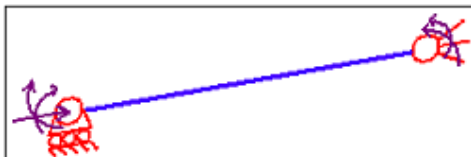


TEST SCHEDULE B 36	EN 1993-1-1: 2005 (EUROCODE 3)	Sargon ©, Cescoplus ©
BUCKLING	COMPRESSION + BENDING 2 + BENDING 3	EC3.BUC.NNM2M3.002



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
4500	$\beta_1=0 \quad \beta_2=1 \quad \beta_3=1$	SIMPLY SUPPORTED	HINGE

LOAD			
Type	Value	Point of application	
COMPRESSION	N=300.000N	LEFT END	
Type	Value	Point of application	
BENDING MOMENT M_2	M=40.000.000Nmm	LEFT END	
BENDING MOMENT M_2	M=-40.000.000Nmm	RIGHT END	
Type	Value	Point of application	
BENDING MOMENT M_3	M=10.000.000Nmm	LEFT END	
BENDING MOMENT M_3	M=-10.000.000Nmm	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 240 A	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]
7684	7,763E+07	2,769E+07	4,155E+05	6,751E+05	2,307E+05
W _{pl2} [mm ³]	W _{pl3} [mm ³]	i ₂ [mm]	i ₃ [mm]	i _t [mm]	
7,446E+05	3,517E+05	100,5	60	69,28	
h	b	t _w	t _f	r	
230	240	7,5	12	21	

OTHER DATA*				
	k_{yy}	k_{yz}	k_{zy}	k_{zz}
Method 1	1,047	0,747	0,556	1,065
Method 2	1,057	0,765	0,634	1,275

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} ***
5,670E-01	6,047E-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
5,670E-01	0,000E+00	6,047E-01	-1,956E-05

(*) 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

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