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BWROG-11018
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Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Joe Golla (NRC)

Subject: BWROG ECCS Suction Strainer Draft Surveys on Headloss and Unqualified Coatings

Reference:
1) BWROG ECCS Suction Strainer Issue Resolution Schedule Update, BWROG-10042, August 31, 2010
2) Summary of September 22, 2010, Public Meeting with the Boiling Water Reactor Owners' Group (BWROG), October 18, 2010 (ML102800152)
3) Summary of October 20, 2010 Public Meeting with the Boiling Water Reactor Owners' Group (BWROG), November 4, 2010 (ML103010393)

The purpose of this letter is to transmit two draft surveys that the BWR Owners' Group (BWROG) Emergency Core Cooling System (ECCS) Suction Strainers Committee plans to release to its members. The surveys are milestones in the BWROG's program plan to resolve the Nuclear Regulatory Commission (NRC) Staff concerns related to suction strainer performance during a Loss of Coolant Accident (LOCA). The information gathered from the surveys will be an input to tasks described in the program schedule (Reference 1), specifically task 3.2.3, "Review [head loss] test methods and correlations; provide justifications for previous tests and correlations," and task 5.1.2, "Develop a coatings assessment guideline document to be used by licensees."

Both surveys were described during the resolution strategy meetings that were held in 2010 on Issue 5, Assessment of Coatings (Reference 2) and Issue 3, Debris Head Loss Correlations (Reference 3).

The BWROG ECCS Suction Strainers Committee requests written feedback within seven weeks (35 working days) of the NRC Staff's receipt of this letter, an interval which was agreed upon during the October 20, 2010 public meeting (Reference 3). NRC Staff feedback on the surveys, before they are submitted to the industry, is important for the BWROG ECCS Suction Strainers Committee to evaluate whether their efforts are in line with NRC Staff guidance. Additionally, future tasks depend upon receiving timely feedback from the Staff.

The first survey (Attachment 1) is an activity under Issue 3, Debris Head Loss Correlations. The survey requests information from BWROG members on the details of previous BWR strainer head loss tests and analysis for their plants. Some of the information collected by this survey will be used to develop a BWROG generic test program to address the thin bed effects issue.

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The second survey (Attachment 2) requests information on the scope and extent of programs in use at domestic BWRs for monitoring and assessment of Service Level 1 containment coatings. The responses provided to the survey will be used by the BWROG to assess the ability and timeliness of existing coatings programs at domestic BWR plants to identify qualified and unqualified coating debris available for transport to the ECCS suction strainers following a LOCA.

In both surveys, the BWROG ECCS Suction Strainers Committee will share results with the NRC Staff, with plant names omitted.

The BWROG is submitting these surveys to provide the Staff with an opportunity to give the BWROG feedback regarding the content of the surveys. Any feedback received within the time period requested will be considered before final issuance of the survey to the BWROG membership. Please contact me or Rob Whelan, BWROG PM, at (910) 200-1006, with any questions. Thank you.

Regards,

Frederick P. "Ted" Schiffley, II
Chairman
BWR Owners' Group

cc: M. H. Crowthers, BWROG Vice Chairman
C.J. Nichols, BWROG Program Manager
BWROG Primary Representatives
S.L. Scammon, BWROG ECCS Suction Strainers Committee Chairman

Attachments

1. Headloss and Near Field Effects Survey

2. Unqualified Coatings Program Survey

Attachment 1 - Headloss and Near Field Effects Survey
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Survey on Head Loss (Issue #3) and Near-Field Effects (Issue #11)

This survey requests information of BWROG members on the details of previous BWR strainer head loss tests and analysis for their plants. Some of the information requested in this survey may need to be obtained by BWROG members from the vendor for their plant's strainers.

The survey-collected information will be grouped and categorized by the BWROG. The categorized information will be provided to the NRC without plant names for NRC review of the adequacy of previous testing and analysis as part of the NRC's effort to review BWR strainer issues.

