OAK RIDGE NATIONAL LABORATORY
OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS, INC

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37831

September 18, 1984

Mr. Thomas A. Ippolito
Project Director
Comanche Peak
Division of Licensing
U. S. Nuclear Regulation Commission
Washington D. C. 20555

Dear Mr. Ippolito:

The enclosed documents are being sent to you at the request of Mr. Yuly Korobov of Carboline Company. To confirm that these are copies of reports in our files we have initialed each page and signed the cover letters. Samples not requested have been deleted from these reports.

If there are any questions or we can be of further service please call on us.

Sincerely,

W. R. Laing/lp

W. R. Laing, Section Head
Analytical Chemistry Division

R D Brooksbank

R. D. Brooksbank
Chemist

R. E. Jones

R. E. Jones
Chemist

WRL:lp

Enclosure

cc: Yuly Korobov w/o enclousre

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OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE CORPORATION
NUCLEAR DIVISION

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

June 24, 1976

Mr. Charles J. Wiegers
Power Industry Manager
Carboline
350 Hanley Industrial Court
St. Louis, Missouri 63144

Dear Mr. Wiegers:

Enclosed are the results of the Decontamination, Irradiation, and DBA tests we ran on your coated steel panels and concrete blocks. The three separate DBA tests (i.e., tables of test conditions, results) are identified by the three different dates noted at the upper right-hand corner of the report sheets. The photographs of systems CBCS 1, 4, 12, and 13 and of the decontamination test panels will follow shortly.

If we can be of further assistance, please feel free to contact us.

Sincerely yours,

L. T. Corbin
Analytical Chemistry Division

LTC:dmw

Enclosures

cc: G. Goldberg

RO Burchsted 9/17/84
RE Jones 9/17/84
W R Laing/lp 9/17/84

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: June 21, 1976

Report of Irradiation, Decontamination, and DBA Testing
Carboline, St. Louis, Missouri

The Irradiation, Decontamination, and Design Basis Accident (DBA) tests are conducted, respectively, in accordance with Bechtel Corporation Standard Specification Coatings for Nuclear Power Plants, Spec. Nos. CP-951, CP-952, and CP-956. The tests are designed also to meet the specifications set in both A.N.S.I. Report N 101.2-1972, Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities, and N 5.12-1974, Protective Coatings (Paints) for the Nuclear Industry. The DBA test spray solution and the test conditions are listed in Tables 1 and 2. After both the DBA and the irradiation tests, the coatings are examined for signs of chalking, blistering, cracking, peeling, delamination, and flaking, according to ASTM standards where applicable. All except the decontamination test panels are returned to the coating manufacturer.

The irradiation tests are run using a spent fuel assembly, removed from the High Flux Isotope Reactor (HFIR) at ORNL, as the source of radiation. These fuel assemblies are stored under 20 feet of demineralized water. The fuel is 93% enriched U^{235} as U_3O_8 combined with aluminum. The spent fuel assemblies are removed after each 23-megawatt day period. Irradiation is done using the gamma energy from the accumulated mixed fission products. This more readily simulates conditions around a reactor than does a cobalt source. Also, the higher gamma activity affords shorter irradiation time to achieve accumulated doses. The dose rate four days after removal of a fuel assembly from the reactor is 1×10^8 rads/hour.

The fuel assembly is 20 inches high. A 20-foot long, 3 1/2-inch diameter pipe, with one end capped, is used for the air irradiation tests. The capped end is lowered into the four-inch opening of the center of the fuel assembly. The open end, above the water level, is covered with an "O" ring sealed flange to which is attached a steel cable and an air outlet hose. The air inlet is located at the bottom of the pipe. The test specimens are connected

RDB 9/17/84
RBJ 9/17/84
WRL/lp 9/17/84

Evaluated G. Goldberg

Approved _____

to the bottom of the cable and lowered into the radiation field. Also at the center of the fuel assembly is a stainless steel clad cadmium tube used as a neutron absorber. This prevents contamination of the test specimens by induced radiation.

The decontamination procedure is as follows: a mixture of fission product nuclides (aged greater than 90 days and less than three years) is neutralized to pH 4 and immediately applied to the test specimens. The specimens are previously degreased in alcohol. After the contaminated spot is air dried, the activities of four of the nuclides are measured by counting with a Ge(Li) detector and a multichannel pulse height analyzer. The specimens are then suspended in a beaker of water at 25°C and washed by stirring for 10 minutes. The specimens are removed, the backs rinsed in water, air dried, and counted as above. The ratios of the activities before, to those after the decontamination are reported as decontamination factors for water. The decontamination and counting steps in 25°C and 80°C acids are repeated, and the respective decontamination factors calculated. The "total overall D. F." is calculated as the ratio of the total activity at the beginning of the test to the total activity at the completion of the three washing steps. All activities are corrected for decay between counts. A computer has been programmed to do all the calculations.

