Japanese design standards for stainless steel

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1. Scope

Design standards for stainless steel structures specified by JSSC (Japan Steel Structural Construction),

1) for general buildings structures in 1995,
Allowable stress design method except for heavy earthquake.
2) for light-weight structures in 2005,
Allowable stress design method, for thin plates under 6mm.
3) for civil structures,
now preparing a draft of design standards.

maybe introduced ?

Design standards for steel and composite structures, in which stainless steel is defined as a kind of structural steel, has published by JSCE(Japan Society of Civil Engineers).

2. Grade of Stainless Steel

1) for general buildings structures in 1995,
Austenitec stainless steel,
SUS304A, SUS304N2, and SUS316.

2) for light-weight structures in 2005,
Austenitec(SUS304A, SUS304N2, and SUS316),
Ferritec(SUS410L and SUS436L), and
Martensite(SUS436) stainless steel.

3) for civil structures now in preparing a draft,
Austenitec(SUS304A, SUS304N2, and SUS316),
Ferritec(SUS410L), and
Duplex stainless steel.
Selectable strength grade for corrosion circumstances.

3. Material Model

1) for general buildings structures in 1995

Material		$\sigma_{0.1}$		Tensile Strength	
		Symbol		Symbol	
Stainless Steel	SUS304A SUS316A SCS13AA-CF	F_y	235	F_u	520
	SUS304N2A		325		690
Bolts	A2–50	${}_fF_y$	210	${}_fF_u$	500
HT Bolts	F10T (10T-SUS)		900		1 000

2) for light-weight structures in 2005,

Spec.	Material	$\sigma_{0.1}$	Tensile Strength
JIS G 4321-00	SUS304A SUS316A	235	520
SSBS 151-04	BS-SUS304 BS-SUS316	235	520
	BS-SUS410L	235	360
	BS-SUS436L	235	410
	BS-SUS410S	235	410
	BS-SUS301L-3/4H	440	820

3) for civil structures now in preparing a draft of design standards.
(in planning)
0.1% proof stress? 0.2% proof stress?

4. Material Properties

1) for general buildings structures in 1995
2) for light-weight structures in 2005,

Material	Specific gravity	E (N/mm²)	G (N/mm²)	ν	Coefficient of linear expansion (1/℃)
SUS304A	7.93	1.93×10^{5}	0.74×10^{5}	0.3	17.3×10^{-6}
SUS316A	7.98	1.93×10^{5}	0.74×10^{5}	0.3	17.3×10^{-6}
BS-SUS410L	7.75	2.00×10^{5}	0.77×10^{5}	0.3	9.9×10^{-6}
BS-SUS436L	7.70	2.00×10^{5}	0.77×10^{5}	0.3	10.4×10^{-6}
BS-SUS410S	7.75	2.00×10^{5}	0.77×10^{5}	0.3	9.9×10^{-6}
BS-SUS301L-3/4H	7.93	1.93×10^{5}	0.74×10^{5}	0.3	17.3×10^{-6}

3) for civil structures now in preparing a draft of design standards.
(in planning)

5. Element Design

1) for general buildings structures in 1995

plate buckling is not allowable, and plastic design is applicable.

2) for light-weight structures in 2005,

same as design method for carbon steel, except for the plate with slenderness exceeding the limited value.

3) for civil structures now in preparing a draft of design standards.
(in planning, data already collected)

6. Column Design

1) for general buildings structures in 1995

$N_C = (2/3)\, N_F$, $\lambda_c \leqq 0.2$

$N_C = (2/3)(1.12 - 0.6\,\lambda_c)\, N_F$, $0.2 < \lambda_c \leqq 1.5$

$N_C = (1/3)\{1/(\lambda_c)^2\}\, N_F$, $0.2 < \lambda_c \leqq 1.5$

2) for light-weight structures in 2005,

same as design for carbon steel, except for the plate with slenderness exceeding the limited value.

3) for civil structures now in preparing a draft of design standards. (in planning)

7. Beam Design

1) for general buildings structures in 1995

bring two Japanese design standards.

2) for light-weight structures in 2005,

same as design for carbon steel, except for the plate with slenderness exceeding the limited value.

3) for civil structures now in preparing a draft of design standards.
(in planning)

8. Reliability Basis/Safety Factors

1) for general buildings sturctures in 1995
2) for light-weight structures in 2005,

Safety factor is equal to 1.5 against long-time loading.

3) for civil structures now in preparing a draft of design standards.
(in planning as limit state design method with partial safety factors, however, statistical data are necessary.)
maybe including the following components,
-how to select materials to achieve anti-corrosion performances,
-to prepare steel grade satisfied a combination of strength and corrosion resistance,
-easy replacement from carbon to stainless steel at the first step,
-concept of acceptable LCC/LCA,
-fatigue,
-fire resistance, etc.

I understand that CEN is necessary,

Collecting actual data of stainless steel specified by design standards,

Evaluating Corrosion data for structural engineer to choose suitable materials,

Necessary material strength for design standards.