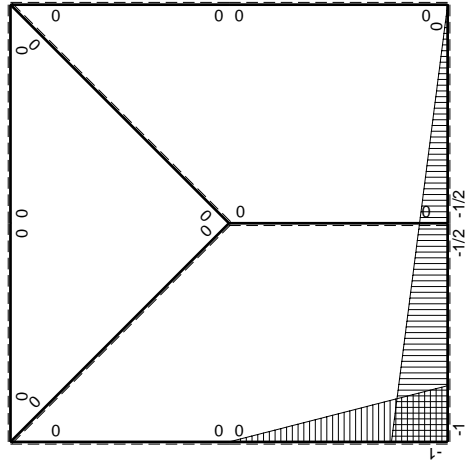


M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	$-Fb/EJ$	$-1/4Fx+1/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/12+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	Fb/EJ	$-1/8Fb+1/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

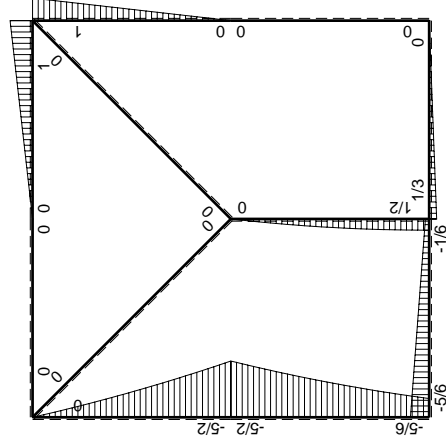
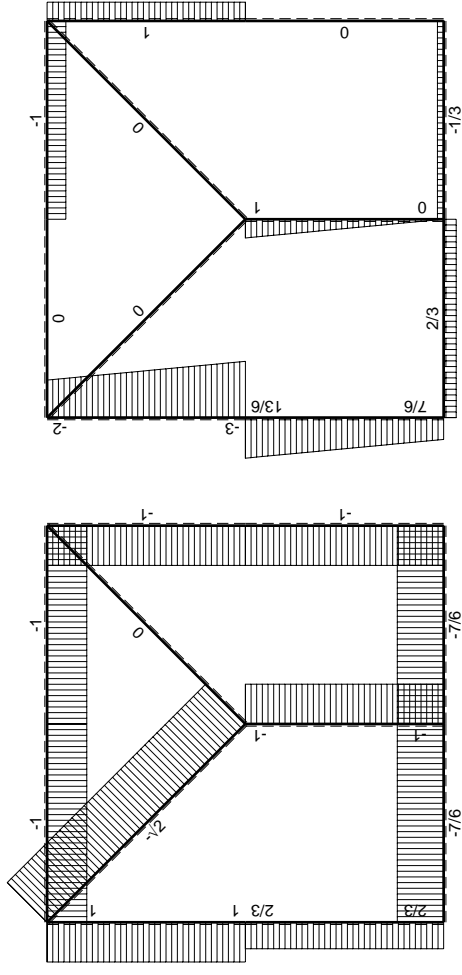
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

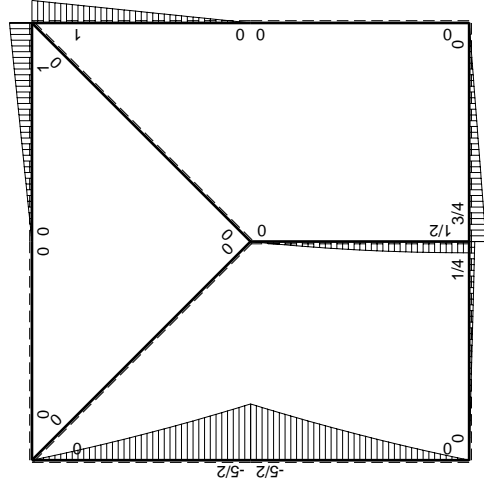
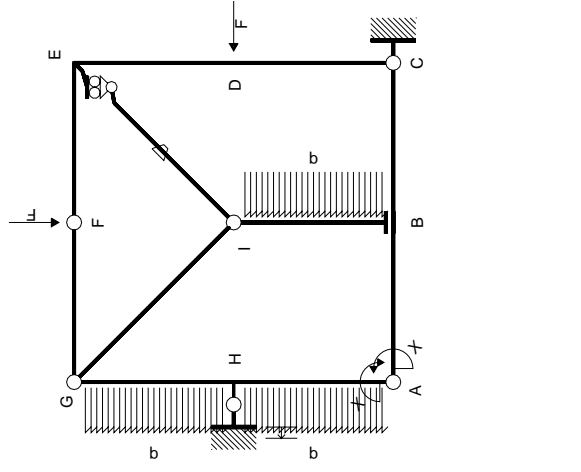
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

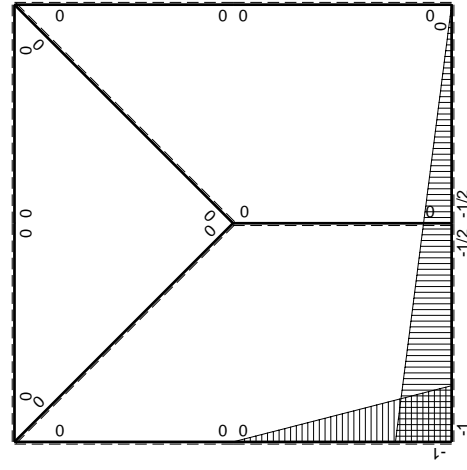
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

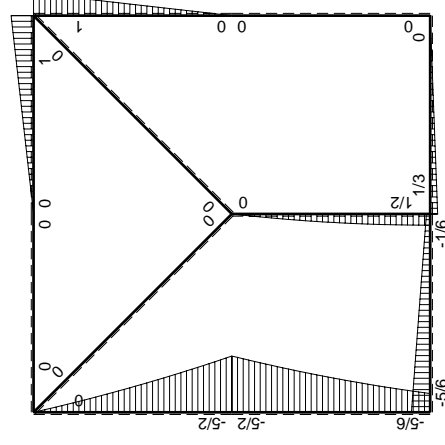
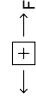
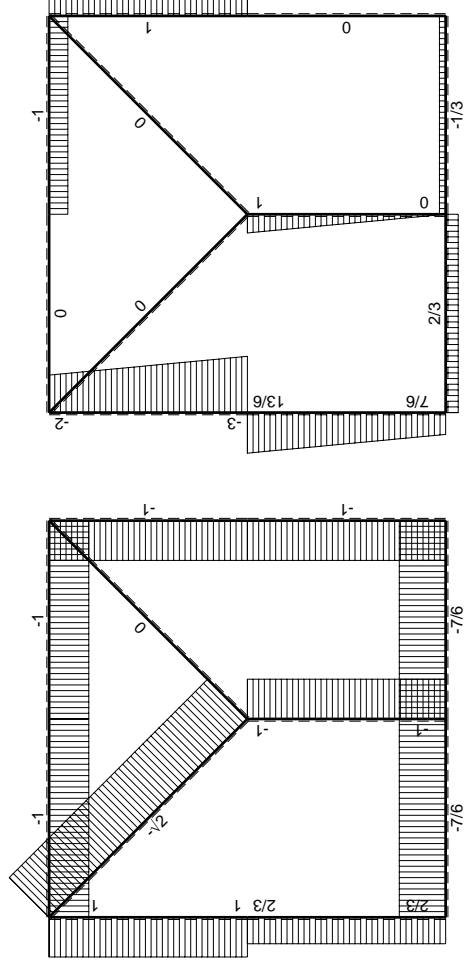
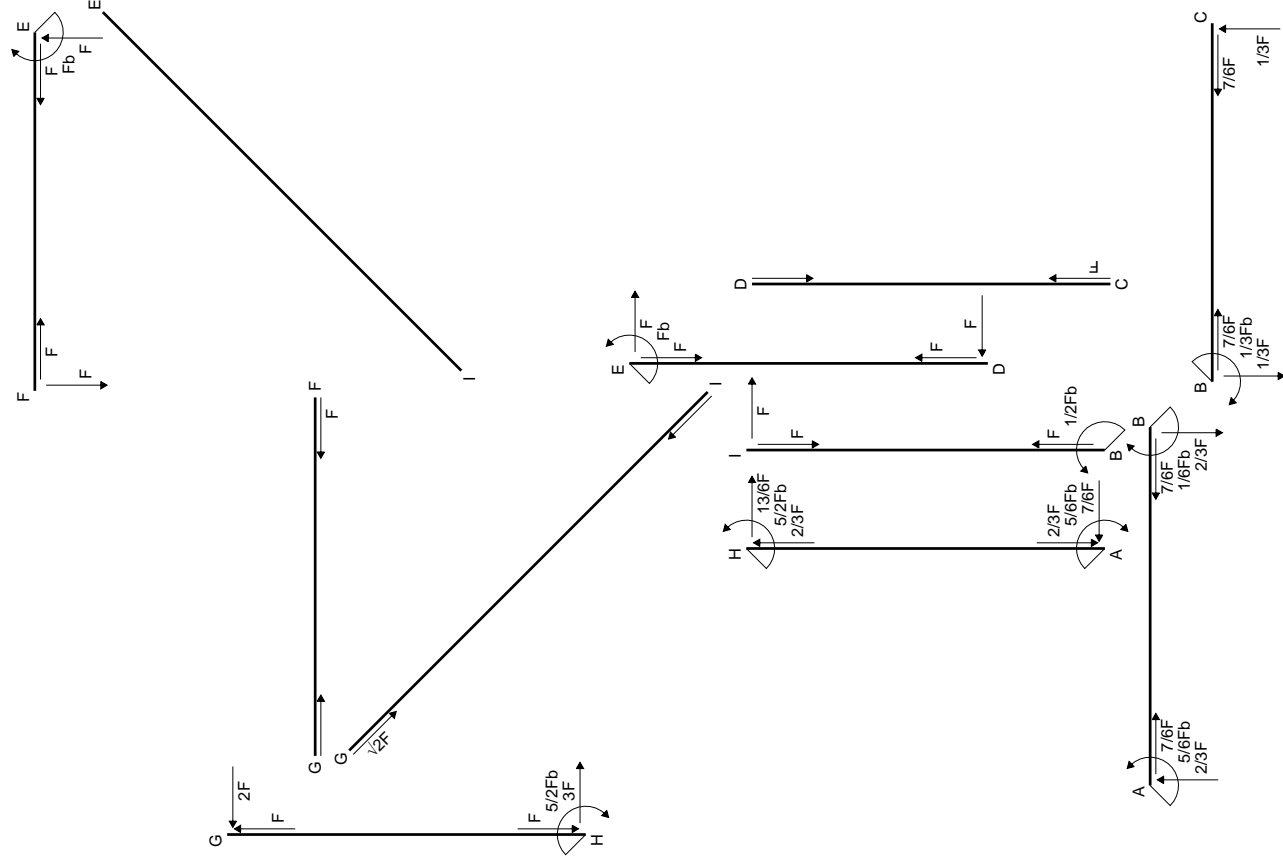
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

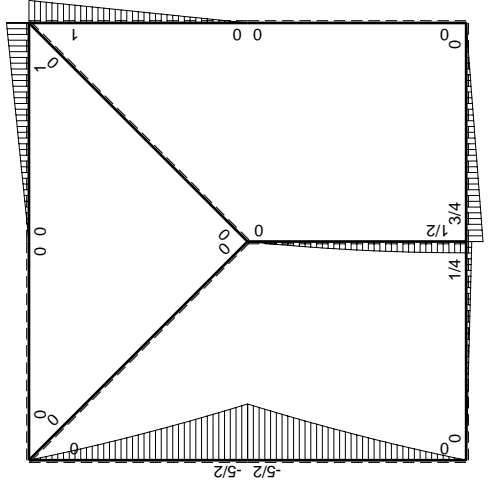
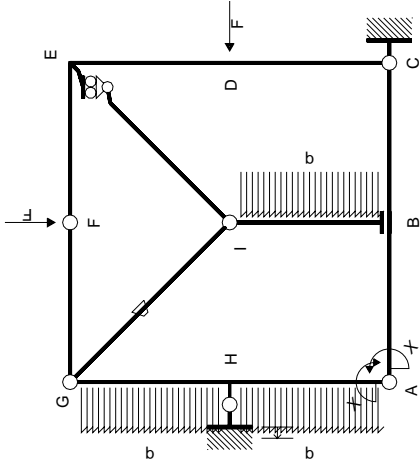
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

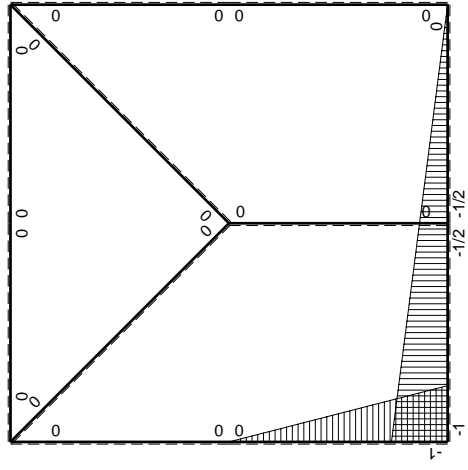
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_x flessione da carichi assegnati



M_y flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

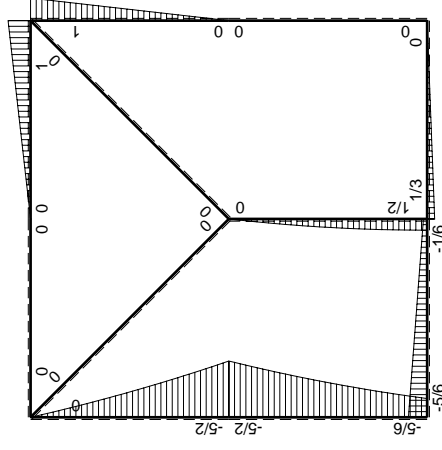
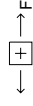
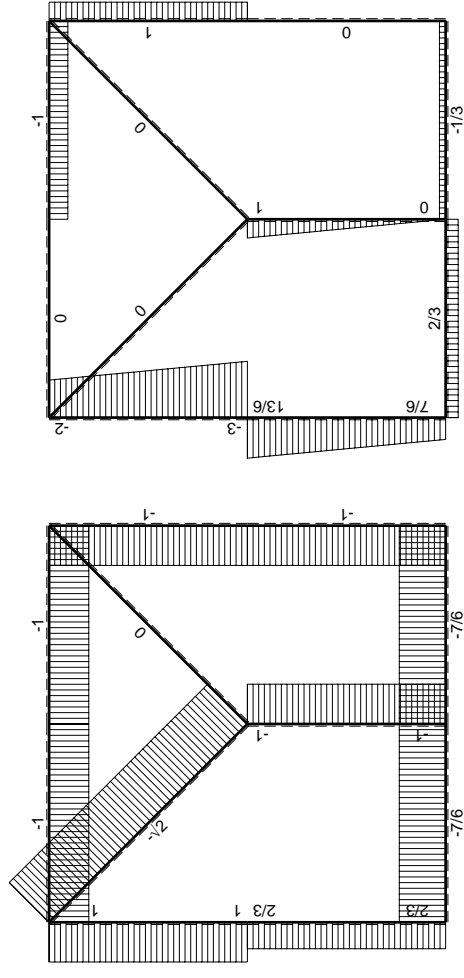
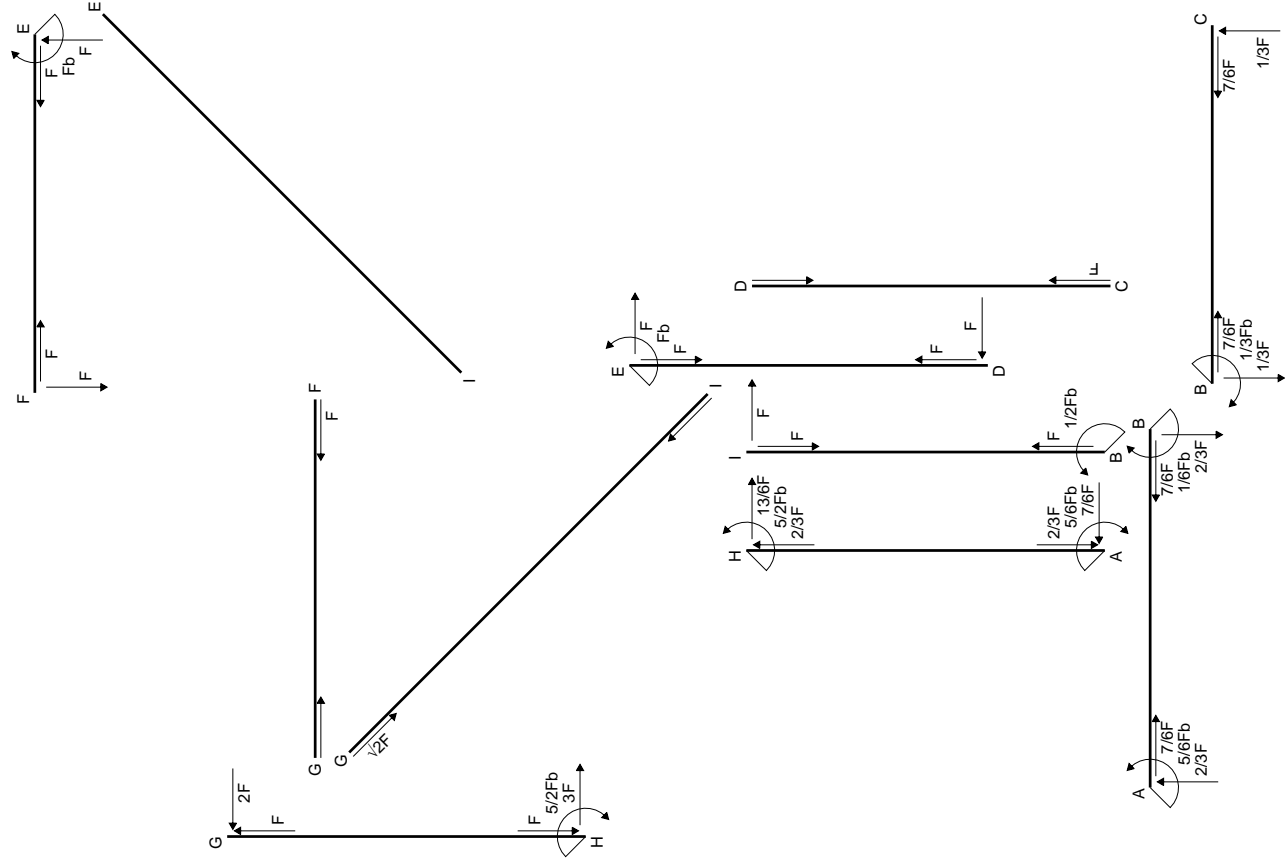
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

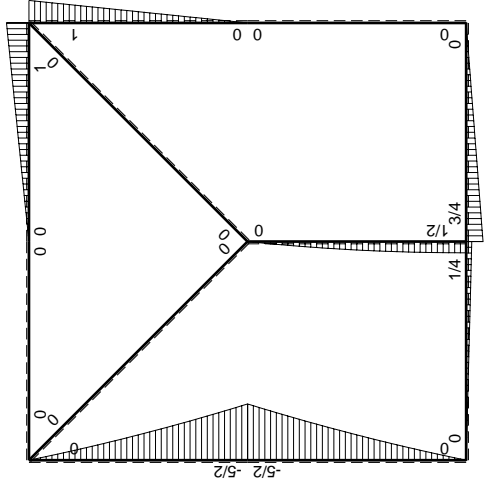
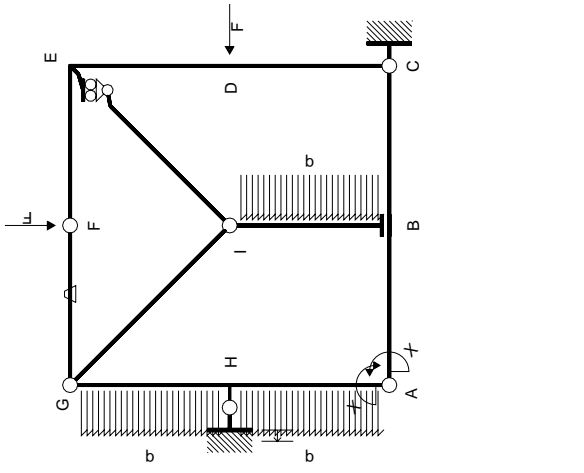
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

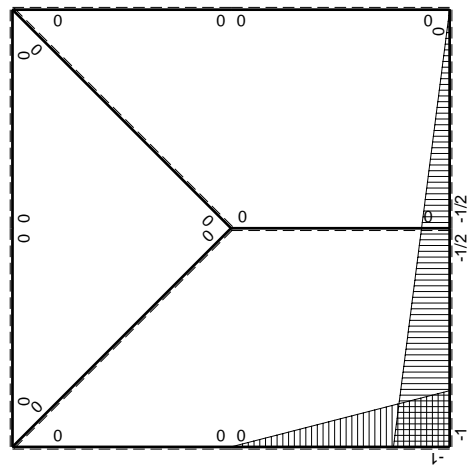
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	-Fb/EJ	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

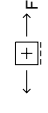
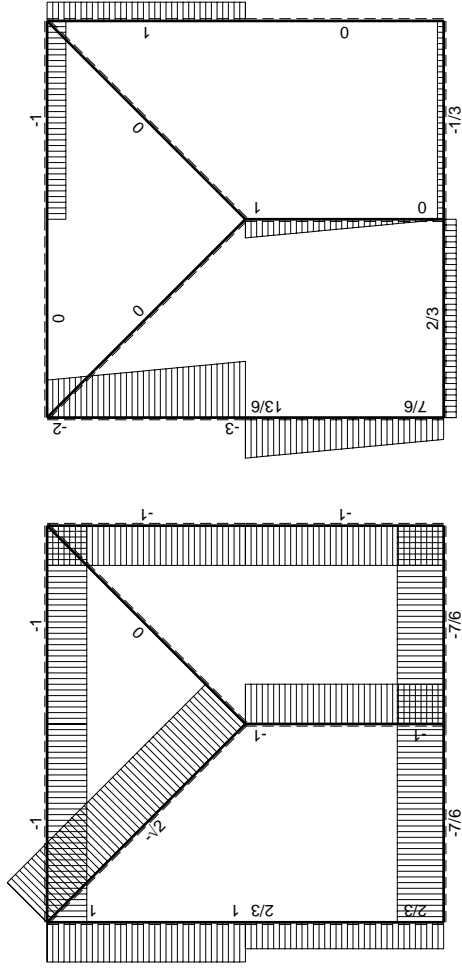
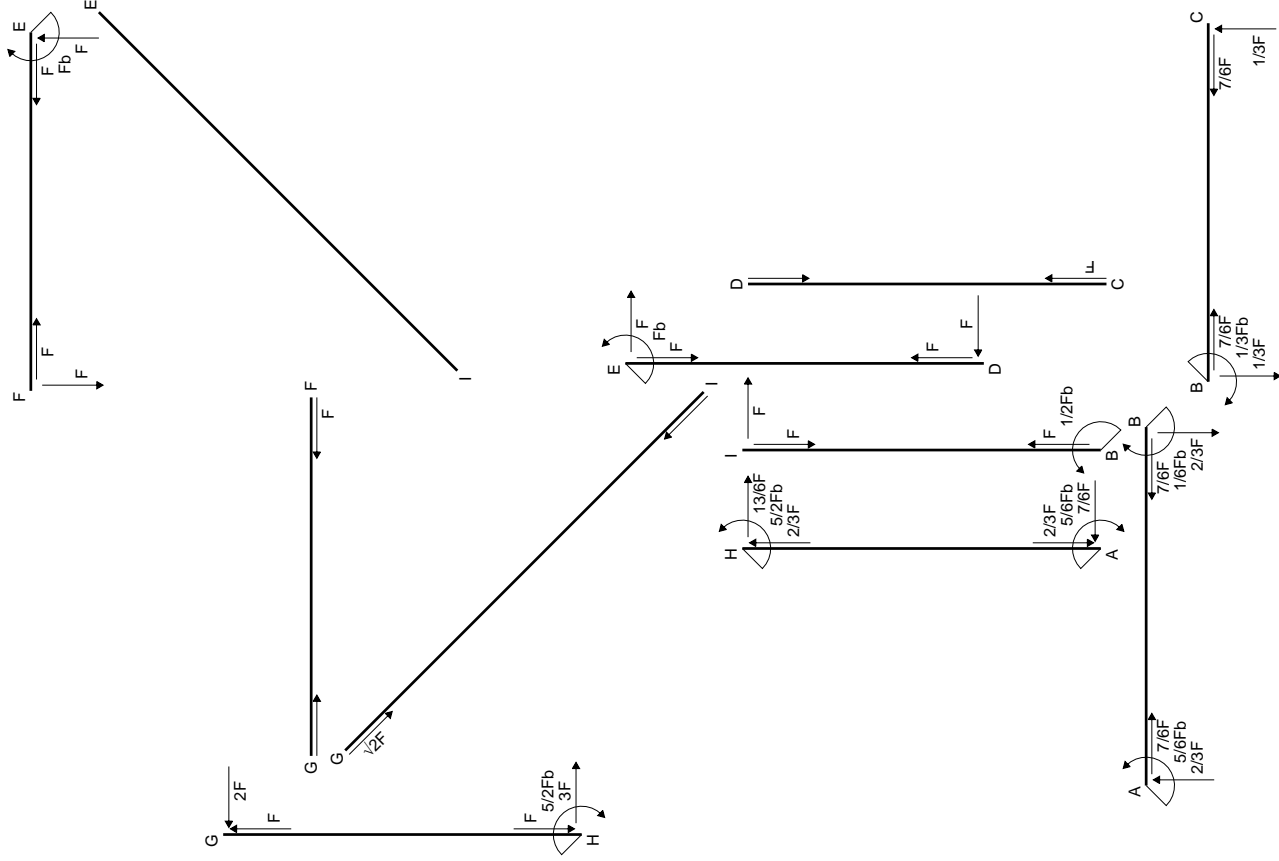
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

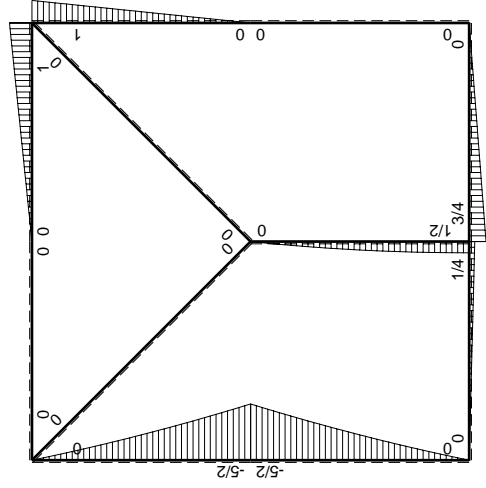
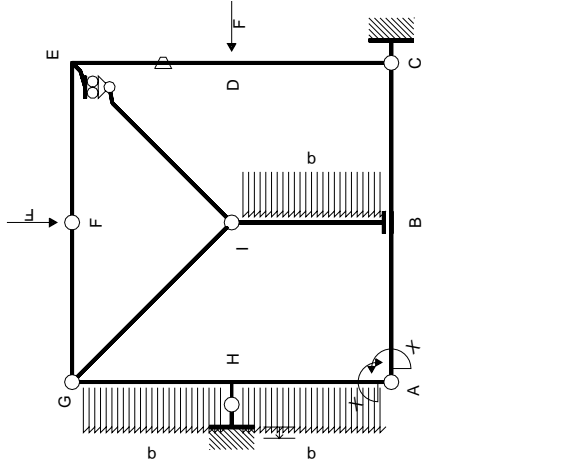
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

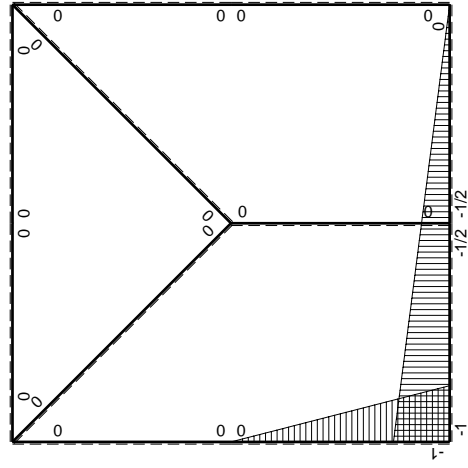
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	-Fb/EJ	0	0	0	0+0	0	
ED b	0	-Fb+Fx	Fb/EJ	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

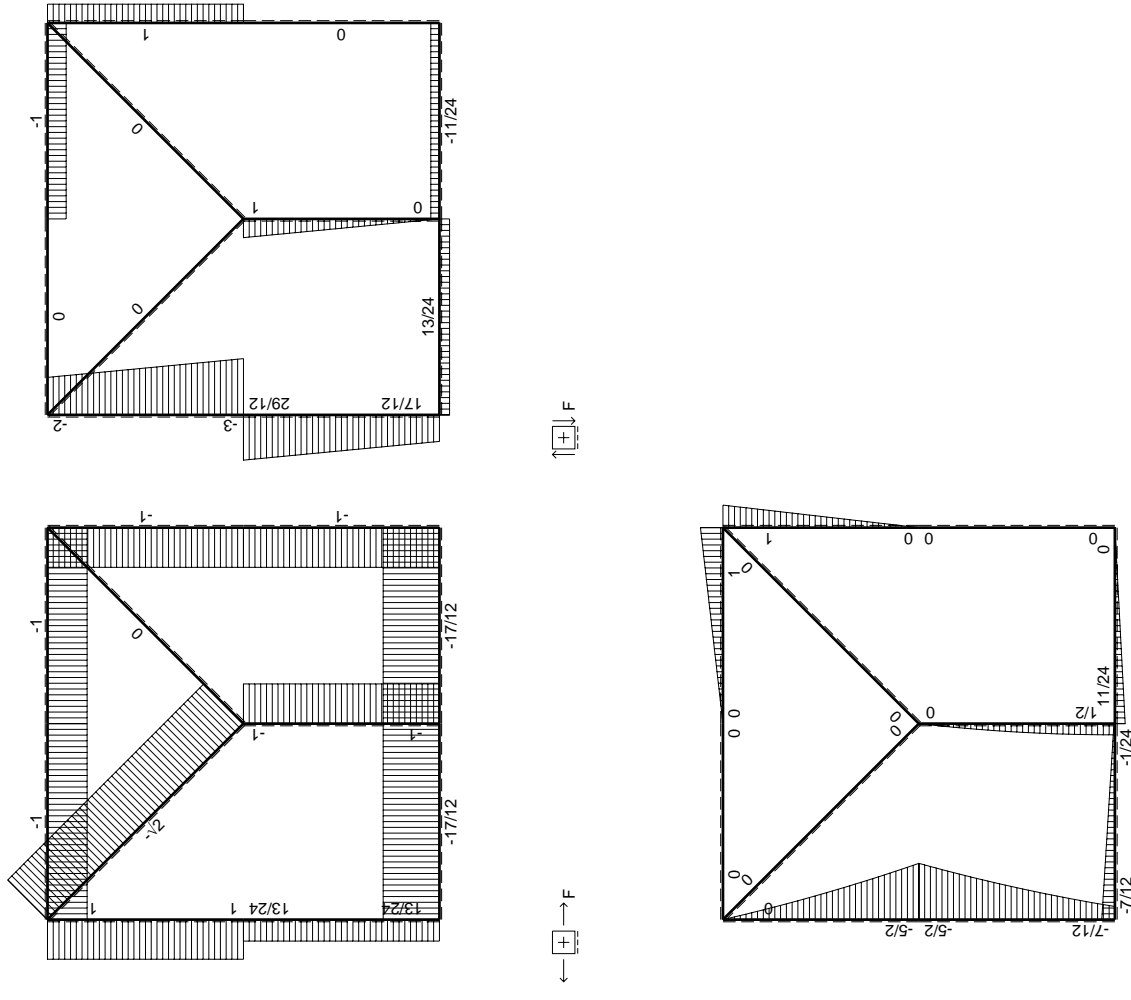
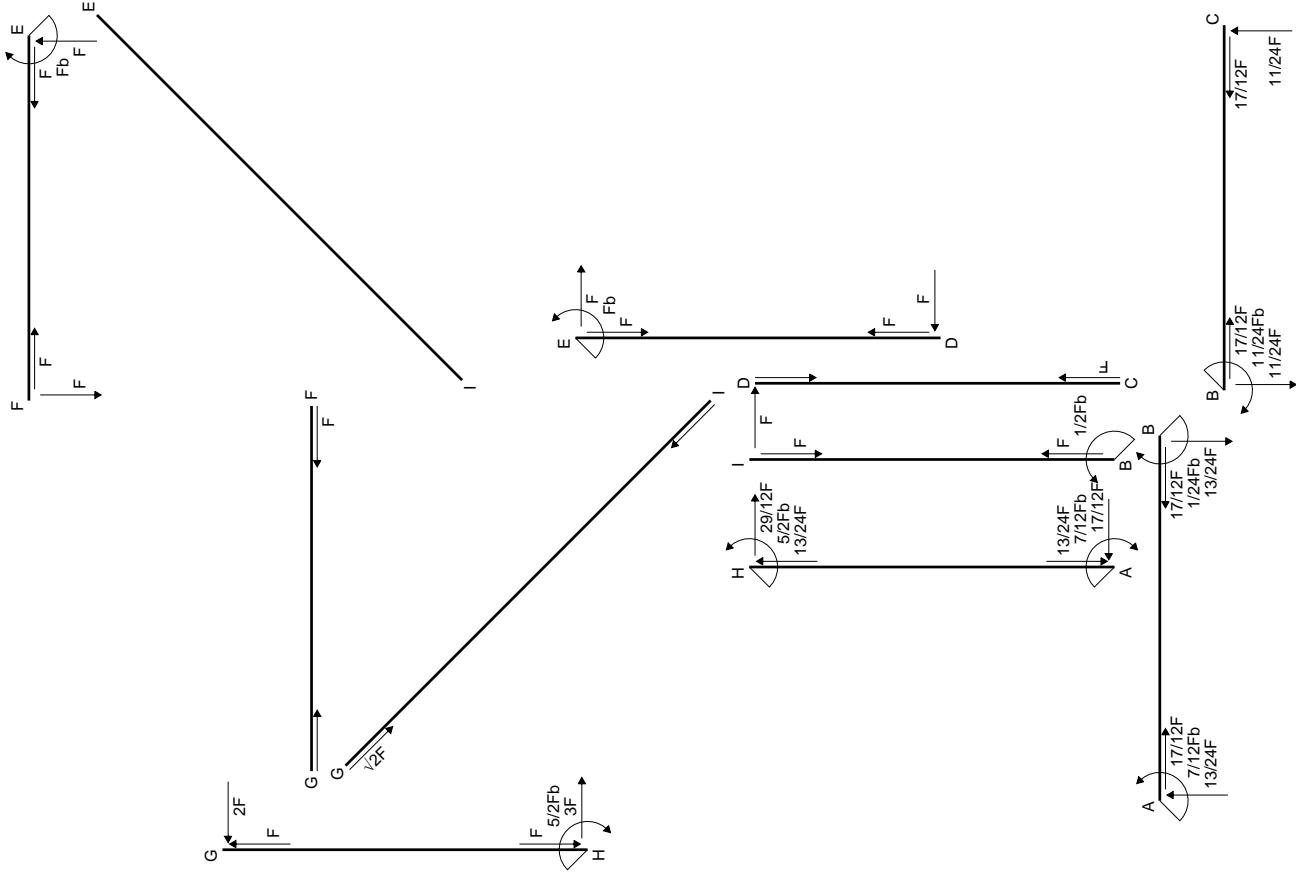
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

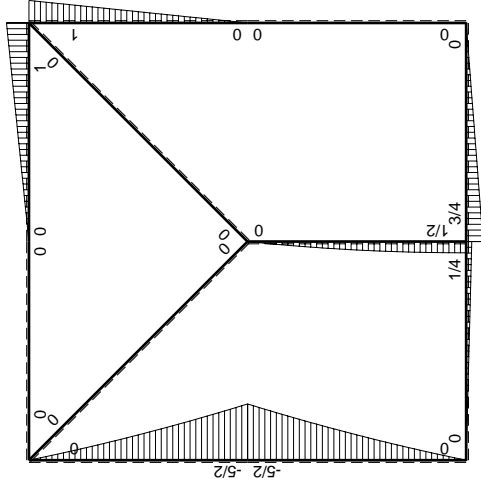
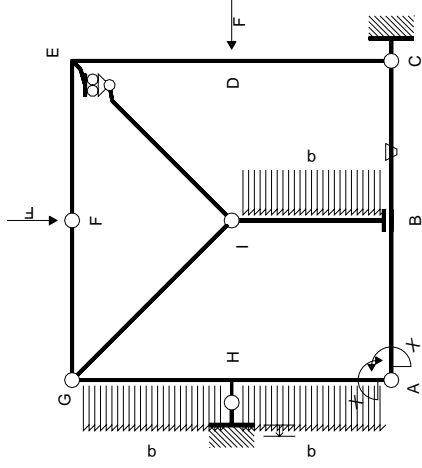
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

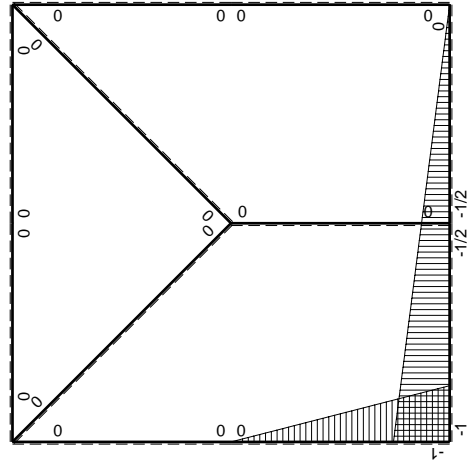
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	$-Fb/EJ$	$-3/8Fb+3/4Fx-3/8Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	Fb/EJ	$-3/8Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ + [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ + [-1/4 x^2/b]_0^b \theta$$

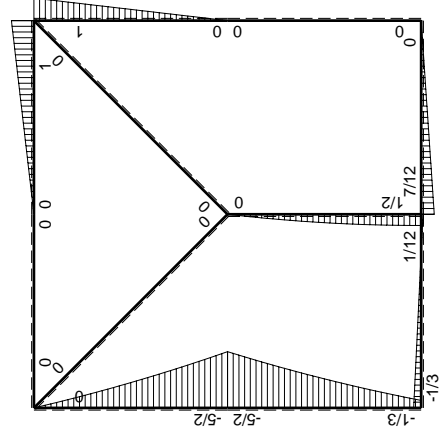
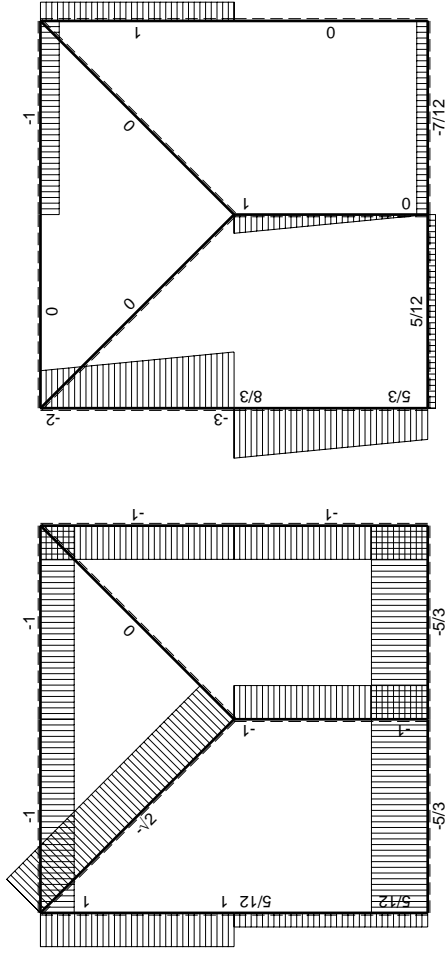
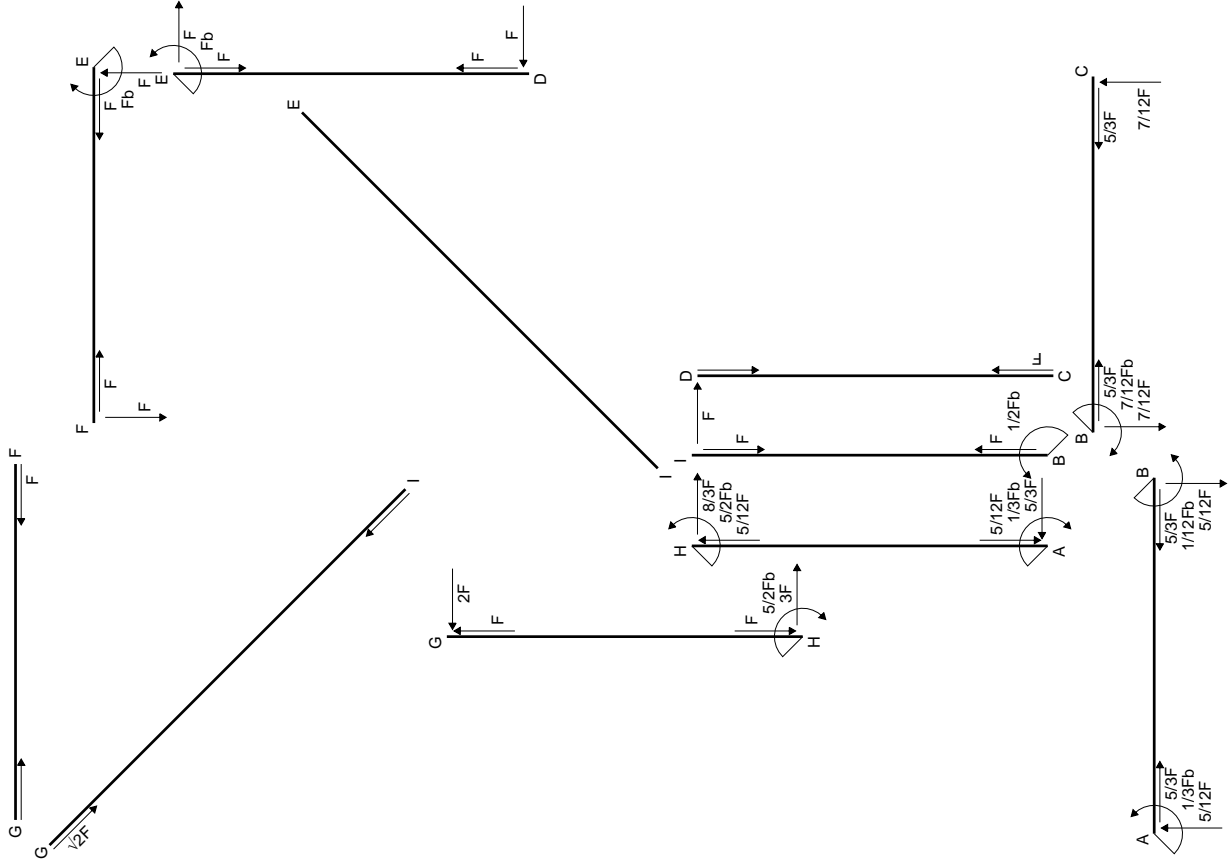
$$= (-1/8 b) Fb 1/EJ + (-1/4 b) \theta = 1/8 Fb^2/EJ$$

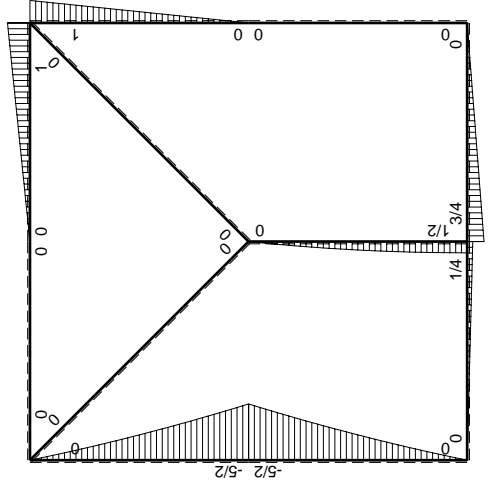
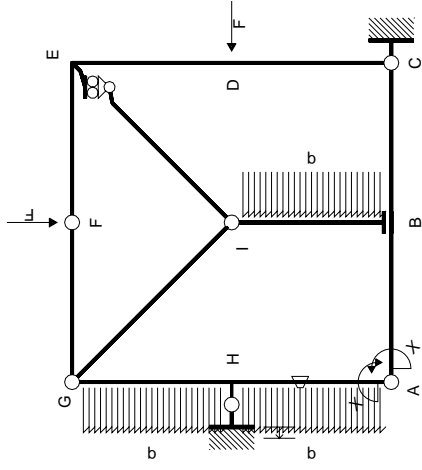
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

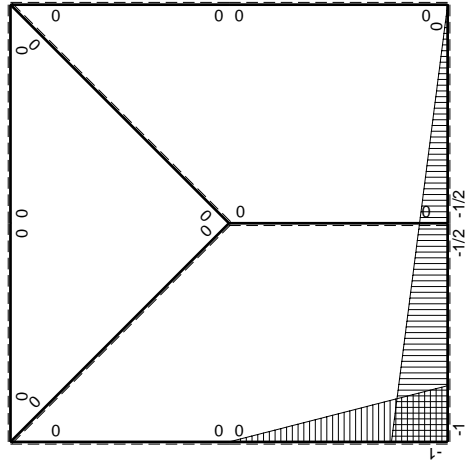
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	-Fb/EJ	$5/2Fx-3Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(3/8+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	Fb/EJ	$2Fx-3/2Fx^2/b-1/2qx^3/b$	Fb/EJ-Fx/EJ	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/3Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/3Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

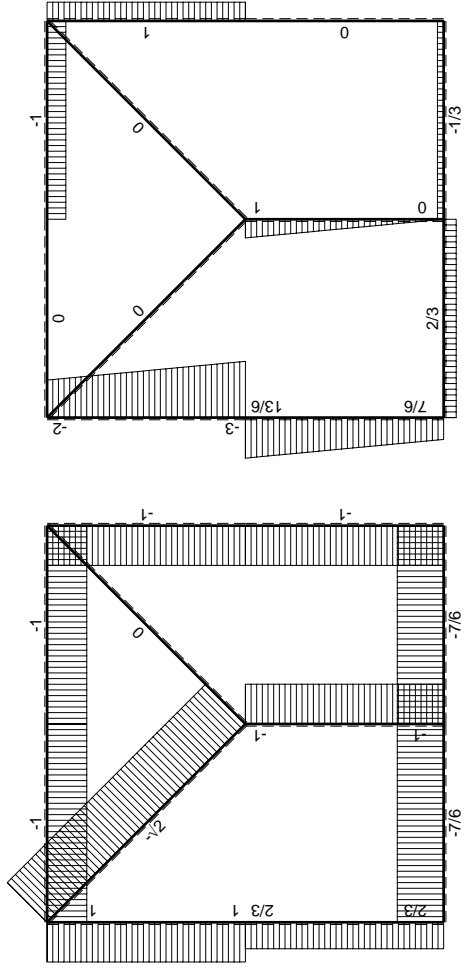
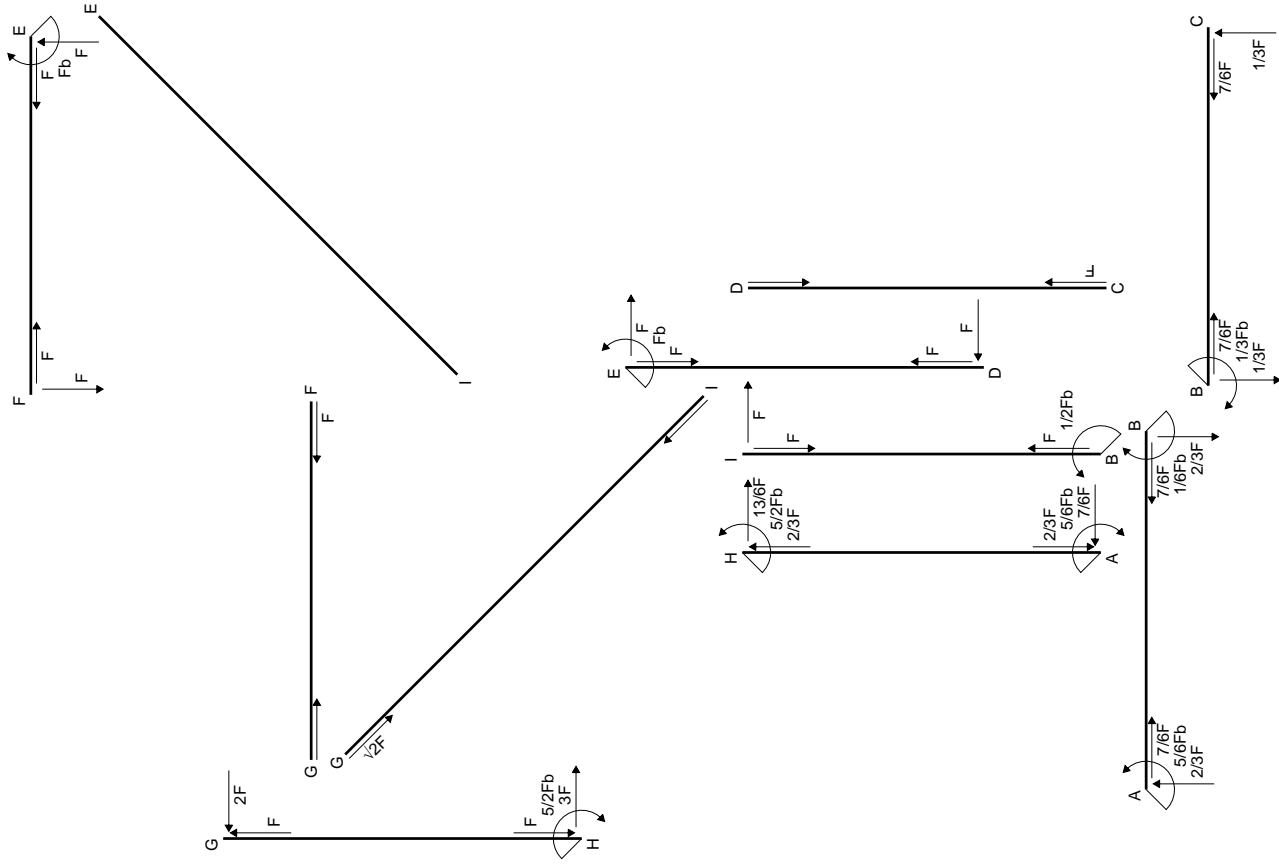
$$= \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 7/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

$$= \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

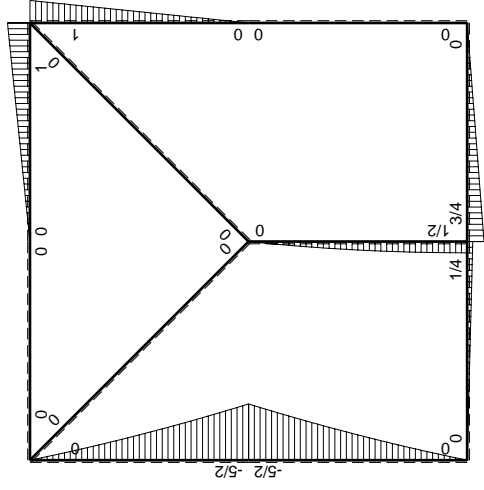
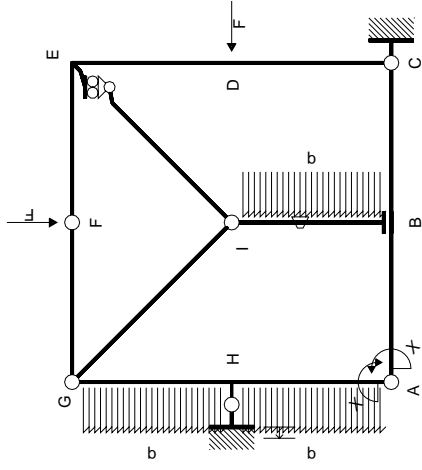
$$= (b - 1/2 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 7/8 Fb^2/EJ$$



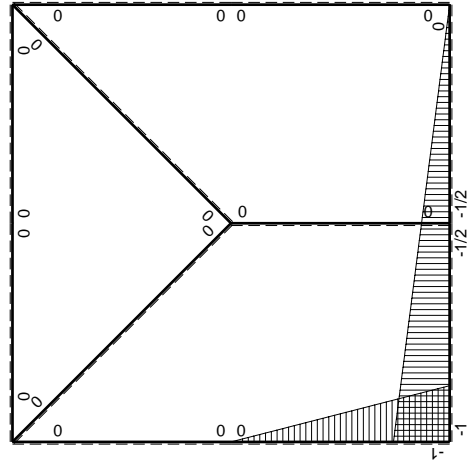
← ⊕ → F

↑ ⊕ ↓ F

← ⊕ → F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	-Fb/EJ	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

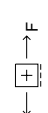
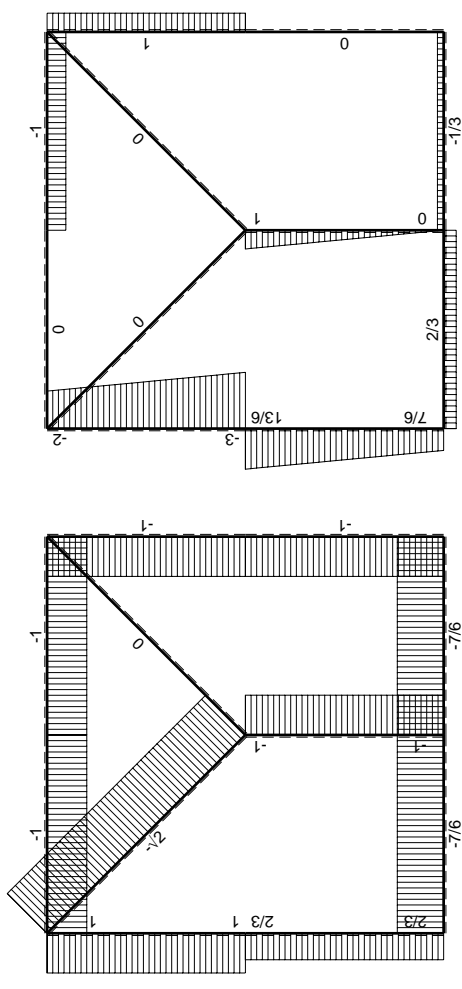
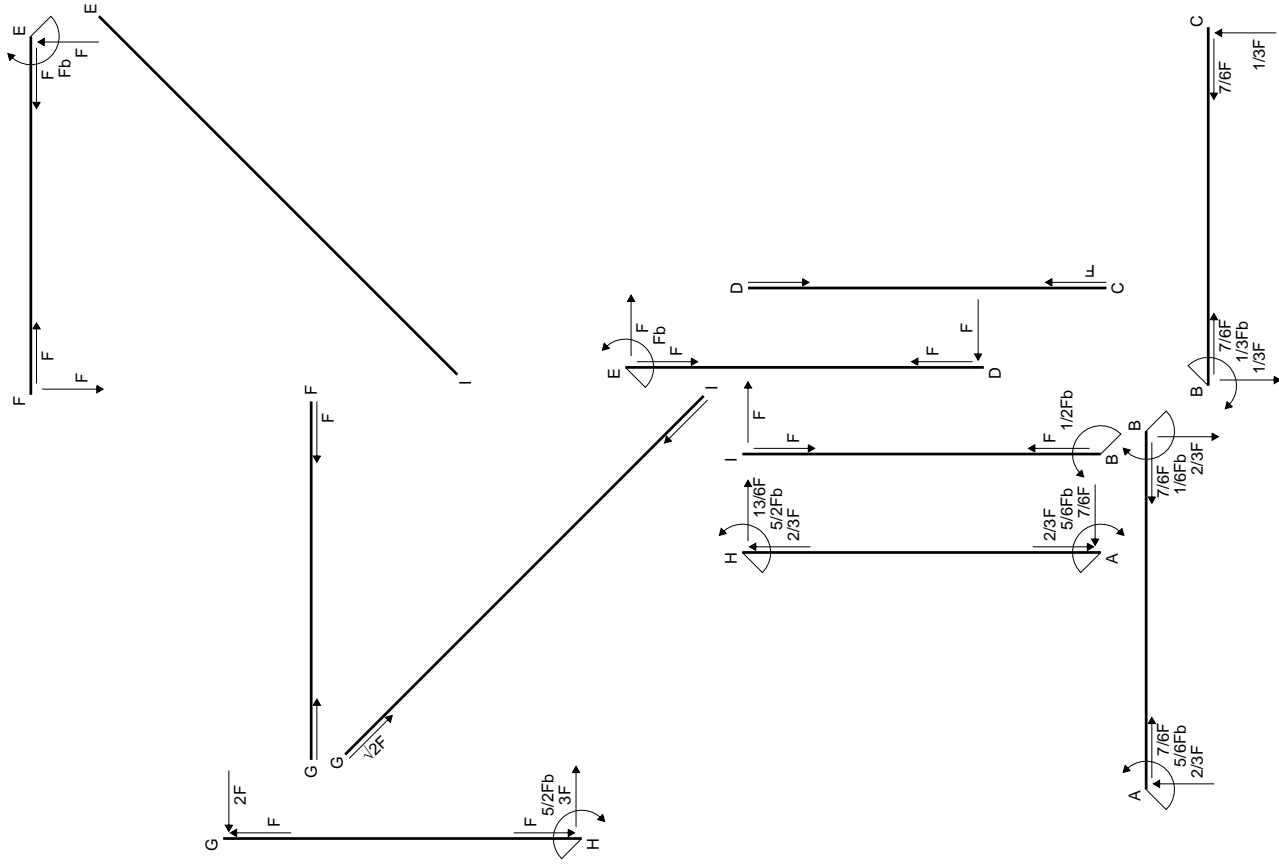
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

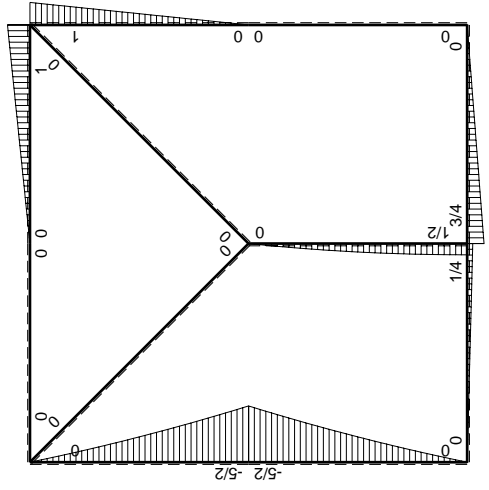
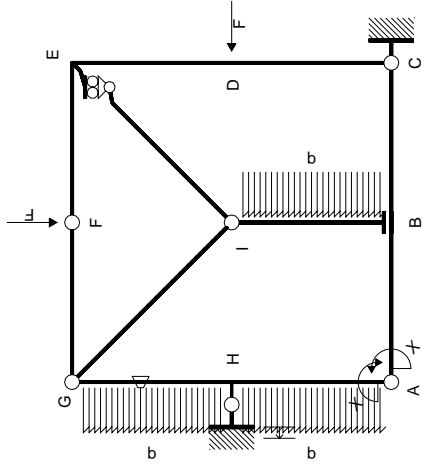
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

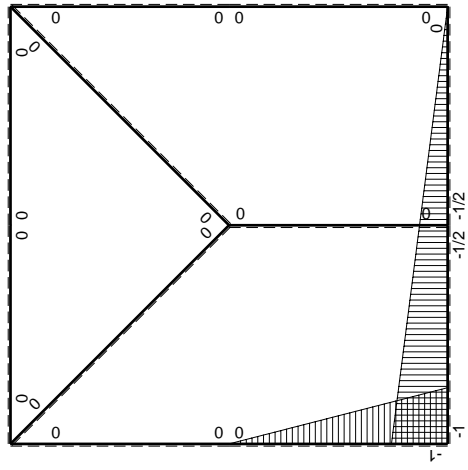
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	-Fb/EJ	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

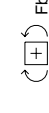
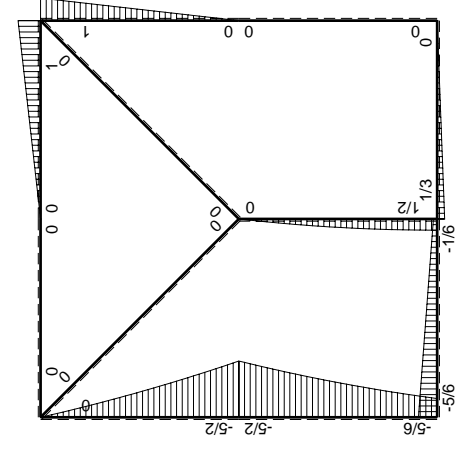
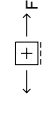
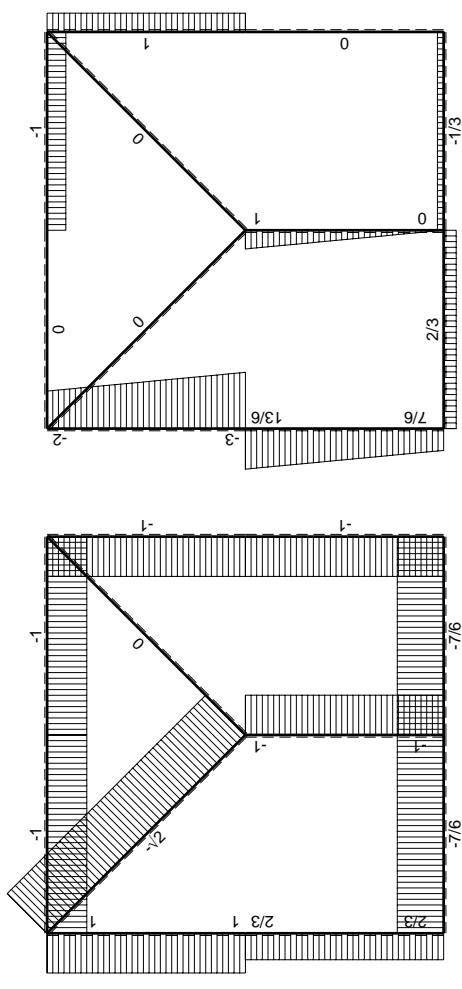
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

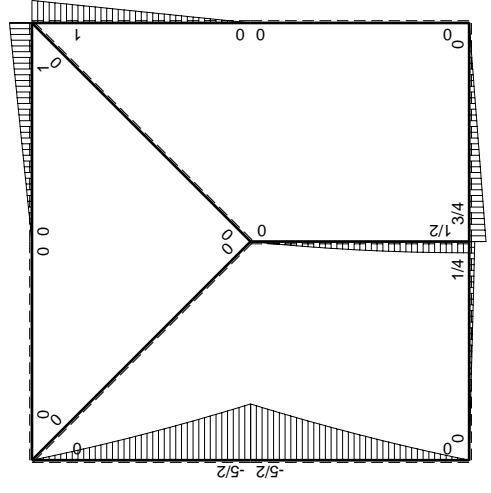
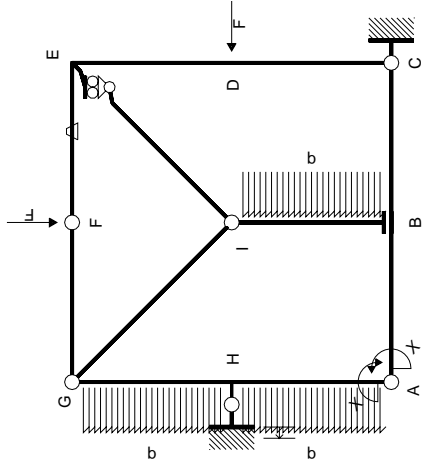
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

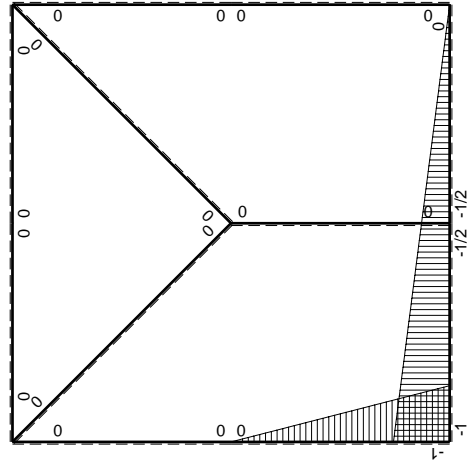
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





(\oplus) M_x flessione da carichi assegnati



(\oplus) M_y flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	-Fb/EJ	0	0	0	0+0	0	
FE b	0	-Fx	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

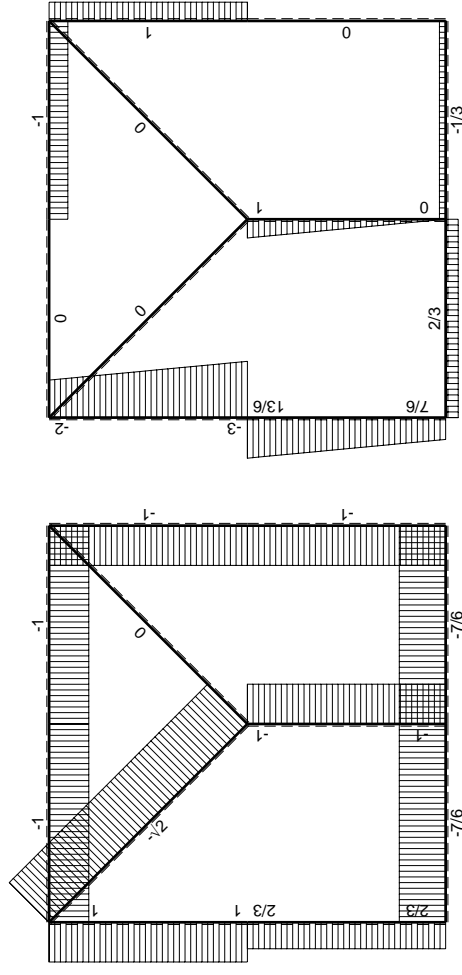
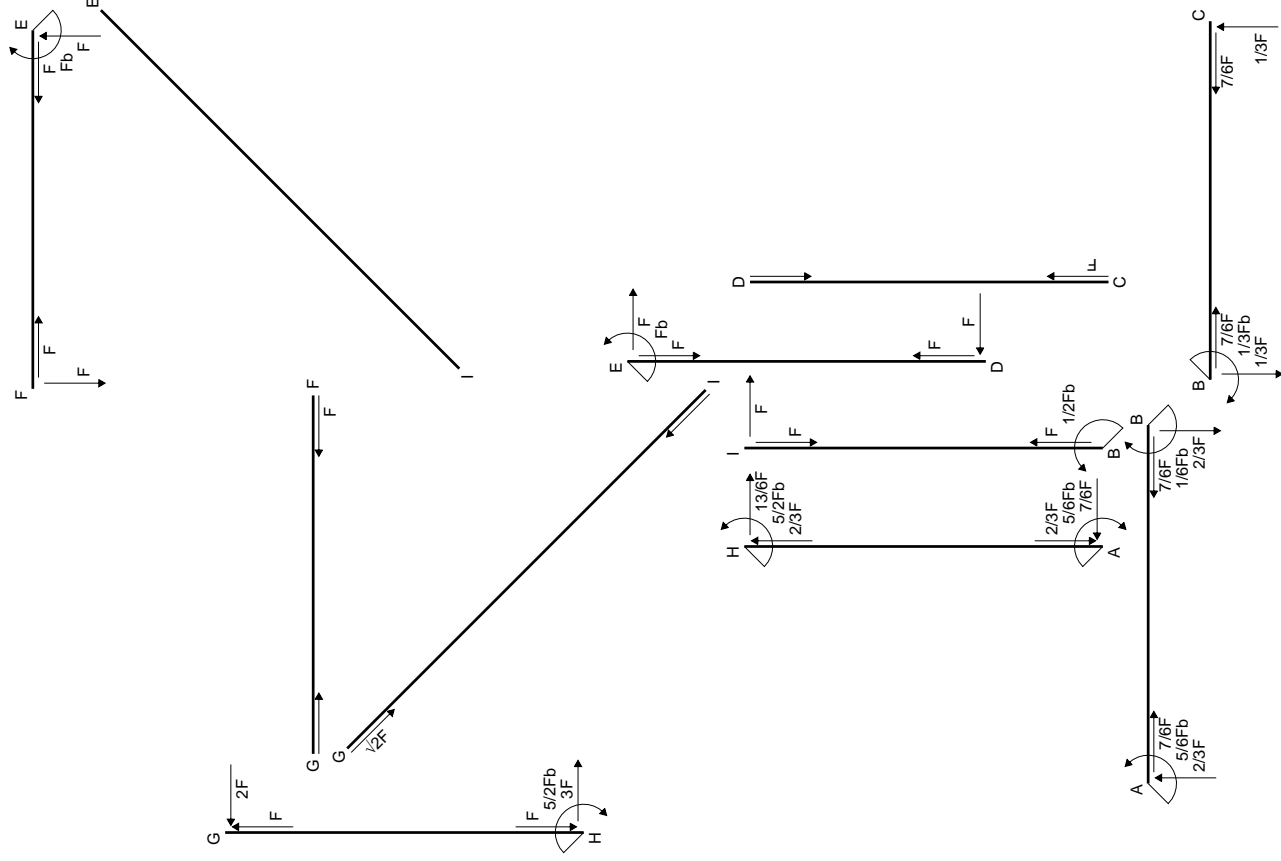
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

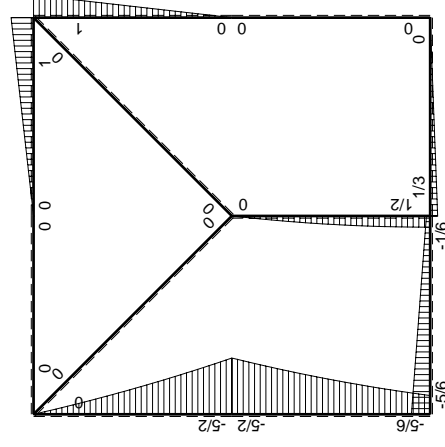
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

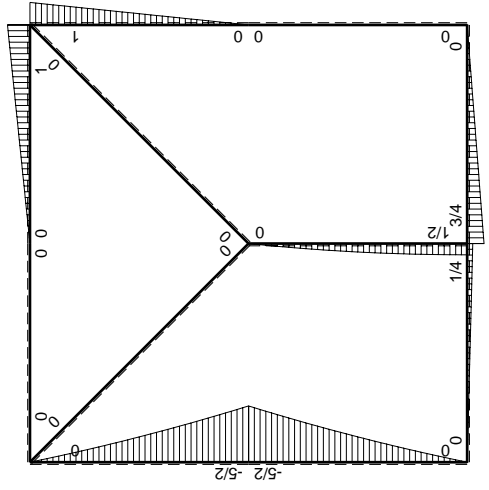
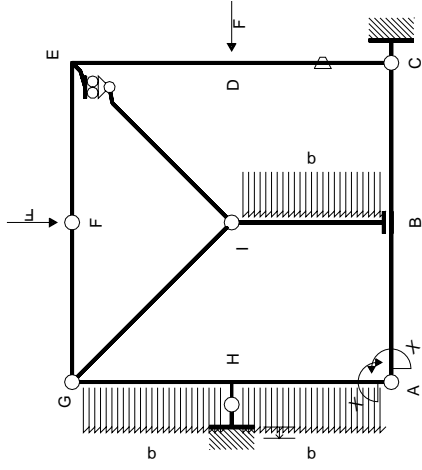


← ⊕ → F

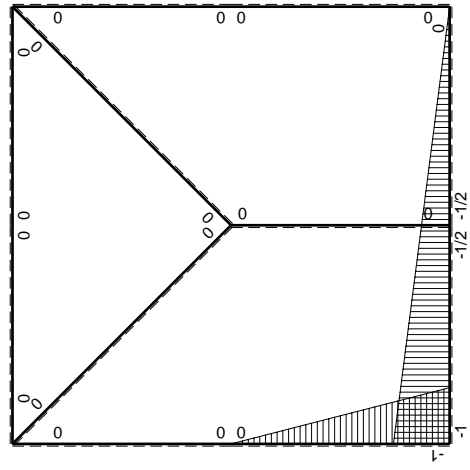
↑ ⊕ ↓ F



⊕ ⊖ Fb



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	0	Fb/EJ	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

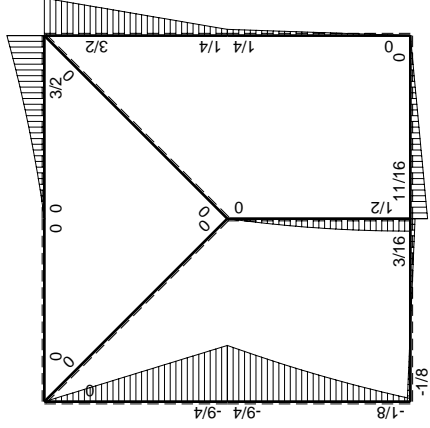
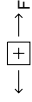
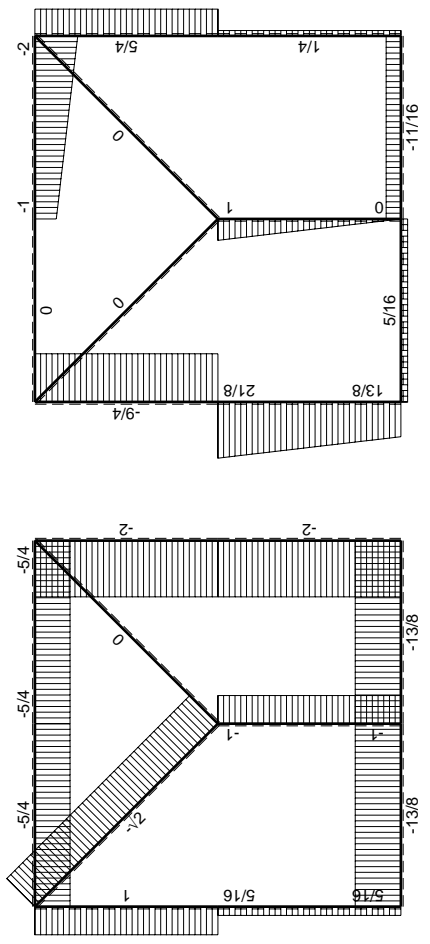
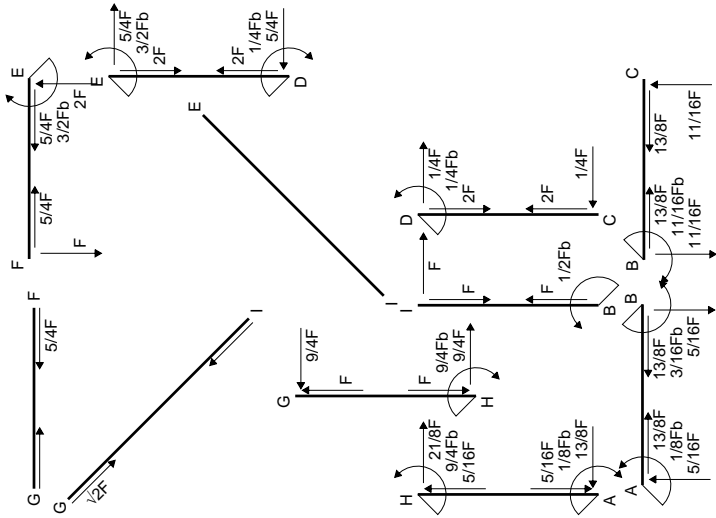
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

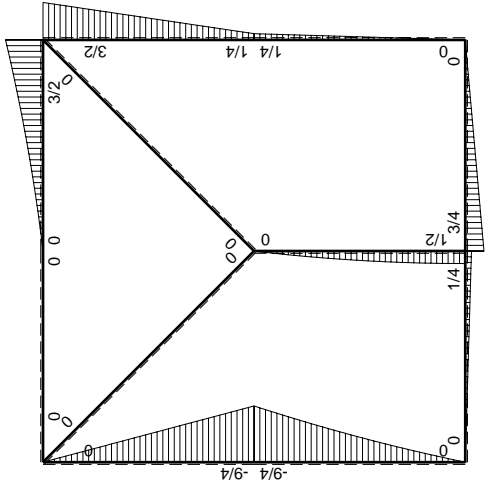
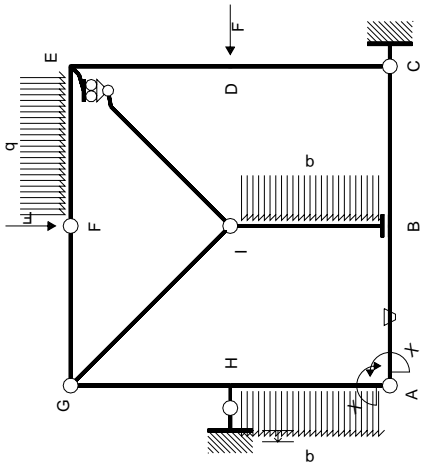
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

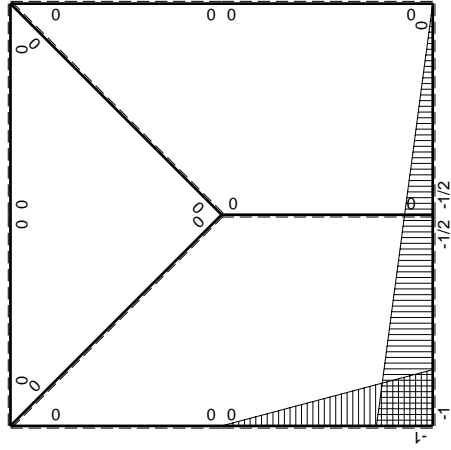
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	$-Fb/EJ$	$-1/4Fx+1/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/12+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	Fb/EJ	$-1/8Fb+1/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

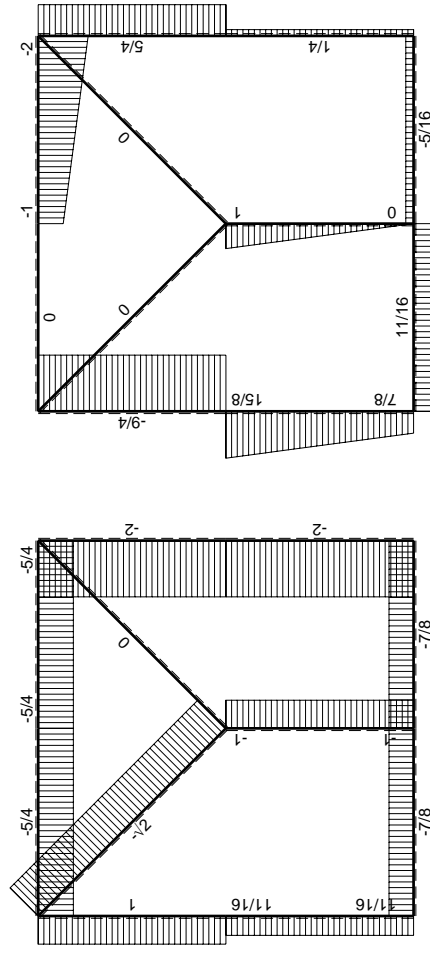
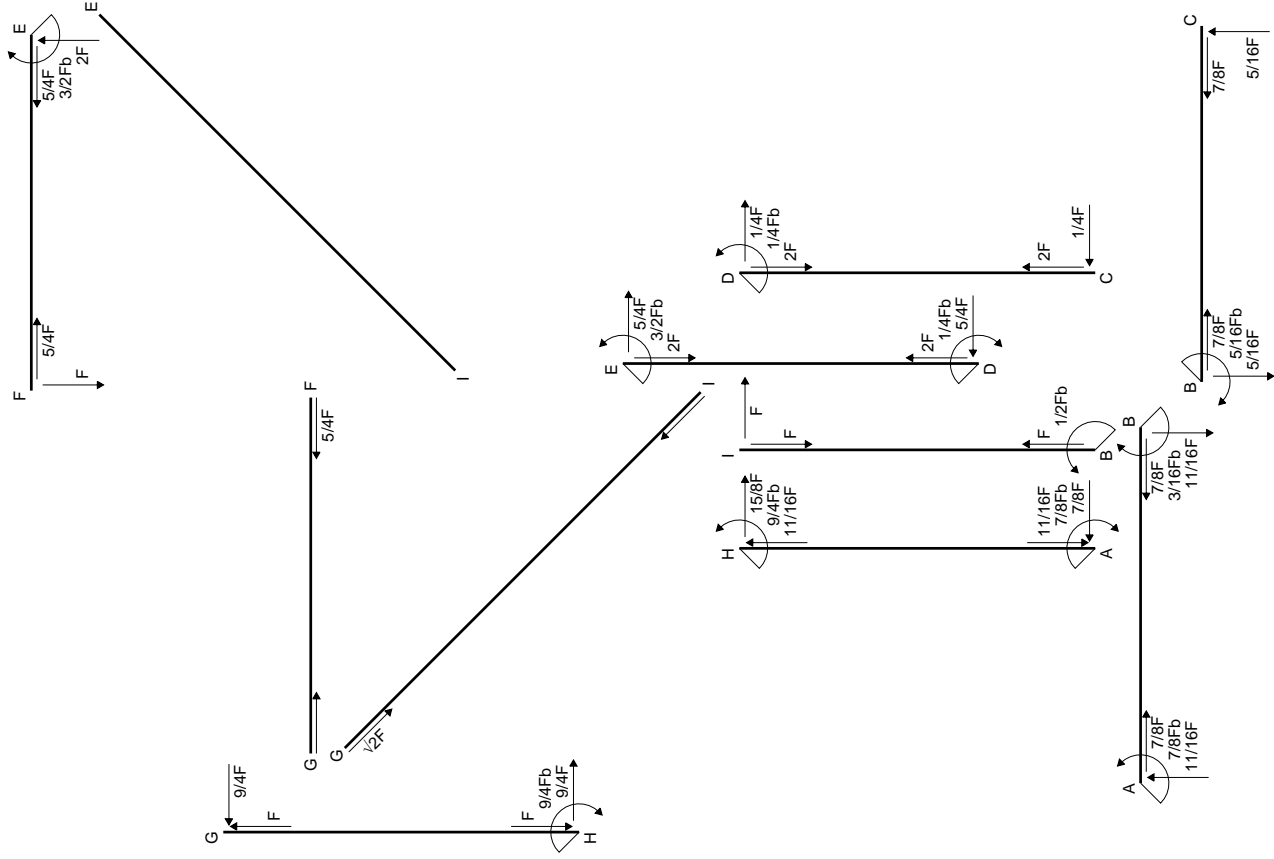
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

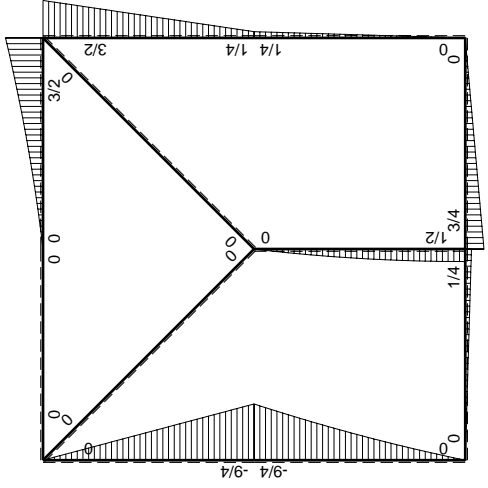
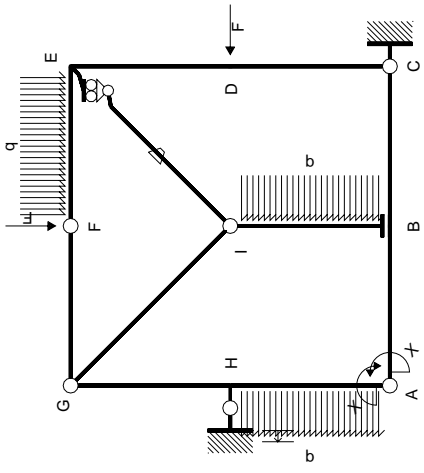
$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$



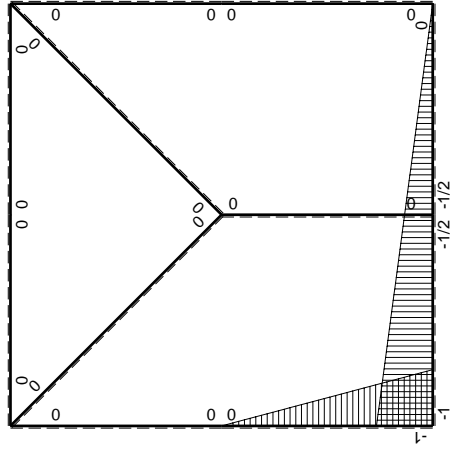
$\left[\begin{array}{c} + \\ - \end{array} \right] \rightarrow F$

$\left[\begin{array}{c} + \\ - \end{array} \right] \rightarrow F$

$\left(\begin{array}{c} + \\ - \end{array} \right) F_b$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

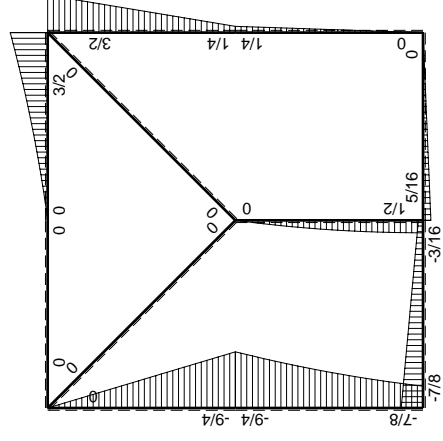
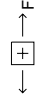
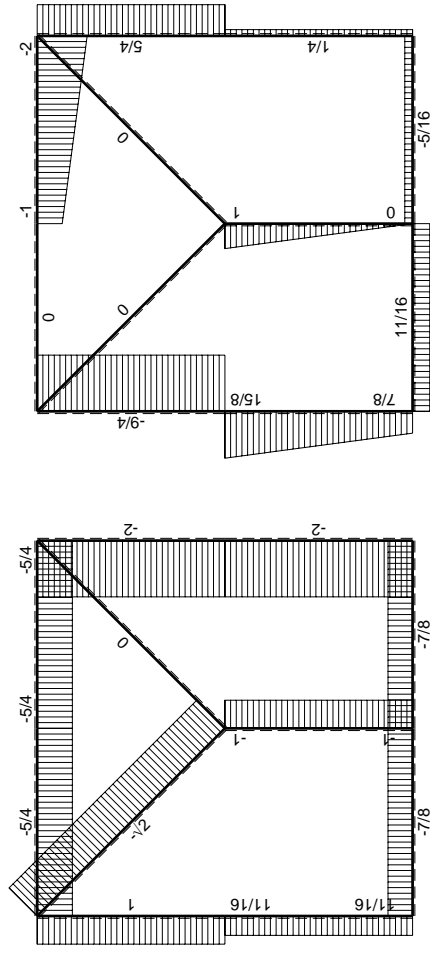
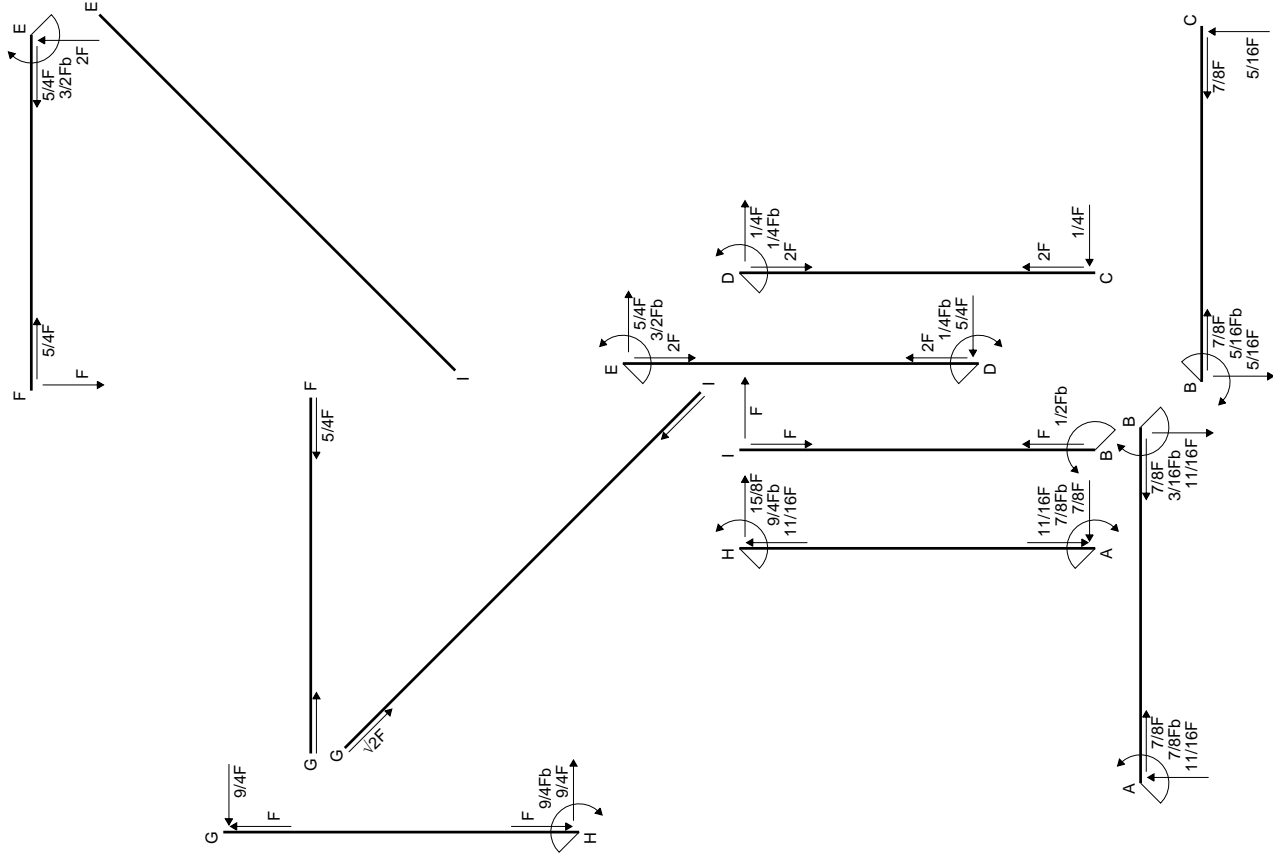
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

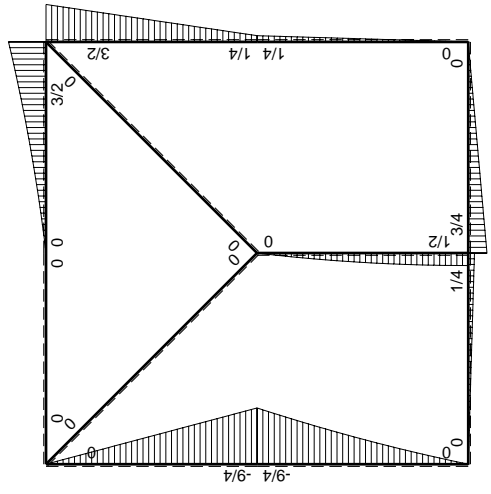
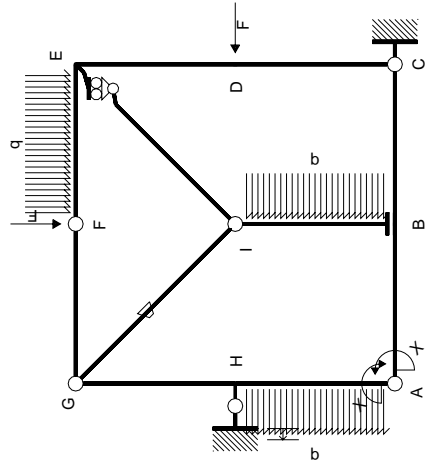
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

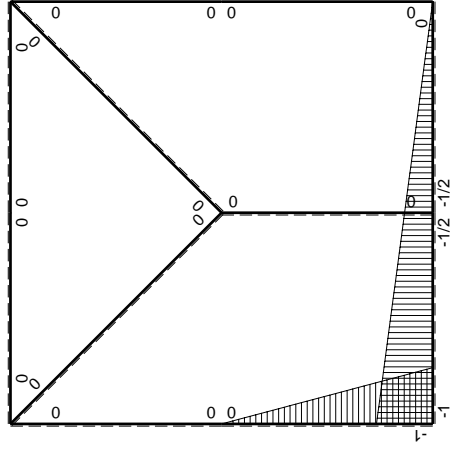
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





(+) M_0 flessione da carichi assegnati



(+) M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

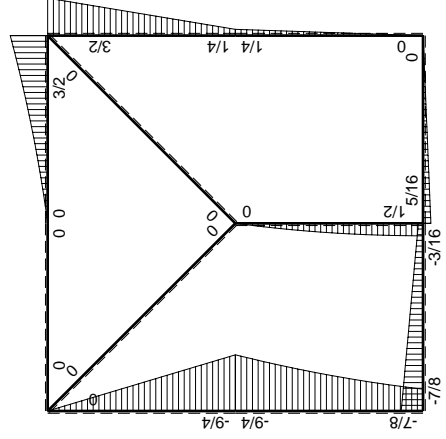
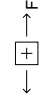
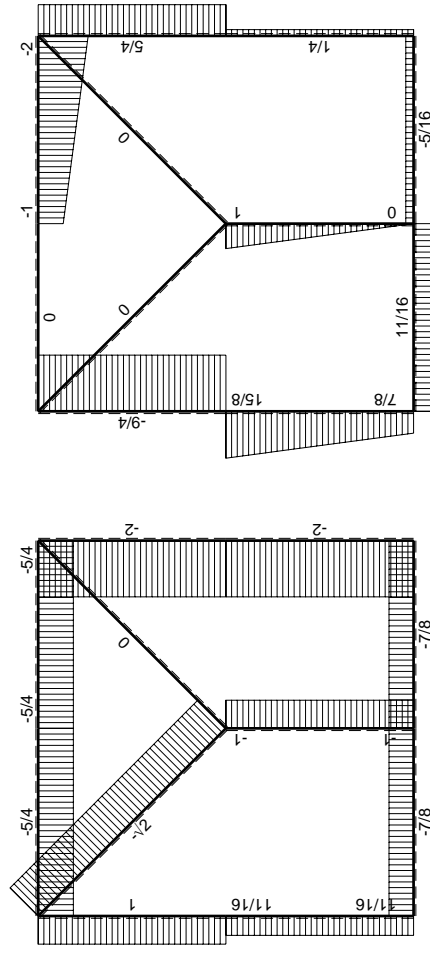
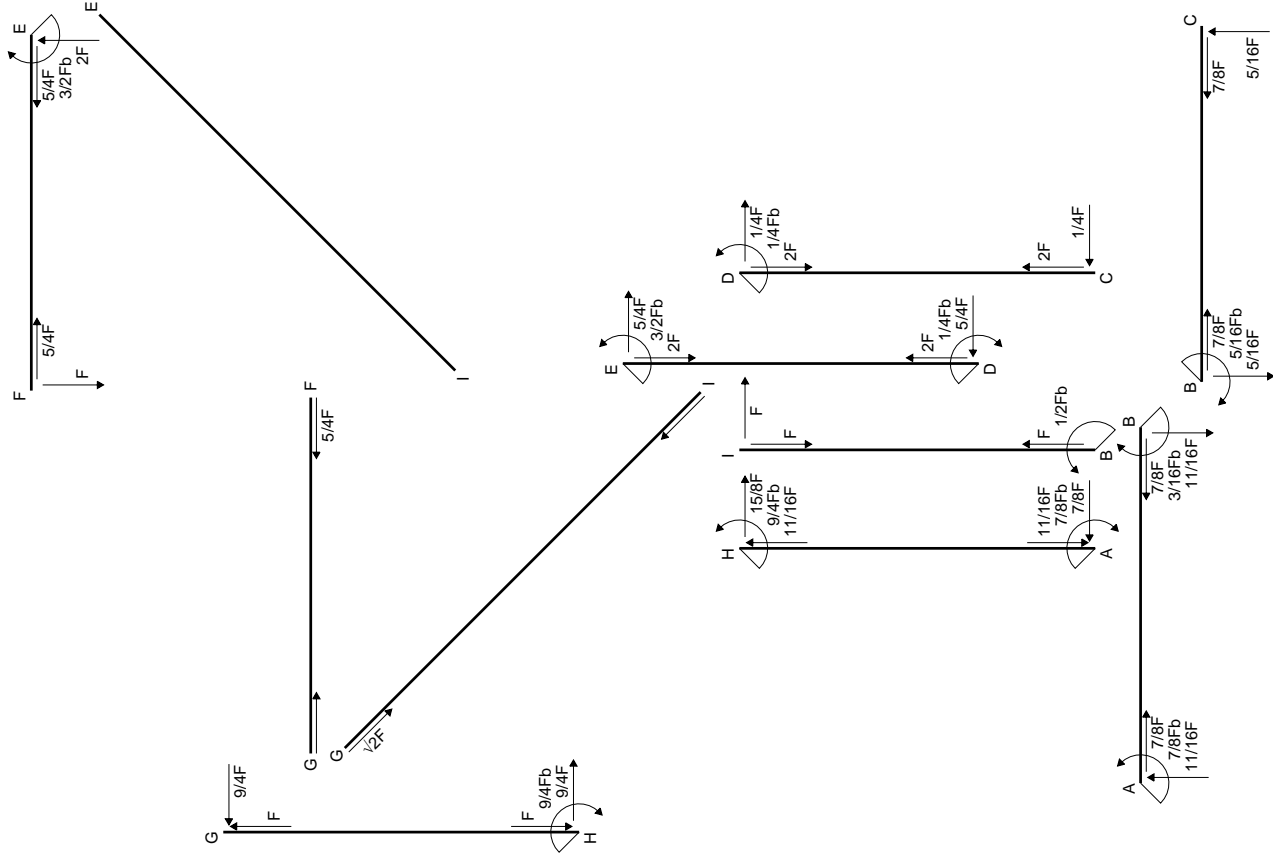
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

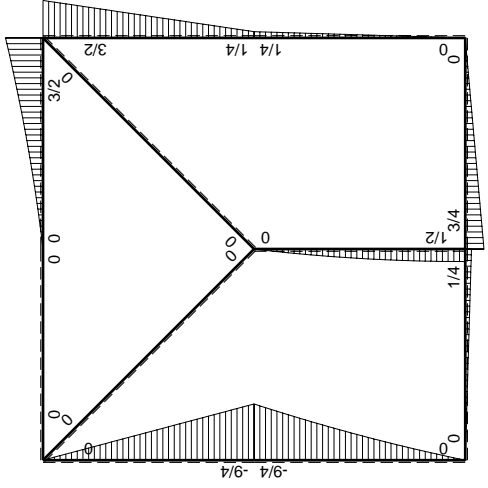
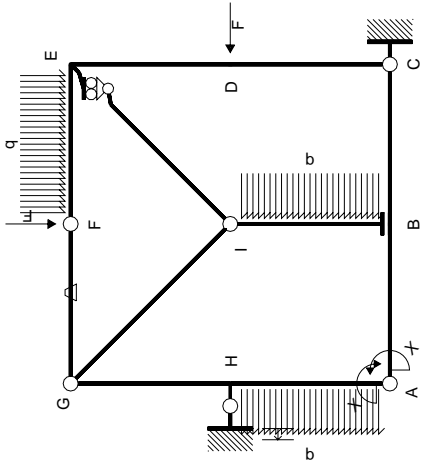
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

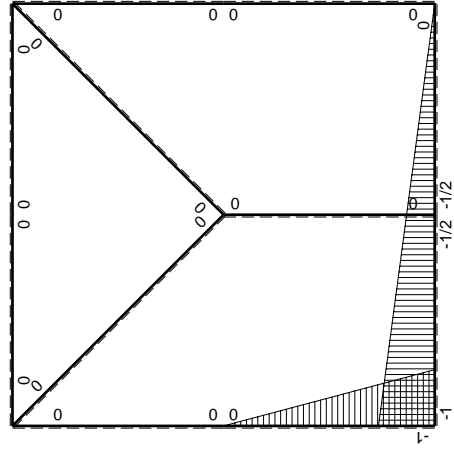
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

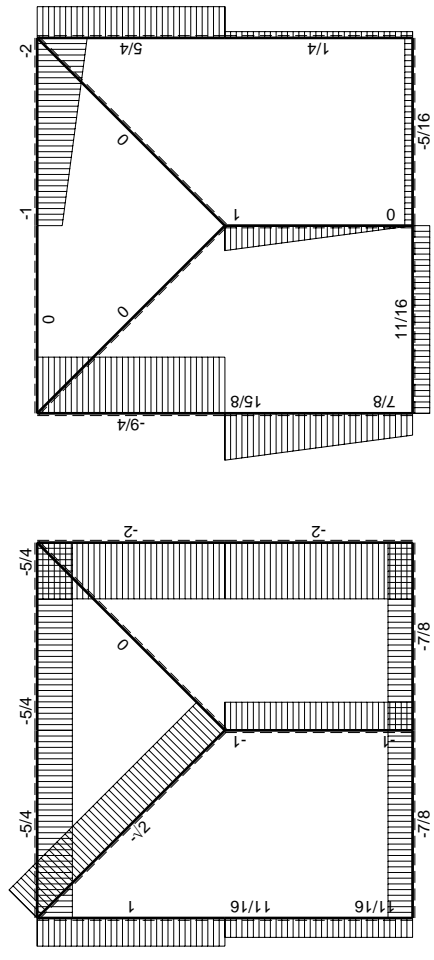
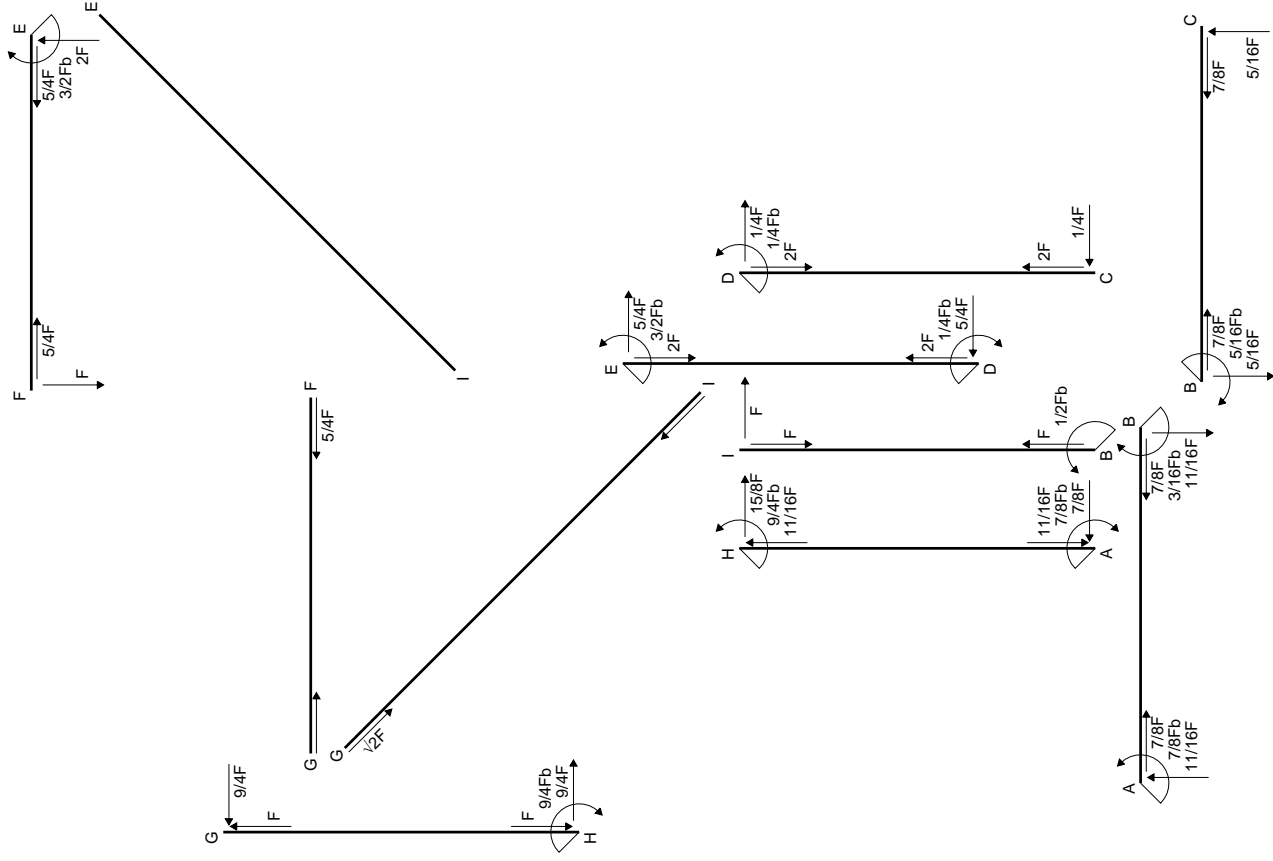
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

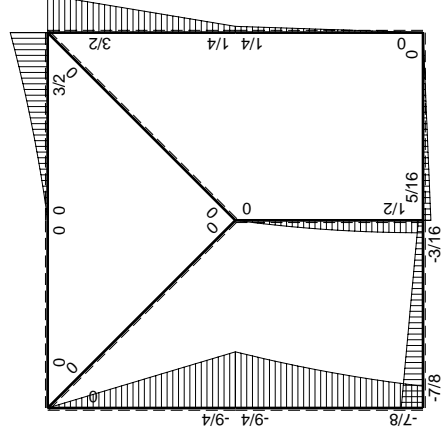
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

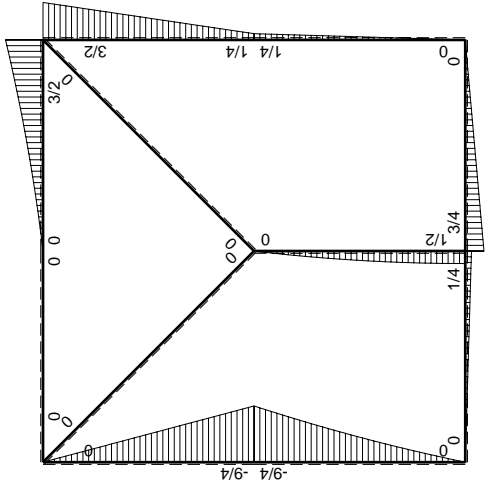
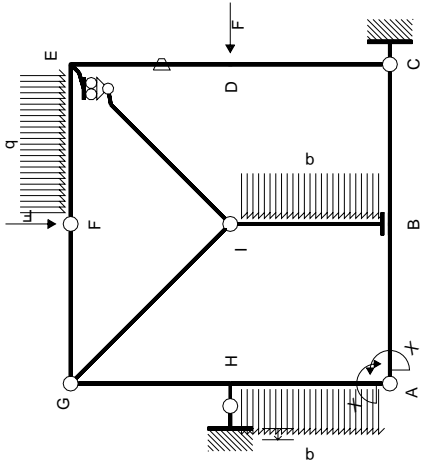


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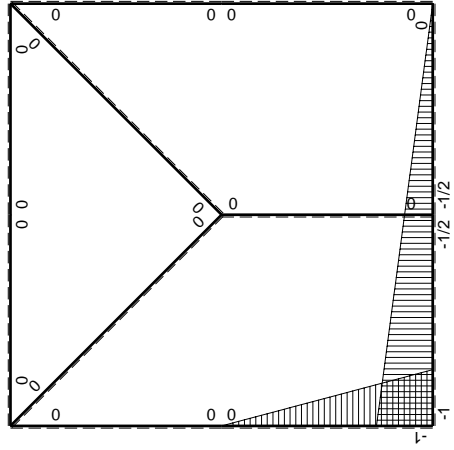
⊕ ↓ F



⊕ ⊕ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

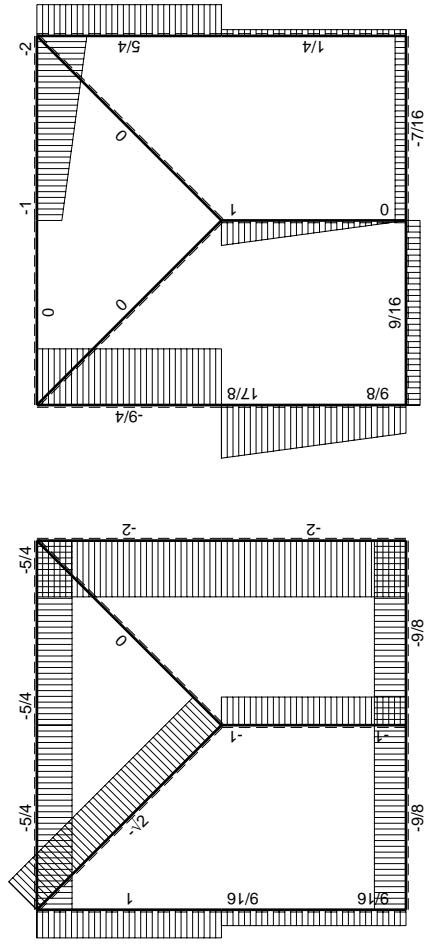
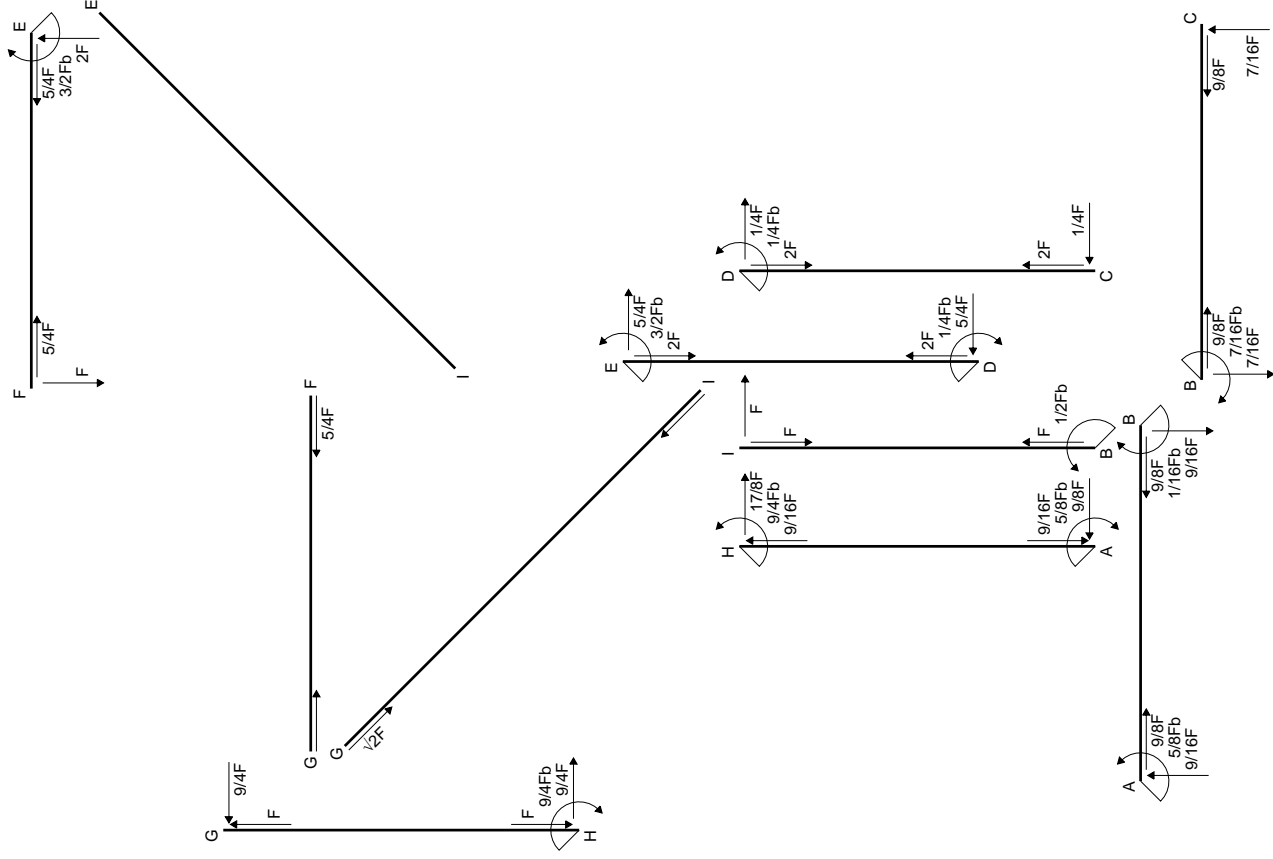
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

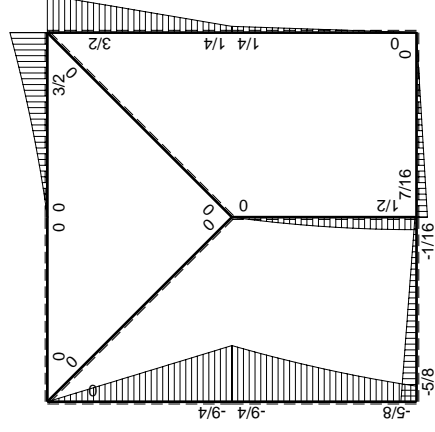
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

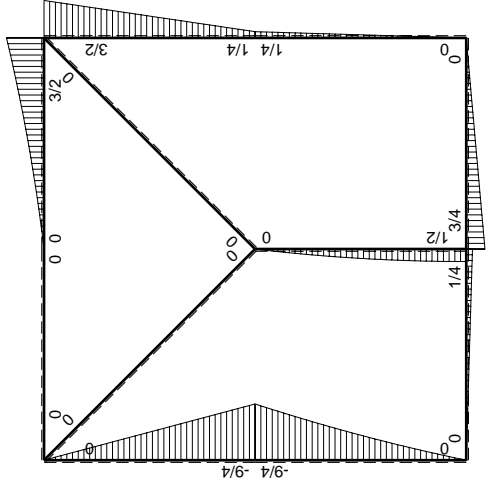
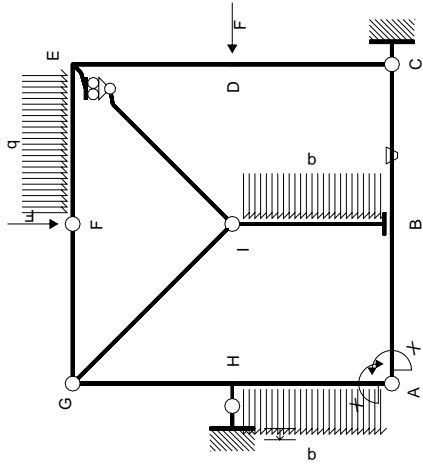


$\leftarrow \rightarrow + \rightarrow F$

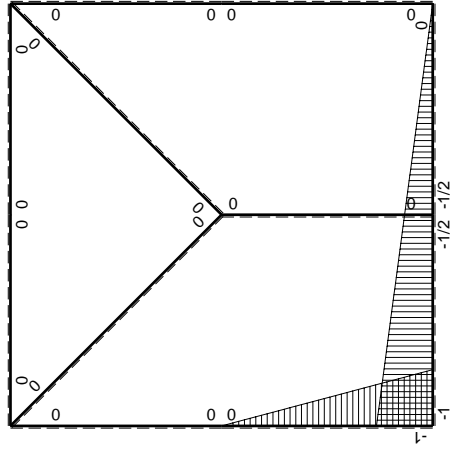
$\uparrow \downarrow + \downarrow F$



$\leftarrow \rightarrow + \rightarrow Fb$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	$-Fb/EJ$	$-3/8Fb+3/4Fx-3/8Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	Fb/EJ	$-3/8Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ + [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ + [-1/4 x^2/b]_0^b \theta$$

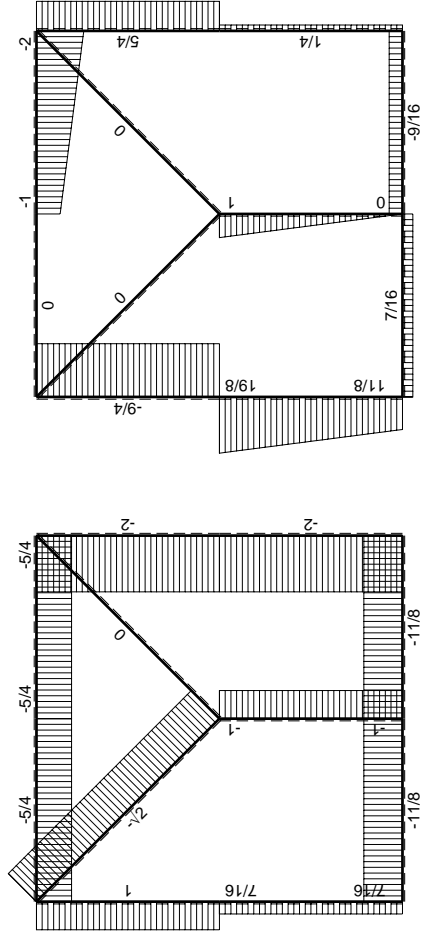
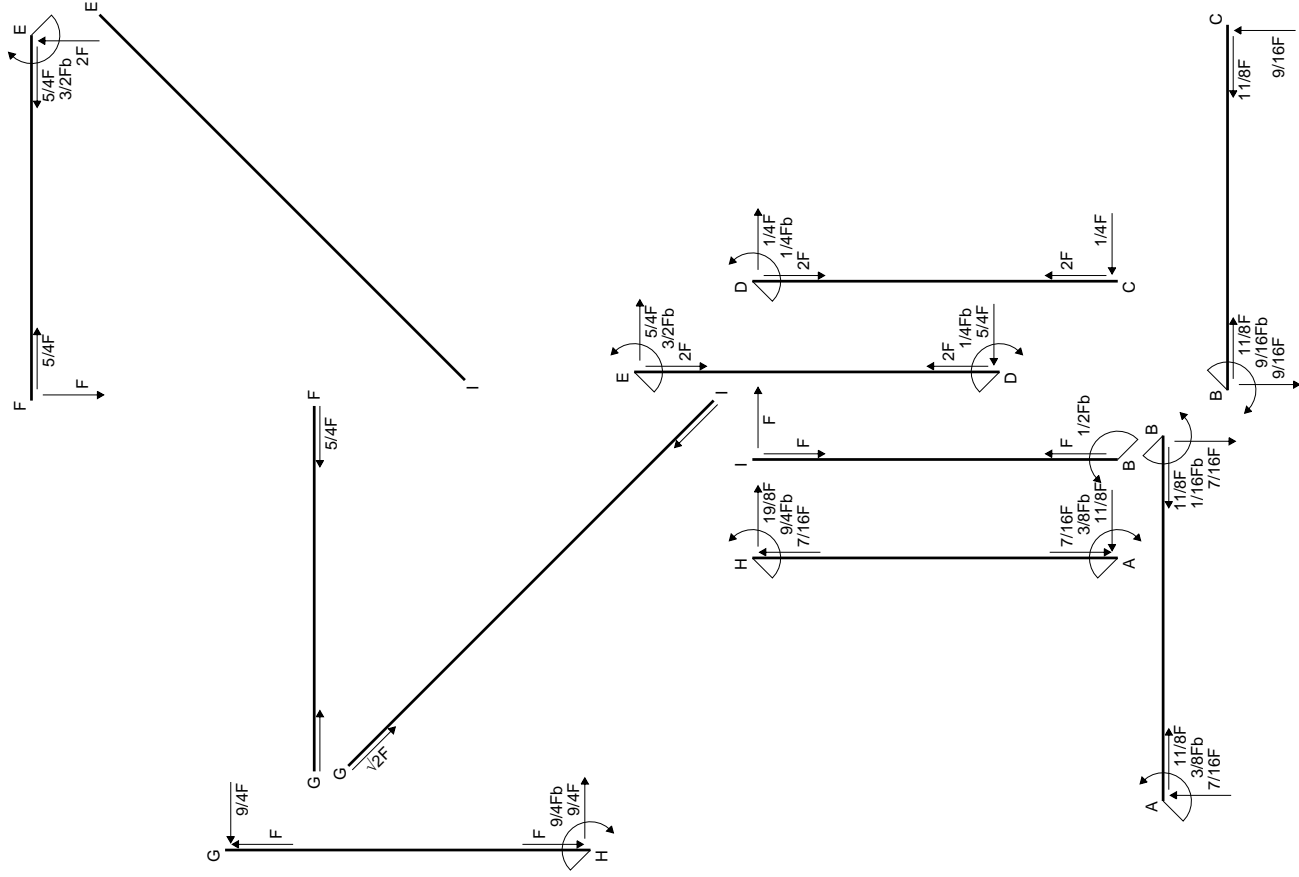
$$= (-1/8 b) Fb 1/EJ + (-1/4 b) \theta = 1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

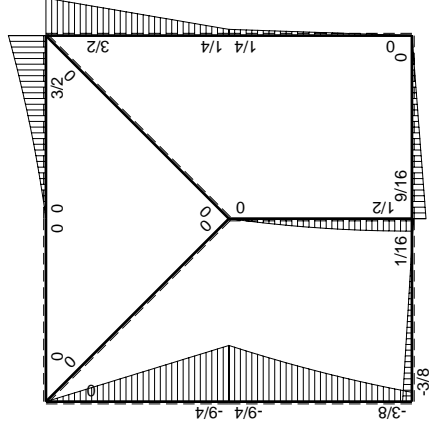
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

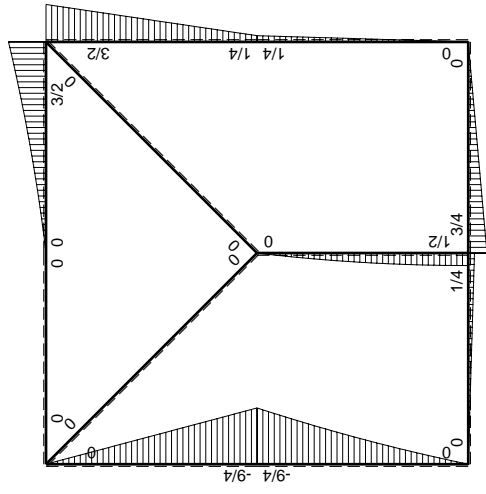
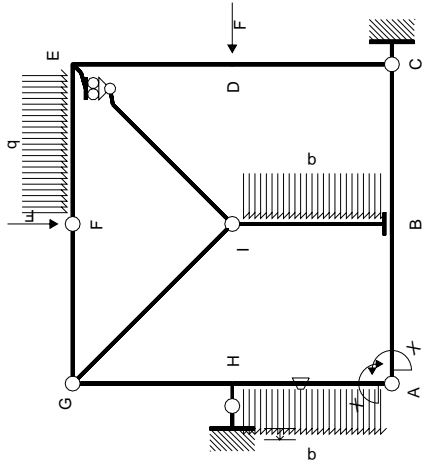


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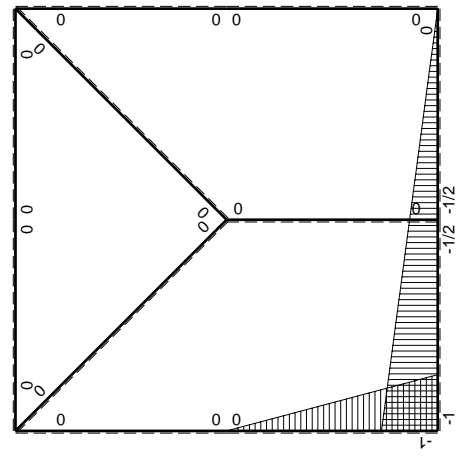
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	$-Fb/EJ$	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/3+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	Fb/EJ	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

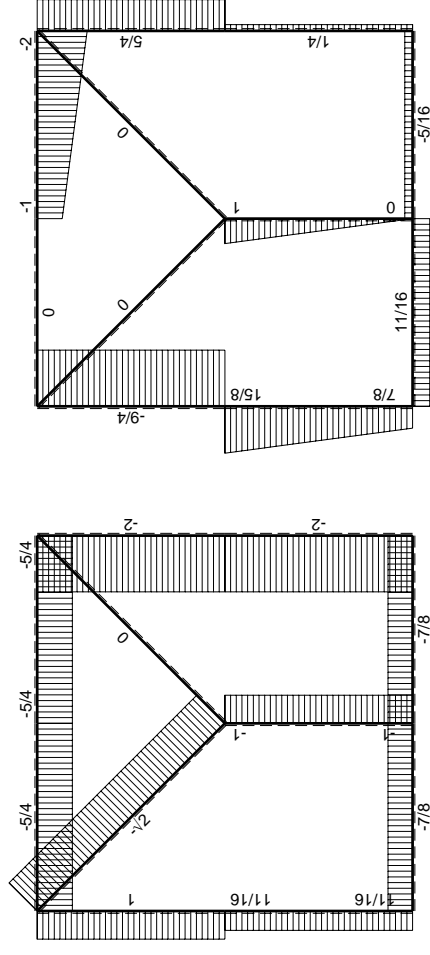
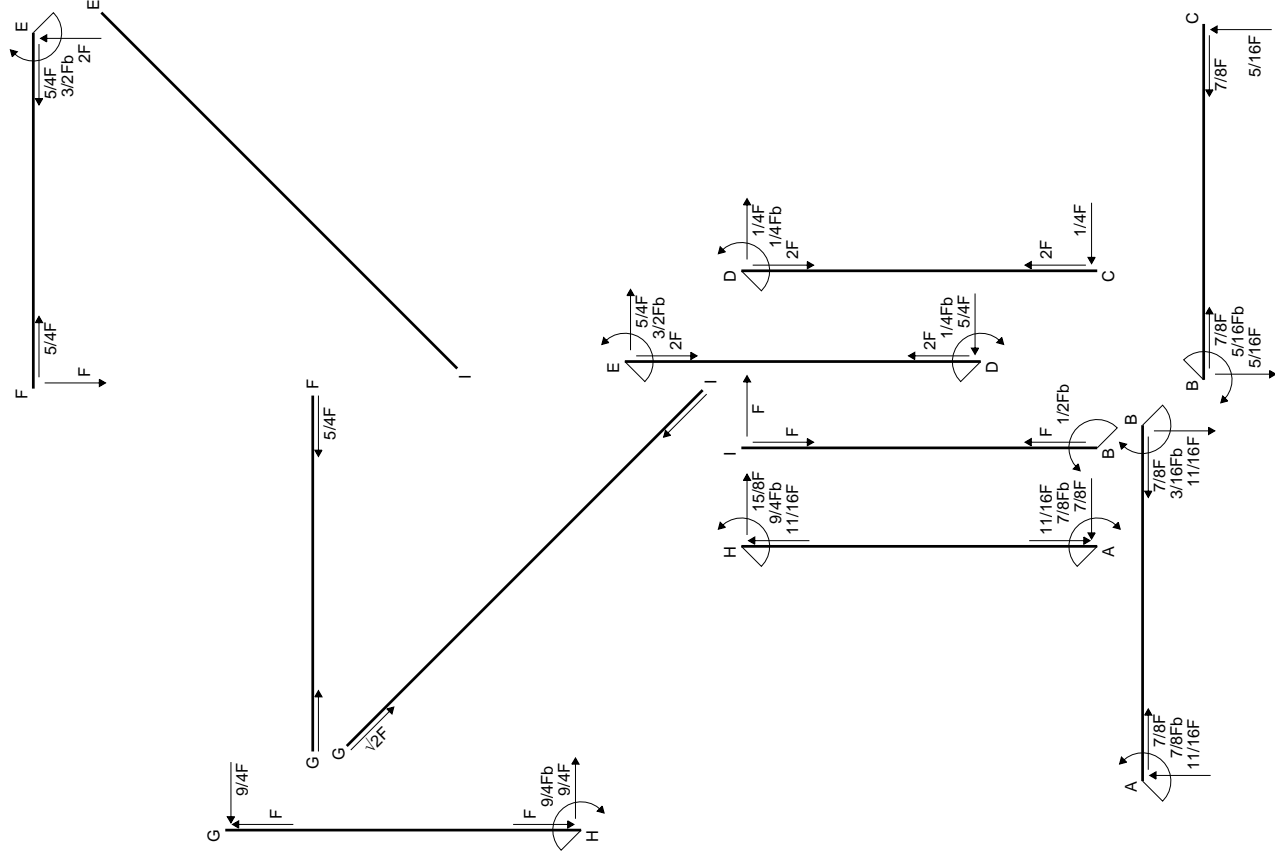
$$= \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 5/6 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

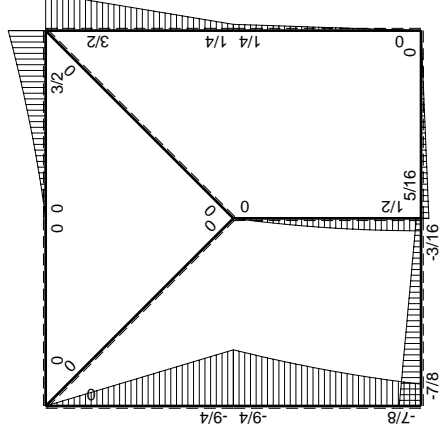
$$= \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 5/6 Fb^2/EJ$$

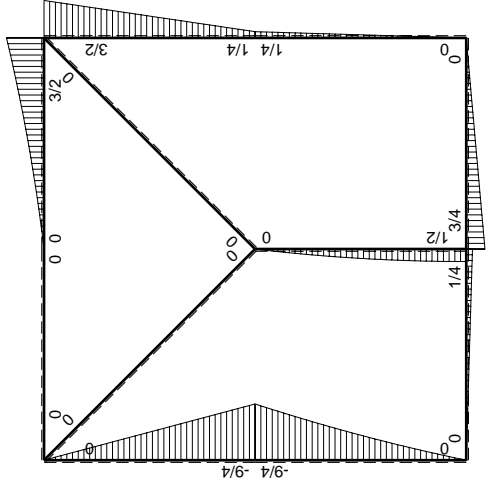
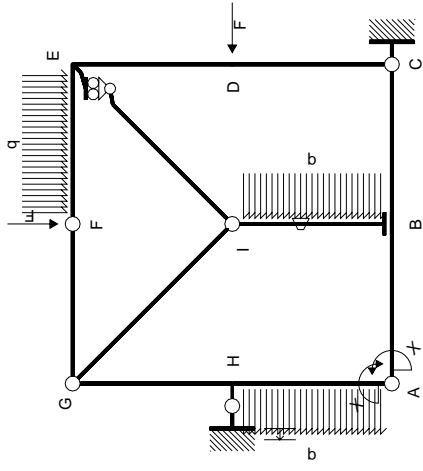


\rightarrow $\left[\begin{smallmatrix} + \\ - \end{smallmatrix} \right]$ F

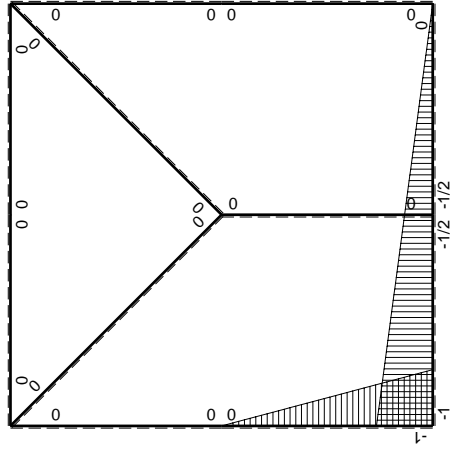
$\left[\begin{smallmatrix} + \\ - \end{smallmatrix} \right]$ F



$\left[\begin{smallmatrix} + \\ - \end{smallmatrix} \right]$ F_b



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

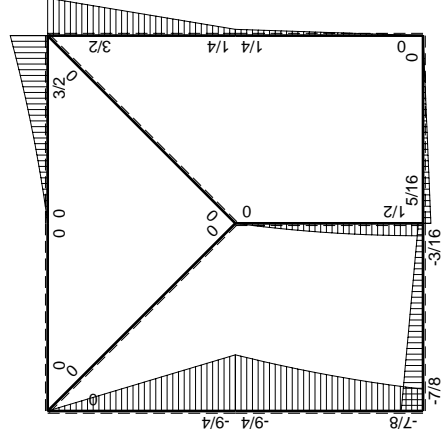
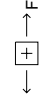
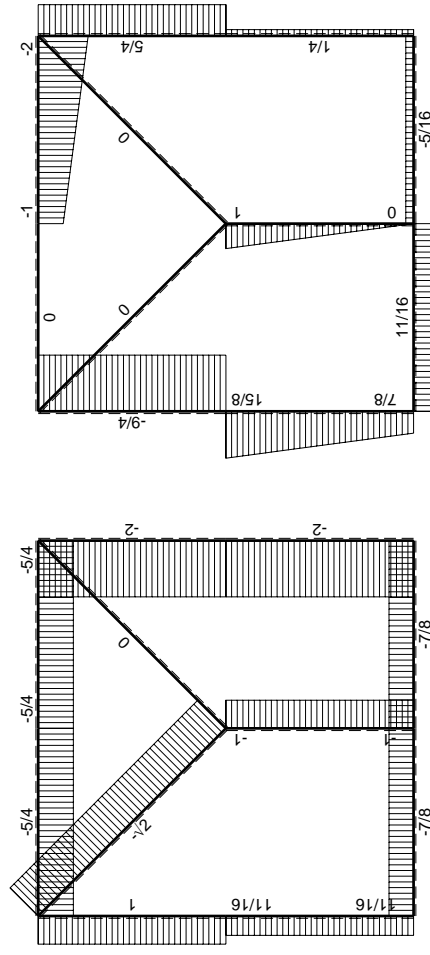
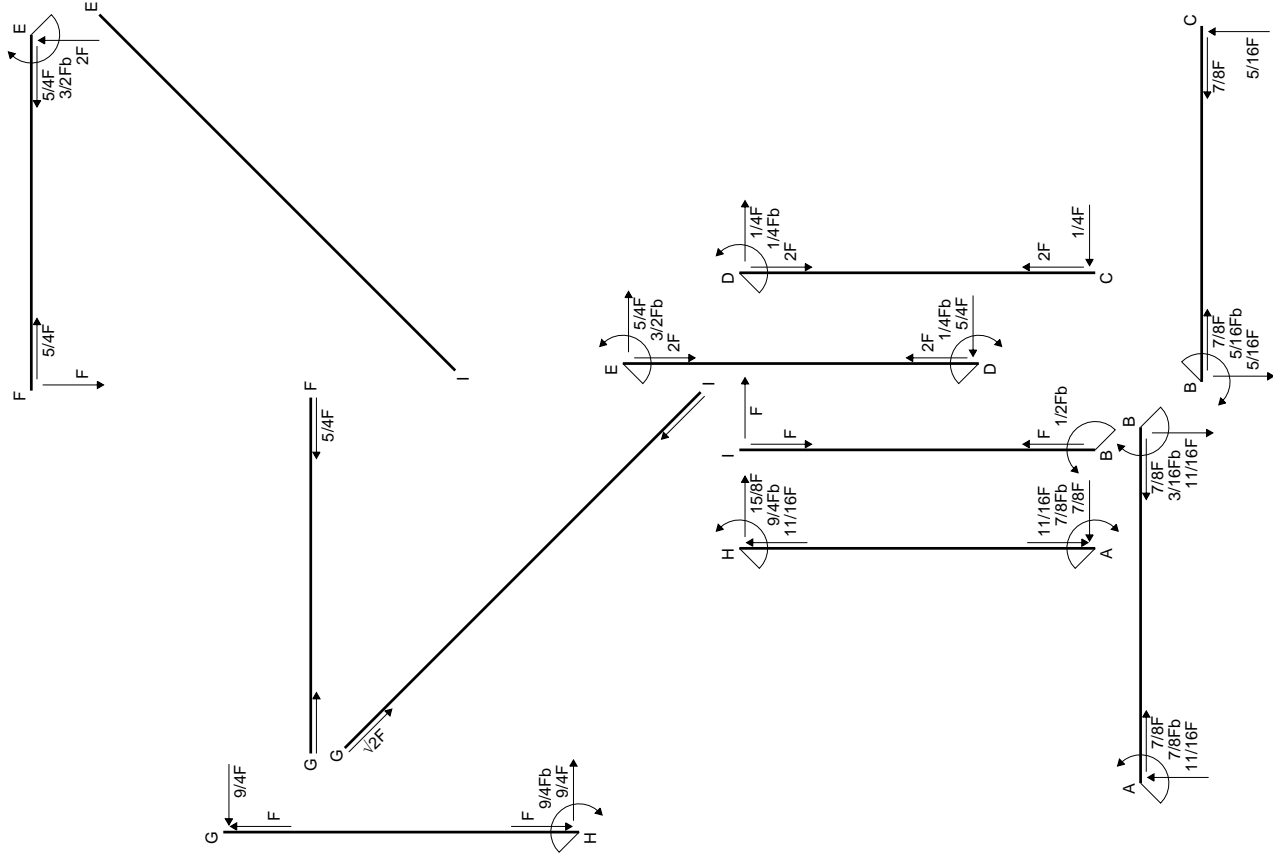
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

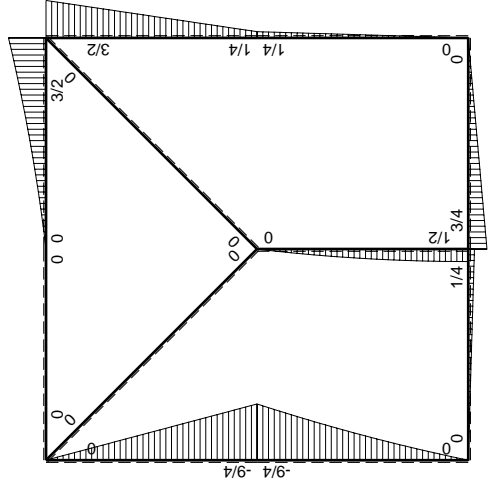
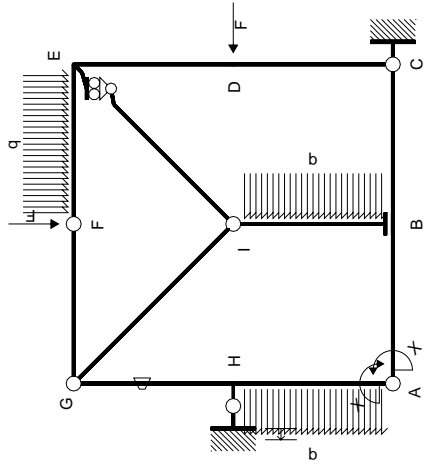
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

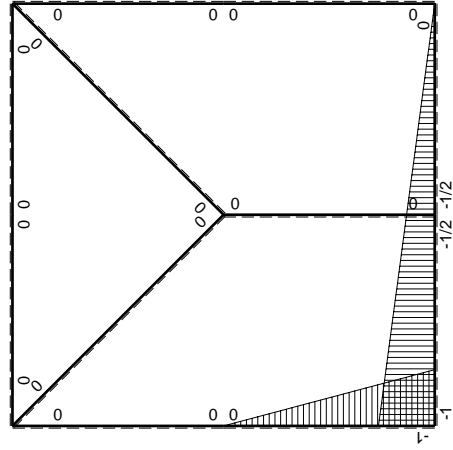
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

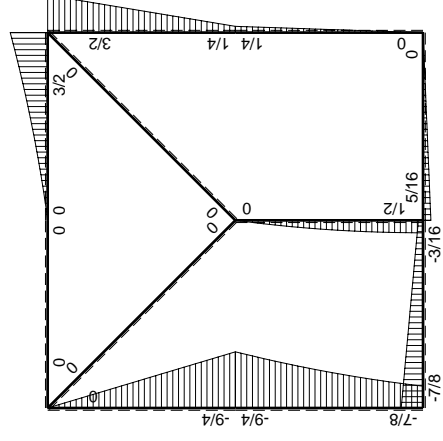
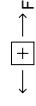
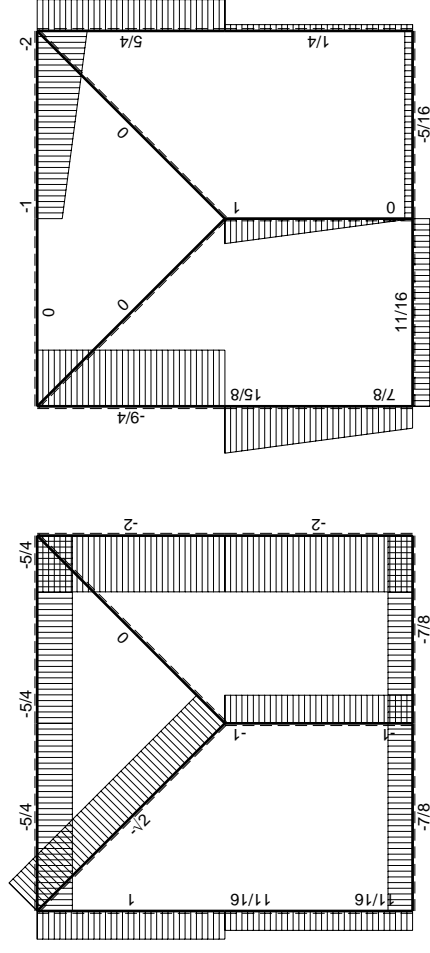
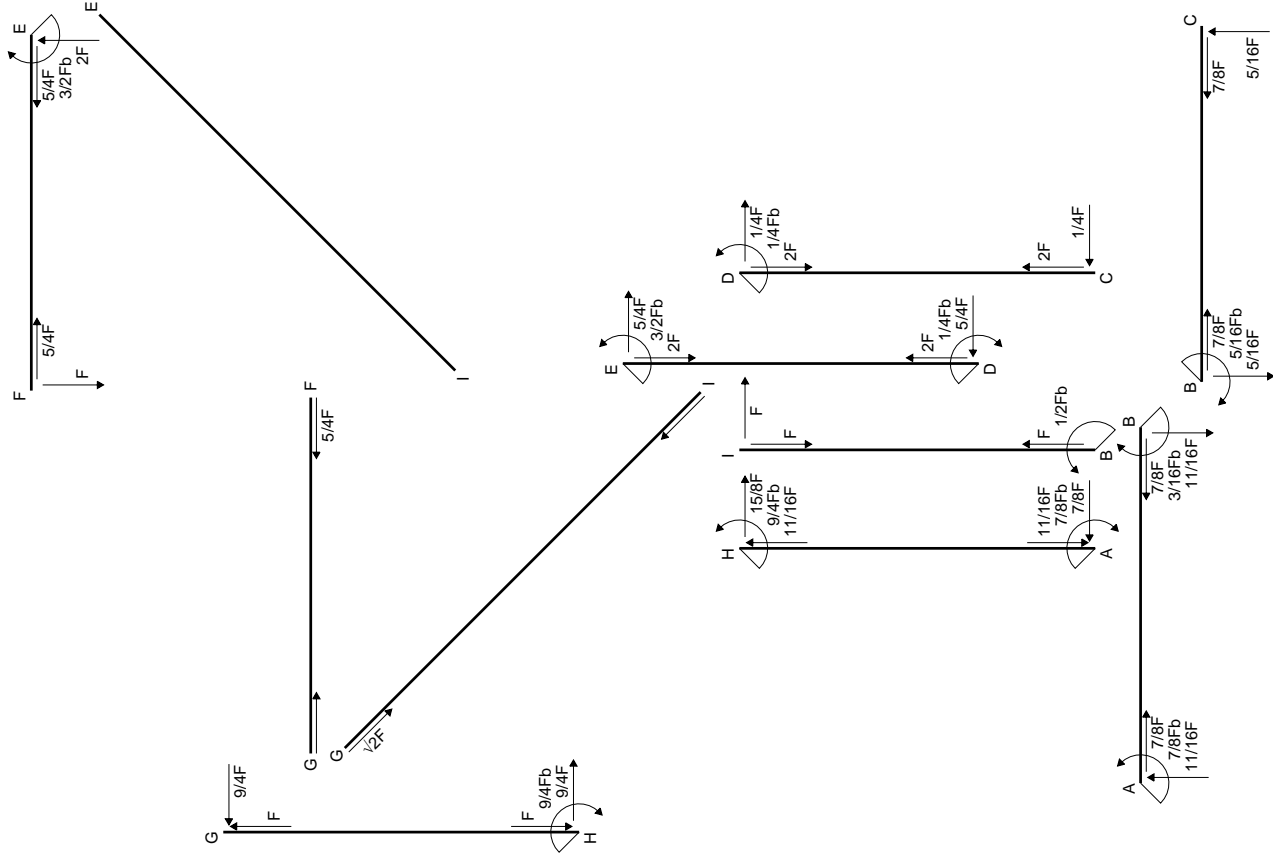
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

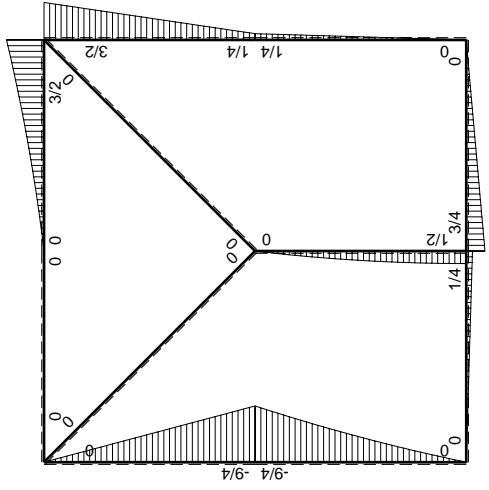
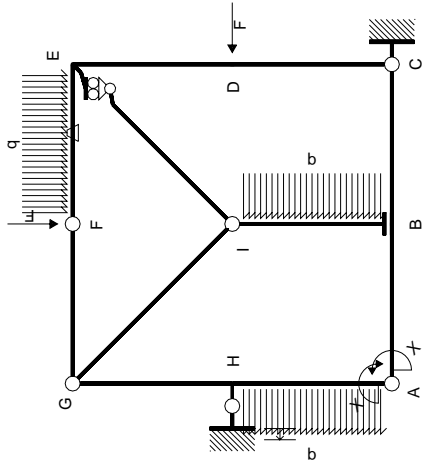
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

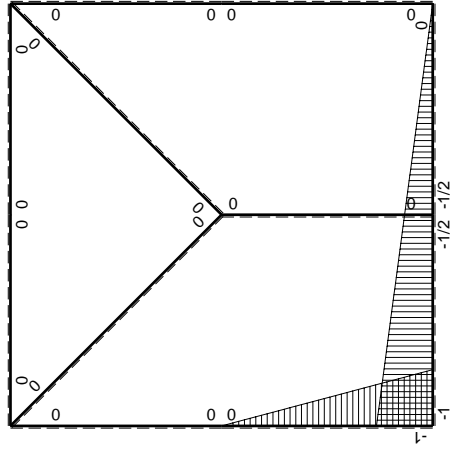
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

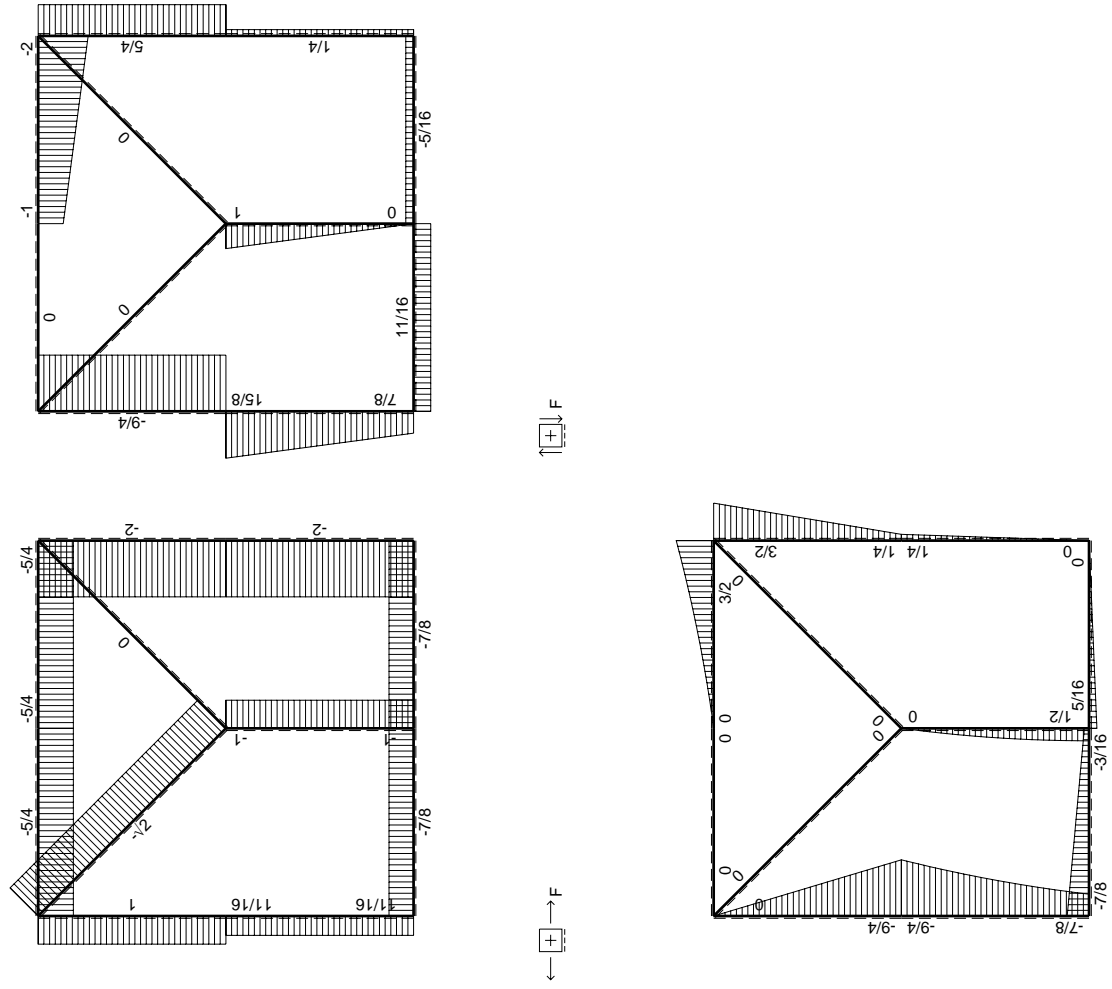
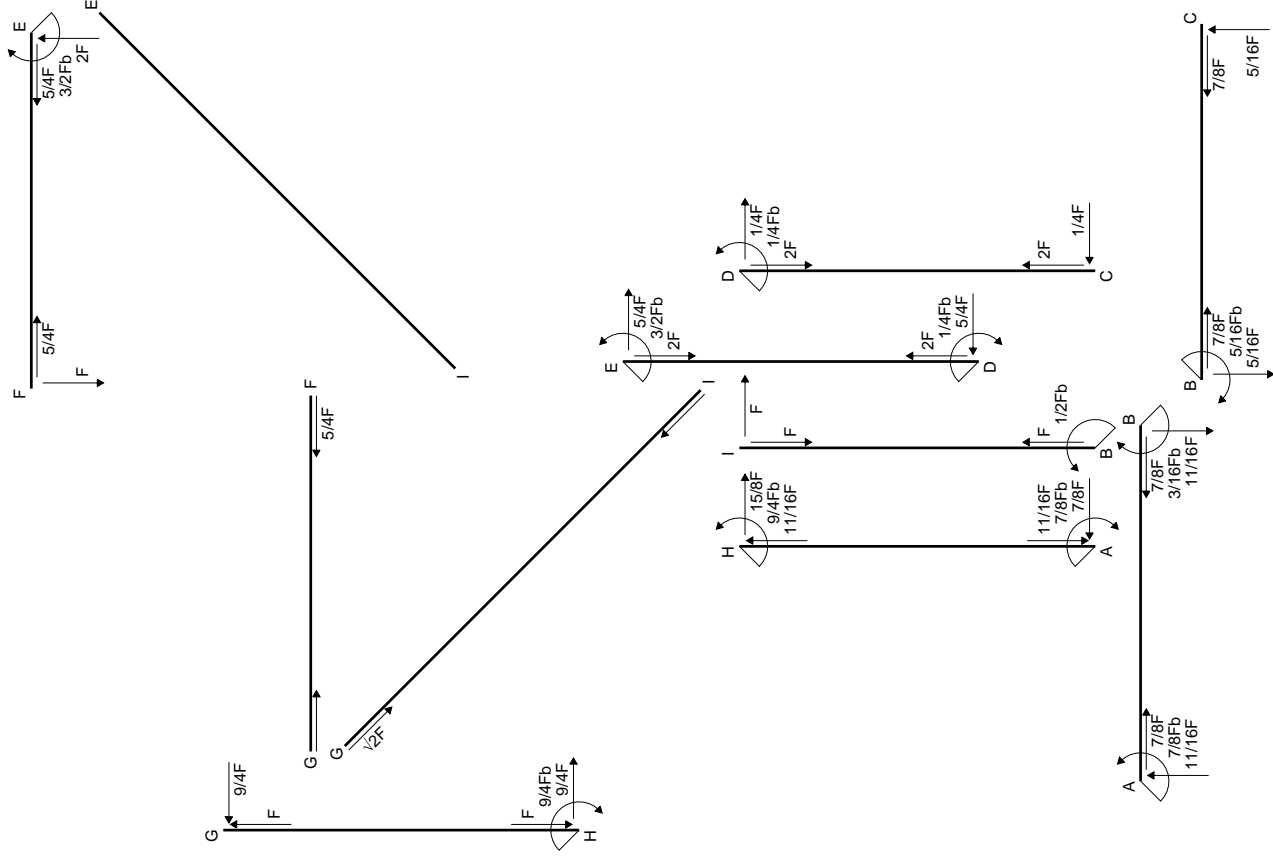
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

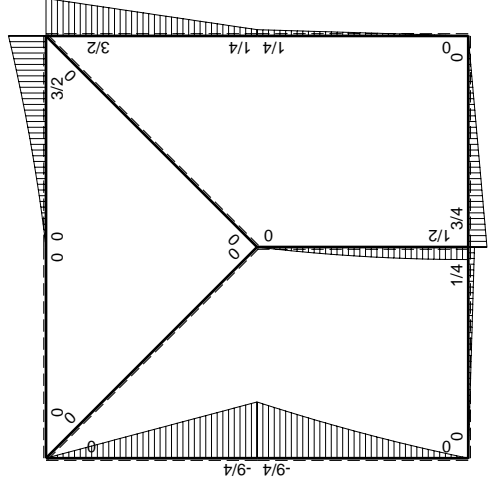
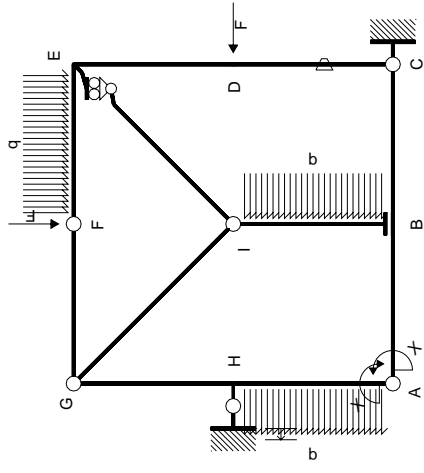
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

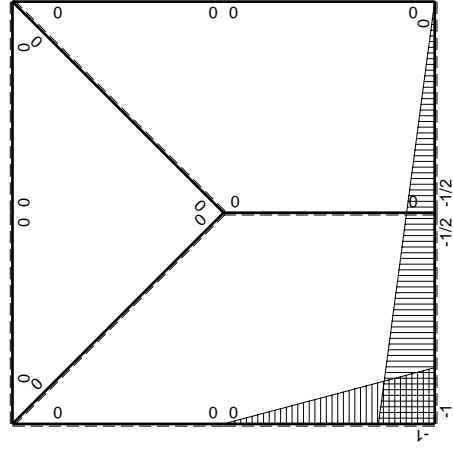
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	Fb/EJ	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

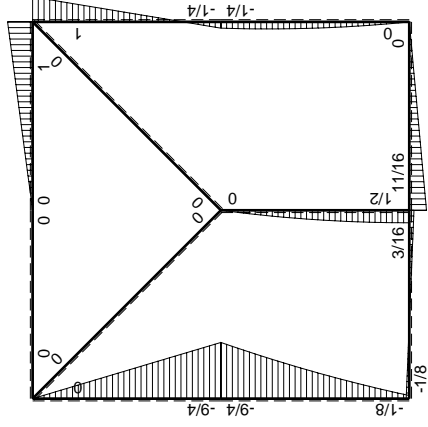
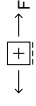
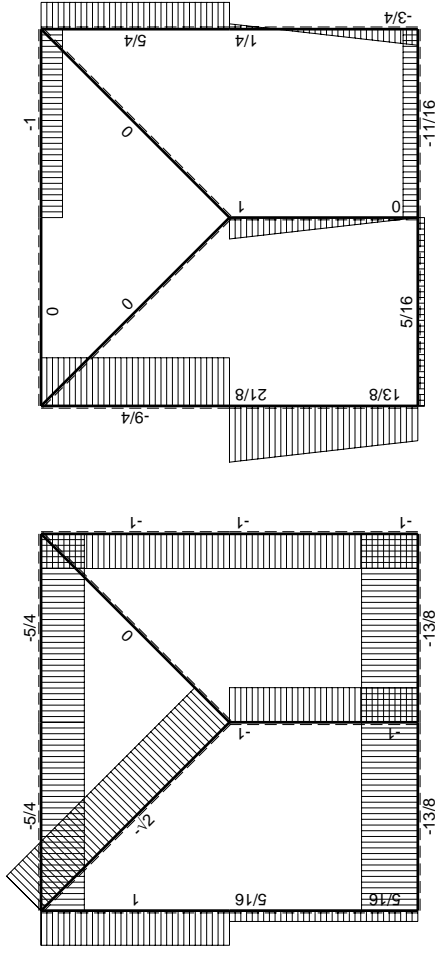
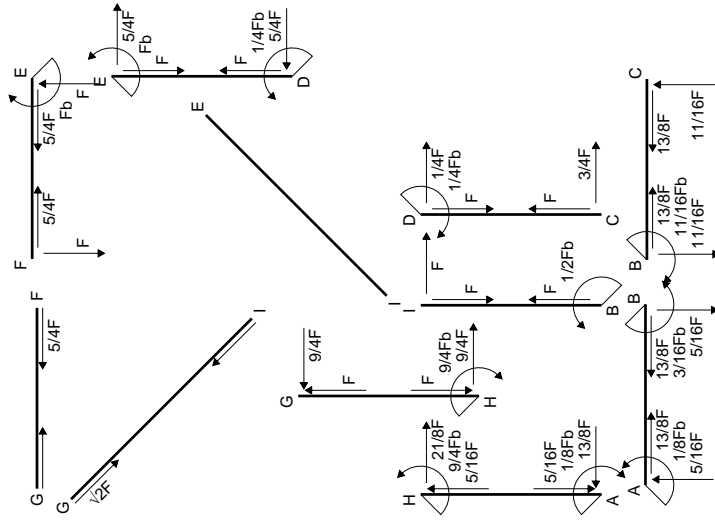
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

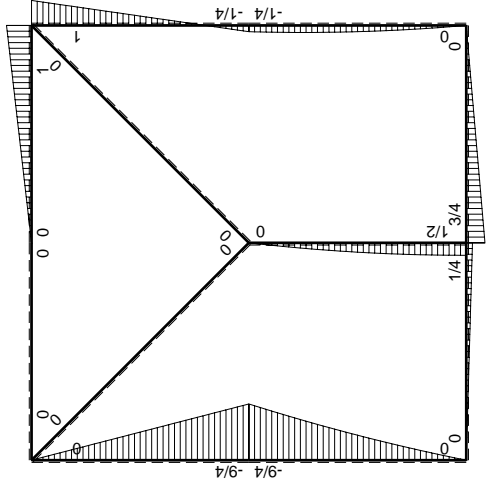
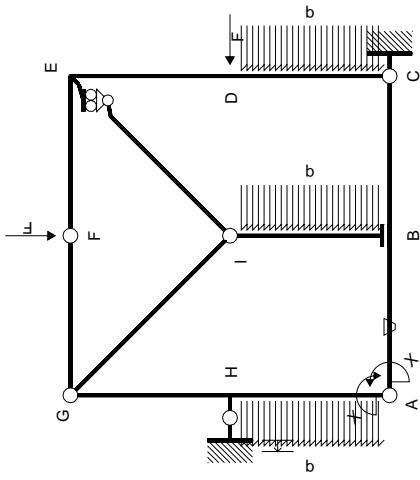
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

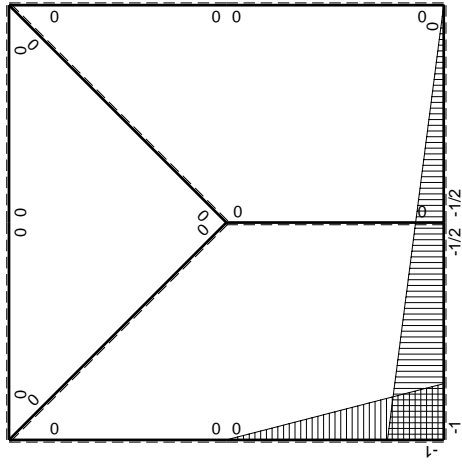
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	$-Fb/EJ$	$-1/4Fx+1/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/12+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	Fb/EJ	$-1/8Fb+1/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

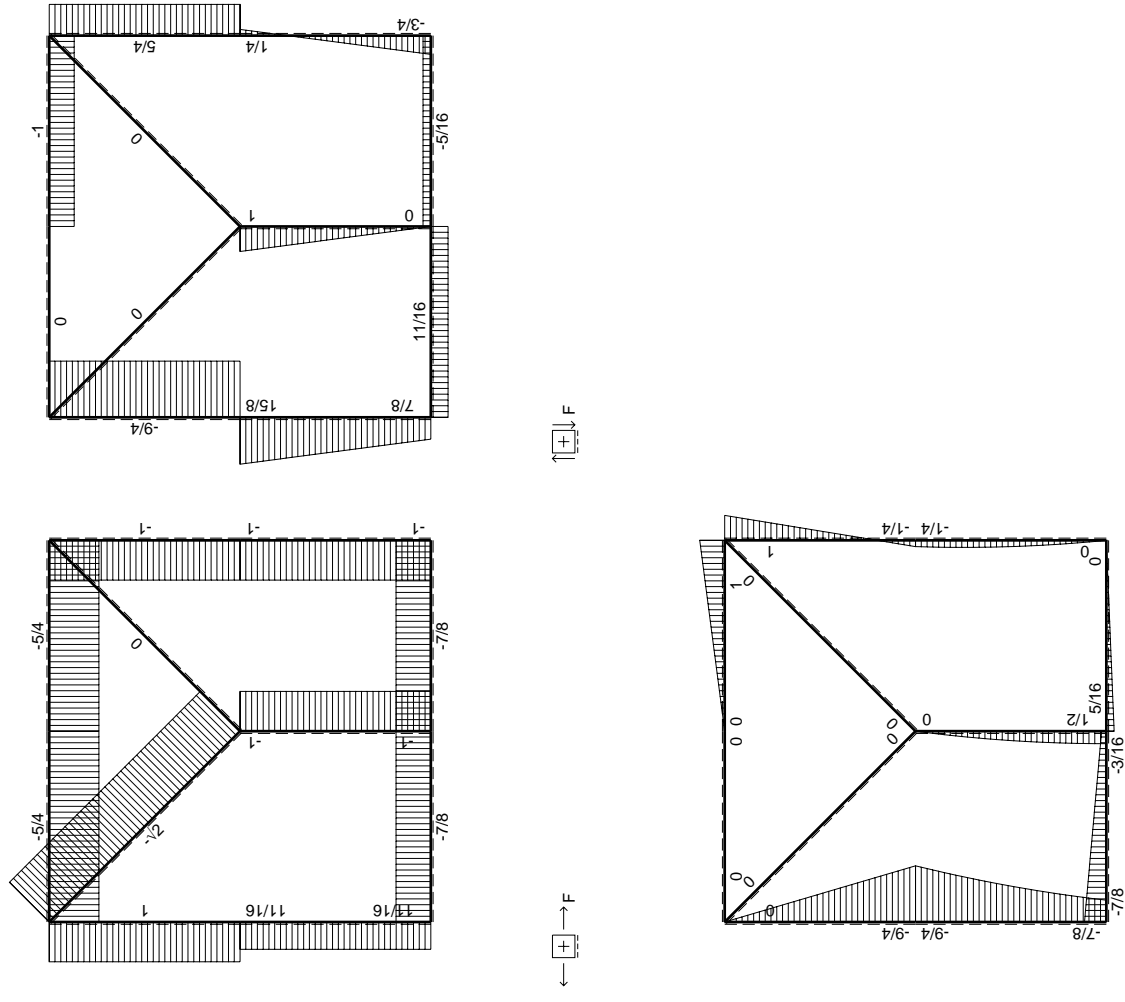
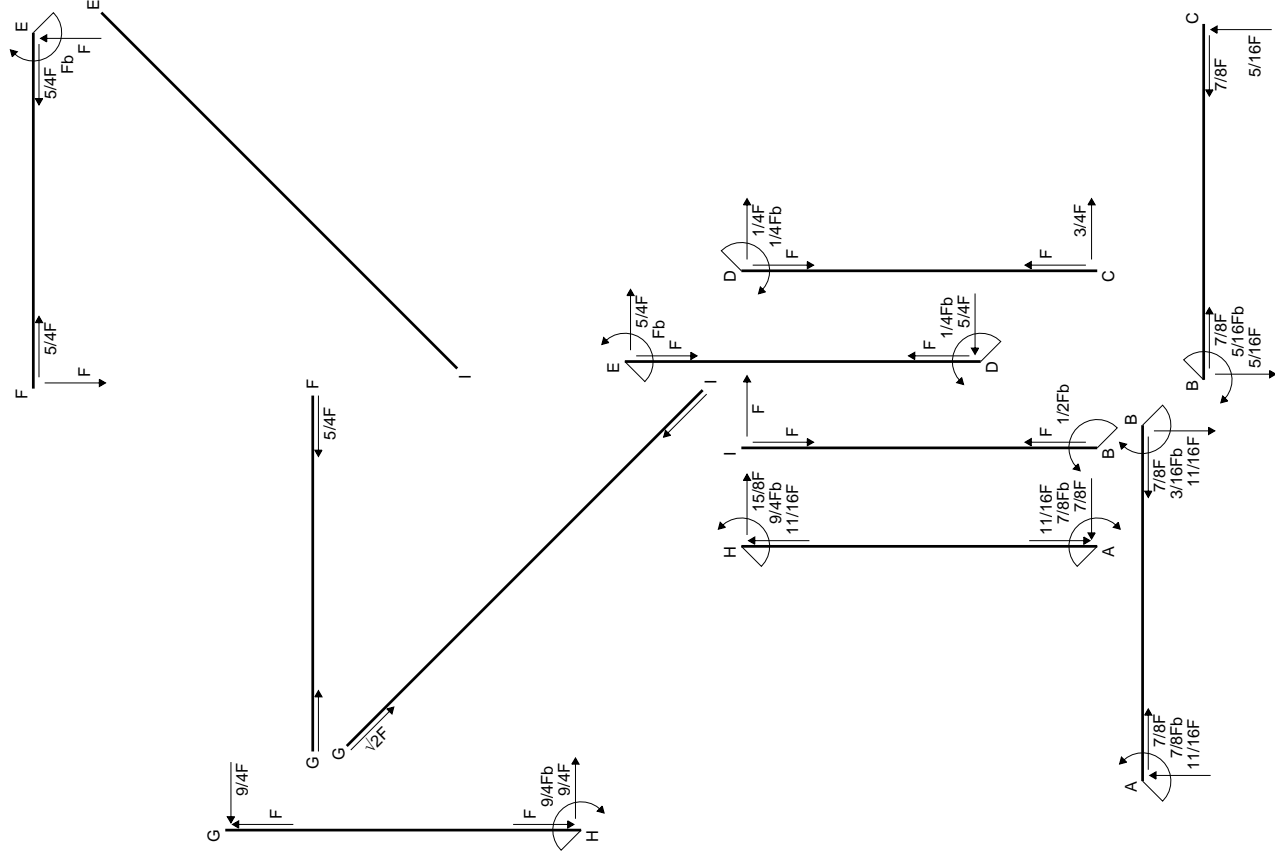
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

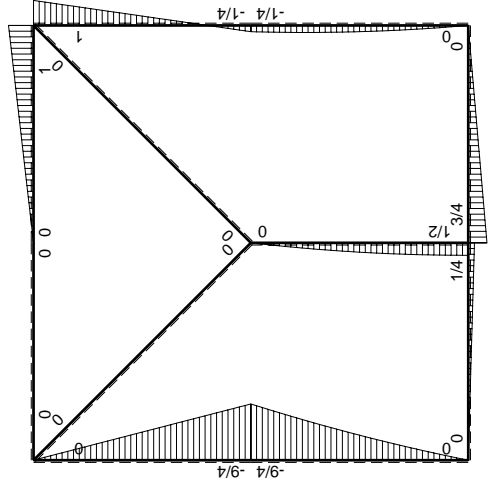
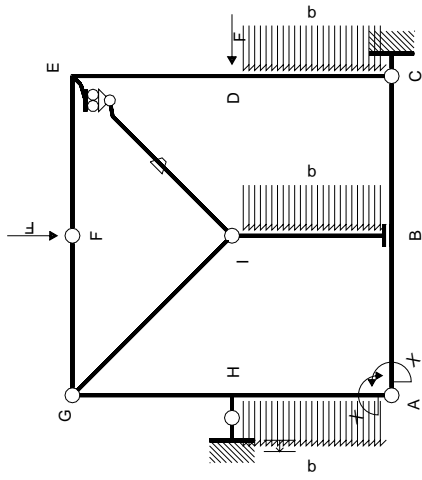
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

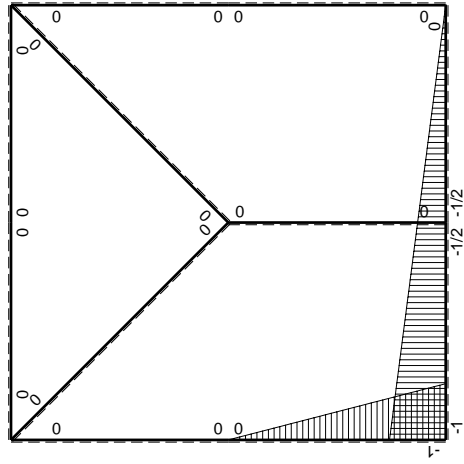
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

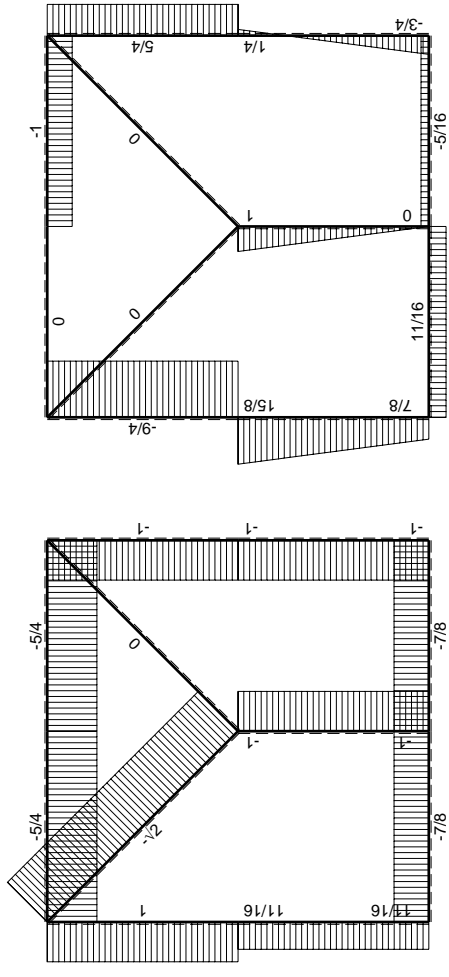
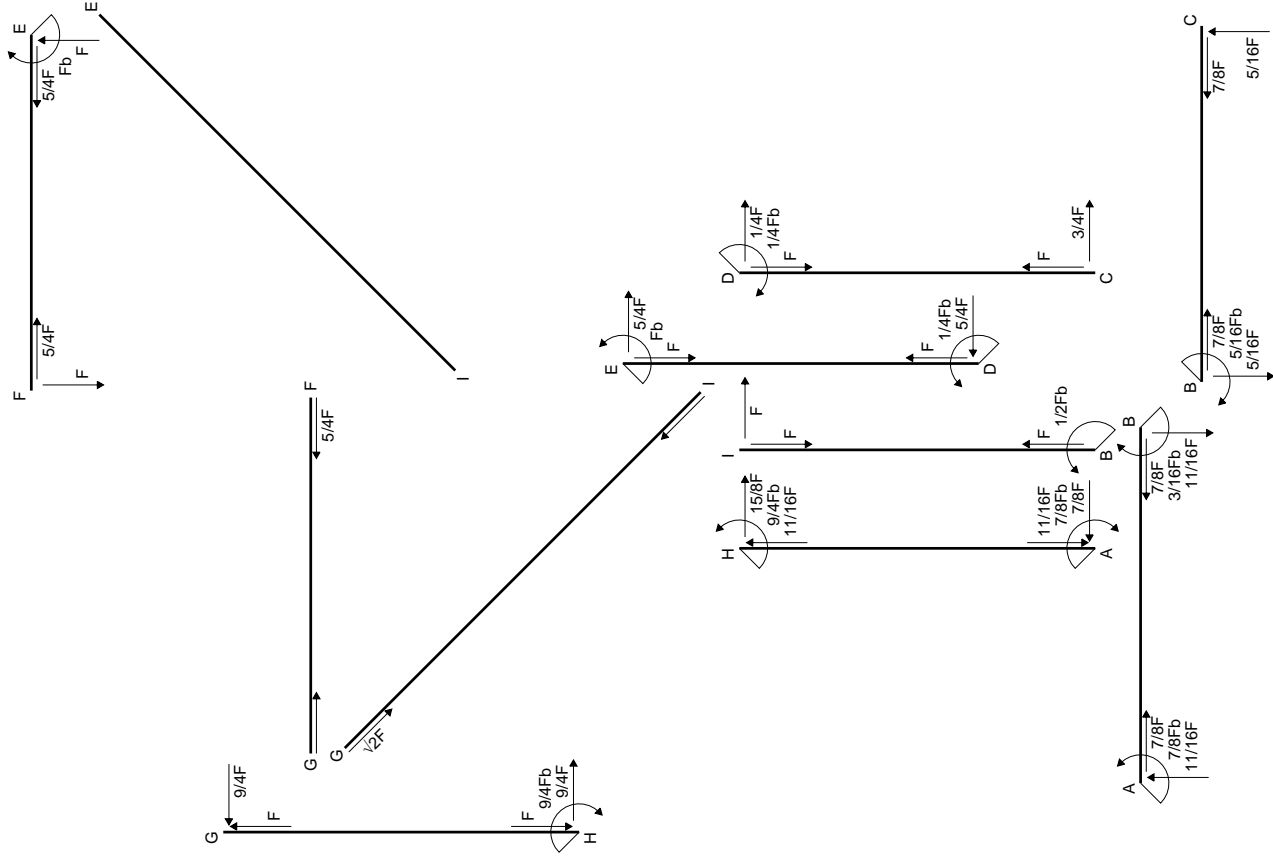
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

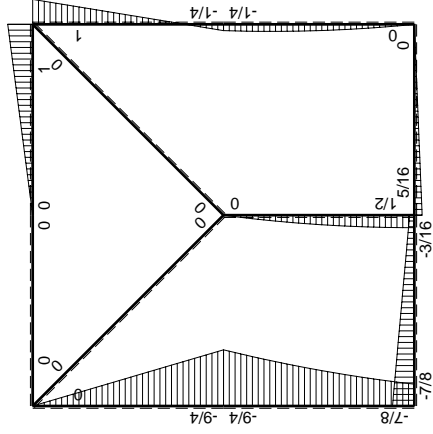
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

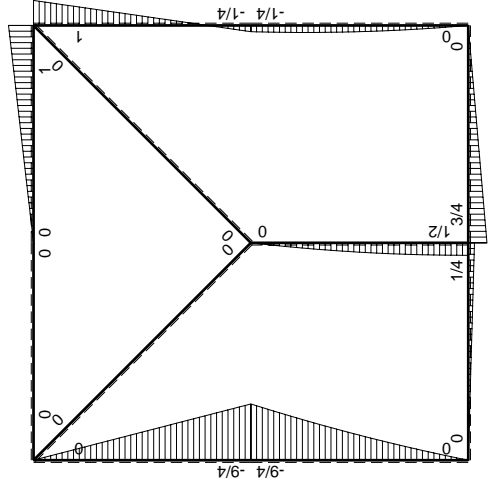
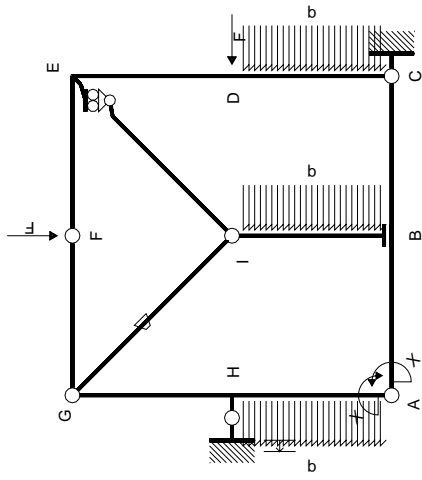


$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow F$

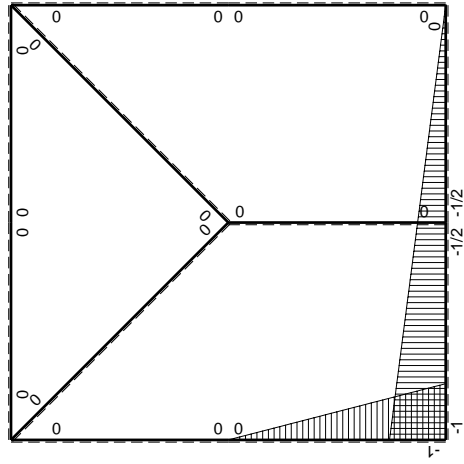
$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow F$



$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow Fb$



M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

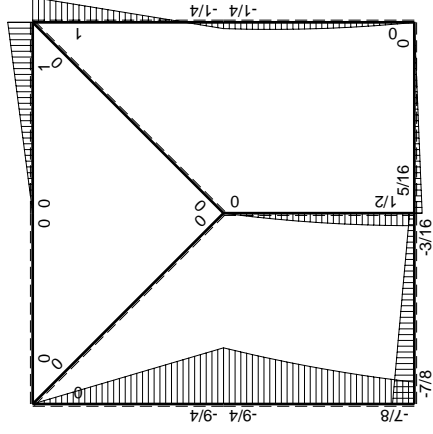
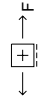
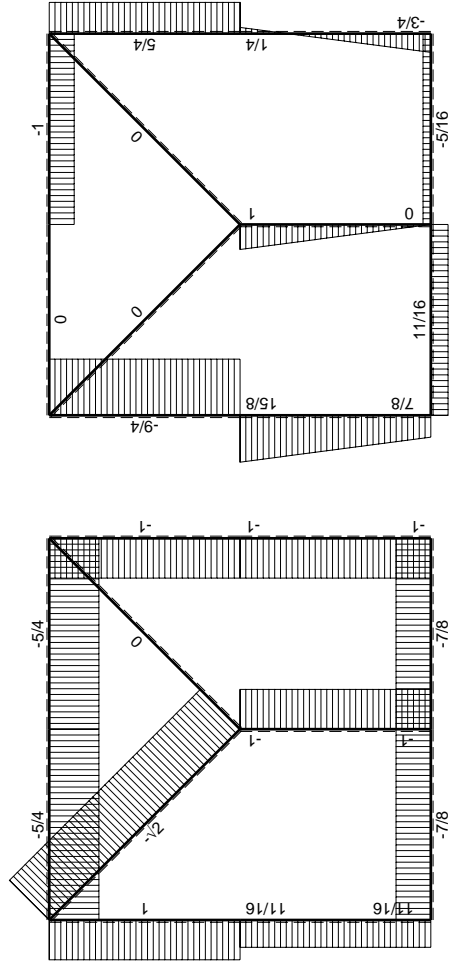
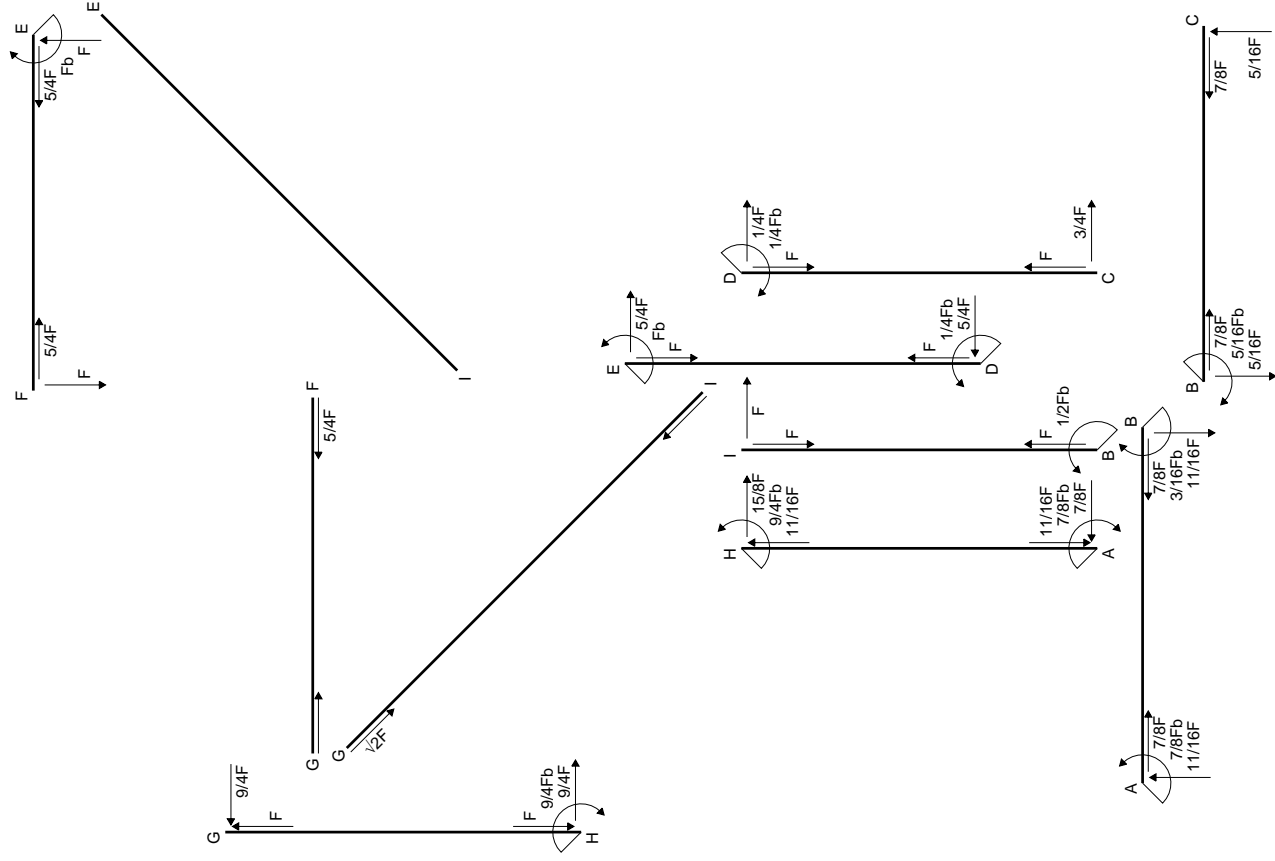
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

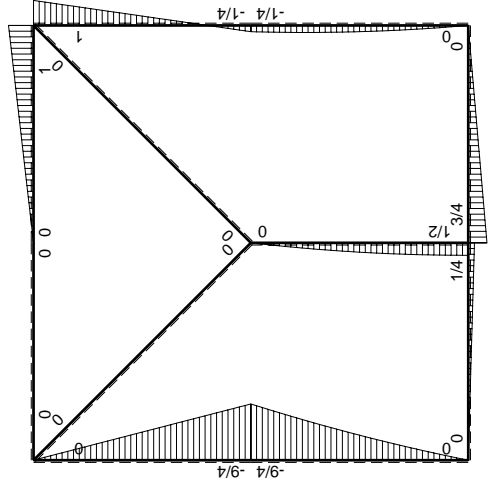
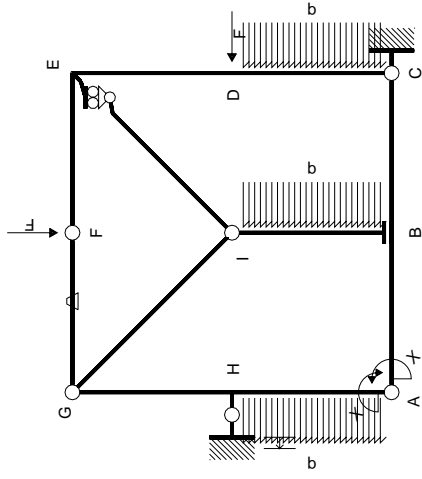
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

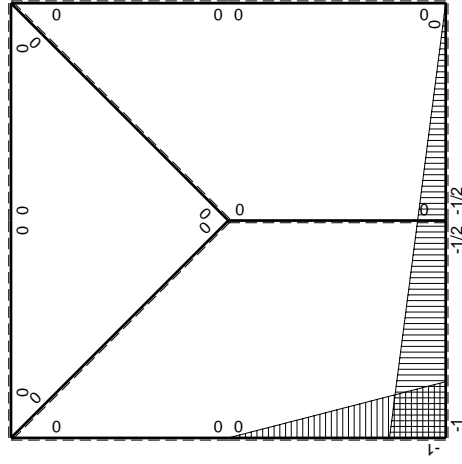
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

