**Attachment 22**

**Non-proprietary Westinghouse Electric Company report DAR-ME-09-10-NP, "Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2," Revision 0**

WESTINGHOUSE NON-PROPRIETARY CLASS 3

Westinghouse

Nuclear Services

**COVER SHEET FOR:**

- ☐ **FUNCTIONAL SPECIFICATION**
- ☐ **QUALIFICATION PROCEDURE**
- ☐ **TEST PROCEDURE**
- ☐ **USER'S MANUAL**
- ☐ **TRAINING DOCUMENT**
- ☐ **EQUIPMENT TRANSFER DOCUMENT**
- ☒ **OTHER:** Technical Report

**DOCUMENT NUMBER & REV:**

DAR-ME-09-10-NP, Revision 0

**TITLE:**

Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2

**PLANT SITE/PLANT ALPHA:** Watts Bar 2 / WBT

**KEY WORDS:** Core,Exit,Thermocouple,MI Cable, CET,ICI,WINCISE,IITA

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The procedure approval signature of the cognizant manager below confirms that prior concurrence of required review groups has been obtained.

| | | |
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***Electronically approved records are authenticated in the electronic document management system.***

[1]Effective/Revised Date

Westinghouse

# RECORD OF CHANGES

**Document Number:** DAR-ME-09-10-NP **Revision No.:** 0

**Title:** Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2

| CHANGE NUMBER | PARAGRAPH NUMBER | CHANGE DESCRIPTION AND REASON |
|---|---|---|
| 0 | All | Initial Issue |

## TABLE OF CONTENTS

Title Page ..... 1
Record of Revisions ..... 2
Table of Contents ..... 3
List of Tables ..... 3
List of Figures ..... 3
List of Appendices ..... 4
List of Acronyms ..... 5
1.0 - Scope ..... 6
2.0 - Purpose ..... 6
3.0 - References ..... 7
4.0 - Description ..... 8
5.0 - Qualification Testing ..... 14
6.0 - Applicability of the Qualification Test Hardware to the Watts Bar Unit 2 Hardware ..... 28
7.0 - Conclusions ..... 28

## LIST OF TABLES

1 – MI Cable & Connector Hardware Comparison ..... 29
2 – Selected Temperature Values from the LOCA/MSLB Test of Reference 3.1 ..... 33

## LIST OF FIGURES

1 - WINCISE MI Cable Layout ..... 10
2a - MI Cable OBE Comparison [ ]$^{a,c}$ ..... 18
2b - MI Cable SSE Comparison [ ]$^{a,c}$ ..... 19
3 - MI Cable LOCA Profile Comparison – Pressure Profile ..... 21
4 - MI Cable LOCA Profile Comparison – Temperature Profile ..... 23
5 - MI Cable to Feedthrough Module Interface OBE & SSE Comparison ..... 27

## LIST OF APPENDICES

| Appendix | Description |
|---|---|
| A | Summary of Watts Bar Environmental Qualification Parameters from Reference 3.10. (2 total pages) |
| B | Westinghouse (ABB CE) Letter No. CWE-84-0223, "CECo P.O. 254150/254151", "Byron/Braidwood HJTC/CETC M.I. Cable Connector Beta Shielding", Dated November 19, 1984, from R. B. Granstand (ABB CENP) to Hamid Heidarisafa (S&L). (3 total pages) |
| C | TVA Letter Number Reference WBT-TVA-0125-Revised, Dated November 25, 2008, Contract Work Authorization Number: WEST-WBT-2008-005, "Response to WINCISE – Cable Critical Technical Input". (16 total pages) |
| D | Development of Enveloping OBE / SSE Profiles Provided in Reference 3.10. (13 total pages) |

## LIST OF SELECTED ACRONYMS

| Acronym | Definition |
|---|---|
| CET | Core Exit Thermocouple |
| CPA | Containment Penetration Assembly |
| DAP | Diallyl Phthalate |
| EPDM | Ethylene Propylene Diene Monomer |
| EQ | Environmental Qualification |
| MI | Mineral Insulated |
| NSSS | Nuclear Steam Supply System |
| OBE | Operating Basis Earthquake |
| PAM | Post Accident Monitoring |
| RRS | Required Response Spectra |
| $SiO_2$ | Silicon Dioxide |
| SPS | Signal Processing System |
| SSE | Safe Shutdown Earthquake |
| WINCISE | Westinghouse Incore Information Surveillance and Engineering System |

[ ]$^{a,c}$

[ ]$^{a,c}$

## 1.0 SCOPE

This report is an analysis of the environmental and seismic/structural qualification in accordance with IEEE 323-1974 and IEEE 344-1975 of the Westinghouse Incore Information Surveillance and Engineering System (WINCISE) Mineral Insulated (MI) Cabling for Watts Bar Unit 2 based upon the qualification testing presented in References 3.1, 3.3, 3.4, 3.5, 3.7 and 3.9 and as supplemented by References 3.6 and 3.8. The method of hardware qualification is similarity analysis.

The basis for the Watts Bar Unit 2 site specific environmental and seismic/structural qualification parameters is Reference 3.10.

Reference 3.2 gives information for installation, maintenance and inspection guidelines of the supplied hardware as shown in Table 1.

[

]$^{a,c}$

This report is prepared in conjunction with Tennessee Valley Authority (TVA) Work Authorization 65717.

[

]$^{a,c}$

Table 1 is a summary of the supplied hardware.

Figure 1 is a schematic of the supplied hardware.

## 2.0 PURPOSE

This report is based on DAR-ME-09-10, Rev. 0, "Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2". Only minor editorial and formatting changes were made. It was created to submit to the Nuclear Regulatory Commission for the Watts Bar Nuclear Unit 2 Nuclear Steam Supply System (NSSS) Completion Project. Proprietary information is marked by [ ]$^{a,c}$, as defined in Reference 3.17.

This report provides the environmental and seismic/structural qualification summary for the Watts Bar WINCISE MI Cabling Upgrade, meeting the requirements of IEEE-323-1974 and IEEE 344-1975 based on the referenced qualification tests.

In addition, this report provides a description of Watts Bar Unit 2 WINCISE Cable System Upgrade as well as a comparison of the qualification test results with respect to the specified Watts Bar Unit 2 requirements provided in Reference 3.10.

