CP&L

Carolina Power & Light Company

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United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
MISCELLANEOUS STEEL VERIFICATION PROGRAM

Gentlemen:

On July 7-8, 1992, representatives of the Nuclear Regulatory Commission staff visited the Brunswick Steam Electric Plant to discuss the miscellaneous steel design basis documentation program. During the meeting, Carolina Power & Light Company agreed to provide the information requested by the staff in two submittals. The Company indicated the first submittal would be provided by July 24, 1992 and the second submittal would be provided by August 7, 1992. Per telephone conversation with Mr. R. H. Lo on July 24, 1992, CP&L is providing this submittal on July 27, 1992.

Enclosure 1 provides a listing summarizing the information being provided in this submittal and CP&L's planned August 7, 1992 submittal. Enclosure 2 provides the information requested by the staff.

Please refer any questions regarding this submittal to Mr. W. R. Murray at (919) 546-4661

Yours very truly,

D. C. McCarthy
Manager
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WRM/wrm (steel-1.003)

Enclosure

cc: Mr. S. D. Ebneter
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ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
MISCELLANEOUS STEEL VERIFICATION PROGRAM

The miscellaneous steel programmatic and technical issues listed below have been identified for inclusion in CP&L's July 24, 1992 response:

PROGRAMMATIC ISSUES

1. Provide a copy of the Phase I procedure.

2. Clarify specific actions to be completed prior to start-up

   - Describe Phase I and Phase II
   - Rationale for representative platform samples
   - Rationale f[illegible]ns that are not included in samples
   - Rationale for [illegible]ign confidence level for restart

3. Incorporate a mechanism for making procedural program adjustments for potential changing conditions.

4. State explicitly the extent of compliance with 10 CFR Part 50, Appendix B.

TECHNICAL

1. Provide a copy of DG II.20 (Revision 3).

2. Provide the basis for addressing thermal loads.

3. Provide the rationale for addressing inaccessible inspection areas.

4. State explicitly how appropriate dynamic load factors (response spectra) will be used in analysis.

5. Discuss the methodology for addressing interface loads (cable trays, conduit, HVAC, piping).

6. Address the accuracy used in data collection.

7. Address joint fixity.

8. Address bolt torque in miscellaneous steel connection.

The miscellaneous steel programmatic and technical issues listed below have been identified for inclusion in CP&L's August 7, 1992 response:

PROGRAMMATIC

1. Discuss the root causes.

2. Provide the Phase II procedure.

3. Address miscellaneous steel in other Category I.

TECHNICAL

1. Compare long-term acceptance criteria with Updated FSAR and provide justification for any deviations (include use of AISC 8th edition).

2. Provide justification for not considering tornado loads.

ENCLOSURE 2

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
MISCELLANEOUS STEEL VERIFICATION PROGRAM

OVERVIEW:

The Miscellaneous Steel Verification Program was started to develop necessary documentation to bring Licensee Event Report 1-88-35 and Unresolved Item 89-18-02 to closure. This program will also address the Notice of Deviation cited in NRC Inspection Report 92-14. Assessments performed during this program will be in compliance with the design criteria (also called long-term criteria) delineated in the Brunswick Plant Updated Final Safety Analysis Report (FSAR). The Updated FSAR commitments are that the miscellaneous steel be designed according to the requirements of the American Institute of Steel Construction (AISC) Specification for the Design, Fabrication and Frection of Structural Steel for Buildings. The Updated FSAR states that the initial design was to the 6th Edition of the AISC Specification and that current work is to the 8th Edition. The Updated FSAR does not allow an increase in the allowable stresses during severe environmental conditions (e.g., Operating Basis Earthquake) but does allow a factor of 1.5 times the basic allowable stresses for the abnormal and extreme environmental conditions (e.g., Design Basis Earthquake). As stated above, the long-term design criteria for the Brunswick Plant is in compliance with these provisions and the current evaluations will be made using the 8th Edition of the AISC Specification, which meets the Updated FSAR.

When an element does not meet the long-term design criteria, an operability review will be performed on a case-by-case basis. In those situations the specific criteria will be available for NRC review. Such cases will be brought into FSAR compliance prior to restart after the next refueling outage.

