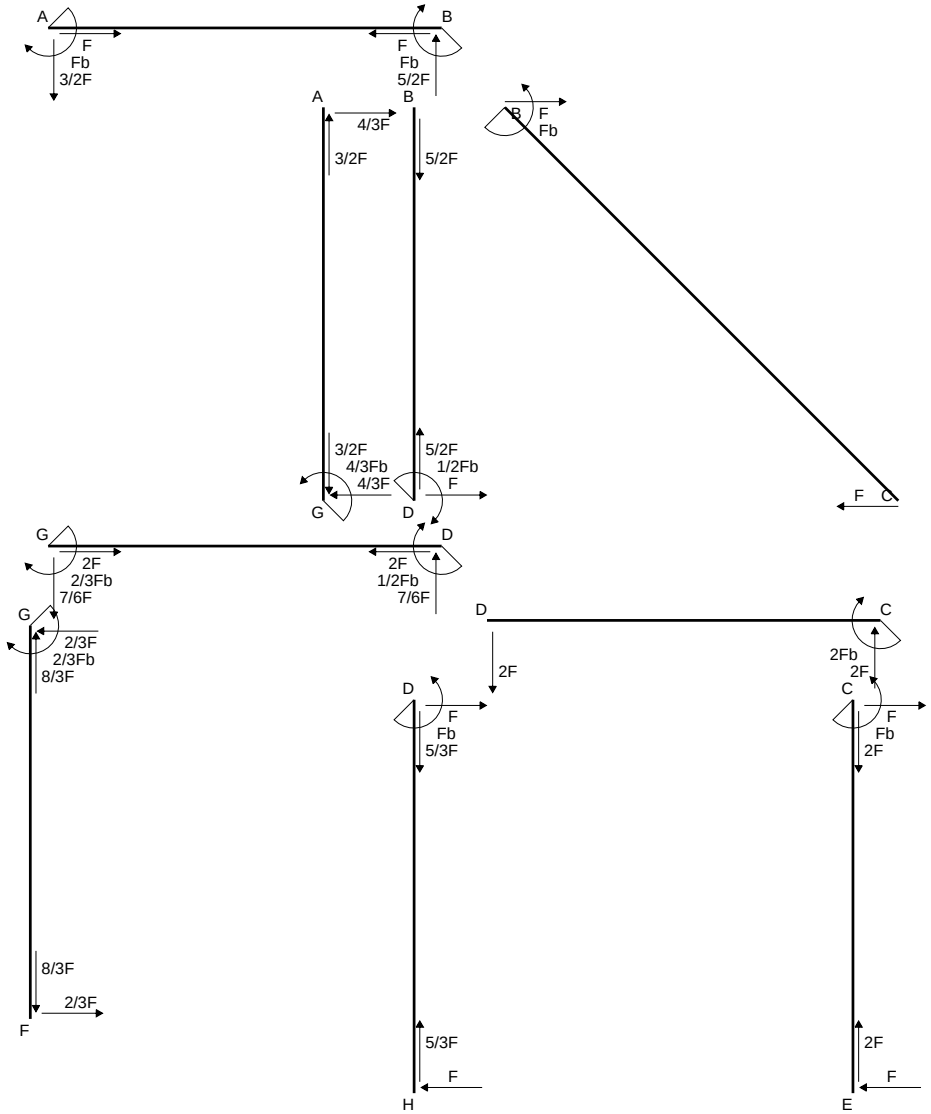
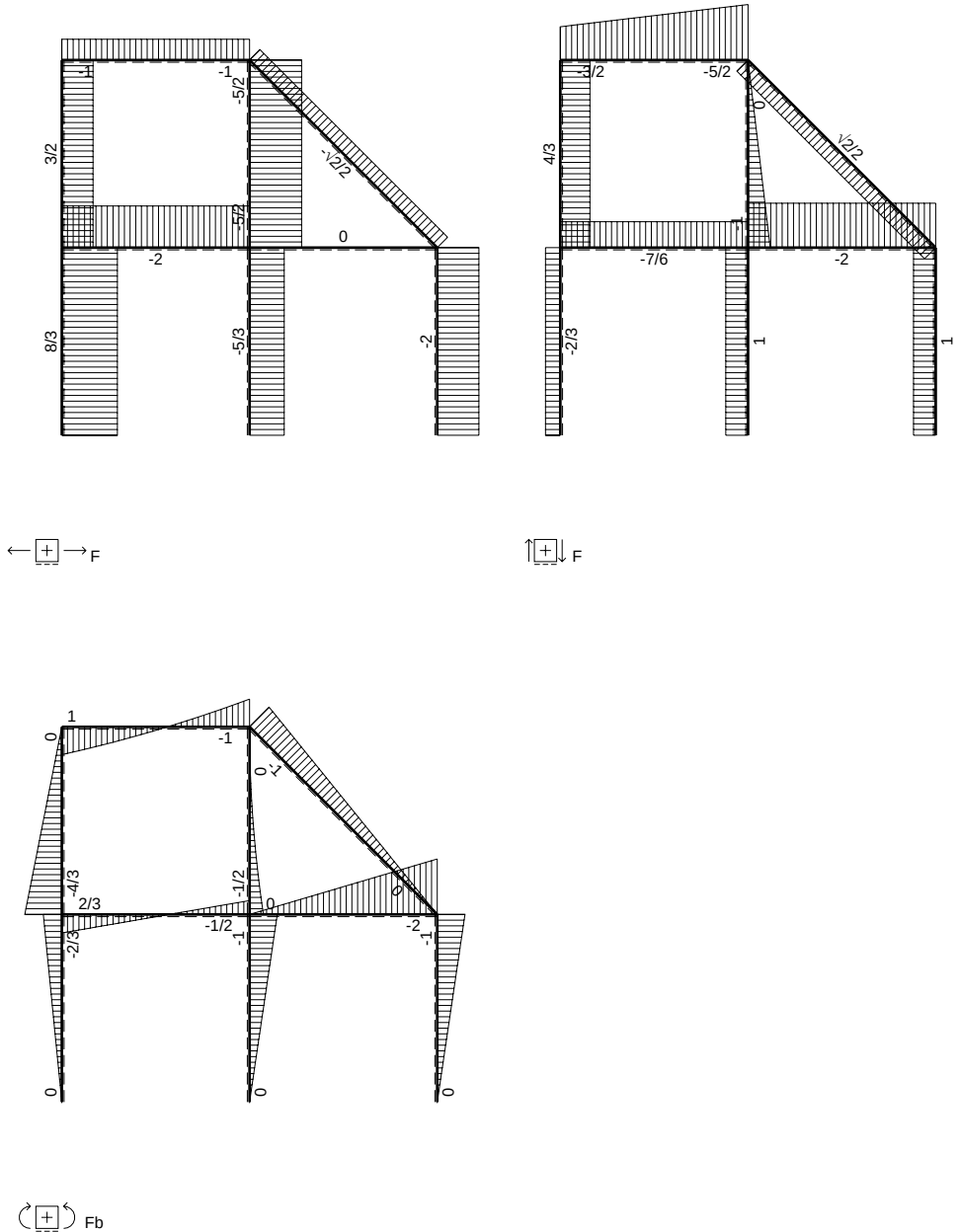
