ATTACHMENT 8.4

STABILIZER INSTALLATION SPECIFICATION NO. 25A5585 REV. 4

GE Nuclear Energy

25A5585 SH NO. 1
REV. 4

EIS IDENT:

REVISION STATUS SHEET

DOCUMENT TITLE STABILIZER INSTALLATION

LEGEND OR DESCRIPTION OF GROUPS

TYPE: INSTALLATION SPEC

FMF: NINE MILE POINT 1

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THIS ITEM IS OR CONTAINS A SAFETY-RELATED ITEM YES ☒ NO ☐ EQUIP CLASS CODE P

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PRINTS TO

MADE BY	APPROVALS	
V. W. PENCE 11/18/94	T. E. GLEASON 11/18/94	GENERAL ELECTRIC COMPANY 175 CURTNER AVENUE SAN JOSE CALIFORNIA 95125
CHKD BY: T. E. GLEASON 11/18/94	ISSUED R. J. AHMANN 11/18/94	CONT ON SHEET 2

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1. SCOPE

1.1 Purpose. This specification provides the engineering requirements for installing stabilizers and H8 weld brackets which replace the H1 through H8 horizontal shroud welds at Nine Mile Point 1.

1.2 If any conflict exists between this document and any other document referenced herein, this document shall govern.

1.3 This document, along with the reactor modification and installation drawing, defines all the engineering requirements for installation of the shroud stabilizers.

1.4 As used herein, the term "Installer" refers to the company or personnel contracted by the Plant Owner to install the shroud stabilizers.

2. APPLICABLE DOCUMENTS

2.1 General Electric Documents. The following documents form a part of this specification to the extent specified herein.

2.1.1 Supporting Documents

a. 25A5583, Shroud Repair Hardware Design Spec.

b. 25A5586, Shroud Repair Code Design Spec.

c. 107E5679, Reactor Modification

d. 21A2040, Cleaning and Cleanliness Control

e. D50YP5, Nickel-Graphite Thread Lubricant

f. 112D6570, Lower Wedge

g. 112D6546, Tie Rod Spring Assembly

h. 112D6565, Upper Wedge

i. 112D6573, Upper Support Assembly

j. 112D6577, Upper Contact

k. 112D6576, Lower Support Assembly

l. 112D6574, Upper Spring Assembly

m. 112D6566, Mid Support

n. 112D6575, Mid Support Assembly

o. 112D6588, Top Support

p. 178B3732, Plate Bracket Assembly

q. 178B3735, Upper Toggle Bolt

r. 112D6618, Clamp/Spacer

s. 262B1285, Spacer

t. 148C6912, Bottom Spring Spacer

2.1.2 Supplemental Documents

a. NEDC-31735P GE BWR Operator's Manual - Materials and Processes

2.2 Codes and Standards. The following codes and standards of the latest issue (or specified issue) form a part of this specification to the extent specified herein.

2.2.1 American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code

Section XI, Rules for Inservice Inspection, 1983 Edition with Addenda through Summer 1983.

3. DESCRIPTION

3.1 The purpose of the stabilizer installation is to structurally replace horizontal girth welds H1 through H7 in the shroud and shroud support cylinder. Weld designations and the design requirements for the stabilizers are defined in the 2.1.1.a design specification. The installation of the shroud stabilizers involves electric discharge machining (EDM) of some slots and holes in the existing structure, assembling the stabilizer hardware in the reactor, and preloading the threaded fasteners. No structural welding or defect removal by machining is involved.

4. RESPONSIBILITIES

4.1 The Installer shall accept full responsibility for his work. The Installer shall comply with the requirements of this document and the supporting documents listed herein.

4.2 The Installer shall take the responsibility for coordination of his work with the work of others including the coordination of work planning and radiation monitoring with the Plant Owner.

4.3 The Installer shall be responsible for providing all specialized handling, alignment, and installation equipment, as may be necessary to perform this work, except as otherwise agreed to by the Plant Owner.

4.4 The Installer, except as otherwise agreed to by the Plant Owner, shall be responsible for machining as specified and limited by the applicable modification drawing.

4.5 The Installer shall supply adequately qualified personnel for supervision and for performing the tasks required to complete the stabilizer installation.

5 REQUIREMENTS

5.1 General

5.1.1 During installation, the Installer, except as otherwise agreed to by the Plant Owner, shall complete data sheets and quality control checksheets as required by the specifications and instructions listed in this document. The Installer shall keep records, etc., for future reference. Video tapes shall be taken of the completed repair. Tabular data entries designated for as-built measurements on the installation drawing shall be recorded.