The extent of the Miscellaneous Steel Verification Program to be completed prior to start-up will consist of a combination of walkdowns and evaluations sufficient to conclude that miscellaneous steel operability issues do not exist in the plant. As outlined in our July 7, 1992 meeting, our current assessment for start-up scope includes the following:

- Phase I walkdown in Reactor Building
- Phase II walkdown in drywell
- Perform bounding analysis of selected platform sections in both the drywell and Reactor Building

If initial walkdowns and preliminary analysis demonstrate sufficient margin, CP&L may revise the start-up scope. In any case, the overall Design Basis Reconstitution of miscellaneous steel will be completed in conjunction with the established outage schedules. Any changes to this scope will be communicated to the NRC.

PROGRAMMATIC ISSUES

ITEM 1:

Provide Phase I procedure.

RESPONSE:

A copy of the Phase I procedure was submitted to the NRC at the July 7, 1992 meeting. Comments received during the July 20, 1992 conference call between CP&L and the NRC will be included in a revision to the procedure.

ITEM 2:

Clarify specific actions to be completed prior to start-up:

- Describe Phase I and Phase II
- Rationale for representative platform section samples
- Rationale for items that are not included in samples
- Rationale for high confidence level for restart

RESPONSE:

a. Description of Phase I and Phase II

Information from walkdowns obtained by CP&L in 1990 and 1991 indicates that the construction of miscellaneous steel in the Reactor Building outside the drywell is generally of good quality. However, minor variances such as an occasional missing weld, loose or missing bolts, minor dimensional variations, and minor gaps between connecting angles and the attaching member have been found. None of these issues were found by CP&L to adversely affect safe plant operation.

These 1990 and 1991 walkdowns, which include a total of nine areas outside the Reactor Building in both units, were initiated due to LER 1-88-35. This LER identified an overstress condition on one beam in each Reactor Building. The issue was also identified by the NRC as Unresolved Item 89-18-02.

Although there are no major known construction-related irregularities in the drywell platform steel, it is being included in the program because of similarities with the miscellaneous steel design and construction.

The large amount of miscellaneous steel required a considerable effort to formally document and evaluate. For this reason, a two-phased program is planned. The objective of Phase I and the early part of Phase II is to establish early in the program a high level of confidence in the design and construction of miscellaneous structural steel. Both phases will occur simultaneously. However, Phase II will continue toward formal documentation of the design basis of part of CP&L's Design Basis Reconstitution Program.

Phase I Program

The Phase I Program consists of an engineering walkdown of the miscellaneous steel outside the drywell. This engineering walkdown is directed toward providing an immediate appraisal of miscellaneous steel members and connections outside the drywell by teams of experienced civil/ structural engineers. Phase I is based on the concept employed by SQUG for resolution of USI A-46, in that it uses trained, experienced engineers to provide an

immediate assessment and identify outliers. It is designed to identify significant deficiencies. It is not intended that the specific SOUG General Implementation Procedure (GIP) be implemented in this program.

The engineering teams visually compare the actual conditions against the drawings. Each team consists of two members, with each engineer independently evaluating each steel member. The walkdown team will categorize each steel member and connection into one of five categories:

a. No evident design and/or construction-related irregularities

b. Minor design and/or construction-related irregularities but no significant effect in load carrying capability

c. Requires modification (outlier)

d. Requires further evaluation (these items will be further evaluated by conventional techniques to ensure that the member has adequate capacity)

e. Not accessible

Reports prepared by the engineering team provide a technical justification if the member/connection is placed in categories b, c, or d. The approach used and typical results are reviewed by a Technical Advisory Committee, which includes three nationally recognized consultants. Modification packages will be prepared for those identified in the evaluation to require modification.

The drywell platform steel will be evaluated to an equivalent level early in the Program, but in a slightly different way. In the interest of maintaining personnel exposures as low as reasonably achievable, the activities discussed above will be incorporated into the Phase II program for the drywell, reducing the man-hours required to be spent in the drywell. The Phase II program for the drywell will be expedited to the extent necessary to allow an engineering evaluation before plant start-up. Details are provided below.

