
Supplement No. 1 to the Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities

(ANSI/AISC N690-1994)

Approved by the
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N690 Supplement No. 1, April 15, 2002
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

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April 15, 2002

Page 1

Q1.0.1 SCOPE

Revise Item 5 as follows:

5. A quality assurance program covering nuclear safety-related steel structures shall be developed prior to starting any work. The general requirements and guidelines for establishing and executing the quality assurance program during the design and construction phases of nuclear facilities are those established by Title 10 of the Code of Federal Regulations, Part 50 (10CFR50) Appendix B for Nuclear Power Stations and Independent Spent Fuel for Commercial Reactors Storage Facilities or Part 830.120 (10CFR830.120) for applicable U.S. Department of Energy Nuclear Facilities.

Add the following to the end of this section:

This Specification includes the list of symbols and the appendices.

Single angle members shall comply with the *Specification for Allowable Stress Design of Single-Angle Members* and with this Specification.

Design of structural joints shall comply with the *Specification for Structural Joints Using ASTM A325 or A490 Bolts* (Research Council on Structural Connections) and the *Structural Welding Code-Steel* (AWS D1.1), and with this specification.

Page 2

Q1.0.2 DEFINITIONS

Replace the definition for Secondary Stress with the following:

Secondary Stress

N690 Supplement No. 1, April 15, 2002
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

Secondary stress is a stress developed by the self-constraint of a structure rather than from external loads. It must satisfy an imposed strain pattern. The basic characteristic of a secondary stress is that it is self-limiting. Examples of secondary stresses are effects arising from contraction or expansion resulting from one or more of the following:

- Temperature changes
- Shrinkage, moisture changes, creep in concrete for composite construction
- Movement due to differential settlement
- Variation from the assumed connection restraint

Page 3

Q1.0.3 REFERENCED CODES AND STANDARDS

Replace this section with the following:

The following documents are referenced in this Specification. Whenever referenced, the documents by date of issue indicated in this section apply.

ASTM A6/A6M-01	ASTM A20/A20M-01
ASTM A27/A27M-95(2000)	ASTM A36/A36M-00
ASTM A53/A53M-01	ASTM A106-99e1
ASTM A148/A148M-01	ASTM A167-99
ASTM A193/A193M-01	ASTM A194/A194M-01
ASTM A216/A216M-93(1998)	ASTM A217/A217M-99
ASTM A240/A240M-01	ASTM A242/A242M-00a
ASTM A276-00a	ASTM A307-00
ASTM A312/A312M-00c	ASTM A320/A320M-01
ASTM A325-00	ASTM A354-00a
ASTM A449-00	ASTM A479/A479M-00
ASTM A490-00	ASTM A500-01
ASTM A501-01	ASTM A514/A514M-00a
ASTM A515/A515M-92(1997)	ASTM A516/A516M-90(2001)
ASTM A529/A529M-01	ASTM A540/A540M-00
ASTM A563-00	ASTM A564/A564M-01
ASTM A568/A568M-00b	ASTM A572/A572M-00a
ASTM A588/A588M-00a	ASTM A606-01
ASTM A607-98	ASTM A618-01
ASTM A668/A668M-96e1	ASTM A709/A709M-01b
ASTM A852/A852M-01	ASTM A913/A913M-01
ASTM A992/A992M-01	ASTM A1011-01
ASTM C33-01	ASTM D3843-00
ASTM F436-93(2000)	ASTM F436M-93(2000)
ASTM F1554-99	

N690 Supplement No. 1, April 15, 2002
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

American Concrete Institute, *Standard Code Requirements for Nuclear Safety-Related Concrete Structures*, ACI 349-01.

AISC *Specification for Allowable Stress Design of Single-Angle Members*, June 1, 1989.

AISC *Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design*, June 1, 1989.

AISC *Load and Resistance Factor Design Specification for Structural Steel Buildings*, December 27, 1999.

AISC *Code of Standard Practice for Steel Buildings and Bridges*, March 7, 2000.

ASME *Boiler and Pressure Vessel Code*, Section IX, QW-214, 2001.

American Welding Society, *Structural Welding Code – Steel*, D1.1:2000.

American Society of Civil Engineers, *Minimum Design Loads for Buildings and Other Structures*, ASCE 7-98.

ANSI/ASME NQA-1: *Quality Assurance Program Requirements for Nuclear Facilities*, 1992.

Research Council on Structural Connections, *Specification for Structural Joints Using ASTM A325 or A490 Bolts*, 2000.

Title 10 of the *Code of Federal Regulation*, Part 50, Appendix B, 2001.

Title 10 of the *Code of Federal Regulation*, Part 830.120 (to be used for Department of Energy Nuclear Facilities), 2001.

U.S. Nuclear Regulatory Commission Regulatory Guide 1.54, “Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants,” July 2000.

Visual Weld Acceptance Criteria for Structural Welding at Nuclear Power Plants (NCIG-01, Revision 2), Electric Power Research Institute, NP-5380, Volume 1, September 1987.

Page 7

Q1.3.6 LOAD COMBINATIONS

Add the following to this section:

N690 Supplement No. 1, April 15, 2002
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

When any load reduces the effects of other loads and if it can be demonstrated that the load is always present or occurs simultaneously with other loads, the corresponding coefficient for that load shall be taken as 0.90. Otherwise, the coefficient for that load shall be taken as zero.

Page 7

Insert the following new Section Q1.3.7:

Q1.3.7 COMBINED LOSS OF COOLANT AND SAFETY RELIEF DISCHARGE LOADS

In addition to the abnormal loads identified in Q1.3.5, hydrodynamic loads resulting from LOCA and/or safety relief valve actuation shall be appropriately considered for steel structure components subjected to these loads. Any fluid structure interaction associated with these hydrodynamic loads and those from the postulated seismic loads shall be taken into account.