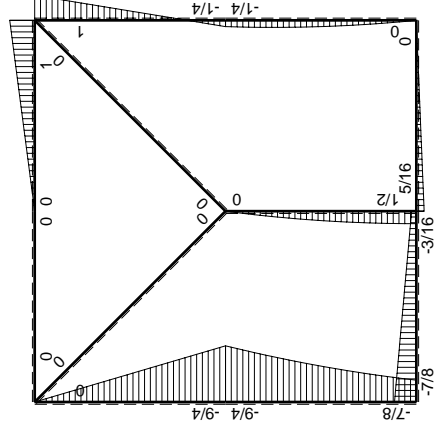
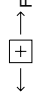
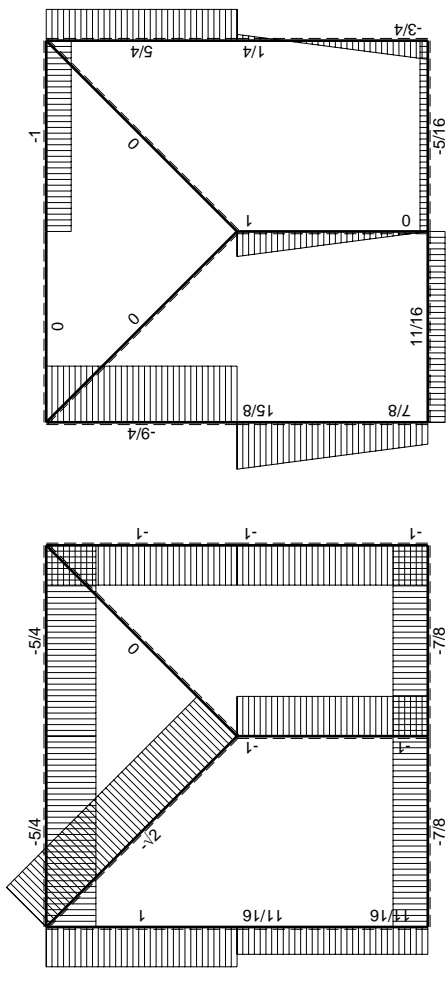
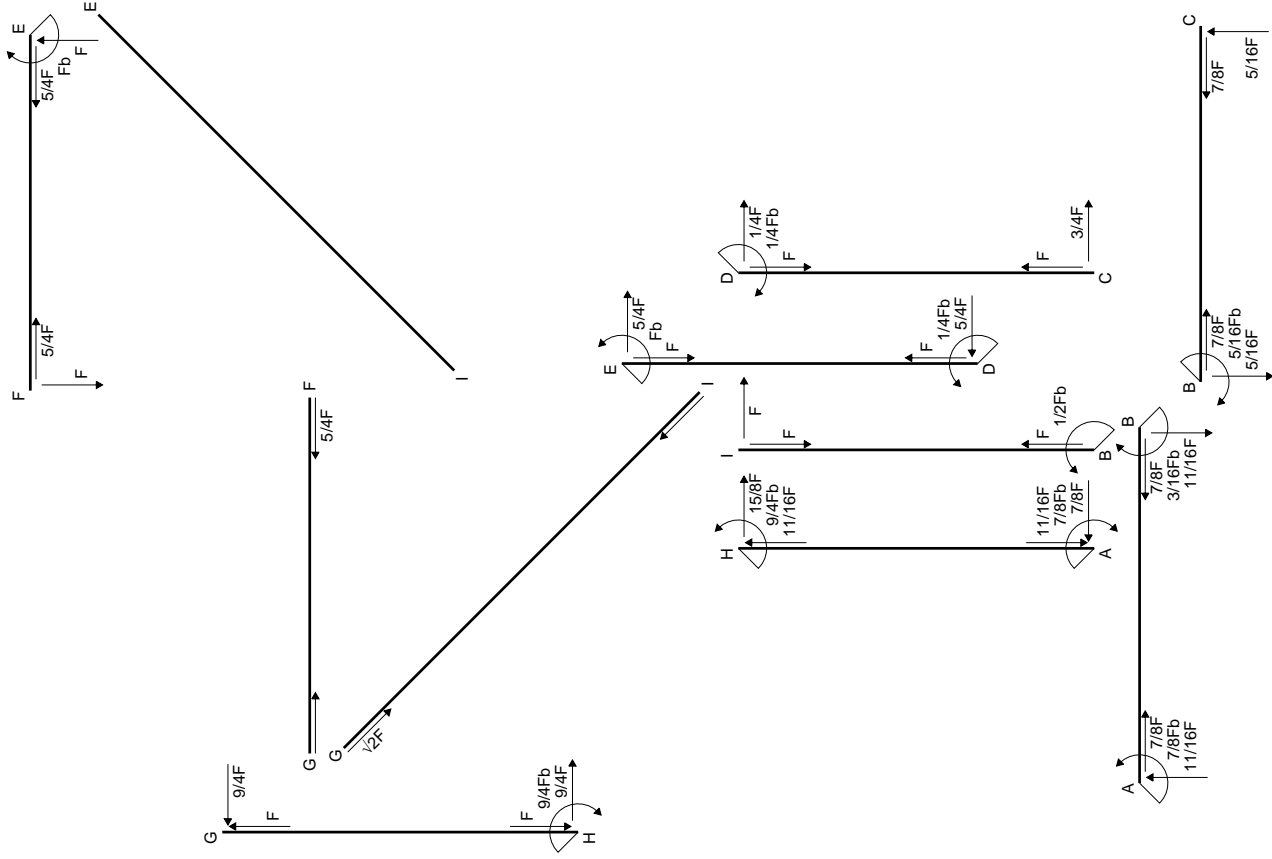
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

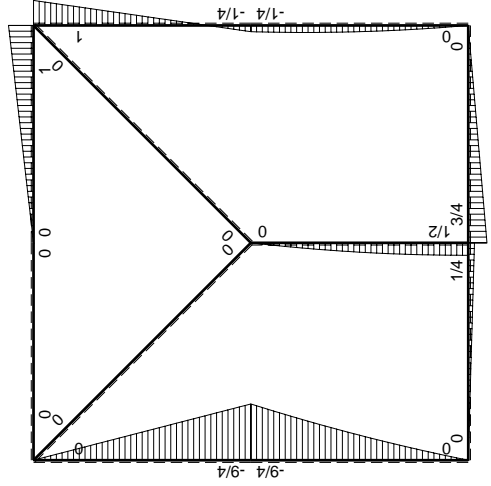
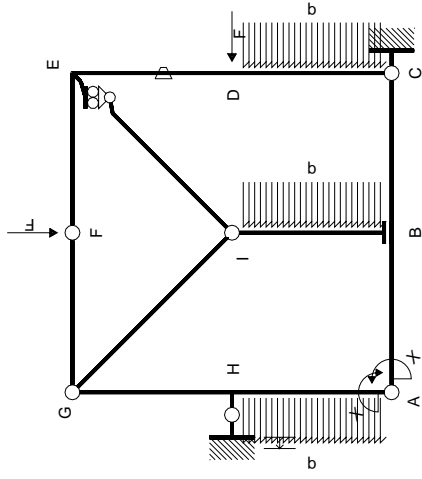
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

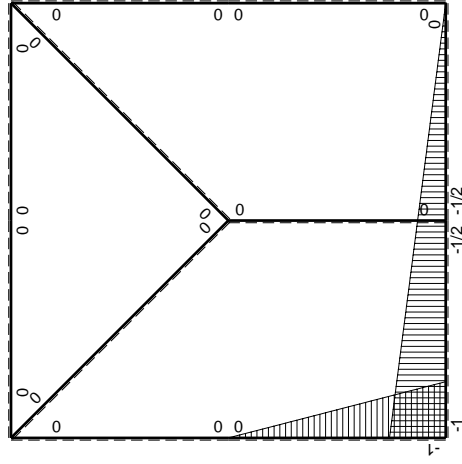
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0			
FE b	0	$-Fx$	0	0	0	0	0+0	0	
FG b	0	0	0	0	0	0			
GF b	0	0	0	0	0	0	0+0	0	
GH b	0	$-9/4Fx$	0	0	0	0			
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0	0+0	0	
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0			
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0	0+0	0	
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

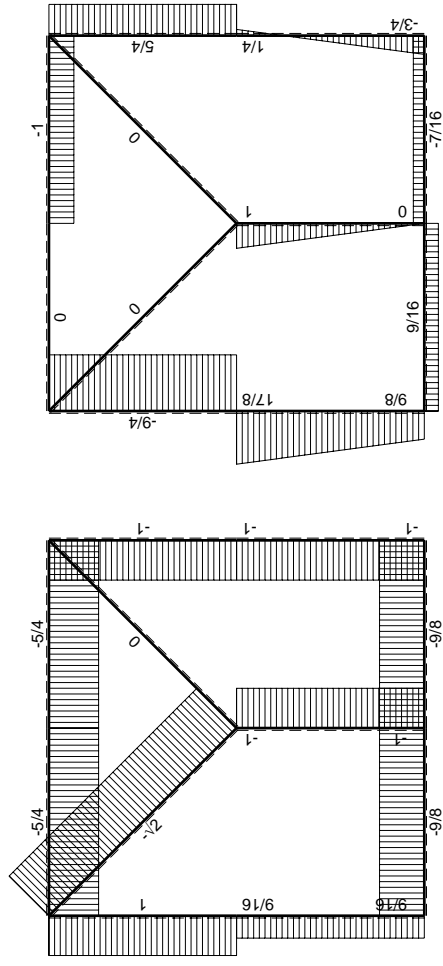
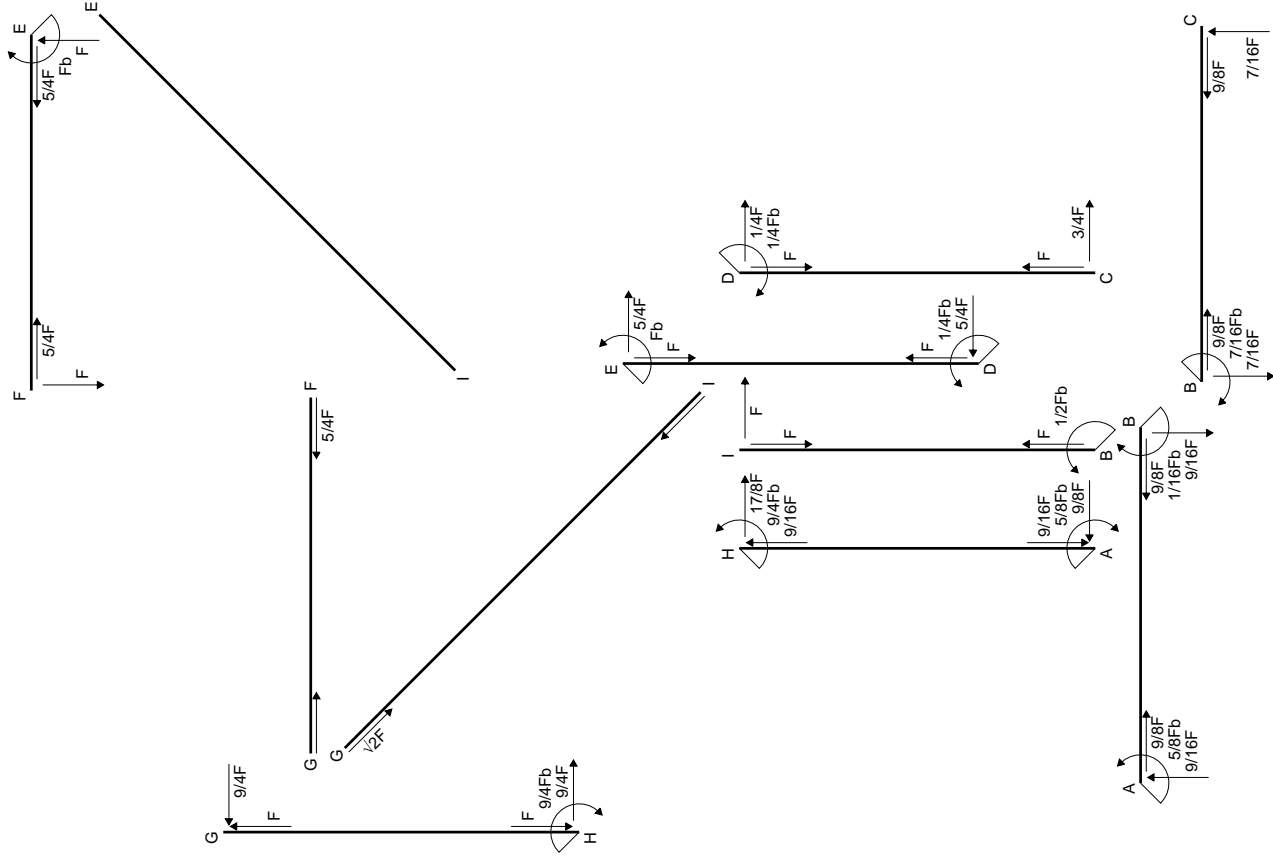
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

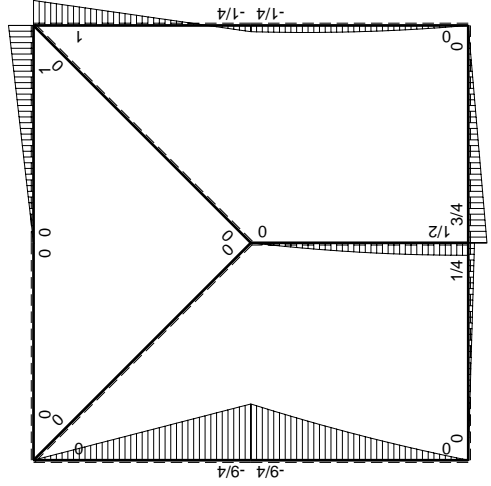
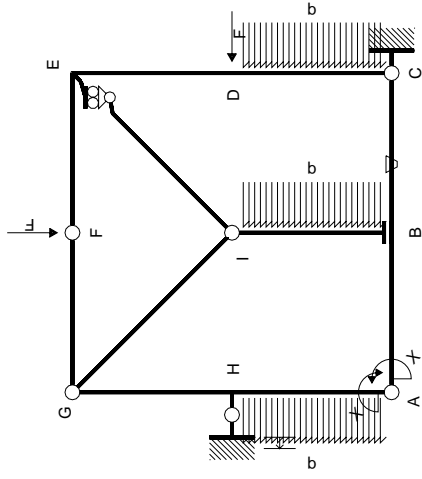
$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$



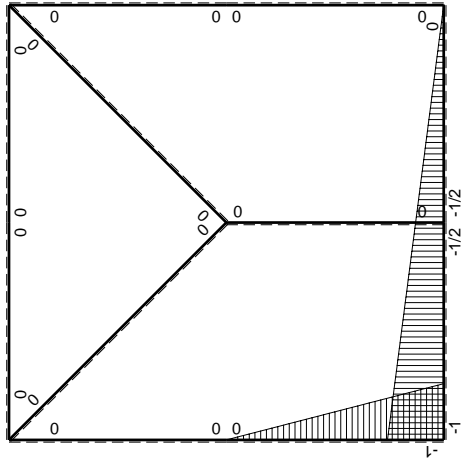
← ⊕ → F

↑ ⊕ ↓ F

⊕ ⊖ Fb



M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	$-Fb/EJ$	$-3/8Fb+3/4Fx-3/8Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	Fb/EJ	$-3/8Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ + \left[1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/4 x^2/b \right]_0^b \theta$$

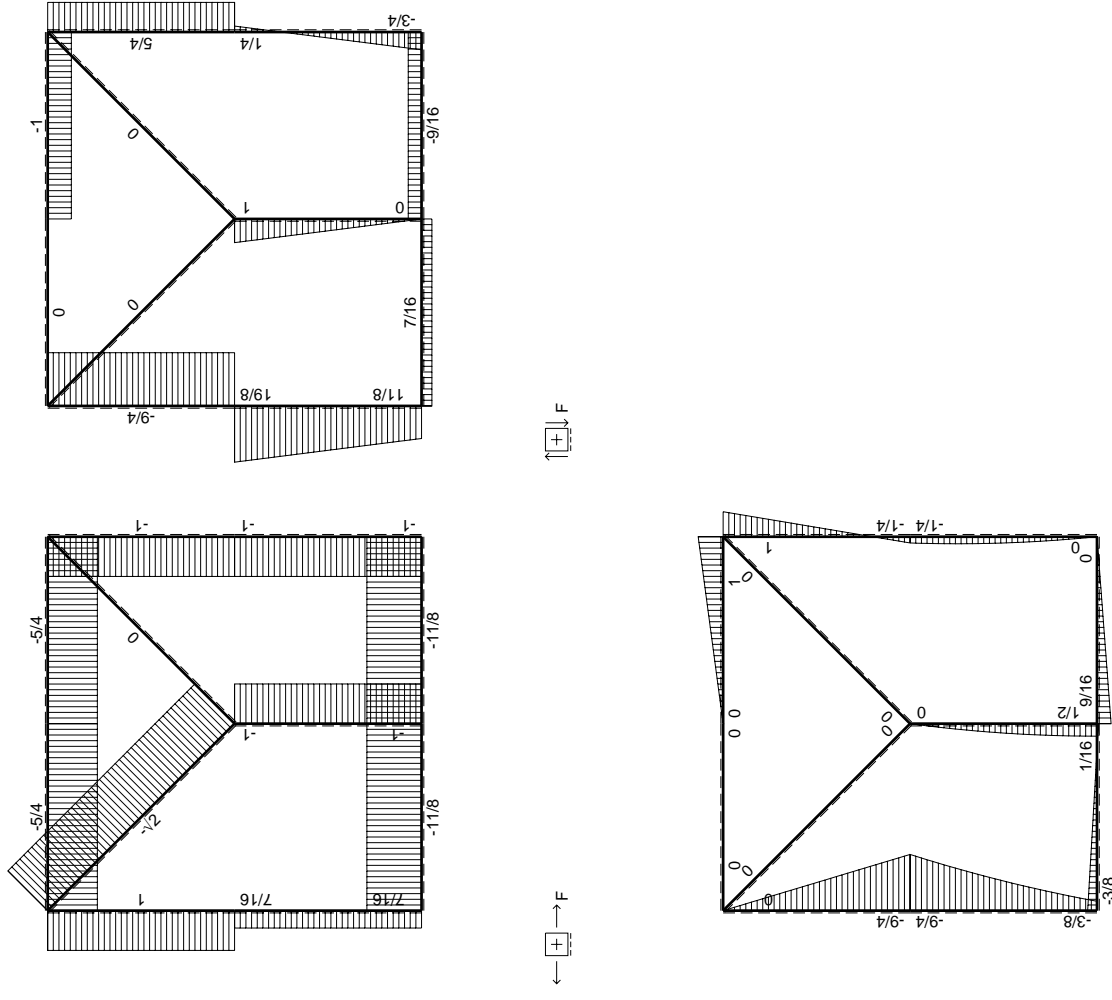
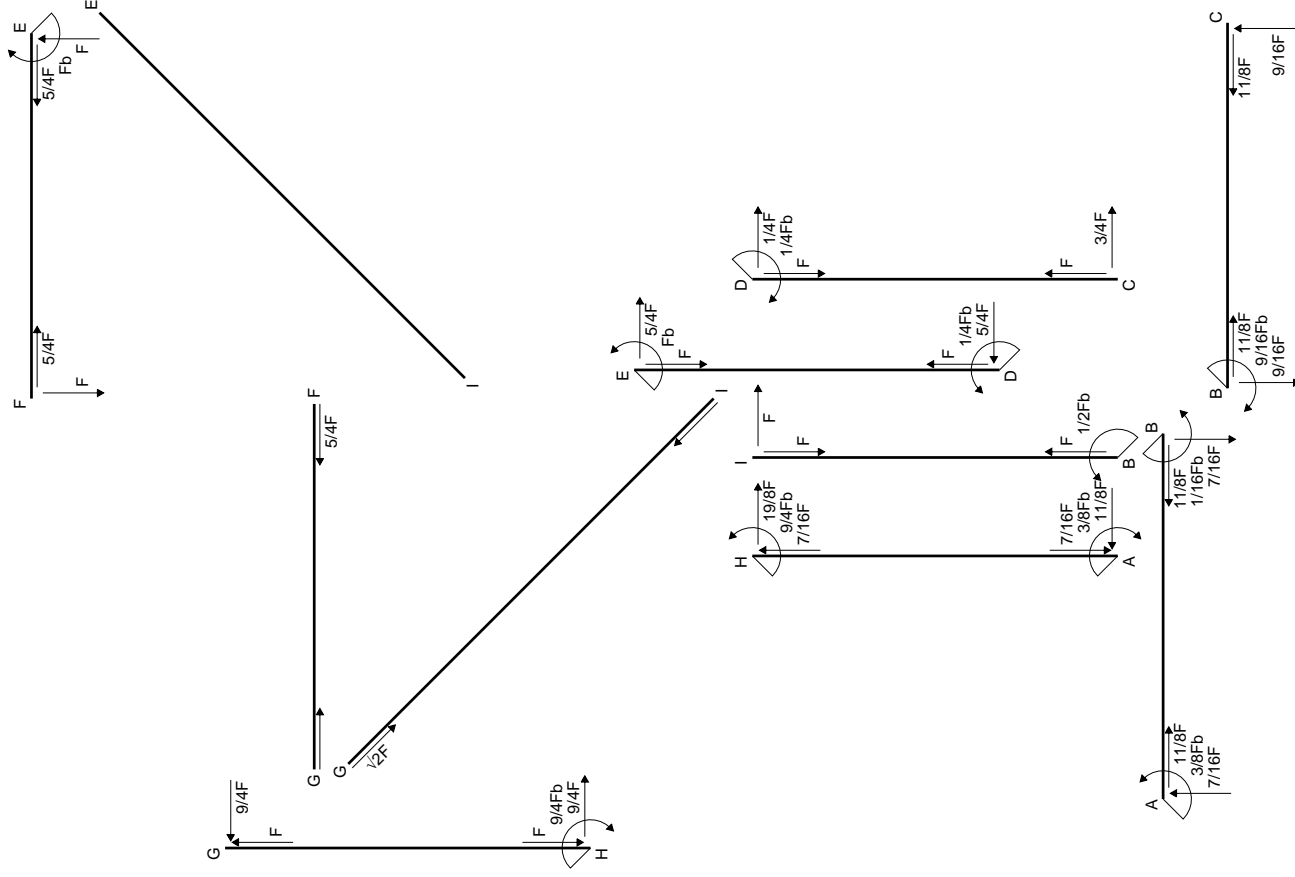
$$= (-1/8 b) Fb 1/EJ + (-1/4 b) \theta = 1/8 Fb^2/EJ$$

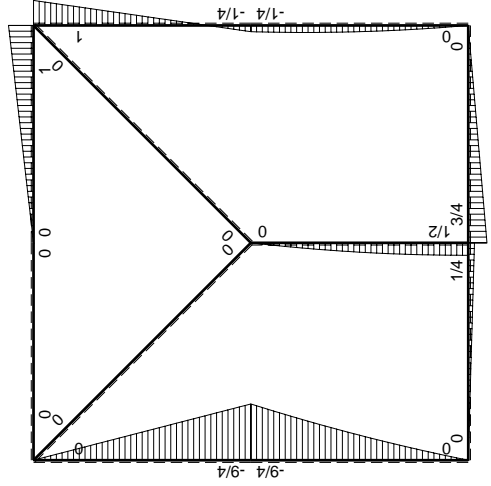
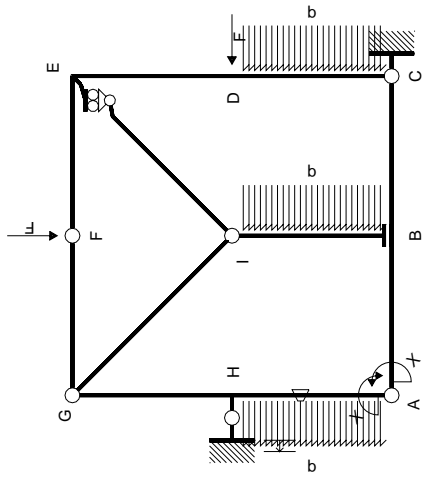
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

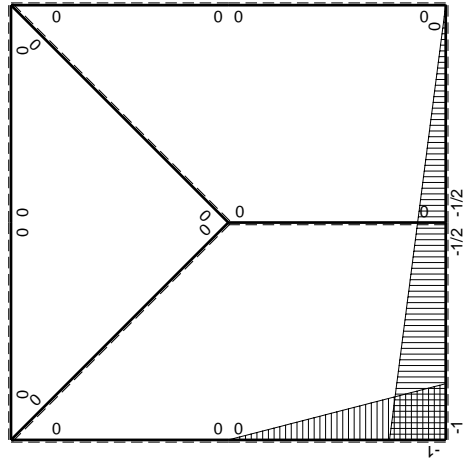
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	$-Fb/EJ$	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/3+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	Fb/EJ	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

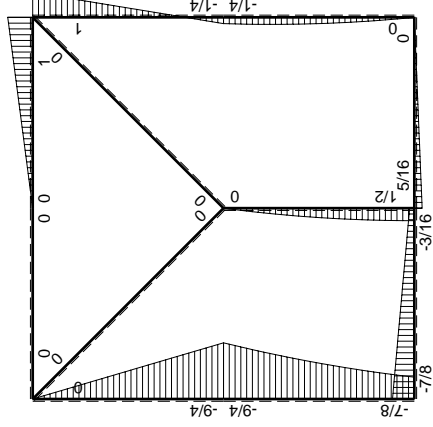
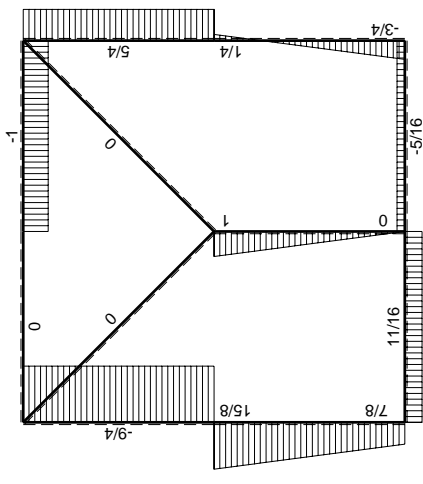
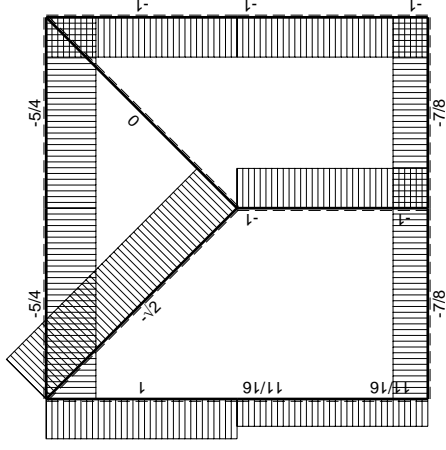
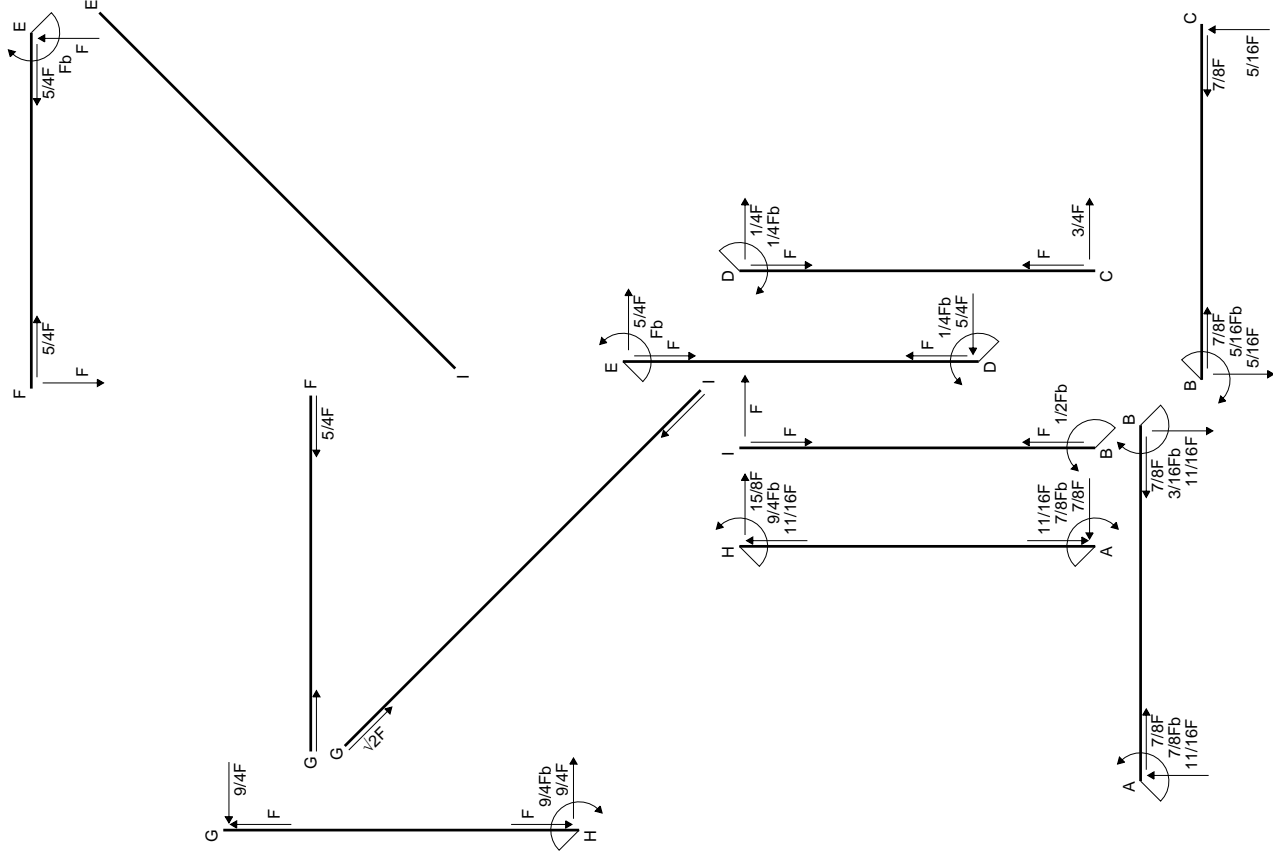
$$= \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

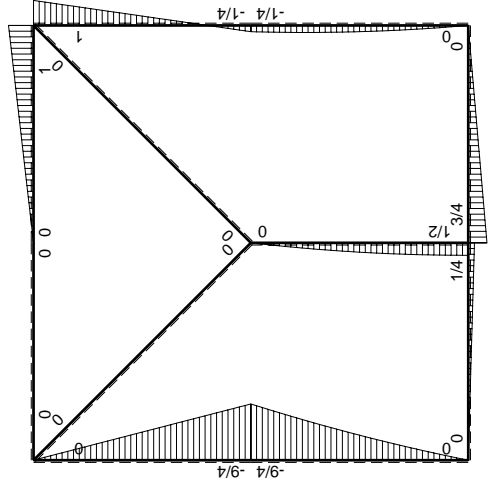
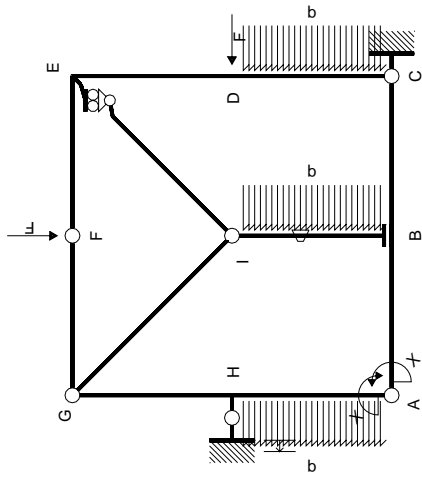
$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 5/6 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

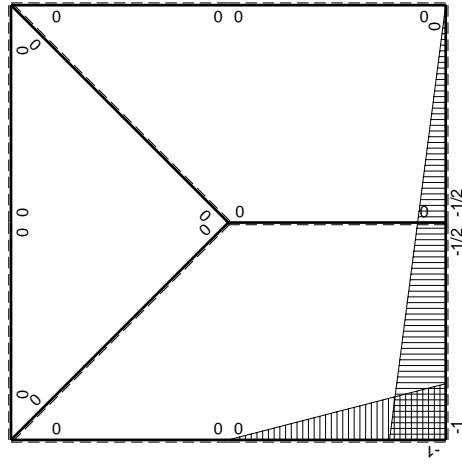
$$= \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 5/6 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

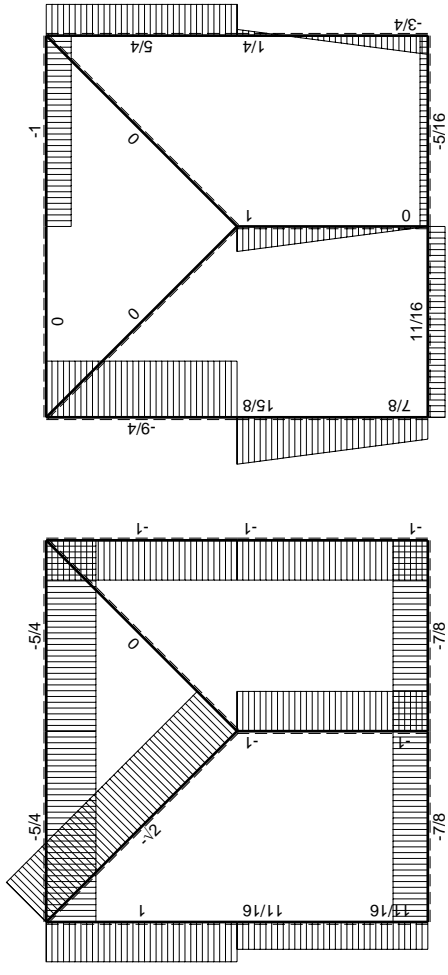
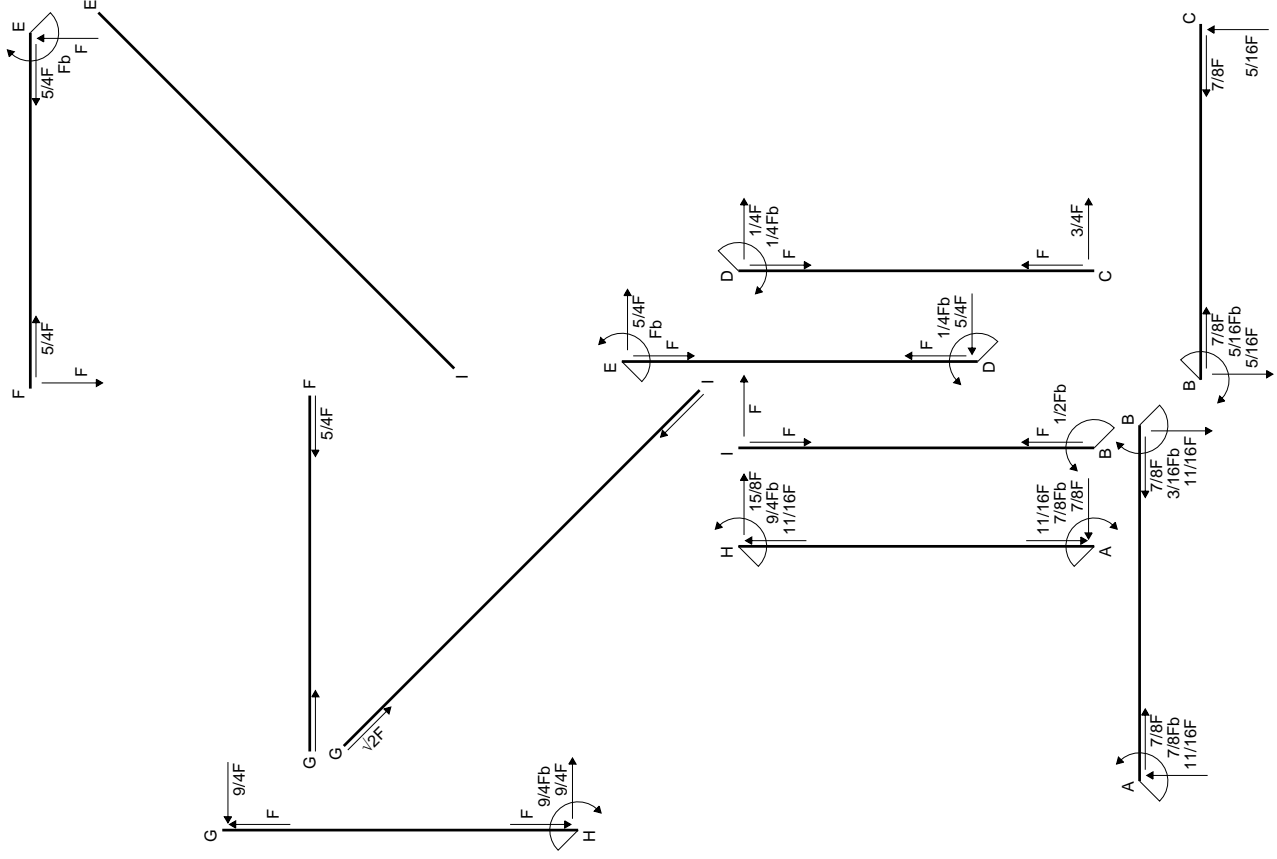
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

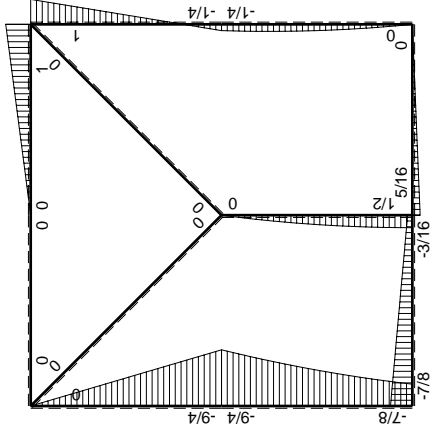
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

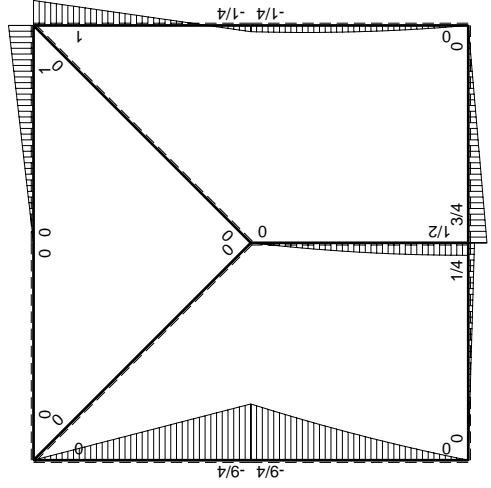
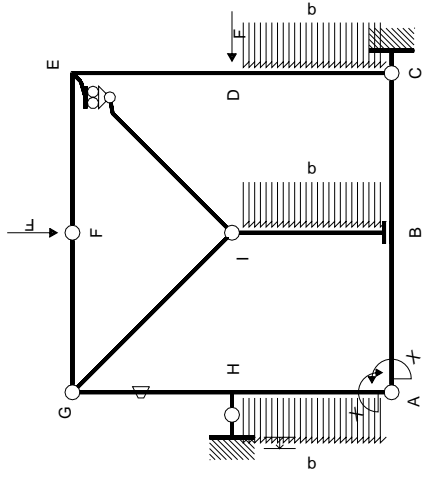


$\left[\begin{array}{c} + \\ - \end{array} \right] \rightarrow F$

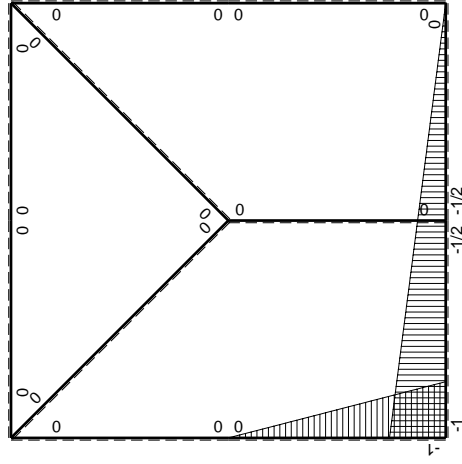
$\left[\begin{array}{c} + \\ - \end{array} \right] \rightarrow F$



$\left[\begin{array}{c} + \\ - \end{array} \right] F_b$



M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

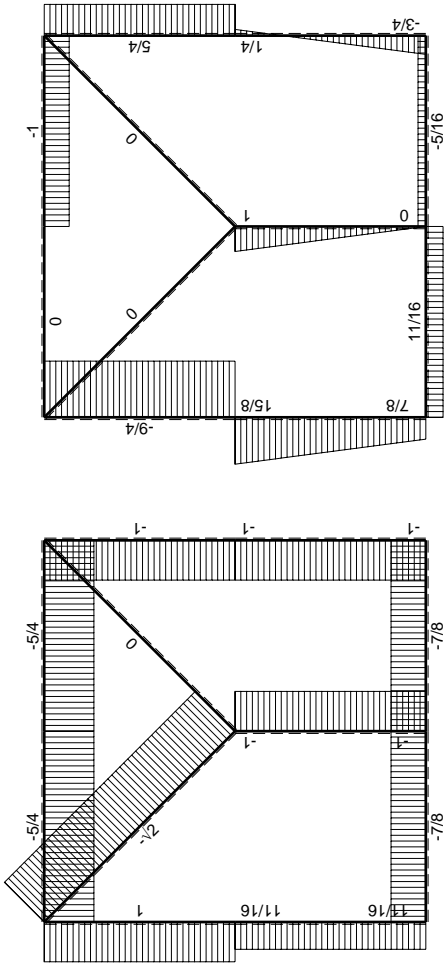
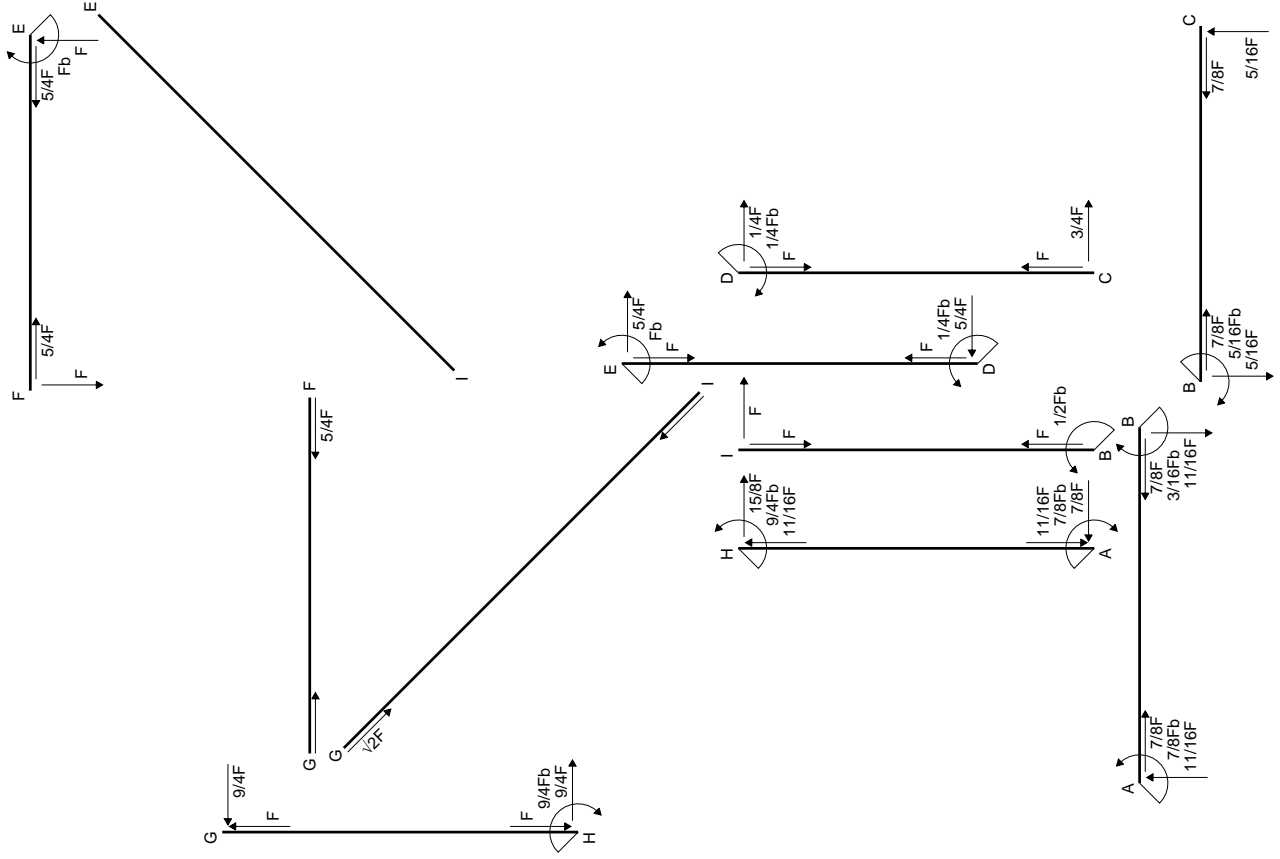
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

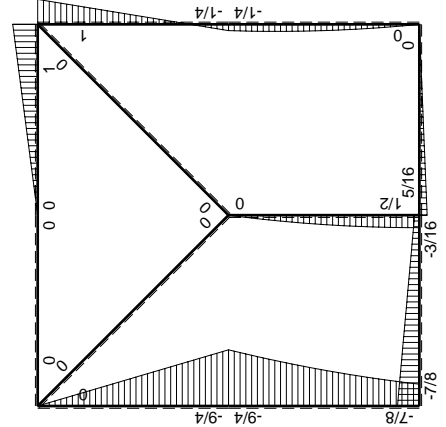
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

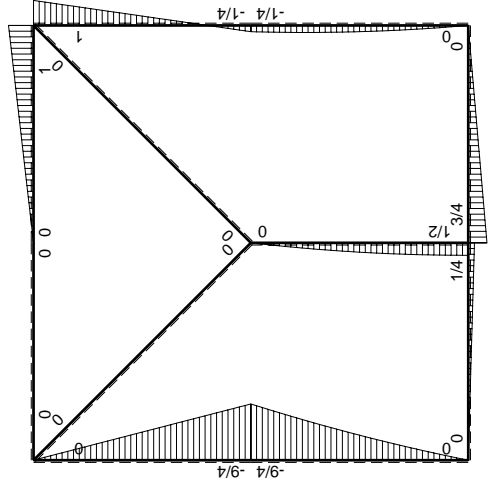
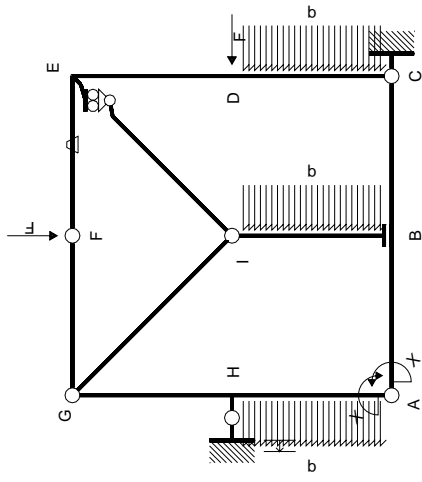


$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow F$

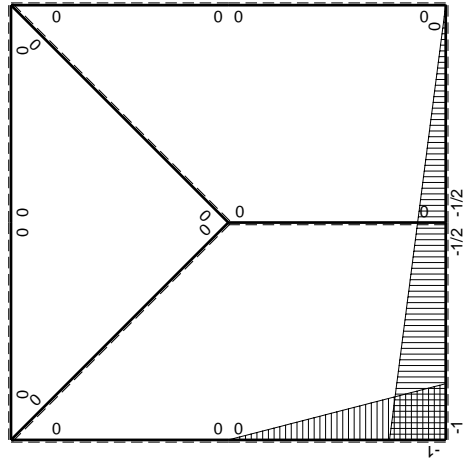
$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow F$



$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow Fb$



M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

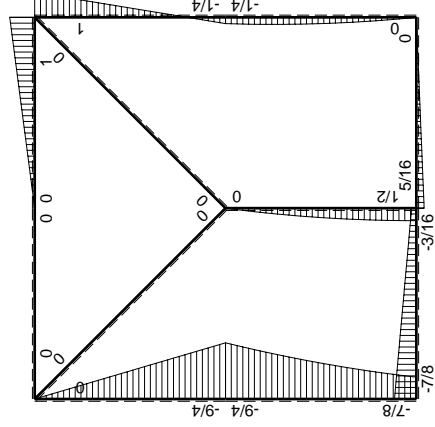
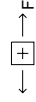
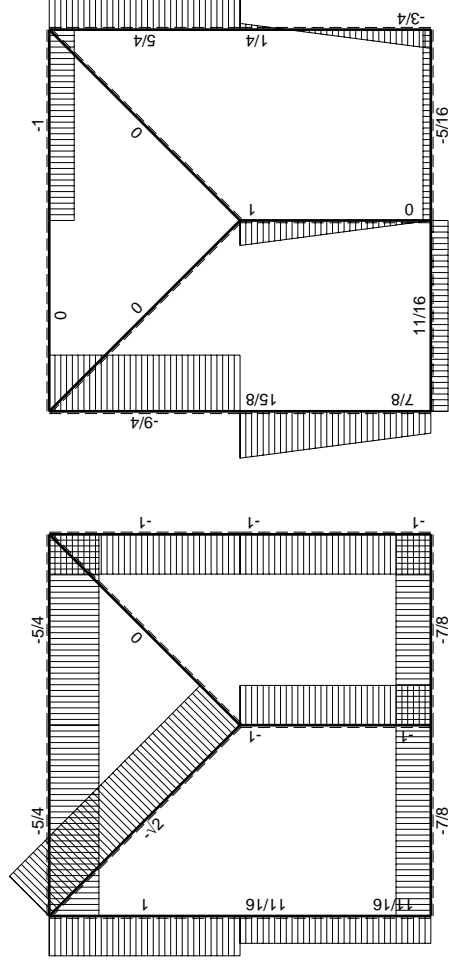
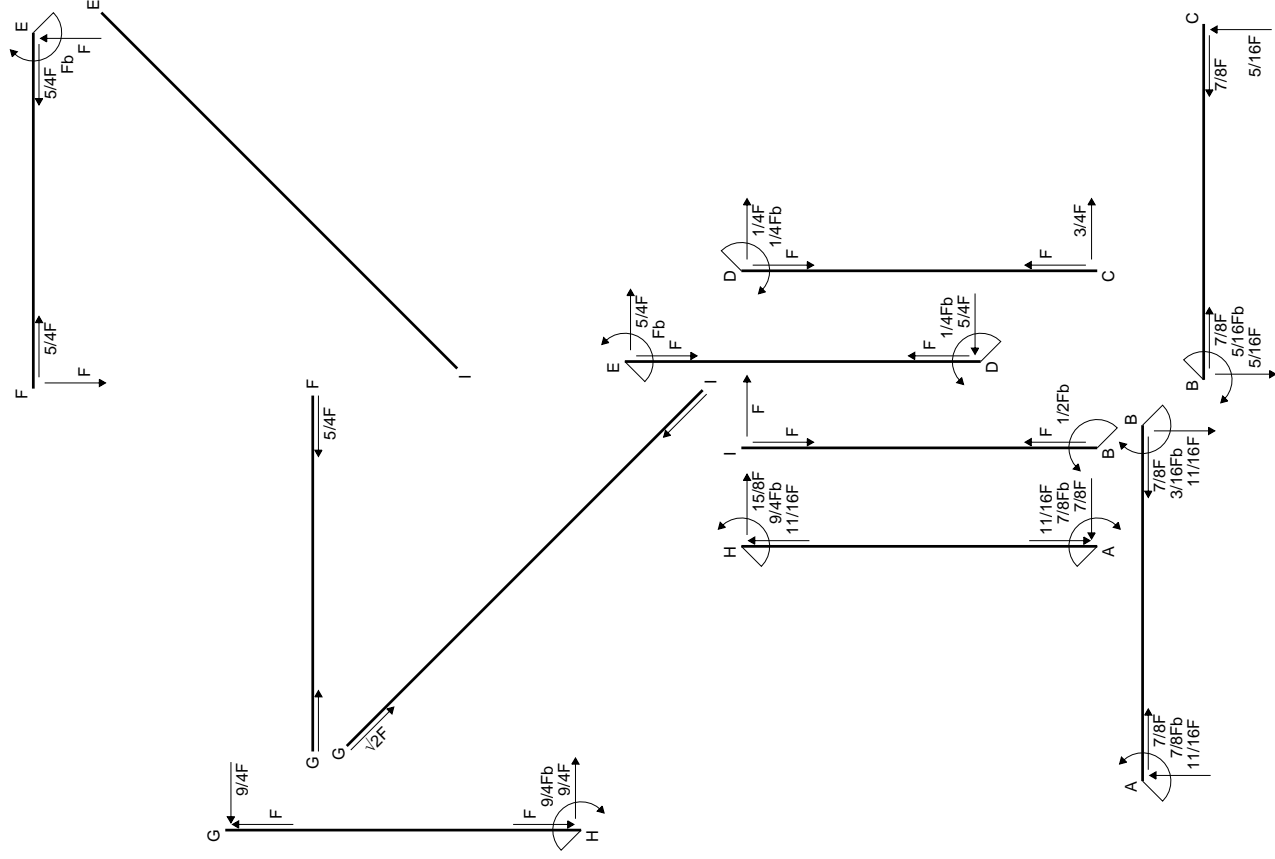
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

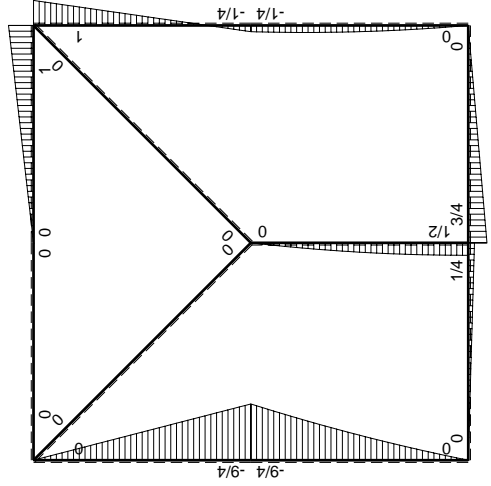
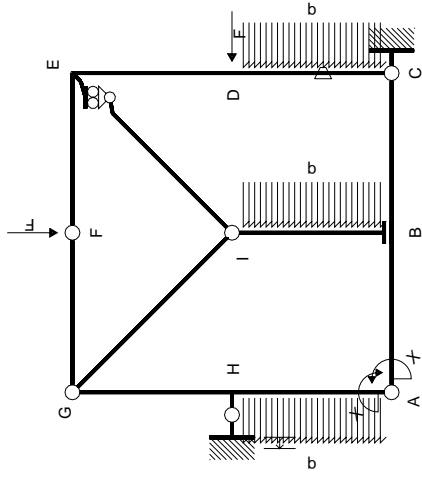
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

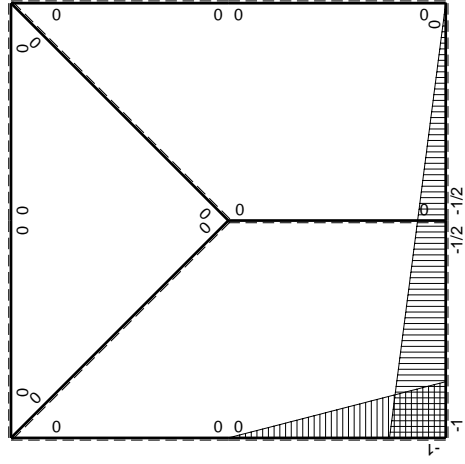
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	Fb/EJ	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

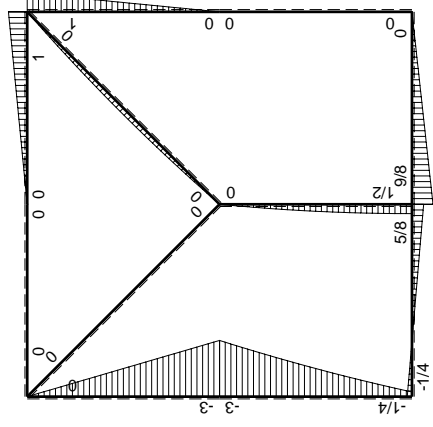
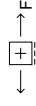
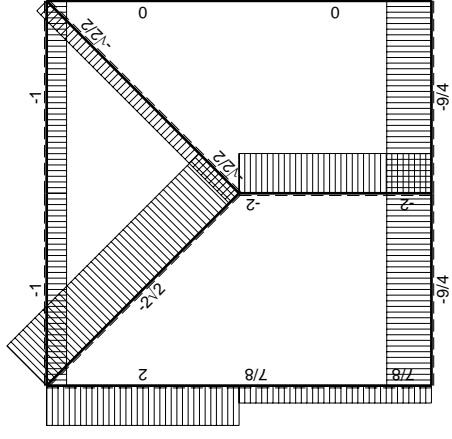
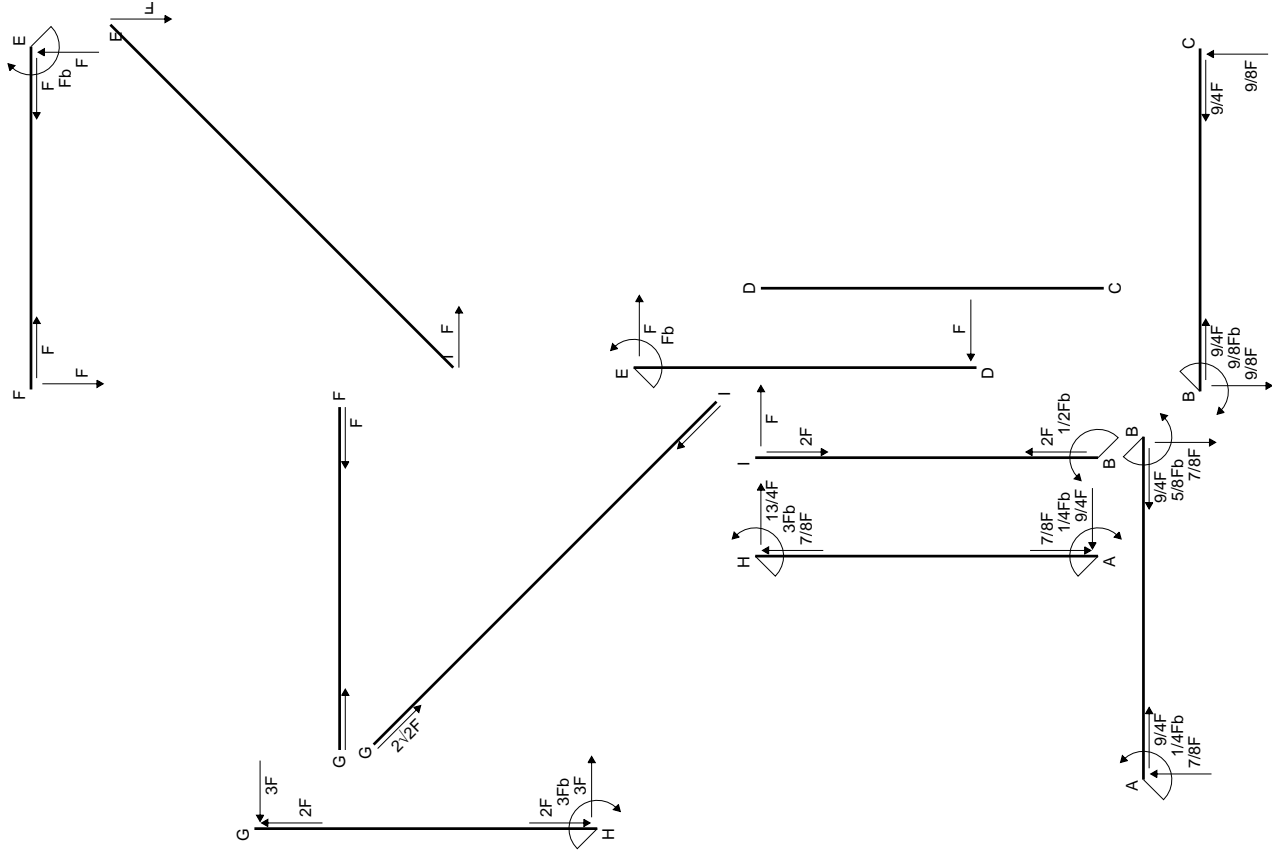
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

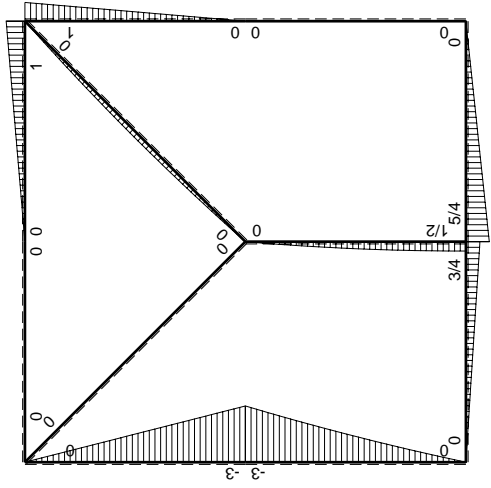
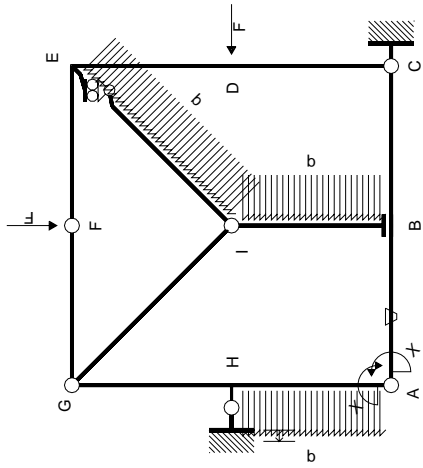
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

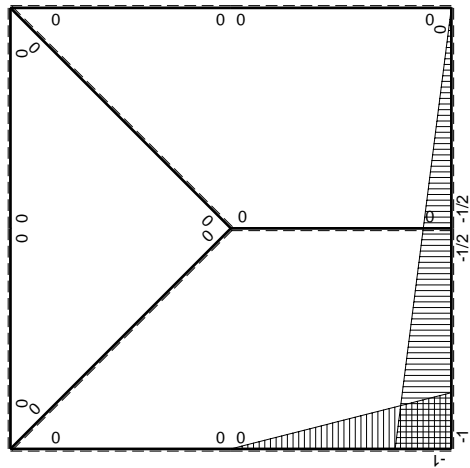
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M₀ flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	$-Fb/EJ$	$-3/4Fx+3/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/4+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	Fb/EJ	$-3/8Fb+3/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3Fx$	0	0	0	0	0+0	0	
HG b	0	$3Fb-3Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ + (b - 1/4 b) \theta = 1/2 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 1/2 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

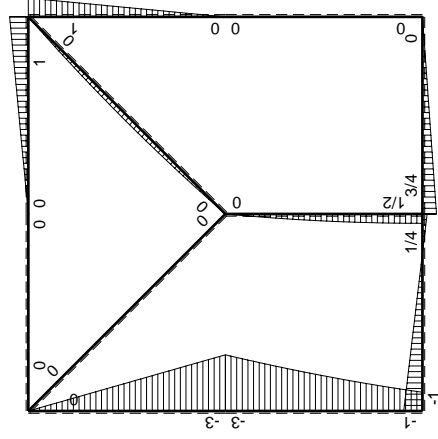
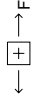
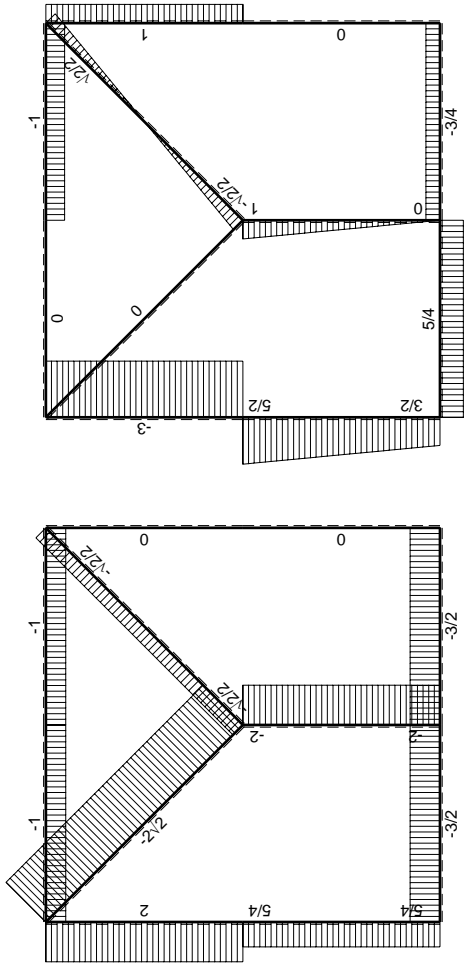
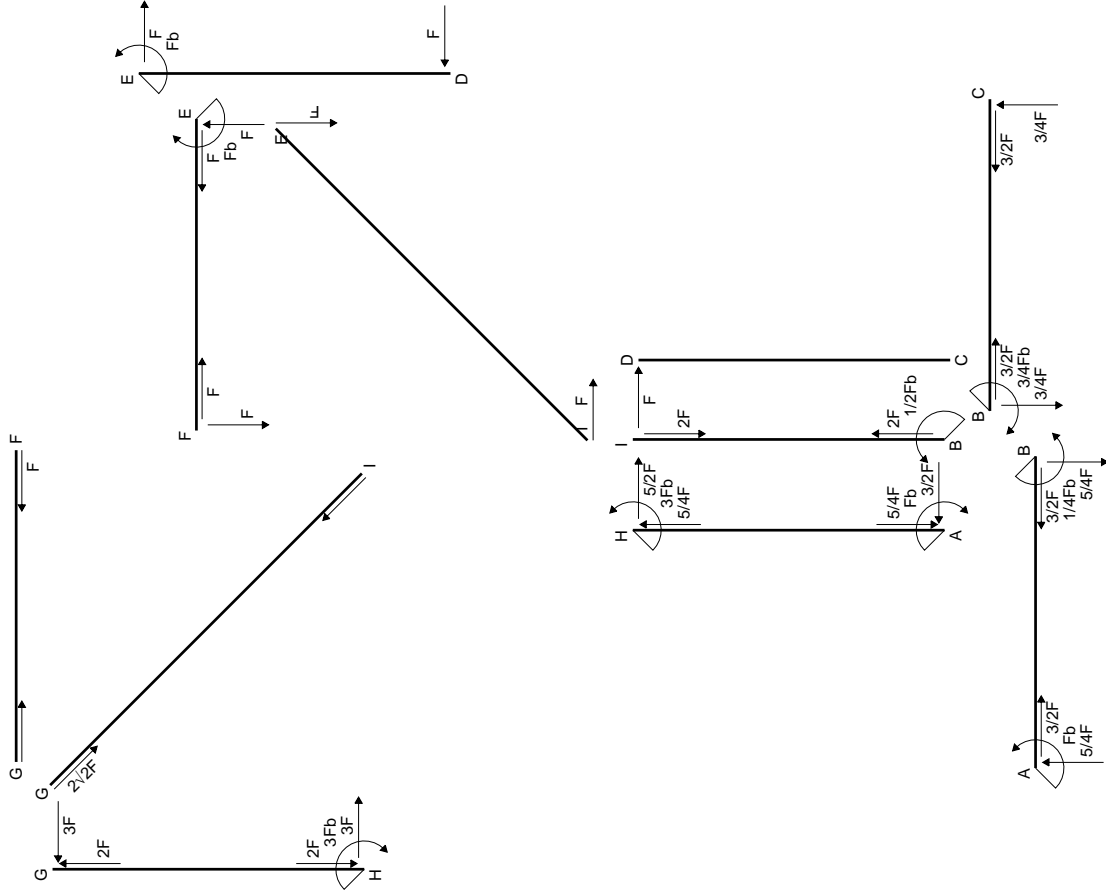
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

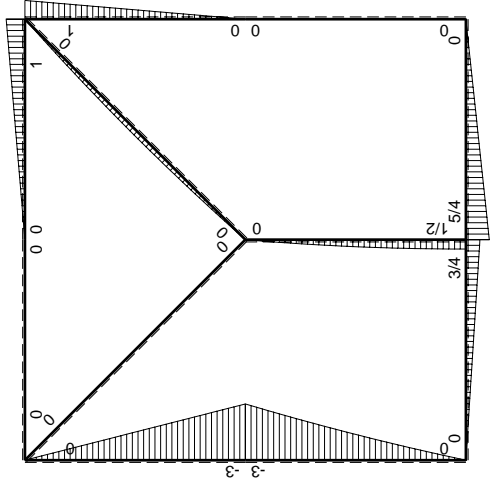
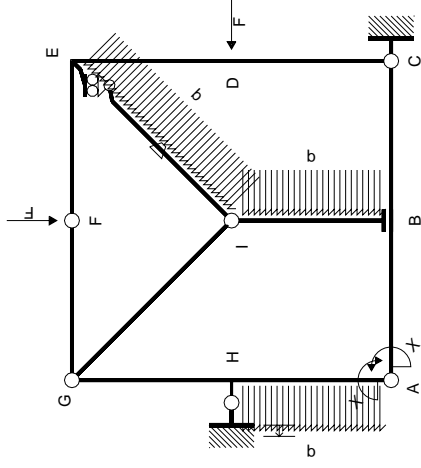
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

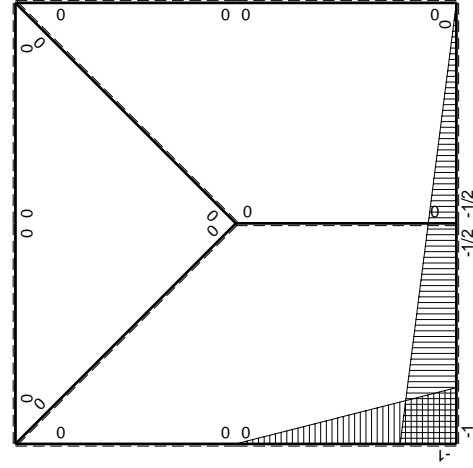
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	-Fb/EJ	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x^2/b + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = \left[-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = \left[-5/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

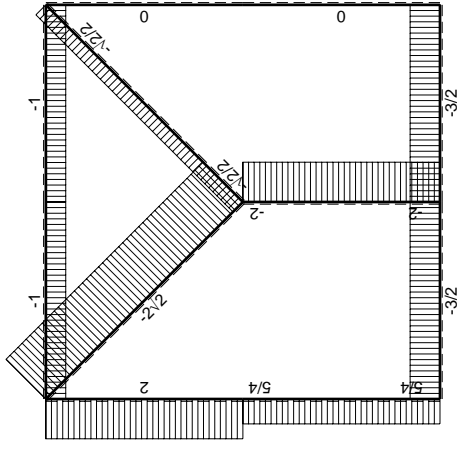
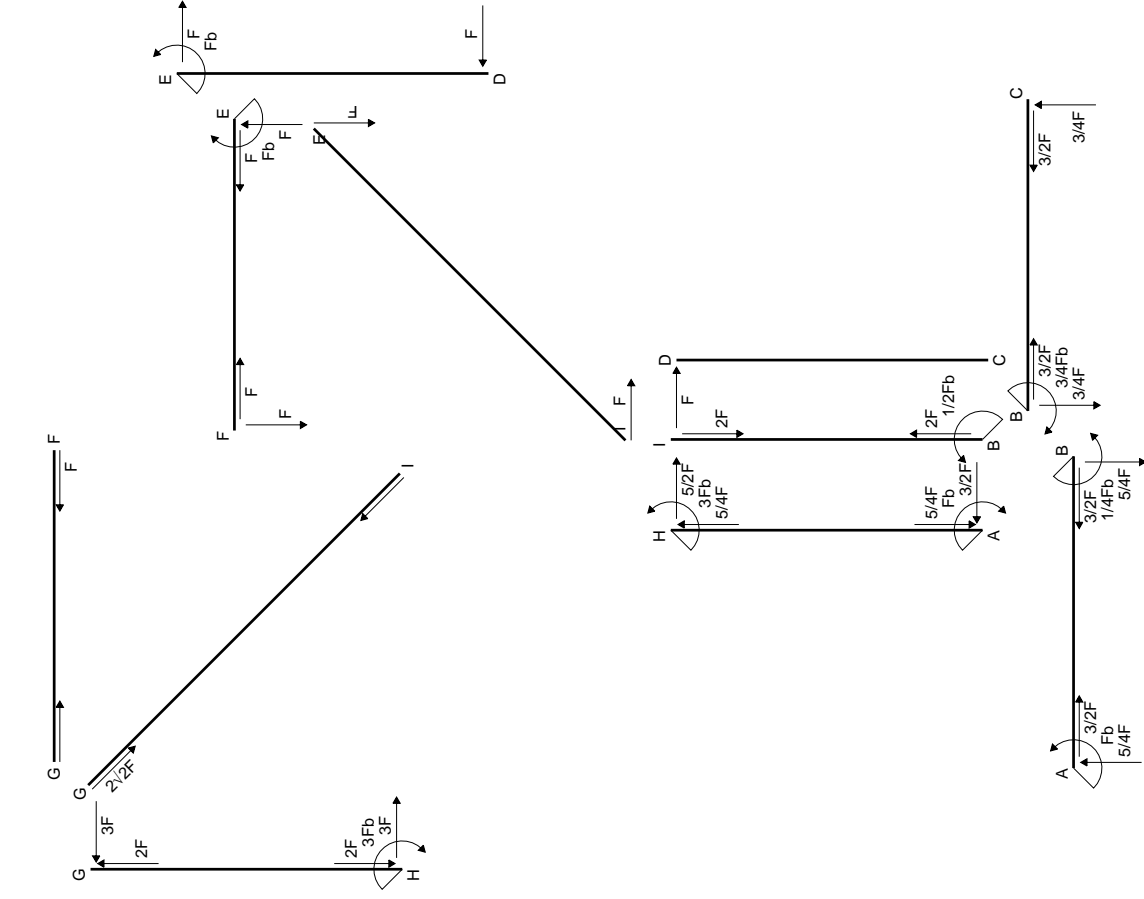
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

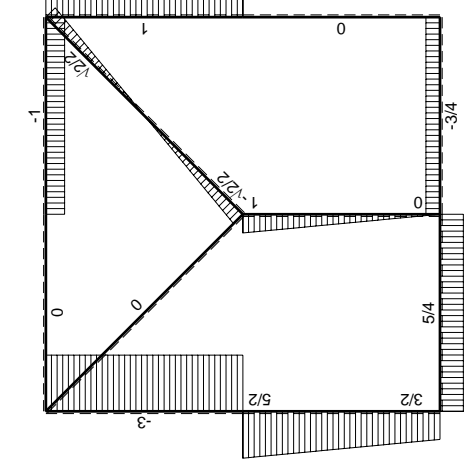
$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

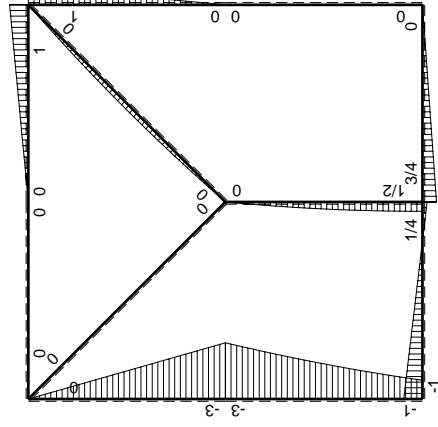
$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$



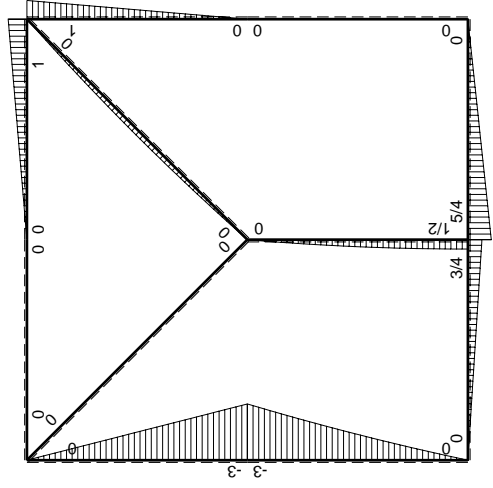
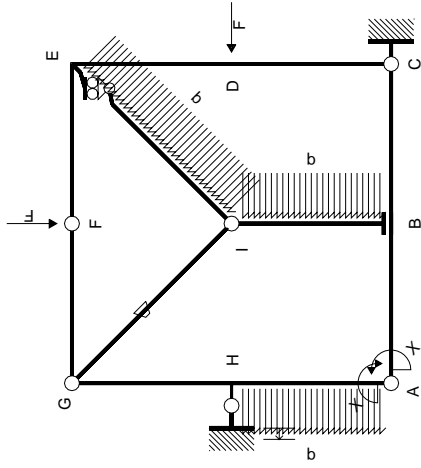
← ⊕ → F



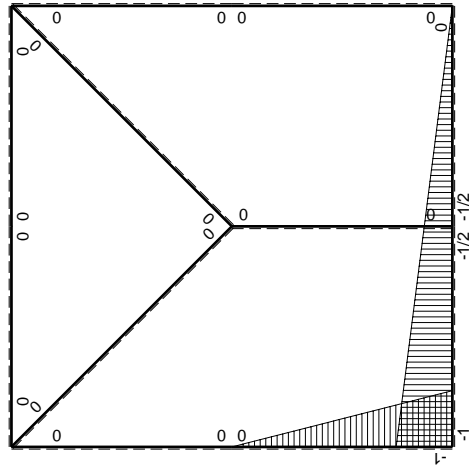
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	0	-Fb/EJ	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

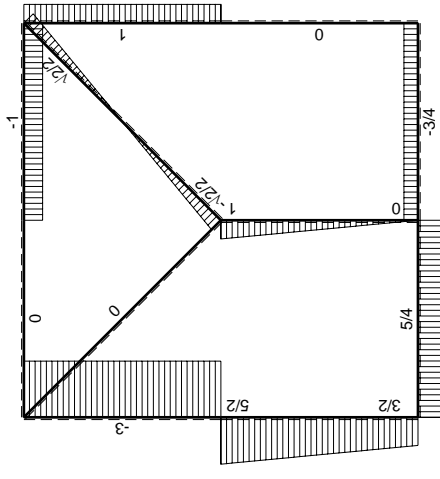
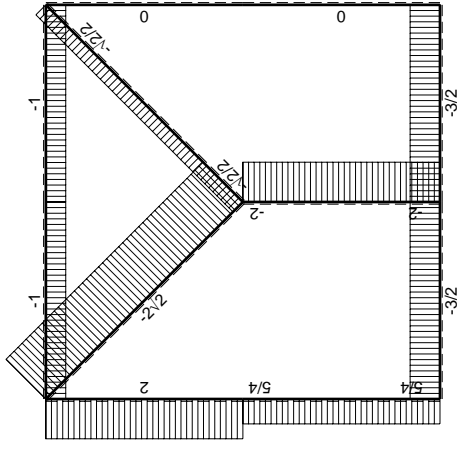
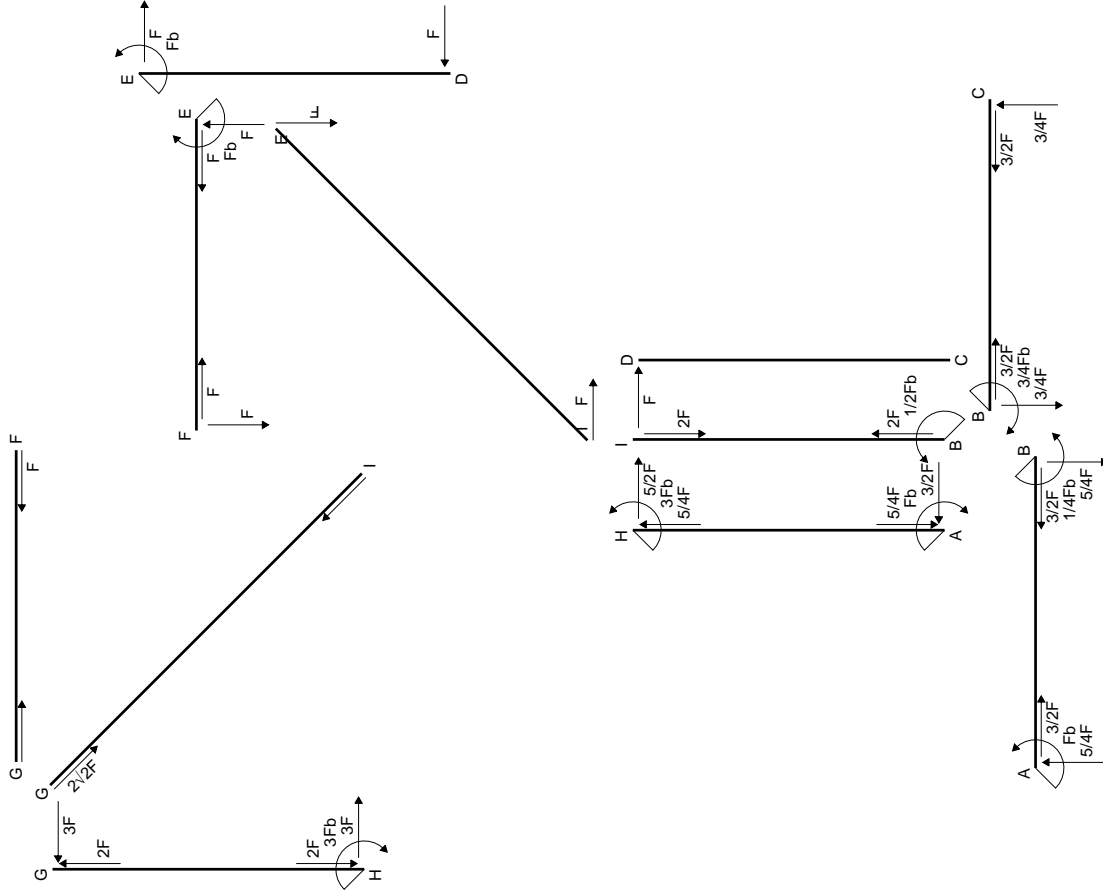
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

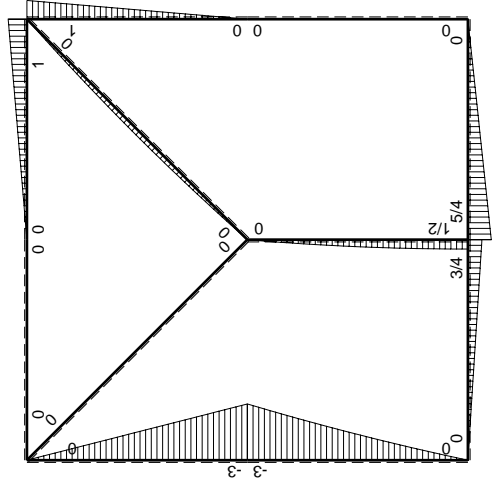
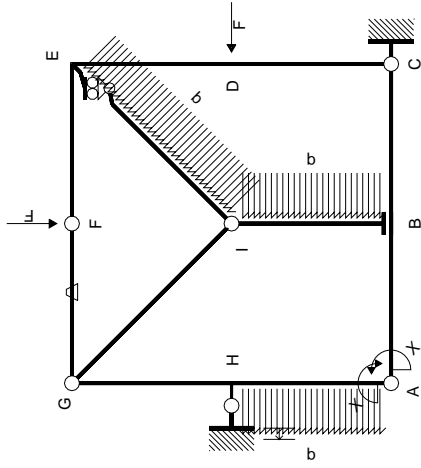
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

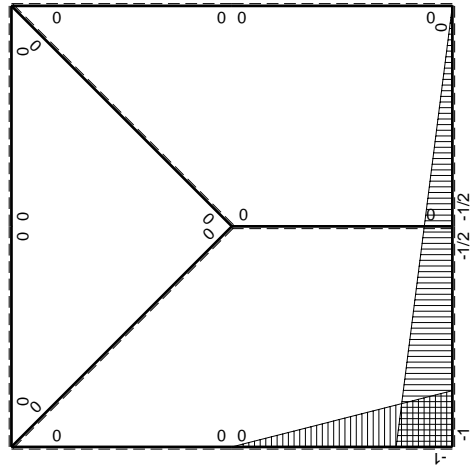
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	-Fb/EJ	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

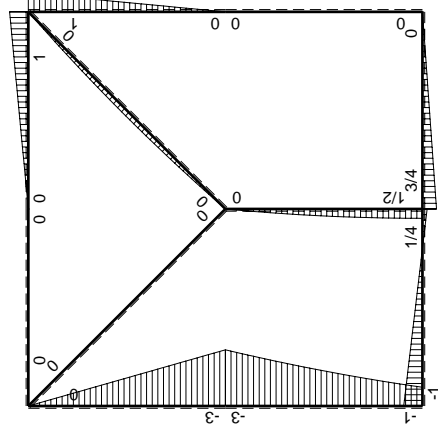
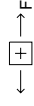
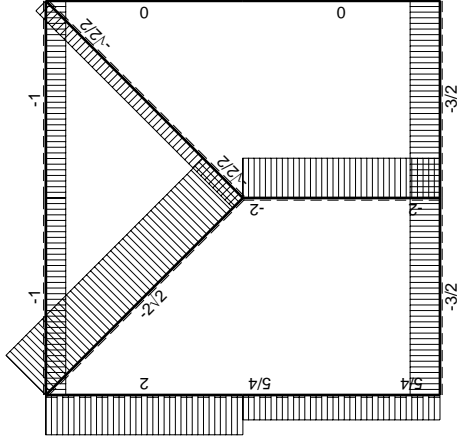
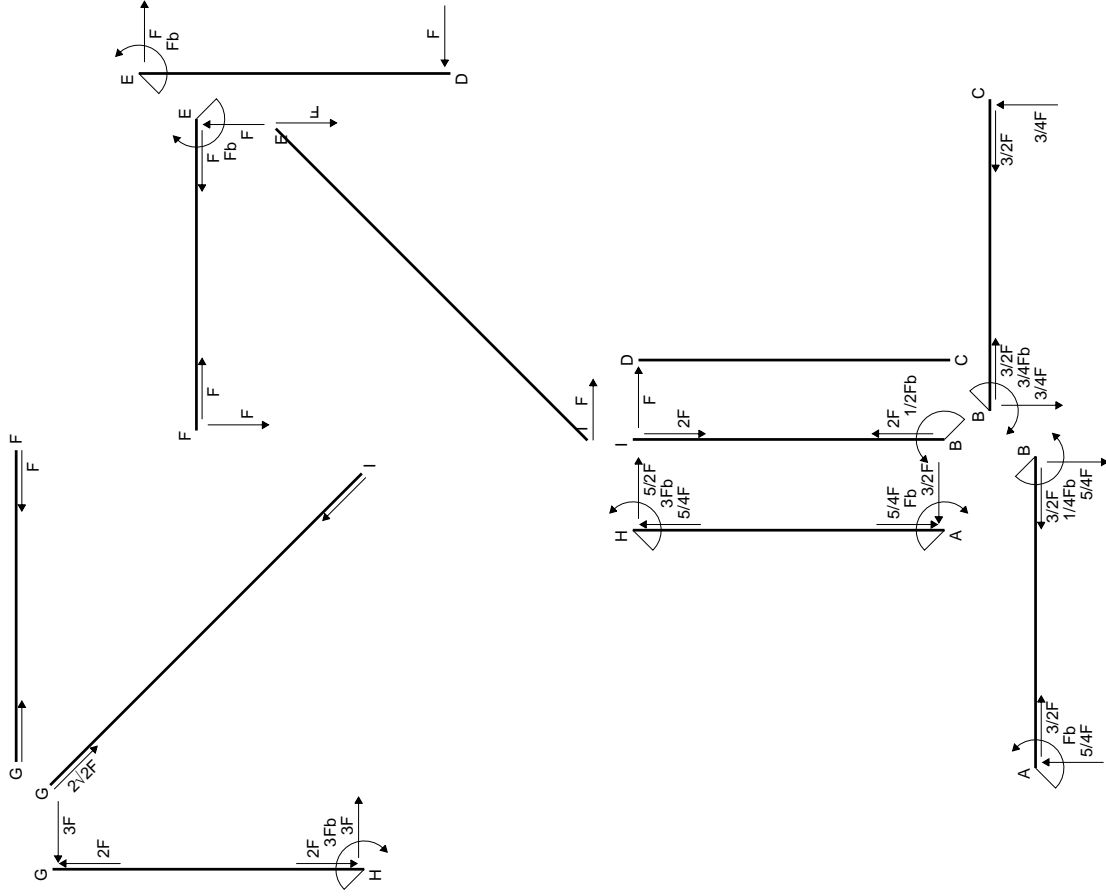
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

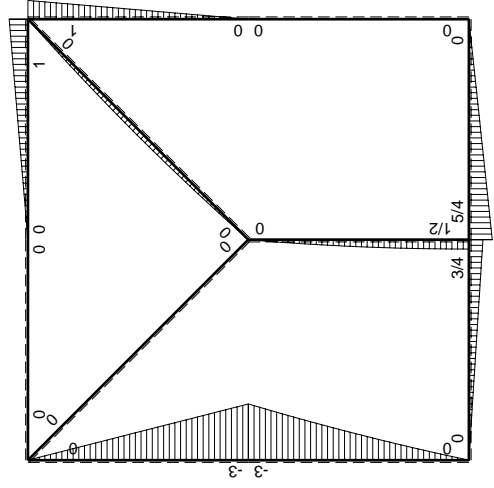
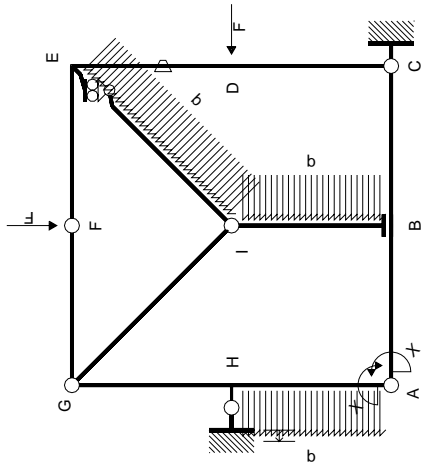
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

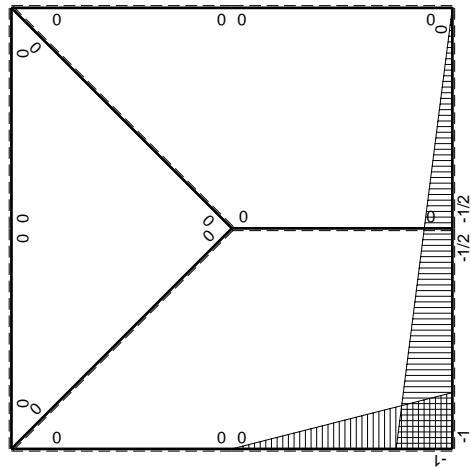
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M₀ flessione da carichi assegnati



M₁ flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	Fb/EJ	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3Fx$	0	0	0	0	0+0	0	
HG b	0	$3Fb-3Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

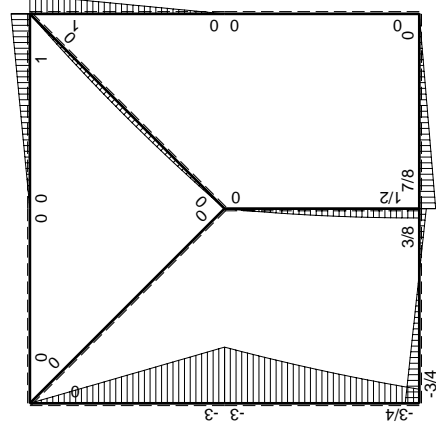
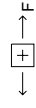
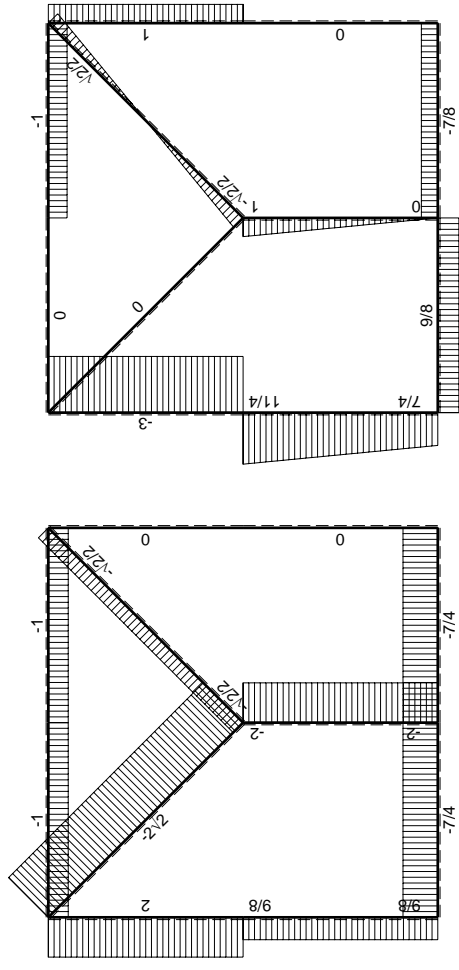
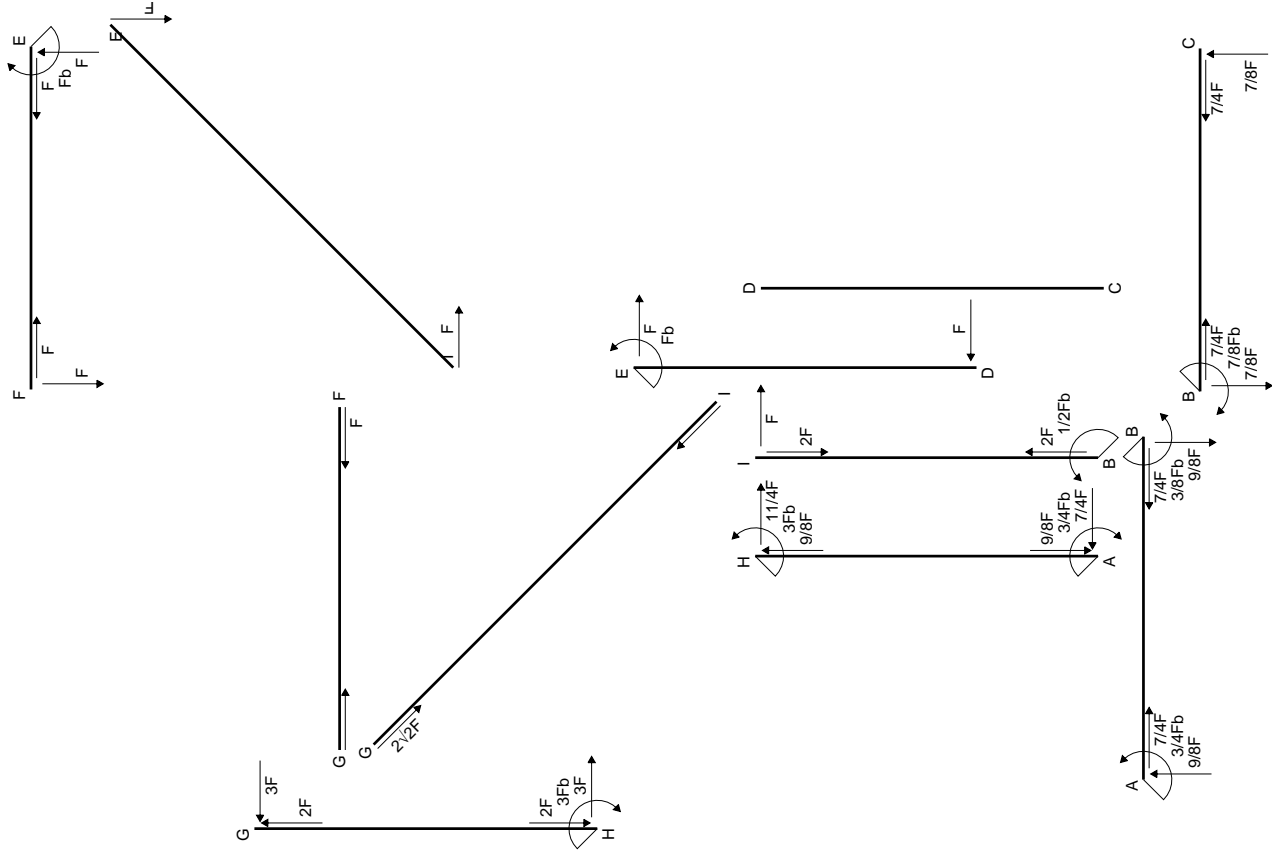
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

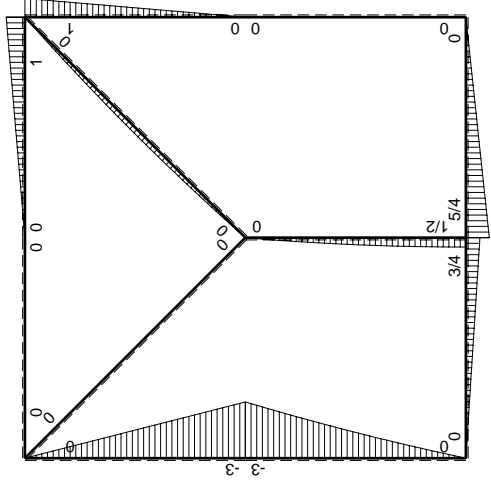
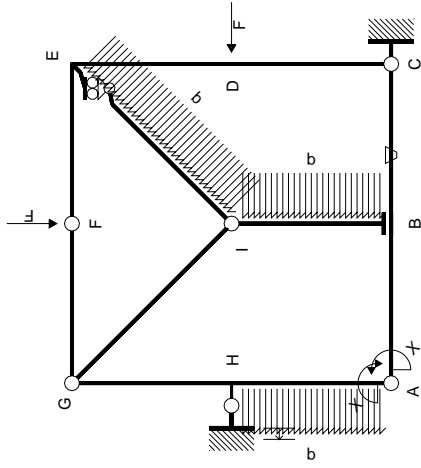
$$L_{HA}^{xo} = \int_0^b (3 x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

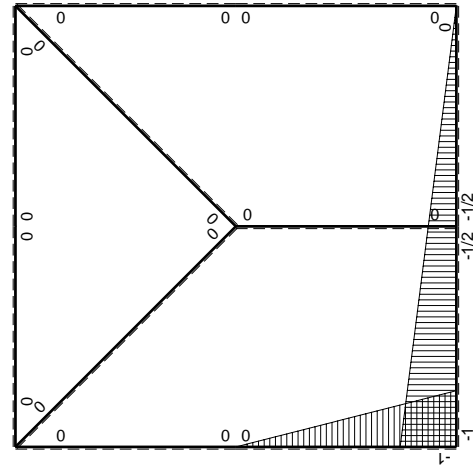
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	$-Fb/EJ$	$-5/8Fb+5/4Fx-5/8Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	Fb/EJ	$-5/8Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3Fx$	0	0	0	0	0+0	0	
HG b	0	$3Fb-3Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x^2/b + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= \left[-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2 \right]_0^b Fb 1/EJ + \left[1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = \left[-5/24 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/4 x^2/b \right]_0^b \theta$$

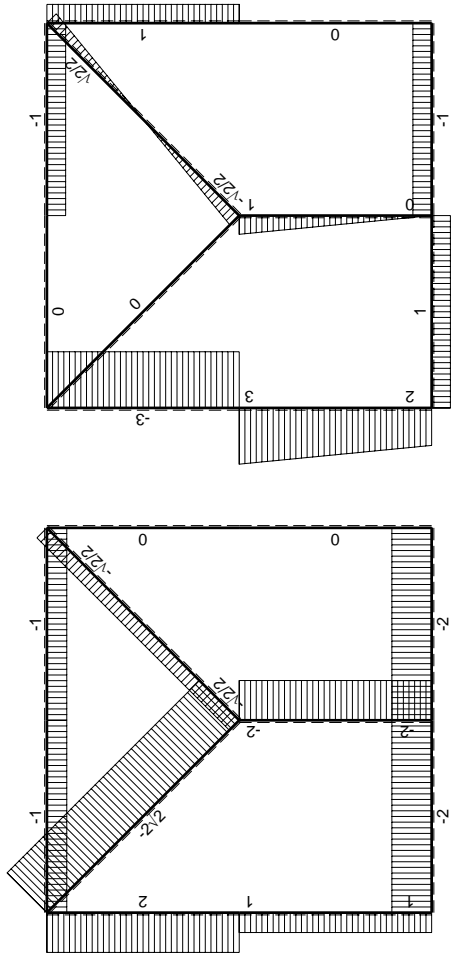
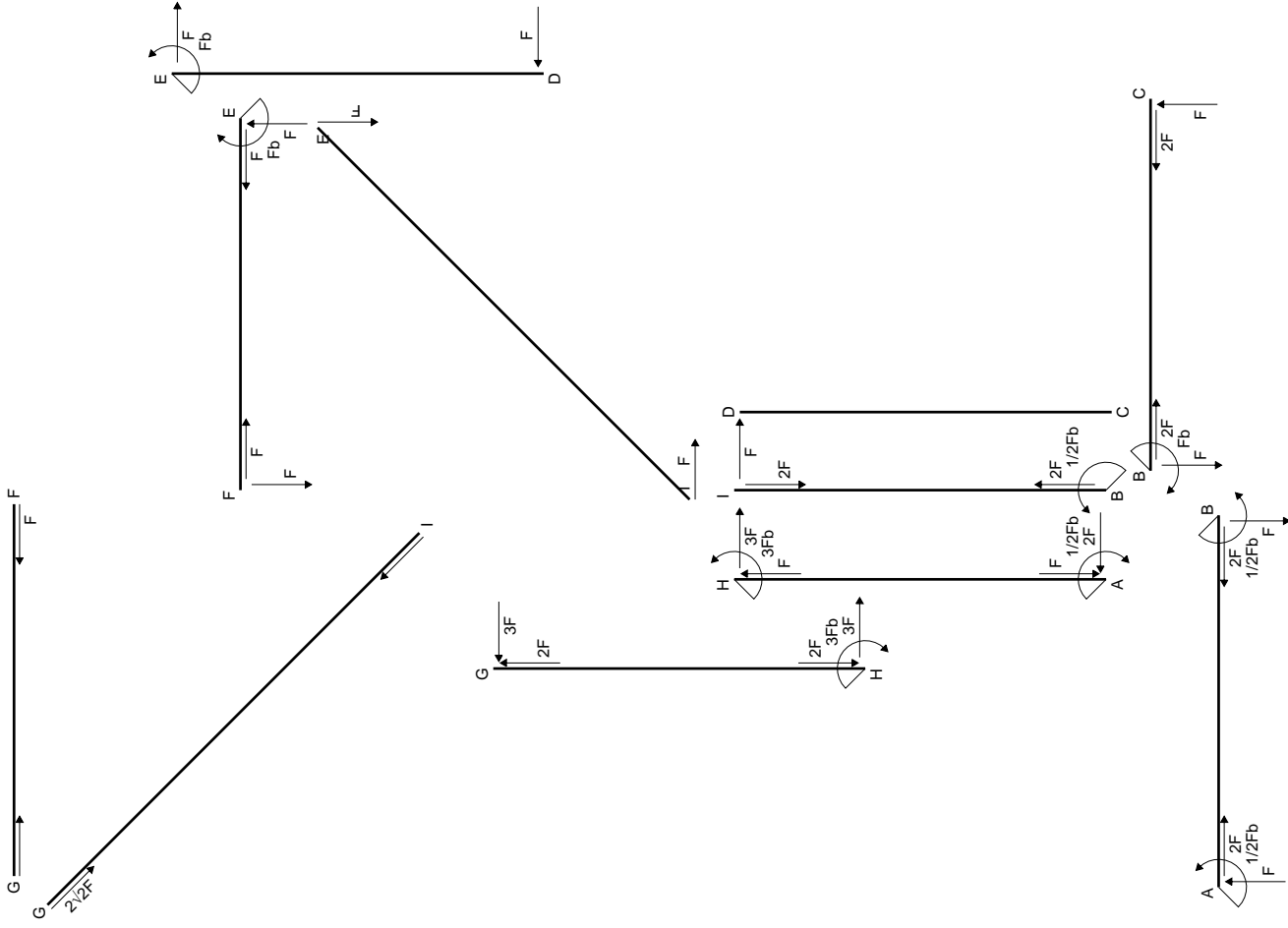
$$= (-5/24 b) Fb 1/EJ + (-1/4 b) \theta = 1/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3 x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

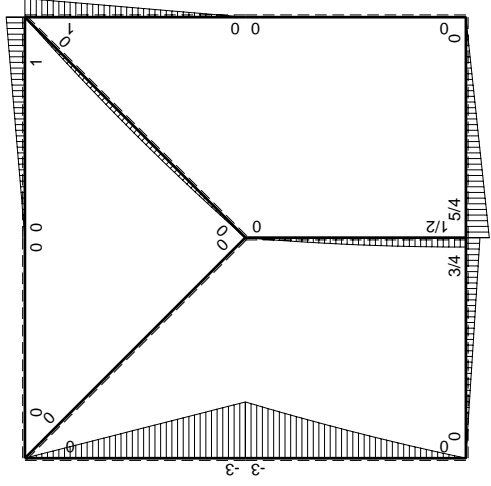
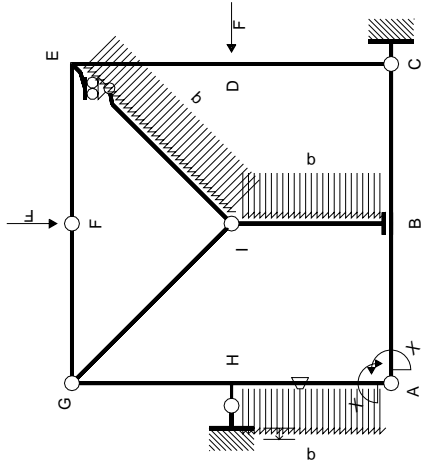
$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$



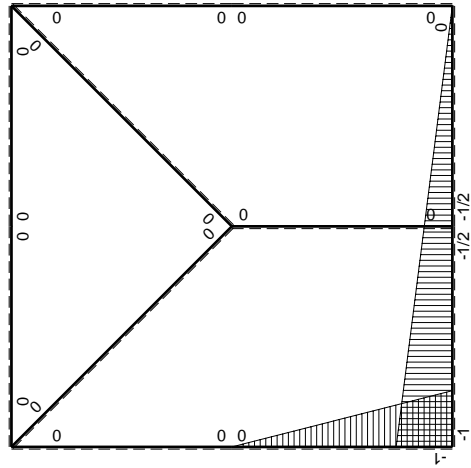
← ⊕ → F

↑ ⊕ ↓ F

⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	-Fb/EJ	$3Fx-7/2Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(11/24+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	Fb/EJ	$5/2Fx-2Fx^2/b-1/2qx^3/b$	Fb/EJ-Fx/EJ	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/2Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/2Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x^2/b + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = \left[-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = \left[-5/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

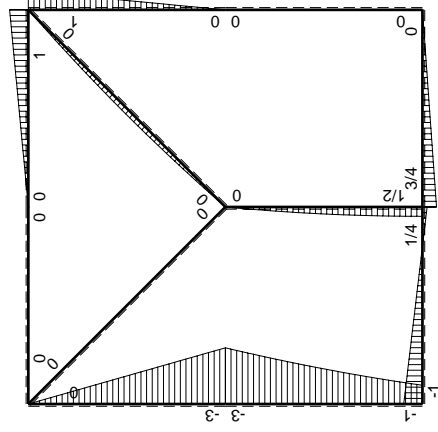
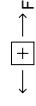
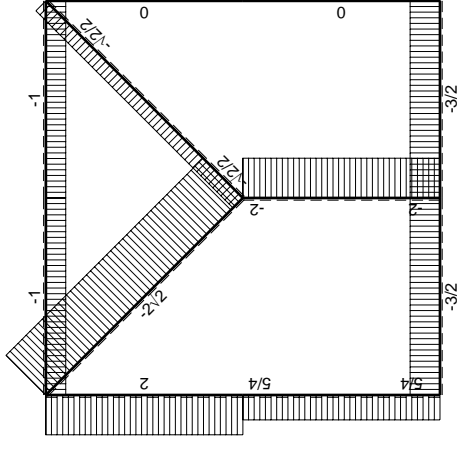
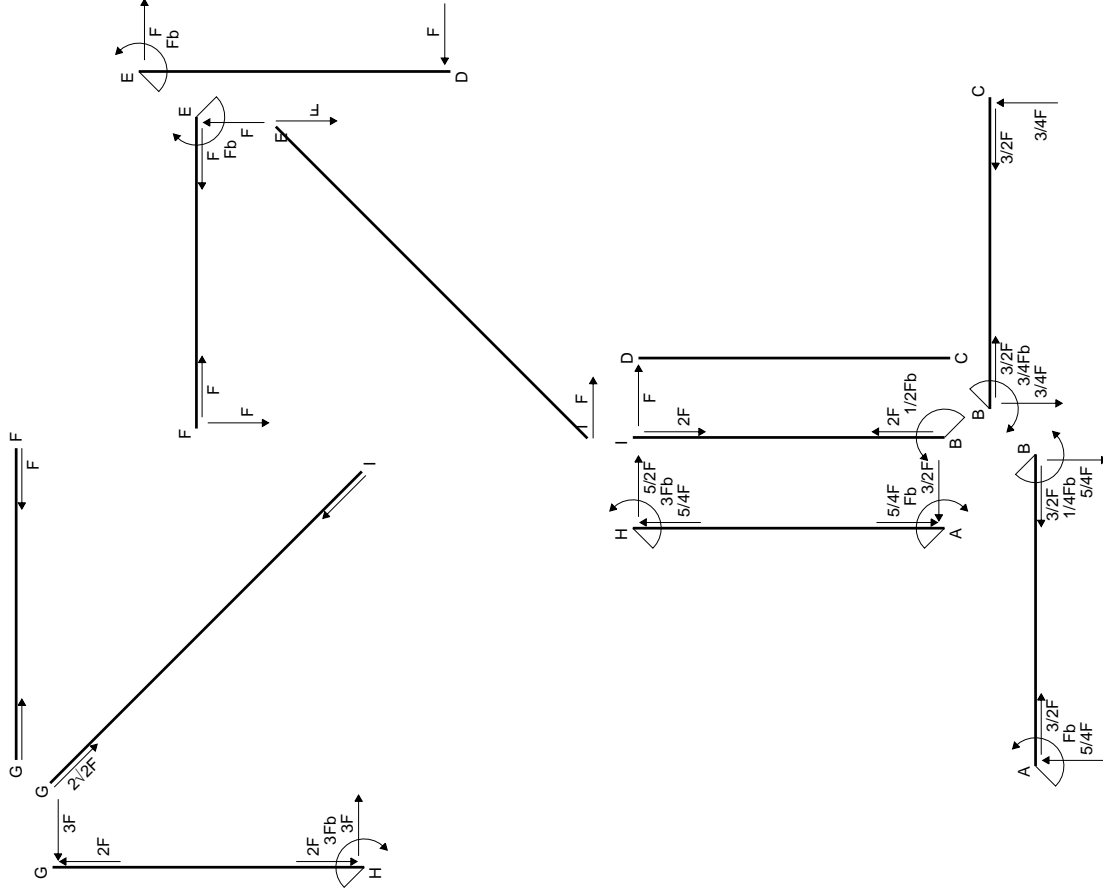
$$= \left[3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

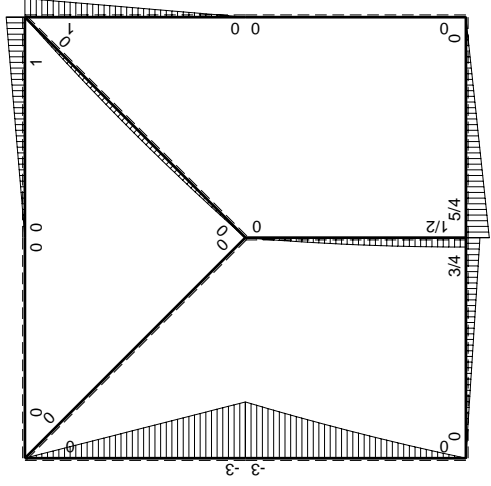
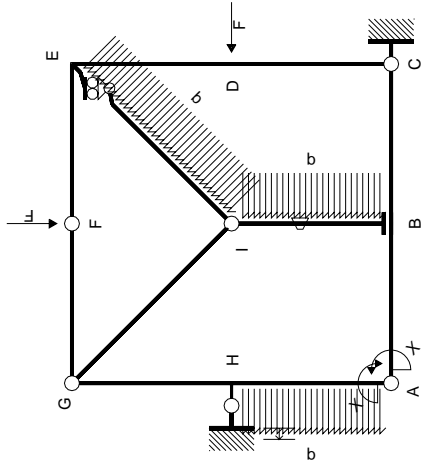
$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 23/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

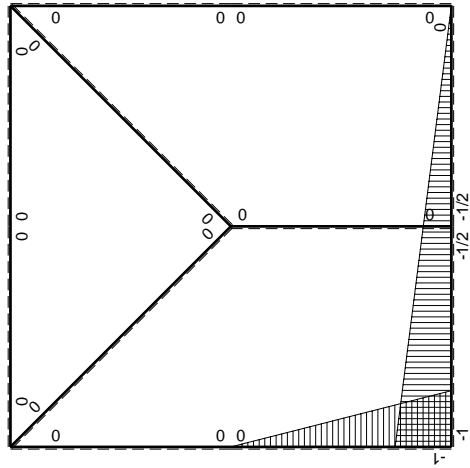
$$= \left[5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 23/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

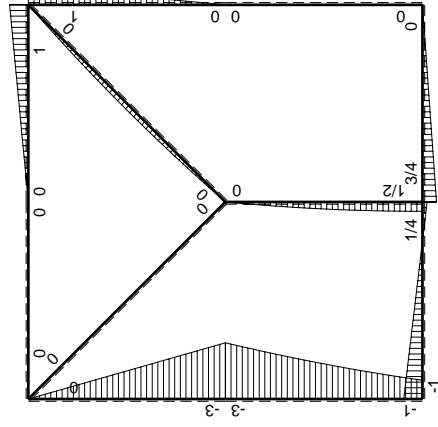
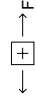
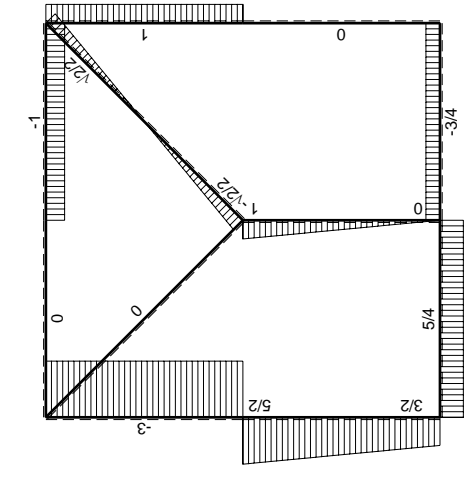
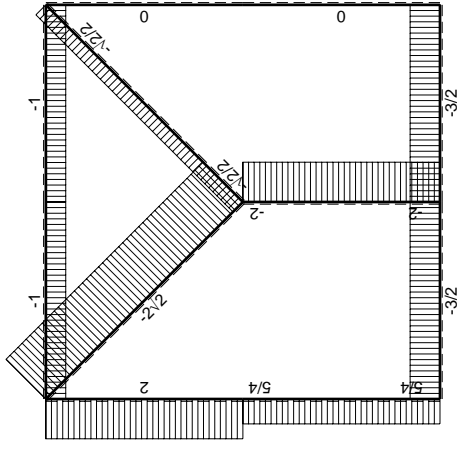
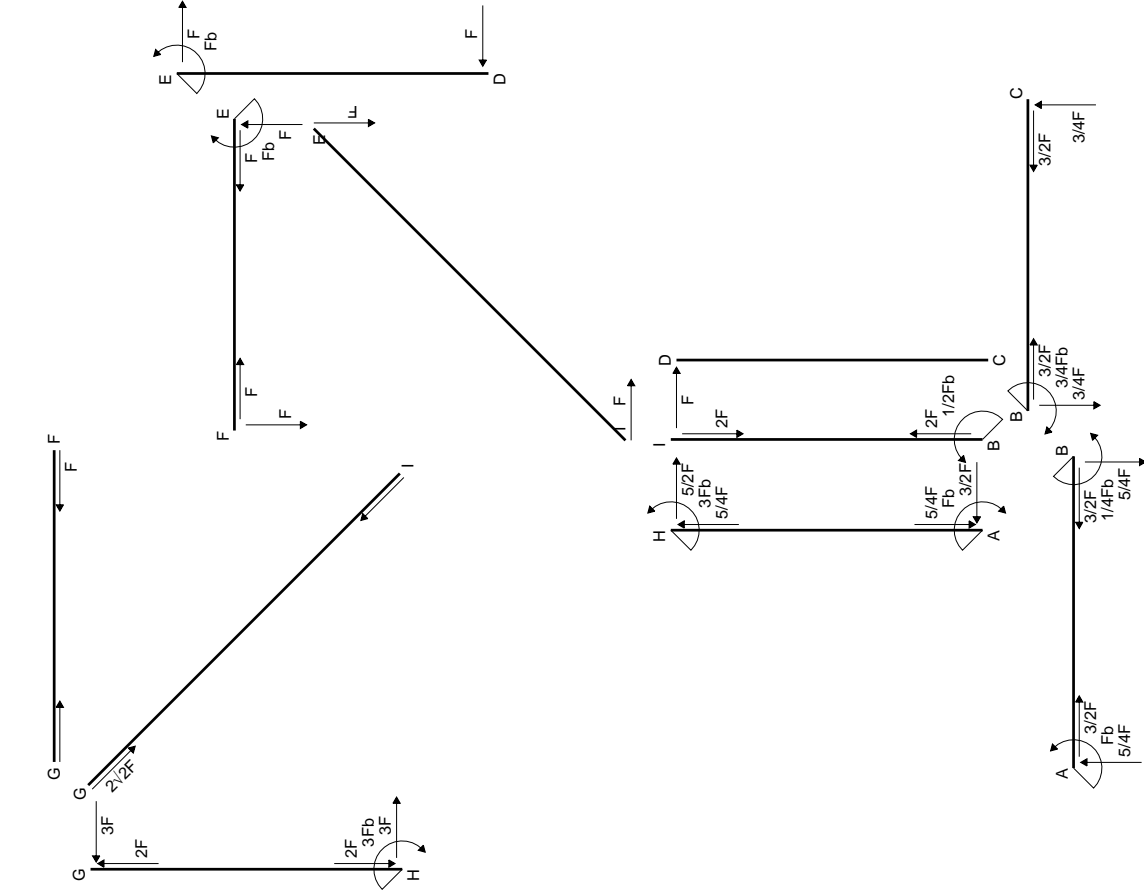
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

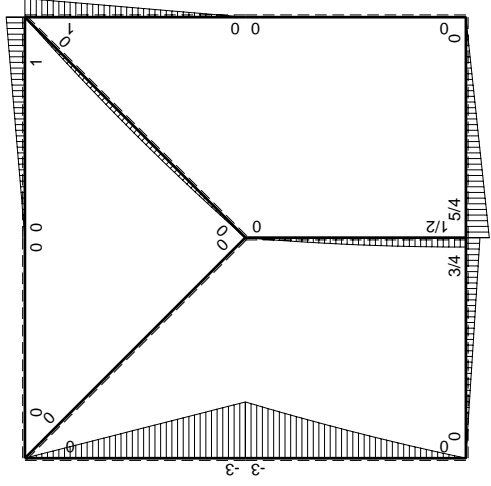
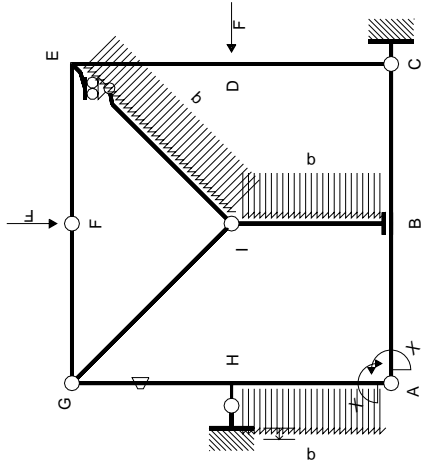
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

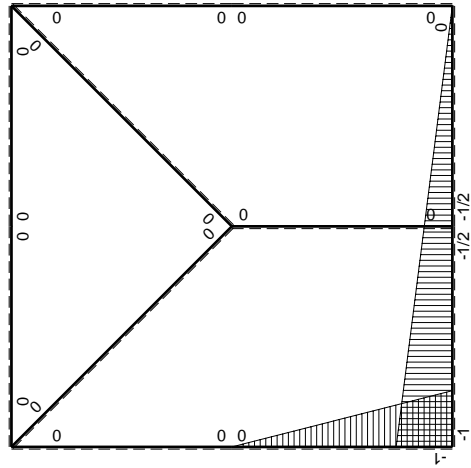
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	-Fb/EJ	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

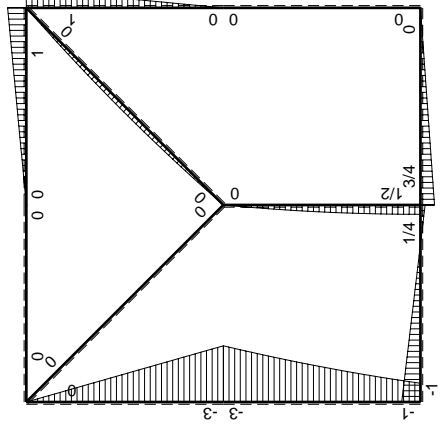
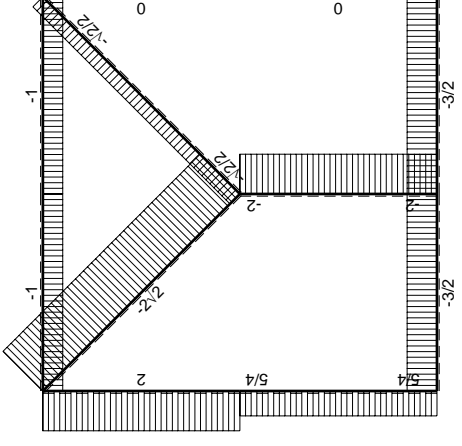
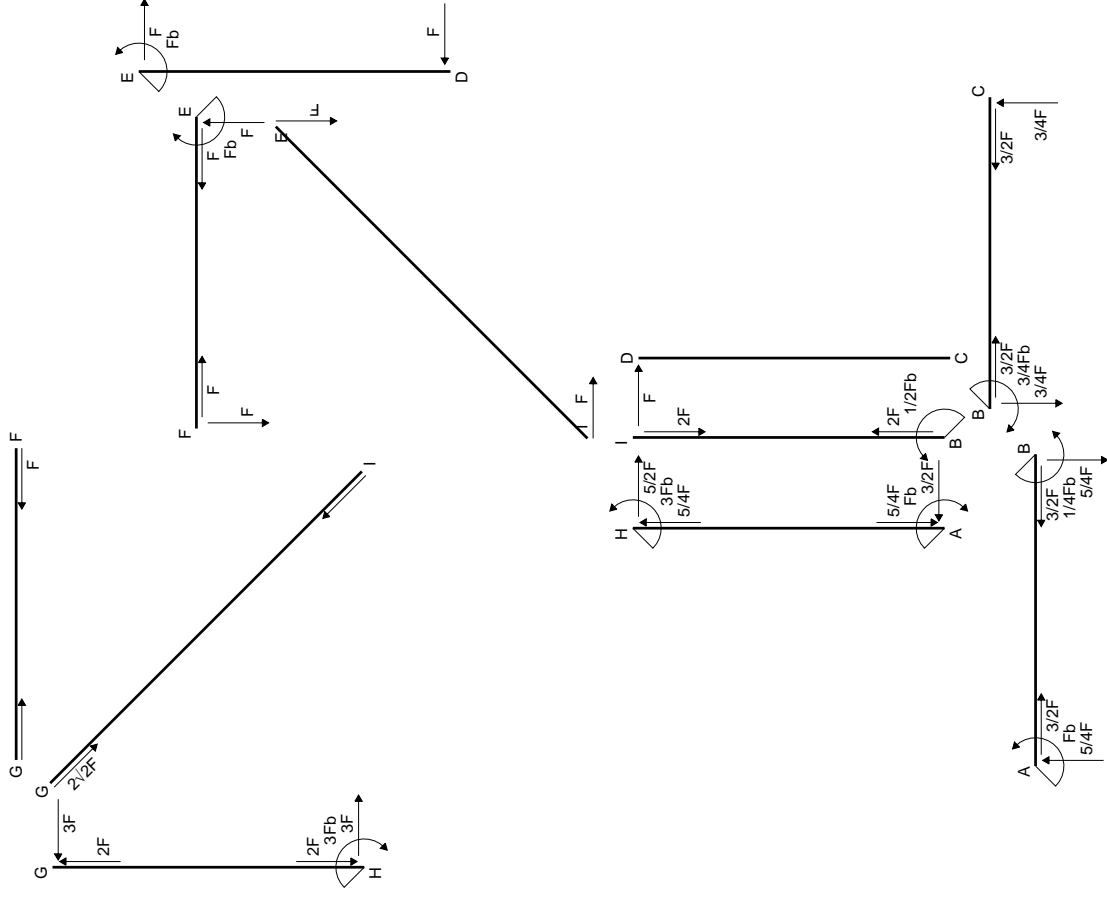
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

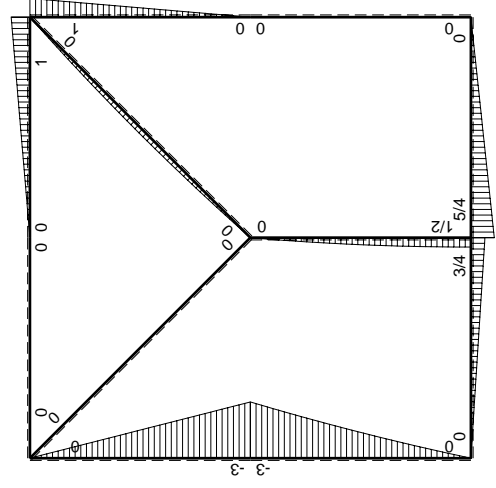
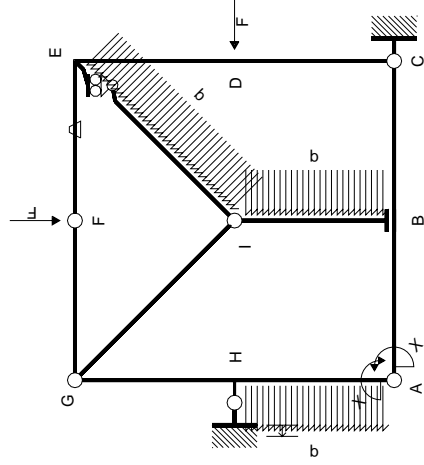
$$L_{HA}^{xo} = \int_0^b (3 x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

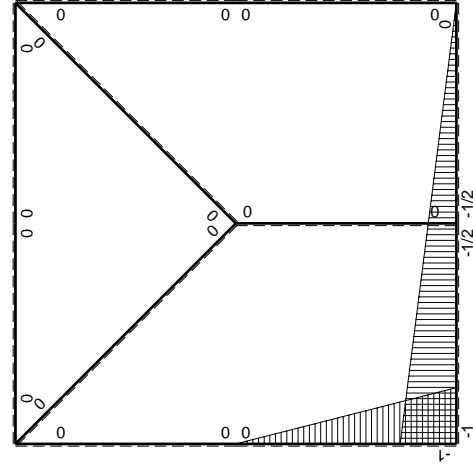
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	-Fb/EJ	0	0	0	0+0	0	
FE b	0	-Fx	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

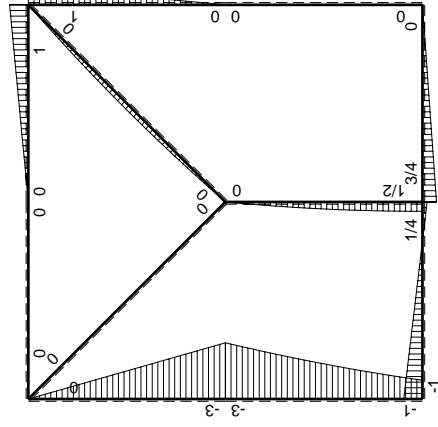
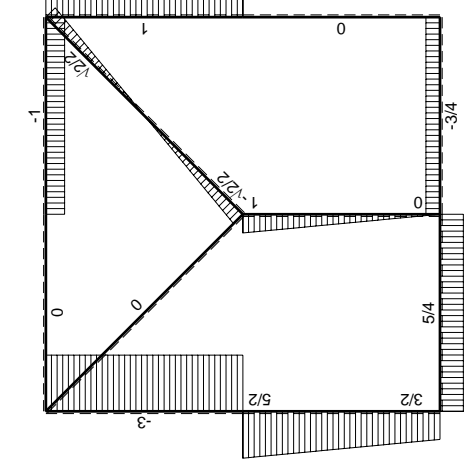
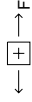
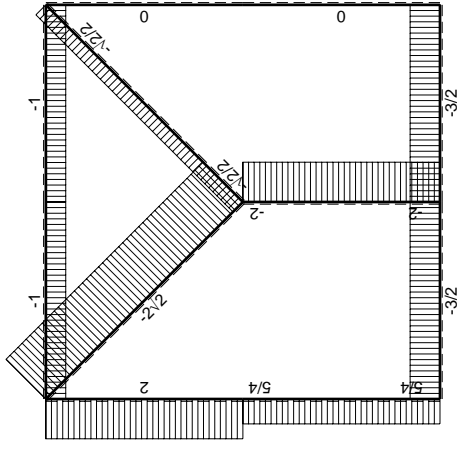
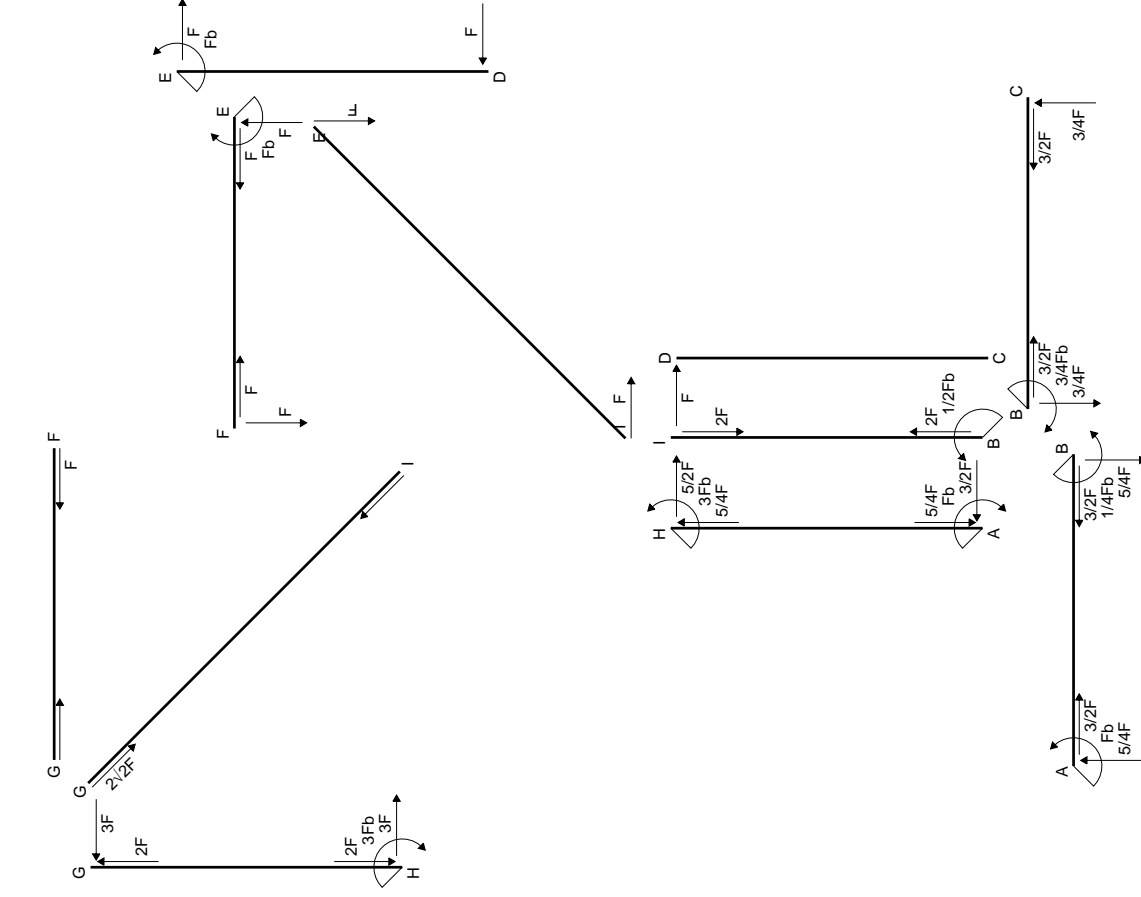
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

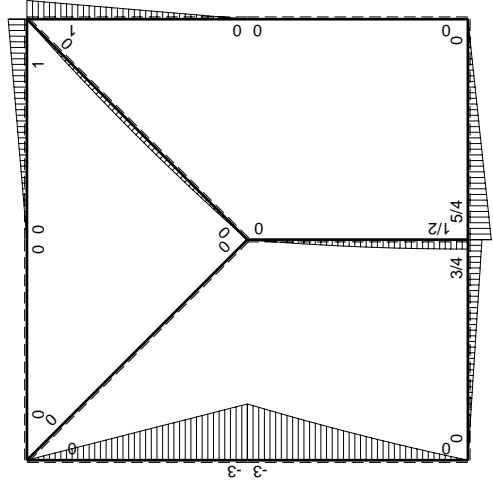
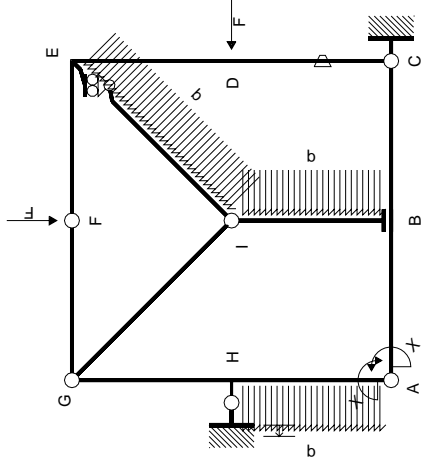
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

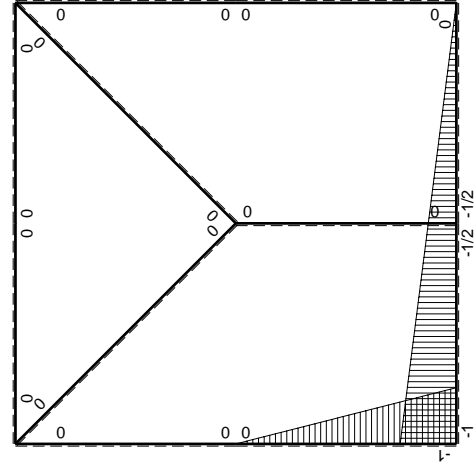
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	0	Fb/EJ	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3Fx$	0	0	0	0	0+0	0	
HG b	0	$3Fb-3Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

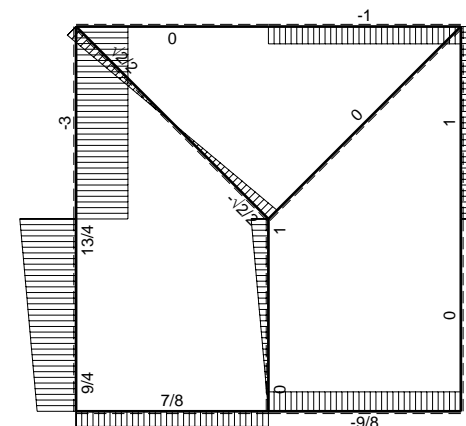
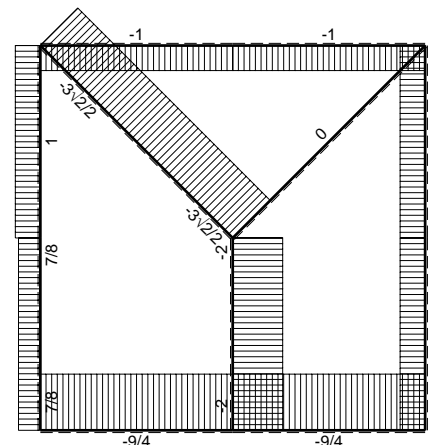
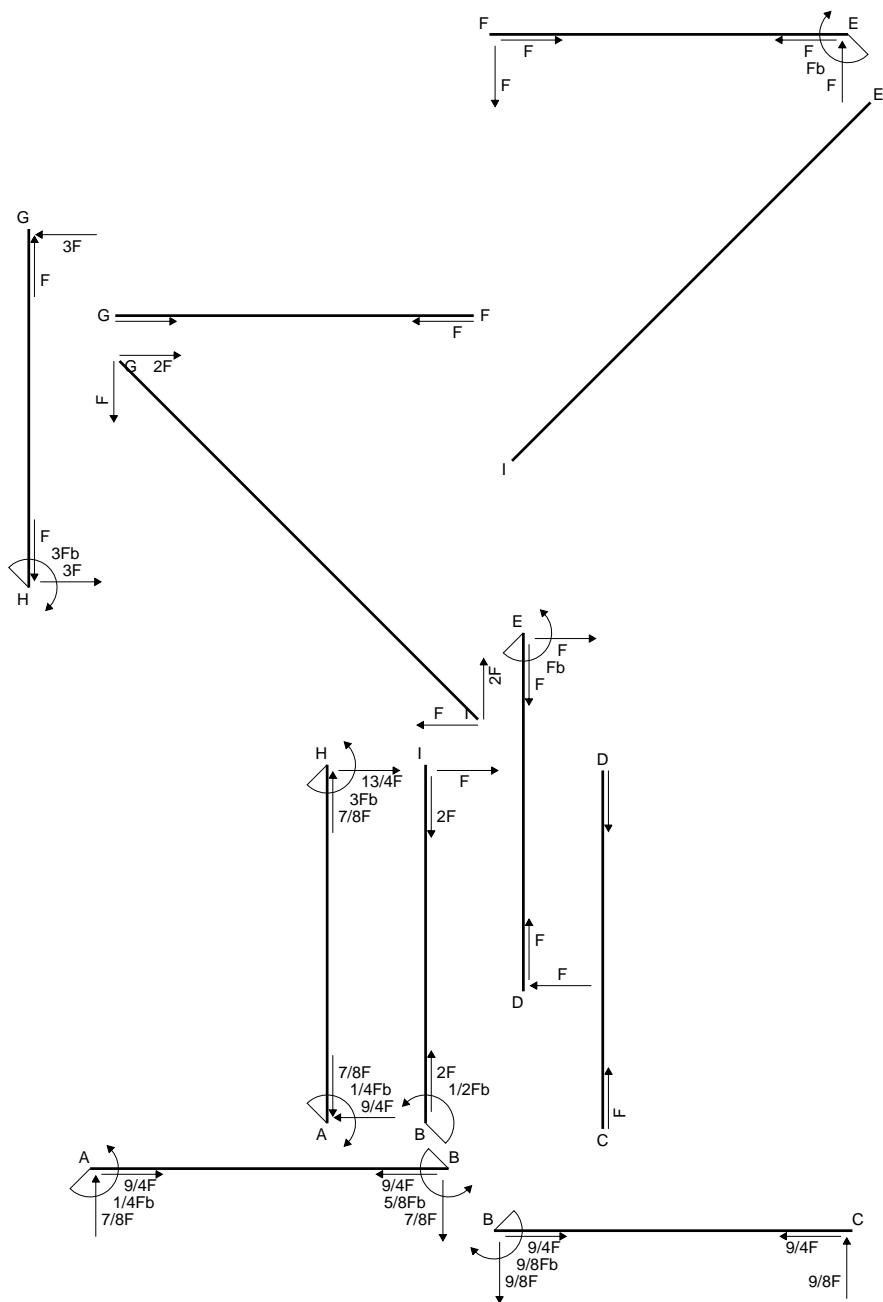
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

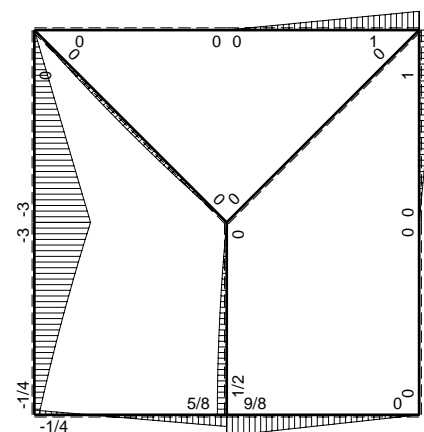
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

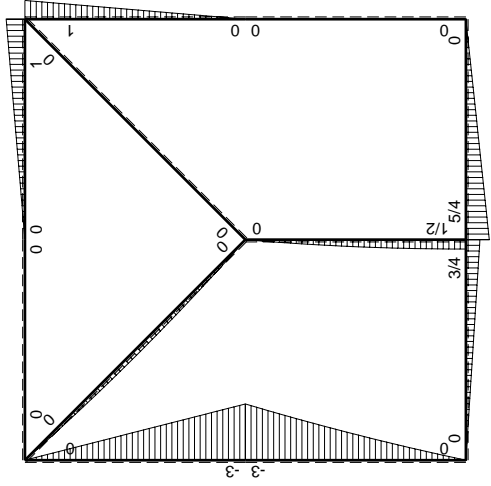
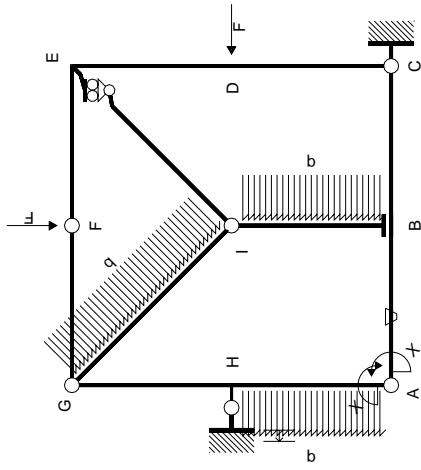


← ⊕ → F

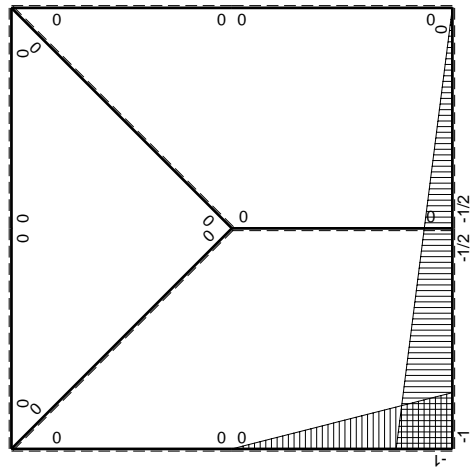
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	$-Fb/EJ$	$-3/4Fx+3/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/4+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	Fb/EJ	$-3/8Fb+3/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3Fx$	0	0	0	0	0+0	0	
HG b	0	$3Fb-3Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ + (b - 1/4 b) \theta = 1/2 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 1/2 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

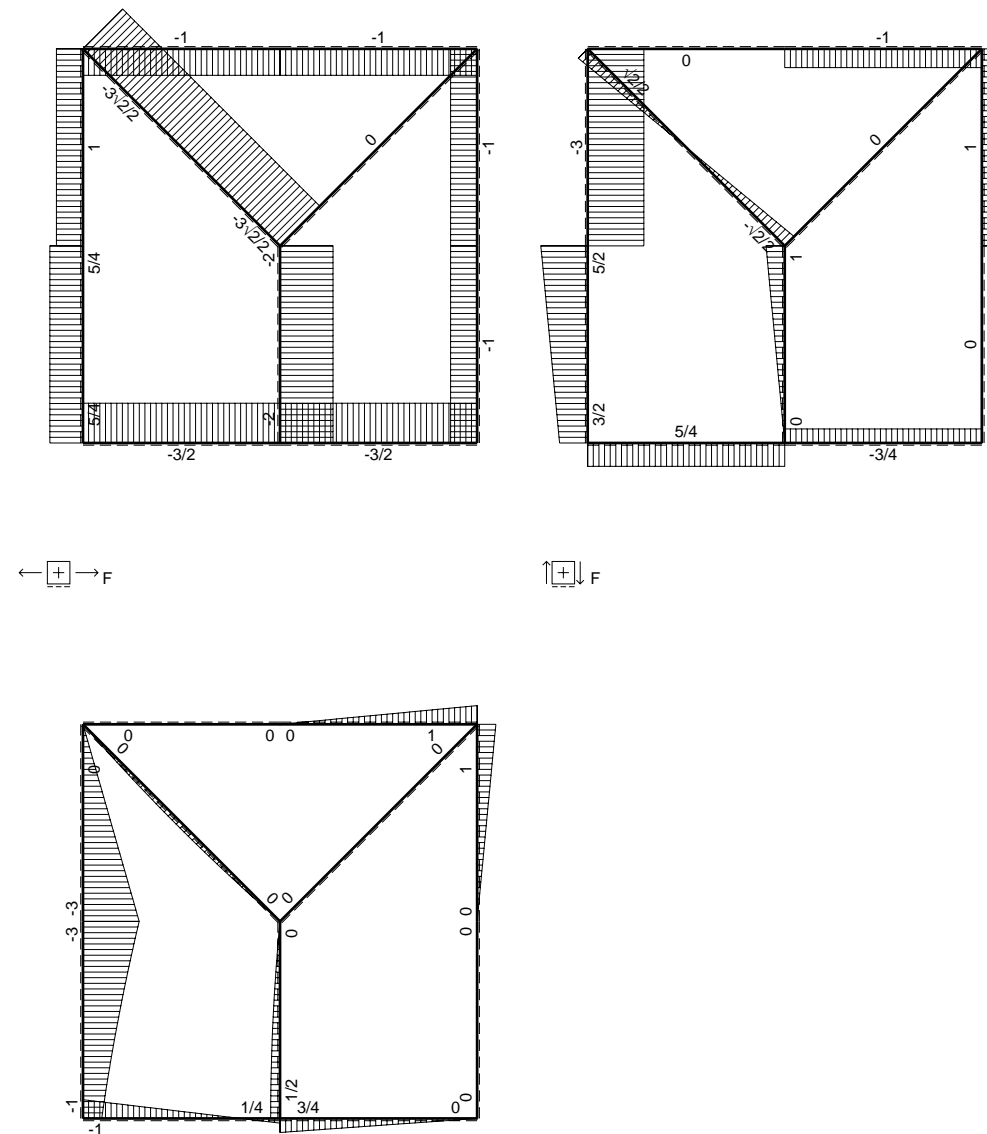
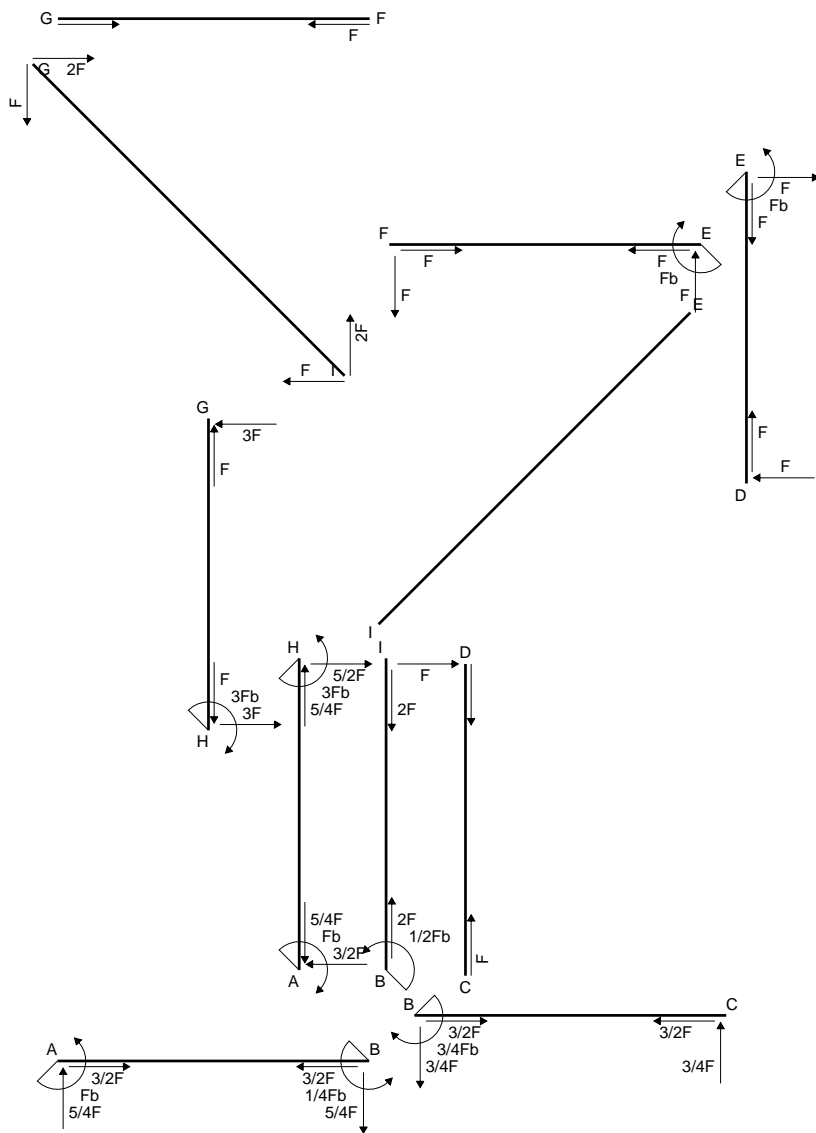
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

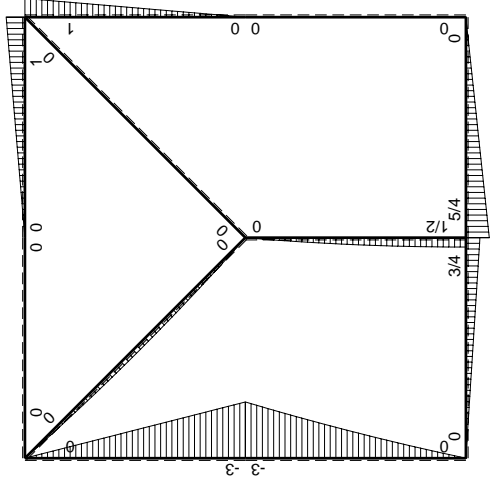
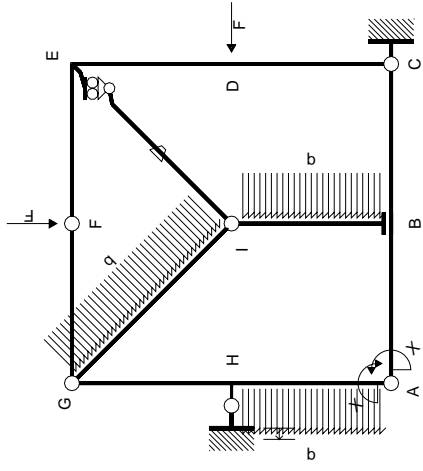
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

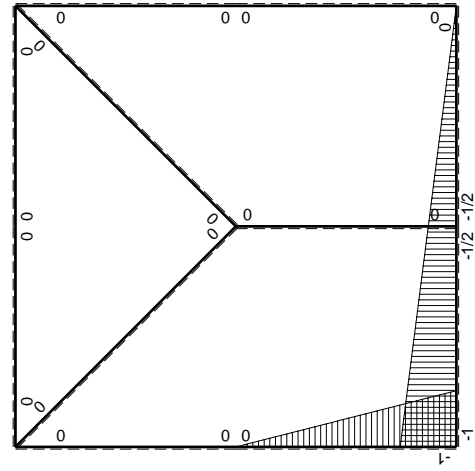
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





 M_b flessione da carichi assegnati



 M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	-Fb/EJ	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							-Fb ² /EJ	
	totali							-Fb ² /EJ	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

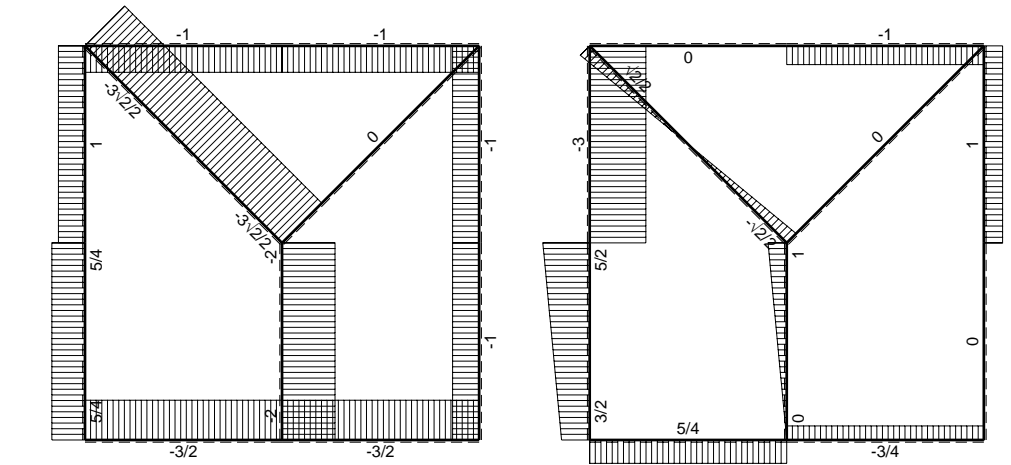
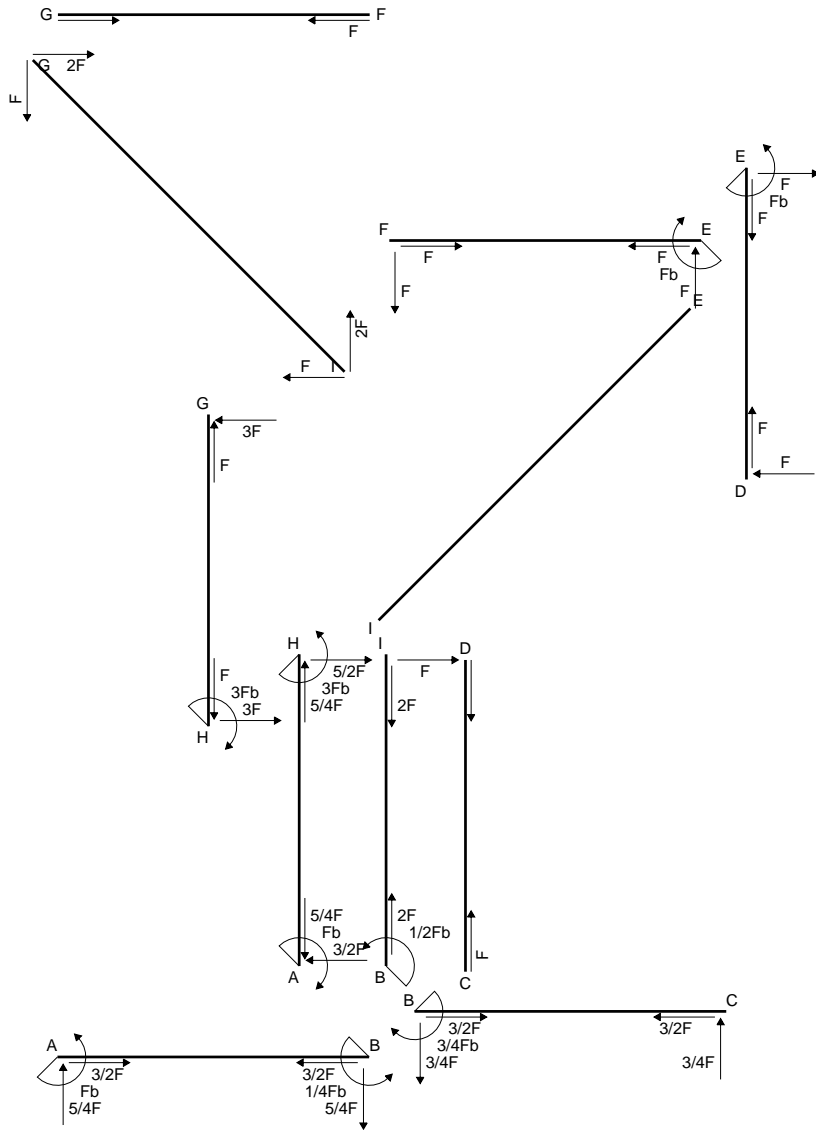
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

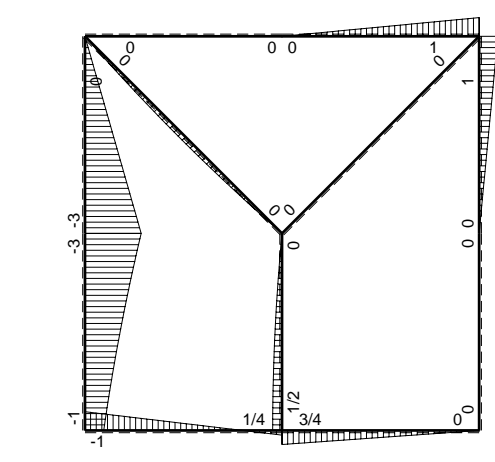
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

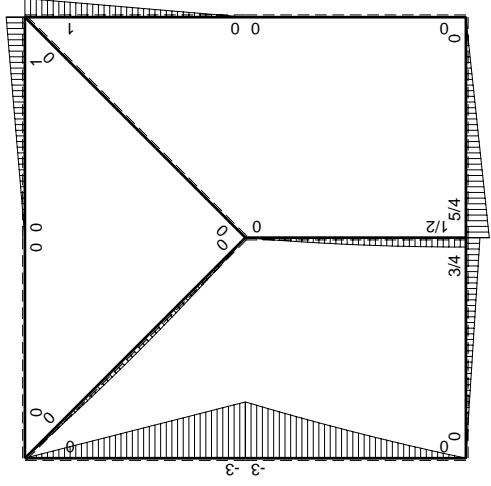
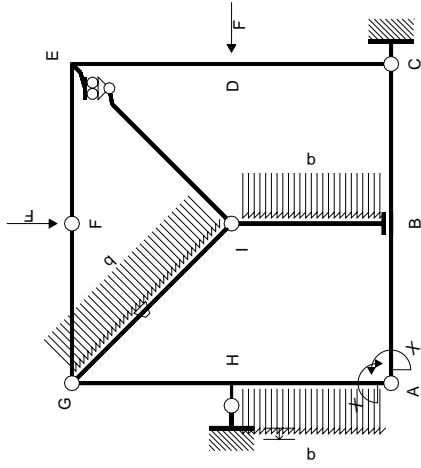


← (+) → F

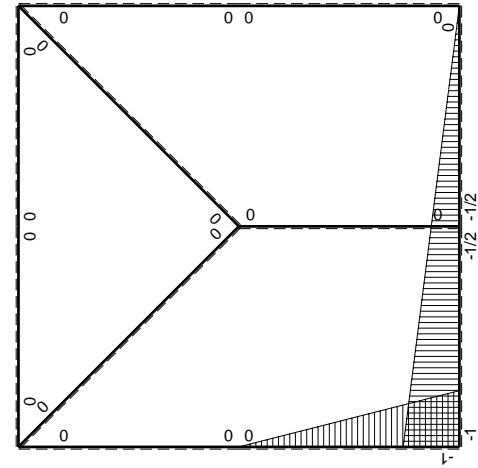
↑ (+) ↓ F



↺ (+) ↻ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	-Fb/EJ	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

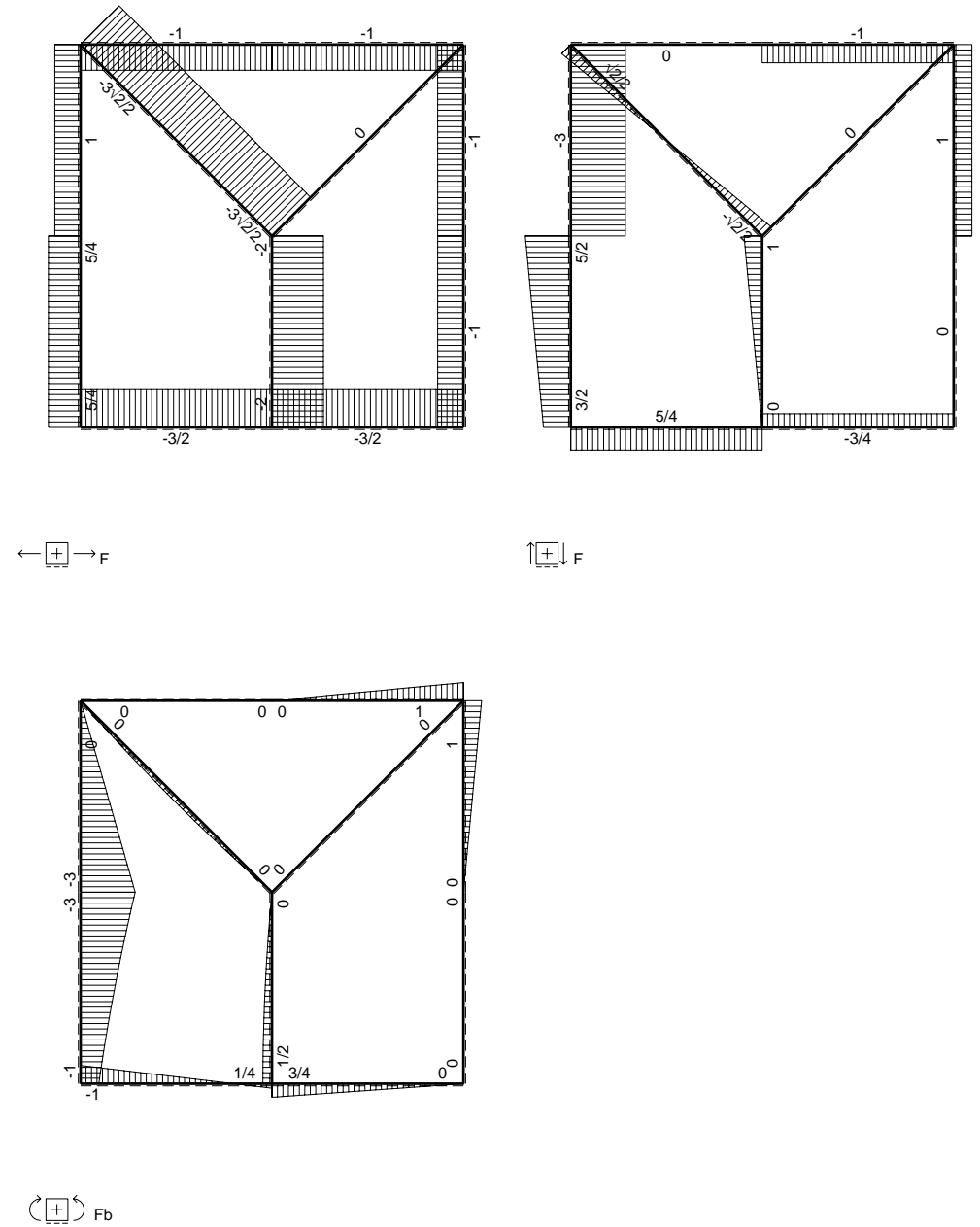
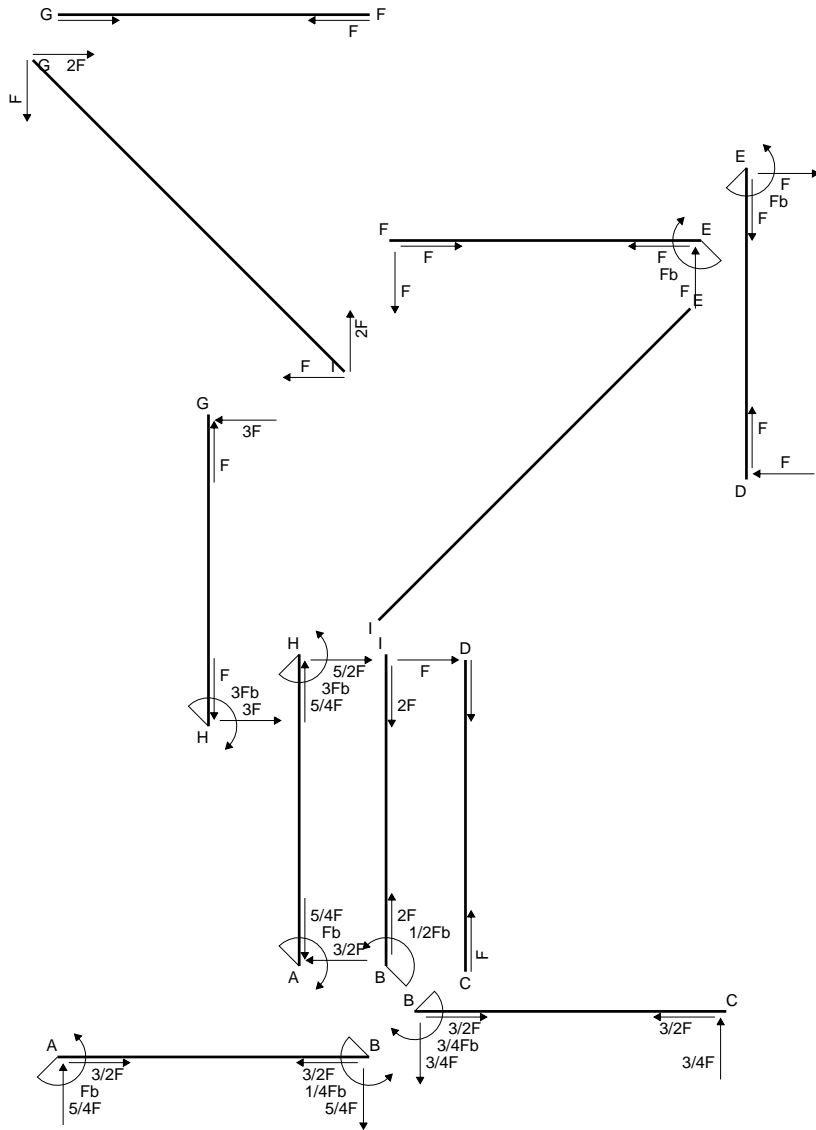
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

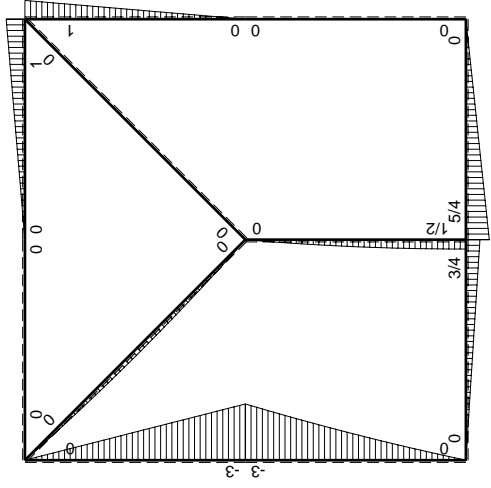
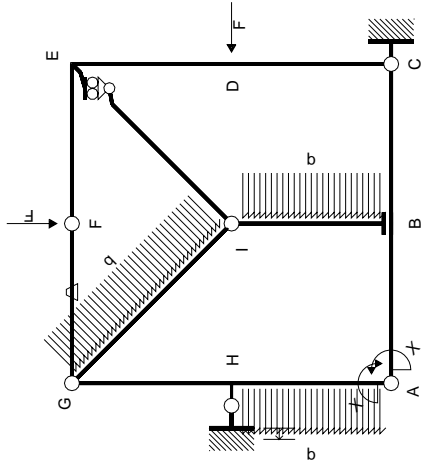
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

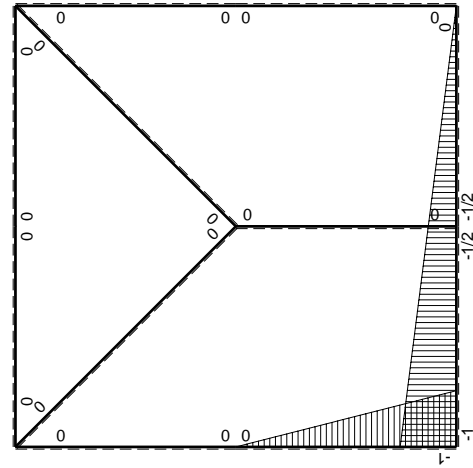
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	-Fb/EJ	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x^2/b + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = \left[-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = \left[-5/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

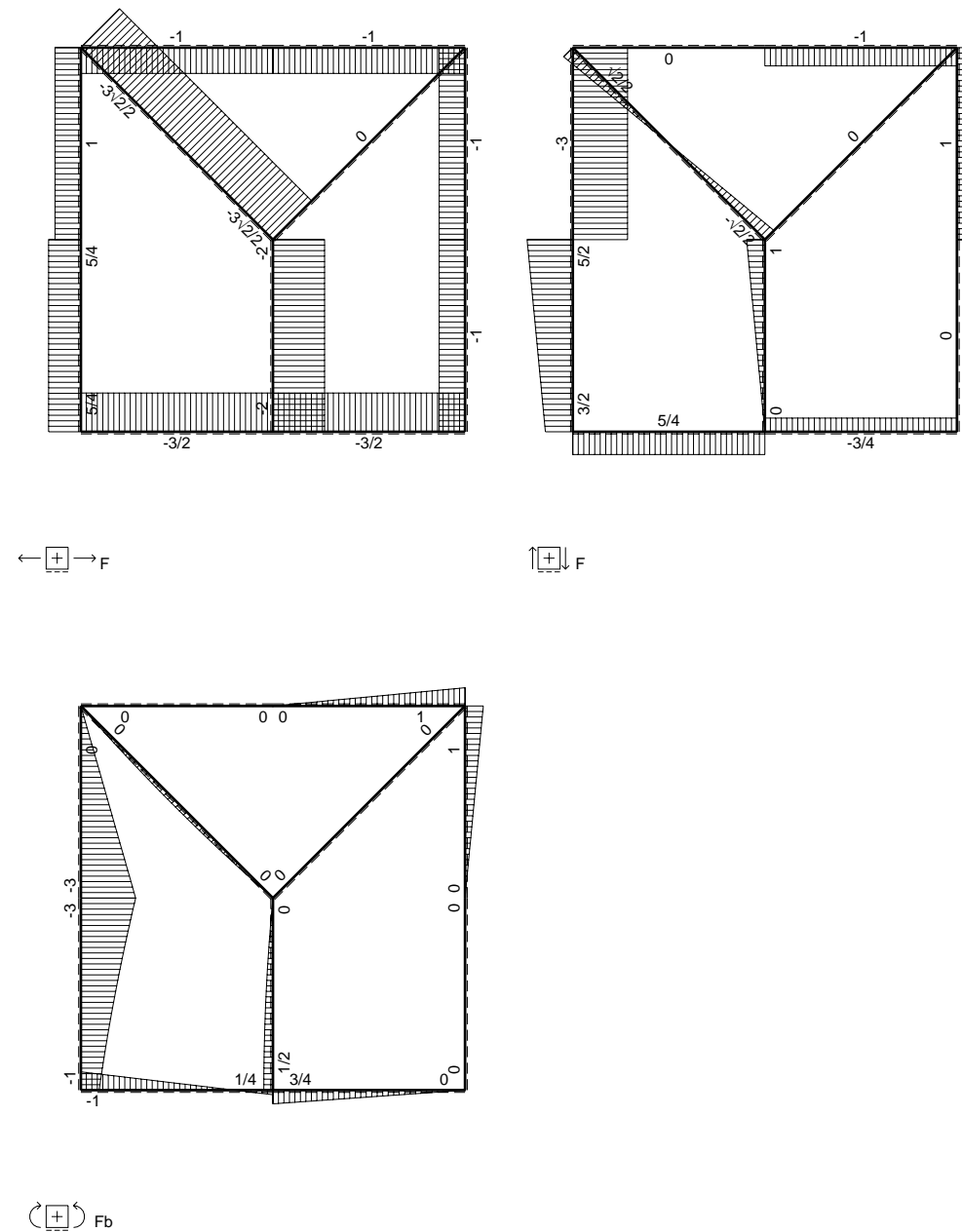
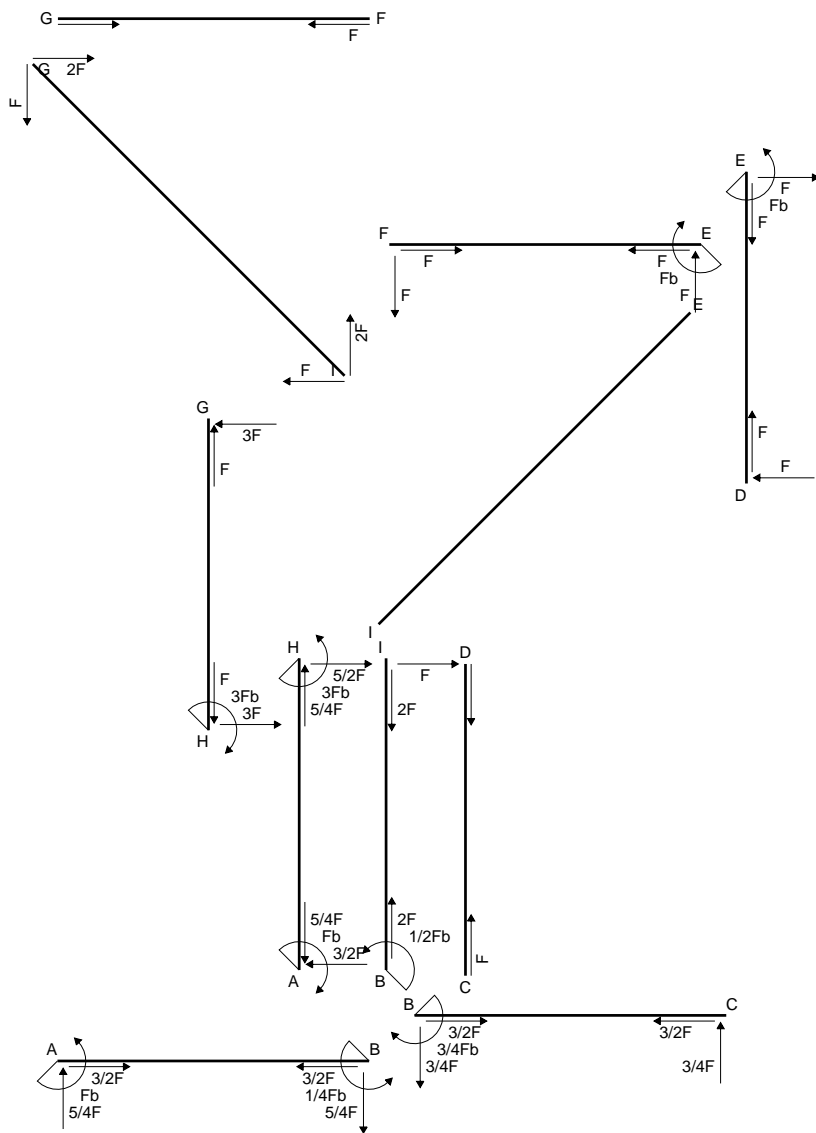
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

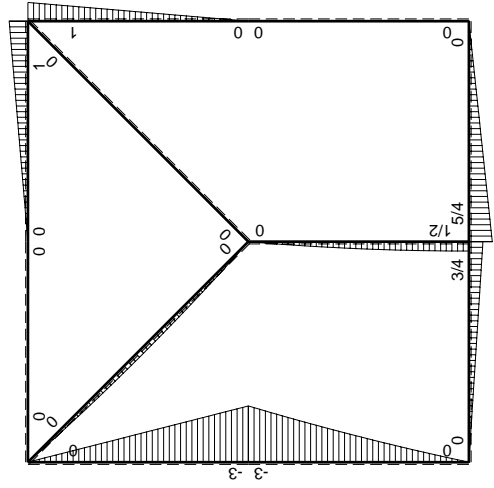
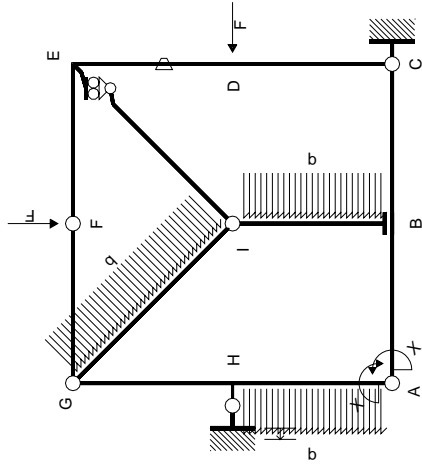
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

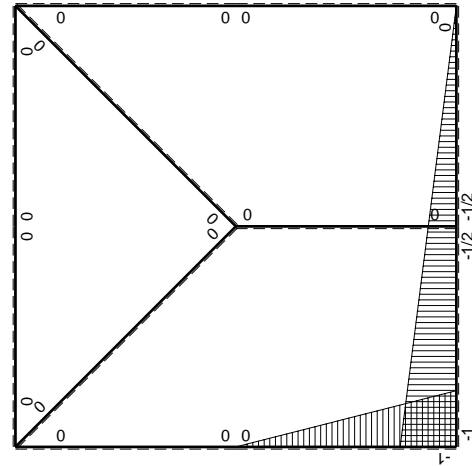
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





 M_0 , flessione da carichi assegnati



 M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	Fb/EJ	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0			
FE b	0	$-Fx$	0	0	0	0	0+0	0	
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3Fx$	0	0	0	0	0+0	0	
HG b	0	$3Fb-3Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

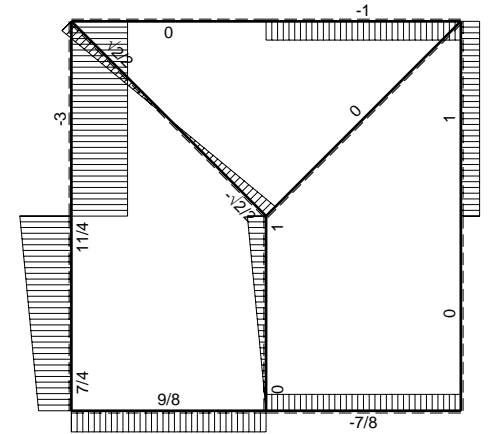
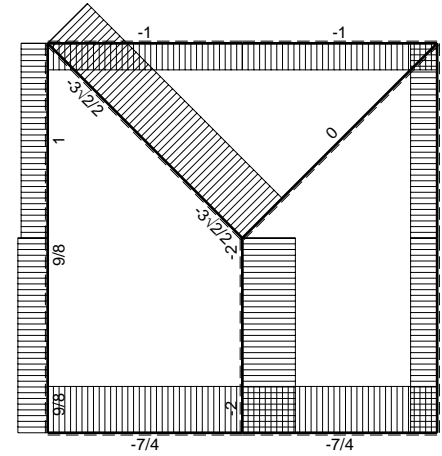
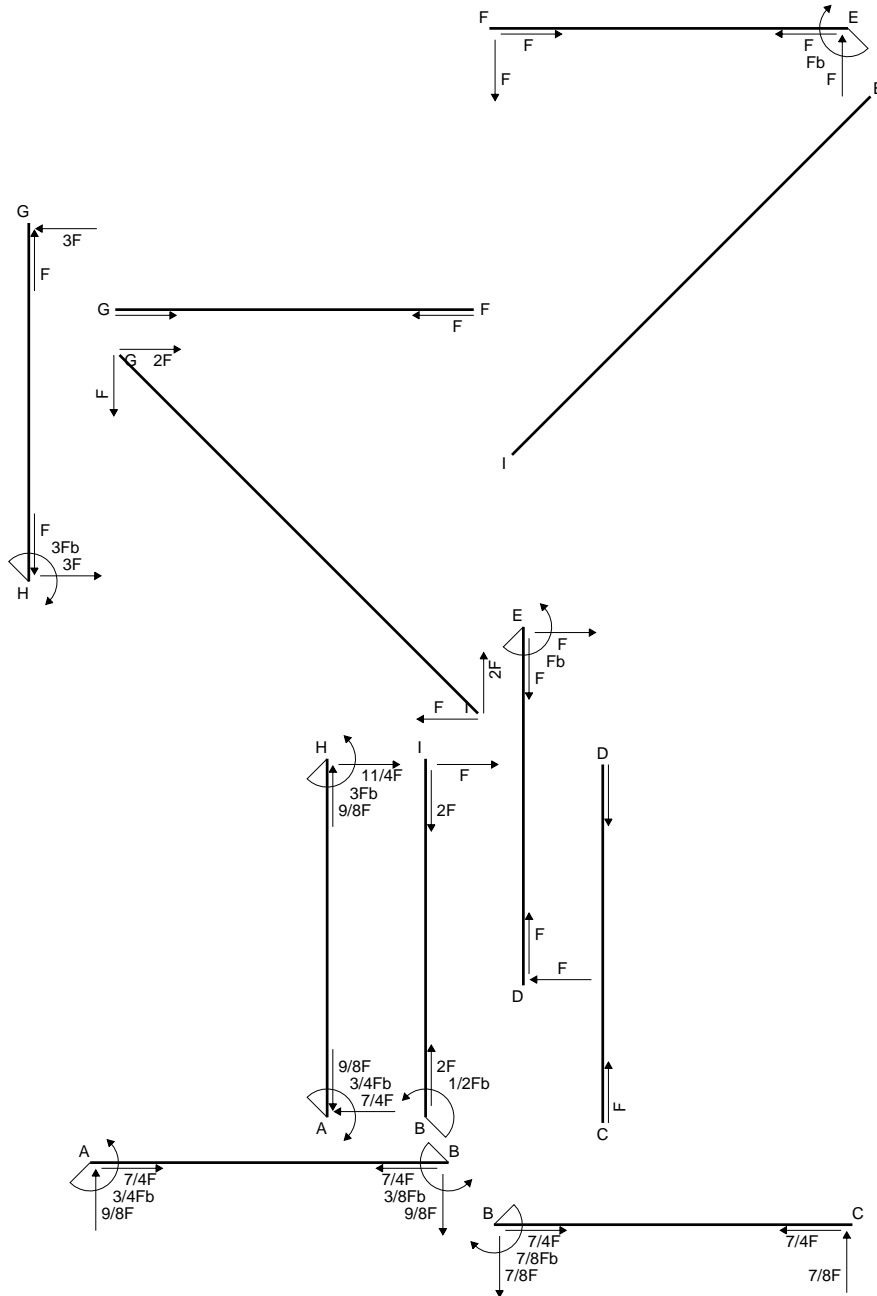
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3 x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

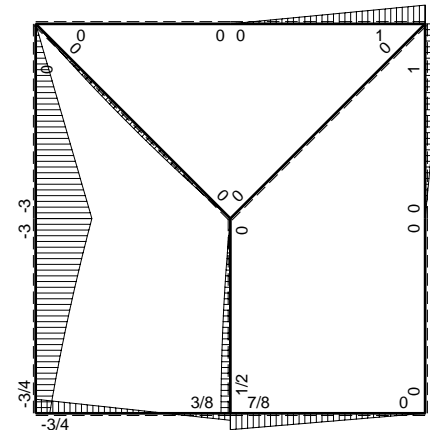
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

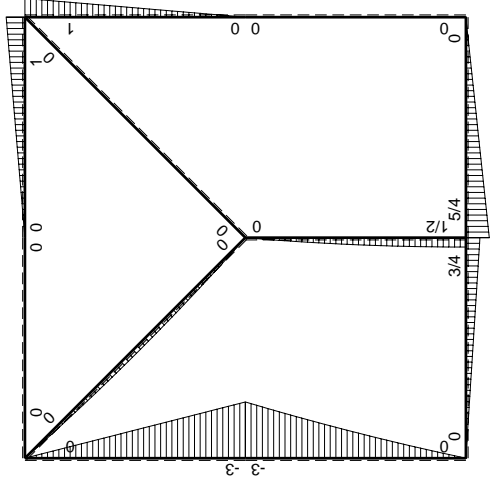
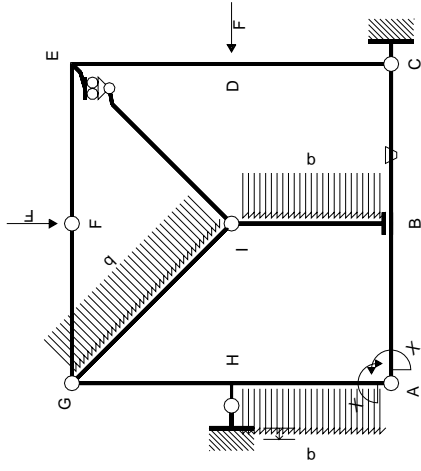


← ⊕ → F

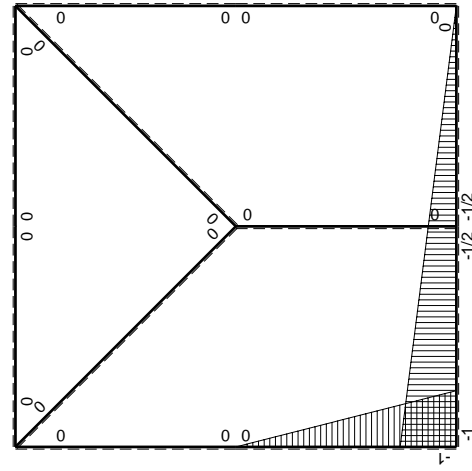
↑ ⊕ ↓ F



⊕ ⊖ F_b



 M_0 , flessione da carichi assegnati



 M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	$-Fb/EJ$	$-5/8Fb+5/4Fx-5/8Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	Fb/EJ	$-5/8Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3Fx$	0	0	0	0	0+0	0	
HG b	0	$3Fb-3Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x^2/b + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= \left[-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2 \right]_0^b Fb 1/EJ + \left[1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = \left[-5/24 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/4 x^2/b \right]_0^b \theta$$

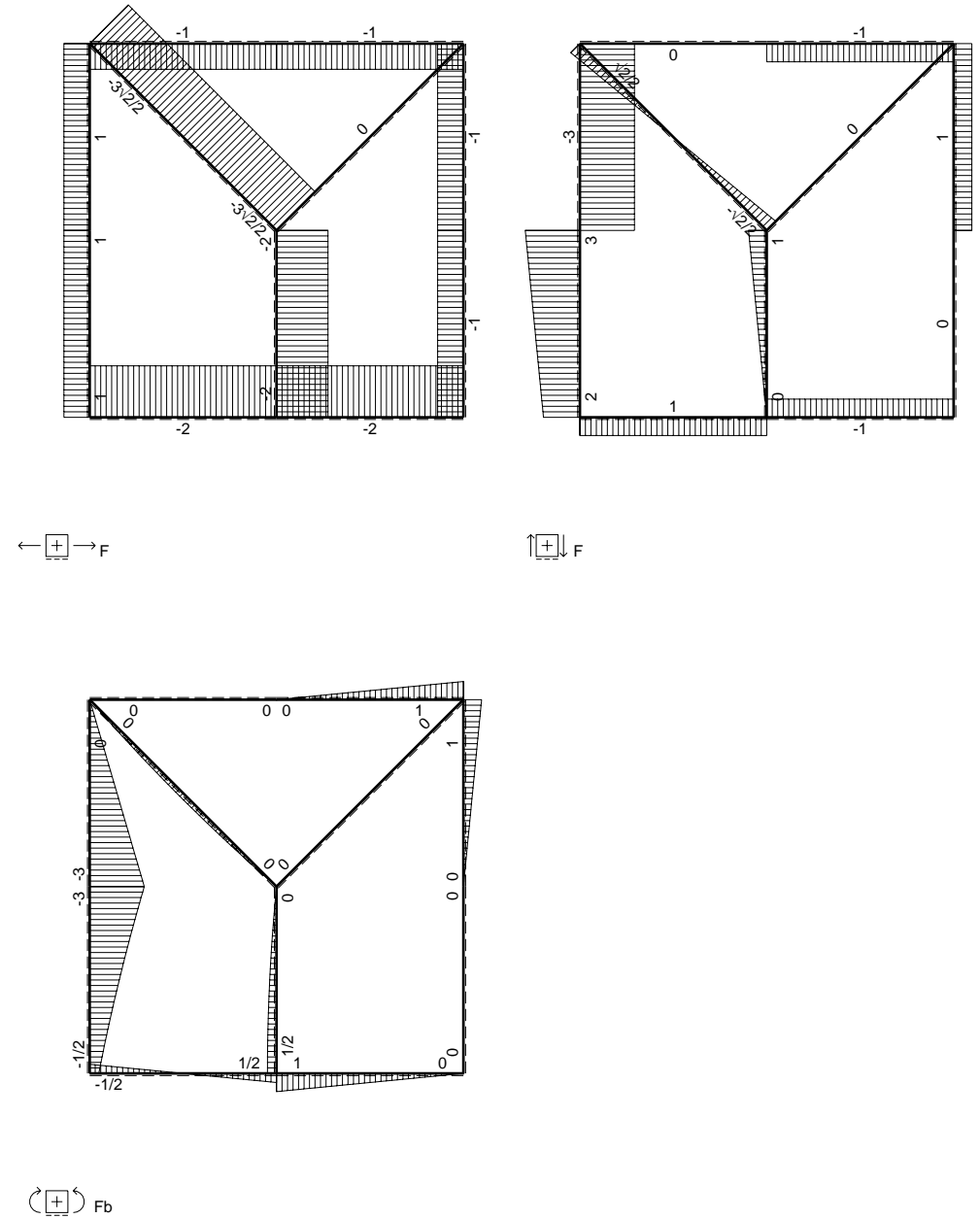
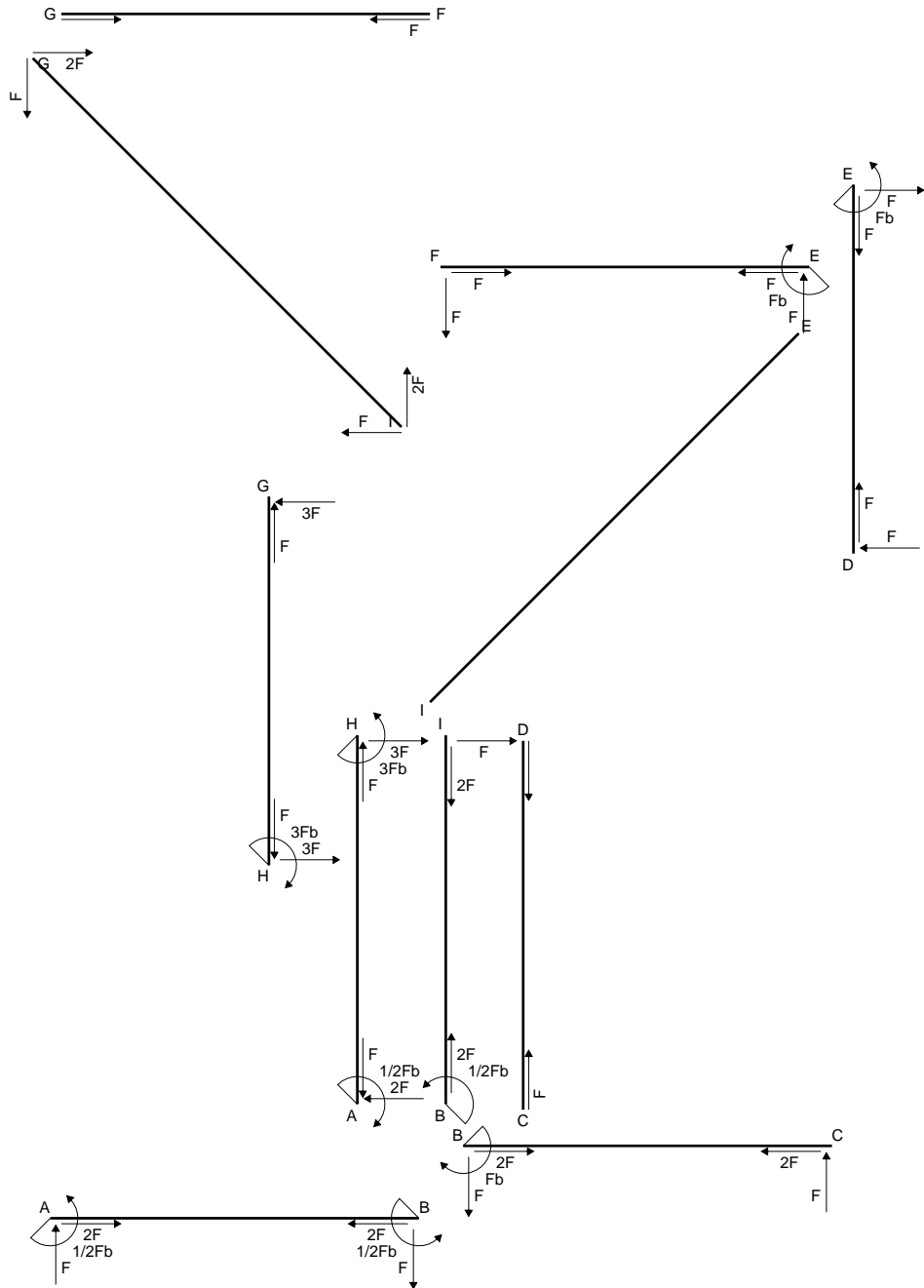
$$= (-5/24 b) Fb 1/EJ + (-1/4 b) \theta = 1/24 Fb^2/EJ$$

