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To:
Brian Sheron

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Description:
Qualified Coatings Assessments

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Special Instructions:



NUCLEAR ENERGY INSTITUTE

Anthony R. Pietrangelo
SENIOR DIRECTOR, RISK REGULATION
NUCLEAR GENERATION DIVISION

March 31, 2006

Dr. Brian W. Sheron
Associate Director, Engineering and Safety Systems
Office of Nuclear Reactor Regulation
Mail Stop O5-7
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Qualified Coatings Assessments

Dear Dr. Sheron:

In a letter to Michael Coyle of NEI, dated January 16, 2006, you identified a concern regarding industry approaches toward assessment of qualified coatings within containment. This letter provides a response to these concerns.

We agree that it is important to account for the contribution of coating failures on the debris sources inside PWR containments. As your letter identifies, industry guidance developed for use by PWR plants in the resolution of GSI-191 (NEI 04-07) calls for a conservative treatment (failure and transportability) of all coatings within the LOCA jet zone of influence (ZOI) and all unqualified or degraded coatings outside the ZOI. This treatment was reviewed by NRC and endorsed via the Safety Evaluation Report on NEI 04-07.

The need for periodic monitoring of coatings to provide assurance that they will remain functional during and following design basis events has been long recognized. Licensees have instituted protective coatings programs that meet applicable regulatory requirements, including Appendix A to 10 CFR Part 50, Criterion 1, *Quality Standards and Records*, Criterion 4, *Environmental and Dynamic Effects Design Bases*, and Appendix B to 10 CFR Part 50, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*. Criterion 1 requires that a quality assurance program be established and implemented in order to provide adequate assurance that structures, systems, and components (SSCs) will satisfactorily perform their safety functions. Criterion 4 requires, in part, that SSCs important to safety be designed to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. Appendix B establishes overall quality assurance program requirements for the design, fabrication, construction, and operation of safety-related nuclear power plant SSCs.



As part of Generic Letter 98-04, *Potential For Degradation of the Emergency Core Cooling System and the Containment Spray System after a LOCA because of Construction and Protective Coating Deficiencies and Foreign Material in Containment*, licensees were requested to provide a summary description of the plant-specific program or programs implemented to ensure that Service Level 1 protective coatings used inside the containment are procured, applied, and maintained in compliance with applicable regulatory requirements and the plant-specific licensing basis for the facility. The generic letter also requested licensees to provide information on how the plant-specific programs meet the applicable criteria of 10 CFR Part 50, Appendix B, as well as information regarding any applicable standards, plant-specific procedures, or other guidance used for: (a) controlling the procurement of coatings and paints used at the facility, (b) the qualification testing of protective coatings, and (c) surface preparation, application, surveillance, and maintenance activities for protective coatings. Maintenance activities involve reworking degraded coatings, removing degraded coatings to sound coatings, correctly preparing the surfaces, applying new coatings, and verifying the quality of the coatings. Licensee responses to GL 98-04 were reviewed and accepted by NRC as part of the generic letter resolution process.

Qualified coating systems are in use at most of the 103 operating power plants in the United States. While there have been some noted instances in which qualified coatings have experienced problems, these instances have been infrequent and have been thoroughly investigated by both the industry and, in some cases, by NRC (Note: a chronology of instances and activities related to protective coatings was included as an attachment to Generic Letter 98-04). The majority of these instances, upon investigation, were attributed to problems associated with the coatings application process (e.g., control over the preparation and cleanliness of the substrate before the coatings were applied, control over preparation of a coating before its application or control over the dry film thickness of coatings applied to the substrate). The potential for unanticipated changes in coating system performance is acknowledged and is a primary reason for the coatings monitoring programs that are currently in place at every operating nuclear power plant.

Licensees' containment coating condition assessment procedures and practices are based on the general and specific guidelines of ASTM D5163. The specific procedures vary from plant to plant, but are generally similar among plants. Visual inspections are performed on accessible coated surfaces of the plant looking for signs of degradation (cracking, checking, peeling, mechanical damage, chemical damage, heat damage, etc).