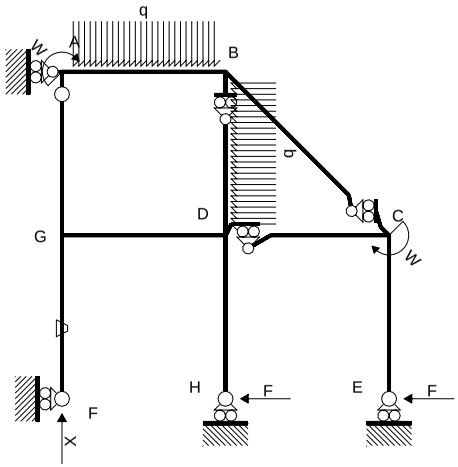
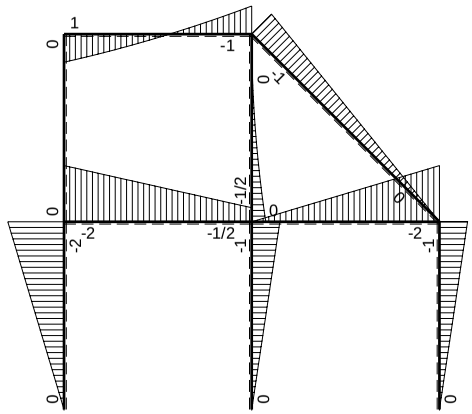