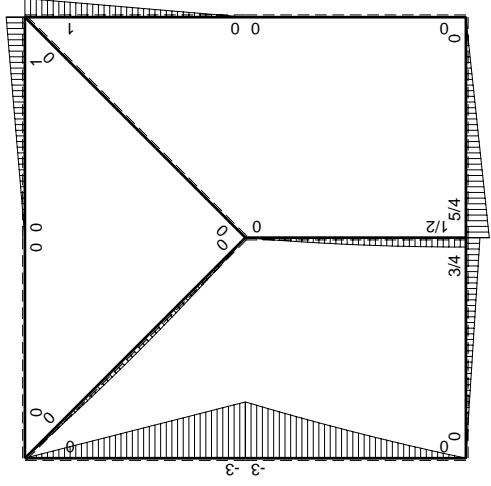
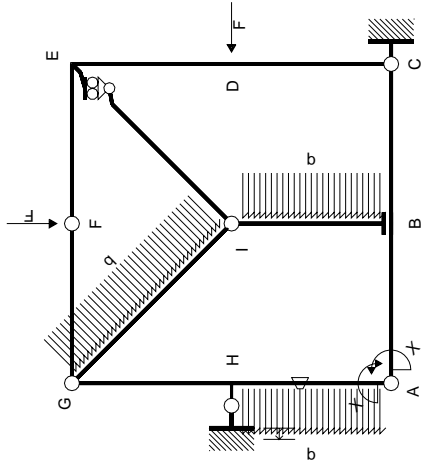
$$L_{HA}^{xo} = \int_0^b (3 x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

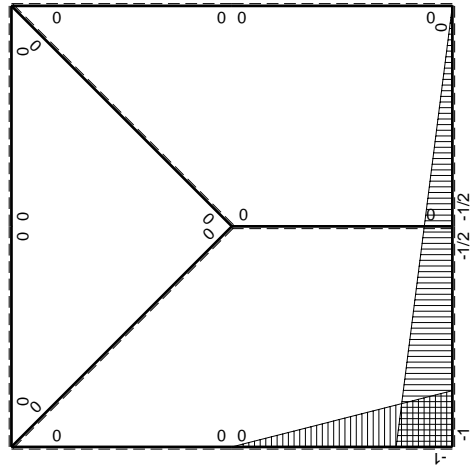
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	-Fb/EJ	$3Fx-7/2Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(11/24+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	Fb/EJ	$5/2Fx-2Fx^2/b-1/2qx^3/b$	Fb/EJ-Fx/EJ	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/2Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/2Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x^2/b + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = \left[-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = \left[-5/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

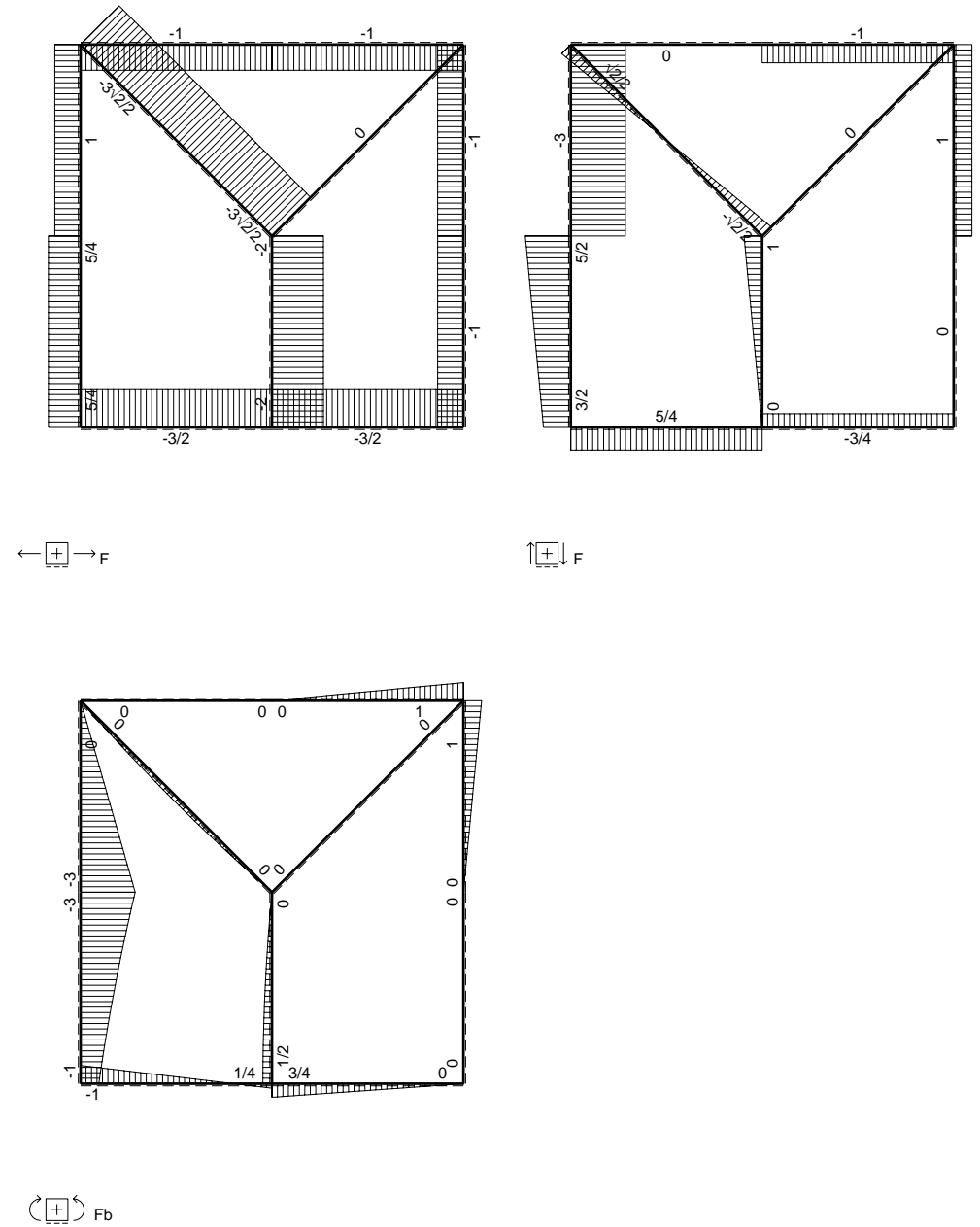
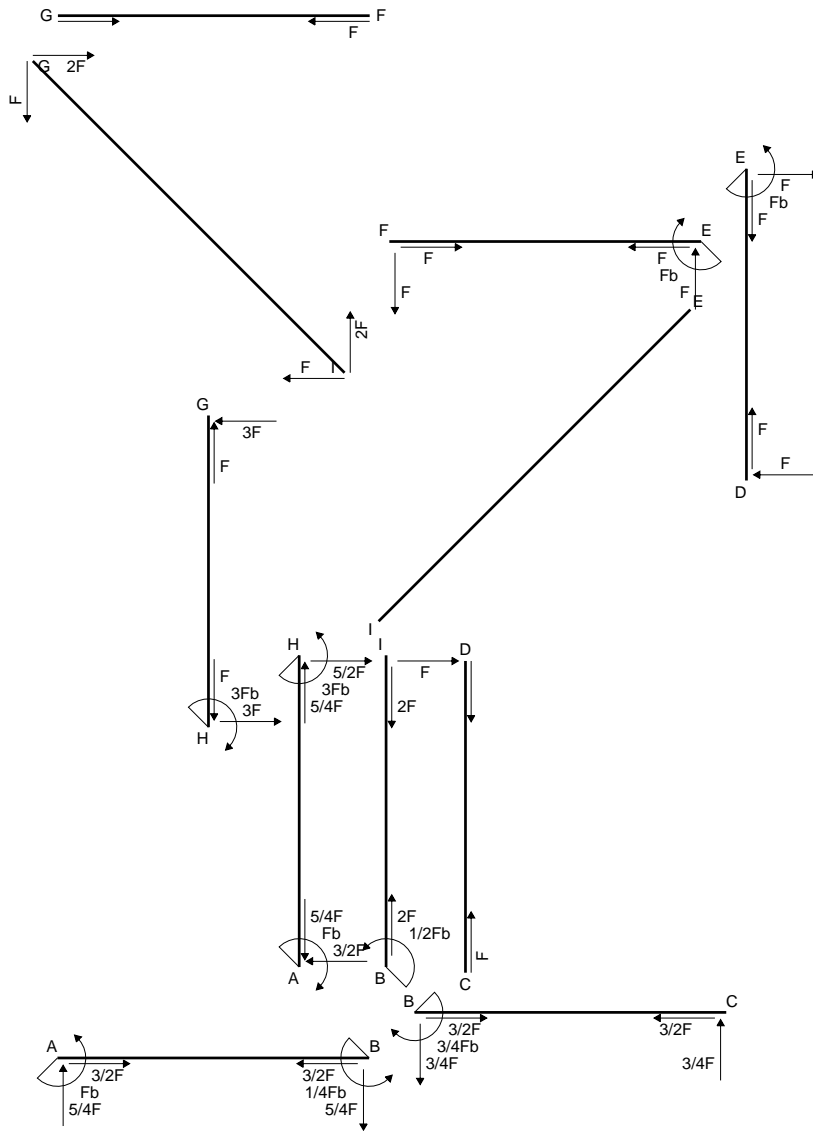
$$= \left[3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

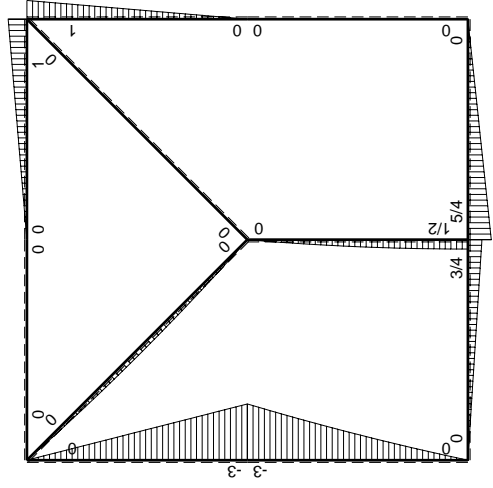
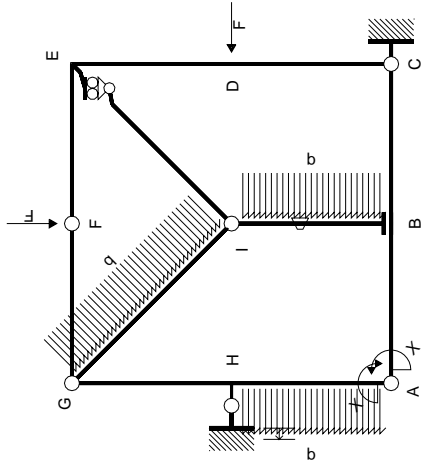
$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 23/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

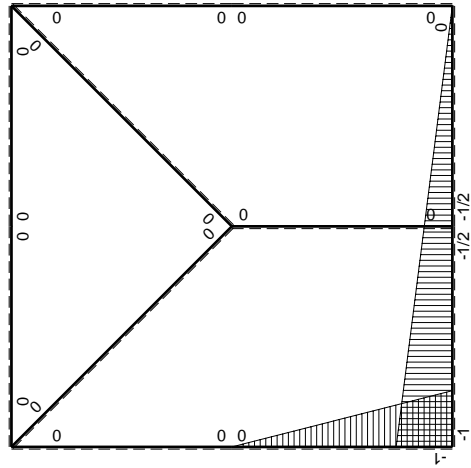
$$= \left[5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 23/24 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	-Fb/EJ	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

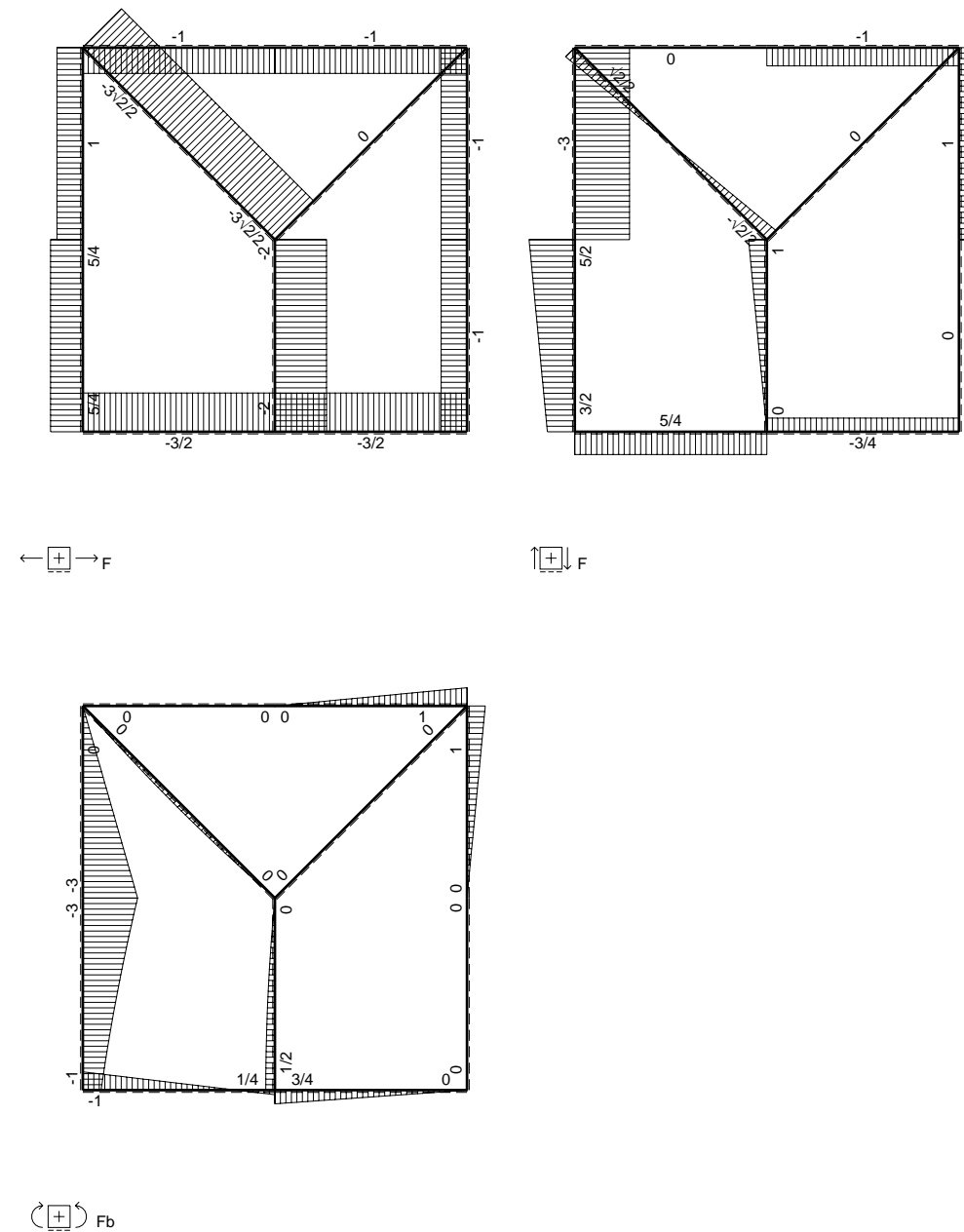
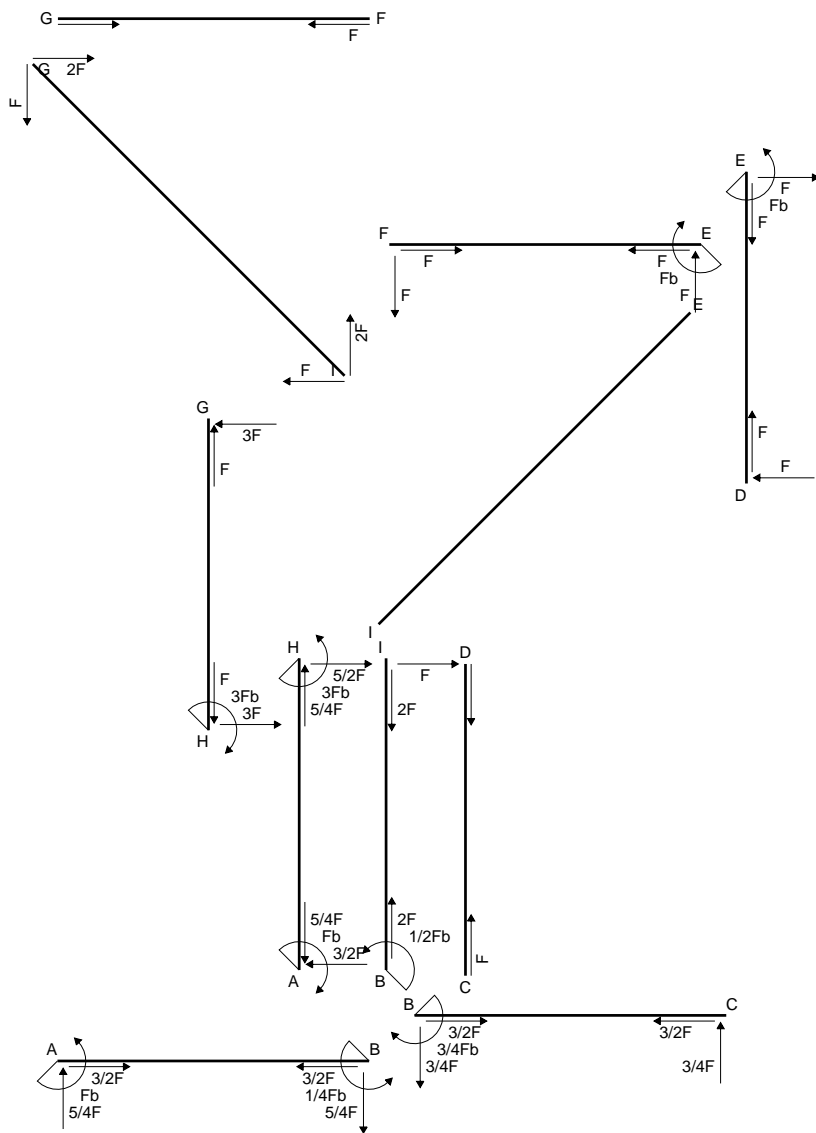
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

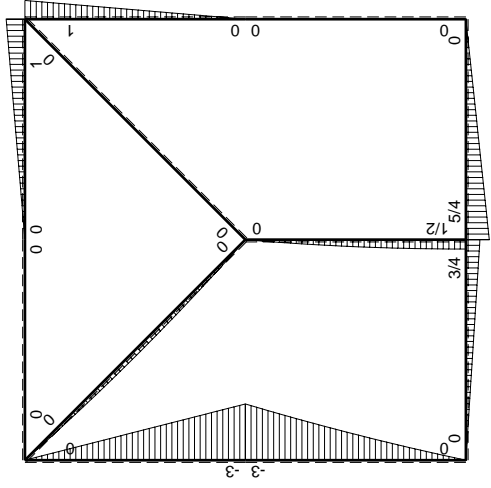
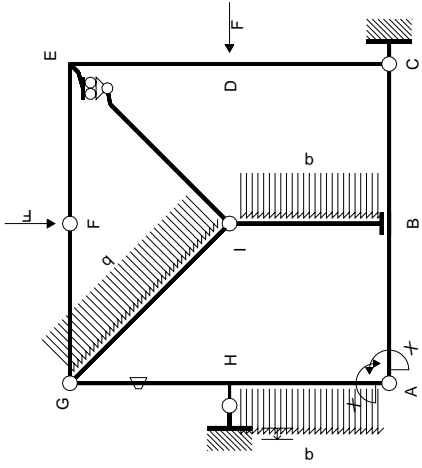
$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

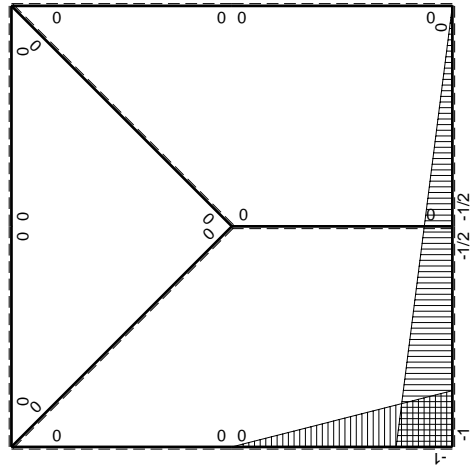
$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$



$\curvearrowright (+) F_b$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	-Fb/EJ	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

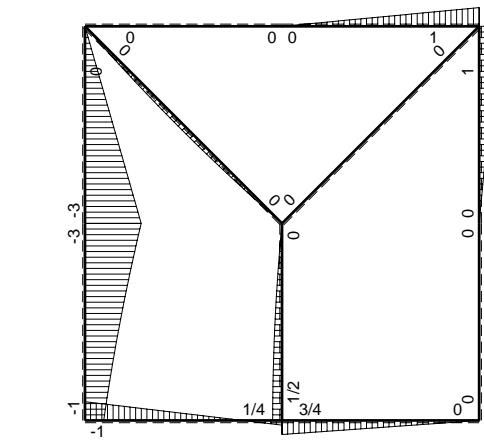
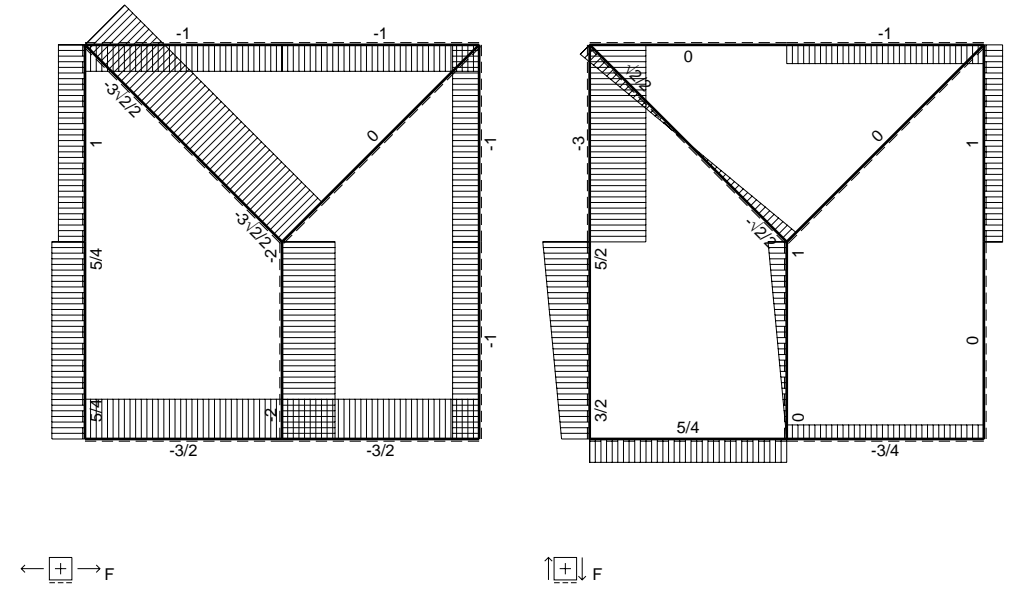
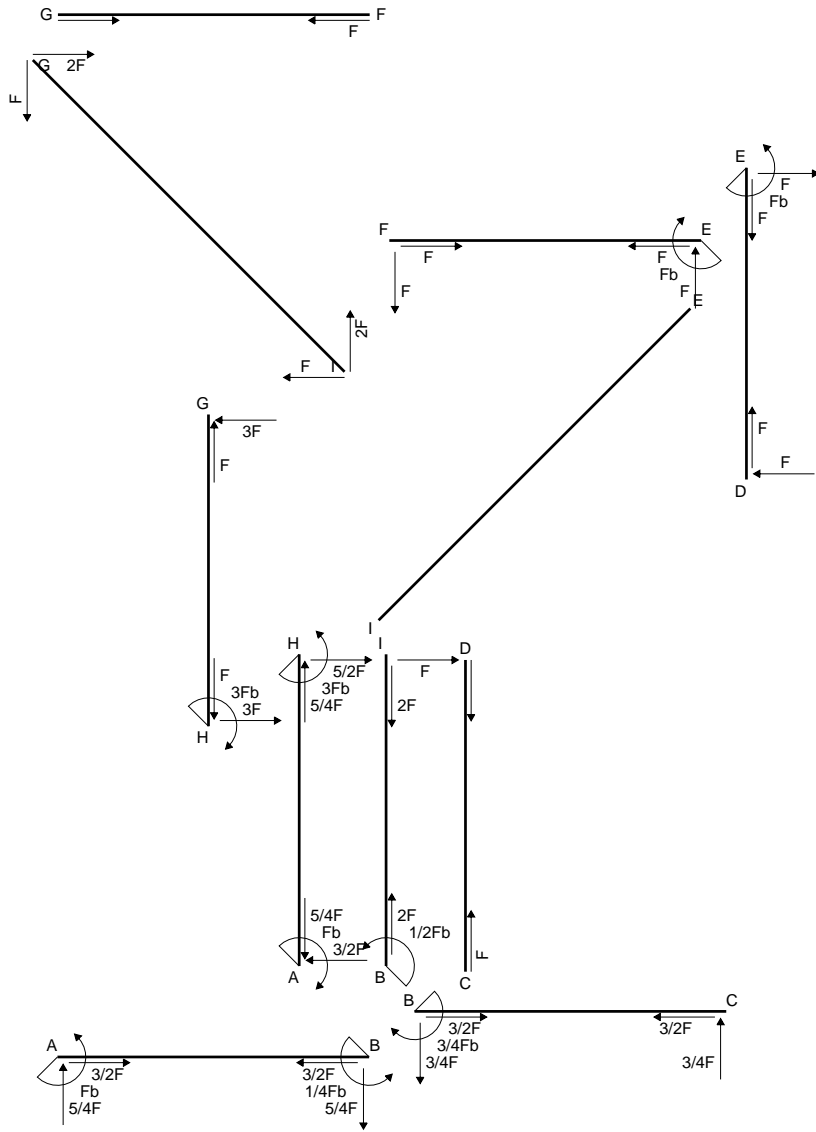
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

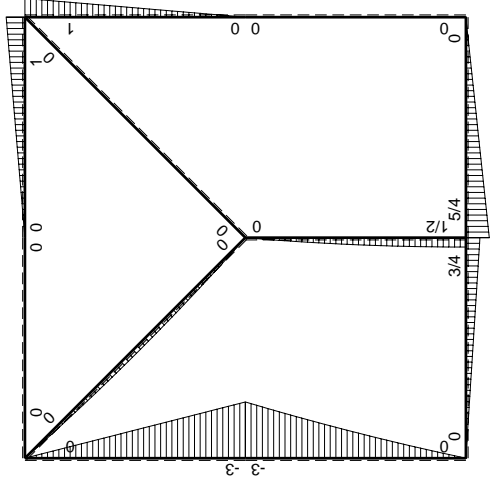
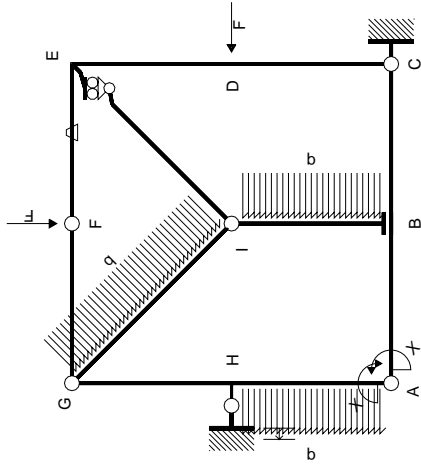
$$L_{HA}^{xo} = \int_0^b (3 x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

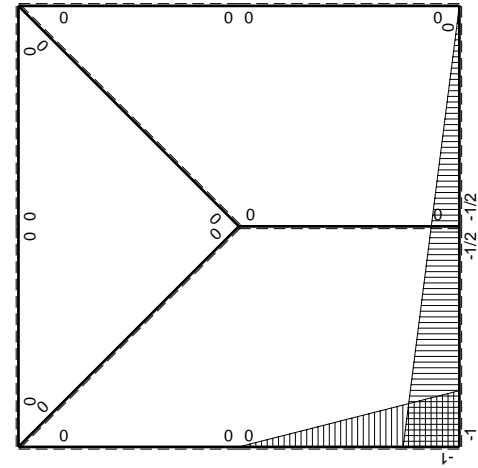
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	-Fb/EJ	0	0	0	0+0	0	
FE b	0	-Fx	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	-3Fx	0	0	0	0	0+0	0	
HG b	0	3Fb-3Fx	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

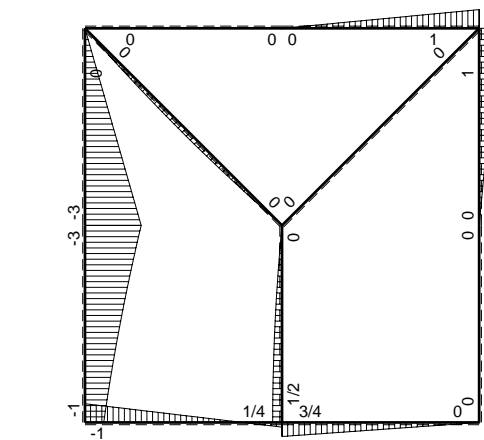
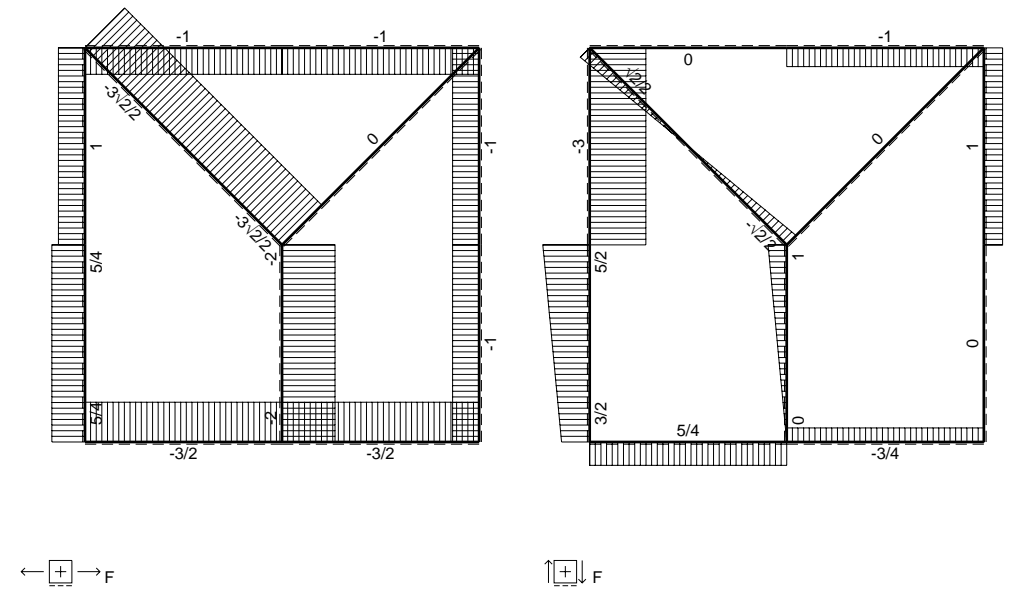
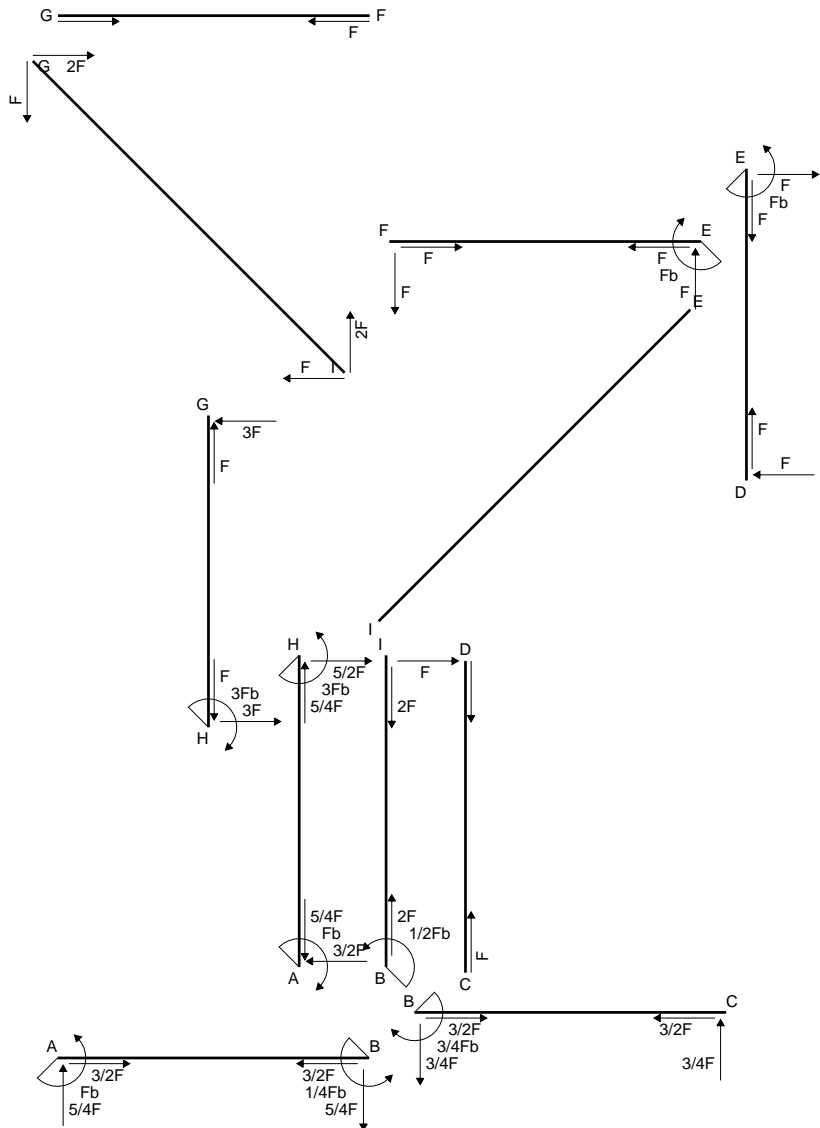
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

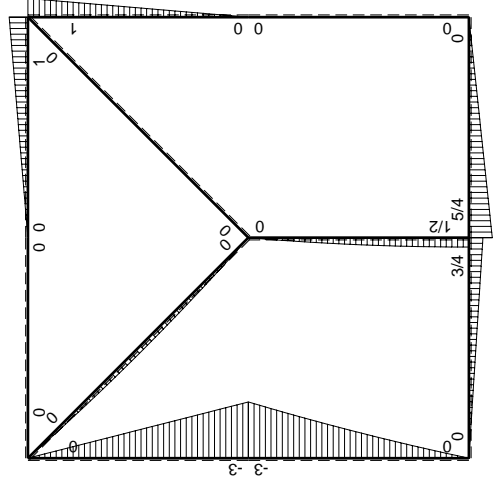
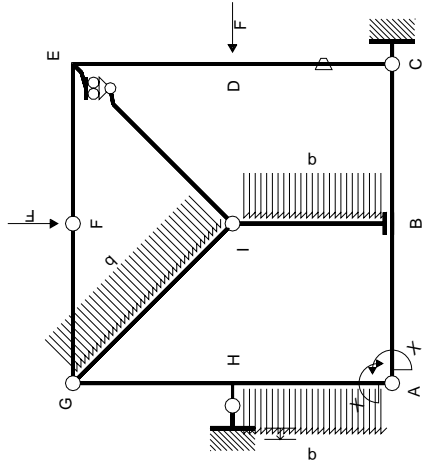
$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

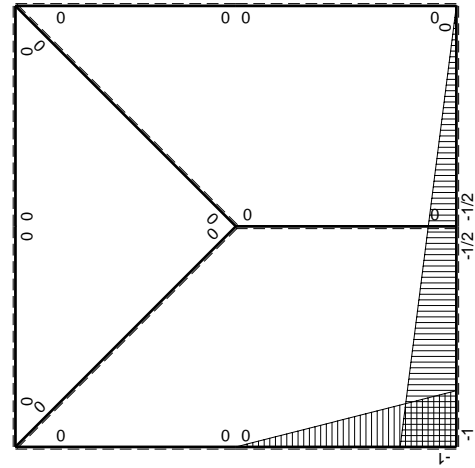
$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$



$\left[\oplus \right] F_b$



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx$	0	$-3/4Fx+3/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/4+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-3/4Fb+3/4Fx$	0	$-3/8Fb+3/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$5/4Fb-5/4Fx$	0	$-5/8Fb+5/4Fx-5/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-5/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-5/4Fx$	0	$-5/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	0	Fb/EJ	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3Fx$	0	0	0	0	0+0	0	
HG b	0	$3Fb-3Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3Fb+7/2Fx-1/2qx^2$	0	$3Fx-7/2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(11/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/2Fx+1/2qx^2$	0	$5/2Fx-2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x^2/b + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-3/8 + 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 1/8 b) Fb 1/EJ = -1/4 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-5/8 + 5/4 x/b - 5/8 x^2/b^2) Fb 1/EJ dx = [-5/8 x + 5/8 x^2/b - 5/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-5/8 b + 5/8 b - 5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-5/8 x^2/b^2) Fb 1/EJ dx = [-5/24 x^3/b^2]_0^b Fb 1/EJ$$

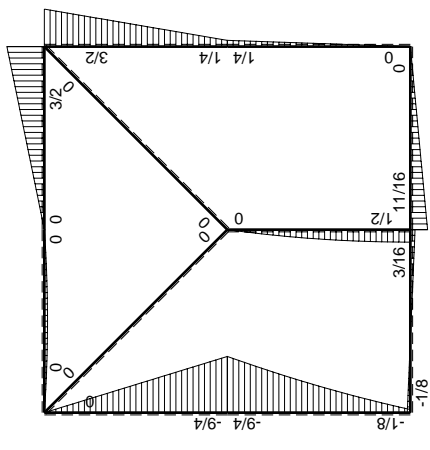
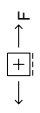
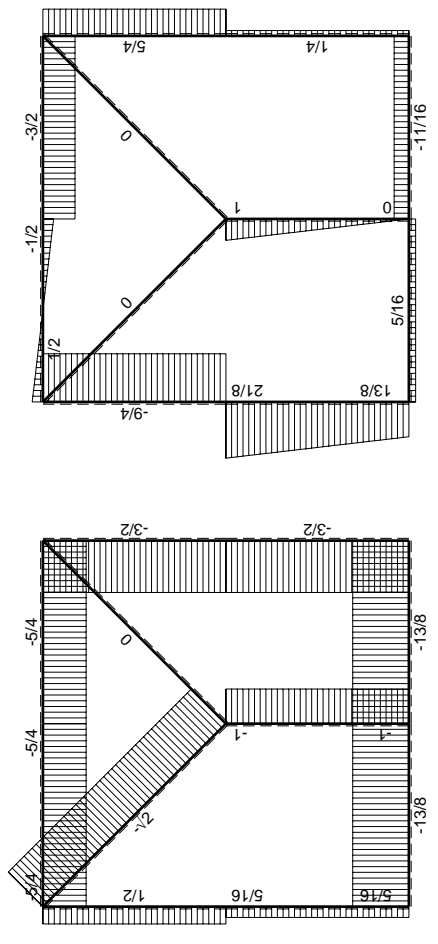
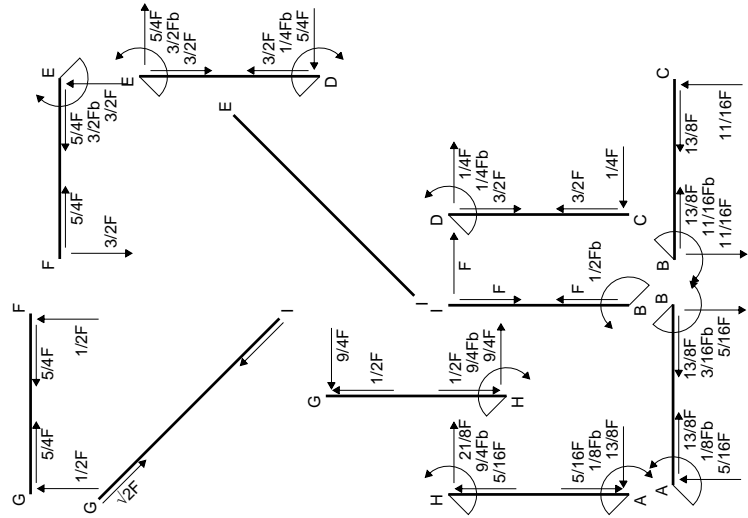
$$= (-5/24 b) Fb 1/EJ = -5/24 Fb^2/EJ$$

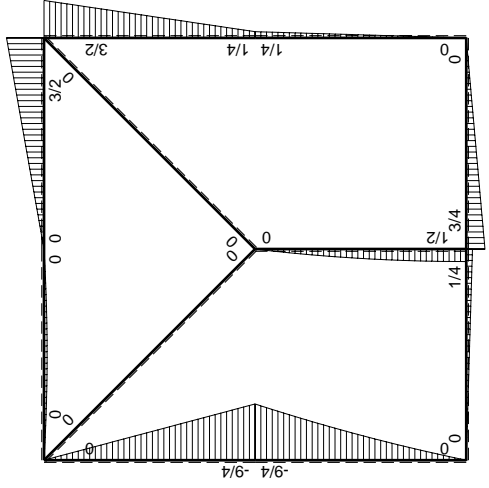
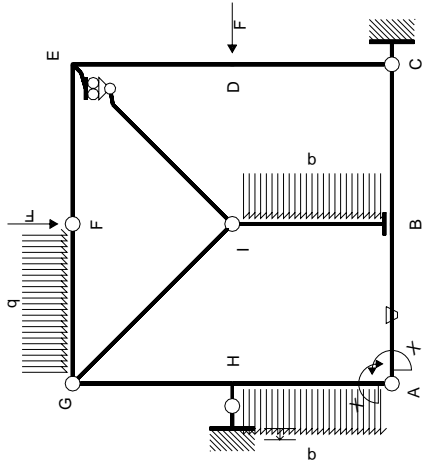
$$L_{HA}^{xo} = \int_0^b (3x/b - 7/2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/2 x^2/b - 7/6 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/2 b - 7/6 b + 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$

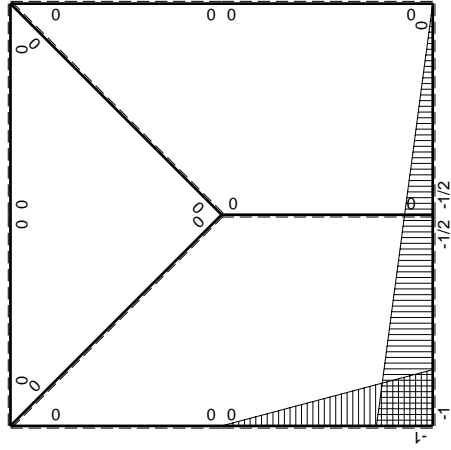
$$L_{AH}^{xo} = \int_0^b (5/2 x/b - 2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - 2/3 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - 2/3 b - 1/8 b) Fb 1/EJ = 11/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	$-Fb/EJ$	$-1/4Fx+1/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/12+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	Fb/EJ	$-1/8Fb+1/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

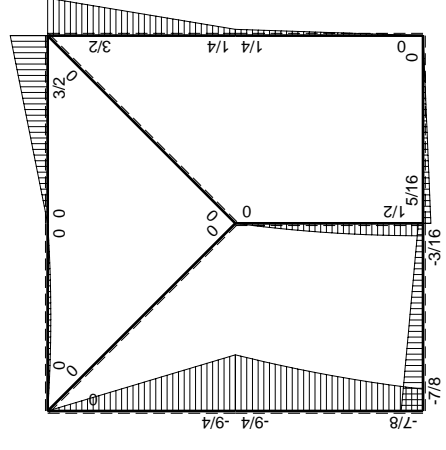
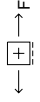
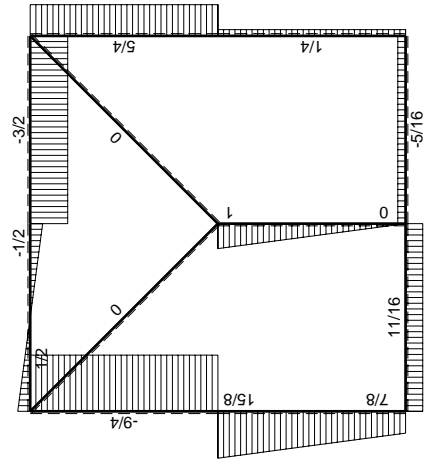
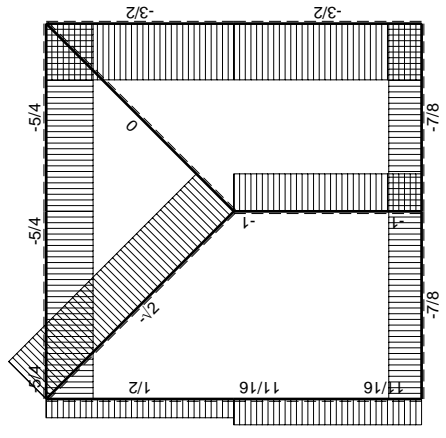
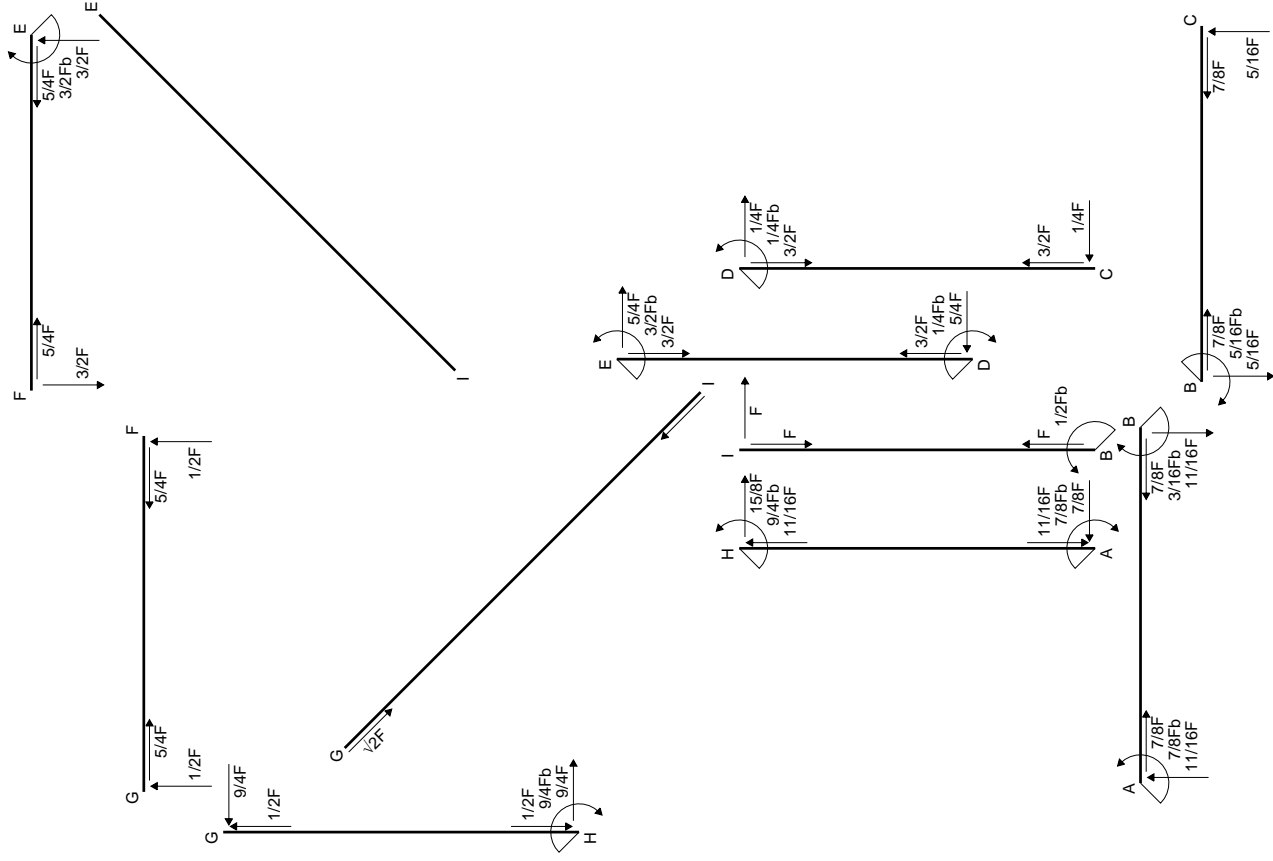
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

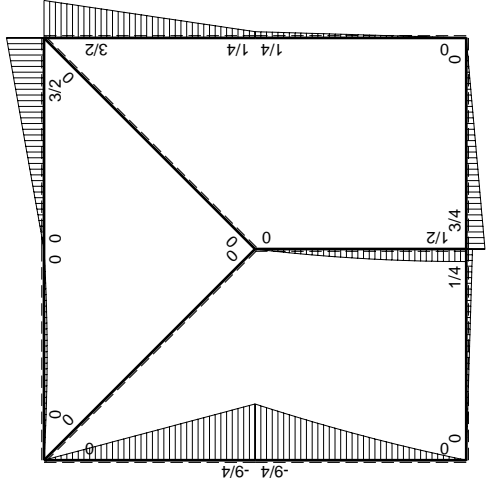
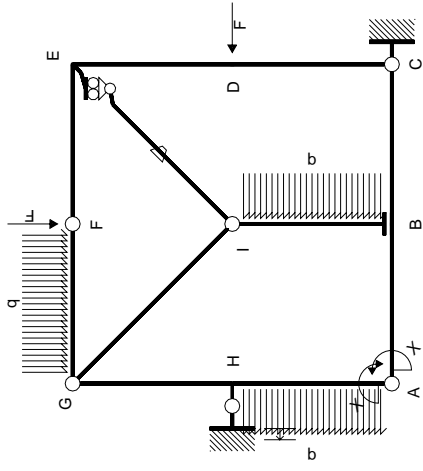
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

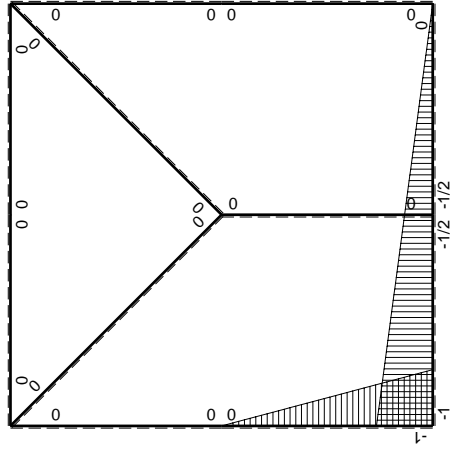
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

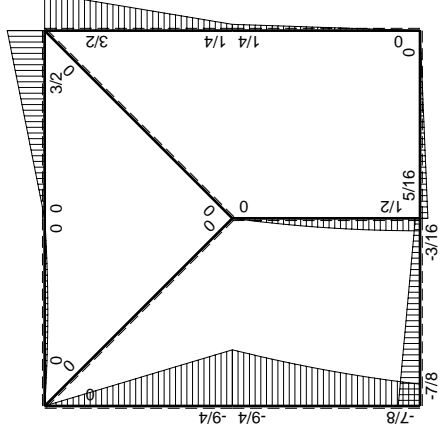
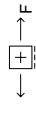
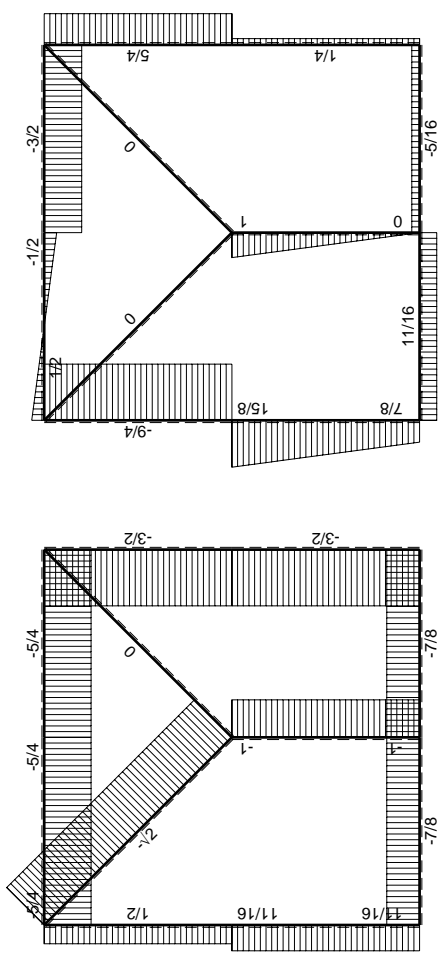
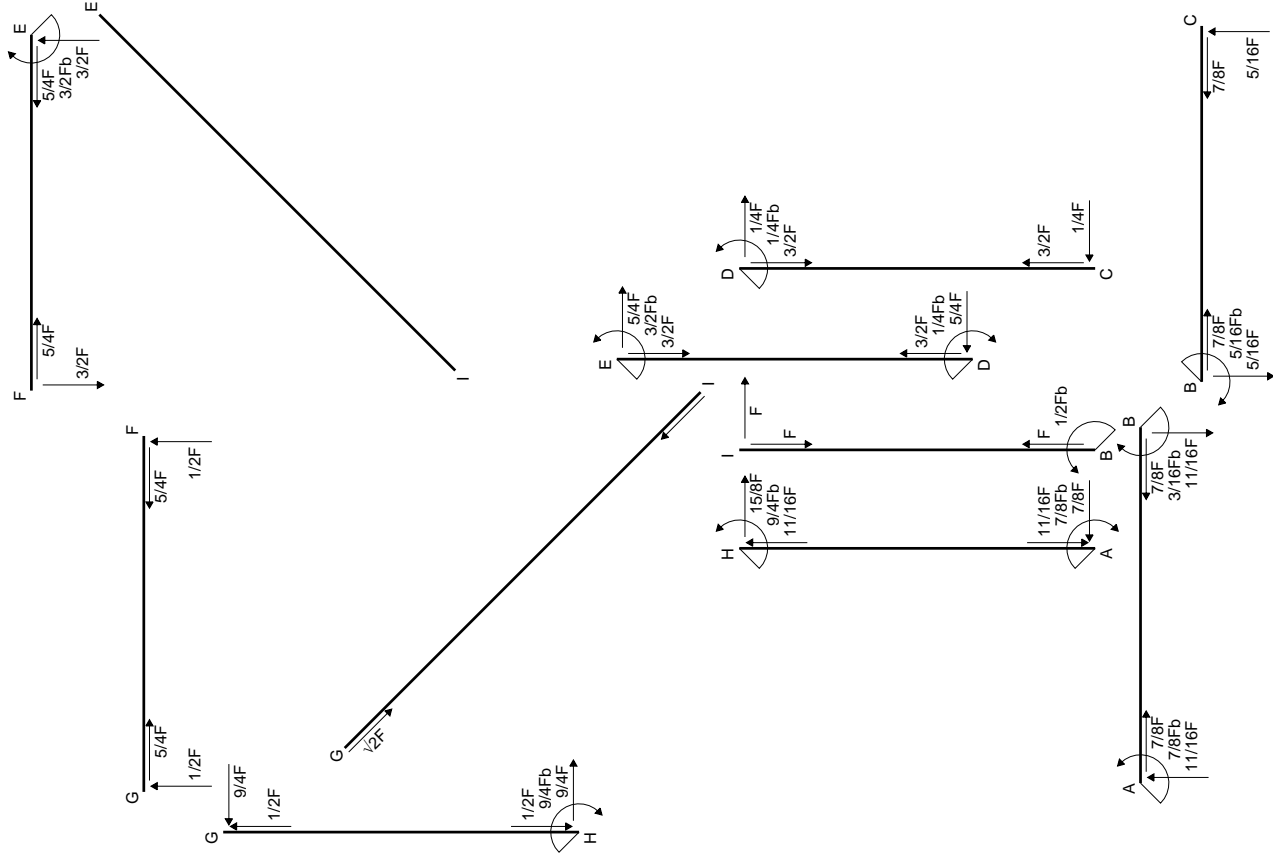
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

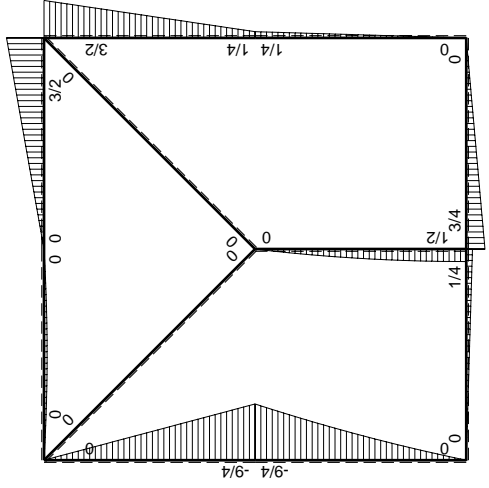
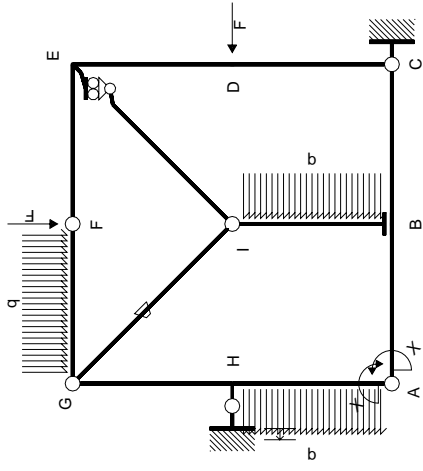
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

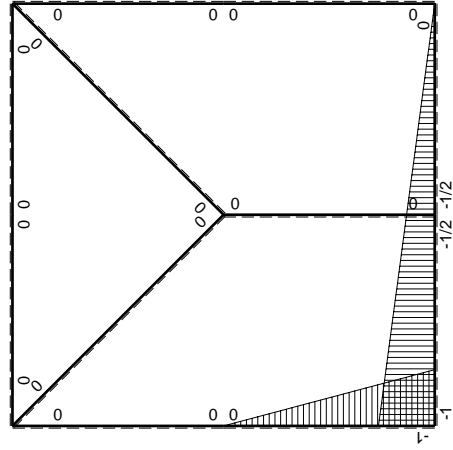
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

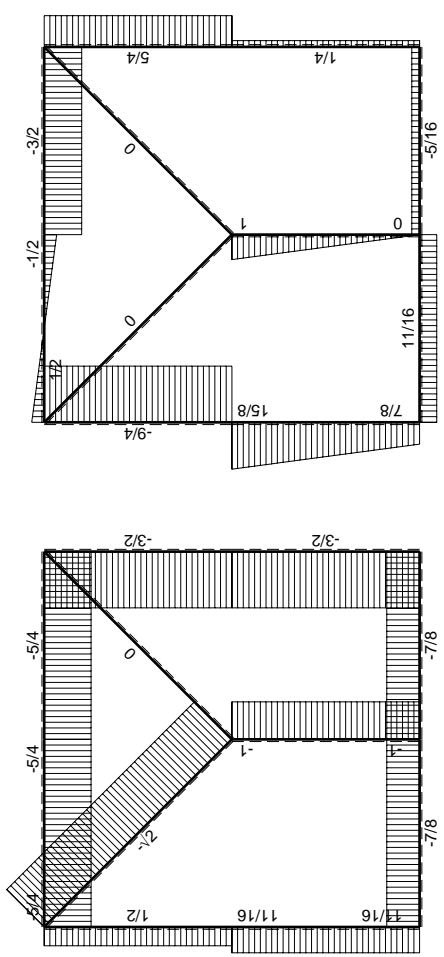
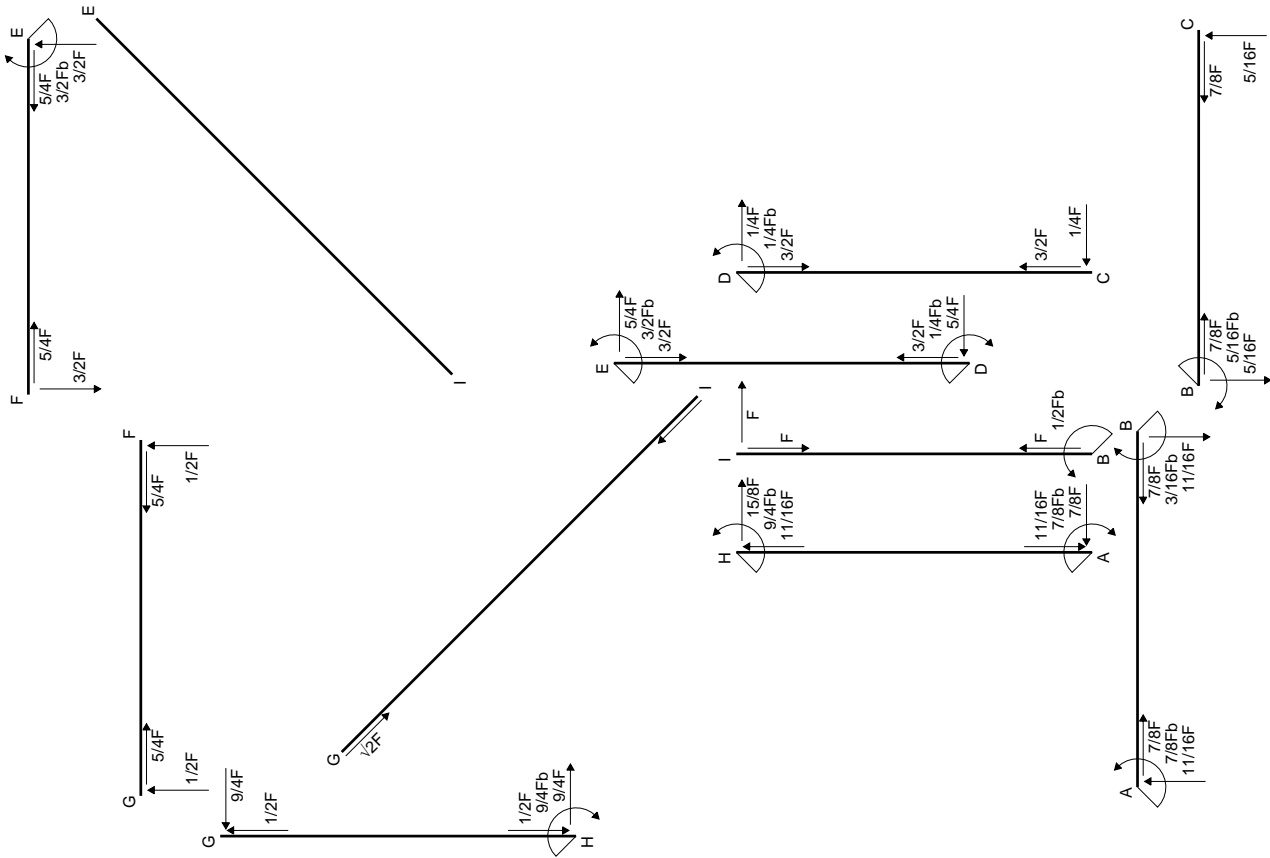
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

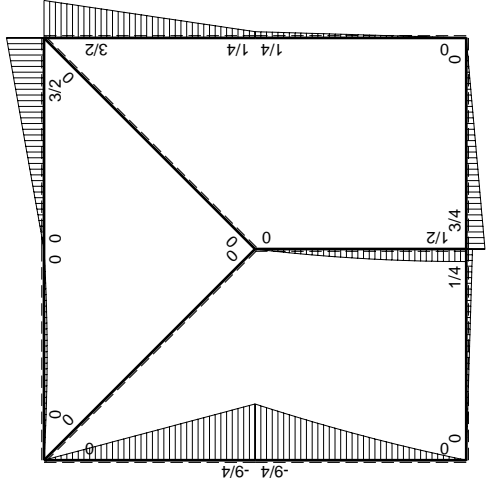
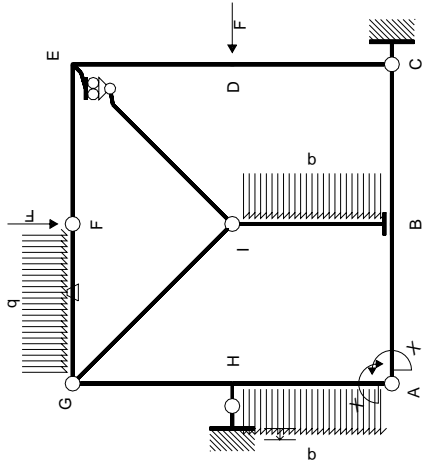
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

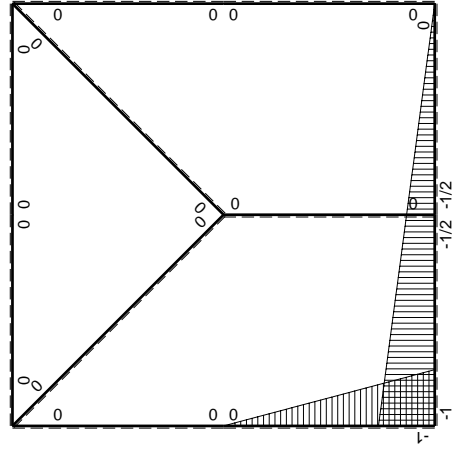
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	Fb/EJ	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

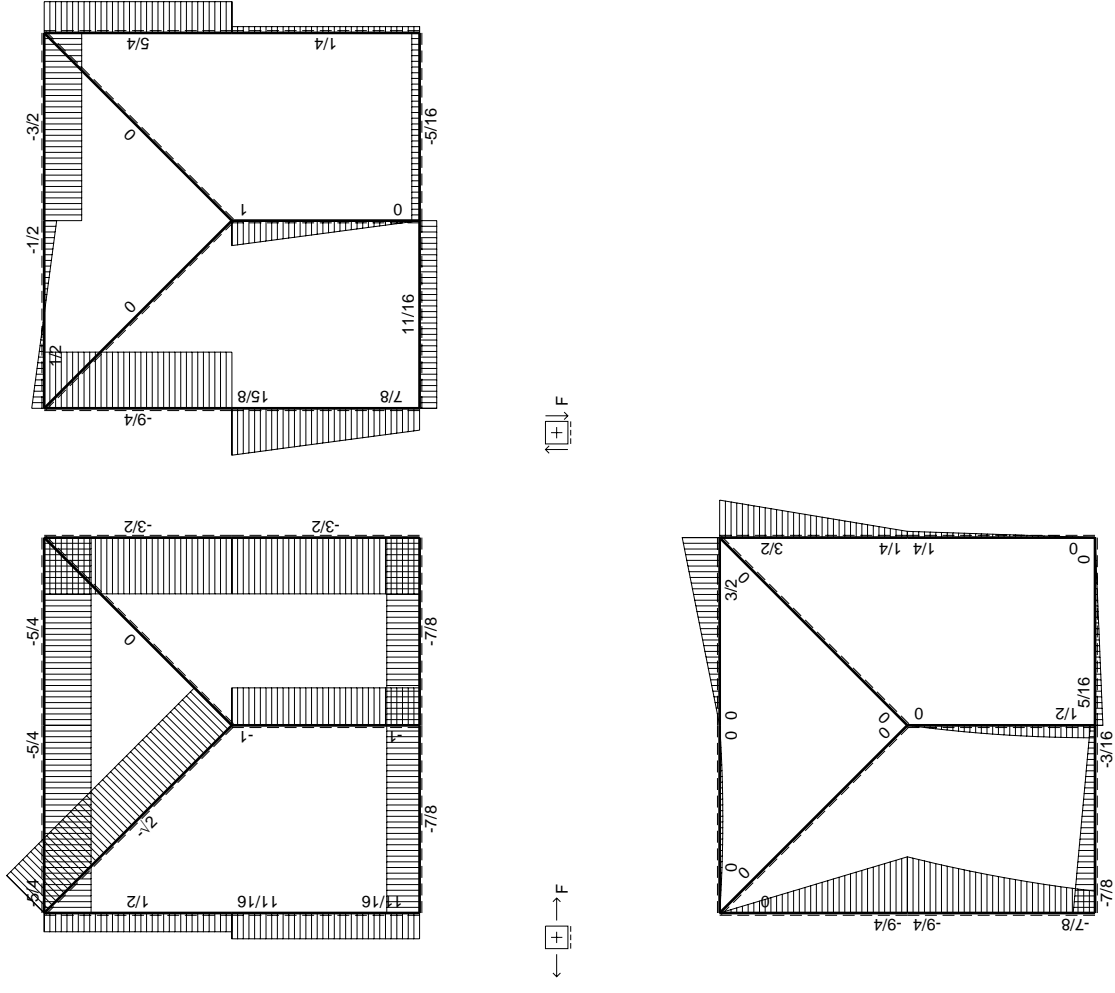
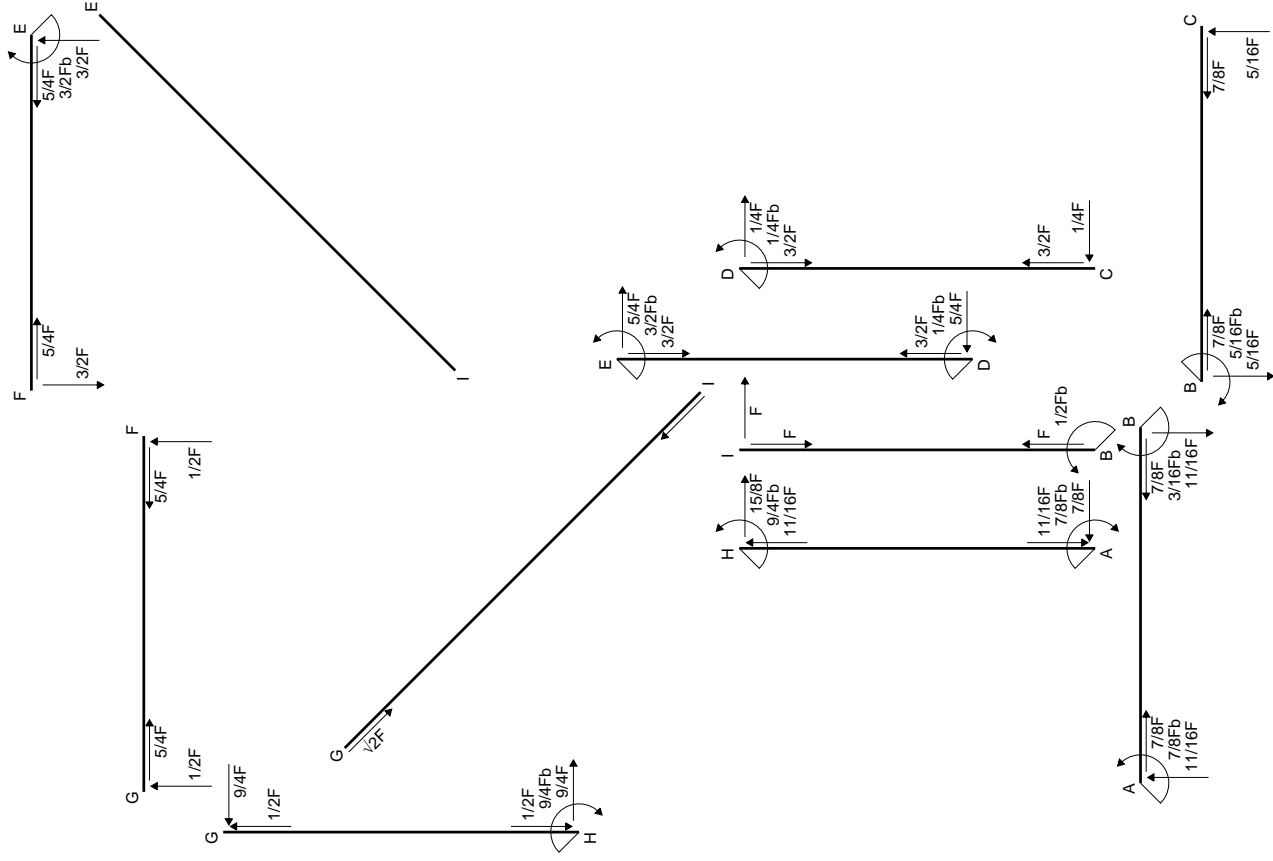
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

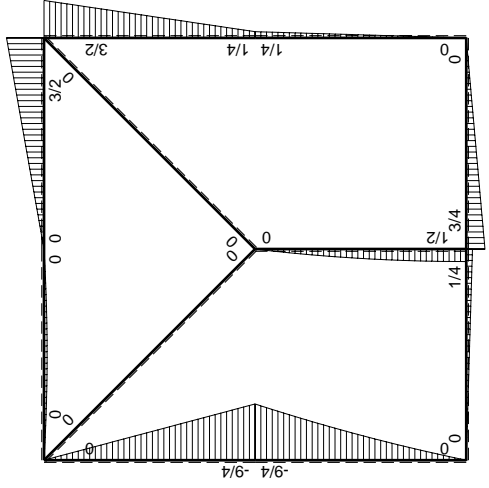
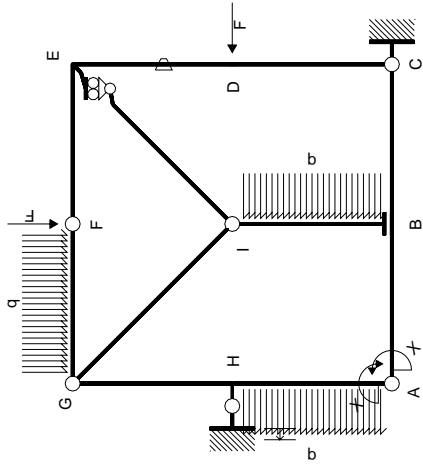
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

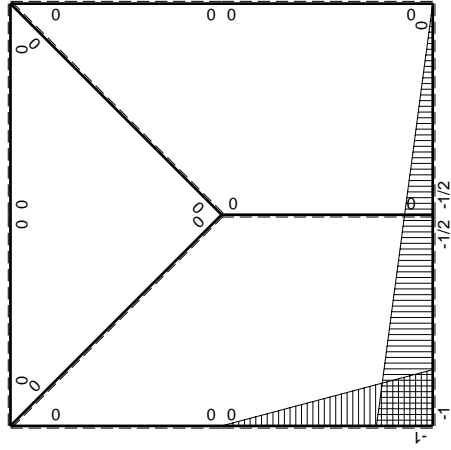
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

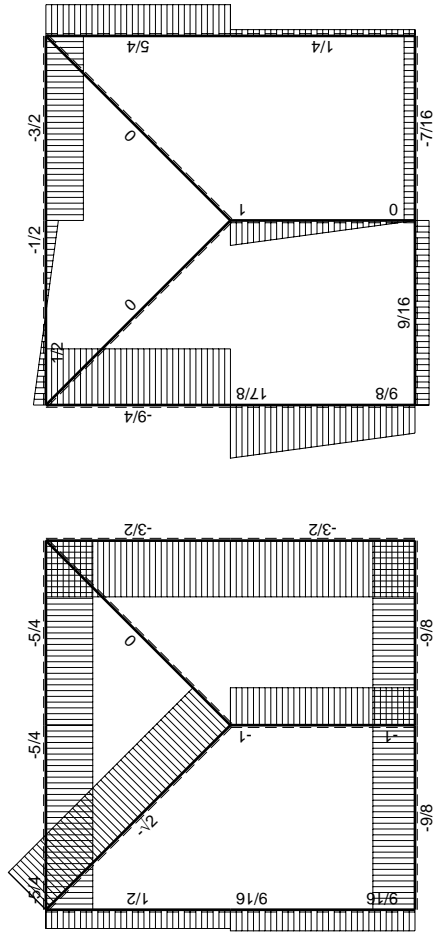
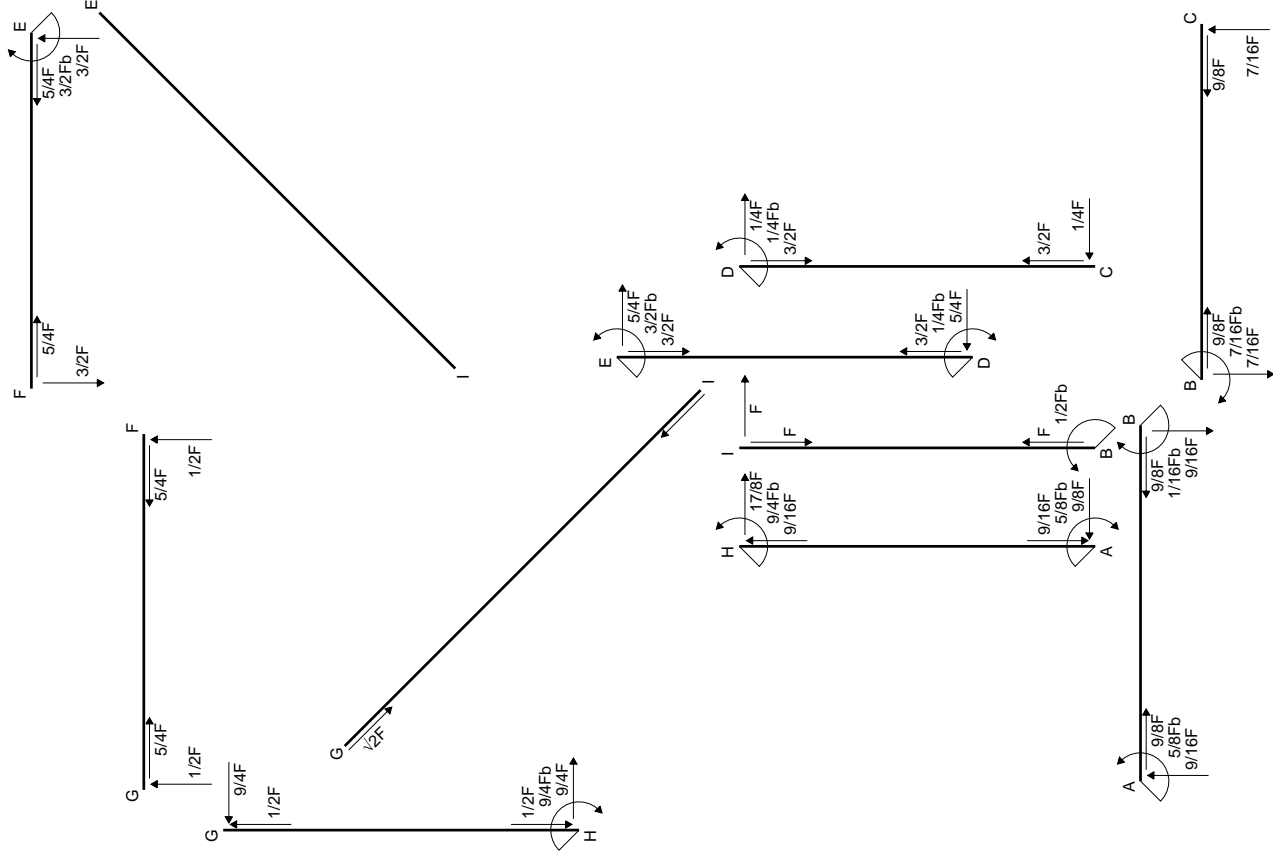
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

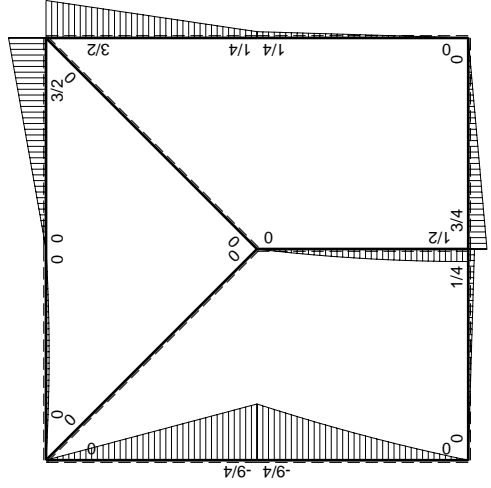
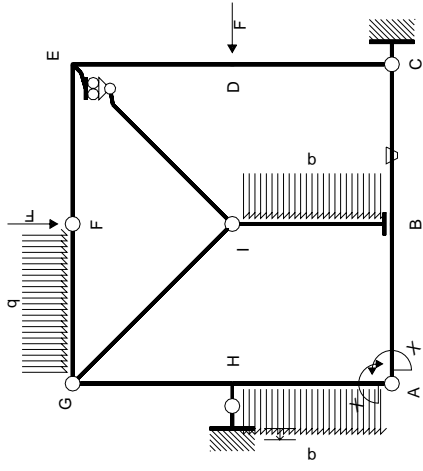
$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$



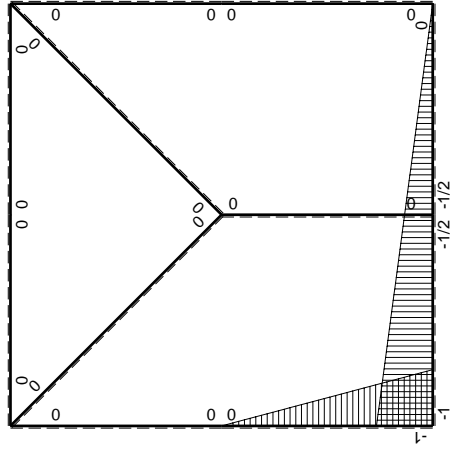
← ⊕ → F

↑ ⊕ ↓ F

← ⊕ → F_b



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	$-Fb/EJ$	$-3/8Fb+3/4Fx-3/8Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	Fb/EJ	$-3/8Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ + \left[1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/4 x^2/b \right]_0^b \theta$$

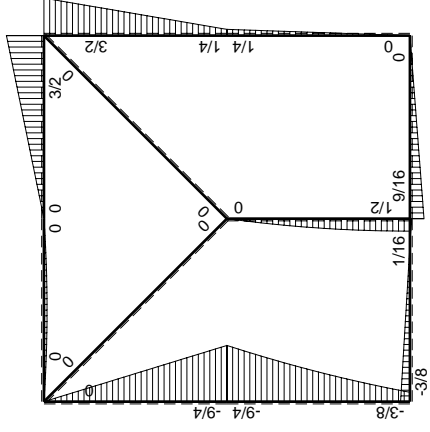
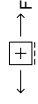
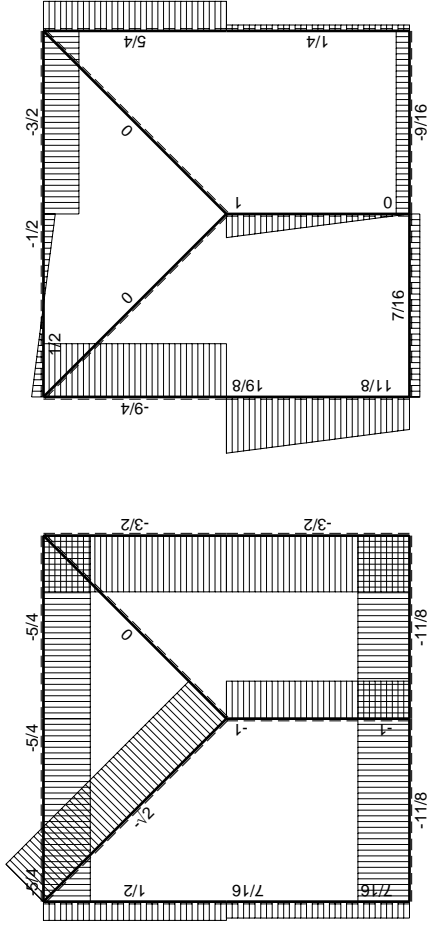
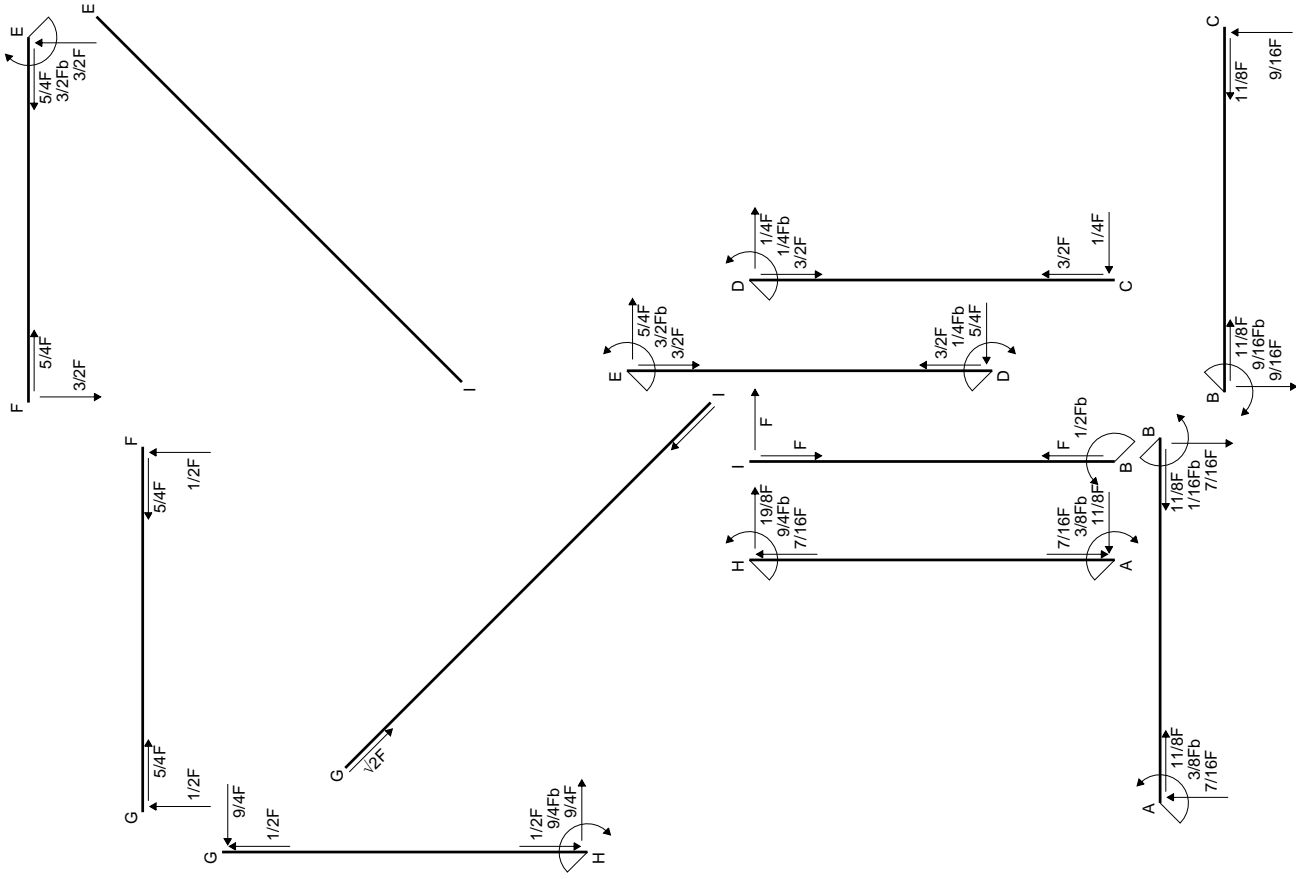
$$= (-1/8 b) Fb 1/EJ + (-1/4 b) \theta = 1/8 Fb^2/EJ$$

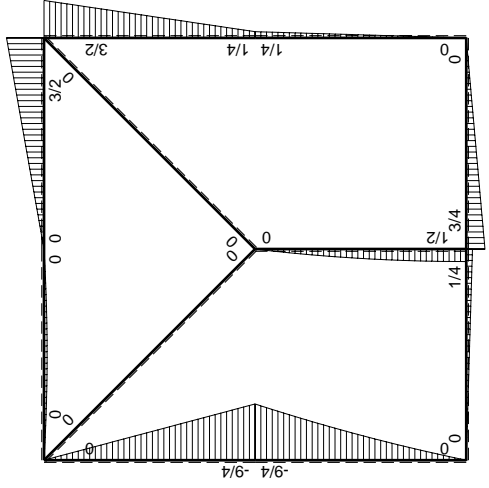
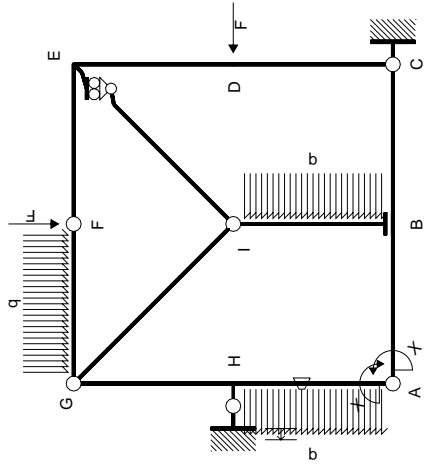
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

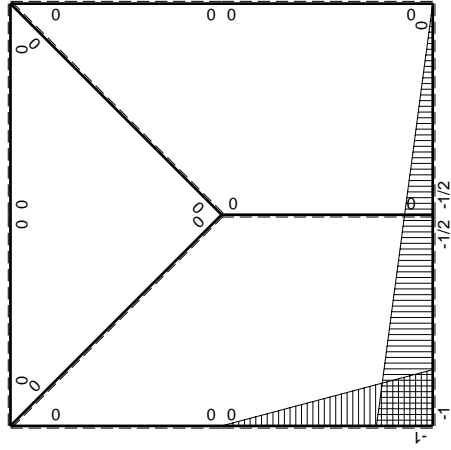
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	$-Fb/EJ$	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/3+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	Fb/EJ	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

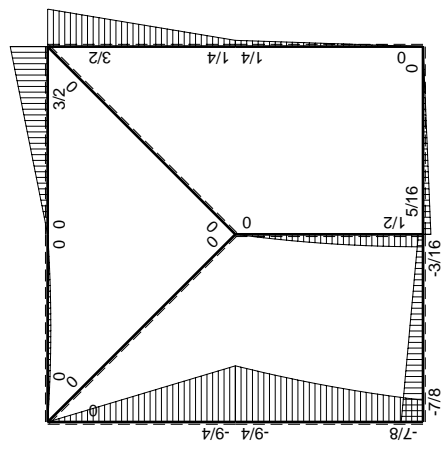
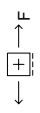
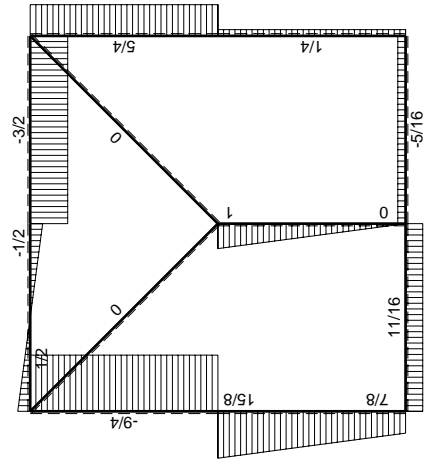
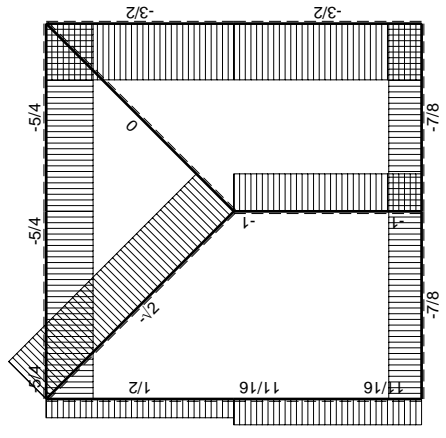
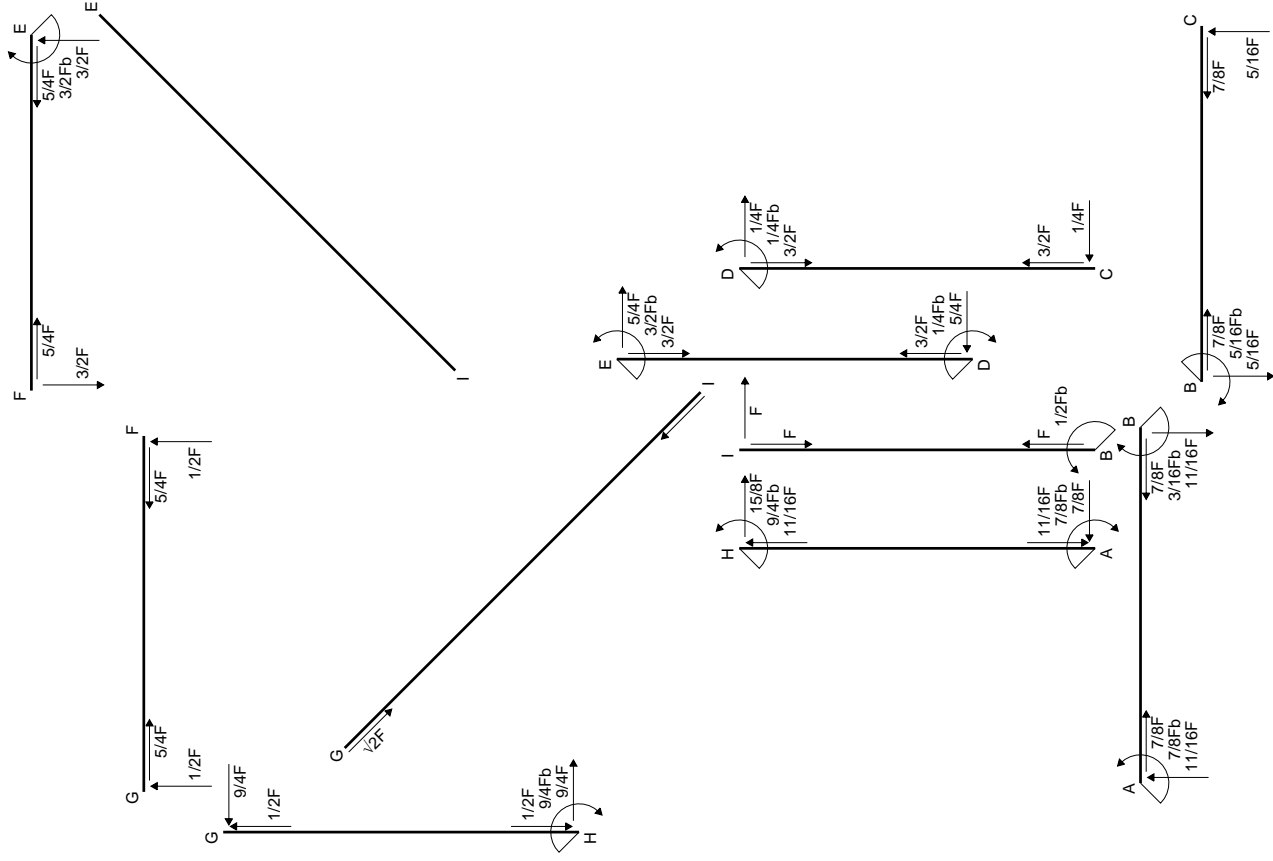
$$= \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 5/6 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

$$= \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 5/6 Fb^2/EJ$$



Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

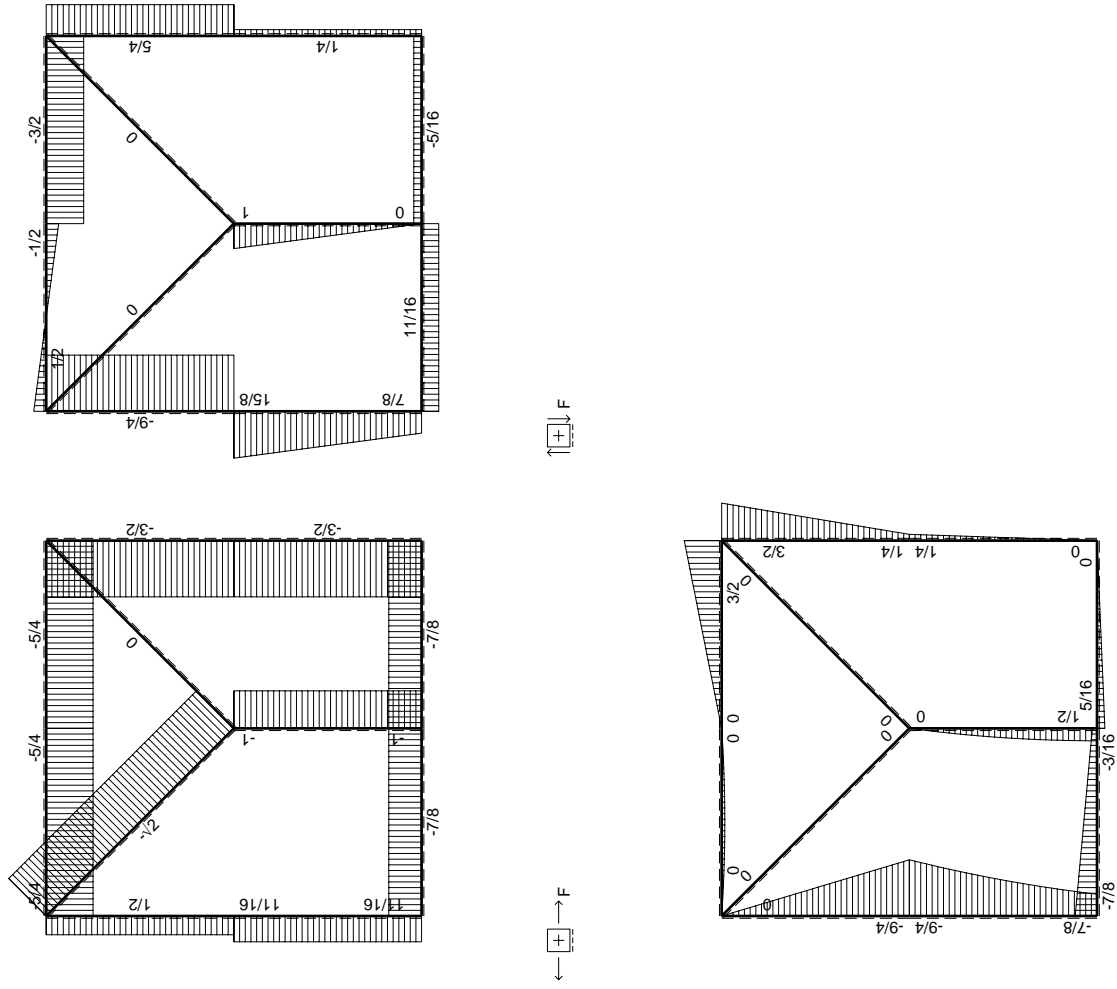
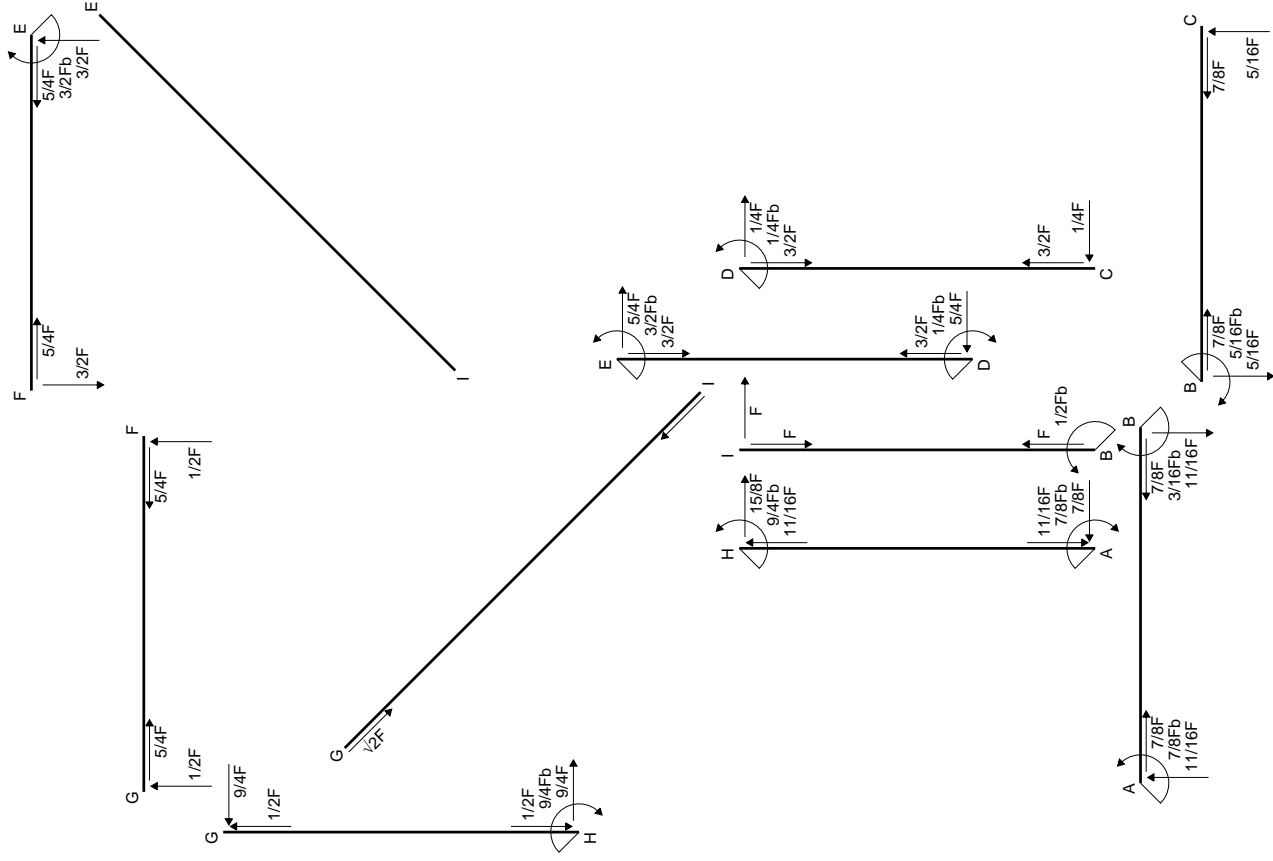
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$



Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

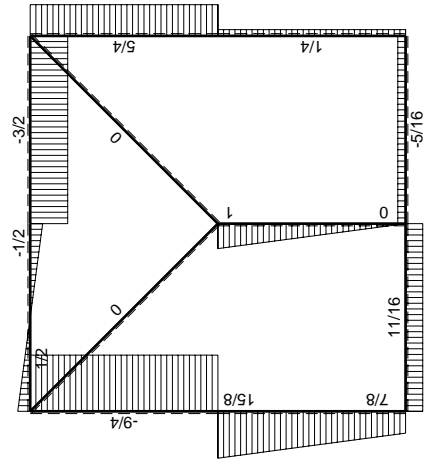
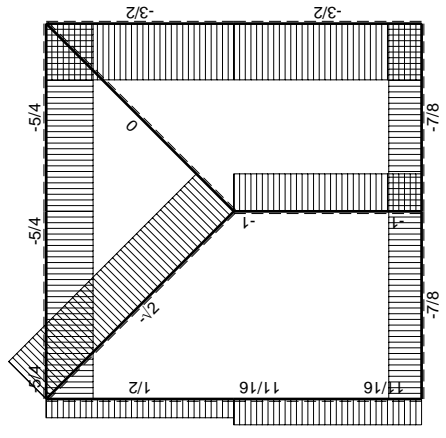
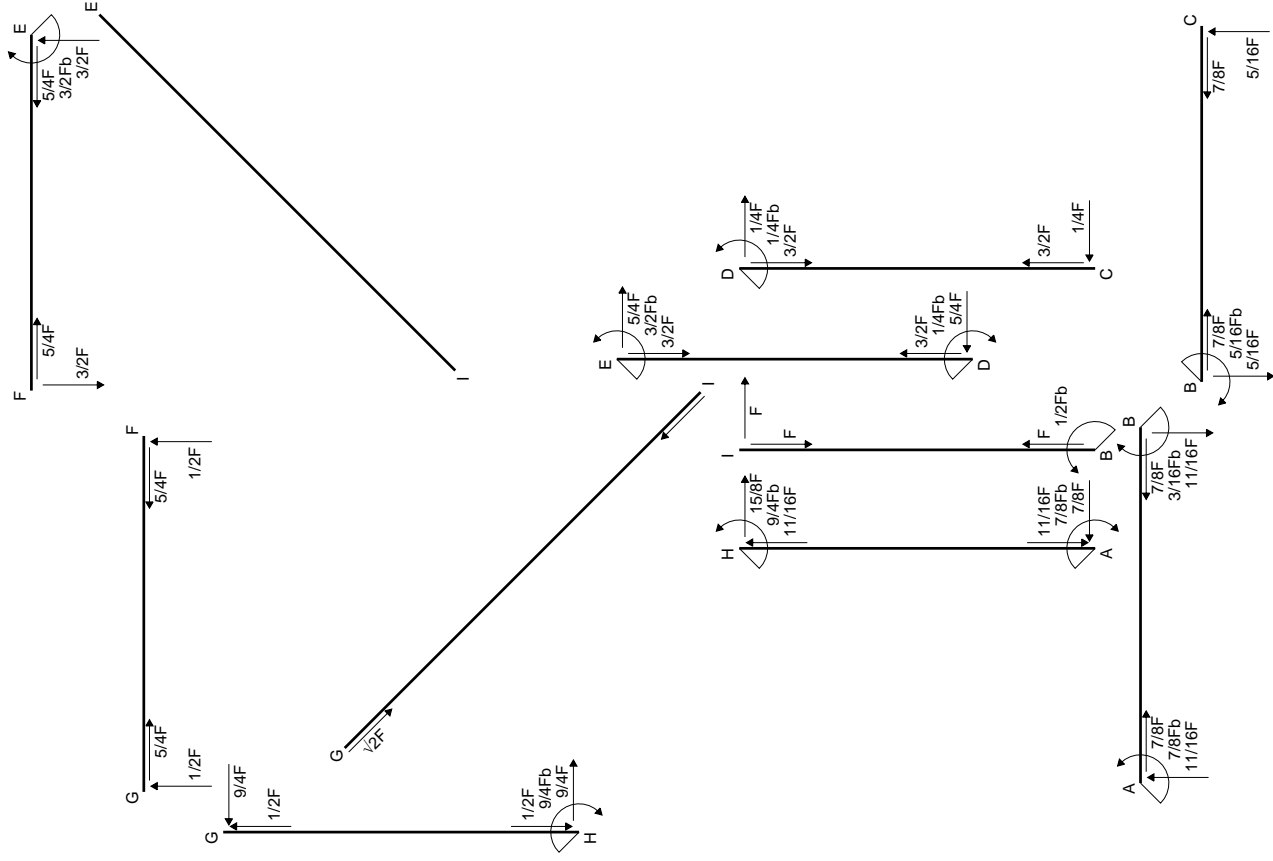
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

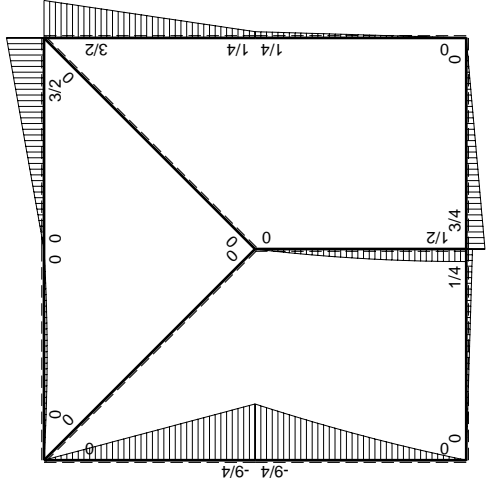
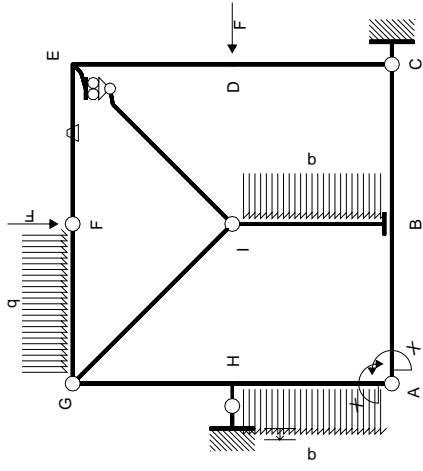
$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$



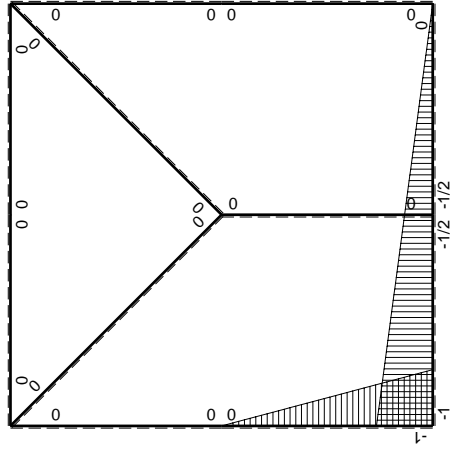
← ⊕ → F

↑ ⊕ ↓ F

⊕ ⊖ F_b



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	Fb/EJ	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

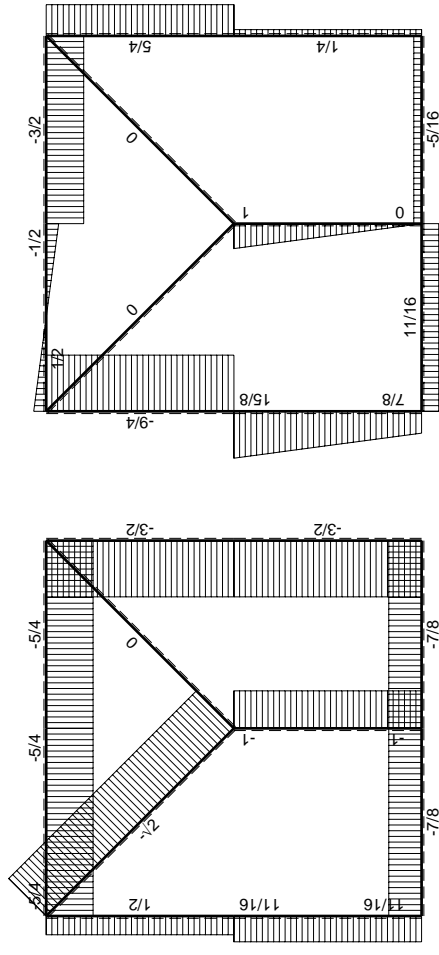
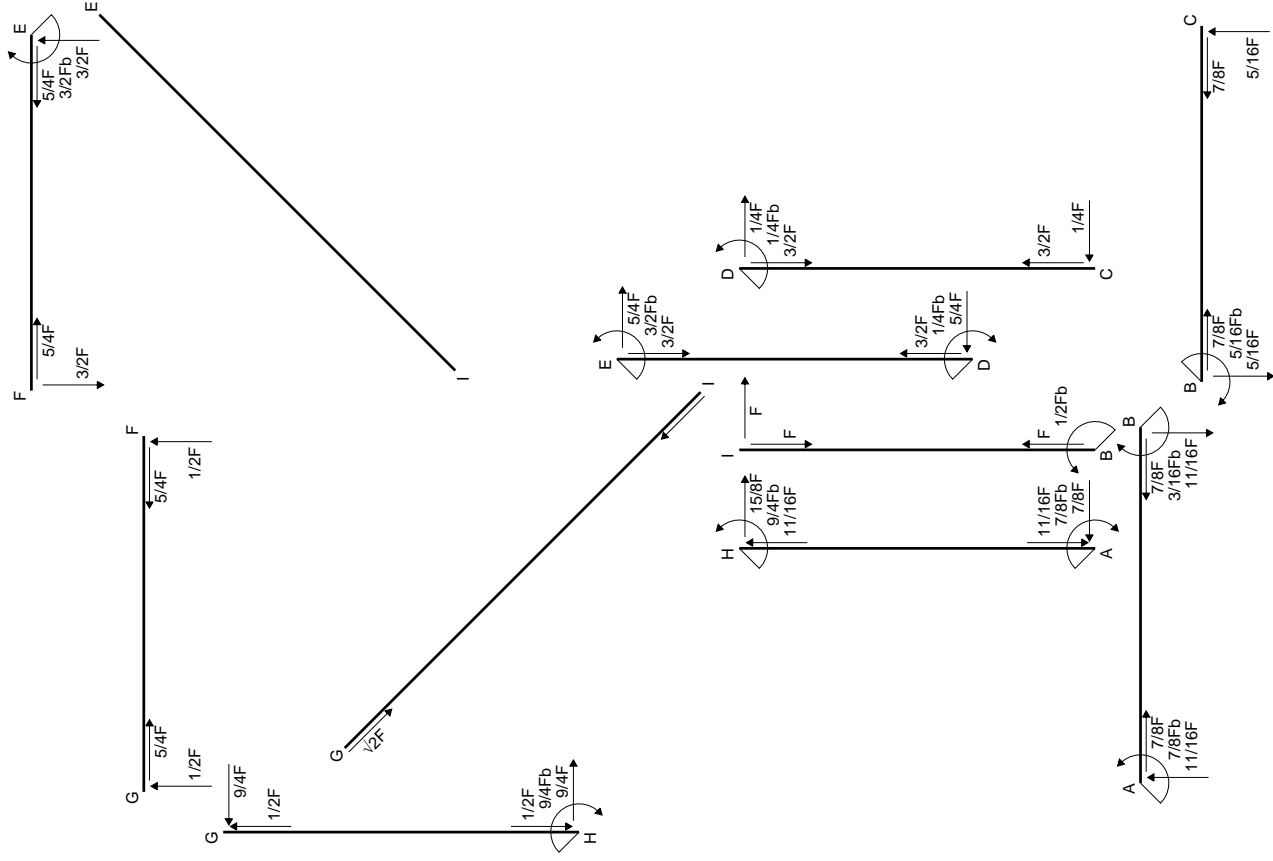
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

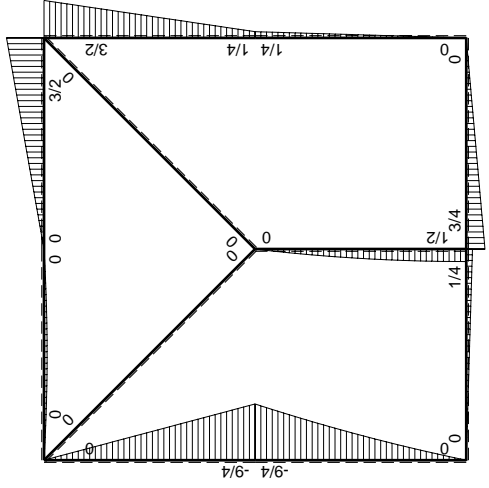
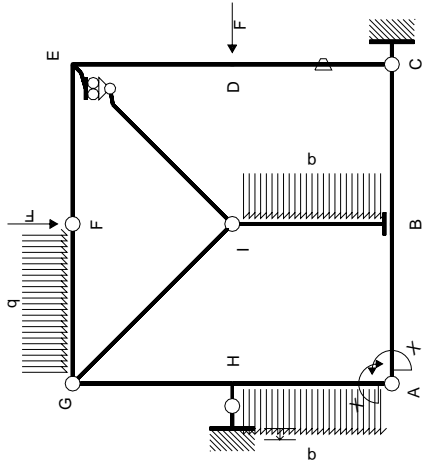
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

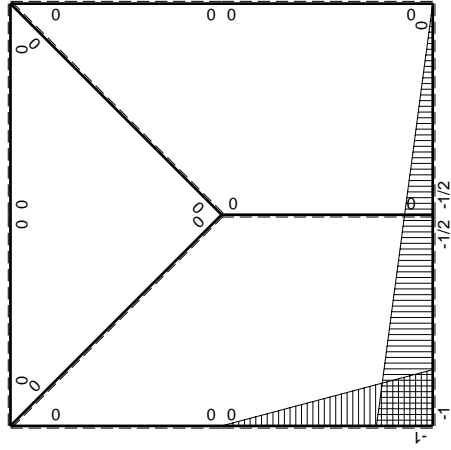


$\left[\begin{array}{c} + \\ - \end{array} \right] \rightarrow F$

$\left[\begin{array}{c} + \\ - \end{array} \right] Fb$



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	Fb/EJ	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

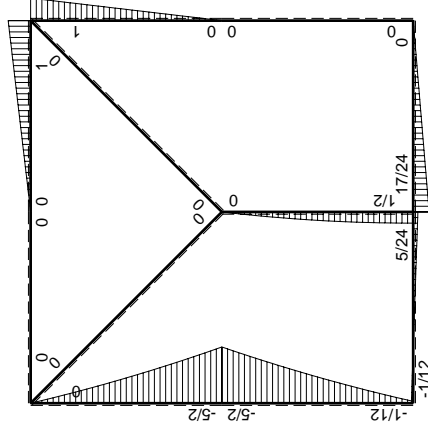
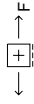
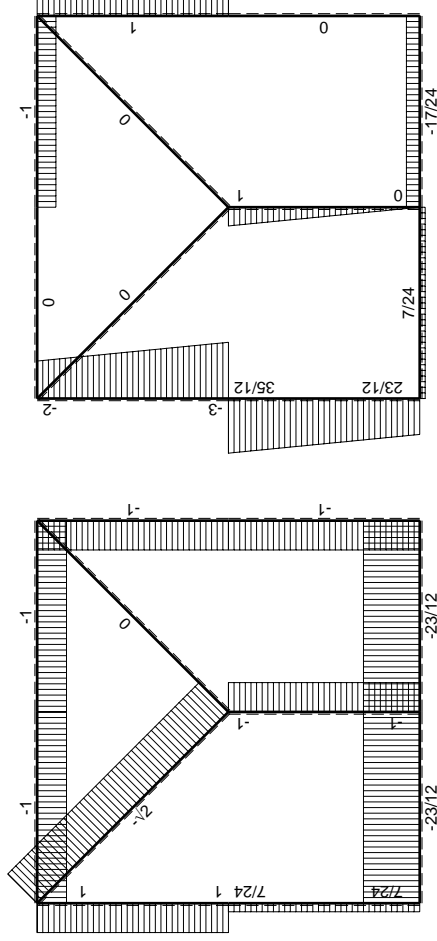
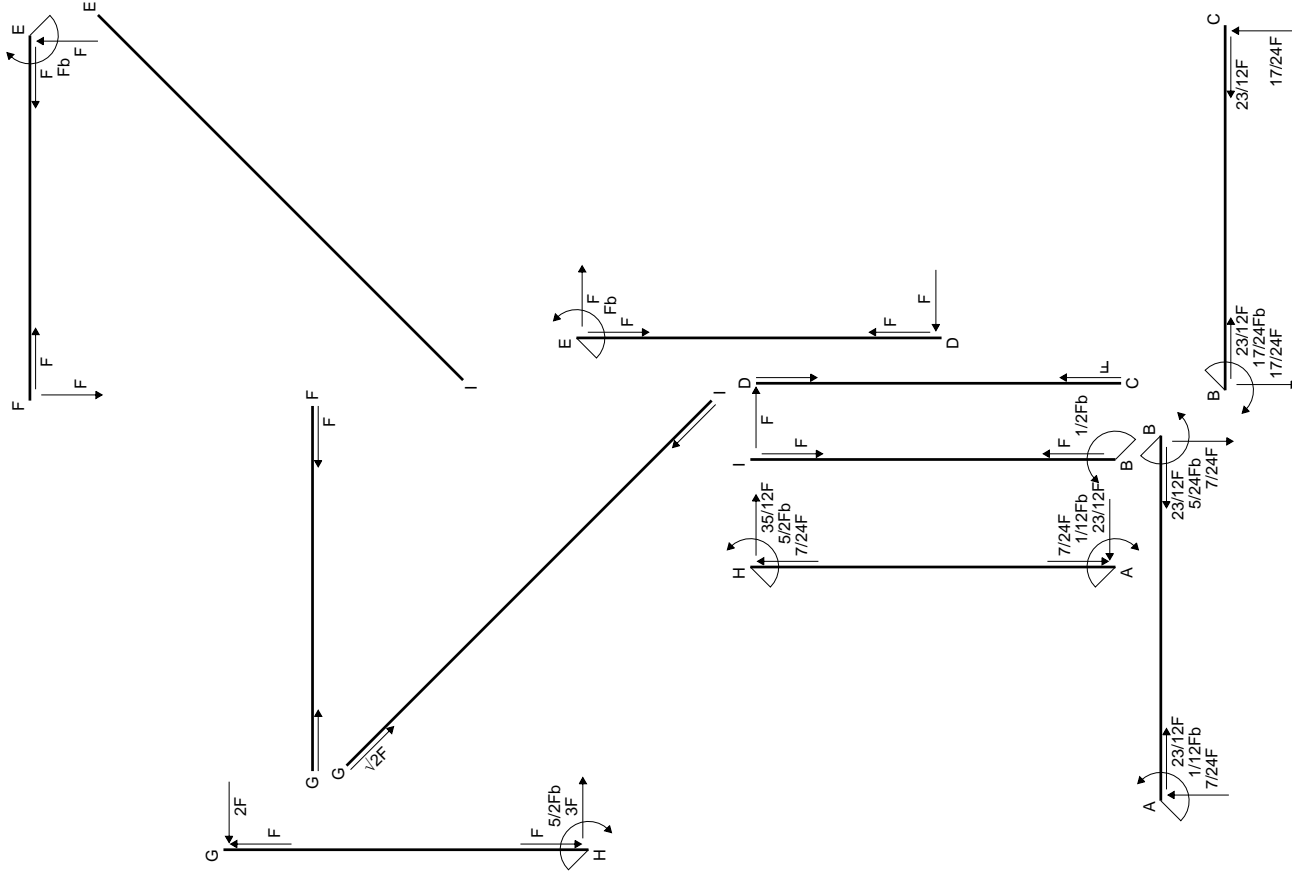
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

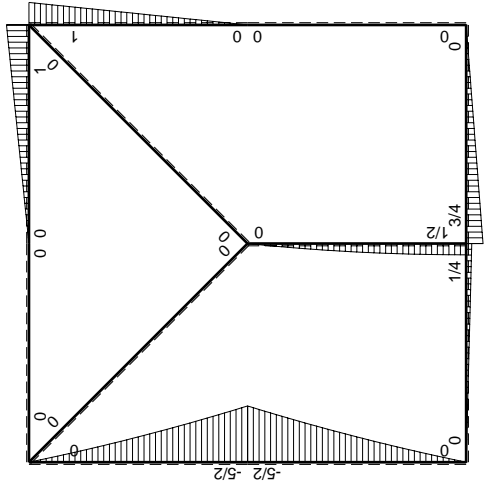
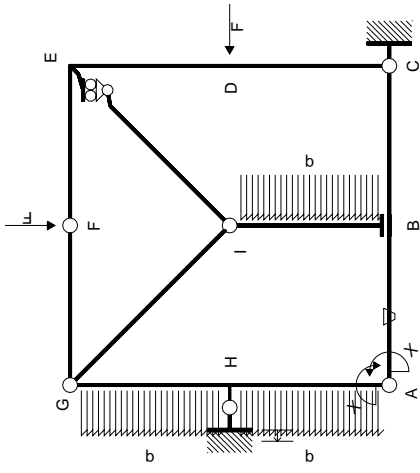
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

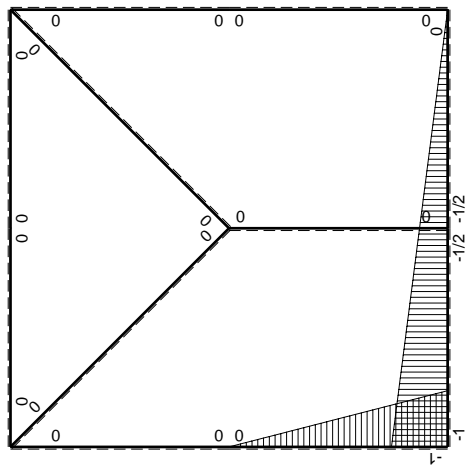
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	$-Fb/EJ$	$-1/4Fx+1/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/12+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	Fb/EJ	$-1/8Fb+1/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

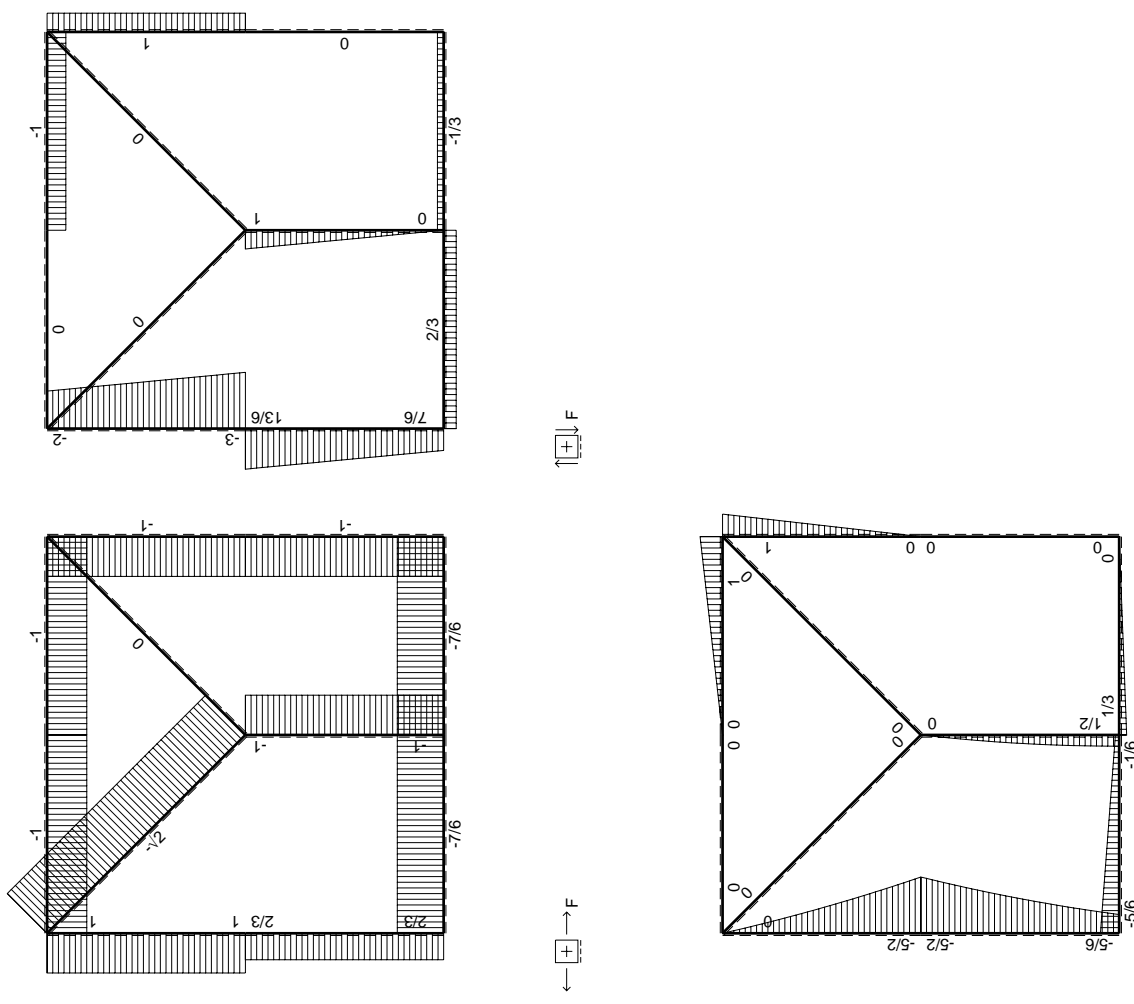
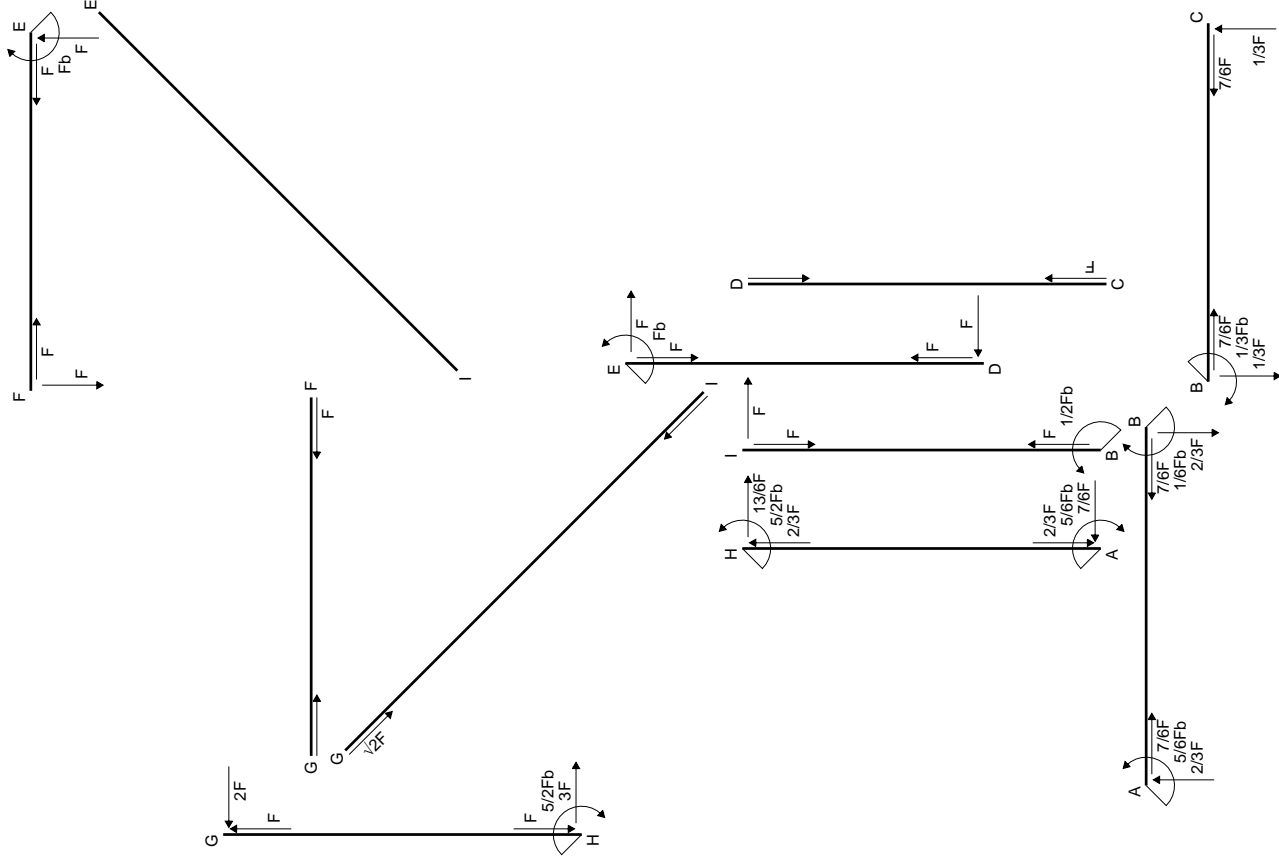
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

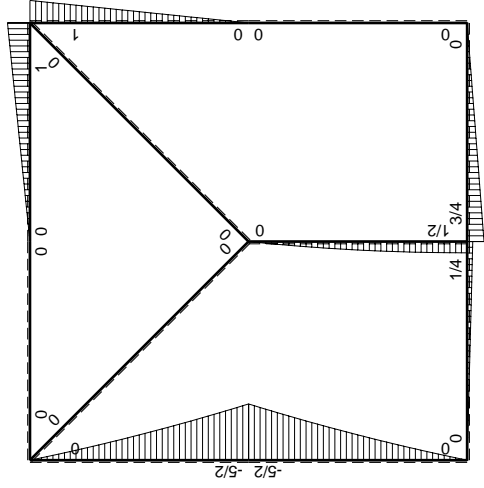
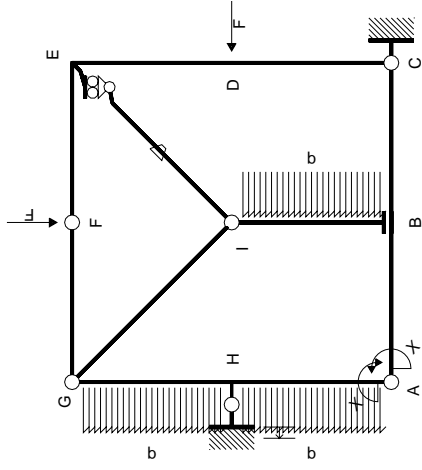
$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

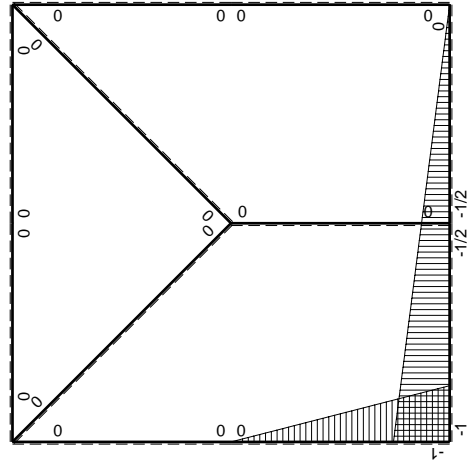
$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$



$\left[\begin{array}{c} + \\ - \end{array} \right] F_b$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

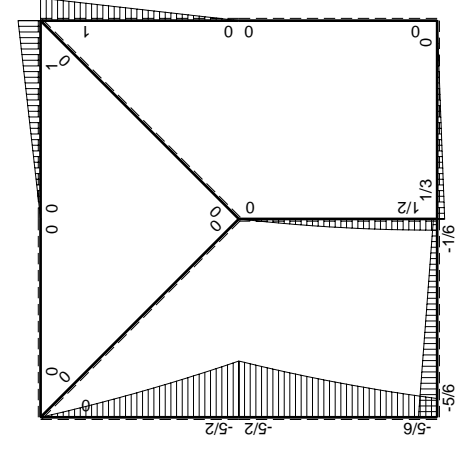
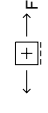
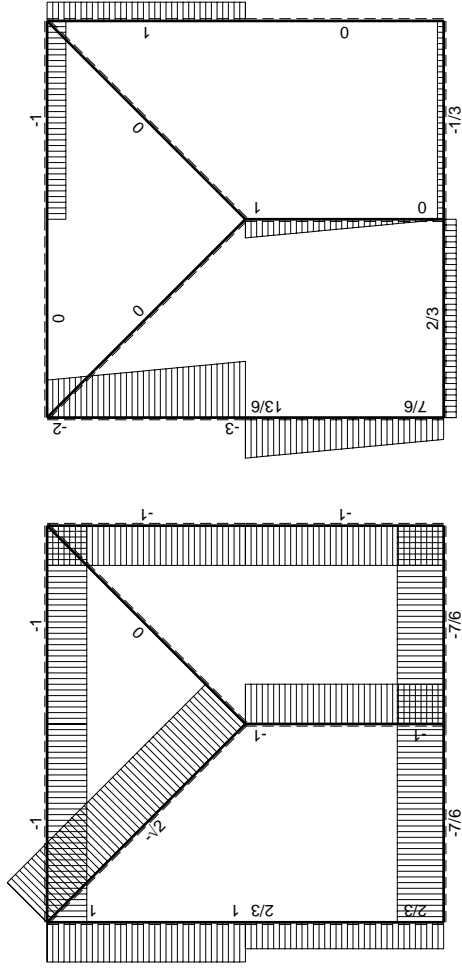
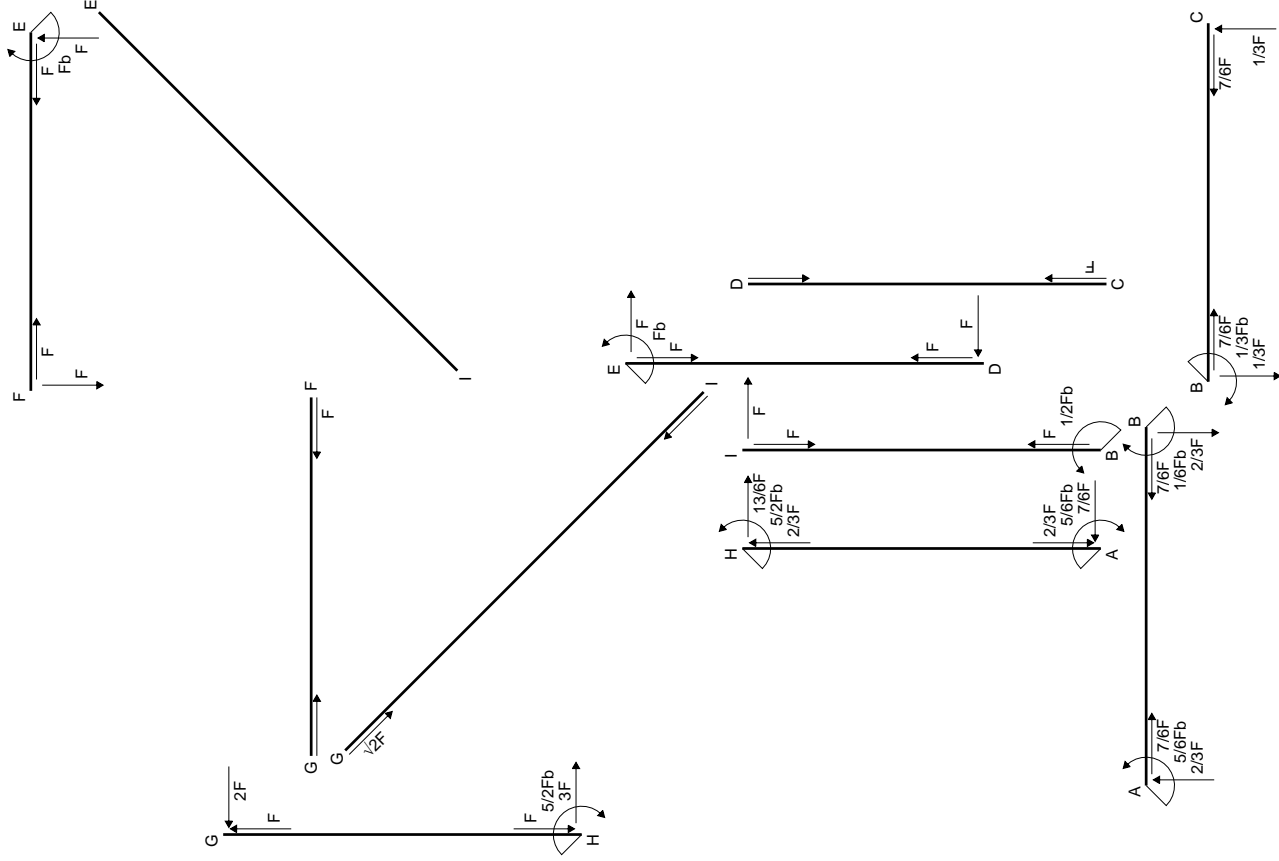
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

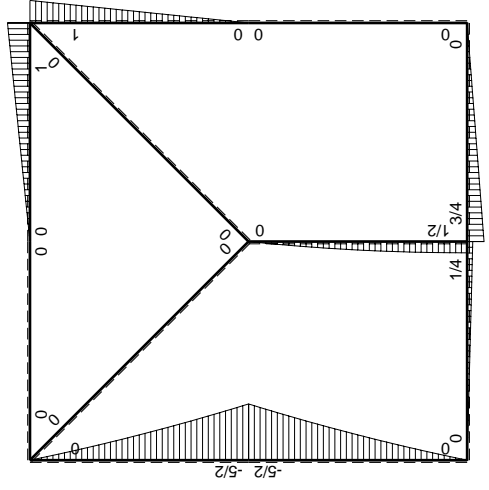
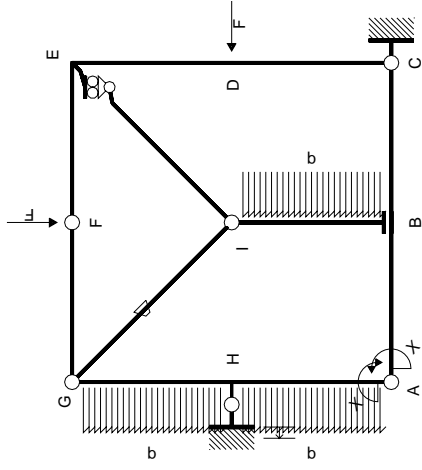
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

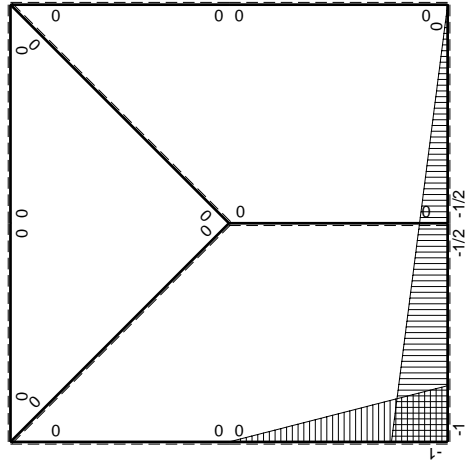
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

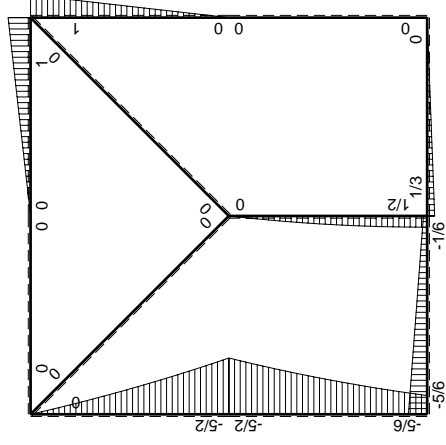
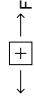
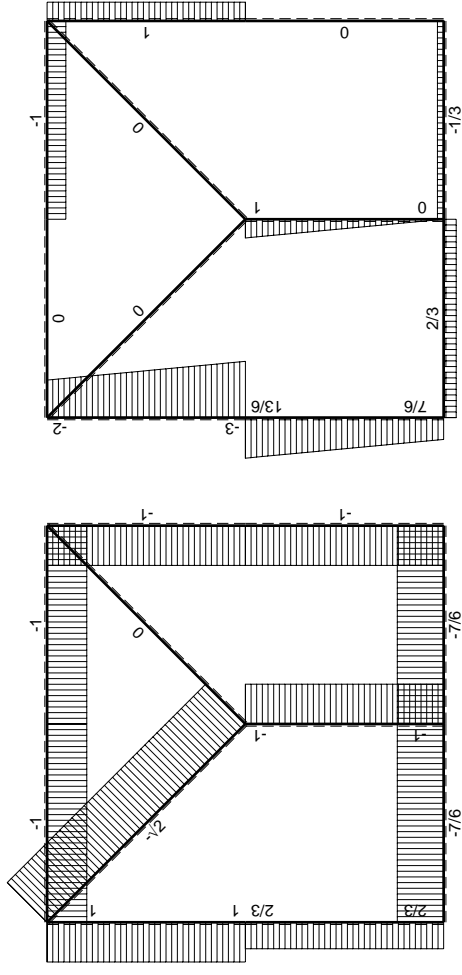
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

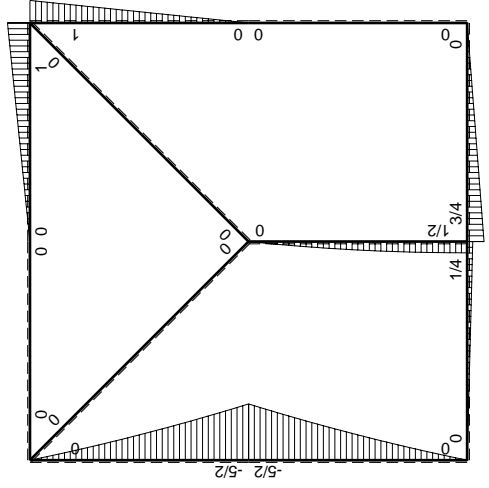
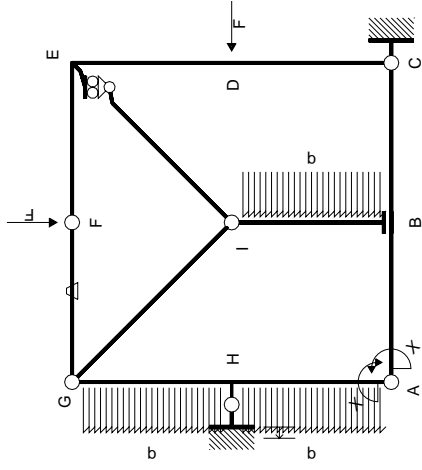
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

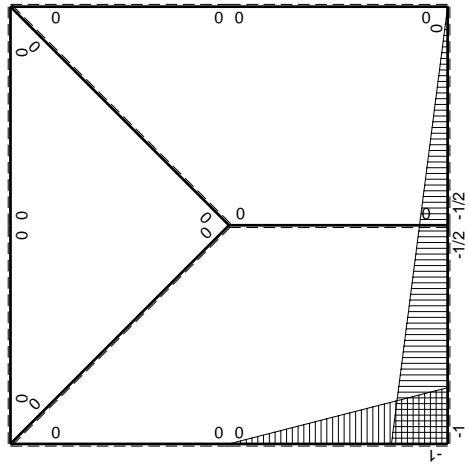
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	-Fb/EJ	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

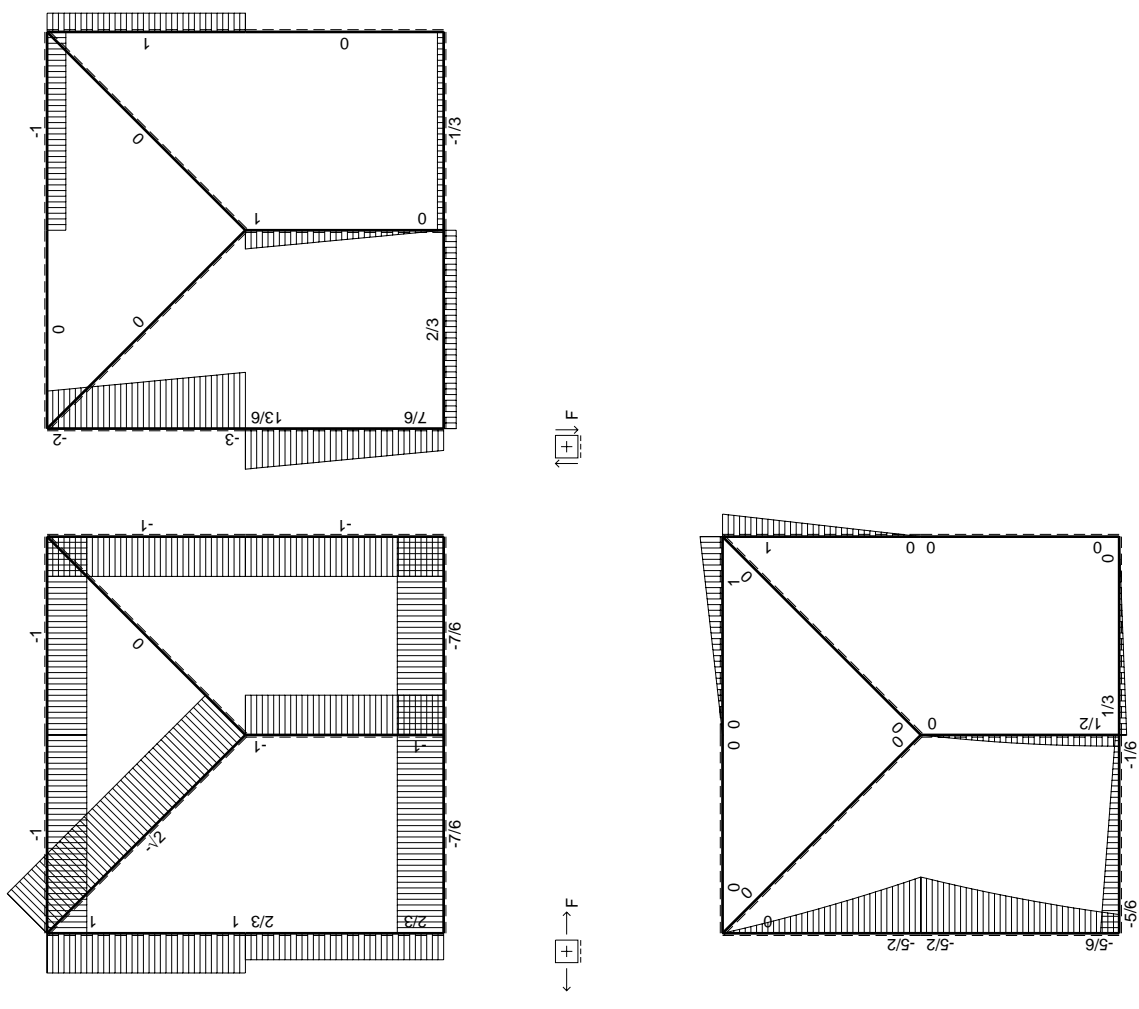
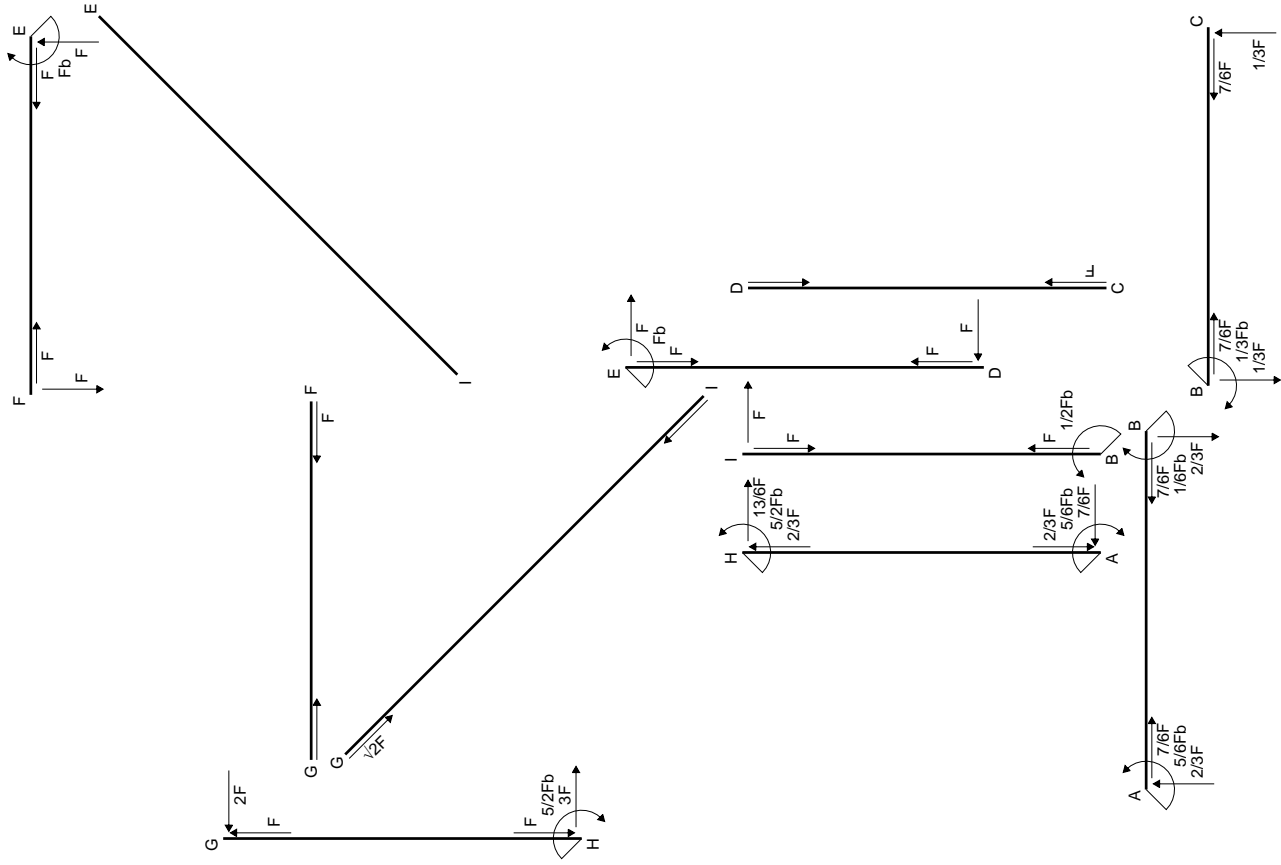
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

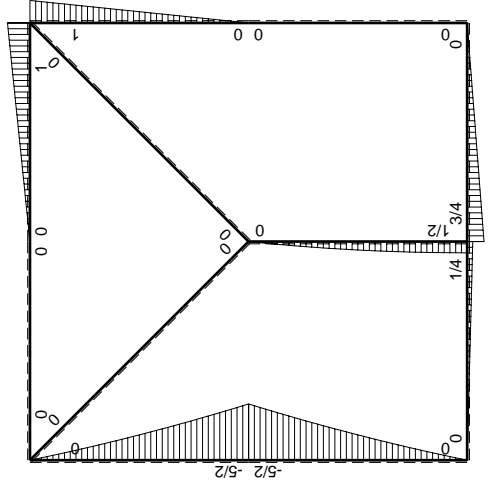
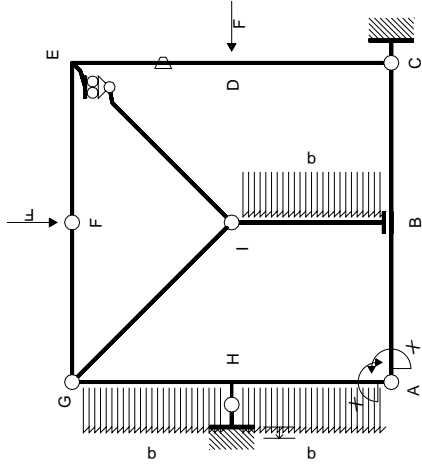
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

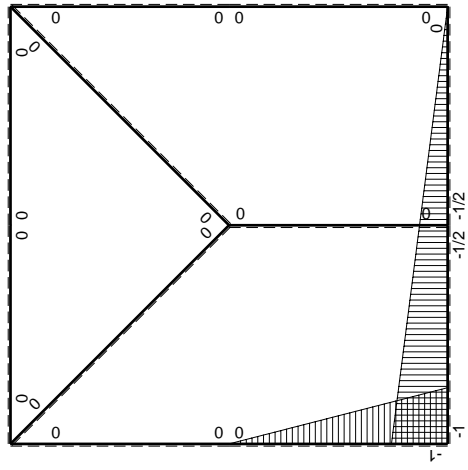
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	Fb/EJ	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0			
FE b	0	$-Fx$	0	0	0	0	0+0	0	
FG b	0	0	0	0	0	0			
GF b	0	0	0	0	0	0	0+0	0	
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

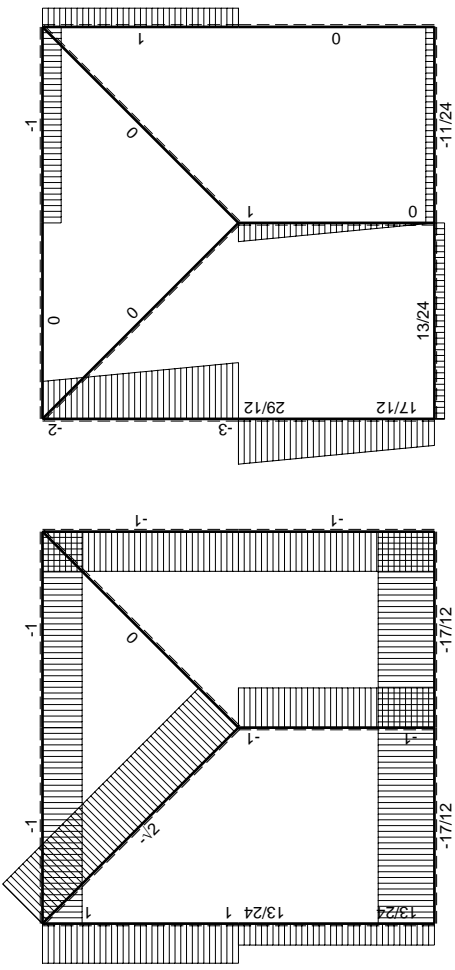
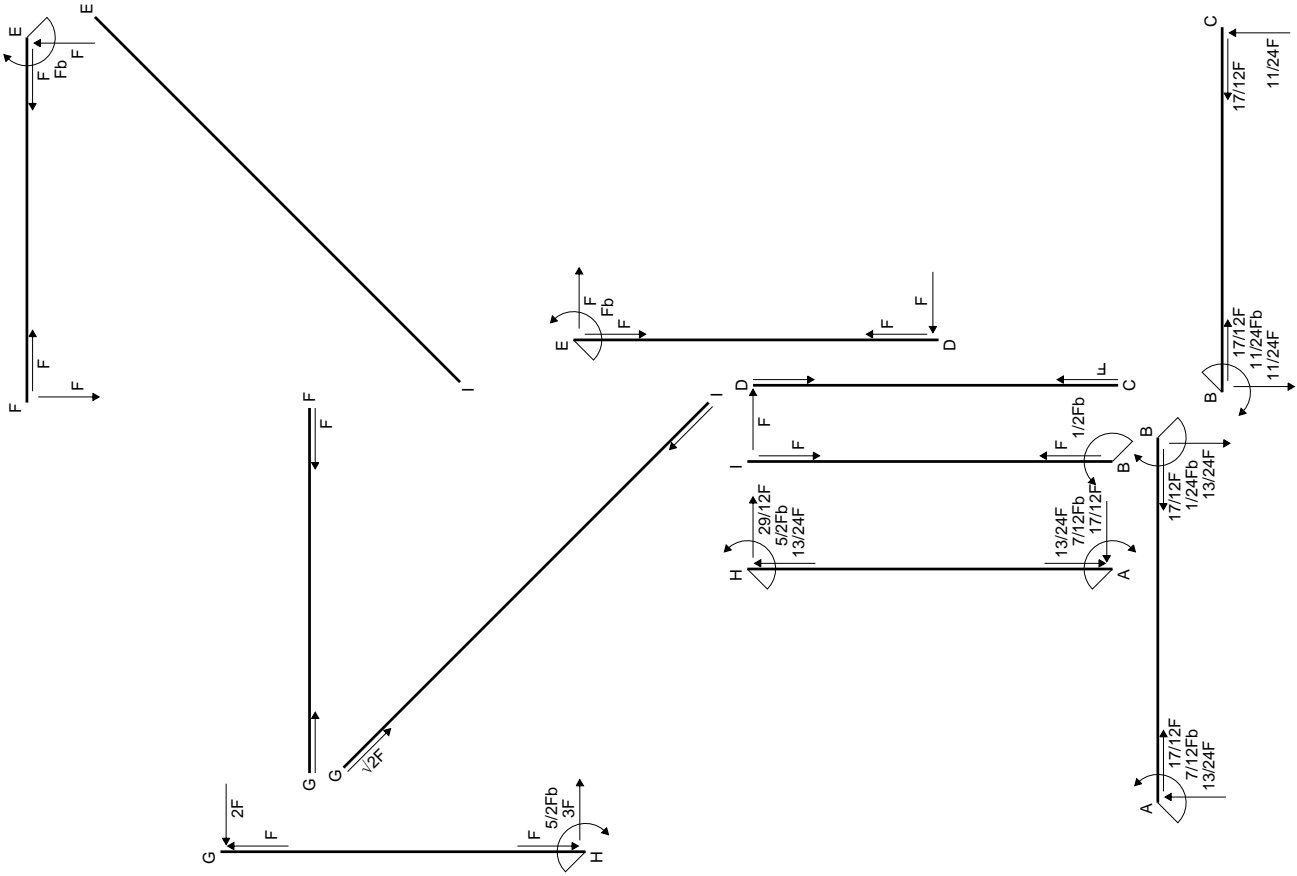
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

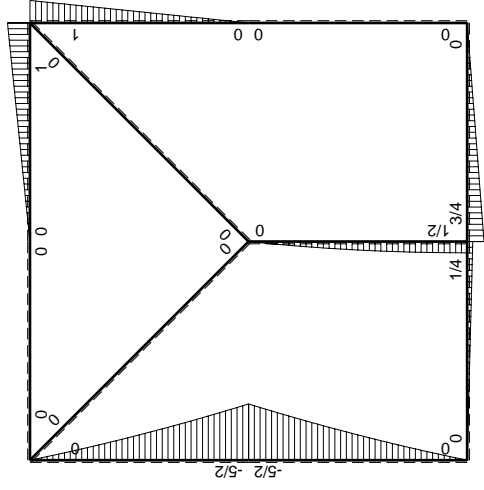
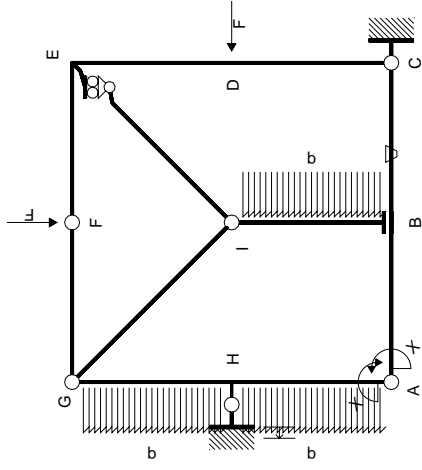
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

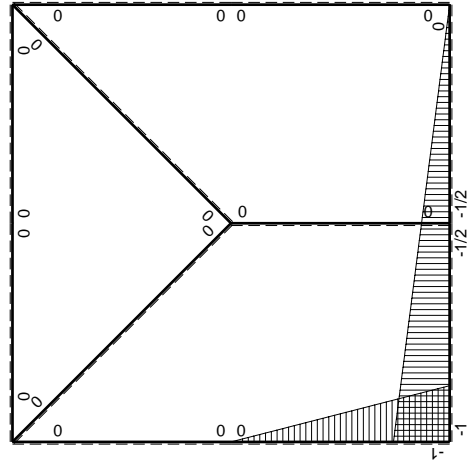


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$\leftarrow \rightarrow$ $\left[\begin{matrix} + \\ - \end{matrix} \right]$ F



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_0(x)$	θ	$M_x M_0$	$M_x \theta$	$M_x M_x$	$\int M_x(M_0/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	$-Fb/EJ$	$-3/8Fb+3/4Fx-3/8Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	Fb/EJ	$-3/8Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ + [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ + [-1/4 x^2/b]_0^b \theta$$

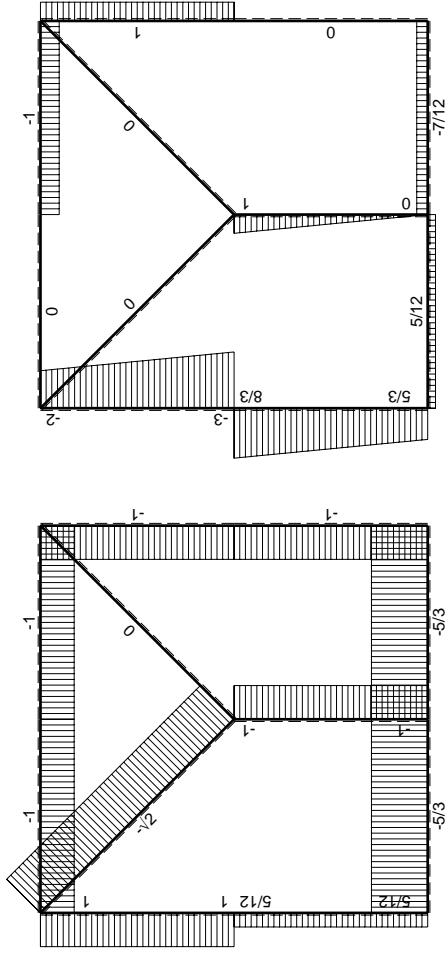
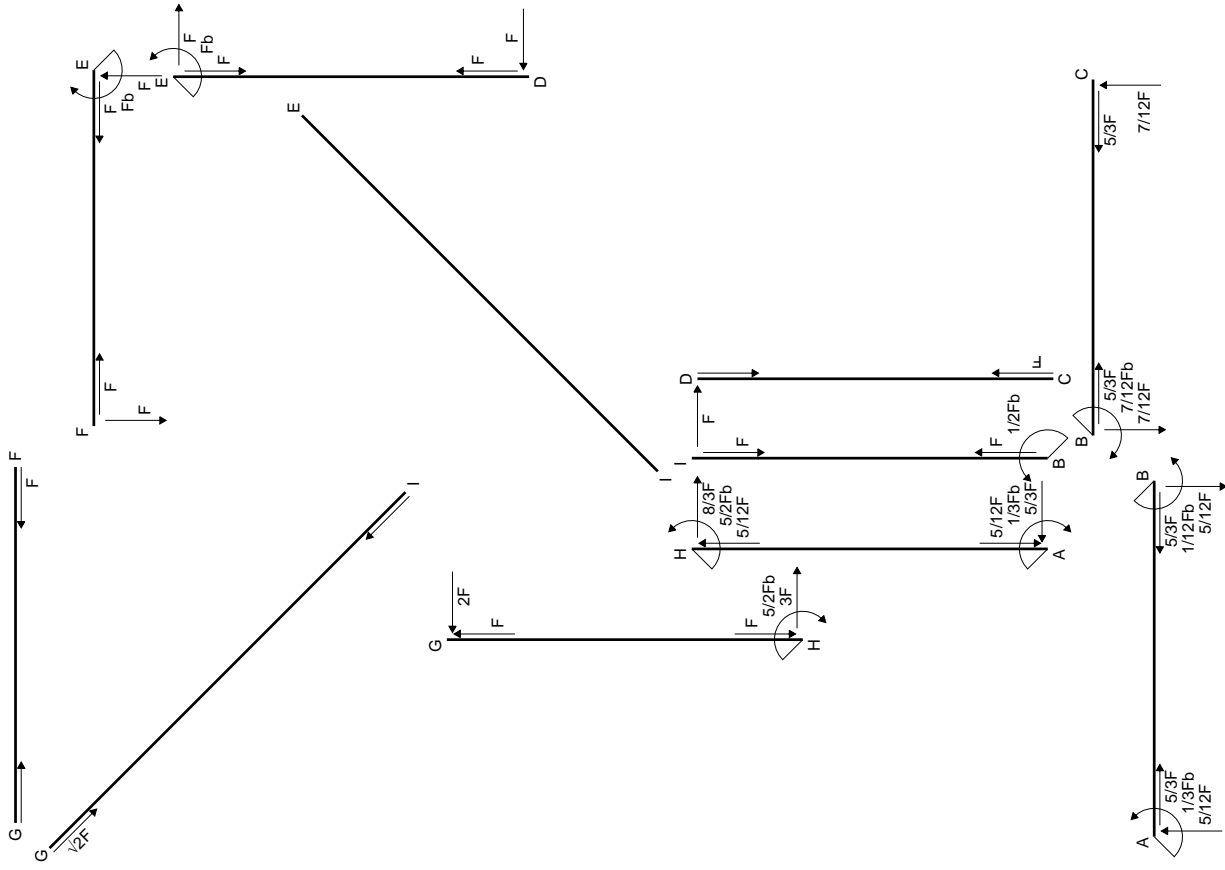
$$= (-1/8 b) Fb 1/EJ + (-1/4 b) \theta = 1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

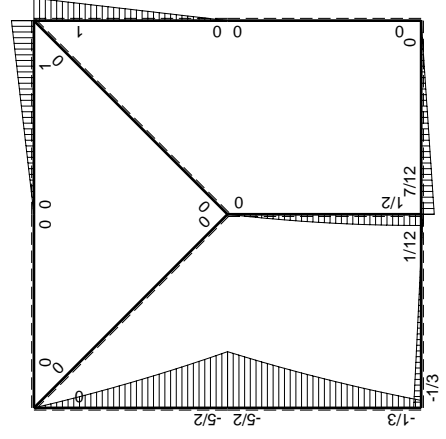
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

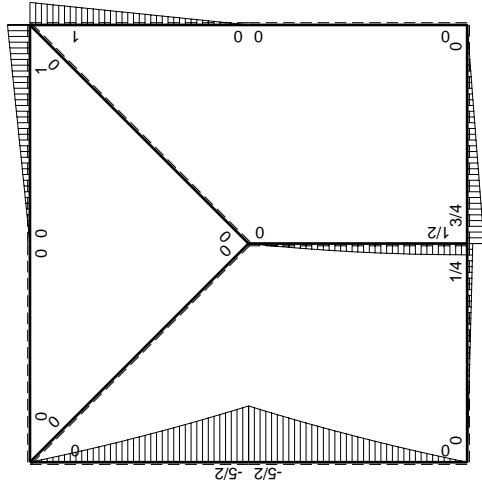
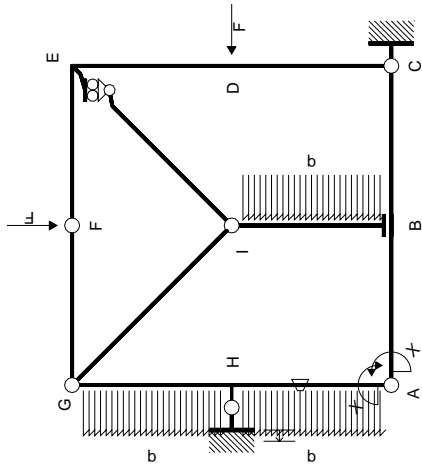


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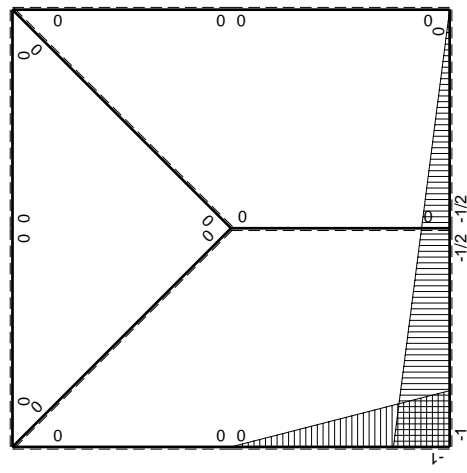
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	-Fb/EJ	$5/2Fx-3Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(3/8+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	Fb/EJ	$2Fx-3/2Fx^2/b-1/2qx^3/b$	Fb/EJ-Fx/EJ	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/3Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/3Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

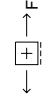
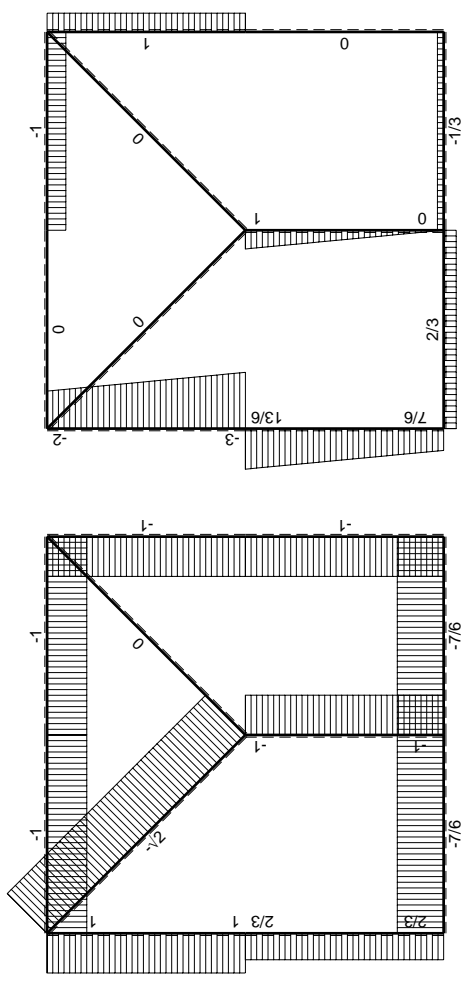
$$= \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

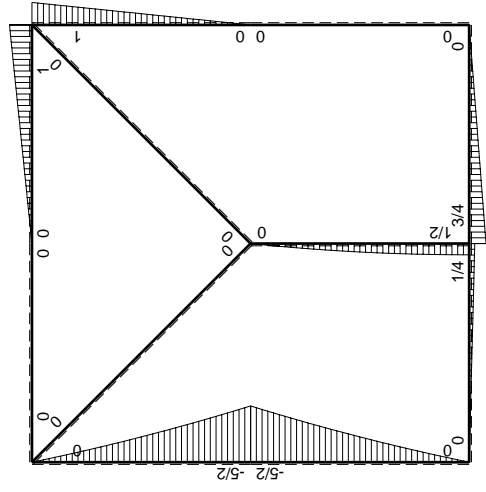
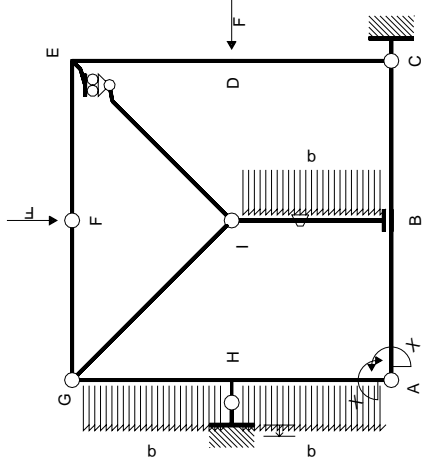
$$= (5/4 b - b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 7/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

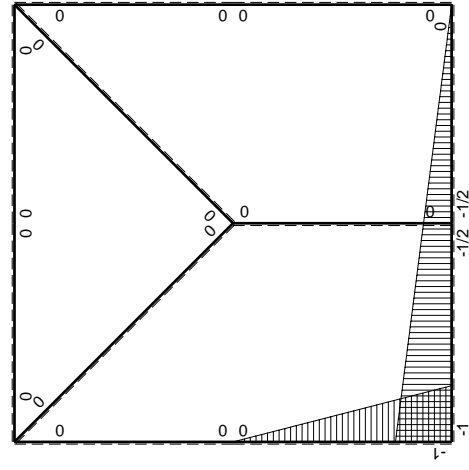
$$= \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 7/8 Fb^2/EJ$$





 M_0 , flessione da carichi assegnati



 M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	-Fb/EJ	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

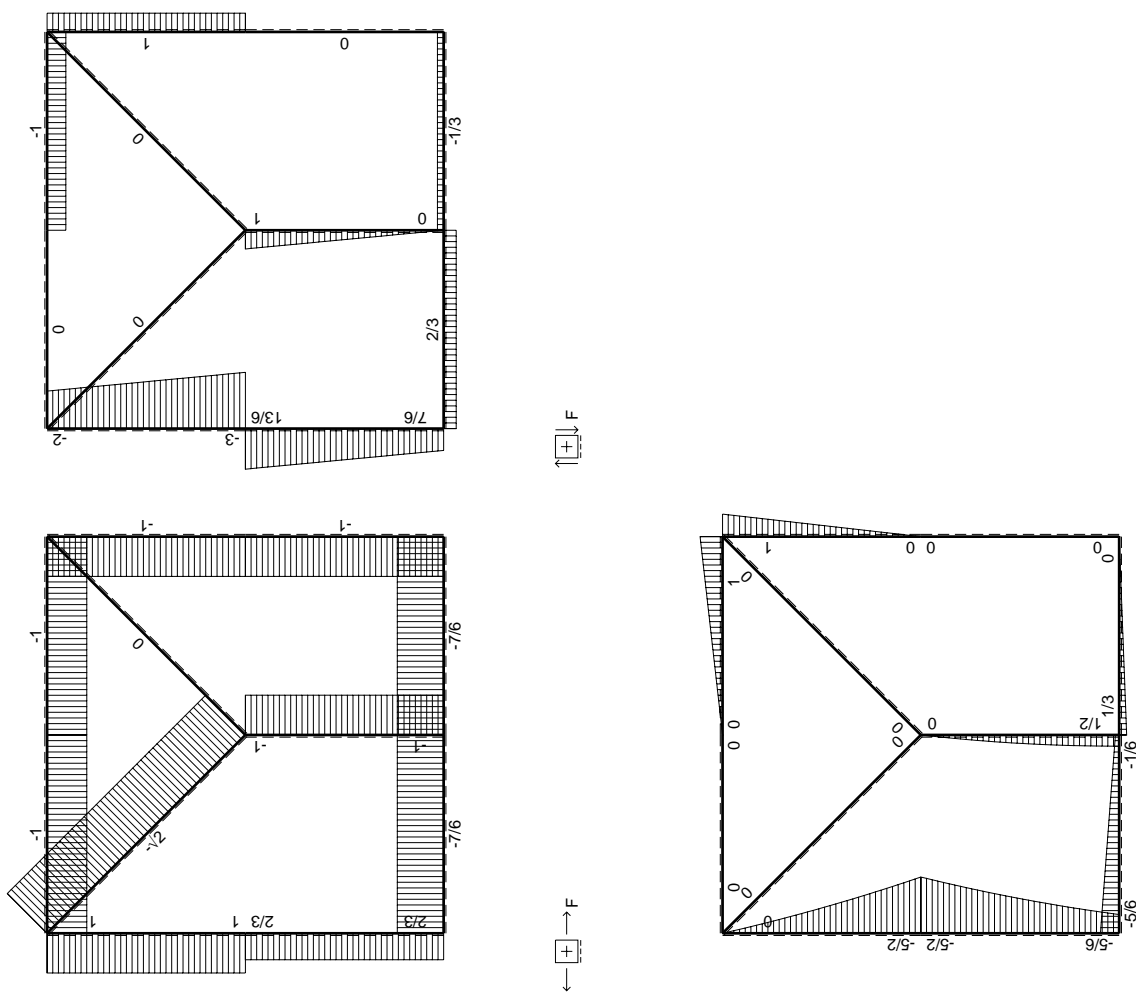
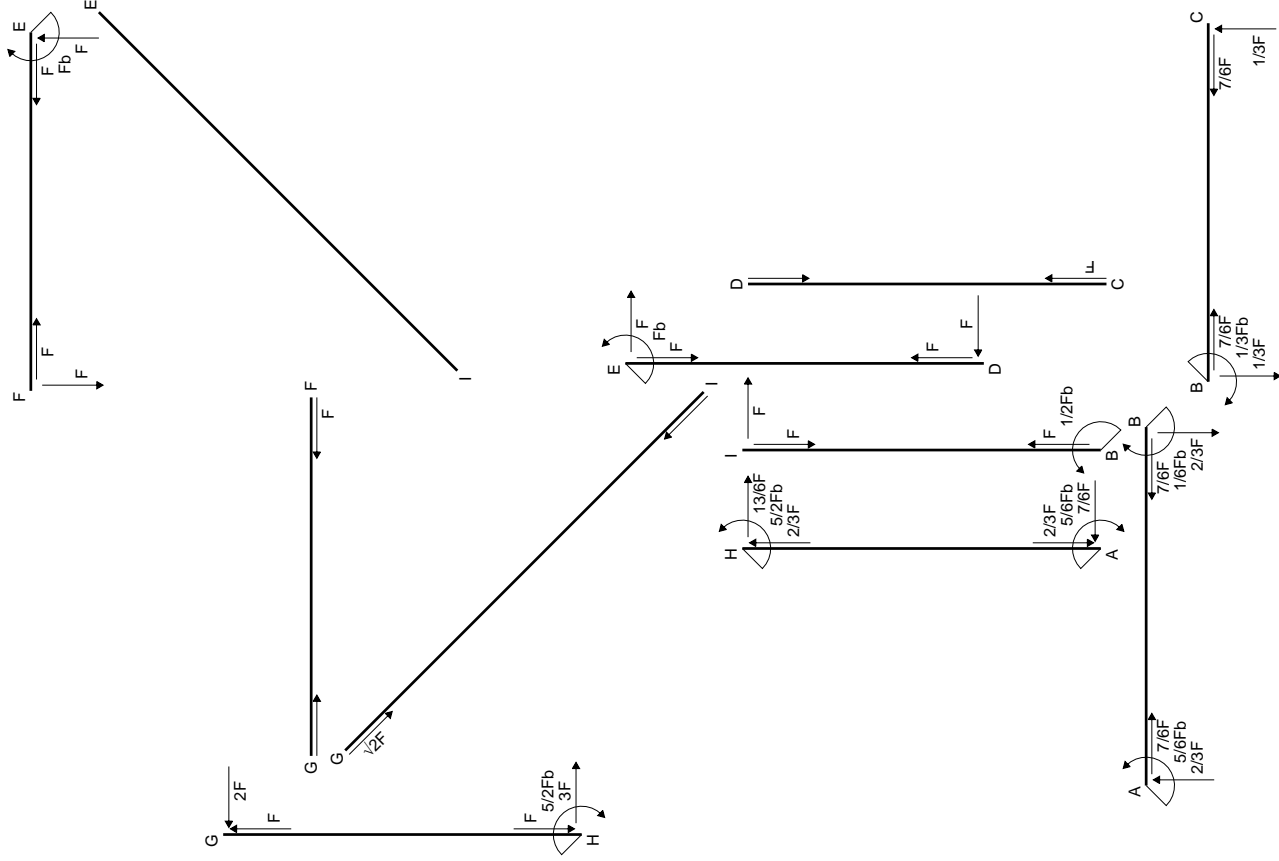
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

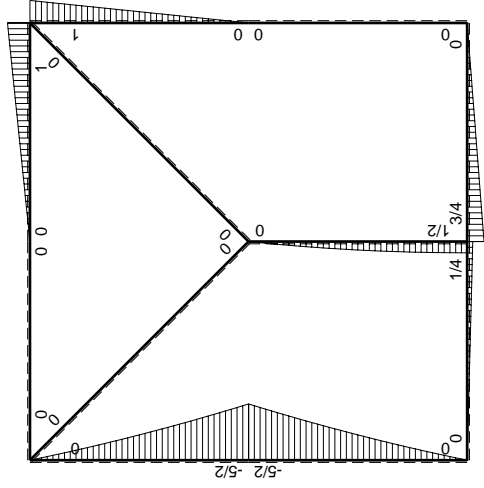
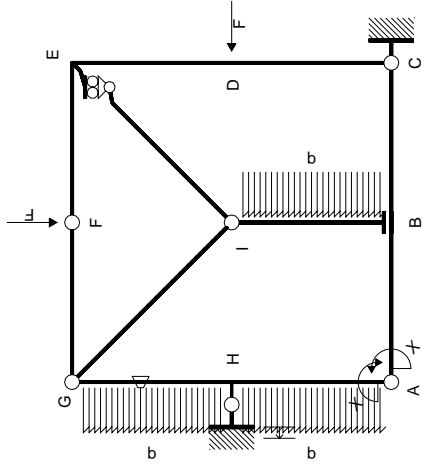
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

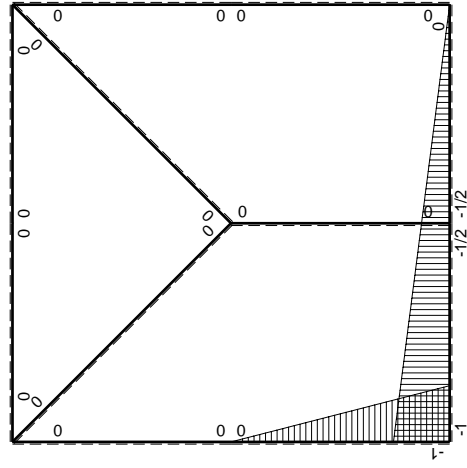
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	-Fb/EJ	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

