Consumers Power

POWERING MICHIGAN'S PROGRESS

Big Rock Point Nuclear Plant, 10269 US-31 North, Charlevoix, MI 49720

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June 4, 1993

Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

DOCKET 50-155 - LICENSE DPR-6 - BIG ROCK POINT PLANT - RESPONSE TO NRC BULLETIN 93-02: DEBRIS PLUGGING OF EMERGENCY CORE COOLING SUCTION STRAINERS

On May 11, 1993, Consumers Power Company (CPCo) received a bulletin from the NRC notifying licensees of a previously unrecognized contributor to the potential loss of net positive suction head (NPSH) for the Emergency Core Cooling Systems (ECCS) for Light Water Reactors during the recirculation phase of a loss-of-cooling-accident (LOCA). The bulletin required all operating reactor licensees to take the recommended actions, and respond within 30 days describing the actions taken associated with the bulletin.

In response to the Bulletin, an evaluation was performed which reviewed susceptible materials in containment, applicable procedures, and design features associated with ECCS recirculation. Details of this evaluation are provided by attachment.

The evaluation concluded the installed plant materials meet the requirements of the Bulletin. The affect of transient materials on ECCS operation is controlled by procedures, physical barriers and inspection.

Patrick M Donnelly
Plant Manager

150122

CC: Administrator, Region III, USNRC
NRC Resident Inspector - Big Rock Point

ATTACHMENTS

JE11

CONSUMERS POWER COMPANY

Big Rock Point Plant
Docket 50-155 License DPR-6

NRC Bulletin 93-02

At the request of the Commission and pursuant to the Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974, as amended, and the Commission's Rules and Regulations thereunder, Consumers Power Company submits our response to NRC Bulletin 93-02 dated May 11, 1993, entitled,"Debris Plugging of Emergency Core Cooling Suction Strainers." Consumers Power Company's response is dated June 4, 1993.

CONSUMERS POWER COMPANY

To the best of my knowledge, information and belief, the contents of this Technical Specification Change Request are truthful and complete.

By _____
David P Hoffman, Vice President
Nuclear Operations

Sworn and subscribed to before me this 7th day of June 1993.

Beverly A. Avery, Notary Public
Jackson County, Michigan

[SEAL]

My commission expires

BEVERLY A AVERY
NOTARY PUBLIC STATE OF MICHIGAN
JACKSON COUNTY
MY COMMISSION EXP. DEC. 3,1996

ATTACHMENT

CONSUMERS POWER COMPANY
BIG ROCK POINT PLANT
DOCKET 50-155

RESPONSE TO NRC BULLETIN 93-02
DEBRIS PLUGGING OF EMERGENCY CORE COOLING SUCTION STRAINERS

ATTACHMENT
BIG ROCK POINT PLANT
RESPONSE TO BULLETIN 93-02

REPORTING REQUIREMENTS

Within 30 days of the date of this bulletin (May 11, 1993), submit a written response stating whether the actions requested by the bulletin have been or will be performed. The requested actions are as follows:

- Identify fibrous air filters or other temporary sources of fibrous material, not designed to withstand a LOCA, which are installed or stored in the primary containment.

- Take any immediate compensatory measures which may be required to assure the functional capability of the ECCS.

- Take prompt action to remove any such material. (NOTE: prompt was defined as 120 days or at the next shutdown, whichever comes first.)

If the use of such material is identified, include the locations and quantity in use, any immediate compensatory measures taken, and the current schedule for removal of this material.

LICENSEE'S RESPONSE

A meeting was immediately held upon receipt of the Bulletin by the Engineering Department to evaluate its impact. The group included several engineers that had previously been involved with projects or other activities in regards to the identification and management of fibrous materials in containment. Three subjects were discussed:

1) the applicable area
2) the applicable equipment
3) the applicable materials

1. The concern in containment was limited to areas below the 592 foot elevation. (The Core Spray Recirculation System would normally be placed into service when water level reaches the 587 foot elevation, not to exceed the 590 foot elevation.)

