

Table 6(A)
Allowable Ranges of Stress in Fatigue*

Category (see Table 6(b))	F_v (MPa)			
	For 100 000 cycles	For 500 000 cycles	For 2 000 000 cycles	Over 2 000 000 cycles
A	415	250	165	165
B	310	190	125	110
C	220	130	90	70†
D	185	110	70	48
E	145	85	55	32
F	110	65	40	18
W	115	85	65	48

*See Table 6(B) and Figure K2.

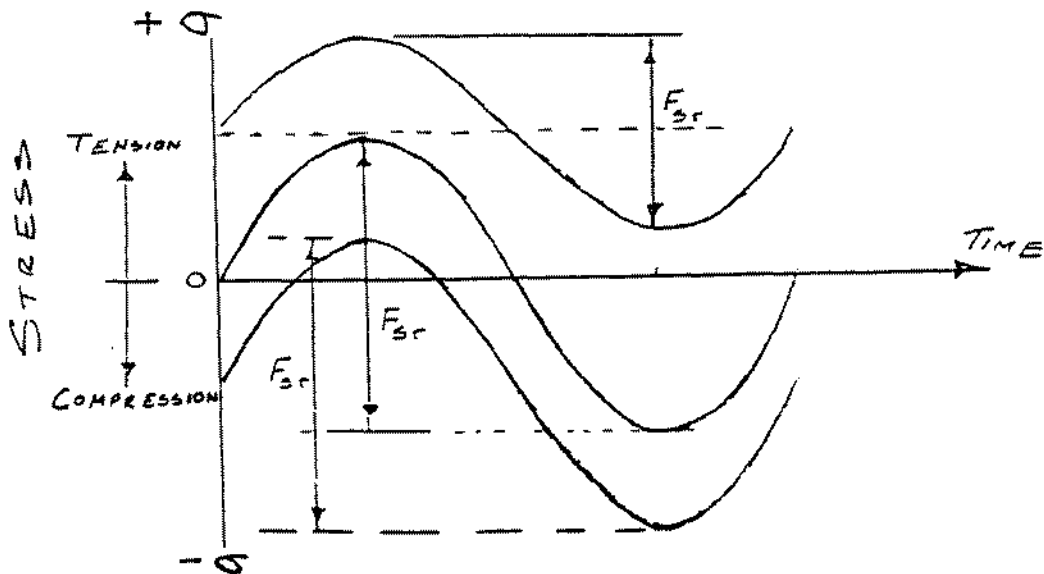
†Except for transverse stiffener welds on girder webs or flanges, where 83 MPa should be used.

ALLOWABLE STRESS RANGE:

$$F_{sr} = \sigma_{max} - \sigma_{min}$$

↑
↑
↑

Maximum Stress
Minimum Stress



Note: $F_{sr} = 0$ if $\sigma_{max} \leq 0$

Table 6(B)
Stress Range Categories for Various Applications

General condition	Situation		Stress range category (see Table 6(A))	Illustrative example (see Figure K2)
	S No.	Description		
Plain material	S1	Base metal with rolled or cleaned surfaces; flame cut edges with a surface roughness not exceeding 1000 (25 μm) as defined by CSA Standard B95	A	1, 2
Built-up members	S2	Base metal and weld metal in members without attachments, built-up of plates or shapes connected by continuous complete or partial penetration groove welds or by continuous fillet welds, parallel to the direction of applied stress	B	3, 4, 5
	S3	Base metal and weld metal along the length of horizontal stiffeners and cover plates connected by continuous complete or partial penetration groove welds or by continuous fillet welds parallel to the direction of applied stress	B	7
Built-up members	S4	Base metal at toe of transverse stiffener welds on girder webs or flanges subjected to calculated flexural stress	C	6
	S5	Base metal at end of longitudinal stiffeners	E	7
	S6	Base metal at end of partial length welded cover plates narrower than the flange, having square or tapered ends, with or without welds across the ends Flange thickness ≤ 20 mm Flange thickness > 20 mm	E	7
			F	
S7	Base metal at end of partial length cover plates wider than the flange having square ends with welds across the ends Flange thickness ≤ 20 mm Flange thickness > 20 mm	E F	7	
Complete joint penetration grooves	S8	Base metal and weld metal at complete penetration groove welded splices of rolled and welded sections having similar profiles when welds are ground flush and weld soundness established by nondestructive examination*	B	8, 9
	S9	Base metal and weld metal in or adjacent to complete penetration groove welded splices at transitions in width or thickness, with welds ground to provide slopes no steeper than 4 in 10 with grinding in the direction of applied stress, and weld soundness established by nondestructive examination.* A 600 mm curved radius transition shall be used for G40.21M-700Q and 700QT steel	B	10, 11