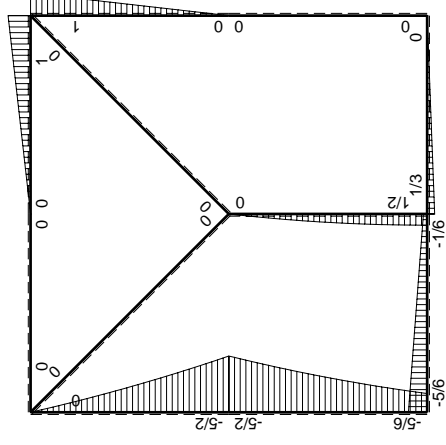
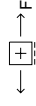
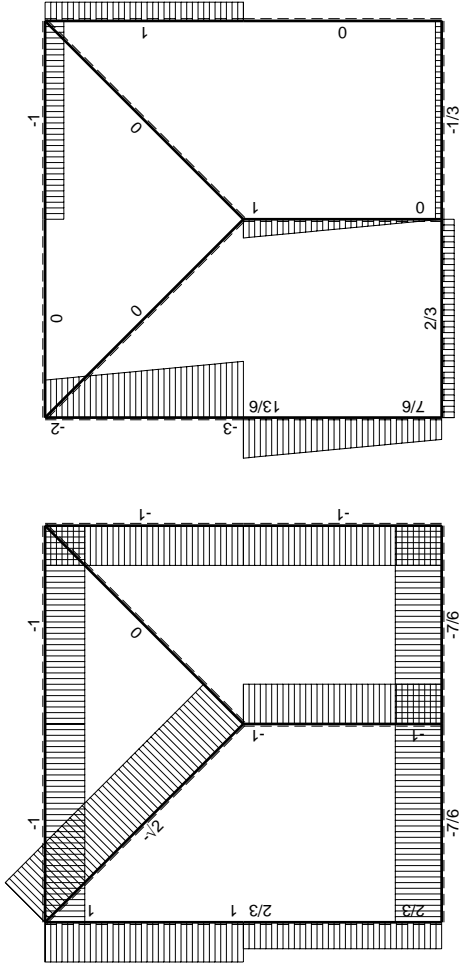
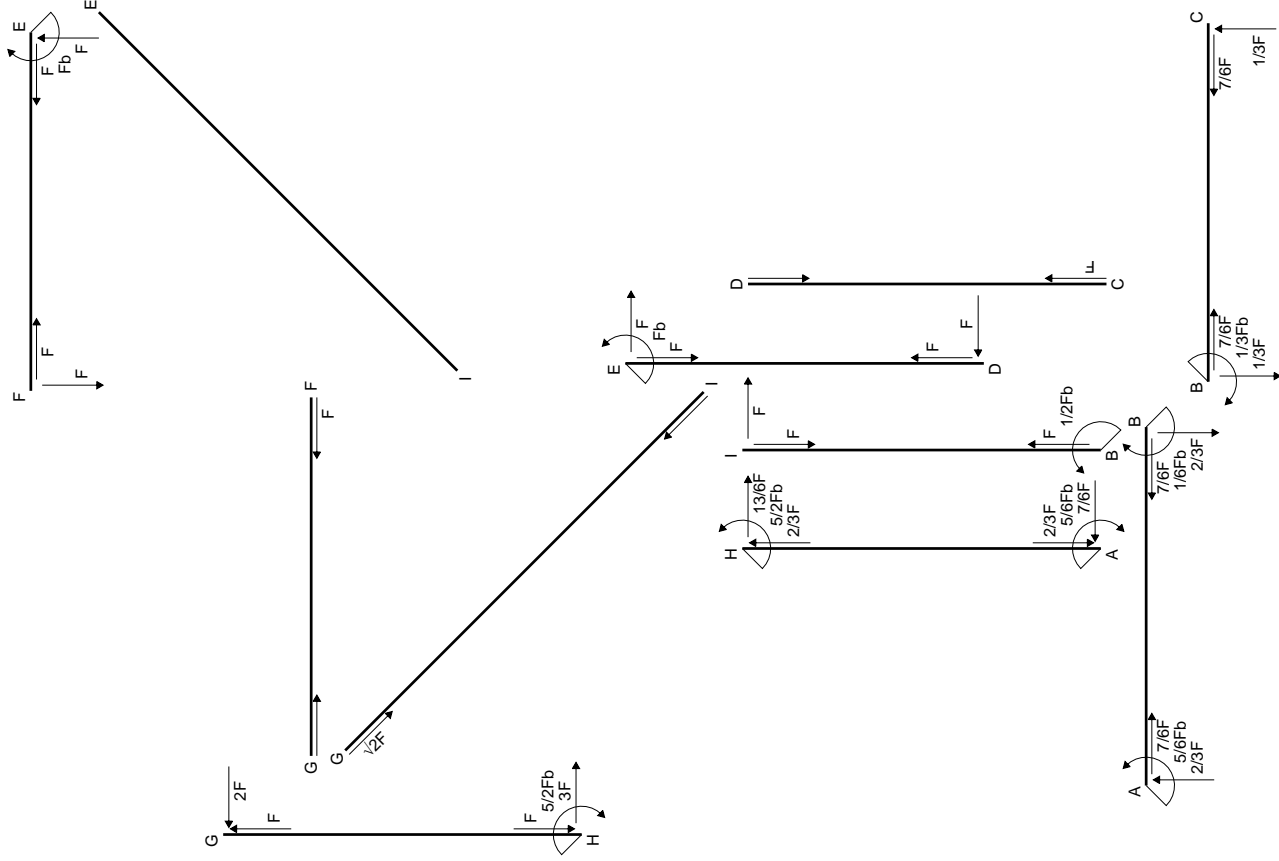
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

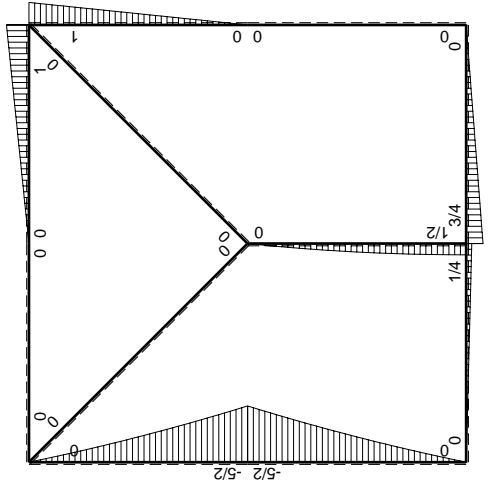
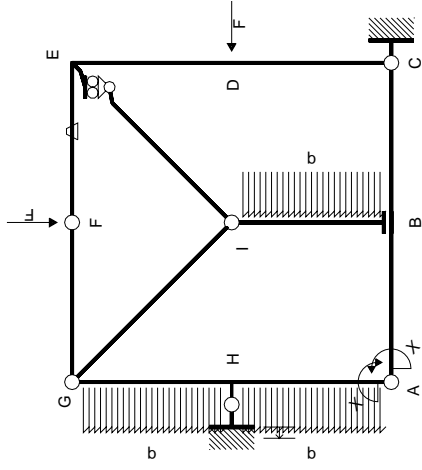
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

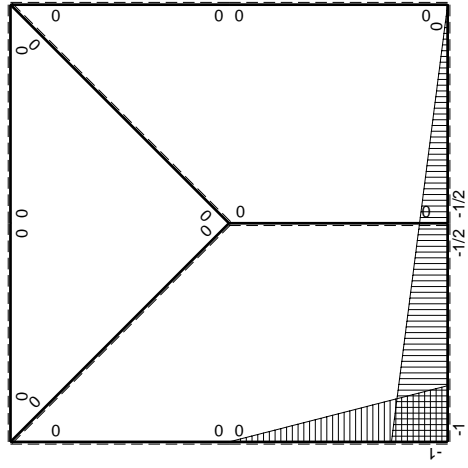
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_1 , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	-Fb/EJ	0	0	0	0+0	0	
FE b	0	-Fx	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

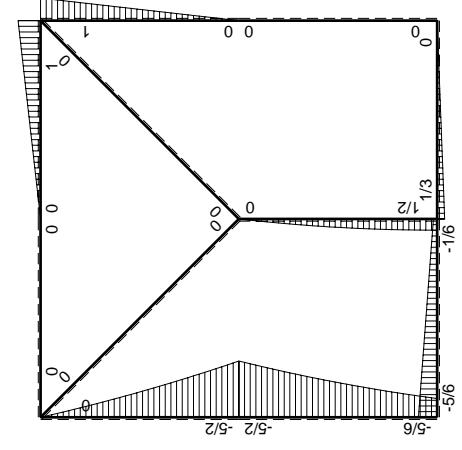
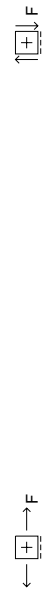
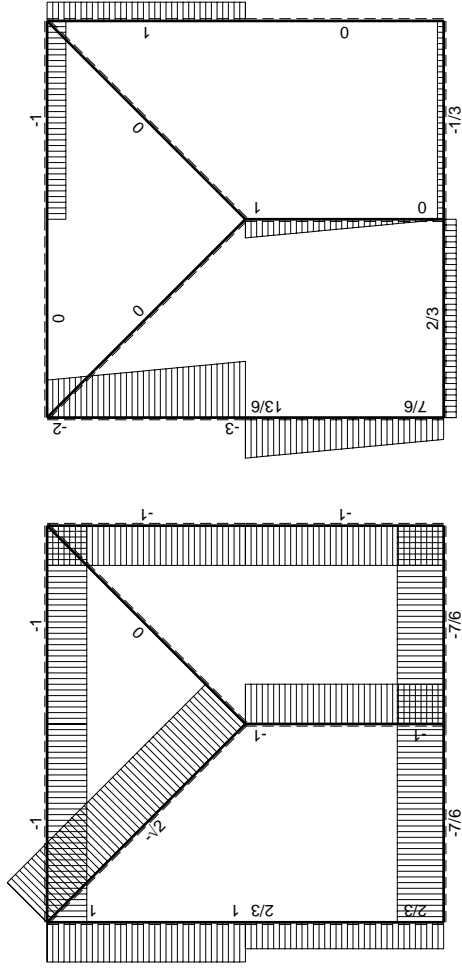
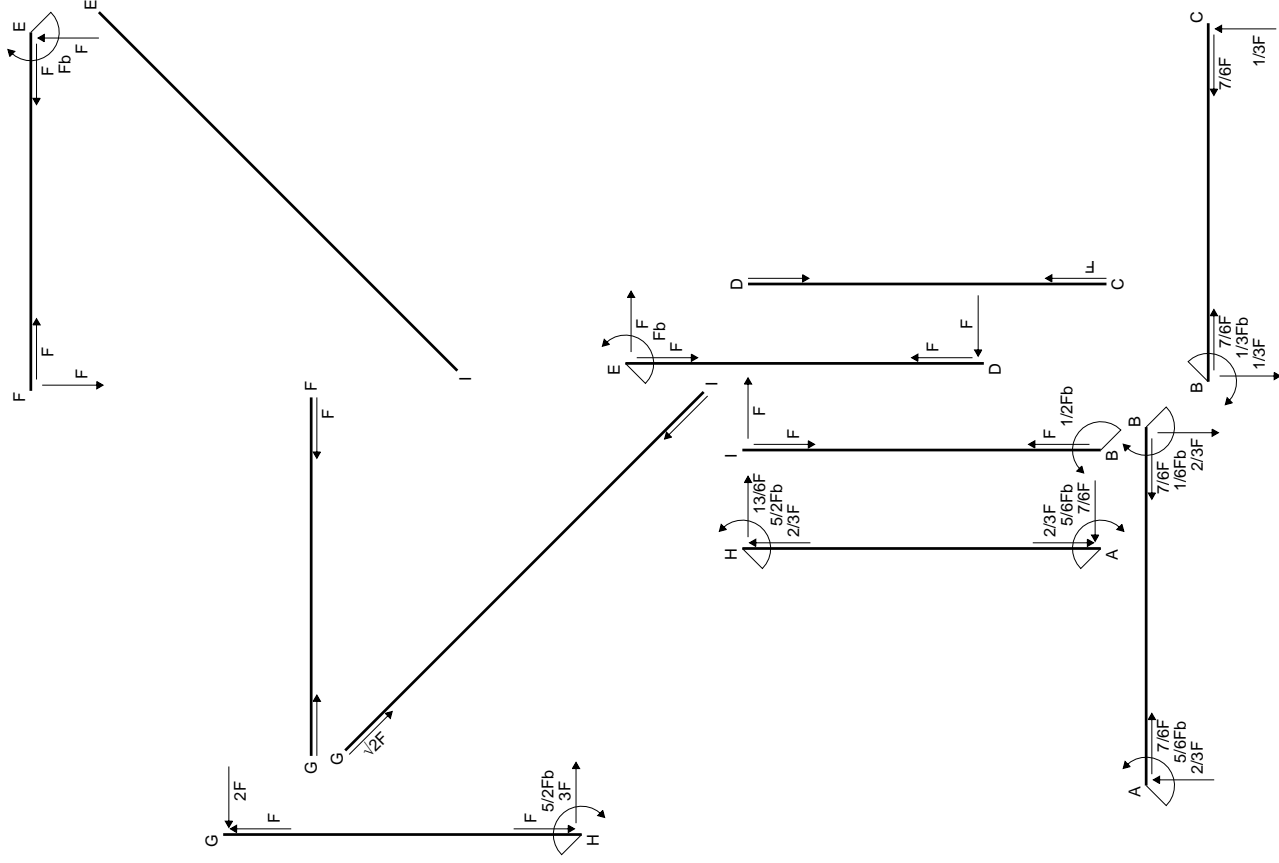
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

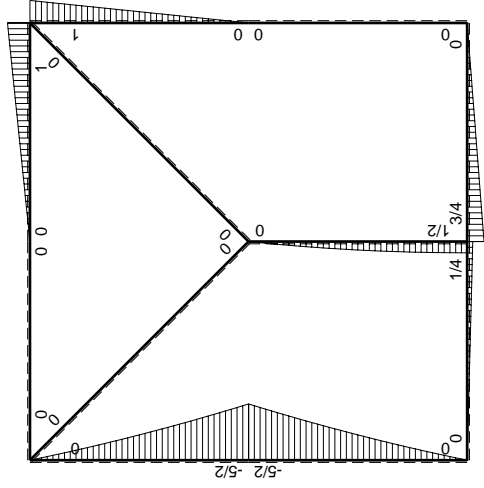
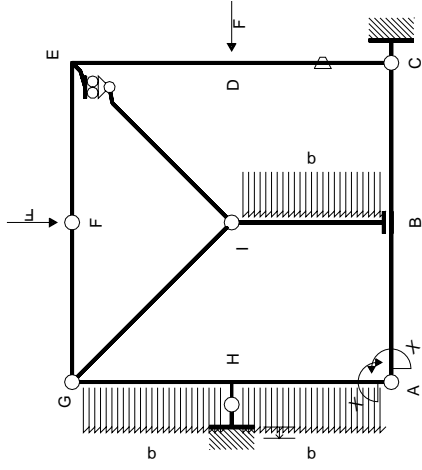
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

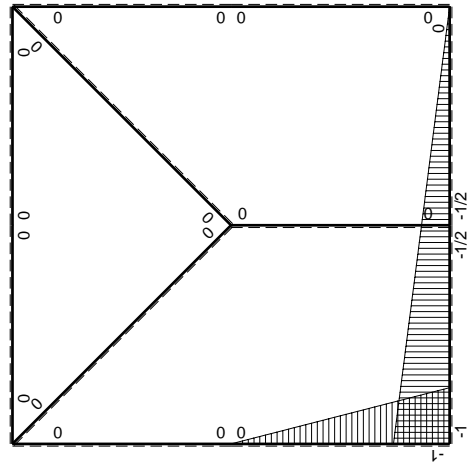
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$		
CD b	0	0	$-Fb/EJ$	0	0	0	0+0	0
DC b	0	0	Fb/EJ	0	0	0		
DE b	0	Fx	0	0	0	0	0+0	0
ED b	0	$-Fb+Fx$	0	0	0	0		
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0
FE b	0	$-Fx$	0	0	0	0		
FG b	0	0	0	0	0	0	0+0	0
GF b	0	0	0	0	0	0		
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0		
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0		
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$		
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-5/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$5/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

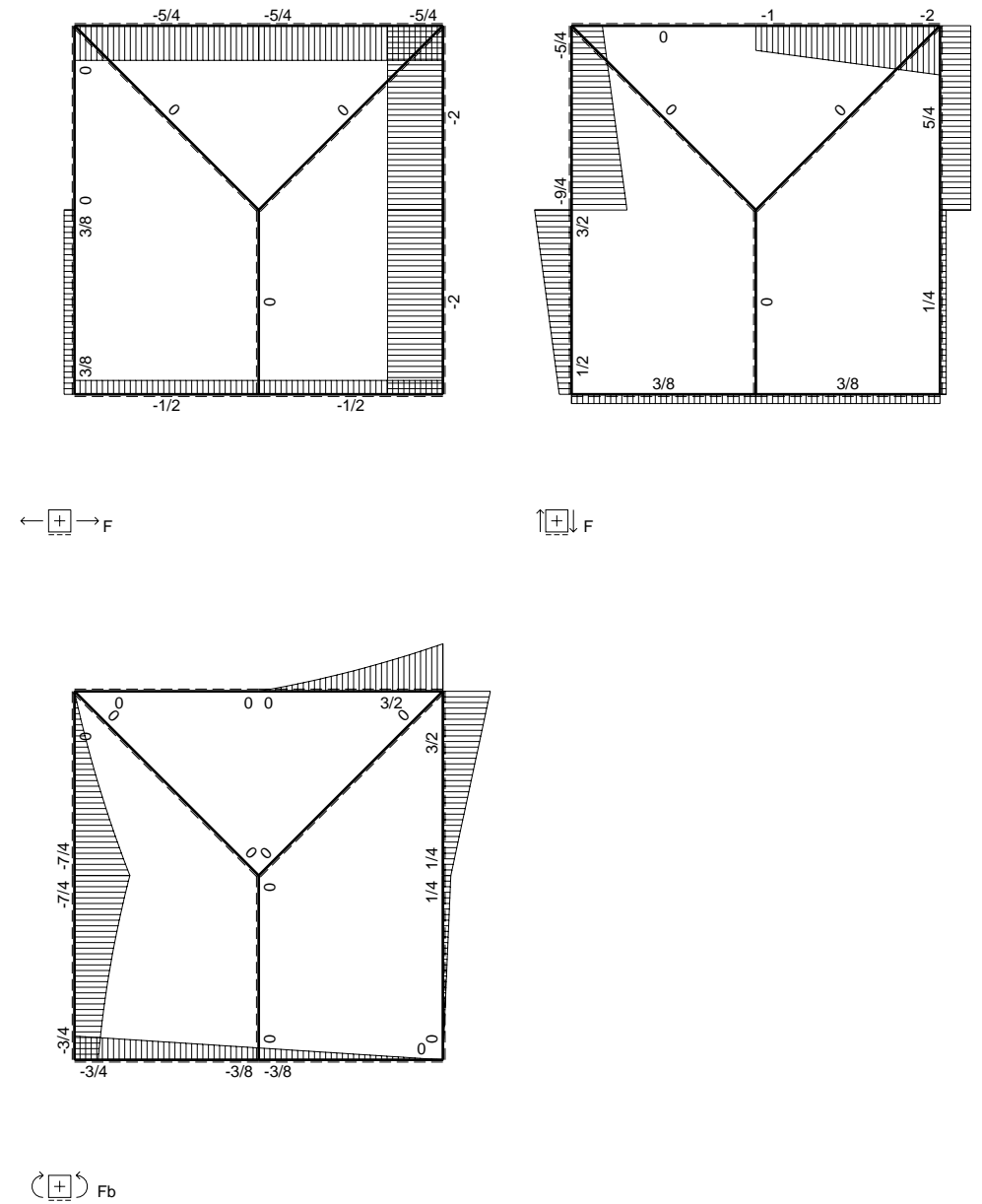
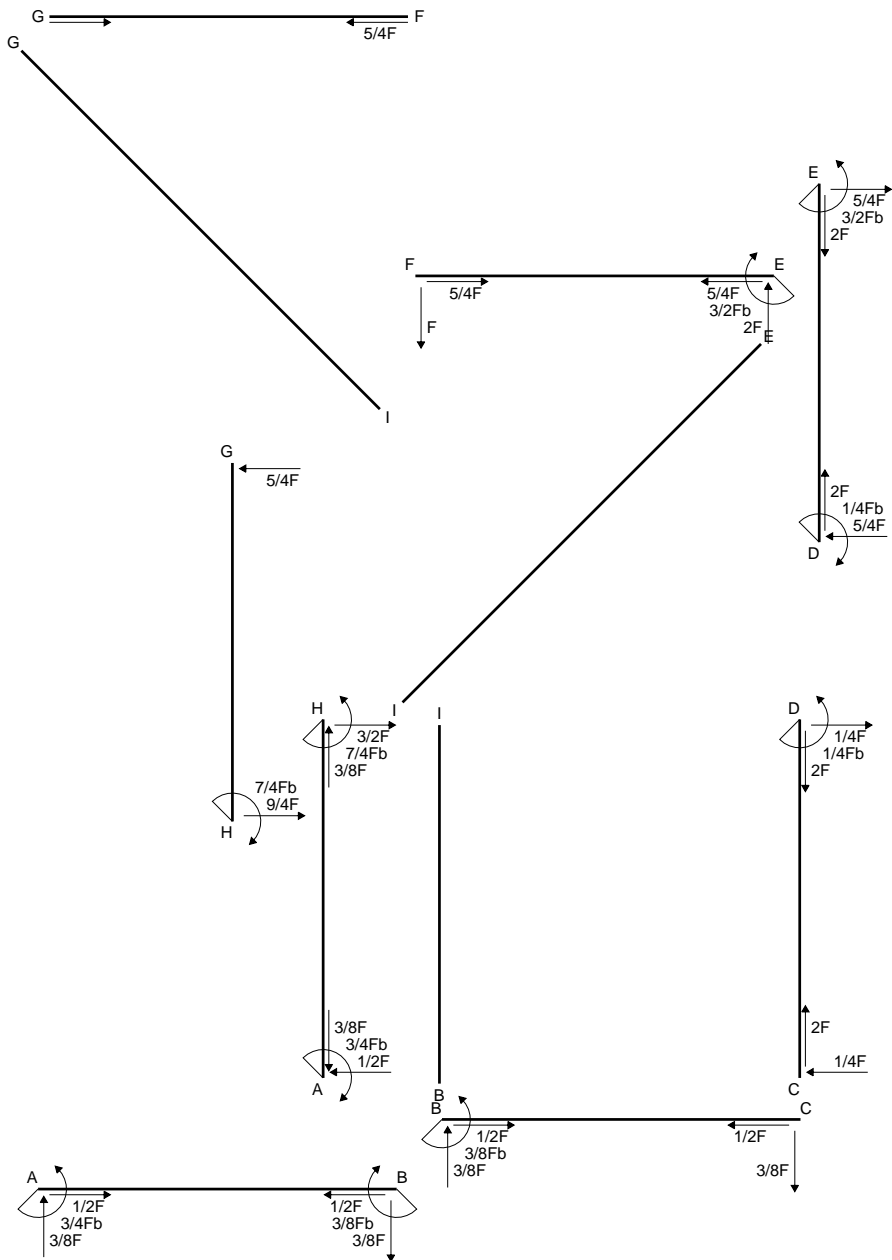
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

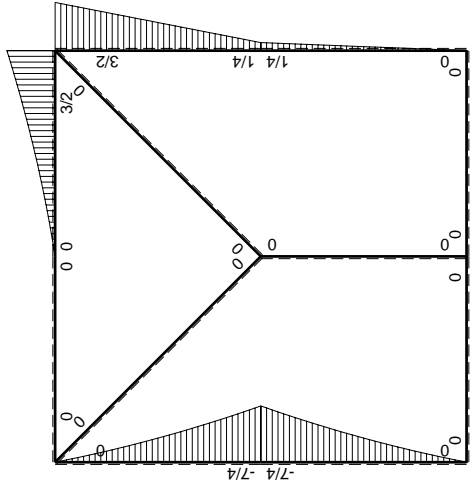
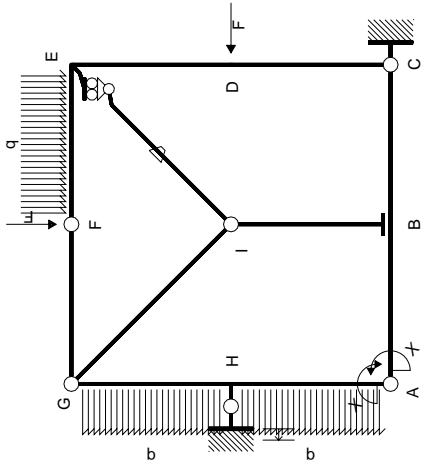
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

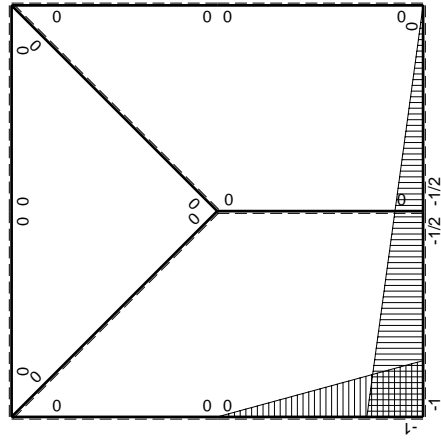
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

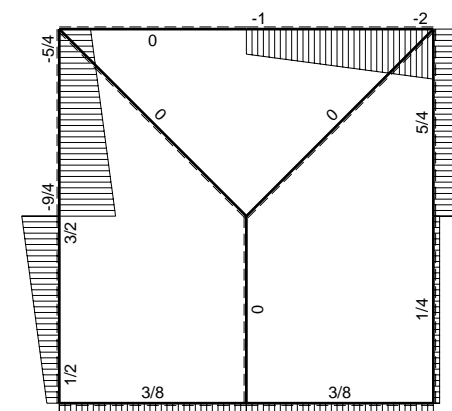
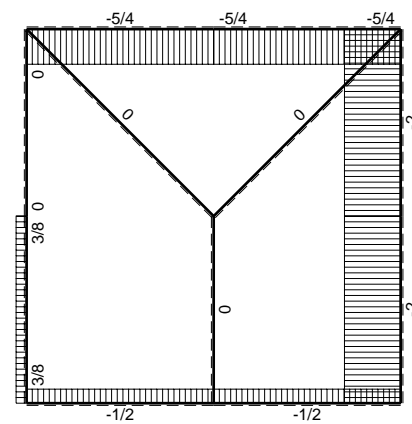
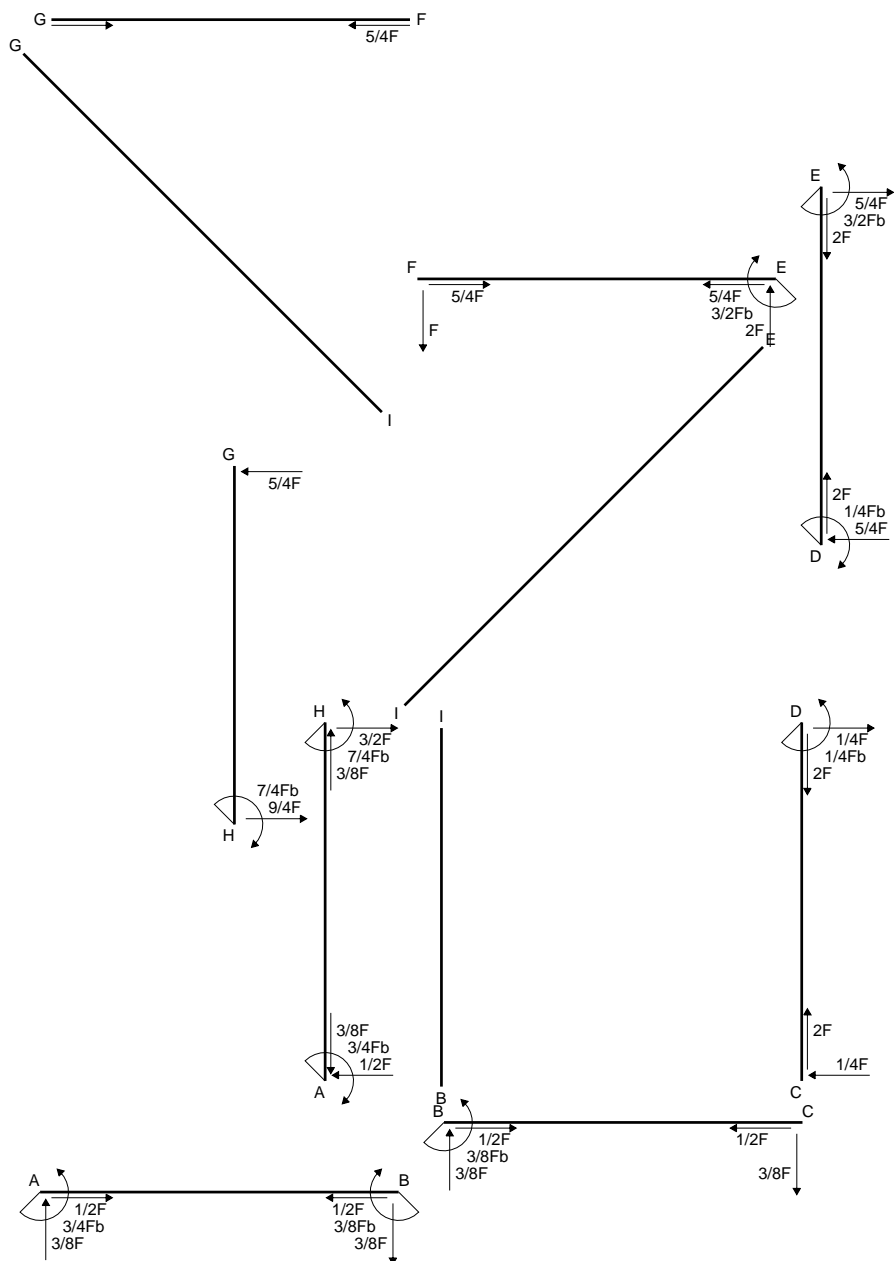
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

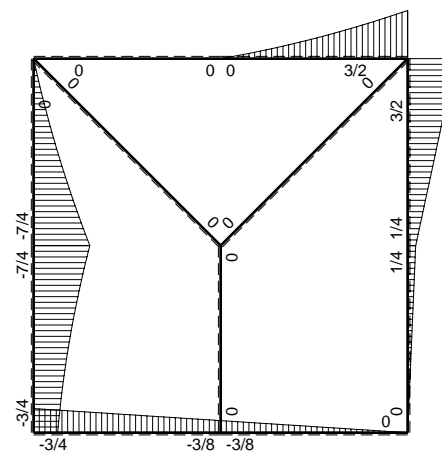
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

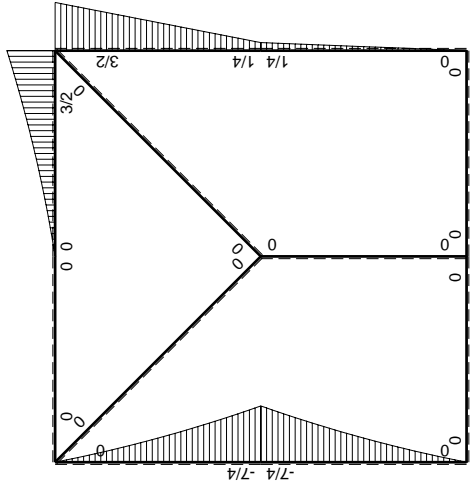
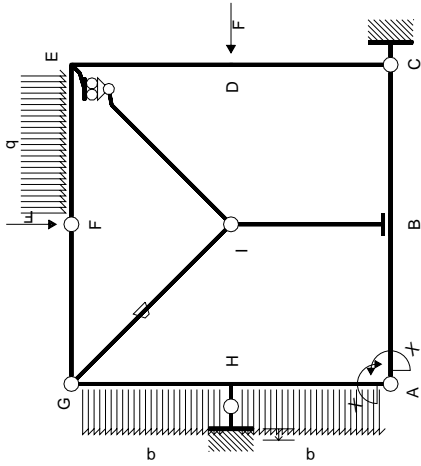


← ⊕ → F

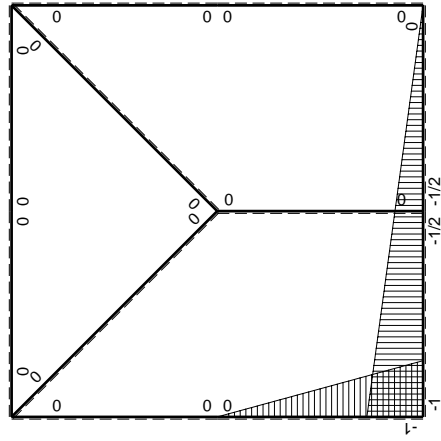
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

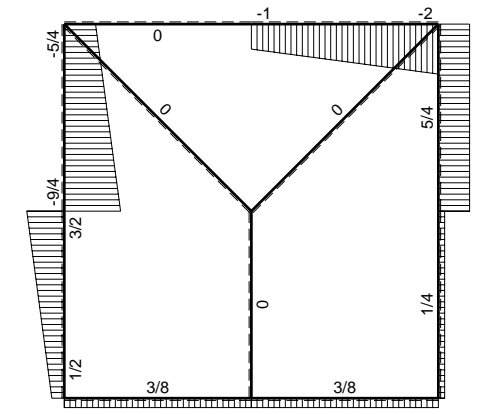
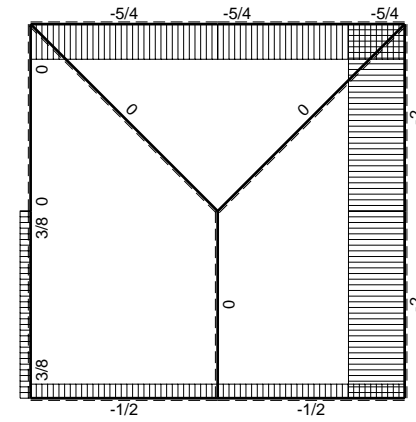
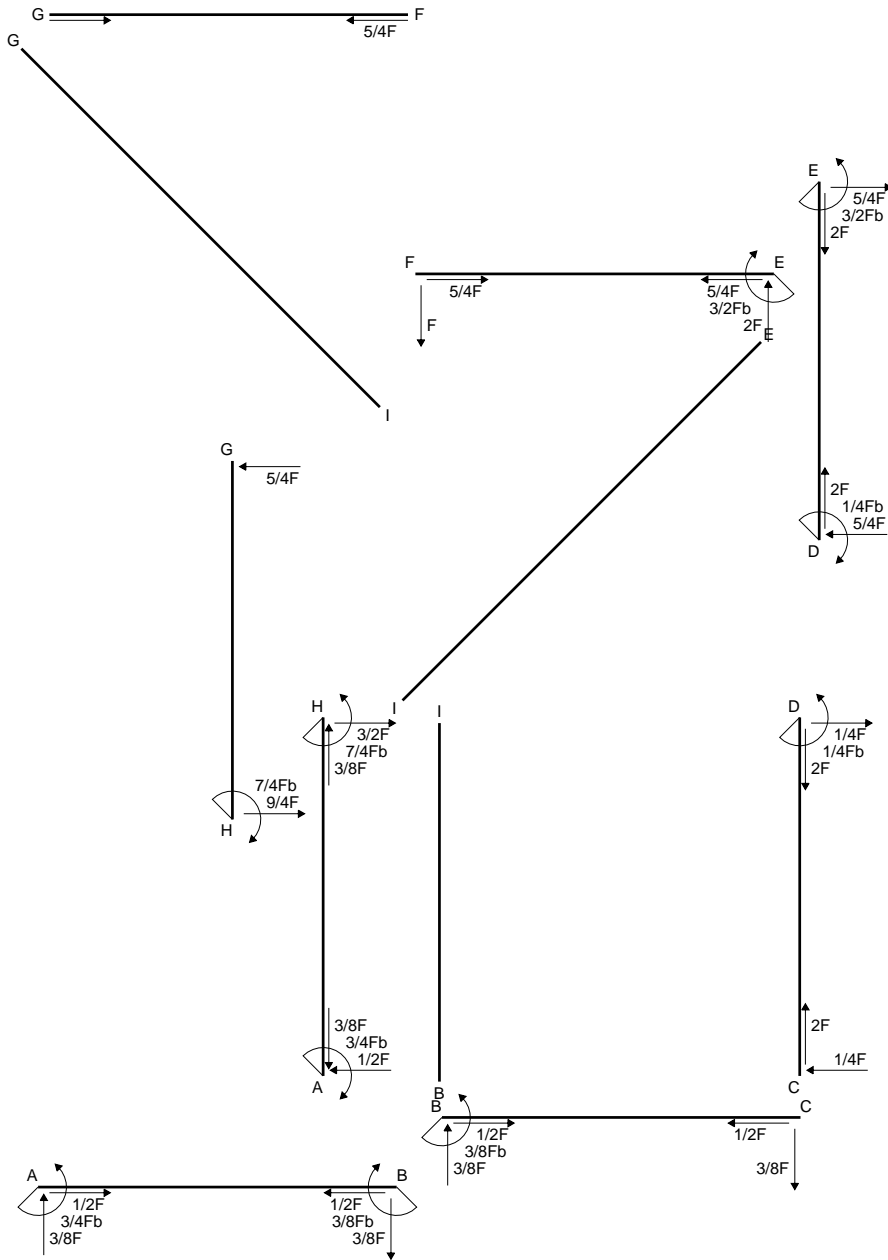
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

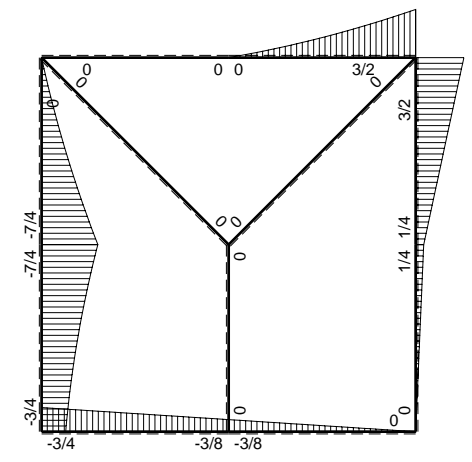
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

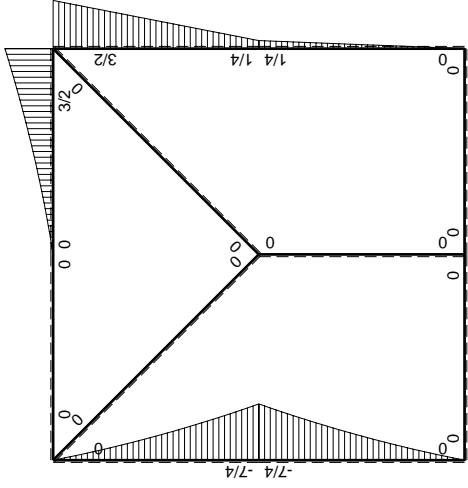
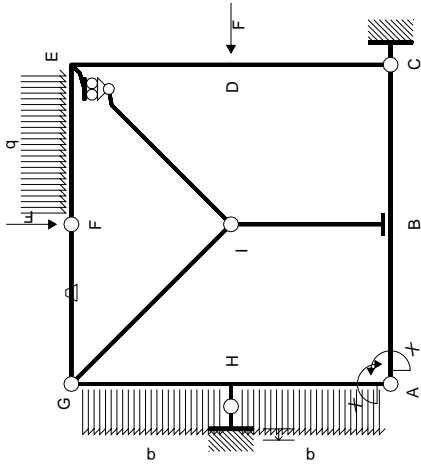


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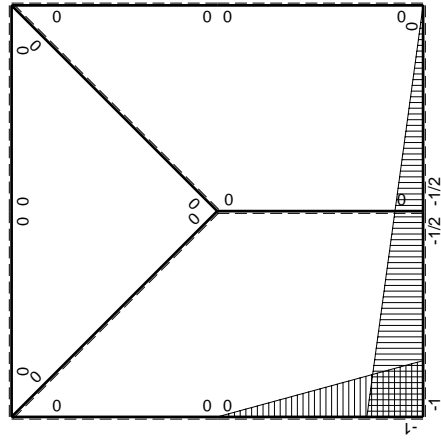
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⊕ ⊖ F_b



M₀ flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

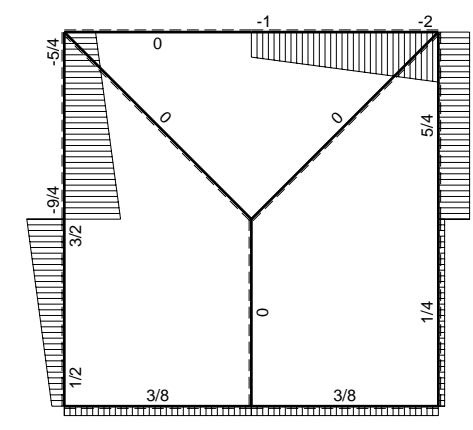
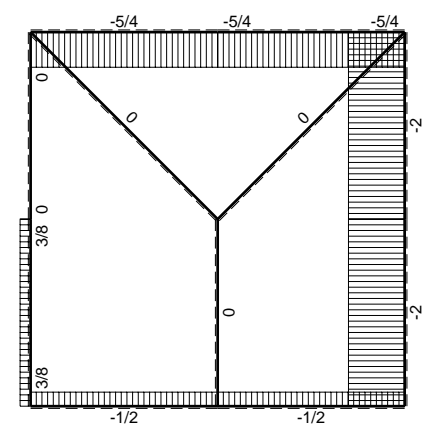
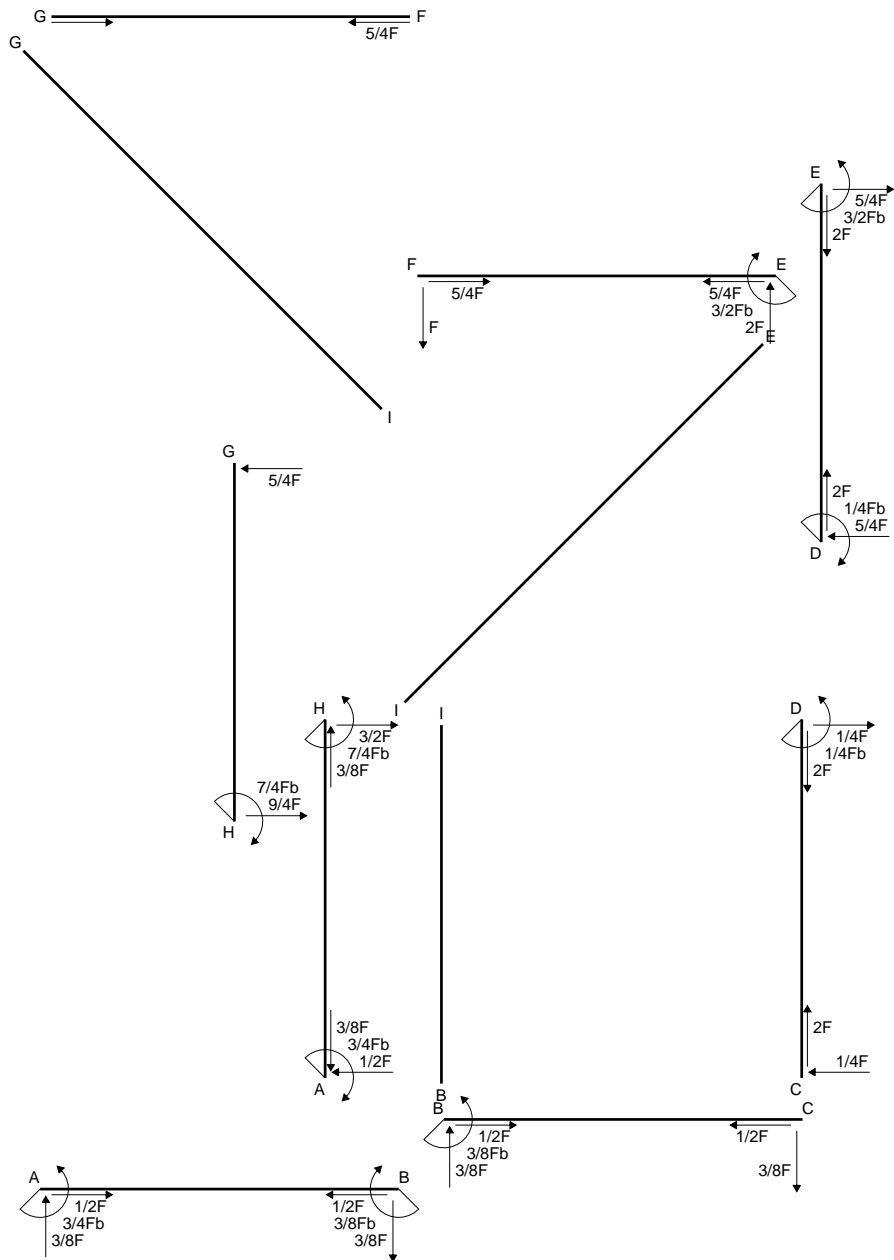
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

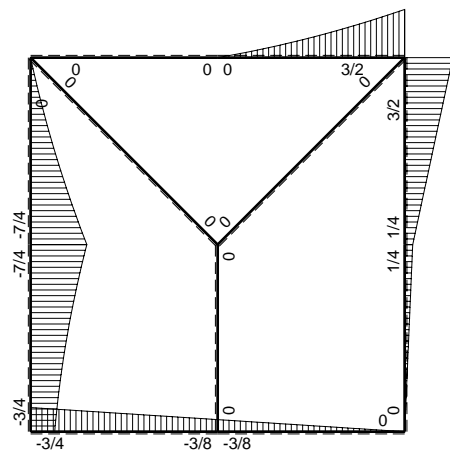
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

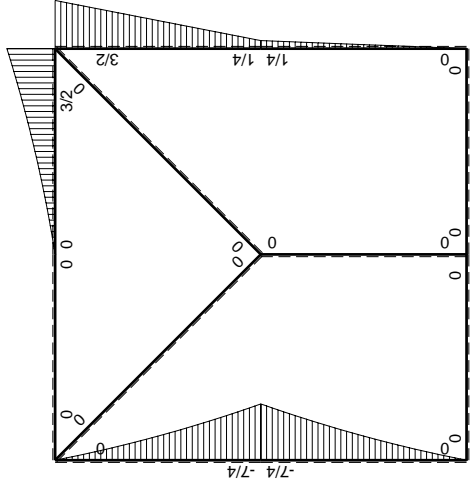
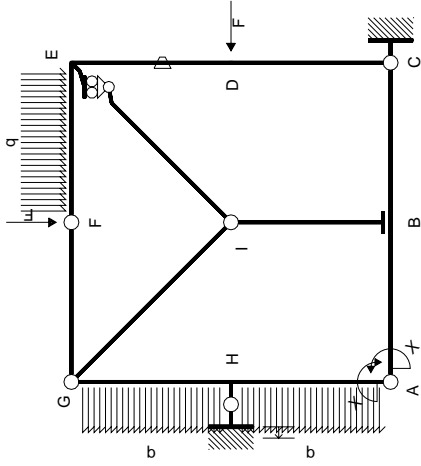


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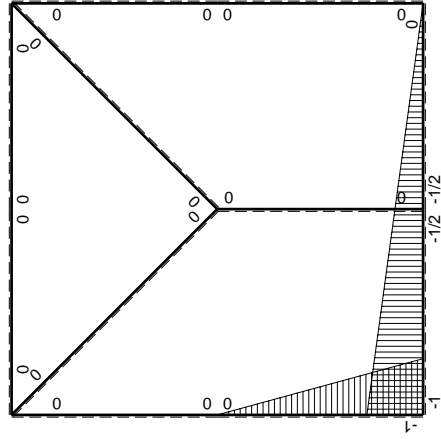
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⊕ ⊖ Fb



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

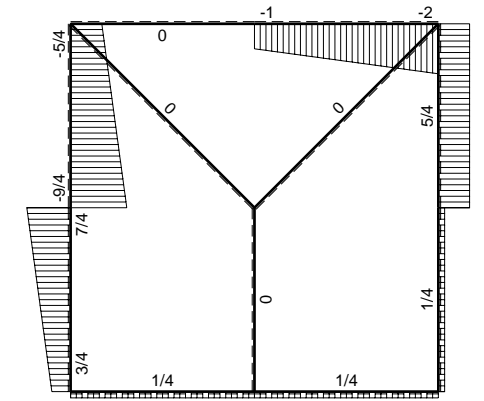
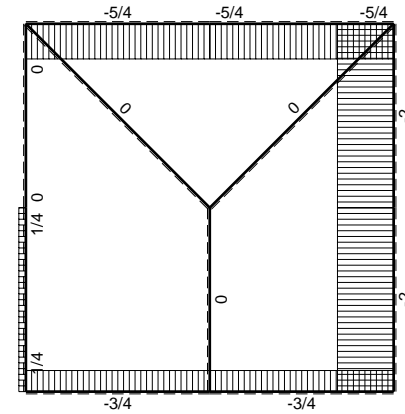
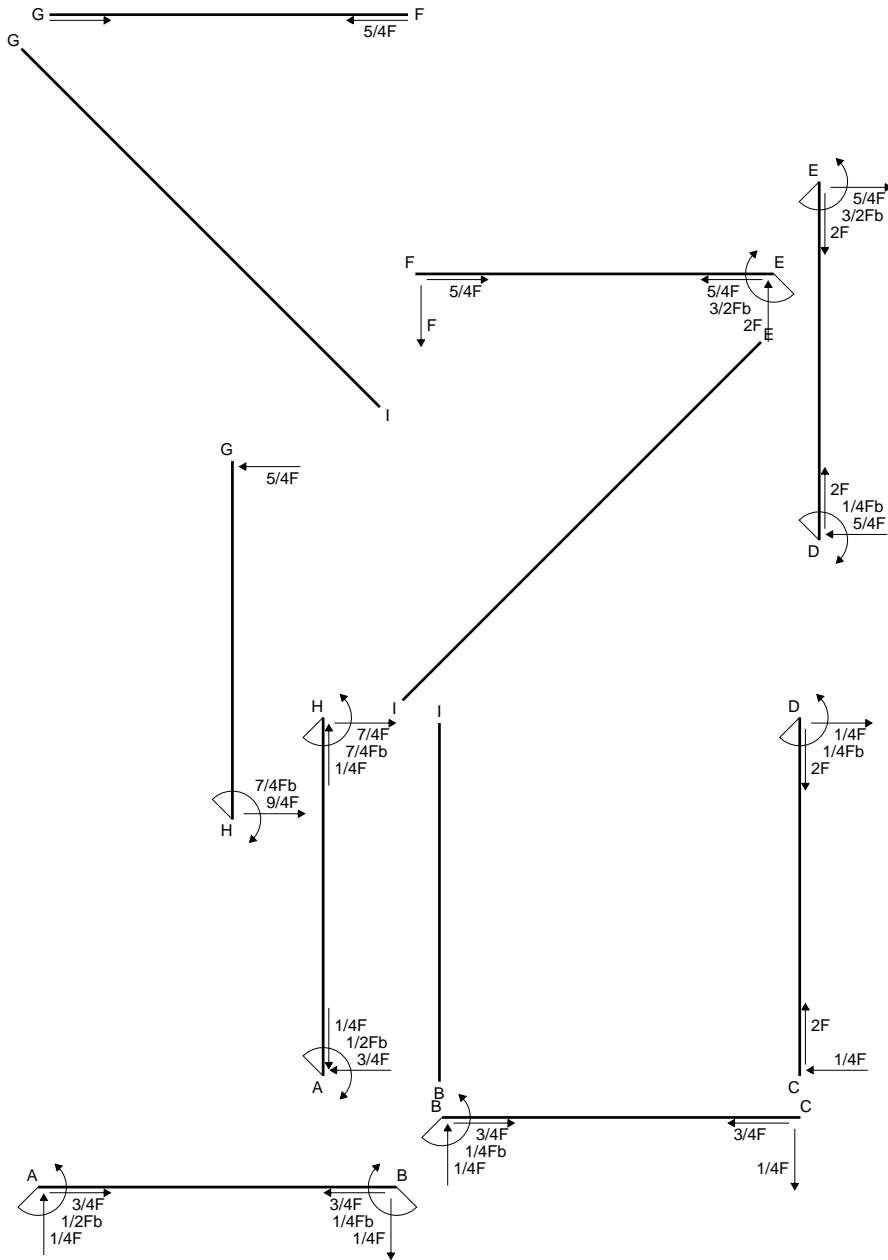
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

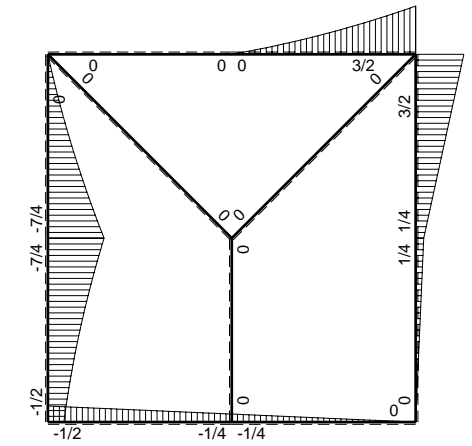
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

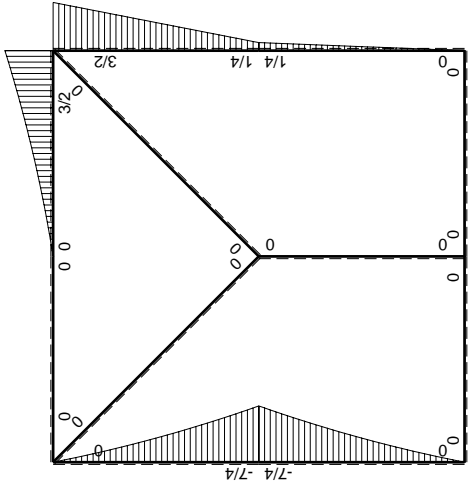
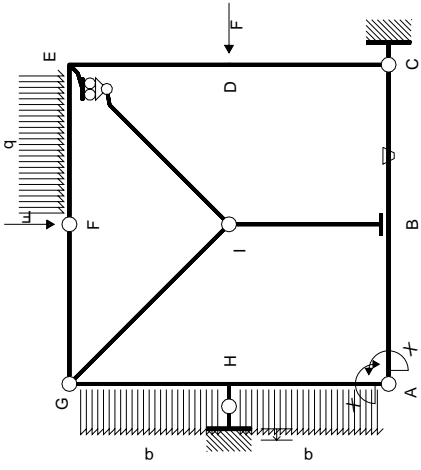


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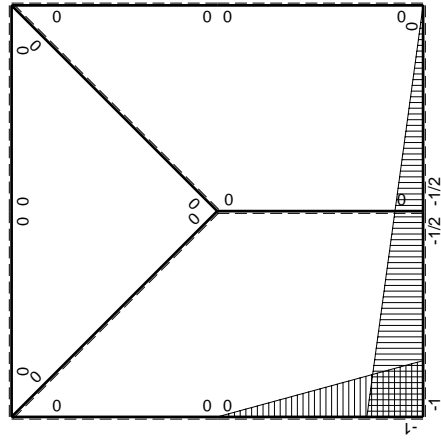
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	$-Fb/EJ$	0	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(0+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	Fb/EJ	0	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/2Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/2Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{BC}^{xo} = \int_0^b (1/2 - 1/2 x/b) \theta dx = [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (1/2 b - 1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/2 x/b) \theta dx = [-1/4 x^2/b]_0^b \theta$$

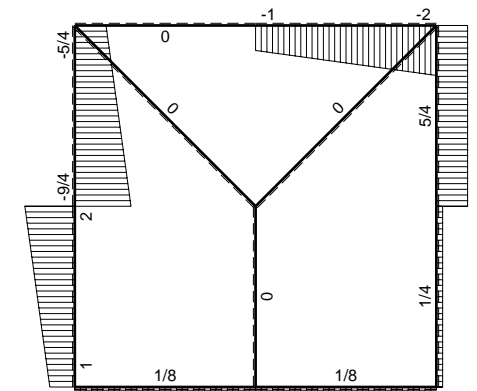
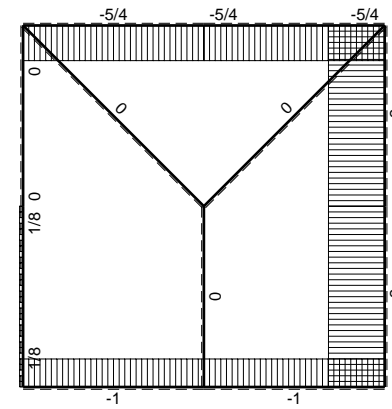
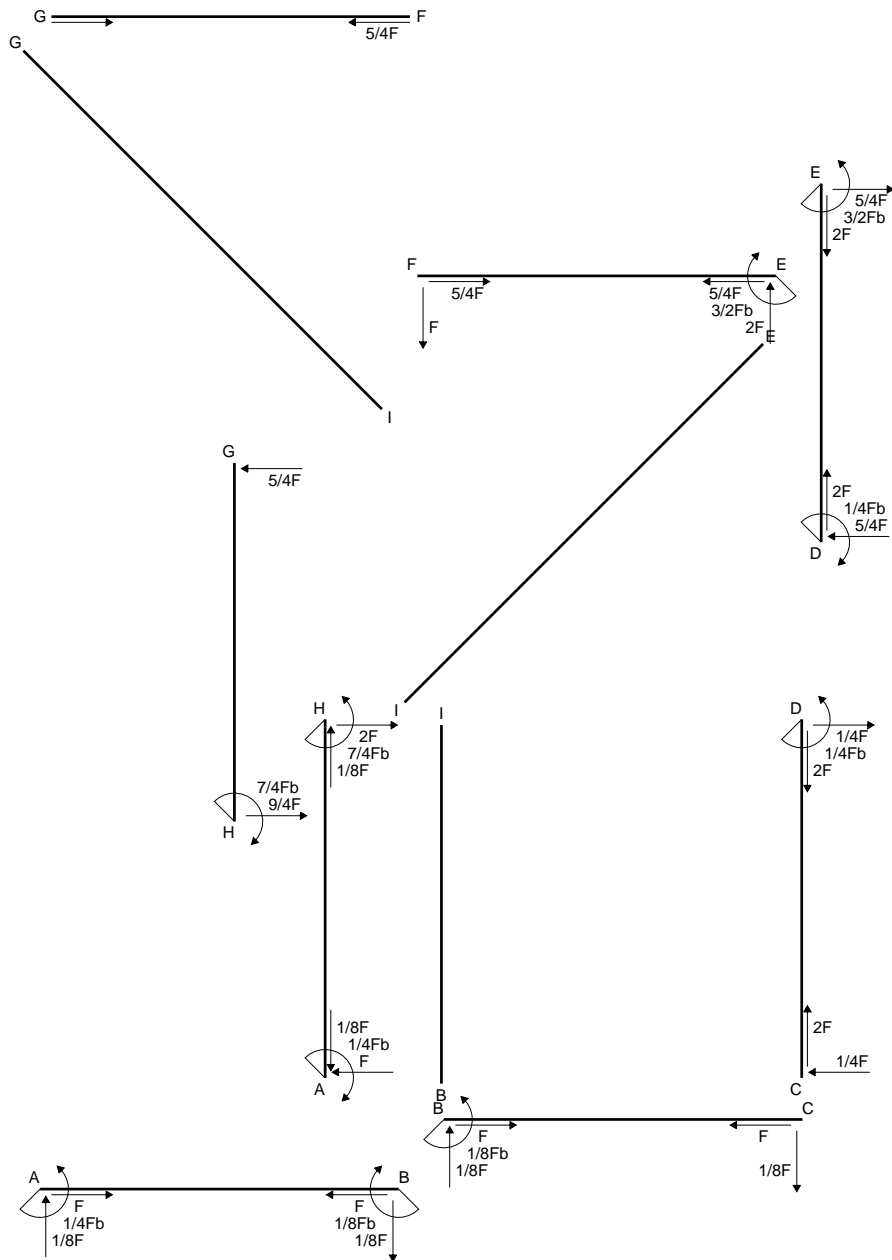
$$= (-1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

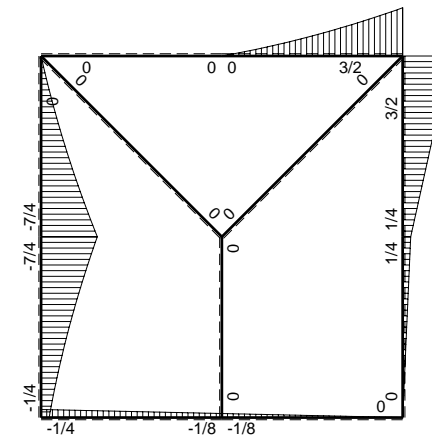
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

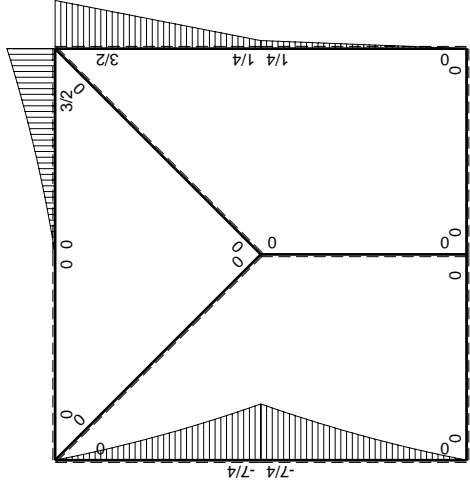
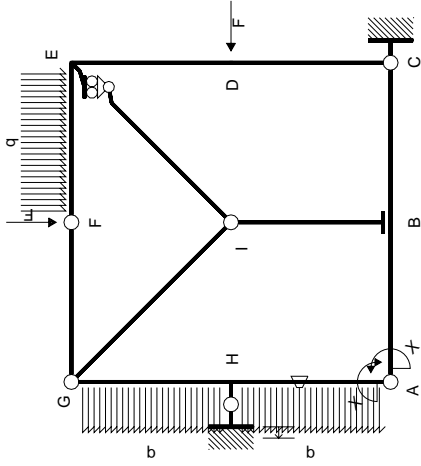


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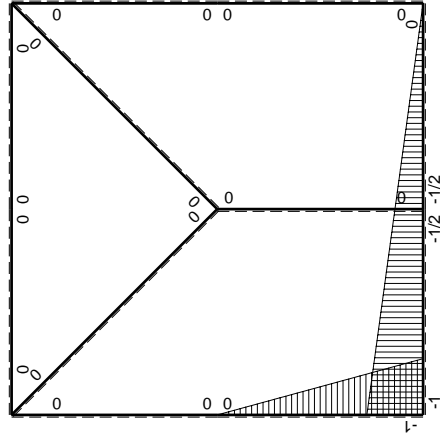
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	$-Fb/EJ$	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/4+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	Fb/EJ	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

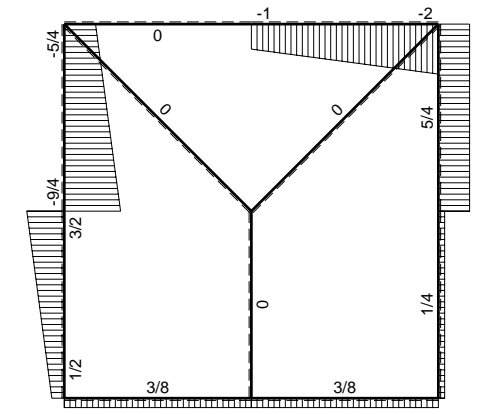
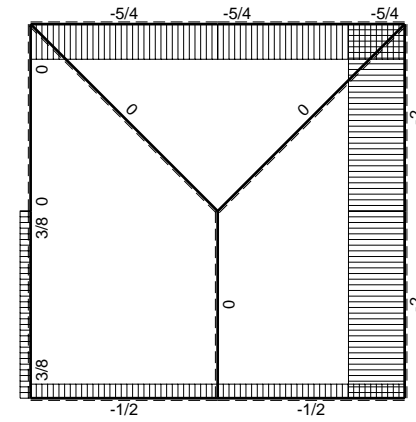
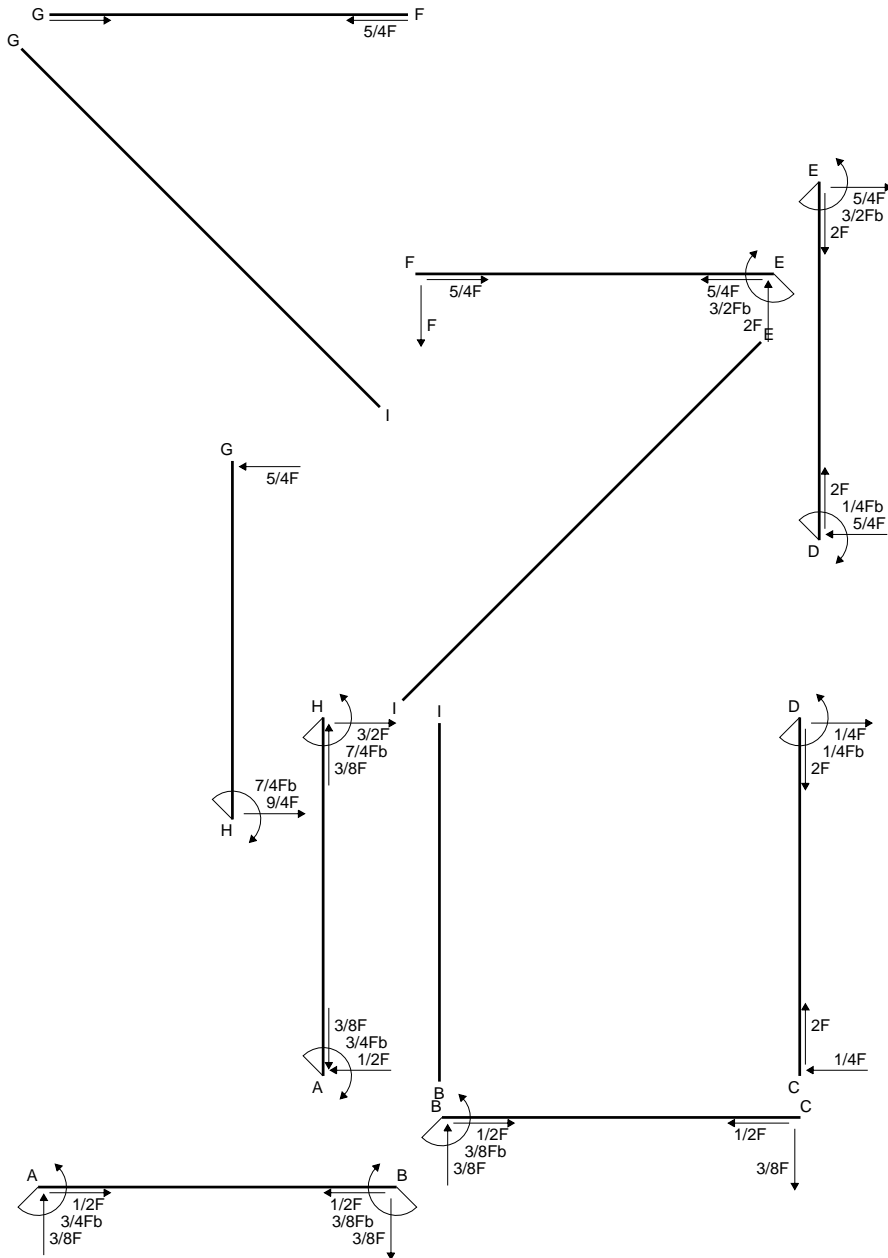
$$= \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 3/4 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

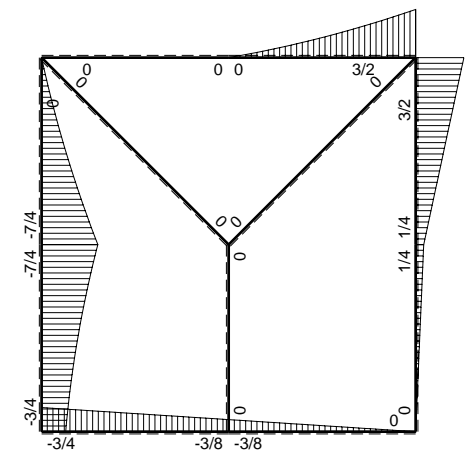
$$= \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 3/4 Fb^2/EJ$$

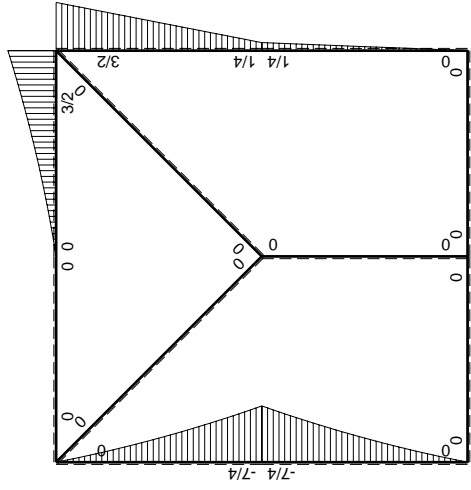
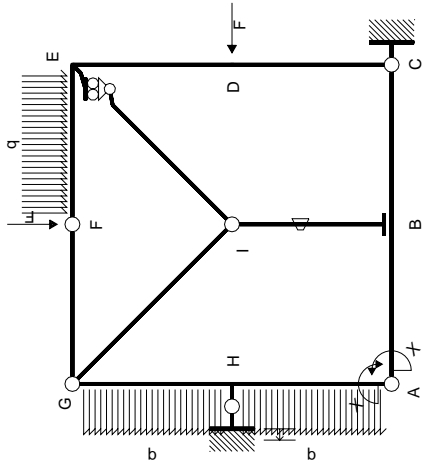


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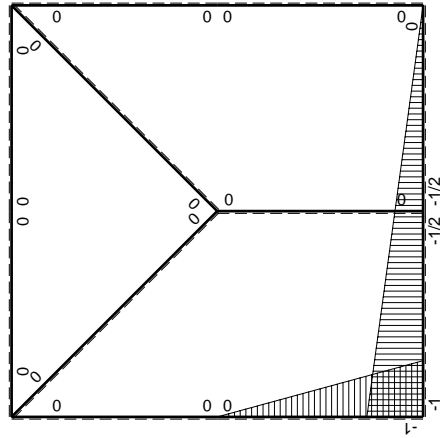
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

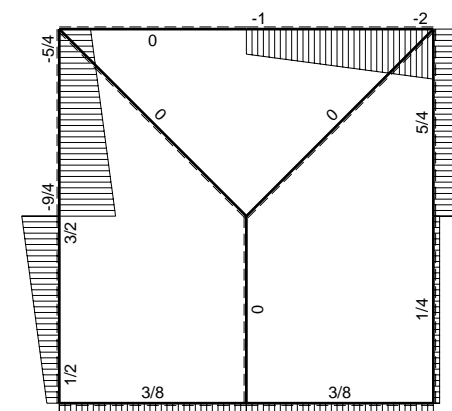
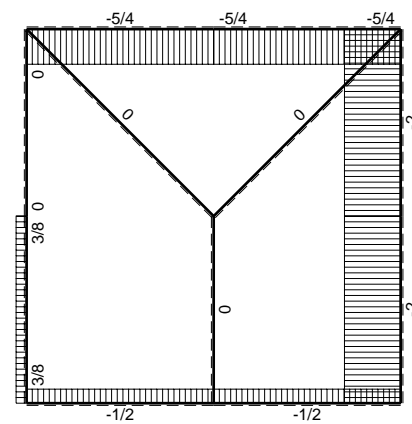
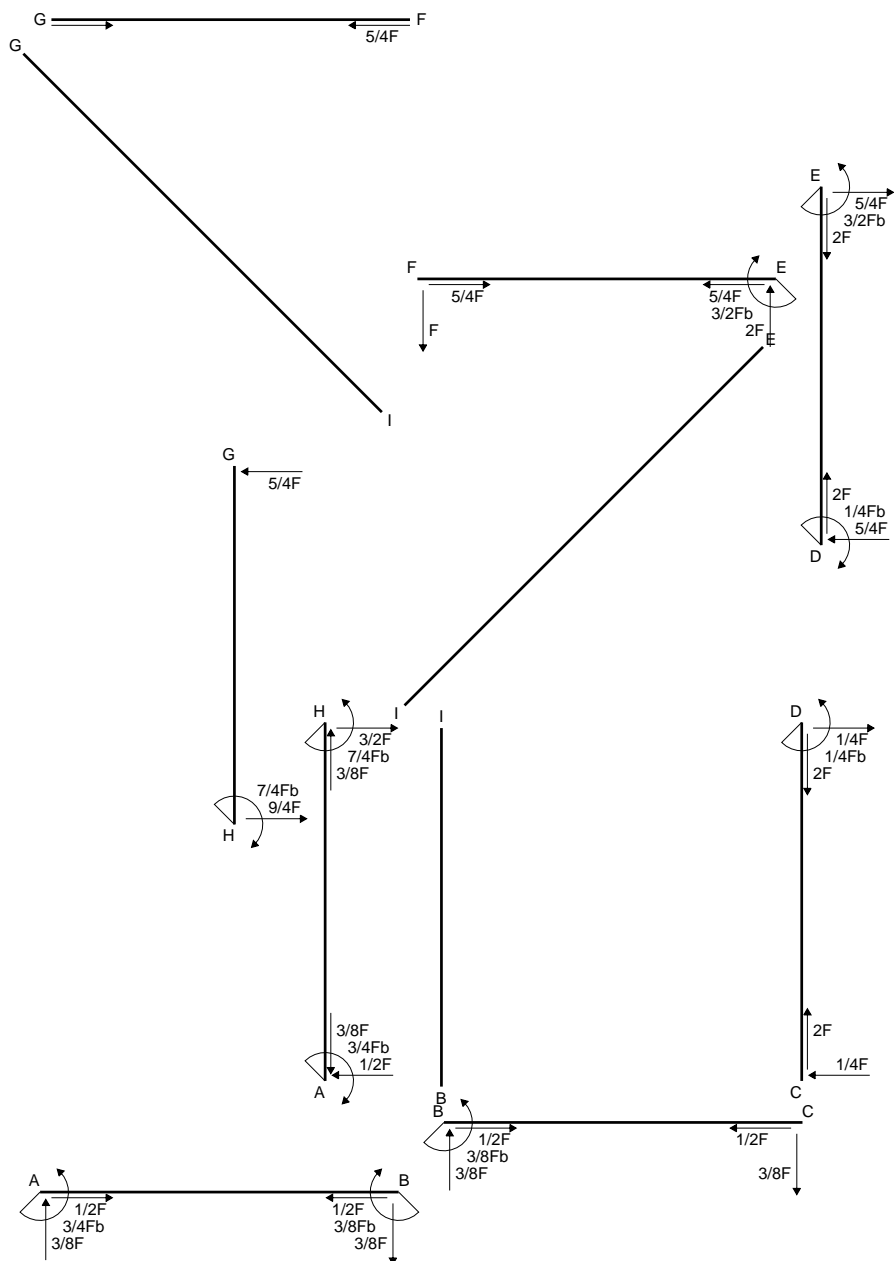
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

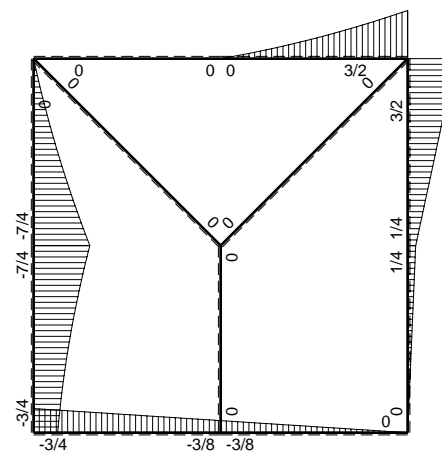
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

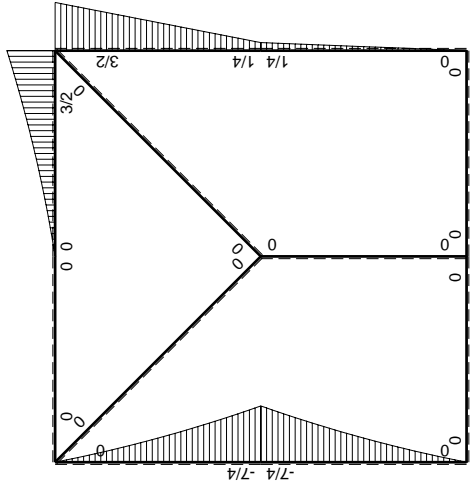
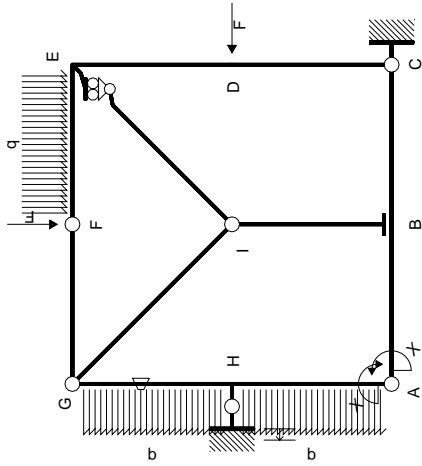


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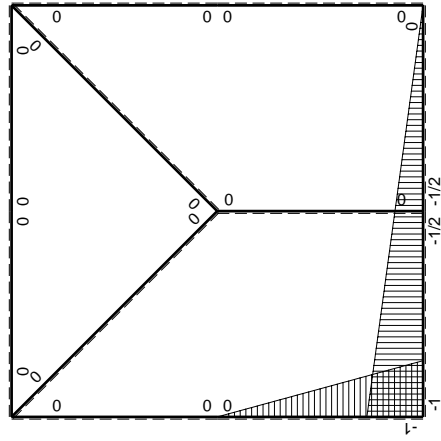
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

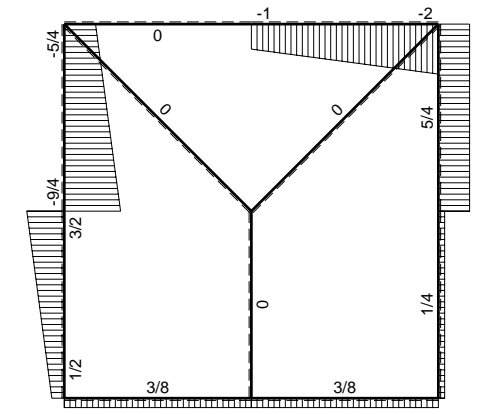
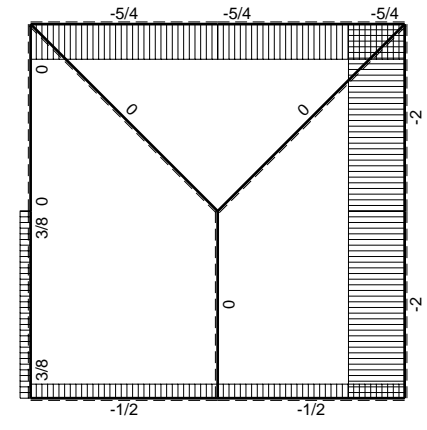
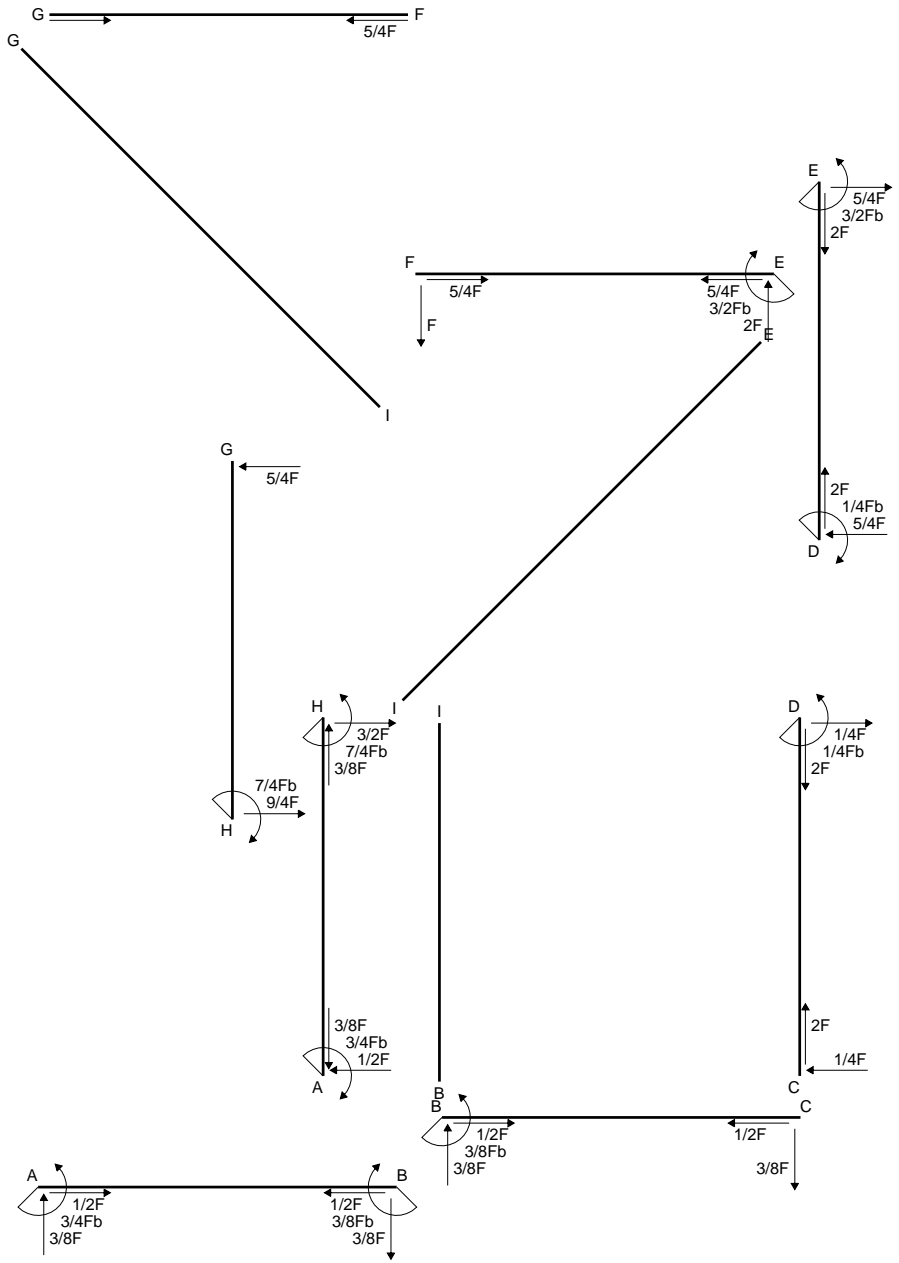
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

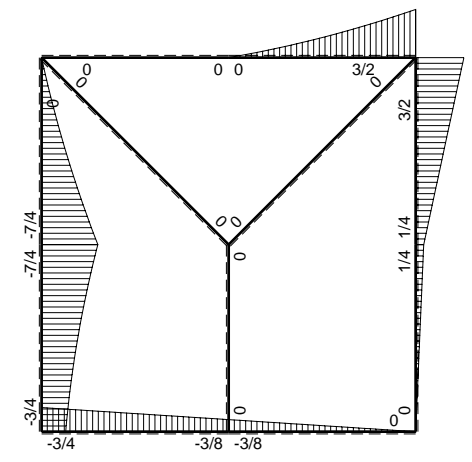
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

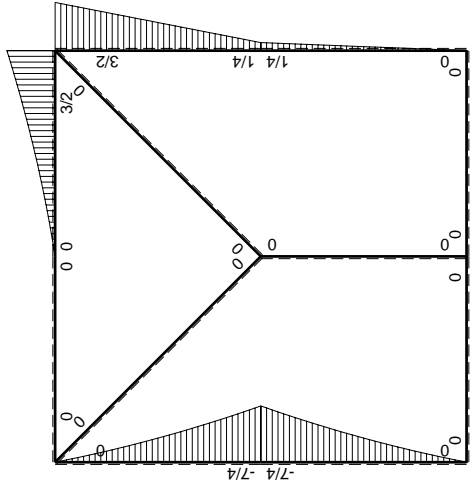
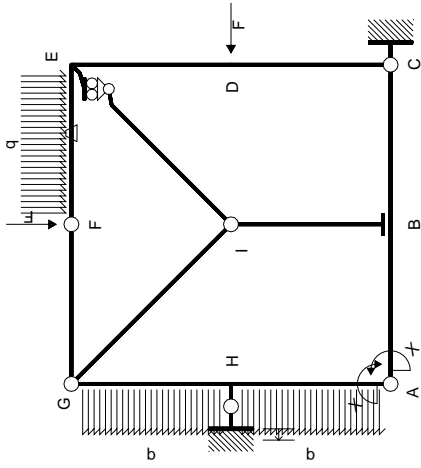


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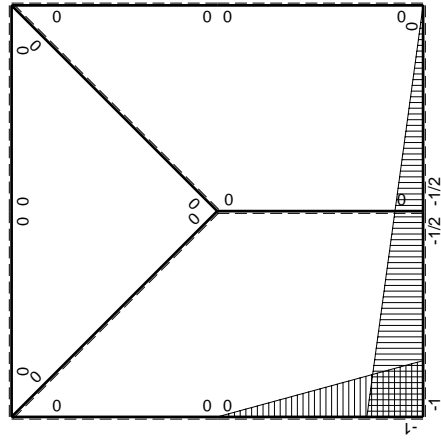
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

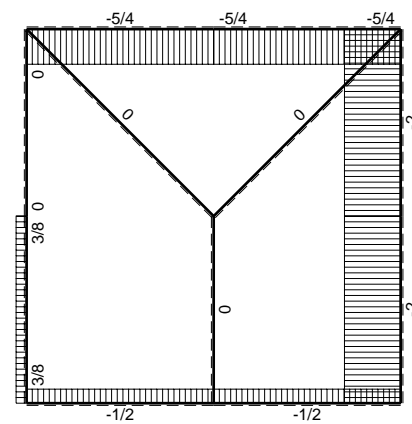
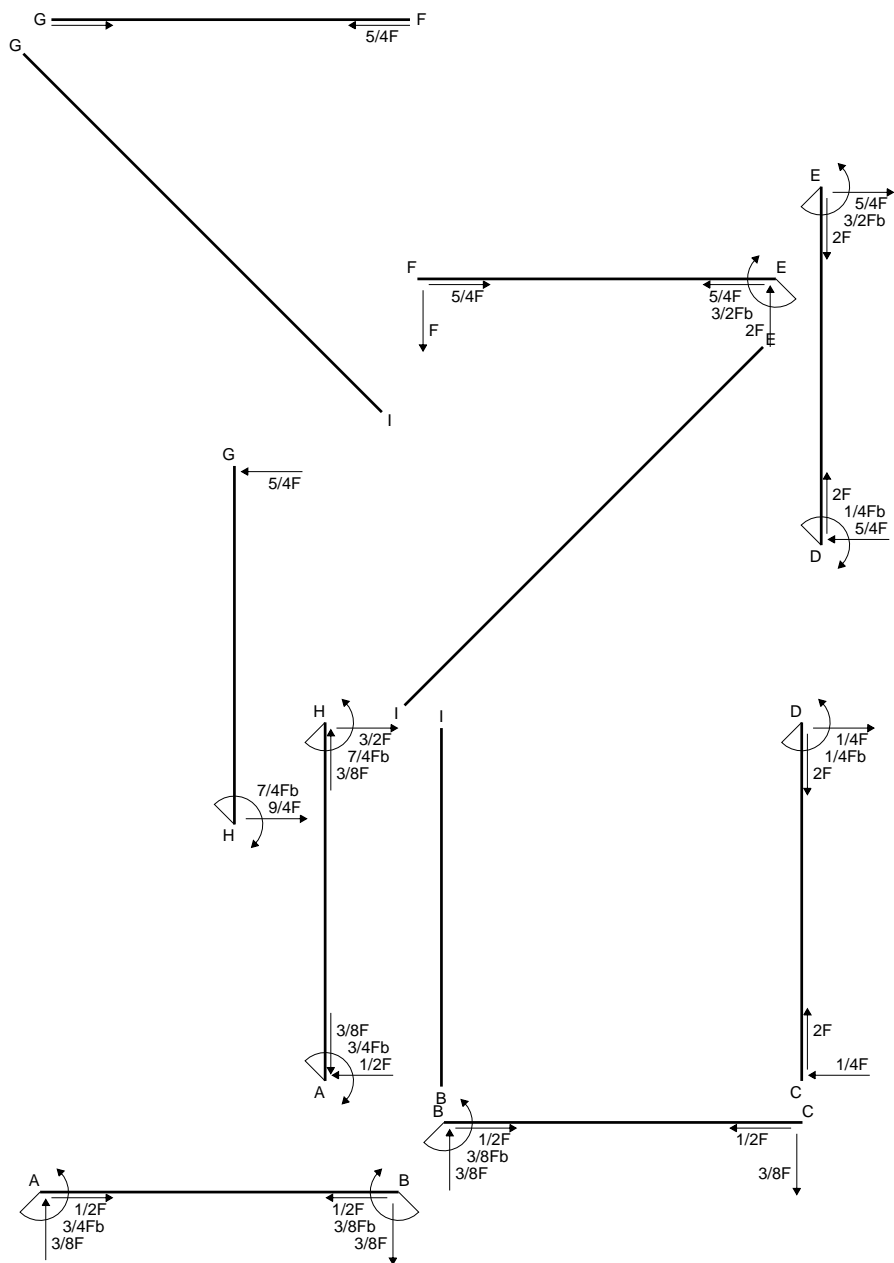
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

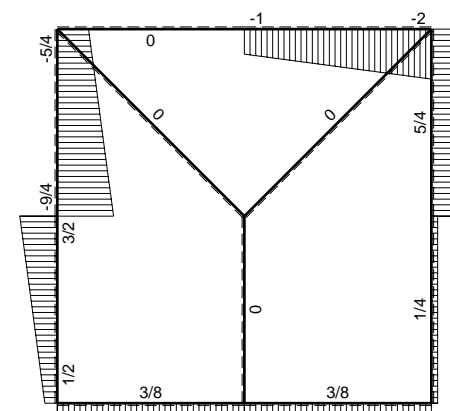
$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

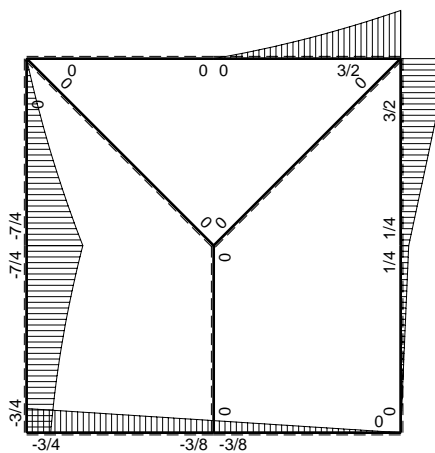
$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$



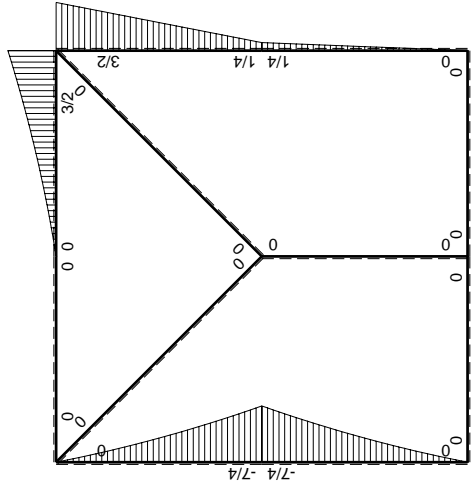
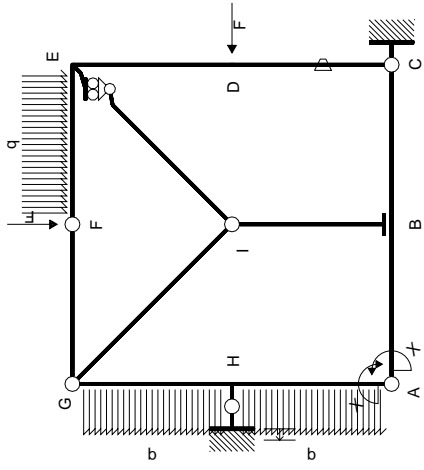
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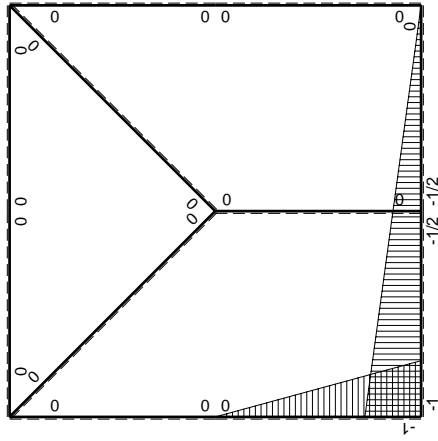
↑ ⊕ ↓ F



⊕ ⊖ F_b



(\oplus) M_0 flessione da carichi assegnati



(\oplus) M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	Fb/EJ	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

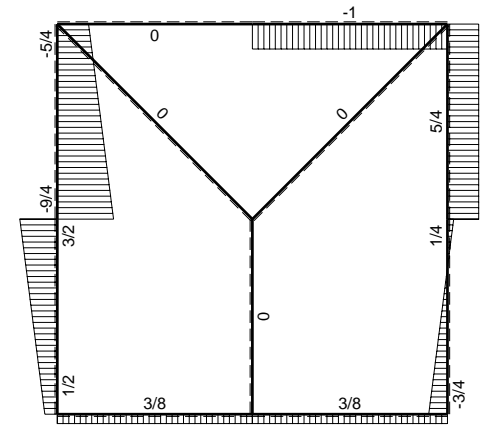
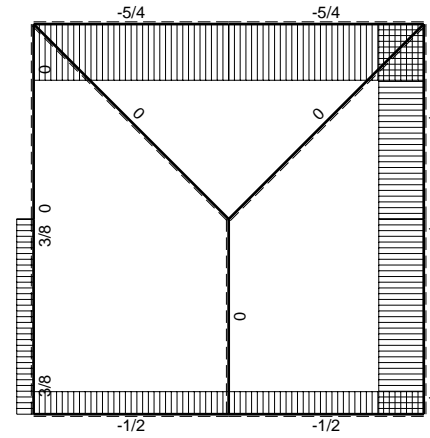
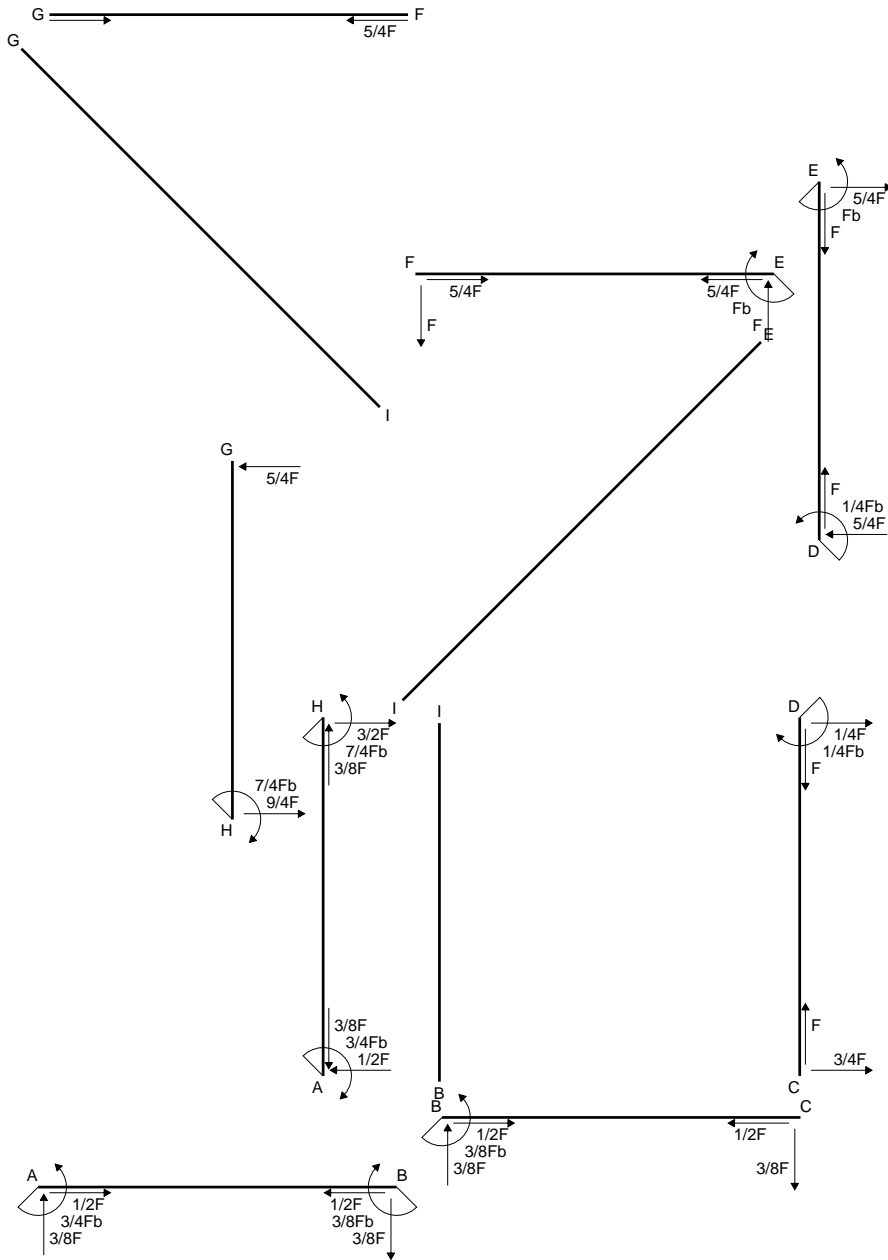
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

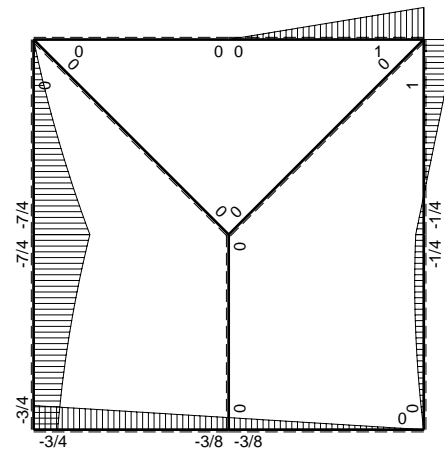
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

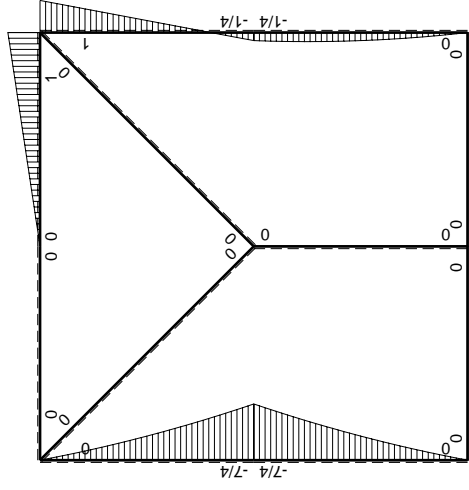
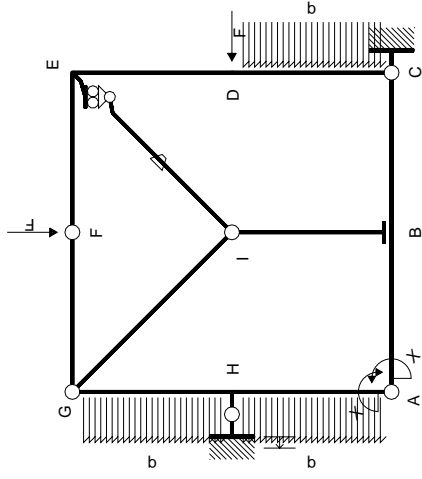


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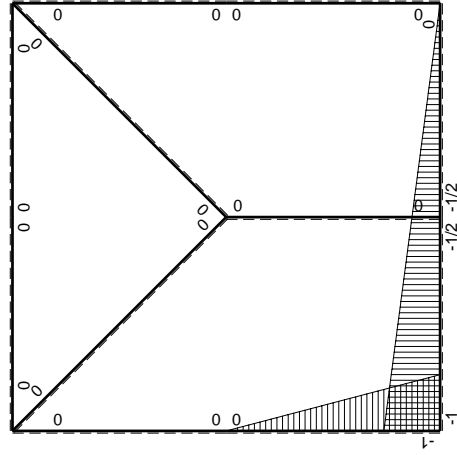
↑ ⊕ ↓ F



⊕ ⊖ F_b



M₀ flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

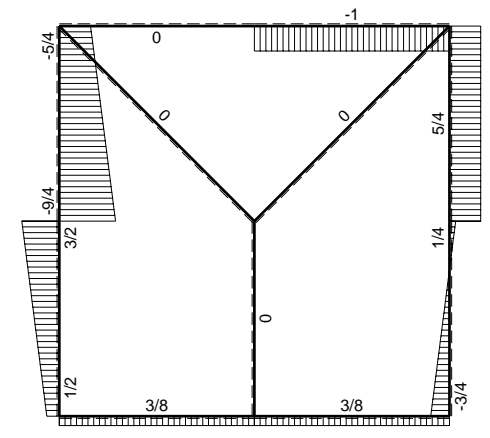
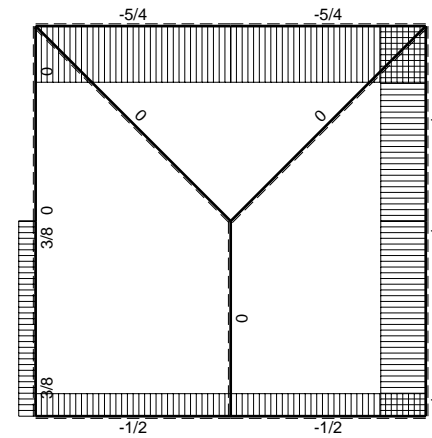
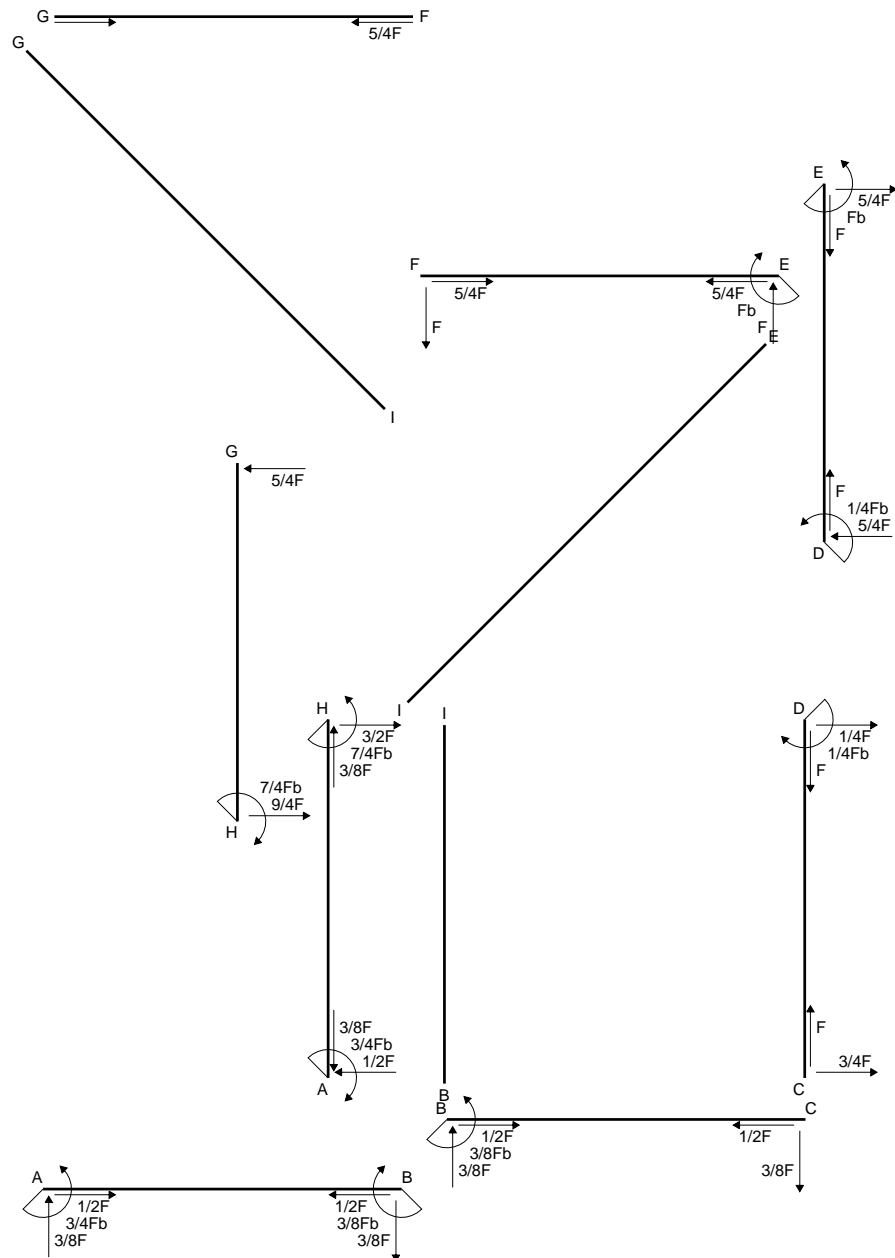
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

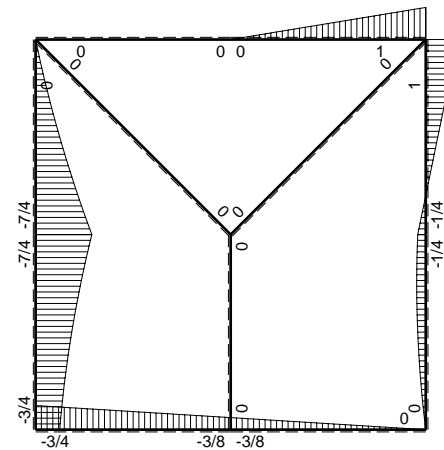
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

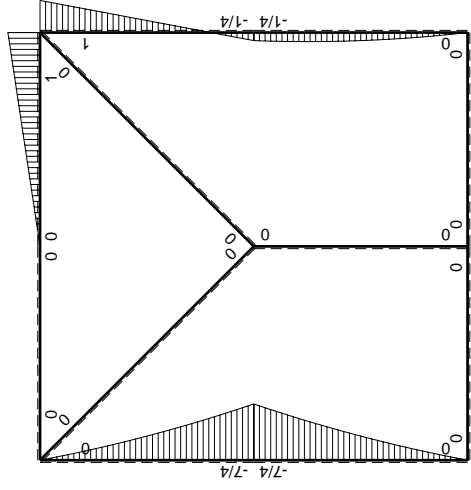
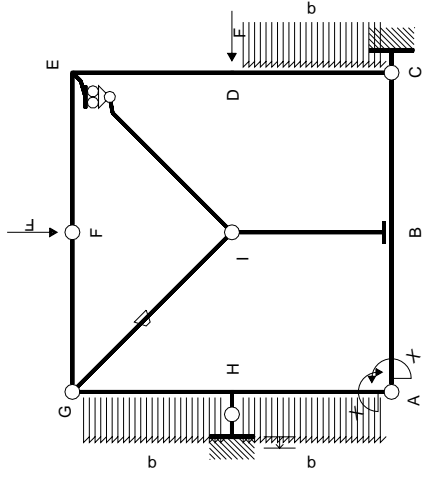


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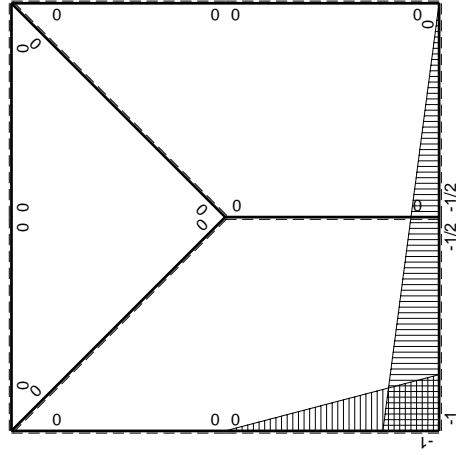
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

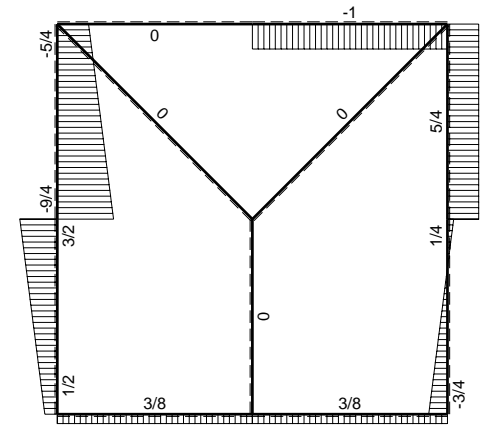
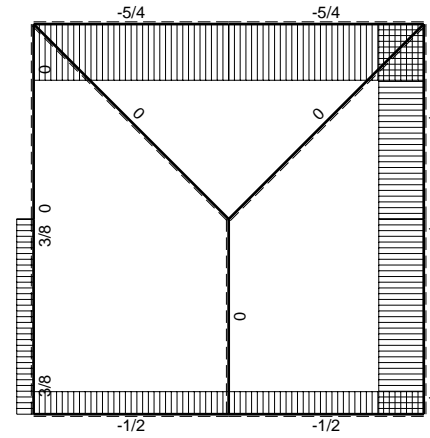
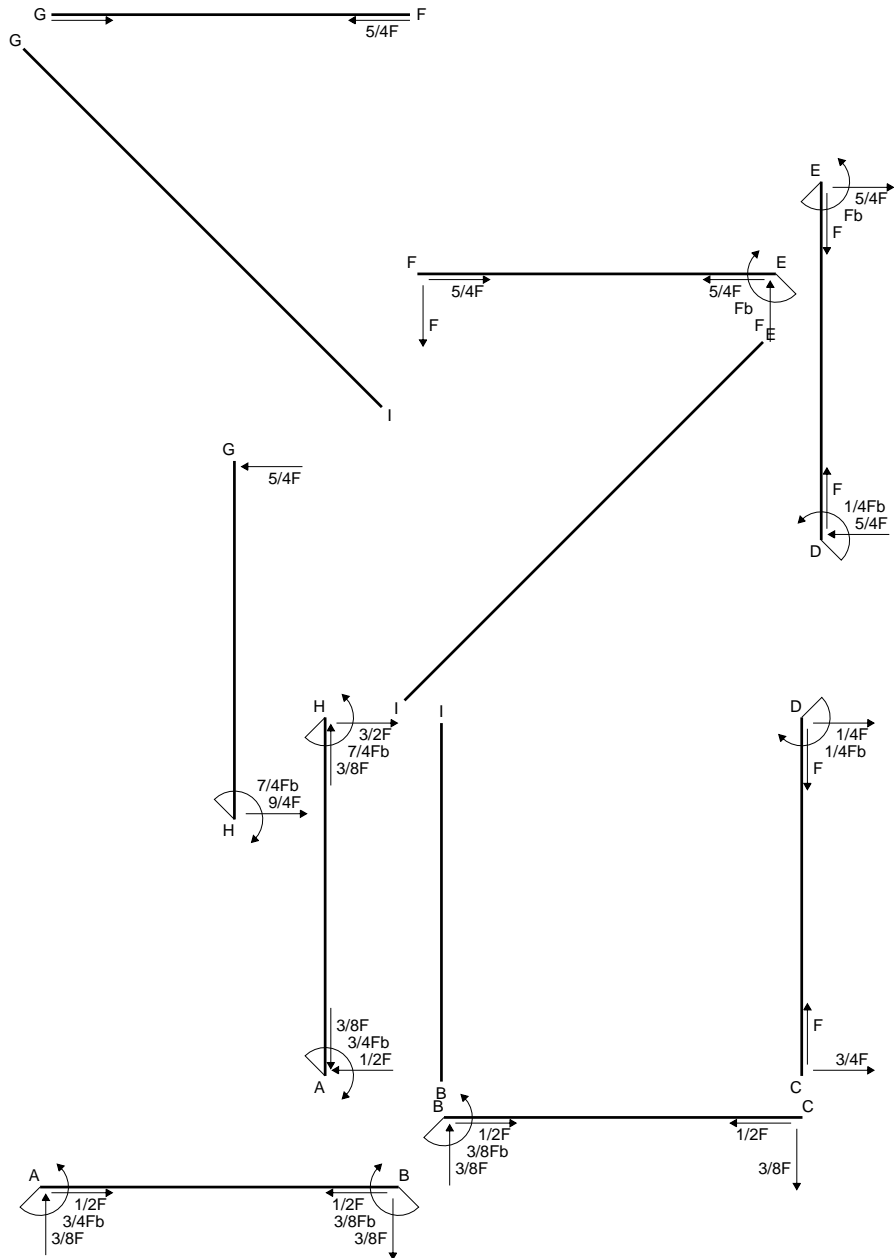
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

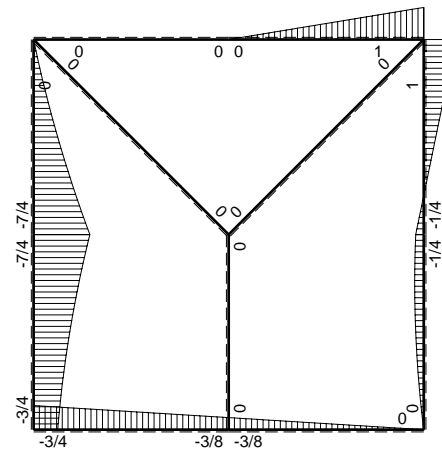
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

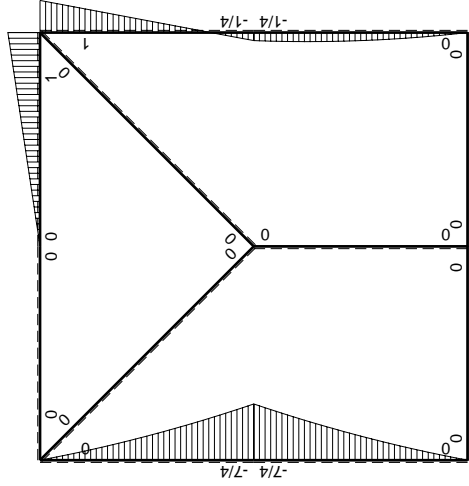
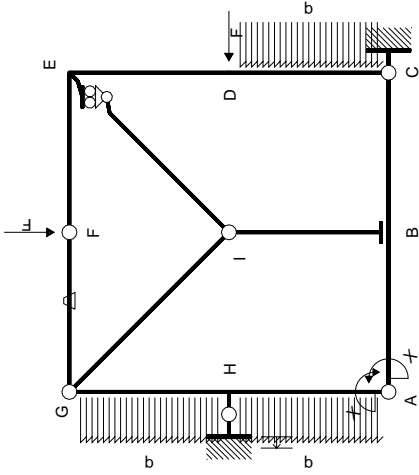


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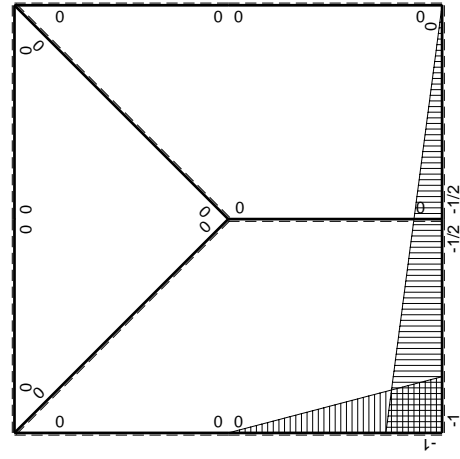
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_1 flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

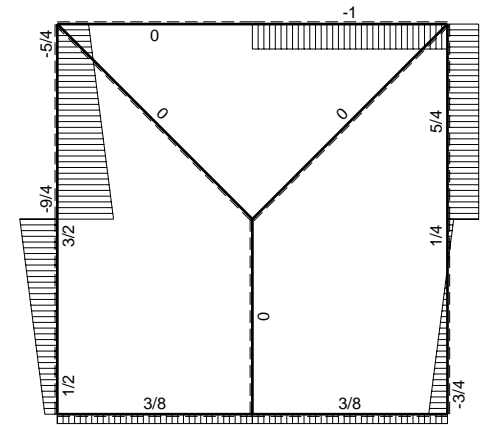
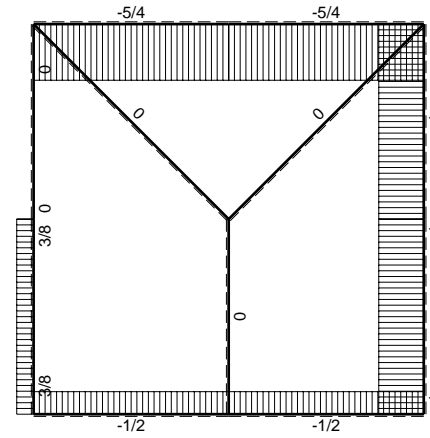
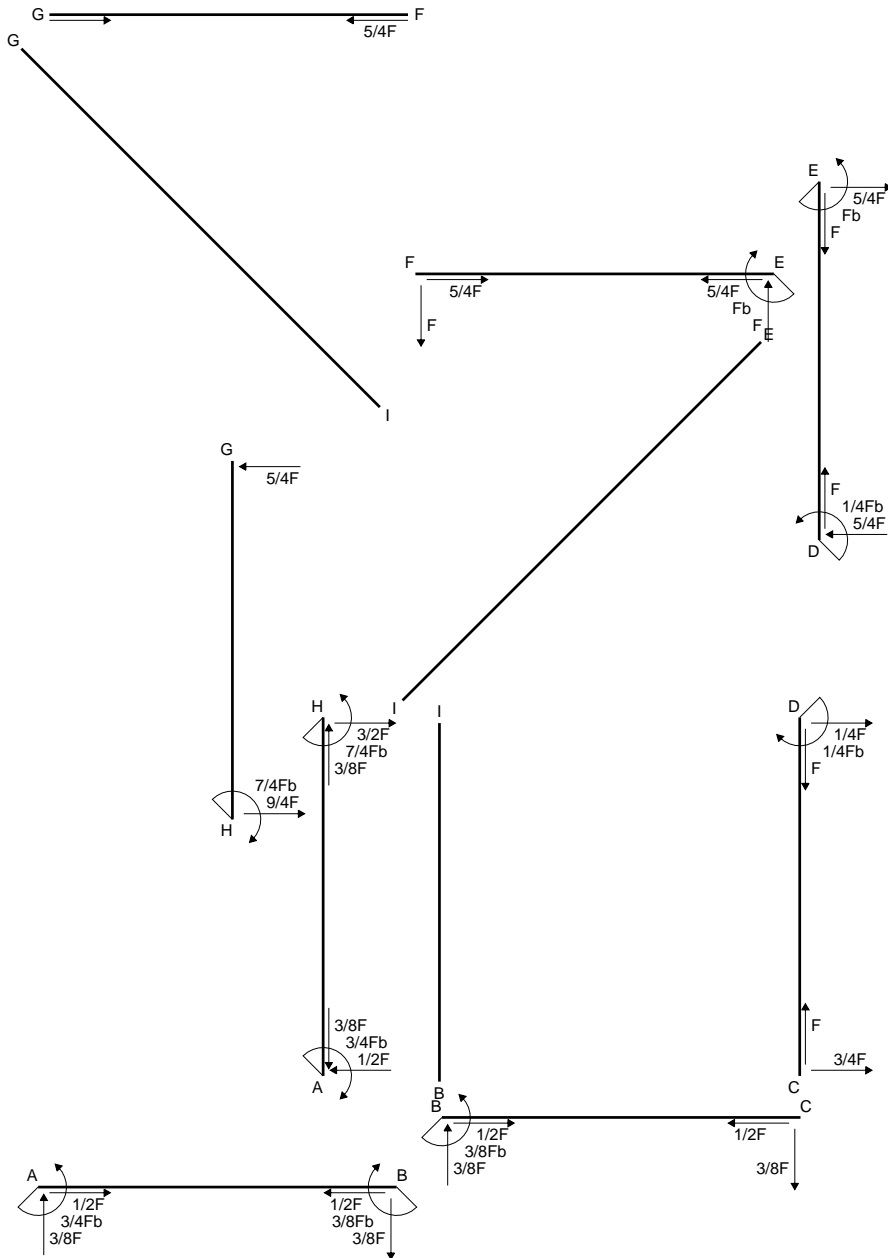
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

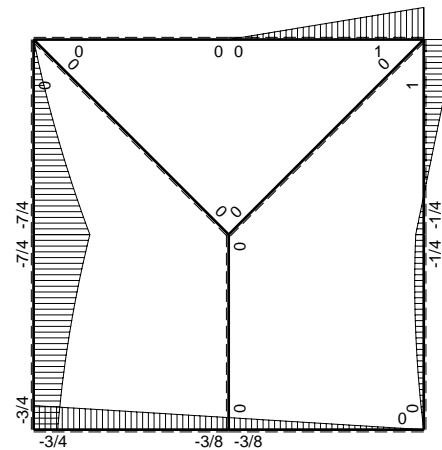
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

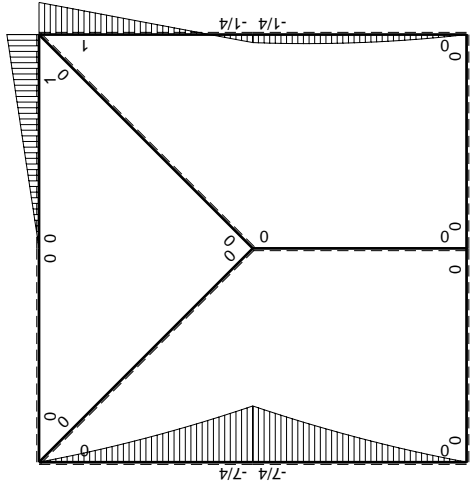
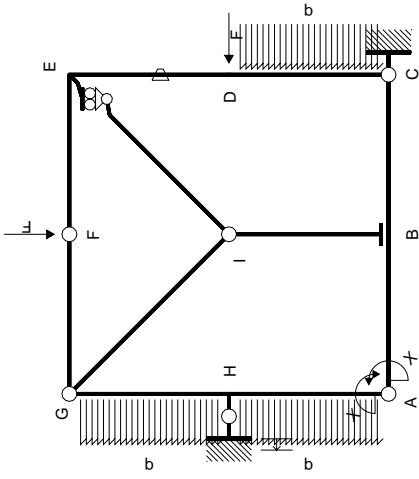


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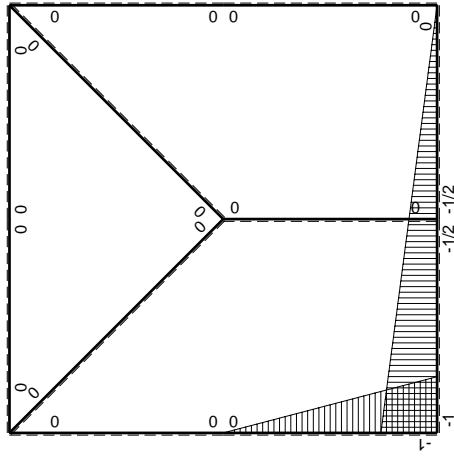
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

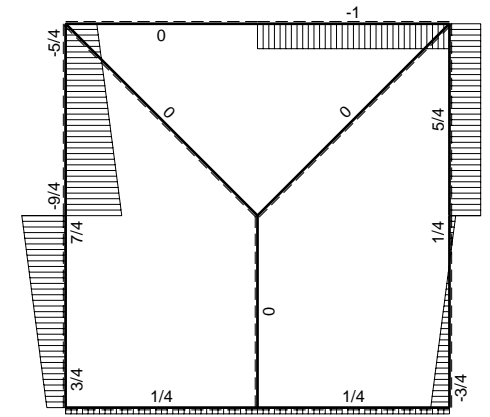
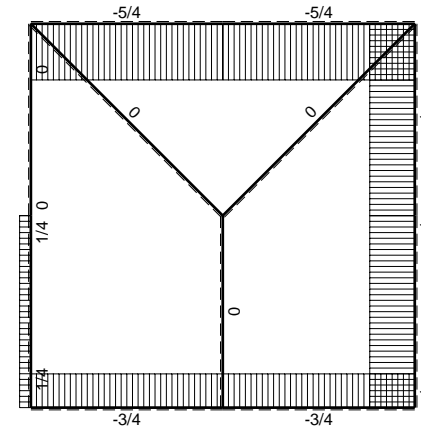
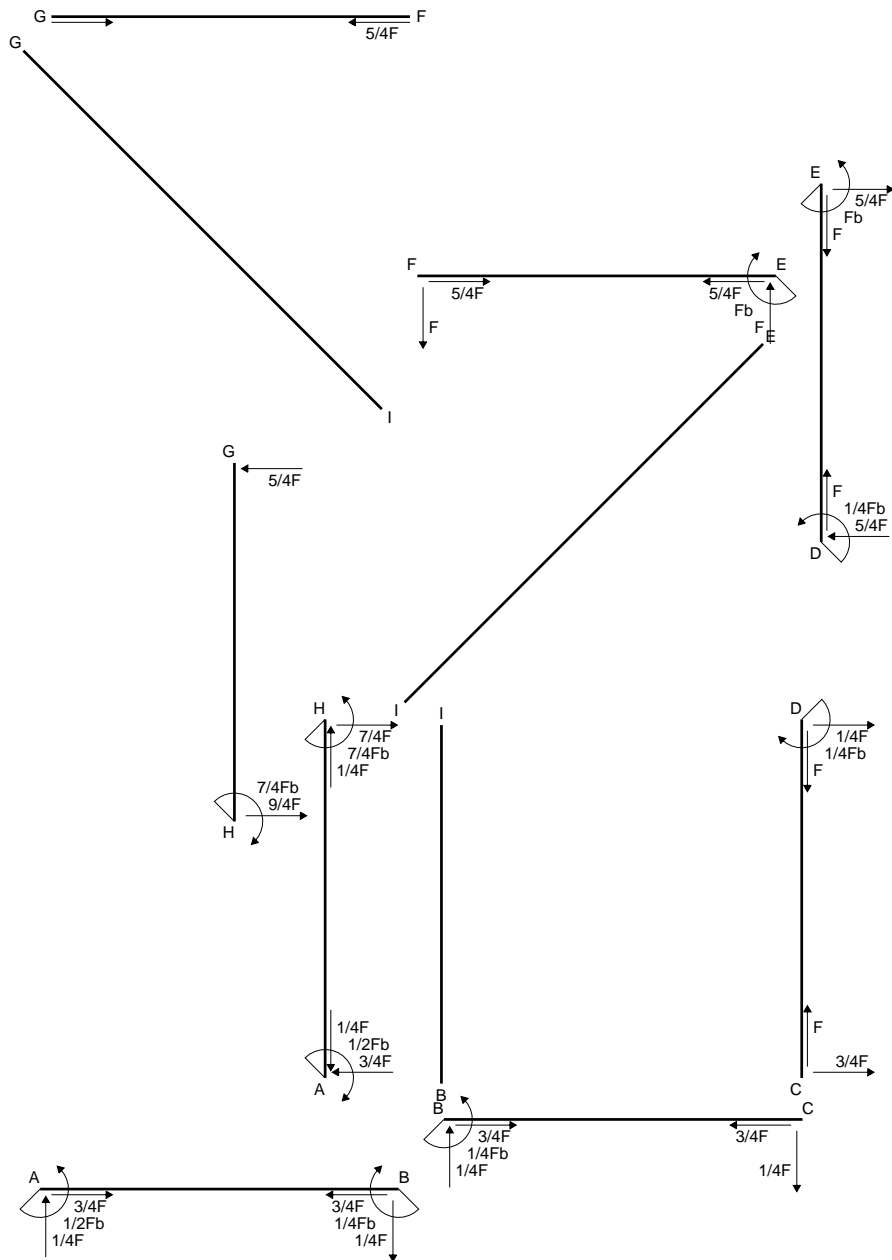
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

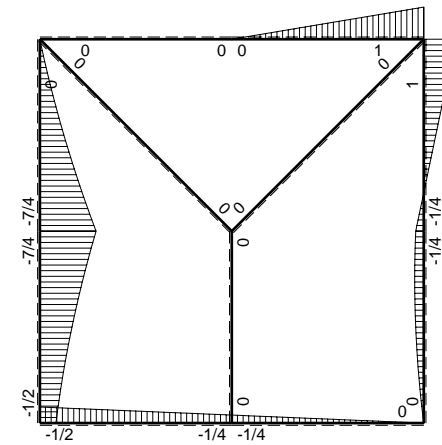
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

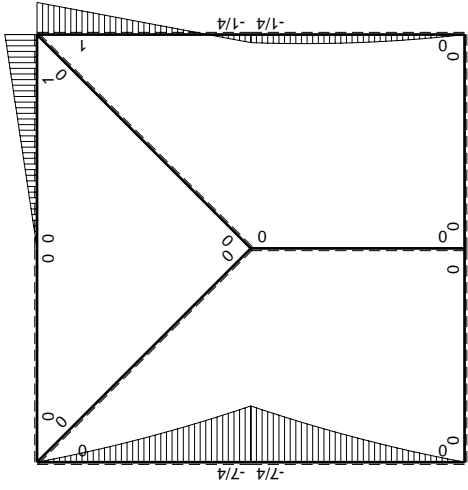
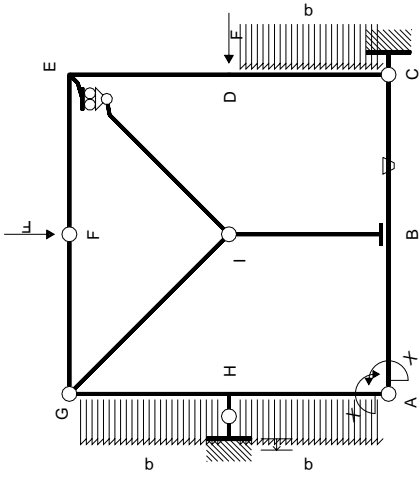


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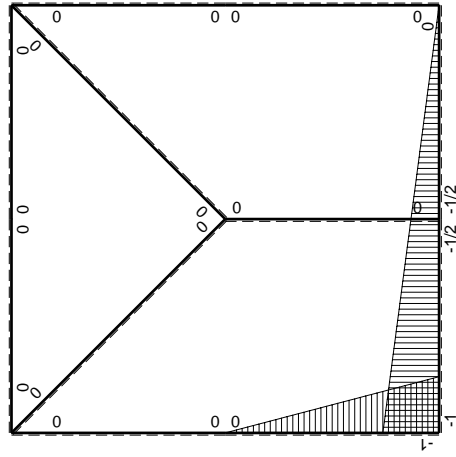
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	$-Fb/EJ$	0	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(0+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	Fb/EJ	0	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/2Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/2Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{BC}^{xo} = \int_0^b (1/2 - 1/2 x/b) \theta dx = [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (1/2 b - 1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/2 x/b) \theta dx = [-1/4 x^2/b]_0^b \theta$$

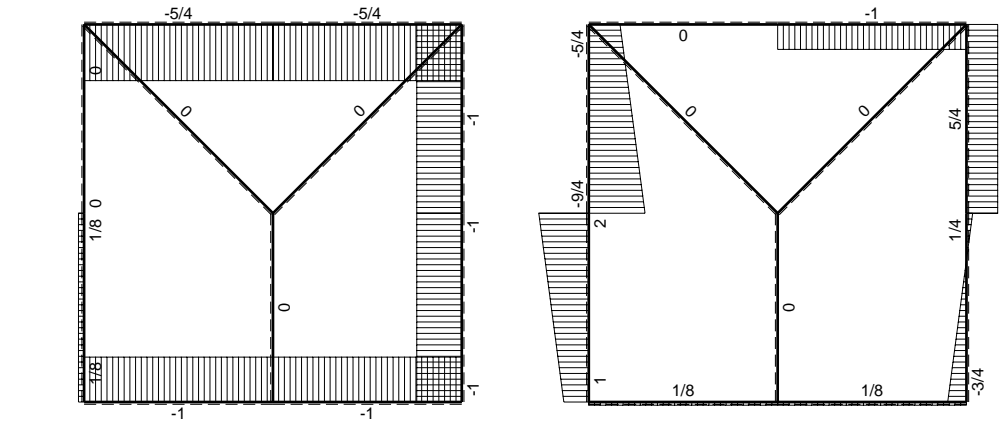
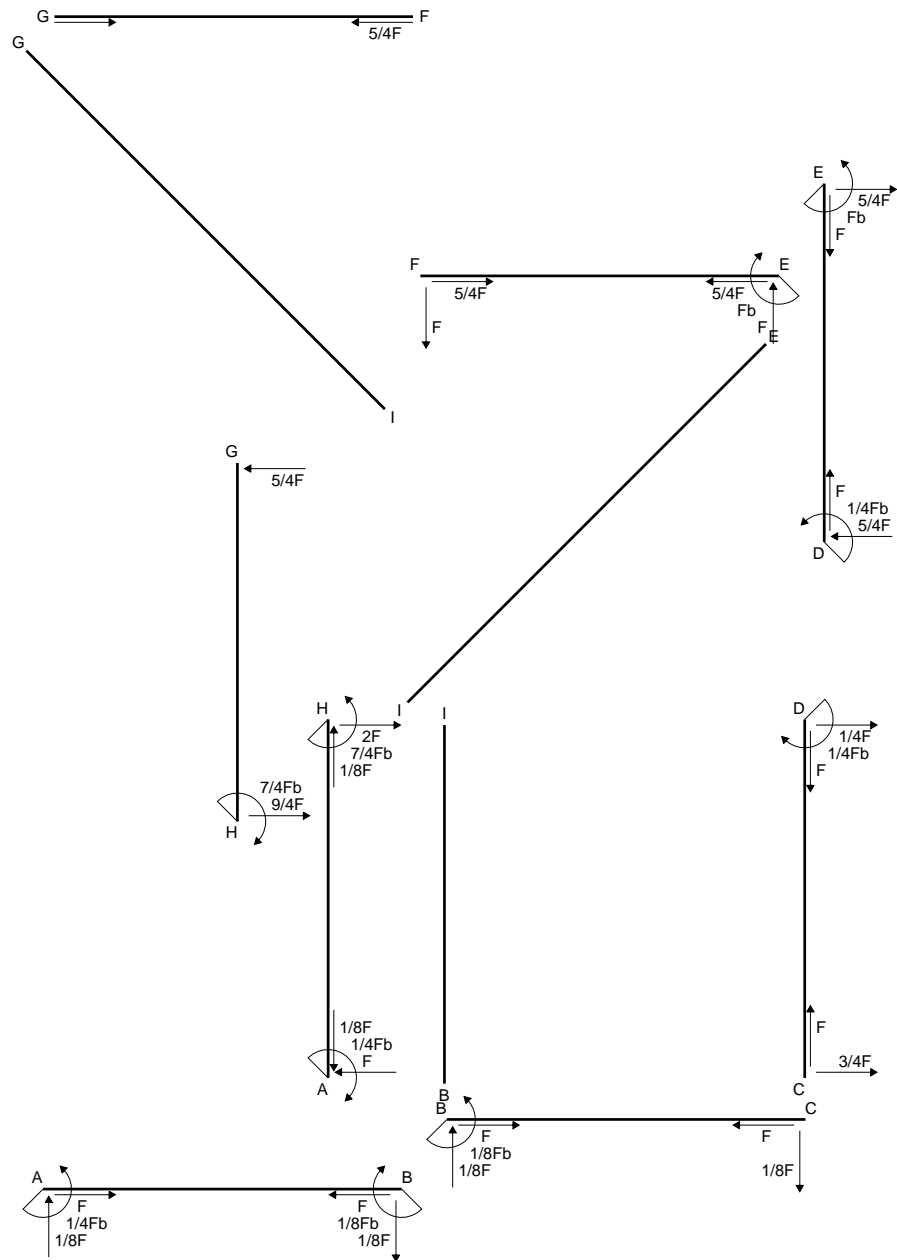
$$= (-1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

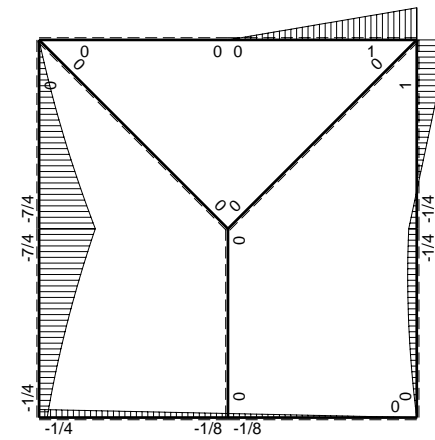
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

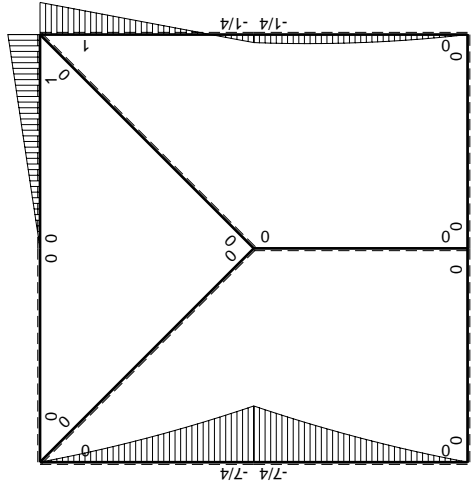
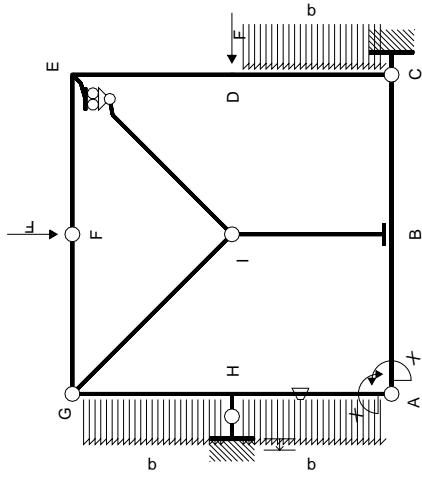


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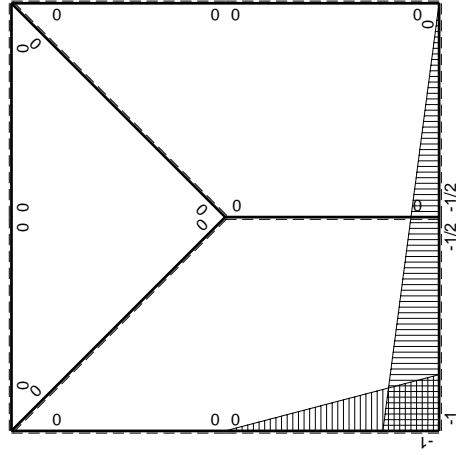
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_1 flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	$-Fb/EJ$	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/4+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	Fb/EJ	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

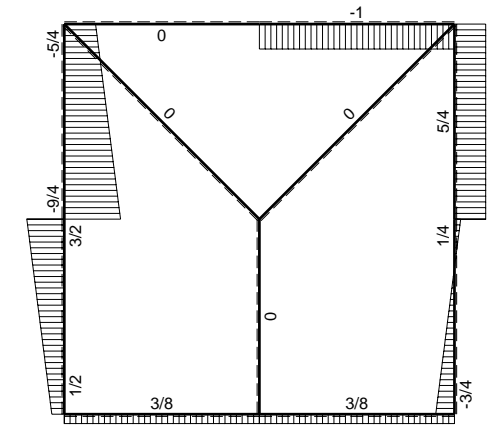
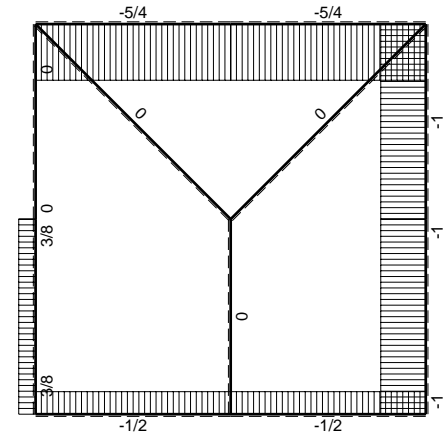
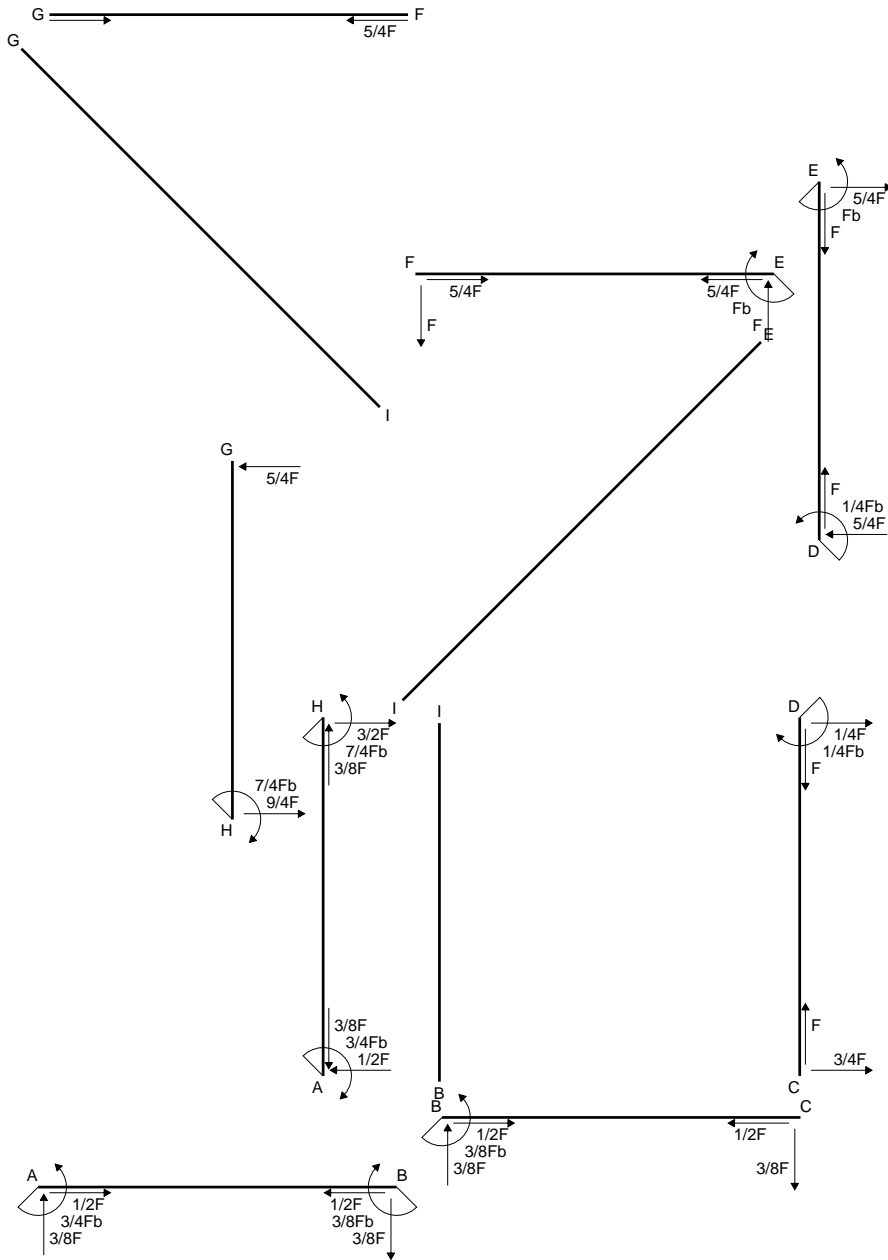
$$= \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 3/4 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

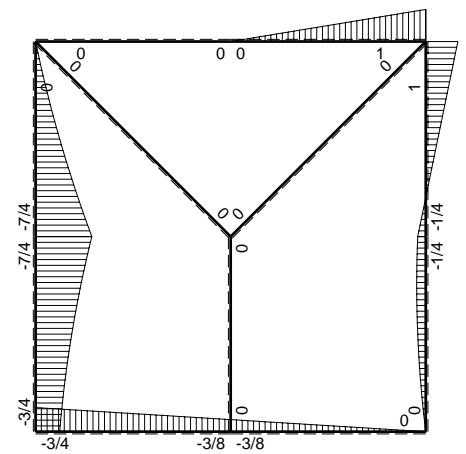
$$= \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 3/4 Fb^2/EJ$$

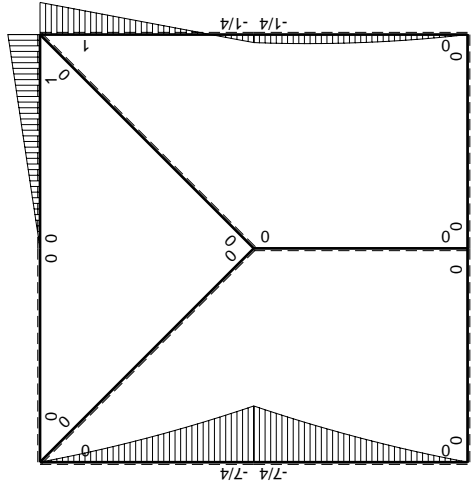
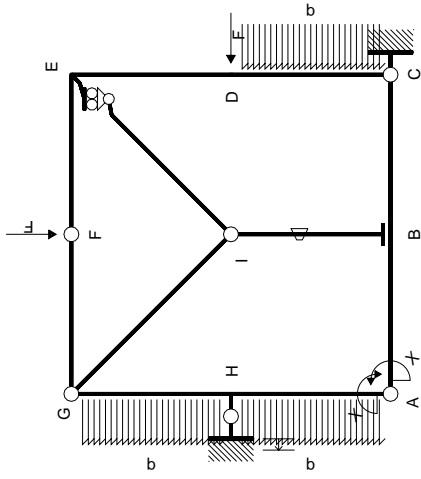


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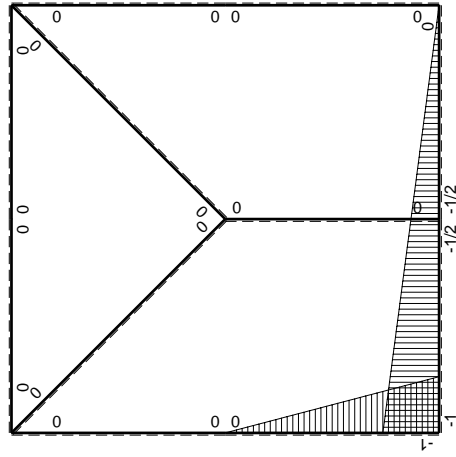
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

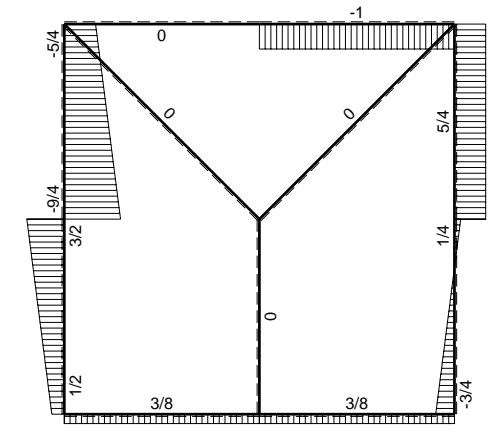
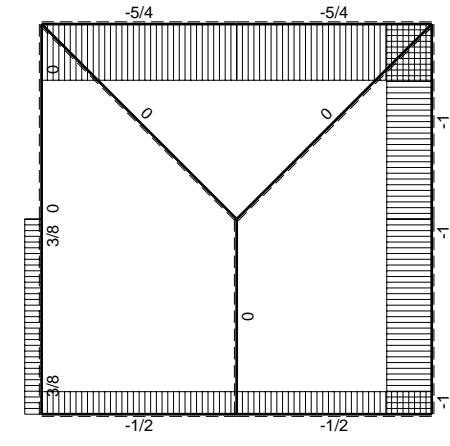
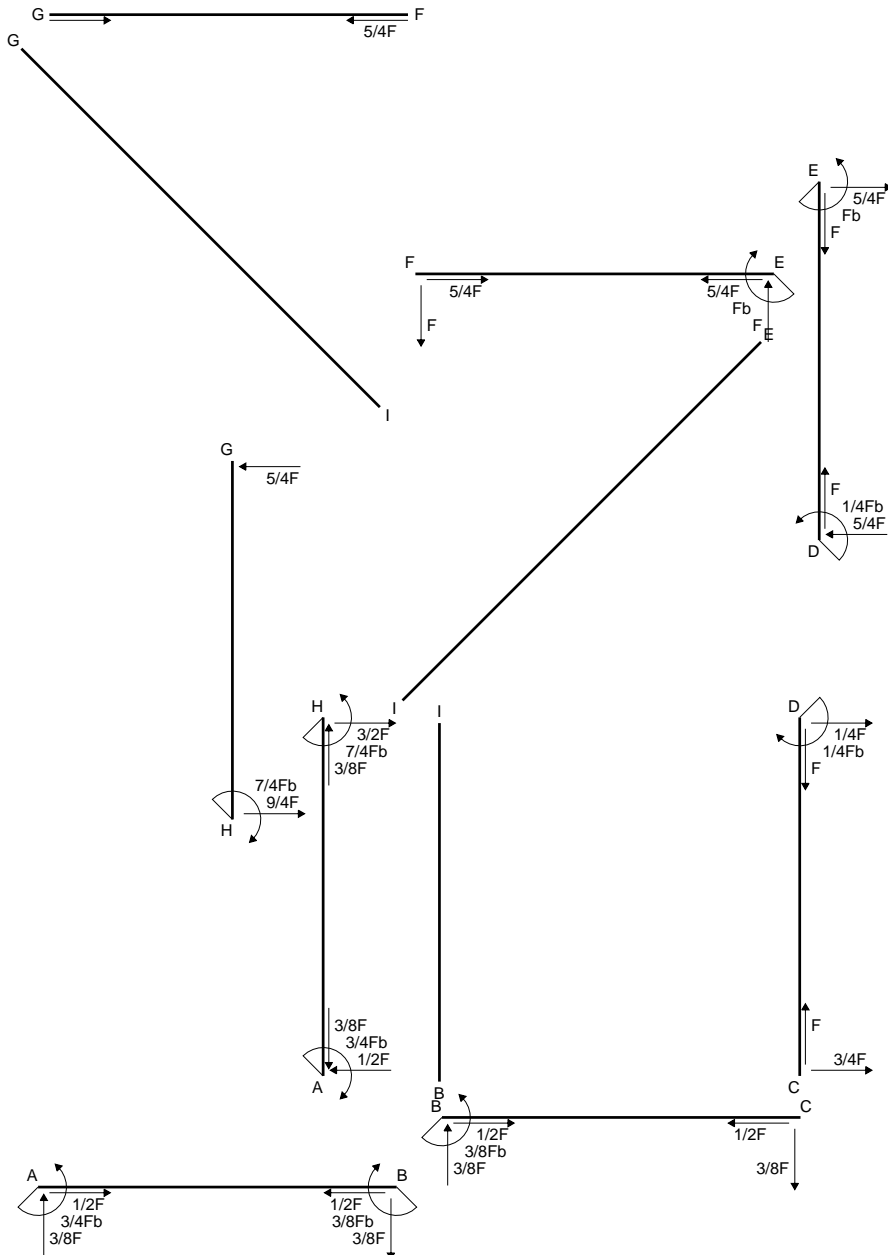
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

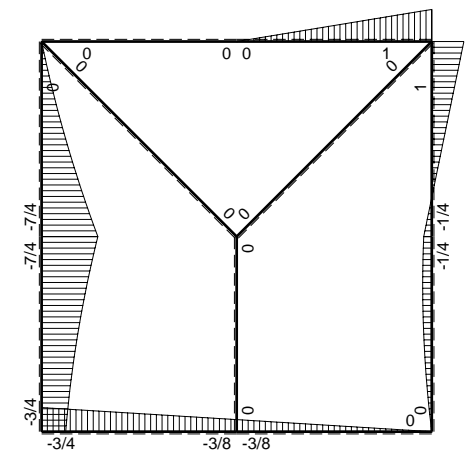
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

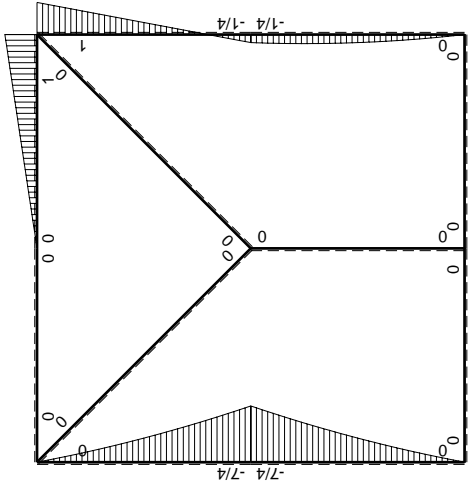
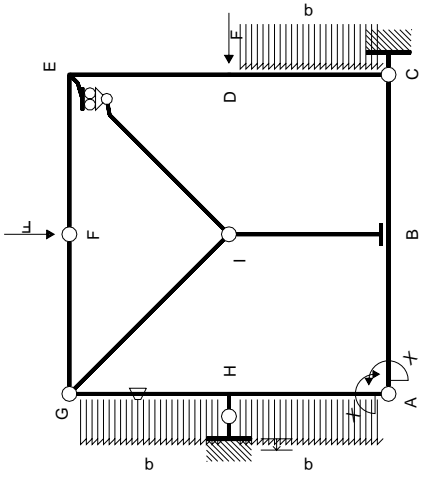


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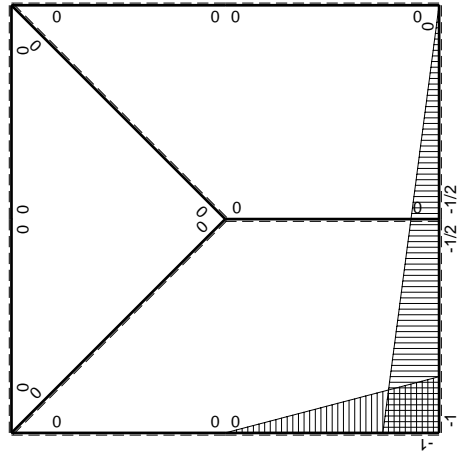
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

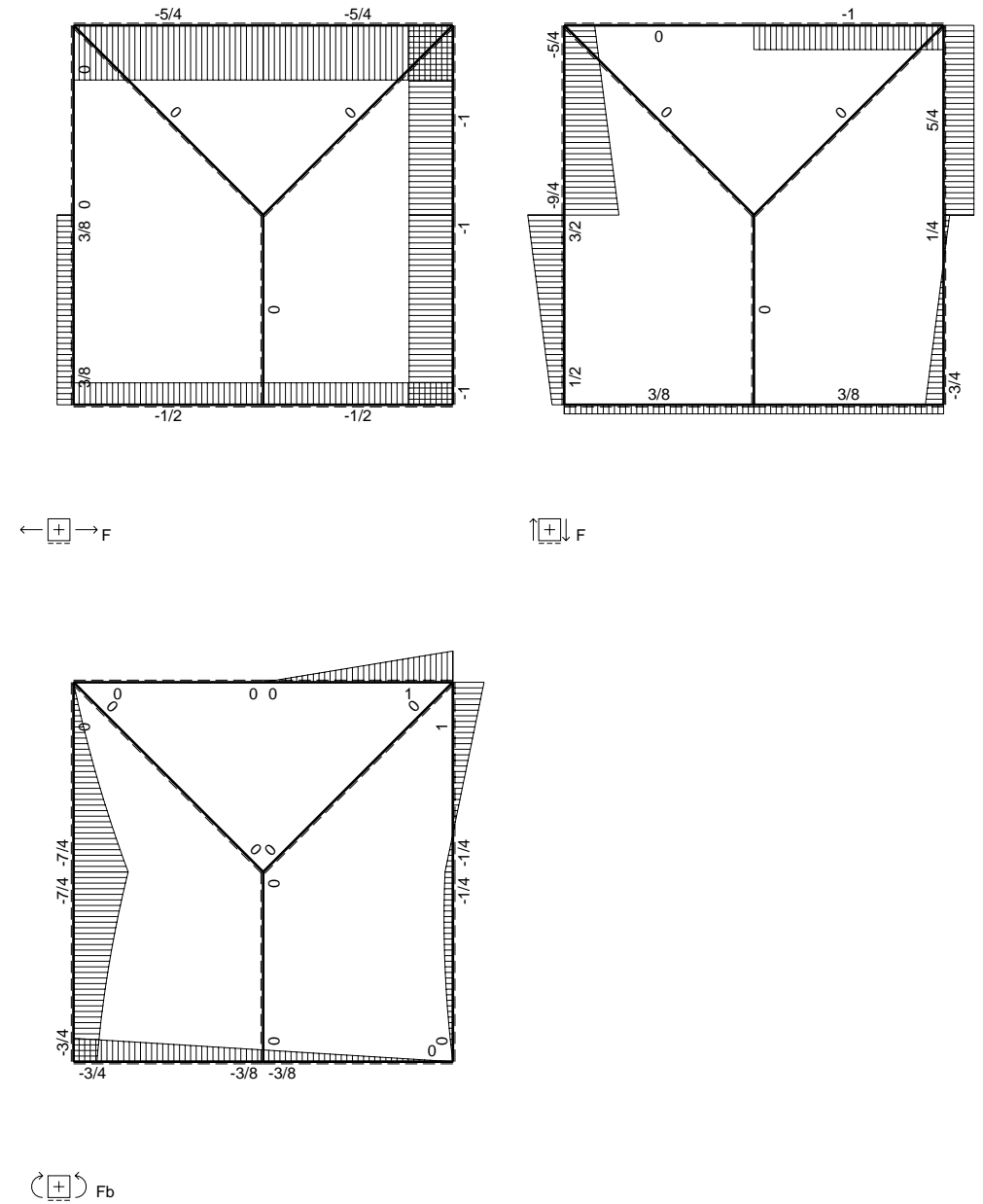
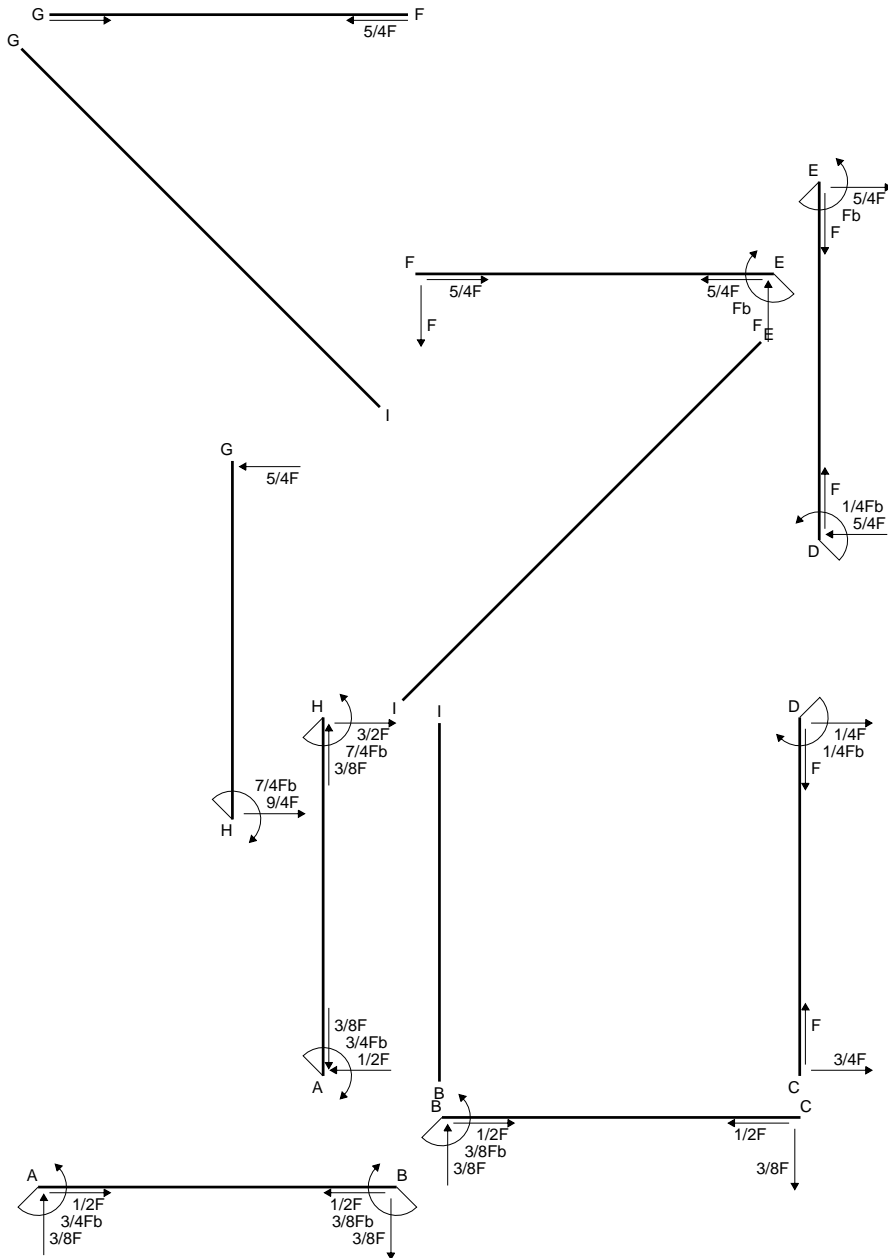
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

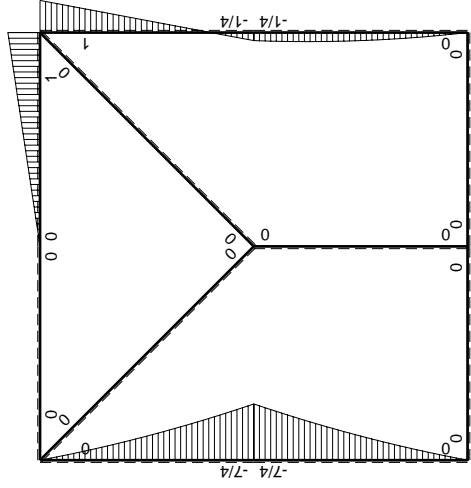
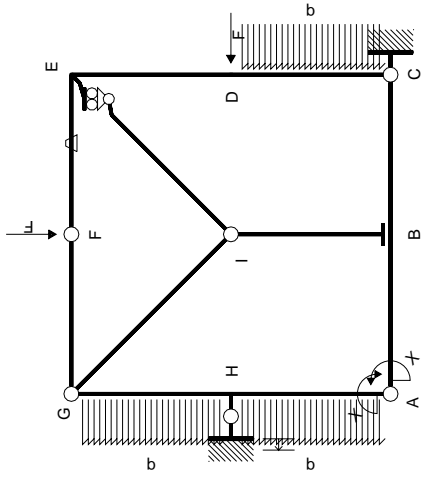
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

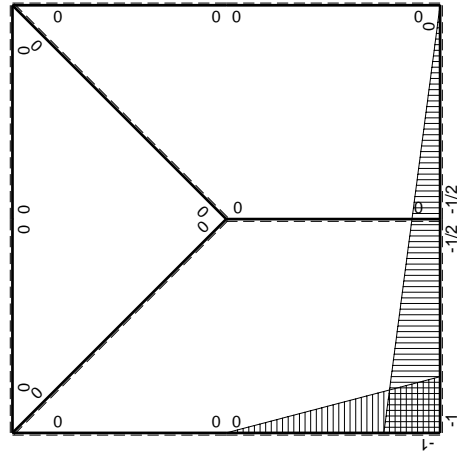
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

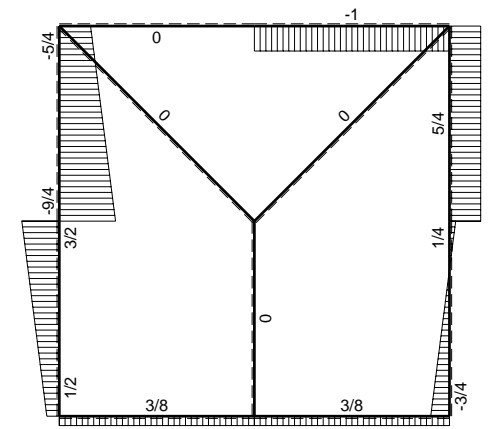
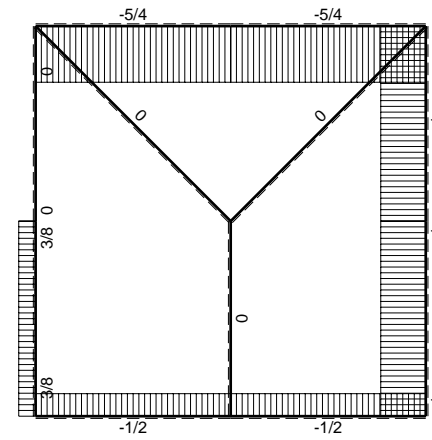
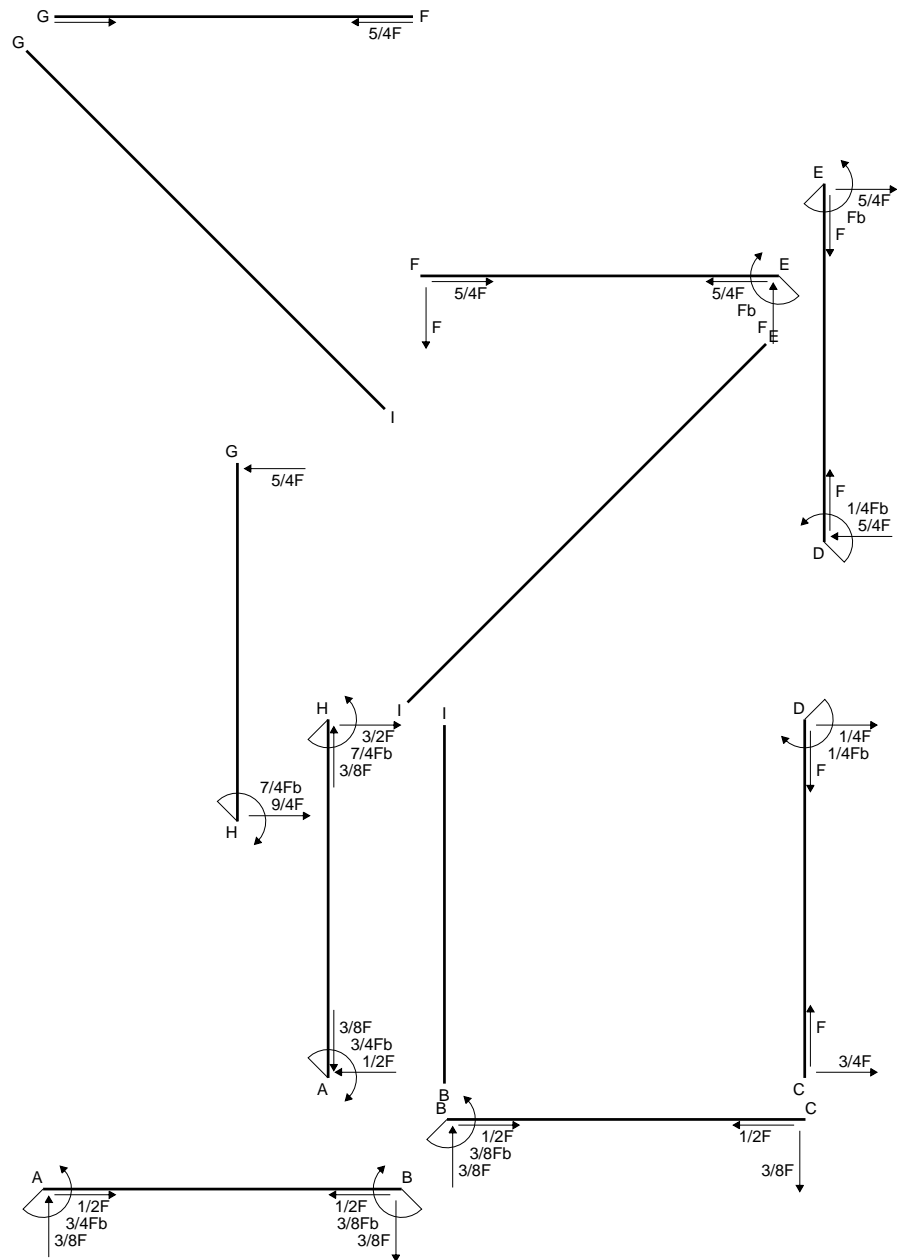
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

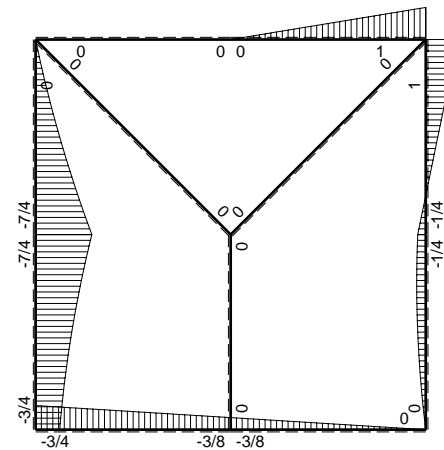
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

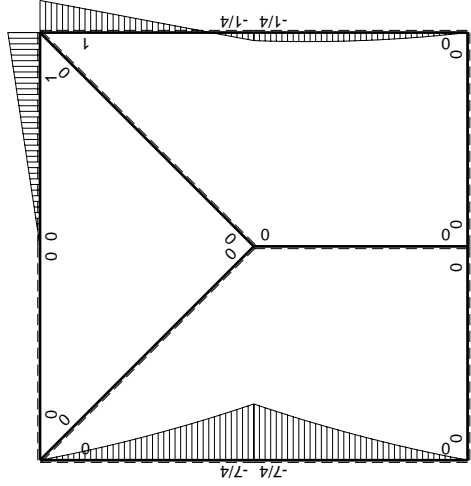
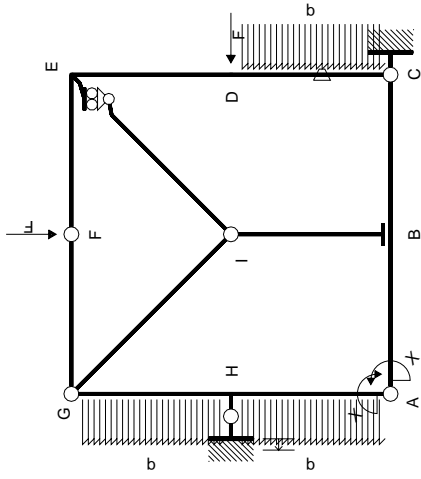


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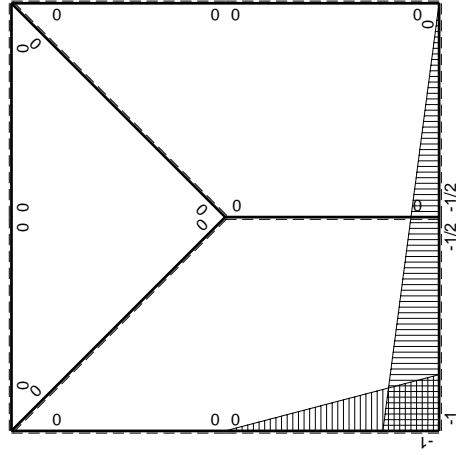
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⊕ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	Fb/EJ	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

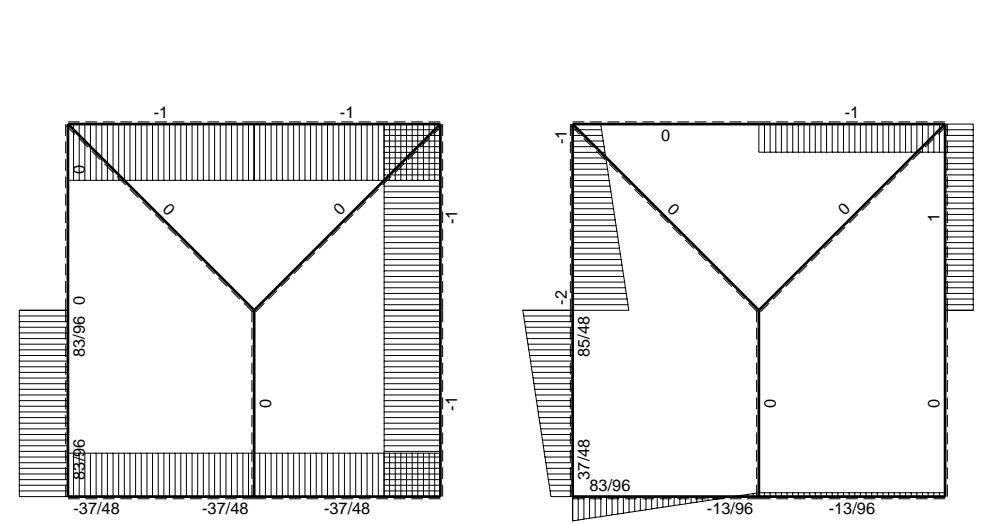
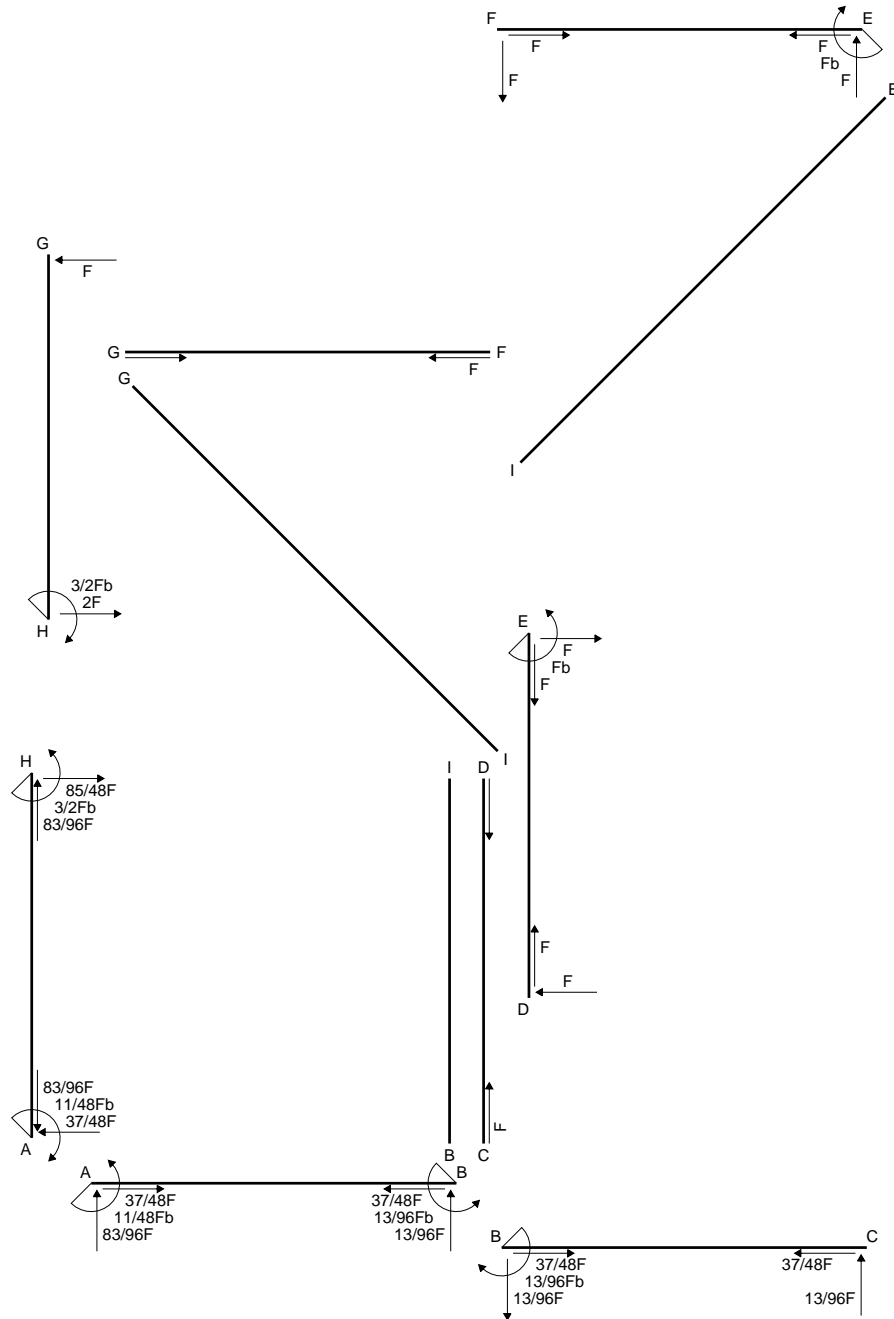
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

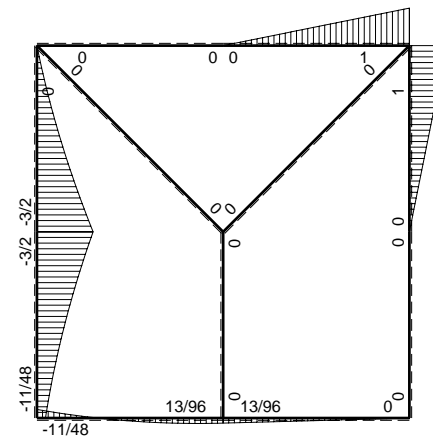
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

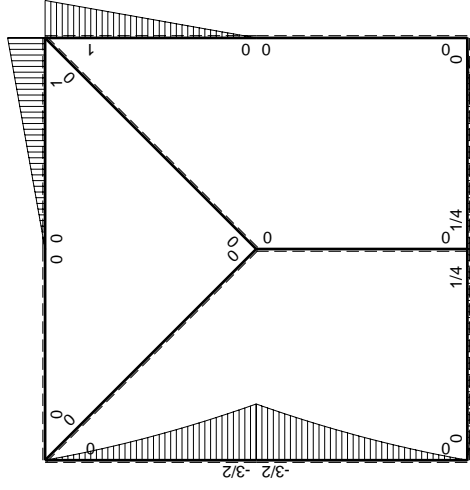
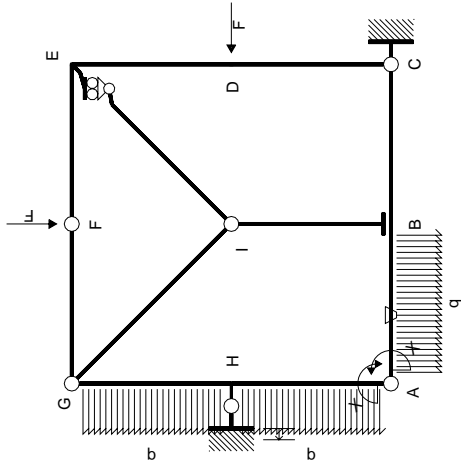


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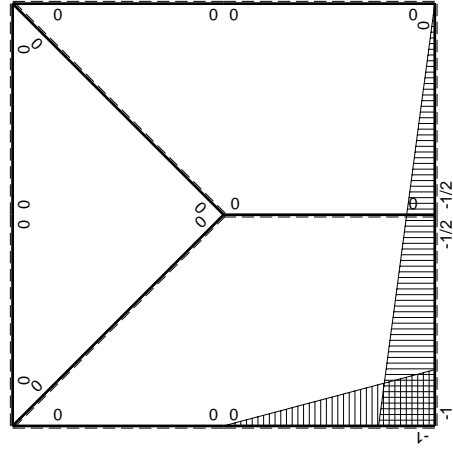
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	$3/4Fx-1/2qx^2$	$-Fb/EJ$	$-3/4Fx+7/8Fx^2/b-1/4qx^3/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-7/48+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb-1/4Fx+1/2qx^2$	Fb/EJ	$-1/8Fb-1/4Fx+1/8Fx^2/b+1/4qx^3/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/4Fb-1/4Fx$	0	$-1/8Fb+1/4Fx-1/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/4Fx$	0	$-1/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/48Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/48Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 7/8 x^2/b^2 - 1/4 x^3/b^3) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= \left[-3/8 x^2/b + 7/24 x^3/b^2 - 1/16 x^4/b^3 \right]_0^b Fb 1/EJ + \left[x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-3/8 b + 7/24 b - 1/16 b) Fb 1/EJ + (b - 1/4 b) \theta = 29/48 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 - 1/4 x/b + 1/8 x^2/b^2 + 1/4 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= \left[-1/8 x - 1/8 x^2/b + 1/24 x^3/b^2 + 1/16 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-1/8 b - 1/8 b + 1/24 b + 1/16 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 29/48 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/8 + 1/4 x/b - 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/8 x^2/b - 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/8 b - 1/24 b) Fb 1/EJ = -1/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

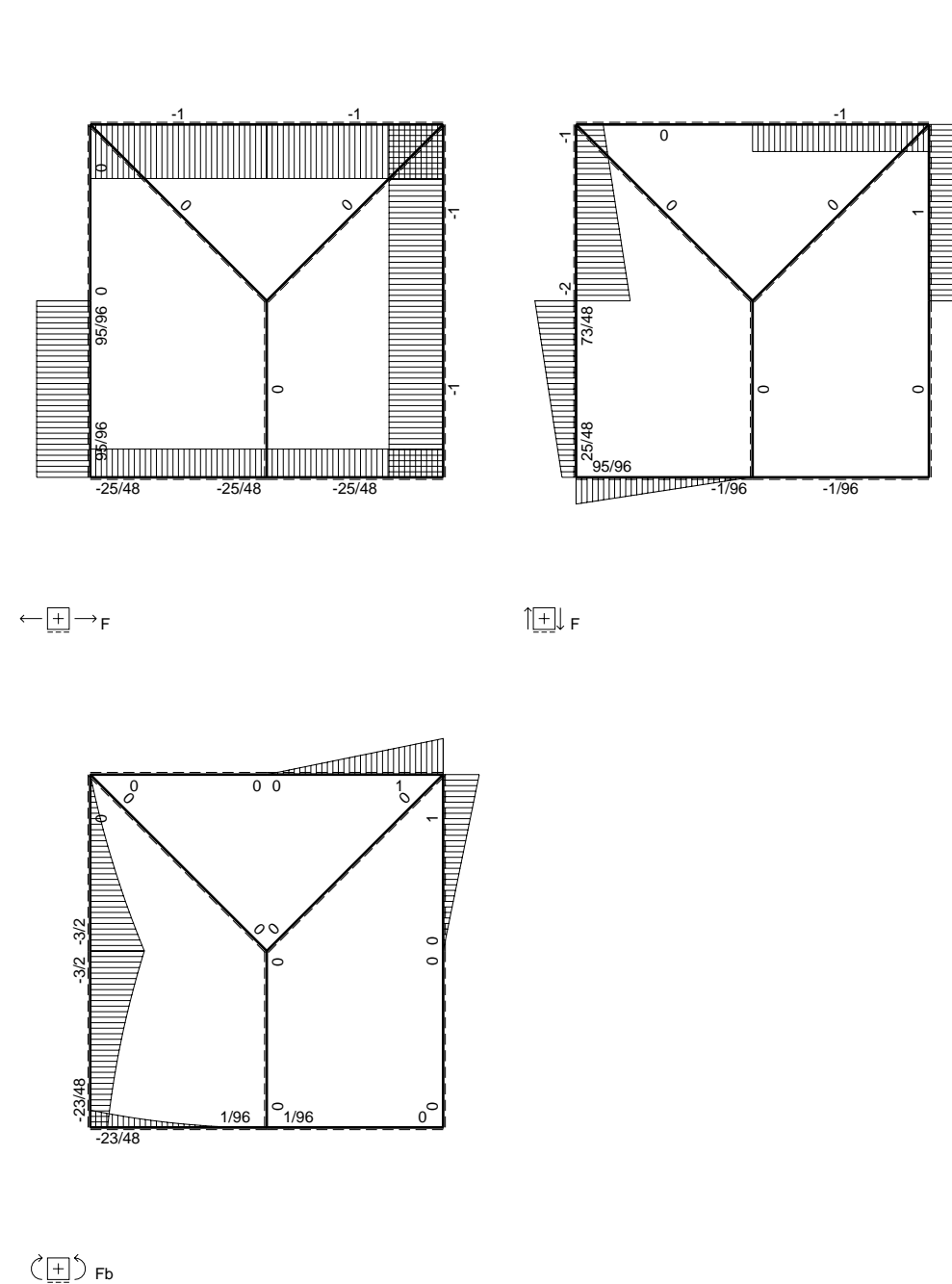
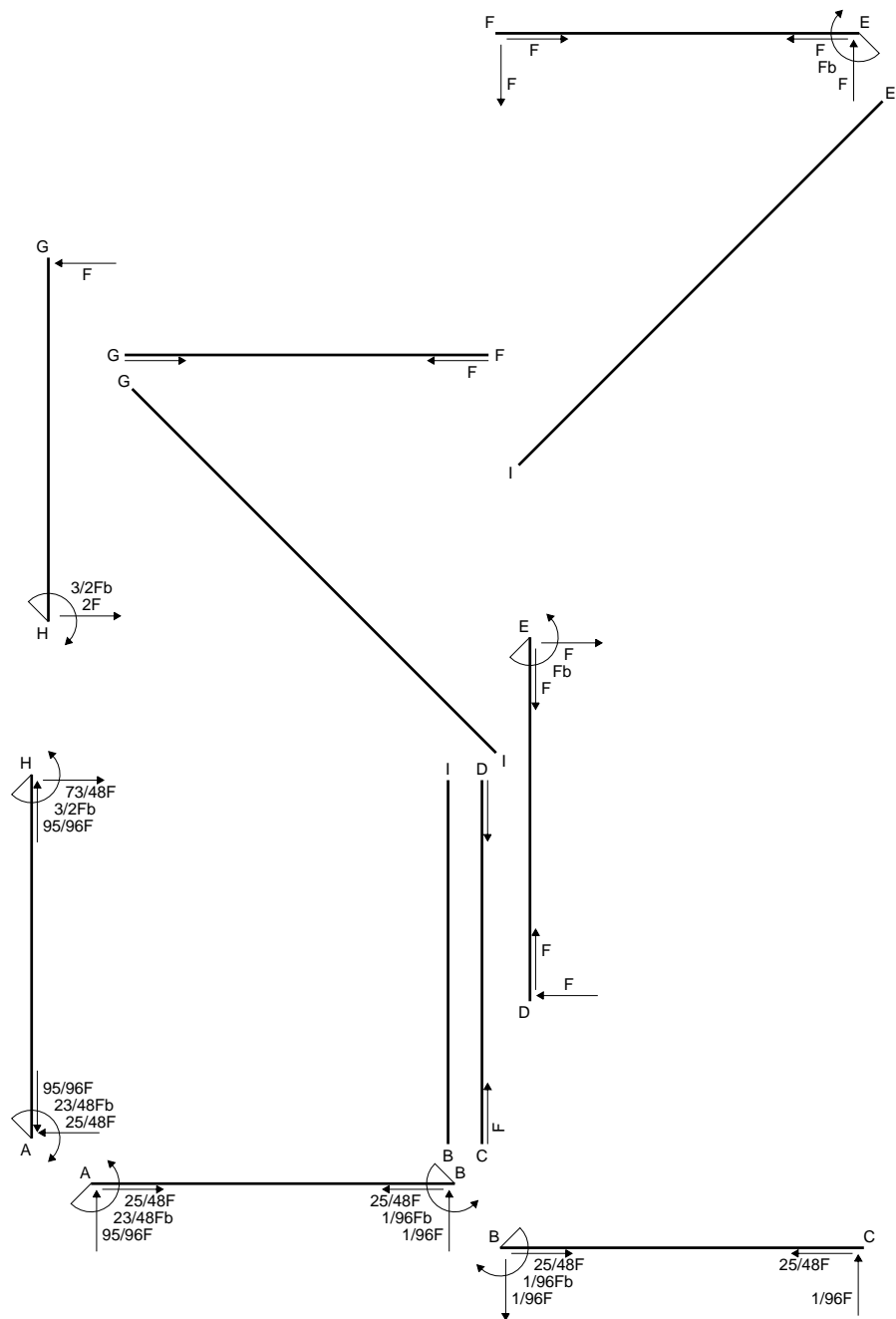
$$= (-1/24 b) Fb 1/EJ = -1/24 Fb^2/EJ$$

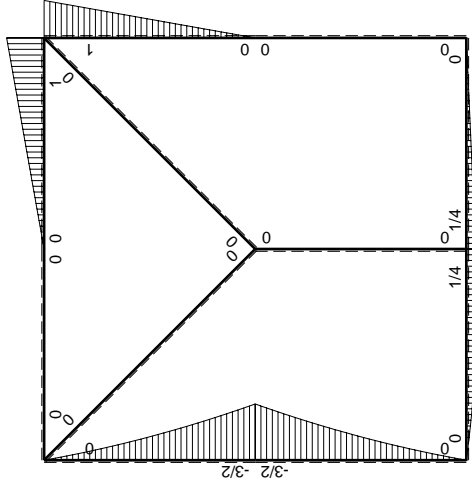
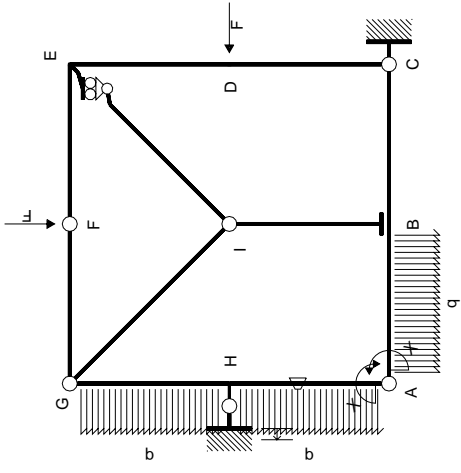
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