5.1.2 Procedures and installation equipment shall be developed and designed to minimize the potential of loose parts within the RPV.

5.1.3 Following completion of the installation of the stabilizers, verification, inspection and signoff shall be performed to ensure that all objects have been removed from the RPV.

5.1.4 All uncontaminated tools shall be stored in an uncontaminated controlled area and brought to the work area only as needed for fit-up and installation.

5.1.5 Refer to 2.1.2.a for miscellaneous consumables approved for use in the reactor vessel.

5.1.6 All Thread connections that are torqued during the installation process shall be coated with D50YP5B, Thread Lubricant.

5.2 Personnel Safety

5.2.1 Radiation Control

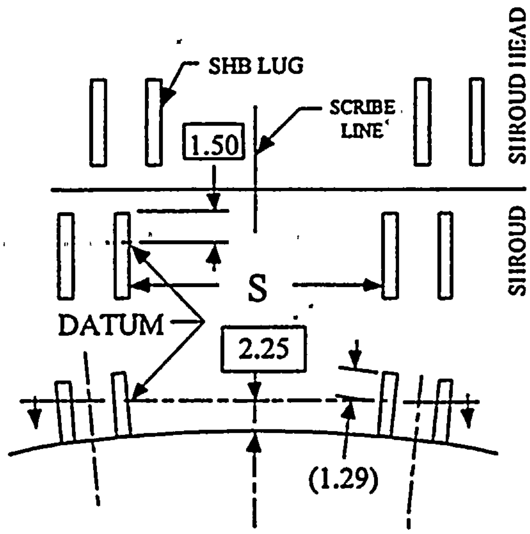
5.2.1.1 All work shall be done with the concurrence of and per the instructions of the authorized site Health Physics Personnel. At no time shall their requirements for dosimeter monitors, protective clothing or devices, time limits, exposure limits, etc., be violated.

5.2.1.2 Machining on contaminated surfaces, as required, shall be done in accordance with Health Physics and Safety Personnel requirements.

5.2.1.3 Radiation control practices shall be used to reduce exposure to workers to levels which are as low as reasonably achievable (ALARA).

5.2.2 Safety Precautions

5.2.2.1 Concern for personnel safety shall govern all work operations. All personnel working in hazardous locations shall be under constant surveillance by other personnel. All electric equipment shall be grounded or double insulated. Welding cables and leads shall be in good condition.



5.2.2.2 All work areas shall be kept neat and orderly. Protective measures and devices shall be used to keep all tools, equipment, and materials from inadvertently dropping into the RPV.

5.2.2.3 Care shall be exercised to keep contamination of articles which must enter and leave contamination zones to a minimum. In all cases, site radiation control requirements shall be met.

5.3 Cleaning and Cleanliness Control

5.3.1 During this stabilizer installation program, cleaning and cleanliness control shall be in accordance with the document listed in paragraph 2.1.1.d, and NMPC Site Procedures. In addition, no graphite lead pencils are allowed to contact stainless steel and nickel alloys, and any expendable items including markers shall meet the requirements of paragraph 2.1.2.a and NMPC site procedures.

5.4 Prerequisites

5.4.1 DELETED

5.4.2 Fuel Support Covers. Sufficient fuel assemblies shall be removed, for installation access, in the vicinity of the core plate wedges. Top Hat Fuel Support Covers shall be installed to assure that nothing can be dropped into the Control Rod Guide Tubes.

5.4.3 Reactor Temperature. The reactor water temperature shall be less than 100°F, however the Shutdown Cooling flow must be off whenever the installation activity in progress involves critical remote underwater handling in the annulus area.

6. INSTALLATION REQUIREMENTS

6.1 The installation sequence described below is not itself mandatory, so long as all specified installation requirements are accomplished. To assist in evaluating alternative sequences, the intent of some requirements, which are not self evident, are summarized in the step description.

> CAUTION: Several piece parts are to be machined based on in-reactor measurements at a specific reactor azimuth. These parts shall then be designated by specific serial number, as recorded on the as-built data table on drawing 107E5679, for that specific azimuth.

6.2 Shroud head bolt (SHB) lugs, on the shroud, are specified on the 107E5679 Modification Drawing as datums for the stabilizer installation, and for machining slots in the shroud head flange. These SHB lugs shall be identified at azimuths 90°, 170° 270° and 350°, including an independent verification as a prerequisite to any physical work. ***Prior to removal of*** the shroud head, place a scribe line on the shroud and shroud head at each stabilizer location. The scribe line shall be midway between the lugs on the shroud as controlled by the scribe tool. This scribe line will be the locating reference for the

slots in the shroud head. Measure and record the outside to outside distance "S". Note that the SHB lugs are not straddled, as in plants with jet pumps. These stabilizers are placed in-between sets of SHB lugs.