Page 8

Q1.4.1 STRUCTURAL STEEL

Add the following standard specifications:

ASTM A529/A529M	<i>High-Strength Carbon-Manganese Steel of Structural Quality</i>
ASTM A606	<i>Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance</i>
ASTM A709/A709M	<i>Structural Steel for Bridges</i>
ASTM A852/A852M	<i>Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi Minimum Yield Strength to 4-in. Thick</i>
ASTM A913/A913M	<i>High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST)</i>
ASTM A992/A992M	<i>Steel for Structural Shapes for Use in Building Framing</i>

Page 8

Q1.4.1 STRUCTURAL STEEL

Add the following to the end of this section:

Some of the material classes and types listed in ASTM standards A167, A276, and A607 are not generally suitable for use in welded applications.

N690 Supplement No. 1, April 15, 2002
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

Therefore, A167 Types 301, 302, 302B, and 305; A276; and A607 Class 1 shall not be used in welded applications.

Page 10

Q1.4.3 BOLTS AND MATERIAL FOR THREADED RODS

Add the following standard specifications:

ASTM A36/A36M	<i>Carbon Structural Steel</i>
ASTM A588/A588M	<i>High-Strength Low-Alloy Structural Steel with 50 ksi [345MPa] Minimum Yield Point to 4-in. [100 mm] Thick</i>
ASTM A193/A193M	<i>Alloy Steel and Stainless Steel Bolting Materials for High-Temperature Service</i>
ASTM A194/A194M	<i>Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both</i>
ASTM F436	<i>Hardened Steel Washers</i>
ASTM F436M	<i>Hardened Steel Washers [Metric]</i>
ASTM F1554	<i>Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength</i>

Page 11

Q1.4.4 FILLER METAL AND FLUX FOR WELDING

Add the following specifications of the American Welding Society:

AWS A5.23	<i>Specification for Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding</i>
AWS A5.28	<i>Specification for Low-Alloy Filler Metals for Gas Shielded Arc Welding</i>
AWS A5.29	<i>Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding</i>

Add the following to the end of this section:

For Charpy V-notch testing requirements, see Section Q1.17.1.

Page 18

Table Q1.5.2.1

Insert the following at the bottom of the table:

A490 bolts, when threads are excluded from shear planes	54.0 ^d	21.0	18.0	15.0	13.0	40.0 ^f
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N690 Supplement No. 1, April 15, 2002
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

Page 21

Q1.5.5 CONCRETE BEARING

Revise the definition of A_1 and A_2 as follows:

- A_1 = area of steel concentrically bearing on a concrete support, in.²
 A_2 = maximum area of the portion of the supporting surface that is geometrically similar to and concentric with the loaded area, in.²

Page 22

Table Q1.5.7.1

Insert revised Table.

TABLE Q1.5.7.1
Load Combinations and Applicable Stress Limit Coefficients

Category	Load Combination ^f	Stress Limit Coefficient ^{b,h}
Normal	1. $D + L$ 2. $D + L + R_o + T_o$	1.0 ^c
Severe ⁱ	3. $D + L + W$ 4. $D + L + E_o$ 5. $D + L + W + R_o + T_o$ 6. $D + L + R_o + T_o + E_o$	1.0 ^c
Extreme	7. $D + L + R_o + T_o + W_t$ 8. $D + L + R_o + T_o + E_s$	1.6 ^{g,k}
Abnormal ^d	9. $D + L + R_a + T_a + P_a$	1.6 ^{g,k}
Abnormal ^{d,j}	9a. $D + L + T_a + P_a$	
Abnormal ^{d,e}	10. $D + L + R_a + T_a + Y_r + Y_j + Y_m + E_o + P_a$	1.6 ^{g,k}
Severe		
Abnormal ^{d,e}	11. $D + L + R_a + T_a + Y_r + Y_j + Y_m + E_s + P_a$	1.7 ^{g,k}
Extreme		

^a Coefficients are applicable to primary stress limits given in Sections Q1.5.1, Q1.5.2, Q1.5.3, Q1.5.4, Q1.5.5, Q1.6, Q1.10, and Q1.11.

^b In no instance shall the allowable stress exceed $0.7F_u$ in axial tension nor $0.7F_u$ times the ratio Z/S for tension plus bending.

^c For primary plus secondary stress, the allowable limits are increased by a factor of 1.5.

^d The maximum values of P_a , T_a , R_a , Y_j , Y_r , and Y_m , including an appropriate dynamic load factor, shall be used in load combinations 9 through 11, unless an appropriate time history analysis is performed to justify otherwise.

^e In combining loads from a loss of coolant accident (LOCA) and a seismic event the SRSS (square root of the sum of the squares) may be used, provided that the responses are calculated on a linear basis.

^f All load combinations shall be checked for a no-live-load condition.

^g In load combinations 7 through 11, the stress limit coefficient in shear shall not exceed 1.4 in members and bolts.

^h Secondary stresses which are used to limit primary stresses shall be treated as primary stresses.

ⁱ Consideration shall also be given to snow and other loads as defined in ASCE 7.

^j This load combination is to be used when the global (non-transient) sustained effects of T_a are considered.

^k The stress limit coefficient where axial compression exceeds 20% of normal allowable, shall be 1.5 for load combinations 7, 8, 9, 9a, and 10 and 1.6 for load combination 11.

N690 Supplement No. 1, April 15, 2002
 AMERICAN INSTITUTE OF STEEL CONSTRUCTION