Citizens Exhibits 46

RAS 14363

From: O'Rourke, John F.
Sent: Wednesday, February 28, 2007 07:20 PM
To: Marcos Herrera (E-mail)
Cc: Gallagher, Michael P; Polaski, Frederick W
Subject: Oyster Creek Drywell Thicknesses to be Used for Base Case Analysis
Attachments: OYSTER CREEK DRYWELL THICKNESSES, Rev2.doc

Marcos: The attached document provides the thicknesses to be used. Please share this info within SI as appropriate. We can discuss any issues on our update call tomorrow.

John

Template=SECY-028

SECY-02

OYSTER CREEK DRYWELL RE-ANALYSIS
DRYWELL THICKNESSES FOR BASE CASE

The base case analysis for the Oyster Creek Drywell Re-Analysis is defined as the 3 dimensional, finite element model using the thicknesses measured during the 2006 1R21 Refueling Outage. Various discussions have been held between the License Renewal Project and Oyster Creek Site Engineering to establish the correct thicknesses to use in the model, particularly in the sandbed region.

The purpose for performing the re-analysis is to identify how much margin exists in the drywell in its current configuration given a more realistic and accurate 3 dimensional modeling versus the more conservative one-tenth segment modeling performed in the early 1990s by General Electric. The GE analysis is the current analysis of record. This re-analysis is expected to demonstrate that higher margins exist regarding shell thicknesses and margins of safety than are contained in the current analysis. The re-analysis will also confirm the structural integrity of the drywell during all loading conditions and show compliance with design basis both now and through the period of extended operation.

The model is being 'built' using Oyster Creek specific input data. This includes the Oyster Creek operating and accident conditions, penetration information, response spectra, piping loads, materials, internal loads, jet loads, boundary conditions and shell thicknesses. Load combinations are as specified in the UFSAR and are unchanged from the current analysis.

THICKNESS INPUT

For all drywell shell areas except the sandbed region and the embedded shell, the shell thicknesses to be used in the model are the "Minimum Measured General Thicknesses" reported to the ACRS Full Committee on slide 18 of the AmerGen presentation. These thicknesses are as follows:

- Cylindrical Region: 604 mils
- Knuckle Region: 2530 mils
- Upper Spherical Region: 676 mils
- Middle Spherical Region: 678 mils
- Lower Spherical Region: 1160 mils (Note: This does not include the sandbed region)

These thicknesses are based on the grid readings taken during the 1R21 Outage.

For the 676 mil nominal embedded shell, there is no measurement data available. AmerGen concluded in its presentation to the ACRS that, if there is corrosion of this shell, it is no worse than 1 mil per year based on actual UT thickness measurements.

Therefore, since the shell has been embedded since original construction (the concrete that embedded the shell was poured in 1966), which, at the time of the 1R21 outage, was 40 years, the thickness value to be used in the re-analysis is 676 mils less 40 mils or 636 mils which is most likely conservative but not overly conservative. This portion of the drywell shell is also not expected to be the limiting portion of the shell.

For the portion of the 1154 mil nominal shell that is also embedded on both sides, additional concrete was removed from the trench in Bay 5 to obtain grid measurements of a portion of this shell segment. Since actual 2006 measurement data is available for this area, the average of the grid measurements will be used for the thickness of this shell segment. That average, as calculated by Site Engineering, is 1113 mils.

SANDBED REGION

For the sandbed region, the discussions between the LR Project and Site Engineering have attempted to define shell thicknesses for each bay that were realistic, defendable to outside agencies and not overly conservative. The thicknesses chosen are based on the internal grid measurements taken at elevation 11'-3" and in the trenches in Bays 5 and 17. The external point measurements present a very conservative representation of shell thickness in that they were chosen visually as the thinnest points in the bays and some metal (unquantified) was removed to prepare the surface for UT measurement and, as such, the thicknesses chosen were not based on external point measurements. Where the internal grid measurements in a particular bay present an unrealistic representation of the shell thickness for the entire sandbed region, engineering judgment was used to appropriately apply internal grid data from adjacent bays to represent the most realistic thicknesses for some of the bays. A bay-by-bay explanation of the rationale for what thicknesses are to be used is presented below. Also, a summary table is included that provides all the thickness measurements to be used for the various areas of the drywell for the base case analysis.

External point measurements were used in a limited way to confirm the basis for an engineering judgment, assuming a normally statistical distribution, regarding an appropriate thickness to use in the re-analysis. Another use for the external point measurements was to define areas of local thinning that encompassed a number of the external points. These areas utilize the average of the points contained within the locally thin areas (defined as either a 12 inch by 12 inch area, a 36 inch by 36 inch area or, in one case, a 2 ½ inch diameter circular area around one point). These are the only uses of the external point measurements.

