Babcock & Wilcox

Diamond Power

P.O. Box 415, Lancaster, Ohio 43130
Telephone: (614) 653-6540

January 28, 1981

Dr. Thomas E. Murley, Director
Division of Safety Technology
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Murley:

Subject: Nuclear Containment Insulation
Topical Report O.C.F.-1

A recent event again prompts me to request that the NRC modify its official published position with respect to the use of fiberglass or other mass insulation inside a nuclear containment. We again press for your recognition that a very real danger exists in the use of fiberglass.

In December 1978 we wrote to the NRC (copy attached for your convenience) to press our conclusion that the topical report and the NRC evaluation did not go far enough in its investigation of the potential for stress corrosion cracking, that the chloride content of a mass insulation, as manufactured, is not a safe criterion on which to judge its future behavior potential as the wicking agent for chloride migration.

Mr. D. B. Vassallo's response of January 31, 1979, copy attached, defends the NRC staff review as having been done in an acceptable manner and justifies their conclusion that ". . . the topical report is acceptable for referencing on specific applications." We strongly disagree that the staff review was adequate. We again urge a revision to your evaluation of the topical report taking into account the danger that fiberglass will be a major contributor to stress corrosion cracking under any one of a number of postulated events.

The recent event referenced in the opening sentence is the accidental flooding of the Indian Point containment by brackish water which contained about 5000 PPM Cl^-. This is just another example of an unplanned occurrence that can bring chlorides and water into contact with a mass insulation which then becomes the agent which causes stress corrosion cracking. In this case, no damage was done because the insulation which became wetted was not a mass-type product, and the stressed metal was not austenitic stainless but that was a fortuitous situation.

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ADD:
J BERGGREN

The topical report and the NRC staff review focused attention only on whether or not Nukon, as manufactured, met the requirements of Regulatory Guide 1.36. It is our position that the utility cannot control events which will cause a change in the chemical makeup of a mass insulation. The characteristics which make fiberglass a good insulator, namely interlocking fibers which trap air, are the very characteristics which enhance the risk of trapping and retaining materials high in chloride content which will later be leached out and deposited on the pipe.

Diamond Power recently commissioned the Alliance Research Center of the Babcock and Wilcox Company to perform two tests.

- They first tested Nukon wetted with simulated primary water, using the standard ASTM Method C692 for Evaluating the Influence of Wicking-Type Thermal Insulations on Stress Corrosion Cracking Tendency of Austenitic Stainless Steel. As expected, no cracks were observed.

- They then tested Nukon wetted with a solution which duplicated the brackish water found in the containment at Indian Point. Also, as expected, severe cracks were evident.

The conclusion as stated in the report is: "This result shows that Nukon insulation could act as a wick for a solution containing chloride ions and, through a wetting and drying action, concentrate them on and, subsequently, crack sensitized Type 304 stainless steel covered by the insulation." This is a risk that can and should be avoided.

The NRC refuses to permit other postulated risks from being accepted by a utility, yet the unfortunate wording in the NRC official response to the Topical Report, OCF-1, infers NRC approves of the product. We fully understand you didn't approve the product, but the industry does not read it that way. Contrary to NRC intent, Mr. Robert Baer's letter of December 8, 1978, and its attachment is being widely distributed as proof that the Owens-Corning product has NRC approval.

I specifically request that you give official recognition to the hazards described and issue a revision to the NRC evaluation of the subject topical report. Mr. Baer's letter should be revised by deleting the phrase " . . . and that the overall integrity of the blankets will not be adversely affected by the conditions found during the lifetime of the plant." The revised letter should emphasize the risk of stress corrosion cracking and indicate that an applicant who references the topical report to support his decision to use fiberglass over austenitic stainless will be required to describe and commit to an ongoing program to assure continuing compliance with Regulatory Guide 1.36.

Please feel free to call me at (614) 653-6540, Ext. 424, if you need any additional information. We are, of course, willing to meet with you in Washington to discuss any aspect of our position.

In any event, we will be in contact with the NRC in about 30 days to answer any questions you may have.