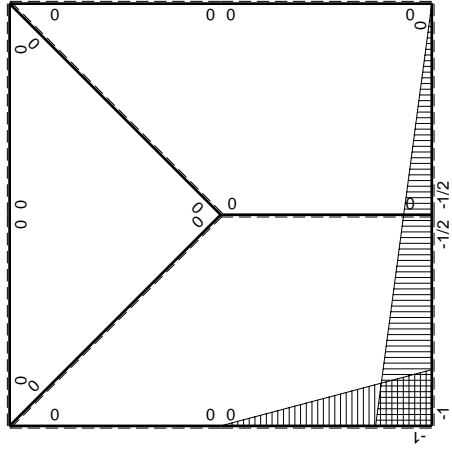
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx-1/2qx^2$	0	$-3/4Fx+7/8Fx^2/b-1/4qx^3/b$	0	$1-x/b+1/4x^2/b^2$	$(-7/48+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb-1/4Fx+1/2qx^2$	0	$-1/8Fb-1/4Fx+1/8Fx^2/b+1/4qx^3/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/4Fb-1/4Fx$	0	$-1/8Fb+1/4Fx-1/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/4Fx$	0	$-1/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	$-Fb/EJ$	$3/2Fx-2Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(5/24+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	Fb/EJ	$Fx-1/2Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-23/48Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$23/48Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 7/8 x^2/b^2 - 1/4 x^3/b^3) Fb 1/EJ dx = [-3/8 x^2/b + 7/24 x^3/b^2 - 1/16 x^4/b^3]_0^b Fb 1/EJ$$

$$= (-3/8 b + 7/24 b - 1/16 b) Fb 1/EJ = -7/48 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 - 1/4 x/b + 1/8 x^2/b^2 + 1/4 x^3/b^3) Fb 1/EJ dx$$

$$= [-1/8 x - 1/8 x^2/b + 1/24 x^3/b^2 + 1/16 x^4/b^3]_0^b Fb 1/EJ$$

$$= (-1/8 b - 1/8 b + 1/24 b + 1/16 b) Fb 1/EJ = -7/48 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/8 + 1/4 x/b - 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/8 x^2/b - 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/8 b - 1/24 b) Fb 1/EJ = -1/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/8 x^2/b^2) Fb 1/EJ dx = [-1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/24 b) Fb 1/EJ = -1/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

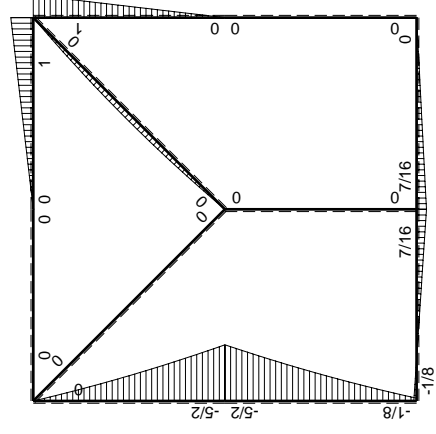
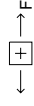
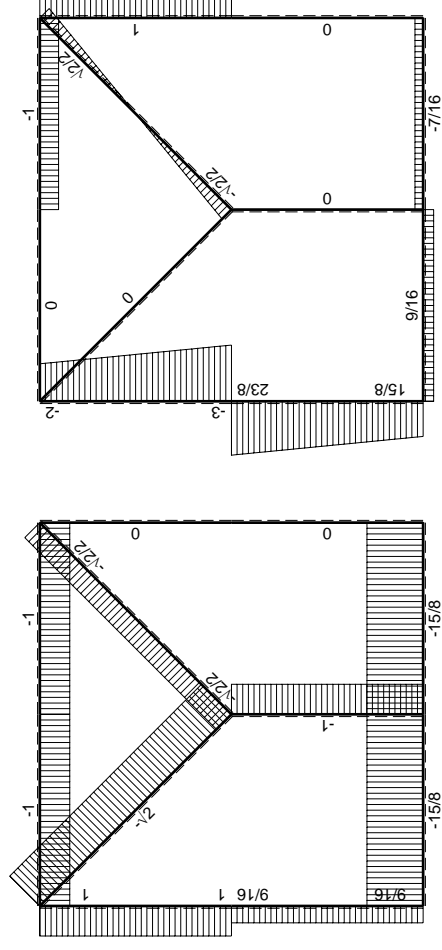
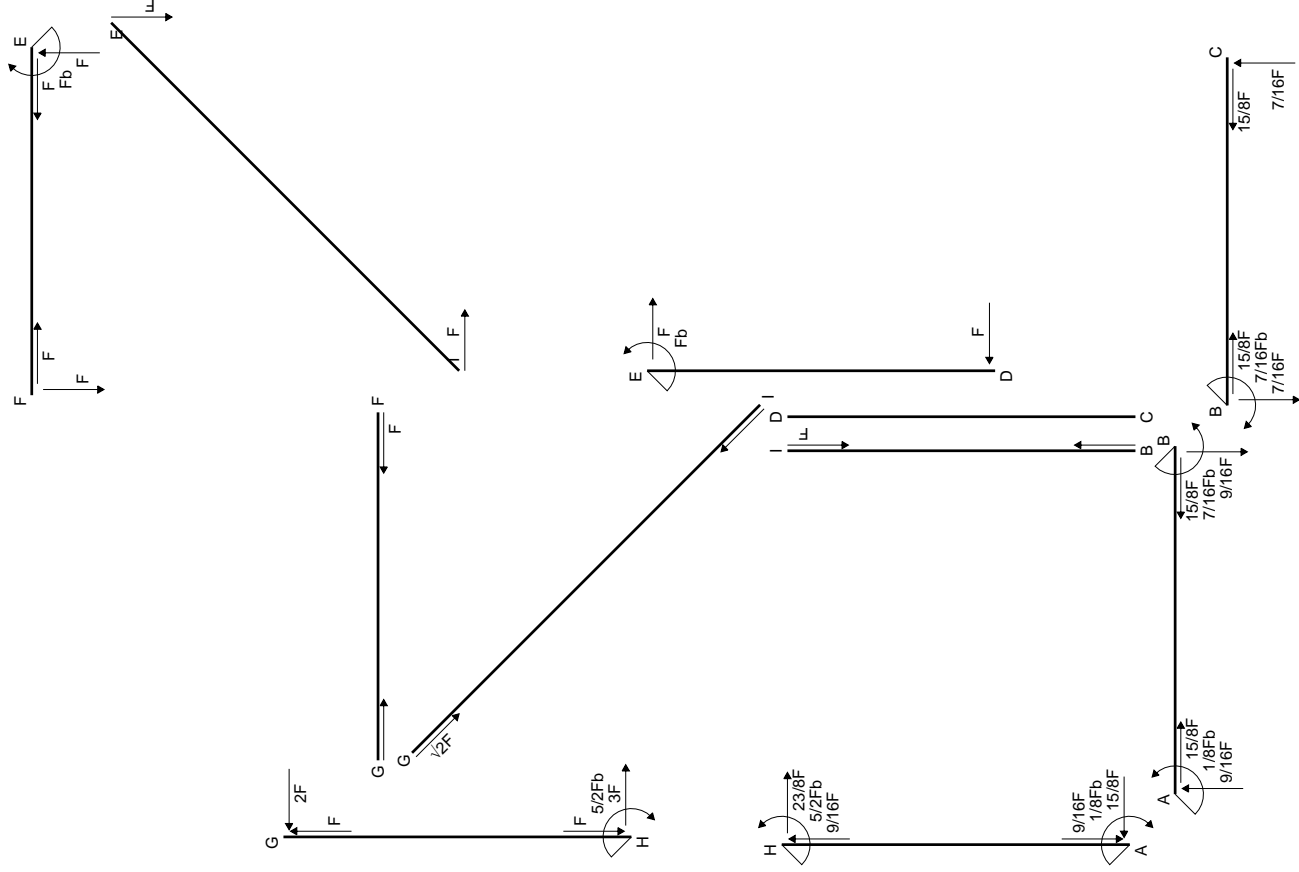
$$= [3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ + [1/2 x^2/b]_0^b \theta$$

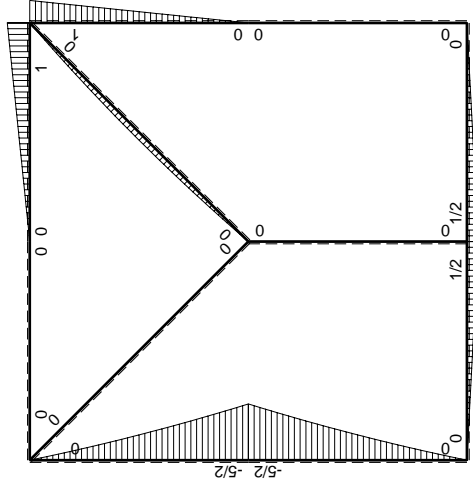
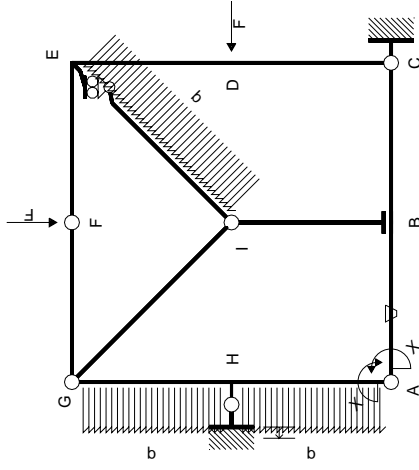
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 17/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

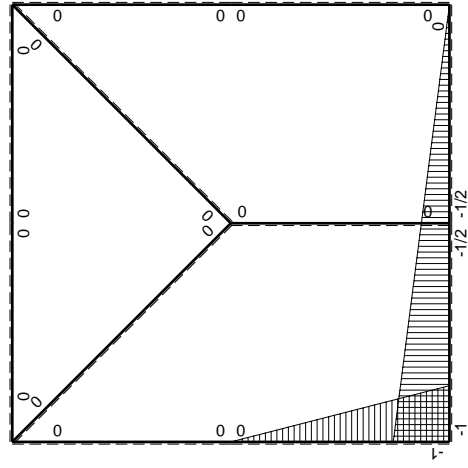
$$= [1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ + [-x + 1/2 x^2/b]_0^b \theta$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 17/24 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	$-Fb/EJ$	$-1/2Fx+1/4Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/6+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	Fb/EJ	$-1/4Fb+1/4Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

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

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

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

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

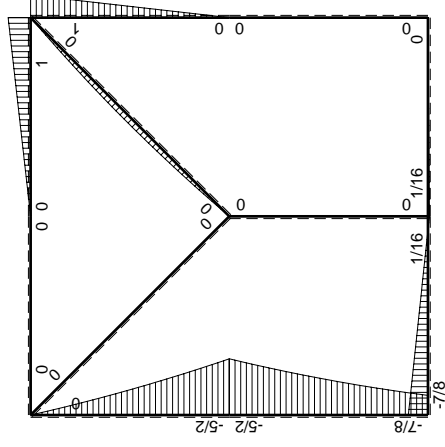
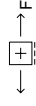
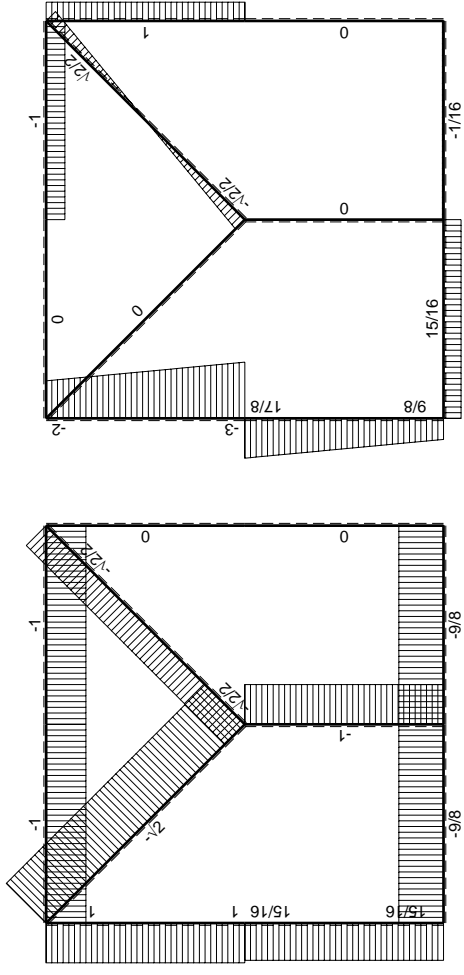
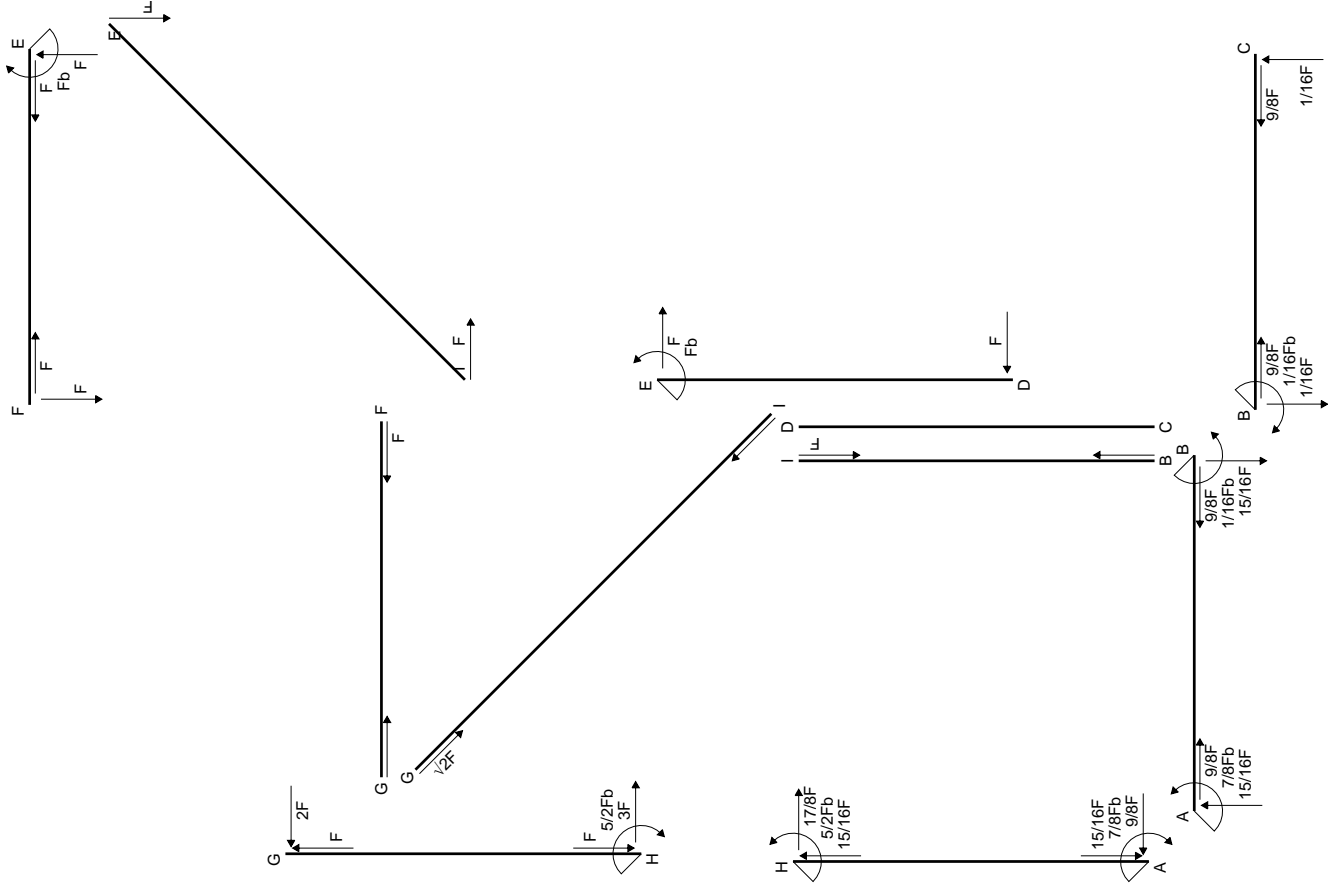
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

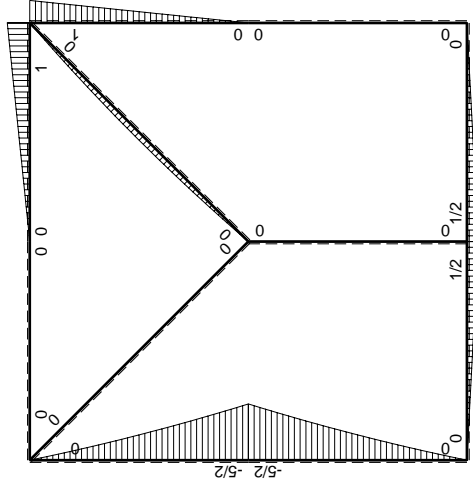
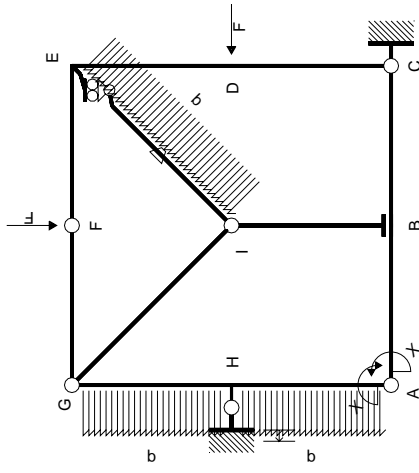
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

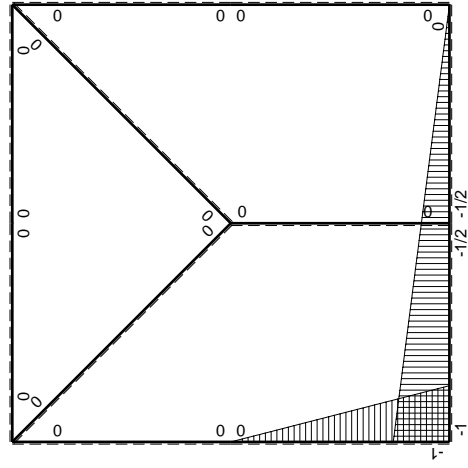
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CD b	0	0	0	0	0	0	0+0	0
DC b	0	0	0	0	0	0	0+0	0
DE b	0	Fx	0	0	0	0	0+0	0
ED b	0	-Fb+Fx	0	0	0	0	0+0	0
EF b	0	Fb-Fx	0	0	0	0	0+0	0
FE b	0	-Fx	0	0	0	0	0+0	0
FG b	0	0	0	0	0	0	0+0	0
GF b	0	0	0	0	0	0	0+0	0
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0	0+0	0
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0
IB b	0	0	0	0	0	0	0+0	0
BI b	0	0	0	0	0	0	0+0	0
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0	0
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

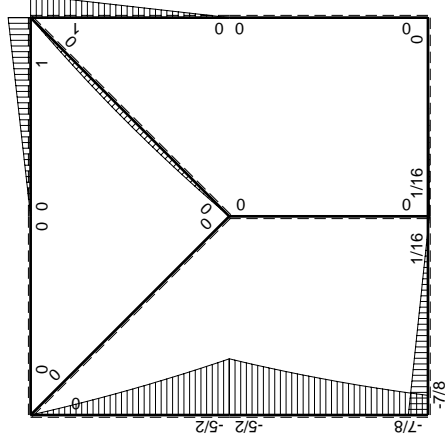
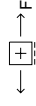
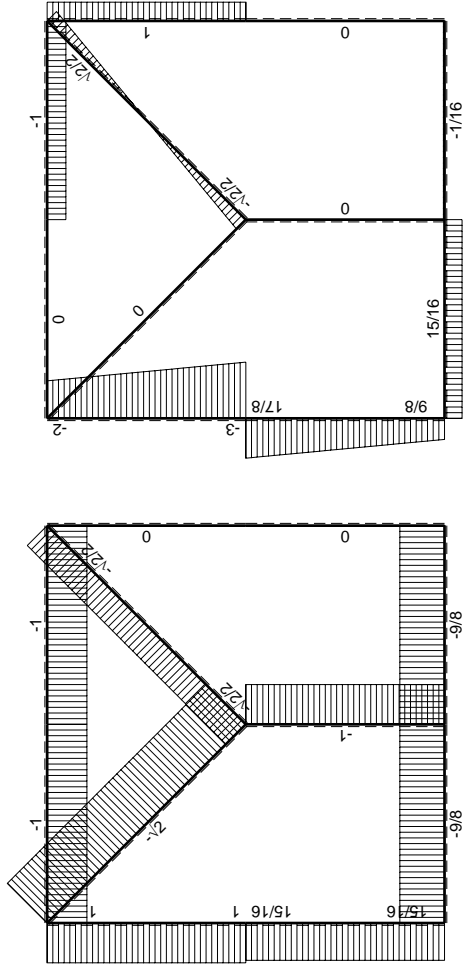
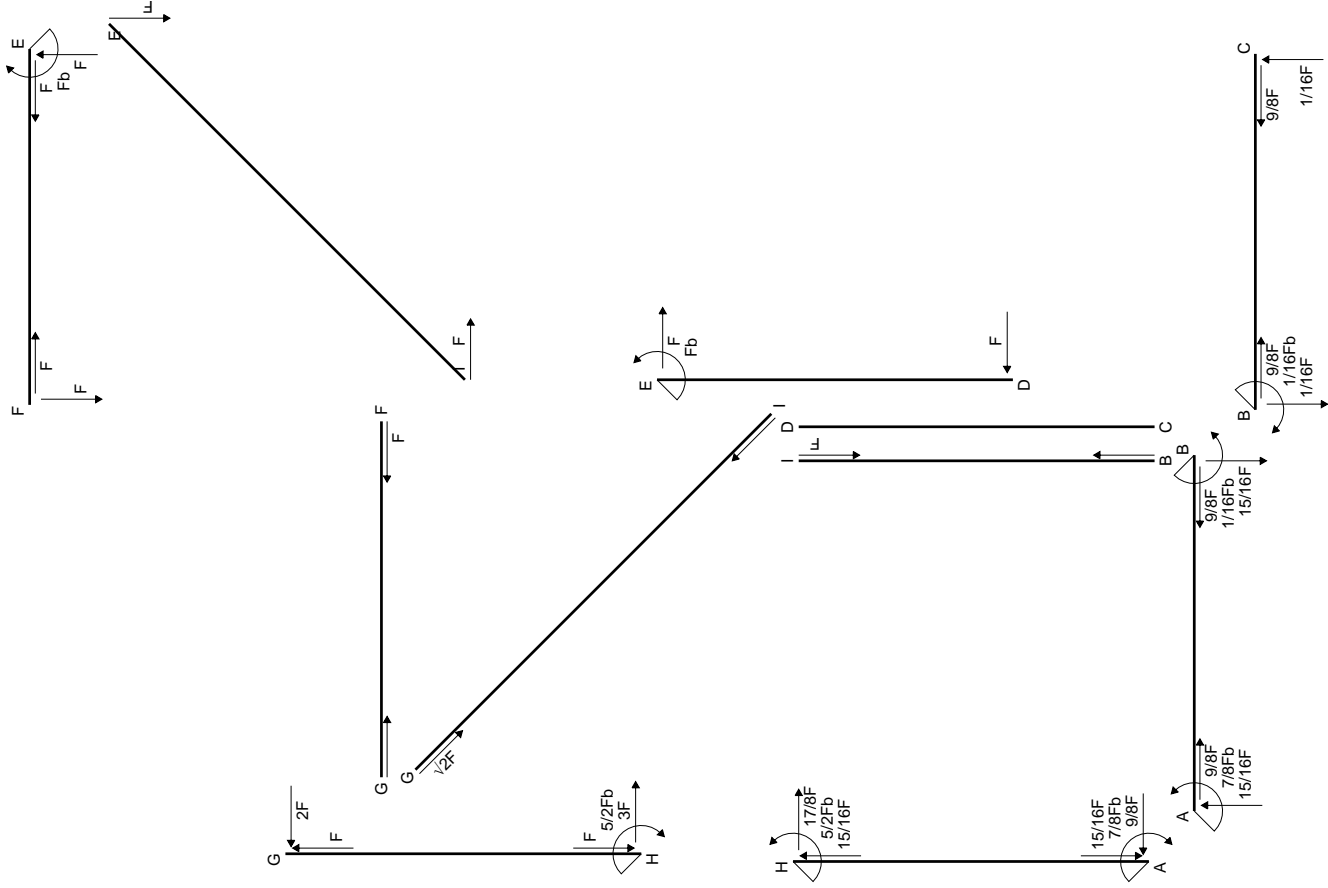
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

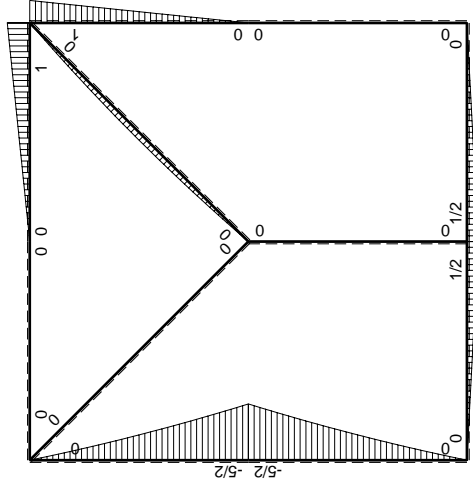
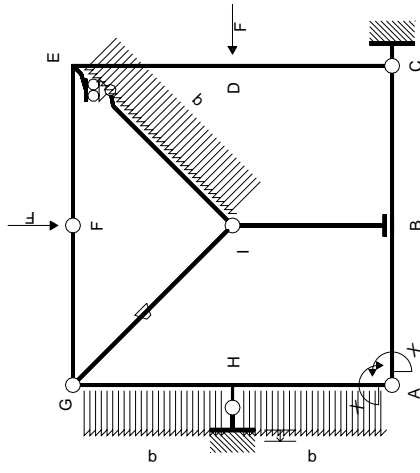
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

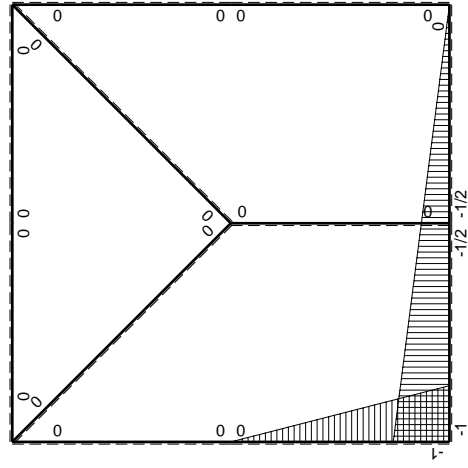
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

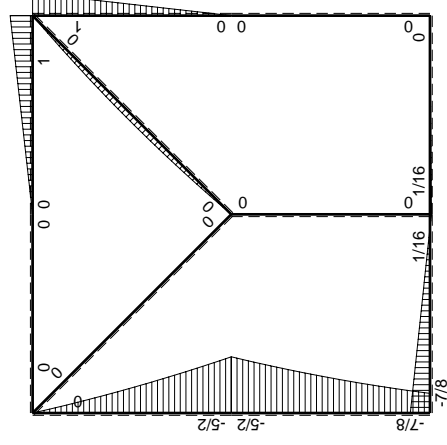
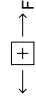
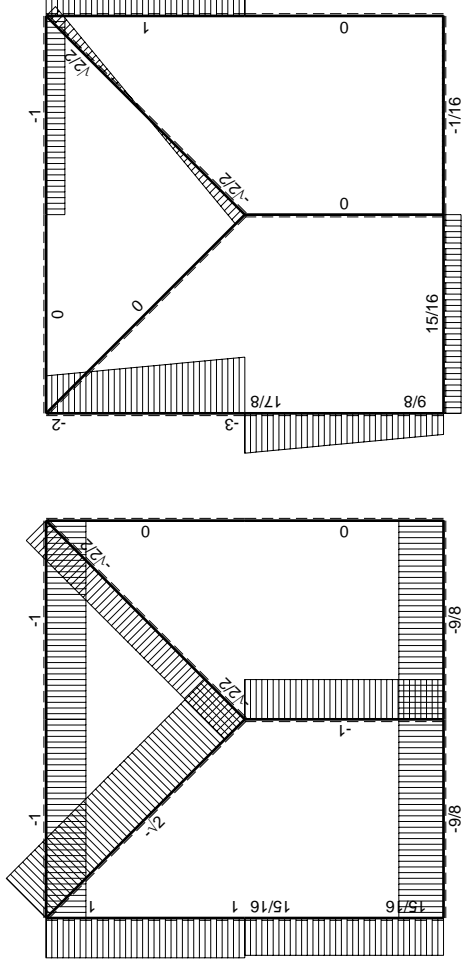
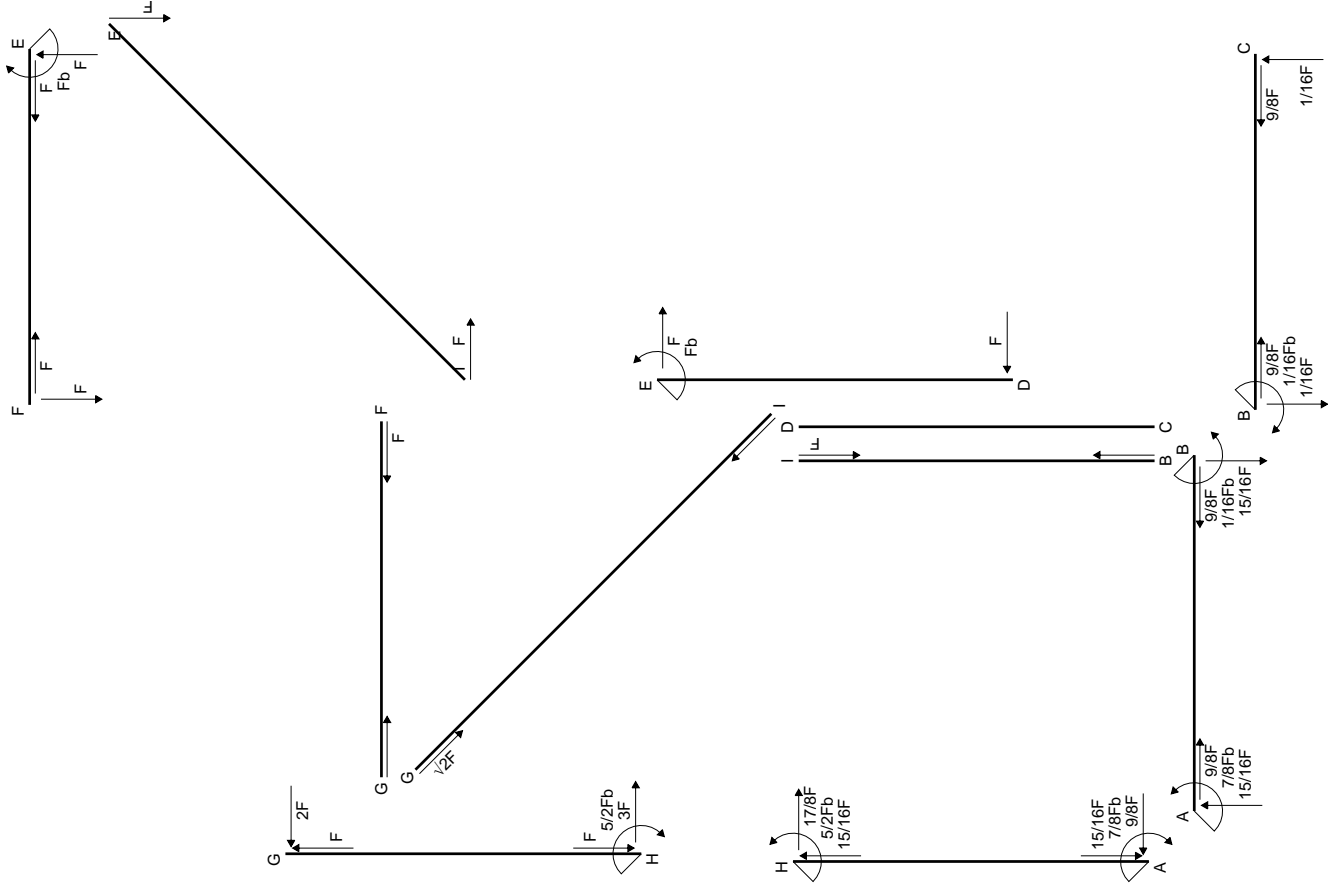
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

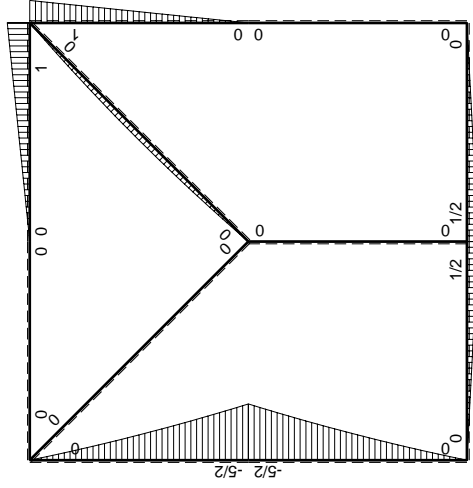
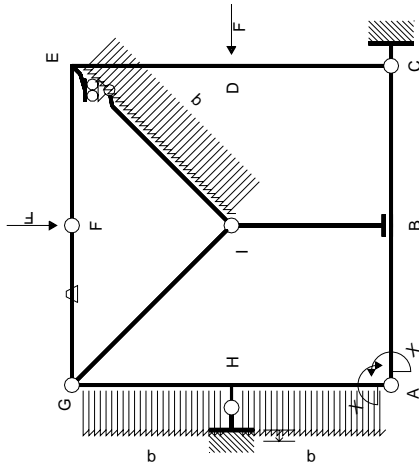
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

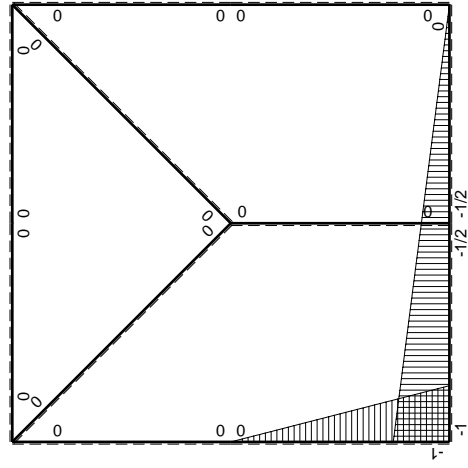
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	-Fb/EJ	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

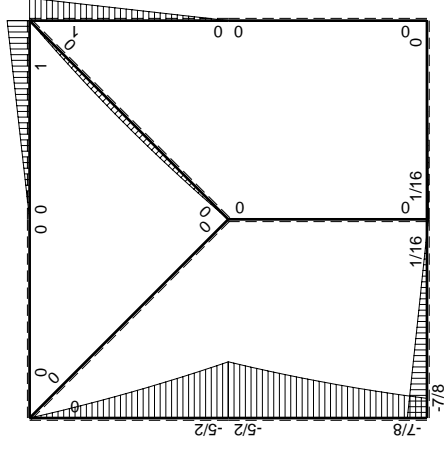
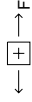
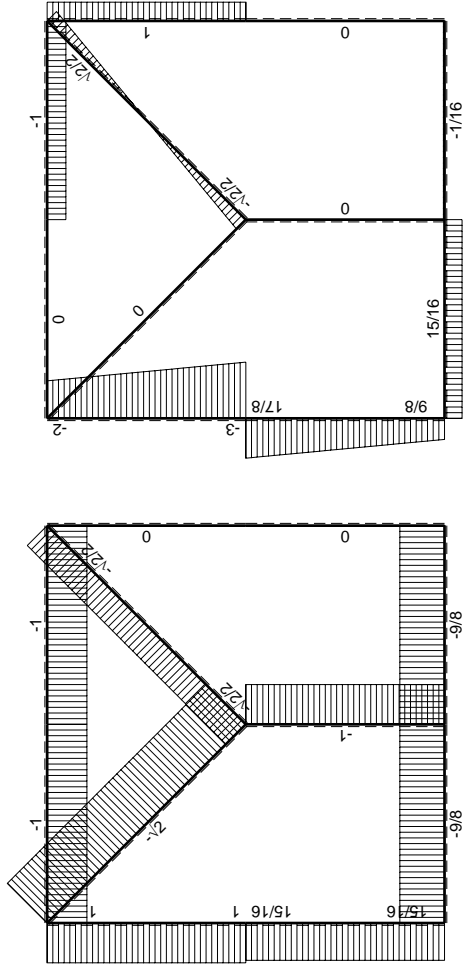
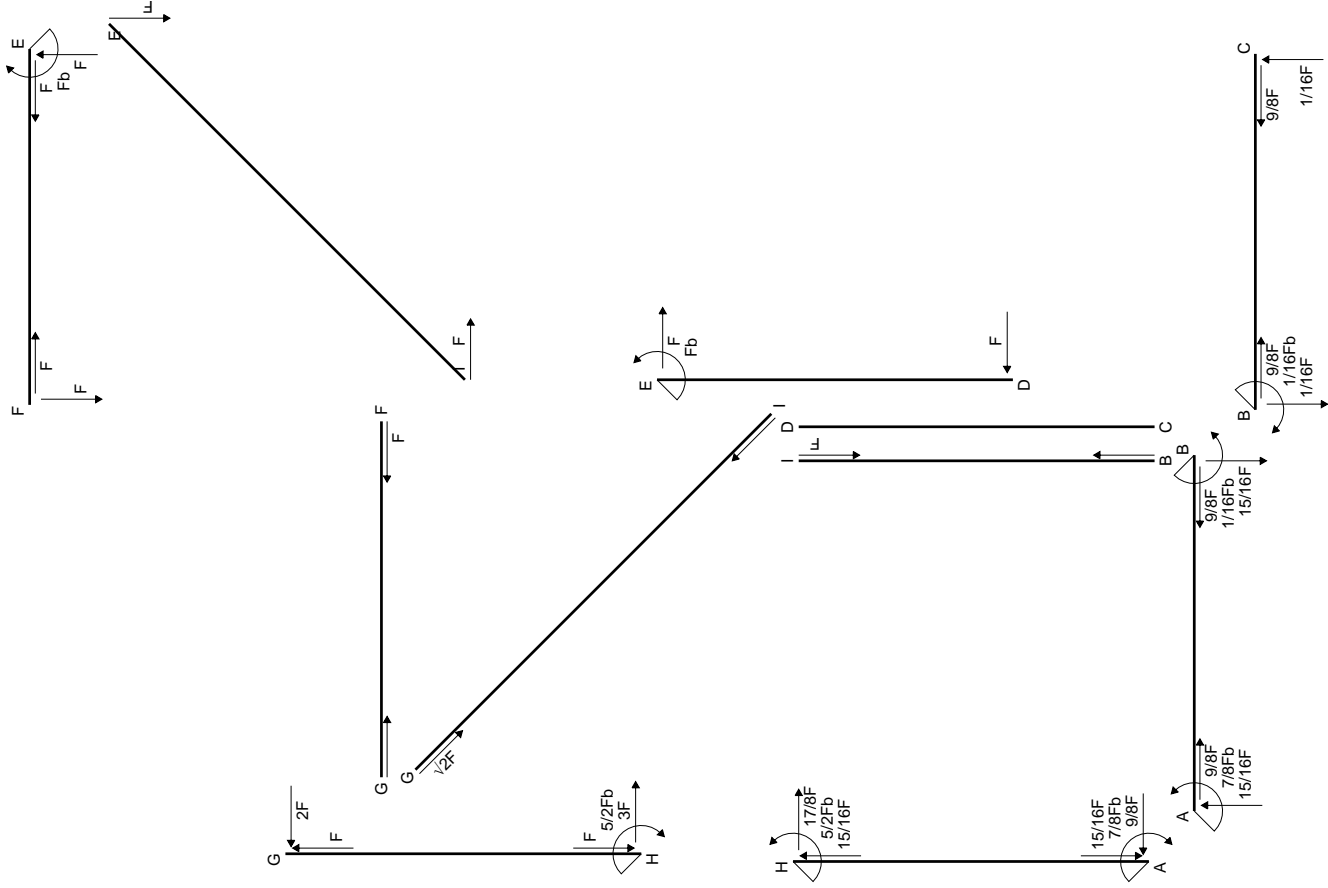
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

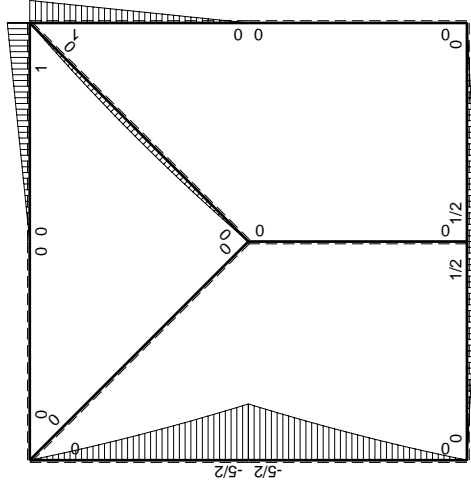
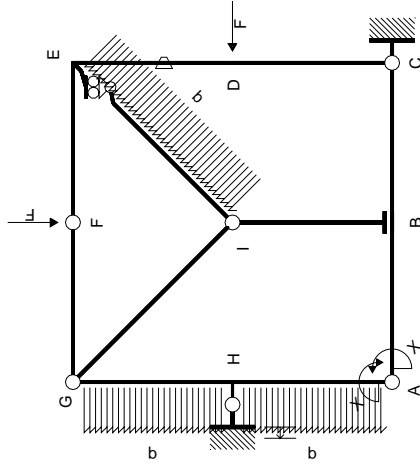
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

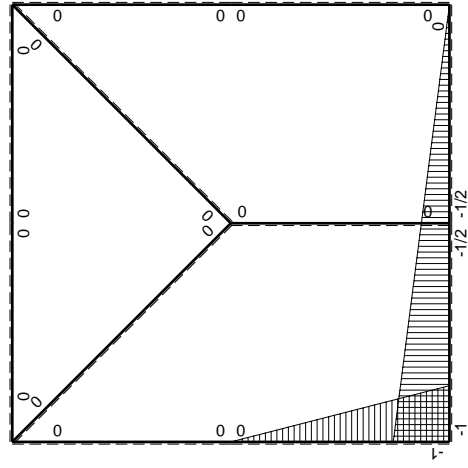
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	Fb/EJ	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

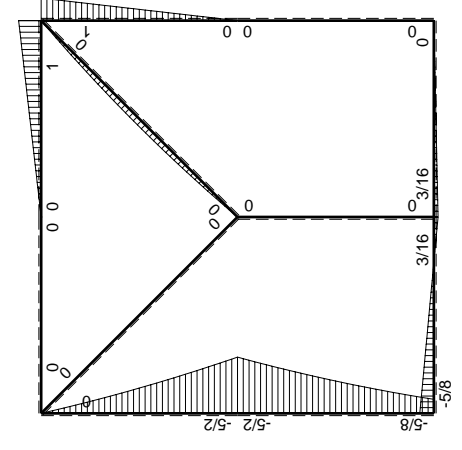
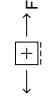
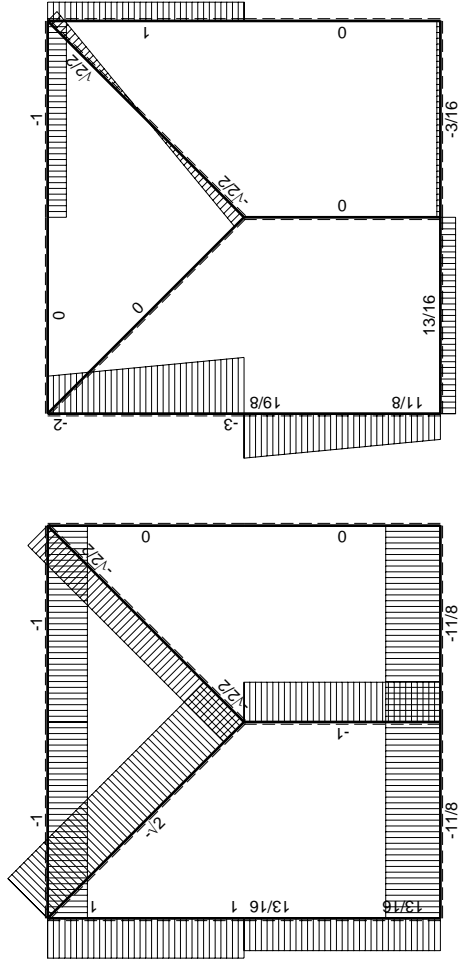
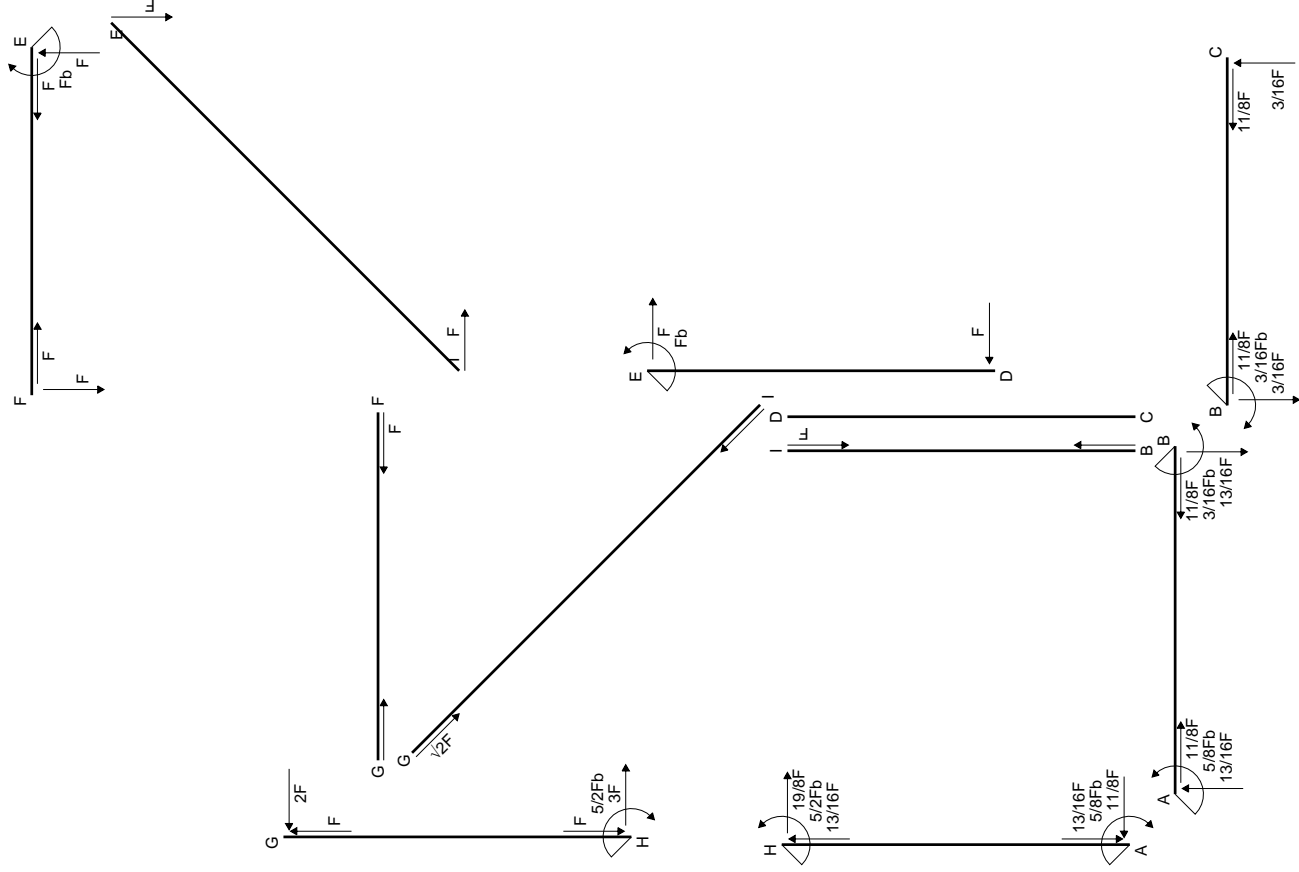
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

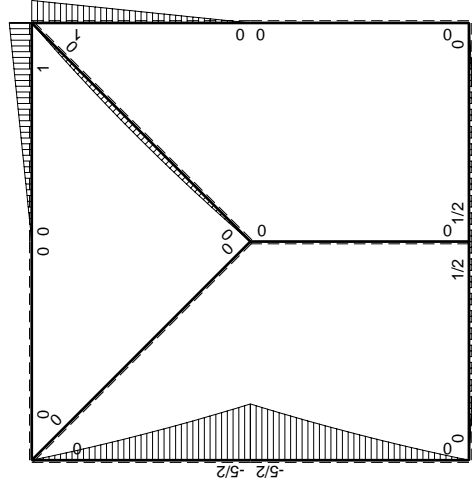
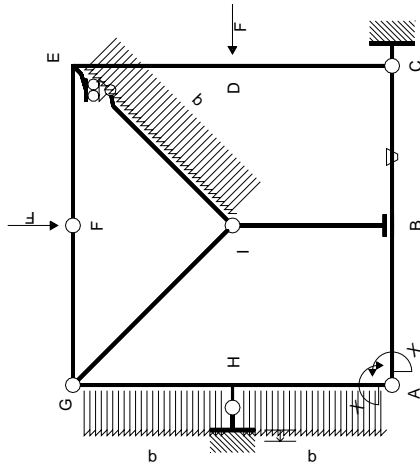
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

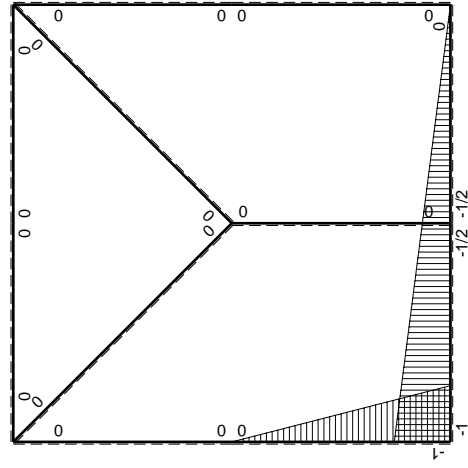
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_X , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	$-Fb/EJ$	$-1/4Fb+1/2Fx-1/4Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	Fb/EJ	$-1/4Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-1/4 b + 1/4 b - 1/12 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/6 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/4 x^2/b \right]_0^b \theta$$

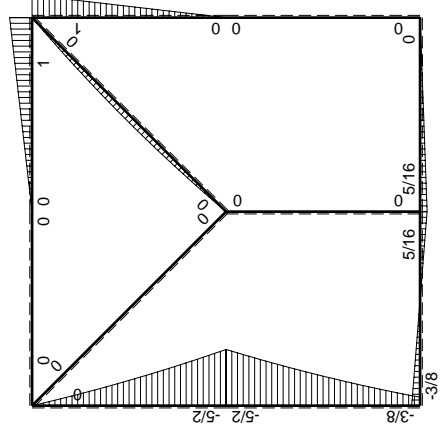
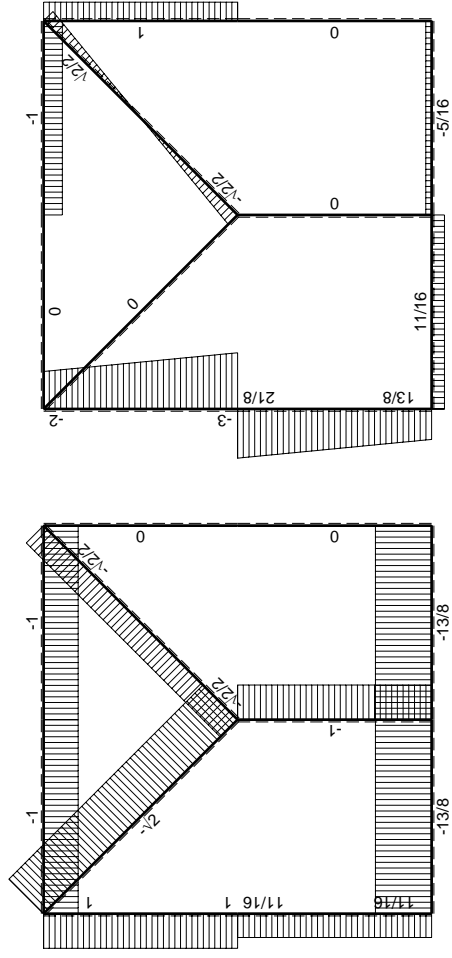
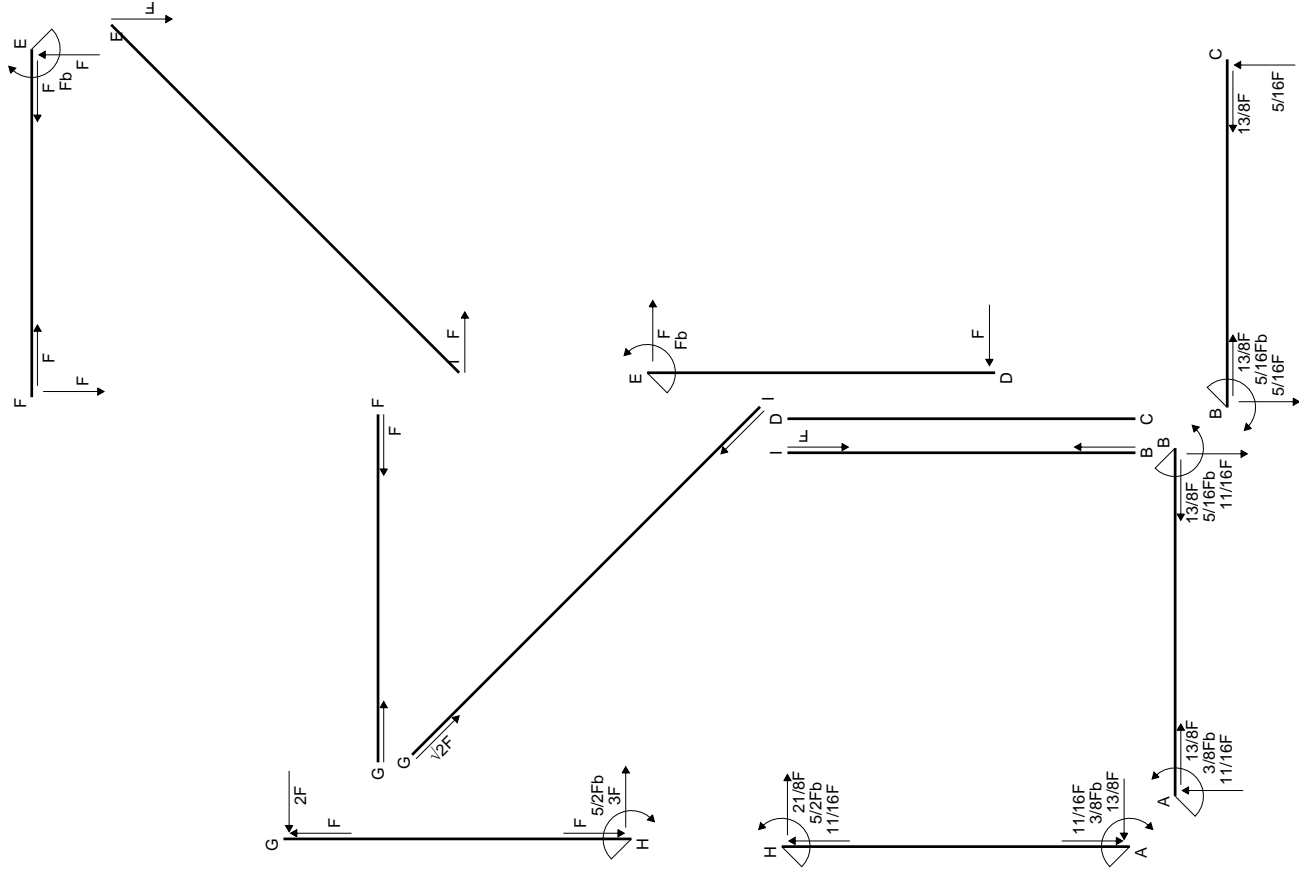
$$= (-1/12 b) Fb 1/EJ + (-1/4 b) \theta = 1/6 Fb^2/EJ$$

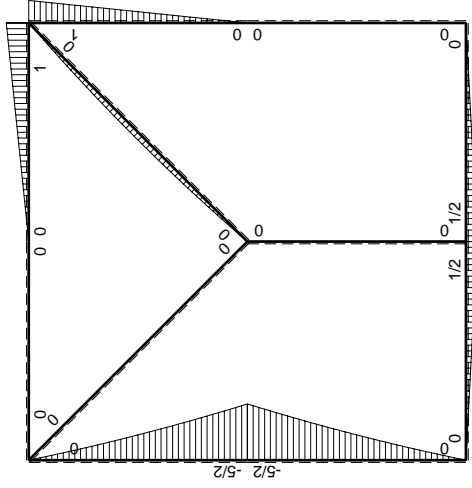
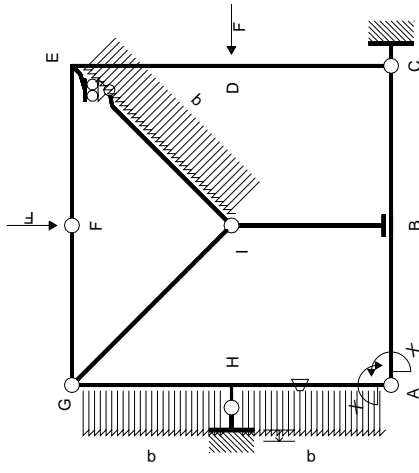
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

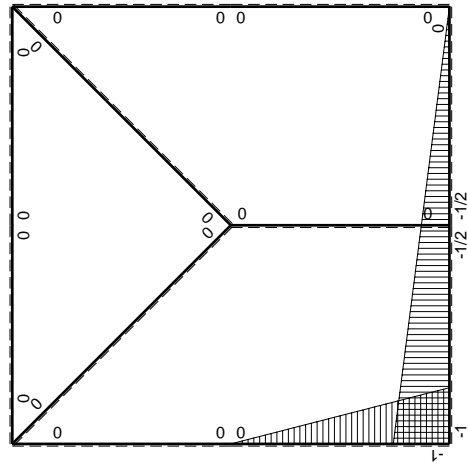
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	-Fb/EJ	$5/2Fx-3Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(3/8+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	Fb/EJ	$2Fx-3/2Fx^2/b-1/2qx^3/b$	Fb/EJ-Fx/EJ	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							-Fb ² /EJ	
	totali							-3/8Fb ² /EJ	Xb/EJ
	iperstatica $X=W_{AB}$							3/8Fb	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

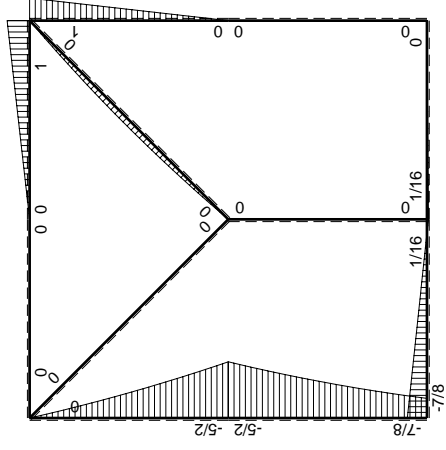
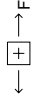
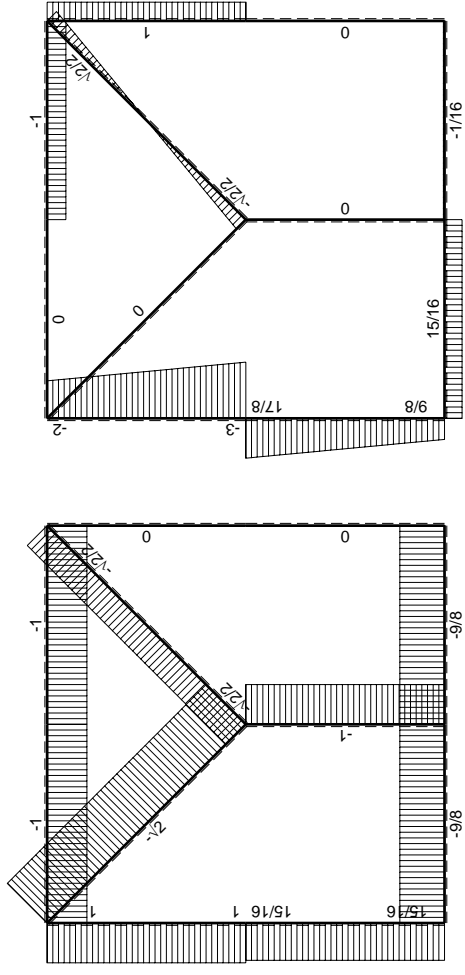
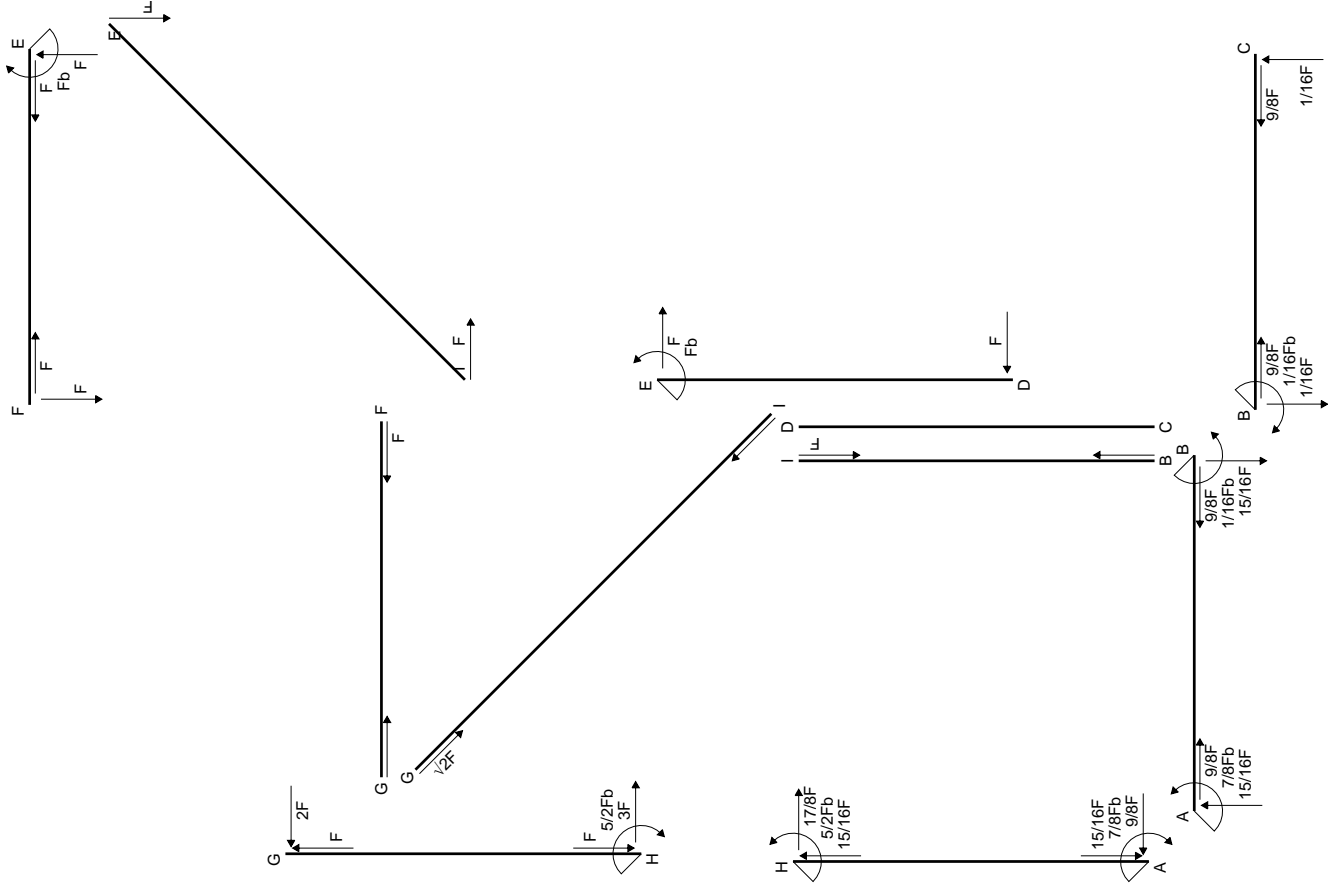
$$= \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

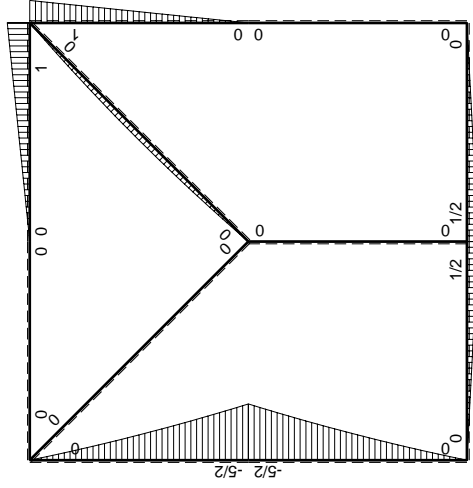
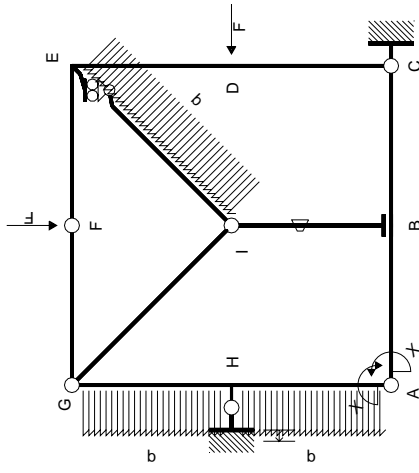
$$= (5/4 b - b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 7/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

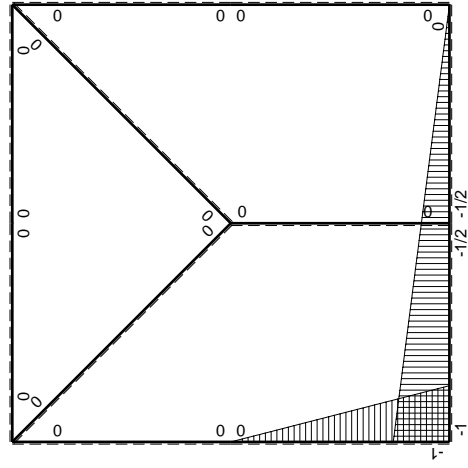
$$= \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 7/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

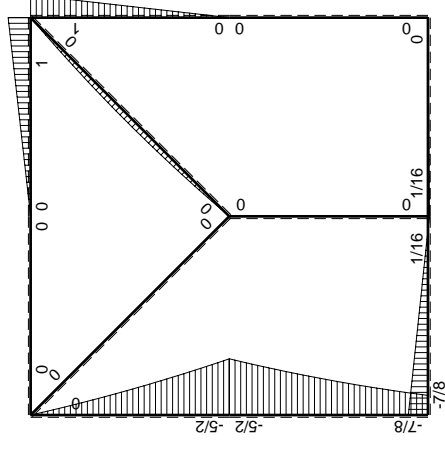
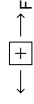
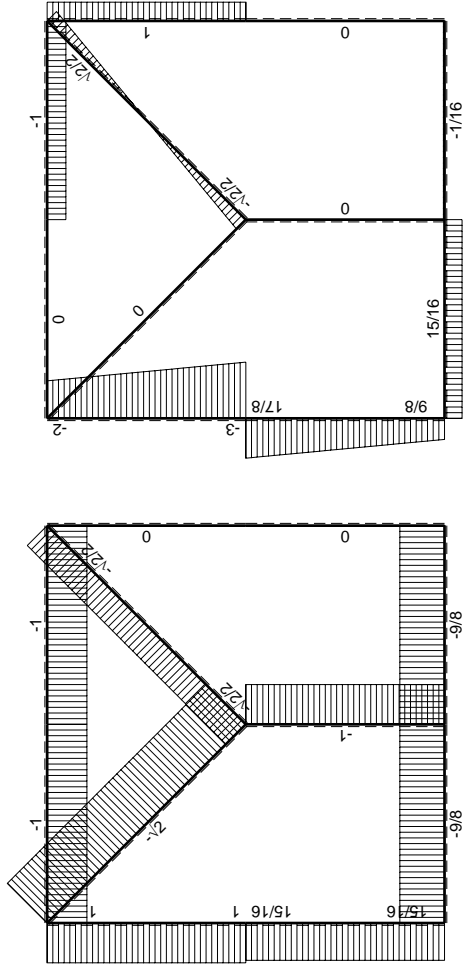
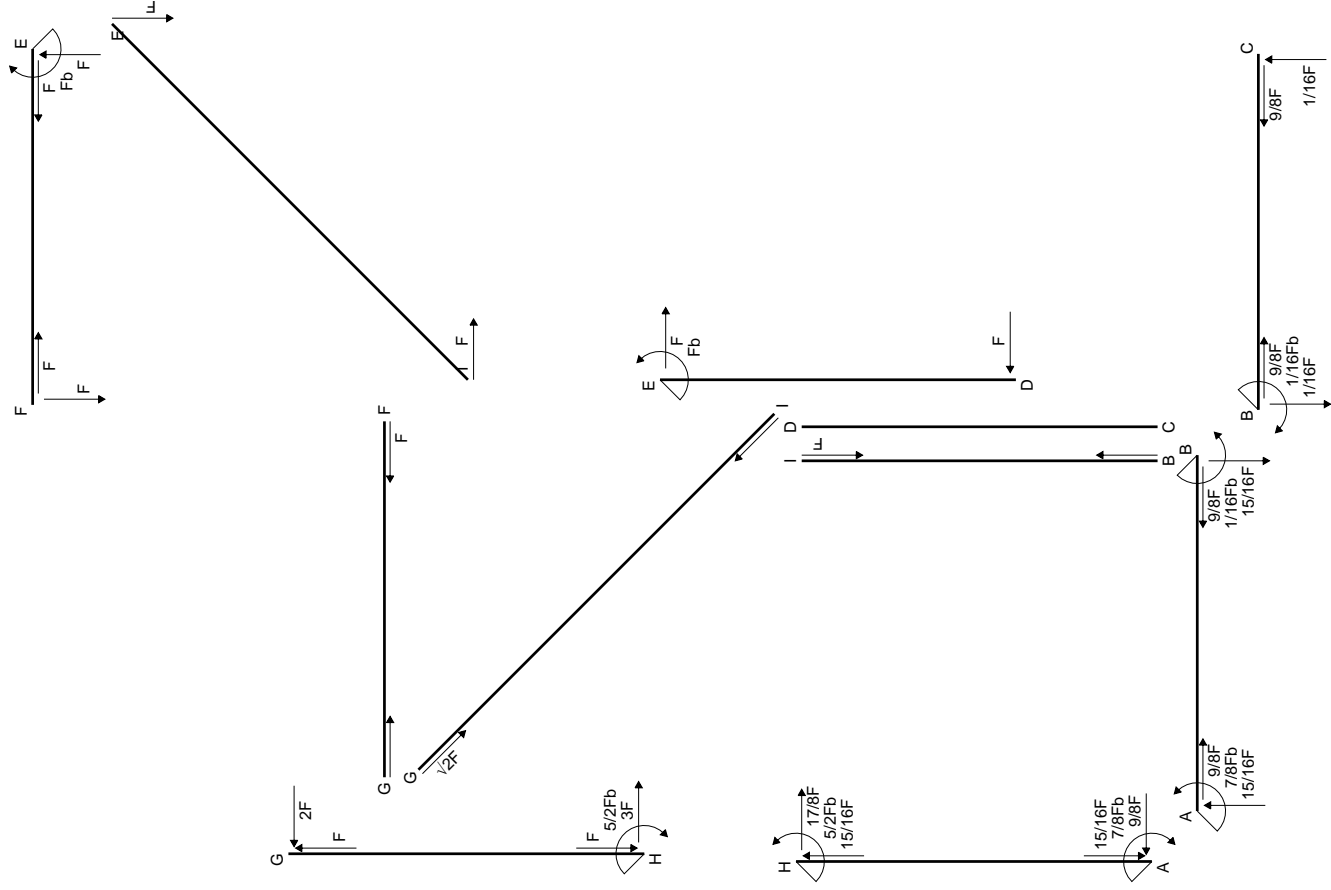
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

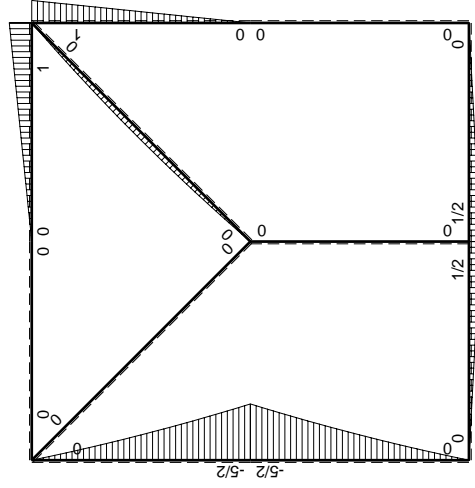
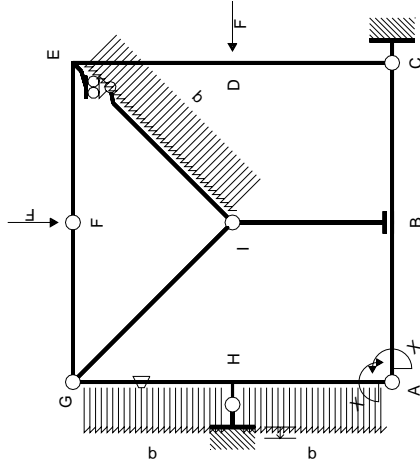
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

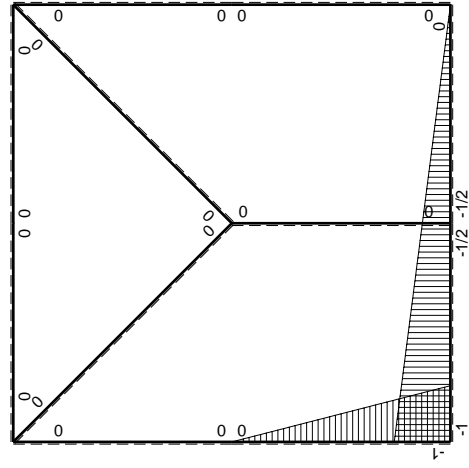
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	-Fb/EJ	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

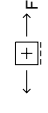
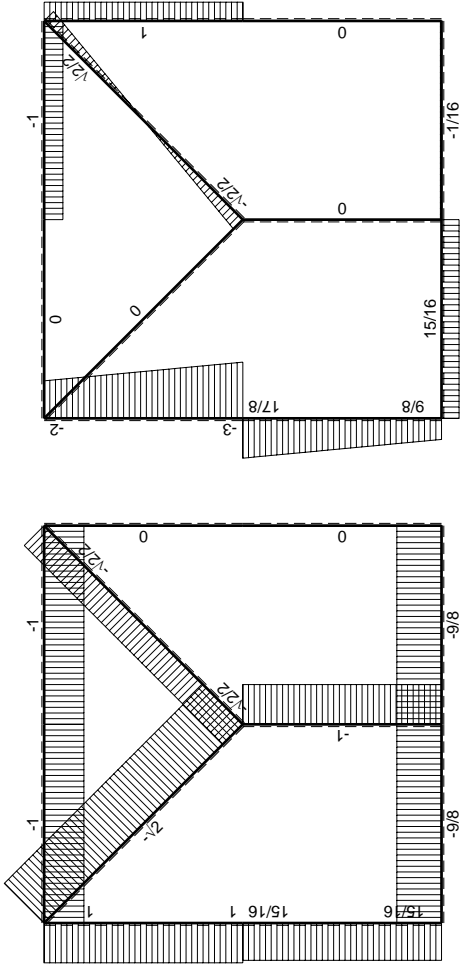
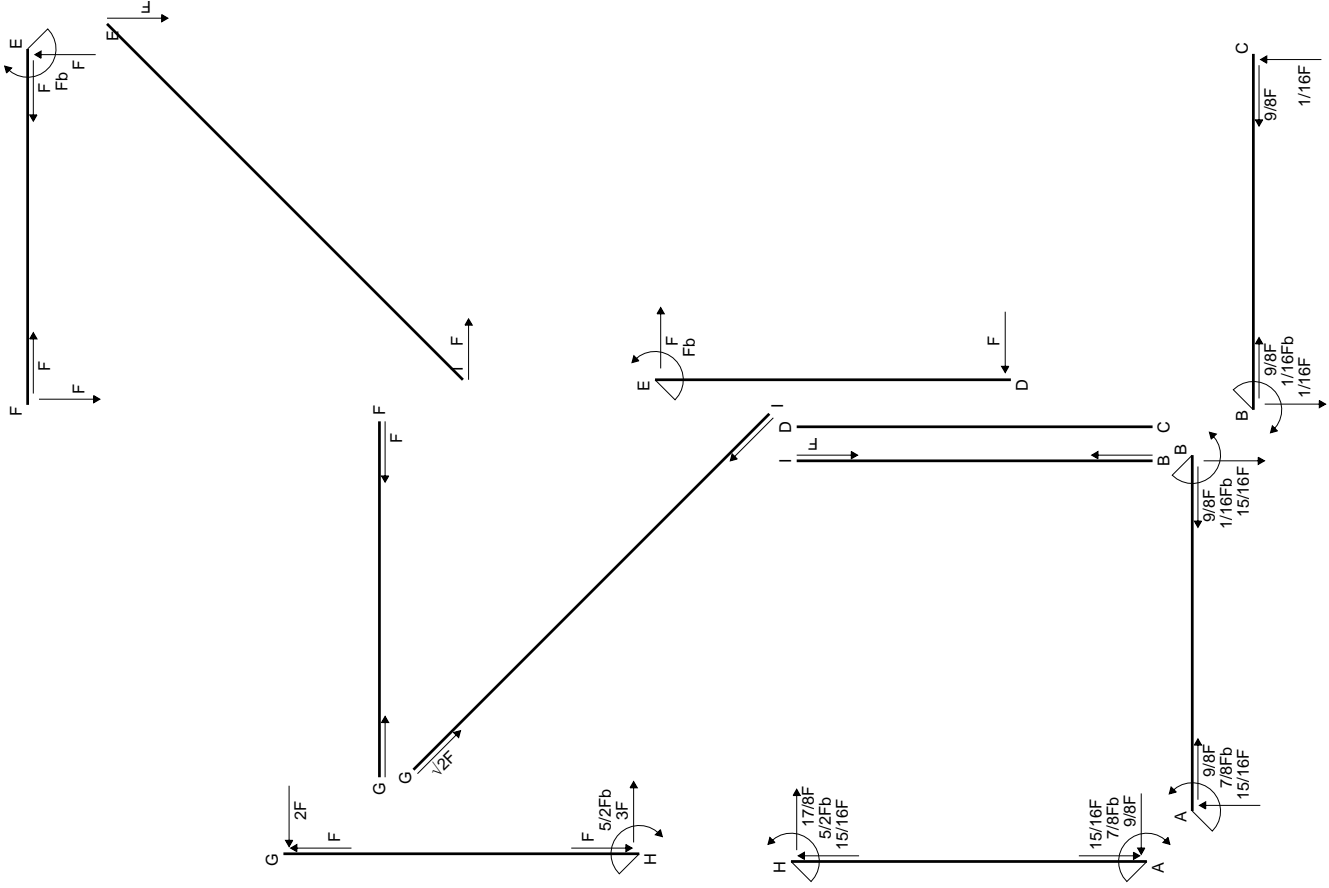
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

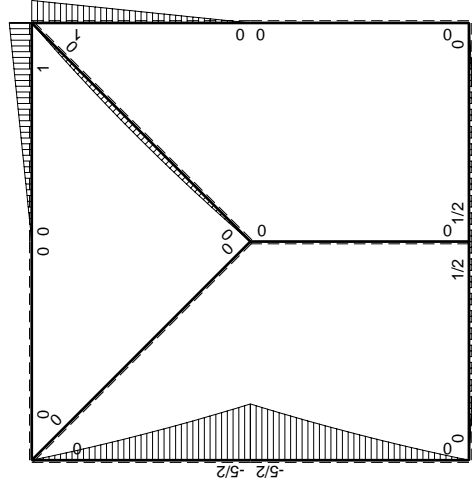
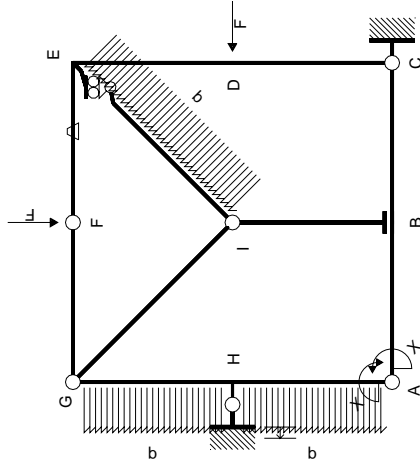
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

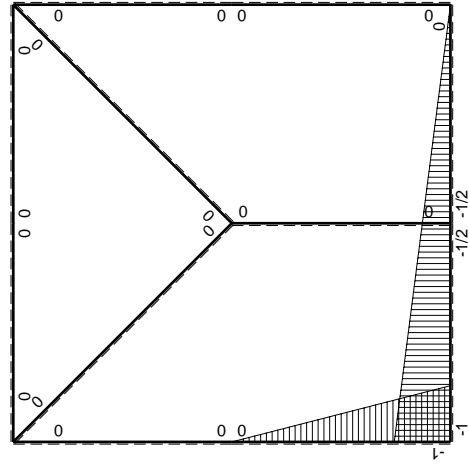
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CD b	0	0	0	0	0	0	0+0	0
DC b	0	0	0	0	0	0	0+0	0
DE b	0	Fx	0	0	0	0	0+0	0
ED b	0	-Fb+Fx	0	0	0	0	0+0	0
EF b	0	Fb-Fx	-Fb/EJ	0	0	0	0+0	0
FE b	0	-Fx	Fb/EJ	0	0	0	0+0	0
FG b	0	0	0	0	0	0	0+0	0
GF b	0	0	0	0	0	0	0+0	0
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0	0+0	0
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0
IB b	0	0	0	0	0	0	0+0	0
BI b	0	0	0	0	0	0	0+0	0
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

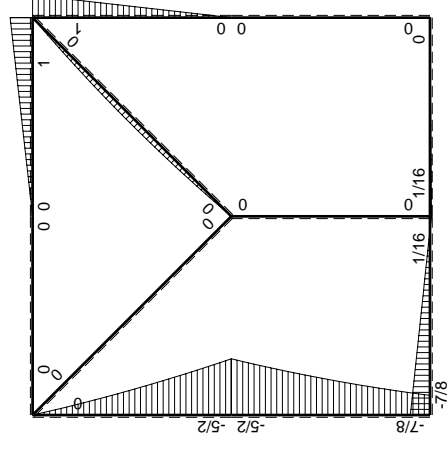
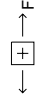
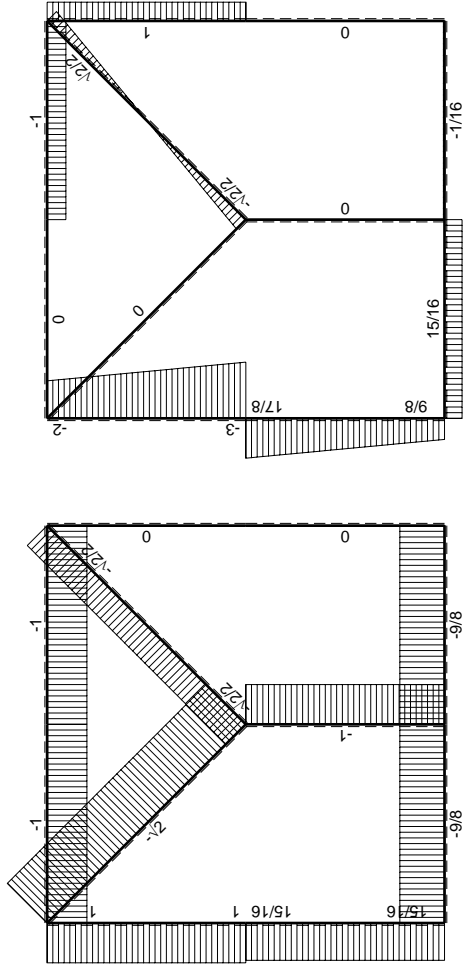
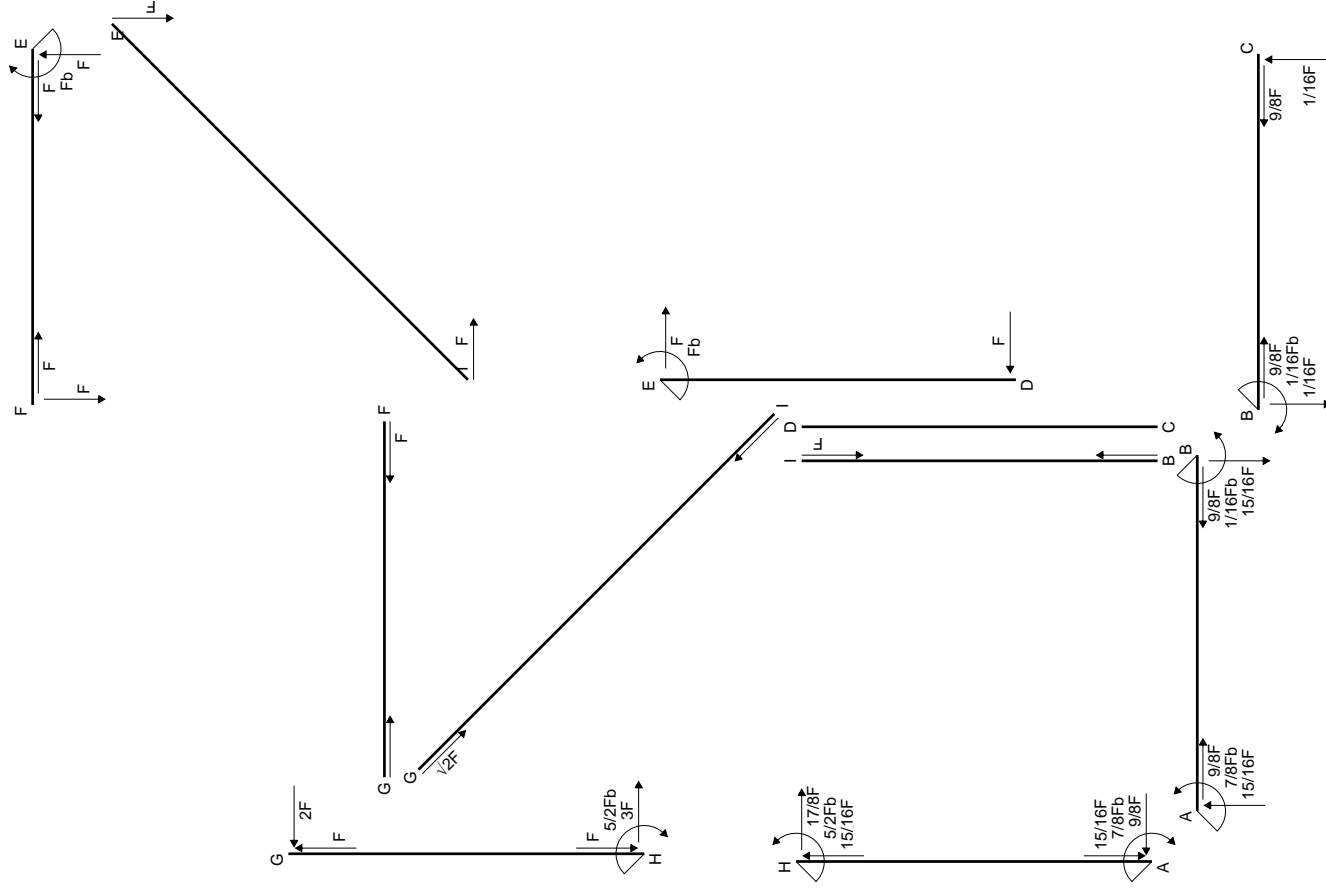
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

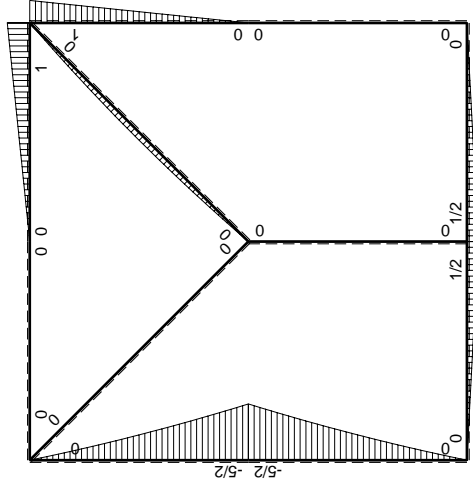
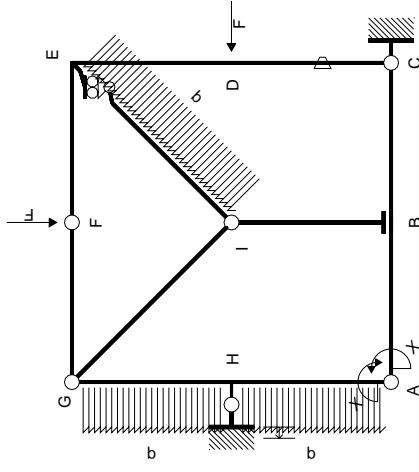
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

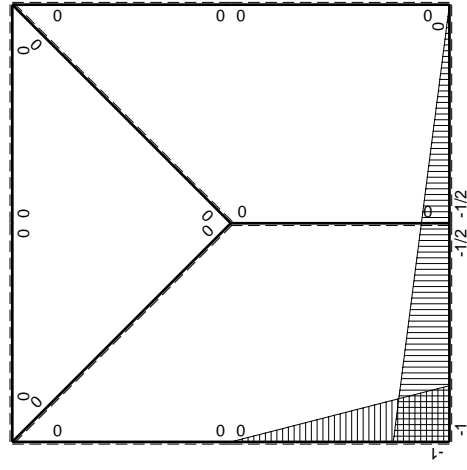
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	0	Fb/EJ	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

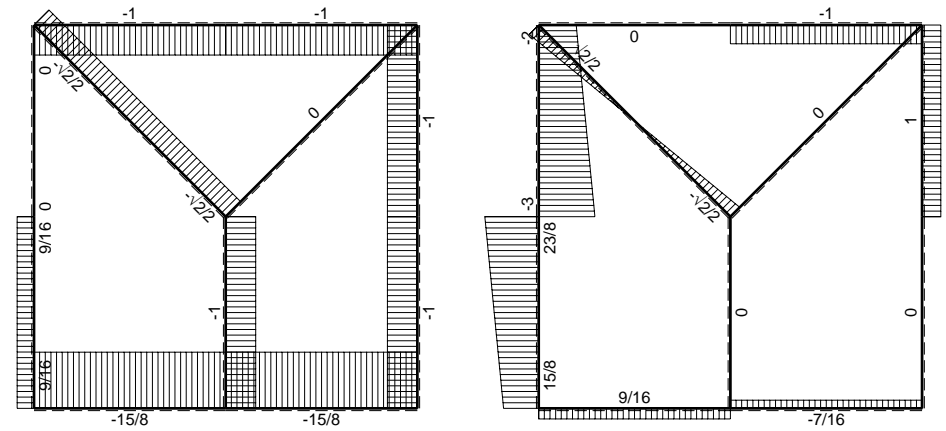
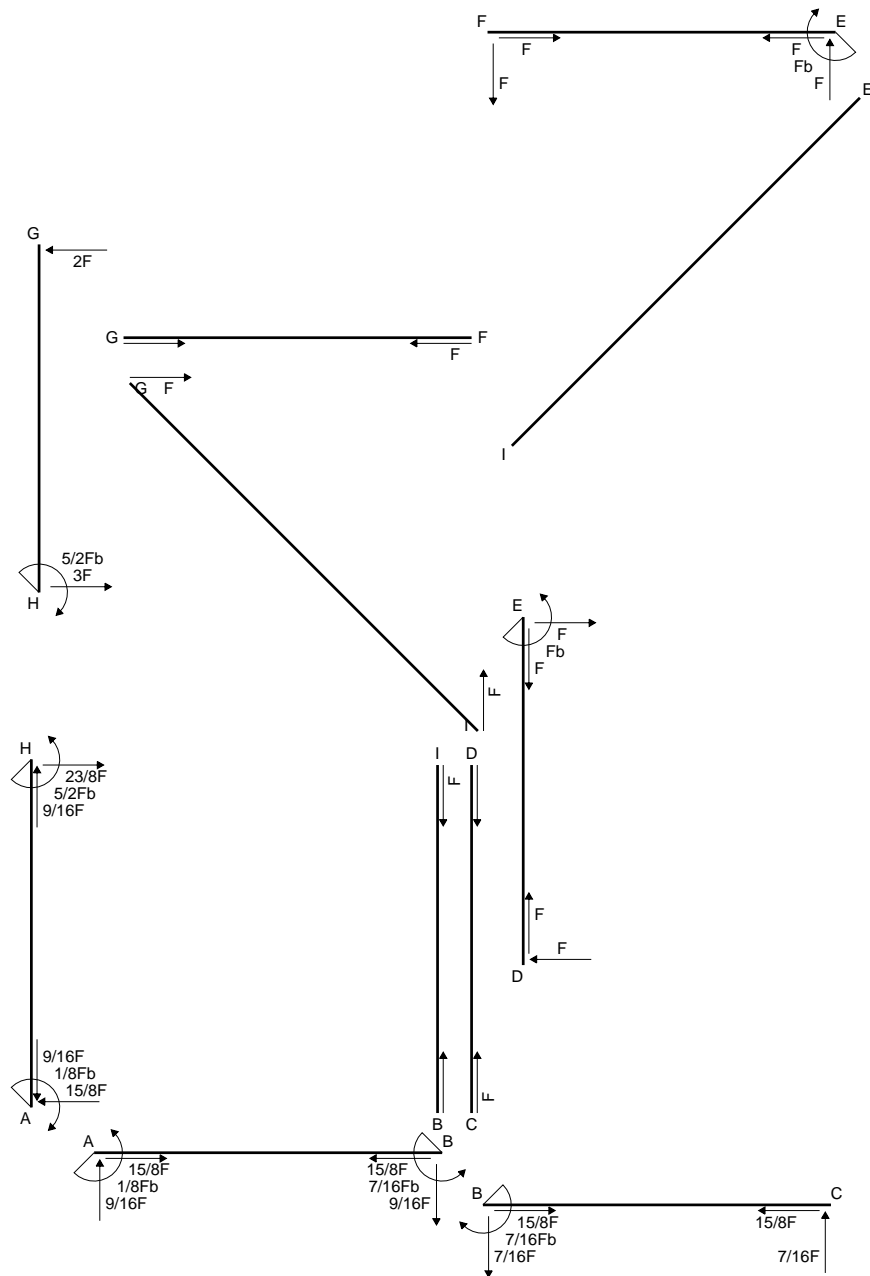
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

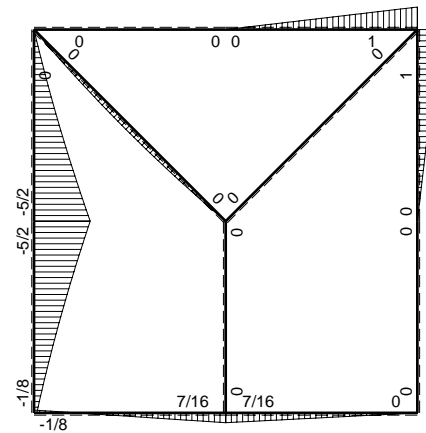
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

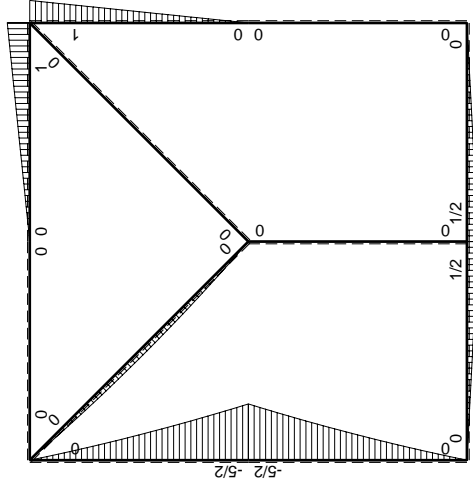
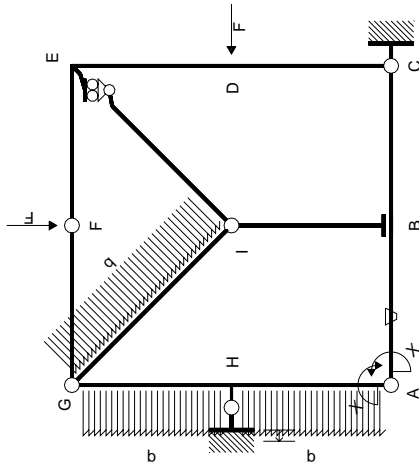


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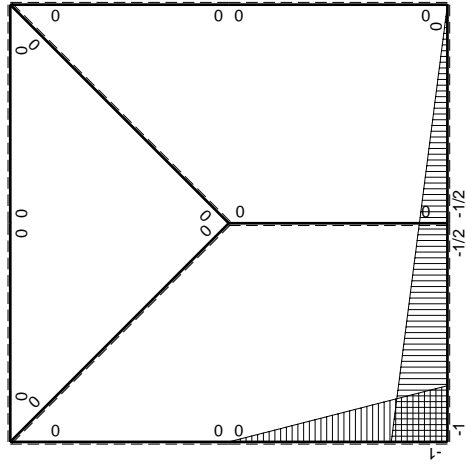
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⊕ ⊖ Fb



M_0 , flessione da carichi assegnati



M_1 , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	$-Fb/EJ$	$-1/2Fx+1/4Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/6+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	Fb/EJ	$-1/4Fb+1/4Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[x - 1/4 x^2/b \right]_0^b \theta$$

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

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/2 x - 1/4 x^2/b \right]_0^b \theta$$

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

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

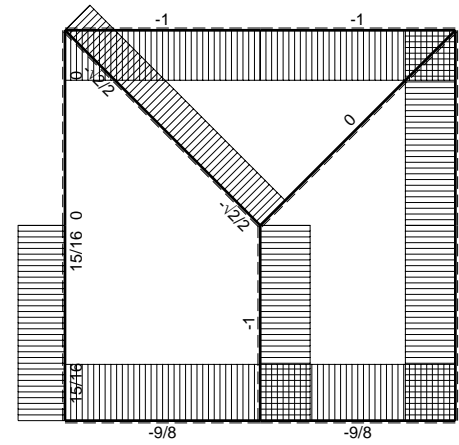
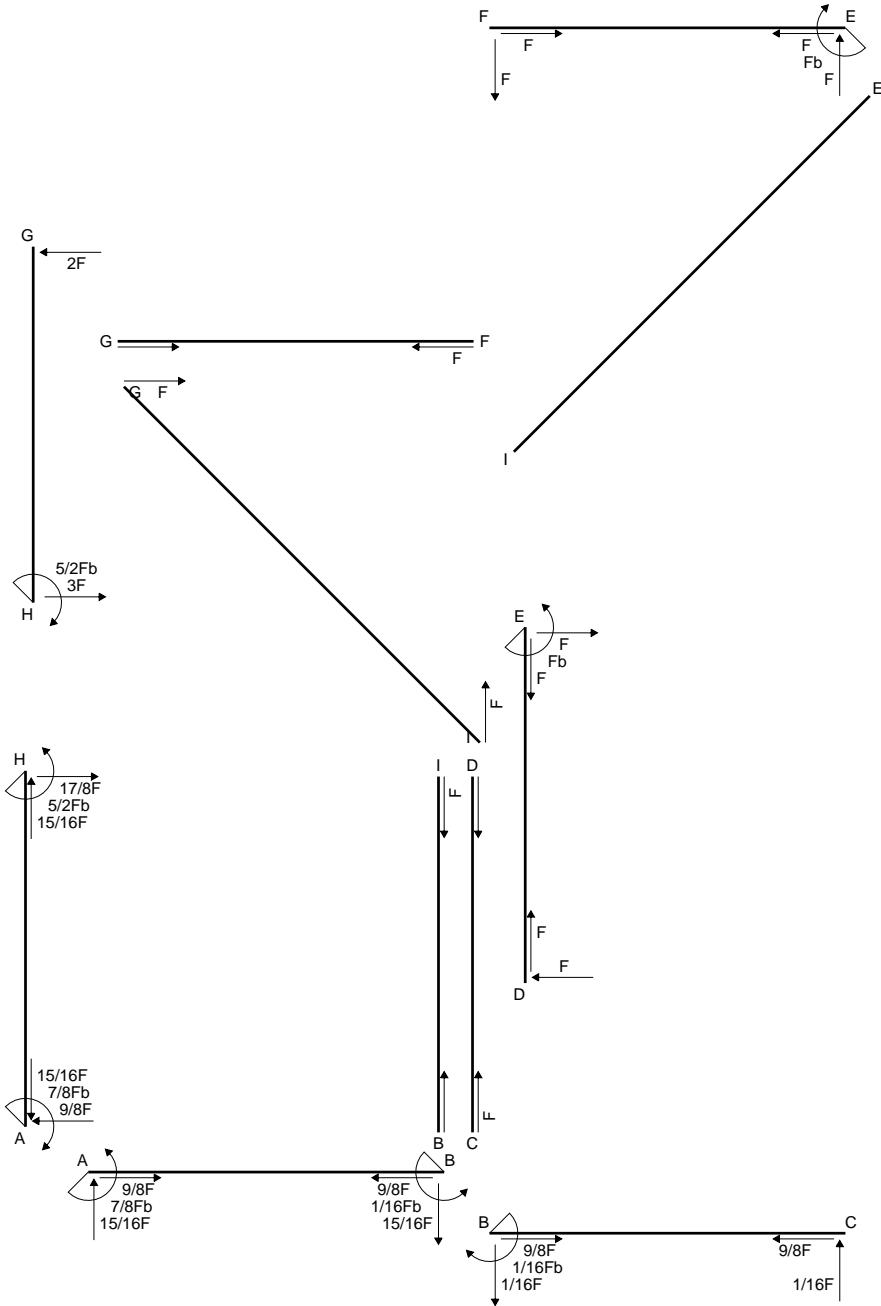
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

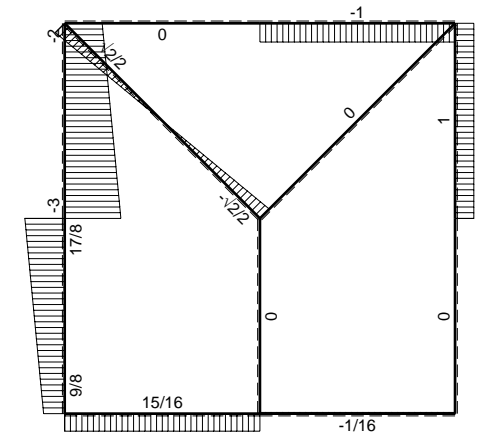
$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

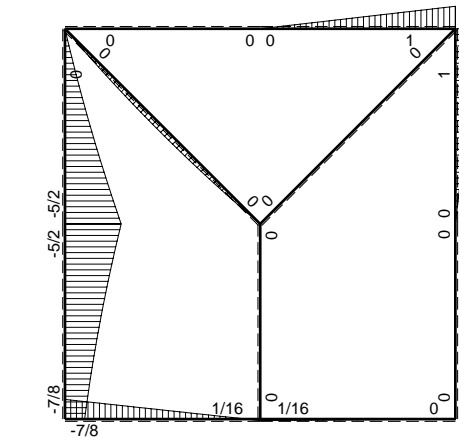
$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$



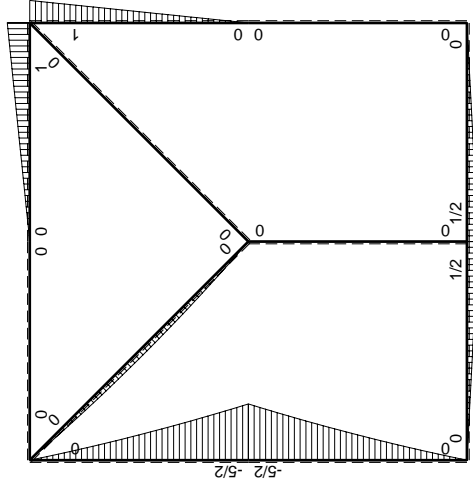
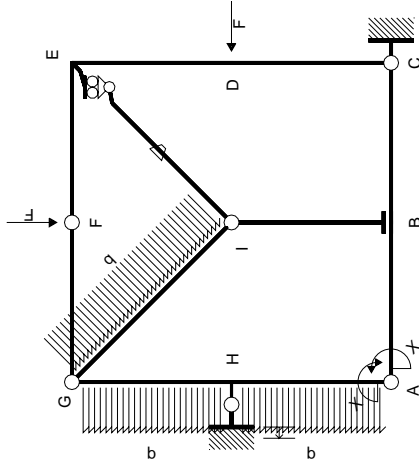
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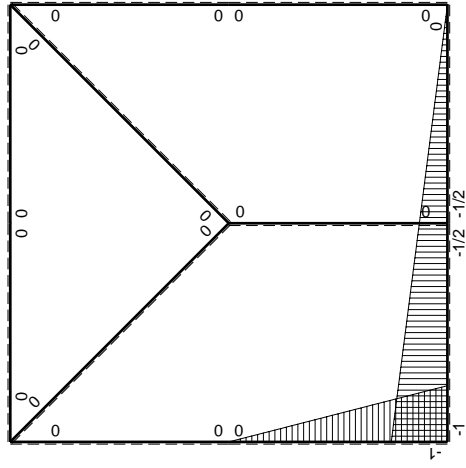
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⊕ ⊖ Fb



M_0 , flessione da carichi assegnati



M_1 , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CD b	0	0	0	0	0	0	0+0	0
DC b	0	0	0	0	0	0	0+0	0
DE b	0	Fx	0	0	0	0	0+0	0
ED b	0	-Fb+Fx	0	0	0	0	0+0	0
EF b	0	Fb-Fx	0	0	0	0	0+0	0
FE b	0	-Fx	0	0	0	0	0+0	0
FG b	0	0	0	0	0	0	0+0	0
GF b	0	0	0	0	0	0	0+0	0
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0	0+0	0
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0
IB b	0	0	0	0	0	0	0+0	0
BI b	0	0	0	0	0	0	0+0	0
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

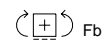
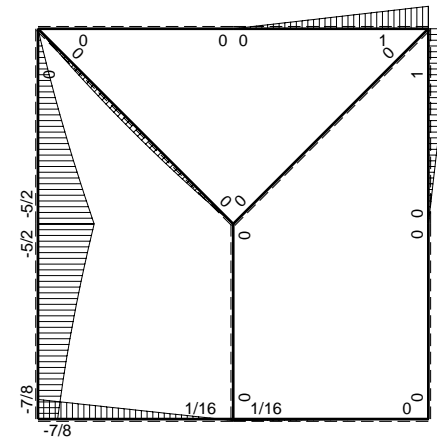
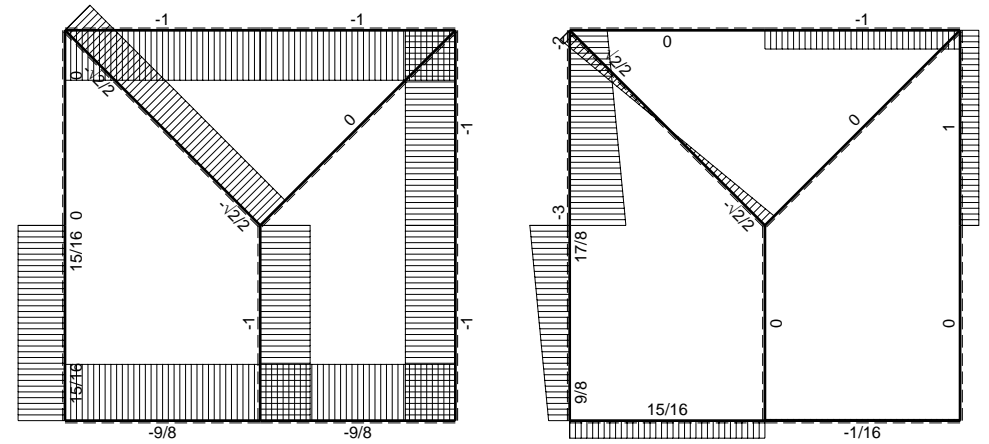
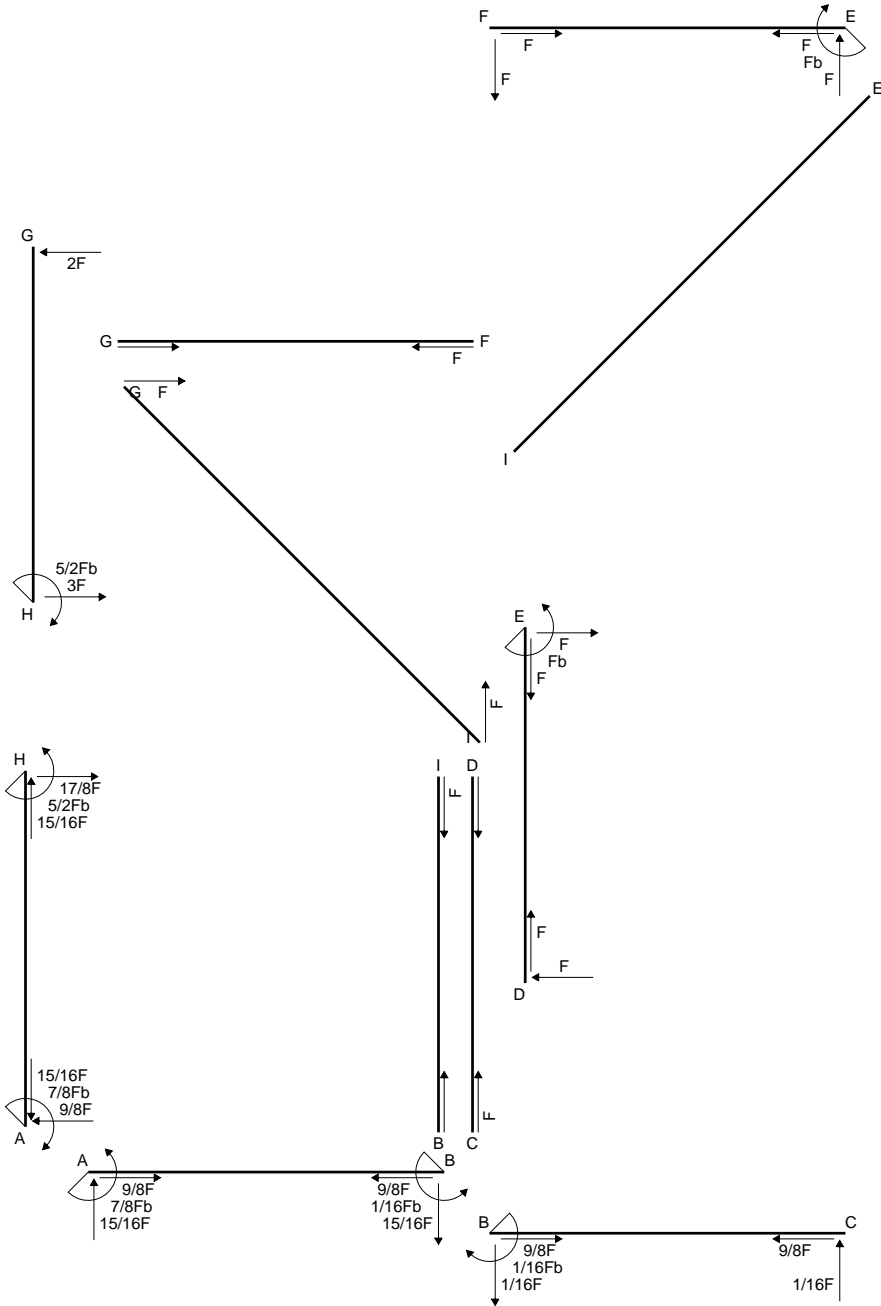
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

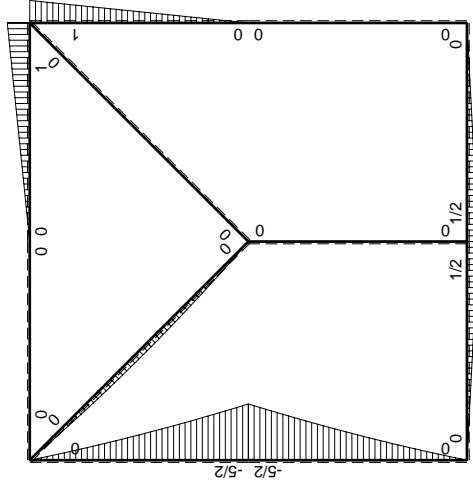
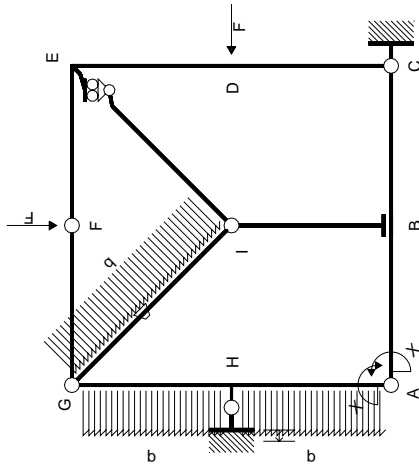
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

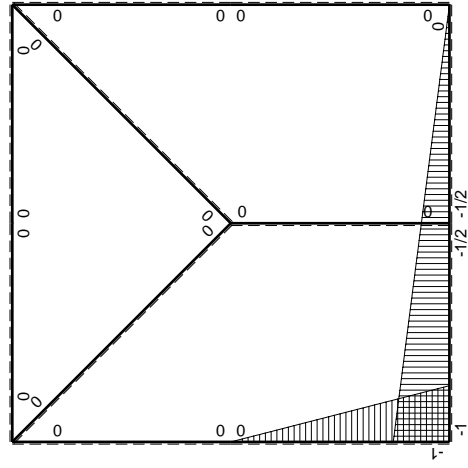
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	-Fb/EJ	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

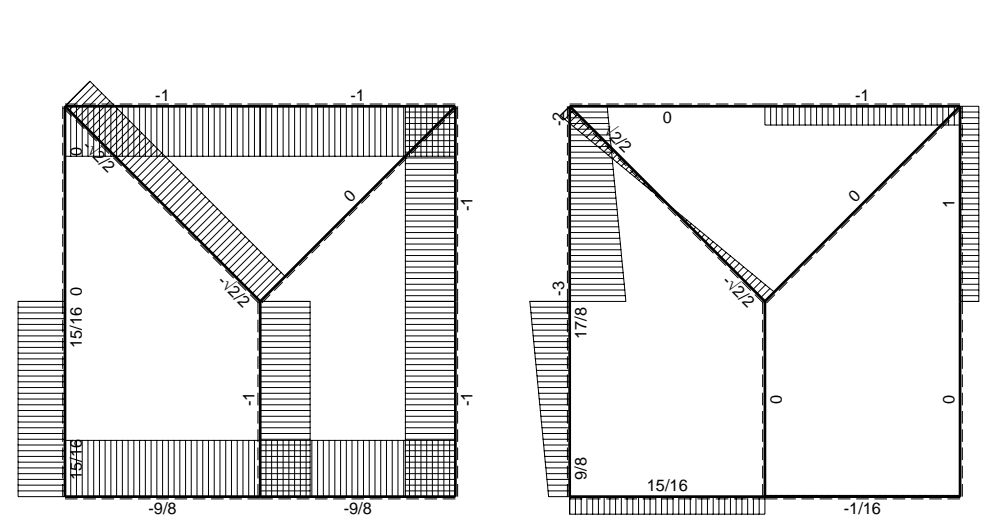
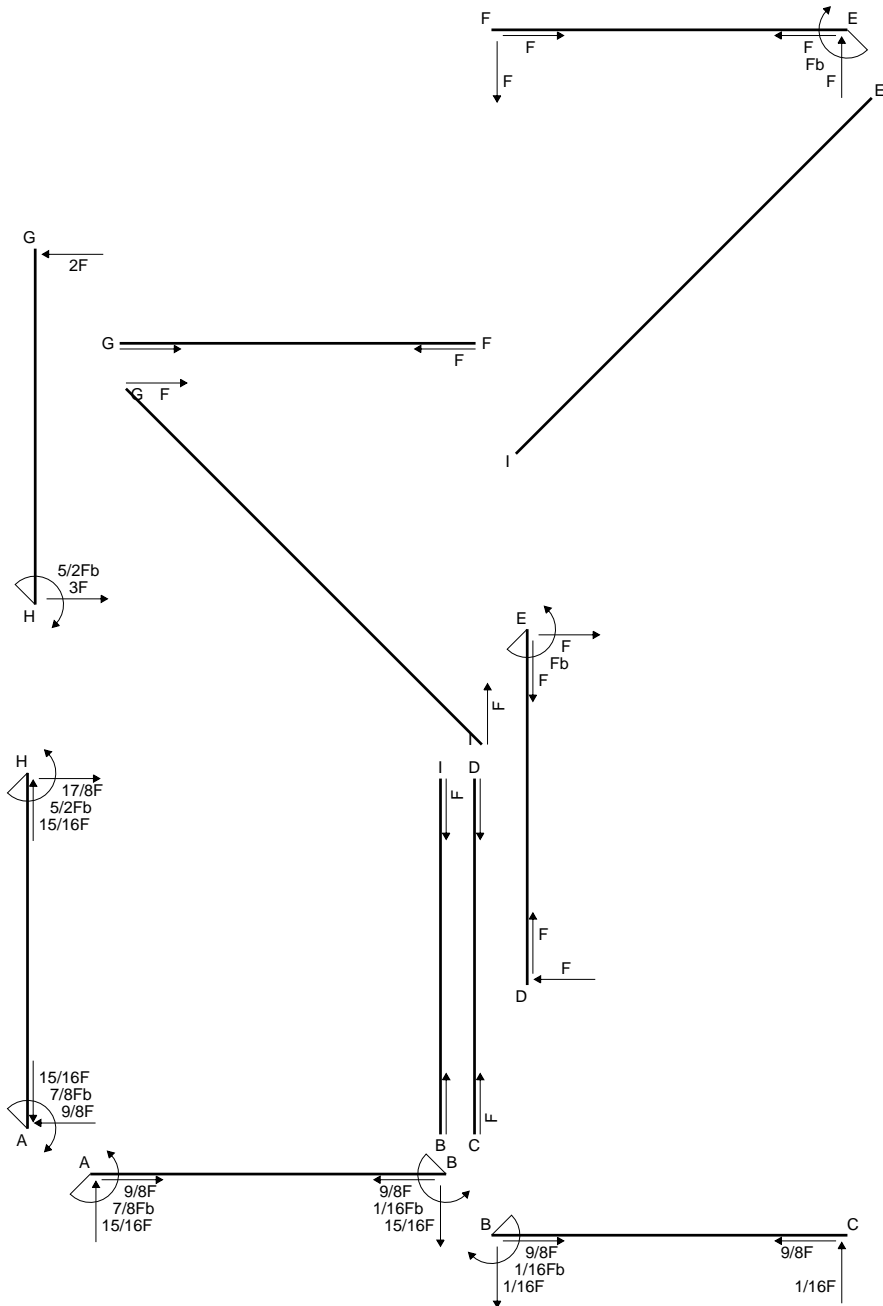
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

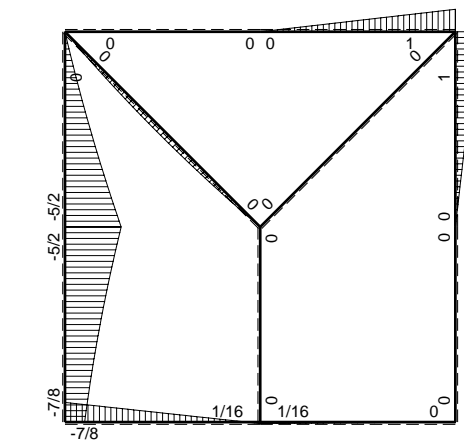
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

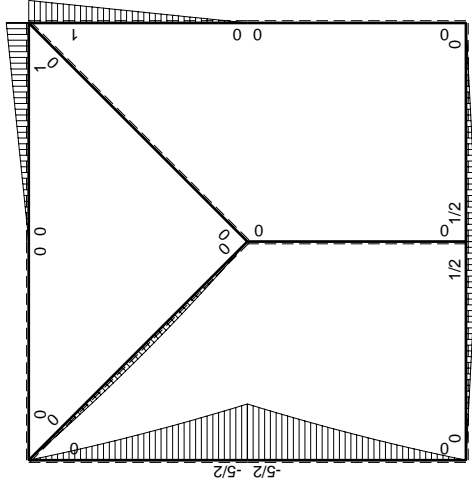
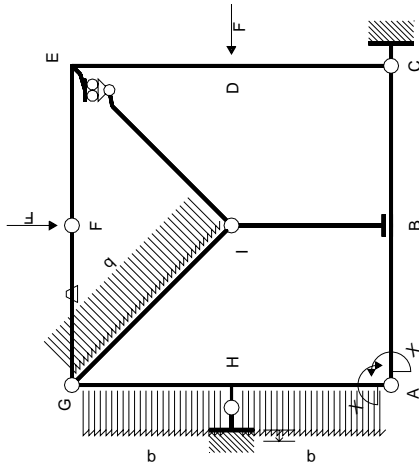


← ⊕ → F

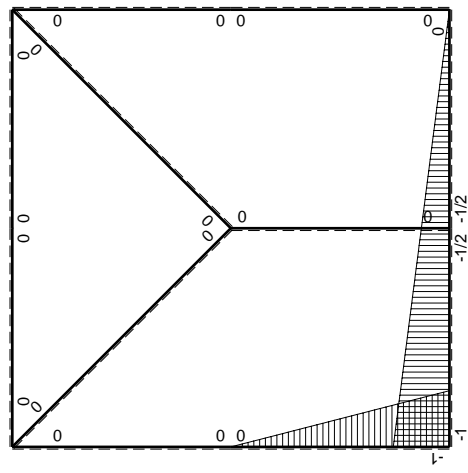
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CD b	0	0	0	0	0	0	0+0	0
DC b	0	0	0	0	0	0	0+0	0
DE b	0	Fx	0	0	0	0	0+0	0
ED b	0	-Fb+Fx	0	0	0	0	0+0	0
EF b	0	Fb-Fx	0	0	0	0	0+0	0
FE b	0	-Fx	0	0	0	0	0+0	0
FG b	0	0	-Fb/EJ	0	0	0	0+0	0
GF b	0	0	Fb/EJ	0	0	0	0+0	0
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0	0+0	0
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0
IB b	0	0	0	0	0	0	0+0	0
BI b	0	0	0	0	0	0	0+0	0
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

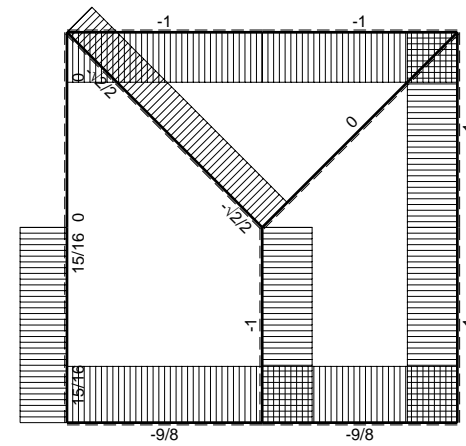
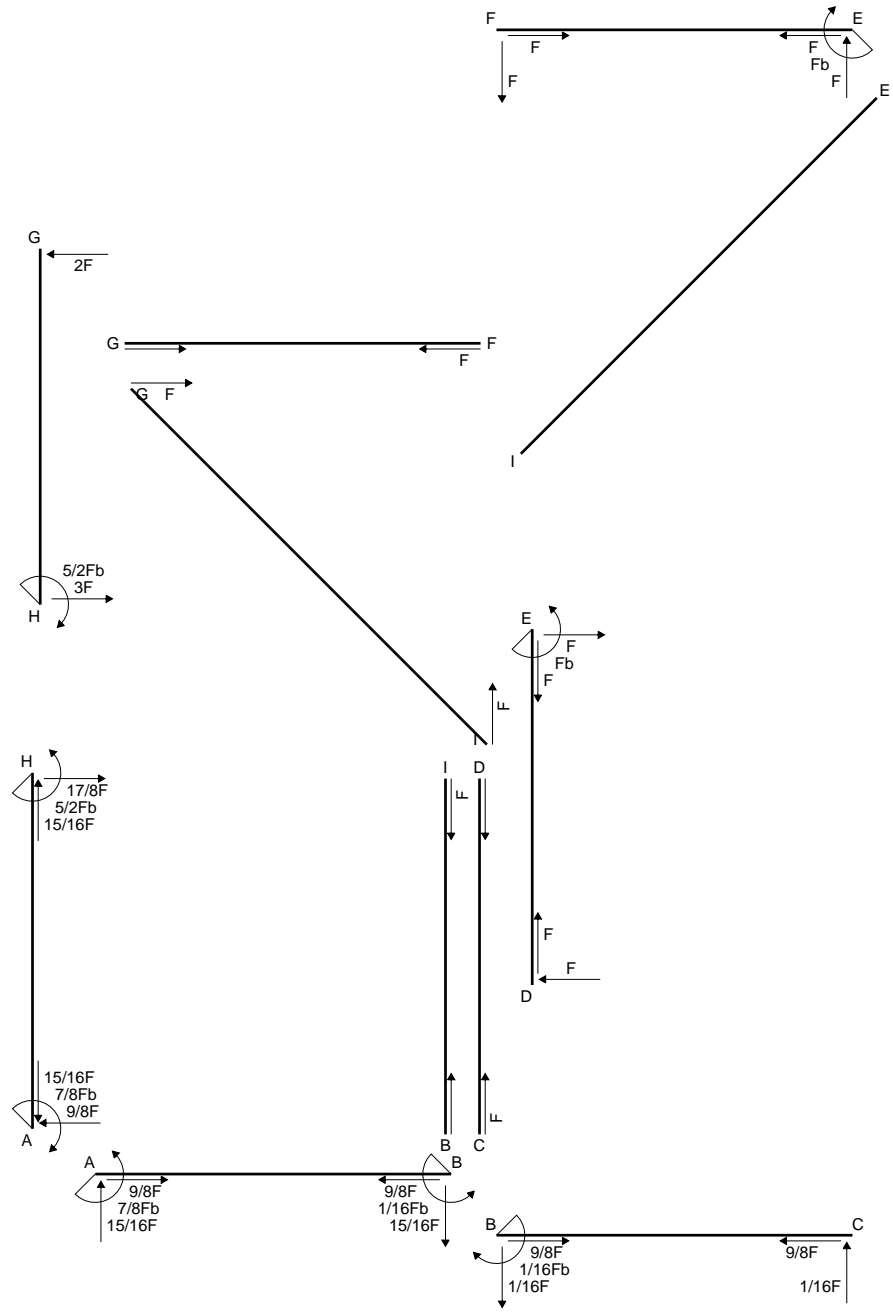
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

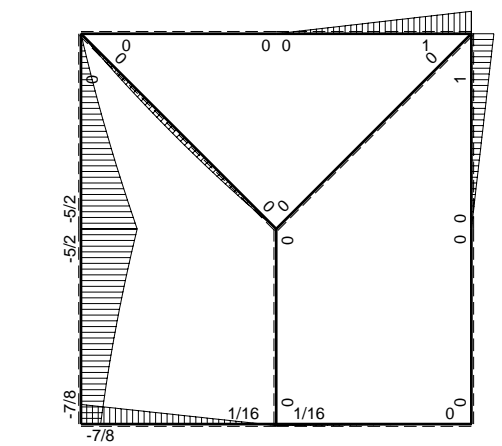
$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

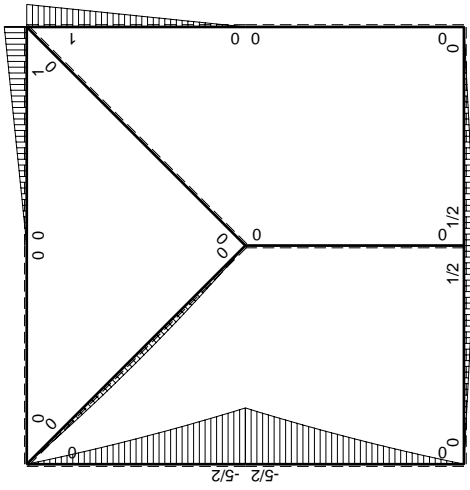
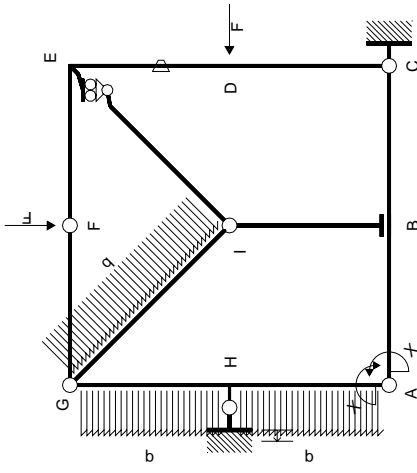
$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$



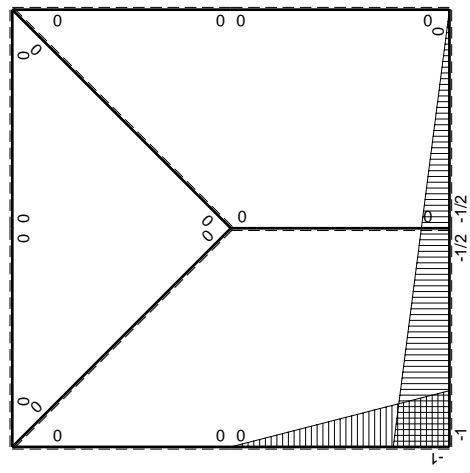
← ⊕ → F



⊕ ↕ Fb



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	Fb/EJ	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

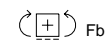
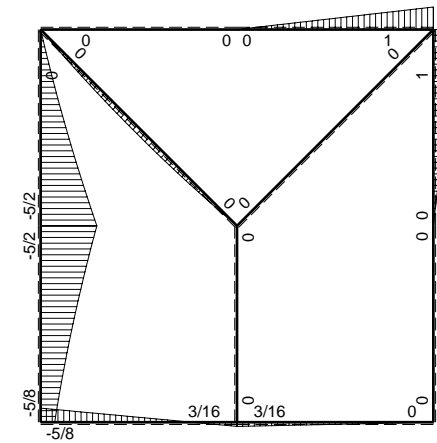
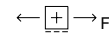
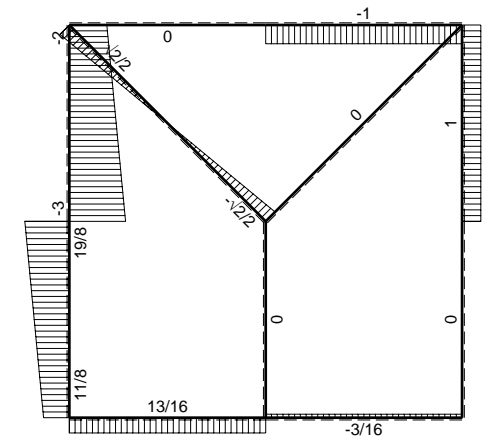
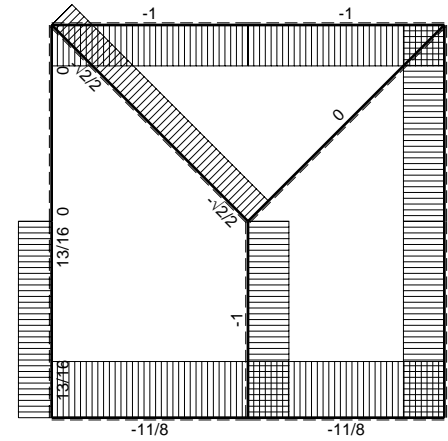
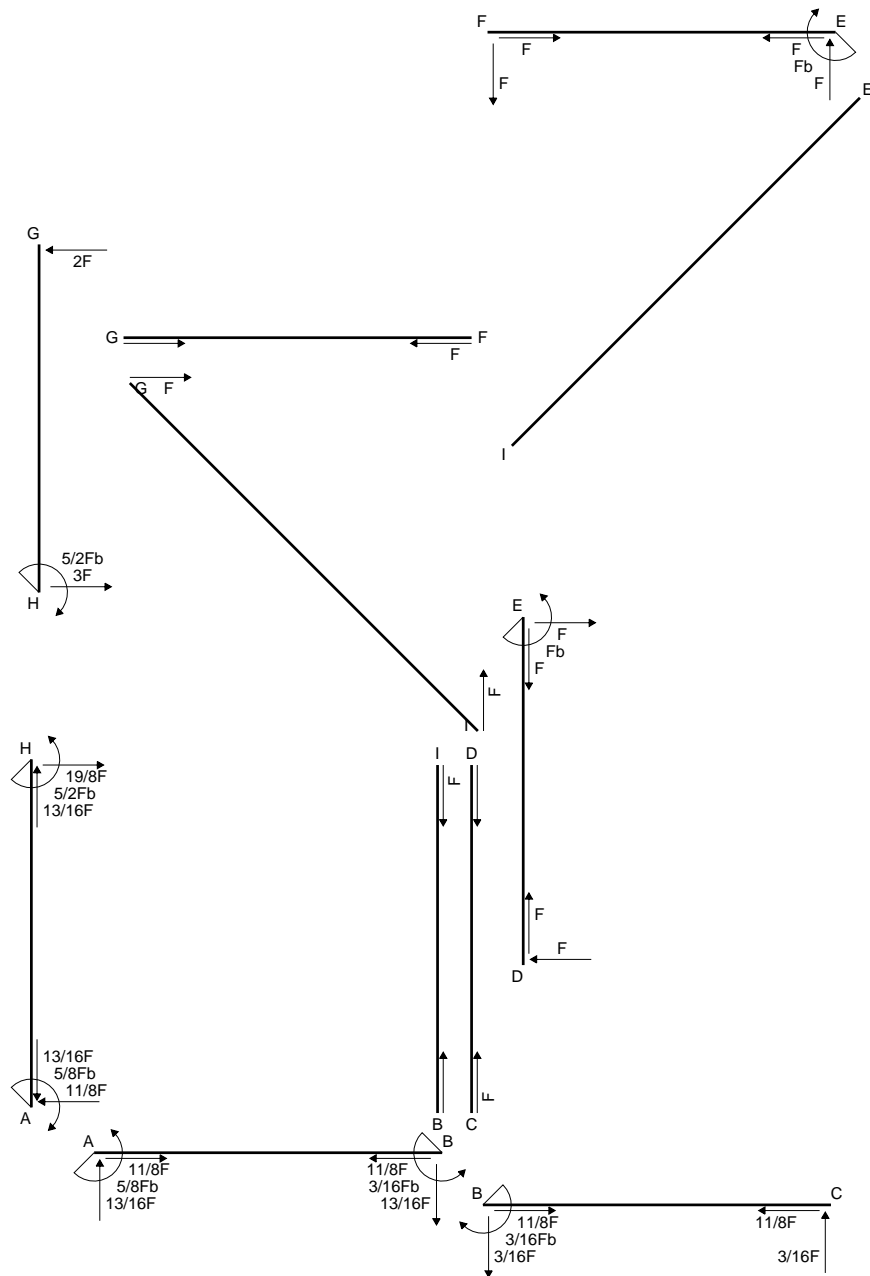
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

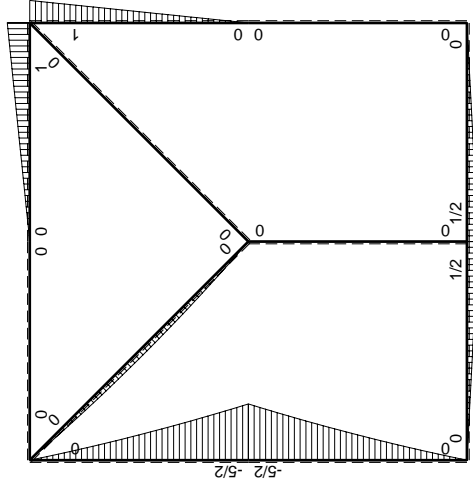
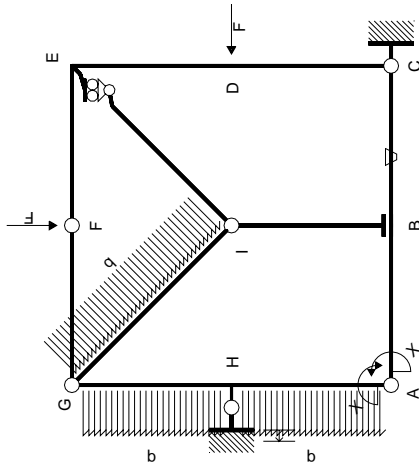
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

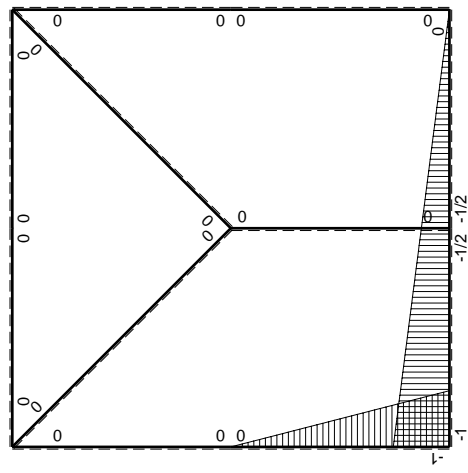
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	$-Fb/EJ$	$-1/4Fb+1/2Fx-1/4Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	Fb/EJ	$-1/4Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-1/4 b + 1/4 b - 1/12 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/6 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/4 x^2/b \right]_0^b \theta$$

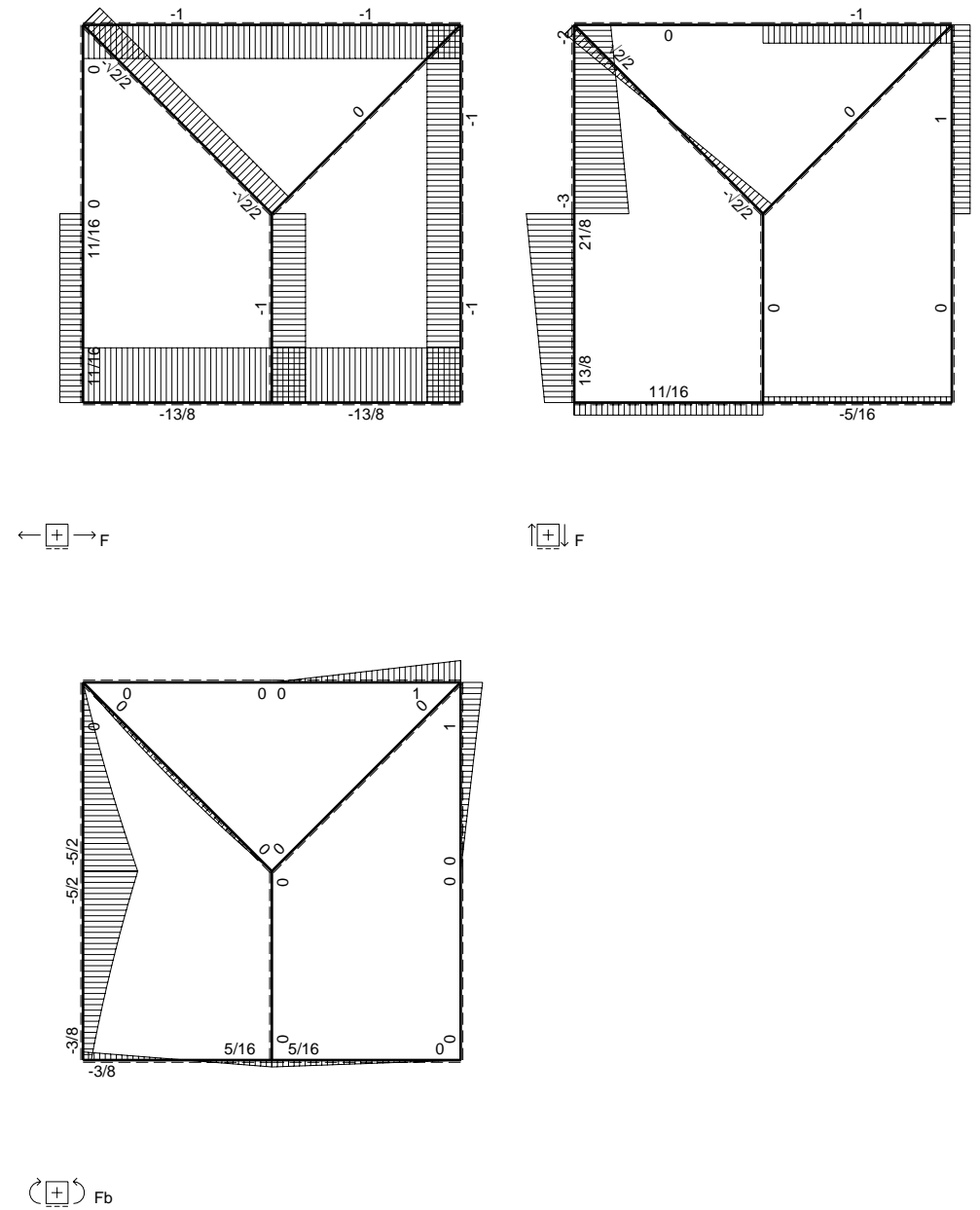
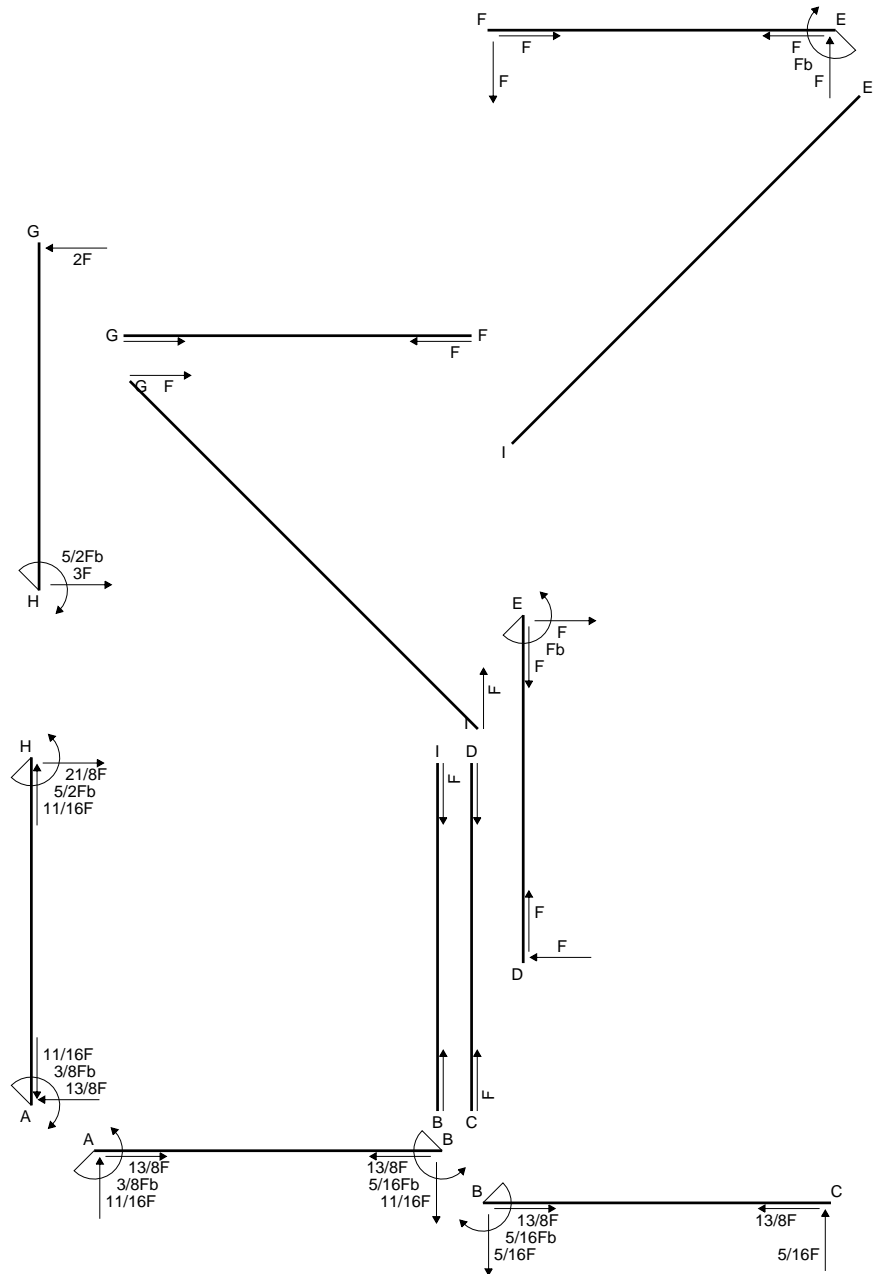
$$= (-1/12 b) Fb 1/EJ + (-1/4 b) \theta = 1/6 Fb^2/EJ$$

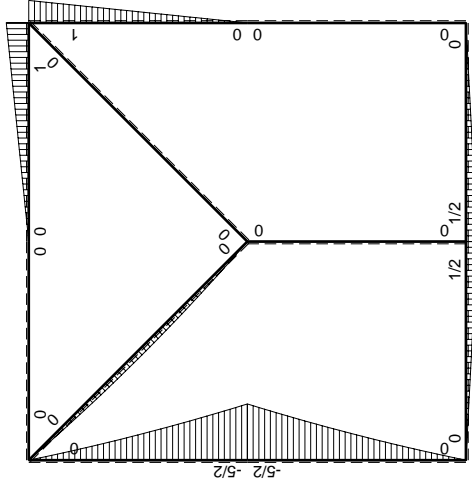
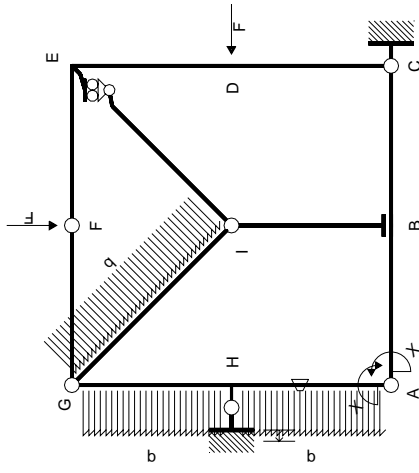
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

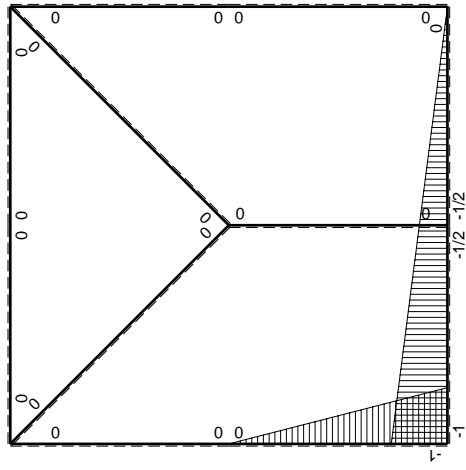
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	-Fb/EJ	$5/2Fx-3Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(3/8+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	Fb/EJ	$2Fx-3/2Fx^2/b-1/2qx^3/b$	Fb/EJ-Fx/EJ	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

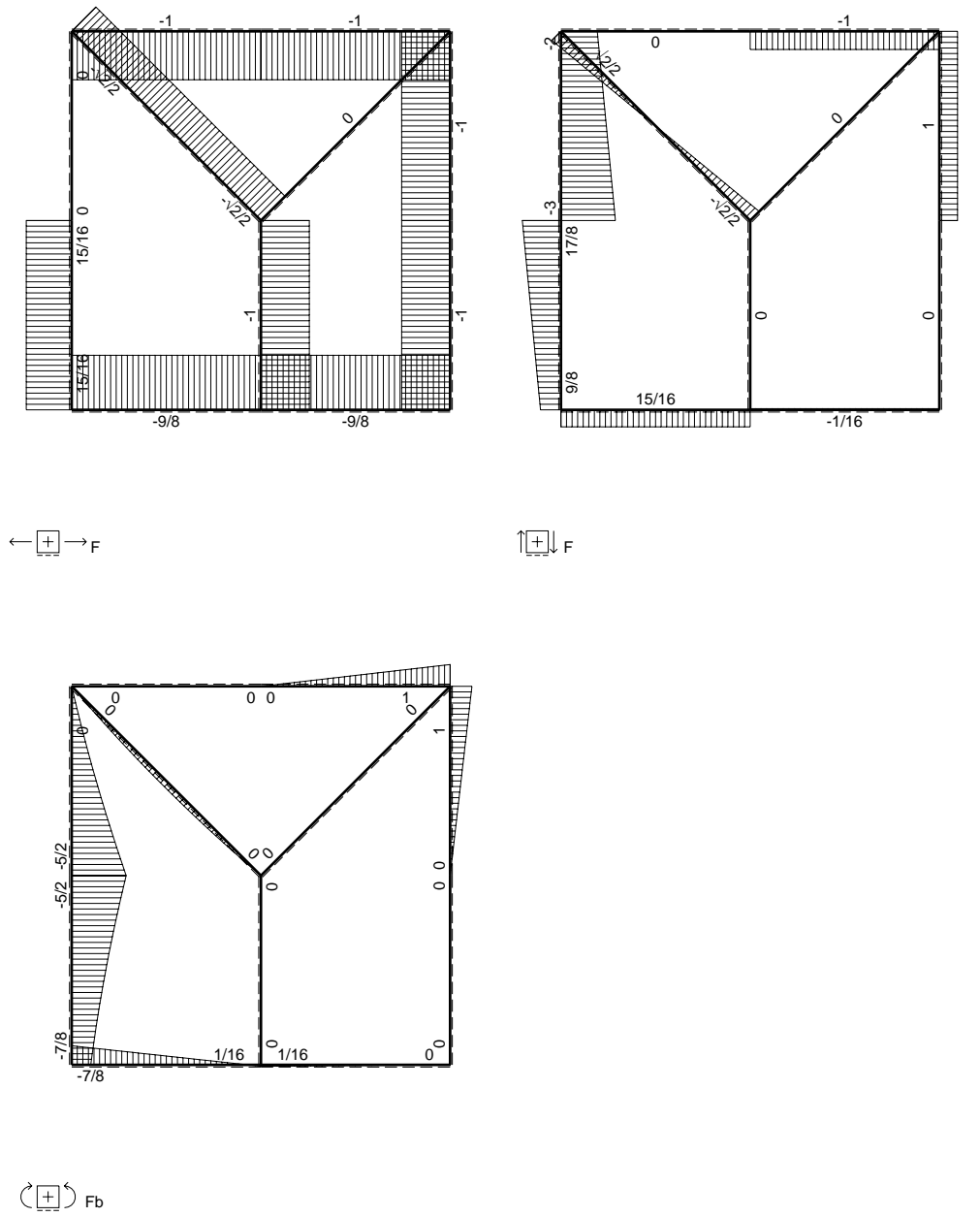
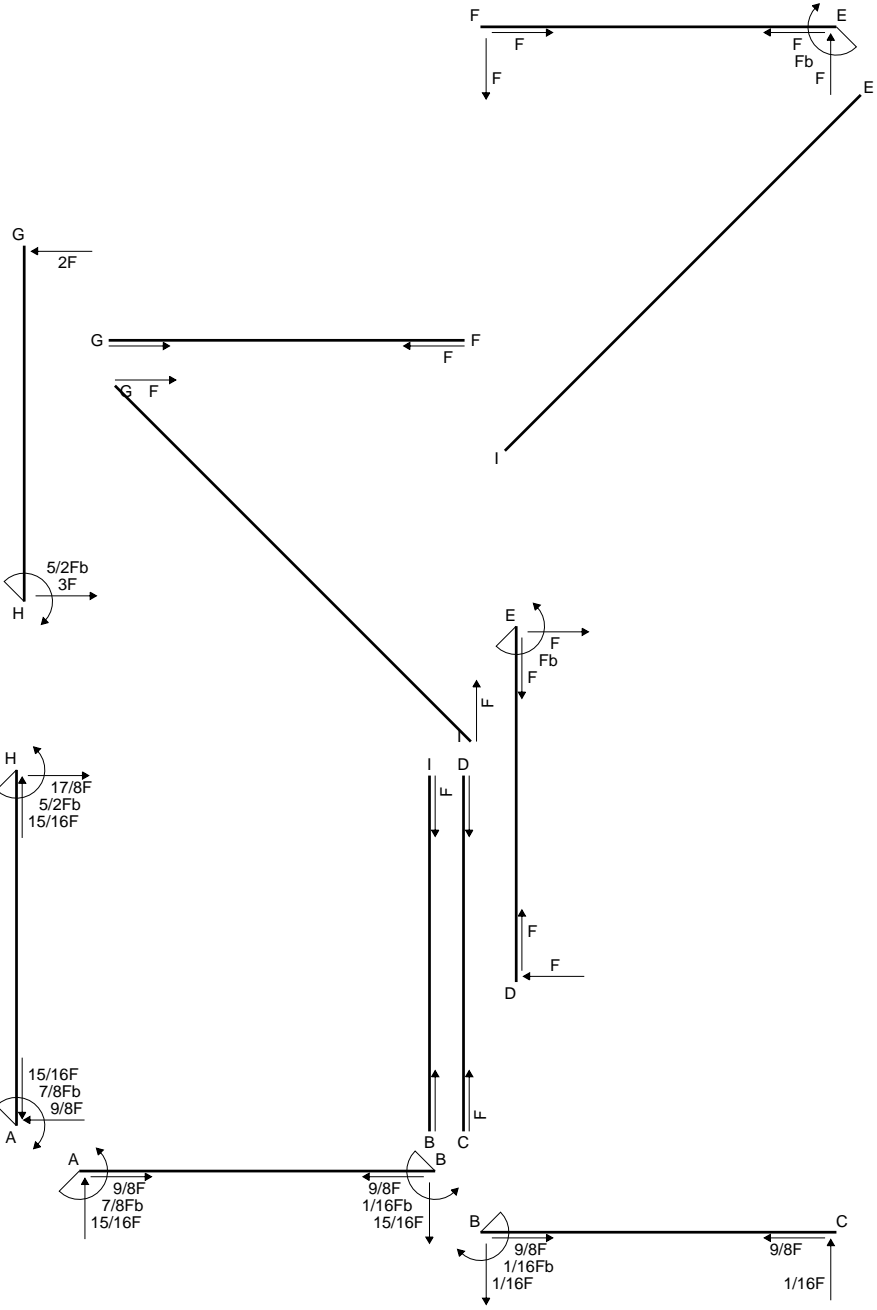
$$= \left[5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

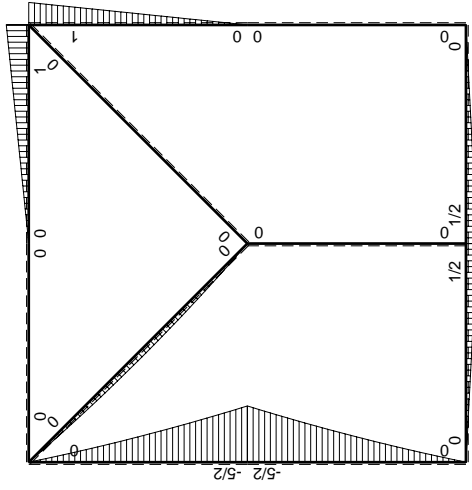
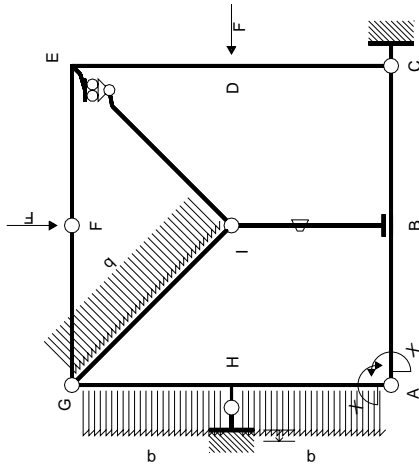
$$= (5/4 b - b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 7/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

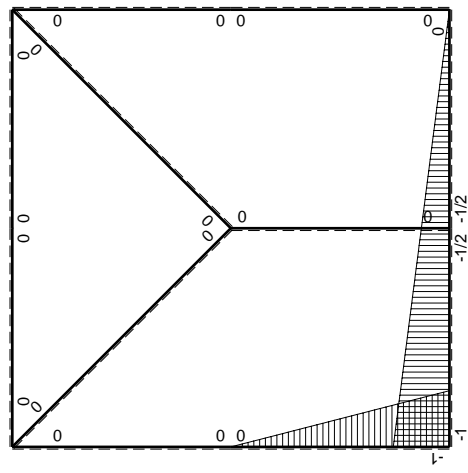
$$= \left[x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 7/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	0	0	0	0	0+0	0	
FE b	0	-Fx	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

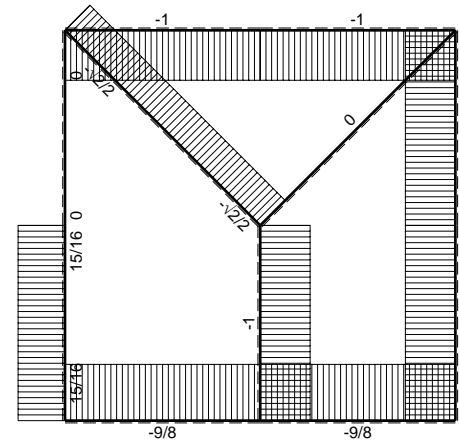
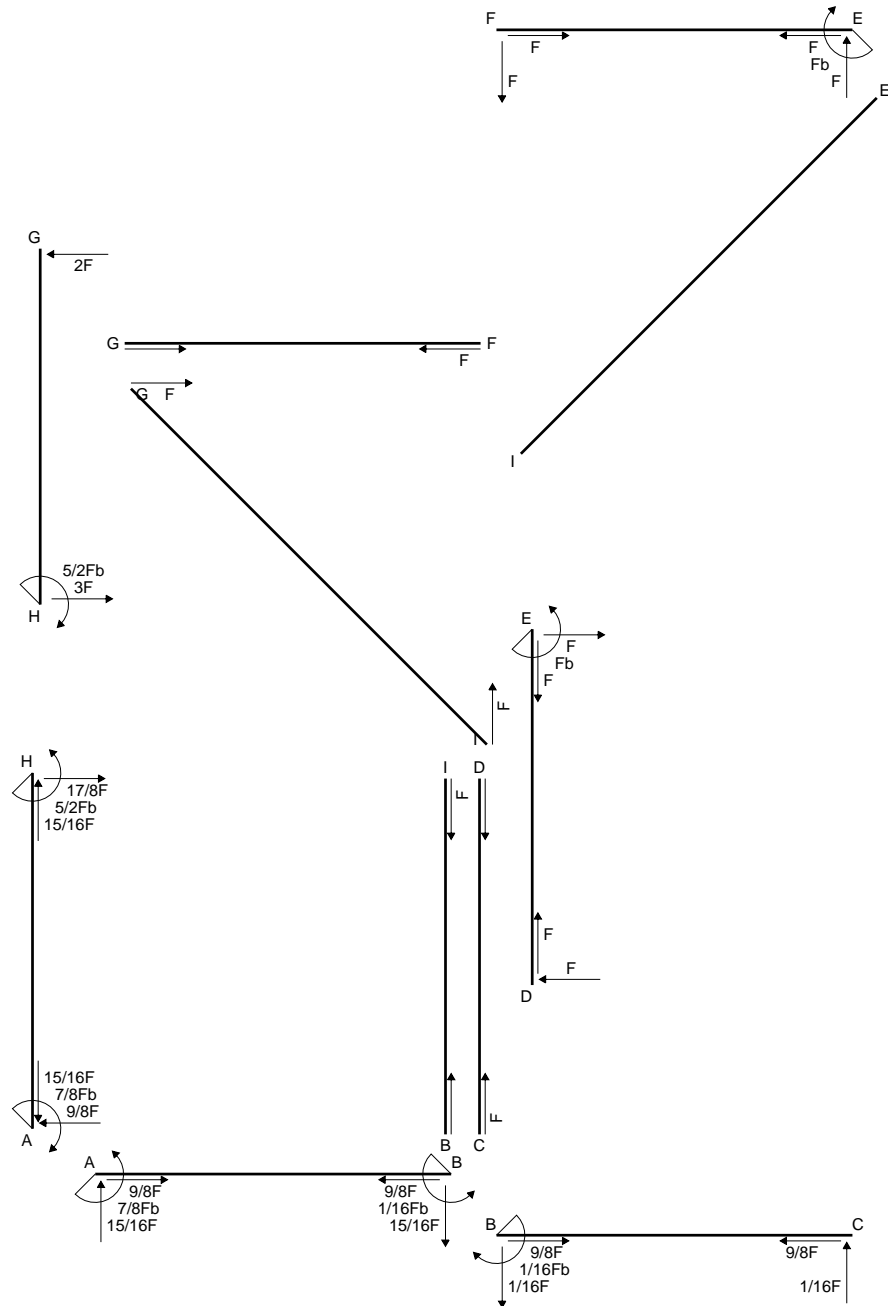
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

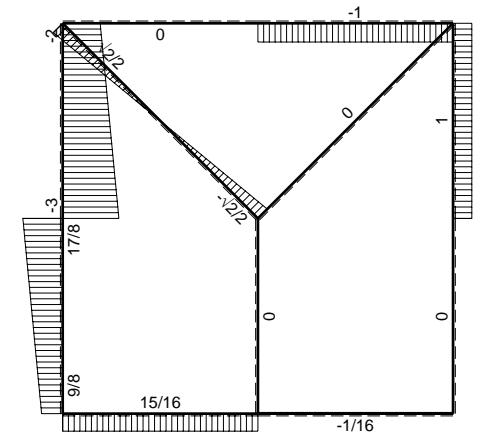
$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

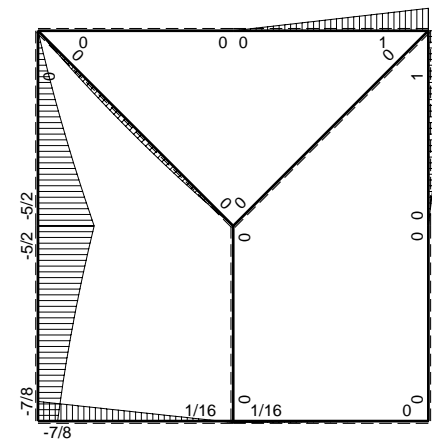
$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$



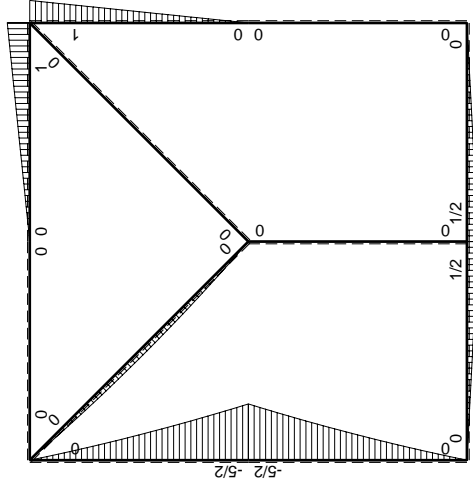
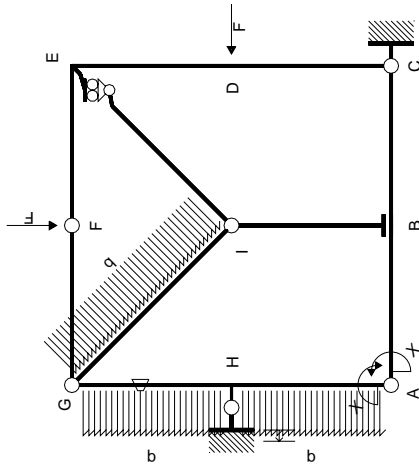
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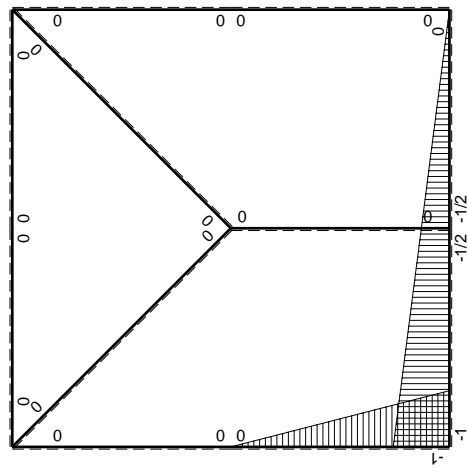
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CD b	0	0	0	0	0	0	0+0	0
DC b	0	0	0	0	0	0	0+0	0
DE b	0	Fx	0	0	0	0	0+0	0
ED b	0	-Fb+Fx	0	0	0	0	0+0	0
EF b	0	Fb-Fx	0	0	0	0	0+0	0
FE b	0	-Fx	0	0	0	0	0+0	0
FG b	0	0	0	0	0	0	0+0	0
GF b	0	0	0	0	0	0	0+0	0
GH b	0	$-2Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0
HG b	0	$5/2Fb-3Fx+1/2qx^2$	Fb/EJ	0	0	0	0+0	0
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0
IB b	0	0	0	0	0	0	0+0	0
BI b	0	0	0	0	0	0	0+0	0
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

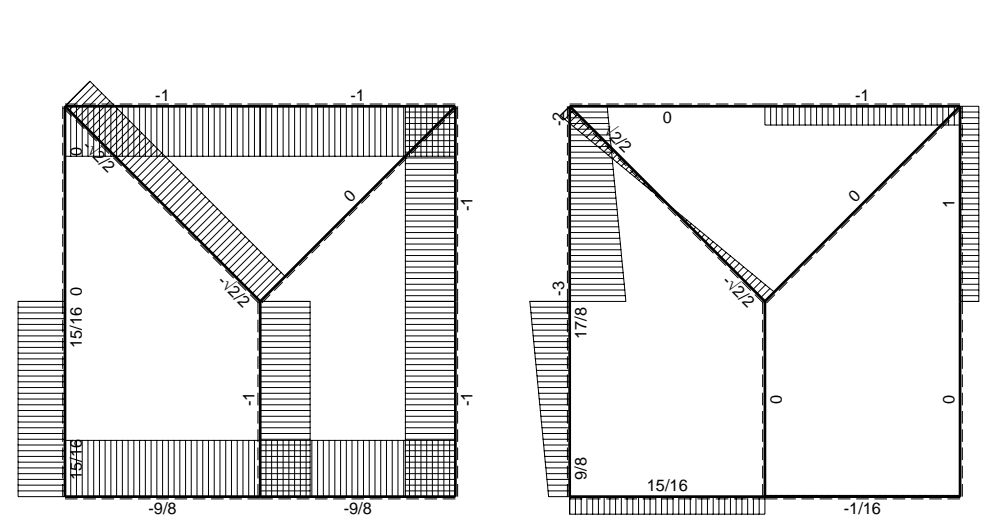
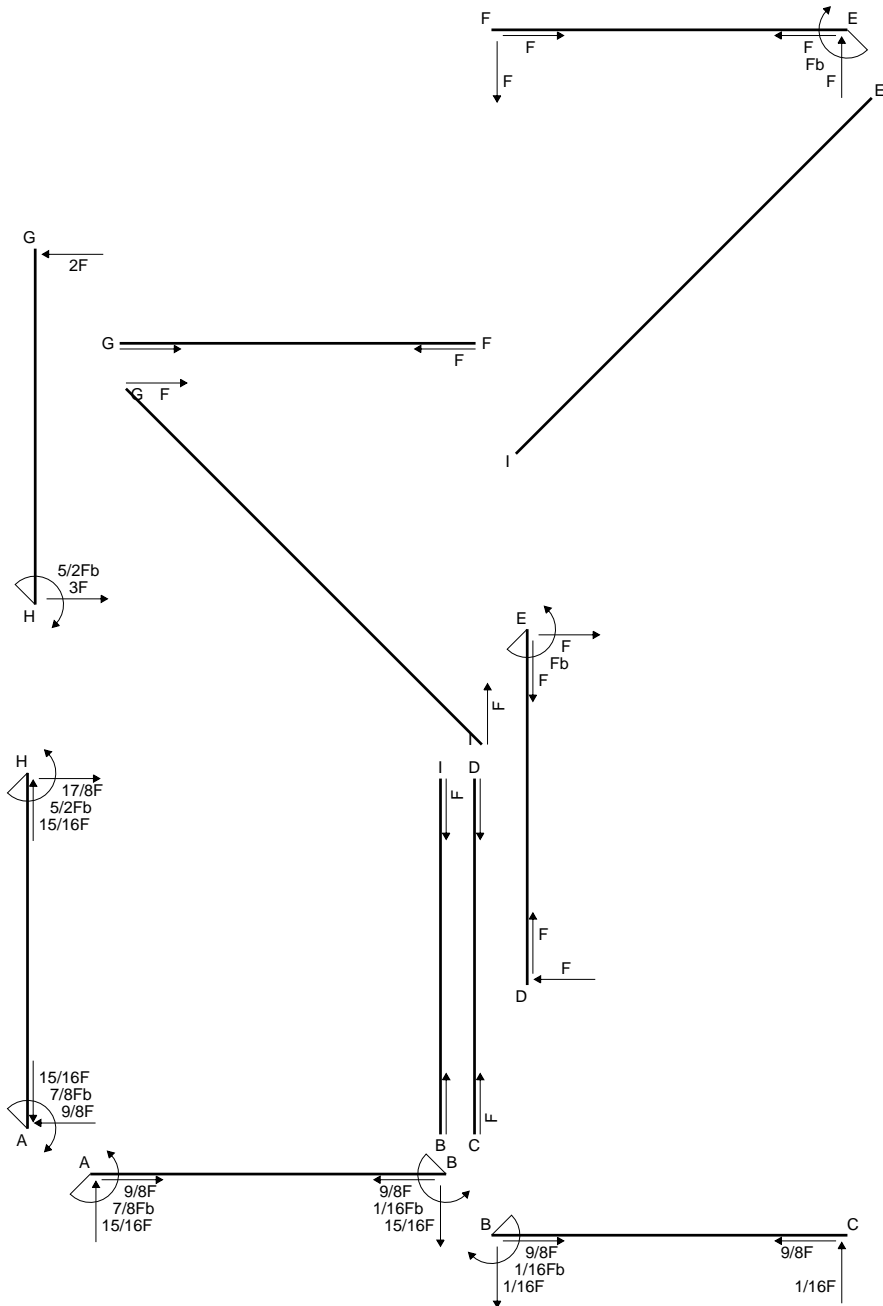
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

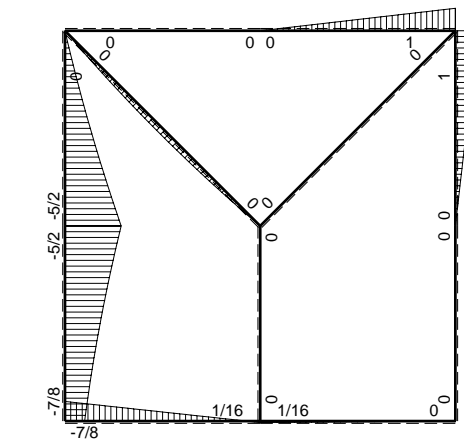
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

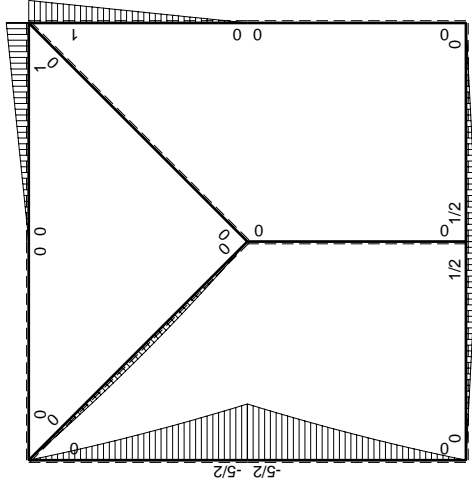
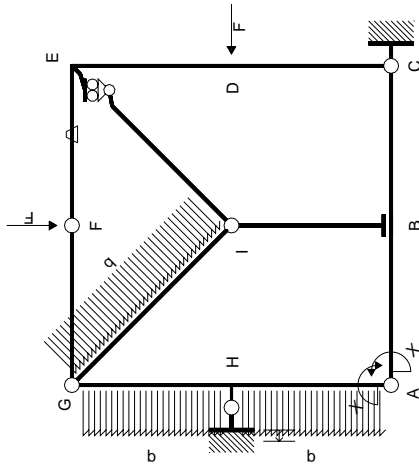


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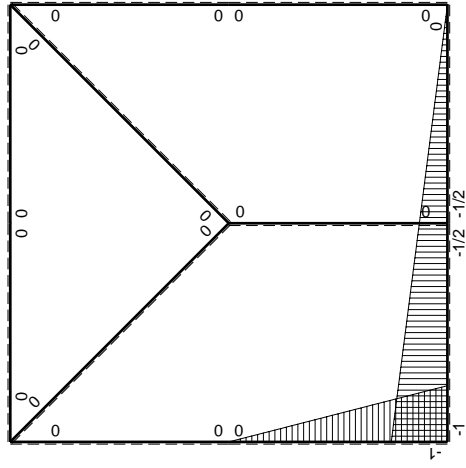
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⊕ ⊖ F_b



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	0	0	0	0	0+0	0	
DC b	0	0	0	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	-Fb+Fx	0	0	0	0			
EF b	0	Fb-Fx	-Fb/EJ	0	0	0	0+0	0	
FE b	0	-Fx	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

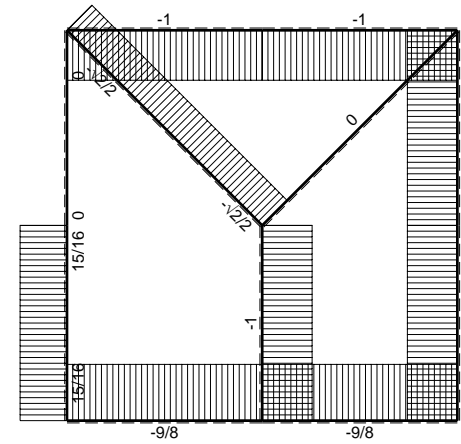
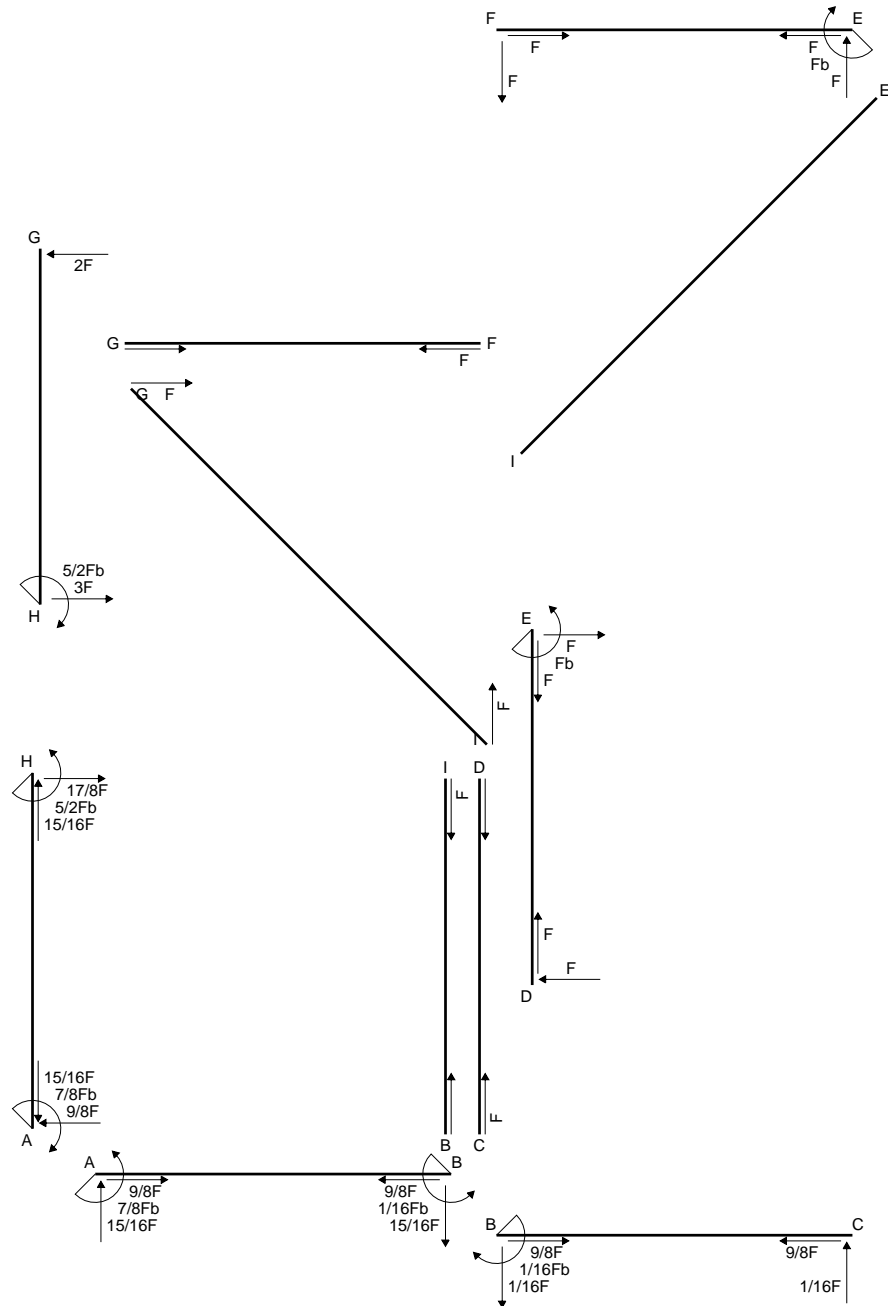
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

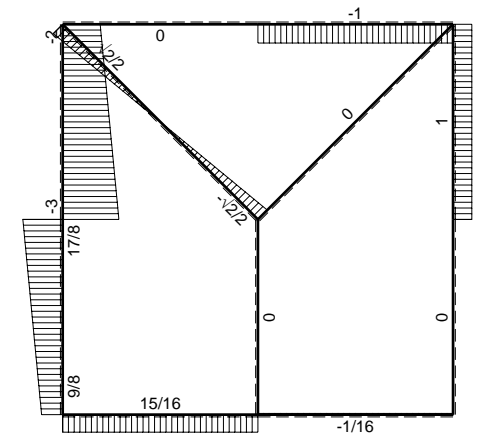
$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

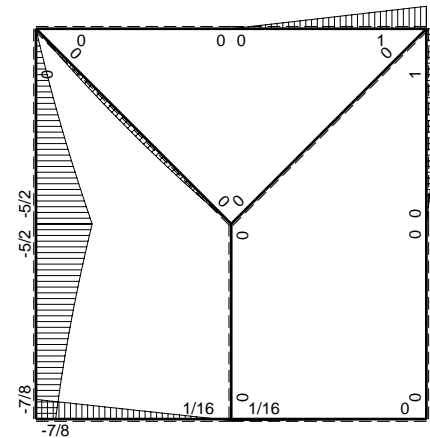
$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$



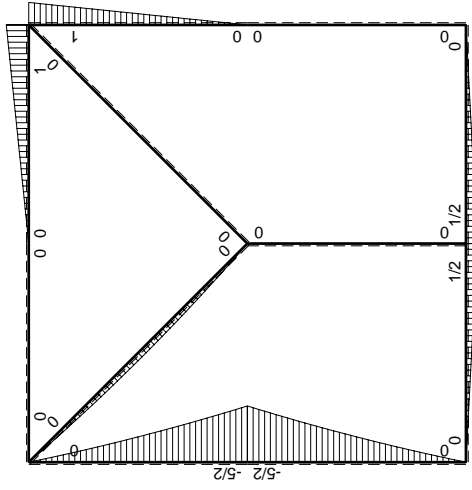
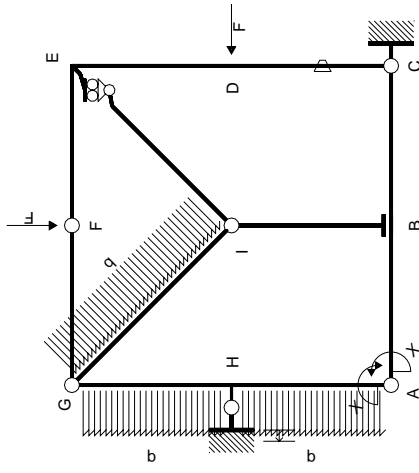
← + → F



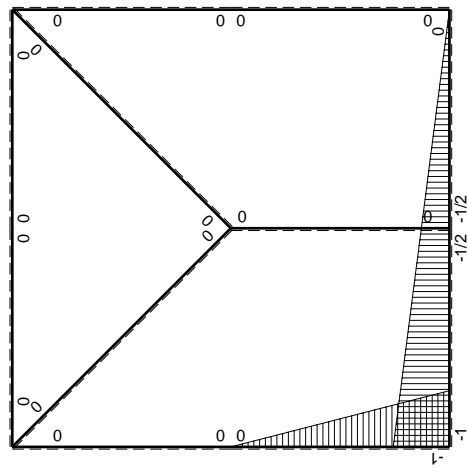
↑ + ↓ F



⊕ + ⊖ F_b



M_0 , flessione da carichi assegnati



M_1 , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	0	Fb/EJ	0	0	0			
DE b	0	Fx	0	0	0	0	0+0	0	
ED b	0	$-Fb+Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-2Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$5/2Fb-3Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/2Fb+3Fx-1/2qx^2$	0	$5/2Fx-3Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(3/8+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$2Fx+1/2qx^2$	0	$2Fx-3/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

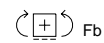
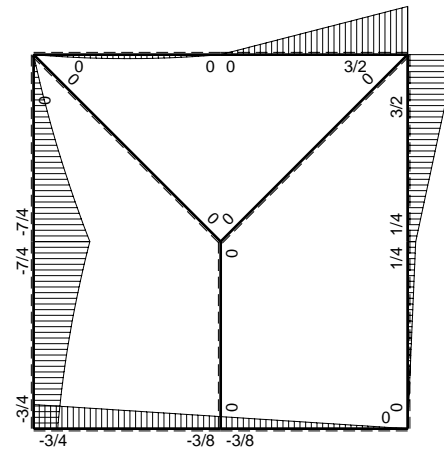
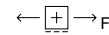
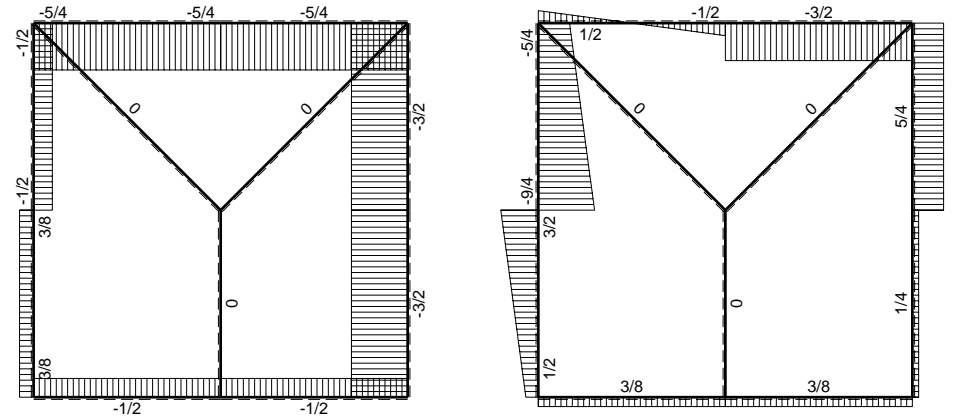
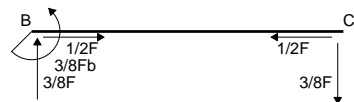
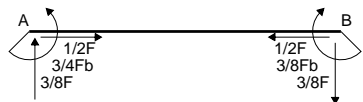
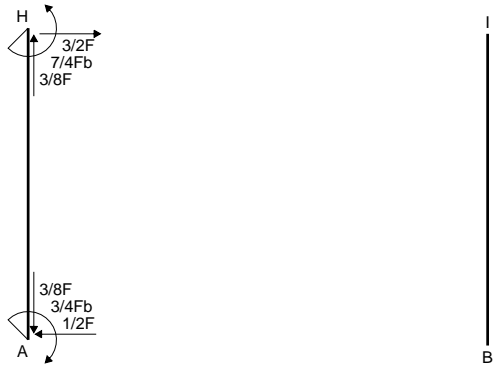
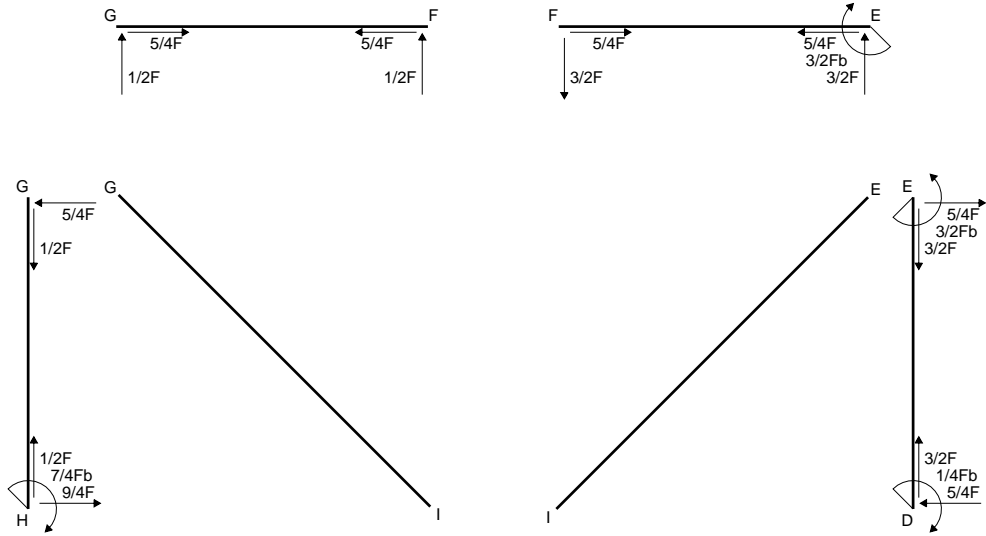
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

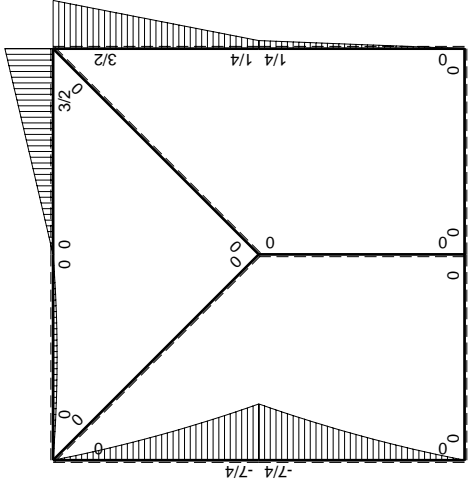
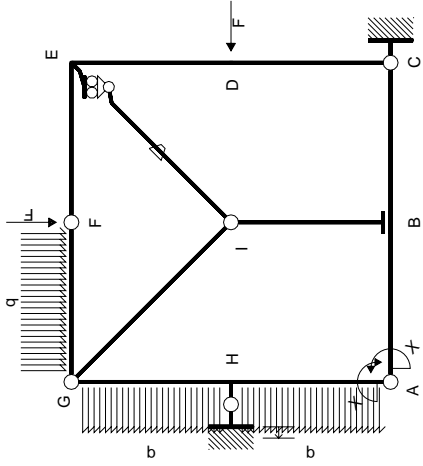
$$L_{HA}^{xo} = \int_0^b (5/2 x/b - 3 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [5/4 x^2/b - x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/4 b - b + 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$