(Continued)

Table 6(B) (Continued)

General condition	Situation		Stress range category (see Table 6(A))	Illustrative example (see Figure K2)
	S No.	Description		
	S10	Base metal and weld metal in or adjacent to complete penetration groove welded splices, involving equal widths and/or thicknesses of material or involving transitions having slopes no greater than 4 in 10 when in either case, reinforcement is not removed and weld soundness is established by nondestructive examination*	C	8, 9, 10, 11
	S11	Base metal at details attached to flanges or webs by groove welds subjected to transverse or longitudinal loading—regardless of detail length, except for conditions as covered by Note (1) in tabulation for Example 12—the stress range categories shall be as shown in Figure K2 in the tabulation for the same Example. Besides being dependent on transition radius, the stress range categories, in the case of flange connections subject to transverse loading, are also a function of relative thickness of material and whether or not groove weld reinforcement is removed	See tabulation in Example 12 and Figure K2	12
Fillet welded connections	S12	Base metal at intermittent fillet welds	E	
	S13	Base metal adjacent to fillet welded attachments where the length, L, of the attachment in direction of stress is less than 50 mm and stud-type shear connectors	C	6, 13, 14, 15
	S14	Base metal at details attached by fillet welds subjected to longitudinal loading only when the detail length, L, in direction of stress is between 50 mm and 12 times the plate thickness, but less than 100 mm and the transition radius R is less than 50 mm	D	14
	S15	For base metals at details attached to webs by fillet welds subjected to transverse and/or longitudinal loading regardless of detail length the stress range categories shall be as shown in Figure K2 in the tabulation for the same. Example: Shear stress on the throat of fillet welds shall be governed by stress range category "W"	See tabulation in Example 12 and Figure K2	12

Table 6(B) (Concluded)

General condition	Situation		Stress range category (see Table 6(A))	Illustrative example (see Figure K2)
	S No.	Description		
Fillet welded connections	S16	Except for cover plates (S6 and S7) and details attached to webs (S15), base metal at end of details 100 mm or longer attached by fillet welds where the length of weld is in the direction of stress	E	16
Fillet welds	S17	Shear stress on throat of fillet welds	W	16
Stud type shear connectors	S18	Shear stress on the nominal area of stud shear connectors	W	13
Mechanically fastened connections	S19	Base metal at gross section of high strength bolted slip resistant connections, except axially loaded joints which induce out-of-plane bending in connected material	B	17
	S20	Base metal at net section of high strength bolted bearing type connections	B	17
	S21	Base metal at net section of bolted connections, other than high strength bearing type	D	17

* For methods of nondestructive examination see CSA Standard W59.