2. Applicable equipment identified were containment air filter elements and pipe insulation.

   There are no ventilating units below the 599 foot elevation. These air filter elements are secured in the ventilating units, and are expected to remain in-situ during a design base accident. They are not subject to direct impingement by containment spray. Pipe insulation is also a factor, but the majority of it is above the 590 foot level, and should be of limited consequences (except for the one strainer in the Recirculating Pump Room).

   However, the filters and pipe insulation are being considered in the unlikely event that the ventilating unit(s) and pipes are destroyed by a missile(s) and the filters/insulation become dislodged. Containment sprays may also have some affect on the filters and pipe insulation.

3. Materials involved are asbestos and calcite insulation, fiberglass air handling filters, anti-contamination clothing, rags (plastic and cloth), duct tape, HEPA filters, strip chart paper and loose paper.

Engineering concluded that immediate compensatory actions to assure the functionality of the ECCS would not be recommended because of the previous actions taken by the facility over the last ten years.

As a result of this Bulletin, a simple solubility test of the identified materials within containment was performed. Test materials included common radiation safety items (paper smear pads, air sample pads, masking tape, etc), cooler unit filters and prefilters, and asbestos, non-asbestos and fiberglass insulation. The test parameter was 150 degree water for a duration of three days.

At the conclusion of the testing, the common radiation safety materials remained intact. All cooler filter material remained unchanged throughout the test period as well as the fiberglass insulation. The asbestos and non-asbestos insulation exhibited some degradation into a powder-like substance that settled to the bottom of the test beaker (asbestos sample degraded by about 40%, and the non-asbestos sample by about 7%); however it should be noted that the insulation samples were unwrapped, loose clumps as compared to the wrapped piping insulation that would be typically found in containment.

REPORTING REQUIREMENTS

If an addressee proposes not to take the actions requested in this bulletin, provide to the NRC staff, within 30 days of the bulletin (May 11, 1993), your proposed alternative course of action and a justification for any deviation from the requested actions.

LICENSEE'S RESPONSE

DISCUSSION

The Big Rock Point Containment is a spherical steel vessel, 130 feet in diameter that extends 27 feet below grade level and 103 feet above grade. The plant is designed so that operating personnel may enter the sphere and remain inside as necessary during normal operation, shutdown and refueling. The approximate free volume in the sphere is 940,000 cubic feet, and there is no "Suppression Pool" or "Torus" as is found in most other BWR designs.

The Core Spray Recirculation System consists of two full capacity pumps and a heat exchanger. The pumps take suction from strainers located in the lower levels of containment and discharge through the core spray heat exchanger to the core and containment spray headers.

Core spray recirculation is initiated when the level of water in the sphere reaches elevation 587'. The water in the sphere will then be recirculated from the suction strainers that are located within the following areas at elevation 577':

1 - Control Rod Drive Pump Room
1 - Immediately below reactor vessel (Control Rod Drive Room)
2 - Accumulator Room
1 - Recirculating Pump Room area.

Only three of the five strainer inlets are required for full capacity. The suction strainers drain into a common header through two locked open 6" valves into the suction side of the core spray pumps through an 8" locked open valve.

Four screen door barriers have been installed in the following locations to protect three of the five strainers from debris blockage during post-LOCA recirculation:

- Spent Fuel Pool Heat Exchanger Room
- East Upper Accumulator Room
- West Upper Accumulator Room
- West Lower Accumulator Room

PROPOSED ACTION

Consumers Power concludes that the Big Rock Point facility currently meets the intent of NRC Bulletin 93-02. As described above, the design of the facility and materials used minimize the potential for strainer blockage. Procedural controls are used to manage transient materials.

The following summary of the resolution of NUREG-0869, Revision 1; USI A-43 Regulatory Analysis provides additional support for this conclusion.