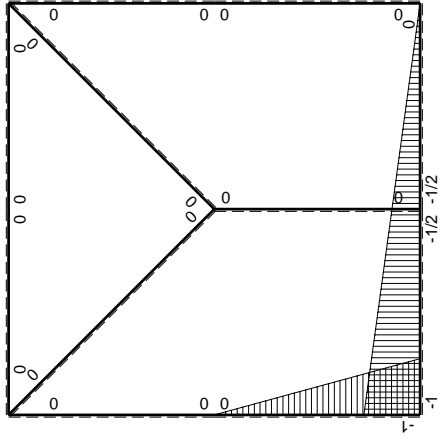
$$L_{AH}^{xo} = \int_0^b (2 x/b - 3/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [x^2/b - 1/2 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (b - 1/2 b - 1/8 b) Fb 1/EJ = 3/8 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

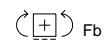
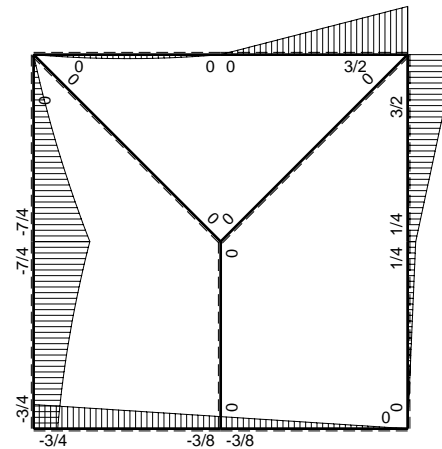
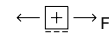
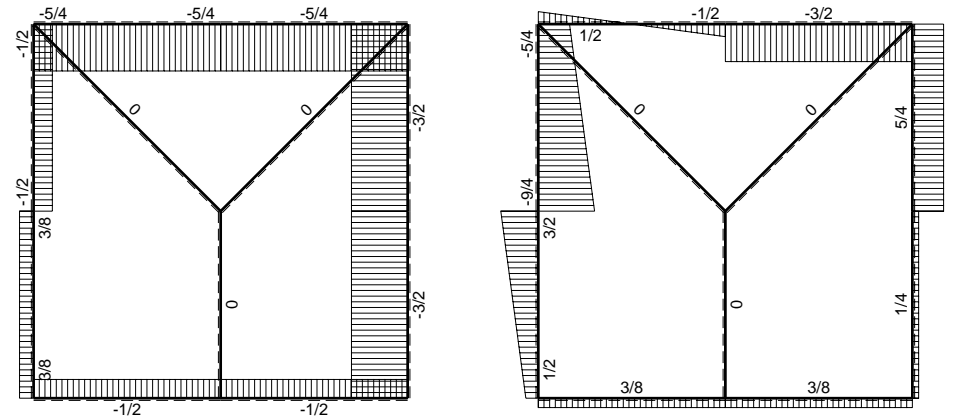
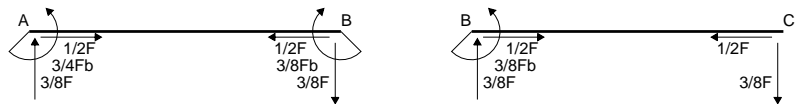
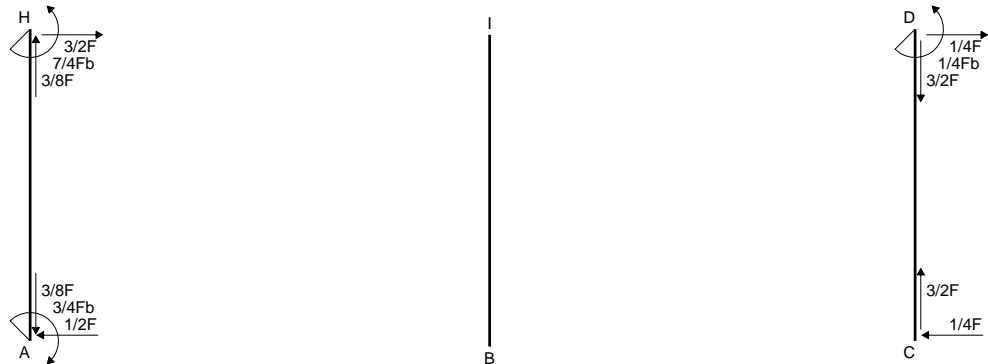
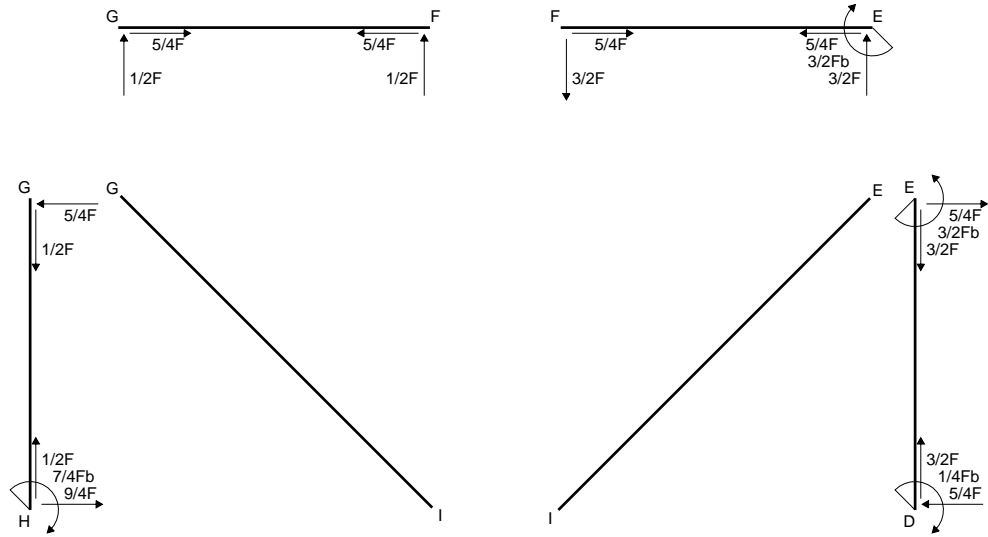
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

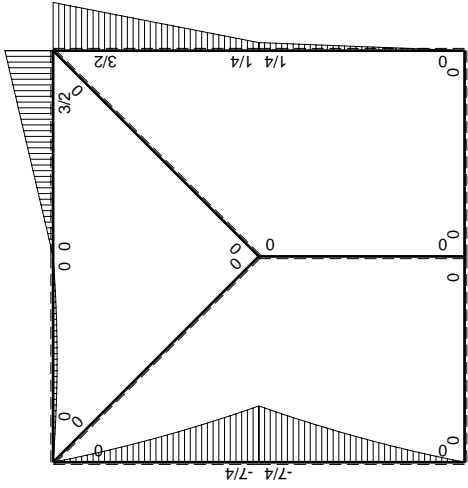
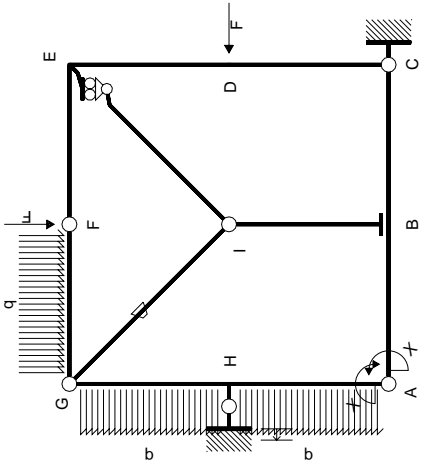
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

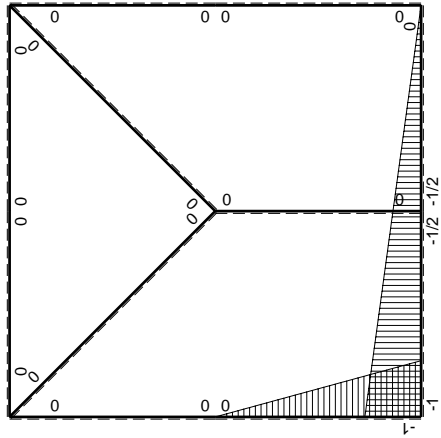
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

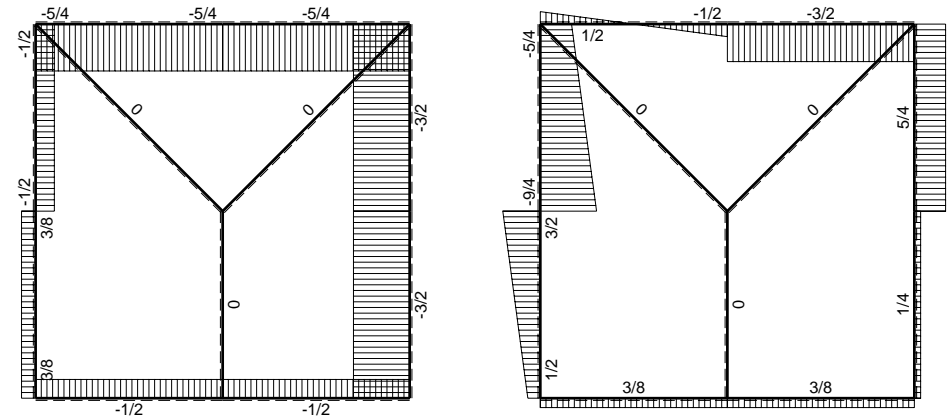
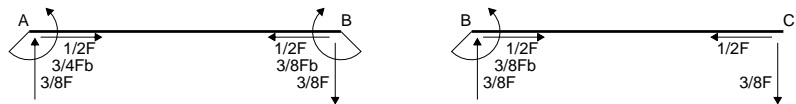
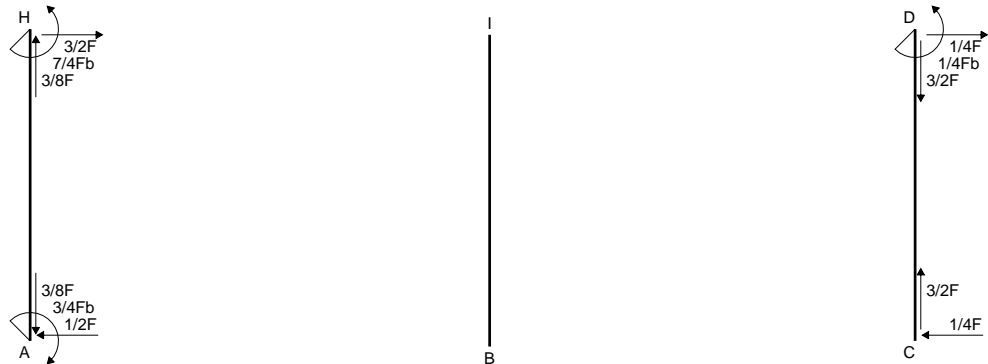
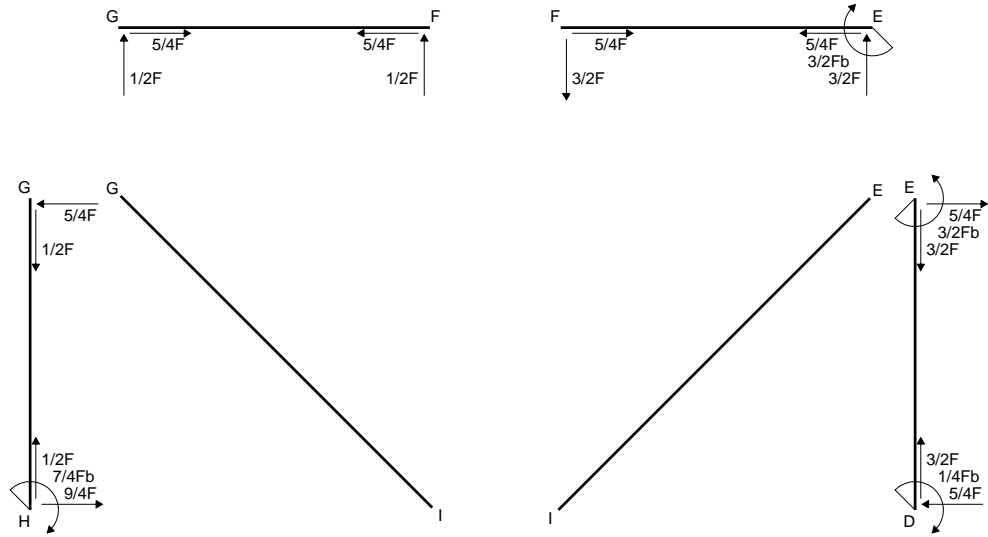
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

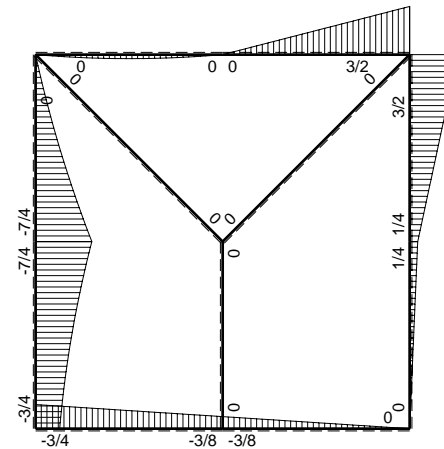
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

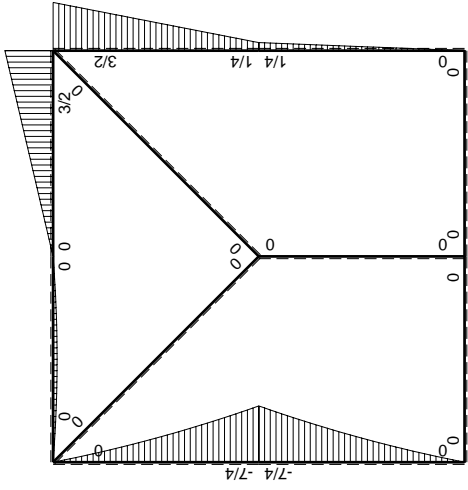
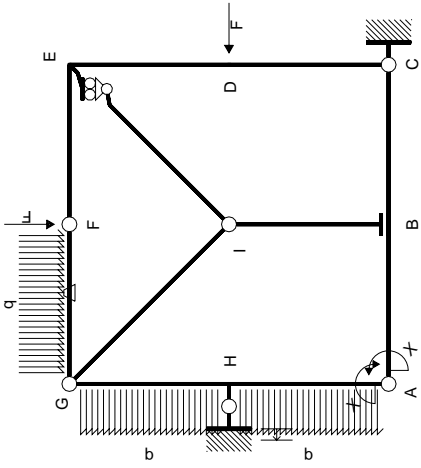


← ⊕ → F

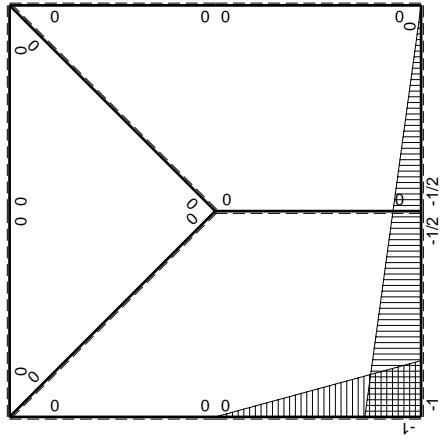
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	Fb/EJ	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

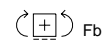
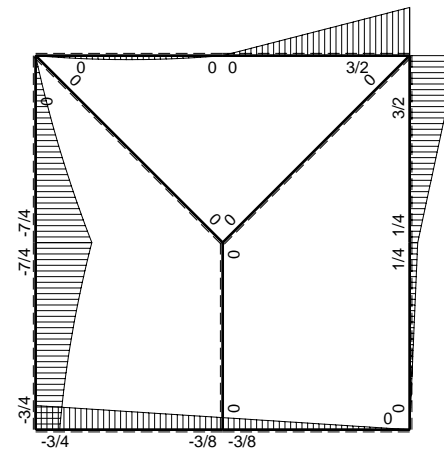
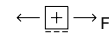
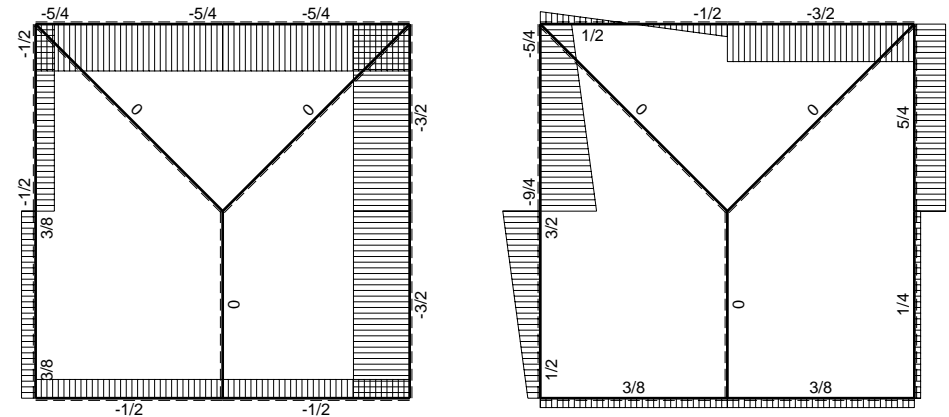
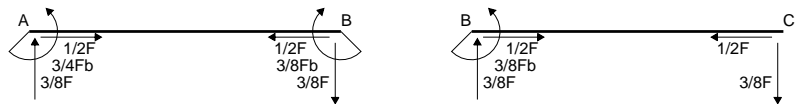
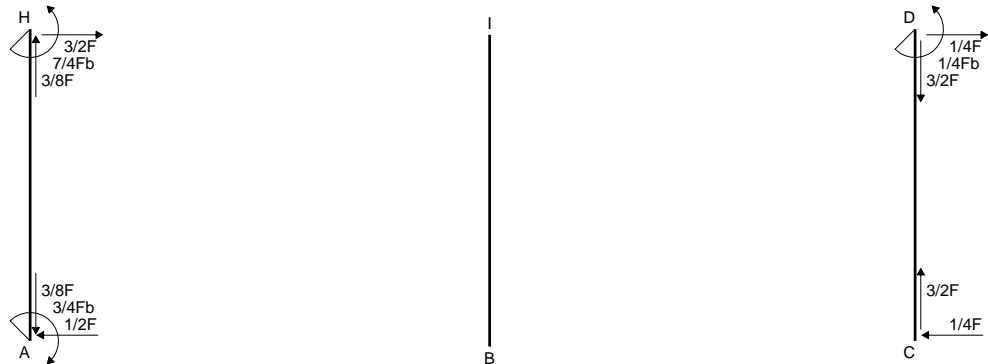
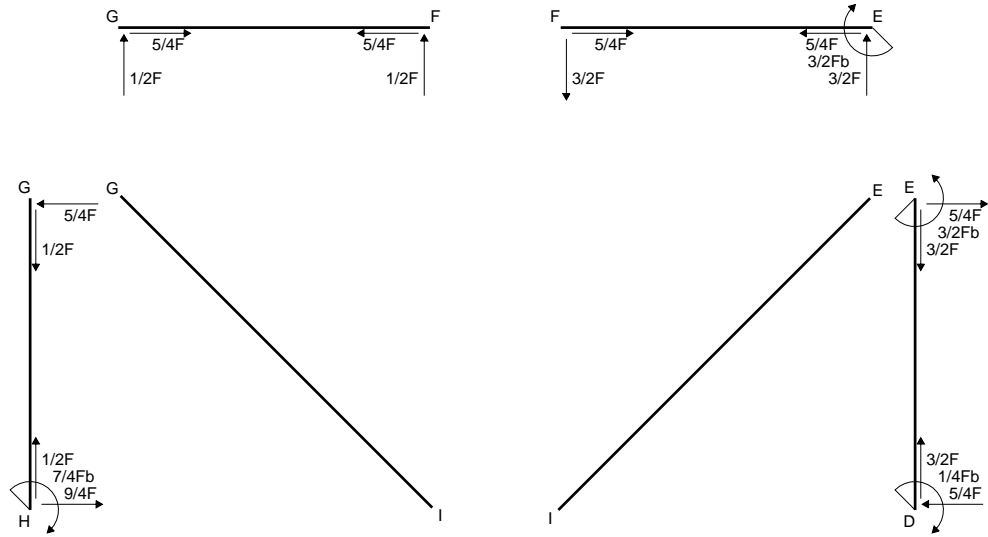
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

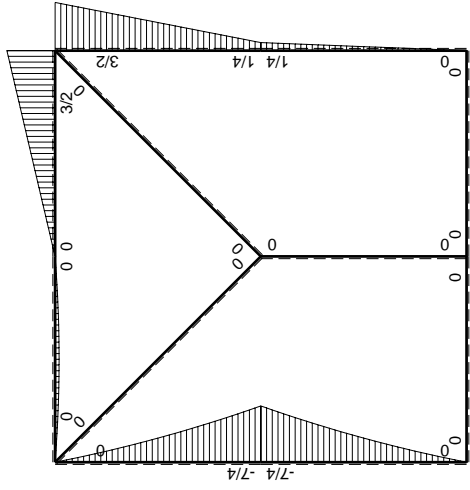
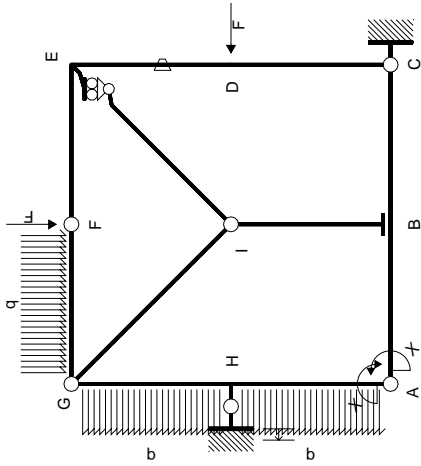
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

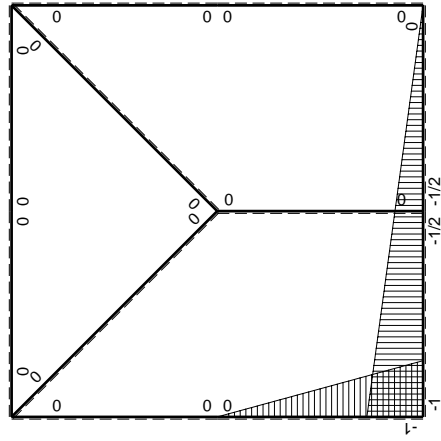
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

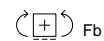
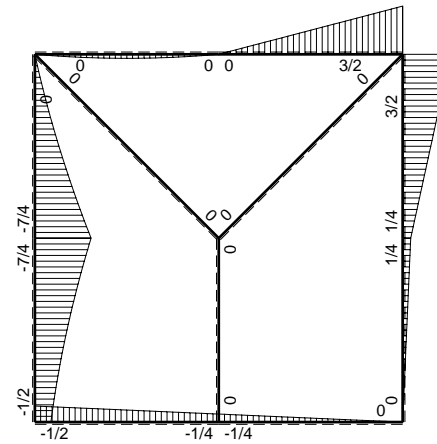
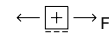
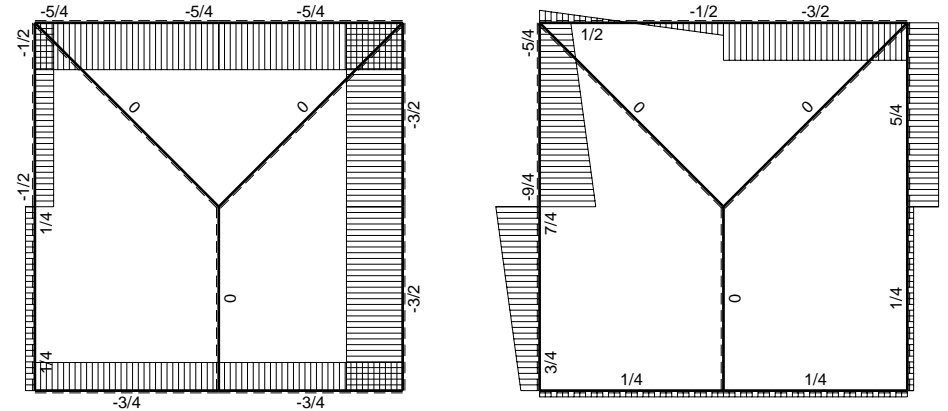
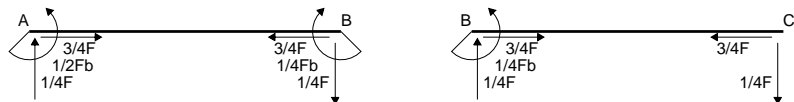
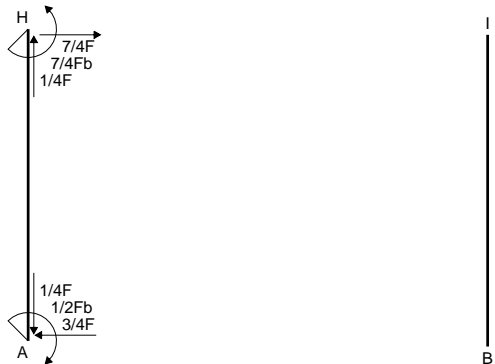
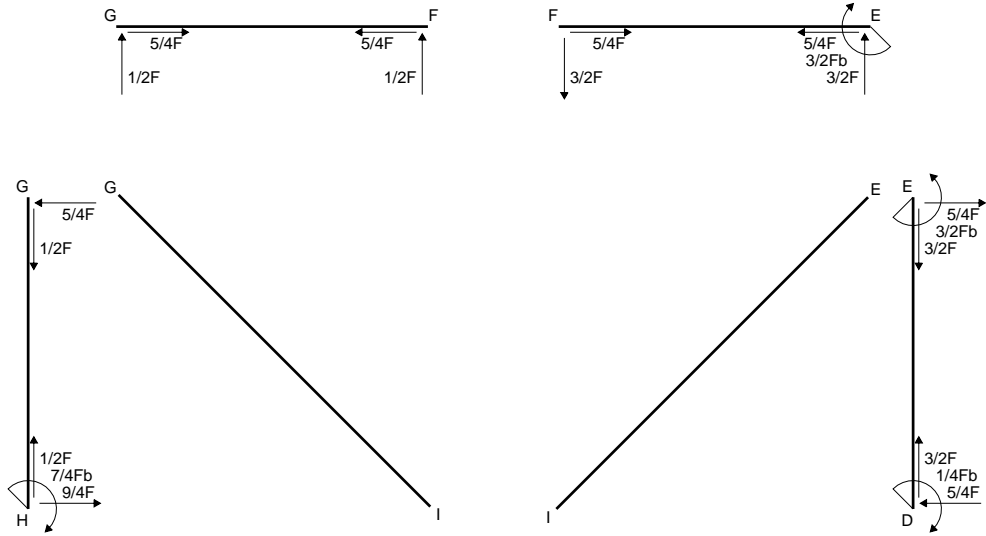
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

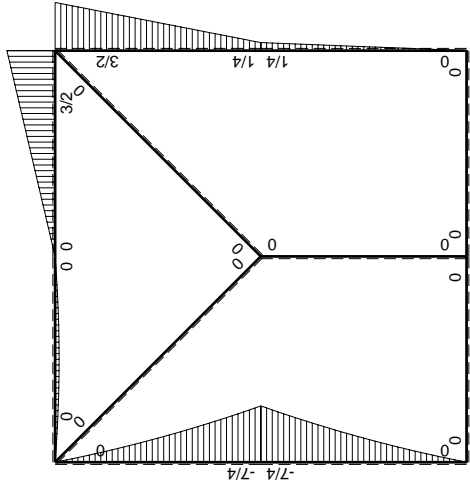
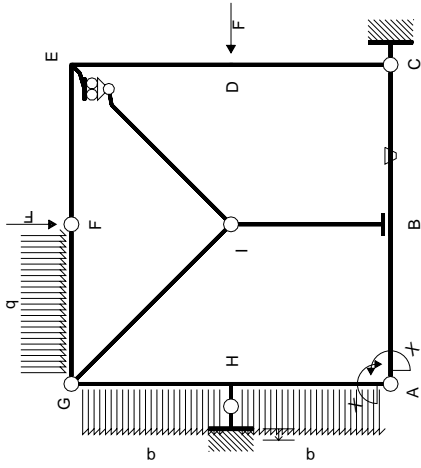
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

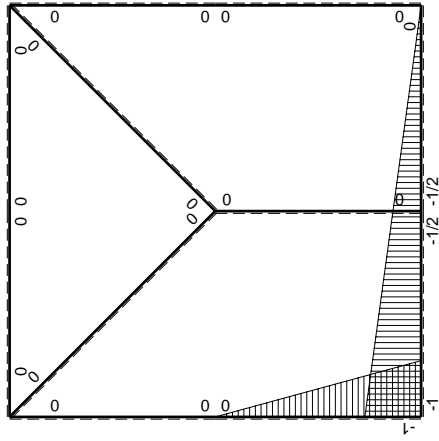
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	$-Fb/EJ$	0	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(0+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	Fb/EJ	0	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/2Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/2Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{BC}^{xo} = \int_0^b (1/2 - 1/2 x/b) \theta dx = [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (1/2 b - 1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/2 x/b) \theta dx = [-1/4 x^2/b]_0^b \theta$$

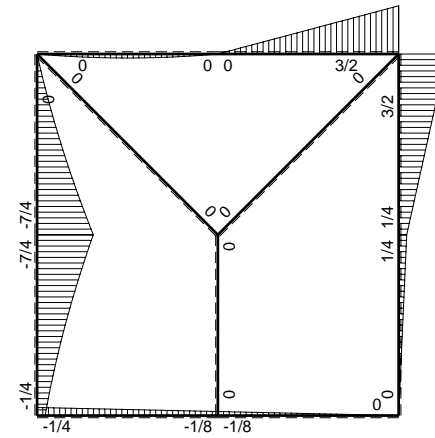
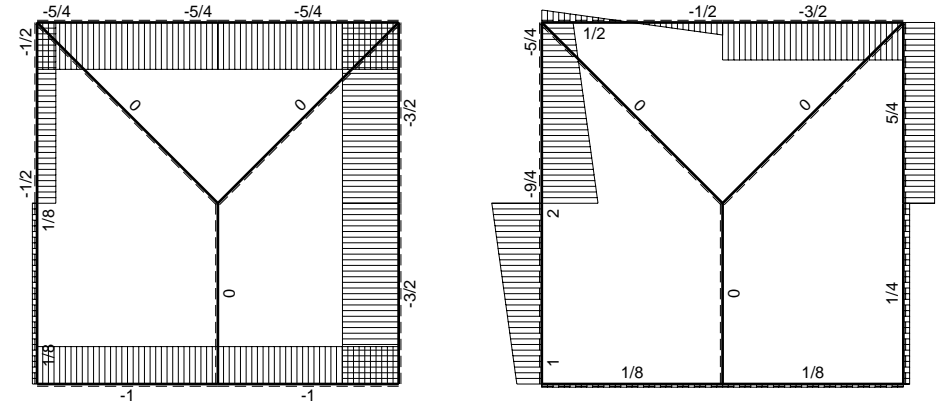
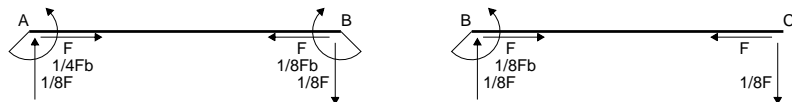
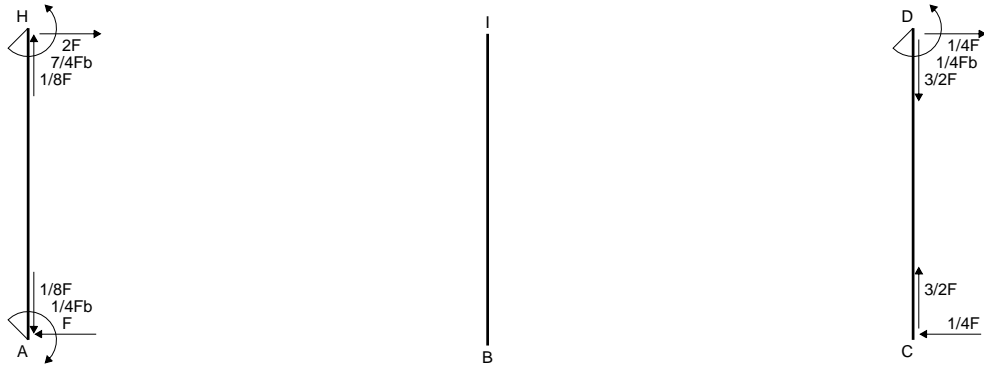
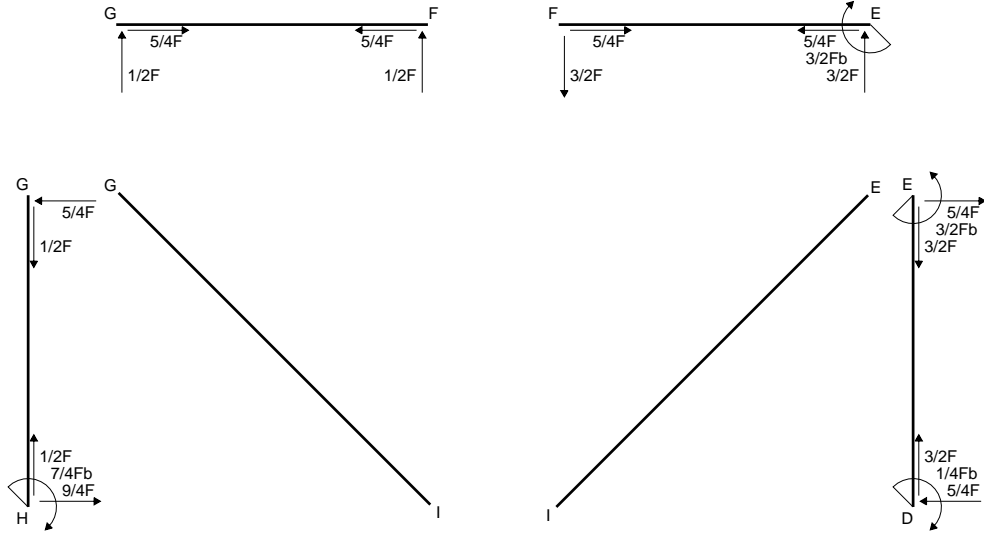
$$= (-1/4 b) \theta = 1/4 Fb^2/EJ$$

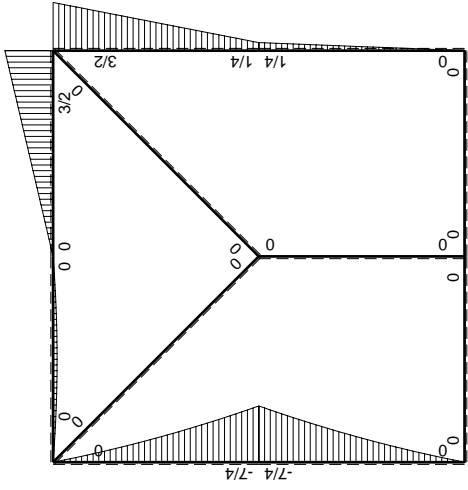
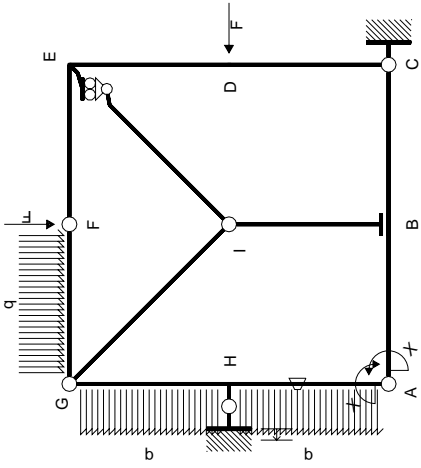
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

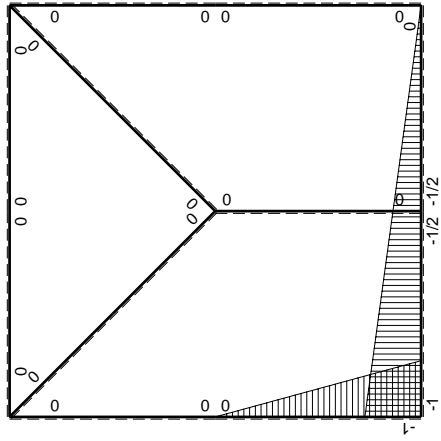
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	$-Fb/EJ$	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/4+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	Fb/EJ	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

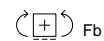
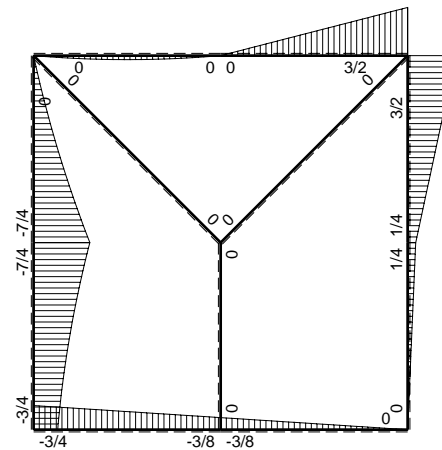
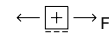
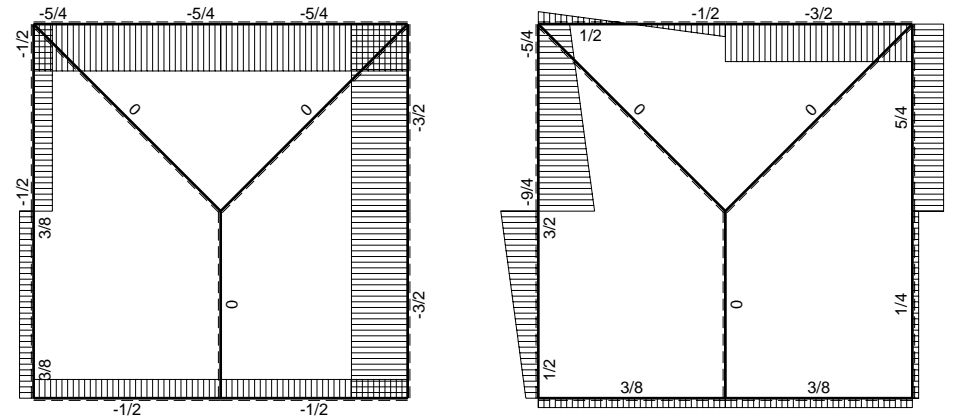
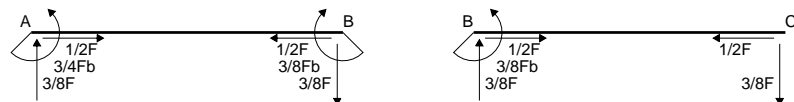
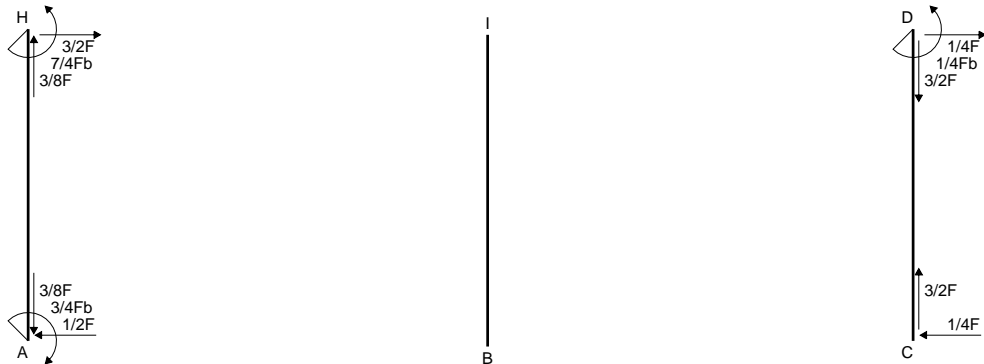
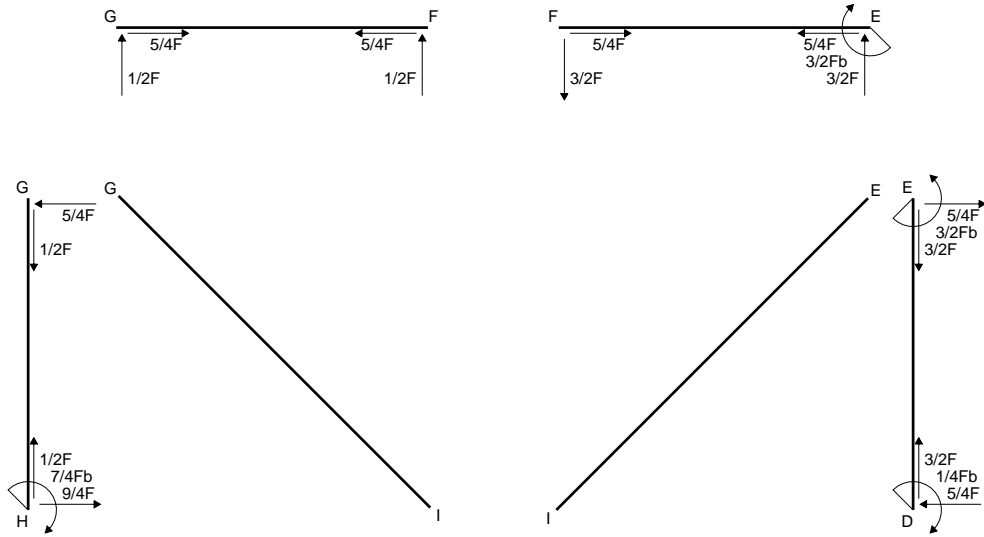
$$= \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

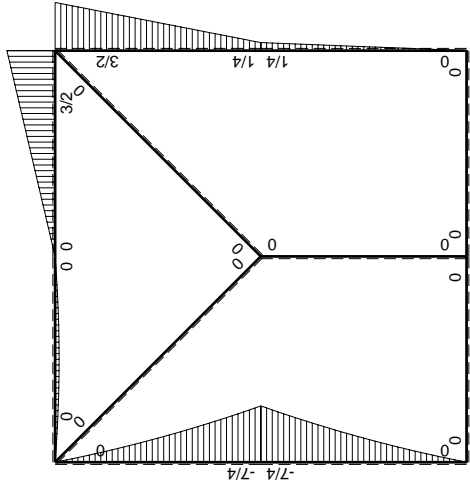
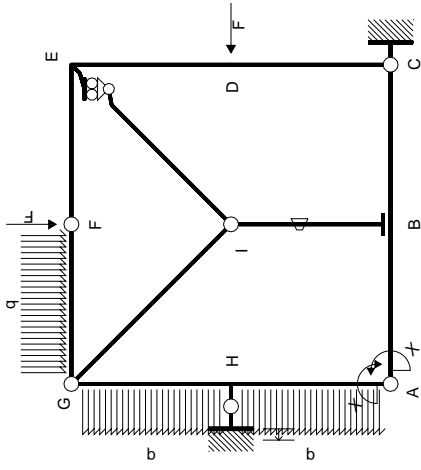
$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 3/4 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

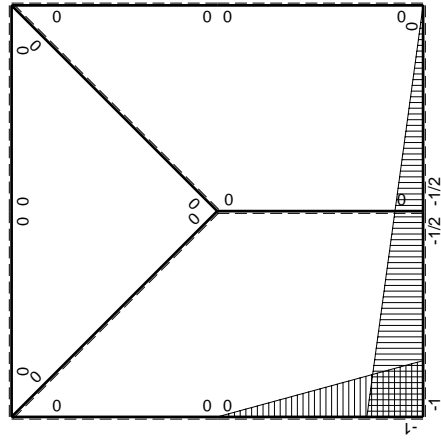
$$= \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 3/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

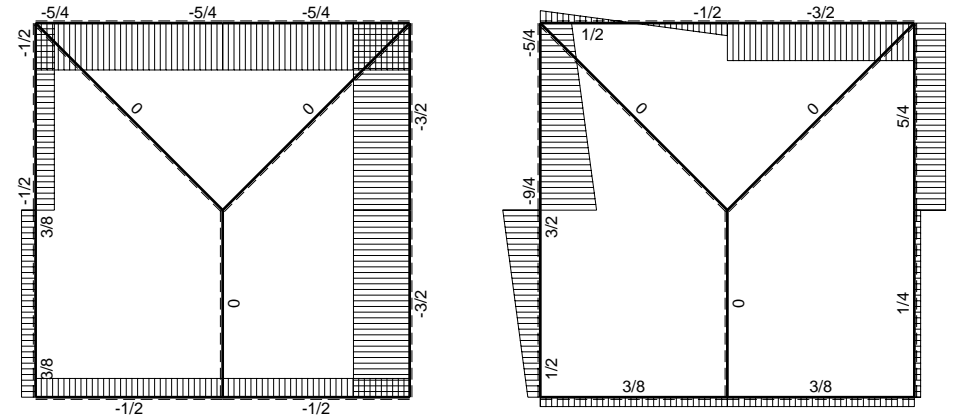
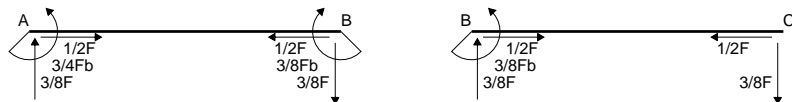
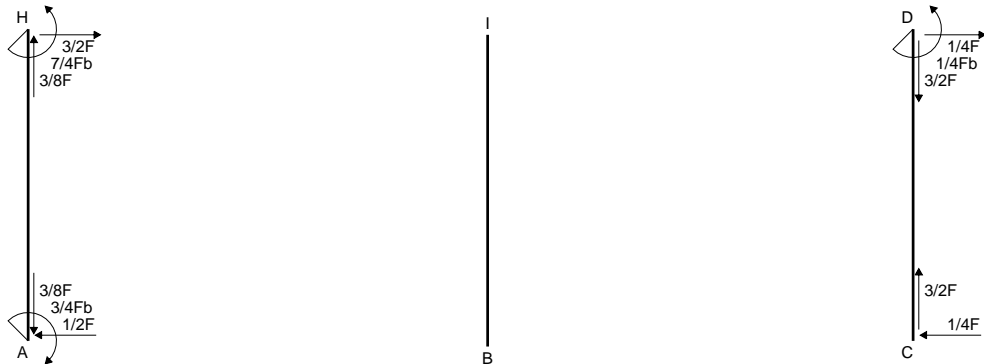
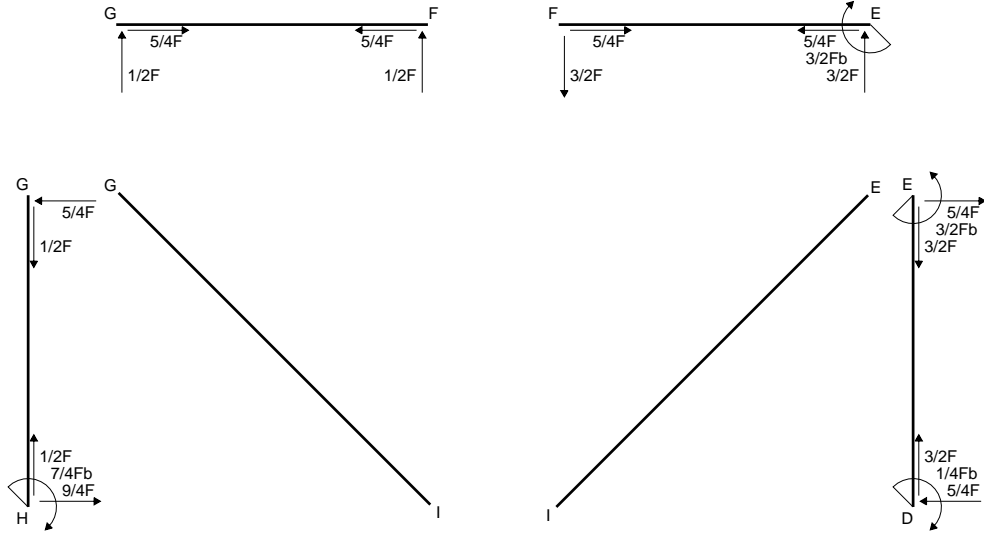
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

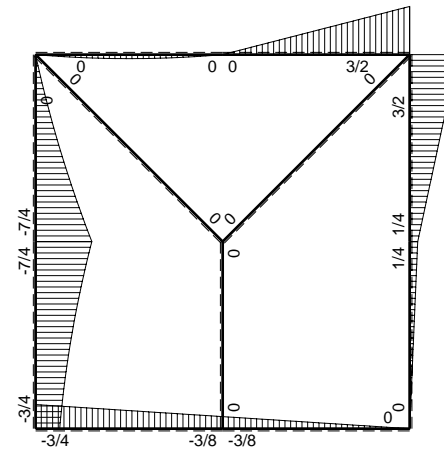
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

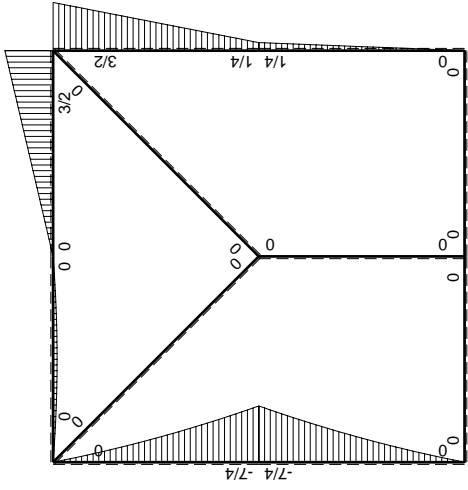
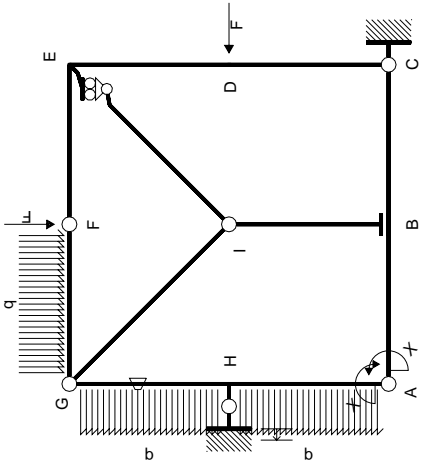


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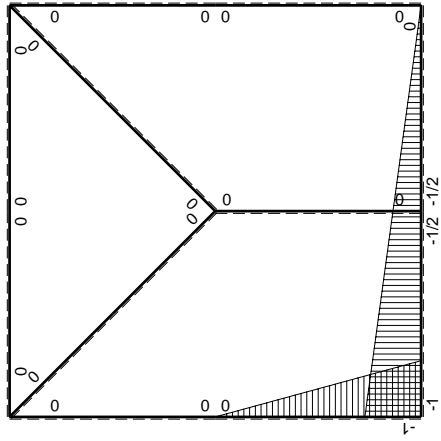
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

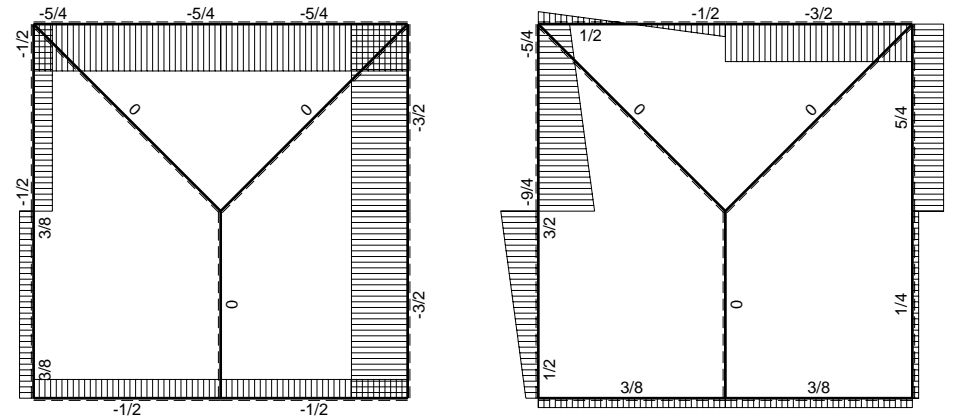
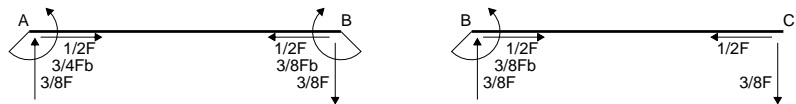
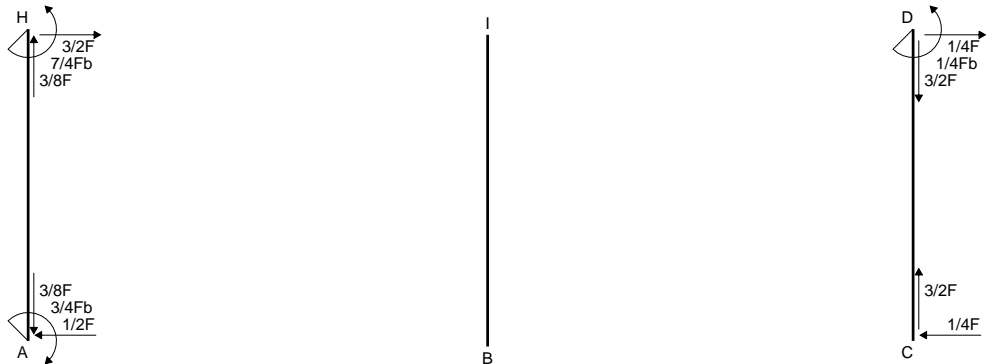
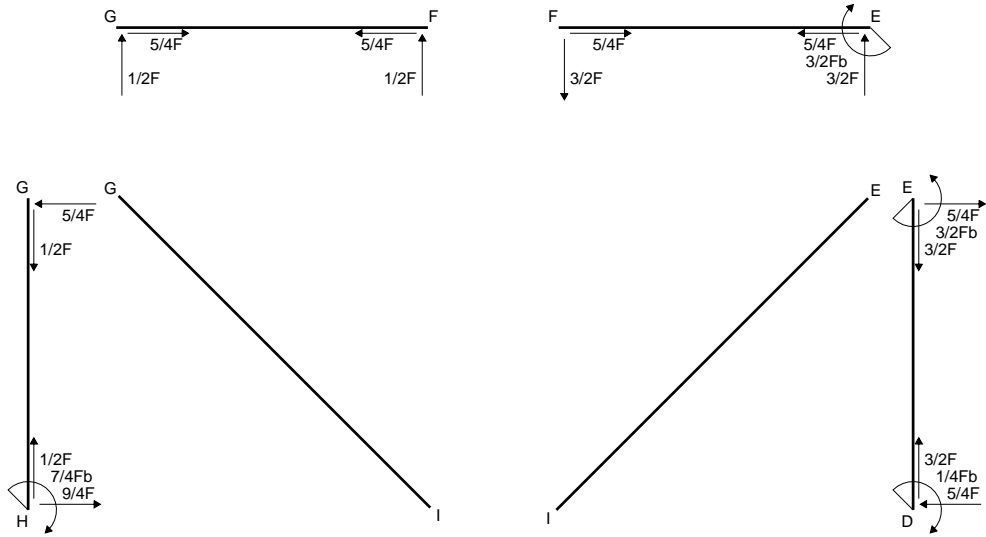
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

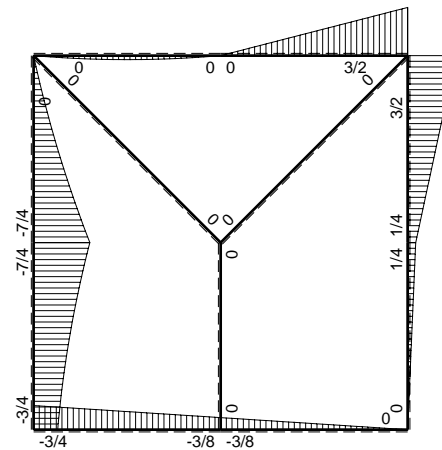
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

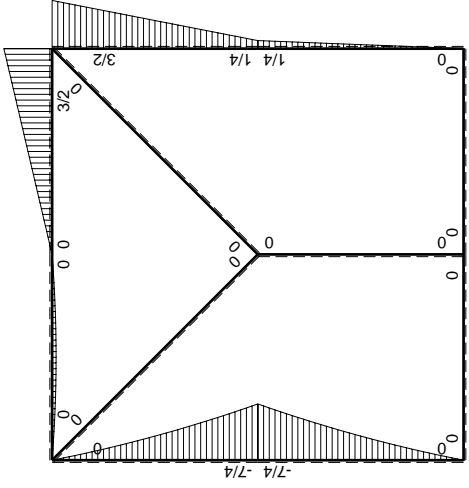
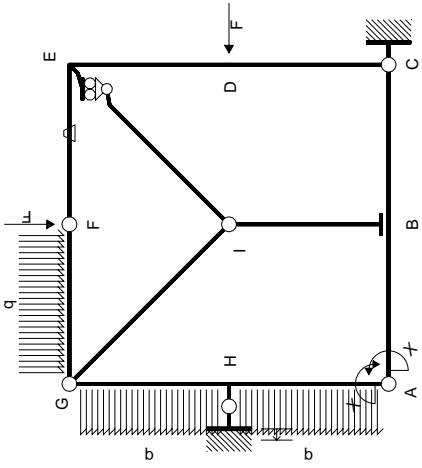


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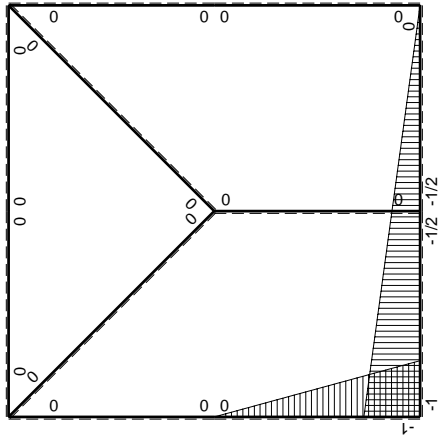
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	Fb/EJ	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

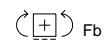
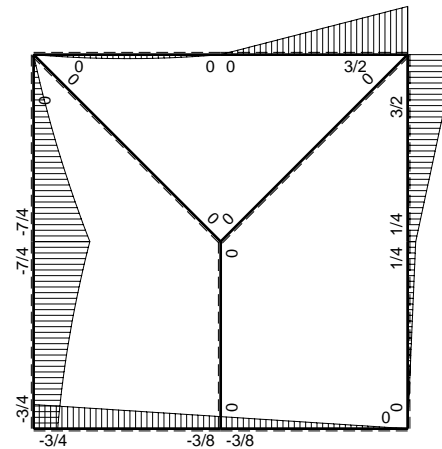
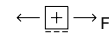
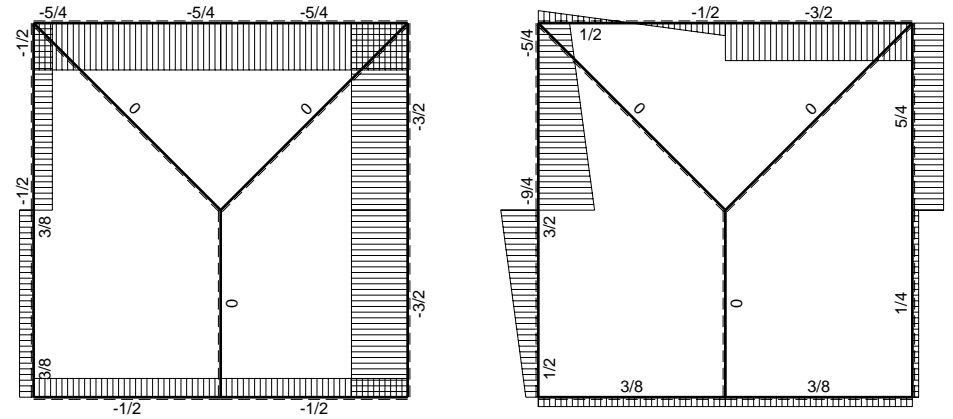
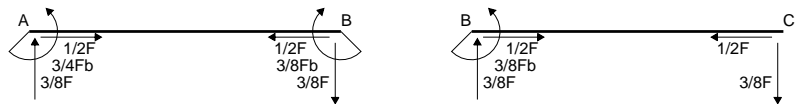
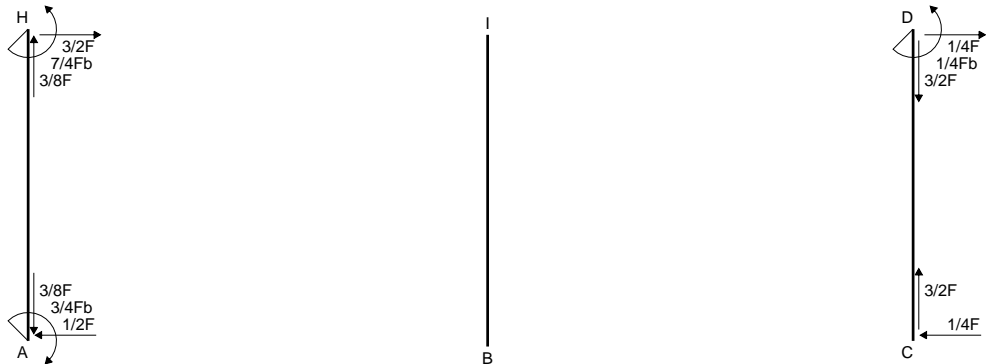
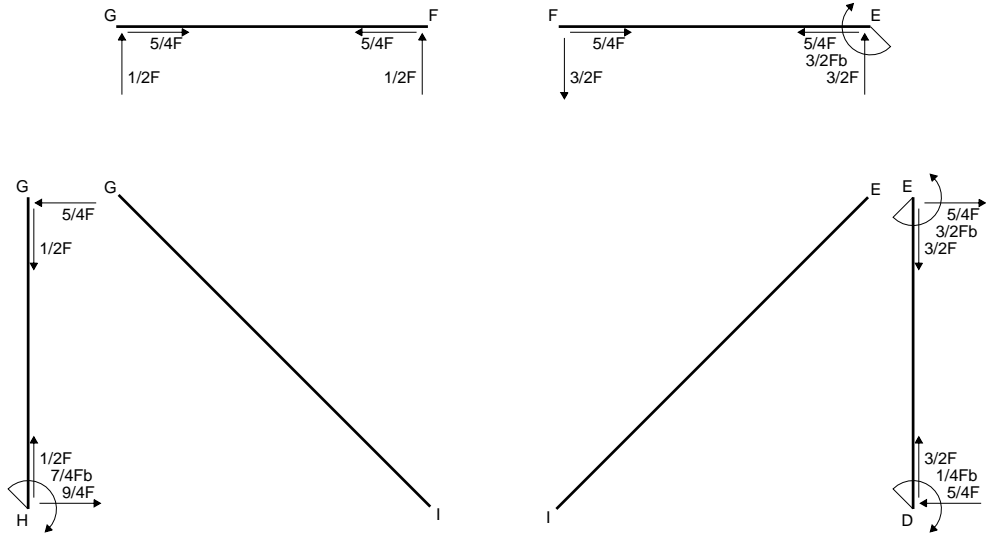
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

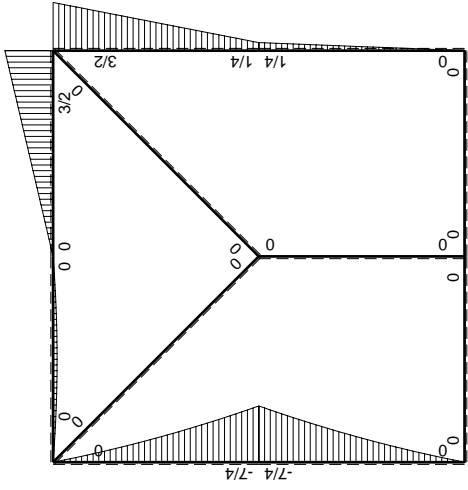
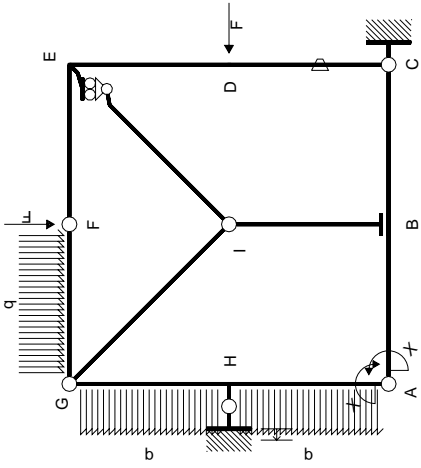
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

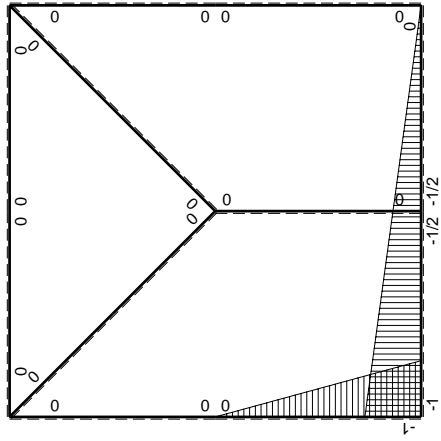
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	Fb/EJ	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-3/2Fx$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

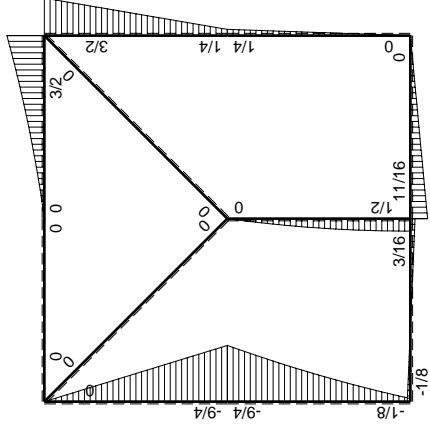
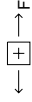
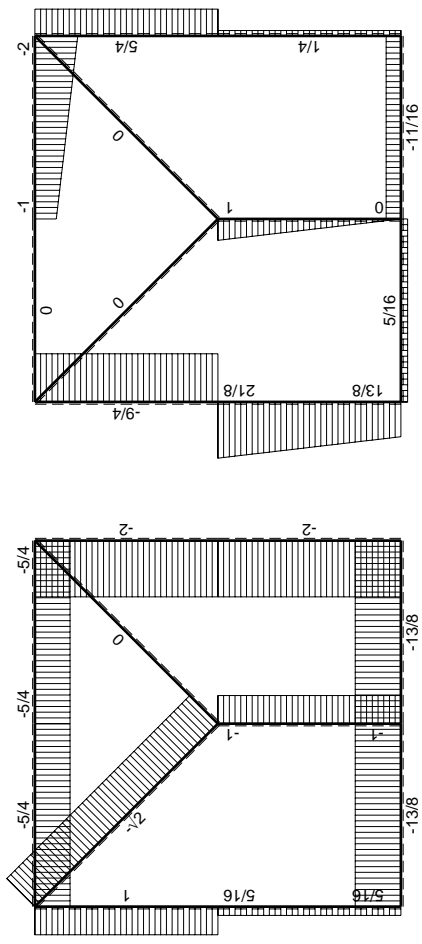
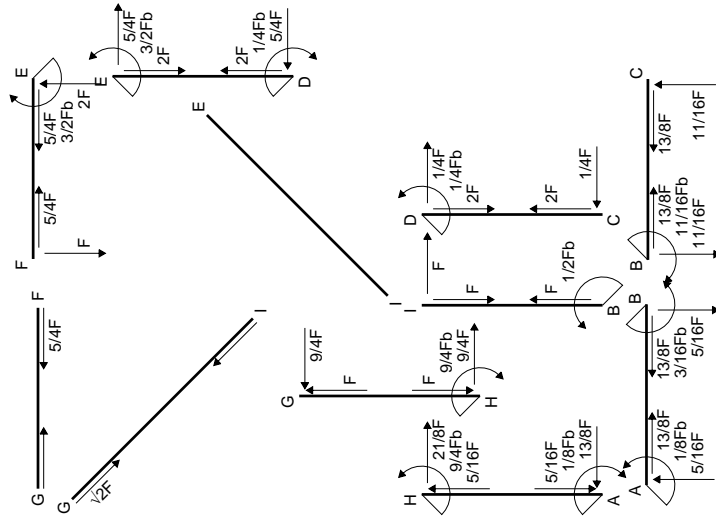
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

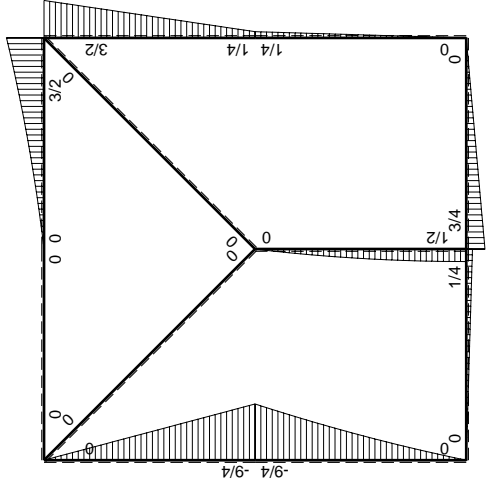
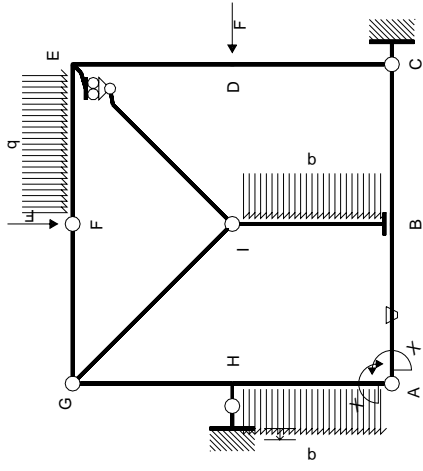
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

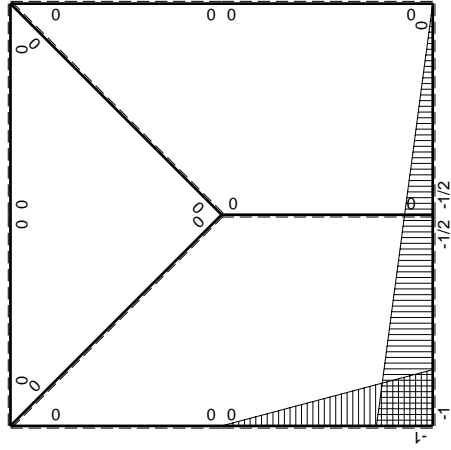
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	$-Fb/EJ$	$-1/4Fx+1/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/12+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	Fb/EJ	$-1/8Fb+1/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

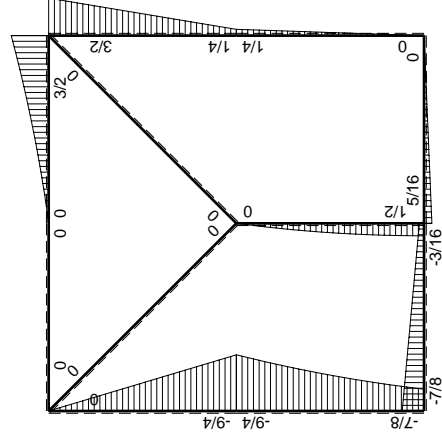
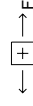
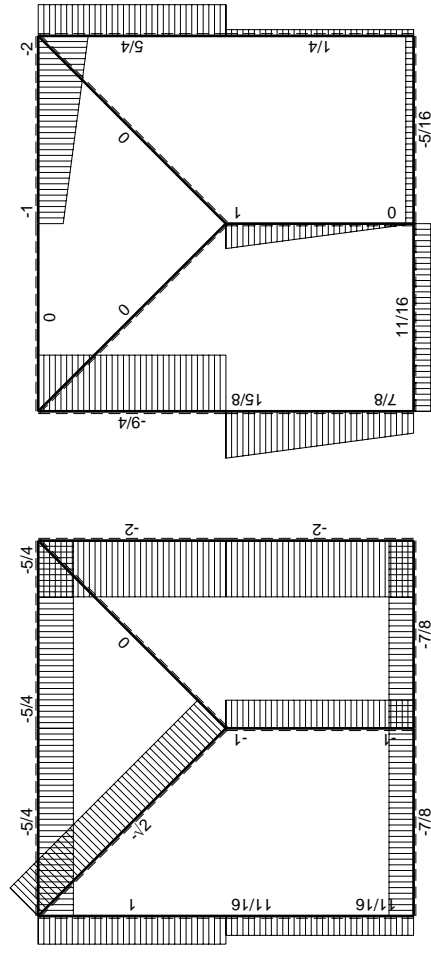
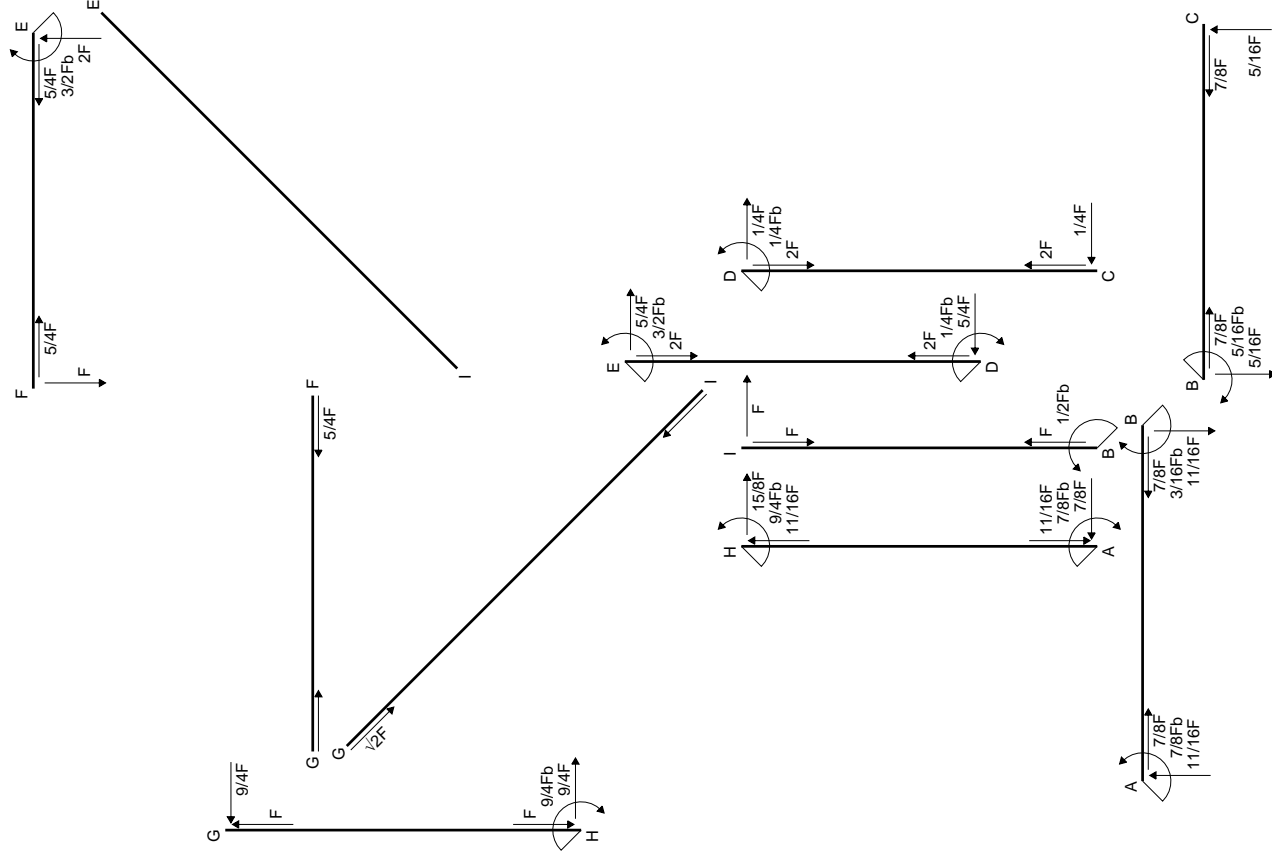
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

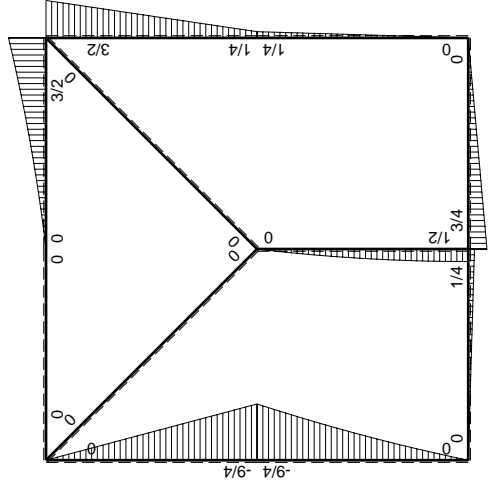
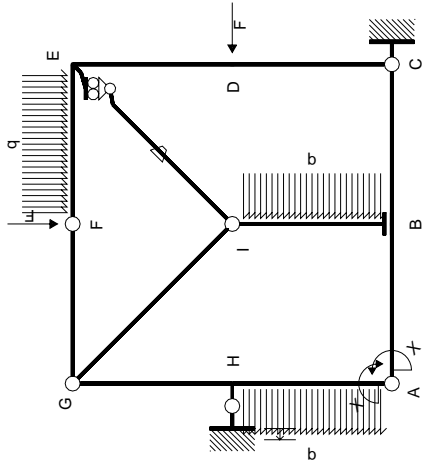
$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

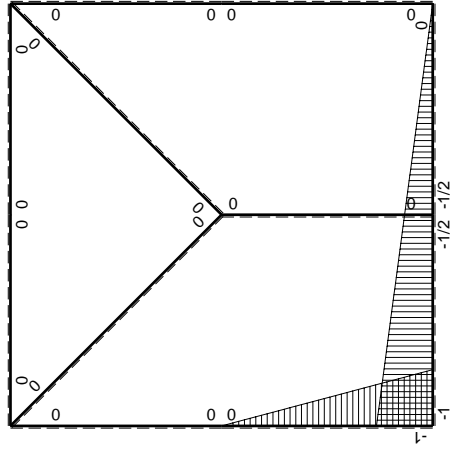
$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$



Fb



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

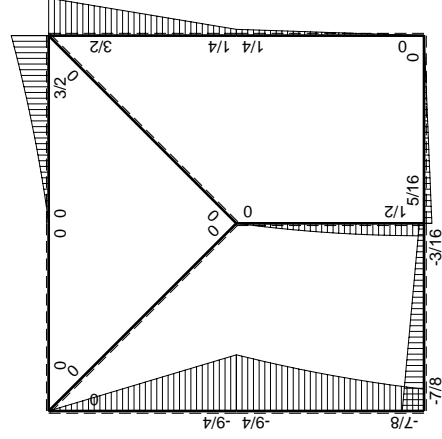
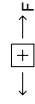
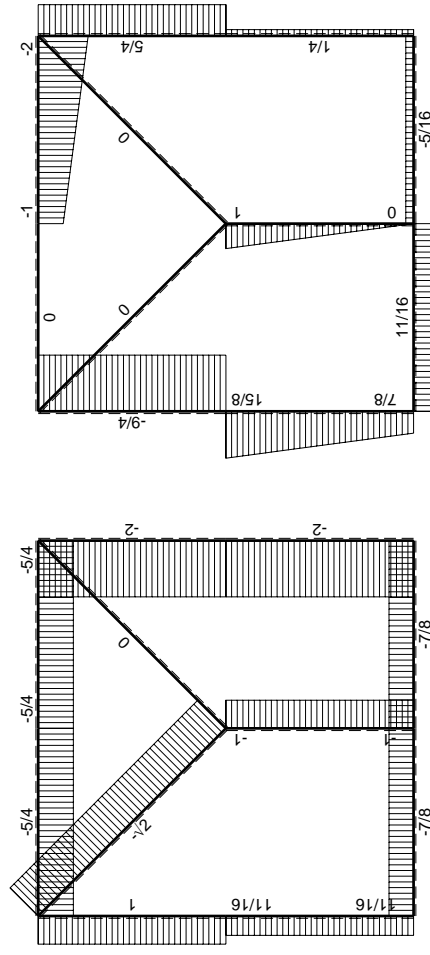
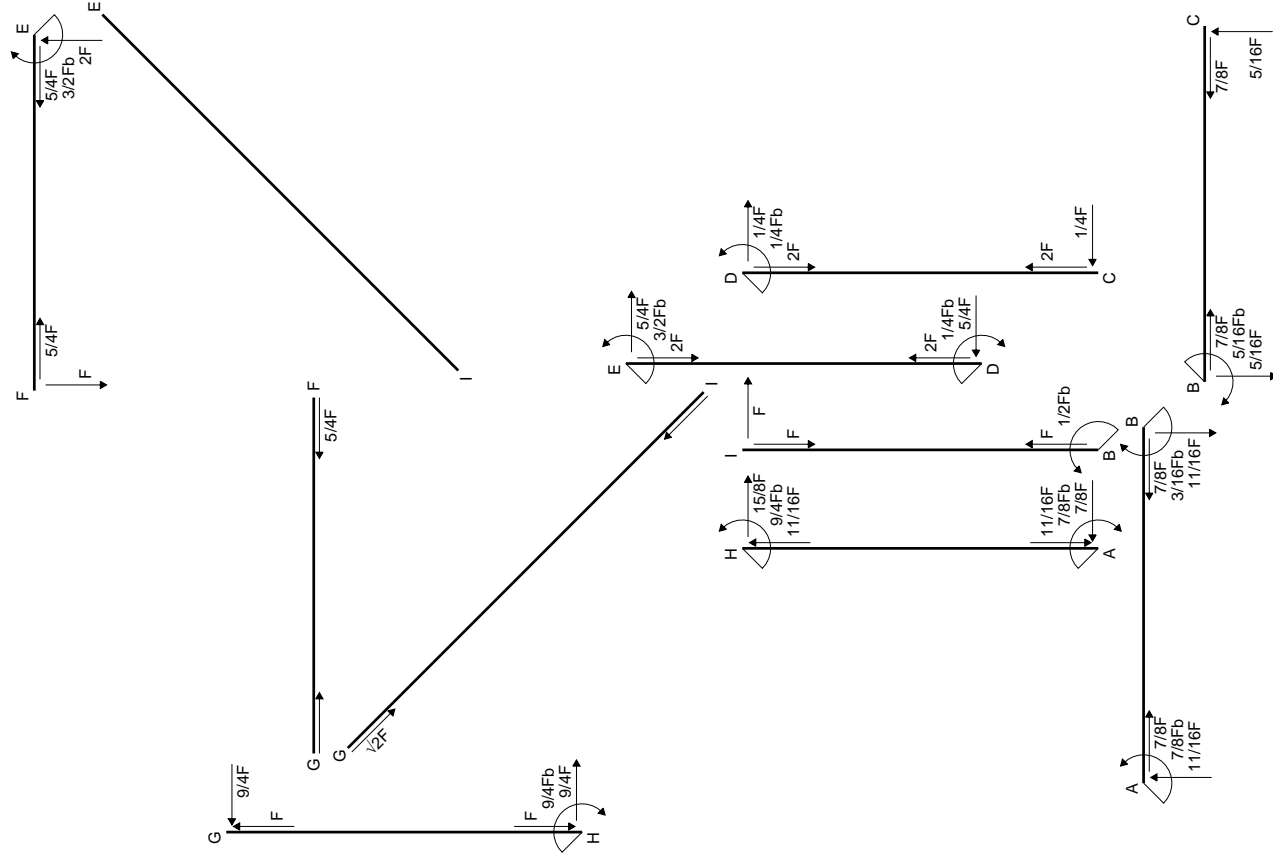
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

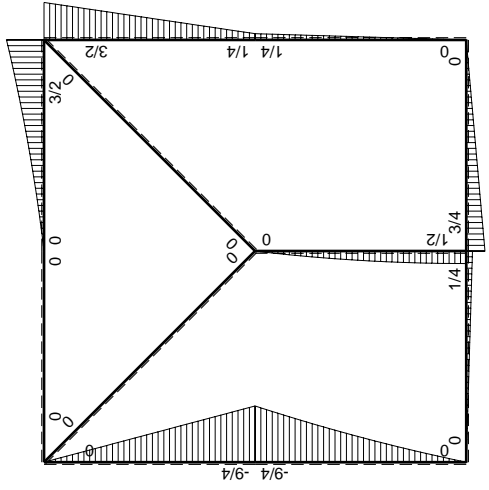
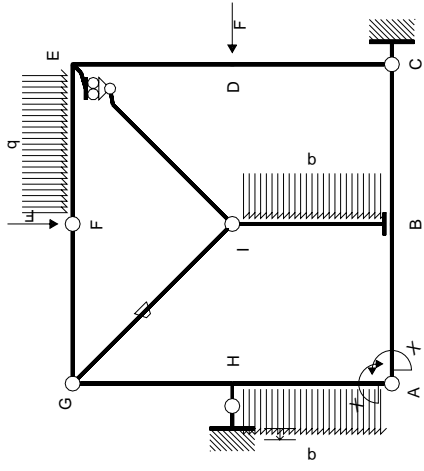
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

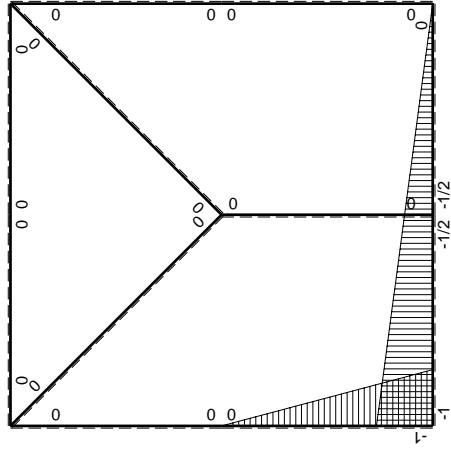
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





(+) M_0 flessione da carichi assegnati



(+) M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

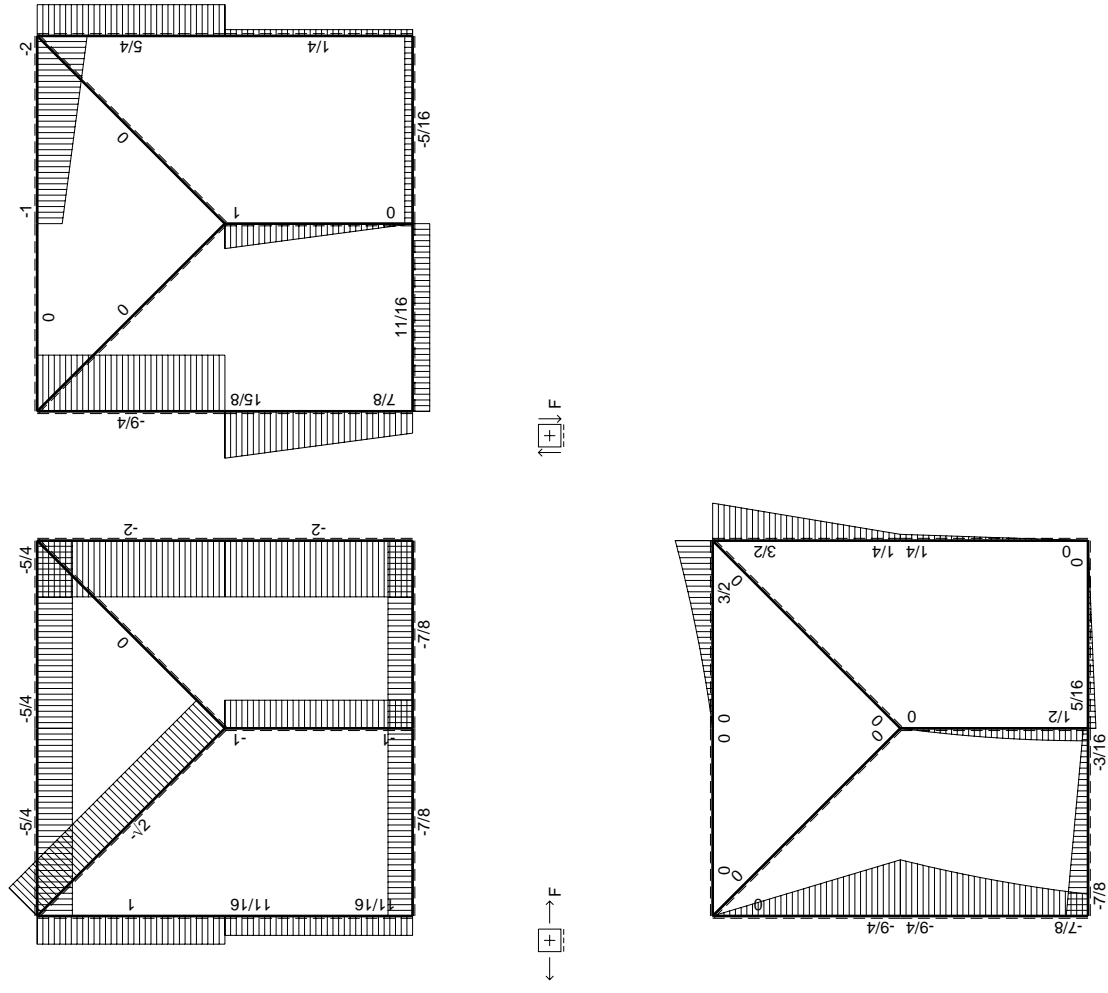
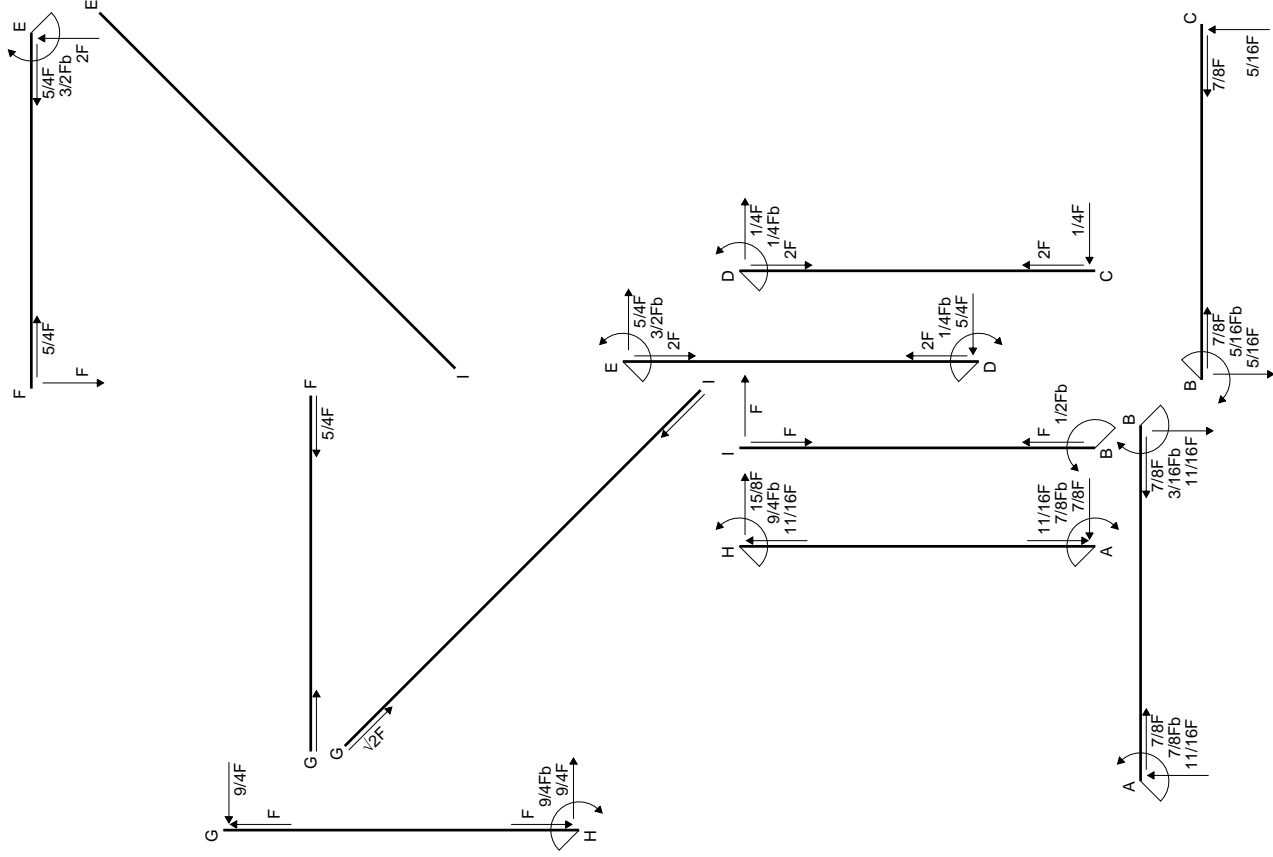
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

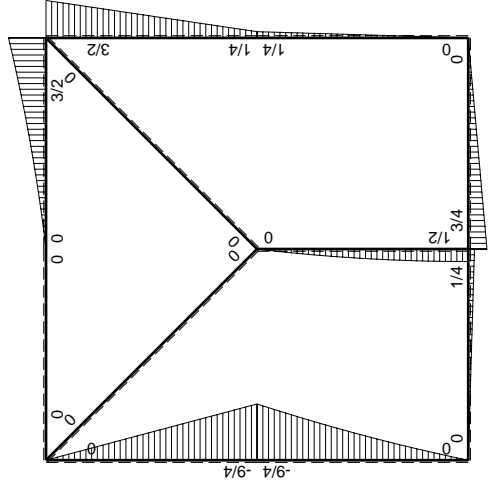
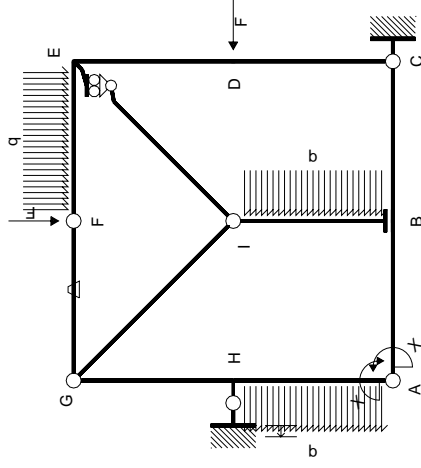
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

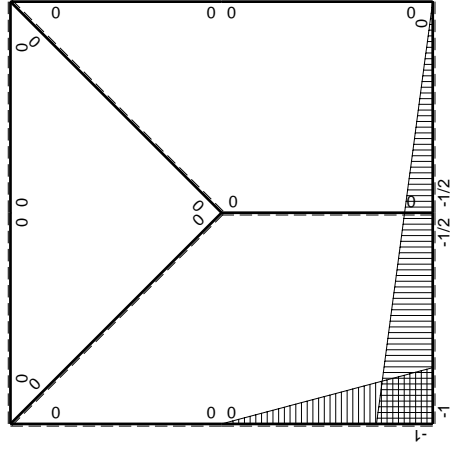
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

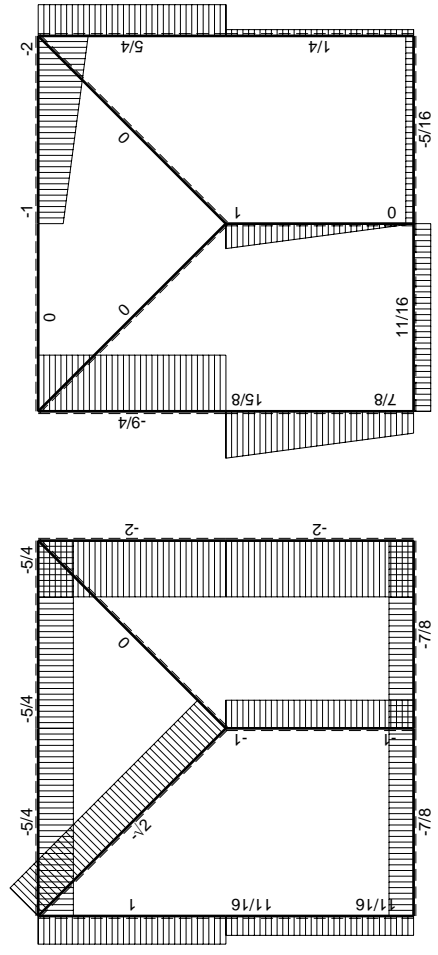
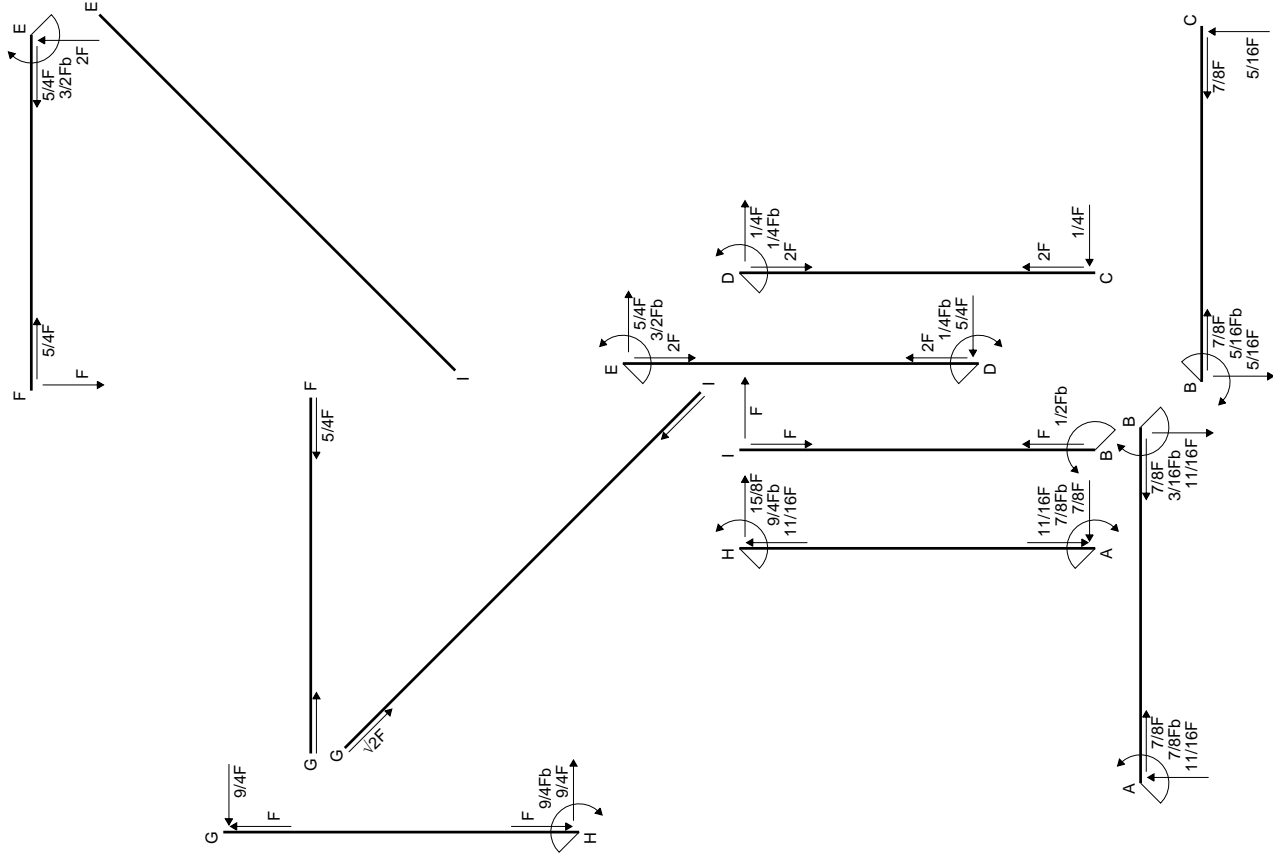
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

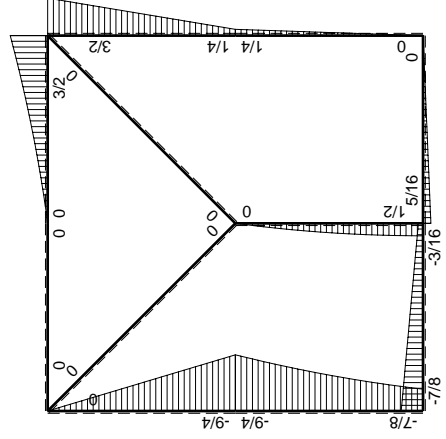
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

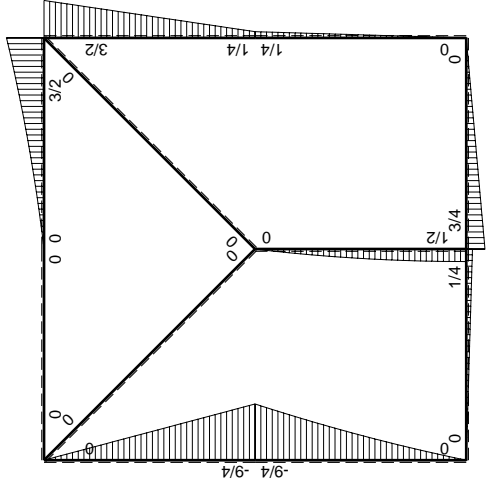
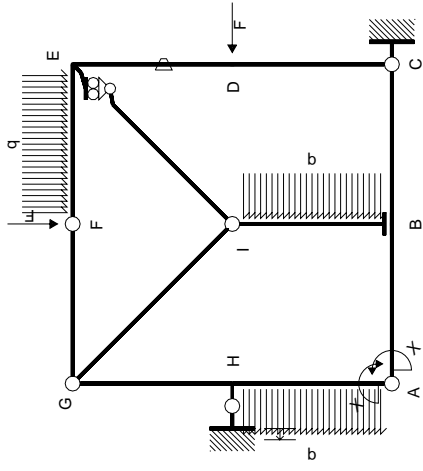



← → + F

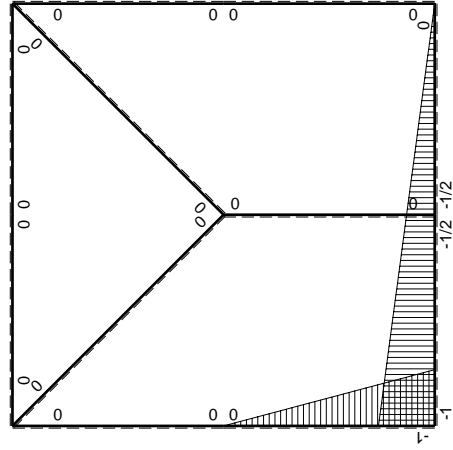
↑ ↓ + F



← → + Fb



 M_0 flessione da carichi assegnati



 M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

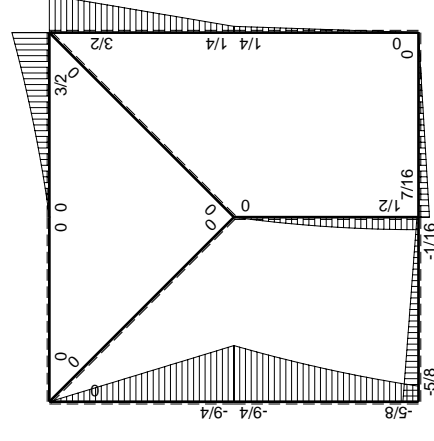
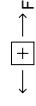
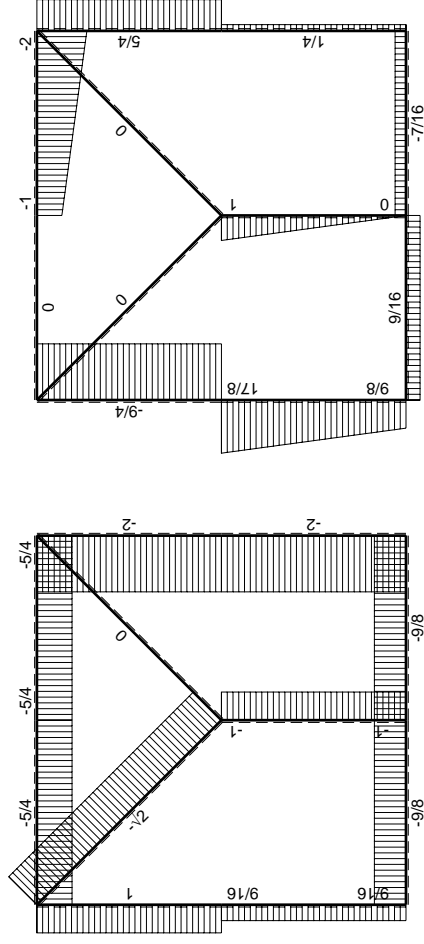
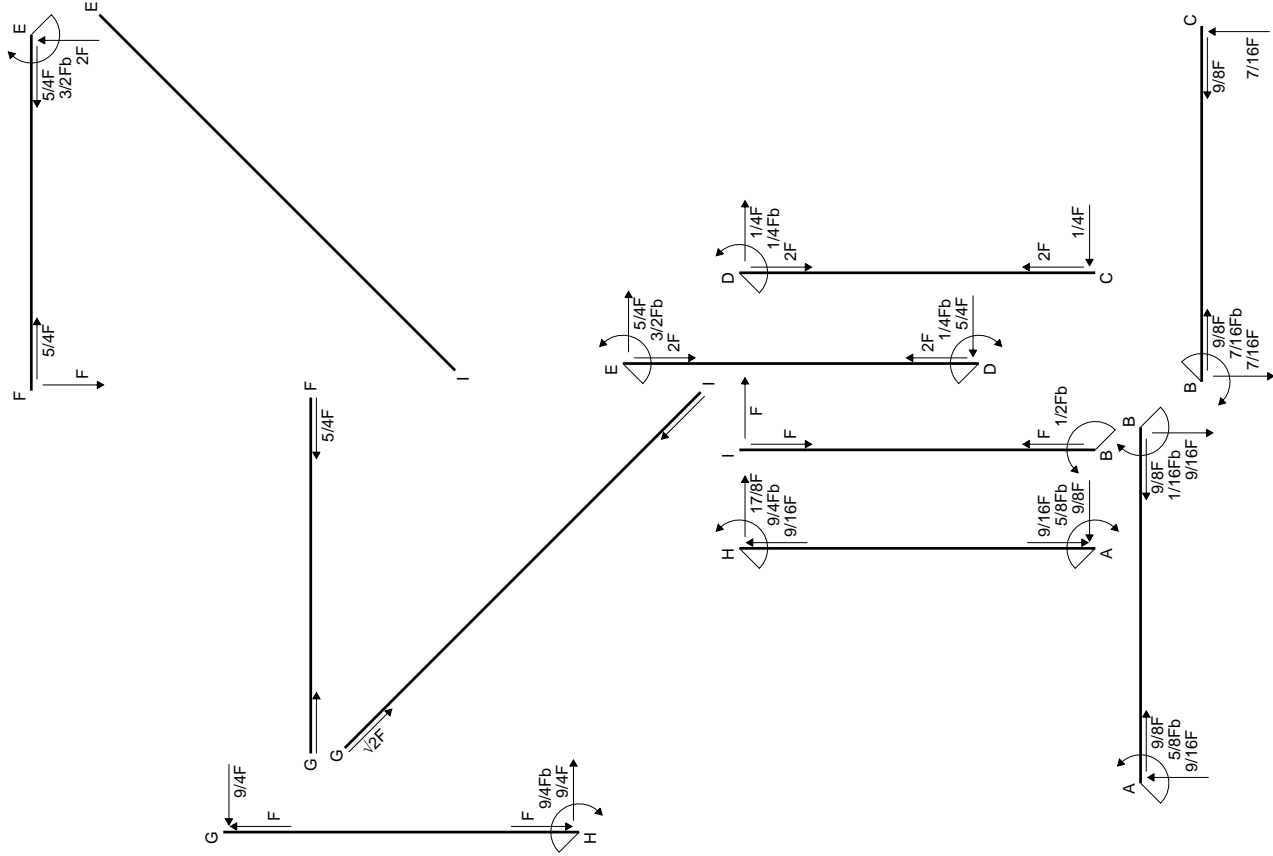
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

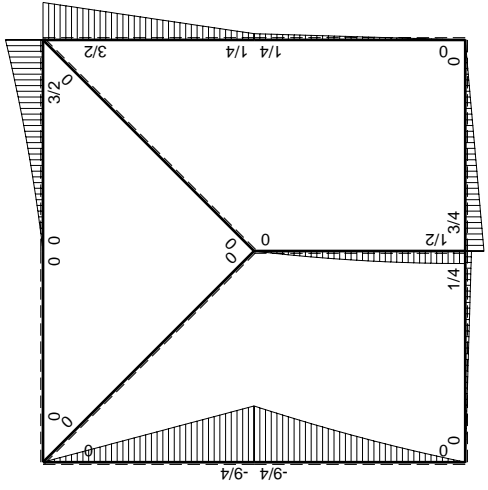
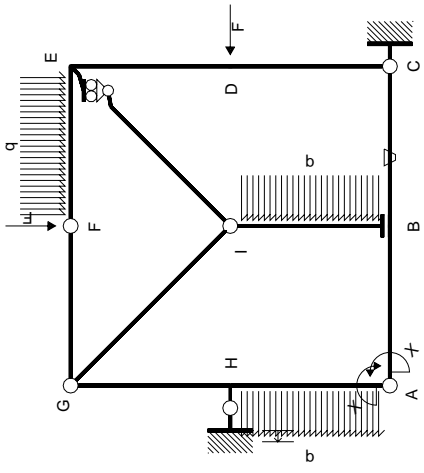
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

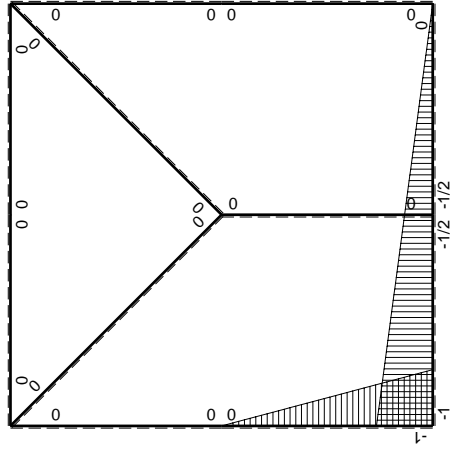
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+1/4)Fb^2/EJ$	$1/12Xb/EJ$
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	$-Fb/EJ$	$-3/8Fb+3/4Fx-3/8Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+1/4)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-3/4Fx$	Fb/EJ	$-3/8Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$		
CD b	0	$1/4Fx$	0	0	0	0	0+0	0
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0		
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0		
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0
FE b	0	$-Fx-1/2qx^2$	0	0	0	0		
FG b	0	0	0	0	0	0	0+0	0
GF b	0	0	0	0	0	0		
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0		
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0		
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$		
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-5/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$5/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ + [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ + [-1/4 x^2/b]_0^b \theta$$

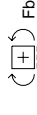
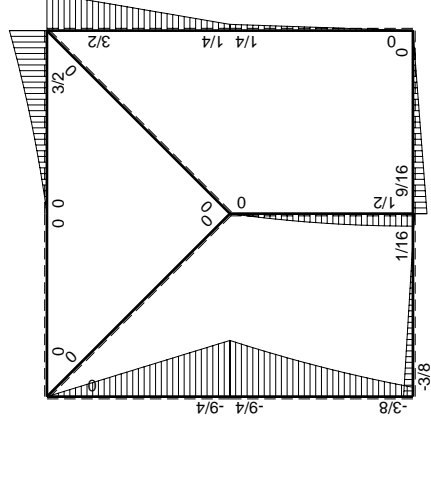
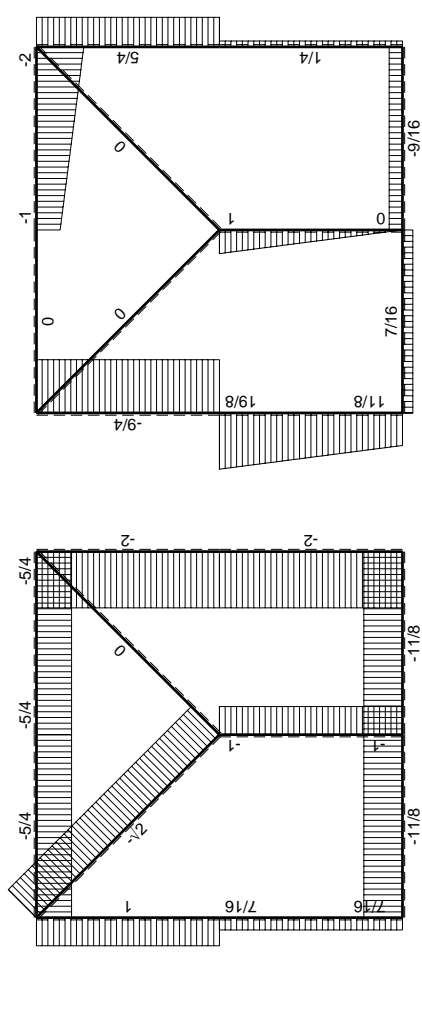
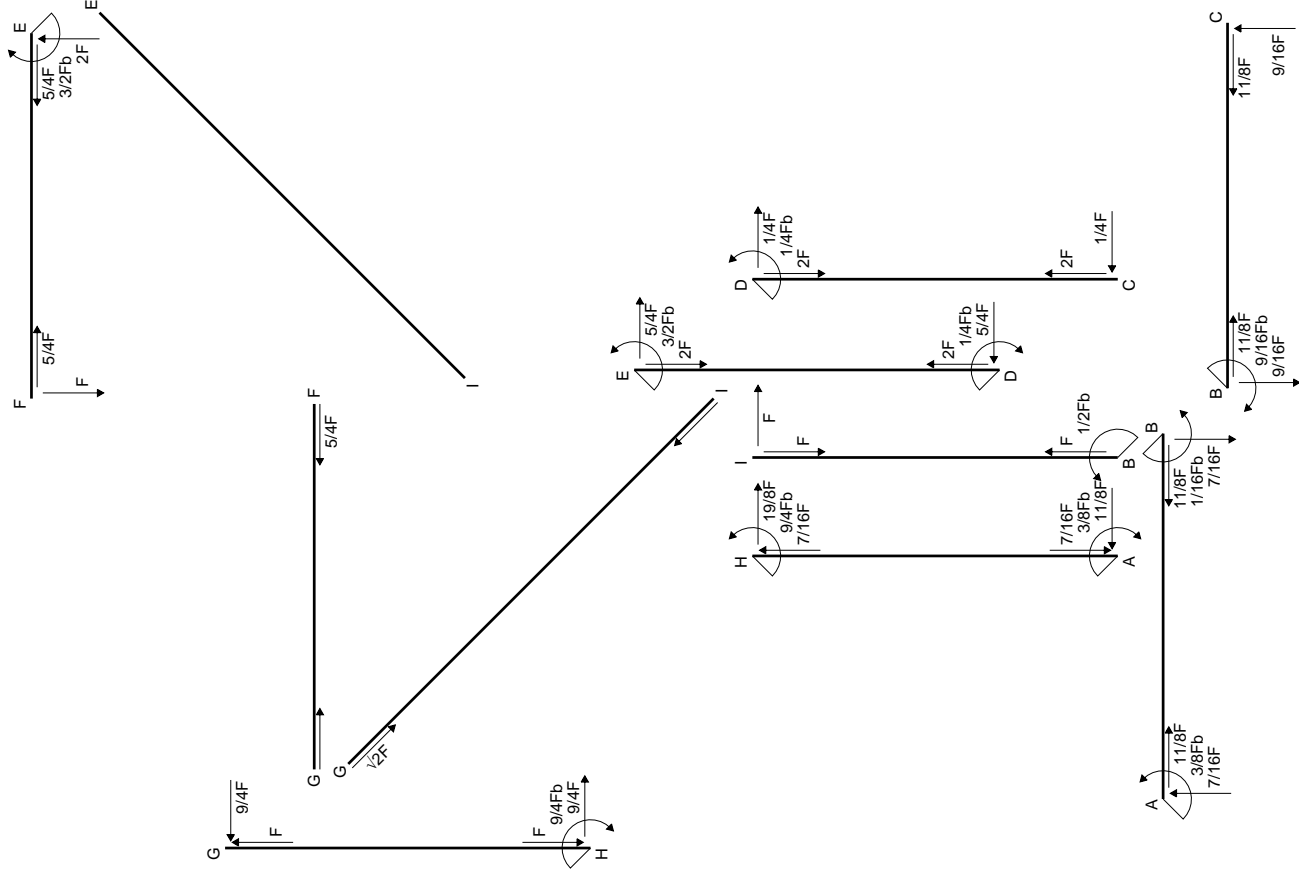
$$= (-1/8 b) Fb 1/EJ + (-1/4 b) \theta = 1/8 Fb^2/EJ$$

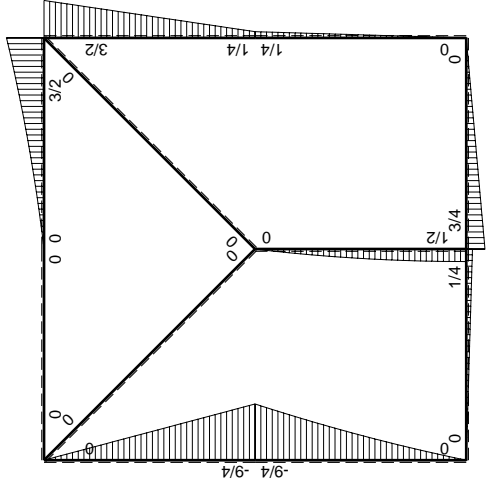
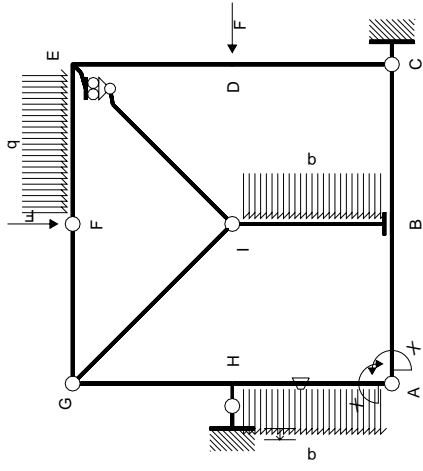
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

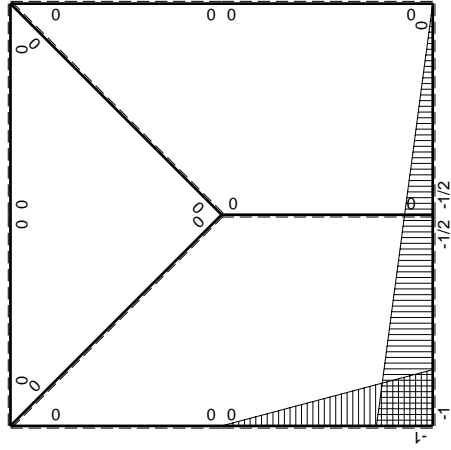
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	$-Fb/EJ$	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/3+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	Fb/EJ	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

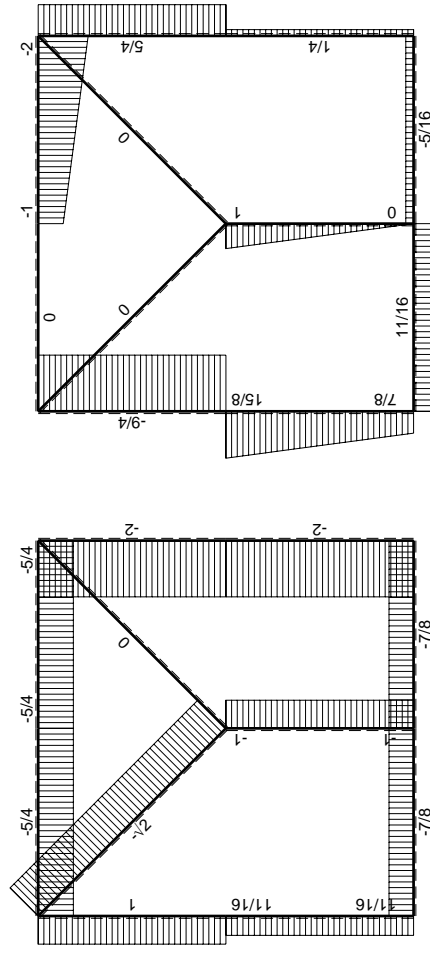
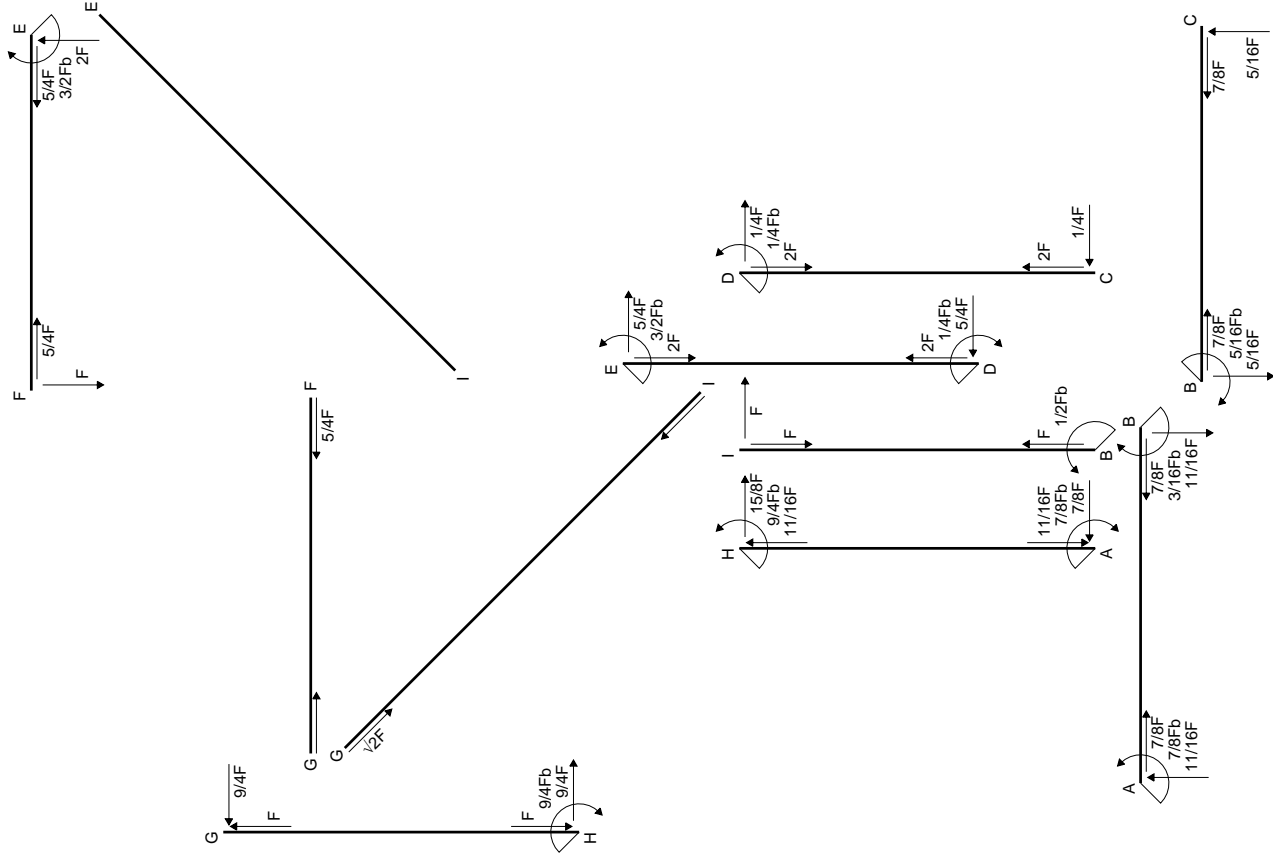
$$= \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 5/6 Fb^2/EJ$$

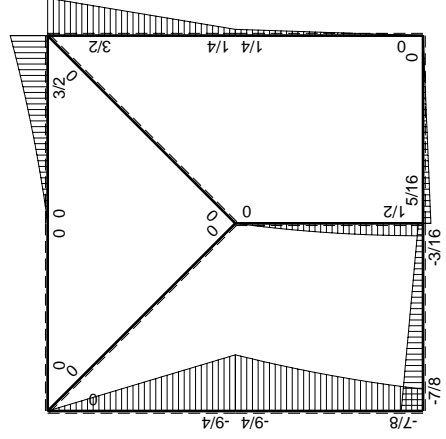
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

$$= \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 5/6 Fb^2/EJ$$

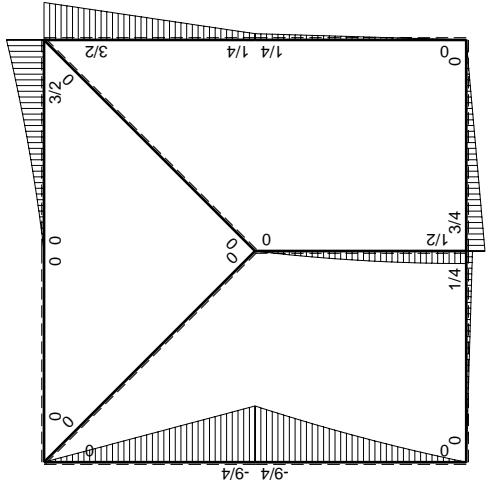
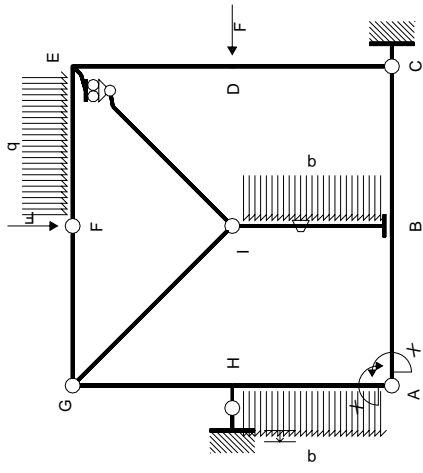


$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow F$

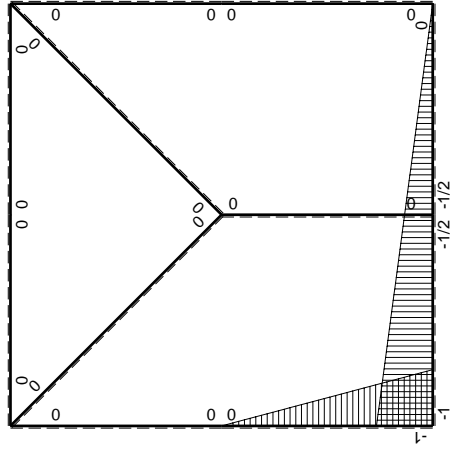


$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow F$

$\left[\begin{matrix} + \\ - \end{matrix} \right] F_b$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

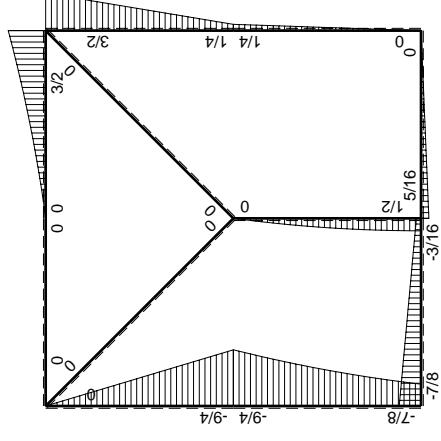
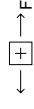
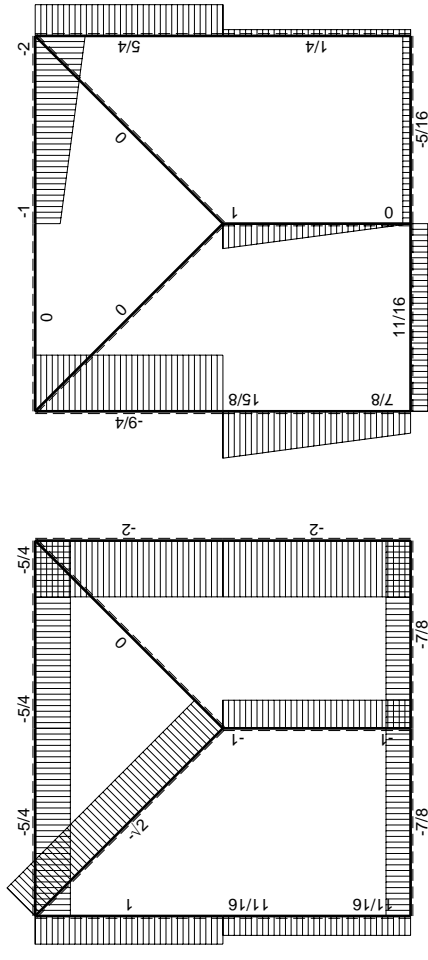
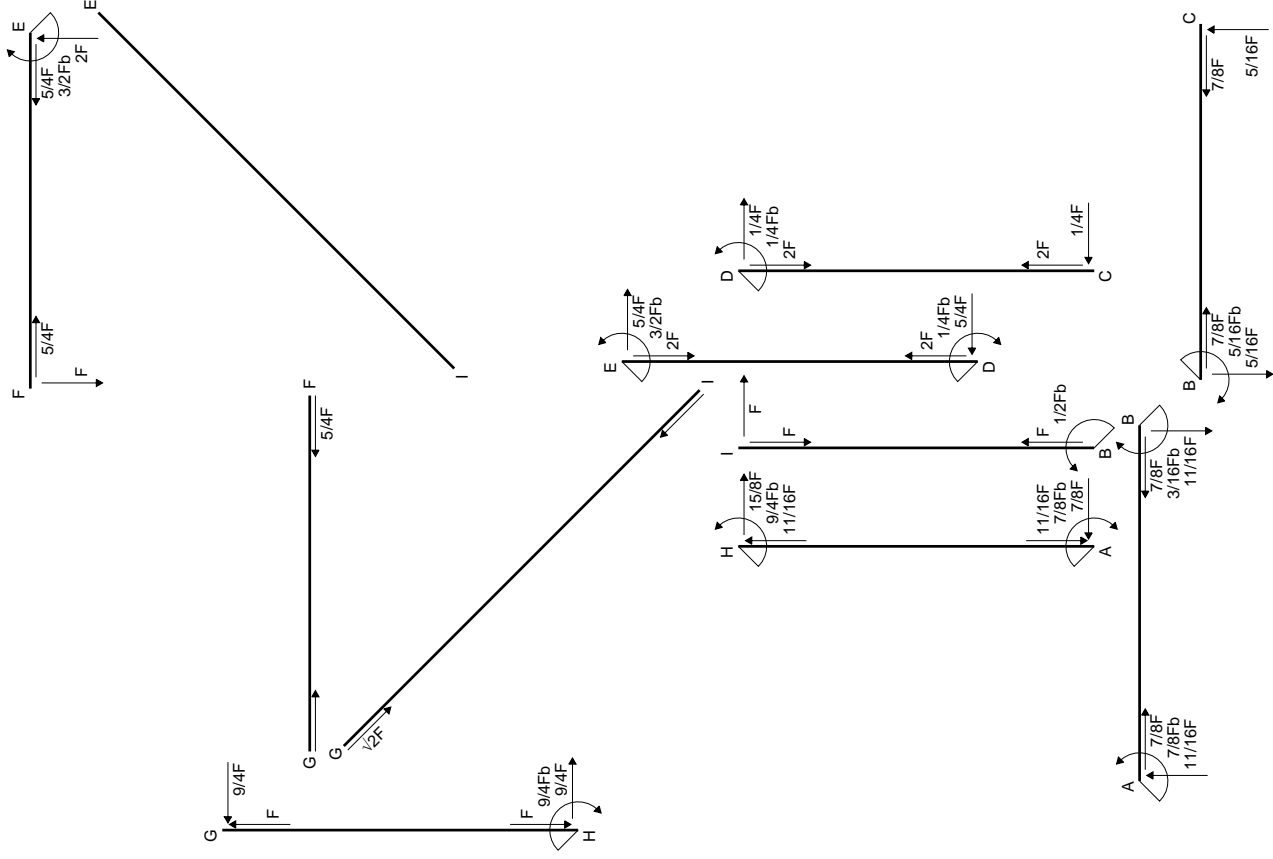
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

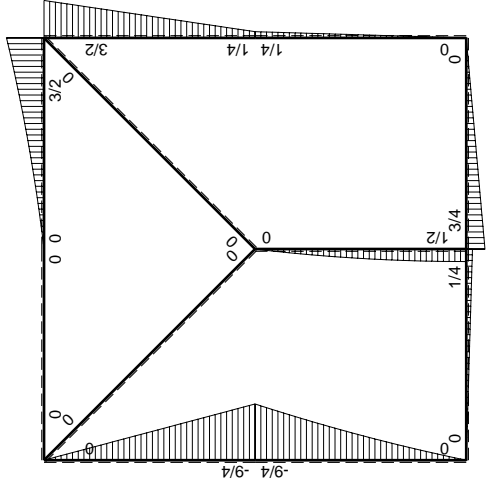
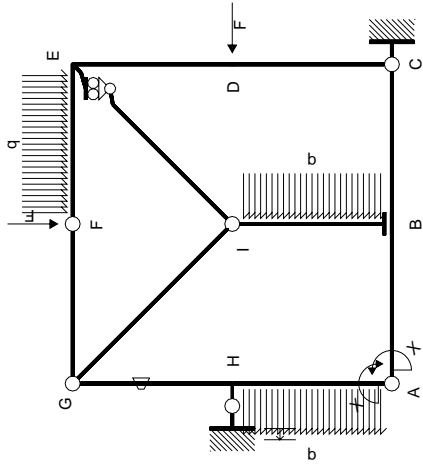
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

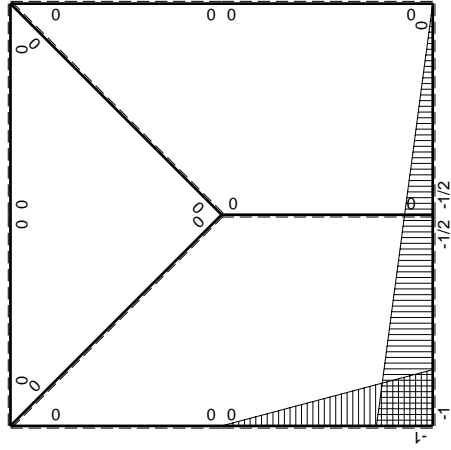
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

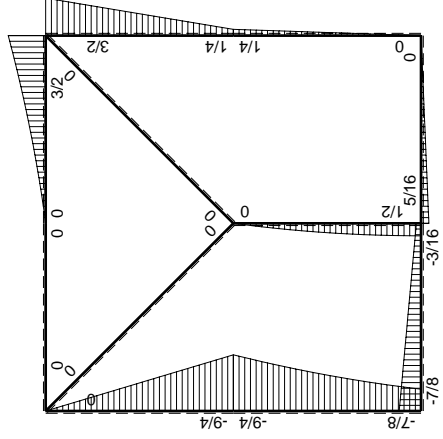
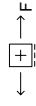
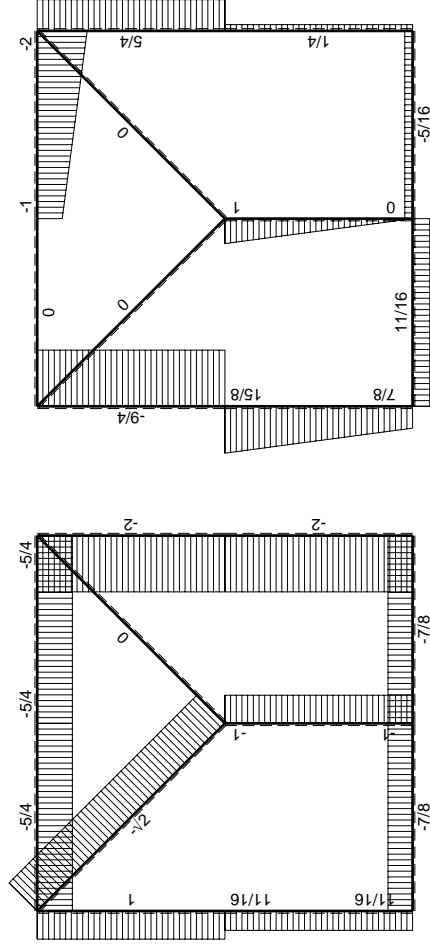
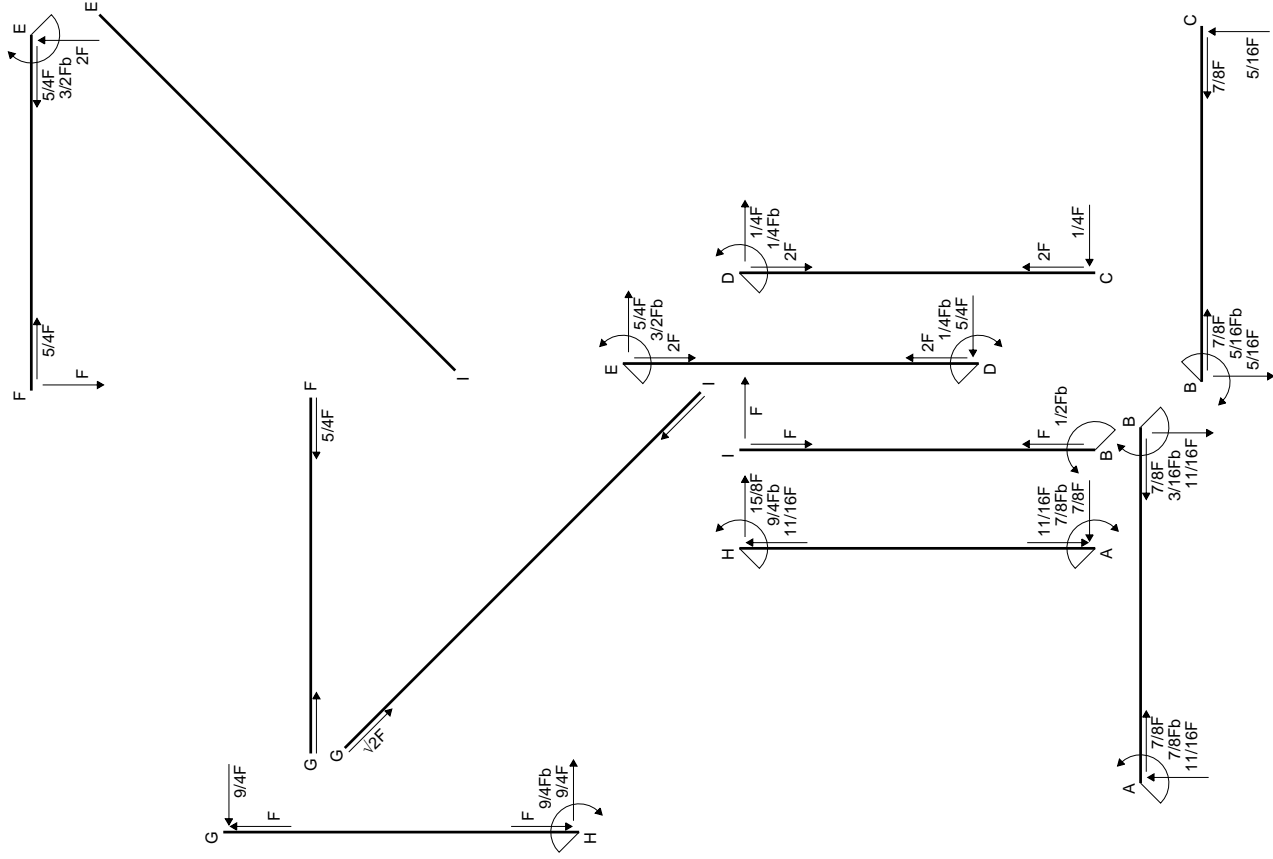
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

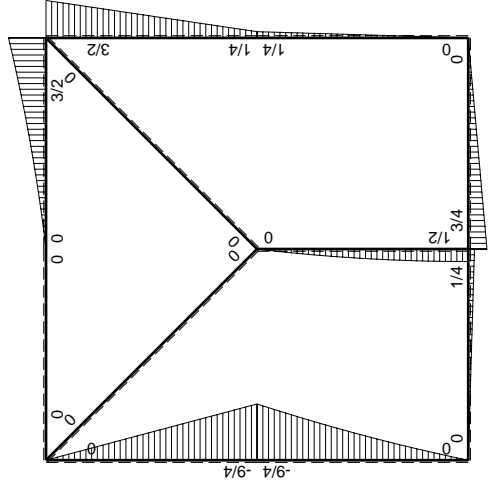
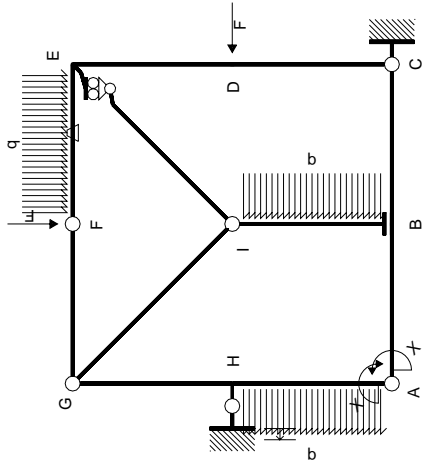
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

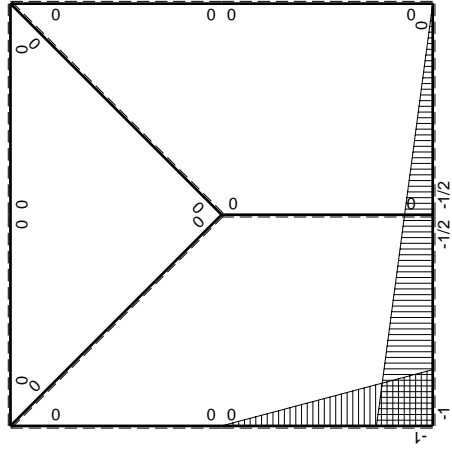
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

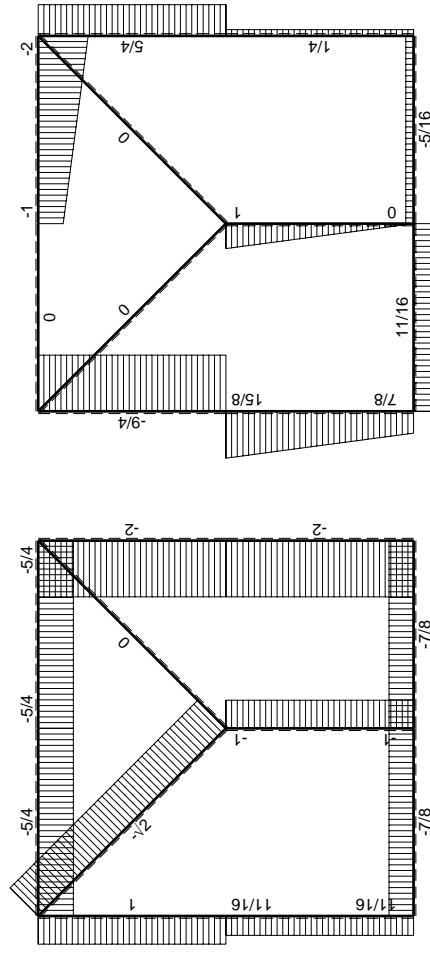
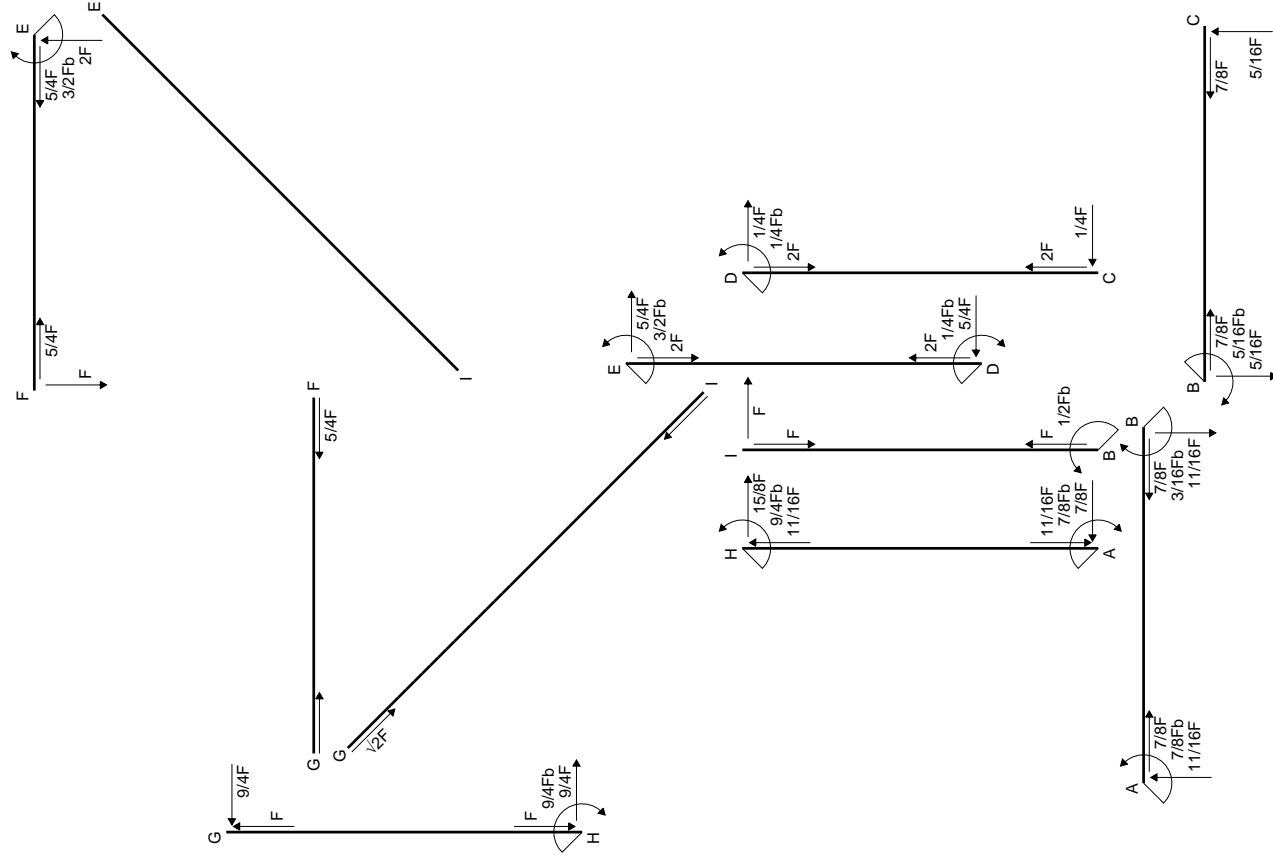
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

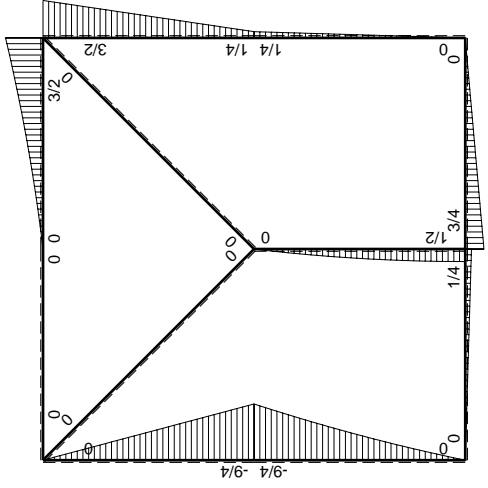
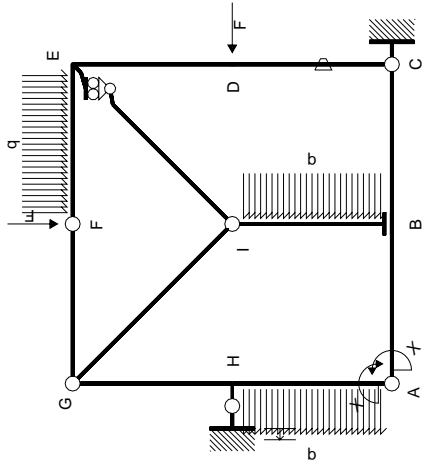
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

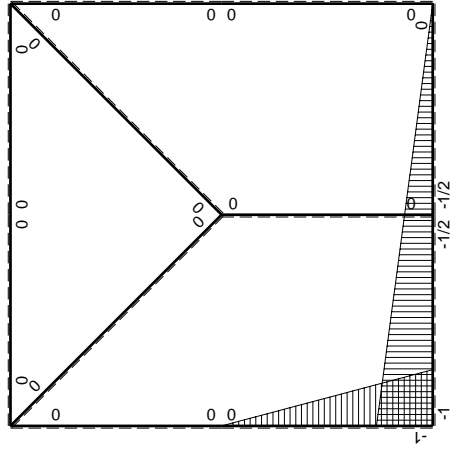


$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow F$

$\left[\begin{matrix} + \\ - \end{matrix} \right] \rightarrow F_b$



M₀ flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	0	$-1/4Fx+1/8Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	0	$-1/8Fb+1/8Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	Fb/EJ	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^2/b + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = \left[-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x^3/b^2 \right]_0^b Fb 1/EJ$$

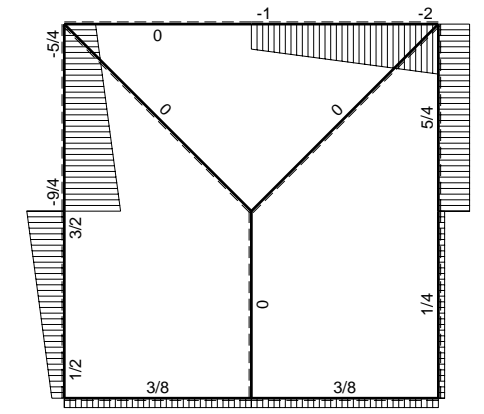
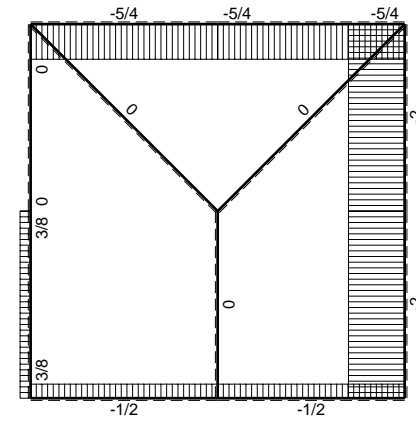
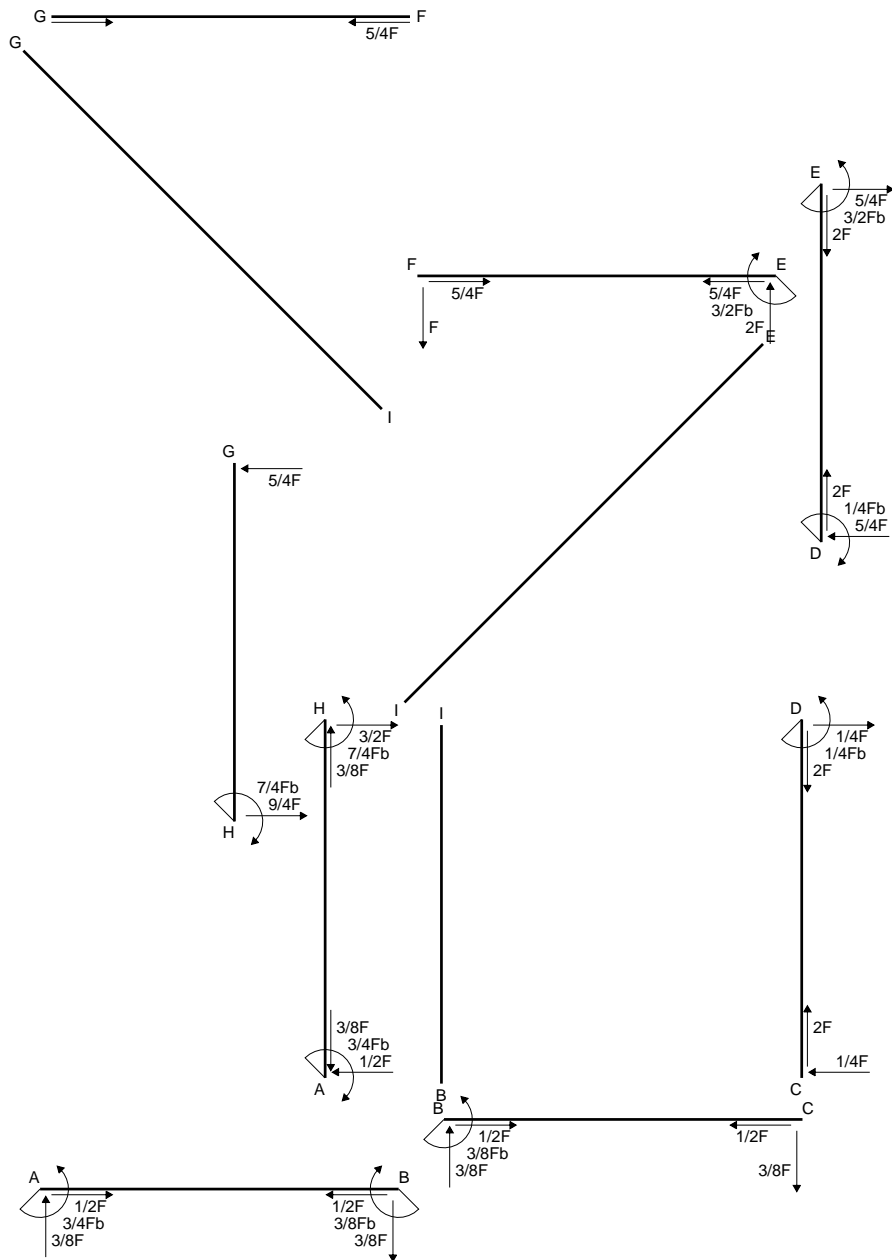
$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

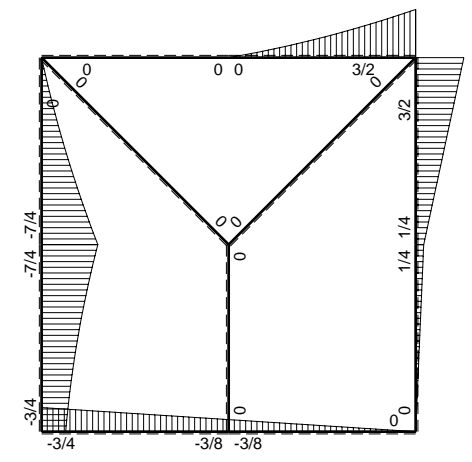
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

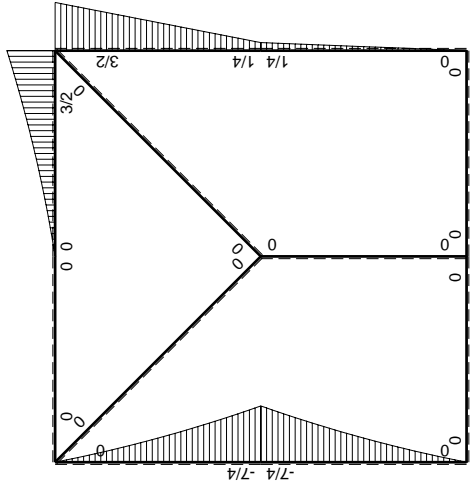
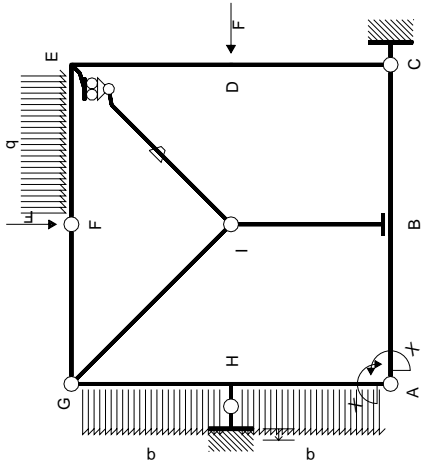


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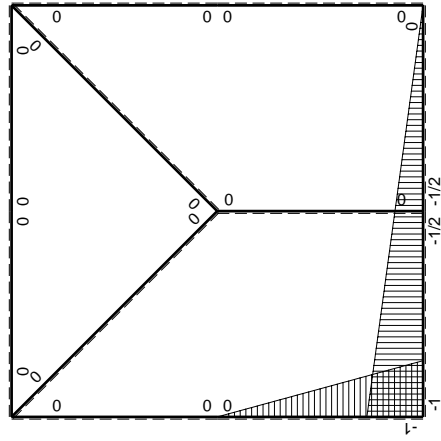
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

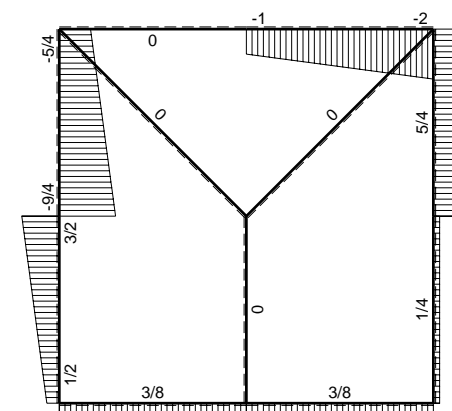
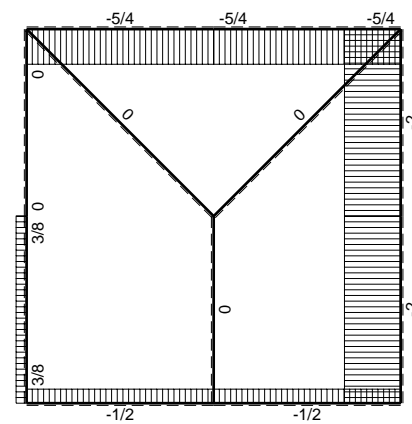
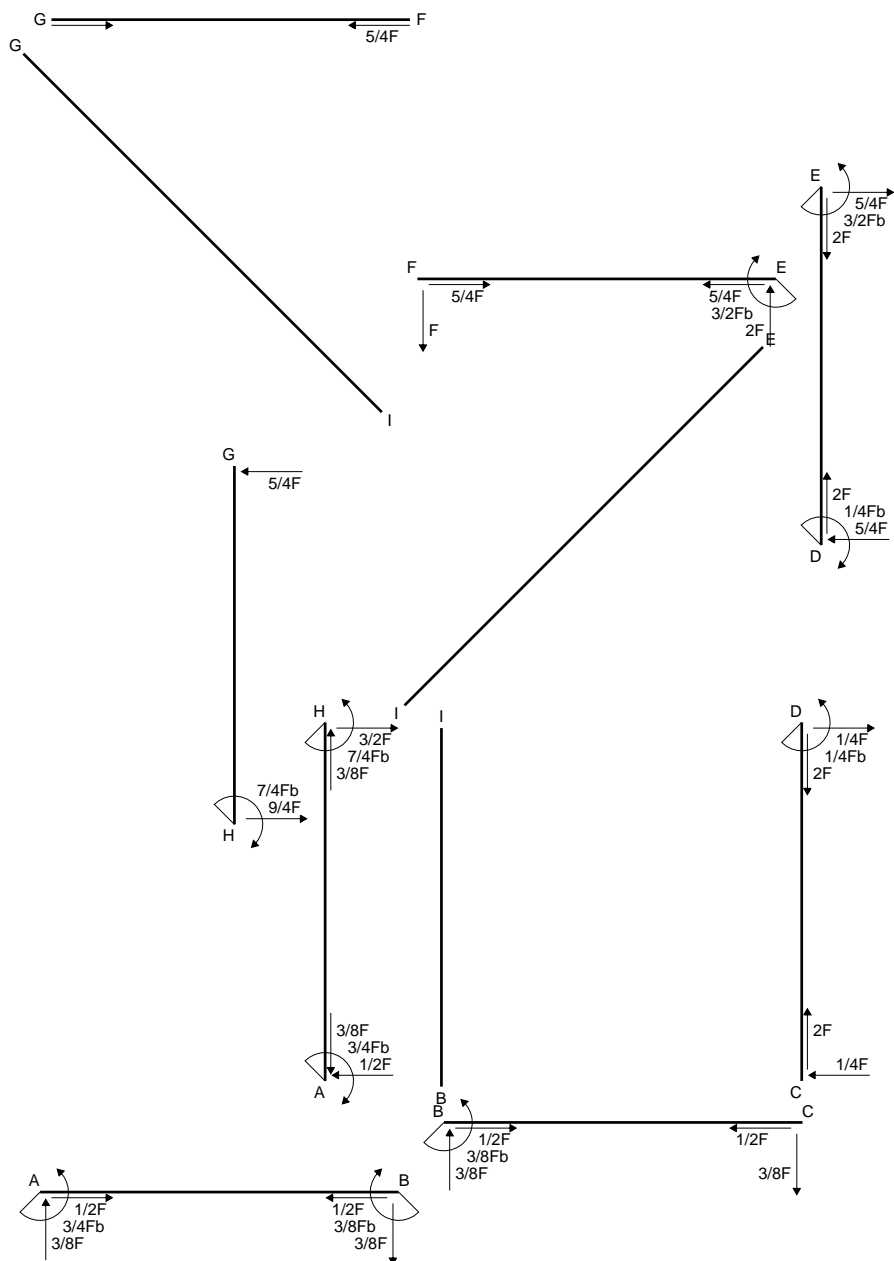
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

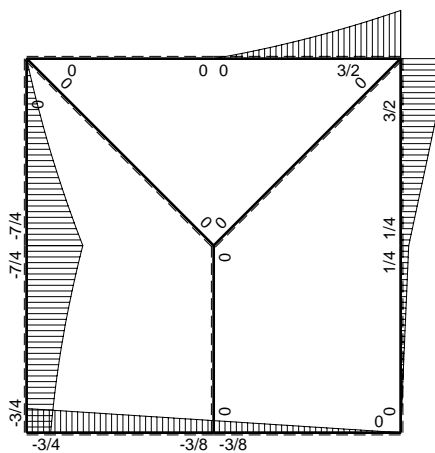
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

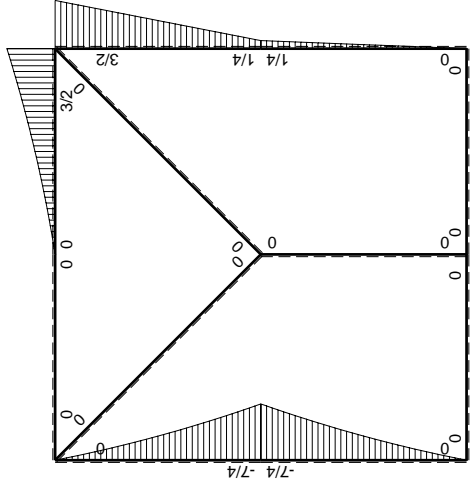
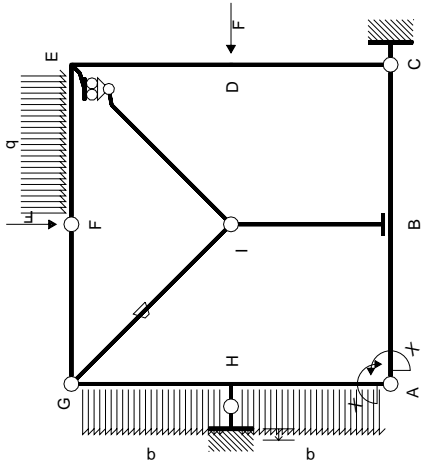


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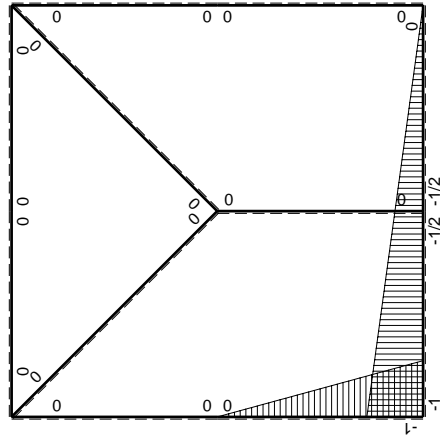
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

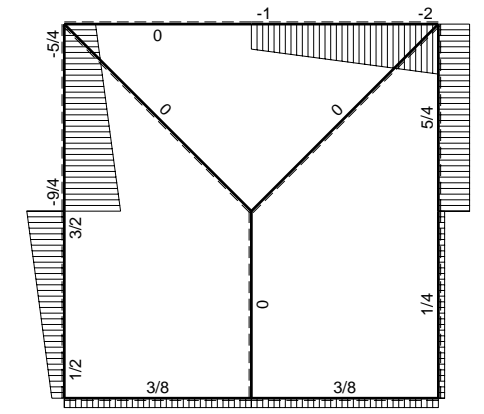
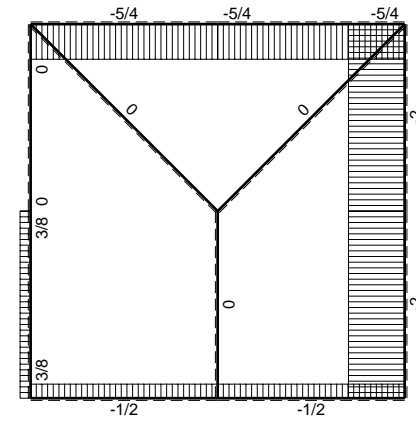
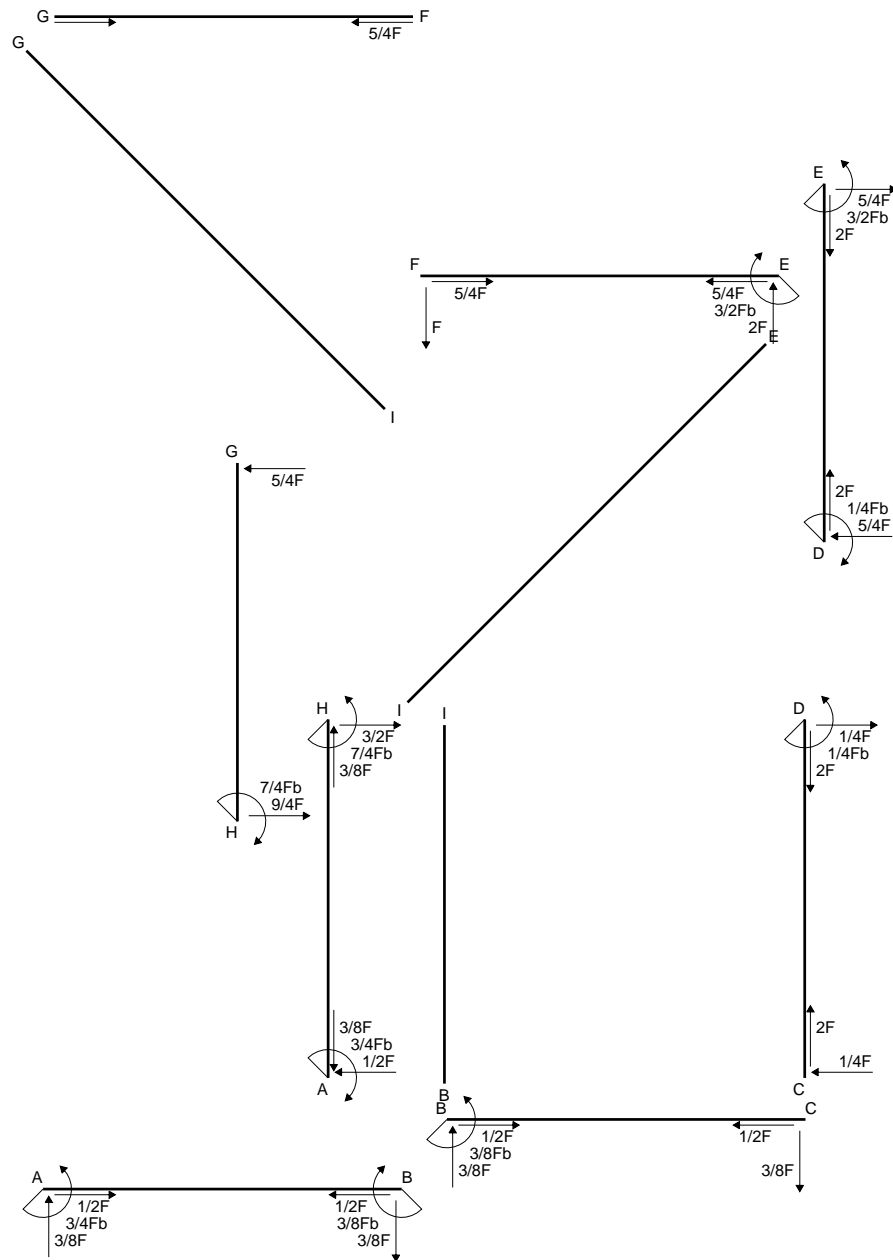
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

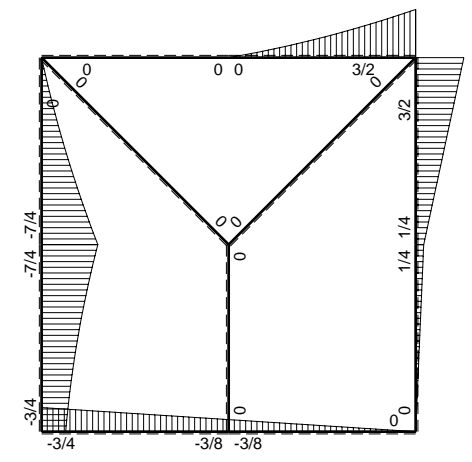
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

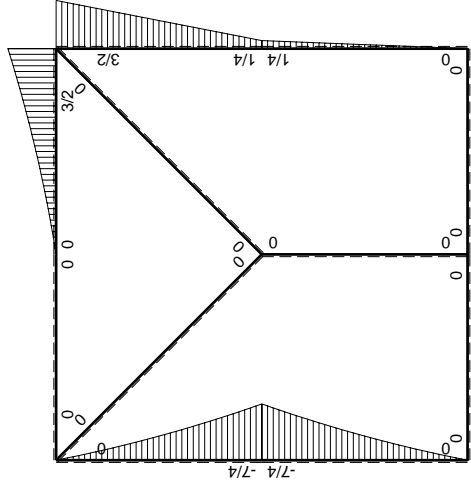
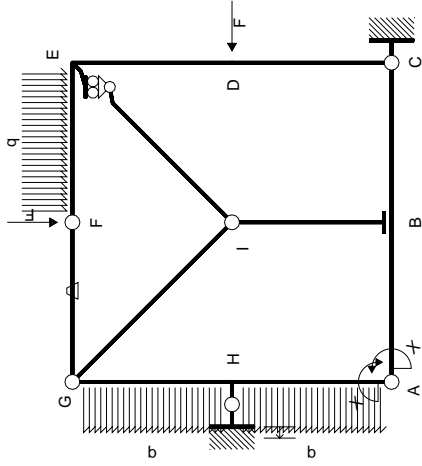


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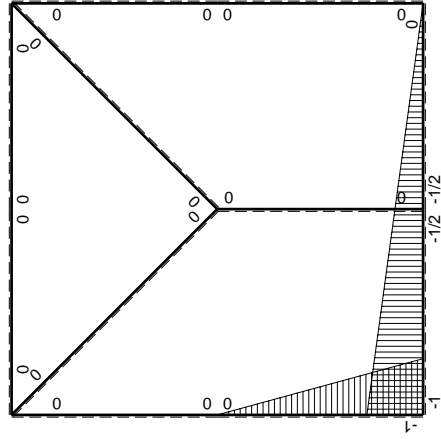
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

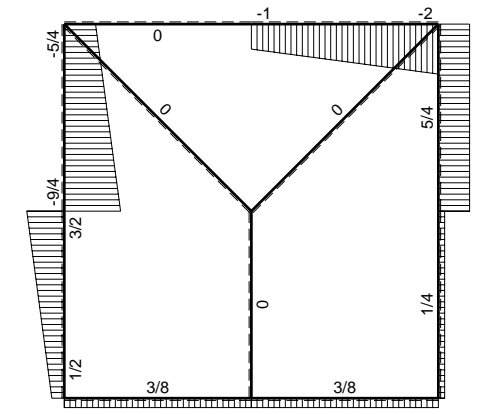
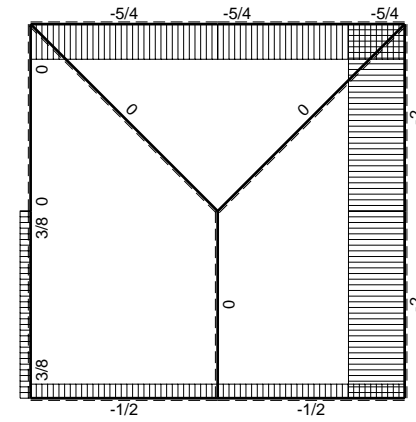
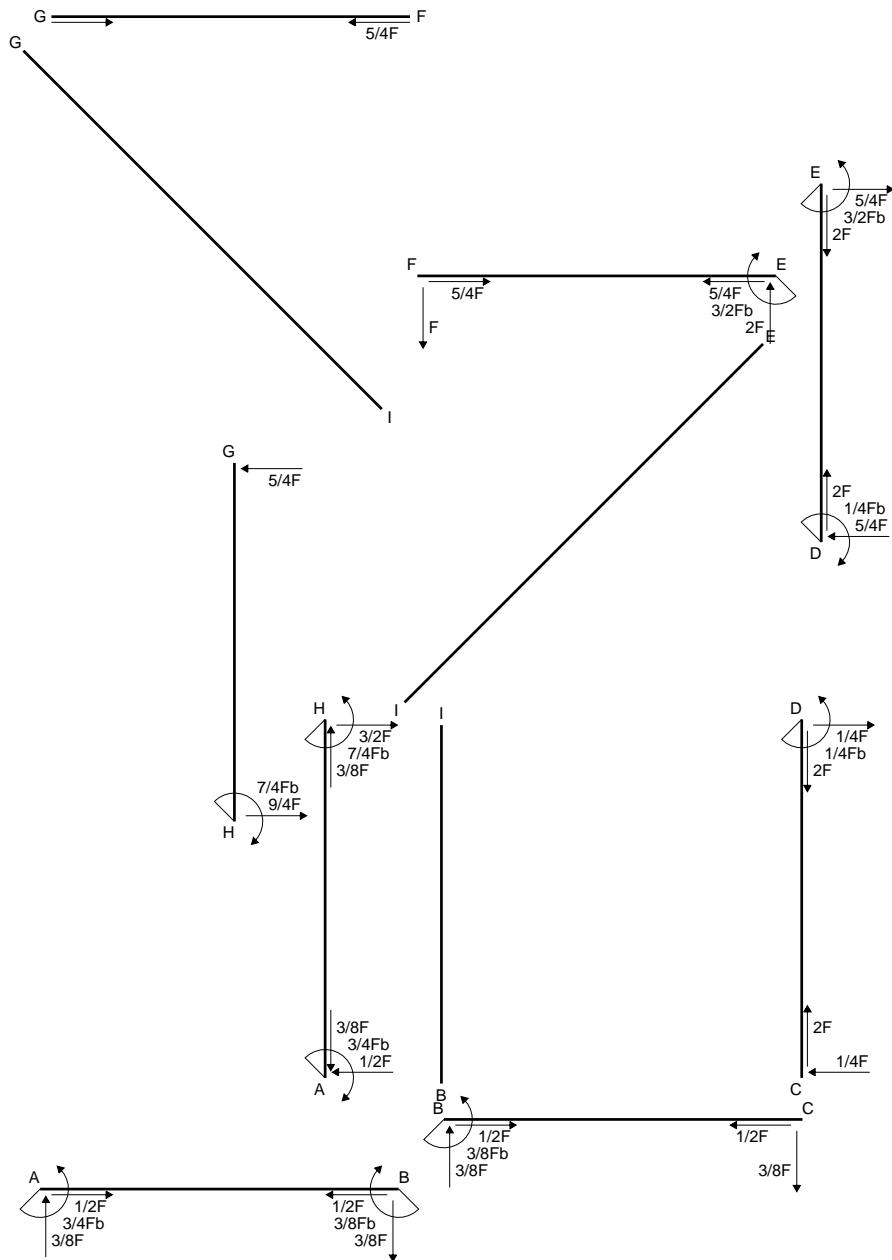
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

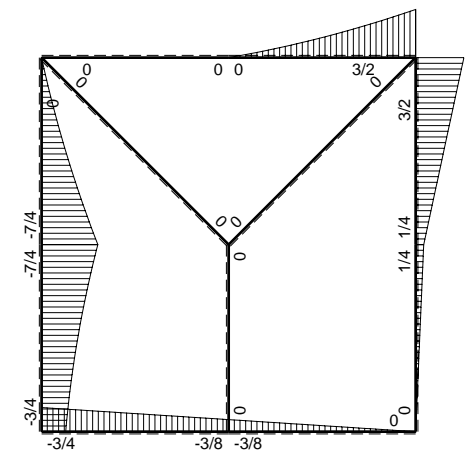
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

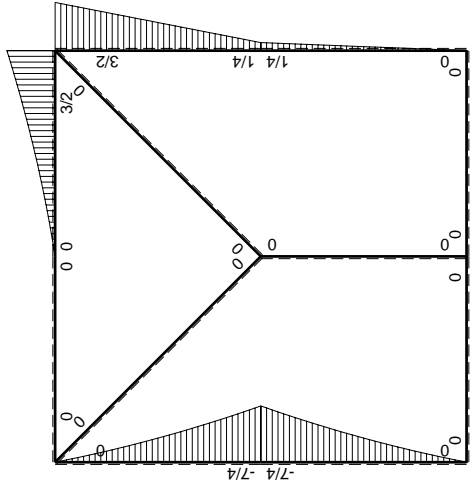
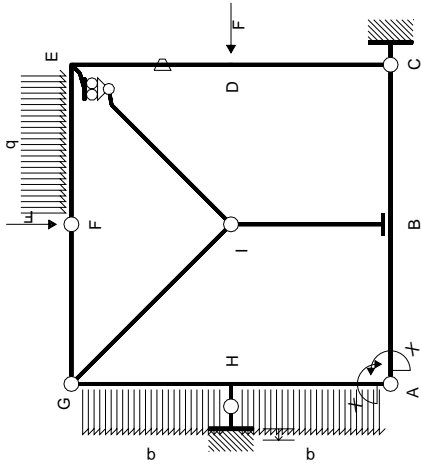


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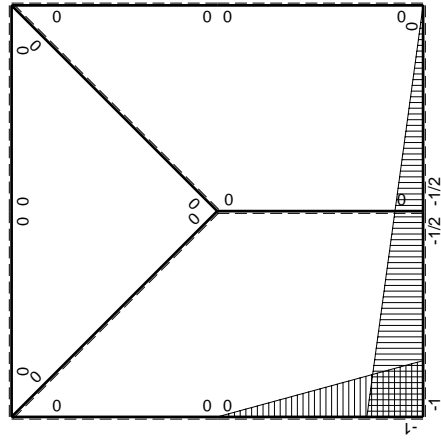
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

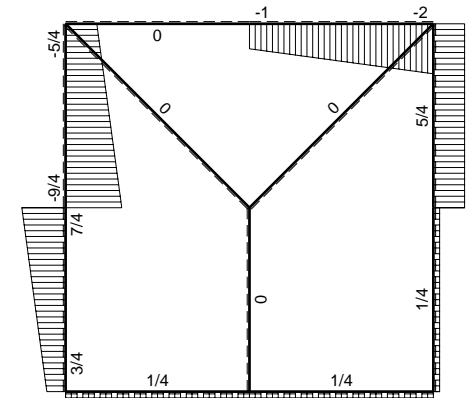
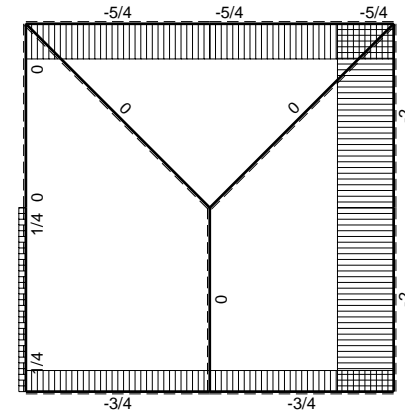
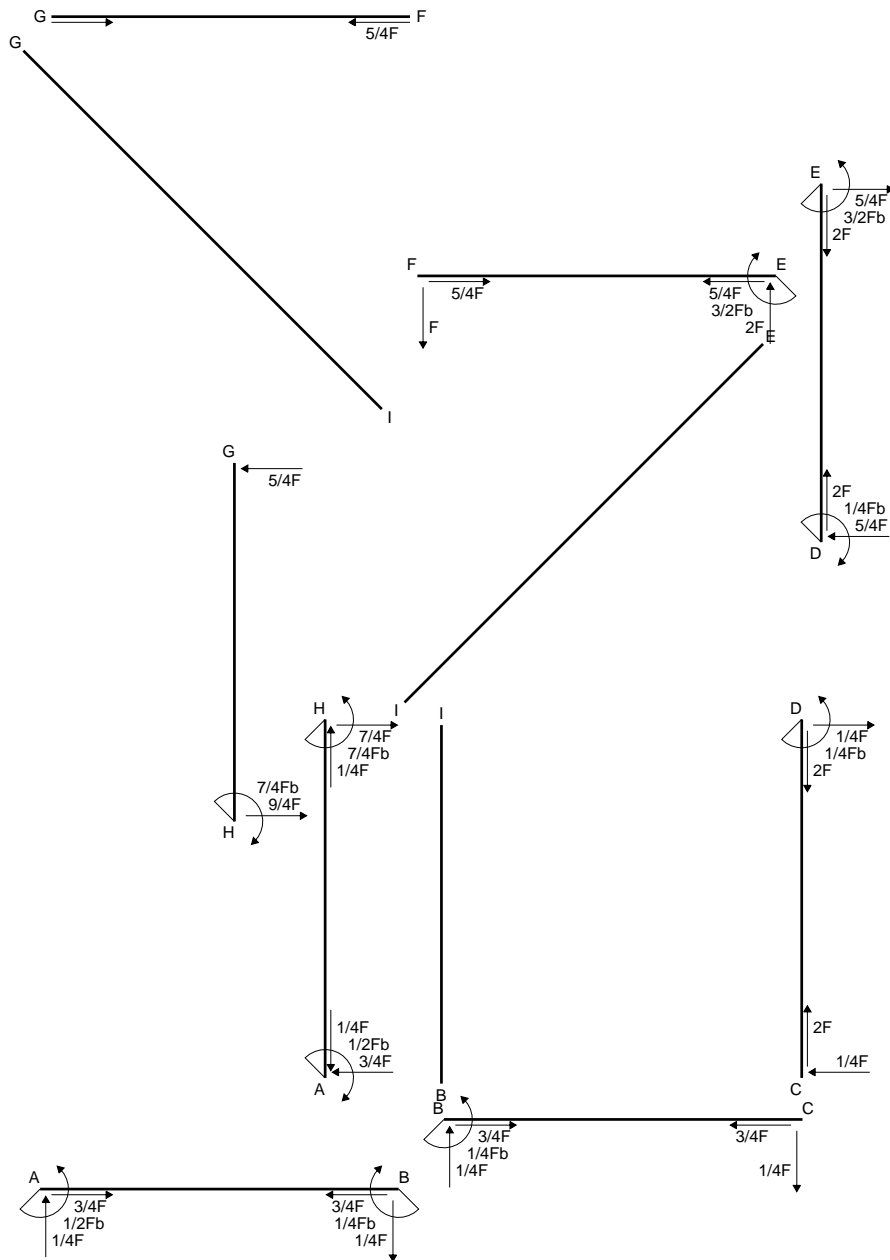
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

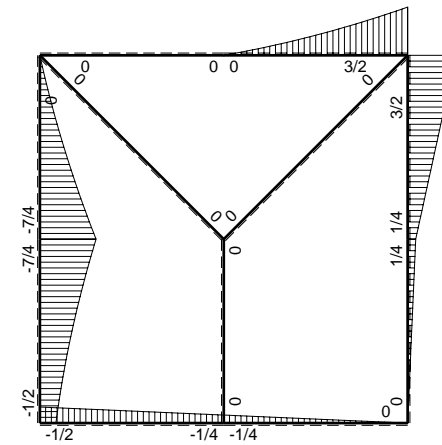
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

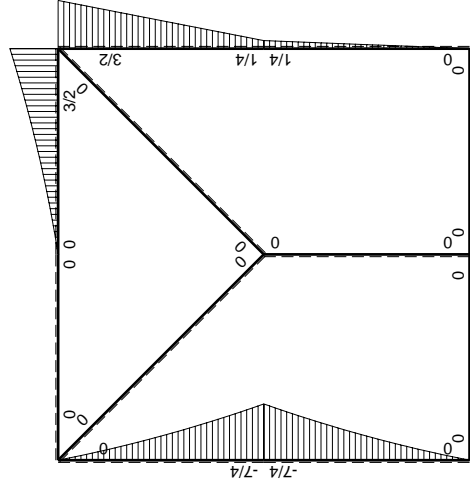
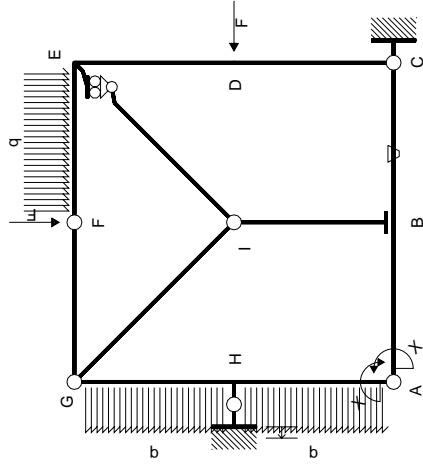


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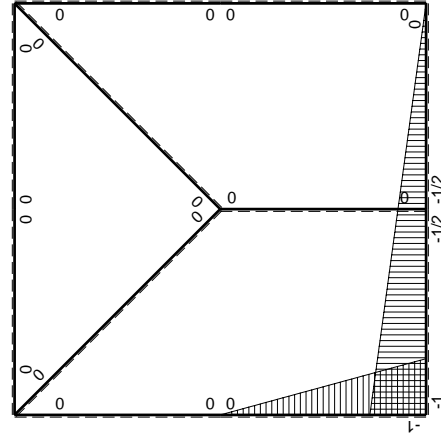
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⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_1 flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	$-Fb/EJ$	0	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(0+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	Fb/EJ	0	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/2Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/2Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{BC}^{xo} = \int_0^b (1/2 - 1/2 x/b) \theta dx = [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (1/2 b - 1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/2 x/b) \theta dx = [-1/4 x^2/b]_0^b \theta$$

