

## Simply supported laterally unrestrained beam

### Access Steel Document SX001a-EN-EU

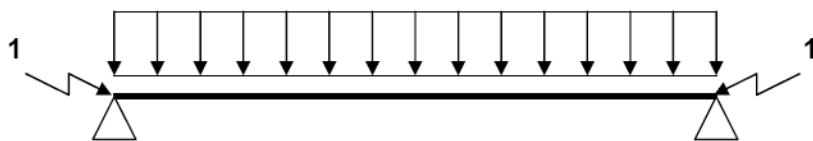
Scia Engineer Version 10.0.86

#### Introduction

This benchmark concerns the example *SX001a-EN-EU Simply supported laterally unrestrained beam* of *Access Steel*, <http://www.access-steel.com/>, 2004.

This example gives the details for the verification of a simple non-composite beam under uniform loading. The beam is laterally restrained at the supports only.

The loading is acting at the top flange (destabilizing). For Lateral Torsional Buckling the 'Rolled Sections or Equivalent Welded' case is used.



1 : Lateral restraint

#### Reference Results

The reference gives following results:

Classification		
Flanges	$c/t_f$	5,07
	Class 1 limit	9,0
⇒ Flanges Class 1		
Web	$c/t_w$	36,1
	Class 1 limit	72,00
⇒ Web Class 1		

Bending resistance	
$M_{c,y,Rd}$	189,01 kNm

Shear resistance	
$A_{v,z}$	3080 mm <sup>2</sup>
$V_{pl,z,Rd}$	417,9 kN
Shear buckling does not need to be considered	

Member Buckling resistance in bending (Rolled)	
C1	1,127
C2	0,454
$M_{cr}$	113,9 kNm
red $\lambda_{LT}$	1,288
$\alpha_{LT}$	0,49
$\chi_{LT}$	0,48
$k_c$	0,94
$f$	0,984
$\chi_{LT,mod}$	0,488
$M_{b,Rd}$	92,24 kNm

## Scia Engineer Results

Width-to-thickness ratio for internal compression parts (EN 1993-1-1 : Tab.5.2. sheet 1).  
ratio 36.13 on position 0.57 m

ratio		
maximum ratio	1	72.00
maximum ratio	2	83.00
maximum ratio	3	124.00

==> Class cross-section 1

Width-to-thickness ratio for outstand flanges (EN 1993-1-1 : Tab.5.2. sheet 2).  
ratio 5.07 on position 0.57 m

ratio		
maximum ratio	1	9.00
maximum ratio	2	10.00
maximum ratio	3	13.77

==> Class cross-section 1

### Shear check (Vz)

according to article EN 1993-1-1 : 6.2.6. and formula EN 1993-1-1 : (6.17)

Table of values		
Vc,Rd	417.92	kN
unity check	0.15	

### Bending moment check (My)

according to article EN 1993-1-1 : 6.2.5. and formula EN 1993-1-1 : (6.12)  
Section classification is 1.

Table of values		
Mc,Rd	189.01	kNm
unity check	0.48	

### LTB check

according to article EN 1993-1-1 : 6.3.2.1. and formula EN 1993-1-1 : (6.54)

Table of values		
Mb,Rd	92.53	kNm
Wy	804300.00	mm <sup>3</sup>
reduction	0.48	
correction factor kc	0.94	
correction factor f	0.98	
modified reduction	0.49	
Beta	0.75	
reference slenderness	0.40	
imperfection	0.49	
reduced slenderness	1.29	
method for LTB curve	Art. 6.3.2.3.	
Mcr	114.43	kNm
unity check	0.98	

LTB		
LTB length	5.70	m
k	1.00	
kw	1.00	
C1	1.13	
C2	0.45	
C3	0.53	

negative influence of load position

## Comments

The results correspond to the benchmark results.