Additionally some of the information collected by this survey will be used to develop a BWROG generic test program to address the thin bed effects issue. BWROG members will have an opportunity to comment on the thin bed effects test program when the specific details have been drafted.

Survey Question (Head Loss)

1. HEAD LOSS PREDICTION Was the strainer head loss for your plant determined with:
    a. A vendor-provided correlation (if so, provide name of vendor),
    b. A vendor-provided correlation with confirmatory plant-specific tests,
    c. Direct use of plant-specific test data,
    d. By another means (if so, please describe)?

2. MIN-K, MICROTHERM, OR CALCIUM SILICATE ("PROBLEMATIC") AND COATING DEBRIS
    a. Does the debris source term for your plant contain any "problematic" (Min-K, Microtherm, or calcium silicate) debris?
    b. If so, what is the average mass of each problematic debris material per square foot of strainer surface area that is transported to the strainer?
    c. Were coating materials assumed to reach the strainer treated as paint chips or particulate? Describe the size characteristics.

3. DEBRIS SETTLING
    a. Did your plant take any credit for debris settling within the suppression pool in the debris transport analysis?
    b. If so, how was it calculated, e.g., the BLOCKAGE or STRAIN codes?
    c. What was the basis for the settling parameters used in the analysis?

4. TIME DEPENDENCE
   a. Did the strainer head loss analysis consider time-dependent transport of debris to the strainer?
   b. If so, how was this time-dependence modeled?

5. DEBRIS MIXTURES
   a. Was your strainer head loss based on a debris source term containing fibrous debris?
   b. If so, did you consider the head loss from both debris loads with a maximum amount of fiber as well as debris loads with a lesser amount of fiber? Please explain.
   c. If problematic debris and fiber are components in your debris source term, did you consider debris loads with a maximum amount of problematic debris but less than the full amount of fiber? Please explain.

6. THIN BED
   a. Did you explicitly consider head loss for thin fibrous debris beds (i.e., fiber bed thicknesses between 1/16 and ½ inch)?
   b. How was strainer head loss determined for thin fibrous bed conditions:
      i. With the same correlation as used for the maximum debris bed,
      ii. With a separate correlation,
      iii. With plant-specific thin bed tests,
      iv. Demonstrated with head loss tests to have a head loss less than with the maximum fibrous debris load
      v. Or by another means (if so, please describe)

Survey Questions (Head Loss Correlations)

7. PROBLEMATIC DEBRIS
   a. If a correlation was used to predict strainer head loss, did the correlation explicitly consider all debris materials applicable to the plant, including problematic debris?
   b. If the correlation did not explicitly consider all debris materials, how was the head loss associated with the excluded materials modeled?

8. TEMPERATURE SCALING
   a. Did the correlation specifically address temperature dependence on head loss?
   b. If so, how was the temperature dependence modeled (e.g., viscosity scaling)?

Survey Questions (Generic and Plant-Specific Head Loss Tests)

9. DEBRIS CHARACTERISTICS AND TESTS
    a. What debris materials and debris surrogates were used in plant-specific or generic tests that are the basis for the predicted strainer head loss?
    b. Describe how the debris materials and surrogates were prepared prior to the tests (e.g., Nukon fiber and coating debris preparation)?
    c. Describe the process used to introduce debris materials into the water in plant-specific or generic tests?
    d. In what sequence were the debris materials/surrogates introduced into the test water?

10. DEBRIS SETTLING
    a. Was debris settling on test facility surfaces allowed to occur during testing?
    b. If no credit was taken for settling in plant-specific tests, what measures were used to ensure that settling did not occur?
    c. If debris was allowed to settle during testing, what measures were used to ensure that the settling was prototypical or conservative?
    d. If available, please provide photographic or other recorded evidence of the amount of debris that settled in strainer tests?

11. TEST TERMINATION
    a. What criteria were used in deciding when to terminate head loss tests?
    b. If test results were extrapolated to a higher final head loss value, how was this extrapolation performed?