Current industry practice is that these assessments should be performed and the results evaluated by individuals who are qualified to the guidance of EPRI 1003102

and recently published ASTM D7108-05. When visual coating deficiencies are discovered, the extent of the condition is then assessed. The extent of condition assessment varies depending on the deficiency type. In the case of isolated areas of peeling and flaking coating, the generally accepted method is to scrape the flaking area back to sound coating. In the case of other defects, such as chemical damage, the coating may be sound, but discolored due to the chemical exposure. Typically, chemically damaged coatings are removed and the area is recoated. Still other visual indications, such as checking, may be determined to be sound and solid coating and only require continued monitoring.

During condition assessments, in accordance with ASTM standards, if anomalies (visual indications) are observed, ASTM D5163 recommends that the licensee take any or all of a number of actions to determine the extent of the condition, including but not limited to: adhesion testing by knife (D6677-01), by pull-off test (D4541-95), by tape (D3359-02), dry film thickness (D1186-01), etc. as appropriate.

The use of visual examination methods, with appropriate follow-up examinations, is endorsed by Regulatory Guide 1.54, Revision 1, and is also endorsed by the Generic Aging Lessons Learned (GALL) Report (NUREG 1801). Regulatory Guide 1.54, Revision 1, endorses ASTM D5163-96 as an acceptable means for establishing an in-service coatings monitoring program for Service Level I coating systems. NUREG 1801, Revision 1, issued in October of 2005, endorses the latest revision of ASTM D5163-05a, as an acceptable methodology for monitoring the condition of Service Level I Coatings. Licensee responses to Generic Letter 98-04 committed to performing visual condition assessment inspections, which were all accepted by the NRC.

The ASTM coatings condition assessment standards are based on years of collective experience and knowledge of coating failures, research and historical data, failure mechanisms, and standard industry practices. An industry-wide review by EPRI of coatings assessment records could find no documented instances of degradation of reactor containment coating systems (or any other industrial coatings systems) that did not first exhibit visual precursors that could be detected and investigated by qualified personnel during periodic examinations. Restated in a different way, visual precursors were found to exist in all documented instances of degradation of reactor containment coatings. Studies and tests of aged coatings (both qualified and unqualified coatings) have demonstrated the robustness and longevity of properly applied coating systems.

The combination of test data and experience data supports the suitability of visual inspection as a key part of licensee coatings monitoring programs and demonstrates the adequacy of visual inspection as a means to provide reasonable assurance that

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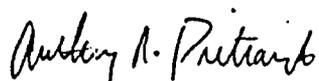
qualified coatings remain in compliance with the qualification requirements. We believe the guidance contained in ASTM D5163-96 and the latest revision of D5163 dated 2005 is sufficient to permit licensees to develop and maintain containment coatings condition assessment programs.

Industry continues to carefully examine programs and methods for containment coatings condition assessment with the intent of adopting additional nondestructive and destructive protocols for investigation of visual anomalies. To this end, a workshop on containment coatings condition assessment will be hosted by ASTM Committee D33, Protective Coatings and Linings for Power Generation Facilities, on July 18-19, 2006 at ASTM Headquarters in West Conshohocken, PA.

As part of the resolution process for GSI-191, licensees will need to assess their protective coatings programs and modify them, as necessary, to provide reasonable assurance that their programs continue to meet applicable regulatory requirements. An aspect of these programs that will take on increased importance as GSI-191 resolutions are incorporated into PWR licensing bases is the remediation action taken upon identification of degraded coatings. GSI-191 resolutions will require an accounting of the potential coating contributions to the overall debris source term to a higher degree than is currently required. In recognition of this, we are working with EPRI and the Nuclear Utility Coatings Council (NUCC) on ways to assist and improve industry programs in this area.

We are available to meet with you and your staff to further discuss coatings monitoring and remediation programs. Please contact me at (202) 739-8081, arp@nei.org or John Butler at (202) 739-8108, jcb@nei.org should you have any questions.

Sincerely,



Anthony R. Pietrangelo

c: Mr. Tom O. Martin, U.S. Nuclear Regulatory Commission
Mr. Jerad S. Wermiel, U. S. Nuclear Regulatory Commission