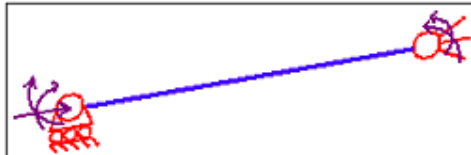


TEST SCHEDULE B 35	EN 1993-1-1: 2005 (EUROCODE 3)	Sargon ©, Cescoplus ©
BUCKLING	COMPRESSION + BENDING 2 + BENDING 3	EC3.BUC.NNM2M3.001



Program: WEURO © version October 2007 for Sargon and Cescoplus
Keywords: EN 1993, Eurocode 3, example, validation, benchmark, reliability, quality control, error measure. **Parole chiave:** Eurocodice 3, esempio, validazione, test ,affidabilità, controllo di qualità, misura dell'errore
Tv=exploitation target value, **Cv**=exploitation computed value
Authors: Ing. Marco Croci, Ing. Paolo Rugarli

BEAM			
Length [mm]	Buckling factors	Left end	Right end
1000	$\beta_1=0 \quad \beta_2=1 \quad \beta_3=1$	FREE	FIXED

LOAD			
Type	Value	Point of application	
COMPRESSION	N=100.000N	LEFT END	
Type	Value	Point of application	
BENDING MOMENT M_2	M=2.000.000Nmm	LEFT END	
BENDING MOMENT M_2	M=-2.000.000Nmm	RIGHT END	
Type	Value	Point of application	
BENDING MOMENT M_3	M=3.000.000Nmm	LEFT END	
BENDING MOMENT M_3	M=-3.000.000Nmm	RIGHT END	

MATERIAL	S235					
f_y [N/mm ²]	f_u [N/mm ²]	E [N/mm ²]	ν	γ_{M0}	γ_{M1}	γ_{M2}
235	360	2,10E+05	0,3	1,1	1,1	1,25

CROSS-SECTION	HE 200 B	CLASS: N ⁻ → 1 M ₂ → 1 M ₃ → 1 N ⁻ + M ₂ + M ₃ → 1 (reclasses method****)			
A [mm ²]	J ₂ [mm ⁴]	J ₃ [mm ⁴]	J _t [mm ⁴]	W ₂ [mm ³]	W ₃ [mm ³]
7808	5,696e+07	2,003e+07	5,928e+05	5,696e+05	2,003e+05
W _{pl2} [mm ³]	W _{pl3} [mm ³]	i ₂ [mm]	i ₃ [mm]	i _t [mm]	
6,426e+05	3,058e+05	85,40	50,70	57,74	
h	b	t _w	t _f	r	
200	200	9	15	18	

OTHER DATA*				
	k_{yy}	k_{yz}	k_{zy}	k_{zz}
Method 1	0,989	0,656	0,514	0,954
Method 2	0,995	0,593	0,597	0,989

TARGET VALUES BASED ON PRELIMINAR COMPUTATIONS

$$\begin{aligned}
 Tv_{1,j} &= N / (\chi_2 A f_y / \gamma_{M1}) + k_{yy} M_2 / (W_{pl2} f_y / \gamma_{M1}) + k_{yz} M_3 / (W_{pl3} f_y / \gamma_{M1}) \\
 Tv_{2,j} &= N / (\chi_3 A f_y / \gamma_{M1}) + k_{zy} M_2 / (W_{pl2} f_y / \gamma_{M1}) + k_{zz} M_3 / (W_{pl3} f_y / \gamma_{M1})
 \end{aligned}
 \quad \left. \vphantom{\begin{aligned} Tv_{1,j} \\ Tv_{2,j} \end{aligned}} \right\} Tv_{method\ j} = \max(Tv_{1,j}, Tv_{2,j})$$

Tv _{method1} **	Tv _{method2} ***
1,115E-01	1,144E-01

CHECKER'S RESULTS (COMPUTED VALUES) AND COMPARISON WITH THE TARGET

Cv _{method1}	(Cv ₁ -Tv ₁)/Tv ₁	Cv _{method2}	(Cv ₂ -Tv ₂)/Tv ₂
1,115E-01	-3,329E-04	1,144E-01	1,726E-04

(*) formulae given in EN 1993-1-1 6.3.3, annex A and annex B

(**) more accurated

(***) easier to use

(****) P. Rugarli, *Strutture in acciaio, La classificazione delle sezioni, Commento all'Eurocodice 3*, EPC Libri, 2007