

Title:	API 620 Annex X, addition of UNS S82441		Agenda Item # 620-2084
Date:	5/7/2026		
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Purpose:	Addition of duplex stainless steel UNS S82441 to relevant paragraphs of API 620 Annex X.		
Source:	C. Tigerstrand, RATIONALE AND SUPPORTING DATA FOR INCLUSION OF DUPLEX STAINLESS STEEL UNS S82441 (TYPE 2404) IN API 650 AND API 620 ANNEX X.		
Revision:	Rev. 2 in Red. Original API 620 Text in Black.		
Impact:	Alloy and specifications to be included in paragraphs: X.1.1 and X.2.3.1. Alloy and values to be included in tables: X.1, X.2a, X.2b, X3.a, X3.b, X.4a, X.4b, X.5a, and X.5b.		
Rationale:	The duplex stainless steel grade UNS S82441, 2404, is developed with the objective of filling the gap between duplex grades 2304 (S32304) and 2205 (S32205/S31803). The alloy is designed using leaner chemistry than 2205. Its corrosion resistance is significantly higher than Austenitic SS Type 316, approaching that of 2205. The mechanical strength of 2404 is higher than both 2304 and 2205, enabling shell thickness reduction of larger tanks.		
Current Document:	API 620 12th Edition, Annex X.		

Proposed Document:

X.1.1 This annex covers materials, design, fabrication, erection, and testing requirements for aboveground, welded, duplex stainless steel storage tanks constructed of material grades 2205 (UNS S31803), 2003 (UNS S32003), 2101 (UNS S32101), 2102 (UNS S82011), 2202 (UNS S32202), 2205 (UNS S32205), 2304 (UNS S32304), **2404 (UNS S82441)** 255 (UNS S32550), 255+ (UNS S32520), 2507 (UNS S32750), and Z100 (UNS S32760). This annex does not cover stainless steel clad plate or strip lined construction.

X.2.3.1 Tests for detecting detrimental intermetallic phases for ASTM A923 are required from one plate per heat treat lot as follows:

UNS S32205/S31803 Method B & C

UNS S82441 Method B & C

UNS S32003 Method B & C

UNS S32750 Method B & C

UNS S32550/S32520 Method B & C

UNS S32760 Method B & C

Table X.1 ASTM Materials for DSS Components

S82441

Plate & Structural

A240 X

A276 X

A554 X

Tube and Pipe S & W

A789 X

A790 X

A928 X

Forgings & Fit

A182

A815

Bolting and Bars

A479 X

A1082

Table X-2a—Allowable Stresses for Tank Shells (SI)

Alloy	Nominal Plate Thickness, <i>t</i>	Min Yld	Min Ten	Allowable Stress MPa for Design Temp Not Exceeding (<i>S_{ts}</i>)		
	mm	MPa	MPa	40 °C	90 °C	120 °C
S31803		450	620	186	186	183
S32003		450	655	197	174	168
S32101		450	650	194	176	172
S82011		450	655	196	194	187
S32202		450	650	196	194	187
S32205		450	655	197	176	172
S32304		400	600	180	174	168
S32550		550	760	228	227	221
S32520		550	770	232	203	201
S32750		550	795	240	239	232
S32760		550	750	223	203	199
S82441	<i>t</i> < 10	540	740	222	216	211
	<i>t</i> ≥ 10	480	680	204	198	193

NOTE 1 *S_{ts}* may be interpolated between temperatures.

NOTE 2 The design stress shall be the lesser of 0.3 of the minimum tensile strength or 0.6 of the minimum yield strength.

NOTE 3 For dual certified materials, S31803/S32205 and S32550/S32520, use the allowable stress of the grade specified by the purchaser.

NOTE 4 The hydrotest stress allowable shall be as shown in 5.5.7.

