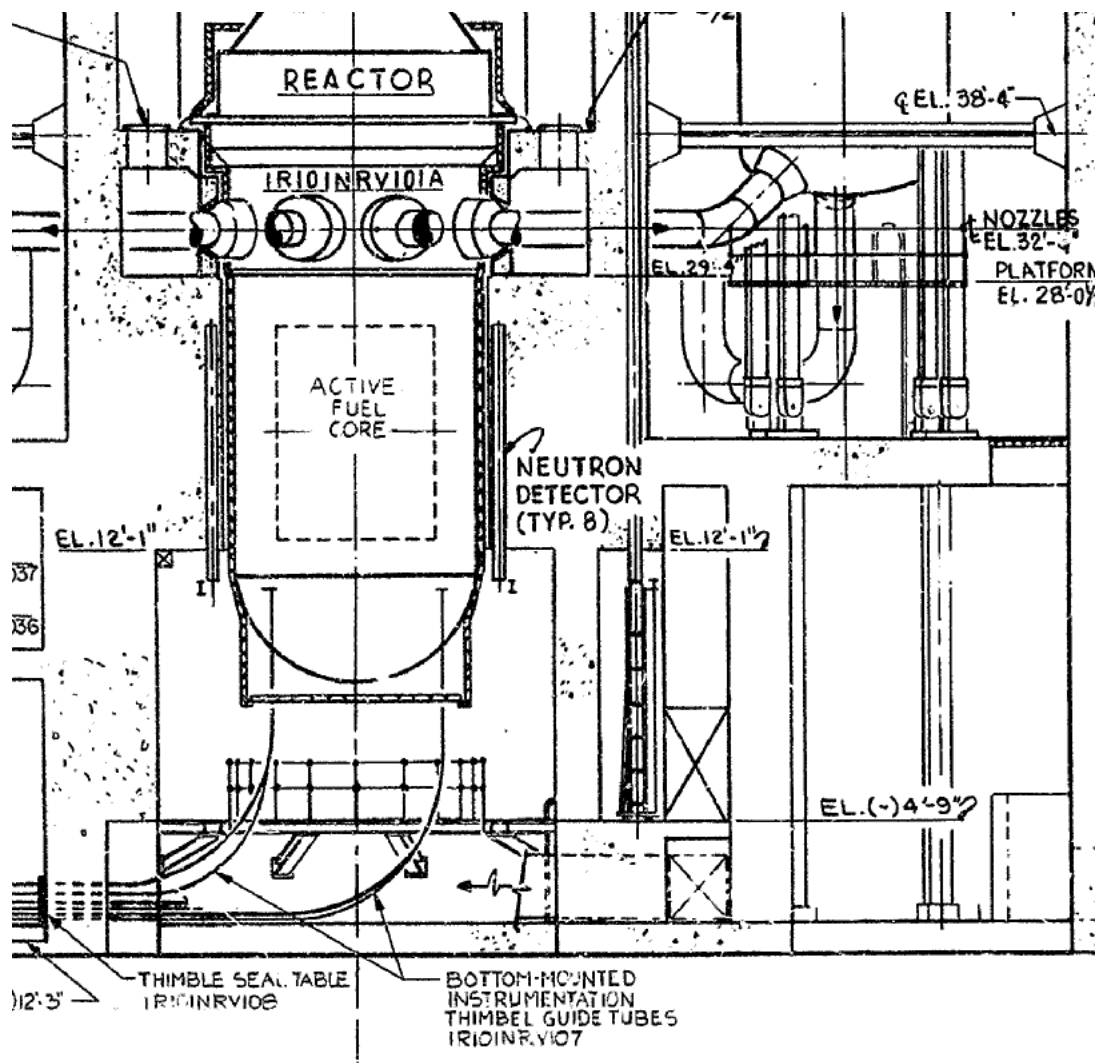


Quantity of Coatings

1,570 lbs of epoxy coatings on the concrete walls and ceilings

Unit 1 has a larger quantity since the Unit 2 walls are not epoxy coated all the way up to the ceiling and also since the ceilings in Unit 2 are not epoxy coated.

The sump performance evaluation is based on the higher quantity for Unit 1.



The Reactor Cavity is designated as Reactor Containment Building Room 001.

Type of Coatings

Brown and Root Technical Reference Document 5A810WQ005-A “Painting Schedule for Service Level I, II, and III Areas” from 1979 calls for the Reactor Cavity walls to be coated using the following Level I concrete coating system defined in HL&P Specification #7A810XS002-A-HL:

- Nutec 10 Primer/Sealer
- Nutec #11S Concrete Masonry/Surfacer
- Nutec #11 Concrete Masonry/Surfacer
- Reactic (Nutec) #1201 Epoxy Topcoat

Service History

Just prior to the initial startup of Unit 1 in 1987 during hot functional testing, repairs were made to the concrete wall coating in the Reactor Cavity. Cracks in the originally installed coating were chased and the adjacent coating was removed. These areas were not top-coated due to the unavailability of that coating at the time. Instead the areas were left with only a base sealer. See Unit 1 photographs.

No other evidence has been found of any repairs since then in Unit 1. Also Unit 2 had no evidence found of any repairs since the startup of the Unit in 1989. A search of work order history and a search of condition reports did not yield any repair requests or coating conditions in either Unit. The maintenance work planner who has been dealing with coatings since startup was not aware of Similar discussion with Engineering personnel who perform Reactor Vessel inspections in Room 001 also did not yield any information concerning coating problems.

As seen in the photographs, the current condition of the coatings in both Units appears good.