## 3.0 REFERENCES


3.1 Westinghouse (ABB CE) Report Number CE-NPSD-275-P, "Summary Report: Class 1E Qualification Test of the Electronic Resources Division (ERD) Electrical Connectors and Mineral Insulated Cable", Dated November 1984. (TVA Reference Number T25060314156).

3.2 Westinghouse Document Number DP-ME-09-1, Revision 0, "Technical Manual for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2".

3.3 Westinghouse (ABB CE) Report Number CE-NPSD-275-P, Supplement 2-P, "Qualification Summary Report for the Single Glass Bead Seal Multipin Connector Family Supplied by ERD for Combustion Engineering", Dated September 1988. (TVA Reference Number T25060314157)

3.4 Westinghouse (ABB CE) Report Number CE-NPSD-654-P, "Qualification Summary Report for the Imaging and Sensing Technology Canada Inc. Flexible MI Cable with Litton Connectors", Dated March 1991. (TVA Reference Number T25060314158)

3.5 Westinghouse (ABB CE) Report Number CE-NPSD-329-P, "Qualification Summary Report for the Conax Feedthrough Modules with Whittaker Connectors", Dated March 6, 1986.

3.6 Westinghouse Document Number CN-ME-09-5, Revision 00, "Aging Calculations for the Watts Bar Unit 2 Core Exit Thermocouple Cable & Connector Upgrade".

3.7 Conax Buffalo Document Number IPS-752, Revision D, "Design Qualification Report for Electric Penetration and Feedthrough Assemblies for Watts Bar Nuclear Plant Units 1 & 2 Tennessee Valley Authority". (TVA Reference Number B78000810004)

3.8 Westinghouse (ABB CE) Letter No. CWE-84-0223, "CECo P.O. 254150/254151", "Byron/Braidwood HJTC/CETC M.I. Cable Connector Beta Shielding", Dated November 19, 1984, from R. B. Granstand (ABB CENP) to Hamid Heidarisafa (S&L). (This Document is Appendix B).

3.9 NTS Test Report Number 60353-94N, "Test Report for Mechanical Cycling & LOCA Testing of One (1) ERD Multipin Connector for Commonwealth Edison Company", Issue Date 1/26/94. (TVA Reference Number T25060314162)

3.10 Watts Bar Letter Number WBT-TVA-0125 - Revised, "Response to WINCISE – Cable Critical Technical Input", Dated November 25, 2008, CWA Number WEST-WBT-2008-005. (This Document is Appendix C)

3.11 Westinghouse Drawing No. E-WBN2-155-001, Revision 01, "WINCISE System Layout Drawing". (TVA Reference Number E-WBN2-155-01)

3.12 Westinghouse Drawing No. E-WBN2-155-002, Revision 01, "WINCISE 1 to 2 Transition Cable Assemblies". (TVA Reference Number E-WBN2-155-02)

3.13 Westinghouse Drawing No. E-WBN2-155-003, Revision 01, "WINCISE 6 to 1 Transition Cable Assemblies". (TVA Reference Number E-WBN2-155-03)

3.14 Westinghouse Drawing No. E-WBN2-155-004, Revision 01, "WINCISE CET Containment Cable Sub-Assemblies". (TVA Reference Number E-WBN2-155-04)

3.15 Westinghouse Drawing No. E-WBN2-155-005, Revision 01, "WINCISE CET Containment Feedthrough Cable Assemblies". (TVA Reference Number E-WBN2-155-05)

3.16 TVA Reference Number EDCR 52321. (This is a document that provides in-containment cable routing so that it can be confirmed that all of the electrical connectors are installed above the surge flood elevation.)

3.17 Westinghouse Document Number WCAP-7211, Rev. 5, "Proprietary Information and Intellectual Property Management Polices and Procedures".

## 4.0 DESCRIPTION

### 4.1 WINCISE SYSTEM DESCRIPTION

The WINCISE cabling consists of silicon dioxide ($SiO_2$) insulated, multi-conductor stainless steel sheathed cable that is hermetically sealed through an all-welded construction technique. Each cable train or set is comprised of 3 cable sections.

The first cable section, the 1 to 2 Transition Cable Assembly (Figure 1), consists of a multipin electrical connector at one end that mates to the WINCISE Incore Detector and carries the signals from 5 vanadium detectors and one CET signal. This cable section then separates the vanadium signals and CET signals into two separate cables. The vanadium signals are routed to the Signal Processing System (SPS) Cabinet and the CET signals are routed to the next MI Cable section. There is one of these cable sections for each incore detector.

The second cable section, 6 to 1 Transition Cable Assembly (Figure 1), gathers CET signals from up to six 1 to 2 Transition Cable Assemblies into a single multipin electrical connector. This entire cable section will be installed completely [ ]$^{a,c}$ at Watts Bar Unit 2.

The third cable section, the Containment Feedthrough Cable Assembly (Figure 1), is a combination MI Cable and Containment Penetration Assembly (CPA) Feedthrough Module. This cable section carries up to 6 CET signals from the 6 to 1 Transition Cable Assembly through the CPA. At the ex-containment interface, the cable section pigtail conductors will be spliced into the existing plant cabling and enclosed in Raychem-style heat shrink tubing hardware.

The breakout feature of the 1 to 2 Transition Cable Assemblies allows the safety related CET signals to be parted from the non-safety related vanadium signals so that each set of signals can be routed independently to meet TVA-specific cable training and separation requirements.

Figure 1 and Reference 3.11 each have a schematic of the upgraded WINCISE cable system.