The internal grid measurements demonstrate that, for several bays, the external corrosion began below the level of the elevation of the grid readings. Whether there was insufficient sand in the bay such that the shell was not in contact with wetted sand or the water level in those bays did not rise to the elevation of the grid readings is not known. The internal grid readings and visual information in the form of exterior shell pictures confirm that, in some bays, near nominal shell thicknesses exist at the upper portions of the sandbed region. To more realistically represent the thicknesses in the bays and to

ensure that the near nominal thicknesses are appropriately modeled in the re-analysis, the bays were divided into 2 segments, one above and one below the 11'-0" elevation with appropriate thickness values as described below in the bay-by-bay explanations.

SANDBED REGION SHELL THICKNESSES

The following is an explanation, by bay, of the shell thicknesses to be used in the re-analysis model and the rationale for using each of the values. The thickness information is summarized in a table following the bay-by-bay explanation.

Bay 1: This bay is appears to be exhibiting a different corrosion pattern than is exhibited in most of the other bays. It is also not exhibiting a normal distribution pattern based on the grid average with a 22 mil sigma. Since this bay is adjacent to Bay 19 and these two bays were judged to be the most corroded bays, the average grid value of 826 mils from Bay 19 will be used this entire bay. The external point test would support a value higher than 826 mils; therefore, to use 826 mils is conservative and acceptable.

Bay 3: This bay has nominal or above wall thickness above 11'-0"; however, using the grid average for the entire bay would not adequately represent the corrosion below 11'-0". Above 11'-0", the grid average of 1180 mils will be used. Below 11'-0", the average of the thicknesses below 11'-0" from Bays 1 (826 mils) and 5 (1074 mils) will be used for Bay 3 (950 mils).

Bay 5: This bay also has nominal or above wall thickness above 11'-0"; therefore, the grid average of 1185 mils will be used. Below 11'-0", the average of the trench readings above the sandbed floor, since the trench spans the entire length from the floor to close to elevation 11'-0", will appropriately represent the general thickness of the bay below 11'-0". This value is calculated as 1074 mils.

Bay 7: This bay has close to nominal wall thickness above 11'-0"; therefore, the grid average of 1133 mils will be used. Below 11'-0", similar to Bay 3, a representative thickness of the average between Bay 5 (1074 mils) and Bay 9 (993 mils) will be used for the shell thickness below elevation 11'-0" (1034 mils).

Bay 9: This bay exhibits corrosion both above and below elevation 11'-0". Above 11'-0", the thickness can be appropriately represented by the weighted (one is a 49 point grid and the other is a 7 point grid) average of the two internal grids (1074 mils). Below 11'-0", it is more appropriate to use the smaller of the two internal grid averages for the general shell thickness. This value is 993 mils.

Bay 11: This bay exhibits corrosion both above and below elevation 11'-0". Therefore, the average of the internal grid measurements will be used for the general shell thickness for the entire bay. This value is 860 mils (average of 822 and 898).

Bay 13: This bay exhibits corrosion both above and below elevation 11'-0". There are 3 internal grid measurements in this bay (two 49 point grids and one 7 point grid). The 7 point grid indicates good wall thickness and appears to be an anomaly in this bay given that the other two grids are indicating corrosion. Therefore, the average of the two 49 point internal grids will be used for the general shell thickness for the entire bay. This value is 907 mils.

Bay 15: This bay is exhibiting higher thicknesses above elevation 11'-0". Therefore, this bay will be split as above and the weighted average of the two grids (one 49 point and one 7 point) will be used for the thickness of the shell above 11'-0". This value is 1062 mils. Below 11'-0", similar to Bays 3 & 7, a representative thickness of the average between Bay 13 (907 mils) and Bay 17 (954 mils) will be used for the shell thickness below elevation 11'-0" (931 mils).

Bay 17: This bay has two 49 point grids and a portion of a grid that is partially in Bay 17 and partially in Bay 19. Since this third grid is at the edge of the bay, it will not be used to determine any representative thickness of the bay. Of the remaining two grids, the majority of the area above elevation 11'-0" appears to be best represented by the weighted average of the bottom of the grid closest to Bay 15 (Grid 17A) and the entire middle grid (Grid 17D). This value is 864 mils. Below 11'-0", Bay 17 has a trench similar to Bay 5. The trench provides representative data for most of the sandbed region between elevations 8'-11" and 11'-0". Therefore, the average of the internal grid measurements in the trench area will be used for the shell thickness below 11'-0". This value is 954 mils.

Bay 19: This bay exhibits corrosion both above and below elevation 11'-0". Therefore, the average of the internal grid measurements (three 49 point grids) will be used for the shell thickness for the entire bay. This value is 826 mils.