6.3 Go-gage checks shall be performed on the shroud flange and steam dam for fit-up with the Upper Support (also check for possible prior damage to the steam dam).

6.4 Measure and record the annulus width at the top guide support ring and the core support ring elevations as shown on the 107E5679 Modification drawing. Examine the RPV and shroud contact surfaces to assure that there are no abrupt discontinuities; if so, EDM spotface these areas flush. In taking these measurements, a tool simulating the piece part will be used to assure proper footprint contact.

6.5 Measure and record the distance between the Core Plate and the Shroud at each Core Plate Spacer location.

6.6 Based on the in-reactor measurements, machine Core Plate Spacer, 112D6617, as shown on the Modification drawing, 107E5679. This will leave a total clearance between the shroud, spacer, and core plate of .020 to .030 in.

6.7 Based on the in-reactor measurements, machine part 112D6570, Lower Wedge, and 112D6571 Lower Contact, as shown on the 107E5679 Modification drawing. Assemble the Lower Wedge, and Lower Contact as shown on the Tie Rod Spring Assembly, drawing 112D6546, except rotate the wedge 180° out of position for installation.

6.8 Based on the in-reactor measurements at the upper spring location, machine parts 112D6577, Upper Contact, and 112D6565, Upper Wedge, as shown on the 107E5679 Modification drawing. Assemble the Upper Contact and Upper Wedge as shown on the Upper Spring Assembly, drawing 112D6574.

6.9 Machine (EDM) slots in the shroud head flange as specified on the 107E5679 Modification drawing. Align the EDM tooling to the scribe line to a tolerance of ± .060.

6.10 In accordance with the 107E5679 Modification drawing, machine (EDM) two (2) holes, 4.075 ± .015 in. dia. (hole size after honing), in shroud support skirt at each of the four Stabilizer positions. EDM swarf shall be captured to the maximum extent practical.

6.11 Hone the holes in the Inconel 600 shroud support, to assure the removal of microfissures from the EDM holes. The honing operation shall remove a minimum of 0.004 inch from the inside surface of the hole while meeting the final hole size requirement. The minimum required material removal will correspond with a bright surface finish.

6.12 DELETED

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6.17. Install the Lower Support Assembly, 112D6576 into the holes in the shroud support cone per 107E5679, Modification drawing, and torque nuts to 40 ± 5 ft-lbs, in a progressive sequence of approximately 10 ft-lb increments.

6.18. Install locking nut, torque to 30 ± 10 ft-lbs, and crimp sleeve into grooves on toggle bolt.

6.19 After installation of the Lower Support Assembly, measure the distance to the vessel wall at the mid support location. Based on this in-reactor measurement, machine the two contact surfaces of the mid support, 112D6566, in accordance with the requirements of the 107E5679 Modification Drawing.

6.20 Install Spacers, 262B1285, under the Top Support to obtain proper clearance under the Top Guide Support Flange. The dimensions per the Modification Drawing will result in a clearance of 0.50 to 1.00 inch.

CAUTION: Maneuvering of the Tie Rod Spring Assembly must be done with extreme care to avoid damaging reactor hardware.

6.21 Install the Tie Rod Spring Assembly, 112D6546, in accordance with the requirements of the 107E5679, Modification drawing. Maneuver the clevis pin under the hook on the Lower Support, and hold in place. Rotate the Top Support, 112D6588 to the installed position.

6.22 Adjust the Centering Studs on the Upper Support per the dimensional requirements on the Modification drawing, 107E5679, and crimp the locking nuts to secure the proper spacing. The resulting clearance will be 0.015 ± .003 on each side.

6.23 Position the Upper Support Assembly, 112D6573, over the tie rod. Hang the Upper Support Assembly over the steam dam and center between shroud head bolt lugs.

6.24 Remove the temporary thread protection from the tie rod. Install the tie rod nut and torque to 175 ± 15 ft-lbs. Force the upper end of the tie rod radially inward during tensioning. Check the Locking Latch on top of the nut for proper groove engagement.

6.25 Deflect the Lower Spring, 112D6568, away from the vessel wall, and rotate the Lower Wedge, 112D6570, 180° and slide it up the guide pin until the latch engages in the installed position. Visually check for proper latch engagement.