Phase II Program

The Phase II program applies to both the drywell platform steel and the miscellaneous steel in the Reactor Building outside the drywell. Phase II consists of two major parts. One part consists of a preliminary analysis of representative platform sections in the drywell and in the Reactor Building outside of the drywell. The current scope is defined as three platform section evaluations in each building to be used as enveloping cases. These platform sections will be selected to be representative worst cases in their respective areas as follows:

1. The platform section that has attachments with the largest loads

2. The platform section that has the most attachments

3. The platform section that is considered the most critical based upon its function and expected capacity

The preliminary analysis will include the most critical load case that includes the design (DBE) earthquake. It will be consistent with the FSAR commitments in that the absolute sum of the worst case horizontal plus vertical seismic motion will be evaluated. Loads will include results from the IE Bulletin 79-14 program and other major attachment loads derived from data obtained from a walkdown. The platforms will be evaluated against allowable stresses for abnormal loads of 1.5 times the 1978 Edition of the American Institute of Steel Construction Specification, which is consistent with the Updated FSAR for current work.

A second part of the Phase II program provides more detailed verification and documentation of miscellaneous structural steel. This activity will occur concurrently with the Phase I program and part 1 of the Phase II program. It consists of methodically verifying that miscellaneous structural steel is consistent with the best available design documents and recording any identified differences. This portion of the program concentrates on taking photographs of members, connections, embeds, and surface-mounted plates; reviewing these photographs to identify any differences from the design drawing and other construction-related irregularities, and measurement of those components identified as irregular (i.e., not in accordance with design drawings and/or with standard practices).

Prior to plant operation, the drywell platform photographs will be reviewed and walkdown results will be evaluated by an engineering team to identify any modifications required before plant start-up.

The Phase I program and the portion of the Phase II program that will be completed before plant operation will provide a high confidence level that the miscellaneous structural steel at the Brunswick Steam Electric Plant is adequate to function in a safe manner for defined enveloping plant loading conditions.

The Phase II program will continue after plant operation to complete data collection outside the drywell. In addition, the data collected will be used to update the drawings and as input for calculations. Final calculations will be prepared to represent all the structural steel affected by this program. These calculations will satisfy all Updated FSAR commitments, including load cases and acceptance criteria. Consistent with the Updated FSAR, the criteria will be based upon the 1978 Edition of the AISC Specification.

b. Rationale for Selection of Representative Enveloping Platform Sections

The selection of representative platform sections for preliminary analysis is one of several tasks directed toward developing a high confidence level early in the program that the structural steel will function properly under all defined loading conditions. The selection of specific platform sections is based upon the use of enveloping cases. The concept of design by envelop is an acceptable, common practice among design engineers for structures that have a commonality of configuration, material, applied loads, and acceptance criteria. Likewise, verification of design can be based upon a similar approach.

Miscellaneous Steel Outside Drywell:

The miscellaneous steel items outside the drywell are generally elevated platforms that consist of standard steel shapes and are connected to each other with clip angles and/or seat angles that are either welded or bolted. Each of the platforms was designed, fabricated, and erected using the same criteria and procedures.

In selecting the representative cases, loading is one of the more important factors, since the other factors are essentially the same. These platforms are loaded in a similar fashion, primarily by a combination of hangers from below that support piping, raceway and HVAC, and occasional equipment resting on the steel. To provide assurance that a representative enveloping loading case is identified, the platform sections with the estimated highest load and the platform with the most loads will be selected.

Drywell:

The drywell has five (5) total platforms, each at a different elevation. The upper three drywell platform sections are similar in construction and loading, the two lower platforms are different. However, the lower drywell platform sections consist of very heavy radial members connected by generally smaller tangential members. The radial members of the lowest (elevation 17 foot) platform consist primarily of wide flange members, whereas the elevation 38 foot platform radial members are built-up box members. Because of these differences, each of the two lower platform sections will be evaluated individually.

The upper three platform sections are considerably smaller, primarily serve as personnel access, and have few attachments. All the platforms have similar size and type members which are connected with similar type clip angles. They were designed, fabricated, and erected using the same criteria and procedures.

c. Rationale for Items not Included in Phase I Analyses

As indicated in the previous responses, the available data suggests that the construction-related irregularities which are identified are relatively minor in terms of their effect on the load carrying capability of miscellaneous structural steel. The program that has been developed for completion prior to plant start-up is adequate to identify and resolve such construction-related irregularities that could affect the ability of the steel to function in a safe and adequate manner for all the defined load cases imposed on the structure during plant operation. The part of the program that will be completed prior to plant operation will both resolve any irregularities that may have resulted from construction and maintenance activities, and ensure, on an enveloping basis, that the steel is capable of supporting the critical design loads.

d. Rationale for High Confidence Level for Restart

The program is intended to confirm that the structure is constructed according to the original design drawings and that any significant deviations are assessed for adequacy prior to start-up.