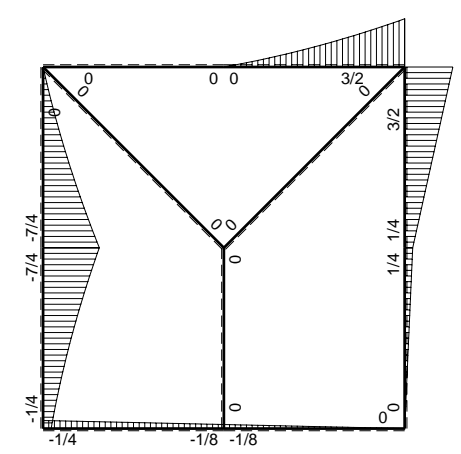
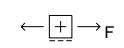
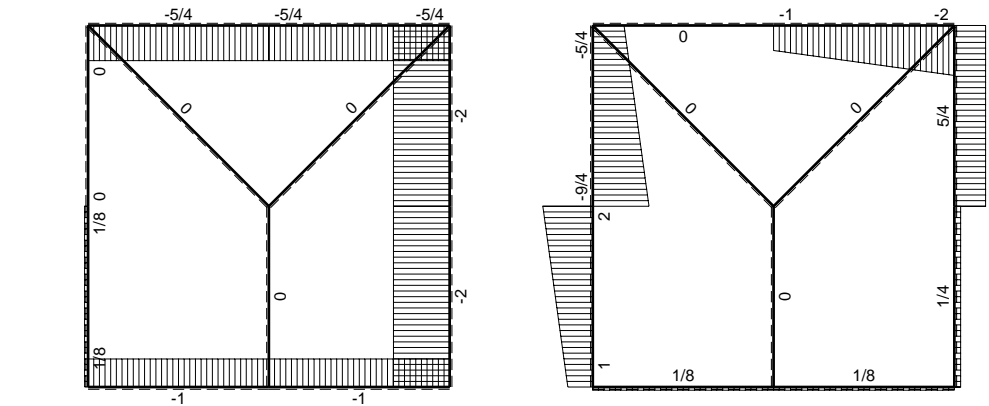
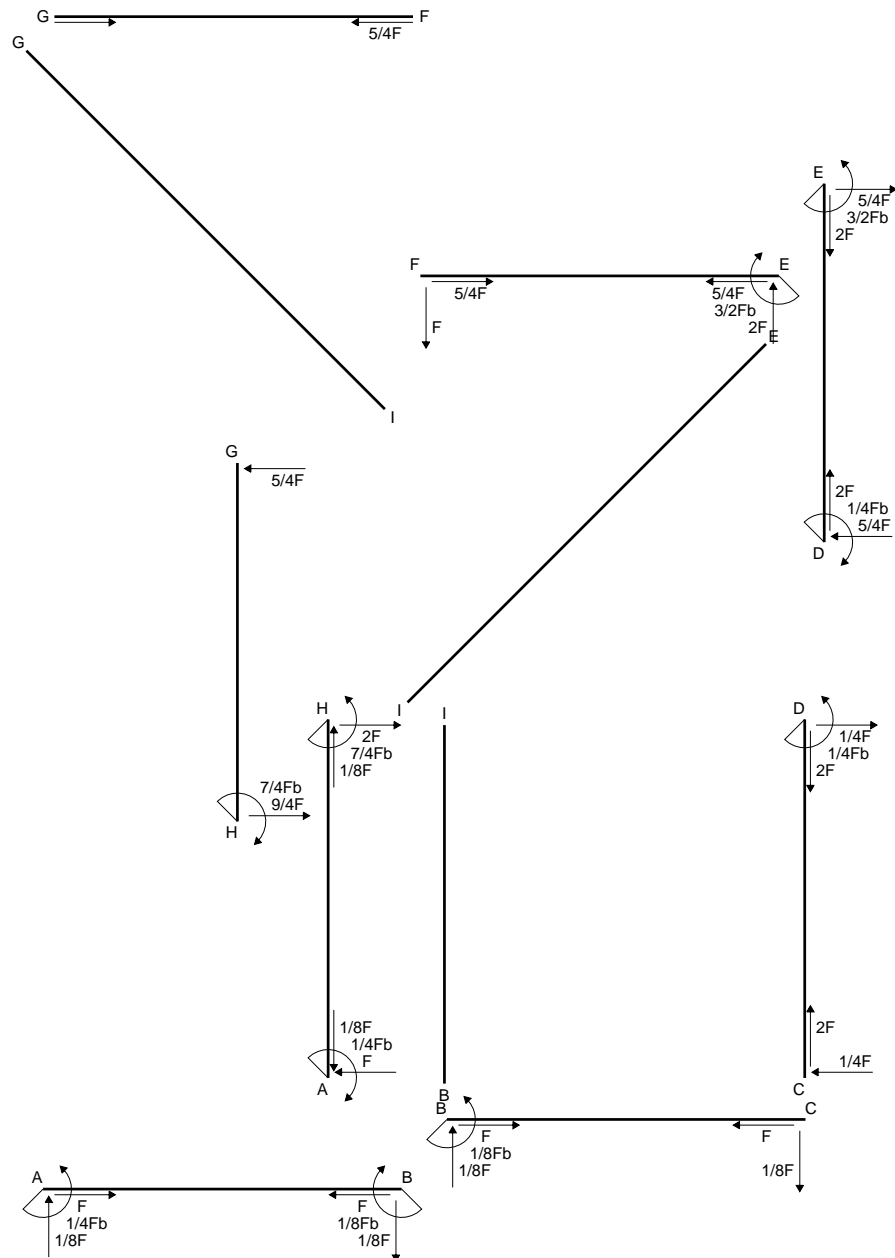
$$= (-1/4 b) \theta = 1/4 Fb^2/EJ$$

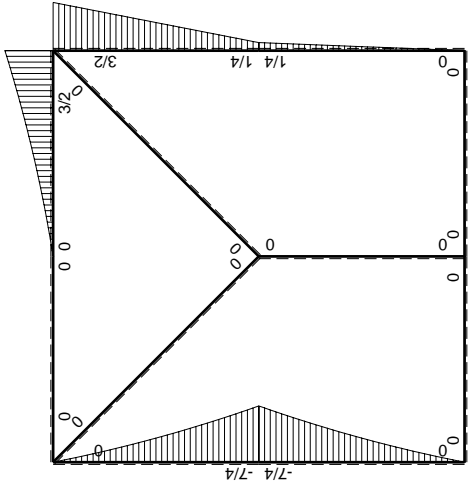
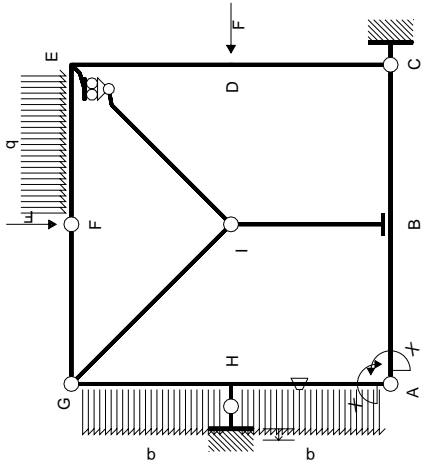
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

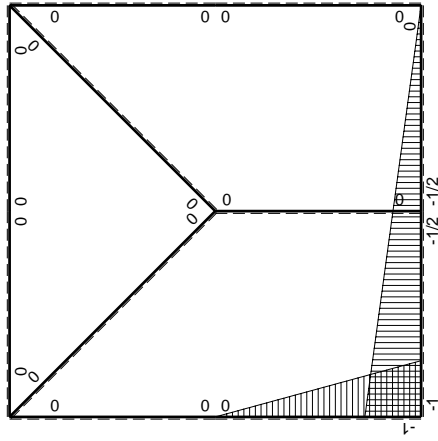
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	$-Fb/EJ$	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/4+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	Fb/EJ	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

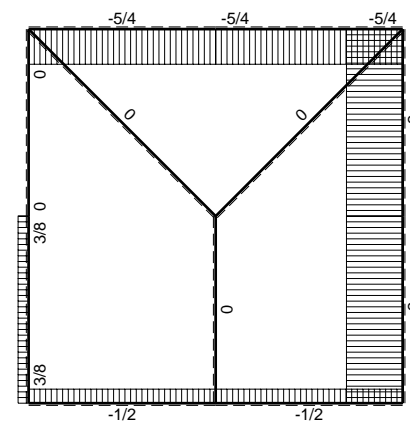
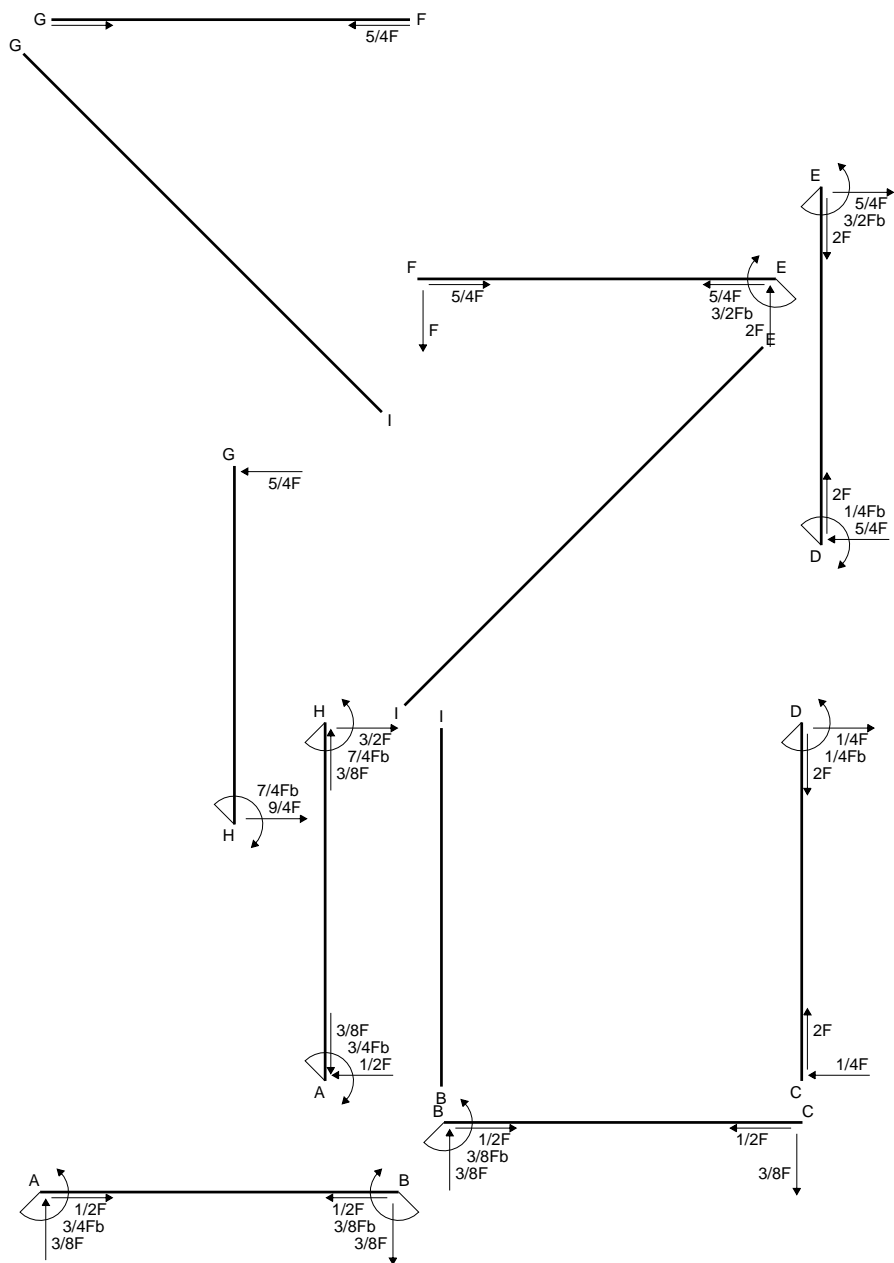
$$= \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 3/4 Fb^2/EJ$$

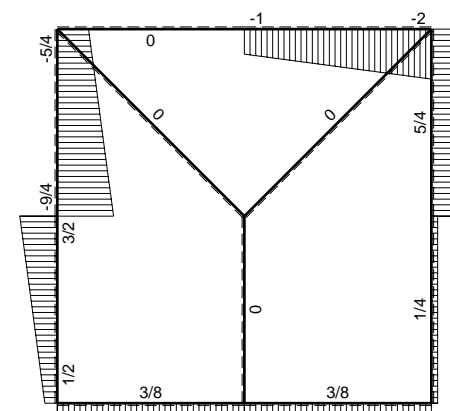
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

$$= \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

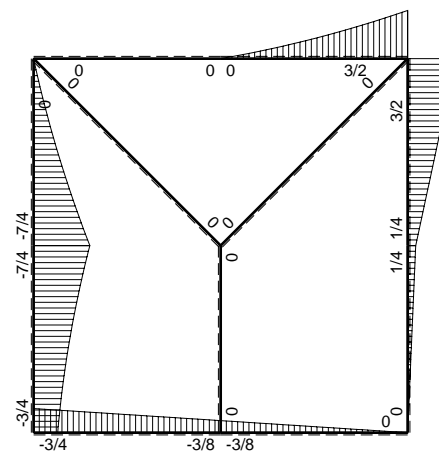
$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 3/4 Fb^2/EJ$$



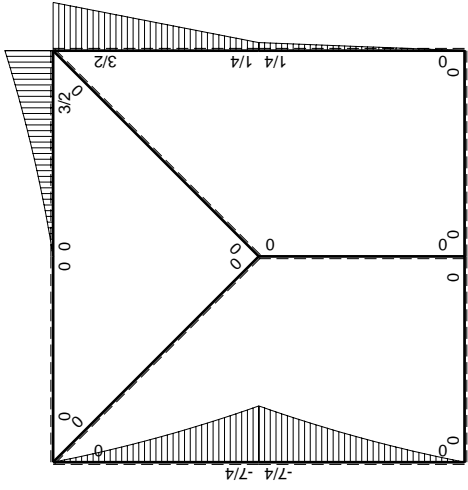
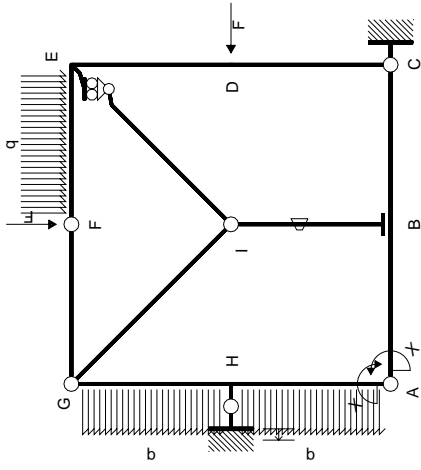
$\left[\begin{smallmatrix} + \\ - \end{smallmatrix} \right] F$



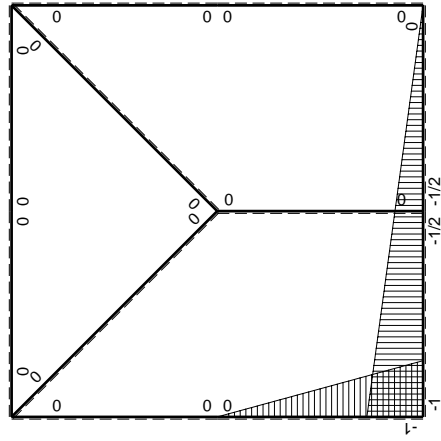
$\left[\begin{smallmatrix} + \\ - \end{smallmatrix} \right] F$



$\left[\begin{smallmatrix} + \\ - \end{smallmatrix} \right] Fb$



M₀ flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

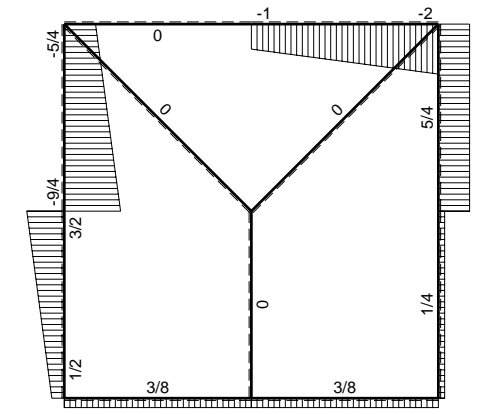
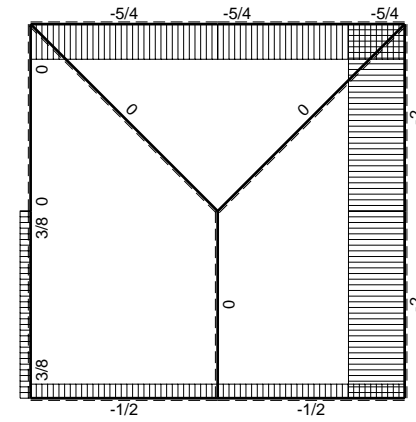
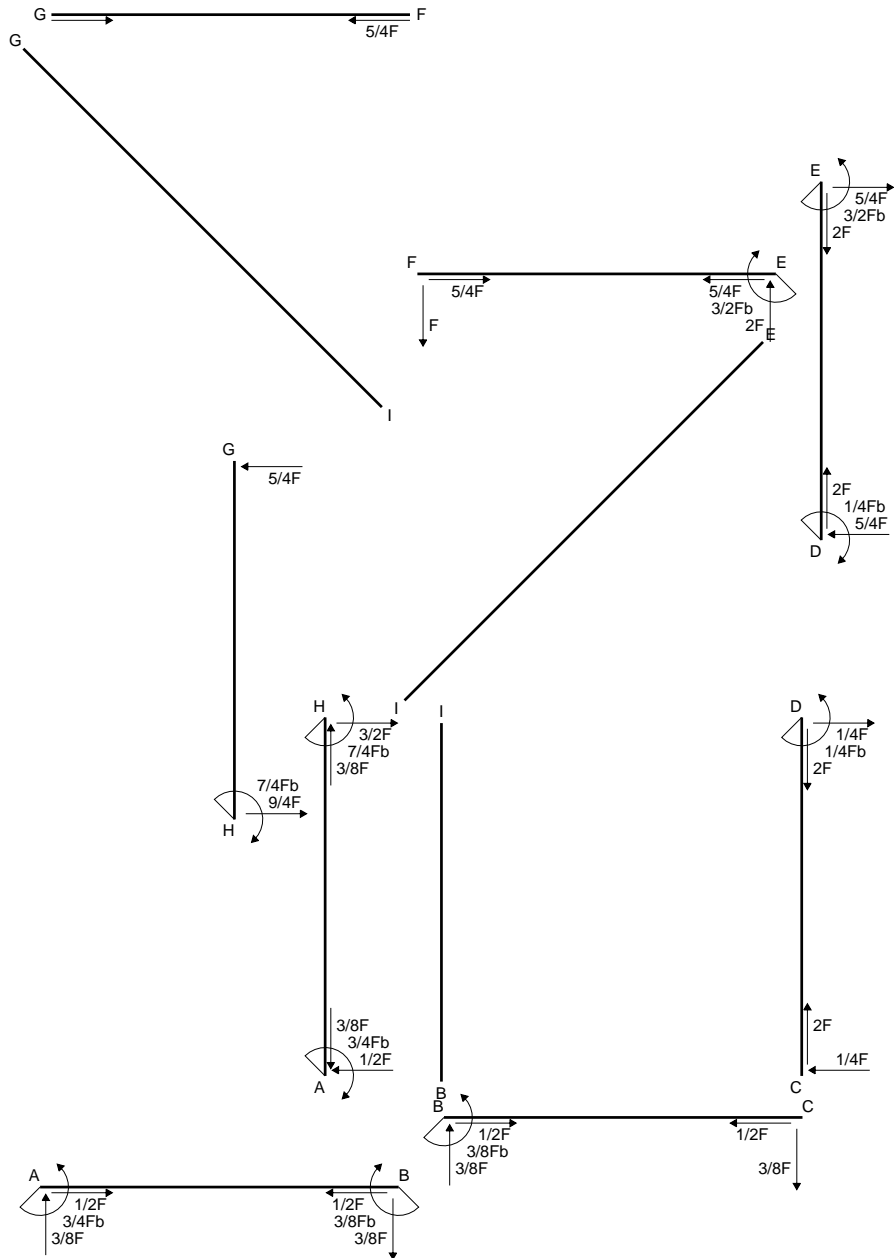
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

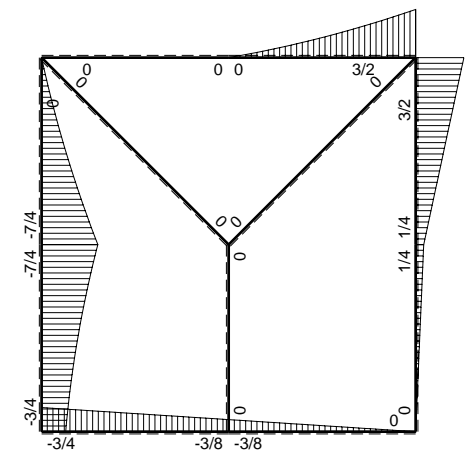
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

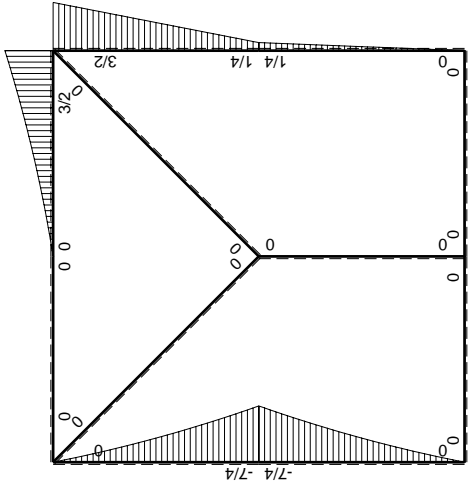
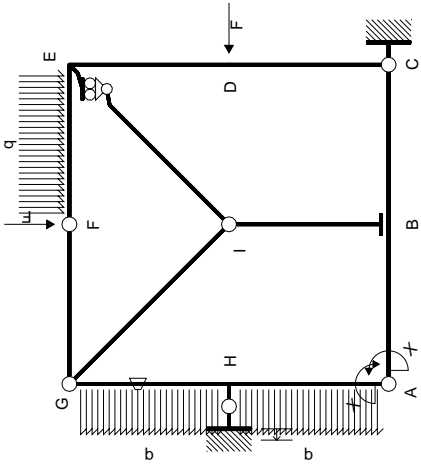


← ⊕ → F

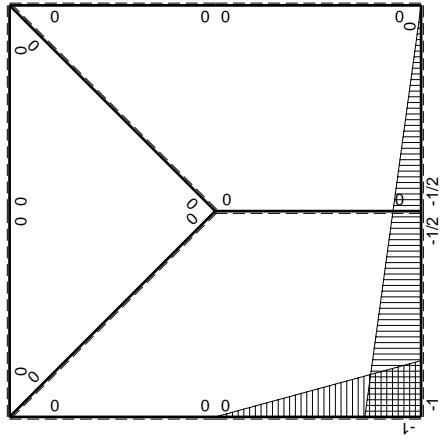
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

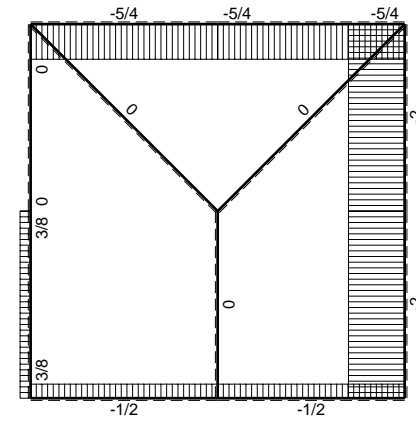
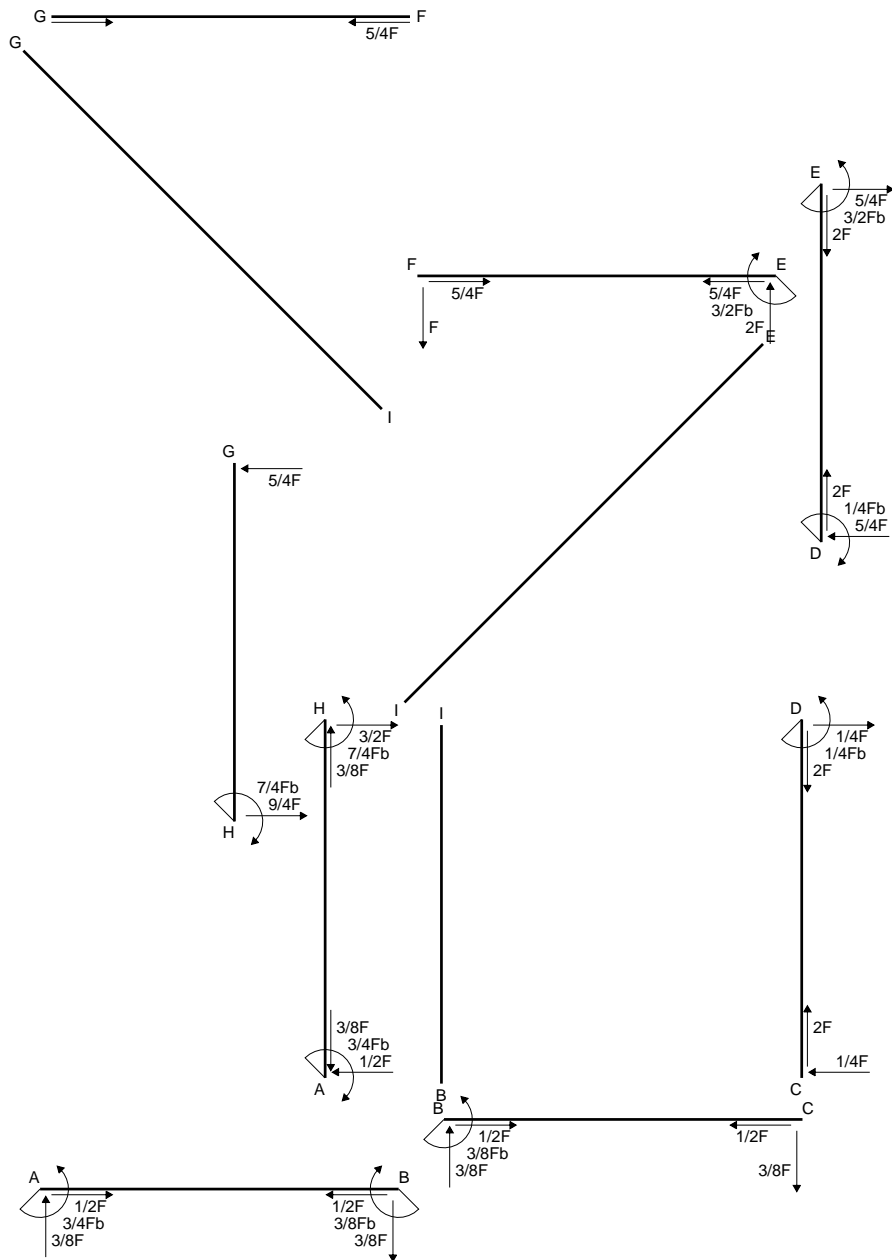
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

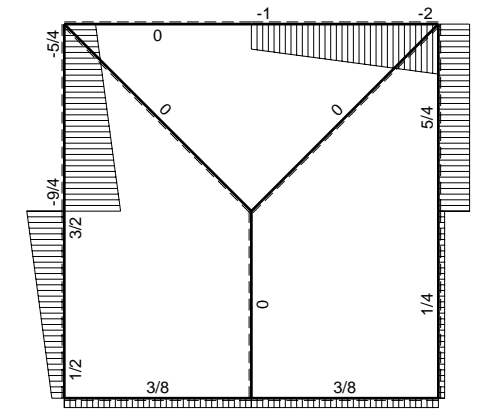
$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

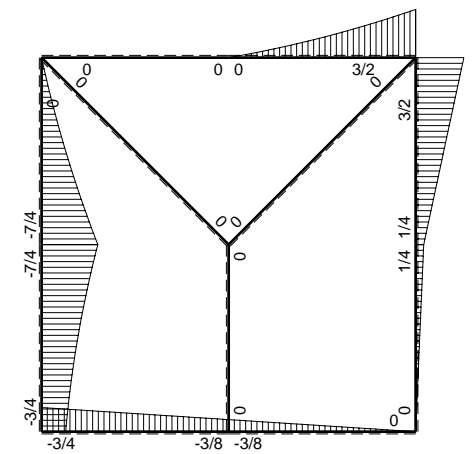
$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$



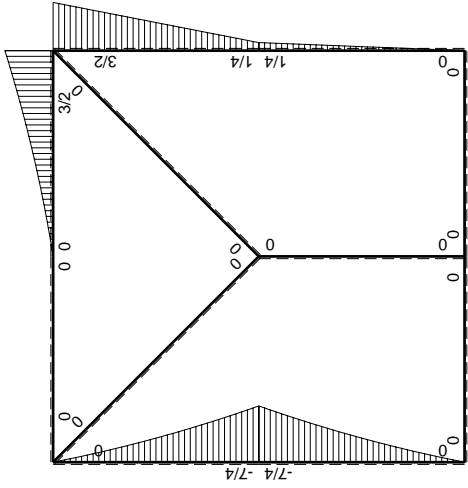
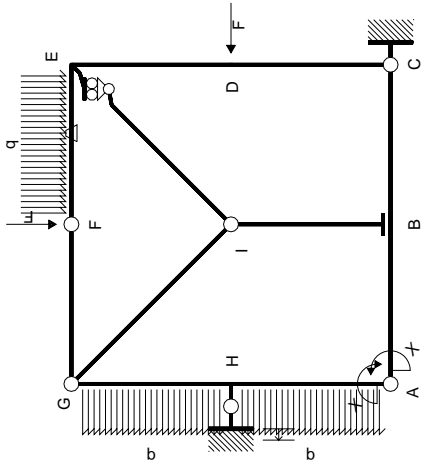
$\leftarrow \boxed{+} \rightarrow F$



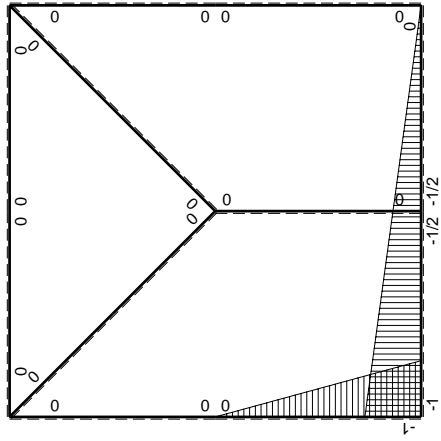
$\uparrow \boxed{+} \downarrow F$



$\curvearrowright \boxed{+} \curvearrowleft F_b$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

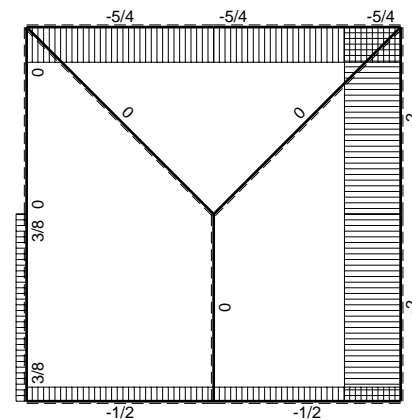
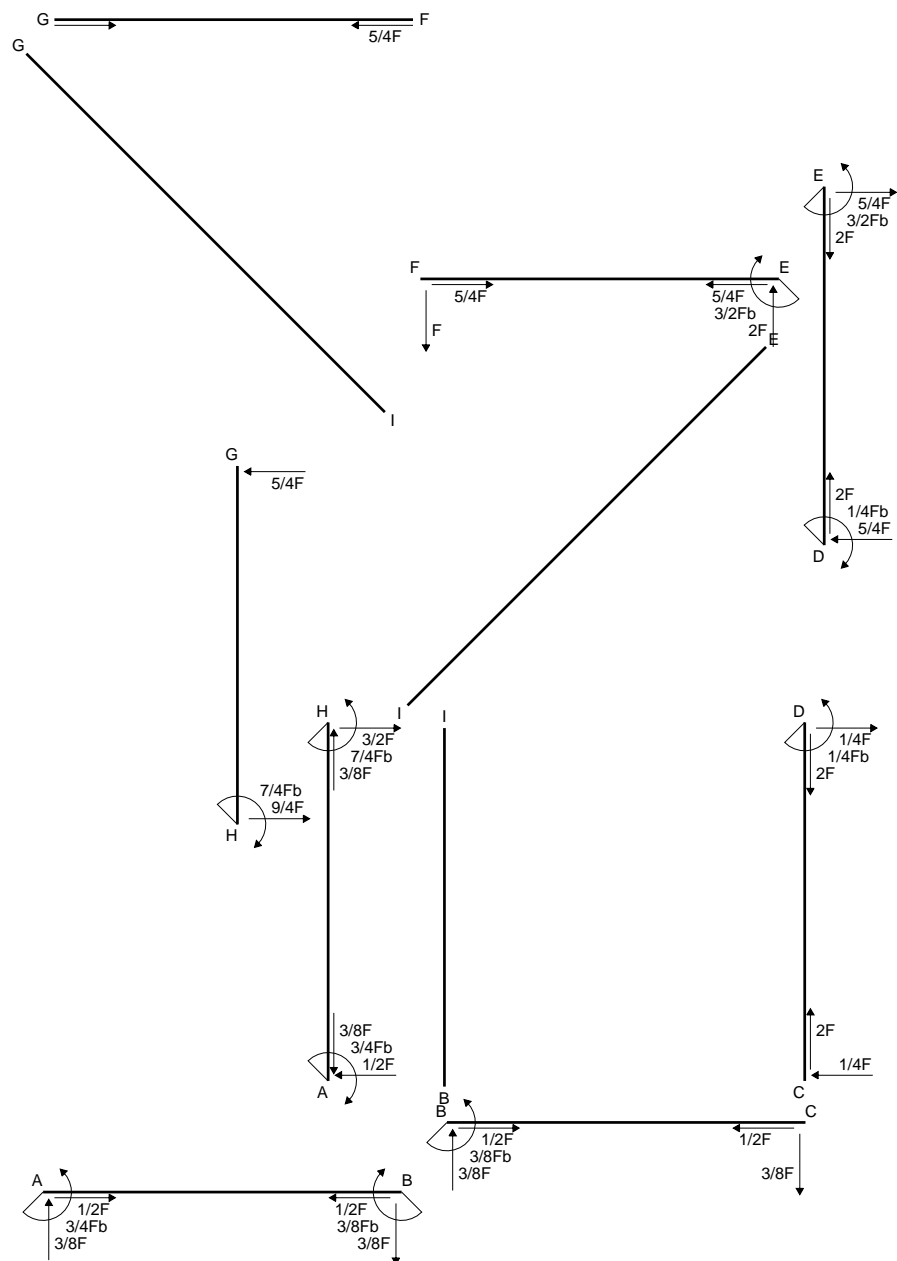
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

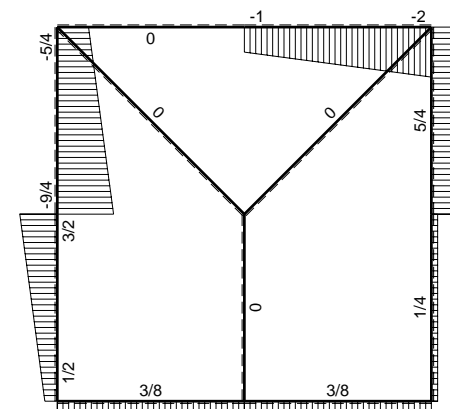
$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

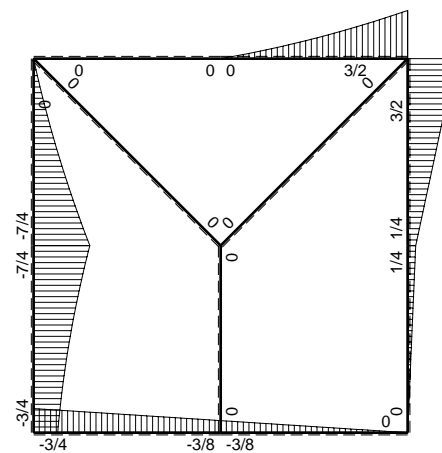
$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$



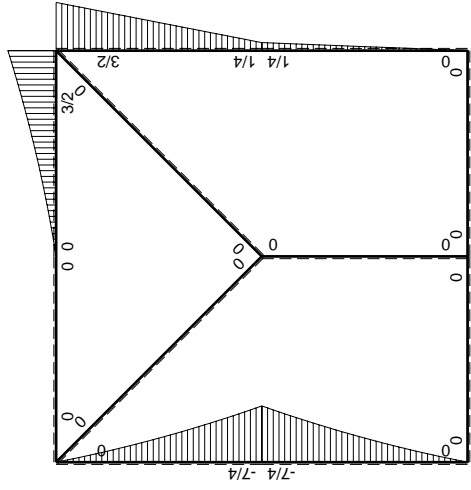
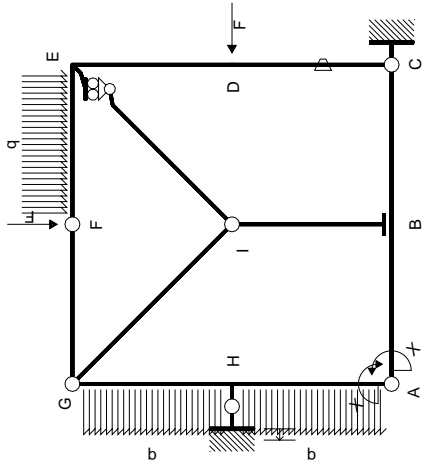
$\leftarrow \oplus \rightarrow F$



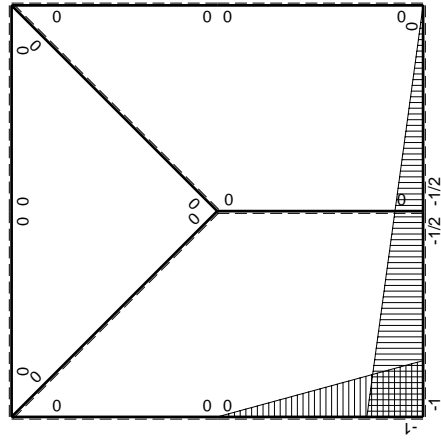
$\uparrow \oplus \downarrow F$



$\curvearrowright \oplus \curvearrowleft Fb$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	Fb/EJ	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx-1/2qx^2$	0	0	0	0	0+0	0	
HG b	0	$7/4Fb-9/4Fx+1/2qx^2$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-7/4Fb+9/4Fx-1/2qx^2$	0	$7/4Fx-9/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/4+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$5/4Fx+1/2qx^2$	0	$5/4Fx-3/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-3/4Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$3/4Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

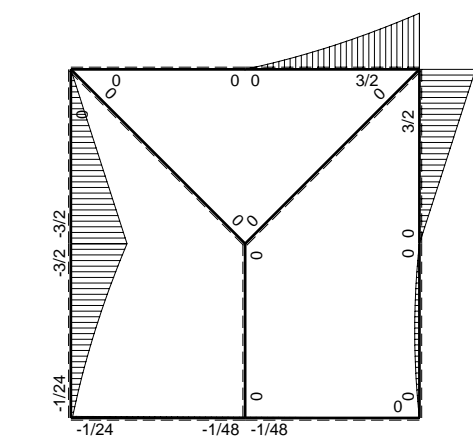
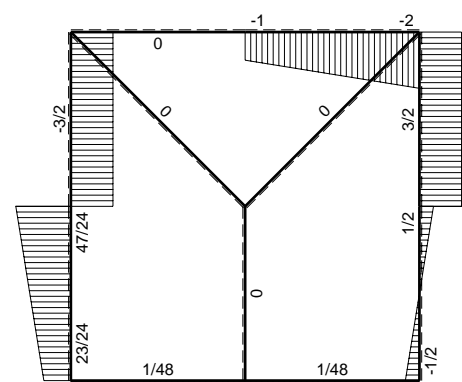
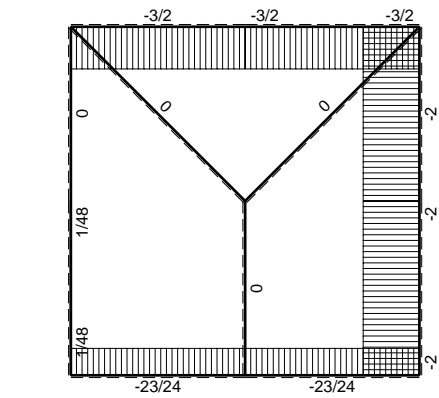
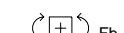
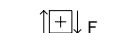
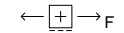
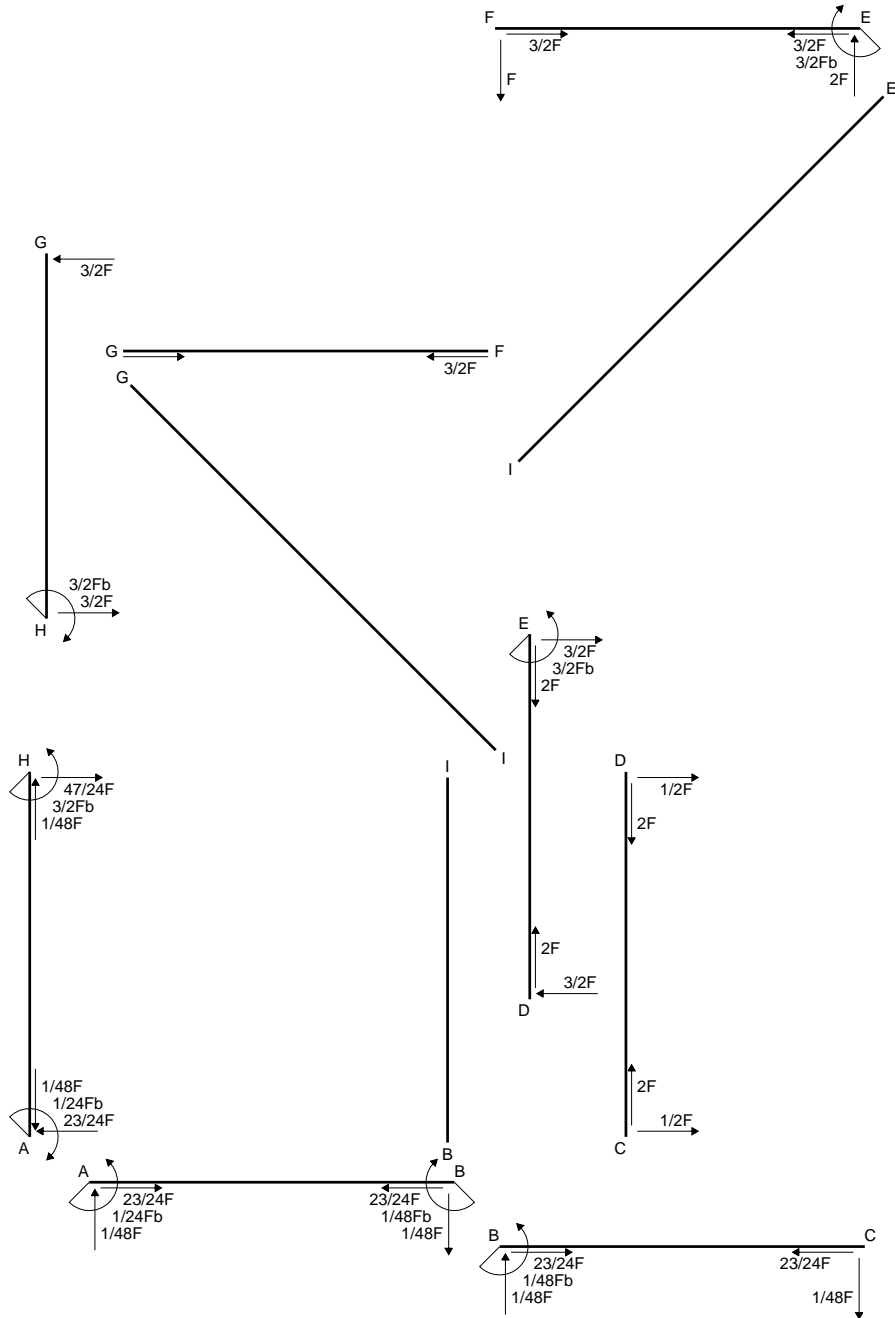
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

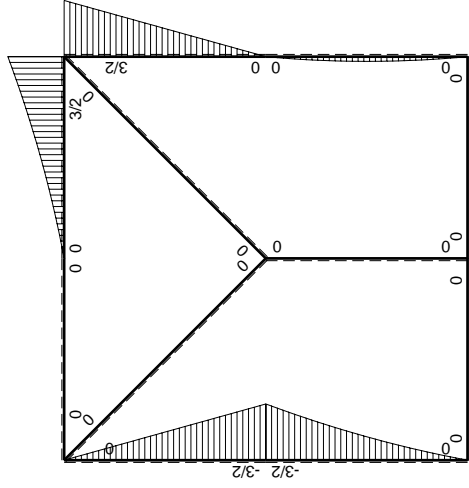
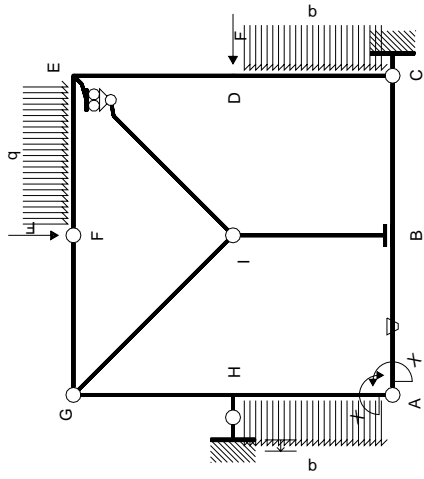
$$L_{HA}^{xo} = \int_0^b (7/4 x/b - 9/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 3/4 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 3/4 b + 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$

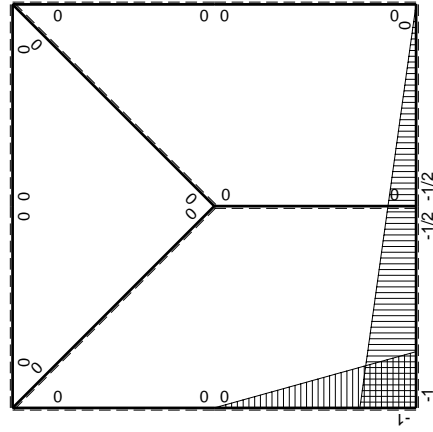
$$L_{AH}^{xo} = \int_0^b (5/4 x/b - 3/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 1/4 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 1/4 b - 1/8 b) Fb 1/EJ = 1/4 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$
 @ Adolfo Zavelani Rossi, Politecnico di Milano, vers.27.03.13

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	0	$-Fb/EJ$	0	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(0+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	Fb/EJ	0	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (1 - 1/2 x/b) \theta dx = [x - 1/4 x^2/b]_0^b \theta$$

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

$$L_{BA}^{xo} = \int_0^b (-1/2 - 1/2 x/b) \theta dx = [-1/2 x - 1/4 x^2/b]_0^b \theta$$

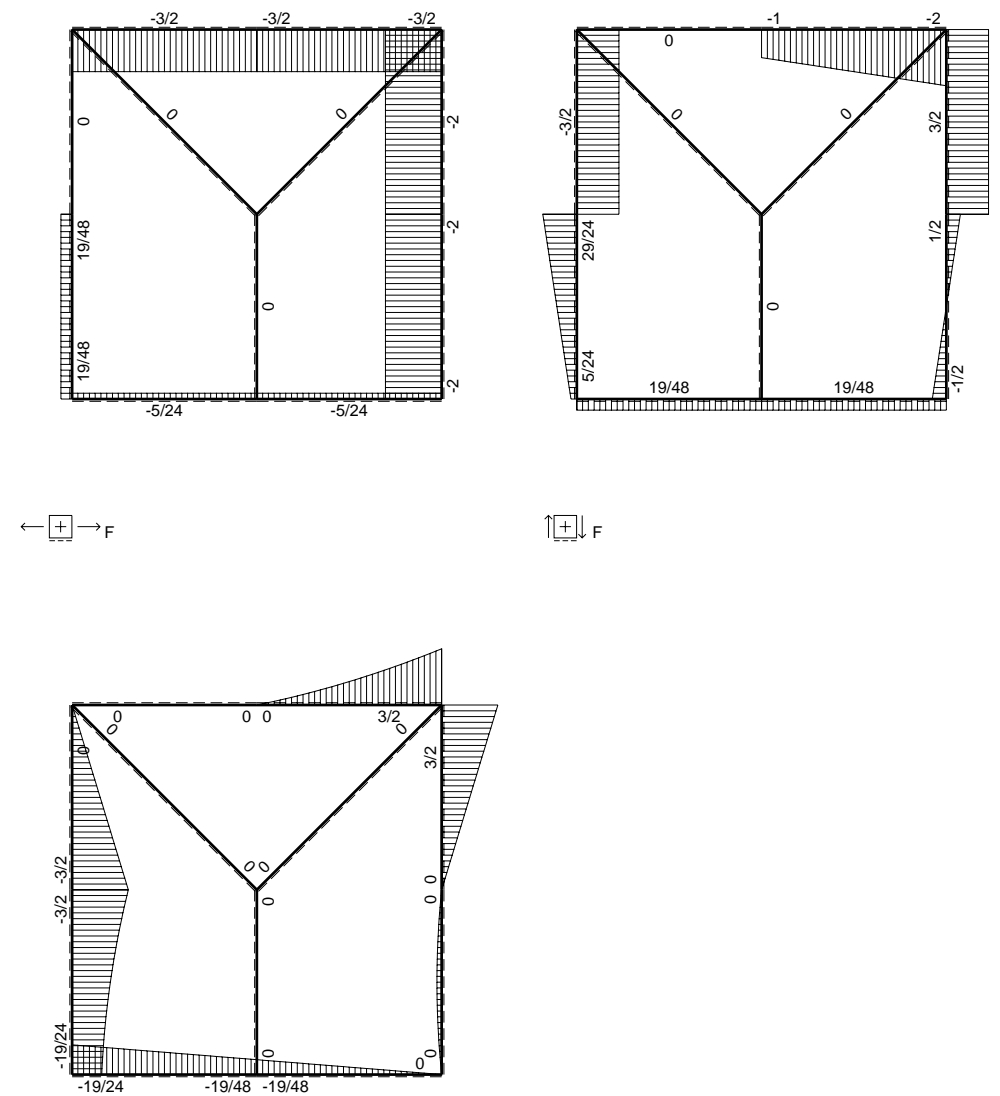
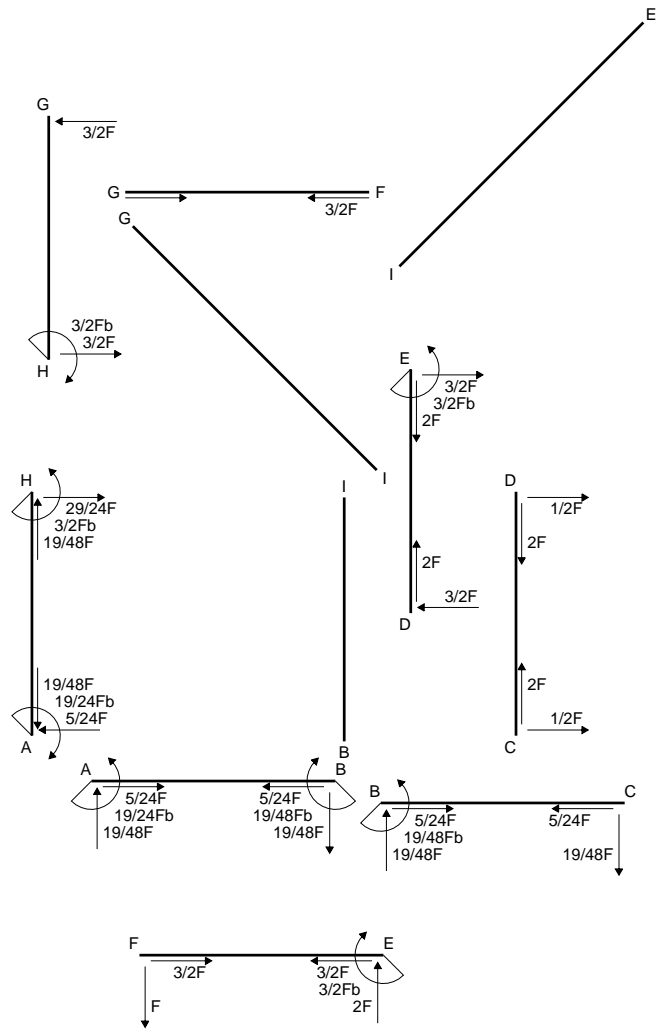
$$= (-1/2 b - 1/4 b) \theta = 3/4 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

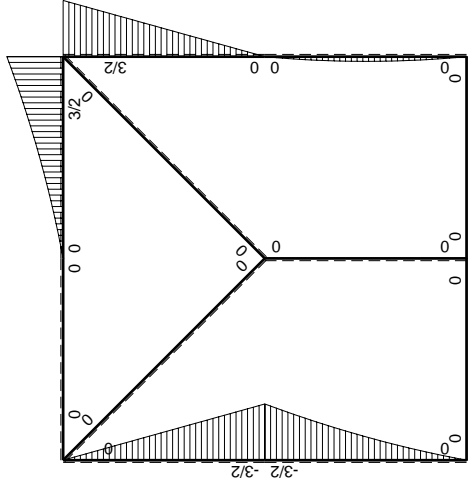
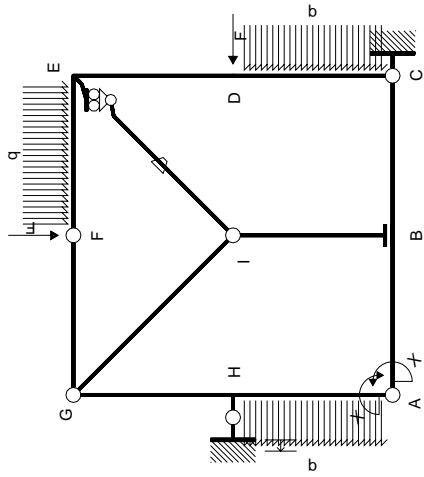
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

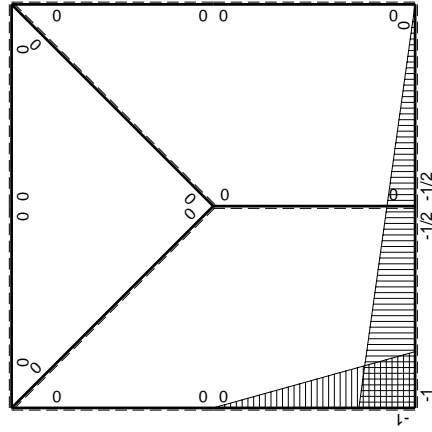
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



$\left[\oplus \right] F_b$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

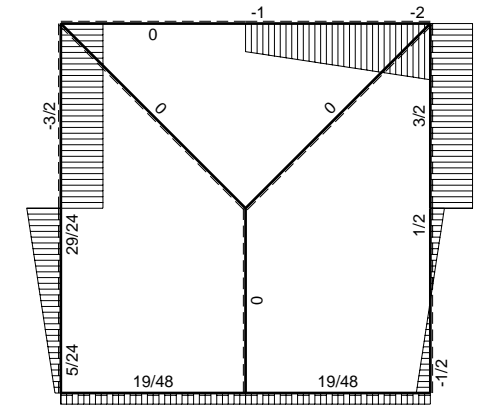
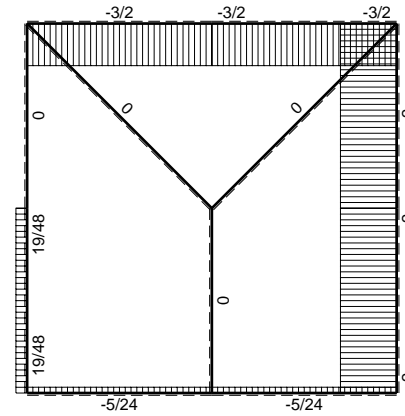
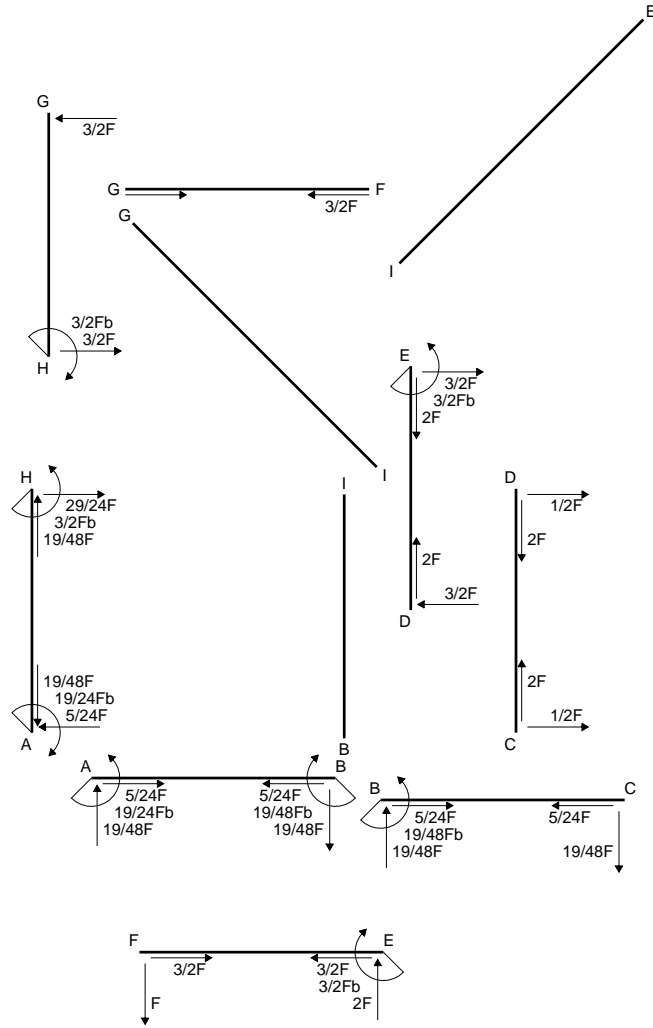
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

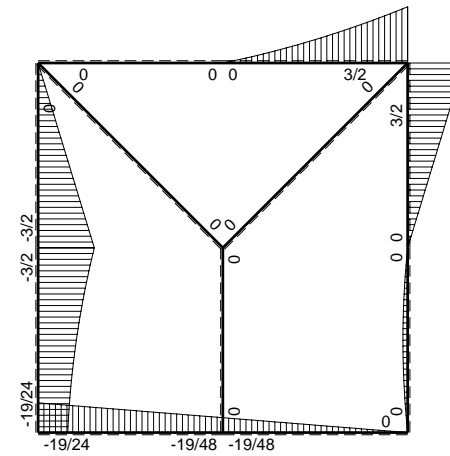
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

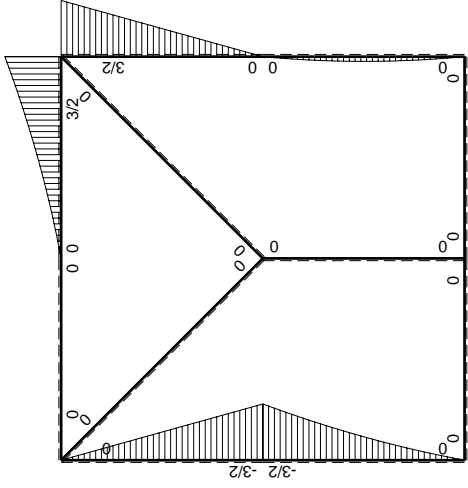
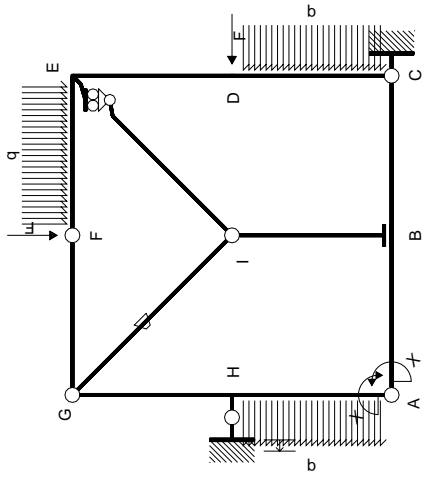


← ⊕ → F

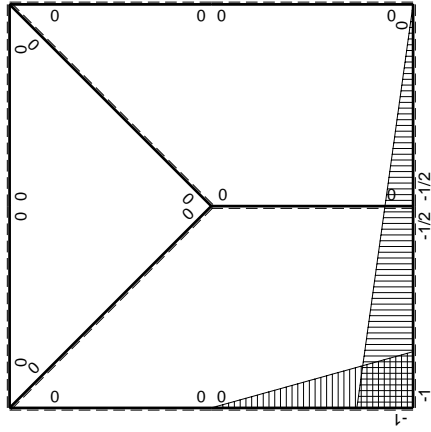
↑ ⊕ ↓ F



⊕ ⊖ Fb



M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

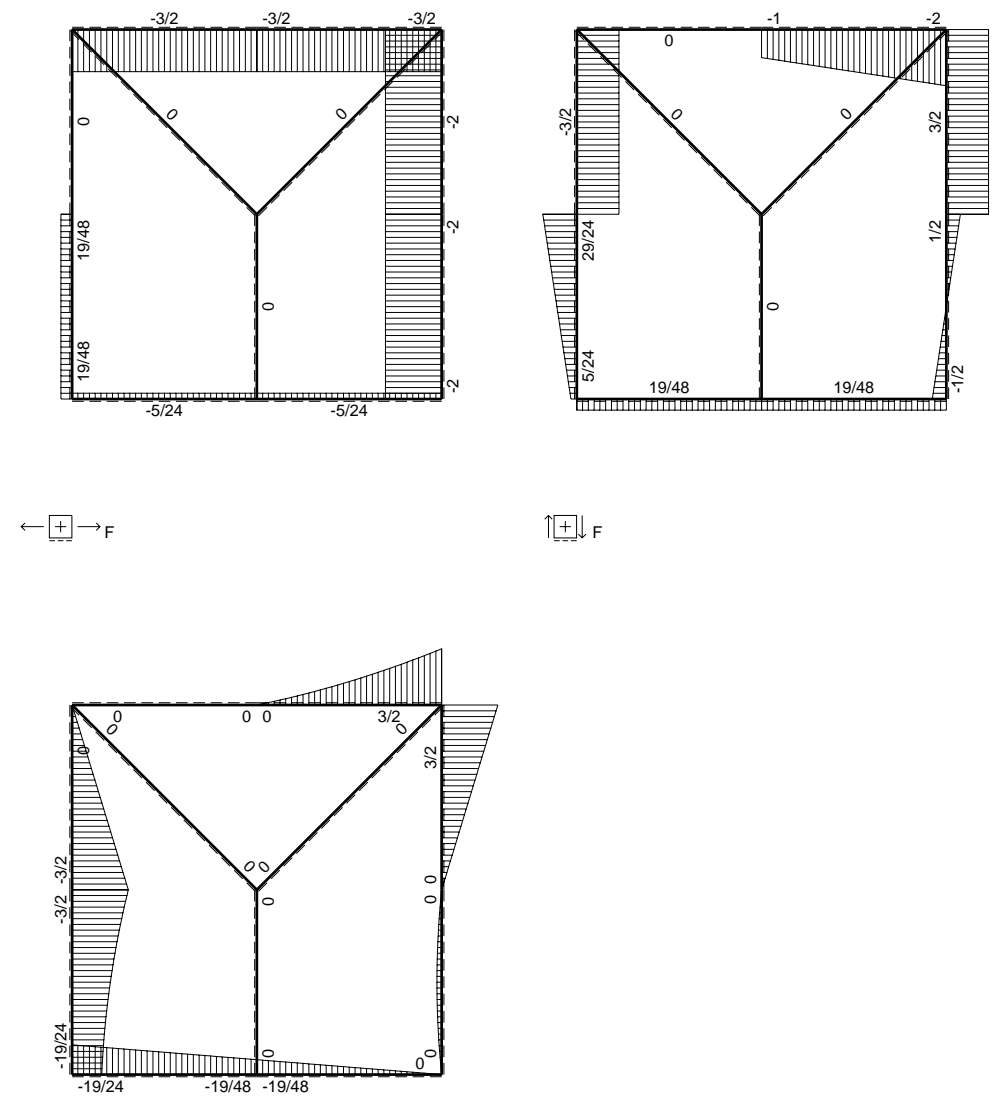
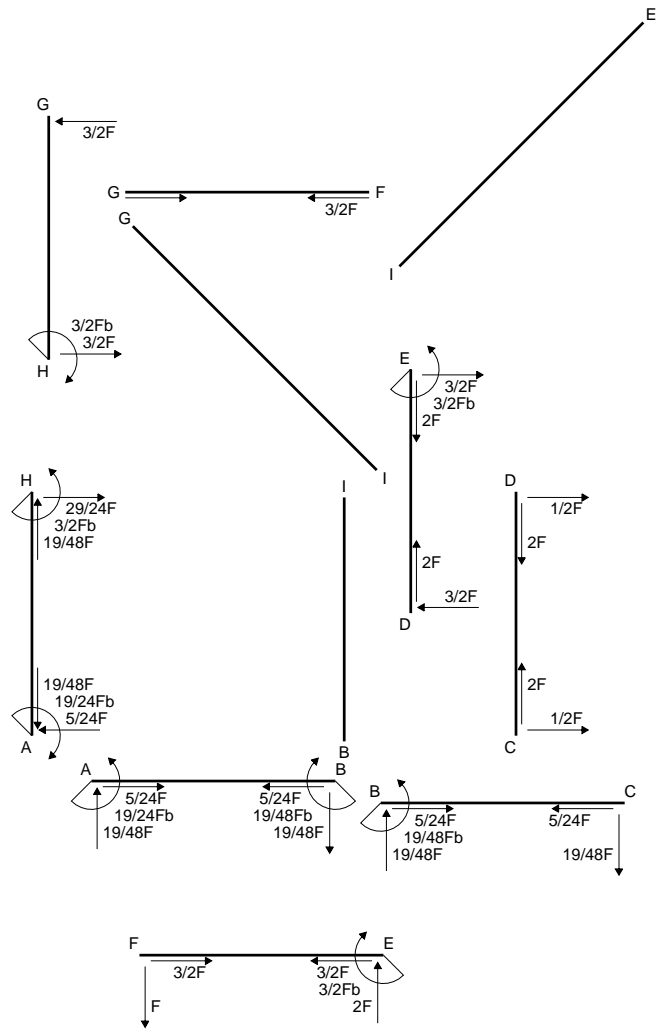
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

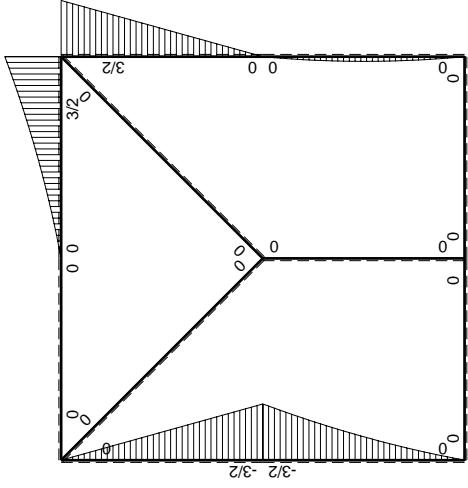
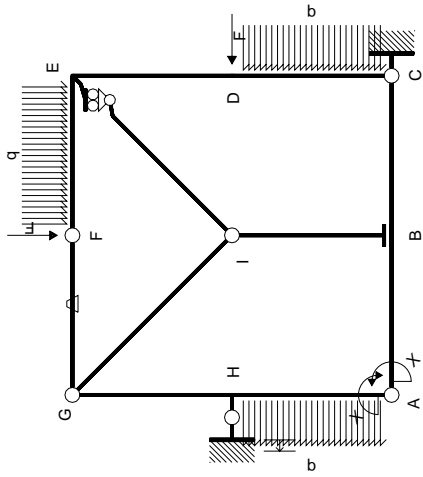
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

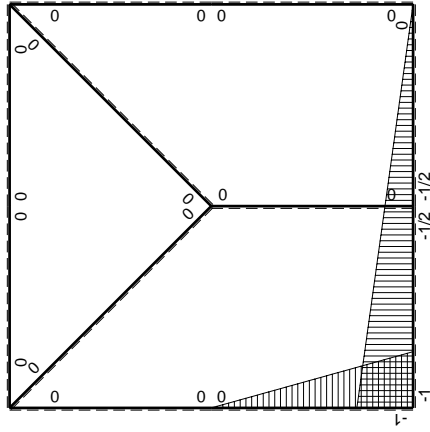
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

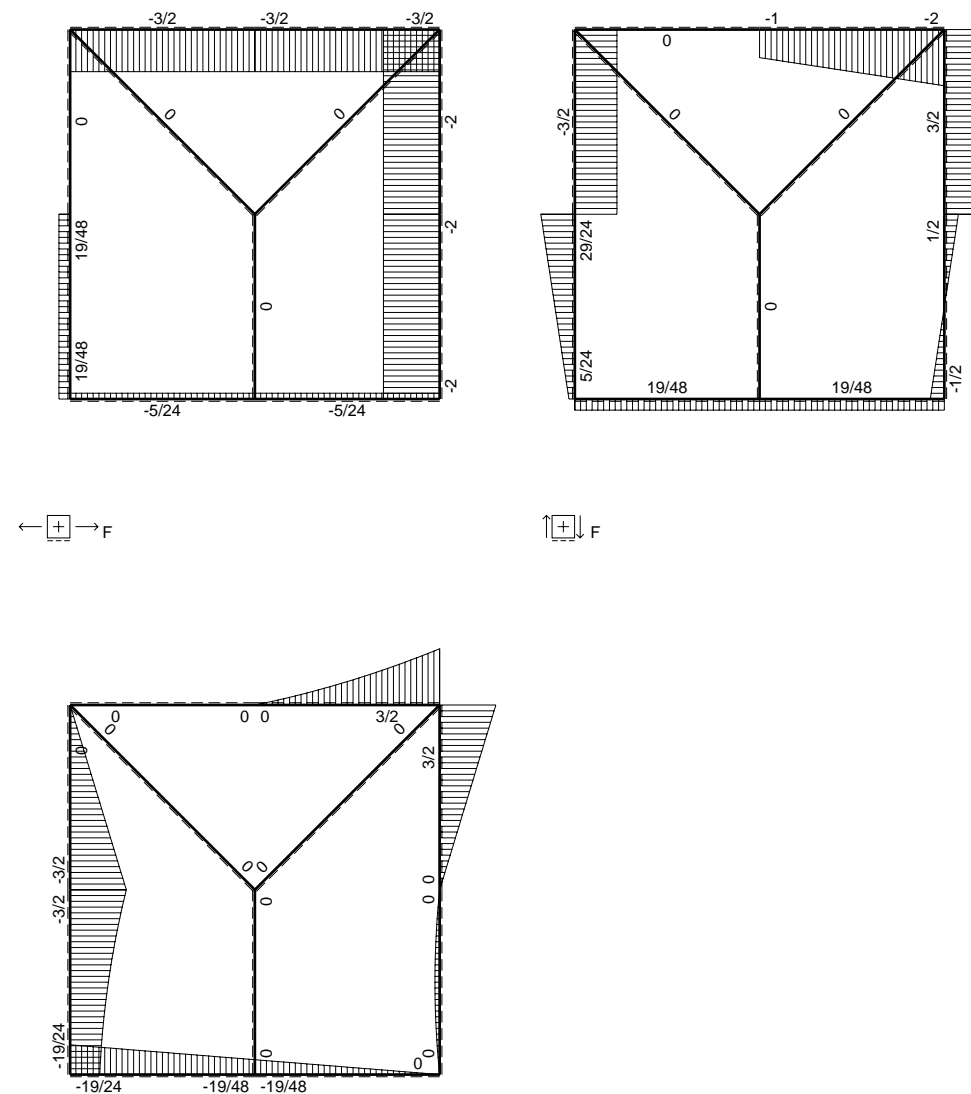
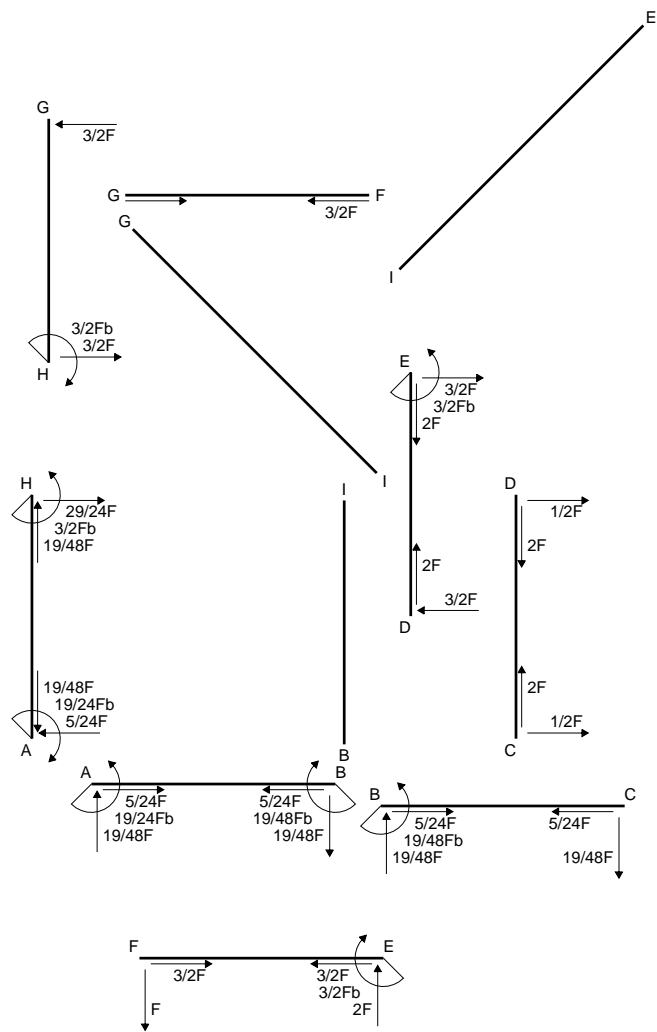
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

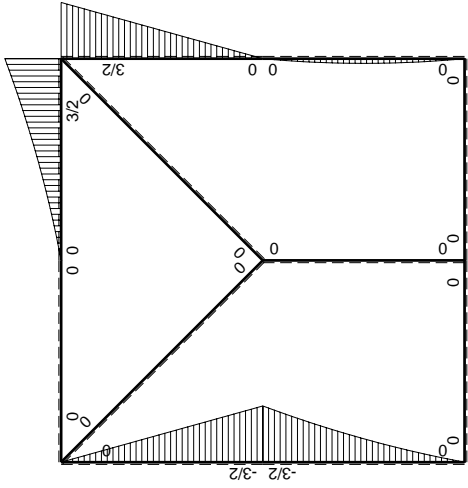
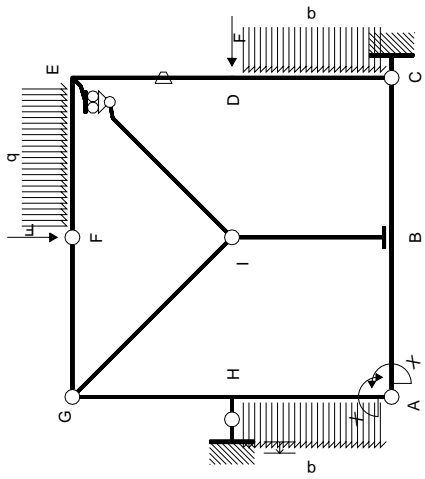
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

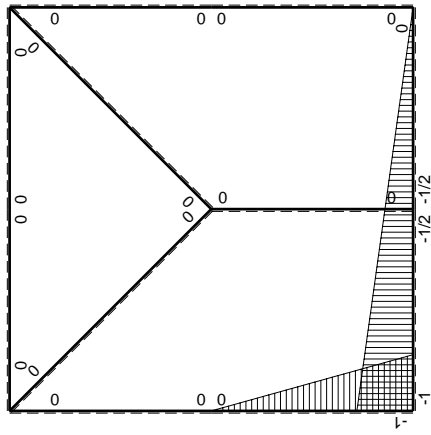
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



$\curvearrowright \oplus \curvearrowleft F_b$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

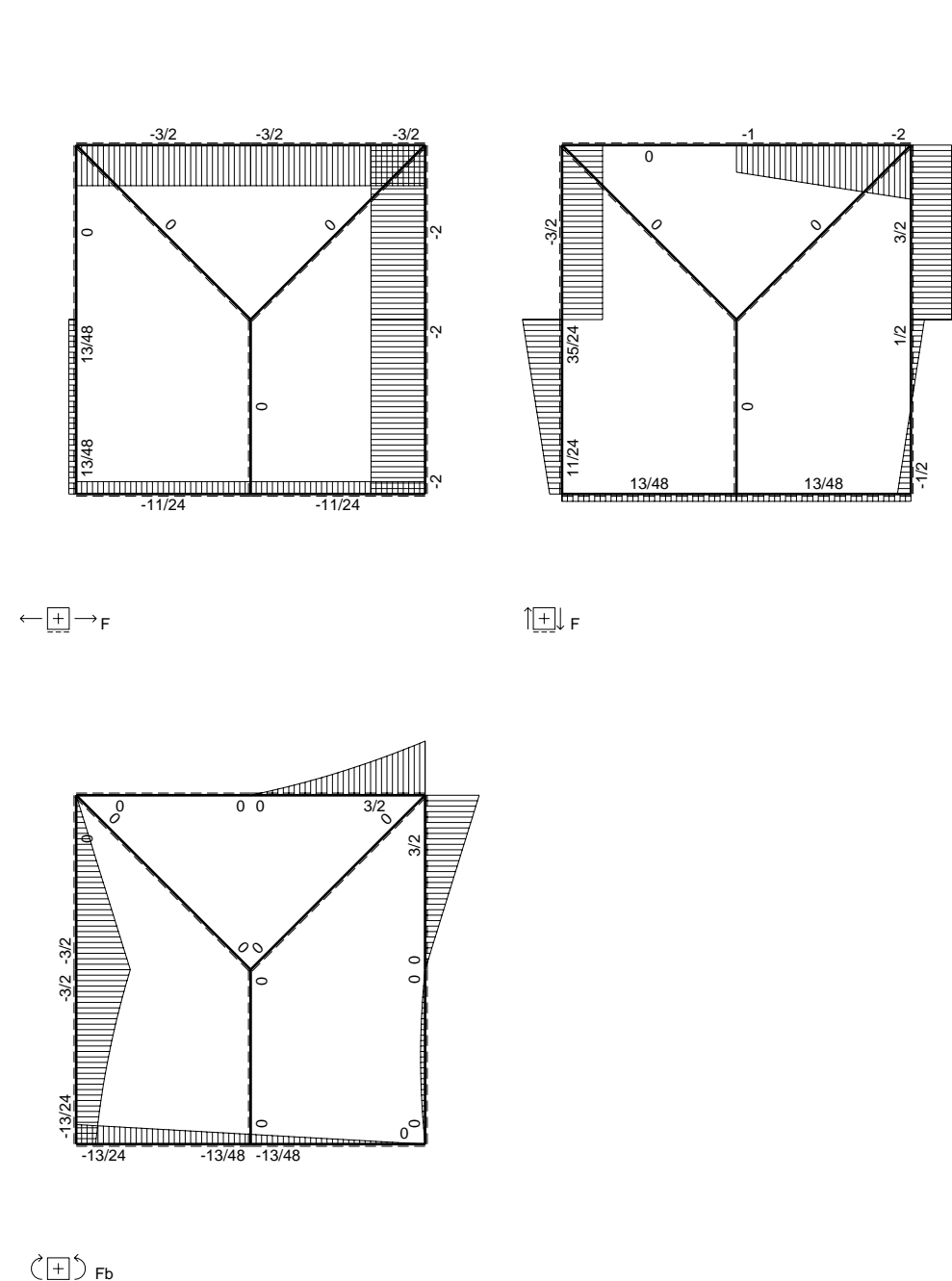
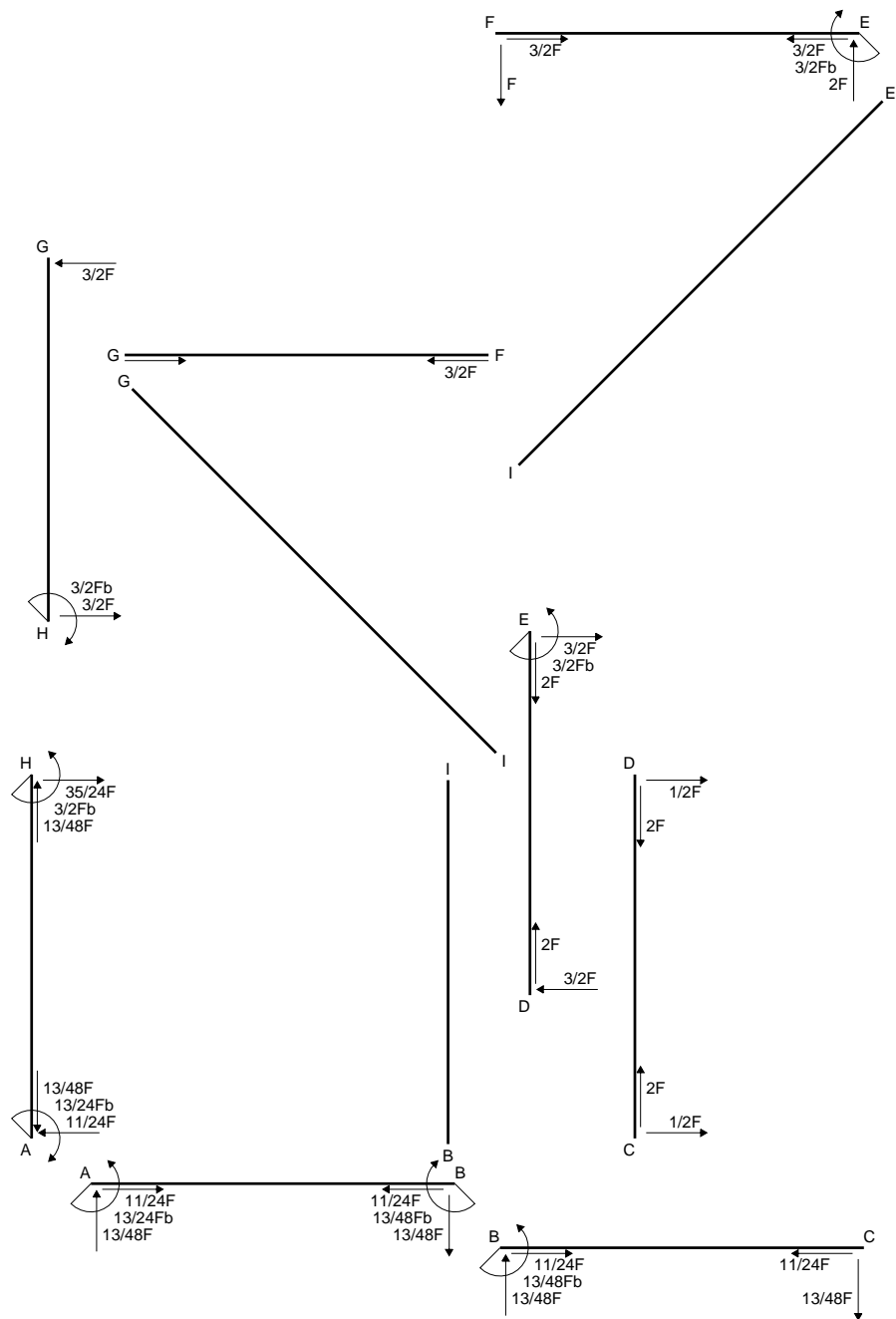
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

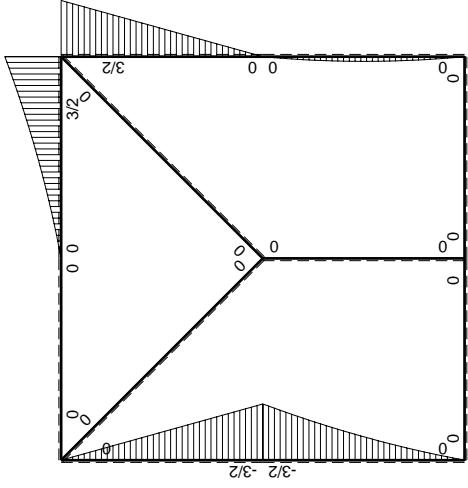
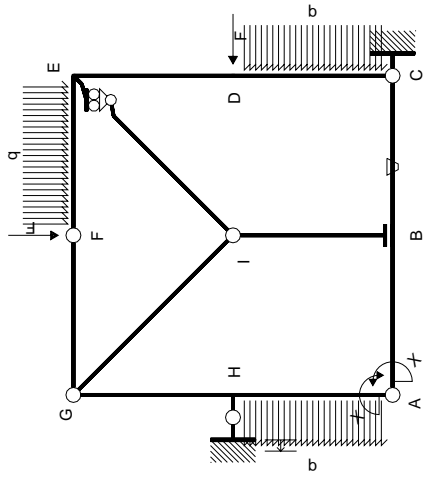
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

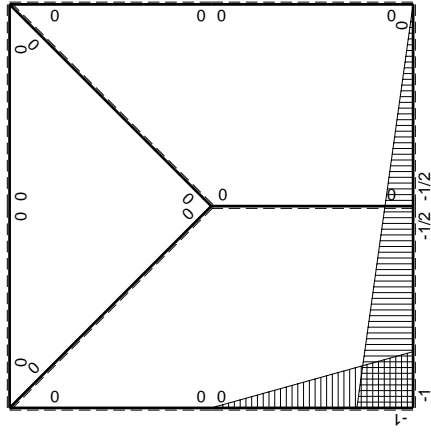
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	$-Fb/EJ$	0	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(0+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	Fb/EJ	0	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-13/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$13/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{BC}^{xo} = \int_0^b (1/2 - 1/2 x/b) \theta dx = [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (1/2 b - 1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/2 x/b) \theta dx = [-1/4 x^2/b]_0^b \theta$$

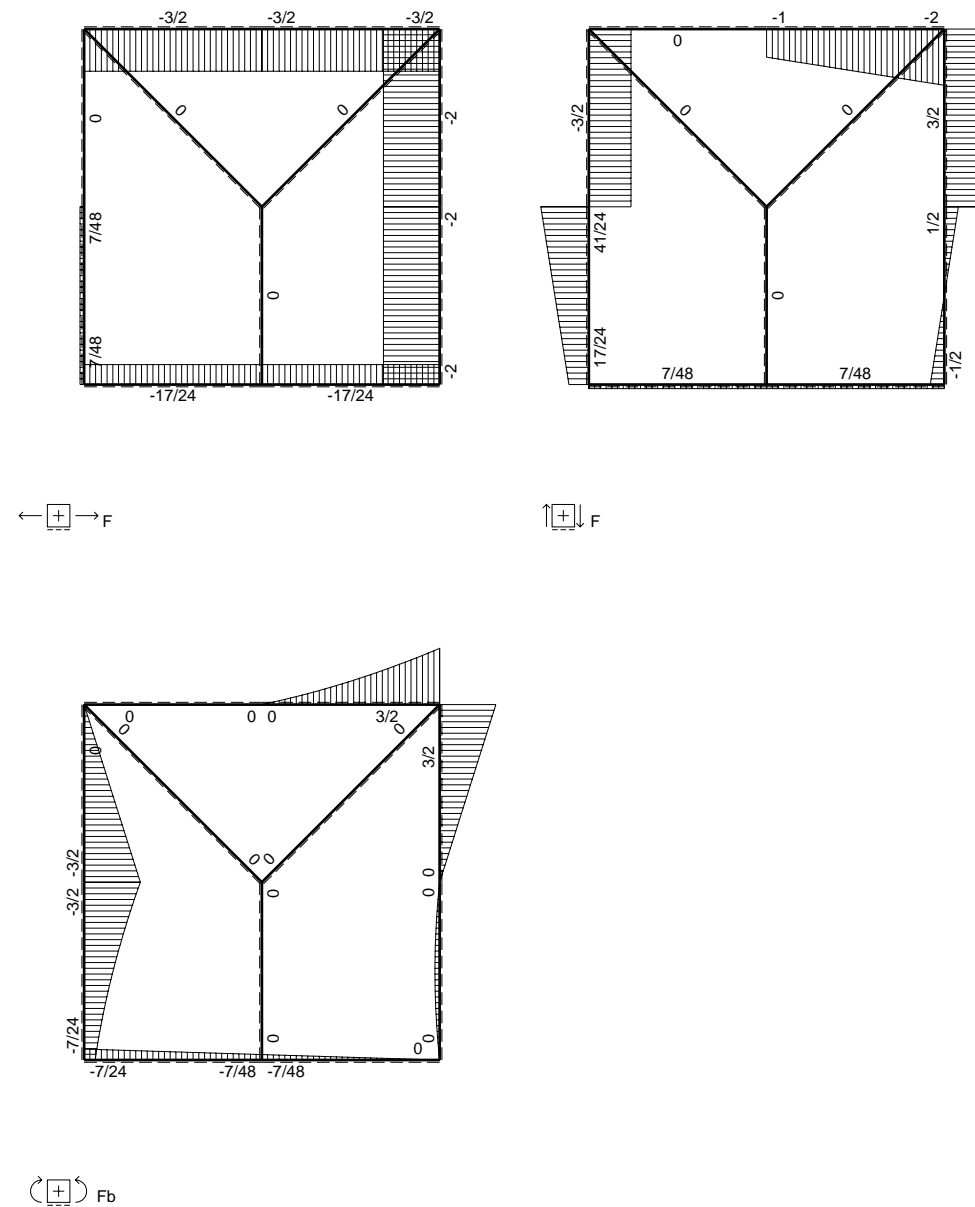
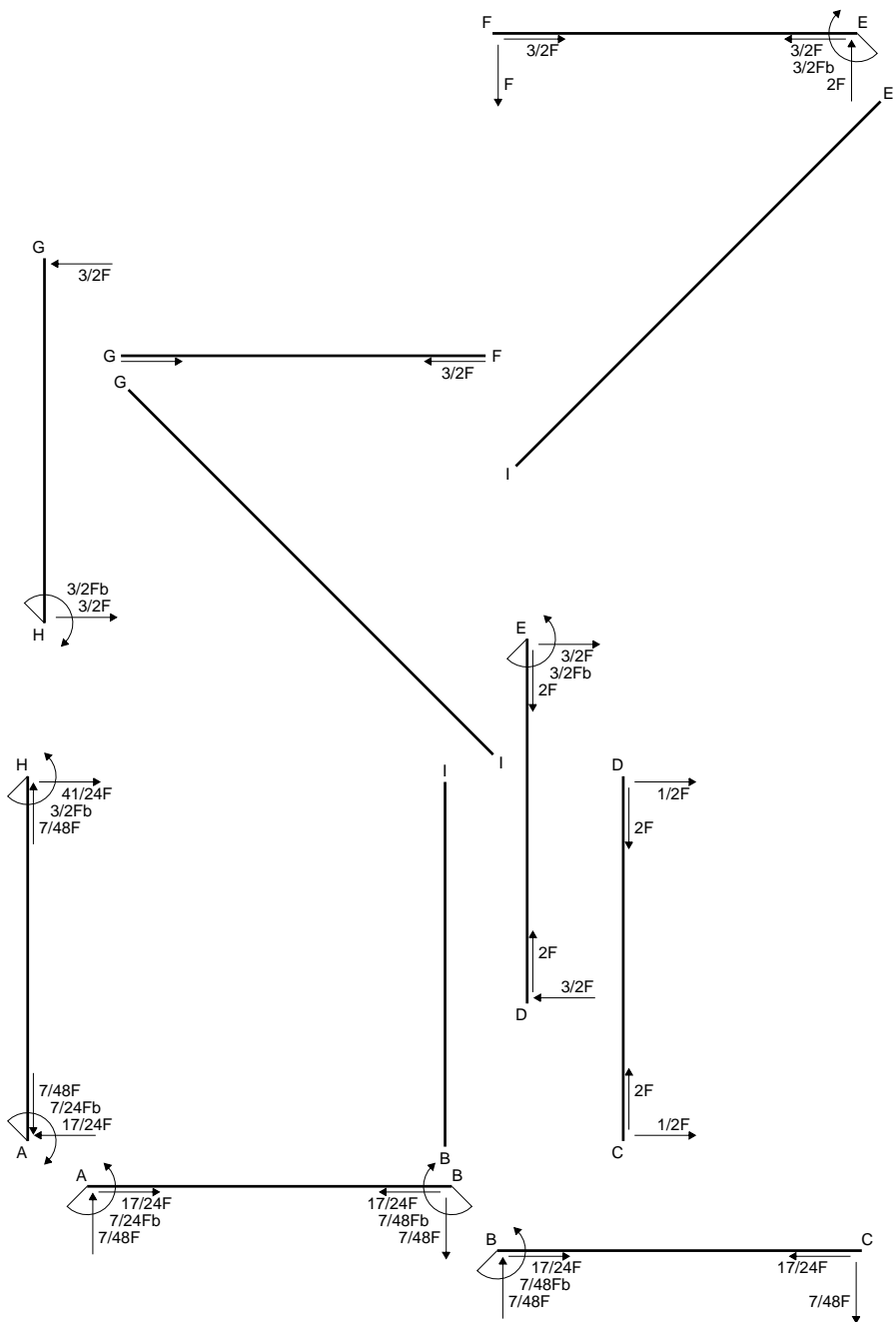
$$= (-1/4 b) \theta = 1/4 Fb^2/EJ$$

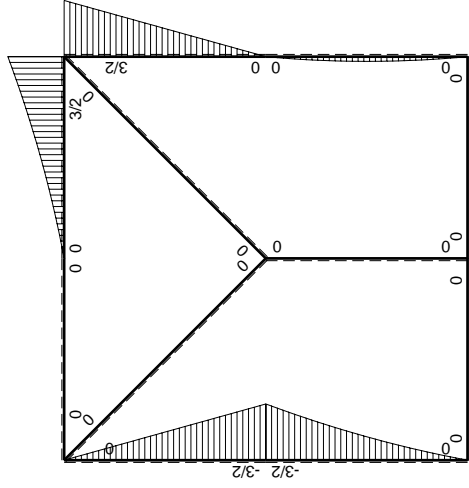
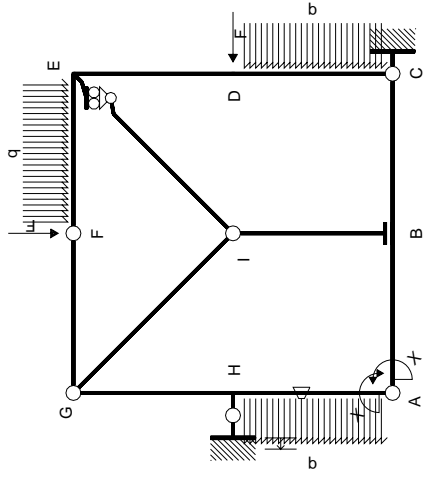
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

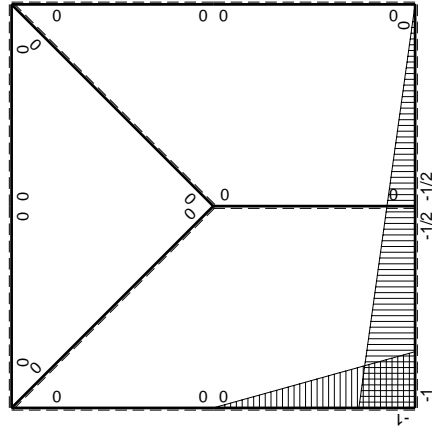
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	$-Fb/EJ$	$3/2Fx-2Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(5/24+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	Fb/EJ	$Fx-1/2Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

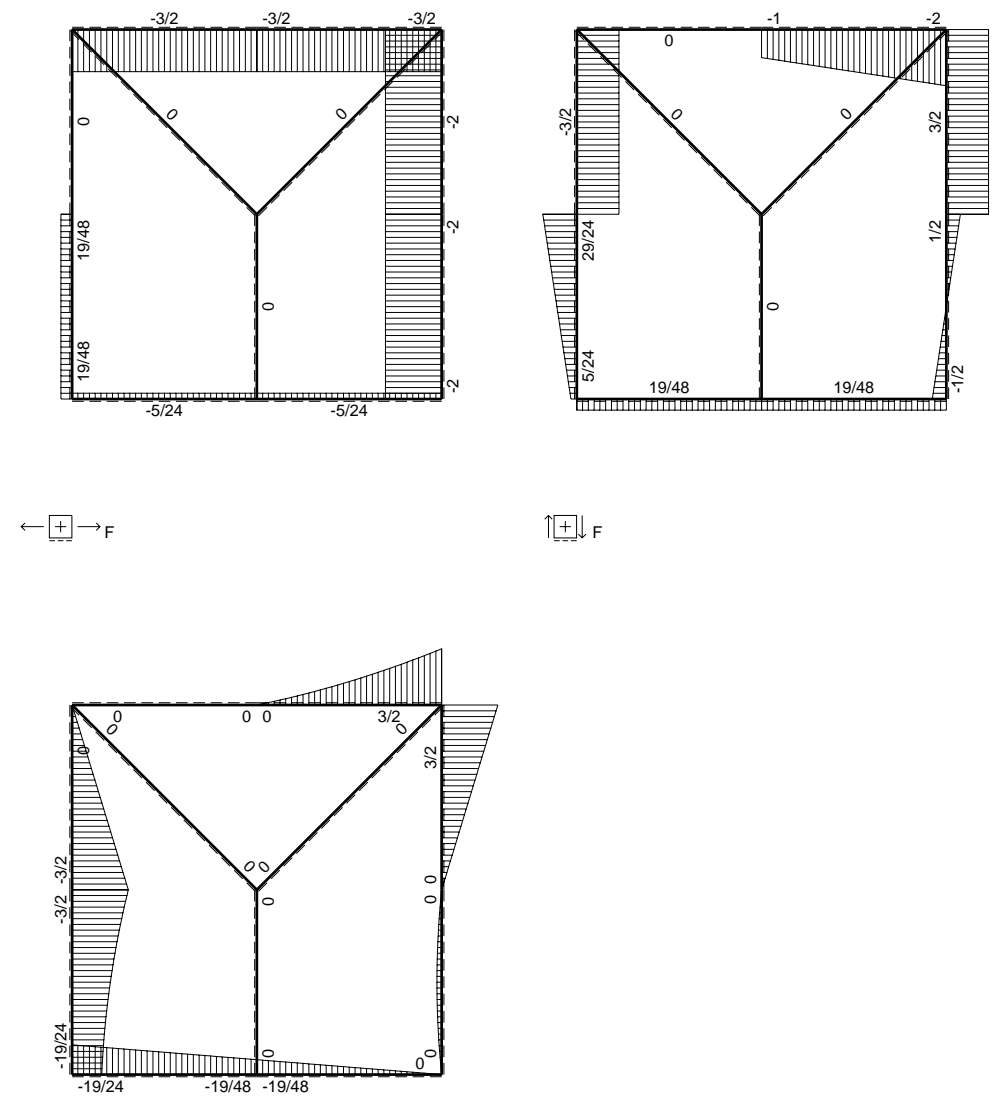
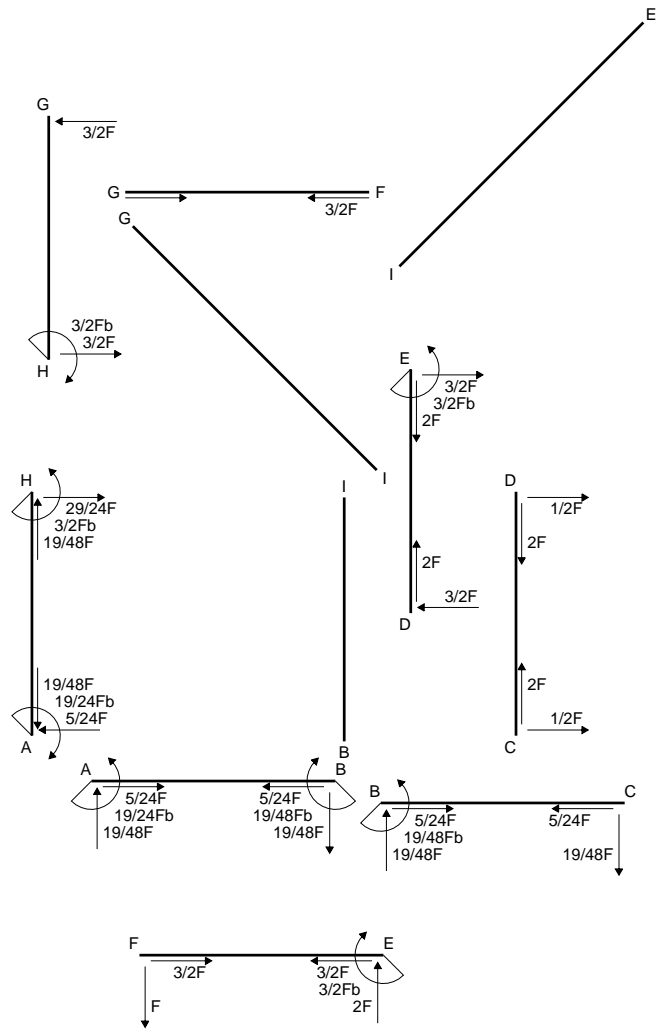
$$= \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

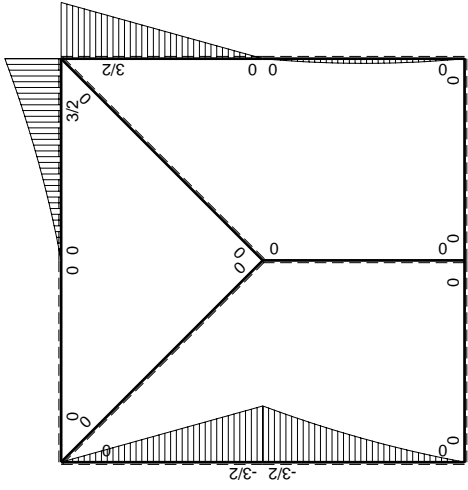
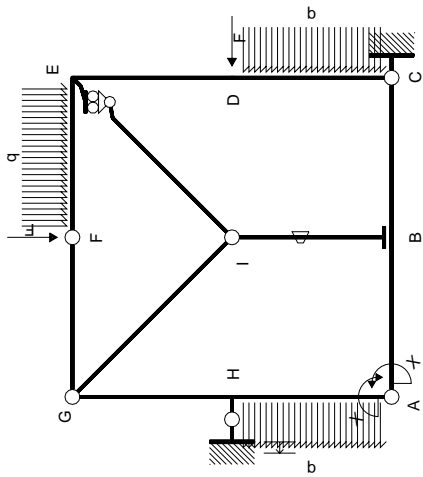
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 17/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

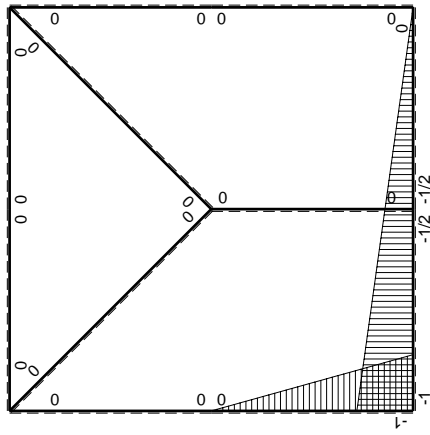
$$= \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 17/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

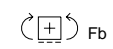
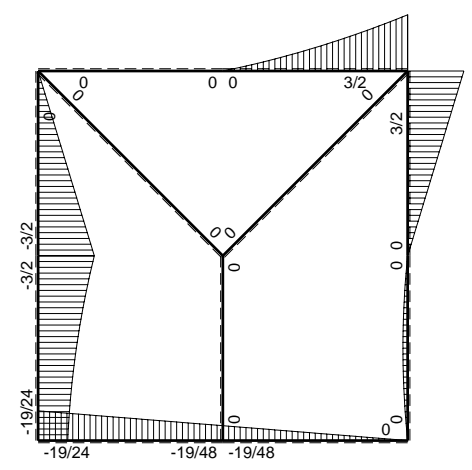
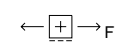
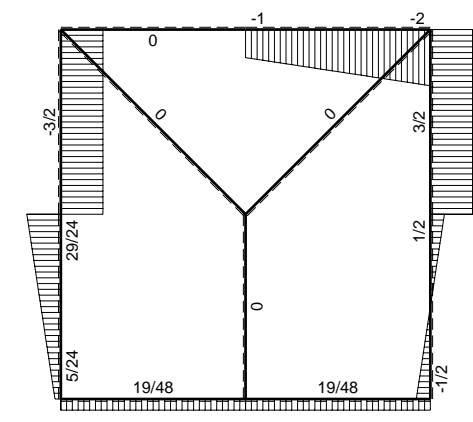
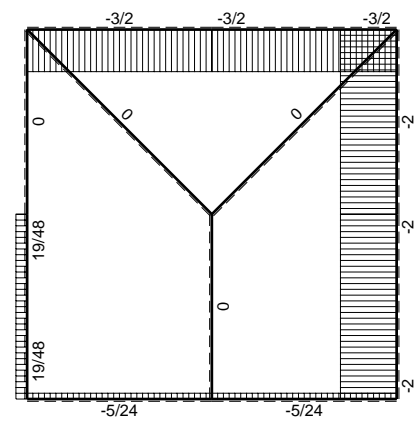
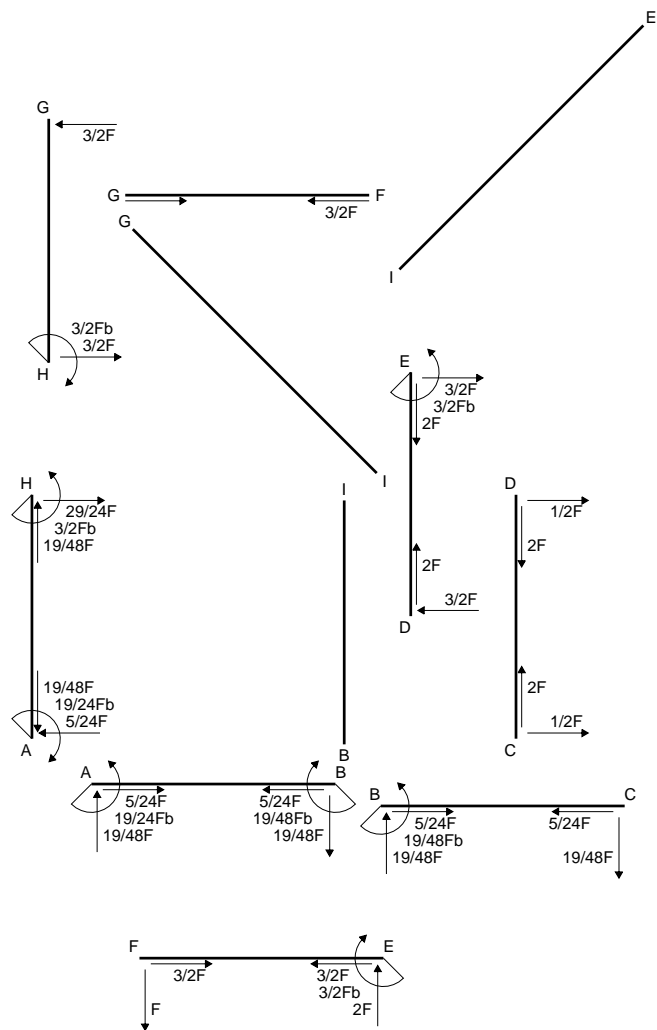
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

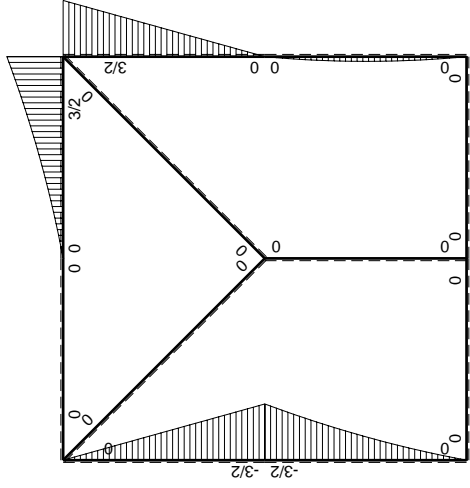
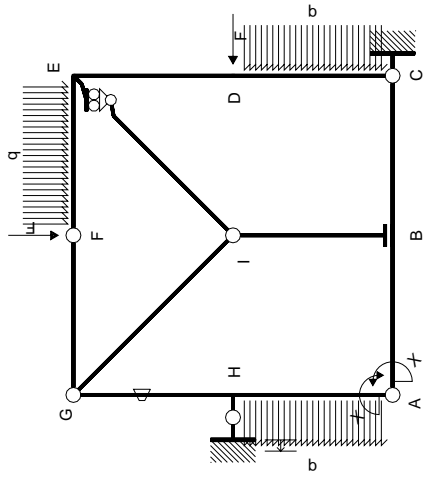
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

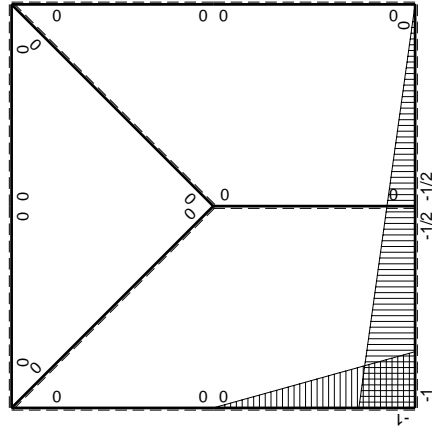
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

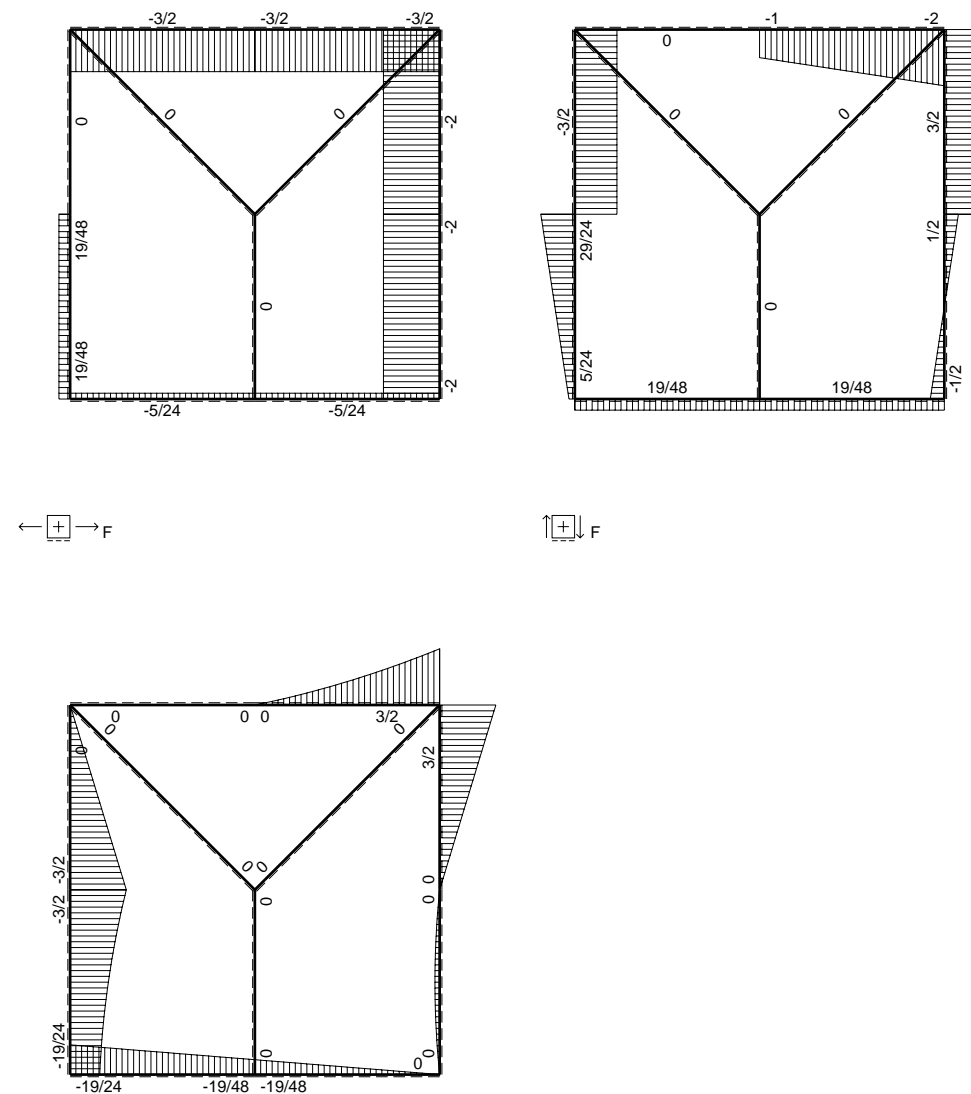
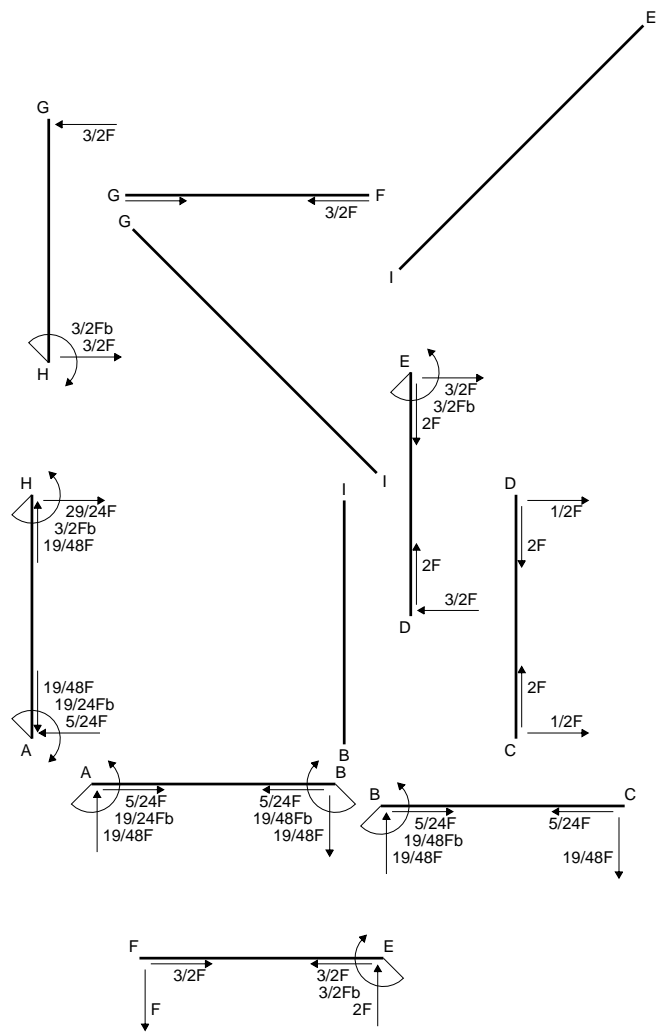
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

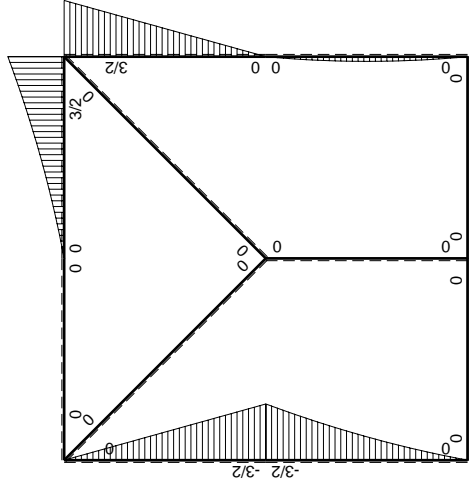
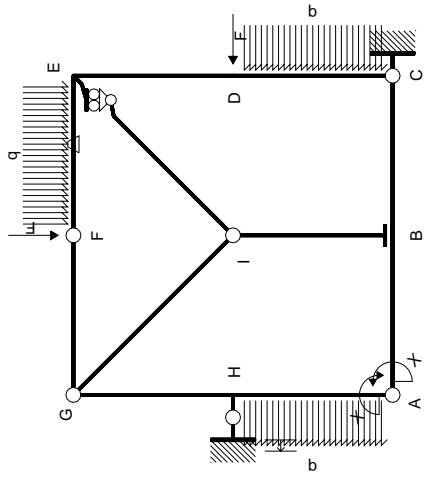
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

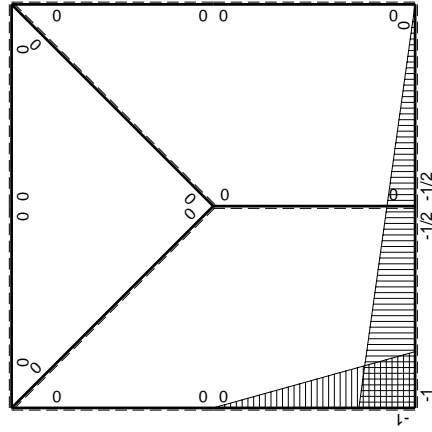
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

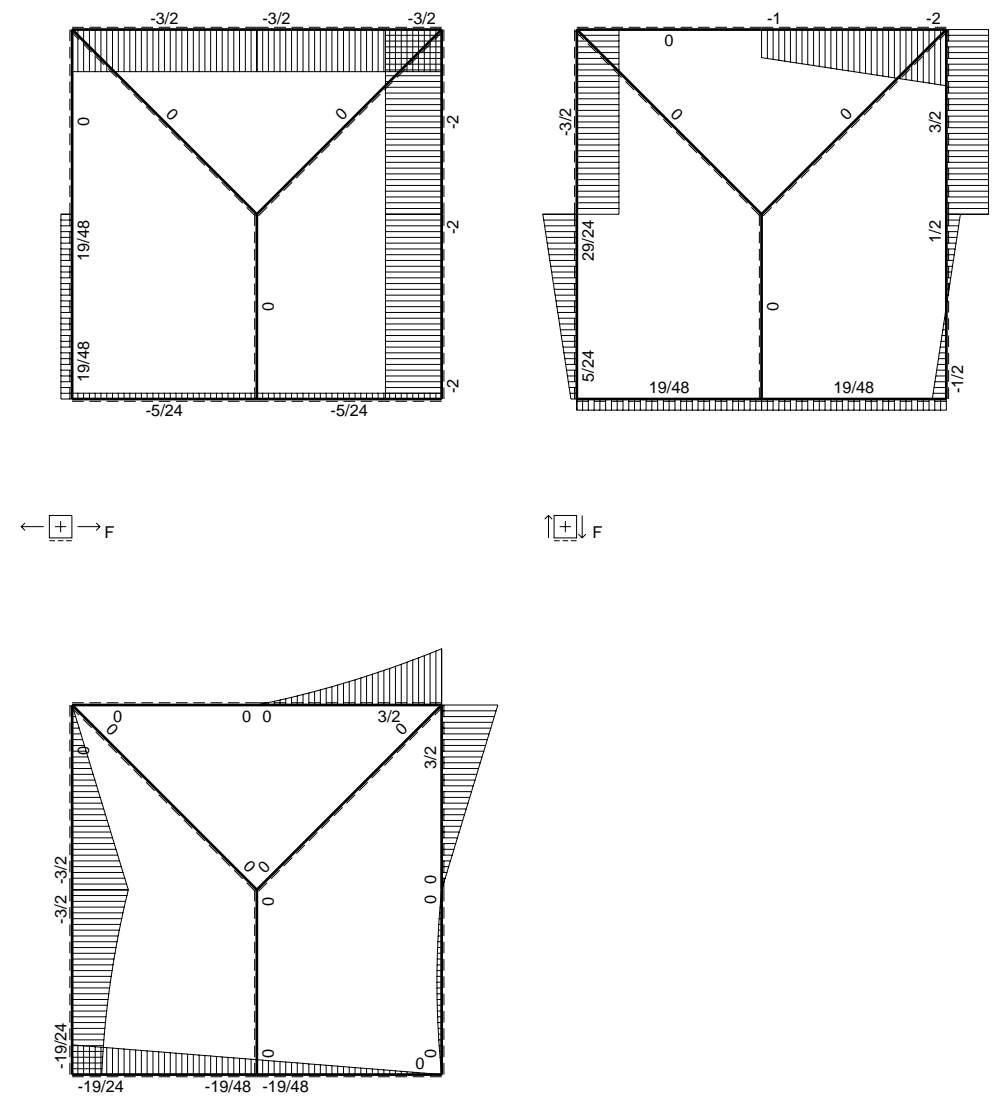
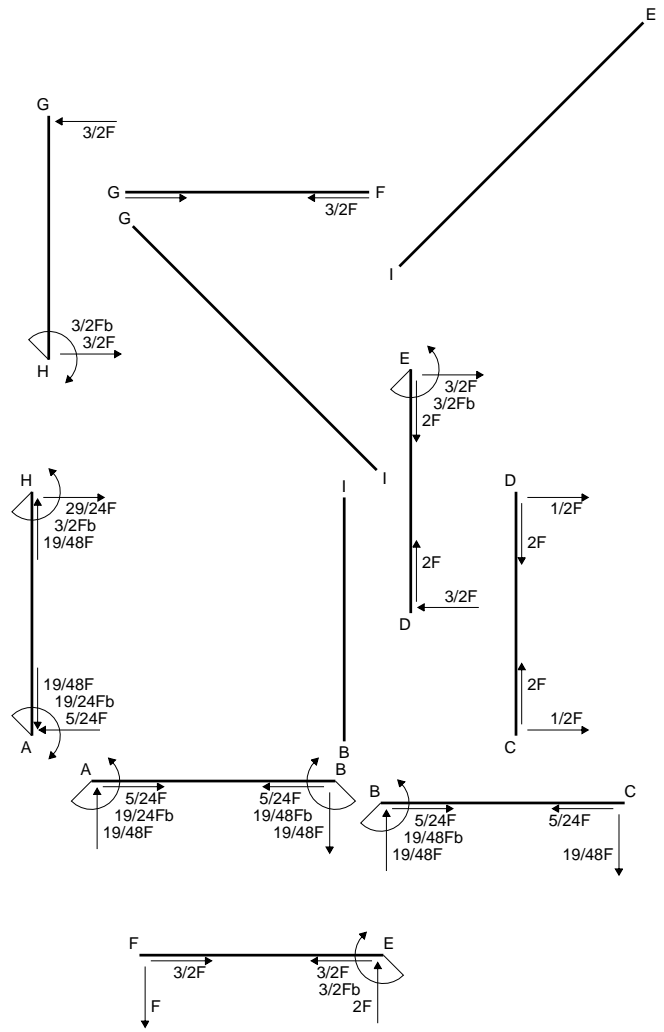
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

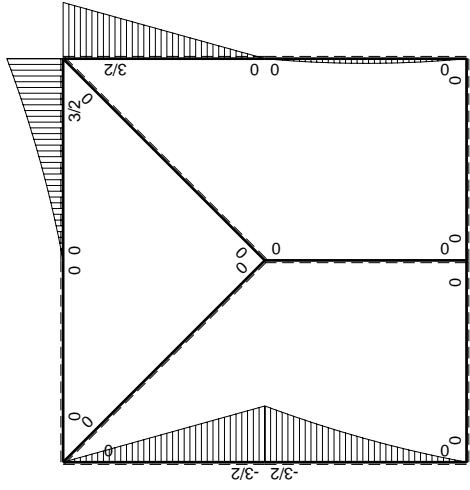
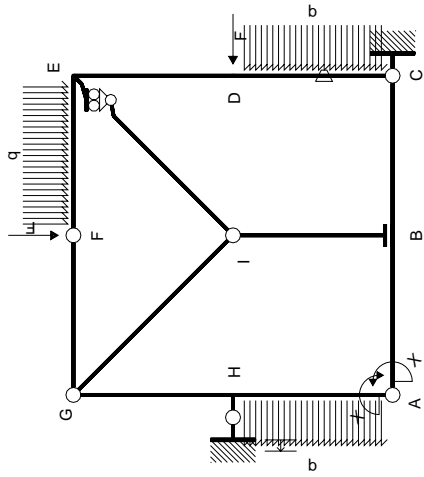
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

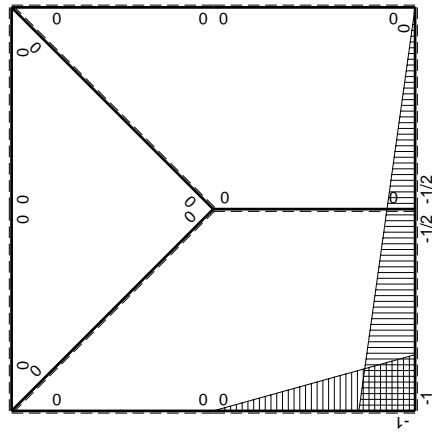
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$-1/2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$1/2Fx-1/2qx^2$	Fb/EJ	0	0	0			
DE b	0	$3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+3/2Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

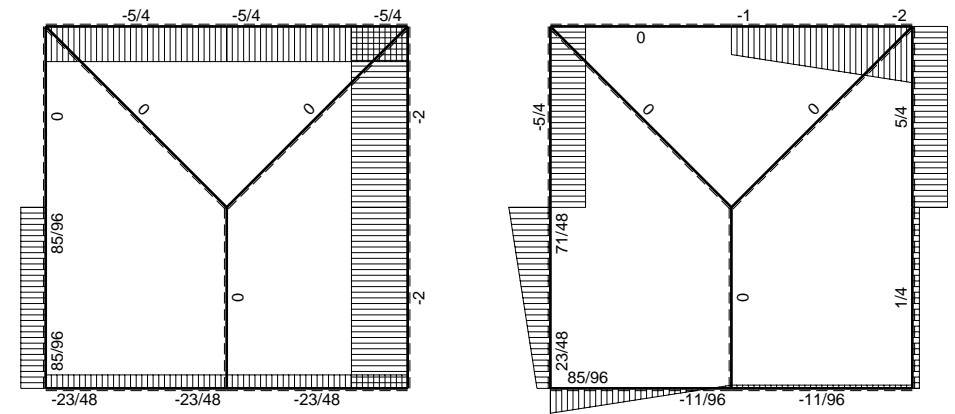
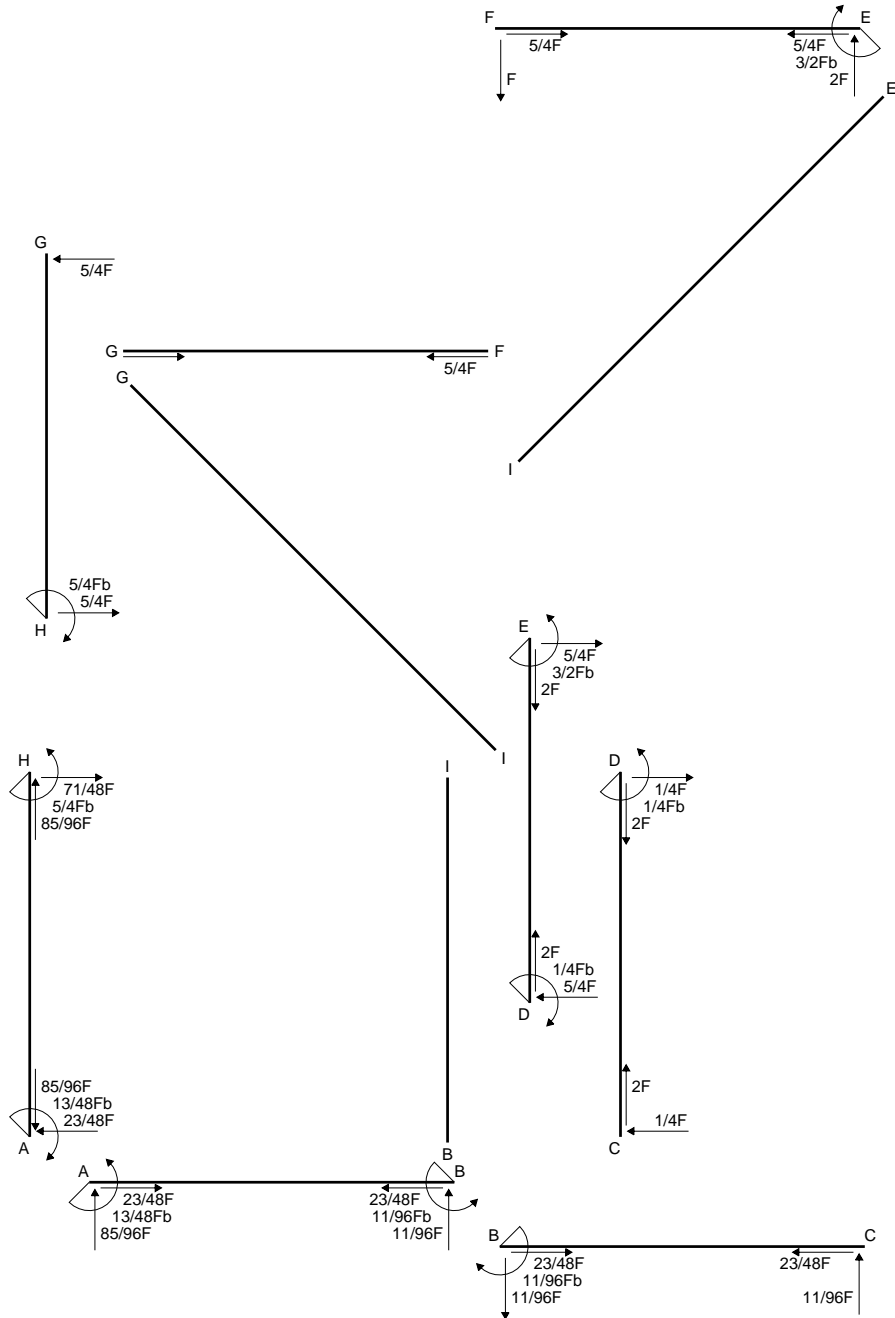
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

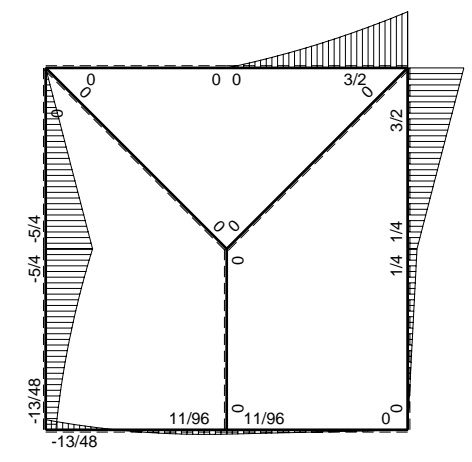
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

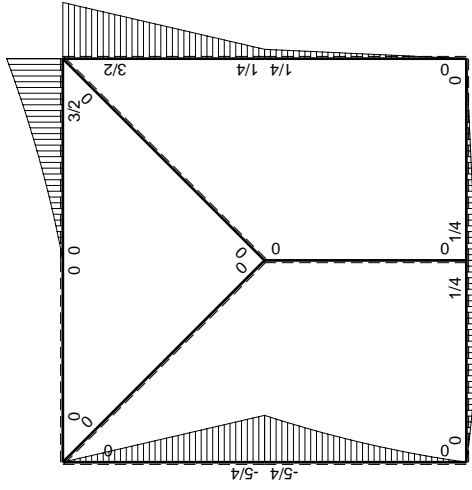
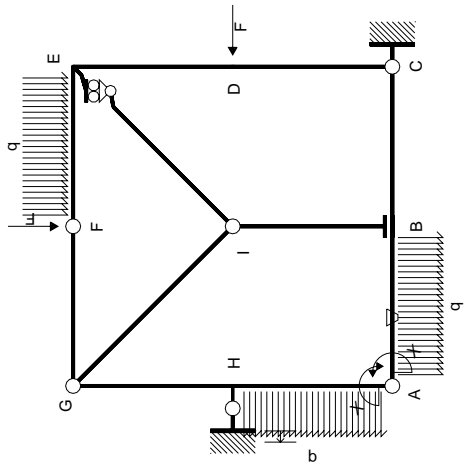


← ⊕ → F

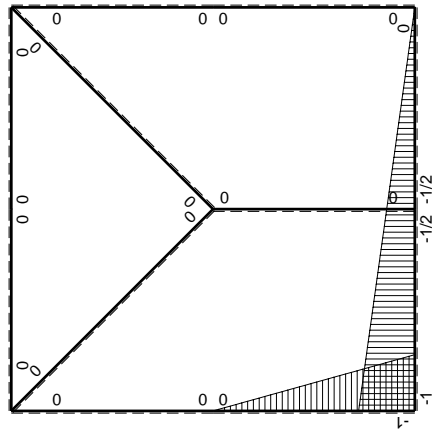
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	$3/4Fx-1/2qx^2$	$-Fb/EJ$	$-3/4Fx+7/8Fx^2/b-1/4qx^3/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-7/48+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb-1/4Fx+1/2qx^2$	Fb/EJ	$-1/8Fb-1/4Fx+1/8Fx^2/b+1/4qx^3/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/4Fb-1/4Fx$	0	$-1/8Fb+1/4Fx-1/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/4Fx$	0	$-1/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx$	0	0	0	0	0+0	0	
HG b	0	$5/4Fb-5/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/4Fb+7/4Fx-1/2qx^2$	0	$5/4Fx-7/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/6+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$3/4Fx+1/2qx^2$	0	$3/4Fx-1/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-13/48Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$13/48Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 7/8 x^2/b^2 - 1/4 x^3/b^3) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= \left[-3/8 x^2/b + 7/24 x^3/b^2 - 1/16 x^4/b^3 \right]_0^b Fb 1/EJ + \left[x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-3/8 b + 7/24 b - 1/16 b) Fb 1/EJ + (b - 1/4 b) \theta = 29/48 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 - 1/4 x/b + 1/8 x^2/b^2 + 1/4 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= \left[-1/8 x - 1/8 x^2/b + 1/24 x^3/b^2 + 1/16 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-1/8 b - 1/8 b + 1/24 b + 1/16 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 29/48 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/8 + 1/4 x/b - 1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/8 x + 1/8 x^2/b - 1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/8 b - 1/24 b) Fb 1/EJ = -1/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/8 x^2/b^2) Fb 1/EJ dx = \left[-1/24 x^3/b^2 \right]_0^b Fb 1/EJ$$

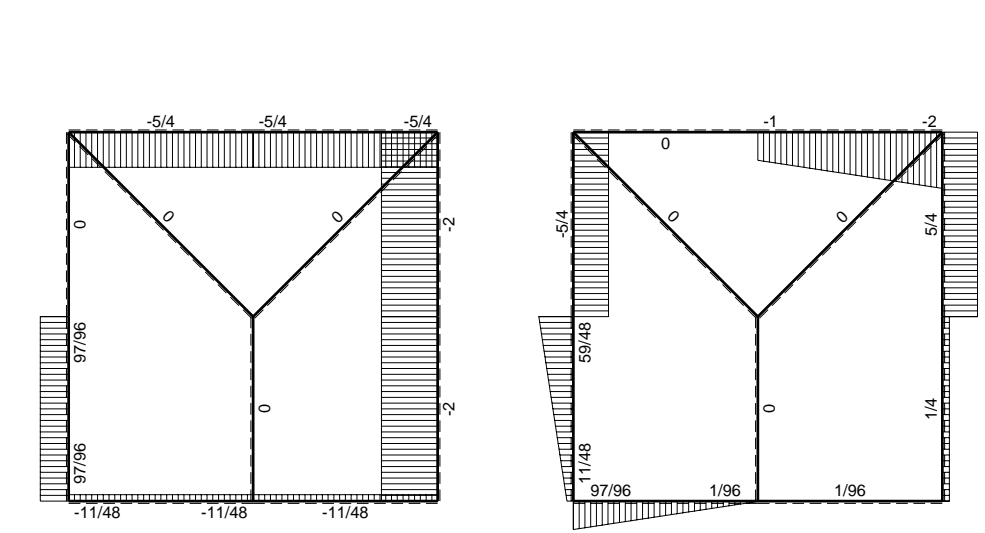
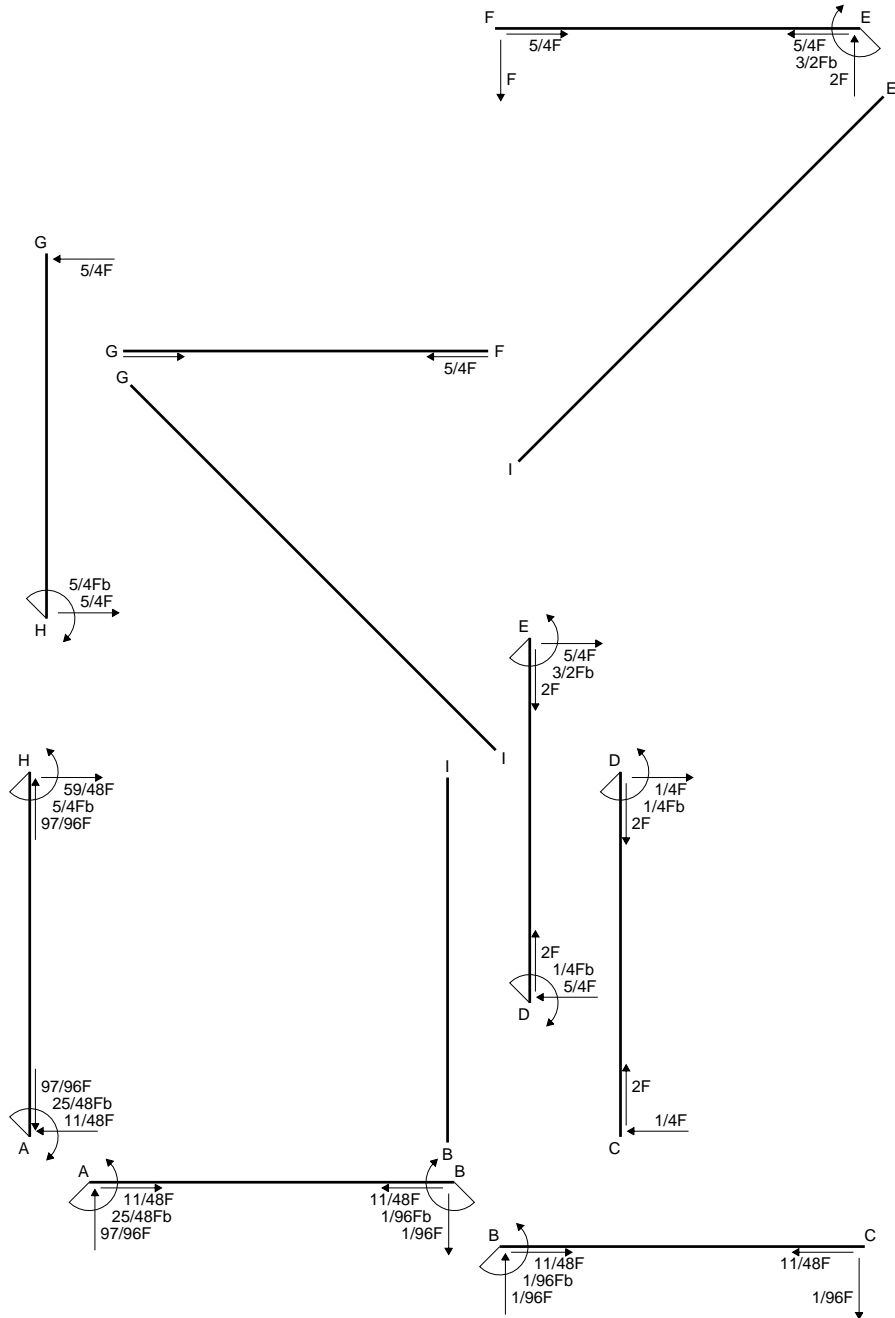
$$= (-1/24 b) Fb 1/EJ = -1/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/4 x/b - 7/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[5/8 x^2/b - 7/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (5/8 b - 7/12 b + 1/8 b) Fb 1/EJ = 1/6 Fb^2/EJ$$

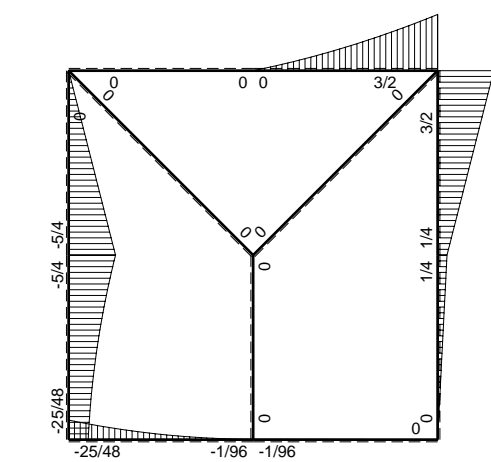
$$L_{AH}^{xo} = \int_0^b (3/4 x/b - 1/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/8 x^2/b - 1/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/8 b - 1/12 b - 1/8 b) Fb 1/EJ = 1/6 Fb^2/EJ$$

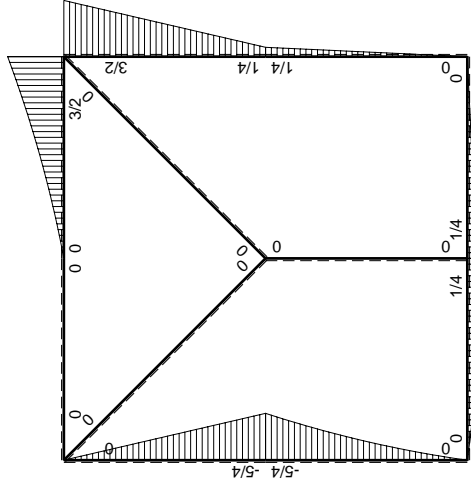
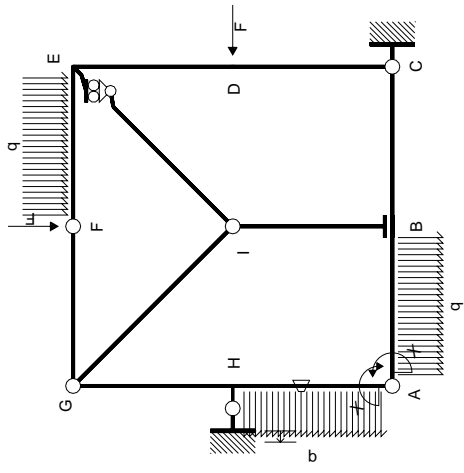


← ⊕ → F

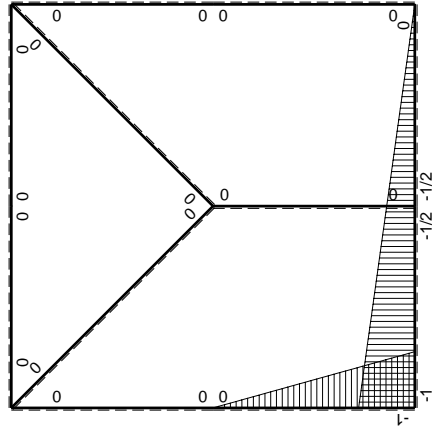
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$3/4Fx-1/2qx^2$	0	$-3/4Fx+7/8Fx^2/b-1/4qx^3/b$	0	$1-x/b+1/4x^2/b^2$	$(-7/48+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb-1/4Fx+1/2qx^2$	0	$-1/8Fb-1/4Fx+1/8Fx^2/b+1/4qx^3/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/4Fb-1/4Fx$	0	$-1/8Fb+1/4Fx-1/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/24+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/4Fx$	0	$-1/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-5/4Fx$	0	0	0	0	0+0	0	
HG b	0	$5/4Fb-5/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-5/4Fb+7/4Fx-1/2qx^2$	$-Fb/EJ$	$5/4Fx-7/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/6+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$3/4Fx+1/2qx^2$	Fb/EJ	$3/4Fx-1/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-25/48Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$25/48Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-3/4 x/b + 7/8 x^2/b^2 - 1/4 x^3/b^3) Fb 1/EJ dx = [-3/8 x^2/b + 7/24 x^3/b^2 - 1/16 x^4/b^3]_0^b Fb 1/EJ$$

$$= (-3/8 b + 7/24 b - 1/16 b) Fb 1/EJ = -7/48 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 - 1/4 x/b + 1/8 x^2/b^2 + 1/4 x^3/b^3) Fb 1/EJ dx$$

$$= [-1/8 x - 1/8 x^2/b + 1/24 x^3/b^2 + 1/16 x^4/b^3]_0^b Fb 1/EJ$$

$$= (-1/8 b - 1/8 b + 1/24 b + 1/16 b) Fb 1/EJ = -7/48 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/8 + 1/4 x/b - 1/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x + 1/8 x^2/b - 1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b + 1/8 b - 1/24 b) Fb 1/EJ = -1/24 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/8 x^2/b^2) Fb 1/EJ dx = [-1/24 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/24 b) Fb 1/EJ = -1/24 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (5/4 x/b - 7/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

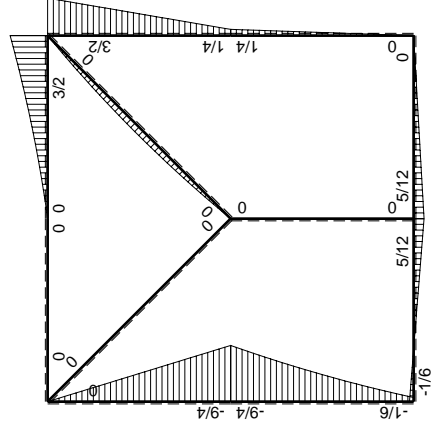
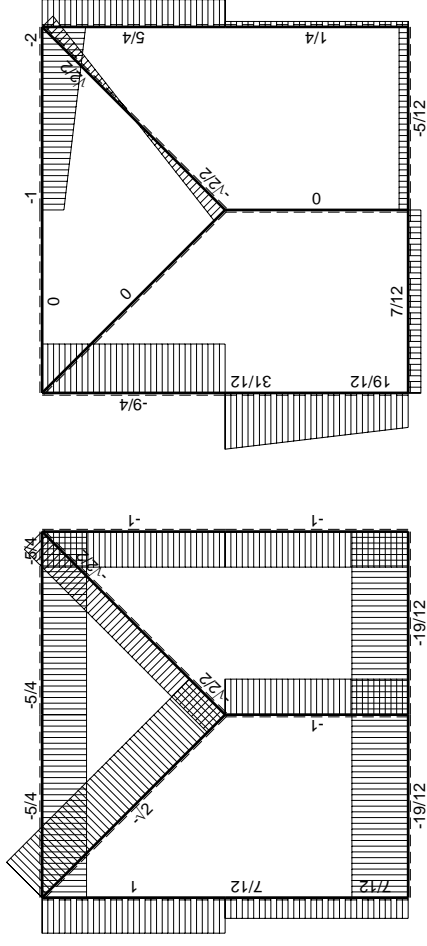
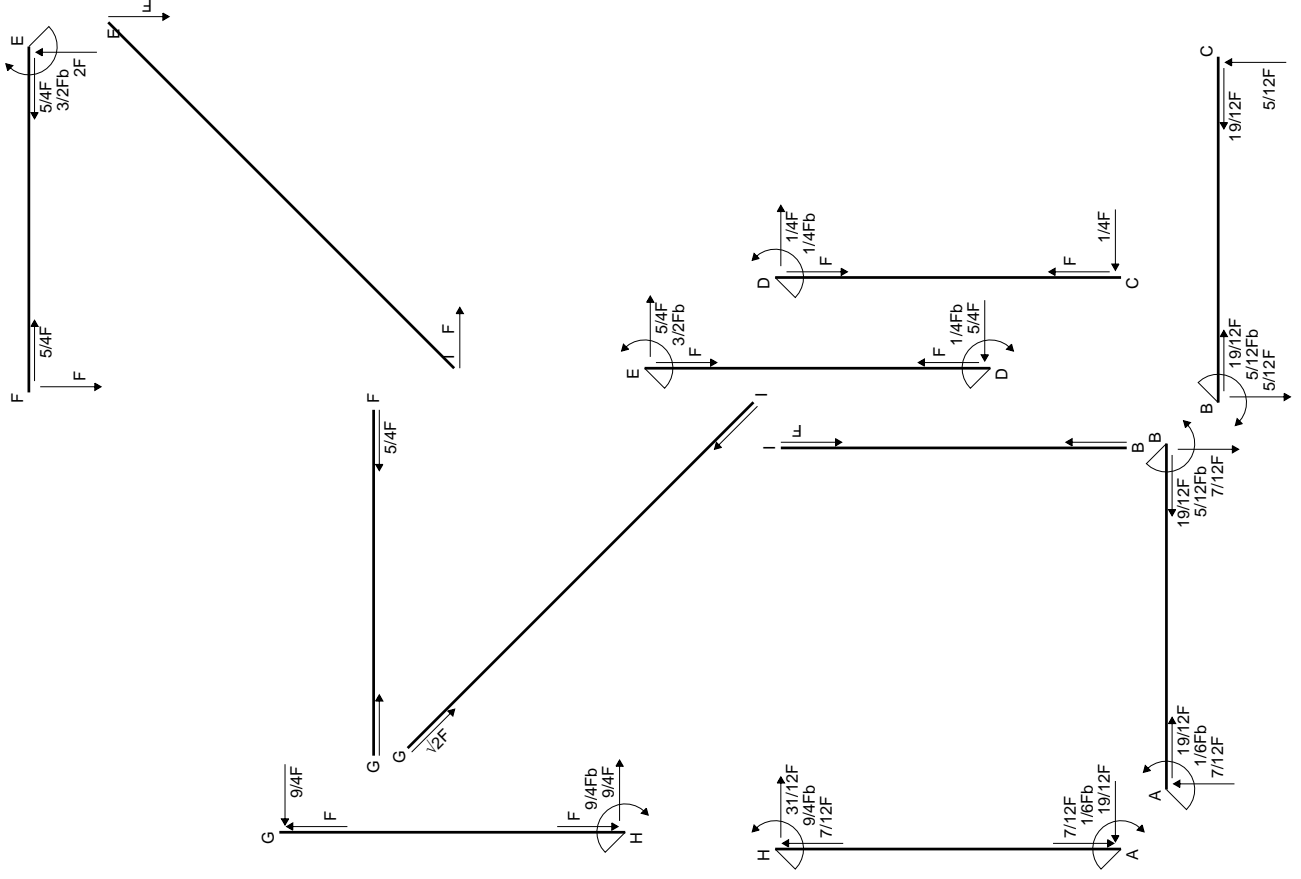
$$= [5/8 x^2/b - 7/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ + [1/2 x^2/b]_0^b \theta$$

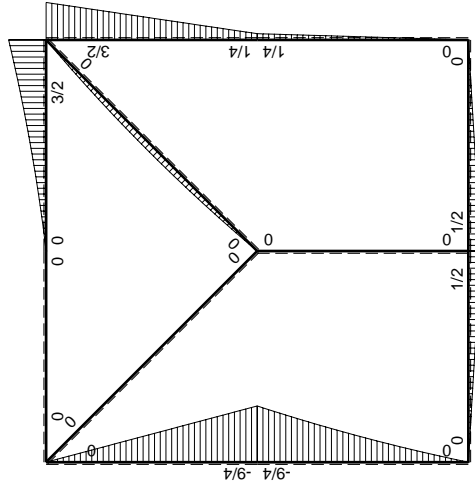
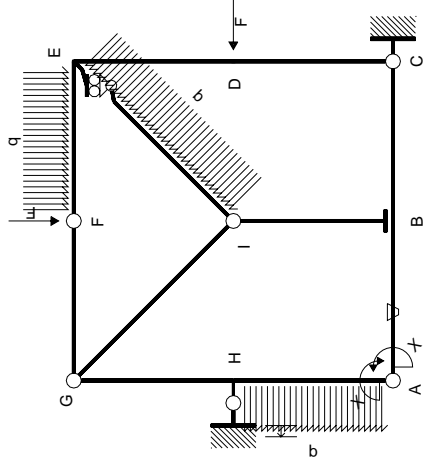
$$= (5/8 b - 7/12 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 2/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (3/4 x/b - 1/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

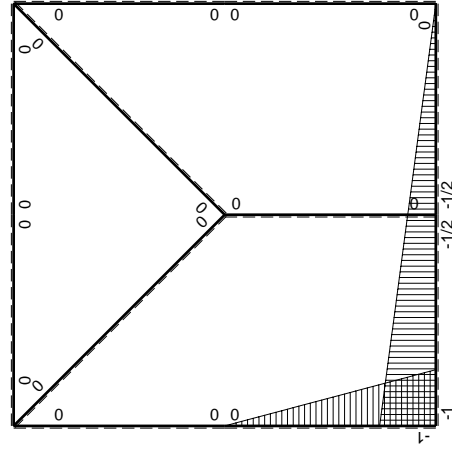
$$= [3/8 x^2/b - 1/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ + [-x + 1/2 x^2/b]_0^b \theta$$

$$= (3/8 b - 1/12 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 2/3 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	$1/2Fx$	$-Fb/EJ$	$-1/2Fx+1/4Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/6+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	Fb/EJ	$-1/4Fb+1/4Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

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

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

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

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

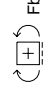
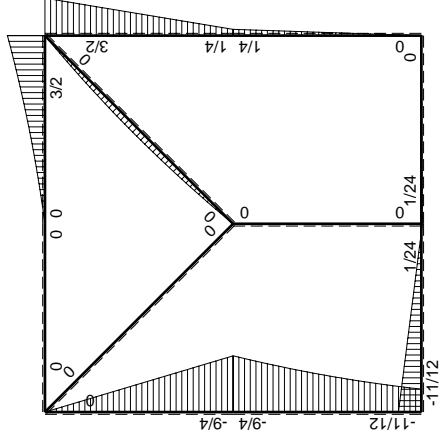
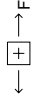
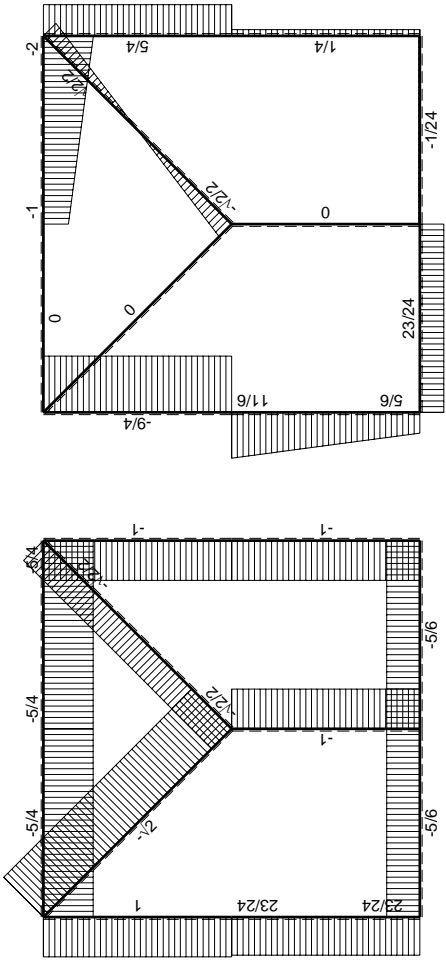
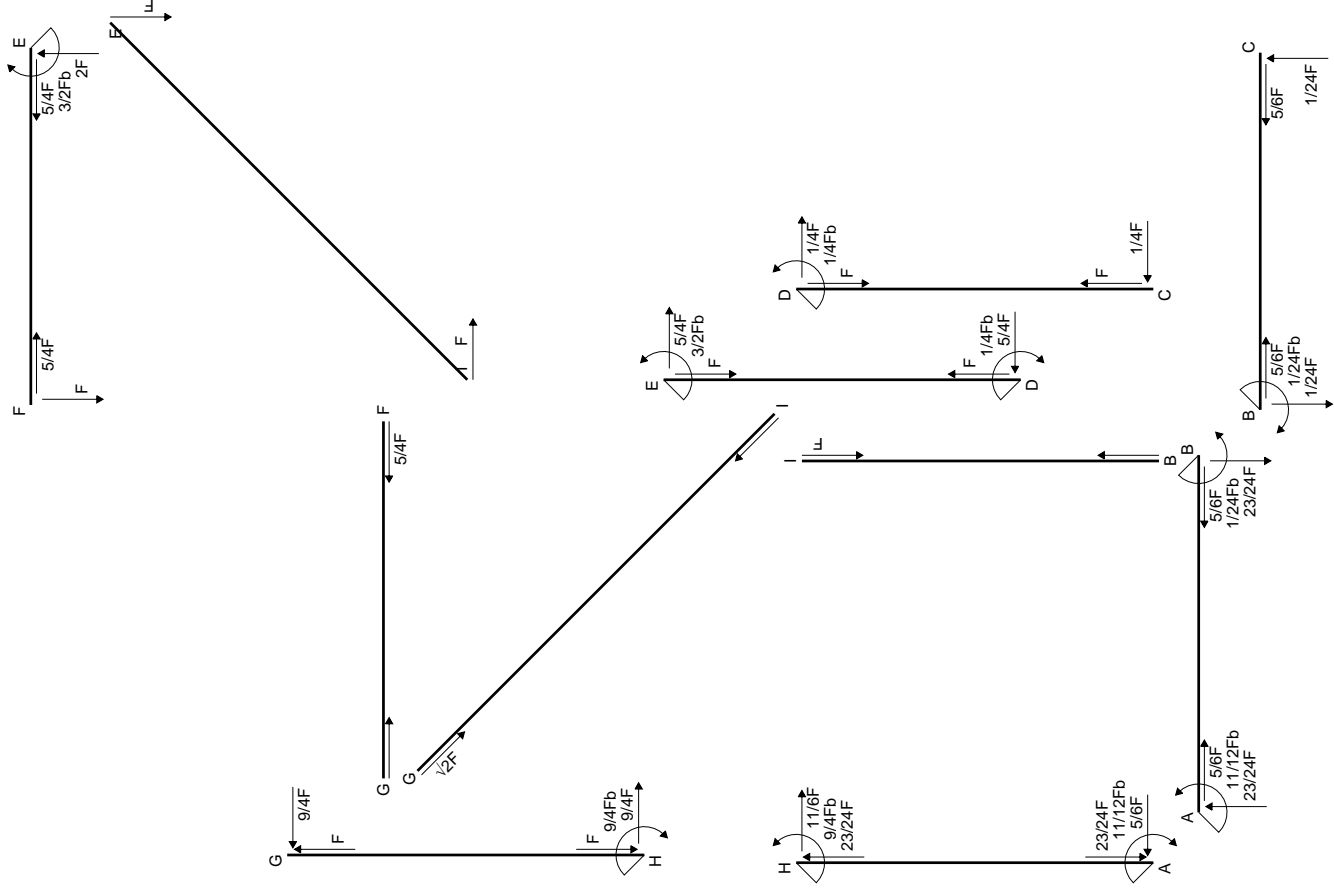
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

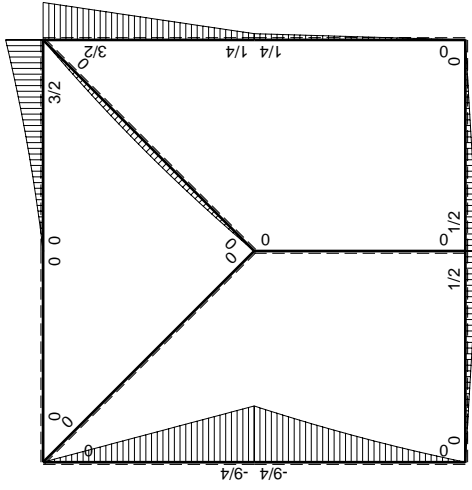
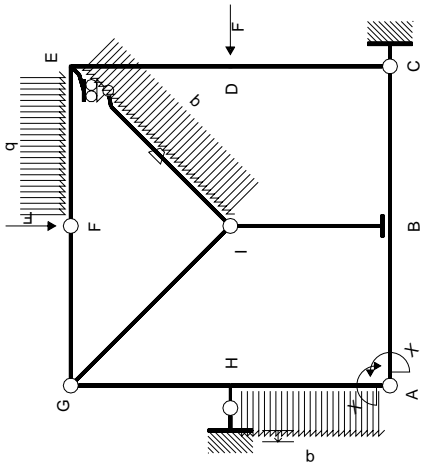
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

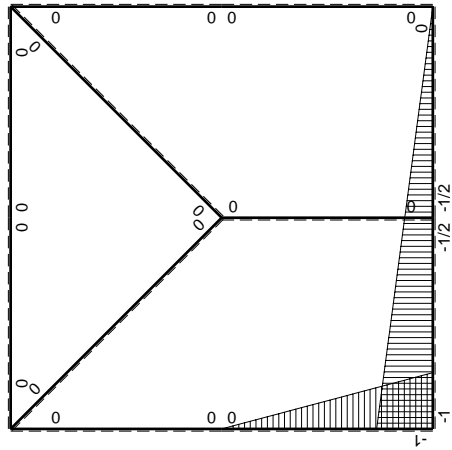
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

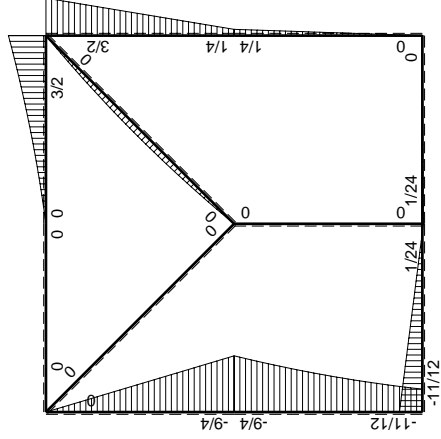
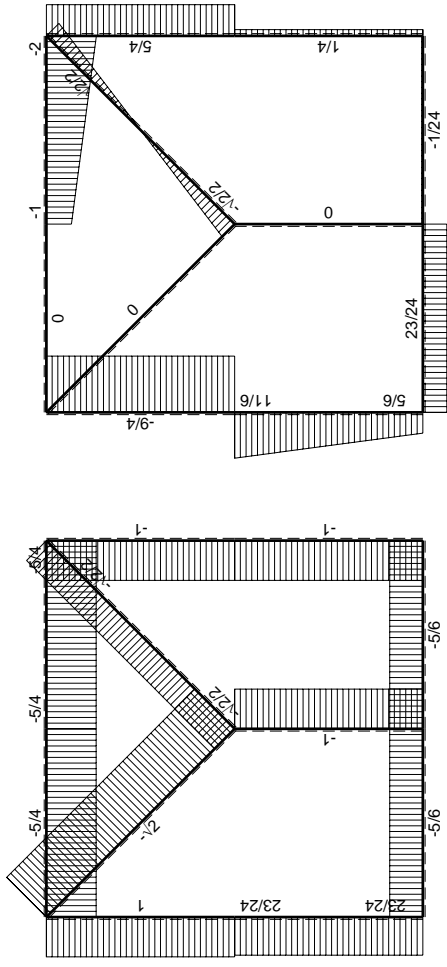
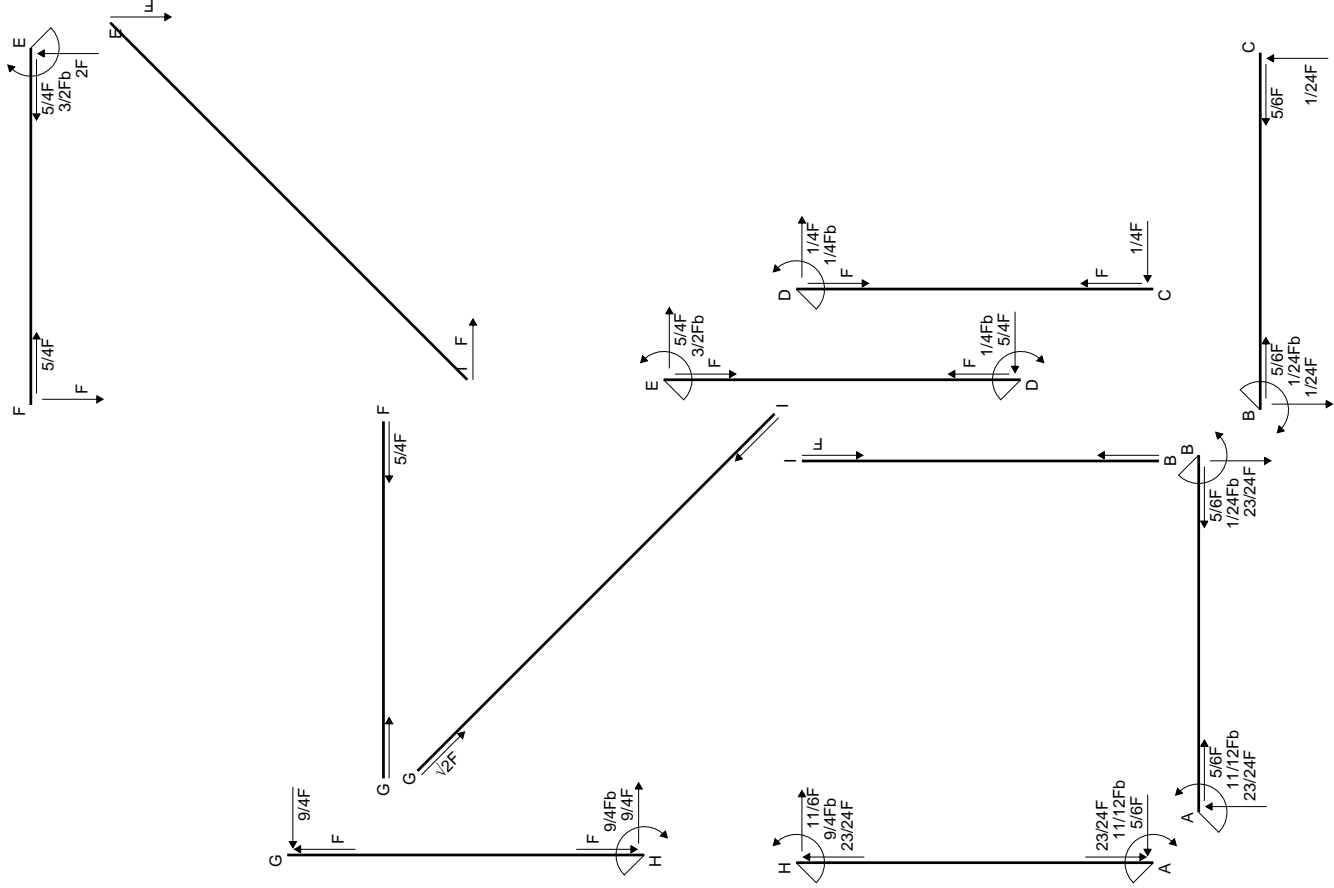
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

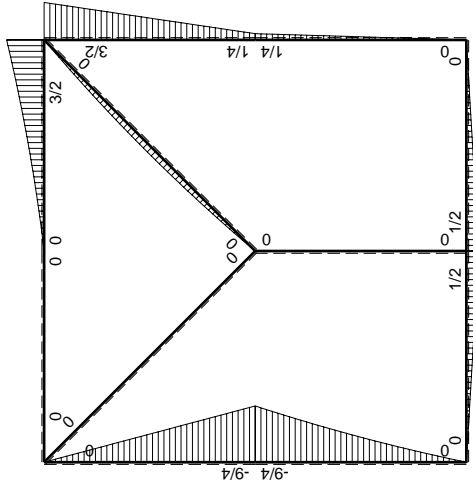
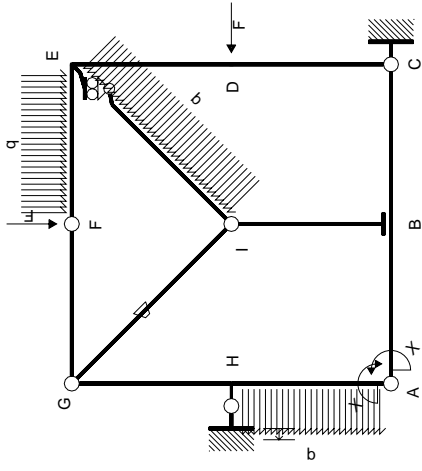
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

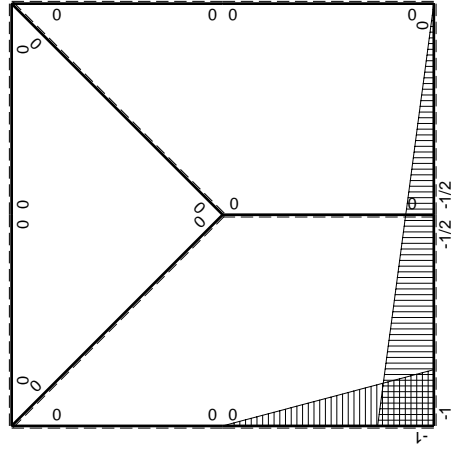
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

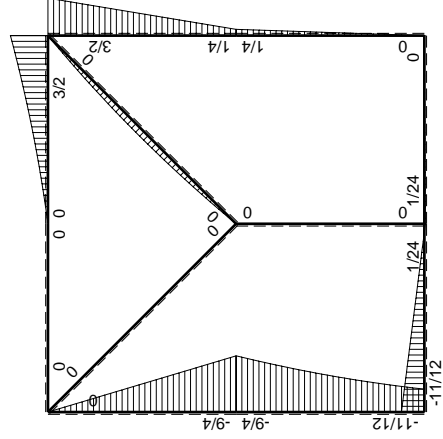
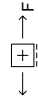
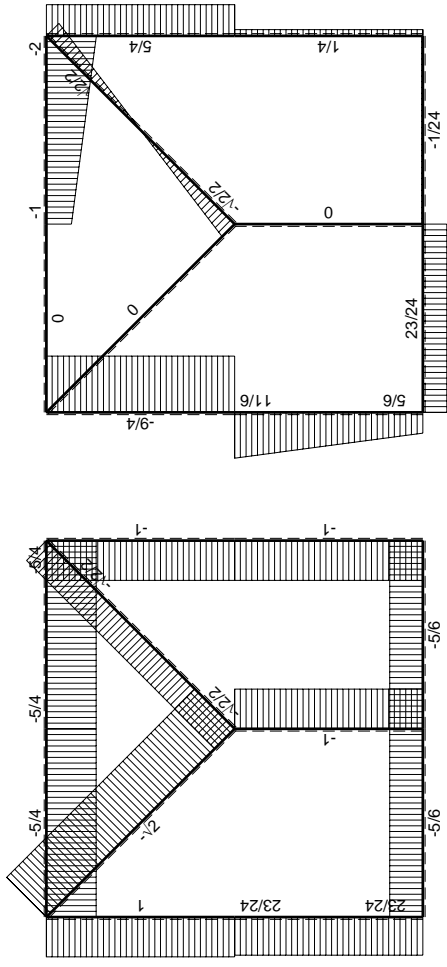
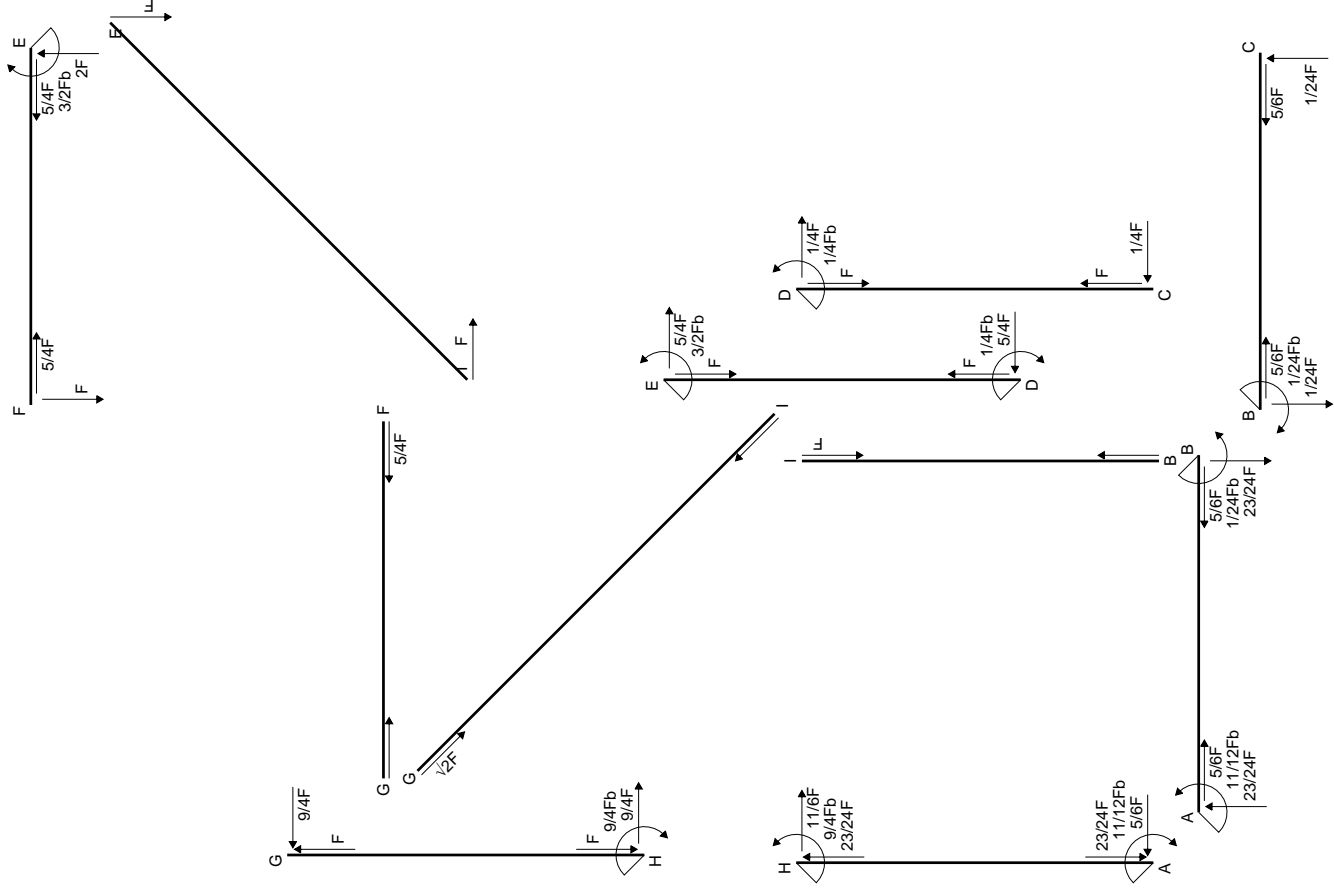
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

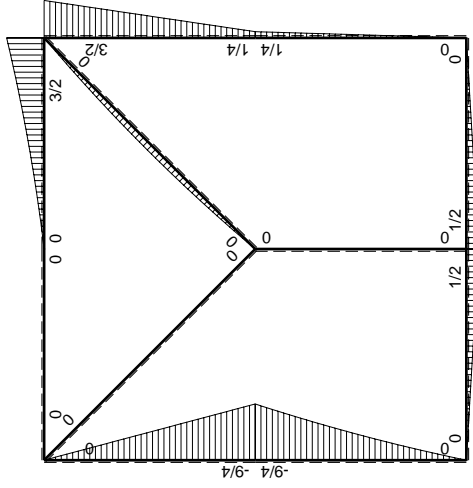
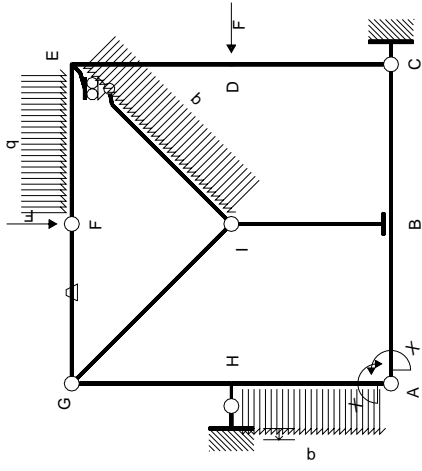
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

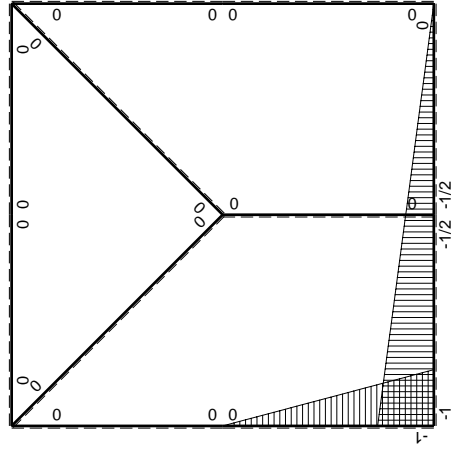
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

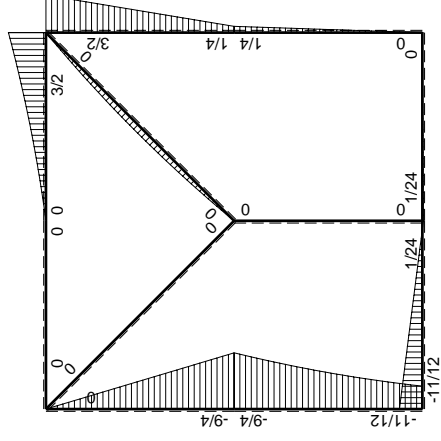
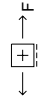
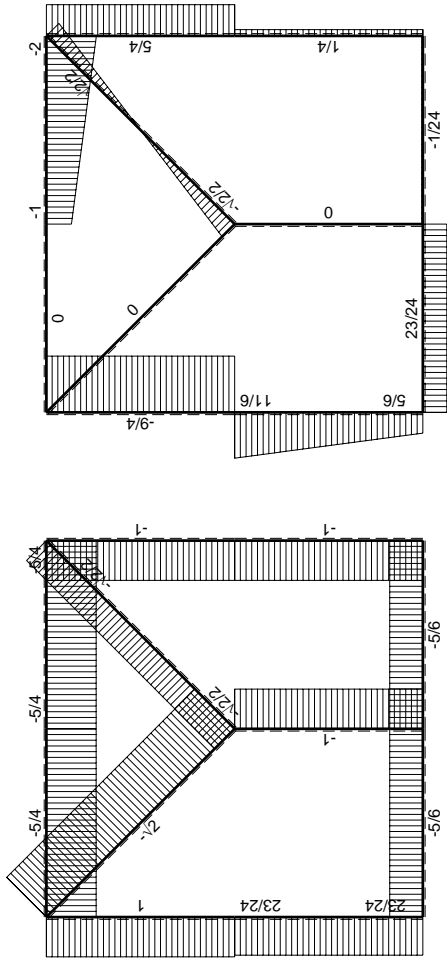
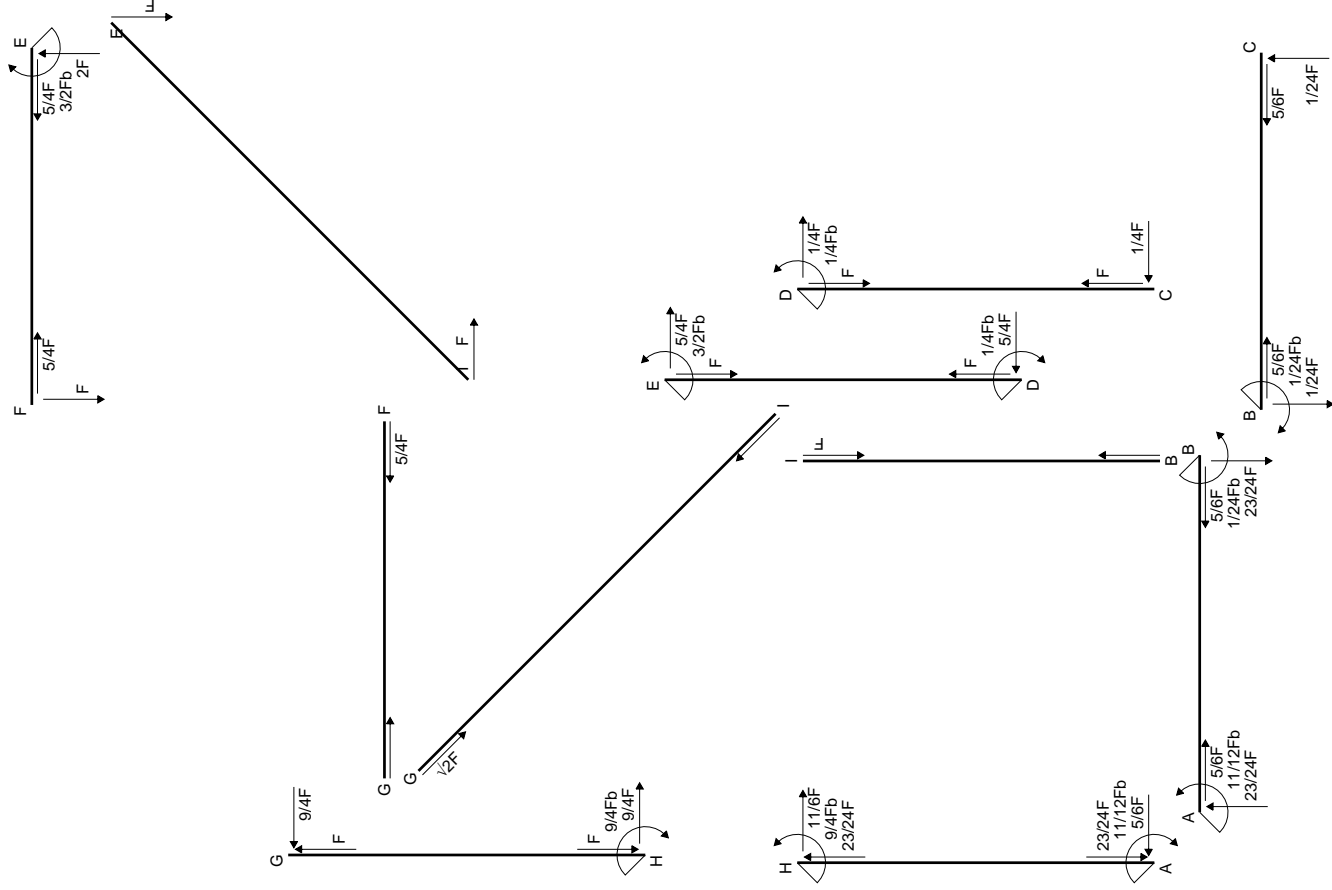
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

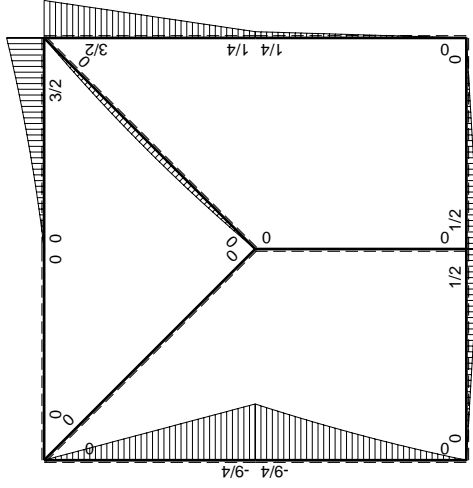
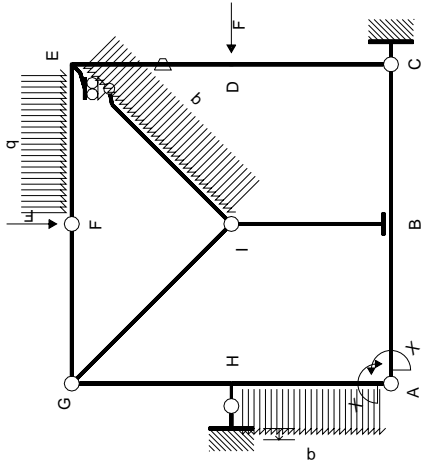
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

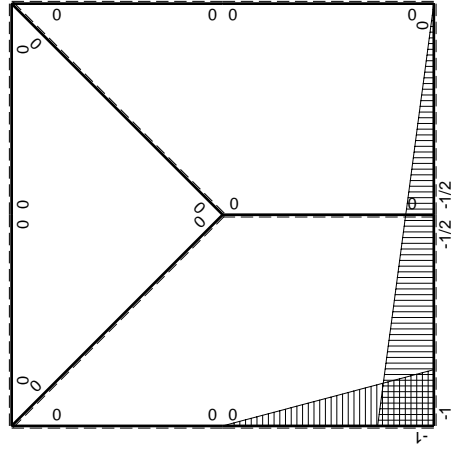
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

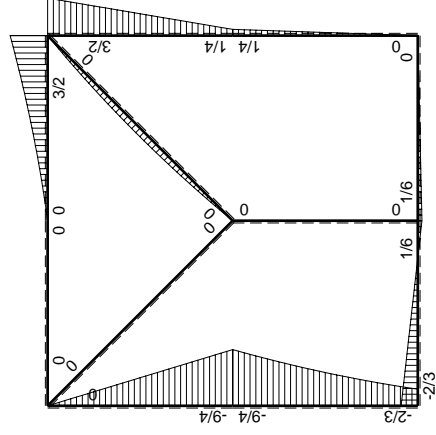
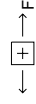
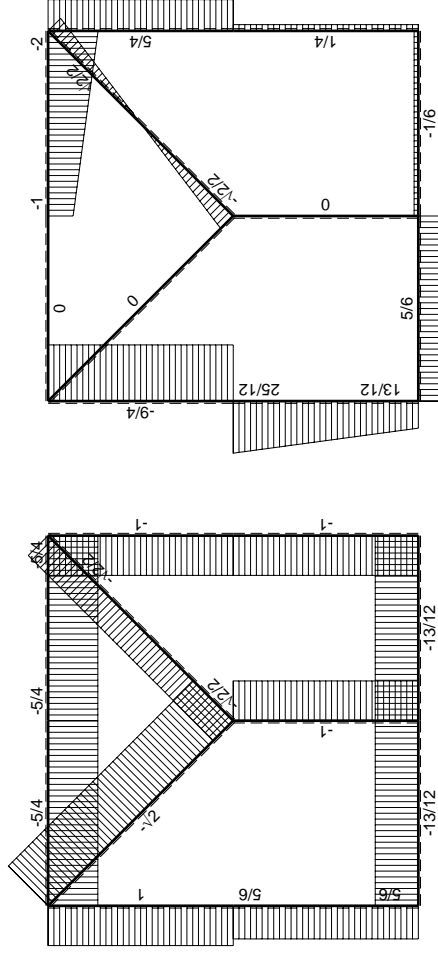
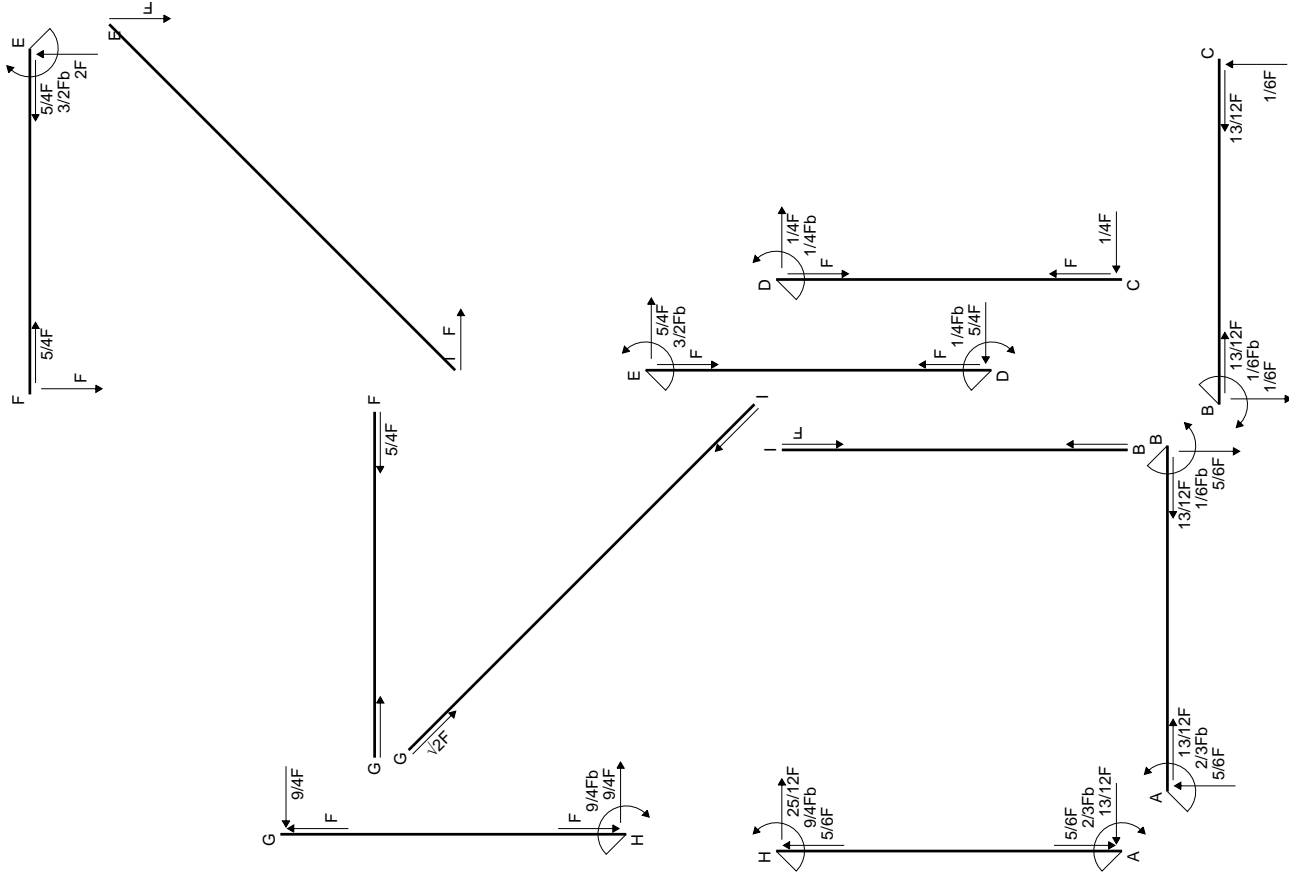
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