6.26 Spring the Tie Rod away from the vessel approximately 0.25in. to allow installation of the Mid Support. The Mid Support will latch into a notch in the ring on the Tie Rod. Visually check for proper latch engagement. Visually confirm that contact exists between the mid support and theRPV wall. Visually confirm a gap greater than 0.37 inches and less than 0.75 inches exists between the mid support and the shroud.

6.27 Install Upper Spring Assembly, 112D6574, in accordance with the requirements of the reactor Modification drawing. Engage with Upper Support Assembly and confirm that Latches have locked over pins. Rotate the jacking bolt until the Upper Wedge contacts the vessel wall, approximately 28 turns (.25 in. gap). Preload the upper spring an additional 8 ± 2 turns (.07 ± .02 in.) as specified on

the 107E5679 Modification drawing. Check that the spring retainers have properly locked the head of the jacking bolt after the tool is removed.

6.28 Install the Core Plate Wedges, 112D6618, in four places and torque the jacking bolt to 7 - 10 ft-lb. Check that the spring retainers have properly locked the head of the jacking bolt after the tool is removed. If retainers are not locked, the torque may be increased to reach the next set of notches.

6.29 Install a Bottom Spring Spacer, 148C6912P001 on the stabilizer lower springs at 90 degrees, at 166 degrees and at 350 degrees per Modification Drawing 107E5679. Visually check to assure the Bottom Spring Spacer clamping surfaces are against (zero clearance) the lower contact and that the step at the ends of the legs are engaged under the lower contact.

7. EXAMINATION AND TESTING

7.1 Visual Examination. Visually examine the installed stabilizers to verify compliance with the 107E5679 Modification Drawing.

8. RECORDS AND SUBMITTALS

8.1 Prior to implementation of this stabilizer installation program, the following procedures shall be submitted by the Installer and approved by the Owner.

a. Installation and inspection procedures including sequence data sheets, measurement data sheets, quality control checksheets, drawings, sketches, instructions, etc.

b. Cleaning and cleanliness control procedures.

c. Machining procedures as applicable.

8.2 After implementation of this stabilizer installation program, all recorded data records, photographs, video tapes, etc., shall be submitted by the Installer to the Owner for file and information within 30 days. The 107E5679 modification and installation drawing shall be updated to incorporate the in-reactor as-built measurements, with corresponding serial numbers of the parts machined as part of the installation process. One copy shall be submitted to GENE within 30 days.

9. DEVIATIONS AND SUBSTITUTIONS

9.1 All deviations, as a result of damaged equipment, nonconforming conditions, or any proposal by the Installer for substitutions, modifications, or relaxation of the specified materials, procedures or design shall be submitted to the Owner for consideration and approval.

ENCLOSURE 2

SUMMARY OF NMPC
10 CFR 50.59 SAFETY EVALUATION

Enclosure 2
10 CFR 50.59 Safety Evaluation Summary
(Criteria, Conformance & References)

ANALYSIS

The applicable criteria and conformance for this analysis is as follows. The criteria is the same criteria that was used for the original Shroud Repair Design Safety Evaluation, Reference 23. The conformance sections specifically address the two proposed modifications.

Design Life (Criteria)

The design life of all repair hardware will be for twenty-five years (the remaining life of the plant, plus life extension beyond the current operating license), to include 20 Effective Full Power Years.

Repair Design Life (Conformance)

The hardware for the two modifications is fabricated to the same design basis, including material requirements, as the original shroud repair hardware. All repair hardware has been designed for a design life of twenty-five years (the remaining life of the plant, plus life extension beyond the current operating license), to include 20 Effective Full Power Years. This requirement is documented in reference 1.

Assuring an adequate design life is mainly a material selection and process control effort, for this equipment. The selection of low carbon stainless steels and high nickel alloys assures the best available materials for the nuclear reactor environment. Solution annealing and sensitization testing are imposed to guard against inter granular stress corrosion cracking (IGSCC). Process chemical controls are imposed to assure that contamination by heavy metal and chlorine or sulfur compounds will not occur. This is the same design selections and controls imposed for a standard forty year plant life. There is nothing in the equipment or installation that puts a specific limit on how long it can be used, such as creep or radiation degradation.

Safety Design Basis (Criteria)

To assure the safety design basis is satisfied and that the safe shutdown of the plant and removal of decay heat are not impaired, the repair hardware shall assure that the core shroud will maintain the following basic safety functions:

- To limit deflections and deformation to assure that the Emergency Core Cooling Systems (ECCS) can perform their safety functions during anticipated operational occurrences and accidents.

