. The K_e penalty factor is based on the Primary plus Secondary stress range. Therefore, the peak selection methodology implemented by the WESTEMS™ NB-3200 algorithm is based on [

] ^{a,c} A

characteristic of the peak selection methodology is that the thermal stress contributions to S_n and S_p can be separated by a period of time. For example, the thermal discontinuity stress will typically maximize later than the shock stress due to a given load excursion. Both types of thermal stress are included in S_p , but only thermal discontinuity stress is included in S_n . Therefore the S_n peak time can lag the S_p peak time in response to the same load excursion. This phasing of the S_n and S_p stress histories can result in different S_n and S_p peak times being selected in response to the same transient load excursion.

For a given load excursion, the methods of the ASME Code require only one peak time to be selected to represent the stress response to the load excursion in its contribution to a stress range pair. The software algorithm can result in [

] ^{a,c} The

resulting fatigue stress ranges and cumulative usage factor continue to meet the design criteria and requirements of the ASME Code.

The peak merge time constant input for an NB-3200 evaluation [

] ^{a,c}

Instructions for determining the time constant:

[

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

J^{a,c}

This process will be addressed in the WESTEMS™ NB-3200 analysis procedure section of the WESTEMS™ User Manual that is being produced in response to RAI WSTM-006.

User instructions describing limitations of using the time constant:

Section 8.1.3 of the WESTEMS™ User Manual currently discusses "Fatigue Analysis Peak and Valley Selection and Peak Editing Guidelines." It includes a discussion of the time constant including its application and limitations, including:

"General guidelines for the time constant are as follows:

- i. [

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

J^{a,c} Review of these limitations will be included in the WESTEMS™ NB-3200 analysis procedure section of the WESTEMS™ User Manual that is being produced in response to RAI WSTM-006 and will ensure that the time constant input does not [

J^{a,c}

As an example, Sn and Sp plots are shown below for two representative transient cases. [

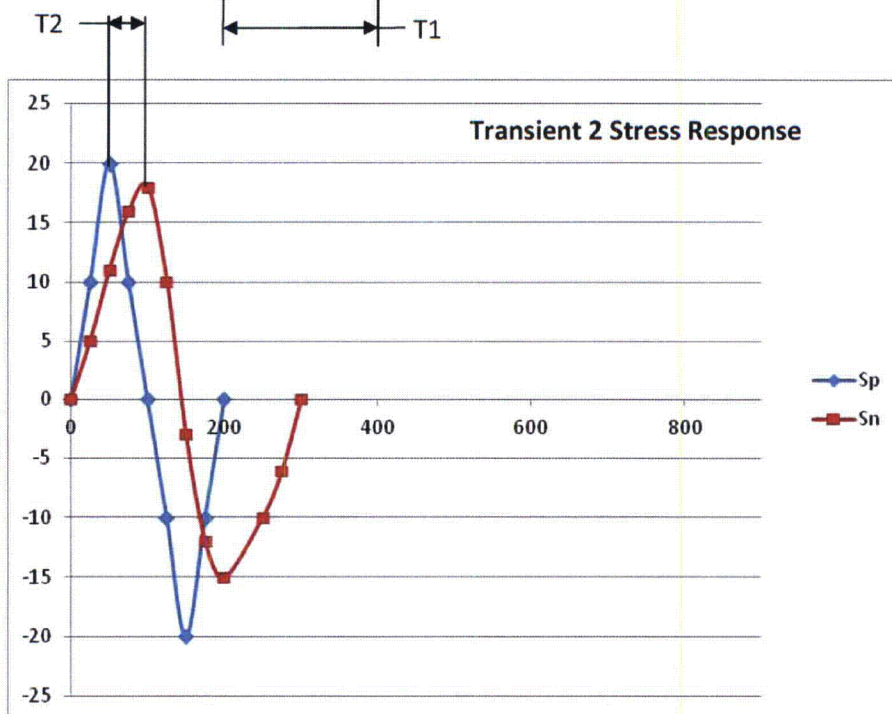
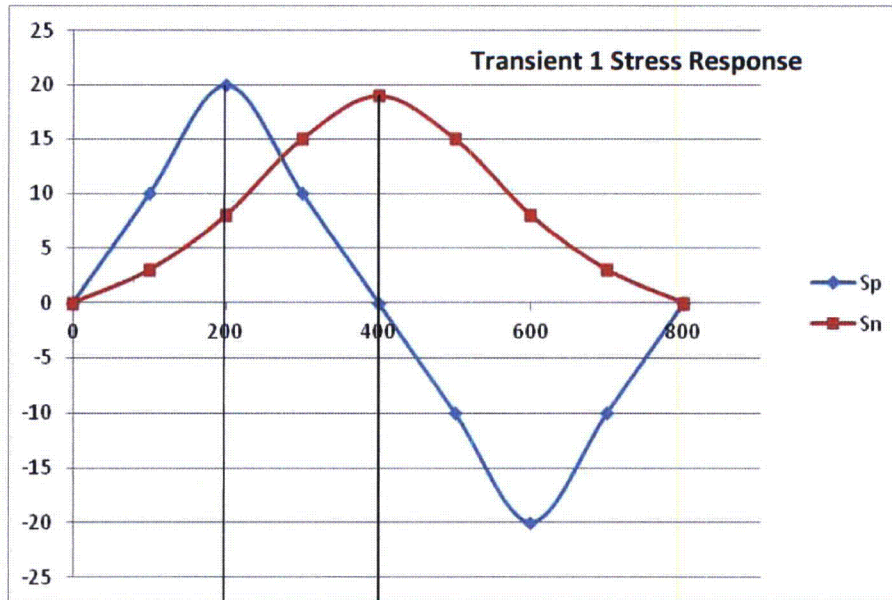
WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