a,c

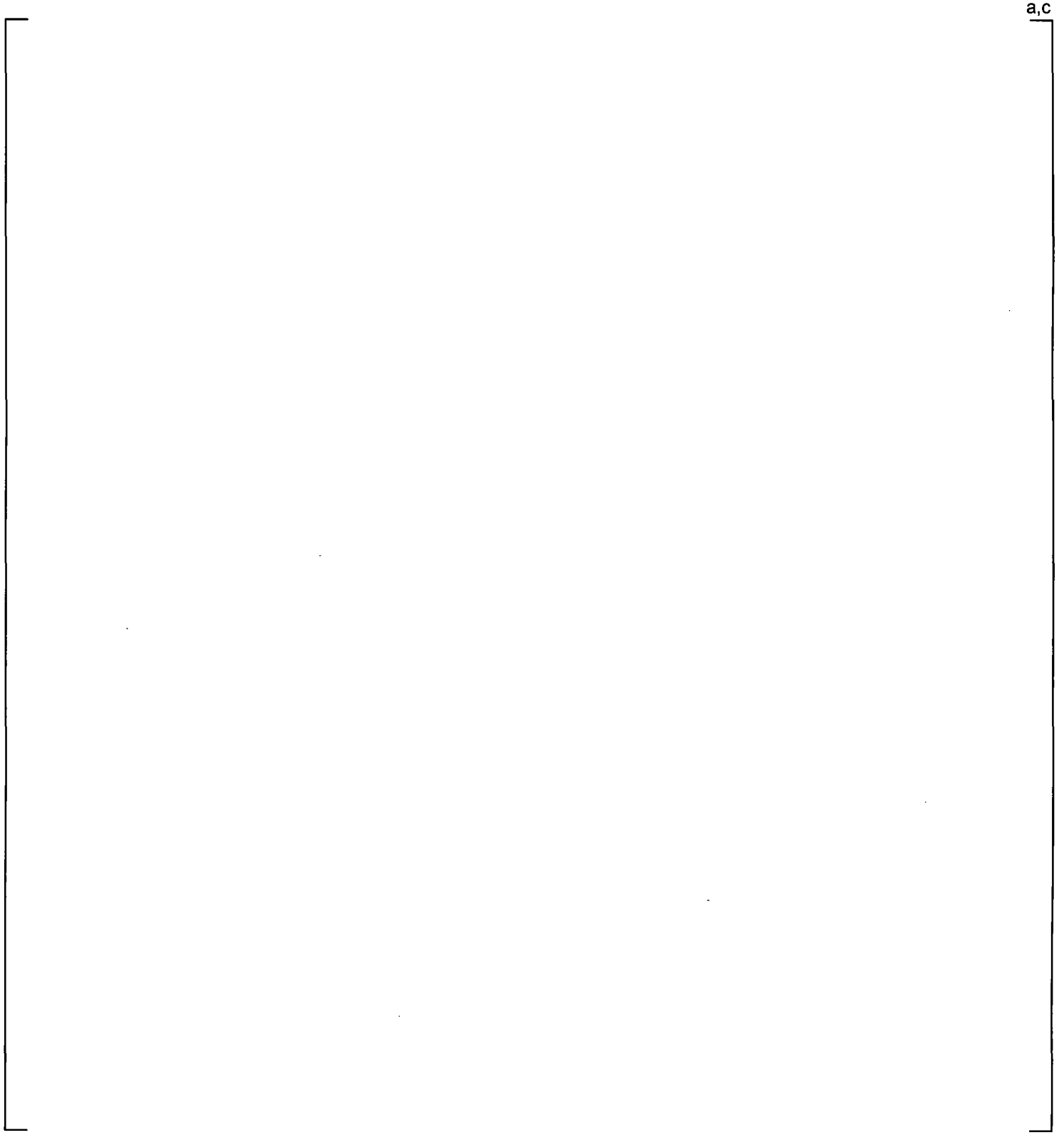

**Figure 1**
***WINCISE MI Cable Layout***

4.1.1 WINCISE 1 TO 2 TRANSITION CABLE ASSEMBLY (Reference 3.12)

Each 1 to 2 Transition Cable Assembly [

]$^{a,c}$

These Cable Assemblies are hermetically sealed by an all-welded construction technique. This technique (process), together with the use of inorganic materials, provides a high tolerance for abnormal temperatures and pressures, and minimal susceptibility to radiation damage.

[

]$^{a,c}$

4.1.2 WINCISE 6 TO 1 TRANSITION CABLE ASSEMBLY (Reference 3.13)

[

]$^{a,c}$

These Cable Assemblies are hermetically sealed through an all-welded construction technique. This technique (process), together with the use of inorganic materials, provides a high tolerance for abnormal temperatures and pressures and minimal susceptibility to radiation damage.

All connectors for the 6 to 1 Transition Cable Assemblies are factory installed on the attendant cable. No field connector termination is applicable.

4.1.3 WINCISE CET CONTAINMENT FEEDTHROUGH CABLE ASSEMBLY (References 3.14 and 3.15)

[

]$^{a,c}$ These MI cables are housed in a flexible stainless steel hose.

These Cable Assemblies are hermetically sealed through an all-welded construction technique. This technique (process), together with the use of inorganic materials, provides a high tolerance for abnormal temperatures and pressures and minimal susceptibility to radiation damage.

[

]$^{a,c}$

The ex-containment pigtail portion exiting the Feedthrough Module consists of [

]$^{a,c}$

The Feedthrough Module itself is installed into [ ]$^{a,c}$ CPAs at Watts Bar Unit 2, [ ]$^{a,c}$

### 4.1.4 CONTAINMENT CABLE ASSEMBLY TO PLANT CABLING SPLICE INTERFACE

[

]$^{a,c}$ These splices will be installed and qualified by TVA personnel and are not included in this report.

### 4.1.5 CLARIFICATION OF THE TERMS "SEMI-RIGID" AND "FLEXIBLE" MINERAL INSULATED (MI) CABLE ASSEMBLIES

Throughout this report, the terms "semi-rigid" and "flexible" are used to describe the MI Cable. The following defines "semi-rigid" and "flexible":

Semi-rigid MI Cable is a silicon dioxide mineral insulated, multi-conductor, stainless steel sheathed cabling which is hermetically sealed through an all-welded construction technique. The materials used in the semi-rigid cabling have a high tolerance for abnormal temperatures and pressures and have minimal susceptibility to radiation damage.

[

]$^{a,c}$ The addition of the stripwound hose to the semi-rigid cabling design is fully addressed in this report.

[

]$^{a,c}$

# 5.0 QUALIFICATION TESTING

## 5.1 MINERAL INSULATED (MI) CABLE & CONNECTORS

The Westinghouse MI Cabling scope includes components that have been qualified to IEEE Standards 323-1974 and 344-1975 including NUREG 0588, Rev. 1. The method of qualification for this report is similarity analysis. Table 1 shows a similarity and part number matrix of the qualification and supplied hardware.

The WINCISE 1 to 2 Transition Cable Assemblies, 6 to 1 Transition Cable Assemblies and CET Containment Feedthrough Cable Assemblies are provided with factory terminated electrical connectors, meaning that field termination of the electrical connectors to the cable is not applicable. There are no field-terminated electrical connectors.

