GPU Nuclear

GPU Nuclear Corporation
Post Office Box 480
Route 441 South
Middletown, Pennsylvania 17057
717 944-7621
TELEX 84-2386
Writer's Direct Dial Number:

September 17, 1982
5211-82-223

Office of Nuclear Reactor Regulation
Attn: J. F. Stolz, Chief
Operating Reactors Branch No. 4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
TMI-1 Containment Flood Level Calculation

In response to your request for additional information dated July 26, 1982, enclosed please find information concerning the subject item which supplements our response of June 11, 1982.

Sincerely,

RJ Toole

H. D. Hukill
Director, TMI-1

HDH:LWH:CJS:vjf

Enclosure

cc: R. Jacobs
R. C. Haynes

A001

TMI-1 Containment Flood Level Calculations

Item 1:

In the containment flood level calculation the volumes of the major structures in containment are calculated based on what appears to be the design value dimensions. Verify that no significant differences exist between actual plant dimensions and design dimensions. Include in your reponse tolerances for wall dimensions and thicknesses, and values and tolerances for floor slope. Discuss the effects of the tolerances and slope on the conservatism of the flood level calculations.

Response:

In the calculations nominal dimensions were used. This approach is conservative for the following reasons:

As indicated in the FSAR (pa. 5-33) erection tolerance for RB liner is ± 3 in. As the plates are installed during construction and tend to go out of tolerance, the next plate is brought back to tolerance. The tolerance variation could as likely increase available floodable volume and reduce the flood level. The net effect of any tolerance variation is believed to be zero and was not included due to other conservatisms that were included as discussed below.

In our calculation conservatism has been built in by assuming the RV cavity and the stairway as not being floodable, the trench as being solid (also not floodable) and the sump full.

Elevator shaft	- 99 ft^3. /ft.
RV cavity	- 855 ft^3. /ft.
RB sump	- 1170 ft^3. /ft.
Trench	- 450 ft.

However, recalculating the available volume using the FSAR worst tolerances with the exception of the RCDT compartment, elevator shaft and letdown cubicle wall which have been scaled off the drawings, yields a maximum water level to be 5.73 feet.

Based on the above, it can be seen that this additional conservatism is unnecessary, but even if it were to be introduced, the maximum permissible water level of 5.81 feet is not reached.

Item 2

Several non-floodable structures in the floor region of containment have been neglected in the flood level calculation, specifically, the steam generator supports, ventilation equipment supports, stairways, and grating support columns. Consider the contribution of these and any other unaccounted structure and equipment, and revise the flood level calculation as appropriate.

Response:

The above were evaluated and found to have insignificant effect on the overall calculations when compared to the conservatism indicated in 1 above. For example the largest supports, the steam generator supports, account for less than 4.8 $ft.^3/ft.$

Therefore, we consider the above stated conservatism to be far in excess to cover the items neglected.

Item 3

In determining the volume of water added to containment, a portion of the BWST and NaOH tank contents is assumed to remain in the tanks. Provide sketches an calculations to support this assumption. Also, address the significance of water addition from the coolant storage makeup tank during a small break LOCA.

Response:

The maximum available volumes for both the BWST and NaOH tanks are from the limits and precautions procedures (OP 1101-1) For your information, the BWST discharge piping (24") is 2'4" above the tank bottom, and the NaOH discharge (4") is 2'6" above tank bottom (See attached pages from OP 1101-1).

With regard to make-up tank additions, it should be noted that the tank is isolated on HPI initiation. Therefore, it is not appropriate to include this in the RB flooding calculation. However, the MU-T volume (507 ft.) if included would not increase the calculated water level significantly (5.71' vs. 5.66'). It should be noted that this level assumes the makeup tank to be full to its maximum usable volume and that all the volume is injected into the RCS. Normally, this tank is only 73% full.

Item 4:

With regard to the leakage of service water into containment, provide a summary description of a) all service water systems expected to be operational following onset of a LOCA, including emergency fan coolers; b) leakage experience for these systems (including typical leakage rates; c) surveillance procedures and operating limits for these systems; d) leak detection and isolation provisions for each system; and e) containment flood level monitoring instrumentation (including location, range, indicators, and alarms).

Response:

a) Service Water Systems inside RB:

- (a) RB Emergency Cooling System or Nuclear Service Closed Cooling System
- (b) Main Steam System
- (c) Feedwater or Emergency Feedwater Systems
- *(d) Fire Service System
- *(e) Nuclear Service Closed Cooling System (RC Pumps)
- *(g) Liquid Waste disposal (RCDT to Isolation Valve & RB Sump)
- *(h) Demineralized Water (Isolation on Reactor Trip)

*Isolated by RB isolation system

b) While no exact data .s available from these systems, the leakage into the sump is considered minimal. Discussion with Operations Department indicate that leakage into the sump is less than 1,000 gallons per month. Additionally, the RB emergency cooling system has a flow rotometer installed and is checked daily as part of the plant surveillance and provides assurance that the system is not leaking prior to the event. (RB emergency cooling is not normally used and any leakage would be noticed on the flow rotometer.)