ROB 9/17/84
REJ 9/17/84
WRL 9/17/84
lp

Evaluated L. Goldberg

Approved _____

Manufacturer: Carboline

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: June 15, 1976

Decontamination Test Results:

These tests performed according to ORNL Master Analytical Manual Method No. 2 0920 and Bechtel Corp. Spec. CP-952.

ORNL Log Book No. A 7562; 4-23-6

Sample Number	Contaminant	Decontamination Factor (DF) Water @25°C	Acid @25°C	Acid @80°C	Overall	Percent of Total Activity Removed[1]
810	Ce-144	5.9	10	≥24	≥1500	
CZ-11/	Ru-105	16	1.7	1.7	44	
305	Cs-137	≥480	6.2	2.2	≥6500	
	Zr-95	3.6	13	2.0	94	
	TOTAL	9.6	5.1	2.2	110	99.1

[1]Percent of total activity removed = $(1 - \frac{1}{DF}) \times 100$.

COB 9/17/84
RLO 9/17/84
WRE/lp 9/17/84

Approved

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
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NUCLEAR DIVISION

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

August 17, 1978

Mr. Dan W. McBride
Nuclear Market Specialist
Carboline
350 Hanley Industrial Court
St. Louis, MO 63144

Dear Mr. McBride:

Enclosed are the results of the irradiation, decontamination, and DBA tests you requested. The conditions of the two DBA tests were identical and are listed in Table 2.

If we can be of further assistance, please feel free to call on us.

Sincerely yours,

L. T. Corbin

L. T. Corbin, Section Head
Analytical Chemistry Division

LTC:dmw

Enclosures

R O Burtsbard 9/17/84
R E. Jones 9/17/84
W R Laing /lp 9/17/84

Manufacturer: Carboline
St. Louis, MO

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: Aug. 16, 1978

Report of Irradiation, Decontamination, and DBA Testing

The irradiation, decontamination, and design basis accident (DBA) tests are conducted, respectively, in accordance with Bechtel Corp. Standard Specification Coatings for Nuclear Power Plants, spec. Nos. CP-951, CP-952, and CP-956 (or with modifications as noted in Table 2, DBA test conditions). The tests are designed also to meet the specifications set in both A.N.S.I. report N 101.2-1972, Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities, and N 5.12-1974, Protective Coatings (Paints) for the Nuclear Industry. The DBA test spray solution and the test conditions are listed in Tables 1 and 2. After both the DBA and the irradiation tests, the coatings are examined for signs of chalking, blistering, cracking, peeling, delamination, and flaking, according to ASTM standards where applicable. All except the decontamination test panels are returned to the coating manufacturer.

The irradiation tests are run using a spent fuel assembly, removed from the High Flux Isotope Reactor (HFIR) at ORNL, as the source of radiation. These fuel assemblies are stored under 20 feet of demineralized water. The fuel is 93% enriched U^{235} as U_3O_8 combined with aluminum. The spent fuel assemblies are removed after each 23-megawatt day period. Irradiation is done using the gamma energy from the accumulated mixed fission products. This more readily simulates conditions around a reactor than does a cobalt source. Also, the higher gamma activity affords shorter irradiation time to achieve accumulated doses. The dose rate four days after removal of a fuel assembly from the reactor is 1×10^8 rads/hour.

The fuel assembly is 20 inches high. A 20-foot long, 3-1/2-inch diameter pipe, with one end capped, is used for the air irradiation tests. The capped end is lowered into the four-inch opening of the center of the fuel assembly. The open end, above the water level, is covered with an "O" ring sealed flange to which is attached a steel cable and an air outlet hose. The air inlet is located at the bottom of the pipe. The test specimens are connected to the bottom of the cable and lowered into the

RDB 9/11/84 Evaluated R. D. Bolling
RBJ 9/17/84 Approved L. T. Corbin
WRL/ep 9/17/84

Manufacturer: Carboline
St. Louis, MO

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: Aug. 16, 1978

radiation field. Also at the center of the fuel assembly is a stainless steel clad cadmium tube used as a neutron absorber. This prevents contamination of the test specimens by induced radiation.

