IA-E-102

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SUBJECT:	Containment	FROM:	J.W. Thiesing
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The following are some observations and estimates concerning the containment building and an estimate of the lower bound for total metal-water reaction.

I. Operating History During Incident

A. Simulate H_2 burn (1400, 3-28-79) to determine magnitude of burn and confirm spray operation. Determine pressure and temperature transient during H_2 burn.

B. More definitive containment pressure data is needed. Based on plot provided showing a 28 psig peak pressure, a burn of approx. 250 lb moles H_2 would be required, equivalent to a 27% Zr-H_2O reaction consumed in the burn. The burn would create a short term superheat in containment of (+1000 degrees F). Spray actuation would reduce superheat to zero in about 1 minute. (operator log on 3-28-79 (1350) indicates that spray actuation occurred implying a peak pressure of at least the 30 psig spray set point. Containment H_2 at the time would have been 4.7% H2, assumming all H_2 was consumed.

II. Current Status

A. Containment H_2 is now at about 2 V/O corresponding to a Zr-H_2O reaction of about 11.5%. (Thus metal water reaction was greater than 27% + 11.5% = 38.5%).

*(Also note that a 1000 ft^3 bubble in the RCS at 280 degrees F and 1000 psig would correspond to an additional 13% Zr-H_2O reaction, and the saturated H_2O in RCS corresponds to an additional 2.5% Zr-H_2O reaction for a grand total estimate of at least <u>54% Zr-H_2O Reaction</u> 166 079

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B. Current building pressure holding at about - 1.0 psig and 50 degrees F.

1. Continued negative pressure probably implies some inward buckling of the liner plate due to trapped air behind the liner and inleakage through flud head welds and hatch liners and seals to the area behind the liner plate.

Recommend maintenance of current status to prevent leakage of containment inventory to environment. Any potential future liner problems could be solved by allowing containment pressure to rise to - 0.1 psig but accuracy of containment pressure monitors and potential barometric pressure swings mitigate against this.

C. Current containment leakage area, and rate of outleakage as a function of positive pressure, could be estimated by careful simulation of current operating mode, and system and containment parameters.

III. Future Disposition of Containment

A. Reduction of PCS temperature will increase ability to maintain negative pressure in containment as will cessation of venting through pressurizer relief block valve.

B. Increase in service water temperature as summer approaches will decrease ability to maintain negative pressure.

C. Maintenance of negative pressure over a long period will increase containment non-condensible gas inventory due to inleakage, and thus reduce ability to maintain negative pressure. Also, as the non-condensible gas inventory rises, the negative pressure inducing efficiency of the air coolers decreases due to the relative inefficiency of reducing air temperature compared to reducing humidity by condensation.

D. Should the reactor coolant system be forced into the feed and dump mode again, the containment can accommodate the current heat load at a steady-state temperature of about 200 degrees F (about 10-20 psig) forever with only one air cooler running. With all 5 coolers running, the steady-state temperature would be about 130 degrees F, maybe 1-3 psig. (note: steaming rate for current decay heat load is 40 gpm) Pressure rise with only one cooler running is very slow, resulting in a pressure of 6.5 psig at one day.