A. SEP Topic VI-1, Organic Materials

Based on results of qualification tests conducted, and in consideration of the coating types existing in the plant (alkyds and urethanes), the staff concluded that there was reasonable assurance that the coatings inside the containment of the Big Rock Point Plant would not create a hazardous environment or cause the failure of engineered safety systems following an accident. Further, the staff concluded that the proposed visual inspection program provided reasonable assurance that the coating systems would be adequately maintained.

B. Reference to NUREG/CR-2982, Revision 1; Buoyancy, Transport and Head Loss of Fibrous Reactor Insulation

NUREG/CR-2982 analyzed shreds of fiberglass insulation of approximately 3/4 inches in size and found that the minimum flow velocity required to transport sunken insulation pieces of this size was 0.2 ft/sec. This was the smallest size of insulation debris used in the analysis. NUREG-0869 (Table 4.1) also states that at recirculation flow velocities of less than 0.2 ft/sec, transport of insulation debris is unlikely. Required flow velocities would be much higher for larger pieces of insulation.

The calculation performed specific to Big Rock resulted in a velocity of 0.026 ft/sec. This flow velocity is significantly less than the minimum transport velocity of 0.2 ft/sec, therefore objects would not be transported to the strainers.

C. Recent completion of Living Schedule Issue 93-104A, Installation of Screen Doors to Protect Core Spray Suction Strainers Against Blockage

The probability of a suction strainer(s) becoming blocked and resulting in inadequate post-LOCA recirculation is a function of many factors. These include:

1) the size and location of a pipe break with respect to the type and amount of insulation in this location that could be blown free

2) the containment layout, suction strainer location(s) and recirculation water flow patterns

3) size of the suction strainers

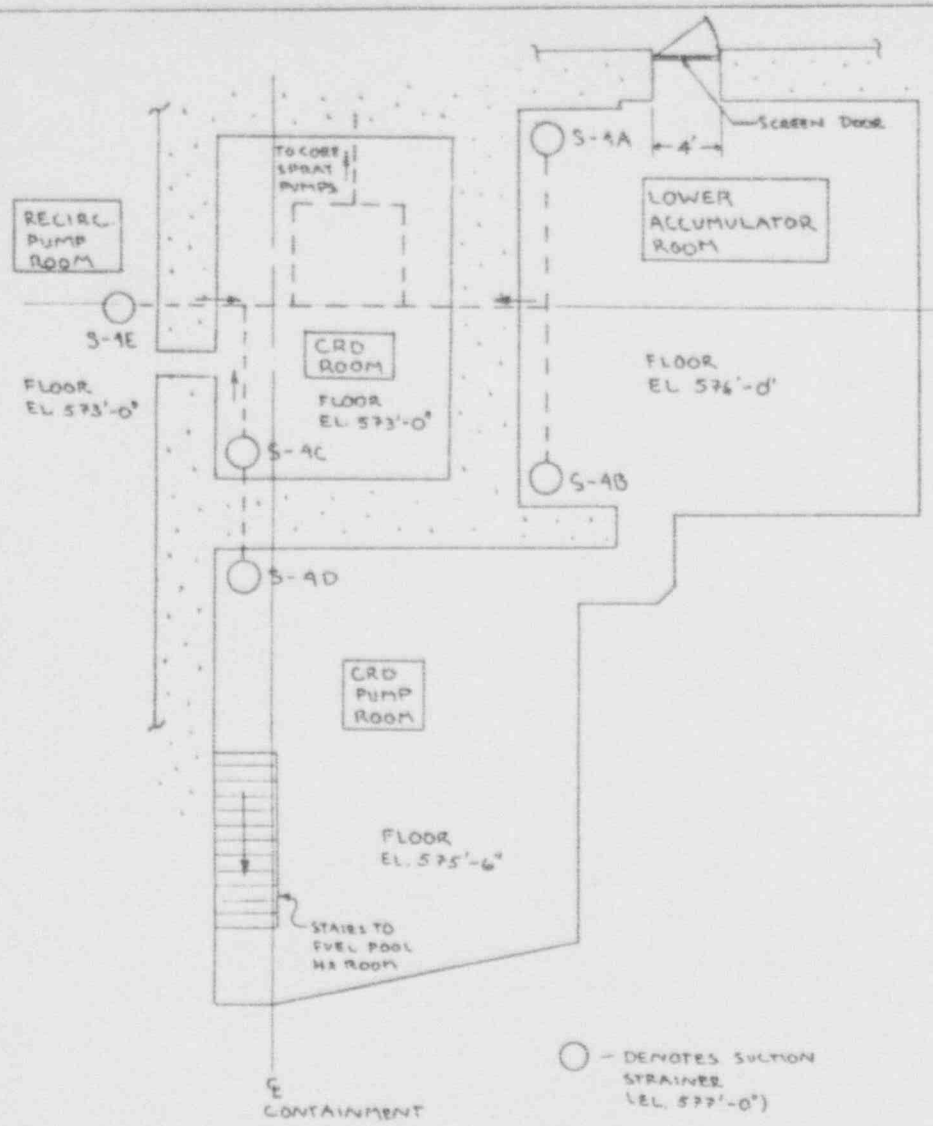
4) post-LOCA recirculation flow and NPSH requirements

