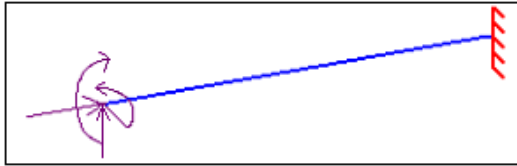


TEST SCHEDULE R 49	EN 1993-1-1: 2005 (EUROCODE 3)	Sargon ©, Cescoplus ©
RESISTANCE	COMPRESSION+BENDING2 AND 3+ SHEAR2 AND 3	EC3.RES.NNM2M3T2T3.003



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]	Left end	Right end
5000	FREE	FIXED

LOADS			
Type	Value	Point of application	
BENDING MOMENT M_2	$M=100.000.000\text{Nmm}$	LEFT END	
BENDING MOMENT M_3	$M=10.000.000\text{Nmm}$	LEFT END	
COMPRESSION	$N=900.000\text{N}$	LEFT END	
SHEAR T_2	$T=300.000\text{N}$	LEFT END	
SHEAR T_3	$T=250.000\text{N}$	LEFT 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	IPE 360	CLASS: N⁻ →2 M₂ →1 M₃ →2 N⁻ + M₂ + M₃ →2 (reclasses metod**)			
A [mm ²]	J_2 [mm ⁴]	J_3 [mm ⁴]	J_1 [mm ⁴]	W_2 [mm ³]	W_3 [mm ³]
7273	1,627E+08	1,043E+07	3,732E+05	9,037E+05	1,228E+05
W_{pl2} [mm ³]	W_{pl3}	i_2 [mm]	i_3 [mm]	i_1 [mm]	
1,019E+06	1,911E+05	149,5	37,9	49,07	
h	b	t_w	t_f	r	
360	170	8	12,7	18	

OTHER DATA					
$N_{pl}=A f_y/\gamma_{M0}$ [N]		$M_{pl2}=W_{pl2} * f_y/\gamma_{M0}$ [Nmm]	$M_{pl3}=W_{pl3} * f_y/\gamma_{M0}$ [Nmm]	$A_{v2}=2b t_f$ [mm ²]	
1.553.777		217.695.455	40.825.909	4.318	
$A_{v3}=A-2b t_f+(t_w+2r) t_f$ [mm ²]		$V_{pl2}=A_{v2} * (f_y / \sqrt{3}) /\gamma_{M0}$ [N]	$V_{pl3}=A_{v3} * (f_y / \sqrt{3}) /\gamma_{M0}$ [N]	ρ_2	ρ_3
3.513,8		532.600	433.400	1,602E-02	2,361E-02
a_{v2}	a_{v3}	$N_{pl.V}=N_{pl} (1-\rho_2 a_{v2}-\rho_3 a_{v3})$ [N]	$n_V=N/N_{pl.V}$	$a=(A-2b t_f)/A$	
0,594	0,483	1.521.276	0,592	0,406	
$M_{N2}=M_{pl}(1-n)/(1-0,5a)$ [Nmm]		$M_{N3}=M_{pl}[1-((n-a)/(1-a))^2]$ [Nmm]	$W_{2,2}$	$W_{2,3}$	
111.549.458		36.839.702	0,736	0,358	
$W_{3,2}$		$W_{3,3}$	$M_{NV2}=M_{N2}*(1-w_{2,2}\rho_2-w_{2,3}\rho_3)$	$M_{NV3}=M_{N3}*(1-w_{3,2}\rho_2- w_{3,3}\rho_3)$	
0,960		0,072	109.292.571	36.210.455	

TARGET VALUES BASED ON PRELIMINAR COMPUTATIONS

$$T_v=(M_2/M_{NV2})^\alpha+(M_3/M_{NV3})^\beta \quad \text{with } \alpha=2, \beta=5n_V=2,958$$

T_v
8,594E-01

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

C_v	$(C_v-T_v)/T_v$
8,588E-01	-7,098E-04

(*) length is only 1mm in order to diminish the increase of moment along the beam

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