12. TEMPERATURE SCALING
    a. Were strainer head loss test results scaled to account for differences in test vs. plant water temperature?
    b. If so, what scaling method was used?
    c. Was there any evidence of "bore holes" (holes that form in thin beds when subjected to high head losses) such as fluctuations in pressure drop across the bed with time during the testing?
    d. If available, please provide a copy of the time history of the pressure drop for tests performed with thin fibrous beds?

13. TEST GEOMETRY SCALING One concern with strainer head loss tests concerns how prototypic the debris deposition on the test article was vs. the expected deposition on the plant strainer following a LOCA.
    a. Please provide a brief description of the similarities and differences between the strainer test article and the plant strainer.
    b. Does the plant strainer design contain features that encourage a uniform deposition of debris on the strainer surfaces?
    c. Were similar features used in the strainer test article?
    d. Was there evidence of a non-uniform debris deposition on the test article?
    e. Is there photographic evidence, or other documentation, that shows the debris bed on the test strainer and whether it had a uniform thickness?
    f. Were strainer tests based on having an equivalent debris bed thickness and flow velocity through the bed as would be expected in the plant strainer following a LOCA?
    g. If the test did not use an equivalent bed thickness and flow velocity, what scaling method was used to obtain strainer head losses for the plant?

14. THIN BED TESTS
    a. Were tests performed for a range of fiber bed thicknesses, including thin beds (1/8 inch thickness or less)?
    b. If thin bed tests were performed, was there any evidence of "bore holes" in the debris bed?
    c. Please provide a time history of the pressure drop in the bed for tests performed with thin beds?

Attachment 2 – Unqualified Coatings Program Survey
BWROG-11018

Survey on Assessment of Coatings – Description of Coatings Monitoring and Assessment (Issue #5)

This survey requests information of BWROG members on the details of coatings monitoring and assessment programs at their plants. The survey-collected information will be grouped and categorized by the BWROG. The categorized information will be provided to the NRC without plant names for NRC review of the adequacy of coatings monitoring and assessment programs as part of the NRC's effort to review BWR strainer issues.

The questions posed in the survey will address the categories of information discussed in the March 2008 NRC staff review guidance[1] for responses to Generic Letter 2004-02[2] questions on coatings evaluation. The noted review guidance (see Attachment 1) provides recommendations on the content of PWR licensee responses to be considered "*sufficient to support closure of the aspects of the generic letter related to protective coatings*".

The responses provided to the survey will be used by the BWROG to assess the ability and timeliness of existing coatings programs at domestic BWR plants to identify qualified and unqualified (or degraded qualified) coating debris types and quantities potentially available for transport to the ECCS suctions strainers following a LOCA event. Of equal importance is whether existing coatings programs have provisions that assure the predicted coatings debris quantities remain bounded by the design basis coatings loads used for strainer hydraulic sizing evaluations.

Where practical, the survey will be formatted to allow respondents to address the survey questions in one of several ways:

- By checking potentially applicable industry standards listed in drop-down menus (i.e., the various ANSI or ASTM standards referenced in Reg Guide 1.54[3] revisions 0, 1, and 2).
- By checking the applicable standards listed in drop-down menus, with exceptions and/or other details described in a free-form comment field.
- By using the free-form comment field to identify alternate standards or procedures being used and to add other comments that address the survey question.

Survey Questions

Note: The first two questions parallel the similarly-numbered issues discussed in the Ref. 1 staff review guidance for protective coatings.

1. Provide a summary of the type(s) of coating systems used in containment, including both qualified and unqualified (or degraded qualified) coatings. Specifically, identify the following:
    a) The types of qualified coatings used in containment. This may include several types of coatings and several different manufacturers (e.g., Carboline CZ 11 Inorganic Zinc primer, Ameron 90 epoxy finish coat) and should address all qualified coating types used in containment.

c) The types of unqualified coatings, or degraded qualified coatings, present inside containment, if known*.

d) The substrate (steel or concrete) upon which each coating type is applied should be provided as well as the quantities (ft^2) of each coating type.

e) Dry film thickness (DFT) for each coating system should also be provided. DFT may come from plant records, manufacturer recommendations, or actual sample measurements on the existing coatings. The applicable source for DFT should be identified.