This section addresses only the MI Cable and Connector portion of the Scope of Supply. Section 5.2 contains the information for the Feedthrough Module Assembly portion of the WINCISE CET Containment Feedthrough Cable Assemblies.

The following sections present a comparison of the results of the Qualification Test Program with Watts Bar Unit 2 parameters. The tested MI cable fulfilled the electrical operability acceptance criteria throughout all phases of testing.

The specific Watts Bar Unit 2 environmental parameters/inputs selected for this report were taken from Reference 3.10 and are summarized in Appendix A.

### 5.1.1 NORMAL OPERATING ENVIRONMENT CONDITIONS

#### 5.1.1.1 Thermal Aging Conditions

The Watts Bar Unit 2 normal operating service temperature is specified as [ ]$^{a,c}$ in Reference 3.10.

The qualification test hardware of Reference 3.1 specifies a continuous service temperature [ ]$^{a,c}$

The age limiting material for the thermal aging [ ]$^{a,c}$ as provided in Appendix A of Reference 3.1.

Age sensitive materials and function are discussed in Appendix A of Reference 3.1.

There are no construction materials that are subject to failure [ ]$^{a,c}$.

The thermal aging program of Reference 3.1 exceeds the Watts Bar Unit 2 normal operation service [ ]$^{a,c}$ specified in Reference 3.10.

5.1.1.2 Relative Pressure - Normal Conditions

The Watts Bar Unit 2 normal operating relative pressure is [ ]$^{a,c}$ as specified in Reference 3.10.

The qualification hardware test program of Reference 3.1 specifies normal environment operating pressure [ ]$^{a,c}$.

The test program envelopes the relative pressure requirements of Reference 3.10.

5.1.1.3 Relative Humidity - Normal Conditions

The Watts Bar Unit 2 normal operating relative humidity is [ ]$^{a,c}$ as specified in Reference 3.10.

The construction materials on the exterior surfaces that form the hermetic boundary are not subject to degradation as a result of relative humidity exposure. In addition, the qualification hardware test program of Reference 3.1 specifies a [ ]$^{a,c}$ relative humidity for the normal service operating conditions. The test program envelopes the Watts Bar requirements of Reference 3.10.

5.1.1.4 Radiation Aging - Normal Conditions

The Watts Bar Unit 2 normal operating radiation aging for [ ]$^{a,c}$ as specified in Reference 3.10.

The qualification test hardware of Reference 3.1 was exposed to a Cobalt 60 gamma source for a period [ ]$^{a,c}$. The calculated dose based on the dosimetry was [ ]$^{a,c}$. This dose included a 10% margin to account for the synergistic effects of simultaneous irradiation and thermal aging.

The radiation aging program of Reference 3.1 envelopes the radiation aging requirements of Reference 3.10.

5.1.1.5 Mechanical Aging

There [ ]$^{a,c}$ for Watts Bar Unit 2 specified in Reference 3.10.

The qualification test of Reference 3.1 includes [

]$^{a,c}$, to mechanically age the hardware. This test was performed prior to the seismic testing of Section 5.1.3 of this report.

A subsequent test was done in 1994 to further verify the mechanical integrity of the multipin connector (Reference 3.9). This test included [

]$^{a,c}$. The results showed that the multipin connector, including [ ]$^{a,c}$ maintained its integrity during and after this mechanical/LOCA test.

5.1.2 ABNORMAL CONDITIONS

5.1.2.1 Thermal Aging Conditions

The Watts Bar Unit 2 abnormal operating service temperature is specified as [ ]$^{a,c}$ in Reference 3.10.

The qualification test hardware of Reference 3.1 specifies a continuous service temperature of [

]$^{a,c}$

The age limiting material for the thermal aging is [ ]$^{a,c}$ as provided in Appendix A of Reference 3.1.

Age sensitive materials and function are discussed in Appendix A of Reference 3.1.

There are no construction materials subject to failure within the [ ]$^{a,c}$.

The normal operation thermal aging program of Reference 3.1 exceeds the Watts Bar Unit 2 abnormal operation service maximum temperature of [ ]$^{a,c}$ specified in Reference 3.10.

5.1.2.2 Relative Pressure - Abnormal Conditions

The Watts Bar Unit 2 abnormal operating relative pressure is [ ]$^{a,c}$ as specified in Reference 3.10.

The qualification hardware test program of Reference 3.1 specifies [ ]$^{a,c}$ as the normal environment operating pressure.

5.1.2.3 Relative Humidity - Abnormal Conditions

The Watts Bar Unit 2 abnormal operating relative humidity is [ ]$^{a,c}$ as specified in Reference 3.10.

The qualification hardware test program of Reference 3.1 specifies a [ ]$^{a,c}$ relative humidity for the normal service operating conditions. [

]$^{a,c}$

The test program satisfies the Watts Bar relative humidity requirements of Reference 3.10.

### 5.1.3 DYNAMIC / SEISMIC TESTING

The Watts Bar Unit 2 required response spectra (RRS) is provided in Reference 3.10.

The qualification hardware test response spectra are provided in Figure 11 of Reference 3.1.

#### 5.1.3.1 MI Cable Operating Basis Earthquake (OBE) & Safe Shutdown Earthquake (SSE) Comparison at [ ]$^{a,c}$:

OBE – For simplification, enveloping profiles were developed for the various OBE RRS of Reference 3.10 as presented in Appendix D. This simplified profile is conservative and is presented in Figure 2a for comparison with the qualification test response spectra of Reference 3.1.

SSE – For simplification, enveloping profiles were developed for the various SSE RRS of Reference 3.10 as presented in Appendix D. This simplified profile is conservative and is presented in Figure 2b for comparison with the qualification test response spectra of Reference 3.1.

The testing performed in Reference 3.1 was performed on semi-rigid mineral insulated cabling. A separate seismic and vibration test for the flexible mineral insulated cable, including the stripwound hose, was performed as documented in Reference 3.4. This supplemental testing of Reference 3.4 used the [ ]$^{a,c}$. In all cases, the test data exceeds Watts Bar Unit 2 requirements.