The program addresses these considerations directly, relying mainly on walkdowns. The Phase I program for the miscellaneous steel outside the drywell uses experienced civil/structural engineers to walk down the affected areas and visually compare each accessible member with the design documents to identify potential differences or other irregularities. This is a relatively simple and sure method to identify issues that may have a significant effect on structural performance. Significant design and/or construction-related irregularities (those that could affect load carrying capacity) identified as a result of this process will be further evaluated and/or modified, as required, to restore the load carrying capability of the structure. A similar program will occur in the drywell, except that the

evaluation will be performed by use of photographs of members, connections, embeds, and surface-mounted plates included in the program and walkdowns of selected members to capture and resolve significant design/construction-related irregularities.

In addition, the validity of the original design is being reinforced by an analytical evaluation of the structures using conventional techniques, based on enveloping concepts, as discussed above. Modifications will be made as determined necessary to ensure that the structures have adequate design margin.

With these considerations addressed, a high confidence level exists that the structures will safely perform their function for all design loading considerations.

ITEM 3:

Incorporate a mechanism for making procedural program adjustments for potential changing conditions.

RESPONSE:

The Phase II Walkdown Procedure has been revised to permit adjustments in the walkdown program as the work progresses. In addition, a "Miscellaneous Steel Verification Procedure" document is being prepared as a top-tier document to control the walkdown review and resolution process. This document will be applicable to both phases. This document has provisions to continually review the results of walkdowns and evaluations and assess the adequacy and usefulness of the data collected, consistency of the results, and adequacy of resolution of design and construction-related irregularities.

As the walkdowns proceed, the results will be reviewed to verify that the procedure is workable, appropriate data is obtained, and that the personnel collecting the data understand the requirements and are comfortable with the procedure and the work process that it imposes. Program changes may also be made to address the broadness issue as well as to provide flexibility in adjusting the scope of the program.

The approach and results of the work performed under both phases will be reviewed by an independent Technical Advisory Committee which consists of senior engineer personnel, including three nationally recognized consultants not associated with the implementation of the verification program. This team will meet periodically and provide guidance to the work process, as necessary. The input from the Technical Advisory Committee will be used in making decisions on program adjustments.

ITEM 4:

State explicitly compliance with Appendix B.

RESPONSE:

The Bechtel QA program for the Brunswick Steam Electric Plant is delineated in the QA Program Plan (QAPP), Rev. 0, dated June 17, 1992. The QAPP references and identifies portions of the

current revision of Bechtel Nuclear Quality Assurance Manual (NQAM) which are applicable to this project, consistent with Bechtel's activities on this project.

The NQAM contains quality policies which correspond to each of the 18 Criteria of 10 CFR 50, Appendix B. The quality policies contained in the NQAM are based on, and consistent with, the Bechtel QA Topical Report, BQ-TOP-1, Rev. 4A, dated February 1988, which has been reviewed and accepted by the NRC, on a generic basis. The policies comply with the QA program requirements described in ANSI/ASME NQA-1, ANSI N45.2, and various QA-related N45.2 daughter standards.

As for the extent of compliance with 10 CFR 50, Appendix B, the QAPP delineates compliance with the Appendix B criteria, consistent with the plant walkdown and engineering activities within Bechtel's scope of work.

TECHNICAL ISSUES

ITEM 1:

Provide a copy of DG II.20 (Revision 3).

RESPONSE:

A copy of Design Guide II.20 has been provided to the NRC in a previous meeting. As stated earlier, the representative, enveloping platform section analysis will be checked against the BNP UFSAR licensed criteria (1.5 x AISC, 8th Edition, Allowable Stresses) against DBE loading only. Anchor bolt acceptability will be per IEB 79-02, Supplement 1 criteria using a factor of safety of 2. Licensed damping ratios will be used. In the event of localized exceedance of 1.5 x AISC allowables, those will be noted and individually justified. In addition, exceedance of a upper bound shear stress of .55 Fy will be noted. This criteria will support the overall acceptability of the structural steel for startup as applied to the representative cases.