A
B
F
Fb
3/2F
5/2F
4/3F
G
D
2F
2/3Fb
7/6F
1/2Fb
2/3F
8/3F
5/3F
C
2Fb
H
E

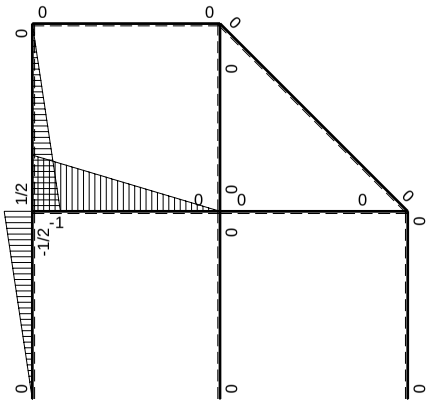

F
Fb



Schema di calcolo iperstatico



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

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Quadro contributi PLV per iperstatica $X=V_F$

→	$M_x(x)$	$M_o(x)$	θ	M_xM_o	$M_x\theta$	M_xM_x	$\int M_x(M_o/EJ+\theta)dx$	$\int XM_xM_x/EJdx$
AB b	0	$Fb-3/2Fx-1/2qx^2$	0	0	0	0	0+0	0
BA b	0	$Fb-5/2Fx+1/2qx^2$	0	0	0	0		
BC $\sqrt{2}b$	0	$-Fb+\sqrt{2}/2Fx$	0	0	0	0	0	0
BD b	0	$-1/2qx^2$	0	0	0	0	0+0	0
DB b	0	$1/2Fb-Fx+1/2qx^2$	0	0	0	0		
DC b	0	-2Fx	0	0	0	0	0+0	0
CD b	0	2Fb-2Fx	0	0	0	0		
CE b	0	-Fb+Fx	0	0	0	0	0+0	0
EC b	0	Fx	0	0	0	0		
FG b	-1/2x	-2Fx	-Fb/EJ	Fx^2	1/2Fxb/EJ	$1/4x^2$	$(1/3+1/4)Fb^3/EJ$	$1/12Xb^3/EJ$
GF b	1/2b-1/2x	2Fb-2Fx	Fb/EJ	$Fb^2-2Fbx+Fx^2$	$1/2Fb^2/EJ-1/2Fxb/EJ$	$1/4b^2-1/2bx+1/4x^2$		
GD b	-b+x	$-2Fb+3/2Fx$	0	$2Fb^2-7/2Fbx+3/2Fx^2$	0	$b^2-2bx+x^2$	$(3/4+0)Fb^3/EJ$	$1/3Xb^3/EJ$
DG b	x	$1/2Fb+3/2Fx$	0	$1/2Fbx+3/2Fx^2$	0	x^2		
DH b	0	-Fb+Fx	0	0	0	0	0+0	0
HD b	0	Fx	0	0	0	0		
GA b	1/2b-1/2x	0	0	0	0	$1/4b^2-1/2bx+1/4x^2$	0+0	$1/12Xb^3/EJ$
AG b	-1/2x	0	0	0	0	$1/4x^2$		
	totali						$4/3Fb^3/EJ$	$1/2Xb^3/EJ$
	iperstatica $X=V_F$						-8/3F	

Sviluppi di calcolo iperstatica

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$L^{XX}_{FG} = \int_o^b (1/4\ x^2/b^2)\ b^2\ 1/EJ\ dx = [1/12\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/12\ b)\ b^2\ 1/EJ = 1/12\ b^3/EJ$

$L^{XX}_{GF} = \int_o^b (1/4 - 1/2\ x/b + 1/4\ x^2/b^2)\ b^2\ 1/EJ\ dx = [1/4\ x - 1/4\ x^2/b + 1/12\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/4\ b - 1/4\ b + 1/12\ b)\ b^2\ 1/EJ = 1/12\ b^3/EJ$

$L^{XX}_{GD} = \int_o^b (1 - 2\ x/b + x^2/b^2)\ b^2\ 1/EJ\ dx = [\ x - x^2/b + 1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (\ b - b + 1/3\ b)\ b^2\ 1/EJ = 1/3\ b^3/EJ$

$L^{XX}_{DG} = \int_o^b (\ x^2/b^2)\ b^2\ 1/EJ\ dx = [1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/3\ b)\ b^2\ 1/EJ = 1/3\ b^3/EJ$