[

]$^{a,c}$

a,c

[

]

**Figure 2a**

***MI Cable OBE Comparison [ ]$^{a,c}$***

a,c

**Figure 2b**

***MI Cable SSE Comparison [ ]a,c***

## 5.1.4 ACCIDENT CONDITIONS

### 5.1.4.1 Radiation Aging - Accident Conditions

*Accident Dose* - The Watts Bar Unit 2 accident dose specified in Reference 3.10 is [ ]$^{a,c}$.

The qualification test hardware of Reference 3.1 was subjected to an accident [ ]$^{a,c}$.

*Gamma Component* - The required accident dose of Reference 3.10 includes a [ ]$^{a,c}$.

*Beta Component* – The required accident dose of Reference 3.10 includes a [ ]$^{a,c}$. As demonstrated in Reference 3.8, a [ ]$^{a,c}$ (Appendix B).

*Combining Gamma and Beta Component Accident Doses* – Combining the gamma component and gamma equivalent beta dose, and adding a 10% margin for accident doses yields a total required accident dose of [ ]$^{a,c}$.

The total required accident dose of [ ]$^{a,c}$ is enveloped by the [ ]$^{a,c}$ accident dose from Reference 3.1.

The accident radiation dose of Reference 3.1 envelopes the requirements for accident conditions for Watts Bar Unit 2 as specified in Reference 3.10.

### 5.1.4.2 Pressure Profile - Accident Conditions

Watts Bar Unit 2 required peak pressure is specified in Reference 3.10.

In Figure 3, the qualification test pressure profile of Reference 3.1, Figure 21 is superimposed on the Watts Bar requirements.

The pressure profile of the hardware tested in Reference 3.1 envelopes the Watts Bar Unit 2 LOCA pressure profile requirement [

]$^{a,c}$

The LOCA pressure profile of the hardware tested in Reference 3.1 envelopes the Watts Bar Unit 2 LOCA/MSLB pressure profile requirements of Reference 3.10.

a,c

**Figure 3**
***MI Cable LOCA Profile Comparison – Pressure Profile***

5.1.4.3 Temperature Profile - Accident Conditions (LOCA/MSLB)

Watts Bar Unit 2 required temperature profile is specified in Reference 3.10.

In Figure 4, the qualification test temperature profile of Reference 3.1, Figure 21 is superimposed on the Watts Bar requirements.

The qualification test temperature profile of Reference 3.1 envelopes Watts Bar Unit 2 requirements of Reference 3.10 with [

]$^{a,c}$

The LOCA/MSLB temperature profile of the hardware tested in Reference 3.1 envelopes the Watts Bar Unit 2 LOCA/MSLB temperature profile requirements of Reference 3.10.

5.1.4.4 Humidity - Accident Conditions

The Watts Bar Unit 2 relative humidity requirement [ ]$^{a,c}$ as specified in Reference 3.10.

The environmental test hardware of Reference 3.1 was subjected to [ ]$^{a,c}$.

5.1.4.5 Chemical Spray - Accident Conditions

The Watts Bar Unit 2 chemical spray requirement of a [ ]$^{a,c}$ is specified in Reference 3.10.

The qualification test chemical spray of Reference 3.1, is comprised of [

]$^{a,c}$

This chemical spray envelopes the requirements of Reference 3.10.

a,c

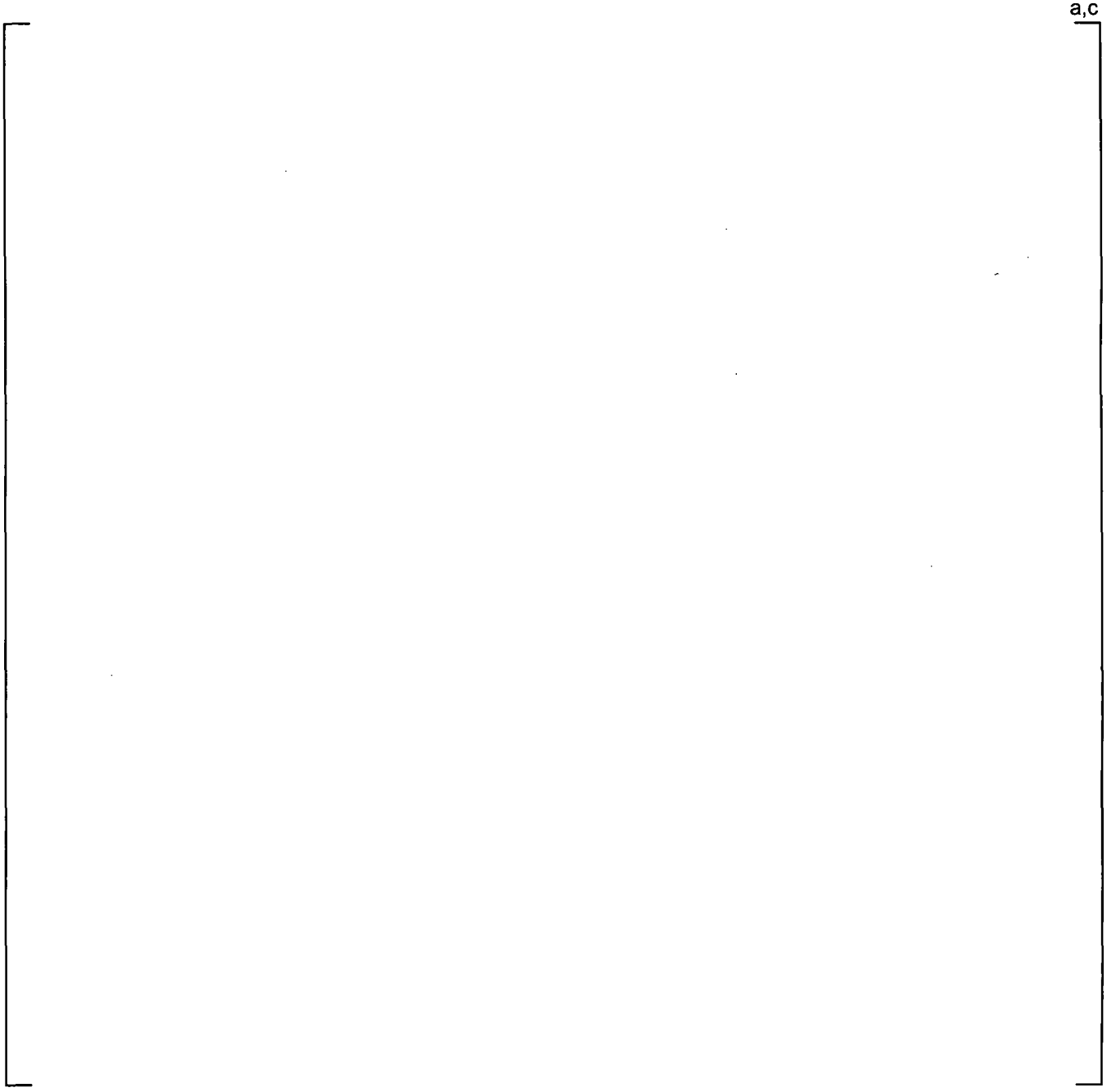

**Figure 4**
***MI Cable LOCA Profile Comparison – Temperature Profile***

5.1.4.6 Submergence

The Watts Bar Unit 2 submergence requirement elevations specified in Reference 3.10 are [