ITEM 2:

Provide the basis for addressing the thermal loads.

RESPONSE:

The thermal loads addressed in this item are those that result from restraint of thermal growth of structural members subject to uniform temperature changes. Reactions from pipe thermal loads are included in evaluations as part of the attachment loads.

Thermal loads are in general self-limiting and induce secondary stresses in the affected members. The self-limiting aspect is due to the fact that any local deformation that will relieve the constraint will also reduce thermal stresses. Such deformations include minor movement or distortion of connected components (e.g., clip angles, beam webs, slip of bolted connections, and embeds) and small lateral displacement of the beams to accommodate thermal growth. In such cases, the in-plane load carrying capability of the member will not be significantly affected since these deformations are small and will be out-of-plane.

Consistent with the above philosophy, power plant design practice is to allow for effects of thermal loads, considering the layout and connection types used in each structure, as depicted in the structural design drawings. The common design philosophy for structural steel was to provide clip angle or beam seat angle (with a restraining angle at or near the top flange) connections which minimize thermal stresses.

In general, the structural layout is such that the restrained thermal expansions are limited to less than 1/8 inches at each end. Such an expansion is considered negligible considering the play available between the bolt and the bolt hole, and flexibility of the clip angle or seat angle joints. These considerations have led to a structural layout which permits thermal growth in general.

It is recognized that there are box beams with welded connections at the lower elevations of the drywell that may restrain free thermal growth. However, the drywell platform layout permits both radial and vertical thermal growth. Previous experience indicates that the radial beams and columns will have small thermal stresses due to the restrained thermal growth. The tangential beams closer to the center have been observed to develop larger thermal stresses; however, these members are relatively short with small thermal growth and, as discussed above, minor end deformations will relieve the thermal stresses.

Where thermal effects are considered significant, such as a beam with both ends welded between two rigid supports, evaluations will be made to ensure adequacy of design. In such cases, it is reasonable to permit inelastic deformation so long as the induced strains are limited to about three times the yield. However, slotted holes are generally provided in such situations to facilitate construction as well as to allow thermal expansion and, therefore, the strain limitation is not expected to be invoked except in isolated cases.

ITEM 3:

Provide the rationale for addressing inaccessible areas.

RESPONSE:

Inaccessible areas are anticipated to be mainly connections to embeds and surface-mounted plates. In these cases, photographs will be taken for visible segments of the component. Using these photographs, an assessment will be made as to the consistency of actual conditions. If it is judged that the actual installation is consistent with the design drawings, no further action will be taken. If such a judgement cannot be reached, further evaluations may be made using "similarity" or "margin" concepts. If the component or assembly is similar to another component or assembly which is accessible, the similarity concept may be used as the acceptance criteria, i.e., if the accessible item is acceptable as-is, so is the inaccessible item. For unique cases, a reduction in capacity may be assumed (e.g., a factor of 0.75, similar to the SQUG General Implementation Procedure) and the component is checked using the actual loading conditions. If the component still cannot be judged to be acceptable using the above logic, further action consistent with the nature, type, and condition of the component will be taken.

ITEM 4:

State explicitly how appropriate dynamic load factors (response spectra) will be used in analysis.

RESPONSE:

Dynamic effects will be determined either by dynamic analysis or by equivalent static analysis methods. Where dynamic analysis is used natural frequencies of the platforms will be obtained using conventional dynamic analysis techniques as part of the analytical evaluation. The natural frequencies will account for both global and individual beam behavior in both the vertical and appropriate horizontal direction. These natural frequencies will be used in conjunction with the appropriate floor response spectra to determine an appropriate amplification factor in each of the horizonal and vertical directions to account for seismic effects. Damping for the miscellaneous structural steel will be consistent with that specified in the Updated FSAR. An appropriate multi-mode factor will be applied to account for the effects of higher modes, rigid body effects, and modal variations. For the equivalent static analysis method, where natural frequencies are not obtained, the seismic amplification will be taken from the peak of the response spectra times a multi-mode factor for the appropriate damping value.

ITEM 5:

Discuss the methodology for addressing interface loads (cable trays, conduit, HVAC, piping).