Yours very truly,

MIRROR INSULATION
Unit of Diamond Power

David A. Rausch
Manager of Engineering

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Attachments

cc: Paul S. Check, NRC-Assistant, Director for Plant Systems, w/att.
Karl Kniel, NRC-Chief, Generic Issues Branch, w/att.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FILE NO.

JAN 31 1979

Mr. D. A. Rausch
Manager, Engineering
Mirror Insulation
Diamond Power Division
P. O. Box 415
Lancaster, Ohio 43130

SUBJECT: DIAMOND POWER LETTER REGARDING OWENS-CORNING FIBERGLAS TOPICAL REPORT OCF-1, NUCLEAR CONTAINMENT INSULATION SYSTEM

Dear Mr. Rausch:

Your letter of December 6, 1978 provided information that you wished us to consider prior to completing our review of the subject topical report. As you now know, our review had been completed and our Topical Report Evaluation had been issued prior to receipt of your letter. A copy of our Evaluation was sent to you on December 19, 1978.

Even though our review of the topical report had been completed, we have carefully considered the points raised in your letter and conclude that a revision to our evaluation of the subject topical report is not needed. The bases for this conclusion are discussed below.

The NRC staff's review of the Owens-Corning topical report considered: (1) release of airborne particles leading to a radiation health hazard in service; (2) stress corrosion cracking of the austenitic stainless steel surfaces that come in contact with the insulation; (3) deterioration of the thermal properties during normal operation, complicating operation and control of the plant; (4) potential for creating fire hazard in the containment area that could interfere with safe operation of the plant; (5) interference with the emergency spray system in the event of a loss-of-coolant accident; and (6) blocking of pressure relief ports in the event of an accident.

We believe that these are the major safety considerations for this type of insulation. Our approval of the topical report merely means that the NRC staff has determined that the report is an acceptable reference for licensing actions. It does not imply that the staff believes that it is superior to a competitive product or that it is suitable for every possible application. The licensee bears the primary responsibility for the selection of all components and systems, including thermal insulation.

Many of the points mentioned in your letter were raised a number of years ago by members of the NRC staff and the Advisory Committee on Reactor Safeguards. This led to the issuance of a number of Regulatory Guides.

As discussed below, one of these, Regulatory Guide 1.36, "Nonmetallic Thermal Insulation for Austenitic Stainless Steel," issued in February 1973 deals specifically with thermal insulation; and the others with general requirements for all components regarding shipping, storage, installation, inspection, housekeeping, and quality assurance during operation.

Position C.1 of Regulatory Guide 1.36 cautions:

> "All insulating materials should be manufactured, processed, packaged, shipped, stored, and installed in a manner that will limit, to the maximum extent practical, chloride and fluoride contamination from external sources."

The specific criteria that the Nuclear Regulatory Commission uses for evaluation of thermal insulation to be used on austenitic stainless steel are the criteria of Regulatory Position C.2 (Qualification Test) of Regulatory Guide 1.36. The Position C.2 Qualification Test requires that a representative insulation sample pass an appropriate stress corrosion cracking test and comply with the Regulatory Guide Figure 1 chemical analyses limitation regarding leachable chloride, fluoride, sodium and silicate. The test data and information in the subject topical report show that the Nu'k'on insulation meets the guide and is qualified for use in light-water-cooled nuclear plants in this respect.

As your letter notes, there are a number of potential sources of radioactive or chemical contamination, during construction and operation. These sources apply to all plant components, not only thermal insulation. The NRC staff requires that all equipment and components that may affect plant safety be packaged, shipped, stored, installed, operated, and maintained in a manner to prevent radioactive and chemical contamination. There are a number of Regulatory Guides that deal with this subject. Examples of these are Regulatory Guide 1.38, "Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water-Cooled Nuclear Power Plants," Revision 2, issued in May 1977; Regulatory Guide 1.116, "Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems," issued in May 1977; Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants," Revision 2, issued in September 1977; and Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operations)," Revision 2, issued in March 1978. The NRC staff, as part of our plant specific review, requires that applicants develop a program to implement these Regulatory Guides or their equivalent.