J^{a,c}

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)



WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Topical Report (TR) Revision:

None

Supporting References Revision:

None

ENCLOSURE 6

Response to RAI-WSTM-010

(Non-Proprietary)

WESTINGHOUSE TOPICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: WSTM-010

Revision: 0

Question:

WCAP-17577-P, Revision 1, "Topical Report on ASME Section III Piping Fatigue Analysis Utilizing the WESTEMS Computer Code," Section 1.1, states in part that, "The WESTEMS program is designed to provide qualified fatigue analysts the necessary tools to perform fatigue analyses commensurate with the degree of conservatism required to demonstrate qualifications to ASME Code limits."

Provide the indoctrination and training and requirements for the fatigue analysts that perform fatigue analyses to demonstrate qualifications to ASME Code limits using the WESTEMS computer code.

Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, Criterion II, establishes quality assurance program requirements. Criterion II states in part that, "The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained."

Westinghouse Response:

The Westinghouse Quality Program defines how the company meets customer and regulatory requirements. The top level (Level 1) is the Westinghouse Quality Management System (QMS). The QMS describes the Westinghouse quality program and commitments for 10 CFR 50 Appendix B and other Nuclear Industry and International standards, including ASME NQA-1-1994 Edition. This document is general in nature, but applicable to all personnel. The QMS is also reviewed and approved by the USNRC. From the QMS, Level 2 and Level 3 provide implementation procedures. Level 2 Policies & Procedures are applicable at the Business Unit level, while Level 3 documents are individual department or group procedures. The ASME Quality Assurance Program, WCAP-12308, Rev. 34 provides additional requirements for meeting the ASME Quality Assurance requirements. These documents are applicable to certain analyses performed within Westinghouse. The group manager identifies which documents apply to the analysis being performed and notifies the analyst regarding which are to be included in the analysts training needs assessment. Training is addressed in level 2 procedure WEC 2.6, Training, and is documented according to the requirements of the level 2 procedure WEC 17.1, Records.