]a,c

The new CET MI Cable Assembly hardware will be routed as provided in Reference 3.16 so that all electrical connectors are installed [

]a,c

The supplied hardware and associated installation satisfies the submergence requirement of Reference 3.10.

5.2 FEEDTHROUGH MODULE ASSEMBLY

This Section addresses the Feedthrough Module with an integral pigtail portion of the WINCISE CET Containment Feedthrough Cable Assemblies (Reference 3.15).

The Containment Penetration Assemblies used for this upgrade are Penetration Numbers [ ]a,c (Reference 3.10).

Reference 3.7 is the Watts Bar plant-specific Environmental and Seismic Qualification Report that was previously approved by TVA and is the EQ basis for the Conax Buffalo Containment Penetration Assemblies currently installed at Watts Bar Units 1 & 2.

[

]a,c

## 5.3 FEEDTHROUGH MODULE TO MI CABLE INTERFACE ON THE WINCISE CET CONTAINMENT FEEDTHROUGH CABLE ASSEMBLY

This Section addresses the interface between the MI Cable and the Feedthrough Module on the WINCISE CET Containment Feedthrough Cable Assembly.

The environmental qualification of the MI Cable hardware and the Feedthrough Module hardware has been previously demonstrated by separate qualification testing programs.

[

]$^{a,c}$ This section provides a comparison of this testing to the Watts Bar Unit 2 seismic requirements.

In addition, this section also [ ]$^{a,c}$ Watts Bar Unit 2-specific submergence requirement.

### 5.3.1 VIBRATION AGING

[ ]$^{a,c}$ identified for Watts Bar Unit 2 for this application.

Vibration aging was performed as part of the qualification test of Reference 3.5 [ ]$^{a,c}$

### 5.3.2 DYNAMIC / SEISMIC TESTING

The Watts Bar Unit 2 RRS is presented in Reference 3.10.

The seismic testing performed on the qualification hardware is presented in Reference 3.5.

OBE – For simplification, enveloping profiles were developed for the various OBE RRS of Reference 3.10 as presented in Appendix D. This simplified curve is conservative and is presented in Figure 5 for comparison with the qualification test response spectra of Reference 3.5.

SSE – For simplification, enveloping profiles were developed for the various SSE RRS of Reference 3.10 as presented in Appendix D. This simplified curve is conservative and is presented in Figure 5 for comparison with the qualification test response spectra of Reference 3.5.

The seismic testing performed in Reference 3.5 exceeds the Watts Bar Unit 2 seismic requirements from Reference 3.10.

### 5.3.3 SUBMERGENCE

The interface between the MI Cable and Feedthrough Module is located at the same elevation as the installed Feedthrough Modules at Containment Penetration [ ]$^{a,c}$ (Reference 3.10).

The Watts Bar Unit 2 [ ]$^{a,c}$ as provided in Reference 3.10.

The interface between the MI Cable and Feedthrough Module [ ]$^{a,c}$ the submergence requirements of Reference 3.10.