The decontamination procedure is as follows: a mixture of fission product nuclides (aged greater than 90 days and less than three years) is neutralized to pH 4 and immediately applied to the test specimens. The specimens are previously degreased in alcohol. After the contaminated spot is air dried, the activities of four of the nuclides are measured by counting with a Ge(Li) detector and a multichannel pulse height analyzer. The specimens are then suspended in a beaker of water at 25°C and washed by stirring for 10 minutes. The specimens are removed, the backs rinsed in water, air dried, and counted as above. The ratios of the activities before, to those after the decontamination are reported as decontamination factors for water. The decontamination and counting steps in 25°C and 80°C acids are repeated, and the respective decontamination factors calculated. The "total overall D.F." is calculated as the ratio of the total activity at the beginning of the test to the total activity at the completion of the three washing steps. All activities are corrected for decay between counts. A computer has been programmed to do all the calculations.

RDB 9/17/84 Evaluated J. Kelley
RLG 9/17/84 Approved L. T. Corbin
WRL/lp 9/17/84

Manufacturer: Carboline

St. Louis, MO

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: Aug. 16, 1978

Table 1. DBA solution composition, distilled water

0.28 M boric acid (3,000 ppm boron)
0.064 M sodium thiosulfate
Adjusted to pH 9.5 with sodium hydroxide

Table 2. DBA test conditions*

Time	Temperature (°F)	Pressure (psig)	Comments
Start	130	—	Corrected Aug 25, 1980 by RL Apple
10 seconds	307	60	Steam injection.
2 hrs 47 min	307	60	
5 minutes	307-280	60-30	Injected cold spray.
20 minutes	280-250	30	Adjusted pressure.
4 days	250	30	
3 minutes	250-230	10	Drained; injected cold spray.
15 minutes	230-200	10	Adjusted pressure.
3 days	200	10	
End of test			

*These data are taken from recorder charts on permanent file at ORNL.

ORNL Log Book No. A7562; A7-17-8

RDB 9/17/84 Evaluated G Kellogg

RDB 9/17/84 Approved L. T. Corbin

WRL 9/17/84
dp

Manufacturer: Carboline
St. Louis, MO

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: Aug. 16, 1978

System Identification: x Steel ___ Concrete Block

CZ11/305Fin

DBA Test Results:

ORNL Master Analytical Manual Method No. 2 0922;

ORNL Log Book No. A 7562; A7-17-8

Sample No.	DBA Phase	Comments**
S6-105	spray	(SA) Few blisters, #6, sides A, B.
S6-108	spray	(SA) Side A: few blisters, #6. Side B: coatings intact, no defects.
S6-110	spray	(SA) Coatings intact, no defects, sides A, B.
S6-112	spray	(SA) Coatings intact, no defects, sides A, B.
S6-115	spray	(GR) Coatings intact, no defects, sides A, B.
S6-116	spray	(GR) Coatings intact, no defects, sides A, B.
S6-119	spray	(SH) Coatings intact, no defects, sides A, B.
S6-120	spray	(SH) Coatings intact, no defects, sides A, B.

**(SA) = sand blast; (SH) = shot blast; (GR) = grit blast.

REQ 9/17/84
ZOB 9/17/84
WR 8/24 9/17/84

Evaluated [signature]

Approved [signature]

Manufacturer: Carboline
St. Louis, MO

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: Aug. 16, 1978

System Identification: x Steel Panel ___ Concrete Block

CZ11/305Fin

Radiation Tolerance Test Results:

ORNL Master Analytical Manual Method No. 2 0921;
Bechtel Corp. Spec. No. CP-951;
ORNL Log Book No. A 7562; A7-17-8

Initial Dose Rate: 1.5×10^7 rads/hr

Test Conducted In: x air ___ water

Sample No.	Cumulative Dose Rate: 1×10^8 rads	Comments: 1×10^9 rads
S6-101		Coatings intact, no defects, sides A, B.
S6-102		Coatings intact, no defects, sides A, B.

Additional Comments:

RDB 9/17/84
REJ 9/17/84
WRR/ep 9/17/84

Evaluated G. J. Gallinger

Approved L. T. Corbin

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4/78

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POST OFFICE BOX X, OAK RIDGE, TENNESSEE 37831

SENDER: W. R. LAING

MR THOMAS A IPPOLITO
PROJECT DIRECTOR
COMANCHE PEAK
DIVISION OF LICENSING
U S NUCLEAR REGULATION COMMISSION
WASHINGTON DC 20555