

Approval Date: June 23, 2014

Code Cases will remain available for use until annulled by the applicable Standards Committee.

Case 2418-2
SA-182, SA-240, SA-479, SA-789, SA-790, and SA-815
21Cr-5Mn-1.5Ni-Cu-N (UNS S32101) Austenitic-Ferritic
Duplex Stainless Steel
Section VIII, Division 1

Inquiry: May solution annealed UNS S32101 wrought material conforming to the requirements of specifications SA-182, SA-240, SA-479, SA-789, SA-790, and SA-815, or meeting the requirements of Table 1 and mechanical properties of Table 2 and otherwise meeting the requirements of SA-182 be used in the construction of vessels under the rules of Section VIII, Division 1?

Reply: It is the opinion of the Committee that the material described in the Inquiry may be used under the rules of Section VIII, Division 1, provided the following additional requirements are met:

(a) For SA-182, the material meets the chemical analysis and minimum mechanical properties shown in Table 1 and Table 2, respectively.

(b) The maximum allowable design stress values in tension shall be those listed in Table 3 and Table 3M. The maximum applicable use temperature shall be 600°F (316°C).

(c) For external pressure design, Figure HA-5 and Table HA-5 of Section II, Part D shall be used.

(d) This material is assigned P-No. 10H, Group 1.

(e) The solution annealing temperature shall be 1,870°F (1 020°C) minimum and then quenched in water or rapidly cooled by other means.

(f) Heat treatment after welding is neither required nor prohibited. However, if heat treatment is applied, the solution annealing treatment shall be as noted in (e).

(g) The rules that shall apply are those given in Subsection C, Part UHA for austenitic-ferritic duplex stainless steels.

(h) This Case number shall be included in the marking and documentation of the material and shown on the Manufacturer's Data Report.

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.

**Table 1
 Chemical Requirements**

Element	Weight, %
Carbon	0.040
Manganese	4.0-6.0
Silicon, max.	1.00
Sulfur, max.	0.030
Phosphorus, max.	0.040
Chromium	21.0-22.0
Nickel	1.25-1.70
Molybdenum	0.10-0.80
Nitrogen	0.20-0.25
Copper	0.10-0.80

**Table 2
 Mechanical Properties**

Mechanical Properties	$t > 0.187$ in.	$t > 5.00$ mm	$t \leq 0.187$ in.	$t \leq 5.00$ mm
Tensile Strength				
Min. ksi	94	...	101	...
Min. MPa	...	650	...	700
Yield Strength				
Min. ksi	65	...	77	...
Min. MPa	...	450	...	530
Elongation in 2 in., %	30	30	30	30

**Table 3
 Maximum Allowable Stress Values, ksi**

For Metal Temperature Not Exceeding, °F	Seamless Products, $t > 0.187$ in.	Welded Products, $t > 0.187$ in.	Seamless Products, $t \leq 0.187$ in. [Note (1)]	Welded Products, $t \leq 0.187$ in. [Note (1)]
100	26.9	22.9	28.9	24.6
200	26.9	22.9	28.9	24.6
300	25.6	21.8	27.5	23.4
400	24.7	21.0	26.5	22.5
500	24.7	21.0	26.5	22.5
550	24.7	21.0	26.5	22.5
600	24.7	21.0	26.5	22.5

CAUTION: This material may be expected to develop embrittlement after exposure at moderately elevated temperatures. See Section II, Part D, Nonmandatory Appendix A, A-207 and A-208.

NOTE:

(1) All SA-815 products shall only use allowable stresses listed for $t > 0.187$ in.

Table 3M
Maximum Allowable Stress Values, MPa

For Metal Temperature Not Exceeding, °C	Seamless Products, $t > 5.00$ mm	Welded Products, $t > 5.00$ mm	Seamless Products, $t \leq 5.00$ mm [Note (1)]	Welded Products, $t \leq 5.00$ mm [Note (1)]
40	186	158	200	170
65	186	158	200	170
90	186	158	200	170
150	177	150	190	161
200	171	145	184	156
250	170	145	183	156
300	170	145	183	156
325	170	145	183 [Note (2)]	156 [Note (2)]

CAUTION: This material may be expected to develop embrittlement after exposure at moderately elevated temperatures. See Section II, Part D, Nonmandatory Appendix A, A-207 and A-208.

NOTES:

- (1) All SA-815 products shall only use allowable stresses listed for $t > 5.00$ mm.
 (2) This value is provided for interpolation purposes only. The maximum design temperature for this material is as stated in (b).