The surface area of each suction strainer is relatively small (0.7 sq ft) and the potential for significant blockage if debris were to reach one of these strainers is high. Thus, the scope of this project was to install screen doors at four locations in the recirculation water flow path to the suction strainers in order to prevent large debris from entering these areas. The attached diagram shows the locations of each of the five suction strainers and the screen doors. The doors were installed at both openings to the Upper Accumulator Room, the west doorway to the Lower Accumulator Room and the door to the Fuel Pool Heat Exchanger Room. Redundant screens will add additional blockage protection to the two suction strainers in the Lower Accumulator Room (S-4A, S-4B) and the one in the CRD Pump Room (S-4D). There is minimal insulation and other potential debris inside either the Accumulator Room or the CRD Room.

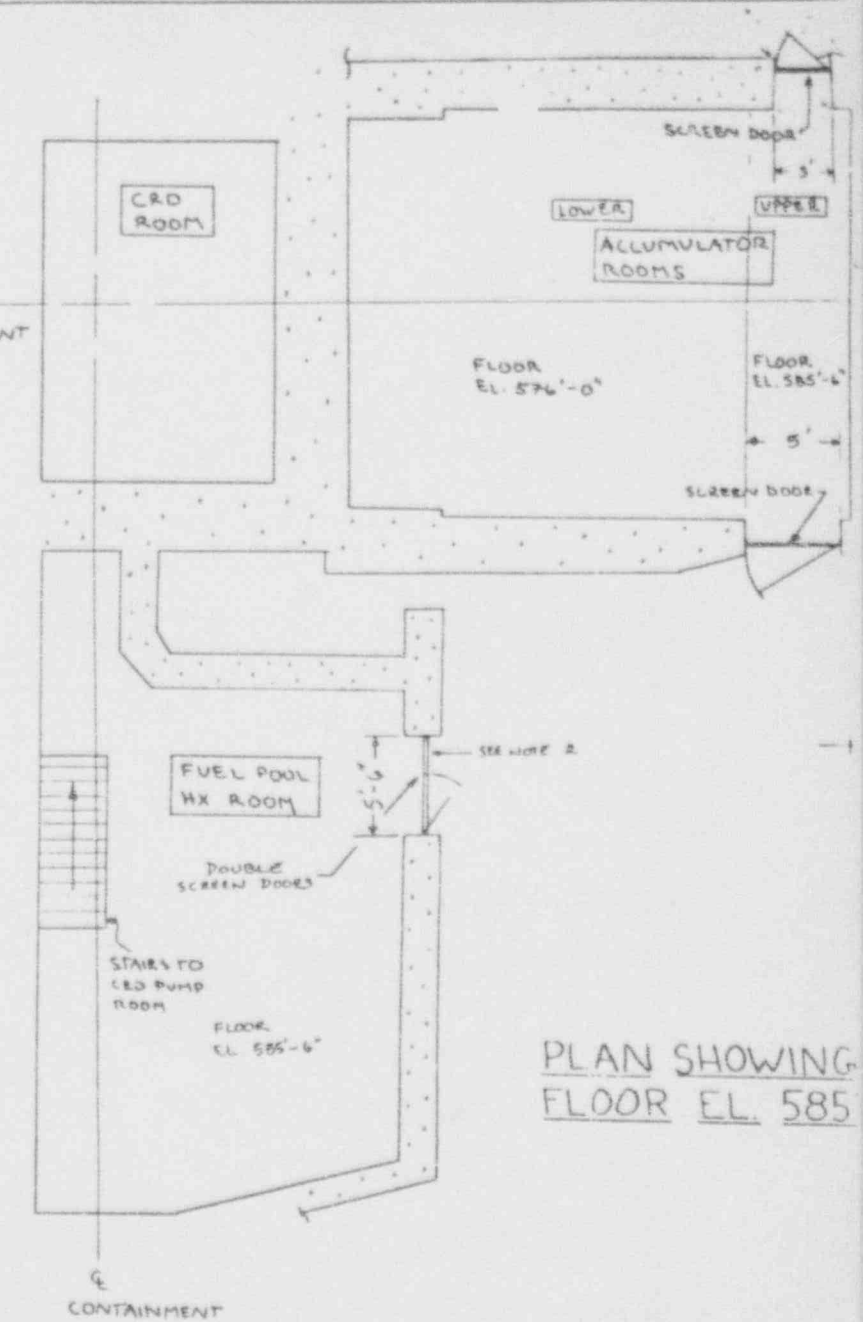
Water must first pass through the Fuel Pool HX Room before reaching the suction strainer in the CRD Pump Room. There is some insulation in the FP HX Room; however most of this insulation is above the 590' elevation (the EEQ flood evaluation). Since the ceiling of this room is concrete, it is not likely that this insulation would become wet or submerged during activation of containment sprays. There are also several openings in the walls of the FP HX Room; however, these openings are above the 590' elevation and do not required a screen barrier since they will not be submerged.