*Note: If licensees are taking credit for a reduction of unqualified coating debris based on the Electric Power Research Institute (EPRI) Original Equipment Manufacturers (OEM) coatings testing program, an accurate estimate of the quantities of each coating type and its substrate may be necessary. Further discussion of the staff's perspective on the EPRI OEM coatings tests is provided in the debris generation section of the Ref. 1 review guidance.

2. Provide a description of your containment coating condition monitoring and assessment program, including:

a) Is top-level guidance for your coatings program provided by a regulatory or industry standard?
   - {Title} {Revision}, or
   - {No}

b) Is top level guidance for your coatings program provided by an internal company procedure?
   - {Yes/No}
   - {Free-form entry to include basis of internal procedure}

d) What is the frequency at which coatings monitoring and assessment is performed at your plant?
   - {Free-form entry to include frequency and basis of frequency of assessment, such as industry standard(s) or other}

e) What is the extent of coatings monitoring and assessment (i.e., what surfaces and components are evaluated and/or not evaluated)?
   - {Free-form entry to include description and basis of extent of assessment, such as industry standard(s) or other}

f) What methods are used for coatings monitoring and assessment**?
   - {Free-form entry to include description and basis of methods used for coatings monitoring and assessment, such as industry standard(s) or other}

g) How are personnel that perform coatings assessment tasks qualified to perform these tasks?
   - {Free-form entry to include description and basis of qualification requirements, such as industry standard(s) or other}.

h) How are degraded coatings reported?
   - {Free-form entry to include description and basis of reporting, such as industry standard(s) or other}.

i) How are degraded coatings tracked?
   - {Free-form entry to include basis for tracking, such as industry standard(s) or other}

j) How are degraded coatings remediated and/or scheduled for future remediation?
   - {Free-form entry to include discussion of approach to remediating and/or scheduling coatings for future remediation, such as industry standard(s) or other}.

k) Does your coatings monitoring and assessment program account for all qualified, unqualified and degraded qualified coatings in containment that could contribute to the ECCS strainer coatings source term? If not, identify what potential source terms are not being considered.
   - {Yes/No}
   - {Free-form entry to include potential source terms that are not being considered and the basis for not considering them.

l) Does your coatings monitoring and assessment program require a comparison of the predicted ECCS strainer coatings source term to the design basis coating source term at each assessment period?
   - {Yes/No}
   - {Free-form entry to discuss basis of not making this comparison, if applicable.

**Note: Per Ref. 1, licensees may reference the EPRI coatings adhesion testing program (see EPRI Report No. 1014883 July 2007) as confirmation of the validity of the visual inspection portion of their coatings assessment program. In addition, licensees may choose to provide a discussion of other activities in which they have participated in to support their coatings program. Such activities may include the EPRI Coatings Aging Task Group, the EPRI survey of coating failure operating experience, physical testing performed by the licensee, and plant operating experience with coating performance.

3. Reg Guide 1.54 (1973) was issued to define methods acceptable to the NRC for complying with the NRC's quality assurance requirements for protective coatings applied to ferritic steels, stainless steel, zinc-coated (galvanized) steel, concrete, or masonry surfaces of water-cooled nuclear power plants.

   In recent discussions with the BWROG, the NRC staff indicated that coating assessment and monitoring programs conforming to the recently released Revision 2 of Reg Guide 1.54 would not require evaluation of adequacy by the NRC.

   a) Does your plant have a licensing commitment to Reg Guide 1.54?
      - {Yes/No}
      - {If so, which revision?}
      - {If not, what is your plant's licensing basis (if any) for coatings monitoring and assessment?}

References

1. *"NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Coatings Evaluation"*, March 2008

2. NRC Generic Letter 2004-02, "*Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors*", September 13, 2004.

3. Regulatory Guide 1.54, Revision 2, "Service Level I, II, and III Protective Coatings Applied To Nuclear Power Plants", October 2010.