- Maintain partitions between regions within the reactor vessel to provide correct coolant distribution, for all normal plant operating modes.

- Provide positioning and support for the fuel assemblies, control rods, incore flux monitors, and other vessel internals and to ensure that normal control rod movement is not impaired.

<u>Safety Design Basis(Conformance)</u>

The changes in the lower spring spacing affects the system spring characteristics for loads acting between two contacts. Additional seismic analysis (Reference 24) calculated core support displacements for the bounding conditions. The section below is revised to include the maximum displacements based on modified lower spring spacing and includes the gap between the shroud and the contact extension. All displacements remain acceptable.

- The core spray piping analysis performed to support the shroud repair included a shroud displacement of 0.904 in. horizontally and 0.65 in. vertically, caused by a fault condition. This displacement will not create an unacceptable loading condition in the ECCS piping and therefore will perform its intended safety function. The proposed modifications do not change the maximum displacements calculated for the original shroud repair at the upper shroud. Therefore there is no change in loading of the core spray piping.

- The proper decay heat removal requires that the shroud to remain as a flow boundary to force water through the fuel and not allow a large leakage into the downcomer region. The maximum permanent horizontal offset of adjacent shell sections, that are not directly supported by either the upper or lower springs, is limited by structural stops to 0.75 in. Since the wall of the shroud is 1.5 in. thick, the shroud will still function properly as a flow boundary within the reactor.

- The safe shutdown of the plant is a function of the SCRAM capability. The core support plate and the top guide must be kept aligned within test limits so that friction between the control rods and fuel bundles will not impair proper motion. The worst case condition exists when the top guide moves one direction and the core support moves the opposite. This creates the maximum angle between the fuel bundles and the guide tubes. The maximum temporary calculated horizontal displacement of the top guide is 0.904 in. and the maximum for the core support is 0.85 in. The corresponding allowable displacement are 1.87 in. and 1.49 in. There is no calculated permanent

horizontal displacement of the top guide and the maximum permanent displacement for the core support is 0.48 inches. The corresponding allowable core support permanent displacements is 0.67 inches.

Flow Partition (Criteria)

Repairs to the core shroud are not required to totally prevent leakage from the core region into the downcomer annulus. However, the design shall ensure that cracked welds do not separate under normal operations as a minimum. Design will account for leakage from the region inside the shroud into the annulus region during normal operation.. The leakage should not exceed the minimum subcooling required for proper recirculation pump operation and the core bypass flow leakage requirements assumed in the reload safety analysis shall be maintained. The design will also verify acceptable leakage through the flow partition resulting from weld separation during accident and transient events.

Flow Partition(Conformance)

The original shroud repair design ensured that cracked welds will not separate under normal operations. The original shroud repair design accounted for leakage from the region inside the shroud into the annulus region during normal operation. The leakage does not exceed the minimum subcooling required for proper recirculation pump operation and the core bypass flow leakage requirements assumed in reload safety analyses is maintained.

There are no requirements for allowable leakage during the accident (LOCA and/or seismic). After the accident, the leakage is limited by the allowable deflections such that the shroud section does not displace sufficiently to open any vertical flow areas. The maximum permanent horizontal displacement of a shroud cylindrical section that is not directly supported by either the upper or lower springs is less than 0.75 inch, which is equal to one half of the thickness of the shroud. Thus, leakage after an accident will be limited to the leakage through a crack. Since the pressure difference across the shroud is small, the leakage will be small.

The two proposed modifications have no affect on the potential weld crack separation or any potential leakage path. The two modifications do not require any new holes or penetrations through the shroud/shroud support. Therefore the leakage calculations and performance predictions in Reference 23 remain valid. The added contact extension provides assurance the maximum permanent displacement of the shroud cylinder between weld H5 and H6A remains less than 0.75 inch.

Flow Induced Vibration(Criteria)

The repair shall be designed to address the potential for vibration, and to keep vibration to an acceptable level. The natural frequency of the repaired shroud, including the repair

hardware, shall be determined. The vibratory stresses shall be less than the allowable stresses of the repair materials. Forcing functions to be considered include the coolant flow and the vibratory forces transmitted via the end point attachments for the repair. Testing may be used as an alternative or to supplement the vibration analysis.