Appendix K

Fatigue

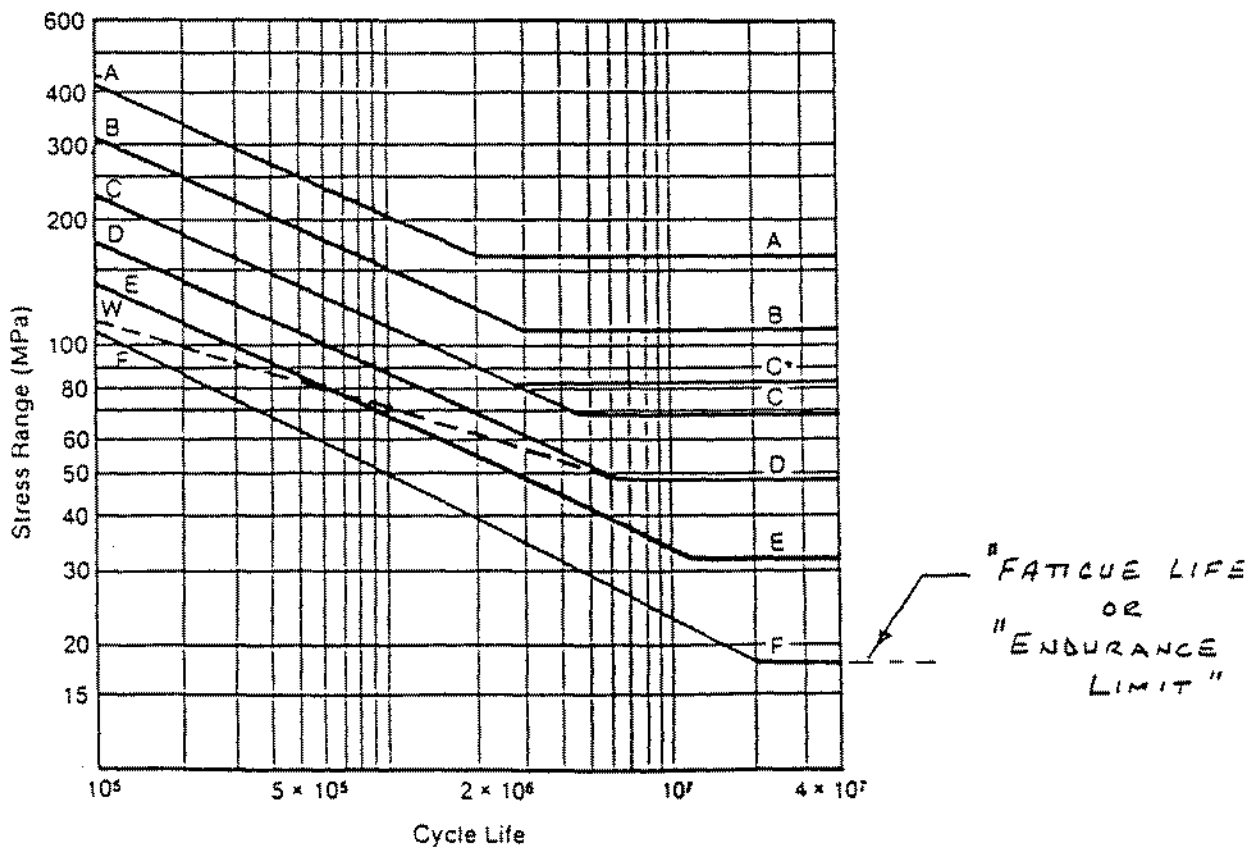
Note: This Appendix is not a mandatory part of this Standard.

K1.

Figure K1 is a plot of the design curves for the allowable stress range for categories A to W in Tables 6(A) and (B).

K2.