Attachment 2 – Unqualified Coatings Program Survey
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NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Coatings Evaluation, March 2008

NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Coatings Evaluation

March 2008

Prepared By:

NRC Staff
Steam Generator Tube Integrity and Chemical Engineering Branch
Division of Component Integrity
Office of Nuclear Reactor Regulation

COATINGS EVALUATION GUIDANCE
FOR NRC REVIEW OF GENERIC LETTER 2004-02 SUPPLEMENTAL RESPONSES
PREPARED BY THE OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF COMPONENT INTEGRITY

Purpose:

Provide guidance to NRR staff on what information is needed for a supplemental response to GL 2004-02 in the review area of protective coatings. This document also describes acceptable technical assumptions based on research conducted by the NRC and the industry. Numerous testing efforts have been conducted by both the NRC and the industry to address technical uncertainties in areas such as zone of influence (ZOI), coating debris characteristics, unqualified coating performance, and assessment of qualified coatings. One objective of this guidance is to provide the staff's perspective on each of the currently available test reports. Licensees may provide an interpretation of the test data from one of these reports that varies from the staff perspective. However, adequate technical justification should be provided in the supplemental response to support the licensee's interpretation.

Supplemental Response Content:

As described in the "Revised Content Guide for Generic Letter 2004-02 Supplemental Responses," issued by letter to NEI dated November 21, 2007 (ML073110389), the staff believes that the following broad categories of information should be sufficient to support closure of the aspects of generic letter related to protective coatings:

Provide a summary of type(s) of coating systems used in containment, e.g., Carboline CZ 11 Inorganic Zinc primer, Ameron 90 epoxy finish coat.

Describe the containment coating condition assessment program.

Describe and provide bases for coatings debris generation assumptions. For example, describe how the quantity of paint debris was determined based on ZOI size for qualified and unqualified coatings.

Describe what debris characteristics were assumed, i.e., chips, particulate, size distribution and provide bases for the assumptions.

Describe and provide bases for assumptions made in post-LOCA paint debris transport analysis.

Discuss suction strainer head loss testing performed as it relates to both qualified and unqualified coatings and what surrogate material was used to simulate coatings debris. Provide bases for the choice of surrogates.

The remainder of this guide will address each of the above mentioned areas in greater detail including any testing, of which the staff is aware, that may provide bases for technical assumptions.

Technical Details to be Included:

1) Provide a summary of type(s) of coating systems used in containment.

Supplemental responses should discuss the types of qualified coatings used in containment. This may include several types of coatings and several different manufacturers (e.g., Carboline CZ 11 Inorganic Zinc primer, Ameron 90 epoxy finish coat). Licensees should list all of the qualified coating types used in their containment. The substrate (steel or concrete) upon which each coating type is applied should be provided as well as the quantities of each coating type. Dry film thickness (DFT) for each coating system should also be provided. DFT may come from plant records, manufacturer recommendations, or actual sample measurements on the existing coatings.

Licensees should also list the types of unqualified coatings present inside containment if known. If licensees are taking credit for a reduction of unqualified coating debris based on the Electric Power Research Institute (EPRI) Original Equipment Manufacturers (OEM) coatings testing program, an accurate estimate of the quantities of each coating type and its substrate may be necessary. Further discussion of the staff's perspective on the EPRI OEM coatings tests is provided in the debris generation section of this guidance document.

2) Describe the containment coating condition assessment program.

Licensees should describe their program for monitoring containment coatings. This description should include the frequency, extent, and method of coating assessment. It should also discuss qualification of personnel. A description of how degraded coatings are reported, tracked, remediated, and/or scheduled for future remediation should also be provided.