Current Condition Based on Photographs of the Area

Unit 1 Photos



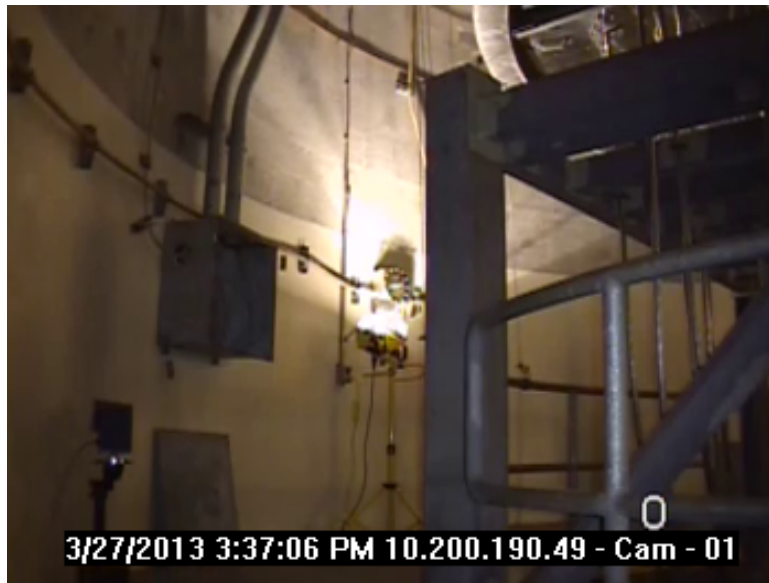
Unit 1 Photos



Unit 2 Photos from 2013







Manufacturer Qualification Data

The test document from Southern Imperial Coatings (filed as STI 525724) states that the Nutec 11/ 11S/ 1201 was qualified to 2E08 rads which is consistent with IEEE STD 323-1974 for normal plus LOCA dose.

However, the epoxy coating for the reactor cavity was deemed by Bechtel during the unqualified coating calculation rack up to be unqualified due to the excessive calculated cumulative radiation dose.

Cumulative Dose Received

The epoxy coating for the reactor cavity was deemed to be unqualified due to excessive radiation.

From design criteria document 4E019NQ1009:

The calculated cumulative design dose for the Reactor Cavity for 40 years is:

Neutron	2.5E10 Rads
Gamma	3.5E9 Rads

The accident dose is given as 1.5E8 Rads.

The calculated cumulative dose was determined considering the reactor operated at 100% power every day for 40 years.

The actual capacity factor for each Unit to date is:

Unit 1	83.7%	from initial operation in 1988 to March 2016 (28 years)
Unit 2	83.2%	from initial operation in 1989 to March 2016 (27 years)

Thus the actual cumulative dose to date is:

= capacity factor x (operating years / design life years) x calculated lifetime dose
= 0.8 x (28/40) x calculated lifetime dose
= 0.56 x calculated lifetime dose

Coatings Assessment

The epoxy coatings in the Reactor Cavity (RCB Room 001) in both Unit 1 and in Unit 2 were applied as Service Level I coatings during the construction phase of the plant. However, these epoxy coatings for the reactor cavity were subsequently deemed to be unqualified due to the excessive calculated cumulative radiation dose. They were not part of the qualified coatings inspection program and there was no continuity of inspections.

The epoxy coatings in the Reactor Cavity in both Unit 1 and in Unit 2 are now deemed as Qualified But Degraded based upon consideration of the following:

- Initial application was safety related (Service Level I)
- No historical evidence of coating problem conditions requiring repairs since installation
- Recent visual observation (photos and personnel observations) shows no signs of degradation
- Estimated cumulative dose to date is over half of the calculated cumulative dose but no current signs of degradation
- Estimated cumulative dose to date exceeds the test qualification value but no current signs of degradation

EPRI Report 1014884 “Plant Support Engineering: Degradation Research for Nuclear Service Level I Coatings” concludes that the majority of coating failures and signs of degradation can be attributed to undetected deficiencies that occurred at the time of coating application. These deficiencies are the major cause of coating deterioration during the coating systems’ service life. The report also states that high radiation is not believed to be a significant cause of coating degradation in containment.

Since the epoxy coatings in the Reactor Cavity in both Units have been in service for over half of their design life with no signs of degradation, any degradation in the future is not expected.

Thus these coatings are considered Qualified But Degraded.

Debris Characteristics

The Reactor Cavity epoxy coatings are considered as Qualified But Degraded and are assumed to fail as chips with the following debris characteristics:

<u>Range (inches)</u>	<u>Weight Distribution (%)</u>
1.0 – 2.0	32.0
0.5 - 1.0	9.04
0.25 – 0.50	4.41
0.125 – 0.25	5.02
< 0.125	37.1 as 15.6 mils chips; 12.3 as 6 mils particulate

Transport Evaluation

No transport is expected for epoxy coating debris inside the reactor cavity for breaks that do not occur within the reactor cavity because

- for breaks that occur outside the reactor cavity, there is no flow into the reactor cavity,
- the path out of the reactor cavity is sufficiently tortuous that this area will be essentially stagnant, and
- any negligible flow from the reactor cavity that could occur will be to a region on the opposite side of the steam generator compartment from where the sumps are located.

For breaks inside the Reactor Cavity (i.e. at the reactor Vessel nozzle), most of the epoxy coating debris will fail as chips. A portion of the debris that is fine chips and the portion that is particulate is subject to transport. The transport path out of Room 001 is through two 4 inch floor drains in the Reactor Cavity floor that go to the Normal Sump. This sump has a cover plate with an opening for water to go out onto the floor when the sump is full. Thus there will be some transport from the Reactor Cavity to the containment pool.