Table NF-3225.2-1
Stress Limit Factors for Class 1, 2, 3, and MC Bolt Design by Analysis

<table>
<thead>
<tr>
<th>Stress Category</th>
<th>Service Level A</th>
<th>Service Level B</th>
<th>Service Level C</th>
<th>Service Level D</th>
<th>Test Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension and</td>
<td>$K_{ps} = 1.0$</td>
<td>$K_{ps} = 1.0$</td>
<td>$K_{ps} = 1.15$</td>
<td>$K_{ps} = 1.25$</td>
<td>$K_{ps} = 1.25$</td>
</tr>
<tr>
<td>shear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GENERAL NOTE:
$K_{ps} = $ stress limit factor applicable to the Design allowable tensile and shear stresses

NOTES:
(1) Not to be used for friction type connections.
(2) Use Appendix F.

(3) the applicable welds may be either square groove, V groove, bevel groove, J groove, U groove, flare V groove, or flare bevel groove [see Figure NF-3226.1(a)-1].

(4) when angle joints are used for connecting a transition in diameter to a cylinder, the angle $\alpha$ of Figure NF-3226.1-1, sketch (f) shall not exceed 30 deg.

(5) A tapered transition having a length not less than three times the offset between the adjacent surfaces of abutting sections, as shown in Figure NF-3226.1(a)-2, shall be provided at joints between sections that differ in thickness by more than one-fourth of the thickness of the thinner section or by more than $\frac{3}{8}$ in. (3 mm), whichever is less. The transition may be formed by any process that will provide a uniform taper. The weld may be partly or entirely in the tapered section, or adjacent to it. This paragraph also applies when there is a reduction in thickness within a spherical shell, or cylindrical course or plate.

(6) When the use of backing rings will result in undesirable conditions such as severe stress or corrosion, the requirements of NF-4240 shall be met.

(b) Corner Joints. Corner joints shall be one of the following:

(1) full penetration, as shown in Figure NF-3226.1-1, sketch (d-1)

(2) partial penetration with a fillet weld as shown in Figure NF-3226.1-1, sketches (d-2) and (d-3)

(3) the applicable welds are fillet, square groove, V groove, bevel groove, U groove, J groove, flared V groove and flute bevel groove

(c) Tee Joints. Tee joints shall be one of the following:

(1) full penetration, Figure NF-3226.1-1, sketches (c) and (g)

(2) partial penetration, double welded with or without additional fillet welds, Figure NF-3226.1-1, sketch (e)

(3) partial penetration, single welded between the end surface of a closed tubular section or a closed formed section, Figure NF-3226.1-1, sketch (h)

(4) the applicable welds may be square groove, bevel groove, J groove, flared V groove or flute bevel groove

NF-3226.2 Stress Intensities and Stress Limits for Welded Joints in Plate- and Shell-Type Supports.

(a) Design Limits. The stress intensity and allowable stress limits which must be satisfied for welds for the Design Loadings stated in the Design Specification shall be the following:

(1) Full Penetration Groove Welds. The stress intensity limits for full penetration groove welds shall not exceed the applicable stress intensity value for the base metal being joined, as specified in NF-3221.1 and Table NF-3324.5(a)-1. See NF-3111.

(2) Partial Penetration Groove Welds

(a) Compression Normal to Effective Throat or Shear on Effective Throat. The stress intensity and stress limits shall be the same as those for the base metal as required in NF-3221.1.

(b) Tension Normal to the Axis of the Effective Throat. The stress limits shall be as specified in Table NF-3324.5(a)-1.

(3) Fillet Welds. The allowable stress limits for fillet welds shall be as specified in Table NF-3324.5(a)-1.

(b) Service Limits, Levels A, B, C, and D, and Test. The rules and stress limits that must be satisfied for welds for any Level A, B, C, and D Service and Test Loadings stated in the Design Specification are those given in (a) multiplied by the appropriate base material stress limit factor given in Table NF-3251.2-1.

(c) The effective sizes of welds shall be as given in NF-3324.5(d) and NF-3324.5(f).