In a letter to the Nuclear Energy Institute dated January 16, 2006 (ADAMS Accession Number ML053470467), the NRC staff expressed concerns regarding the adequacy of the current industry method for assessment of qualified coatings within containment. The staff specifically questioned the adequacy of visual assessment to verify the condition of qualified coatings. In response to the staff concerns, EPRI sponsored a project (see EPRI Report No. 1014883 July 2007) to collect coating adhesion data for coating systems applied in the containments of operating U.S. nuclear power plants to provide confirmatory support for coating inspection methods that rely upon visual inspection as an initial step. The staff has reviewed this report and determined that it provides adequate supporting evidence that the containment coatings monitoring approach contained in ASTM D5163, as implemented by licensees, and endorsed by USNRC in Regulatory Guide 1.54, Rev.1, and NUREG 1801, Vol. 2, Appendix XI.S8, is valid.

Licensees may reference the EPRI coatings adhesion testing program as confirmation of the validity of their coatings assessment program. In addition, licensees may choose to provide a discussion of other activities in which they have participated in to support their coatings program. Such activities may include the EPRI Coatings Aging Task Group, the EPRI survey of coating failure operating experience, physical testing performed by the licensee, and plant operating experience with coating performance.

3) Describe coatings debris generation assumptions.

ZOI:

The NRC generic safety evaluation (SE) (ADAMS Accession No. ML043280007) stated that licensees should use a coatings ZOI spherical-equivalent determined by plant-specific analysis, based on experimental data that correlate to plant materials over the range of temperatures and pressures of concern, or 10D (10 pipe diameters.) In response to this conservative position, several industry groups conducted destructive jet impingement testing of qualified coatings in order to reduce the 10D value. The staff positions on the two sets of testing are provided below for licensees who use the reduced ZOI value rather than the default 10D:

- WCAP-16568-P, "Jet Impingement Testing to Determine the Zone of Influence (ZOI) for DBA-Qualified/Acceptable Coatings":

  Licensees may use this report as the basis for using a ZOI of 4D or greater for qualified epoxy coatings and a ZOI of 5D or greater for qualified untopcoated inorganic zinc coatings.

- Florida Power & Light (FPL) Tests with supporting calculations performed by Areva:

  Licensees may use this report as the basis for using a ZOI of 4D or greater for qualified epoxy coatings. The reports submitted to the NRC by FPL and AREVA at the time of this guidance do not establish a value for untopcoated inorganic zinc. The untopcoated inorganic zinc that was included in the test data eroded at the distances tested (4D). The testers had not established a ZOI for inorganic zinc other than the data that showed it was some value greater than 4D. Unless other data is provided by the licensee, the ZOI for inorganic zinc should remain the default 10D. Licensees may submit other data such as supplemental FPL/AREVA data or WCAP-16568 data, to justify a reduced ZOI for untopcoated inorganic zinc. Similarly, the data submitted to the NRC indicates that Amercoat-90 epoxy failed the tests at the distances tested. Licensees reducing the ZOI to less than 10D for Amercoat 90 should also provide supplemental data.

  The AREVA calculation (Rept No. 32-5066085-00) recommends a ZOI greater than 3.39D. Independent calculations performed for the NRC, using the AREVA inputs, found the maximum bounding break to be 3.67D. The staff therefore determined that a ZOI of 4D for epoxy coatings would be conservative and acceptable.

Unqualified Coatings:

The NRC generic SE recommends that licensees assume 100 percent failure of unqualified coatings. In response to this position EPRI sponsored testing of Original Equipment Manufacturers (OEM) unqualified coatings (see EPRI Report No 1011753, September 2005). The staff positions on these tests are provided below.

Due to the large variation in coating performance, even in the same coating type, it is not possible, based on test results provided to the NRC to date, to predict generically how an unqualified OEM coating will perform under DBA conditions. That is, licensees should not reduce the failure percentage across the board for all unqualified OEM coatings. Therefore, the tests to date do not provide a substantive generic case to challenge the NRC guidance that 100 percent of unqualified coatings should be expected to fail during a DBA condition.