A small opening (approximate size 24" w x 12" h) exists at floor level in the wall between the CRD Room and the Recirc Pump Room that has grating already installed; this grating serves to provide some blockage protection to S-4C. However, it is also likely that this grating could become blocked by insulation debris due to its small size. The suction strainer that has the least protection is located in the Recirc Pump Room (S-4E); S-4E has the greatest potential for blockage due to the large amount of insulation materials and the high probability that a pipe break would occur in this room, verses the other rooms with strainers.

The doors are constructed of expanded metal in a mesh size that will not restrict flow during recirculation; the expanded metal is painted to prevent corrosion while submerged. Due to the low flow/velocities at these doorways, it is improbable that the screen doors could be forced off during recirculation. However, if one of the doors were to become completely blocked by plastic or other large impermeable objects, there are three alternate flow paths (through the remaining doors) to the suction strainers so it is unlikely that the rooms would be pumped dry. The doors will open against the recirculation flow pattern to ensure that the hydraulic forces will not push the doors open. The screen doors are designed such that they will close promptly after entry or exit from the aforementioned areas; the doors are to remain closed during all operating periods except for personnel entry/exit. During outage periods the doors can remain open or be removed at the hinges. In addition administrative controls have been implemented to prevent miscellaneous debris (anti-c's, plastic, etc) which could cause strainer blockage to be left inside these doorways.



PLAN SHOWING
FLOOR EL. 573'-0"



PLAN SHOWING
FLOOR EL. 585

NOTE:
1. ALL SCREEN DOORS/ SECTION CAN BE REMOVED WHEN NECESSARY
2. SCREEN SECTION BOLTED SHUT DURING NORMAL OPERATION. CAN SWING OPEN OR BE REMOVED FOR MAINTENANCE.