Case N-570-2
Alternative Rules for Linear Piping and Linear Standard Supports for Classes 1, 2, 3, and MC
Section III, Division 1

Inquiry: What alternative rules to Section III, Subsection NCA and NF may be used for the construction of Class 1, 2, 3, and MC Linear Piping and Linear Standard Supports?

Reply: It is the opinion of the Committee that as an alternative to the requirements of NCA and NF, Class 1, 2, 3, and MC Linear Piping and Linear Standard Supports may be constructed to ANSI/AISC N690-1994 “Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities,” including Supplement 2, ANSI/AISC N690-1994(R2004) S2.1.

1 GENERAL

1.1 The Owner or his designee shall provide a Design Specification that shall identify the loadings and combinations of loadings for which the supports are to be designed.

1.2 The Owner or his designee shall review and approve each support calculation to determine that all the appropriate Design and Service Loadings have been evaluated and that the acceptance criteria provided in this Code Case and in ANSI/AISC N690 have been considered.

1.3 The supports shall be constructed under a Quality Assurance Program which meets the requirements of the Owner.

1.4 The use of this Code Case shall be in accordance with NCA-1140 and shall be listed on the applicable Data Report for the component which utilizes the Linear Piping or Linear Standard Support.

2 MATERIAL

2.1 In those instances where material may be subject to lamellar tearing, such as through-thickness transmission of tensile loads in thick plates, the Design Specification shall include the requirement that the material be ultrasonically examined. Acceptance criteria shall be as stated in ANSI/AISC N690, Section Q1.4a.

2.2 Copies of Certified Mill Test Reports, certified reports of tests made by the fabricator or a qualified testing laboratory, or Certificates of Compliance as required by ANSI/AISC N690 shall be furnished to the Owner for all supports provided under these requirements.

2.3 The requirements of Section Q1.4 or Q2.2 do not apply to items such as gaskets, seals, bushings, springs, wire rope used as a spring, compression spring end plates, bearings, retaining rings, washers, wear shoes, shims, slide plates, hydraulic fluids, etc., or to material used for stops for seismic and other dynamic loads that are designed primarily for compressive loading and are not connected to the support of the pressure boundary.

Requirements, if any, for these materials shall be stated in the Design Specification, shall conform to the standards and specifications of Section NA2, where applicable. In case Section NA2 does not provide guidance, requirements for these materials, if any, shall be stated in the Design Specification.

3.1 The design requirements which shall be satisfied in elastic analysis for any Design and Level A through D Service Loadings stated in the Design Specification are those given in Table Q1.5.7.1 of ANSI/AISC N690 and the additional requirements of 3.2 through 3.11 below.

3.2 The Normal, Severe, Extreme, Abnormal, Normal Environmental, Abnormal Environmental, and Abnormal Extreme load categories of ANSI/AISC N690 shall be correlated to the appropriate Design and Service Loadings identified in the Design Specification as shown in Table 3.2.

3.3 The rules and stress limits which shall be satisfied for any Test Loading stated in the Design Specification shall be those given for Load Combination 1 in Table Q1.5.7.1 of ANSI/AISC N690 with the test fluid weight included in the Loading 1, multiplied by a stress limit coefficient of 1.33. only the dead, D, live, L, loads and

The Committee’s function is to establish rules of safety, relating only to pressure integrity, governing the construction of boilers, pressure vessels, transport tanks and nuclear components, and inservice inspection for pressure integrity of nuclear components and transport tanks, and to interpret these rules when questions arise regarding their intent. This Code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks and nuclear components, and the inservice inspection of nuclear components and transport tanks. The user of the Code should refer to other pertinent codes, standards, laws, regulations or other relevant documents.

For ASME Committee Use Only

The Normal, Severe
Environmental, Extreme
Environmental and Abnormal

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3.4 The Stress Limit Coefficients in ANSI/AISC N690 shall be modified as shown in Table 3.2.

3.5 For the design of supports, the stresses caused by the restraint of free-end displacements of components and piping, such as thermal expansion and relative anchor displacements, shall be considered as primary stresses.

### Table 3.2

<table>
<thead>
<tr>
<th>Loading Category</th>
<th>Stress Limit Coefficient</th>
<th>Level of Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>1.0</td>
<td>Design and Level A</td>
</tr>
<tr>
<td>Severe</td>
<td>1.23</td>
<td>Level B</td>
</tr>
<tr>
<td>Extreme</td>
<td>1.5</td>
<td>Level C</td>
</tr>
<tr>
<td>Abnormal</td>
<td>1.5</td>
<td>Level C</td>
</tr>
<tr>
<td>Abnormal-Severe</td>
<td>1.5</td>
<td>Level C</td>
</tr>
<tr>
<td>Abnormal-Extreme</td>
<td>1.7</td>
<td>Level D</td>
</tr>
</tbody>
</table>

3.6 Thermal stresses within the support as defined by NF-3121.11 need not be evaluated. For component supports designed as Linear Standard Supports, the range of primary plus secondary stresses resulting from level A and B loading shall be limited to $2S_y$ or $S_u$, at temperature, whichever is less.