Five of the 37 coatings tested, as reported in the EPRI OEM report, showed greater than 80 percent failure, with some as high as 99 percent failure. These coatings included alkyds, moisture-cured urethane, and inorganic zinc rich coatings. Licensees would not be able to demonstrate, based on this report alone, that their coatings would not fail at these high amounts and therefore would not be able to take credit for a reduced amount of unqualified coating debris.

Some coatings did perform much better in the tests. If licensees were able to determine their specific coating types, they may be able to credit a reduction in assumed extent of failure of those types. For example, if a licensee had records of its unqualified coatings that showed they were consistent with the specific types of epoxy tested in the EPRI OEM report, that licensee may be able to justify a reduction in the amount of debris. For such a case, the staff would expect the licensee to select a failure percentage that bounds the worst performing sample of that coating type in the test data. Licensees may also be able to demonstrate the performance of their unqualified coatings through plant- and coating-specific testing.

4) Describe what debris characteristics were assumed, i.e., chips, particulate, size distribution and provide bases for the assumptions.

The NRC generic SE addresses two distinct scenarios for formation of a fiber bed on the sump screen surface. For a thin-bed case, the SE states that all coatings debris should be treated as particulate and assumes 100 percent transport to the sump screen. For the case in which no thin bed is formed, the staff's SE states that the coating debris should be sized based on plant-specific analyses for debris generated from within the ZOI and from outside the ZOI, or that a default chip size equivalent to the area of the sump screen openings should be used.

In response to this position, industry testing was conducted to determine actual debris characteristics for coatings subjected to DBA conditions.

Testing conducted for Comanche Peak by Keeler & Long (Keeler & Long Report No. 06-0413) subjected failed phenoline 305 chips, with a CZ-11 inorganic zinc primer attached to the back side, to a simulated design basis accident (DBA) test in accordance with ASTM 3911. The result was that almost all of the epoxy chips remained larger than 1/32 inch in diameter. The inorganic zinc failed in particulate form and disbonded from the coating chips.

Licensees may use this test report in conjunction with coating chip transport data to reduce the amount of degraded qualified epoxy coating debris. The data are not applicable to coatings in the ZOI since those coatings are expected to fail in particulate form due to erosion. They are only applicable to degraded qualified coatings outside of the ZOI that would be expected to fail by delamination in chip form. The data are not applicable to unqualified coatings.

5) Describe and provide bases for assumptions made in post-LOCA paint debris transport analysis.

The percentage of coatings debris that arrives at the sump strainer in the analysis should be provided. If less than 100 percent of the coating debris generated is analyzed to arrive at the strainer surface, the basis for settlement of the debris should be provided. The basis may be computational fluid dynamics (CFD) analysis, plant-specific transport testing, NRC-sponsored

coating chip transport testing (NUREG/CR-6916), or some combination of these. If coatings debris is assumed to settle, a detailed description of the debris characteristics should be provided. The debris characteristics discussion should include the chip or particle size assumed and the basis for that assumption.

The coatings transport section of supplemental responses to GL 2004-02 does not need to include detailed transport analyses. Coatings transport information can be included in the transport portion of the supplemental response. Key assumptions on coating debris characteristics that are inputs to the transport analysis and the percentage of coatings that are assumed to transport to the strainer should be provided in the coatings section. Qualified coatings debris and unqualified coatings debris from inside the ZOI, degraded qualified coatings debris, and unqualified coatings debris may be described separately in this section as necessary.

6) Discuss suction strainer head loss testing performed as it relates to both qualified and unqualified coatings and what surrogate material was used to simulate coatings debris. Provide bases for the choice of surrogates.

This section should address the type of surrogate material used, the size range of surrogate coatings debris, and the density of the surrogate debris. A comparison of the surrogate debris characteristics to the actual coatings debris characteristics should be provided. Particle size, shape, and density are the parameters to focus on in this section. Licensees should show that their choice of surrogates conservatively represents the coating debris that is expected in a LOCA and the characteristics of the coatings debris assumed in the mechanistic analysis.