

CONTAINMENT SYSTEMS

CONTAINMENT VESSEL STRUCTURAL INTEGRITY

LIMITING CONDITION FOR OPERATION

3.6.1.6 The structural integrity of the containment vessel shall be maintained at a level consistent with the acceptance criteria in Specification 4.6.1.6.

APPLICABILITY: Modes 1, 2, 3, and 4.

ACTION:

- a. With the abnormal degradation indicated by the conditions in Specification 4.6.1.6.1a.4, restore the tendons to the required level of integrity or verify that CONTAINMENT INTEGRITY is maintained within 72 hours and perform an engineering evaluation of the containment and provide a Special Report to the Commission within 15 days in accordance with Specification 6.9.2 or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.
- b. With the indicated abnormal degradation of the structural integrity other than ACTION a. at a level below the acceptance criteria of Specification 4.6.1.6, restore the containment vessel to the required level of integrity or verify that CONTAINMENT INTEGRITY is maintained within 15 days; perform an engineering evaluation of the containment and provide a Special Report to the Commission within 30 days in accordance with Specification 6.9.2 or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.6.1.6.1 CONTAINMENT VESSEL TENDONS

The structural integrity of the prestressing tendons of the containment vessel shall be demonstrated at the end of 1, 3, and 5 years following the initial containment vessel structural integrity test and at 5-year intervals thereafter. The structural integrity of the tendons shall be demonstrated by:

- a. Determining that a random but representative sample of at least 11 tendons (7 hoop and 4 inverted U) each have a observed lift-off force within the predicted limits established for each tendon. For each subsequent inspection one tendon from each group shall be kept unchanged to develop a history and to correlate the observed data. The procedure of inspection and the tendon acceptance criteria shall be as follows:

1. If the measured prestressing force of the selected tendon in a group lies above the prescribed lower limit, the lift-off test is considered to be a positive indication of the sample tendon's acceptability.
 2. If the measured prestressing force of the selected tendon in a group lies between the prescribed lower limit and 90% of the prescribed lower limit, two adjacent (accessible) tendons, one on each side of this tendon shall be checked for their prestressing forces. If the prestressing forces of these two tendons are above 95% of the prescribed lower limits for the tendons, all three tendons shall be restored to the required level of integrity, and the tendon groups shall be considered as acceptable. If the measured prestressing force of any two tendons falls below 95% of the prescribed lower limits of the tendons, additional lift-off testing shall be done to detect the cause and extent of such occurrence. The condition shall be considered as an indication of abnormal degradation of the containment structure.
 3. If the measured prestressing force of any tendon lies below 90% of the prescribed lower limit, the defective tendon shall be completely detensioned and additional lift-off testing shall be done so as to determine the cause and extent of such occurrence. The condition shall be considered as an indication of abnormal degradation of the containment structure.
 4. If the average of all measured prestressing forces for each group (corrected for average condition) is found to be less than the minimum required prestress level at the anchorage locations for that group, the condition shall be considered as abnormal degradation of the containment structure.
 5. If from consecutive surveillances the measured prestressing forces for the same tendon or tendons in a group indicate a trend of prestress loss larger than expected and the resulting prestressing forces will be less than the minimum required for the group before the next scheduled surveillance, additional lift-off testing shall be done so as to determine the cause and extent of such occurrence. The condition shall be considered as an indication of abnormal degradation of the containment structure.
 6. Unless there is abnormal degradation of the containment vessel during the first three inspections, the sample population for subsequent inspections shall include at least 6 tendons (3 hoop and 3 inverted U).
- b. Performing tendon detensioning, inspections, and material tests on a previously stressed tendon from each group. A randomly selected tendon from each group shall be completely detensioned in order to identify broken or damaged wires and determining that over the entire length of the removed wire sample (which shall include the broken wire if so identified) that:

1. The tendon wires are free of corrosion, cracks, and damage, and
2. A minimum tensile strength of 240 ksi (guaranteed ultimate strength of the tendon material) exists for at least three wire samples (one from each end and one at mid-length) cut from each removed wire.

Failure to meet the requirements of 4.6.1.6.1.b shall be considered as an indication of abnormal degradation of the containment structure.

- c. Performing tendon retensioning of those tendons detensioned for inspection to at least the force level recorded prior to detensioning or the predicted value, whichever is greater, with the tolerance within minus zero to plus 6%, but not to exceed 70% of the guaranteed ultimate tensile strength of the tendons. During retensioning of these tendons the changes in load and elongation shall be measured simultaneously at a minimum of three approximately equally spaced levels of force between zero and the seating force. If the elongation corresponding to a specific load differs by more than 10% from that recorded during the installation, an investigation shall be made to ensure that the difference is not related to wire failures or slip of wires in anchorages. This condition shall be considered as an indication of abnormal degradation of the containment structure.

- d. Verifying the OPERABILITY of the sheathing filler grease by assuring:

1. There are no changes in the presence or physical appearance of the sheathing filler-grease including the presence of free water,
2. Amount of grease replaced does not exceed 5% of the net duct volume, when injected at $\pm 10\%$ of the specified installation pressure,
3. Minimum grease coverage exists for the different parts of the anchorage system,
4. During general visual examination of the containment exterior surface, that grease leakage that could affect CONTAINMENT INTEGRITY is not present, and
5. The chemical properties of the filler material are within the tolerance limits specified as follows:

Water Content	0 - 10 % by dry weight
Chlorides	0 - 10 ppm
Nitrates	0 - 10 ppm
Sulfides	0 - 10 ppm
Reserved Alkalinity	>0

Failure to meet the requirements of 4.6.1.6.1.d shall be considered as an indication of abnormal degradation of the containment structure.

4.6.1.6.2 End Anchorages and Adjacent Concrete Surfaces As an assurance of the structural integrity of the containment vessel, tendon anchorage assembly hardware (such as bearing plates, stressing washers, wedges, and buttonheads) of all tendons selected for inspection shall be visually examined. Tendon anchorages selected for inspection shall be visually examined to the extent practical without dismantling the load bearing

components of the anchorages. Bottom grease caps of all vertical tendons shall be visually inspected to detect grease leakage or grease cap deformations. The surrounding concrete shall also be checked visually for indication of any abnormal condition. The frequency of this surveillance shall be in accordance with 4.6.1.6.1. Significant grease leakage, grease cap deformation or abnormal concrete condition shall be considered as an indication of abnormal degradation of the containment structure.

4.6.1.6.3 Containment Vessel Surfaces The exterior surface of the containment shall be visually examined to detect areas of large spall, severe scaling, D-cracking in an area of 25 sq. ft. or more, other surface deterioration or disintegration, or grease leakage, each of which shall be considered as evidence of abnormal degradation of structural integrity of the containment. This inspection shall be performed prior to the Type A containment leakage rate test.