$L^{XX}_{GA} = \int_o^b (1/4 - 1/2\ x/b + 1/4\ x^2/b^2)\ b^2\ 1/EJ\ dx = [1/4\ x - 1/4\ x^2/b + 1/12\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/4\ b - 1/4\ b + 1/12\ b)\ b^2\ 1/EJ = 1/12\ b^3/EJ$

$L^{XX}_{AG} = \int_o^b (1/4\ x^2/b^2)\ b^2\ 1/EJ\ dx = [1/12\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/12\ b)\ b^2\ 1/EJ = 1/12\ b^3/EJ$

$L^{Xo}_{FG} = \int_o^b (\ x^2/b^2)\ Fb^2\ 1/EJ\ dx + \int_o^b (1/2\ x/b)\ \theta\ dx = [1/3\ x^3/b^2]_o^b\ Fb^2\ 1/EJ + [1/4\ x^2/b]_o^b\ \theta$

$= (1/3\ b)\ Fb^2\ 1/EJ + (1/4\ b)\ \theta = 7/12\ Fb^3/EJ$

$L^{Xo}_{GF} = \int_o^b (1 - 2\ x/b + x^2/b^2)\ Fb^2\ 1/EJ\ dx + \int_o^b (-1/2 + 1/2\ x/b)\ \theta\ dx$

$= [\ x - x^2/b + 1/3\ x^3/b^2]_o^b\ Fb^2\ 1/EJ + [-1/2\ x + 1/4\ x^2/b]_o^b\ \theta$

$= (\ b - b + 1/3\ b)\ Fb^2\ 1/EJ + (-1/2\ b + 1/4\ b)\ \theta = 7/12\ Fb^3/EJ$

$L^{Xo}_{GD} = \int_o^b (2 - 7/2\ x/b + 3/2\ x^2/b^2)\ Fb^2\ 1/EJ\ dx = [2\ x - 7/4\ x^2/b + 1/2\ x^3/b^2]_o^b\ Fb^2\ 1/EJ$

$= (2\ b - 7/4\ b + 1/2\ b)\ Fb^2\ 1/EJ = 3/4\ Fb^3/EJ$

$L^{Xo}_{DG} = \int_o^b (1/2\ x/b + 3/2\ x^2/b^2)\ Fb^2\ 1/EJ\ dx = [1/4\ x^2/b + 1/2\ x^3/b^2]_o^b\ Fb^2\ 1/EJ$

$= (1/4\ b + 1/2\ b)\ Fb^2\ 1/EJ = 3/4\ Fb^3/EJ$

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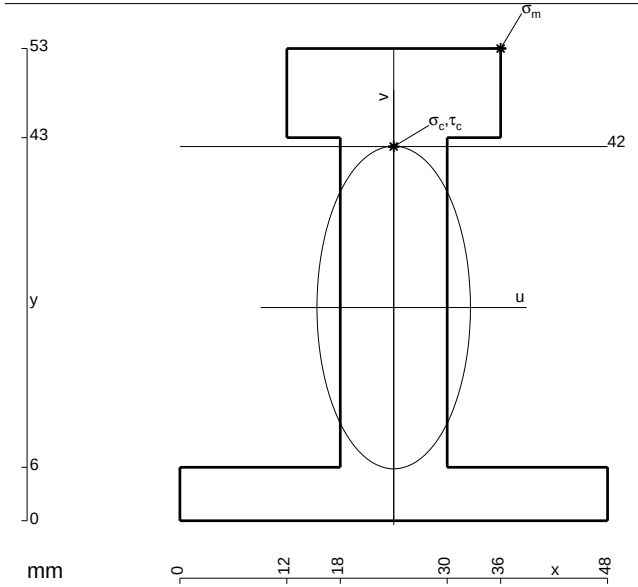

A = 972. mm^2
J_u = 318872. mm^4
J_v = 72144. mm^4
y_g = 23.93 mm
T_y = -2860. N
M_x = -2288000. Nmm
x_m = 36. mm
y_m = 53. mm
u_m = 12. mm
v_m = 29.07 mm
$\sigma_m = -Mv/J_u$ = 208.6 N/mm^2
x_c = 24. mm
y_c = 42. mm
v_c = 18.07 mm
$\sigma_c = -Mv/J_u$ = 129.6 N/mm^2
τ_c = 4.484 N/mm^2
$\sigma_o = \sqrt{\sigma^2 + 3\tau^2}$ = 129.9 N/mm^2
S^* = 5999. mm^3

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