NRC establishes general safety criteria, sets specific requirements, and provides guidance in the form of Regulatory Guides or NUREG reports. The NRC staff performs inspections and audits to assure that programs are properly implemented. However, it should be noted that the licensees are the first line of defense to ensure safety of the public. They directly control plant design, construction, operation and maintenance. The licensees make the basic decision on suitability of specific products and are responsible to see that the plant is operated in accordance with NRC Regulations and in a manner to protect the health and safety of the public.

Operating events can cause contamination. An example of such an event was cited in your letter, namely a fire that occurred on March 6, 1973 during non-nuclear testing of Oconee Unit 1. We believe the actions taken following that event are indicative of the actions that NRC would require be taken by the licensee of any plant which experiences a fire or any other event that could have potentially damaged equipment, including insulation. That is, the event would be thoroughly evaluated to determine which components have been or might have been damaged, the affected or potentially affected components would be replaced or restored to their initial status, and the affected components and systems would be retested to assure that they were able to perform their intended function.

Based on the considerations discussed above, we believe that our review of Owens-Corning Fiberglas Topical Report OCF-1, "Nuclear Containment Insulation System," was performed in an acceptable manner, and covered the major safety concerns. Therefore, we conclude that the topical report is acceptable for referencing on specific applications.

Sincerely,

D. B. Vassallo, Assistant Director
for Light Water Reactors
Division of Project Management

DEC 8 1979

Mr. Gordon Pinsky
Owens-Corning Fiberglas Corporation
P. O. Box 2198
Shawnee Mission, Kansas 66201

Dear Mr. Pinsky:

SUBJECT: FINAL STAFF EVALUATION OF TOPICAL REPORT OCF-1, NUCLEAR CONTAINMENT INSULATION SYSTEM

The staff has completed its evaluation of the subject topical report on your Nu'k'on insulation system and finds it is acceptable for reference in licensing applications. A detailed evaluation of your report is enclosed.

Based on the results of the quantitative and qualitative tests performed by or for Owens-Corning Fiberglas, the staff concludes that the Owens-Corning Fiberglas Corporation's nuclear containment insulation system (Nu'k'on) is capable of retarding heat loss from piping and equipment in containment areas, and that the overall integrity of the blankets will not be adversely affected by the conditions found during the lifetime of the plant. We also conclude that during a loss-of-coolant accident, the Owens-Corning Fiberglas insulation system is not expected to interfere with the operation of the emergency recirculation cooling system.

A copy of this letter and its enclosure should be included in the front of the final revision to your report. This final revision should incorporate and update all additional submissions not yet incorporated into the basic report. Twenty-five copies of this final revision should be sent to the staff within sixty days.

Sincerely,

Robert L. Baer, Program Manager
Light Water Reactors Branch No. 2
Division of Project Management
Office of Nuclear Reactor Regulation

Enclosure:
As stated

Diamond Power

P.O. Box 415, Lancaster, Ohio 43130

Telephone: (614) 653-6540

December 6, 1978

Mr. Robert L. Baer, Chief
Light Water Reactor Branch No. 2
Division of Project Management
Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Nuclear Containment Insulation
Topical Report
OCF-1

Dear Mr. Baer:

It is our understanding that your Branch is preparing to issue, in the near future, NRC's final evaluation of the Owens-Corning topical report. Before doing so, please consider the following information which we believe to be of grave significance. It is our position that any mass insulation, including fiberglass, applied directly to an austenitic stainless steel pipe inside the containment of a nuclear reactor, does have significant potential for causing stress corrosion cracking.

- We contend that the various test methods cited can only determine water leachable halide levels at one particular point in time and cannot predict if and when the mass insulation, by reason of its water absorptivity or its fluid filtering action, will act as a vehicle through which chlorides/fluorides from outside the system may be concentrated at the surface of the stainless steel.

- We contend that, contrary to the claim of the topical report, water is present from time to time in an operating reactor system and can logically be assumed to saturate the fiberglass insulation and when the pipe is heated, to concentrate the contaminants at the stressed surface by evaporation of the water.