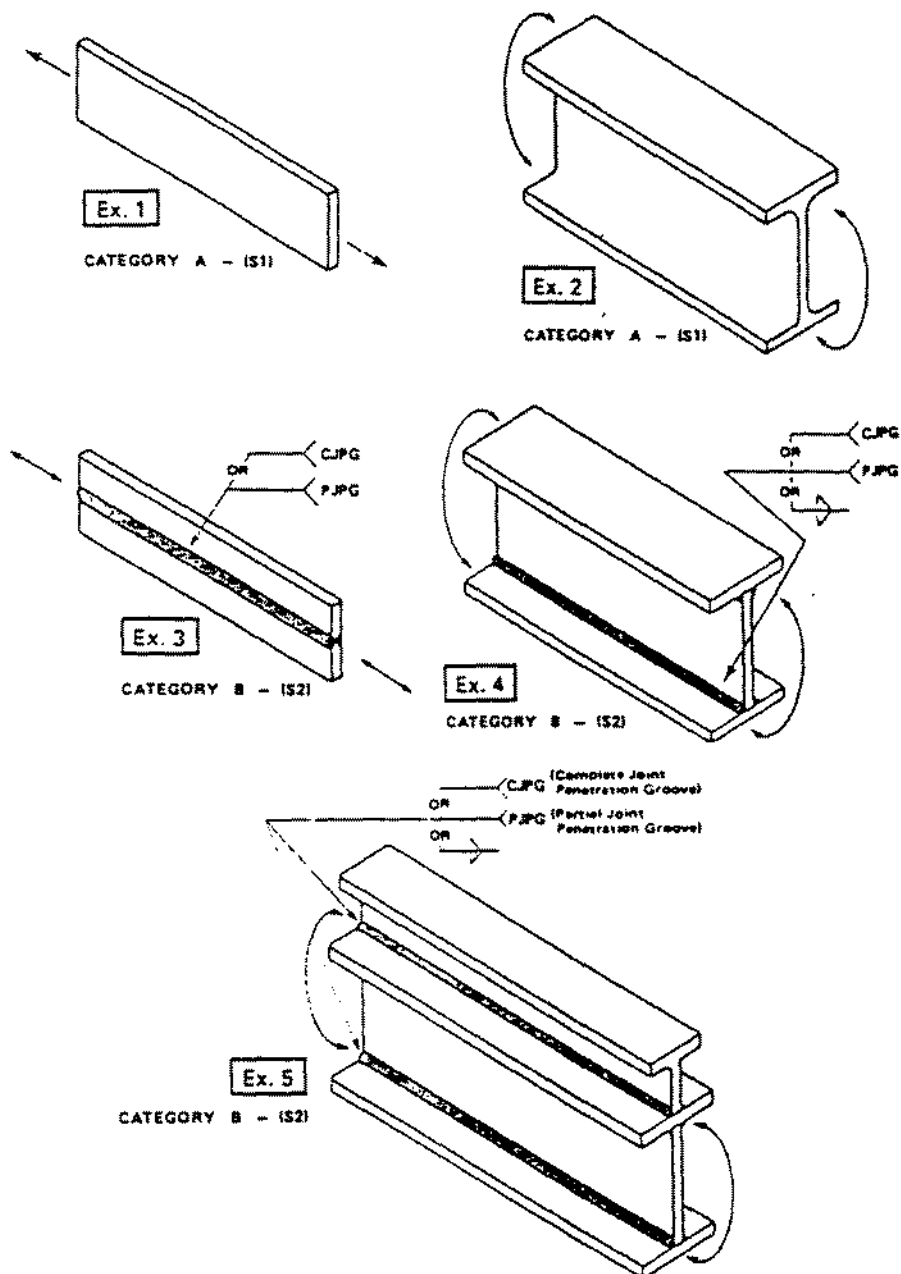
Figure K2 gives illustrative examples of the various fatigue categories described in Table 6(B).



* Except for transverse stiffener welds on girder webs or flanges where 83 MPa should be used.