3.7 Shear stress limit shall not exceed $0.42S_u$, at temperature.

3.8 To avoid column buckling, the allowable stresses shall be limited to two-thirds of the critical buckling stresses.

3.9 The stress limit coefficients in Table 3.2 are not intended for control of deformations. When required by the Design Specification, deformation control must be considered separately.

3.10 As an alternative to design by analysis, Design by Load Rating as defined in NF-3380 and NF-3480 may be used.

3.11 Plastic design per Part 2 of ANSI/AISC N690 shall not be used.

4 FABRICATION

4.1 The requirements for welding qualifications given in NF-4300 may be used for any portion of the fabrication and installation in lieu of those specified in ANSI/AISC N690 provided all such welding is performed by an NPT Certificate Holder.

4.2 Thermal cutting is prohibited on quenched and tempered steels.

5 EXAMINATION

5.1 All full penetration butt welded joints in Class 1 supports shall be nondestructively examined by radiographic or ultrasonic methods in accordance with ANSI/AISC N690.

5.2 All other welded joints in Class 1 supports shall be nondestructively examined by liquid penetrant or magnetic particle methods in accordance with ANSI/AISC N690.

5.3 All NDE personnel shall be qualified to the requirements of ANSI/AISC N690, and all nondestructive examinations shall be supervised or performed by an AWS Certified Welding Inspector.

5.4 As an alternative to 5.3, NPT Certificate Holders may use NF-5500 for NDE personnel qualification.

6 STAMPING

6.1 The requirements of NF-8000 for nameplates, stamping and Data Reports are not required for Linear Piping and Linear Standard Supports designed and constructed to the requirements of ANSI/AISC N690.
NONMANDATORY APPENDIX CC
ALTERNATIVE RULES FOR LINEAR PIPING SUPPORTS

ARTICLE CC-1000
INTRODUCTION

CC-1100 INTRODUCTION

CC-1110 SCOPE AND GENERAL REQUIREMENTS

CC-1111 Scope of This Appendix

This Appendix provides alternative rules to the requirements of Division 1, Subsections NCA and NF, and Division 5, Subsection HA and Subsection HF, Subpart A for Linear Piping Supports that are constructed to ANSI/AISC N690-1994, "Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities," including Supplement 2, ANSI/AISC N690-1994 (R2004) S2, and the requirements of this Appendix. As used in this Nonmandatory Appendix ANSI/AISC N690 refers to ANSI/AISC N 690-18.

CC-1112 General Requirements

(a) When this Appendix is used, the Owner or his designee shall provide a Design Specification (NCA-3252, NCA-3255) that permits the use of this Appendix and identifies the loadings and combinations of loadings for which the supports are to be designed. The Design Specification shall contain sufficient detail to provide a complete basis for construction of the supports.

(b) The Owner or his designee shall perform a documented review of the calculations for each support to determine that all the specified loadings have been evaluated and that the acceptance criteria provided in this Appendix and in ANSI/AISC N690 have been considered. The responsibility for the method of analysis and the accuracy of the calculations remains with the designer.

(c) The supports shall be constructed under a Quality Assurance Program that meets the requirements specified by the Owner.
ARTICLE CC-2000
MATERIALS

CC-2100 MATERIAL REQUIREMENTS

(a) Material shall conform to ANSI/AISC N690.

(b) In those instances where material may be subject to lamellar tearing, such as through-thickness transmission of tensile loads in thick plates, the Design Specification shall include the requirement that the material be ultrasonically examined in accordance with ANSI/AISC N690, Section Q1.4.

(c) The requirements of ANSI/AISC N690 Section Q1.4 or Q2.2 do not apply to bearings, bushings, gaskets, hydraulic fluids, seals, shims, slide plates, retaining rings, wear shoes, springs, washers, wire rope, spring end plates, thread locking devices, cotter pins, sight glass assemblies, spring hanger travel and hydro stops, nameplates, nameplate attachment devices, or for compression dynamic stops used as stops for seismic and other dynamic loads that are designed primarily for compressive loading and are not connected to the pressure boundary and do not provide support of the pressure boundary. Requirements, if any, for these materials shall be stated in the Design Specification.

NOTE: Stops do not include snubbers (NF-3412.4).

CC-2120 CERTIFICATION OF MATERIALS

Copies of Certified Material Test Reports, certified reports of tests made by the fabricator or a qualified testing laboratory, or Certificates of Compliance as required by ANSI/AISC N690 shall be furnished to the Owner or designee for all supports provided under these requirements.
ARTICLE CC-3000
DESIGN

CC-3100 DESIGN REQUIREMENTS

The design requirements that shall be satisfied in the elastic analysis for any Design and Level A through D Service Loadings stated in the Design Specification are those given in Table Q1.5.7.1 of ANSI/AISC N690 and the additional requirements of CC-3120, CC-3130, and CC-3140.