a,c

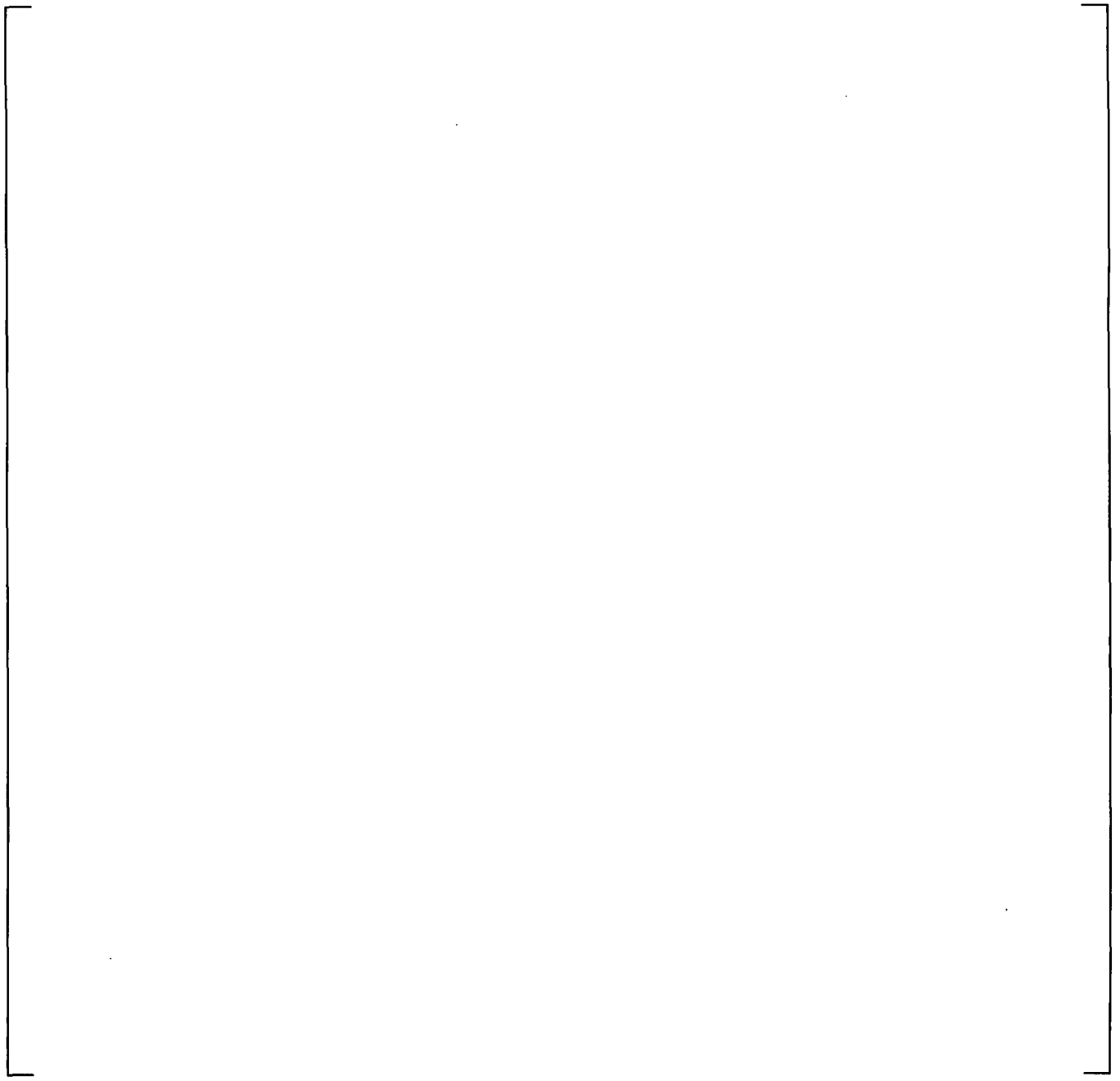

**Figure 5**
**MI Cable to Feedthrough Module Interface OBE & SSE Comparison**

## 6.0 APPLICABILITY OF THE QUALIFICATION TEST HARDWARE TO THE WATTS BAR UNIT 2 HARDWARE

The MI Cable Assemblies, including connectors utilized in the qualification test, are similar to that supplied for Watts Bar Unit 2. Table 1 provides a description of Watts Bar Unit 2 hardware and a comparison with the tested hardware. The qualification test hardware was fabricated to the same material specifications, manufacturing techniques, and quality control standards as the hardware for Watts Bar Unit 2.

The Class 1E equipment provided is the WINCISE 1 to 2 Transition, the WINCISE 6 to 1 Transition, and the WINCISE CET Containment Feedthrough Cable Assemblies.

The measuring and test equipment used during the environmental test programs was in current calibration at the time of use. Supporting documentation is available for review at Westinghouse facilities.

Table 1 shows a summary of the supplied hardware.

## 7.0 CONCLUSIONS

As shown in References 3.1, 3.3, 3.4, 3.5, 3.7, 3.9 and supplemented by References 3.6 and 3.8, the qualification testing meets or exceeds the Watts Bar Unit 2 requirements specified in Reference 3.10. The Watts Bar Unit 2 CET MI Cable System is qualified for Class 1E application in accordance with the methodology and guidance of IEEE 323-1974 and IEEE 344-1975.

# Table 1
# MI Cable & Connector Hardware Comparison

| Description | Watts Bar 2 Hardware P/N | Qualification Test Hardware P/N | Notes |
|---|---|---|---|
| WINCISE 1 to 2 Transition Cable Assembly | E-WBN2-155-002, (Reference 3.12) Items 1 through 58 | [ ]$^{a,c}$ (Reference 3.1) | 1,3 |
| WINCISE 6 to 1 Transition Cable Assembly | E-WBN2-155-003, (Reference 3.13) Items 1 through 10 | [ ]$^{a,c}$ (Reference 3.1) | 1,2,5 & 8 |
| WINCISE CET Containment Feedthrough Cable Assembly | E-WBN2-155-005, (Reference 3.15) Items 1 through 10 | MI Cable Portion:<br>[ ]$^{a,c}$ (Reference 3.1)<br>[ ]$^{a,c}$ (Reference 3.1)<br>Conax Feedthrough Module<br>(Reference 3.7) | 4,5,6 & 7 |

NOTES

[

]$^{a,c}$

[

]a,c

[

]a,c

[

]a,c

6. The attachment of the Feedthrough Module to the MI Cable Assembly is discussed in Section 5.3.

[

]a,c

# Table 2
# Selected Temperature Values from the LOCA/MSLB Test of Reference 3.1

a,c

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# Appendix A

## Summary of Watts Bar 2 Environmental Qualification Parameters from Reference 3.10

Normal Operating Conditions

| Parameter | Value | Source |
|---|---|---|
| Temperature | [ a,c ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Pressure | [ ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Relative Humidity | [ ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Radiation | [ ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |

Abnormal Operating Conditions

| Parameter | Value | Source |
|---|---|---|
| Temperature | [ a,c ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Pressure | [ ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Relative Humidity | [ ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Radiation | [ ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |

## Accident Conditions

| Parameter | Value | Source |
|---|---|---|
| Radiation | [ a,c ] | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Temperature Profile | | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Pressure Profile | | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Spray | | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45) |
| Seismic | | Reference 3.10 |
| Submergence | | Reference 3.10. (TVA Drawings 47E235-42 and 47E235-45, Note 5) |

# Appendix B

**Westinghouse (ABB CE) Letter No. CWE-84-0223, "CECo P.O. 254150/254151", "Byron/Braidwood HJTC/CETC M.I. Cable Connector Beta Shielding", Dated November 19, 1984, from R. B. Granstrand (ABB CENP) to Hamid Heidarisafa (S&L).**

a,c

[ ]

a,c

[ ]