Figure K1
Design Curves for the Allowable Stress
Range for Categories A to W

Appendix K—Figure K2

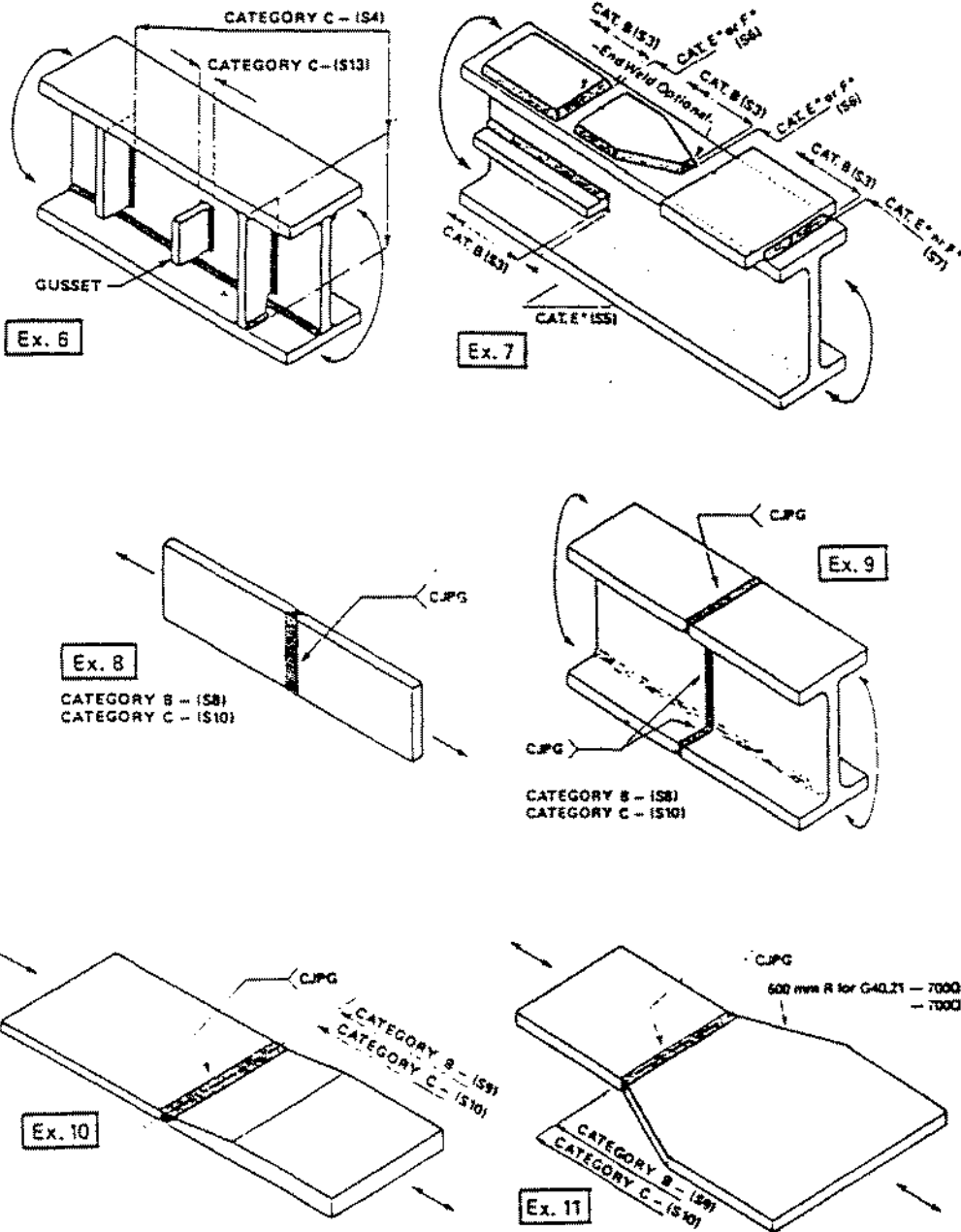


Note: The numbers below each Figure are referenced in Table 6(B).

Figure K2
Illustrative Examples of Various Details
Representing Stress Range Categories

CAN3-S16.1-M84
December, 1984

Appendix K—Figure K2

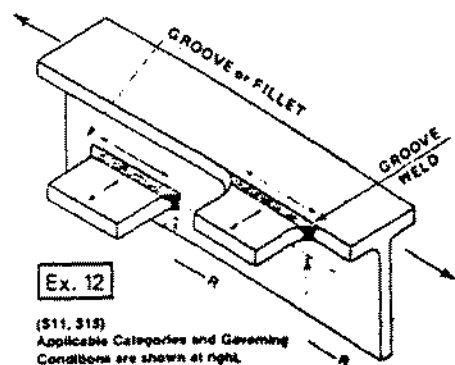


Note: The numbers below each Figure are referenced in Table 6(B).

Figure K2 (Continued)

Steel Structures for Buildings (Limit States Design)
December, 1984

Appendix K—Figure K2

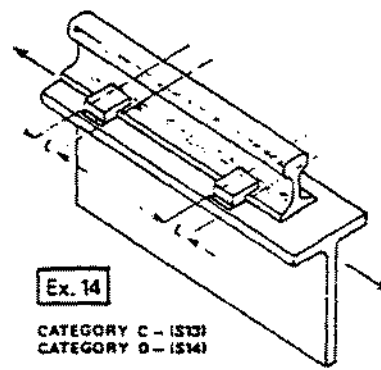
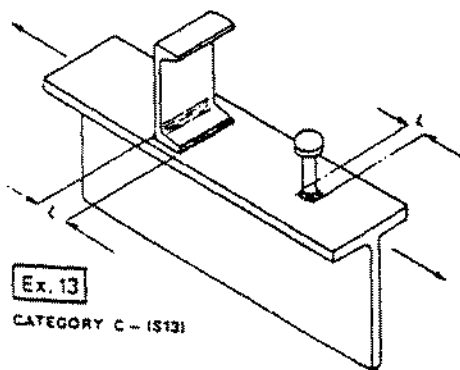