Flow Induced Vibration (FIV) (Conformance)

The original shroud repair was designed to address the potential for vibration, and to keep vibration to a minimum. The natural frequency of the repaired shroud, including the repair hardware, has been determined. The usage factor due to cyclic stresses caused by vibration will be less than 1.0 for the design life of the repair hardware. Forcing functions considered included the coolant flow and the vibratory forces transmitted via the end point attachments for the repair. Details of the original vibration analysis are provided in Reference 23. The two repair modifications have no affect on the natural frequency of the stabilizer assembly or on the vortex shedding frequency. Therefore the original vibration evaluation in Reference 23 remains valid for the stabilizer assemblies.

The potential for vibration of the new extension pieces has been considered. Forcing functions considered, included the vibratory forces transmitted from the stabilizer assemblies and coolant flow. The stabilizer vibratory forces are low, as demonstrated in the original vibration analysis, therefore vibratory forces imposed on the extension pieces are low. The coolant flow will not vibrate the lower contact extensions because the extensions are captured in all directions on the existing lower spring assembly. The lower contact extension is a "U" shaped part which fits around the existing lower contact. Steps at the ends of its legs extend under the lower contact to prevent axial movement. A tang towards the top fits in the gap between the lower contact and the lower spring to prevent horizontal movement. A positive spring force from the legs keep the part tight and prevent random vibrations.

Loading on Existing Internal Components(Criteria)

Increased stress on existing internal components, used in the repair, is acceptable as long as the current plant licensing basis are met. Increases in applied load shall be demonstrated to be acceptable.

- The repair shall be designed so as to produce acceptable loading on the original structure of the shroud, consistent with the criteria provided herein.
- The repair should minimize stresses introduced into the shroud consistent with the criteria provided so as to not aggravate further shroud cracking.
- The repair should minimize the loading on the supporting structures of the shroud, such as the shroud support cone and the RPV wall, to stay within the original design allowable stresses of these structures.

- Supplemental seismic analysis for the proposed modifications shall conform to the same methodology and criteria used in the original shroud repair seismic analysis as documented in the FSAR.

Loading on Existing Internal Components(Conformance)

- Stresses on the original structure of the shroud, which are directly impacted by the shroud repair hardware, have been demonstrated to be acceptable. The results of this evaluation are documented in references 4, 5 and 11 for all of the postulated accidents.

- The original shroud repair was designed to minimize stresses introduced into the shroud consistent with the criteria provided so as to not aggravate further shroud cracking. The addition of the contact extensions and the modification to the 270° tie rod has an insignificant affect on the component loads and stresses. Therefore the evaluation in Reference 23 remains valid.

- The original shroud repair design minimized the loading on the supporting structures of the shroud, such as the shroud support cone and the RPV wall, to stay within the original design allowable stresses of these structures. The results of this evaluation are documented in references 4, 5 and 11 for all of the postulated accidents. Relocating the 270° lower spring assembly changes the spacing between the adjacent lower spring assemblies. The change in spacing affects the net spring characteristics and load distribution when two springs share the horizontal seismic load. Analysis show the load on any one spring does not exceed the loads used in the original stress evaluation, Reference 24. The stress evaluation remains valid for the modified 270° stabilizer modification. .

Seismic Analysis(Conformance)

The modification adding the contact extensions has no affect on the seismic analysis.

Relocating the lower spring affects the original seismic analysis. Supplemental seismic analysis was made using the same methodology and criteria as was used in the original seismic analysis. The changes in the spacing between lower springs and affects the effective spring characteristics when two springs share the horizontal seismic loads. Springs less than 90° apart increase the effective spring constant and springs greater than 90° tend to lower the spring constant. Equivalent spring constants were determined for the bounding conditions and additional seismic calculations were made to determine loads and displacements (Reference 24). The individual spring loads do not exceed the loads used in the original stress evaluation (Reference 25) and the calculated displacements remain acceptable.

Annulus Flow Distribution(Criteria)

The design shall not adversely affect the normal flow of water in the annulus region, or the normal balance of flow in this region. The design shall not adversely restrict the flow of water into the recirculation suction inlet.

Annulus Flow Distribution(Conformance)

Neither of the two modifications adversely affect the normal flow of water in the annulus region, or restrict the flow in any way that would adversely affect normal balance of flow in this region. The design does not adversely restrict the flow of water into the recirculation suction inlet.

Emergency Operating Procedure (EOP) Calculations(Criteria)

Inputs to the EOP calculations, such as bulk steel residual heat capacity and reduction of reactor water inventory shall be addressed based on repair hardware mass and water displacement.

Emergency Operating Procedure (EOP) Calculations(Conformance)

The addition of the spring contact extensions have an insignificant affect on the EOP calculations, such as bulk steel residual heat capacity and reduction of reactor water inventory since the quantity of steel added is negligible as compared to the mass and volume of the existing shroud repair hardware and reactor internals.