NF-3226.3 Consideration of Lamellar Tearing. Welded joint configurations causing significant through-thickness tensile stress [as defined in NF-1215(b)] during fabrication and/or service on rolled product forms should be avoided. However, if this type of construction is used, the designer should consider one or several of the following factors that may reduce the susceptibility of the joint to experience lamellar tearing and provide documentation, including fabrication requirements, in the Design Output Documents:

(a) Reduce volume of weld metal to the extent practical.
(2) partial penetration, double welded [Figure NF-3226.1-1, sketch (b)].

(3) the applicable welds may be either square groove, V groove, bevel groove, J groove, U groove, flare V groove, or flare bevel groove [see Figure NF-3226.1(a)-1].

(4) when angle joints are used for connecting a transition in diameter to a cylinder, the angle \( \alpha \) of Figure NF-3226.1-1, sketch (f) shall not exceed 30 deg.

(5) A tapered transition having a length not less than three times the offset between the adjacent surfaces of abutting sections, as shown in Figure NF-3226.1(a)-2, shall be provided at joints between sections that differ in thickness by more than one-fourth of the thickness of the thinner section or by more than \( \frac{1}{8} \) in. (3 mm), whichever is less. The transition may be formed by any process that will provide a uniform taper. The weld may be partly or entirely in the tapered section, or adjacent to it. This paragraph also applies when there is a reduction in thickness within a spherical shell, or cylindrical course or plate.

(6) When the use of backing rings will result in undesirable conditions such as severe stress or corrosion, the requirements of NF-4240 shall be met.

(b) Corner Joints. Corner joints shall be one of the following:

(1) full penetration, as shown in Figure NF-3226.1-1, sketch (d-1)

(2) partial penetration with a fillet weld as shown in Figure NF-3226.1-1, sketches (d-2) and (d-3)

(3) the applicable welds are fillet, square groove, V groove, bevel groove, U groove, J groove, flare V groove and flare bevel groove

(c) Tee Joints. Tee joints shall be one of the following:

(1) full penetration, Figure NF-3226.1-1, sketches (c) and (g)

(2) partial penetration, double welded with or without additional fillet welds, Figure NF-3226.1-1, sketch (e)

(3) partial penetration, single welded between the end surface of a closed tubular section or a closed formed section, Figure NF-3226.1-1, sketch (h)

(4) the applicable welds may be square groove, bevel groove, J groove, flare V groove or flare bevel groove

**NF-3226.2 Stress Intensities and Stress Limits for Welded Joints in Plate- and Shell-Type Supports.**

(a) Design Limits. The stress intensity and allowable stress limits which must be satisfied for welds for the Design Loadings stated in the Design Specification shall be the following:

(1) Full Penetration Groove Welds. The stress intensity limits for full penetration groove welds shall not exceed the applicable stress intensity value for the base metal being joined, as specified in NF-3221.1 and Table NF-3234.5(a)-1. See NF-3111.

(2) Partial Penetration Groove Welds

(a) Compression Normal to Effective Throat or Shear on Effective Throat. The stress intensity and stress limits shall be the same as those for the base metal as required in NF-3221.1.

(b) Tension Normal to the Axis on the Effective Throat. The stress limits shall be as specified in Table NF-3234.5(a)-1.

(c) Fillet Welds. The allowable stress limits for fillet welds shall be as specified in Table NF-3234.5(a)-1.

(b) Service Limits, Levels A, B, C, and D, and Test. The rules and stress limits that must be satisfied for welds for any Level A, B, C, and D Service and Test Loadings stated in the Design Specification are those given in (a) multiplied by the appropriate base material stress limit factor given in Table NF-3251.2-1.

(c) The effective sizes of welds shall be as given in NF-3234.5(d) and NF-3234.5(f).

**NF-3226.3 Consideration of Lamellar Tearing.**

Welded joint configurations causing significant through-thickness tensile stress [as defined in NF-1215(b)] during fabrication and/or service on rolled