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The training program for the WESTEMS™ analysis addresses two main areas. 1) The level 3 WESTEMS™ Fatigue Procedure PSDR-QP-4.7 and 2) correct use of WESTEMS™ version 4.5.6.

The training for Westinghouse PSDR Level 3 procedure for NB-3600 fatigue analysis and verification using WESTEMS™ software provides the steps for performing and verifying an ASME NB-3600 fatigue analysis using the WESTEMS™ software. It also provides supporting guidelines to perform each step. These include developing an NB-3600 analysis model, defining the appropriate input and analysis options, and clarifying the various methods used for NB-3600 analysis that can be implemented during the overall analysis process. This procedure also offers guidance for both the analyst and verifier to review the results of a fatigue analysis with respect to the chosen inputs and options. The requirements of the fatigue analysis procedure ensure that the analysis is performed to the requirements of the ASME code and a checklist is included with each analysis calculation to ensure that the procedure is followed. This checklist requires the verifier to systematically verify that the analysis inputs and results are correct and that any refinements to the analysis inputs are documented and reviewed according to the requirements of procedure PSDR-QP-4.7 and that Independent verification is performed as required by Westinghouse level 2 procedure NSNP 3.3.3, Design Verification by Independent Review or Alternate Calculations, to ensure that the design analysis is correct.

The WESTEMS™ training is intended to ensure that the analyst is sufficiently trained in the use of the WESTEMS™ computer program, so that the results from the program are correct. The training program outlined below has been specifically fashioned to meet the requirements of AP1000 as defined in the applicable piping design specification and the applicable ASME code. It should be emphasized that the requirements of WCAP-12308 and other QMS procedures are sufficient to ensure that the analysts performing ASME code work are qualified regardless of the computer program which is used.

The WESTEMS™ training consists of four training module presentations and completion of a test problem which is submitted for demonstration of understanding. In addition, a mentoring relationship (on the job training) is established until the analyst has demonstrated sufficient understanding by producing an acceptable analysis which has been determined to be correct. The four training modules are:

- 1- WESTEMS™ Fatigue Training Part 1: Standard Analysis (The contents of this training module include review of appropriate references, project structure, WESTEMS™ model definition, fixed inputs, transient inputs, analysis options, and analyst controls.)
- 2- WESTEMS™ Fatigue Training Part 2: Introduction to ASME stress and fatigue evaluations (The contents of this training module include ASME B&PV code Section III sections, general stress criteria, service conditions, design by analysis, stress classifications, stress qualifications, NB-3200 requirements, NB-3200 fatigue

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requirements, NB-3600 requirements, NB-3600 fatigue requirements, and stress indices.)

- 3- WESTEMS™ Fatigue Training Part 3: NB-3600 Sample Problem (The contents of this training module include overview of WESTEMS™ 4.5.6 standard component analysis, moment inputs, equation 10 primary plus secondary stress, equation 11 total stress, current WESTEMS™ release letter, installation information, material database & water properties file, creating a WESTEMS™ project, creating the component model and adding components, adding moment stress ranges, creating transients, creating history files, creating a transient set, performing analyses, reviewing results, refining analysis and reruns, special consideration for branch components, and appending history files. The analyst is required to complete and submit a homework problem.)
- 4- WESTEMS™ Fatigue Training Part 4: Review of Analysis Results and Verification (The content of this training module includes review of the results, output file structure, analyst review, homework review, 1-D heat transfer, thermal stress, base-time selection, sub-cycle peaks, redundant peak considerations, additional peak review guidelines, NB-3600 fatigue analysis documentation, and the verification process.)

Individual training for each analyst is documented in each analyst's training records and is summarized in a qualification and training matrix, which is maintained by the group manager in accordance with Westinghouse level 2 procedure WEC 2.6, Training.

The qualification matrix is used to determine who is qualified to perform fatigue analysis using WESTEMS™ and who is qualified to verify the WESTEMS™ fatigue analysis.

Topical Report (TR) Revision:

None

Supporting References Revision:

None