Radiation Effects on Repair Design(Criteria)

The design of the repair shall account for the affects of irradiation relaxation utilizing end-of-life fluence on the materials.

Radiation Effects on Repair Design(Conformance)

The original design of the repair accounts for the affects of irradiation relaxation utilizing end-of-life fluence on the materials. In accordance with Reference 1, the design considers an End-of-Life preload relaxation for the upper and lower springs. The radiation level is less than the limit contained in the UFSAR . The basis for this is documented in reference 11 (design basis for reference 1).

The contact extension has a positive spring loaded clamping force around the lower contact. The initial installation clamping force is not required to keep the part captured or for the part to remain functional. Radiation relaxation may reduce, but will not eliminate the positive clamping load. A postulated reduction in the initial clamping load

due to radiation relaxation is not a concern because the extension pieces are captured in all directions as discussed previously and any amount of positive clamping load will prevent free movement or random vibrations of the extension pieces.

Thermal Cycles(Criteria)

The repair hardware shall consider the effects of thermal cycles for the remaining life of the plant. Analysis shall use original plant RPV thermal cycle diagrams. The design shall assume a number of thermal cycles equal to or greater than the number assumed in the original RPV design. Alternatively, thermal cycles defined by actual plant operating data may be employed if technically justified. Using this thermal cycle information repair components and the repaired shroud shall be evaluated for fatigue loading along with any other design vibratory loads.

<u>Thermal Cycles(Conformance)</u>

The original shroud repair hardware considered the effects of thermal cycles for the remaining life of the plant as documented in Reference 5. The stresses resulting from the thermal cycles have been evaluated by a fatigue analysis. The results show that its effect on fatigue life of the plant is negligible. The two modifications have an insignificant effect on previous fatigue analysis.

Chemistry/Flux(Criteria)

The design shall recognize the use of existing and anticipated water chemistry control measures for BWRs and shall consider the affects of neutron flux on any materials used in the repair.

<u>Chemistry/Flux(Conformance)</u>

Since the materials for the two modifications are the same as was used for the installed shroud repair hardware, existing and anticipated water chemistry control measures and the affects of neutron flux on the materials have been addressed and will have no effect on the repair hardware.

Loose Parts Consideration(Criteria)

Repair hardware mechanical components shall be designed to minimize the potential for loose parts inside the vessel. The design repair shall use mechanical locking methods for threaded connections. All parts shall be captured and held in place by a method that will last for the design life of the repair.

Loose Parts Consideration(Conformance)

The modified stabilizer assembly has been designed to minimize the potential for loose parts inside the vessel. The design repair uses mechanical locking methods (such as crimped jam nuts) for threaded connections. All parts are captured and held in place by a method such as pinning, staking, spring retainers, interference fits, and crimping that will last for the design life of the repair.

The lower contact extension is captured in all directions on the existing lower spring assembly. The lower contact extension is a "U" shaped part which fits around the existing lower contact. Steps at the ends of its legs extend under the lower contact to prevent axial movement. A tang towards the top fits in the gap between the lower contact and the lower spring to prevent horizontal movement. A positive spring force from the legs keep the part tight and prevent random vibrations. The spring force is not required to ensure the extension is secured to the existing lower contact.

Loose Parts Generated by the Repair Process

Special tooling/equipment is being provided that will be tested and personnel will be trained on full scale mockups to assure adequate controls exist to minimize the potential for vessel internals damage or loose parts. Protective shields have been designed that can be installed as needed to protect the Feedwater Sparger, Core Spray Line and the Recirculation nozzles. NMPC and GE installation procedures/travelers will be used to establish Foreign Material Exclusion (FME) controls. All tools and equipment used in the Vessel and Spent Fuel Pool will be properly secured.

Inspection Access(Criteria)

The repair design shall be such that inspection of reactor internals, reactor vessel, ECCS components and repair hardware is facilitated. The installed repair hardware shall not interfere with refueling operations and shall permit servicing of internal components. All parts shall be designed so that they can be removed and replaced. This is to provide full access to the annulus area for other possible future inspections and/or maintenance/repair activities that may prove necessary in the future.

Inspection Access(Conformance)

Neither modification affect the access for inspections. All parts have been designed so that they can be removed and replaced.

Crevices(Criteria)

The repair design shall be reviewed for crevices to assure that criteria for crevices immune to stress corrosion cracking acceleration are satisfied.