Table X-2b—Allowable Stresses for Tank Shells (USC)

Alloy	Nominal Plate Thickness, t	Min Yld	Min Ten	Allowable Stress lbf/in. ² for Design Temp Not Exceeding (S_{Ts})		
	in.	lbf/in. ²	lbf/in. ²	100 °F	200 °F	250 °F
S31803		65,000	90,000	27,000	27,000	26,500
S32003		65,000	95,000	28,500	25,200	24,400
S32101		65,000	94,000	28,200	25,500	24,900
S82011		65,000	95,000	28,500	28,100	27,150
S32202		65,000	94,000	28,500	28,300	27,300
S32205		65,000	95,000	28,500	25,500	25,000
S32304		58,000	87,000	26,100	25,200	24,400
S32550		80,000	110,000	33,000	32,900	32,000
S32520		80,000	112,000	33,600	29,400	29,100
S32750		80,000	116,000	34,800	34,700	33,700
S32760		80,000	108,000	32,400	29,400	28,800
S82441	$t < 0.4$ $t \geq 0.4$	78,000 70,000	107,000 99,000	32,200 29,600	31,200 28,700	30,600 28,100

NOTE 1 S_{Ts} may be interpolated between temperatures.

NOTE 2 The design stress shall be the lesser of 0.3 of the minimum tensile strength or 0.6 of the minimum yield strength.

NOTE 3 For dual certified materials, S31803/S32205 and S32550/S32520, use the allowable stress of the grade specified by the purchaser.

NOTE 4 The hydrotest stress allowable shall be as shown in 5.5.7.

Table X-3a—Yield Strength Values (SI)

Alloy	Nominal Plate Thickness, t	Yield Strength MPa for Design Temp Not Exceeding		
	mm	40 °C	90 °C	120 °C
S31803		450	396	383
S32003		450	386	369
S32101		450	379	365
S82011		450	385	367
S32202		448	377	355
S32205		450	358	348
S32304		400	343	331
S32550		550	484	464
S32520		550	448	434
S32750		550	486	466
S32760		550	455	441
S82441	$t < 10$ $t \geq 10$	497 441	423 376	395 352

NOTE 1 Interpolate between temperatures.

NOTE 2 Reference: Table Y-1 of ASME Section II, Part D, or manufacturer's data sheets.

Table X-3b—Yield Strength Values (USC)

Alloy	Nominal Plate Thickness, <i>t</i>	Yield Strength lbf/in. ² for Design Temp Not Exceeding		
	in.	100 °F	200 °F	250 °F
S31803		65,000	57,500	55,600
S32003		65,000	56,000	53,500
S32101		65,000	55,000	53,000
S82011		65,000	55,900	53,150
S32202		65,000	55,500	52,400
S32205		65,000	52,000	50,500
S32304		58,000	49,800	48,050
S32550		80,000	70,200	67,250
S32520		80,000	65,000	63,000
S32750		80,000	70,500	67,600
S32760		80,000	66,000	64,000
S82441	<i>t</i> < 0.4	73,000	60,700	57,900
	<i>t</i> ≥ 0.4	65,000	54,000	51,500

NOTE 1 Interpolate between temperatures.

NOTE 2 Reference: Table Y-1 of ASME Section II, Part D, or manufacturer's data sheets.

Table X-4a—Modulus of Elasticity at the Maximum Operating Temperature (SI)

Alloy	Modulus of Elasticity in MPa for Design Temp Not Exceeding		
	40 °C	90 °C	120 °C
S82441	201000	200000	198000

Table X-4b—Modulus of Elasticity at the Maximum Operating Temperature (USC)

Alloy	Modulus of Elasticity in lbf/in. ² for Design Temp Not Exceeding		
	100 °F	200 °F	250 °F
S82441	29.7	29.2	29.1

Table X-5a—Minimum and Maximum Hot Forming Temperatures and Minimum Soaking Temperature (SI)

Alloy	°C Max	°C Min	°C Min Soaking Temperature
S82441	1150	900	1000

Table X-5b—Minimum and Maximum Hot Forming Temperatures and Minimum Soaking Temperature (USC)

Alloy	°F Max	°F Min	°F Min Soaking Temperature
S82441	2100	1650	1830