Ex. 12

(S11, S15)
Applicable Categories and Governing Conditions are shown at right.

TRANSITION RADIUS "R"	Fillet Connections	Groove Connections			Stress Range Category based on Condition of Joint (2)
	To Web	To Web or to Flange	To Web (3)	To Flange (3)	
			Longitudinal Loading/Transverse Loading	Longitudinal Loading	
	Stress Range Category				
50 mm > R ≥ 0 mm	E	E (1)	E	E E E	
50 mm > R ≥ 50 mm (4)	D	D	D	D D E	
500 mm > R ≥ 150 mm (4)	D	C	C	C C E	
R ≥ 600 mm (4)	D	B	C	B C E	

- (1) For longitudinal loading only, use Category D if axial length is between 50 mm and 12 times the chord thickness, but less than 100 mm.
- (2) Condition of Joint:
 - (1) Equal thickness of parts joined — reinforcement removed.
 - (2) Equal thickness of parts joined — reinforcement not removed.
 - (3) Unequal thickness of parts joined — reinforcement removed.
 - (4) Unequal thickness of parts joined — reinforcement not removed.
- (3) Weld soundness to be established by nondestructive examination.
- (4) Terminal ends of welded joints to be ground smooth.



Note: The numbers below each Figure are referenced in Table 6(B).

Figure K2 (Continued)

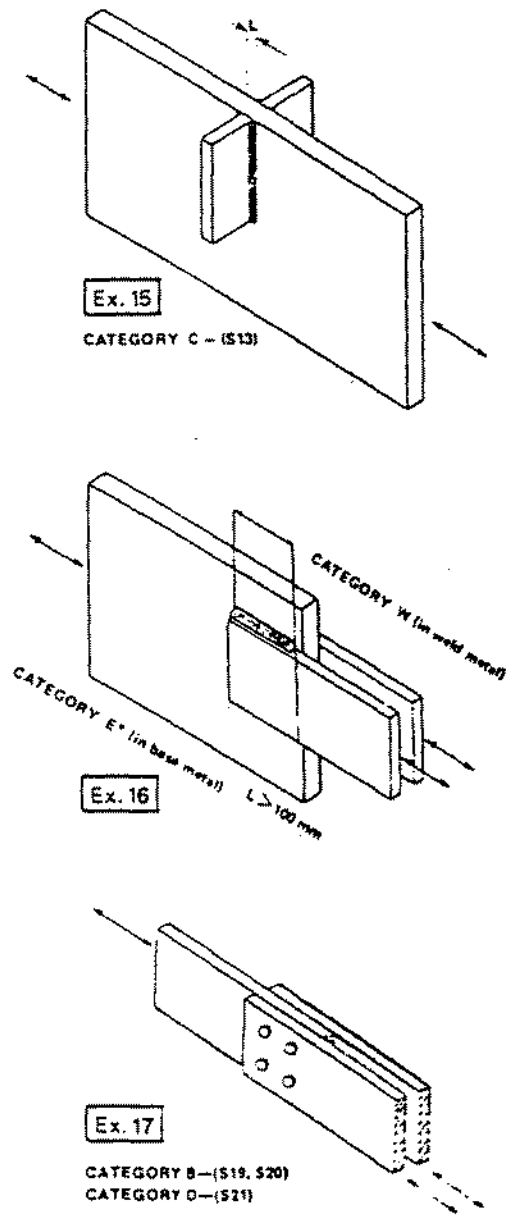


Figure K2 (Concluded)

Note: The numbers below each Figure are referenced in Table 6(B).