(c/d) There are no specific surveillance, operating limits, leak detection or isolation provisios on these systems. There are, however, feedwater and emergency feedwater flow indications to the steam generators. There are also surge tanks in various closed cooling systems which have a low level indication/alarm which when investigated would indicate leakage.

e) Safety grade, redundant Reactor Building and Reactor Building Sump level transmitters are installed with an accuracy of $\pm$ 1/2" (Lt 804, 805, 806, and 807). All instruments have a range of 0-90" (0-7'-6"). The alarm points for these instruments have been arbitrarily set at 5.75 ft. for the Sump and 1.0 ft. for RB.

Item 5:

The TMI-1 flood level calculation yields a "reactor building floodable volume per foot of height" of 10,771 $ft.^3/ft$. The value of TMI-2 is quoted to be 6000 gal./in. or 9,626 $ft.^3/ft.$, based on measurements following the TMI accident. These values are significantly different considering that the two containment designs are similar.

Clarification of the differences between TMI-1 and TMI-2 with regard to the flood level calculation is essential since use of the TMI-2 value in conjunction with estimated water additions for TMI-1 would result in a calculated flood level in TMI-1 of 6.33 ft. Discuss in detail the differences in containment design which would explain this discrepancy, and provide calculations for TMI-2 (for the maximum flood level experienced during the accident) using the same approach as for the TMI-1.

Response:

Our site engineering at TMI-2 has reported the following information:

Total water processed 642,272 gal.

Start level 291.04'

Finish Level 282.78'

D = 8.26'

This is equivalent to 6480 gal./in. or 10,295 $ft.^3$/ft. Using this figure for comparison, the maximum water level at TMI-1 would be 5.86'.

During the draindown the RCS leakage was less than 0.1 gpm (144 gpd) and, therefore, considered insignificant.

Additionally, since the TMI-2 actual flood level is significantly higher than expected at TMI-1, and also as a result of the fact that as the higher the elevation more equipment is present (less free volume) the slight difference in equivalent gallons/inch is not considered significant.

It should also be noted that the TMI-2 free volume, based on a preliminary calculations, is less than that at TMI-1. Using assumptions equivalent to those used in the TMI-1 calculations we calculate an equivalent water volume of 6501 gal./in. which correlates very well with the measured number (6480 gal./in.).

Item 6:

Identify provisions, if any, for reducing flood level, e.g., use of sump pumps to transfer water from containment to waste holdup tanks. Estimate the effect of these provisions on flood level in the short and long terms.

Response:

At this time there are no provisions to transfer water from any accident mitigation equipment, the containment to any waste holdup tanks. Before maximum calculated level is reached during LOCA or HELB, recirculation may be initiated.

3.3 TANKS

3.3.1 BORATED WATER STORAGE TANK (POM)

DESIGN CONDITIONS

A. PRESSURE — TEN FOOT COLUMN OF WATER ABOVE TANK TOP.

B. TEMPERATURE — 150 F

C. TANK VOLUME (AS BUILT) — 368,600 GALS

D. DOME VOLUME WITHOUT DISCHARGING THRU OVERFLOW LINE — 4652 CU-FT; 34,800 GALS

E. VOLUME/FT TANK HEIGHT — 855 CU-FT/FT; 6400 GAL/FT

F. LOCATION OF LEVEL TAP (FROM TANK BOTTOM) — 7 INCHES

NORMAL OPERATING CONDITIONS

A. PRESSURE — ATMOS

B. TEMPERATURE — 70 F

C. VOLUME (TOTAL TO OVERFLOW) — 49,128 CU-FT; 367,482 GALS

(USABLE - FROM TOP OF 24 INCH OUTLET TO OVERFLOW) — 46,292 CU-FT; 346,276 GALS

(USABLE - FROM TOP OF 8 INCH RECYCLE NOZZLE TO OVERFLOW) — 47,779 CU-FT; 357,392 GALS

D. LEVEL — 56 to 57.5 FT

6.2.2 SODIUM HYDROXIDE STORAGE TANK
(BUFFALO)

DESIGN CONDITIONS

A.
PRESSURE
TEN FOOT COLUMN OF WATER ABOVE TANK TOP

B.
TEMPERATURE
150 F

C.
VOLUME
12,750 GALS

D.
VOLUME/IN TANK HEIGHT
20.7 GAL/IN
248.2 GAL/FT

E.
DISTANCE LEVEL TAP ABOVE OUTLET NOZZLE CENTERLINE
14.5 INCHES

NORMAL OPERATING CONDITIONS

A.
PRESSURE
STATIC HEAD OF FLUID IN TANK

B.
TEMPERATURE
70 F

C.
LEVEL
30.0 FT

D.
VOLUME (USEABLE ABOVE LEVEL TAP CENTER LINE)
1345 CU-FT

E.
SODIUM HYDROXIDE CONCENTRATION.
16,500 LBS OF 20 WT PERCENT