COMPARISON

OF

STRUCTURAL INTEGRITY TEST

WITH

USEAC REGULATORY GUIDE 1.18

THREE MILE ISLAND NUCLEAR STATION UNIT #1

Evaluation of the Structural Integrity Test as described in the Appendix 5E of the FSAR with the USAEC Regulatory Guide 1.18, "Structural Acceptance Test for Concrete Primary Reactor Containments", revision 1 dated 12/28/72.

History

The SIT program follows similar published testing programs that have been practiced for other nuclear facilities with similar containment structures. The SIT program has been presented and discussed with the AEC on numerous occasions in the past. The differences and justification of the present SIT Program with the Regulatory Guide 1.18 will be described below.

Discussion

At present the contract has been awarded to a contractor for the installation of instrumentation and acquistion of data for the SIT per the committments of the FSAR.

No new information will be required for compliance with R. G. 1.18, but additional number of instruments already being used, is required. The additional equipment is as follows:

1. Level - 3 extra
2. Jig Transit - 1 extra
3. Invar tape - 3 extra
   a. 325 feet of conduit protective cover of tapes
   b. 29 brackets to support conduit
   c. 3 scales to attached to invar tapes
4. Radial Displacement - Scales - 5 extra
   a. 3 scale brackets for ring girder
   b. 2 scale brackets for cylinder wall
5. Radial Displacements - LVDT - 4 extra
   a. Cable - 1,500 feet required
   b. 3 LVDT bracket supports for tendon gallery
   c. 1 LVDT bracket support for wall-piece of angle

It is possible to do the SIT without the extra levels and jig transit, but without these additional instruments, extra time during the test is required to move the instrument from one position to another position. Moving the instruments can cause errors in the data since the instruments have to be leveled and checked for same position setting each time it is moved. Also, an accident could occur in the moving of an instrument thus causing damage to instrument and thus introducing a chance for more errors and further loss of time.

Brewer Engineering Laboratories, Inc. have contacted the vendors of the levels and jig transits and the vendors estimate that 8 weeks lead time to supply new instruments. There are no used jig transits available for sale or rental. The installation of the instrumentation at the additional three aximuths, which are dictated by the R.G. 1.18, presents conflicts with existing permanent facilities. This problem includes installation of instrumentation supports, and installation and calibration of instruments.

Conclusion

The Structural Integrity Test has been developed during the preliminary and final design stages of the job, to provide a test program which demonstrates that the structural response of the reactor building is within acceptable limits. Equipment and associated hardware, scaffolding and miscellaneous items have been purchased in a timely manner. A late change to a different program, would at this time, cause a serious delay in the current final phase and start-up schedule. There is to our knowledge no engineering justification for changing to the Regulatory Guide test program.

COMPARISON BETWEEN AEC REGULATORY GUIDE 1.18

AND TMI #1 FSAR

STRUCTURAL INTEGRITY TEST

TABLE #1

NO.	MEASUREMENT	AEC R. G.1.18		TMI FSAR #1		COMMENTS
		No. of Azimuths	No. Per Azimuth	No. of Azimuths	No. Per Azimuth	
1.	Radial Displacements					
	a. Cylinder Equipment Access	6	3	3	9	1 a. Cylinder displacements using the FSAR Program with nine points per azimuth will be superior in translating the data to shell stress in contact to the three points required by Reg. Guide 1.18. A total of 27 points are measured in the FSAR Program as compared to 18 points required by Reg. Guide 1.18.
	b. Tangential and Radial	1	12 points	1	14 points	1 b. Except for tangential displacements, the intent of Reg. Guide 1.18 has been met by the FSAR Program.
2.	Vertical Displacements					
	a. Cylinder	6	1	3	1	2 a. Due to the extreme vertical shell stiffness, a total of 3 azimuths for vertical displacements is quite acceptable. The difference in the vertical displacement is minute.
	b. Dome Apex	1	1	1	1	2 b. Identical to Reg. Guide 1.18.

TABLE #1 CONT'D

NO.	MEASUREMENT	AEC R. G. 1.18		TMI #1 FSAR		COMMENTS
		No. of Azimuths	No. Per Azimuth	No. of Azimuths	No. Per Azimuth	
3.	Crack Pattern Areas					
	a. Equipment Access	1	Specifies only 40 sq. ft.	1	1 Quadrant 1740 sq. ft.	The FSAR requirements are in excess of the Reg. Guide Requirements.
	b. Cylinder Mid Height	1	40 sq. ft.	1	36 sq. ft.	
	c. Buttress & Cylinder	1	40 sq. ft.	0	0	
	d. Base Mat and Cylinder	1	40 sq. ft.	1	60 sq. ft.	
	e. Spring Line	1	40 sq. ft.	1		
	f. Ring Girder	1	40 sq. ft.	1	Total of 240 sq. ft.	
	g. Ring Girder	1	40 sq. ft.	1		
	h. Dome	0	0	1		
4.	Strain Gages					
	a. Cylinder and Base Mat Meridional and hoop	1	1	0	0	4 a. Displacement measurement at this level can compensate for strain Gage readings.
	b. Equipment Access Meridional & Hoop	One on & 5T from edge of opening	1	14 Hoop and 44 Meridional gages located along Horiz. & Vertical Center Axis.		4 b. to 4 h. The FSAR Requirements are in excess of Reg. Guide 1.18 Requirements.
	c. Spring Line Meridional & Hoop	1	1	3	2	

TABLE #1 CONT'D

NO.	MEASUREMENT	AEC R. G. 1.18		TMI #1 FSAR		COMMENTS
		No. of Azimuths	No. Per Azimuth	No. of Azimuths	No. Per Azimuth	
4.	Cont'd					
	d. Under Pre-stressing Anchor Shear	1	1	0	0	
	e. Ring Girder	0	0	5	3 at 3 1 at 2	
	f. Dome	0	0	3	2	
	g. Cylinder Liner (Rossette)	0	0	3	2	
	h. Liner at Penetra-tion	0	0	3	14	