Crevices(Conformance)

The selection of the materials for the modification hardware is the same as the original hardware and assures that criteria for crevices shown to be immune to stress corrosion cracking acceleration are satisfied.

Materials(Criteria)

All materials used shall be in conformance with the BWR VIP requirements.

Materials(Conformance)

Materials for the two modifications have the same requirements as the original shroud repair hardware and are in conformance with the BWR VIP requirements.

Maintenance/Inspection(Criteria)

The designed repair shall minimize the need for future inspections and maintenance of the repair components. The designed repair shall minimize the requirement for future inspections of the affected shroud joints.

Maintenance/Inspection(Conformance)

Neither modification has an affect on conformance to the Maintenance/Inspection criteria.

Installation Issues(Criteria)

Tooling/equipment used for installation of repair components shall be evaluated in accordance with Reference 9 and shall consider the following:

- Heavy loads
- Shutdown System Status (N+1)
- Rigging
- Hole Cutting Method

Installation Issues(Conformance)

The modified stabilizer assembly has the same installation requirements as the original stabilizer assembly. No hole cutting is required for either modification. The installation activities associated with the proposed modifications will be evaluated in a separate safety evaluation (Ref. 26).

Existing Reactor Internals(Criteria)

The design shall not rely on existing reactor internals or components to carry loads that have experienced cracking in the industry (e.g. shroud head bolt lugs, stub tubes).

Existing Reactor Internals(Conformance)

Neither modification relies on existing reactor internals or components to carry loads that have experienced cracking in the industry (e.g. shroud head bolt lugs, stub tubes).

REFERENCES

1. GE-NE Specification: 25A5583, Rev. 2, "Shroud Repair Hardware, Design Specification"

2. GE-NE Specification: 25A5586, Rev. 1, "Shroud Repair Code, Design Specification"

3. UFSAR, Rev. 12, Nine Mile Point 1

4. GE-NE Document: 24A6426, Rev. 1, "Reactor Pressure Vessel Stress Report"

5. GE-NE-B13-01739-04, Rev. 0, "Shroud Repair Hardware Stress Analysis"

6. GE-NE-B13-01739-03, Rev. 0, "Seismic Design Report of Shroud Repair for Nine Mile Point 1 Nuclear Power Plant"

7. NRC Generic Letter 94-03, July 25, 1994, "Intergranular Stress Corrosion Cracking of Core Shrouds in Boiling Water Reactors"

8. Niagara Mohawk Procedure: N1-MMP-GEN-914, "Lifting of Miscellaneous Heavy Loads"

9. GE-NE Specification: 386HA852, "Reactor Servicing Tools"

10. GE-NE Document: NEDO-10909, Rev. 7, "SAPG07, Static and Dynamic Analysis of Mechanical and Piping Components by Finite Element Method"

11. GE-NE Document: DRF B13-01739, "Nine Mile Point 1 Shroud Stabilization"

12. GE-NE Procedure: NM-SM-TP&P-04, "EDM Actuators"

13. Niagara Mohawk Procedure: N1-ODG-11, "Outage Safety Assessment"

14. Niagara Mohawk Procedure: NIP-OUT-01, "Shutdown Safety"

15. GE-NE, "Post Inspection Plan"

16. GE-NE Specification: 21A1104, Rev. 0, "Specification for Reactor Pressure Vessel"

17. BWROG VIP Core Shroud Repair Design Criteria, Rev. 1, September 12, 1994

18. GE-NE Specification: 25A5584, Rev. 1, "Fabrication of Shroud Repair Components"

19. GE-NE Drawing: 237E434, Rev. 5, "Reactor Vessel Loadings" GE Drawing

20. GE-NE Specification: 383HA718, Thermal Cycles, Reactor Vessel and Nozzle, Description Basis and Assumptions

21. GE-NE-A0003981-1-13, Rev. 1, "Performance Impact of Shroud Repair Leakage for NMP1", 12/15/94

22. Niagara Mohawk Document: SO-EOP-M018,

23. GE-NE--B13-01739-05, Rev. 1, SAFETY EVALUATION, GE Core Shroud Repair Design

24. Supplement 1, GENE-B13-01739-03, Rev. 0, Nine Mile Point 1, Seismic Analysis, Core Shroud Repair Modification

25. Supplement 4, GENE-B13-01739-04, Nine Mile Point 1, Shroud Repair Hardware Stress Analysis

26. NMPC Safety Evaluation No. 95-007 Rev.1, Nine Mile Point 1, Core Shroud Repair Installation.