RESPONSE:

All large bore (i.e., greater than 4 inches diameter) piping supports included in the IE Bulletin 79-14 program will be imposed on the structures included in this program.

Small bore piping, non-Q piping under 10 inches in diameter, cable tray of four tiers or less, conduit, and HVAC loads are generally substantially lower than the IE Bulletin 79-14 piping loads. To account for these non-IE Bulletin 79-14 commodity loads, field data will be collected from typical areas in the plant, converted into uniform loads, and assigned to individual members. The conversion into uniform loads will include seismic effects and will encompass vertical, horizontal, and torsional effects on individual beams.

These non-IE Bulletin 79-14 loads will be developed by considering typical spans and typical support configurations used at the Brunswick Plant. Seismic loads will be obtained by using the peak of the appropriate response spectra, and an appropriate multi-mode factor. Because of the independent nature of each support, the uniform load factor for each direction will be based on an SRSS response from the individual loads on each member.

As indicated above, torsional effects will also be addressed. Because of the support configuration for these supports, a significant torsional component is not expected. However, torsion loads which may be imposed on the miscellaneous steel or drywell steel will also be determined as part of this effort and converted into an equivalent torsional effect on the steel beam.

ITEM 6:

Address accuracy used in data collection.

RESPONSE:

Measurements will be taken which support related engineering calculations within reasonable analytical accuracy. With this objective in mind, acceptable measuring tolerances may be rather large in some cases.

The criteria for accuracy of measurements included in the walkdown procedure is consistent with the guidance given in Welding Research Counsel Bulletin 316 and 353. The specific attribute being measured and its potential effect on the end results (as alluded to in the preceding paragraph) were also considered in the development of the criteria.

ITEM 7:

Address joint fixity.

RESPONSE:

In general, the analysis of the steel members that are connected in an interrelated fashion will be performed using standard finite element methods. The only exception is those cases where the configuration is so simple that the structural behavior can correctly and completely be captured by classical manual methods. Joint fixity will be treated in the classical manner. Connections by clip angles or seat angles will be treated as pins (i.e., transfer of shear in all directions across the connection). Where the member is continuous or connected in a fashion that there is sufficient stiffness in the connection relative to the attached members to transfer moments, both moment and shear transfer will be imposed. End connections will be treated in the same manner. In general, only shear transfer will be allowed at support points for the platform, unless there is a demonstrated capability for moment transfer.

ITEM 8:

Address bolt torque in miscellaneous steel connections.

RESPONSE:

It should be recognized that most of the miscellaneous steel connections are simple clip angle or seat angle connections and can adequately function as bearing-type connections. Bolt torquing is not a significant factor in their performance under the applied loads. In fact, the 8th Edition of the AISC Specification states ". . . because the performance of bolts in bearing is not dependent upon an assumed minimum level of high pretension, thorough inspection requirement to assure full and complete compliance with pre-tightening criteria is not warranted."

The 6th Edition of the AISC Specification specifies that "...bolts shall be tightened to a bolt tension not less than the proof load given in the applicable ASTM specification for the type of bolt used." The proof load is approximately equal to 70 percent of the strength of the bolt material. Consequently, the pretension corresponding to the proof load is greater than the bolt load based on the basic allowable bolt stresses. For A325 bolts, the ratio of pretension to allowable load ranges between 1.4 and 1.6. Thus, even considering the 1.5 increase in allowable stresses for the faulted conditions, these bolts will be seldom, if ever, stressed to a greater stress level than their initial installation. Furthermore, relaxation in these bolts is negligible if the installation is in accordance

with the AISC specifications, i.e., all joint surfaces are free of scale, dirt, burrs, or any other defects. Therefore, bolts that are properly installed initially will maintain their functionality throughout the design life of the structure. Loose bolts or bolts with gaps between the fraying surfaces have seldom been found during the preliminary walkdowns at the Brunswick Plant. Hence, their numbers are expected to be very small.

The walkdown procedure requires identification and recording of any loose bolts or bolts with gaps between the fraying surfaces. These cases will be dispositioned on a case-by-case basis. Generic resolution of this issue calls for re-tightening of these bolts or re-evaluation of the connection without relying on such bolts.

In view of these discussions, it is concluded that the evaluation program adequately addresses this issue and no other specific action, such as re-torquing of the bolts in general, is needed.