Therefore, we believe the approval of the use of a fiberglass insulation system such as Nukon is not consistent with the concern of both the NRC and the Nuclear Industry for maximum safety. We believe the logic detailed below will be persuasive.

Fiberglass blanket and cloth have large surface areas which make their use as filter materials common. Examples are large industrial filters which are basically fiberglass mat material and filter bags which are commonly made of fiberglass cloth and are used in bag houses. Therefore, it can be postulated that if exposed to halides in the air or on surfaces, it is highly probable that they will pick up, trap, or filter out a significant quantity of material which will produce stress corrosion in stainless steel.

We have identified four primary real conditions which will lead to contamination of fiberglass insulation and thus stress corrosion of stainless steel piping.

Fiberglass insulation can pick up leachable halides during transport between the factory and the nuclear site. Our company had this concern some years ago and thus we commissioned the Alliance Research Laboratory of Babcock & Wilcox to evaluate this potential. Insulation was tested for chloride content, repackaged to the manufacturer's standard, sent on a round trip to Texas and retested. Chloride pick-up increased the contamination to unacceptable levels. This confirmed the experiences of others and the concerns expressed in Regulatory Guide 1.36.

During the construction phase of a nuclear plant, ventilating air contains measurable quantities of halides due to construction activities such as welding, grinding, and painting. It also may have relatively high levels of chlorides due to the proximity of a sea coast. These halides can easily be trapped in fiberglass mat or cloth as a result of relative motion of the air. Physical contact with contaminated surfaces will occur when portions of the insulation are removed to perform baseline weld inspections or when removed and laid down for any other reason.

During inservice inspections, when the insulation components are removed, they will again be exposed to air and surfaces which can potentially transfer quantities of halides to the components. The blankets or cloth cannot avoid physical contact with contaminated surfaces such as work benches, floors, and walkways. (Radioactive dust particles, which can consist of many differing types of materials, will become entrapped in the fibrous media which can create other serious problems such as manpower exposure time limitations, decontamination problems and waste disposal problems, to name a few.)

Another condition to be considered is the contamination potential during and after an electrical fire or oil fire in the containment. Duke Power Company reported to the AEC on May 4, 1973 a description of events associated with an oil fire which occurred in the containment of Oconee Nuclear Station, Unit 1, which clearly demonstrates this potential. It was reported that: "In general, surfaces within the reactor building were coated with smoke and oil residues . . . . analyses of fire residues were performed. These analyses determined that a significant percentage of the residue samples contained unacceptable, or marginally acceptable, concentrations of chlorides and/or fluorides."

The presence of water to infiltrate-saturate a nuclear insulation system is clearly unavoidable. At times during construction, water used for cleanup will surely spill on some of the insulation. Risk of leakage and spills during refueling and valve leakage during operation are very real potential risks. Regulatory Guide 1.36 again provides a caution with reference to water. It says in part, "Accidental spillages and leakages of fluids through pipe fittings, valves, and equipment cannot be entirely prevented . . . ." All specifications require that insulation systems be designed for 100% relative humidity. The topical report under your review has substituted hope for logic in asking you to believe that moisture is not present.

The conclusion that seems inescapable is that there is significant risk that leachable chloride/fluoride ions and water can both be present in a fiberglass insulation system, and that stress corrosion cracking of the primary piping system is possible, if not probable.

We would urge the NRC to prohibit the use of Nukon on stressed austenitic stainless steel inside a nuclear containment. An alternative could require a utility who plans to use Nukon to periodically test a statistically valid sample of insulation pieces using the appropriate ASTM methods to reconfirm the absence of unacceptable levels of leachable chlorides or fluorides. A reasonable interval might be to require such a test at each refueling outage. If any insulation fails to pass the tests, replacement of all insulation should be required.

Thank you for consideration of our position. If any questions arise, we would be pleased to provide additional supporting data or references.

Sincerely,

MIRROR INSULATION
Unit of Diamond Power

D. A. Rausch
Manager, Engineering

DAR/s
cc: Dr. Walter Butler, Chief
Containment Systems Branch
bcc: G. D. Ball
R. T. Gray
D. V. Oetjen
D. F. Stratouly
L. J. Tedesco