# Appendix C

**TVA Letter Number Reference WBT-TVA-0125-Revised, Dated November 25, 2008**

**Contract Work Authorization Number: WEST-WBT-2008-005**

**Response to WINCISE – Cable Critical Technical Input**

a,c

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a,c

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a,c

a,c

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a,c

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a,c

a,c

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a,c

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a,c

a,c

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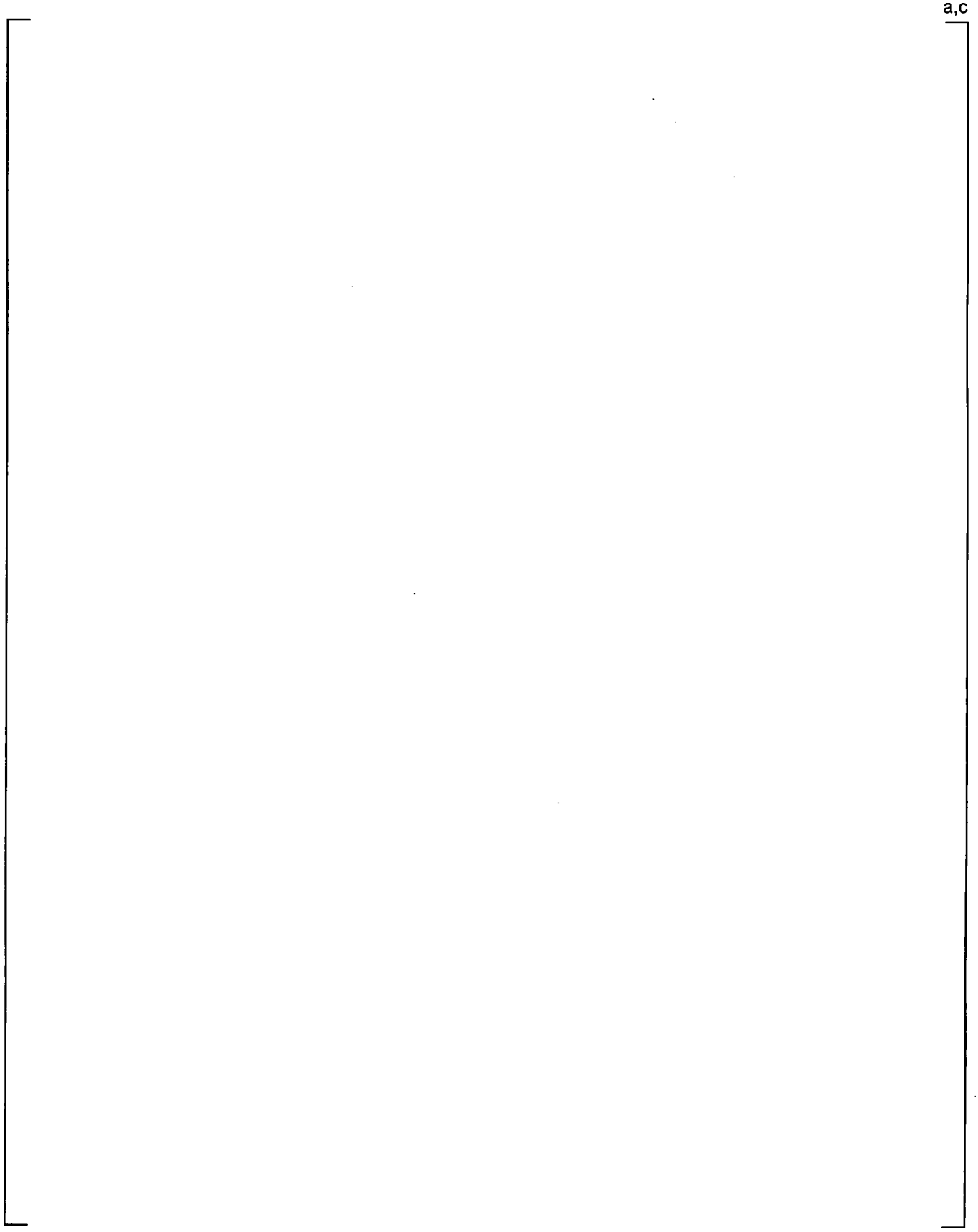
a,c



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# Appendix D

## Development of Enveloping OBE / SSE Profiles Provided in Reference 3.10

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a,c

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a,c

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**Attachment 23**

**Westinghouse Electric Company document CAW-11-3255, "Application For Withholding Proprietary Information From Public Disclosure, DAR-ME-09-10-P, Rev. 0 "Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2," (Proprietary)**

Westinghouse Electric Company
Nuclear Services
1000 Westinghouse Drive
Cranberry Township, Pennsylvania 16066
USA

U.S. Nuclear Regulatory Commission
Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Direct tel: (412) 374-4643
Direct fax: (724) 720-0754
e-mail: greshaja@westinghouse.com
Proj letter: WBT-D-3501

CAW-11-3255

September 23, 2011

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: DAR-ME-09-10-P, Rev. 0, "Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2" (Proprietary)

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-11-3255 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying affidavit by Tennessee Valley Authority.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference this letter, CAW-11-3255, and should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Very truly yours,

J. A. Gresham, Manager
Regulatory Compliance

Enclosures

CAW-11-3255

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared J. A. Gresham, 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:

J. A. Gresham, Manager
Regulatory Compliance

Sworn to and subscribed before me
this 23rd day of September 2011

Renee' Giampole
Notary Public

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Renee Giampole, Notary Public
Penn Township, Westmoreland County
My Commission Expires September 25, 2013

(1) I am Manager, Regulatory Compliance, in Nuclear Services, 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 Proprietary Information from Public Disclosure 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 DAR-ME-09-10-P, Rev. 0, "Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2" (Proprietary), dated September 2011 for submittal to the Commission, being transmitted by Tennessee Valley Authority letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with the Incore Instrument System (IIS) and may be used only for that purpose.

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

(a) Assist the customer in providing technical licensing information to the NRC that is required for approval of the Watts Bar Nuclear Unit 2 IIS.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for the purpose of licensing in-core instrumentation systems.

(b) Its use by a competitor would improve his competitive position in the development and licensing of a similar product.

(c) The information requested to be withheld reveals the distinguishing aspects of a design 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 calculations, analysis 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

Tennessee Valley Authority

Letter for Transmittal to the NRC

The following paragraphs should be included in your letter to the NRC:

Enclosed are:

1. ___ copies of DAR-ME-09-10-P, Rev. 0, "Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2" (Proprietary)

2. ___ copies of DAR-ME-09-10-NP, Rev. 0, "Qualification Summary Report for the WINCISE Cable and Connector Upgrade at Watts Bar Unit 2" (Non-Proprietary)

Also enclosed is the Westinghouse Application for Withholding Proprietary Information from Public Disclosure CAW-11-3255, accompanying Affidavit, Proprietary Information Notice, and Copyright Notice.

As Item 1 contains information proprietary to Westinghouse Electric Company LLC, it is supported by an affidavit signed by Westinghouse, the owner of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b) (4) of Section 2.390 of the Commission's regulations.

Accordingly, it is respectfully requested that the 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 the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-11-3255 and should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.