NG-2330 TEST REQUIREMENTS AND ACCEPTANCE STANDARDS

NG-2331 Material for Core Support Structures Not Exceeding 2 in. (50 mm) Maximum Thickness

Material for core support structures (other than threaded structural fasteners) with nominal thickness 2 in. (50 mm) and less shall be tested as required in the following:

(a) Test three $C_v$ specimens at a temperature lower than or equal to the lowest service temperature. All three specimens shall meet the requirements of Table NG-2331(a)-1.

(b) Apply the procedures of (a) above to

(1) base material,

(2) the base material, the heat-affected zone, and weld metal from the weld procedure qualification tests in accordance with NG-4330, and

(3) the weld metal of NG-2431.

NG-2332 Material With Thickness Exceeding 2 in. (50 mm)

Material for core support structures (other than threaded structural fasteners) with nominal wall thickness over 2 in. (50 mm) shall meet the following requirements:

(a) Establish a reference temperature $R_{NDC}$; this shall be done as required in (1) through (5) below.

(1) Determine a temperature $T_{NDC}$ which is at or above the nil-ductility transition temperature by drop weight tests.

(2) At a temperature not greater than $\left[ T_{NDC} + 60^\circ F \ (33^\circ C) \right]$, each specimen of the $C_v$ test (NG-2321.2) shall exhibit at least 35 mils (0.89 mm) lateral expansion and not less than 50 ft-lb (68 J) energy absorption. Retesting in accordance with NG-2350 is permitted. When these requirements are met, $T_{NDC}$ is the reference temperature $R_{NDC}$.

(3) In the event that the requirements of (2) are not met, conduct additional $C_v$ tests in groups of three specimens (NG-2321.2) to determine the temperature $T_{C_v}$ at which they are met. In this case, the reference temperature $R_{NDC} = T_{C_v} - 60^\circ F \ (33^\circ C)$. Thus, the reference temperature $R_{NDC}$ is the higher of $T_{NDC}$ or $\left[ T_{C_v} - 60^\circ F \ (33^\circ C) \right]$. 

(4) When a $C_v$ test has not been performed at $\left[ T_{NDC} + 60^\circ F \ (33^\circ C) \right]$ or when the $C_v$ test at $\left[ T_{NDC} + 60^\circ F \ (33^\circ C) \right]$ does not exhibit a minimum of 50 ft-lb (68 J) energy absorption and 35 mils (0.89 mm) lateral expansion, a temperature representing a minimum of 50 ft-lb (68 J) energy absorption and 35 mils (0.89 mm) lateral expansion may be obtained from a full $C_v$ impact curve developed from the minimum data points of all the $C_v$ tests performed.

(5) The lowest service temperature shall be not lower than $R_{NDC} + 100^\circ F \ (55^\circ C)$ unless a lower temperature is justified by using methods similar to those contained in Section III Appendices, Nonmandatory Appendix G, Article G-2000.

(b) Apply the procedures of (a) above to

(1) the base material,

(2) the base material, the heat-affected zone, and weld metal from the weld procedure qualification tests in accordance with NG-4330

(3) the weld metal of NG-2431.

(c) Product forms having dimensions which prohibit obtaining drop weight test specimens shall be tested in accordance with NG-2331.

(d) Consideration shall be given to the effects of irradiation on material toughness properties (such as core beltline region of reactor). The Design Specifications shall include additional requirements, as necessary, to assure adequate fracture toughness for the service lifetime of the core support structures. The toughness properties may be verified in service periodically by a material surveillance program using the methods of ASTM E185 and the material conditions monitored by the inspection requirements of Section XI.

NG-2333 Threaded Structural Fasteners

For threaded structural fastener material, including studs and nuts, test three $C_v$ specimens at a temperature no higher than the preload temperature or the lowest service temperature, whichever is the lesser. All three specimens shall meet the requirements of Table NG-2333-1.

Table NG-2331(a)-1
Required $C_v$ Values for Core Structure Material With 2 in. (50 mm) Maximum Thickness (Other Than Threaded Structural Fasteners)

<table>
<thead>
<tr>
<th>Nominal Wall Thickness, in. (mm)</th>
<th>Lateral Expansion, mils (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{5}{8}$ (16) or less</td>
<td>No test required</td>
</tr>
<tr>
<td>Over $\frac{5}{8}$ to $\frac{7}{16}$ (16 to 19), incl.</td>
<td>20 (0.50)</td>
</tr>
<tr>
<td>Over $\frac{7}{16}$ to 1 $\frac{11}{16}$ (19 to 38), incl.</td>
<td>25 (0.64)</td>
</tr>
<tr>
<td>Over 1 $\frac{13}{32}$ to 2 (38 to 50), incl.</td>
<td>40 (1.00)</td>
</tr>
</tbody>
</table>

Table NG-2333-1
Required $C_v$ Values for Threaded Structural Fastener Material

<table>
<thead>
<tr>
<th>Nominal Diameter, in. (mm)</th>
<th>Lateral Expansion, mils (mm)</th>
<th>Absorbed Energy, ft-lb (J)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (25) or less</td>
<td>No test required</td>
<td>No test required</td>
</tr>
<tr>
<td>1 (25) through 4 (100)</td>
<td>25 (0.64)</td>
<td>No requirements</td>
</tr>
<tr>
<td>Over 4 (100)</td>
<td>25 (0.64)</td>
<td>45 (61)</td>
</tr>
</tbody>
</table>