CC-3110 GENERAL DESIGN REQUIREMENTS

(a) For the design of supports, the stress caused by the restraint of free-end displacements of components and piping, such as thermal expansion and relative anchor displacements, shall be considered as a primary stress.

(b) The Normal, Severe, Extreme, Abnormal, Abnormal Severe, and Abnormal Extreme load categories of ANSI/AISC N690 shall be correlated to the appropriate Design and Service Loadings identified in Design Specification as shown in Table CC-3120-1.

CC-3120 DESIGN LOAD CONSIDERATIONS

(a) The stress limit coefficients in Table CC-3120-1 are not intended for control of deformation. When required by the Design Specification, deformation control shall be considered separately.

(b) As an alternative to design by analysis, Design by Load Rating as defined in NF-3380 and NF-3480 may be used.

(c) Plastic design per Part 2 of ANSI/AISC N690 shall not be used.

CC-3140 DESIGN LIMITS

CC-3141 Stress Limits

(a) The rules and stress limits that shall be satisfied for any Test Loading stated in the Design Specification shall be given by Eq. NB2-10 of ANSI/AISC N690 with only the dead, D, and live, L, loads and the test fluid weight included.

(b) The Stress Limit Coefficients in ANSI/AISC N690 shall be modified as shown in Table CC-3120-1.

(c) Thermal stresses within the support as defined by NB2-11 need not be evaluated.

(d) Shear stress limit shall not exceed 0.42 S_{u}, at temperature.

(e) To avoid column buckling, the allowable compressive stresses shall be limited to two-thirds of the critical buckling stress.

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Table CC-3120-1
Correlation of Service Loadings and Stress Limit Coefficients

<table>
<thead>
<tr>
<th>Loading Category</th>
<th>Equation</th>
<th>Stress Limit Coefficient</th>
<th>Level of Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>NB2-10</td>
<td>1.0</td>
<td>Design and Level A</td>
</tr>
<tr>
<td>Severe</td>
<td>NB2-11</td>
<td>1.33</td>
<td>Level B</td>
</tr>
<tr>
<td>Extreme</td>
<td>NB2-12</td>
<td>1.6</td>
<td>Level C</td>
</tr>
<tr>
<td>Abnormal</td>
<td>NB2-13</td>
<td>1.6</td>
<td>Level C (Note 1)</td>
</tr>
<tr>
<td>Abnormal Severe</td>
<td>NB2-14</td>
<td>1.6</td>
<td>Level C (Note 1)</td>
</tr>
<tr>
<td>Abnormal Extreme</td>
<td>NB2-15</td>
<td>1.6</td>
<td>Level D (Note 1)</td>
</tr>
</tbody>
</table>

Notes:
1. The increase shall be limited to 1.5 for members or fasteners in axial tension or in shear.
ARTICLE CC-4000
FABRICATION

CC-4100  FABRICATION REQUIREMENTS

(a) The requirements for welding qualifications given in NF-4300 may be used for any portion of fabrication and installation in lieu of those specified in ANSI/AISC N690, provided all such welding is performed by an N-Type Certificate Holder and the qualification is performed under the QA program applicable to the certificate.

(b) Thermal cutting is prohibited on quenched and tempered steels.
ARTICLE CC-5000
EXAMINATION

CC-5100 EXAMINATION REQUIREMENTS
CC-5110 REQUIRED EXAMINATION OF WELDS
CC-5111 Examination of Welds on Supports for Class 1 Piping

(a) All full penetration butt-welded joints in Supports for Class 1 piping shall be nondestructively examined by radiographic or ultrasonic methods in accordance with ANSI/AISC N690.

(b) All other welded joints in Supports for Class 1 piping shall be nondestructively examined by liquid penetrant or magnetic particle methods in accordance with ANSI/AISC N690.

CC-5120 QUALIFICATION AND CERTIFICATION OF NONDESTRUCTIVE EXAMINATION PERSONNEL

CC-5121 NDE Personnel Requirements

All NDE personnel shall be qualified to the requirements of ANSI/AISC N690, and all nondestructive examinations shall be supervised or performed by an AWS Certified Welding Inspector.

CC-5122 Alternative Rules for Nondestructive Examination Personnel

As an alternative to CC-5121, N-Type Certificate Holders may use NF-5500 for personnel qualification, provided the qualification is performed under the QA program applicable to the certificate.
ARTICLE CC-8000
NAMEPLATES, STAMPING WITH CERTIFICATION MARK, AND DATA REPORTS

CC-8100 GENERAL REQUIREMENTS

Nameplates, stamping with Certification Mark, and Data Reports are not required for Linear Piping Supports designed and constructed to the requirements of this Appendix.