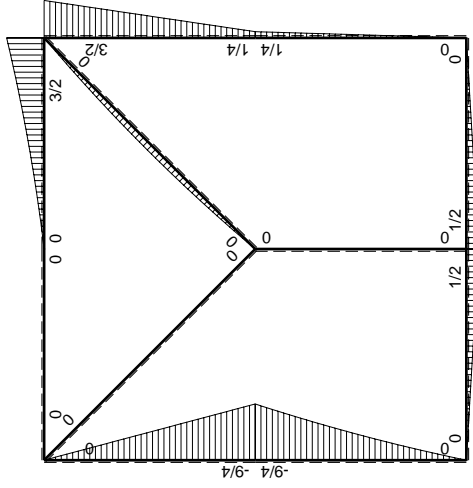
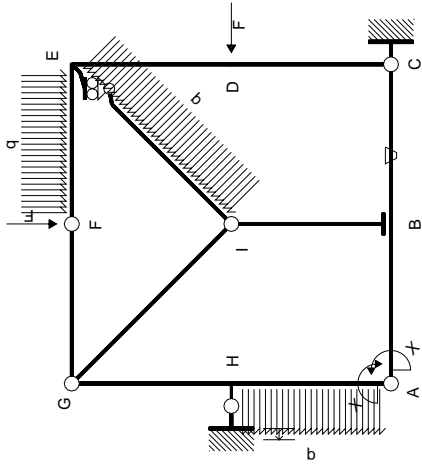
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

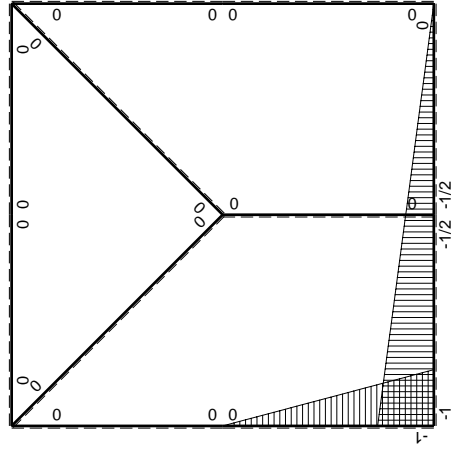
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	$-Fb/EJ$	$-1/4Fb+1/2Fx-1/4Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	Fb/EJ	$-1/4Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-2/3Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$2/3Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-1/4 b + 1/4 b - 1/12 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/6 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/4 x^2/b \right]_0^b \theta$$

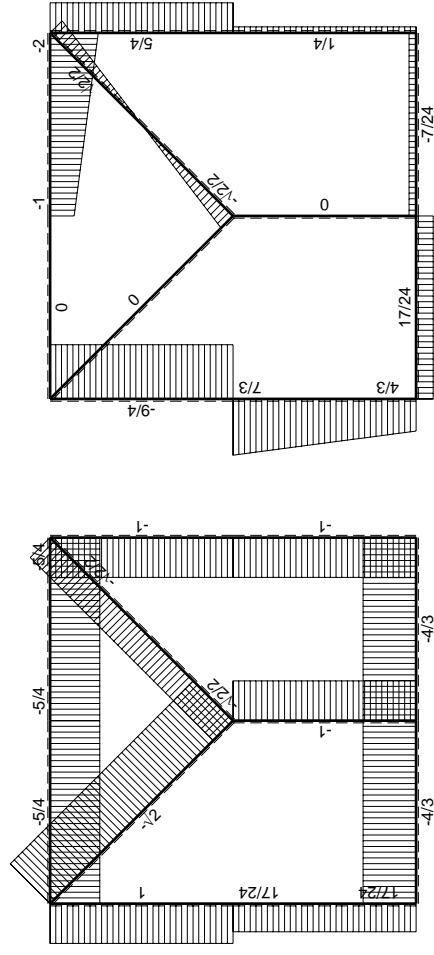
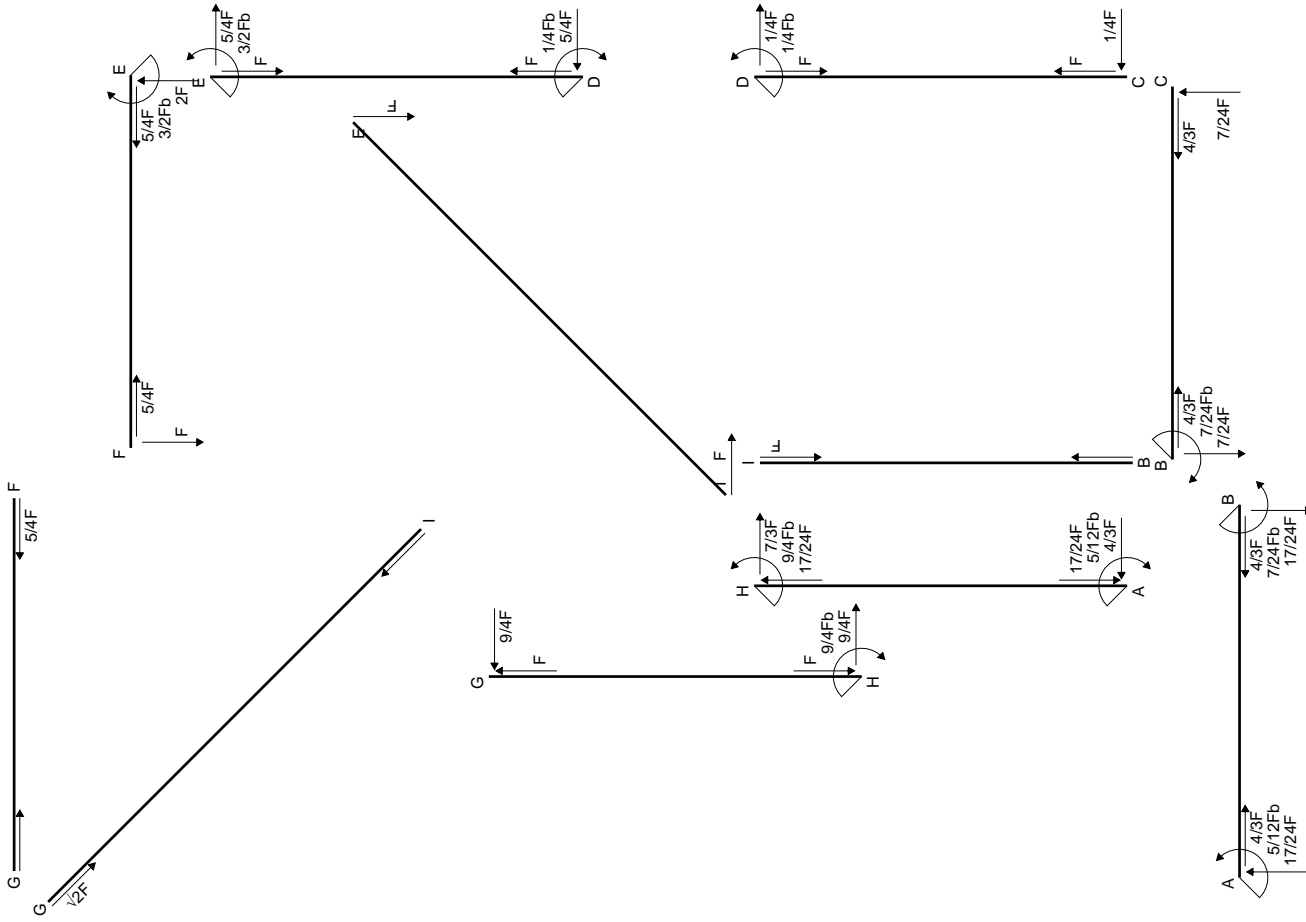
$$= (-1/12 b) Fb 1/EJ + (-1/4 b) \theta = 1/6 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

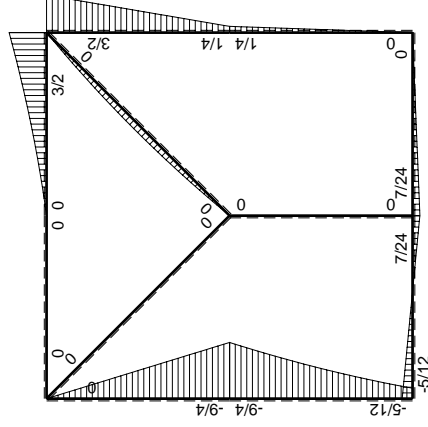
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

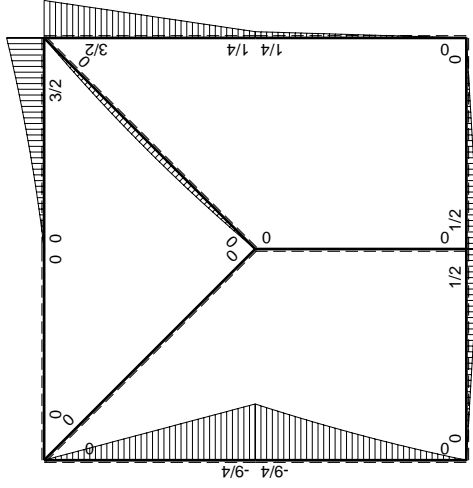
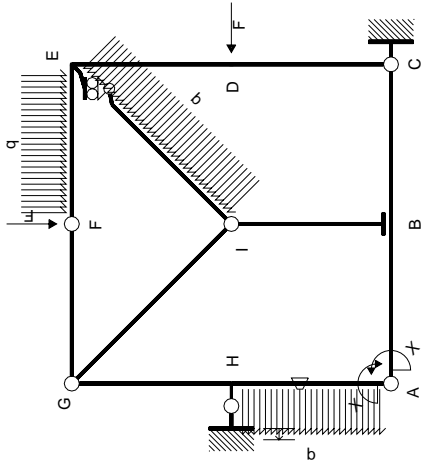


← ⊕ → F

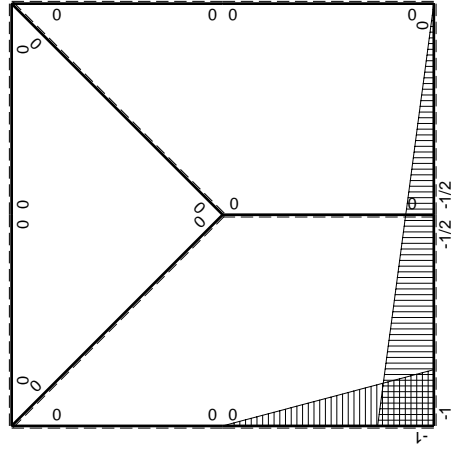
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	$-Fb/EJ$	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/3+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	Fb/EJ	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

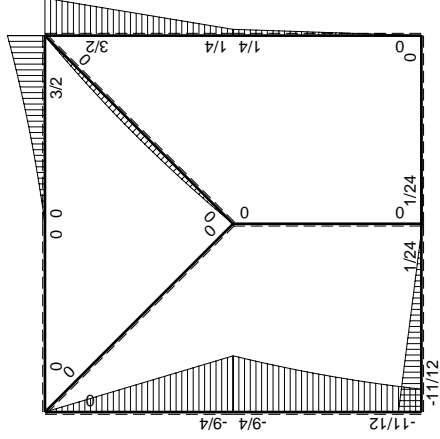
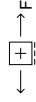
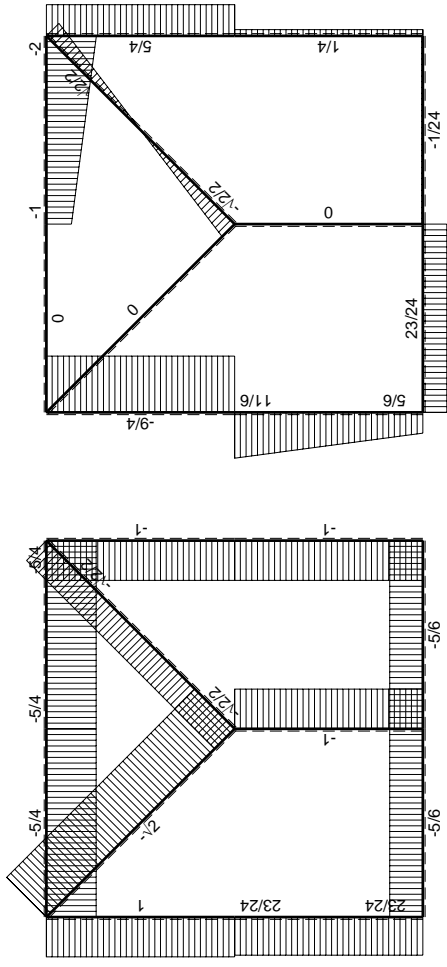
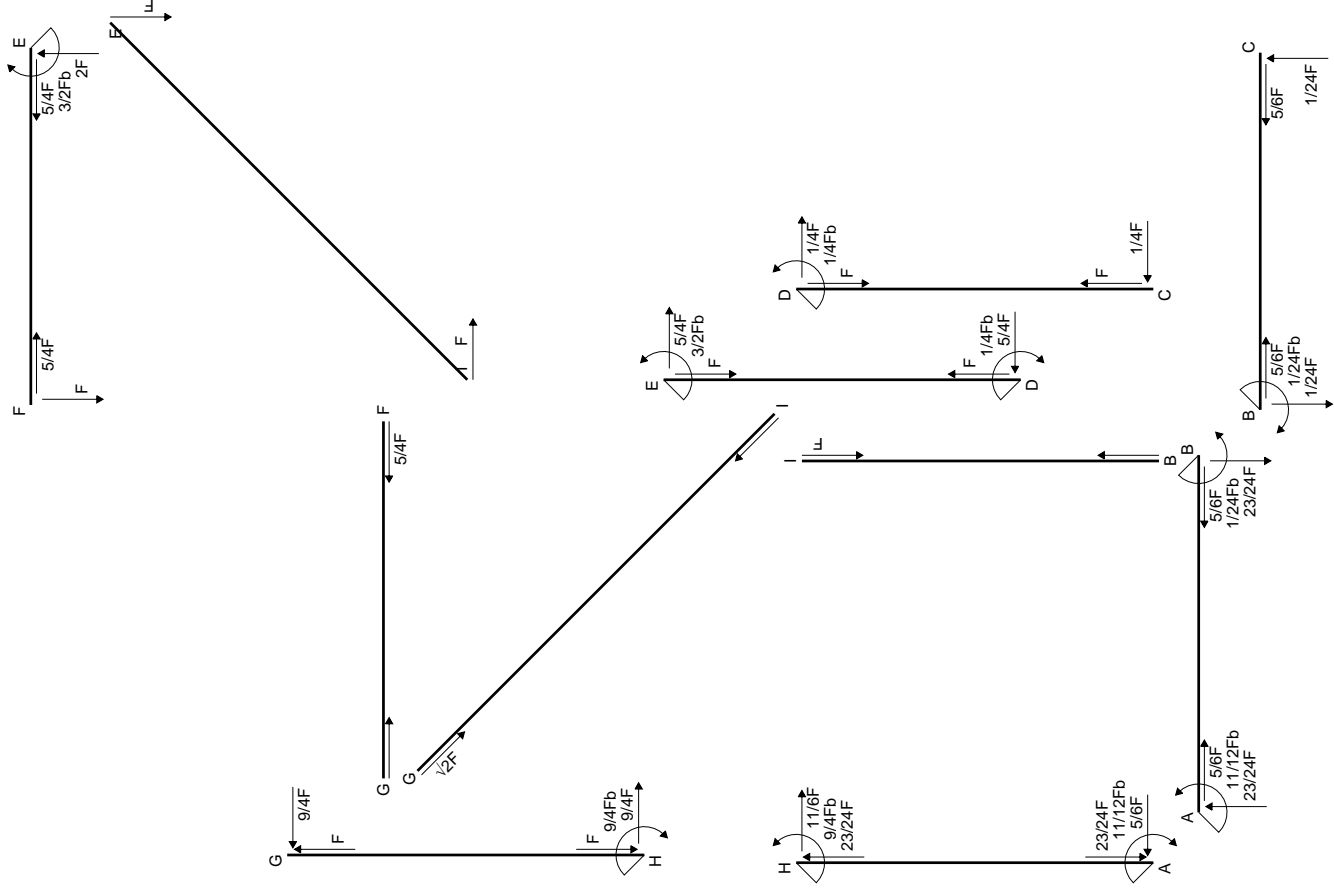
$$= [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ + [1/2 x^2/b]_0^b \theta$$

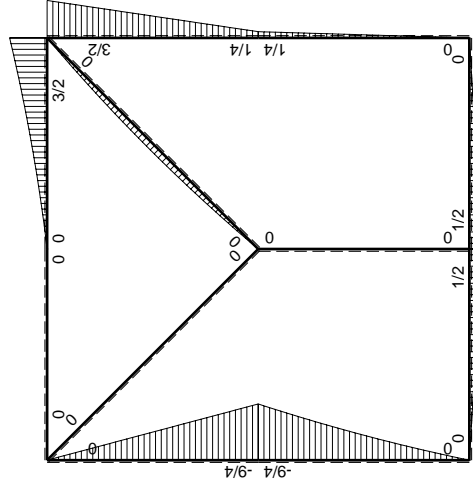
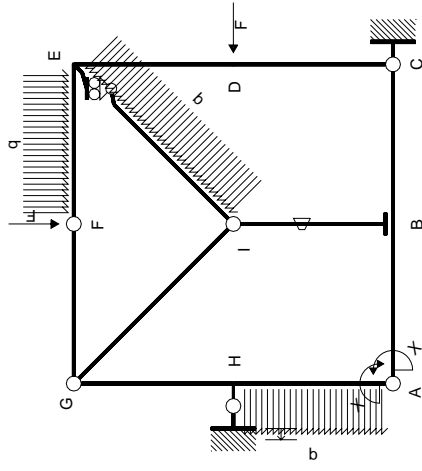
$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 5/6 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

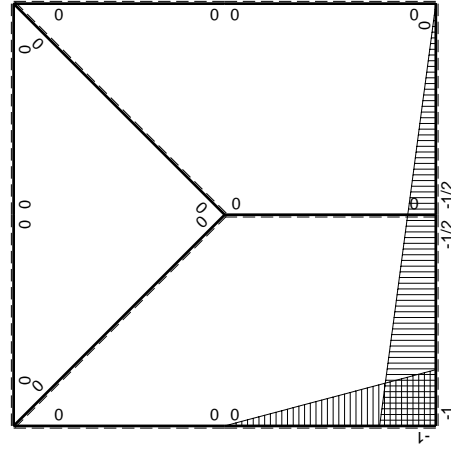
$$= [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ + [-x + 1/2 x^2/b]_0^b \theta$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 5/6 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

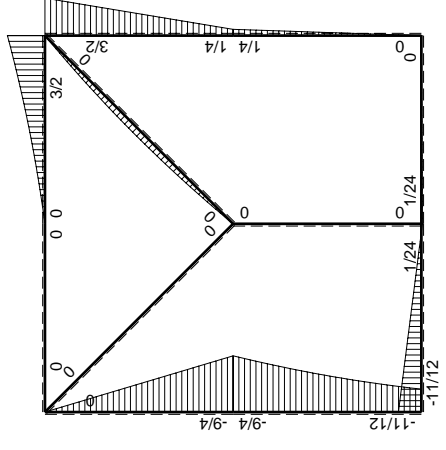
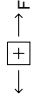
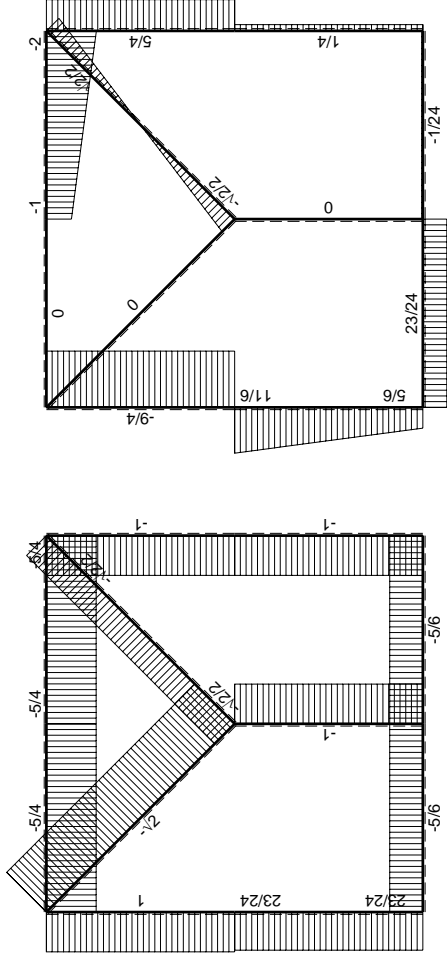
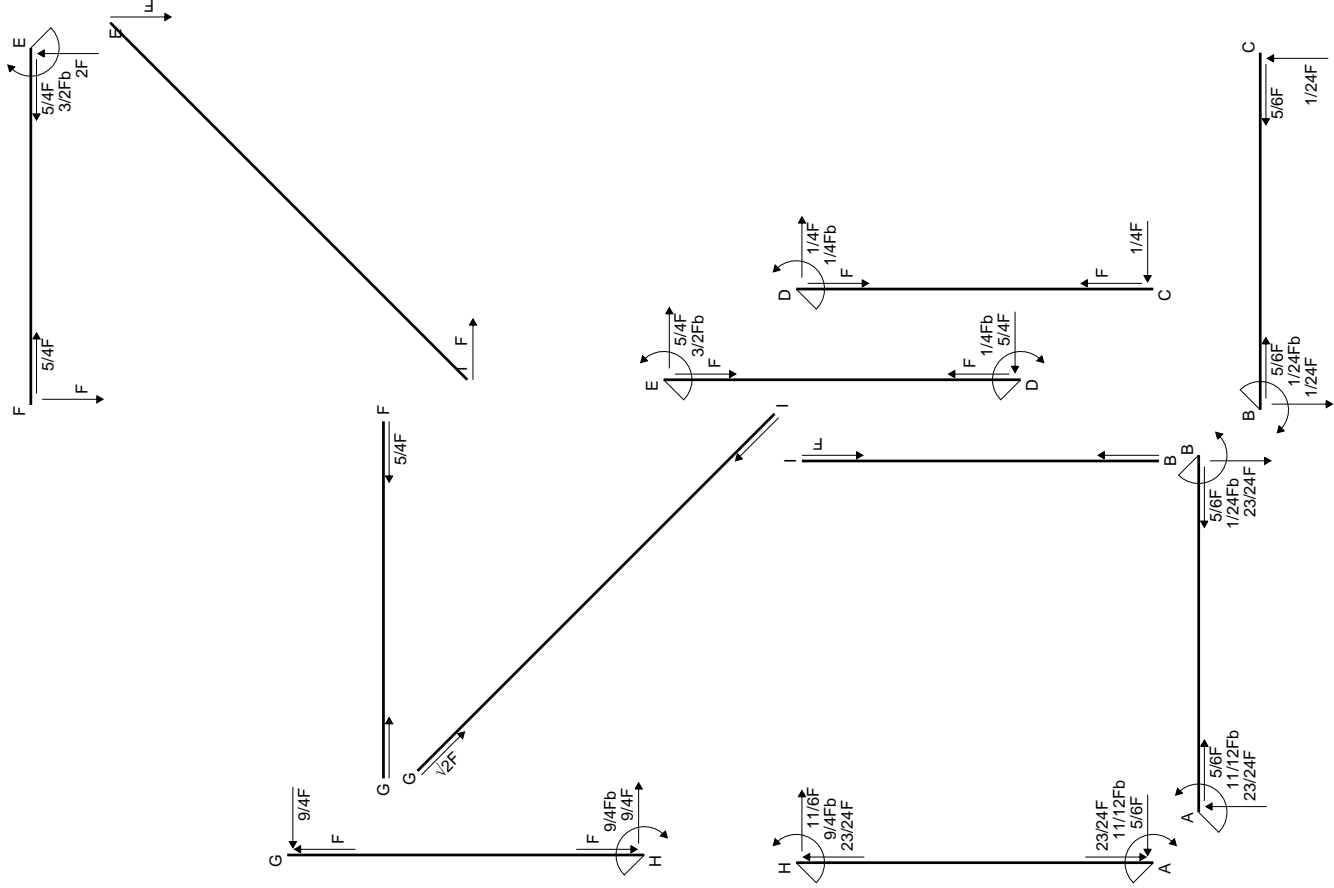
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

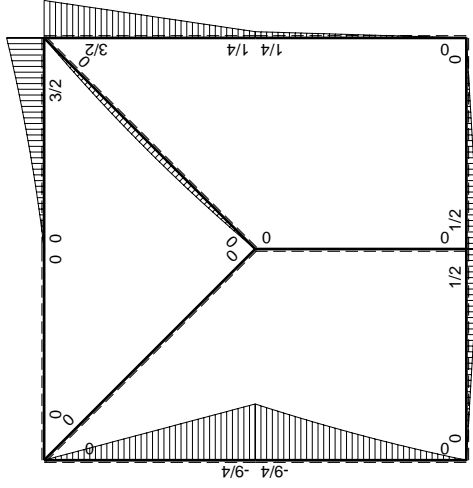
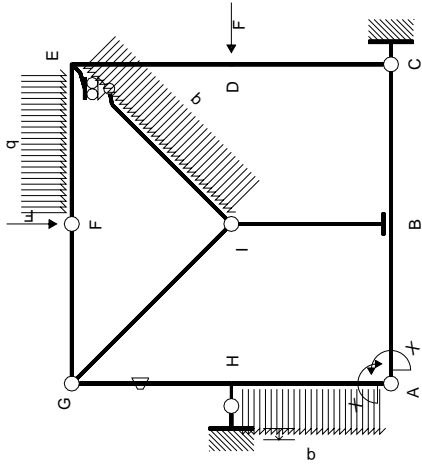
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

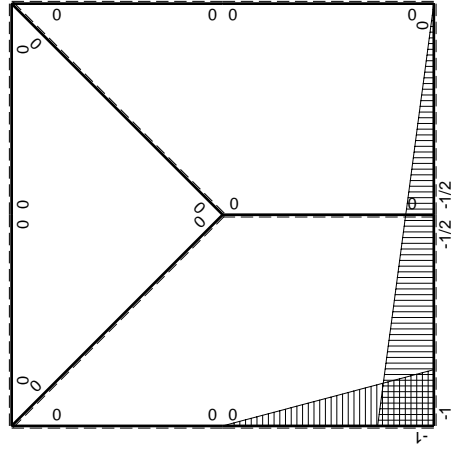
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

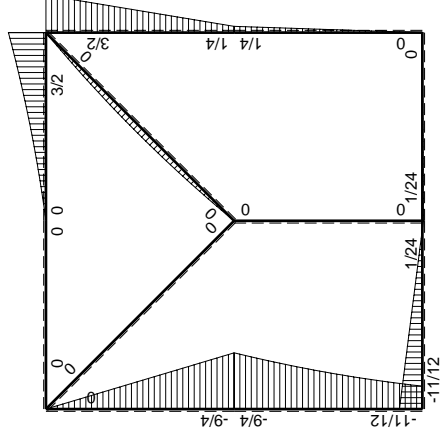
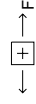
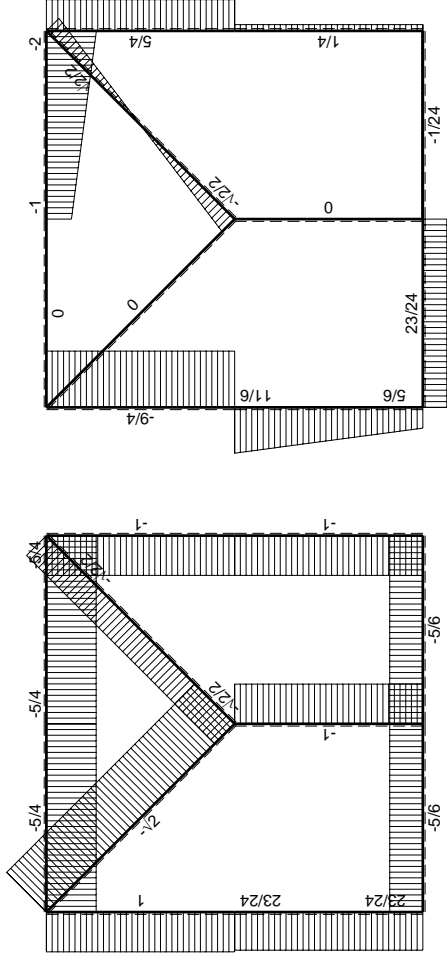
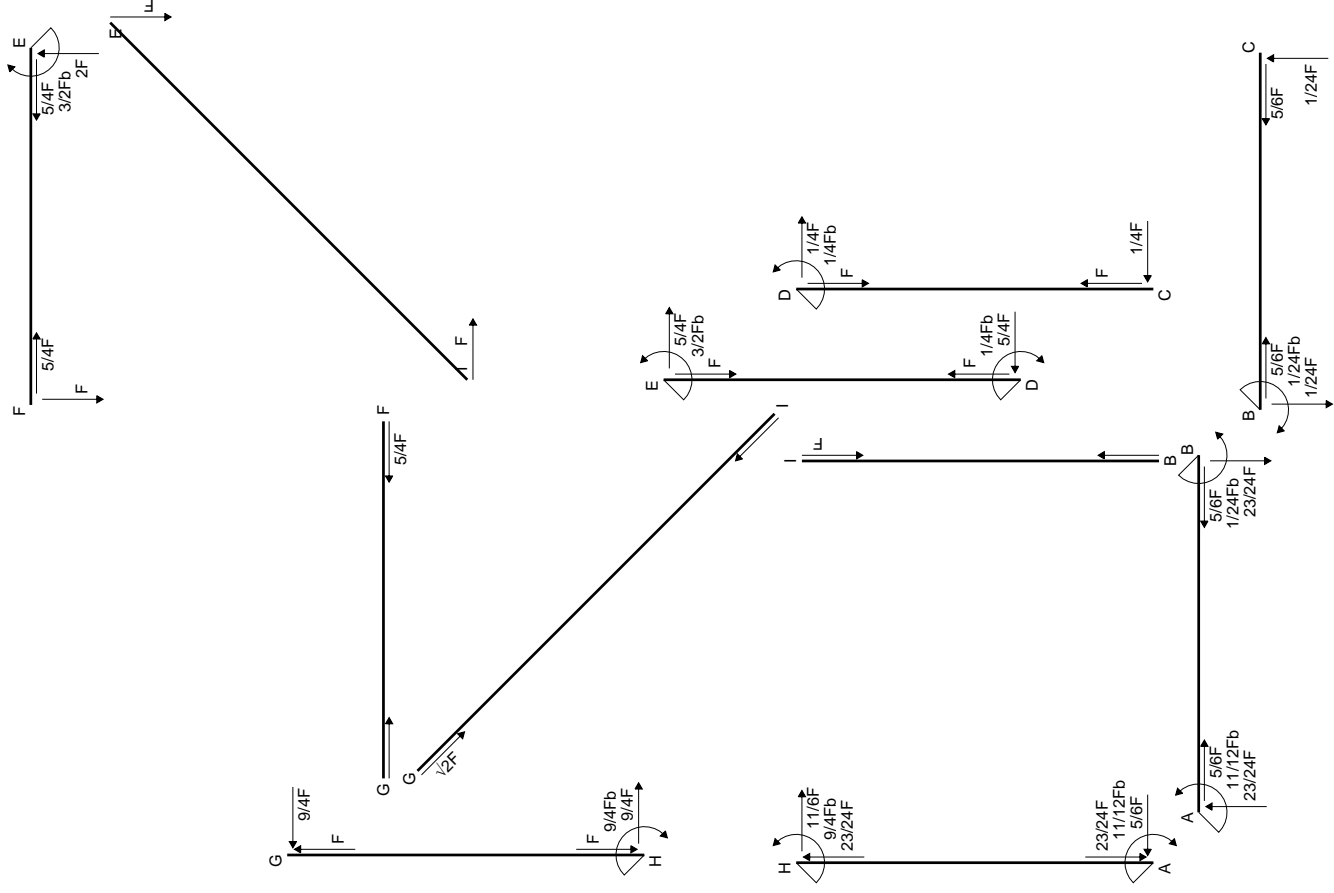
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

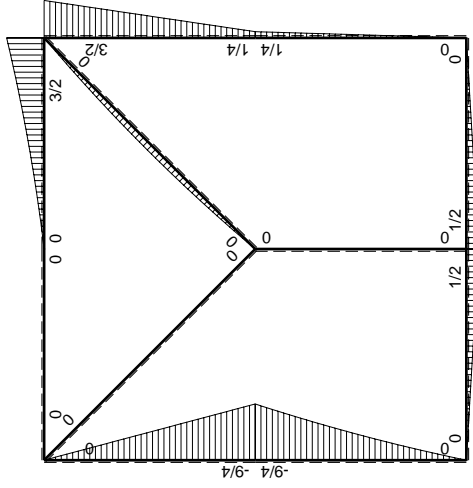
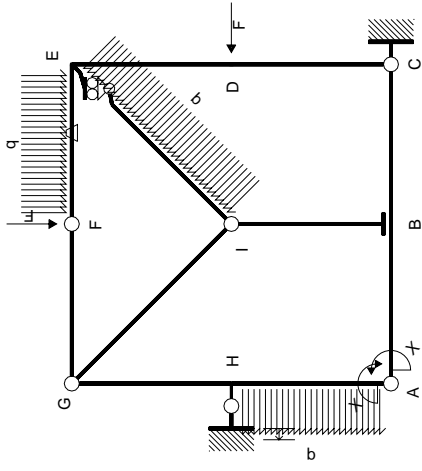
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

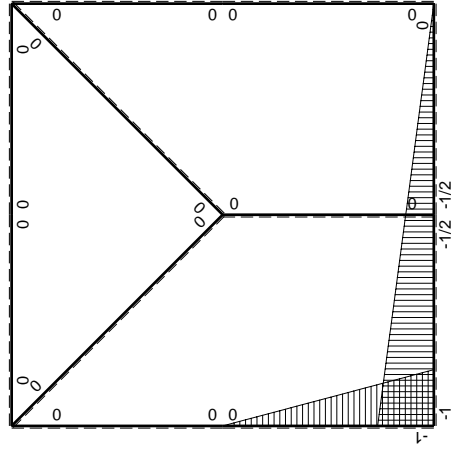
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

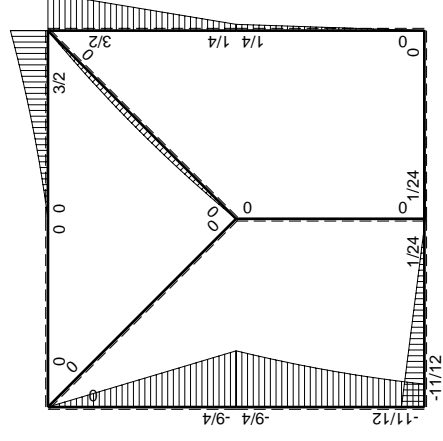
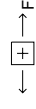
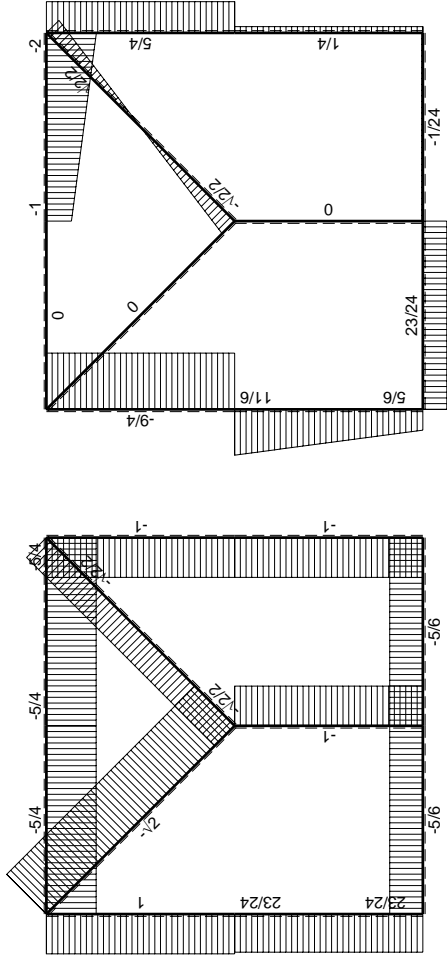
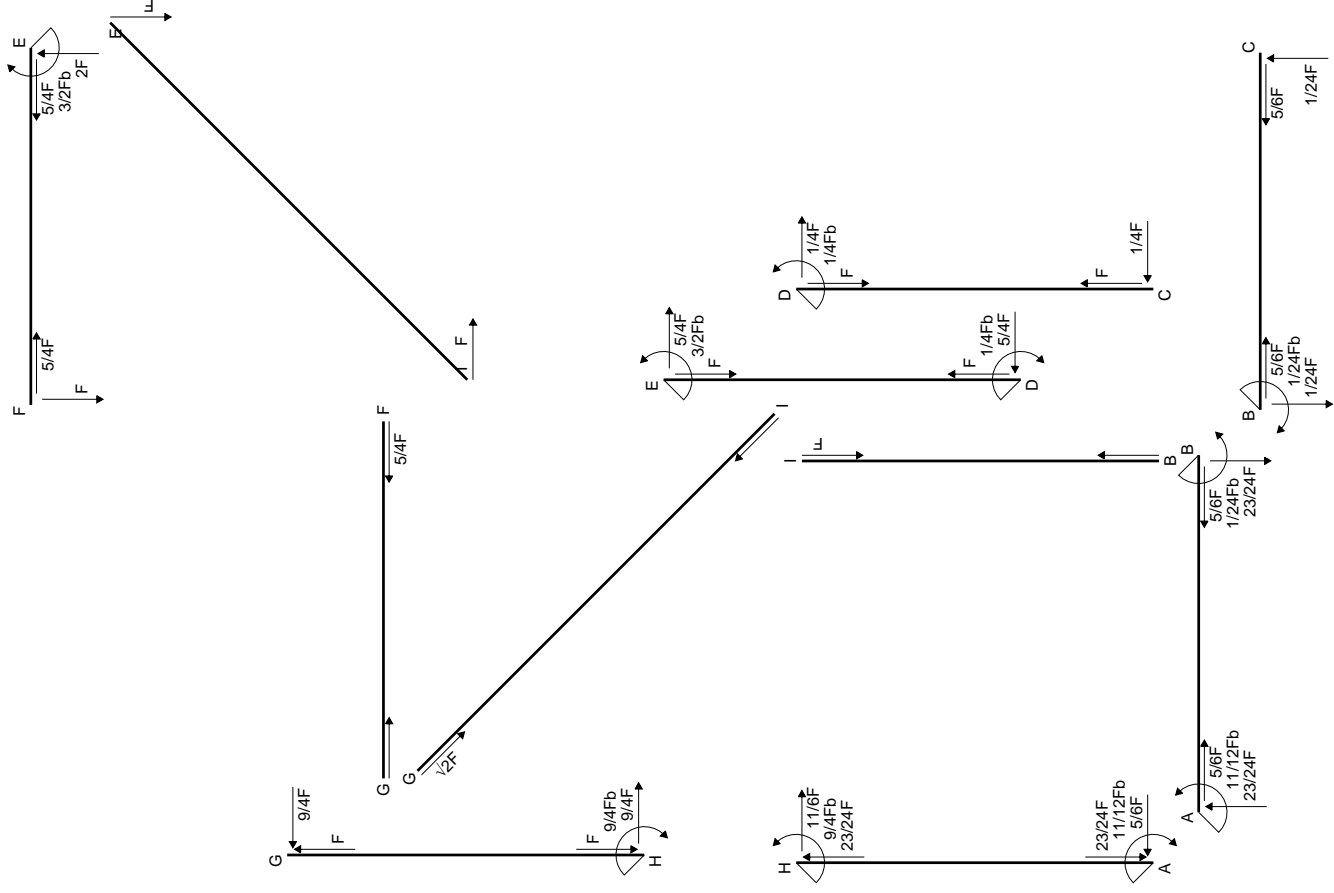
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

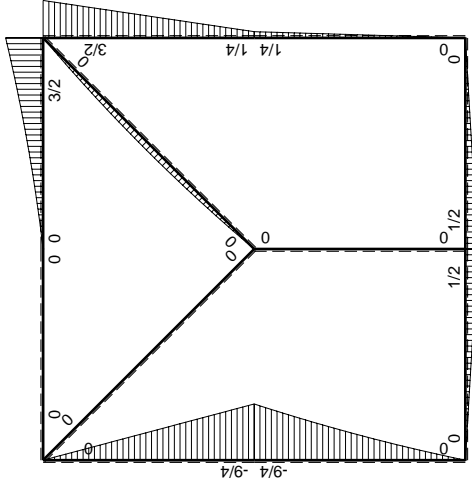
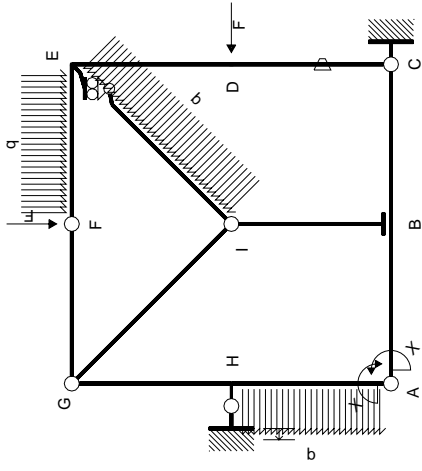
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

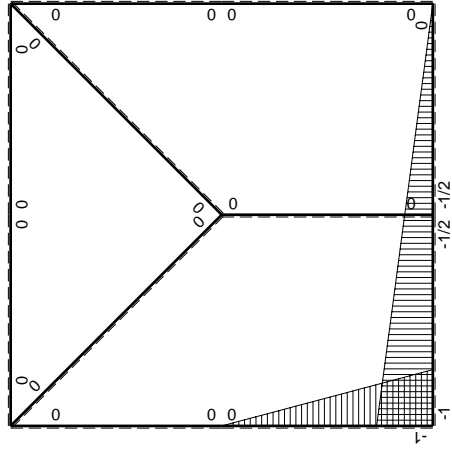
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CD b	0	$1/4Fx$	$-Fb/EJ$	0	0	0	0+0	0
DC b	0	$-1/4Fb+1/4Fx$	Fb/EJ	0	0	0	0+0	0
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0	0+0	0
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0
FE b	0	$-Fx-1/2qx^2$	0	0	0	0	0+0	0
FG b	0	0	0	0	0	0	0+0	0
GF b	0	0	0	0	0	0	0+0	0
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0	0+0	0
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0
IB b	0	0	0	0	0	0	0+0	0
BI b	0	0	0	0	0	0	0+0	0
IE $\sqrt{2}b$	0	$-\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0	0	0
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

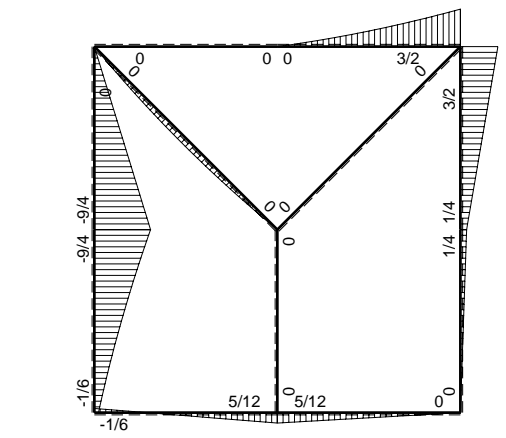
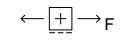
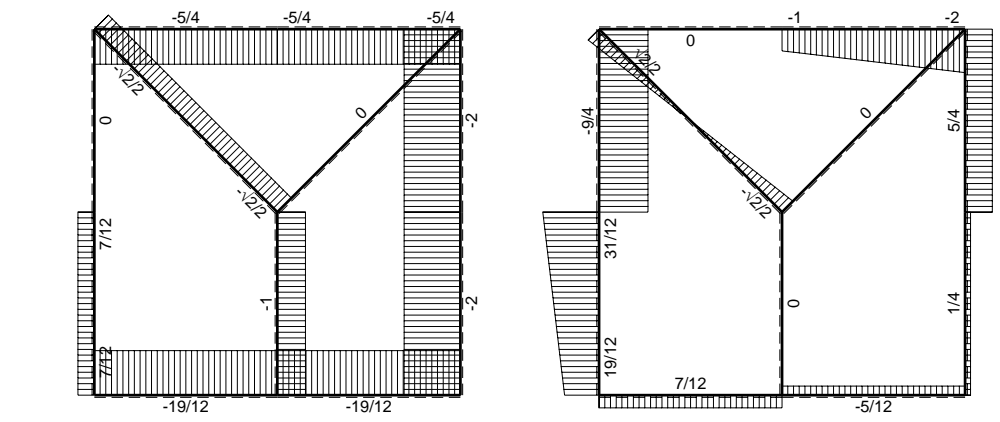
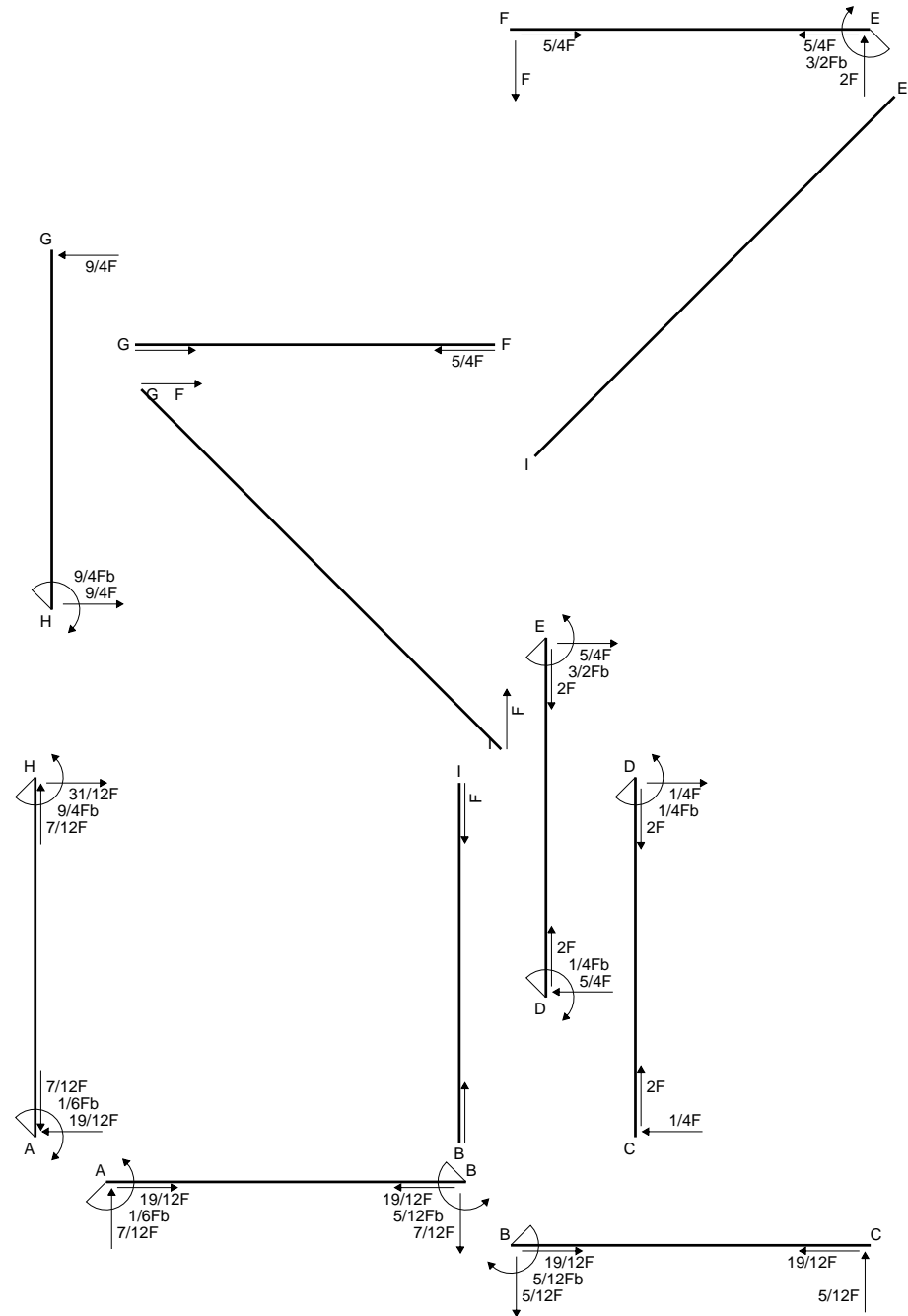
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

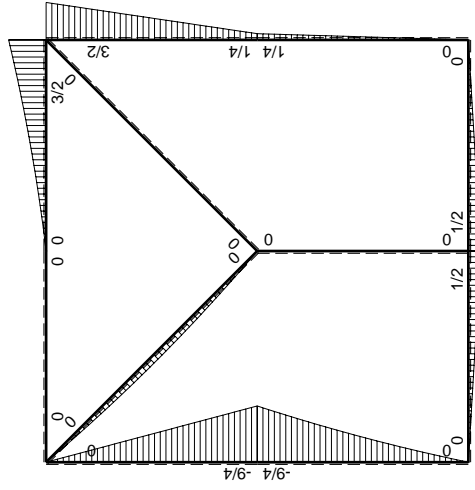
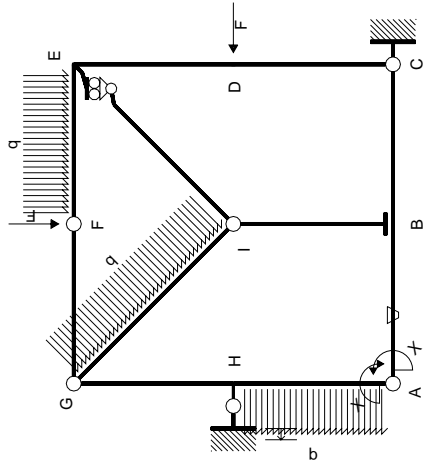
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

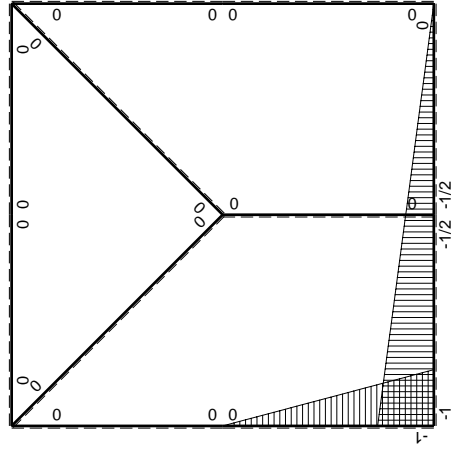
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$
AB b	$-1+1/2x/b$	$1/2Fx$	$-Fb/EJ$	$-1/2Fx+1/4Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/6+3/4)Fb^2/EJ$	$7/12Xb/EJ$
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	Fb/EJ	$-1/4Fb+1/4Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$		
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$		
CD b	0	$1/4Fx$	0	0	0	0	0+0	0
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0		
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0		
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0
FE b	0	$-Fx-1/2qx^2$	0	0	0	0		
FG b	0	0	0	0	0	0	0+0	0
GF b	0	0	0	0	0	0		
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0		
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0
IB b	0	0	0	0	0	0	0+0	0
BI b	0	0	0	0	0	0		
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$		
H	cedimento nodo $-H_{1H}u_H$						$-Fb^2/EJ$	
	totali						$-1/6Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$						$1/6Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

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

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

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

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

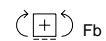
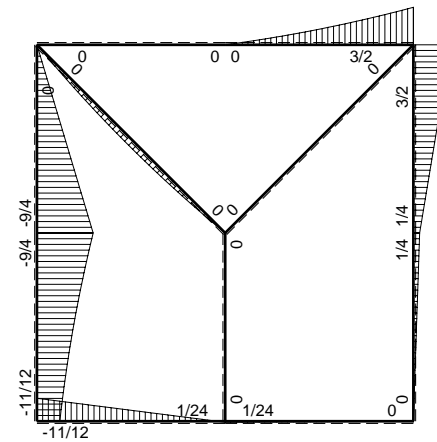
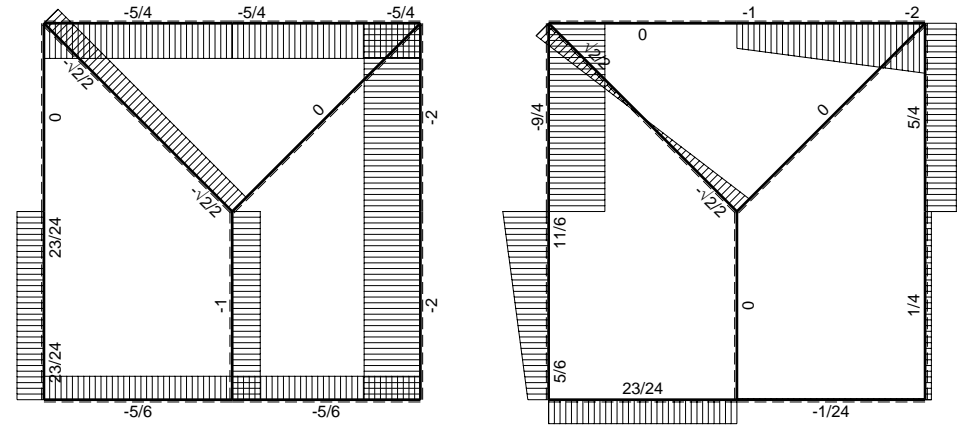
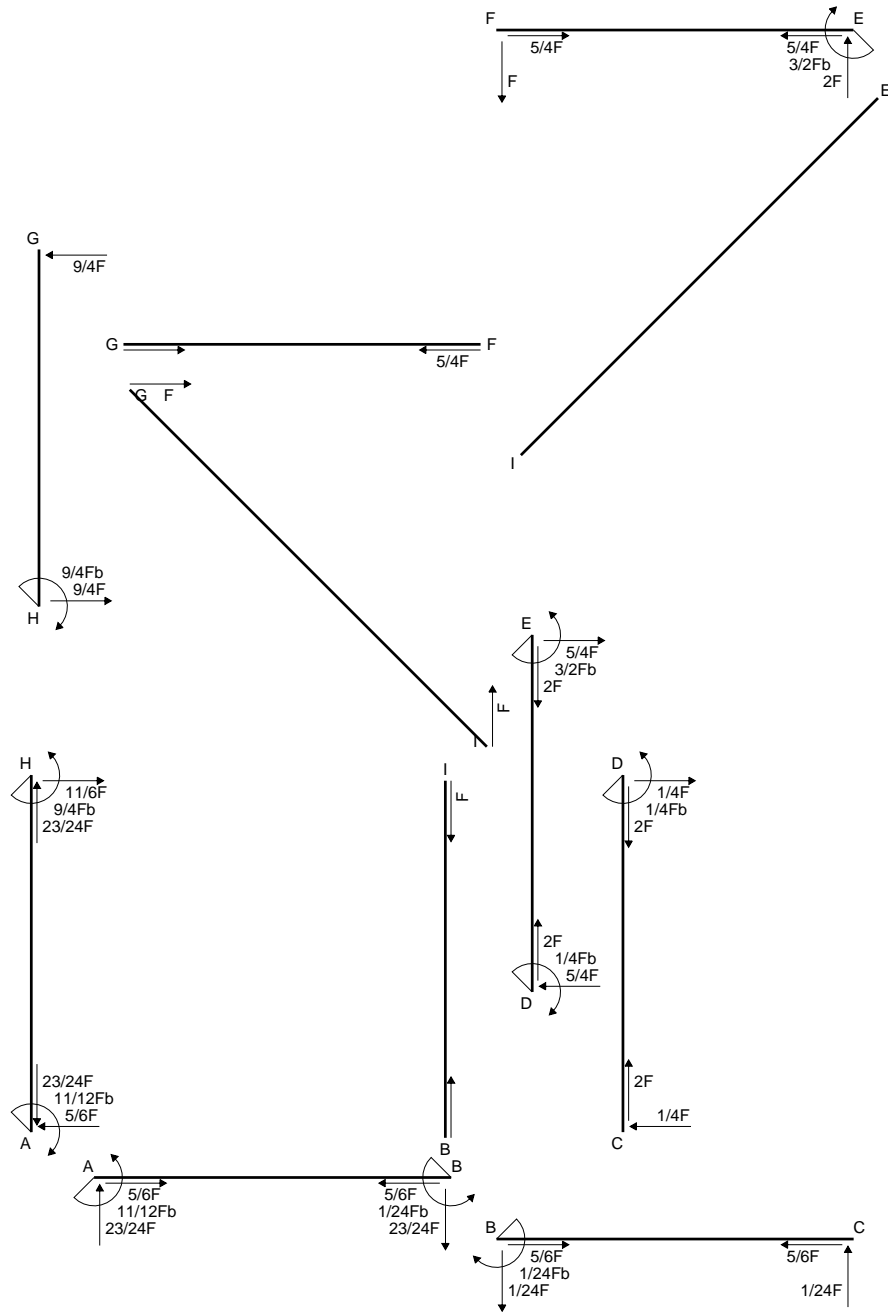
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

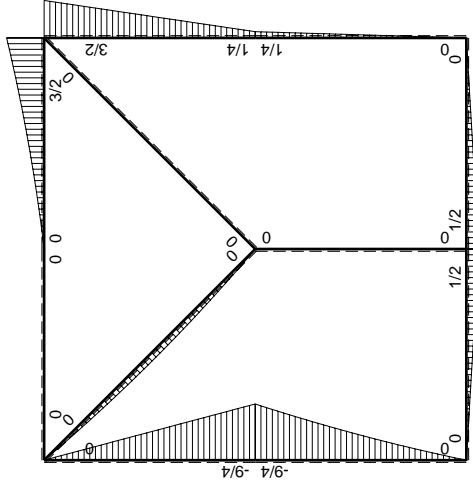
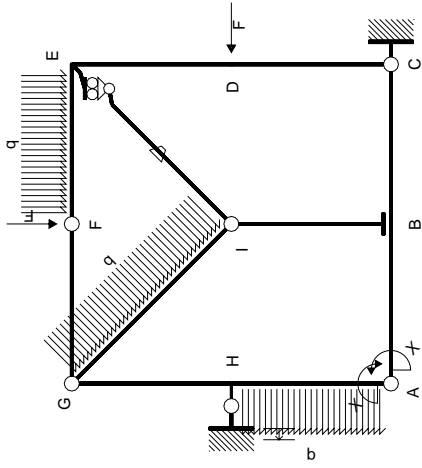
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

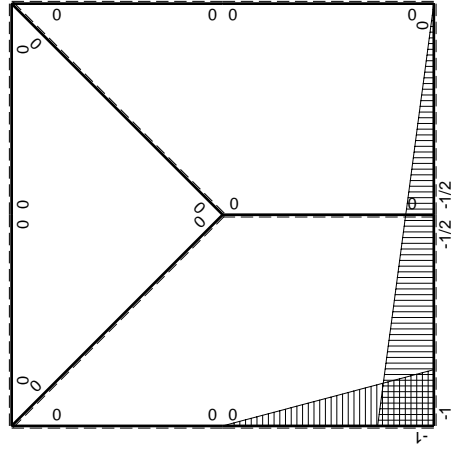
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

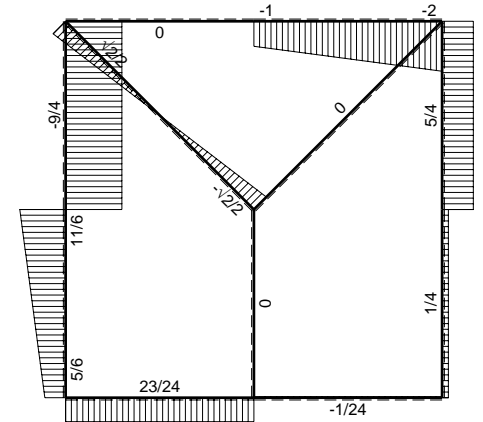
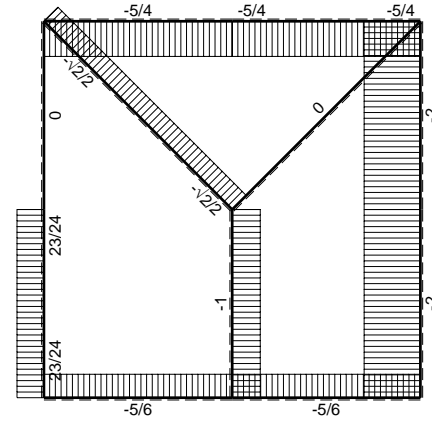
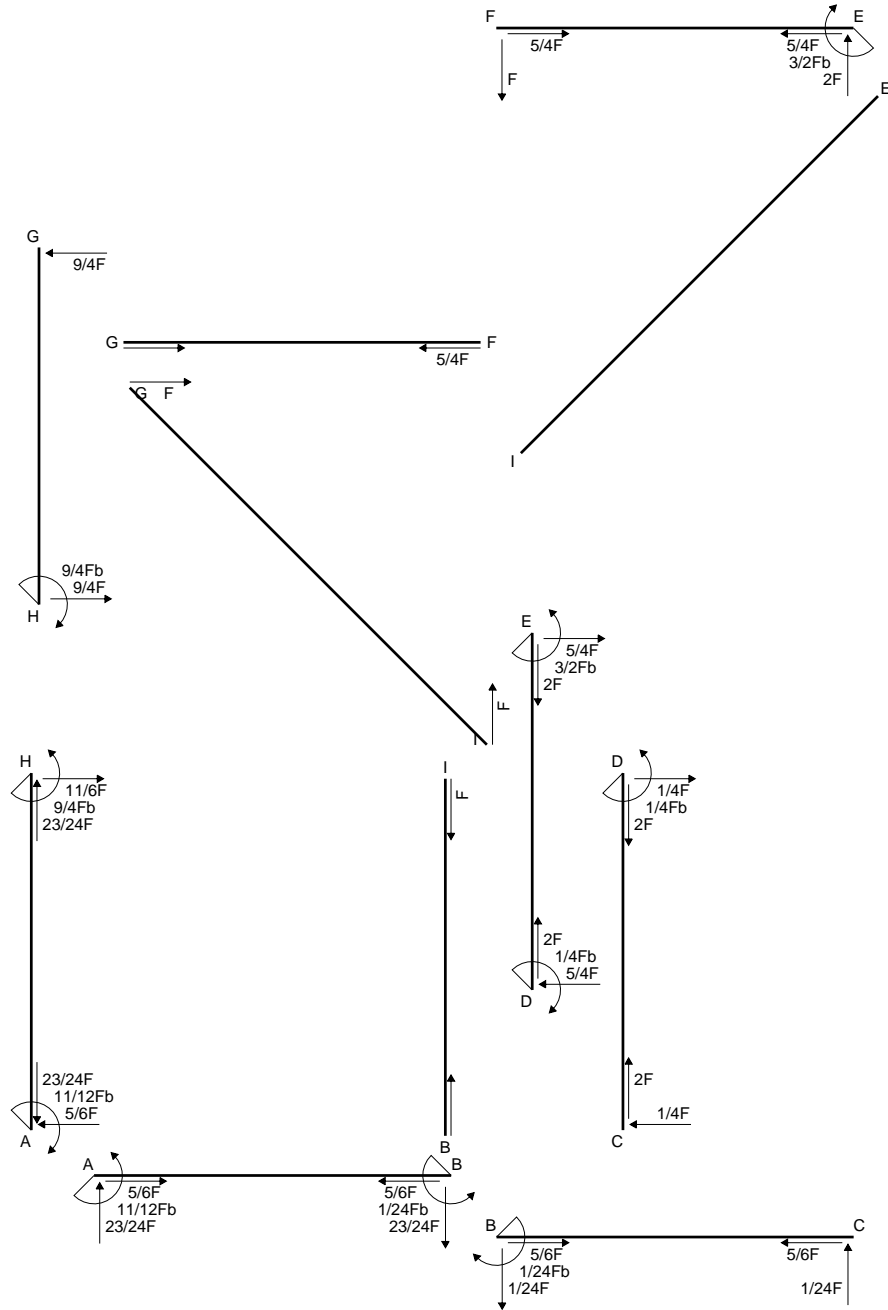
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

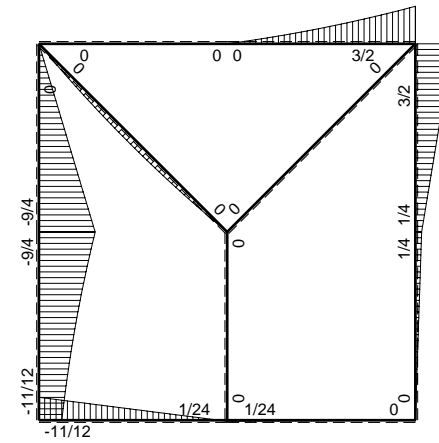
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

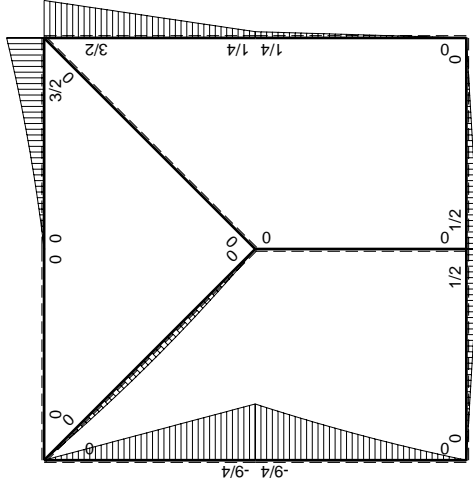
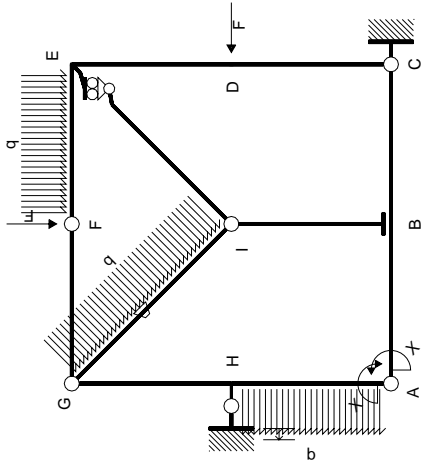


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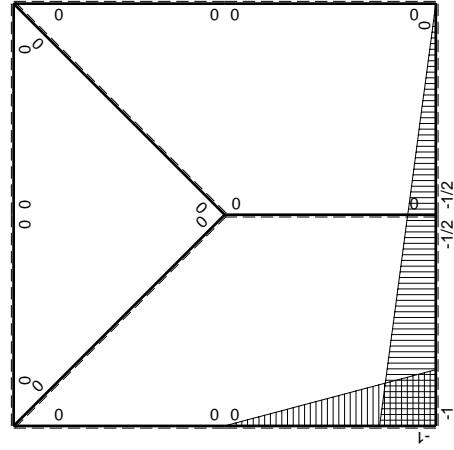
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⊕ ⊖ Fb



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

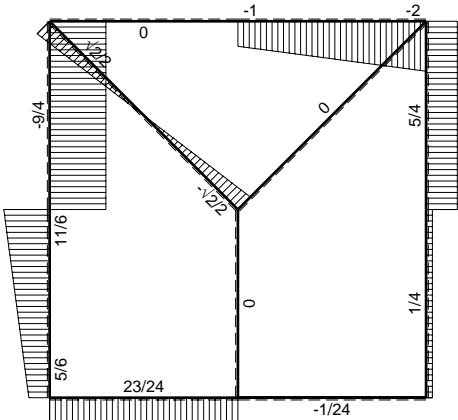
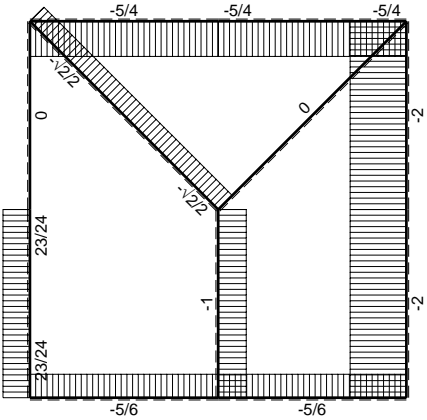
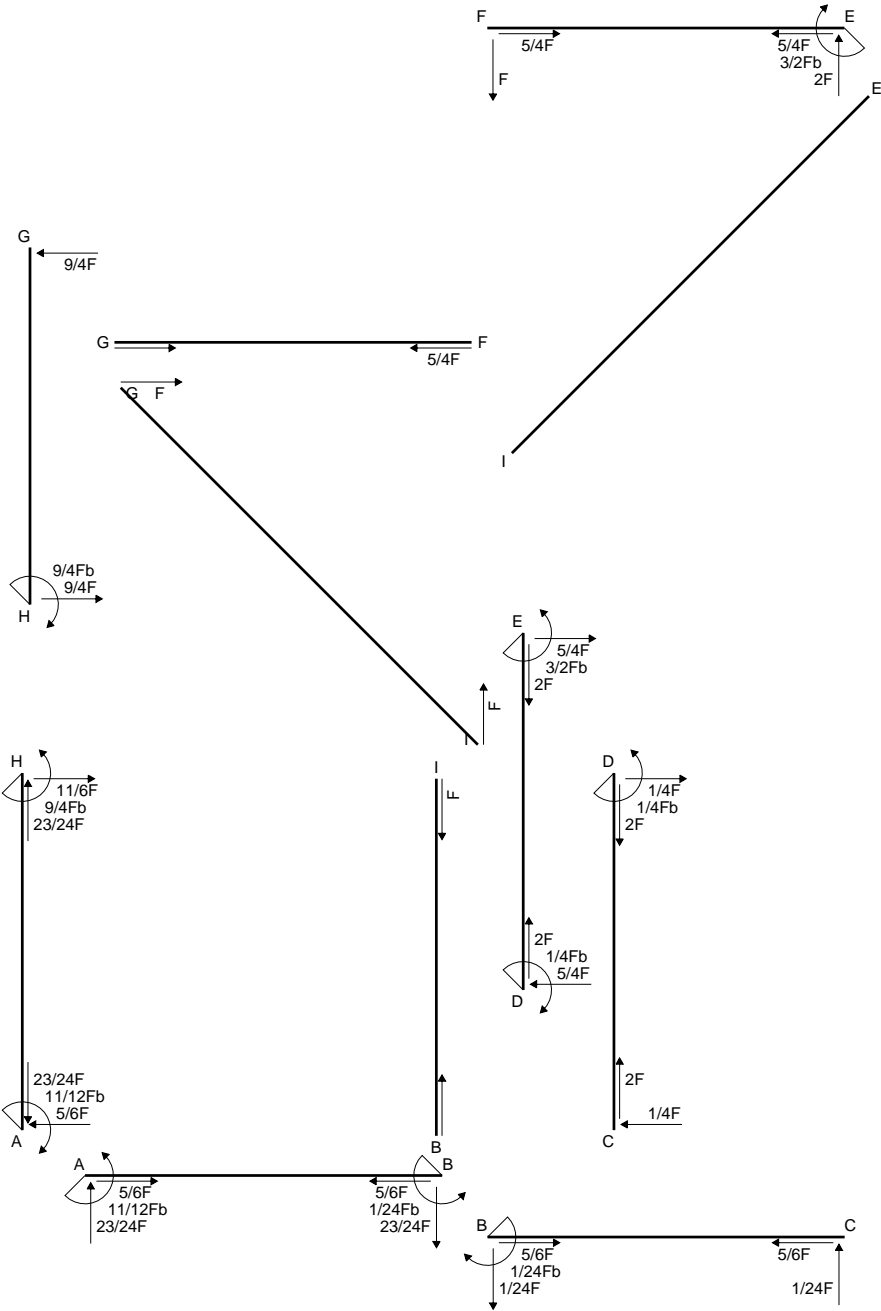
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

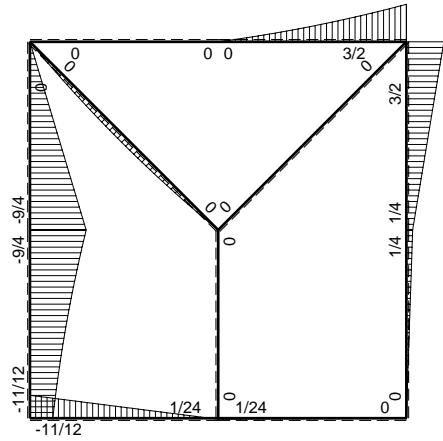
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

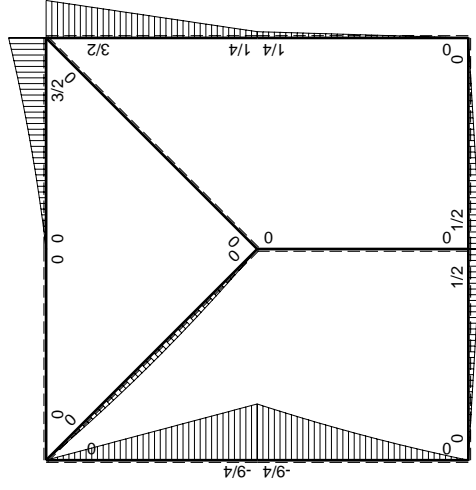
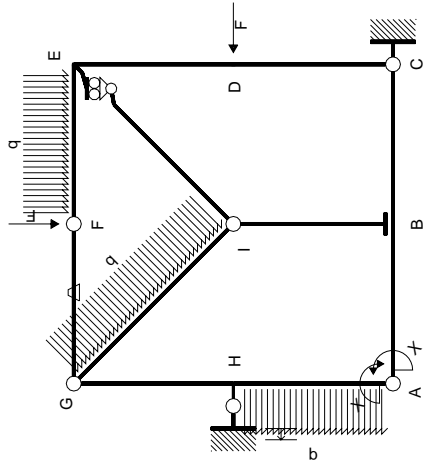


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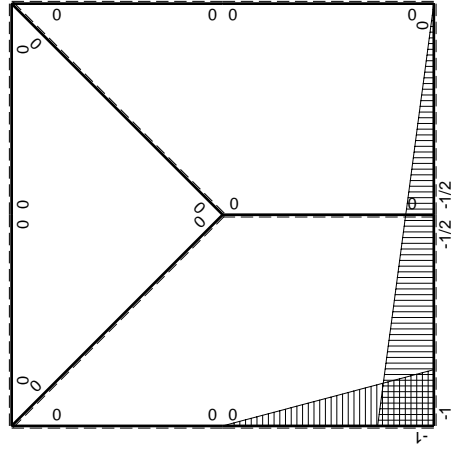
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⊕ ⊖ Fb



M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	0	Fb/EJ	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

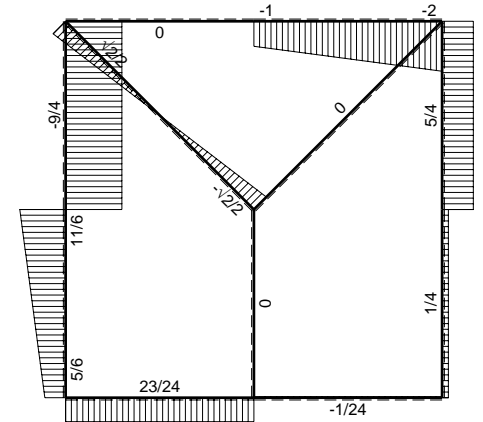
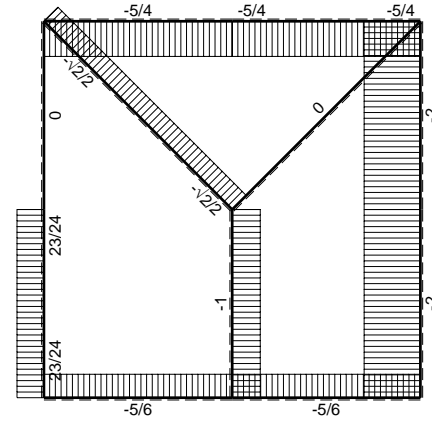
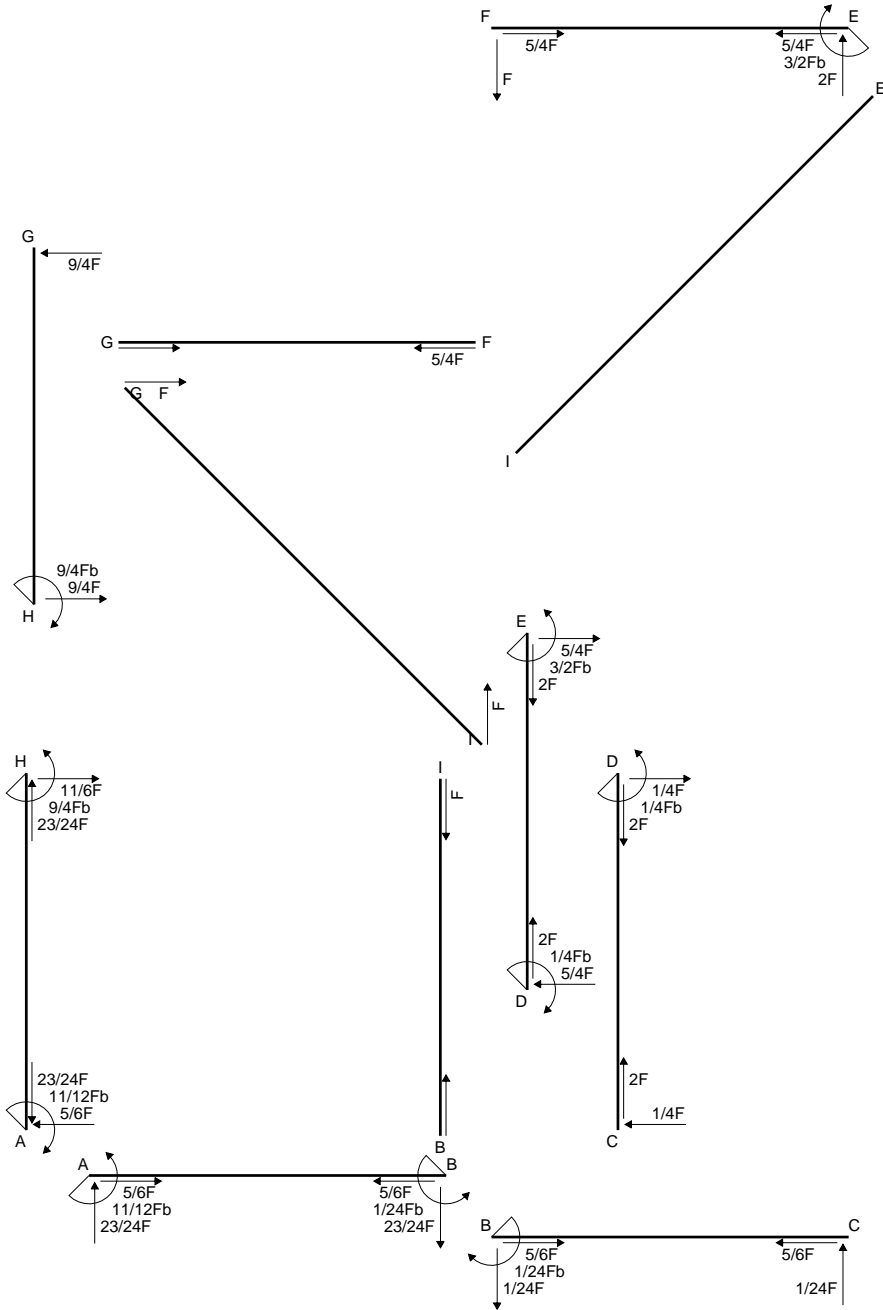
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

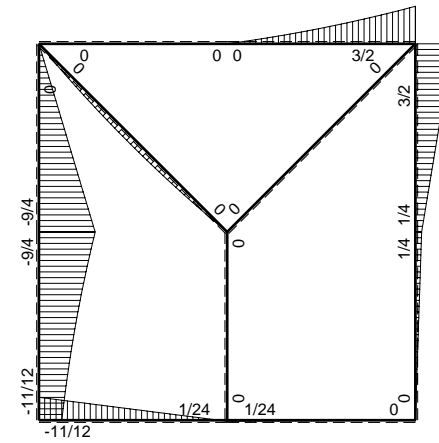
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$



← ⊕ → F

↑ ⊕ ↓ F



⊕ ⊖ F_b

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	Fb/EJ	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0			
FE b	0	$-Fx-1/2qx^2$	0	0	0	0	0+0	0	
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

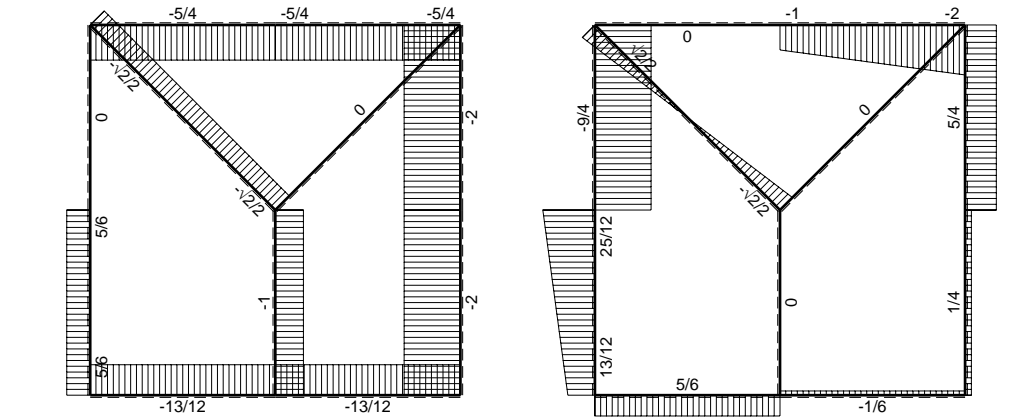
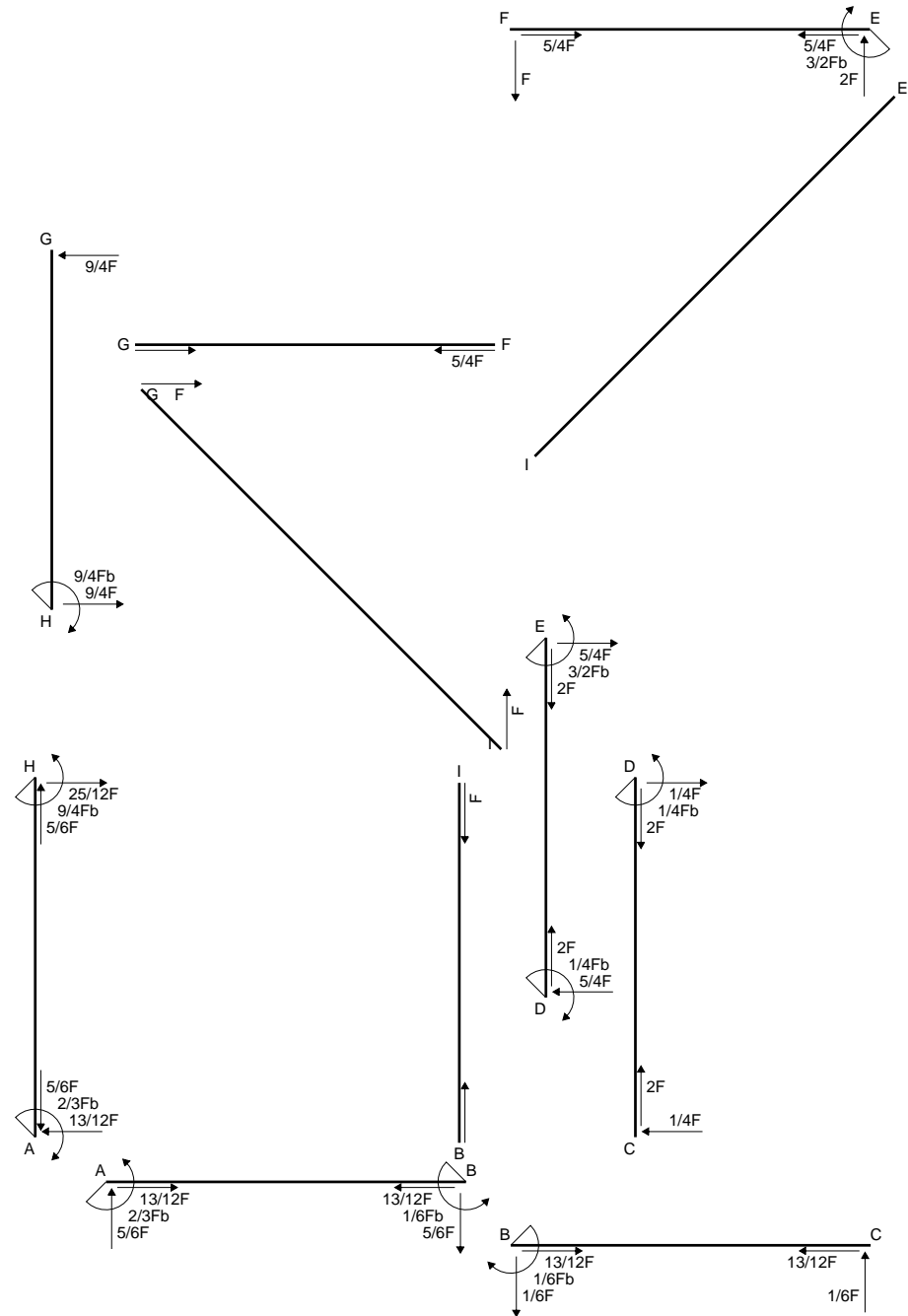
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

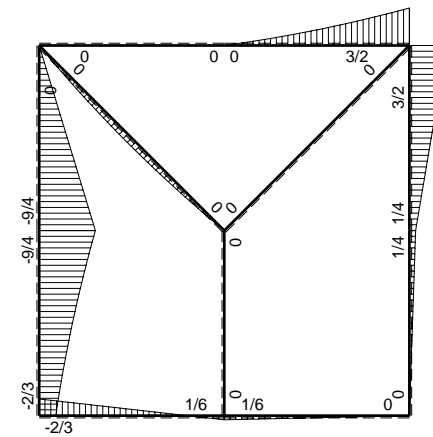
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

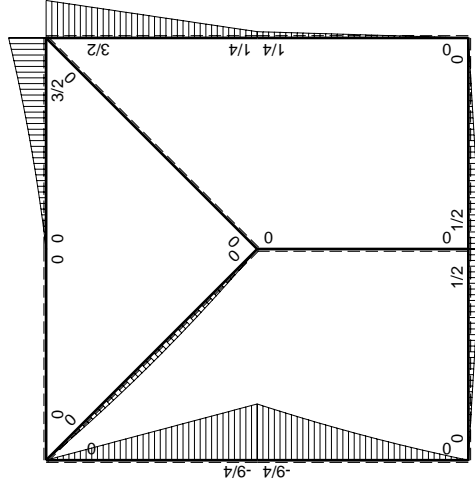
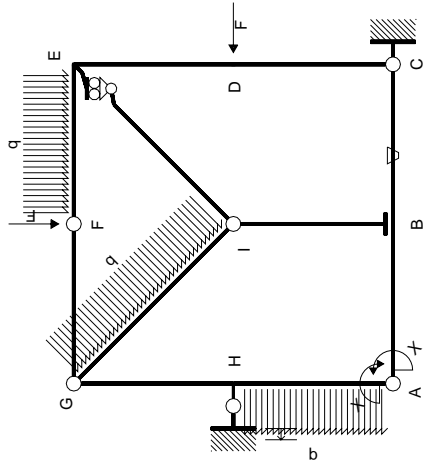


← ⊕ → F

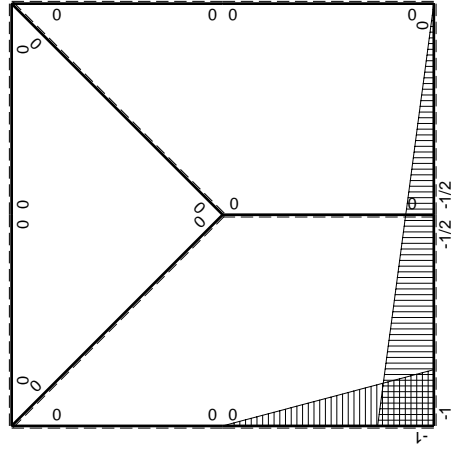
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	$-Fb/EJ$	$-1/4Fb+1/2Fx-1/4Fx^2/b$	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	Fb/EJ	$-1/4Fx^2/b$	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-2/3Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$2/3Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (1/2 - 1/2 x/b) \theta dx$$

$$= \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[1/2 x - 1/4 x^2/b \right]_0^b \theta$$

$$= (-1/4 b + 1/4 b - 1/12 b) Fb 1/EJ + (1/2 b - 1/4 b) \theta = 1/6 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 x/b) \theta dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ + \left[-1/4 x^2/b \right]_0^b \theta$$

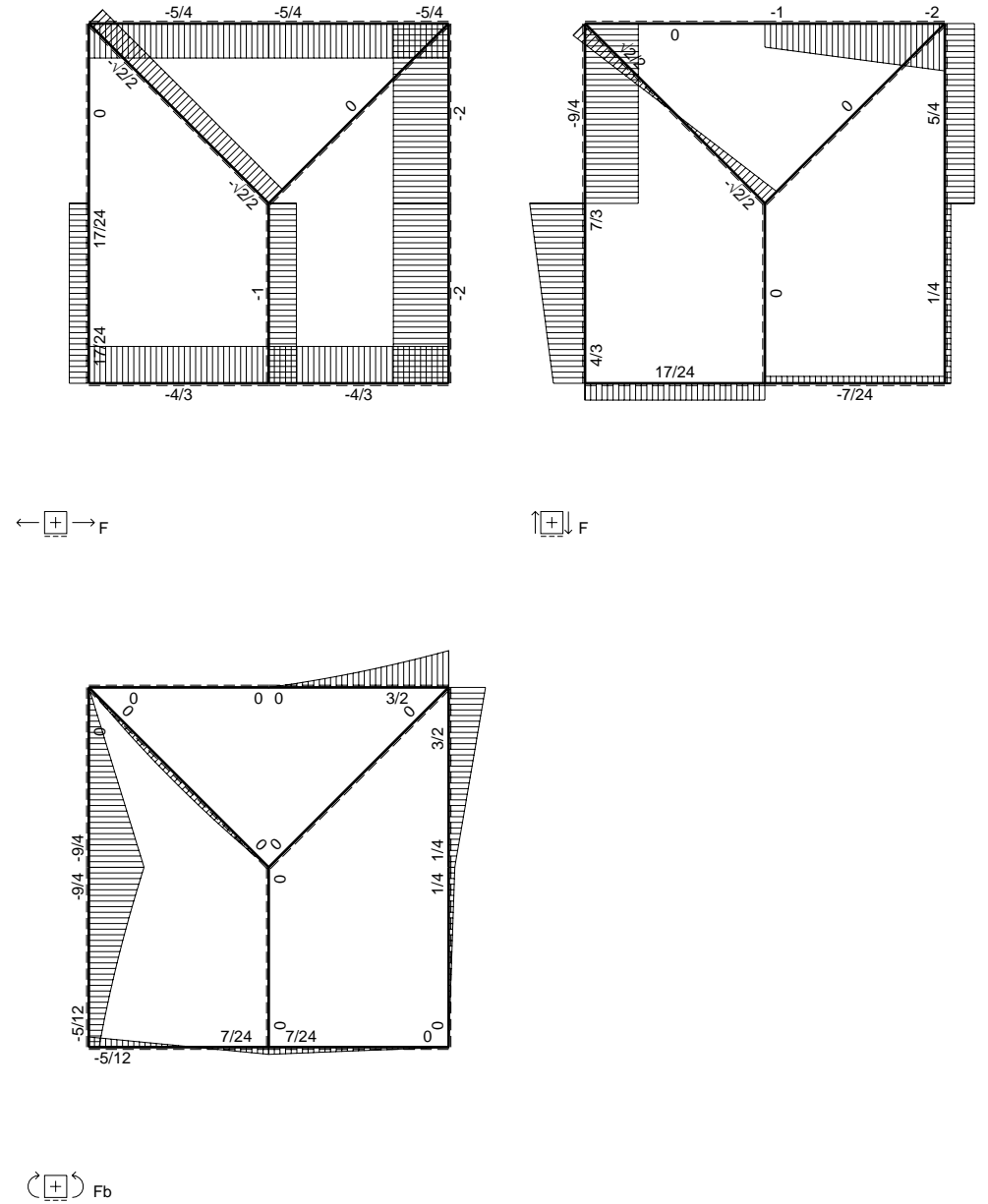
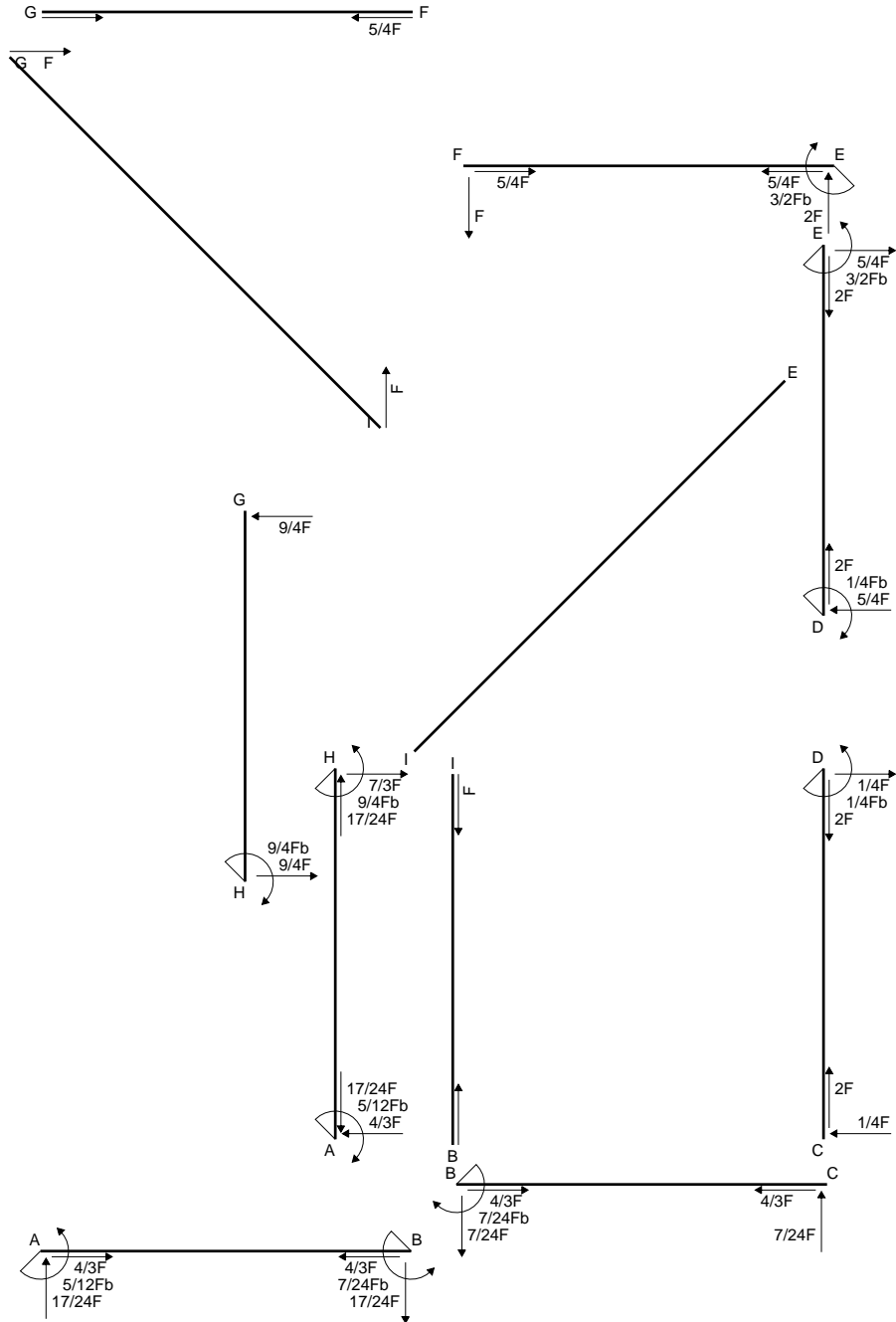
$$= (-1/12 b) Fb 1/EJ + (-1/4 b) \theta = 1/6 Fb^2/EJ$$

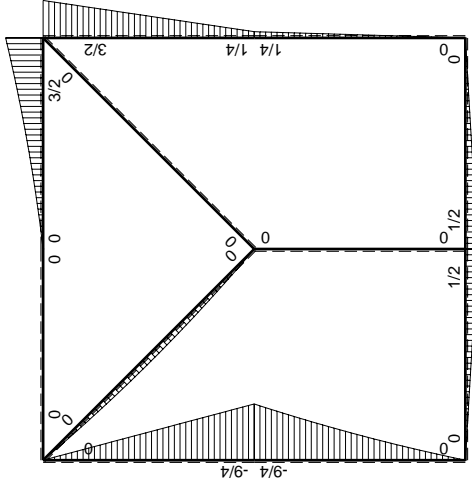
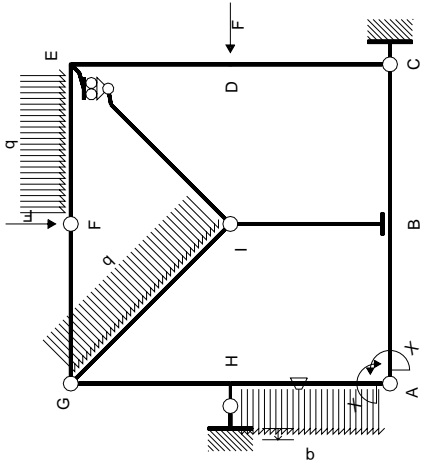
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

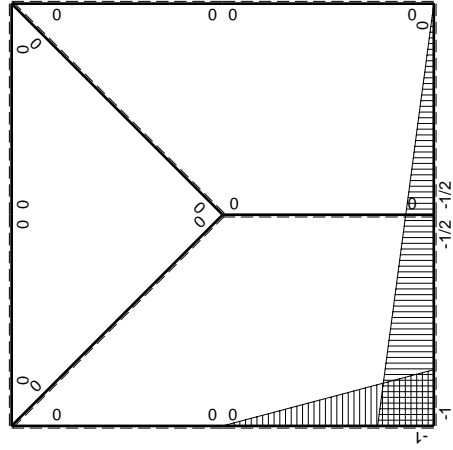
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	$-Fb/EJ$	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(1/3+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	Fb/EJ	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-5/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$5/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

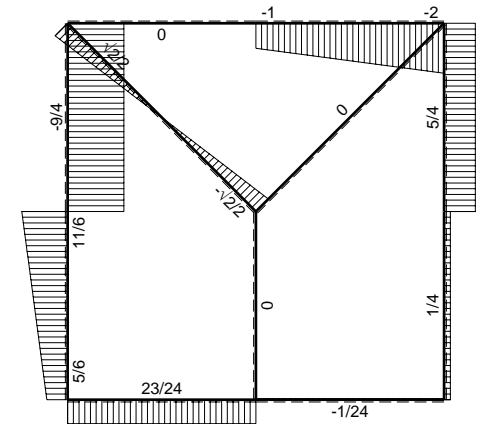
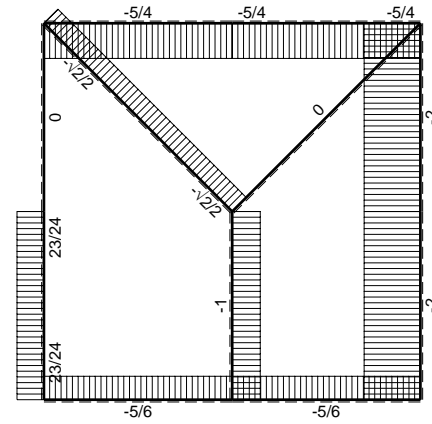
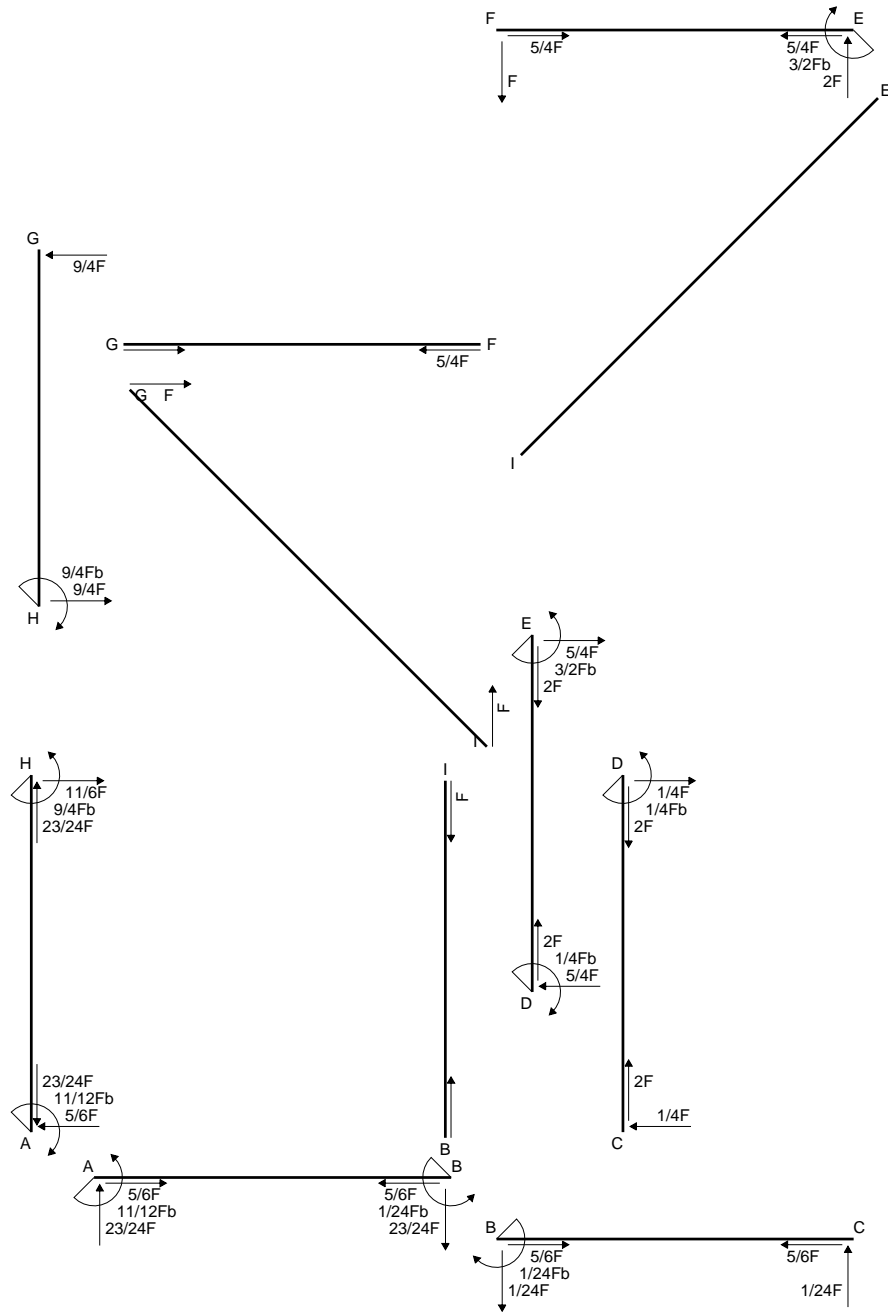
$$= [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ + [1/2 x^2/b]_0^b \theta$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 5/6 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

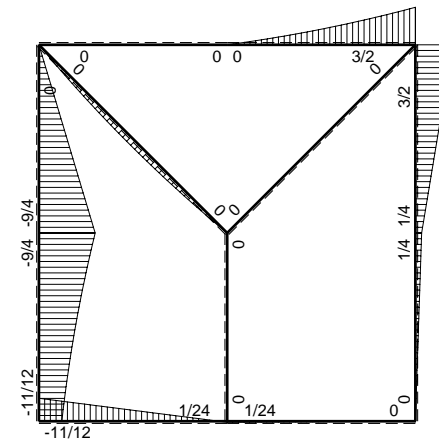
$$= [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ + [-x + 1/2 x^2/b]_0^b \theta$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 5/6 Fb^2/EJ$$



← ⊕ → F

↑ ⊕ ↓ F



⊕ ⊖ Fb

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

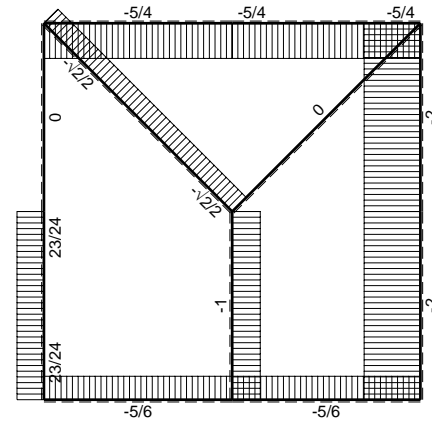
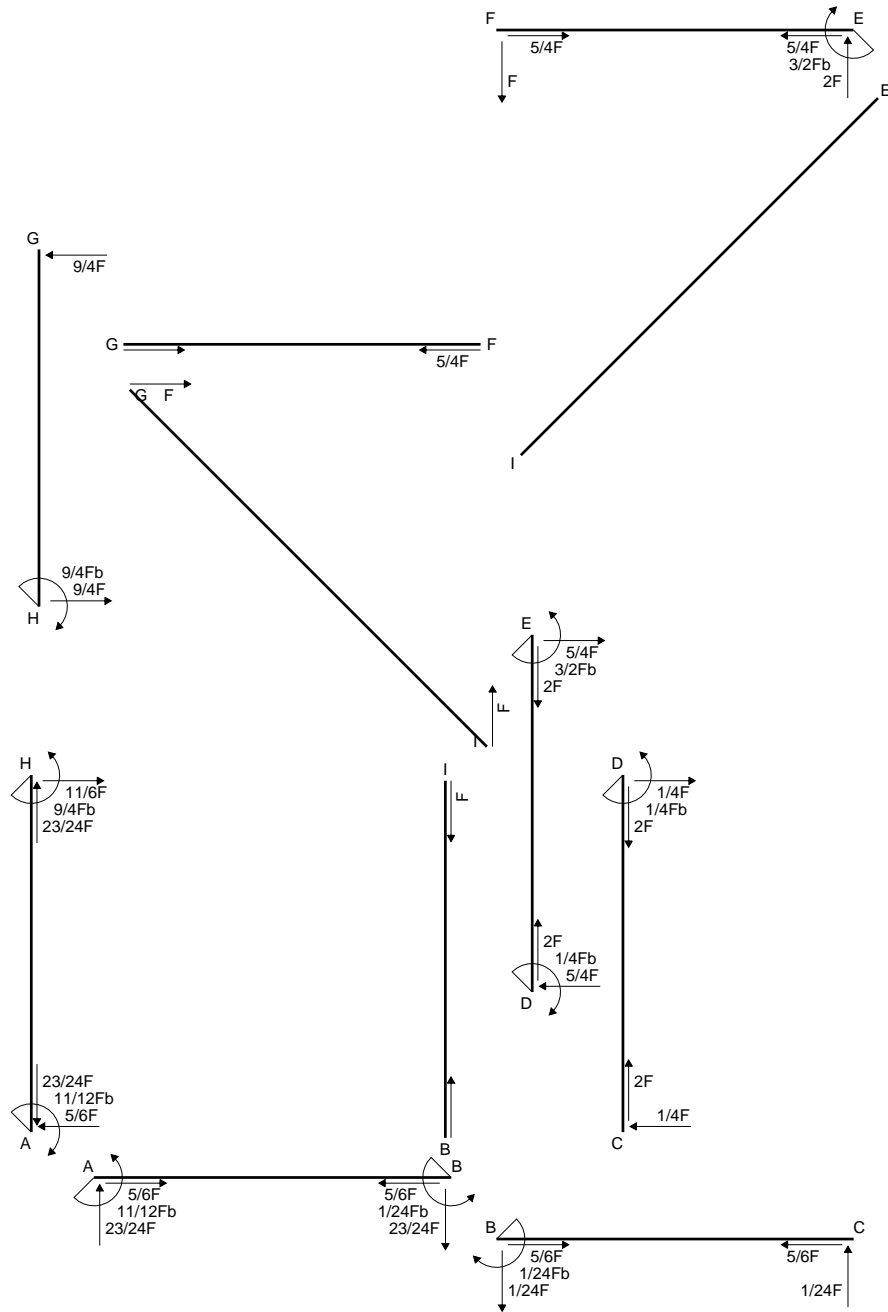
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

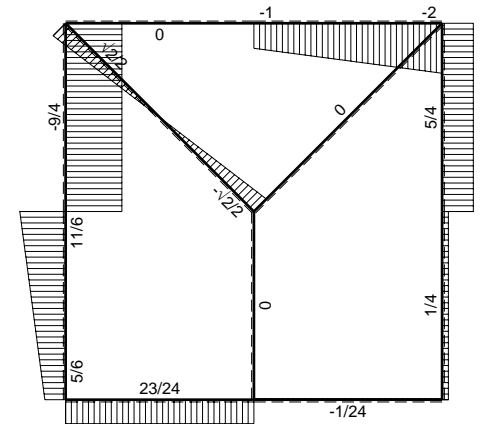
$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

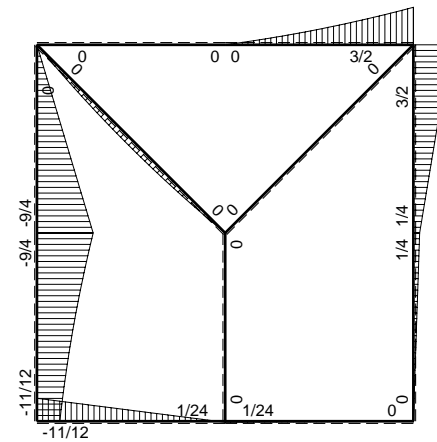
$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$



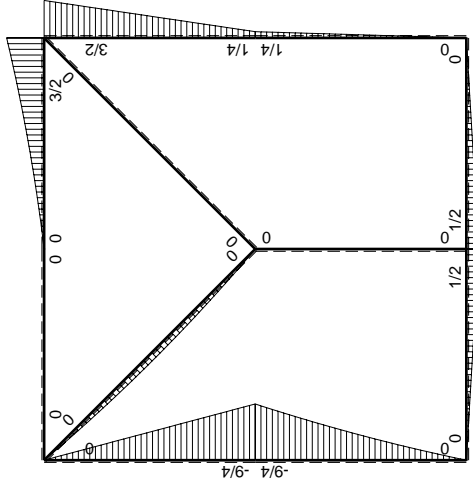
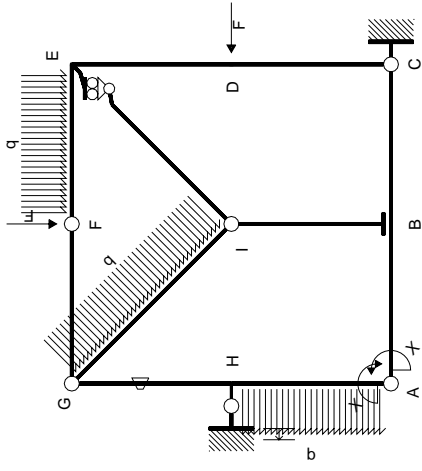
← ⊕ → F



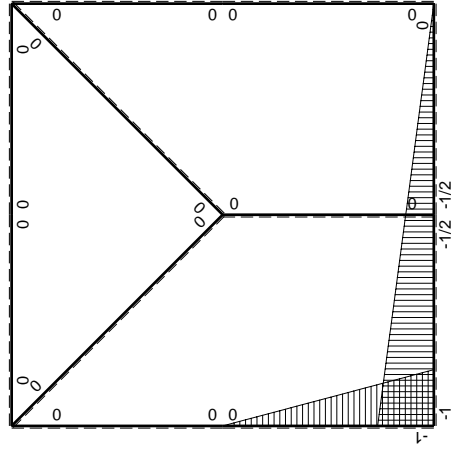
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 , flessione da carichi assegnati



M_x , flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x^2/b + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/12 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = [-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = [-1/12 x^3/b^2]_0^b Fb 1/EJ$$

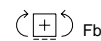
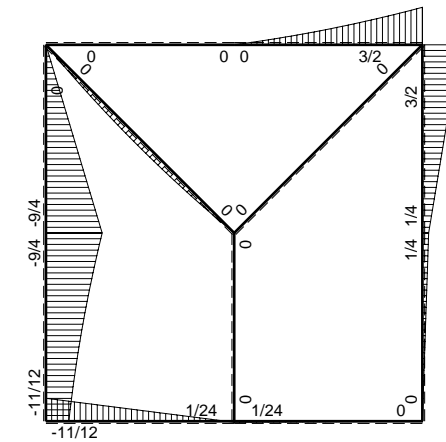
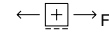
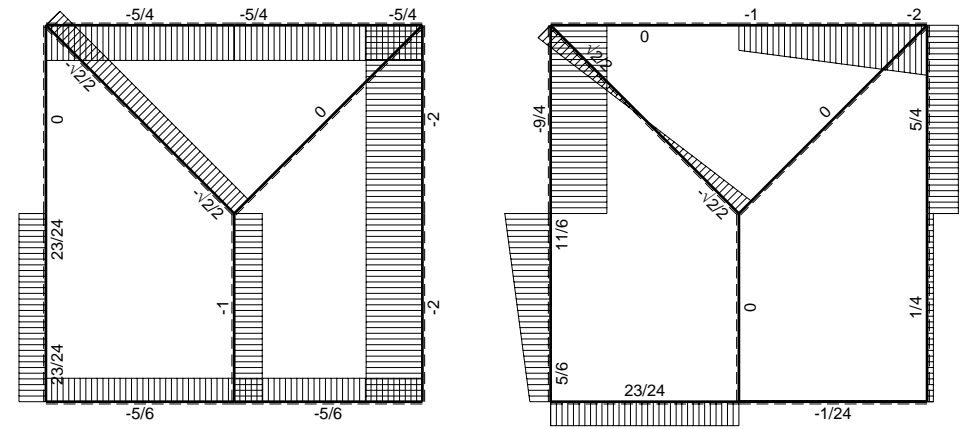
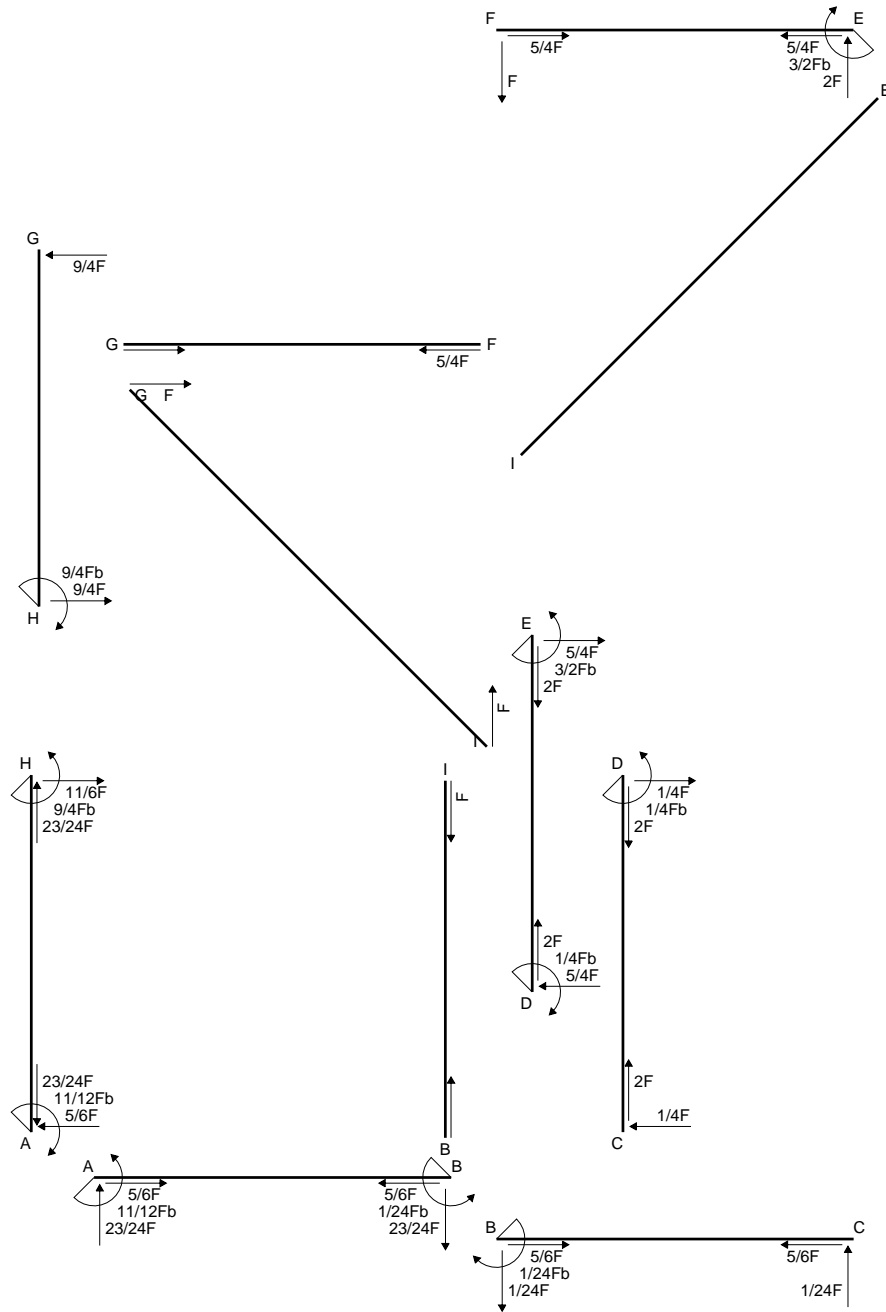
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

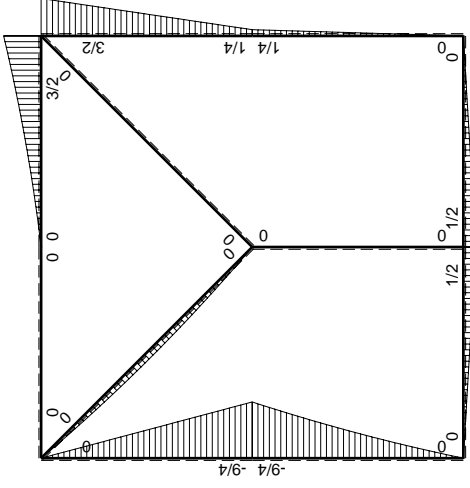
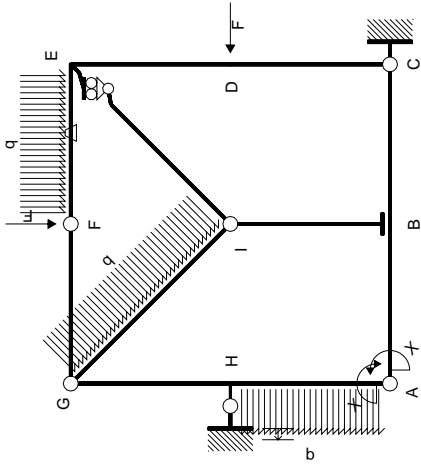
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

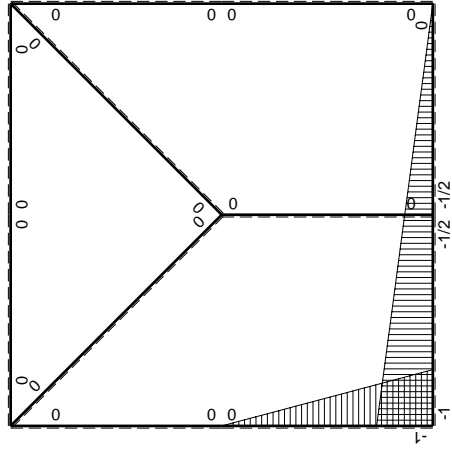
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	0	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	Fb/EJ	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

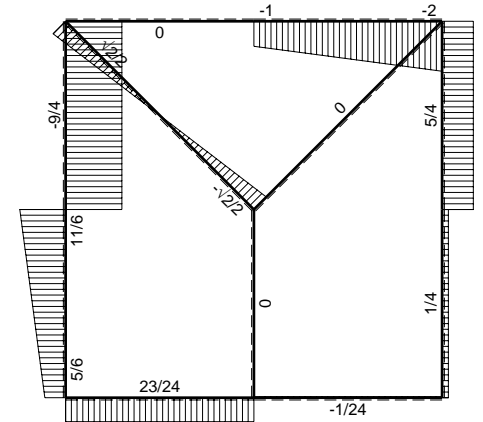
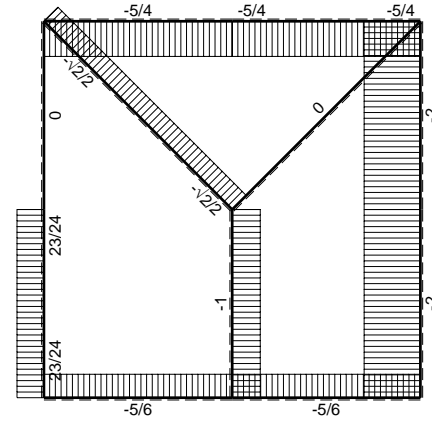
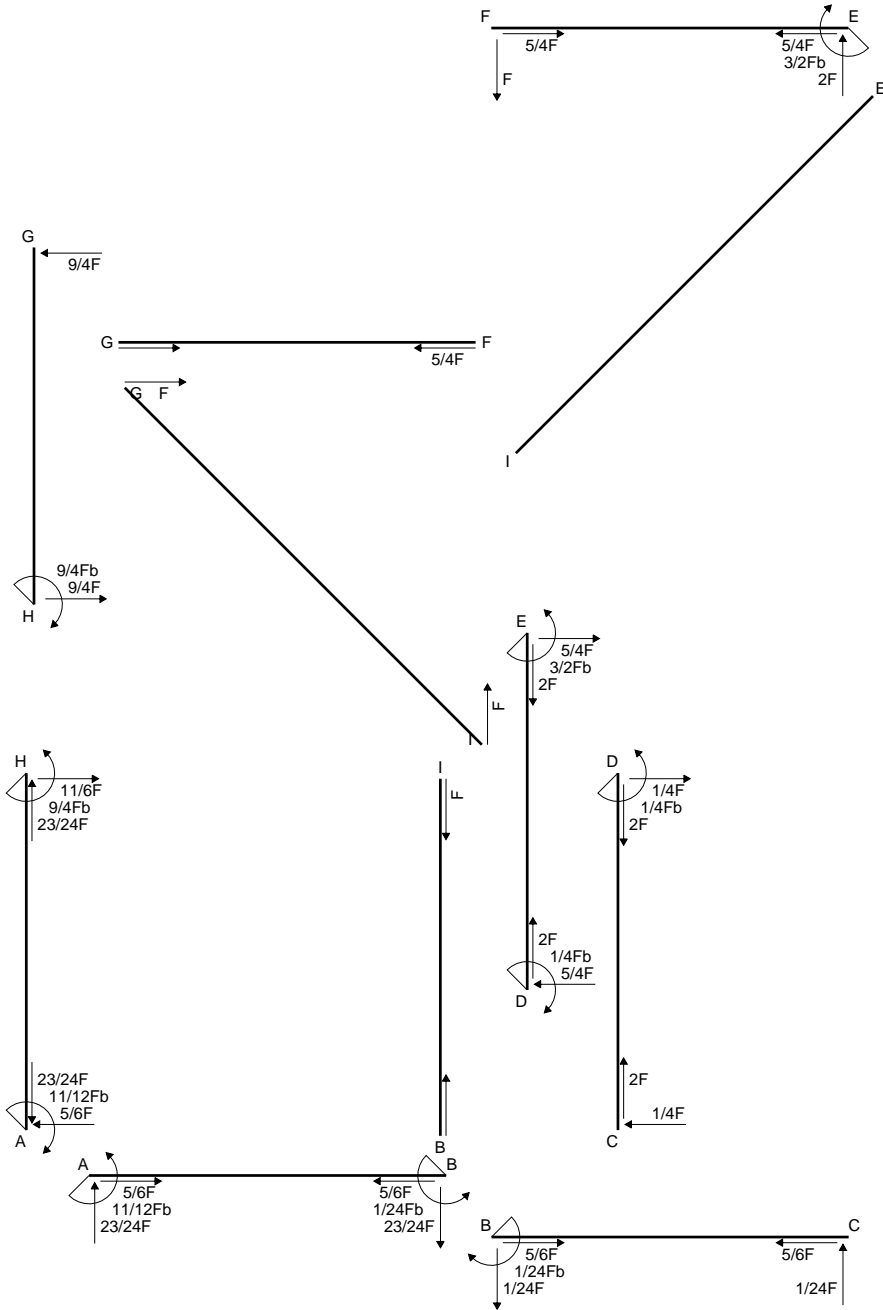
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

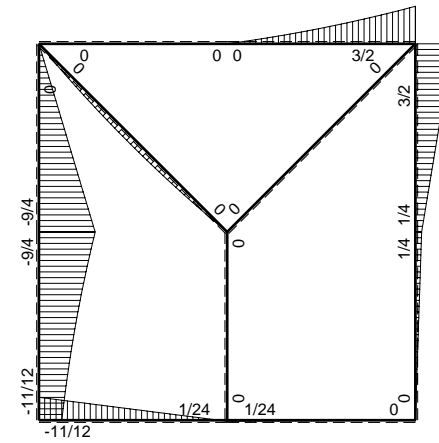
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

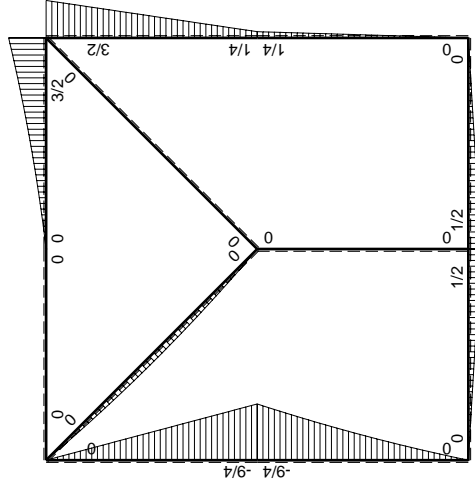
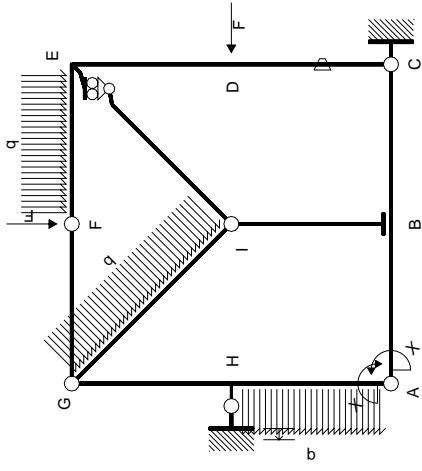


← ⊕ → F

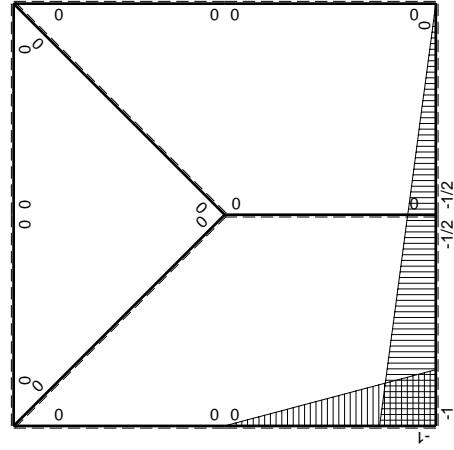
↑ ⊕ ↓ F



⊕ ⊖ F_b



M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/2Fx$	0	$-1/2Fx+1/4Fx^2/b$	0	$1-x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/2Fb+1/2Fx$	0	$-1/4Fb+1/4Fx^2/b$	0	$1/4+1/2x/b+1/4x^2/b^2$	$(-1/6+0)Fb^2/EJ$	$7/12Xb/EJ$	
BC b	$-1/2+1/2x/b$	$1/2Fb-1/2Fx$	0	$-1/4Fb+1/2Fx-1/4Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/12+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-1/2Fx$	0	$-1/4Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$1/4Fx$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$-1/4Fb+1/4Fx$	Fb/EJ	0	0	0			
DE b	0	$1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-3/2Fb+5/4Fx$	0	0	0	0			
EF b	0	$3/2Fb-2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-Fx-1/2qx^2$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	$\sqrt{2}/2Fx-1/2qx^2$	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-11/12Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$11/12Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/2 x/b + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/4 + 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

$$= (-1/4 b + 1/12 b) Fb 1/EJ = -1/6 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-1/4 + 1/2 x/b - 1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/4 x + 1/4 x^2/b - 1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

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

$$L_{CB}^{xo} = \int_0^b (-1/4 x^2/b^2) Fb 1/EJ dx = \left[-1/12 x^3/b^2 \right]_0^b Fb 1/EJ$$

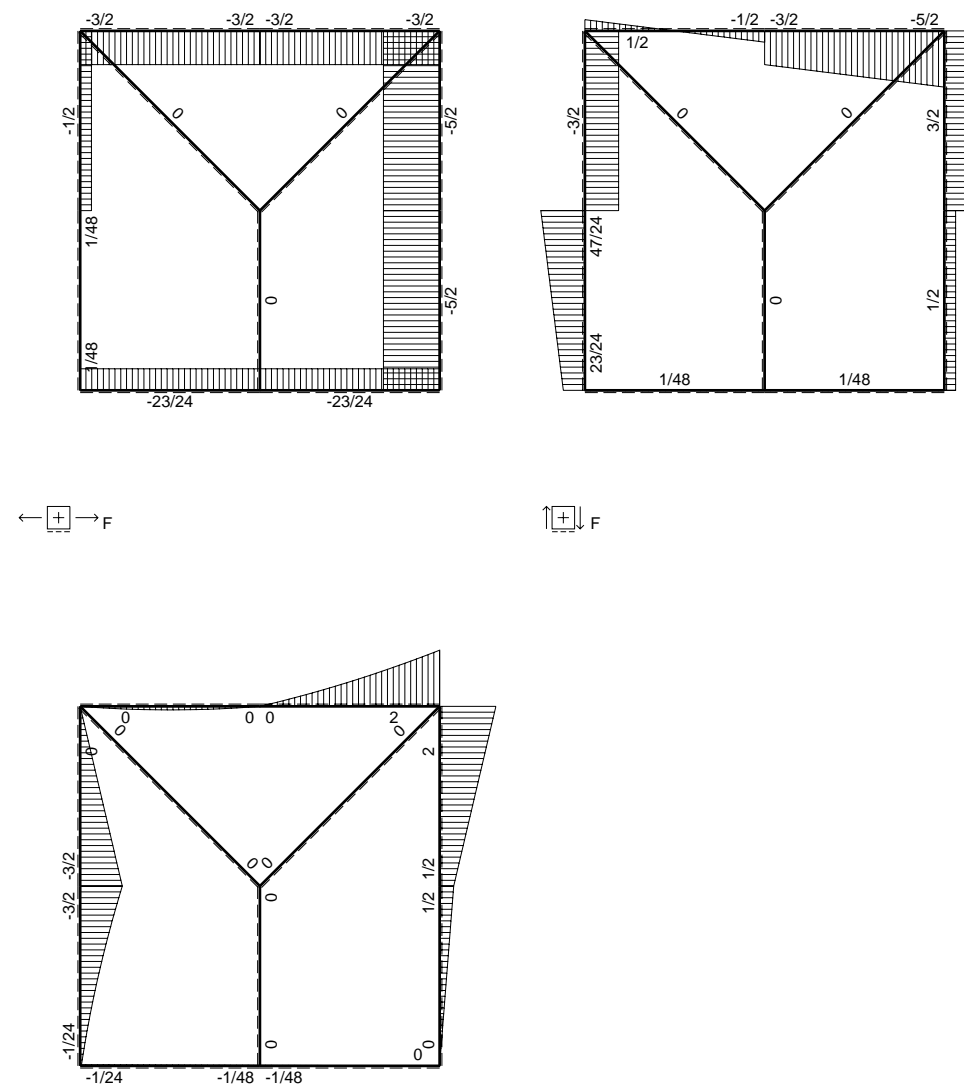
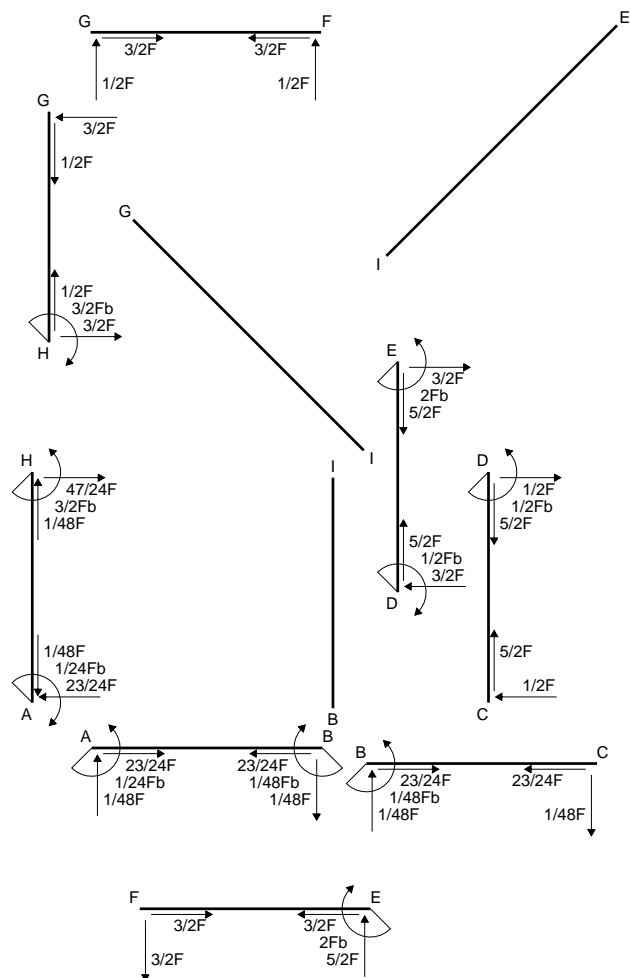
$$= (-1/12 b) Fb 1/EJ = -1/12 Fb^2/EJ$$

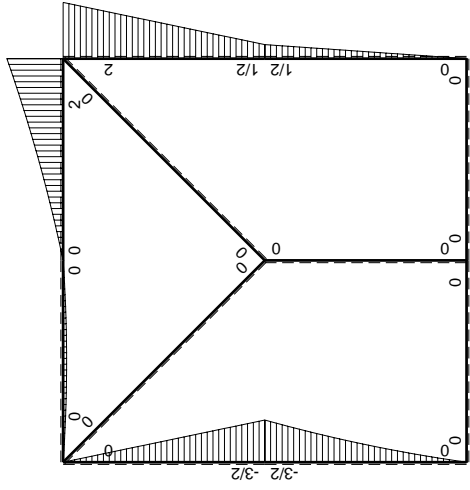
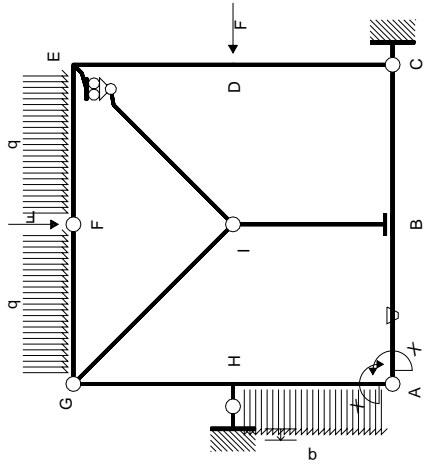
$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

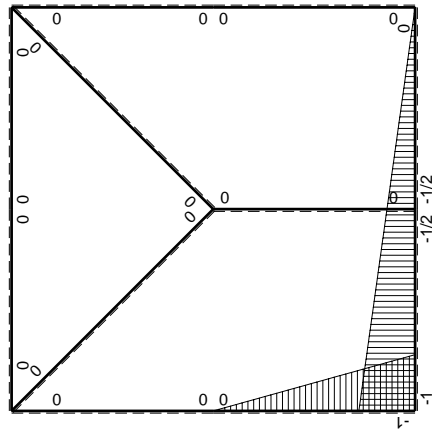
$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJdx$	
AB b	$-1+1/2x/b$	0	$-Fb/EJ$	0	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(0+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	Fb/EJ	0	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (1 - 1/2 x/b) \theta dx = [x - 1/4 x^2/b]_0^b \theta$$

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

$$L_{BA}^{xo} = \int_0^b (-1/2 - 1/2 x/b) \theta dx = [-1/2 x - 1/4 x^2/b]_0^b \theta$$

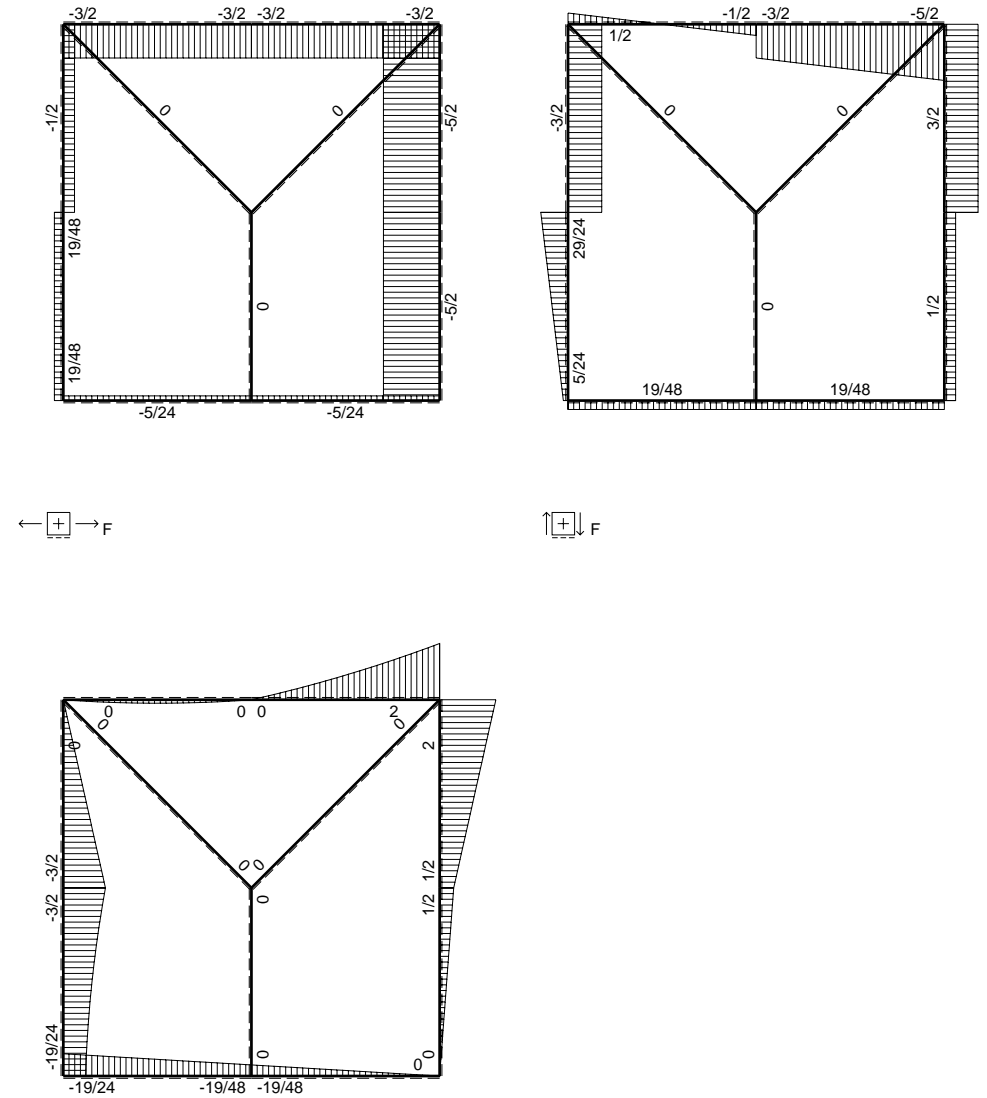
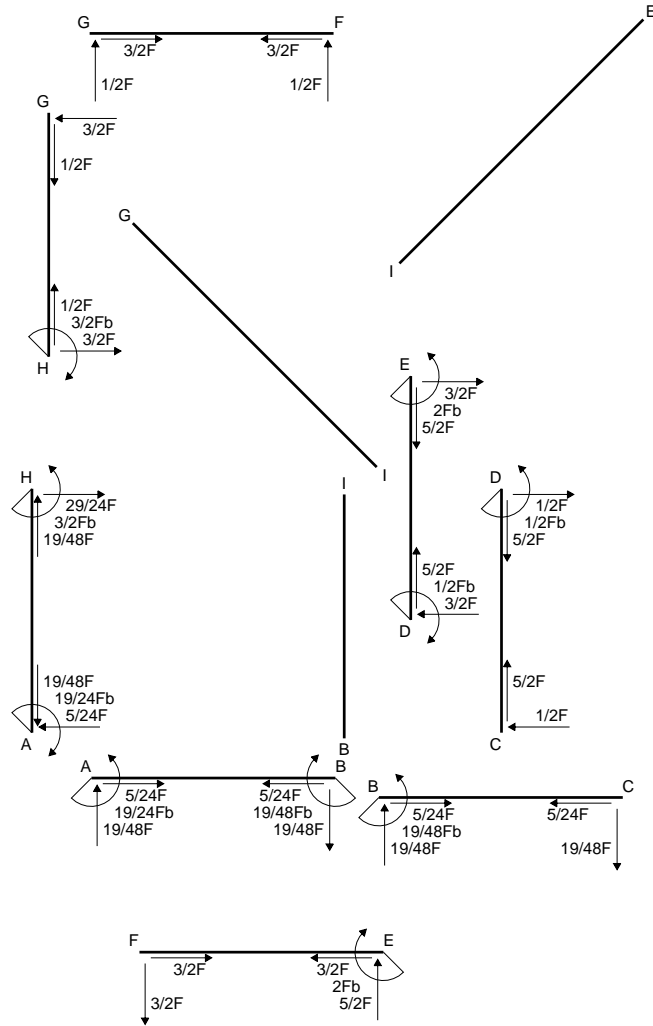
$$= (-1/2 b - 1/4 b) \theta = 3/4 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

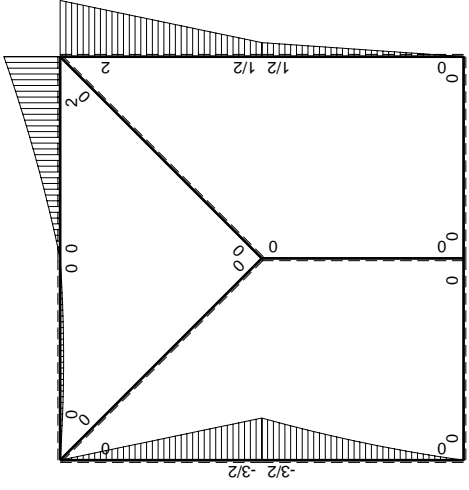
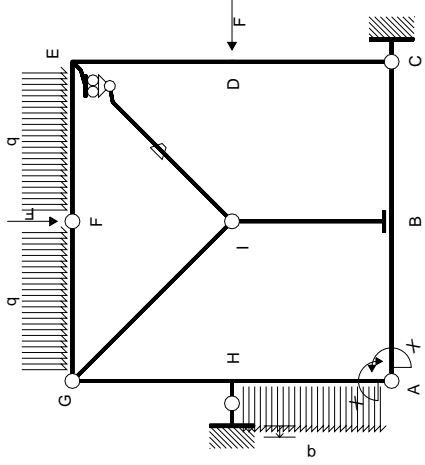
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

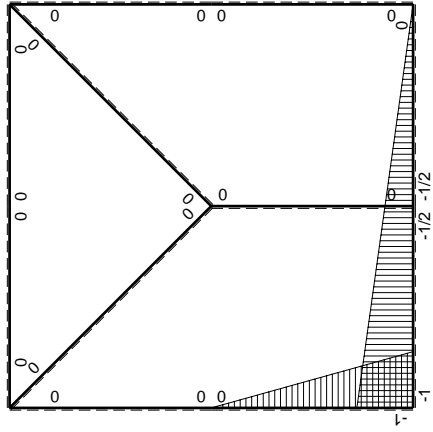
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



$\boxed{+}$ \rightarrow F_b



M_0 flessione da carichi assegnati



M_1 flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

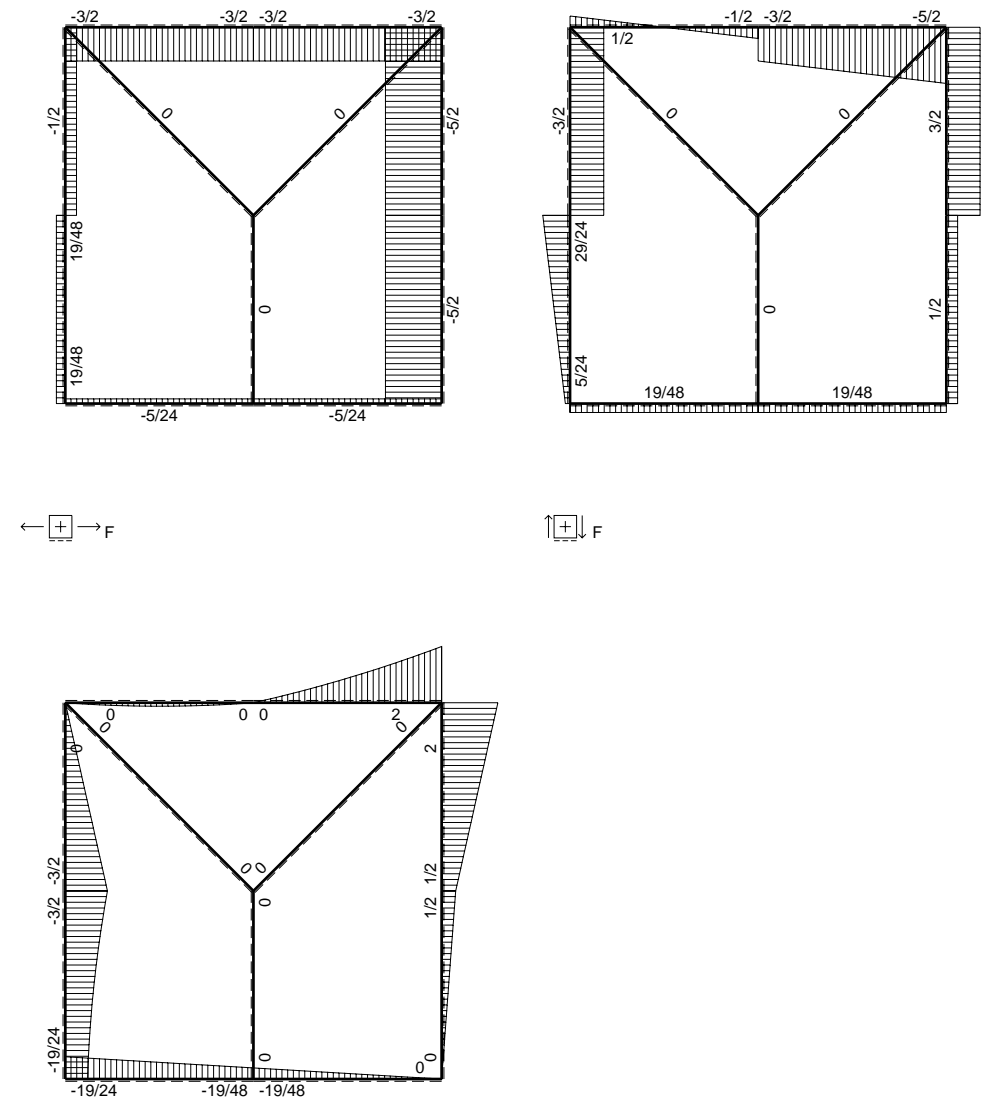
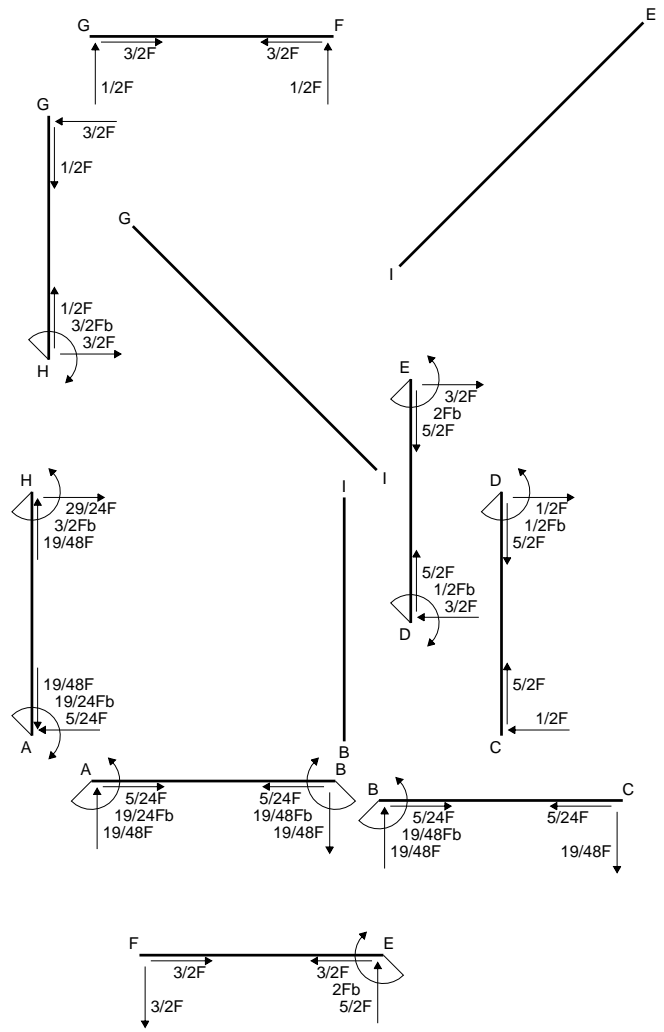
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

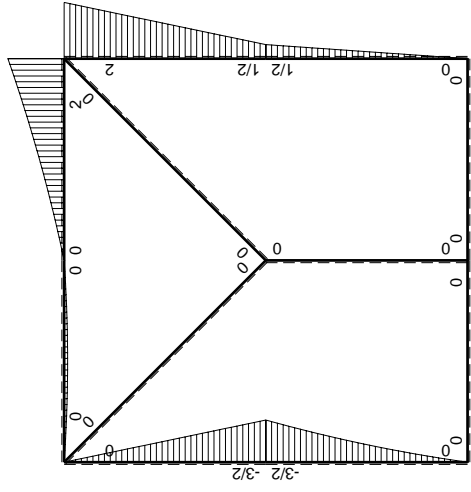
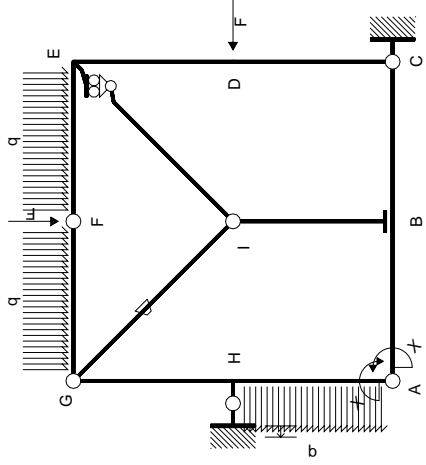
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

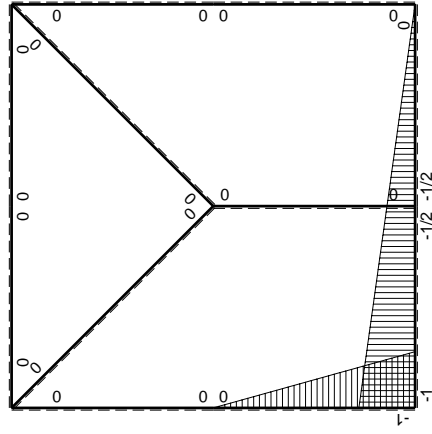
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



⊕ Fb



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	$-Fb/EJ$	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

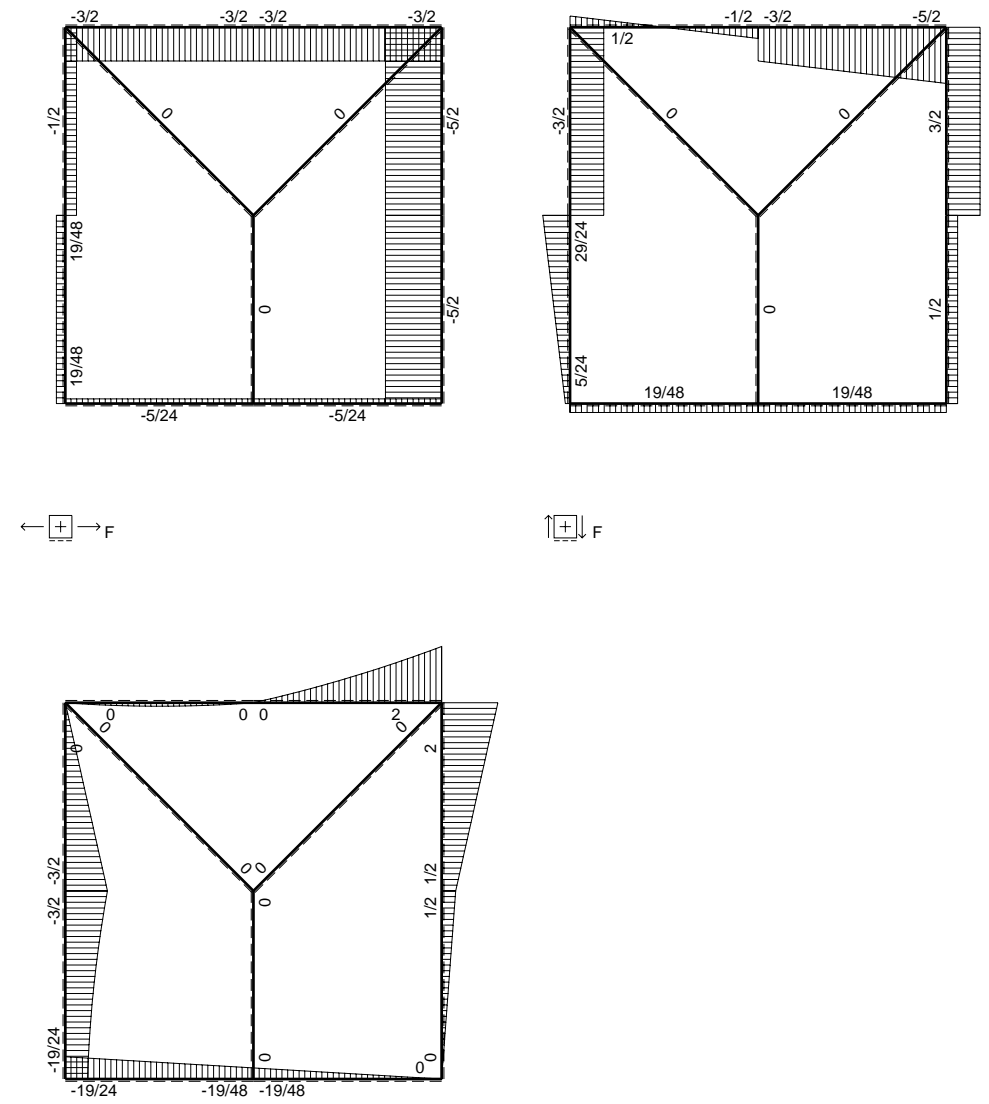
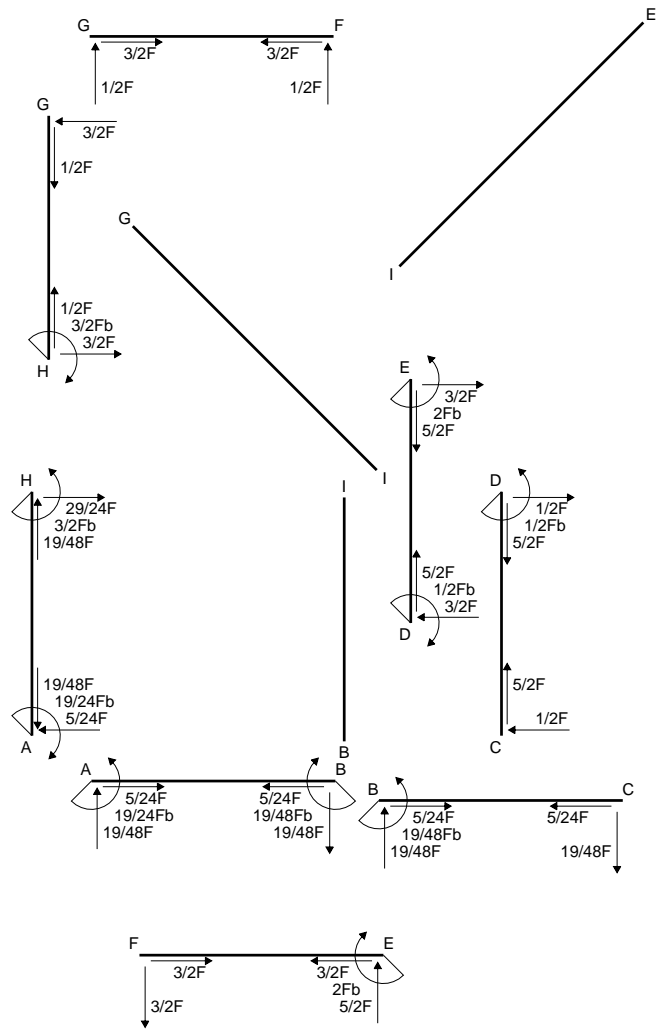
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

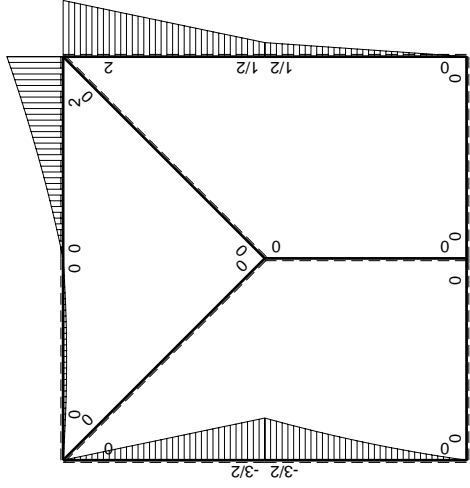
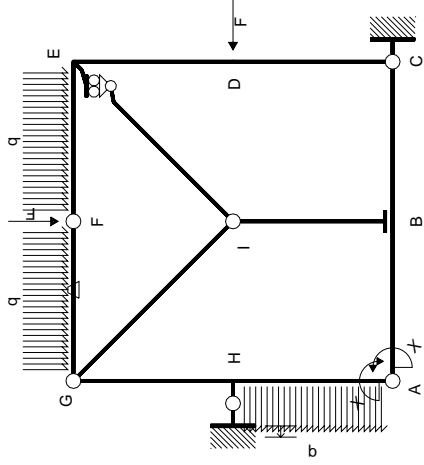
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

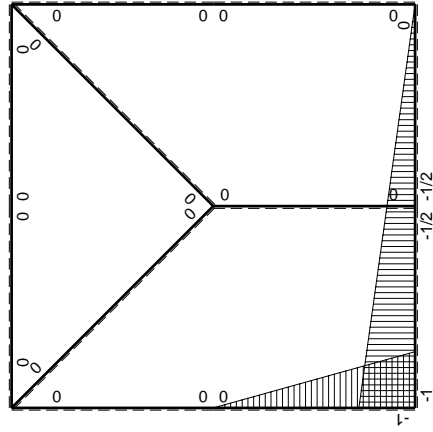
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



\oplus Fb



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	Fb/EJ	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

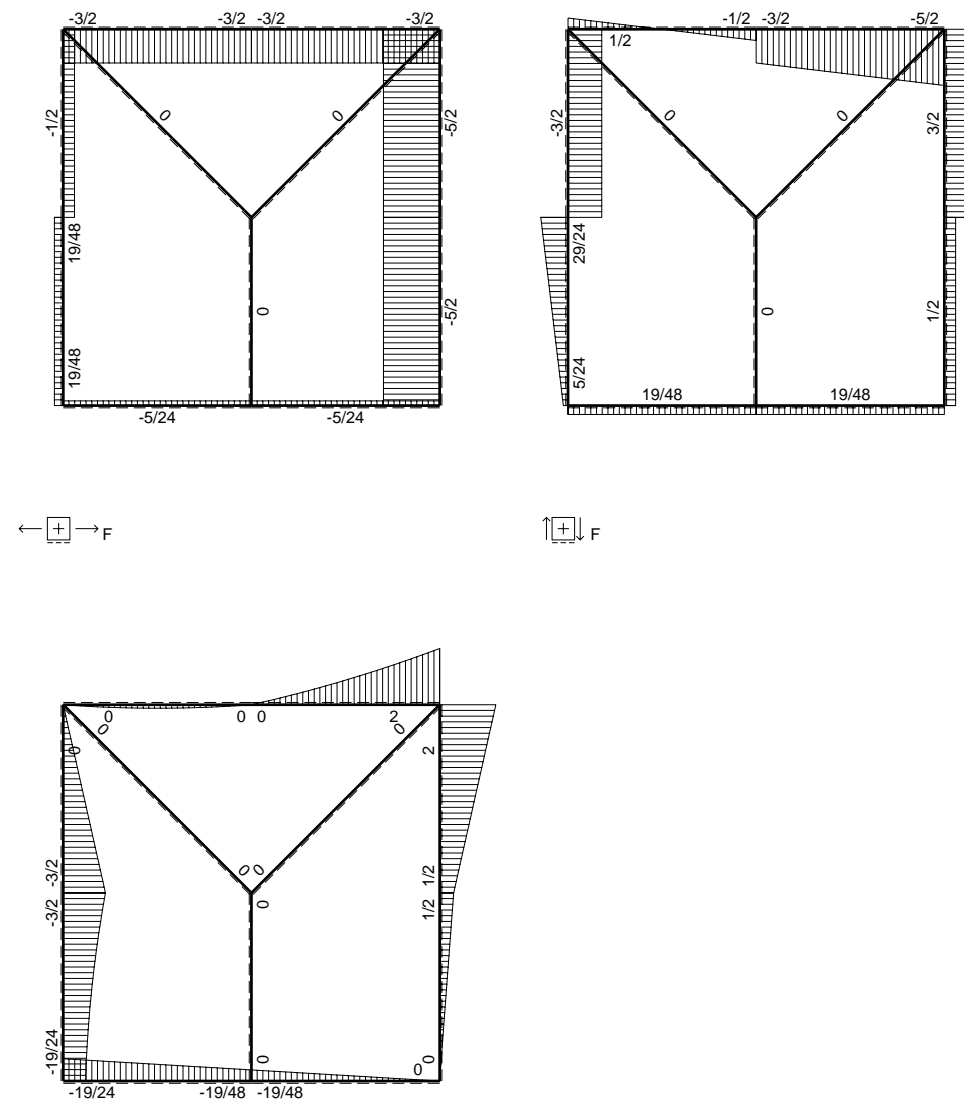
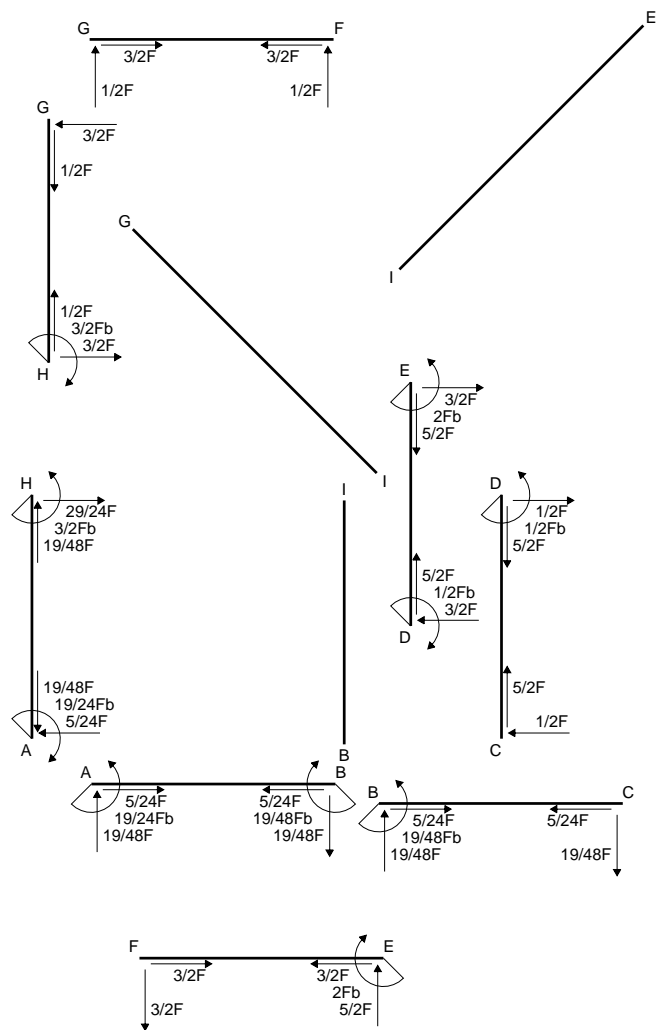
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



$\boxed{+}$ \curvearrowright F_b

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	$-Fb/EJ$	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	Fb/EJ	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

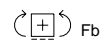
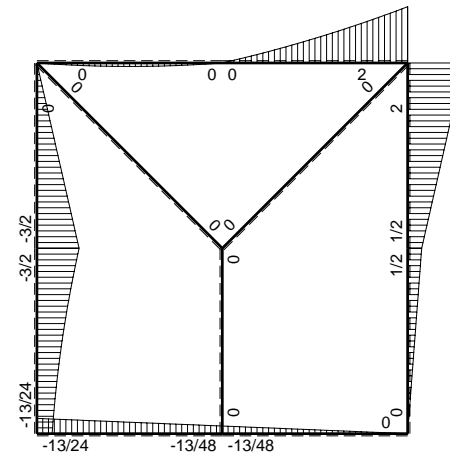
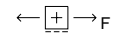
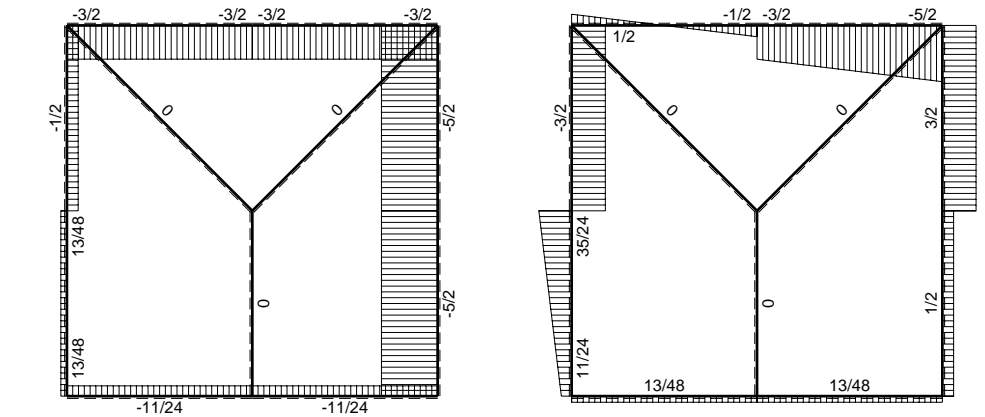
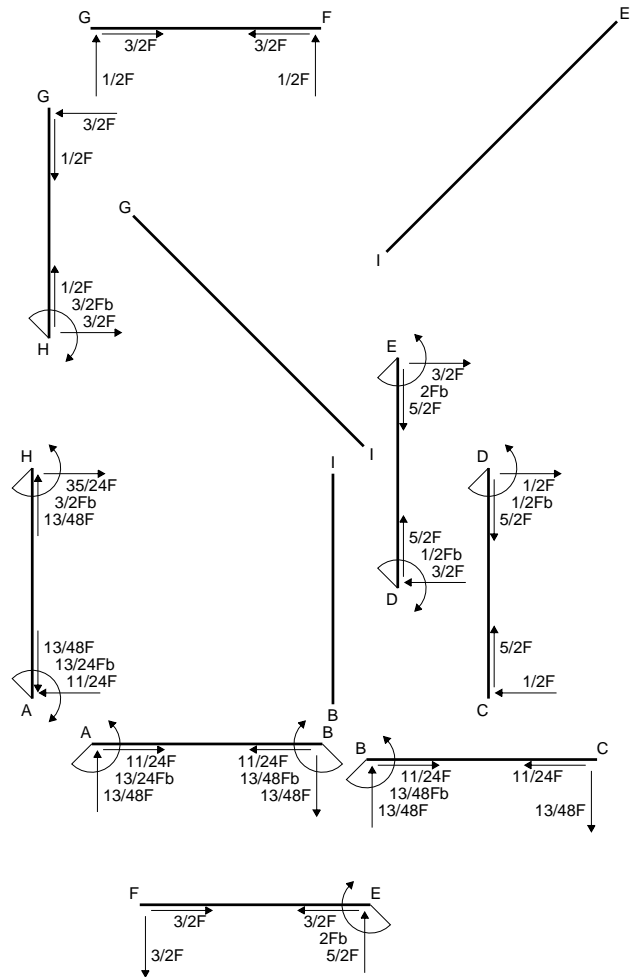
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

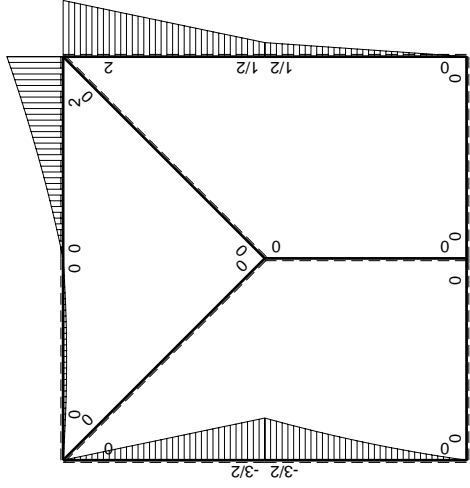
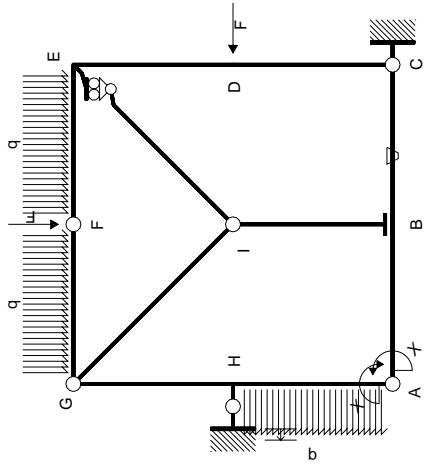
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

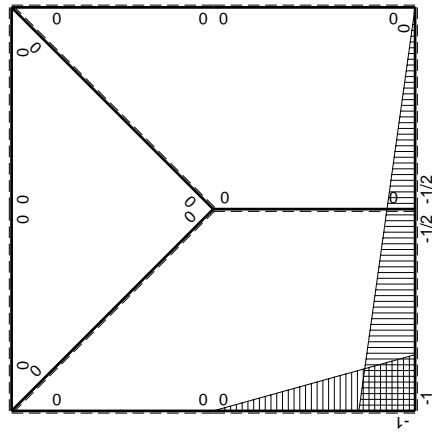
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	$-Fb/EJ$	0	$1/2Fb/EJ-1/2Fx/EJ$	$1/4-1/2x/b+1/4x^2/b^2$	$(0+1/4)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	Fb/EJ	0	$1/2Fx/EJ$	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-13/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$13/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{BC}^{xo} = \int_0^b (1/2 - 1/2 x/b) \theta dx = [1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (1/2 b - 1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-1/2 x/b) \theta dx = [-1/4 x^2/b]_0^b \theta$$

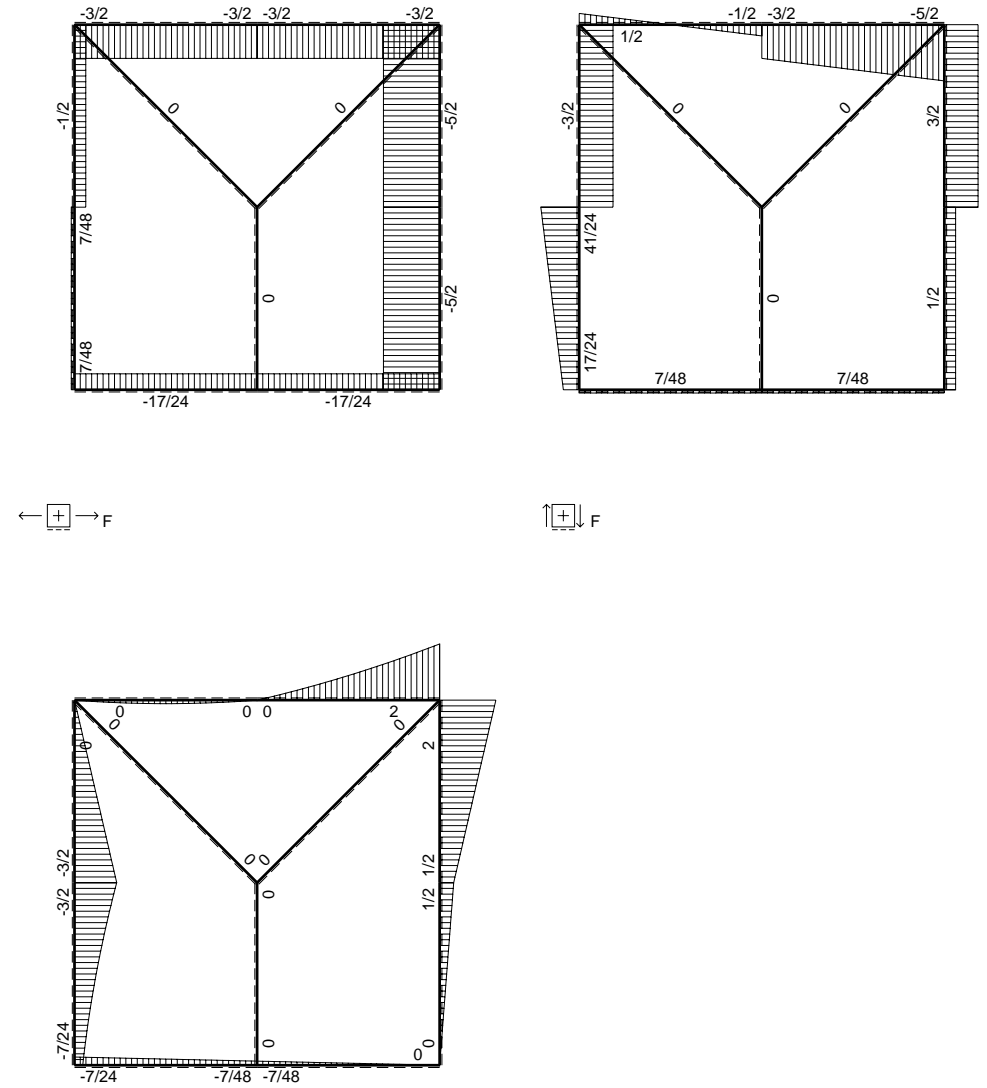
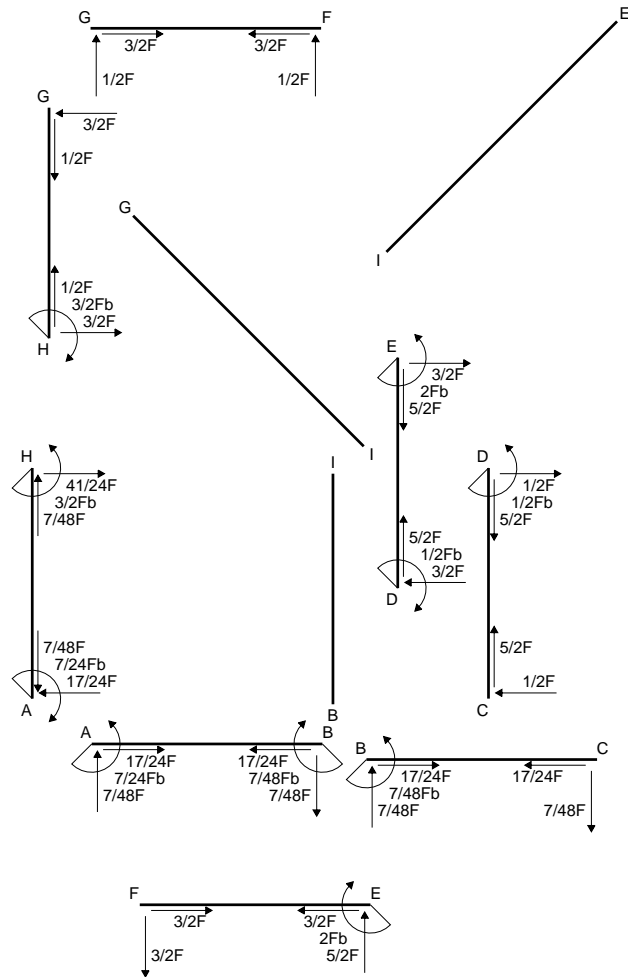
$$= (-1/4 b) \theta = 1/4 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

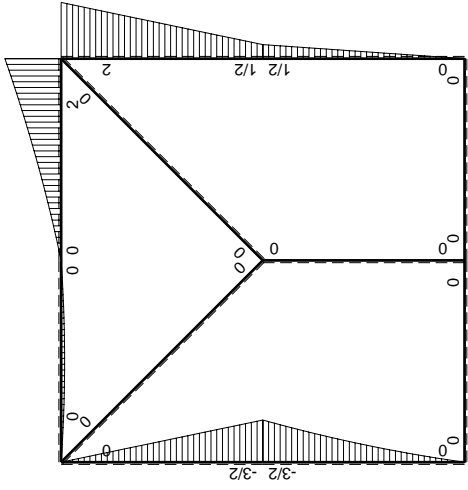
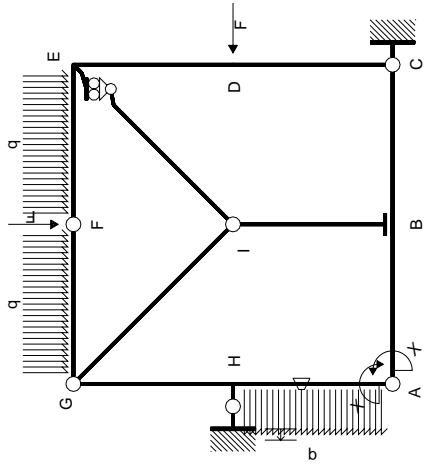
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

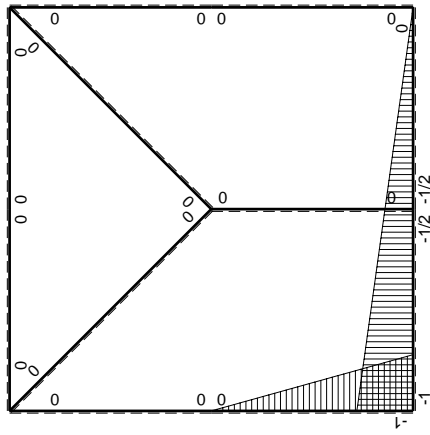
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



$\square +$ \curvearrowright F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x / EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	$-Fb/EJ$	$3/2Fx-2Fx^2/b+1/2qx^3/b$	Fx/EJ	x^2/b^2	$(5/24+1/2)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	Fb/EJ	$Fx-1/2Fx^2/b-1/2qx^3/b$	$Fb/EJ-Fx/EJ$	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-7/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$7/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (x/b) \theta dx$$

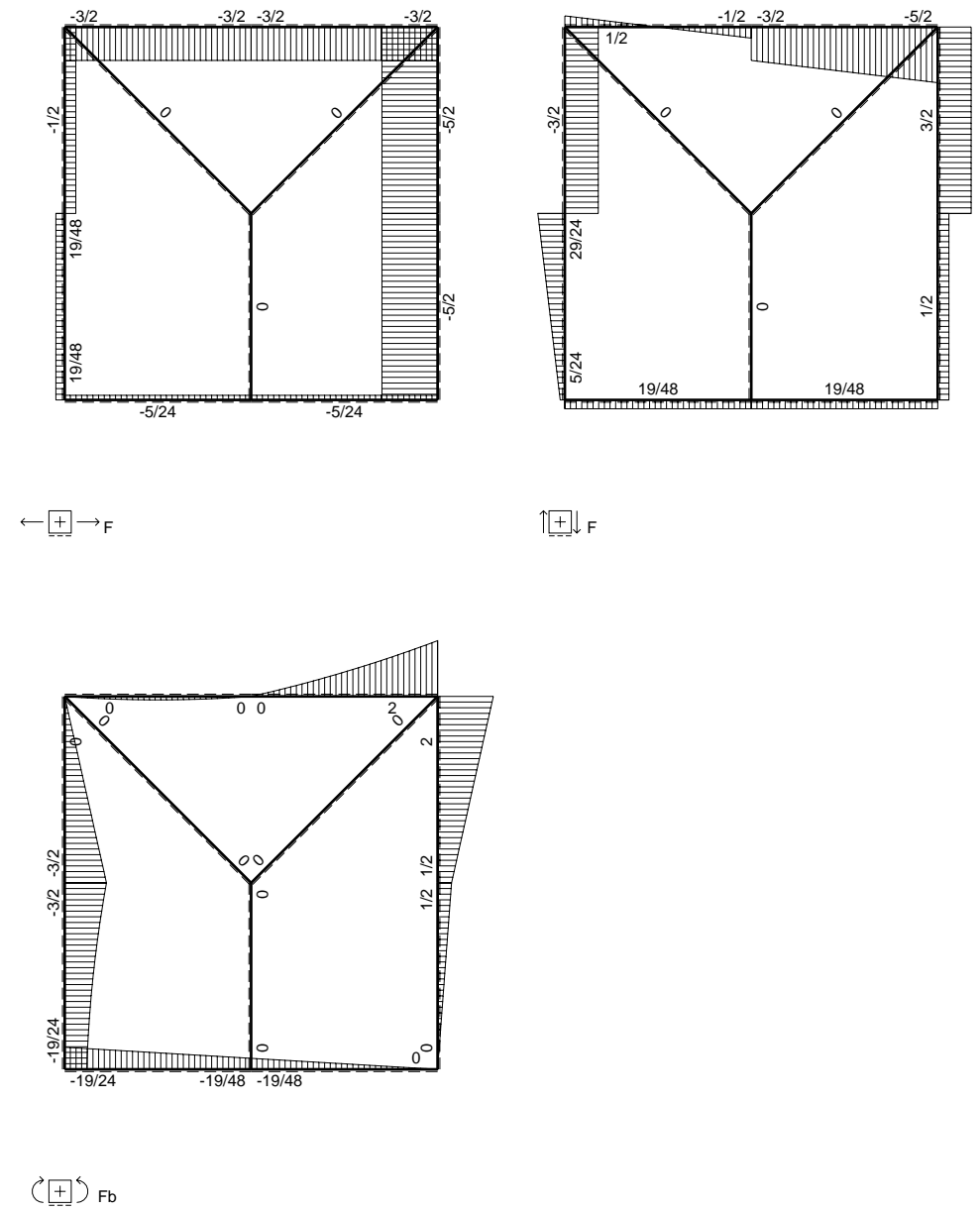
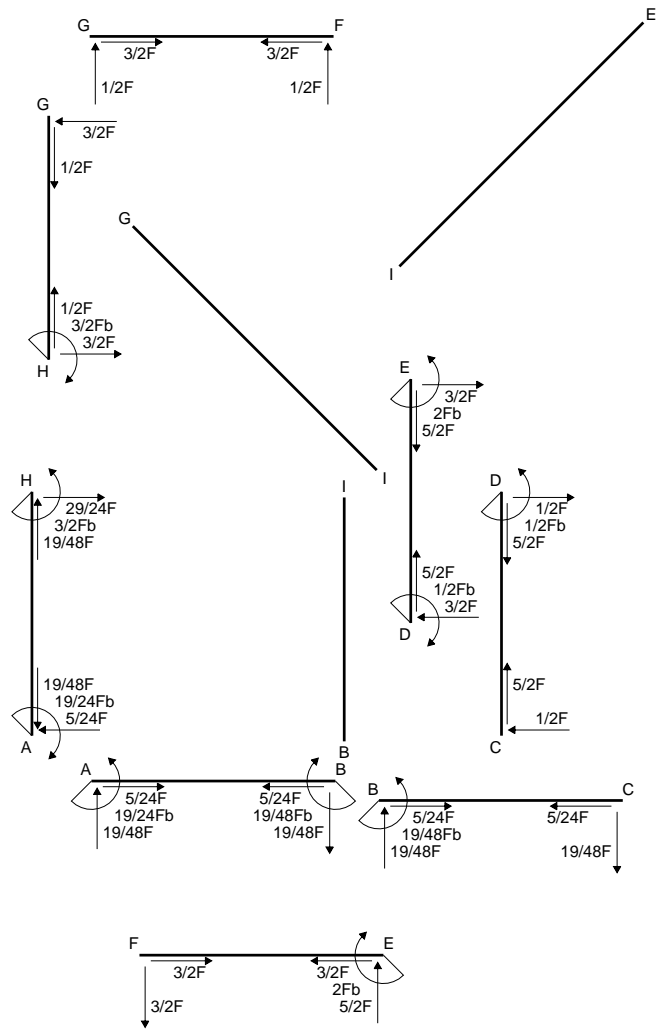
$$= \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[1/2 x^2/b \right]_0^b \theta$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ + (1/2 b) \theta = 17/24 Fb^2/EJ$$

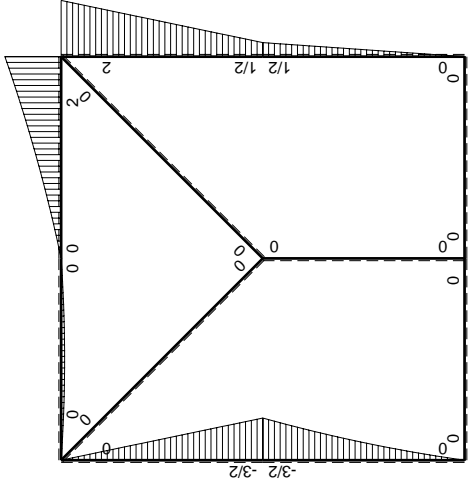
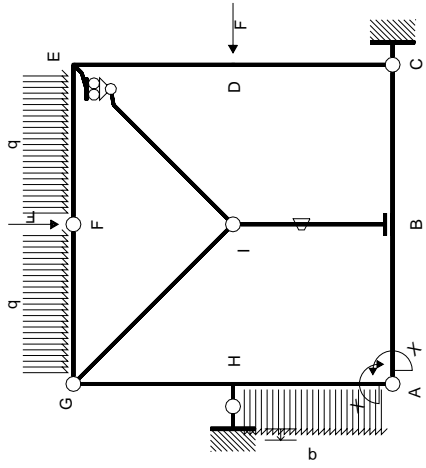
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx + \int_0^b (-1 + x/b) \theta dx$$

$$= \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ + \left[-x + 1/2 x^2/b \right]_0^b \theta$$

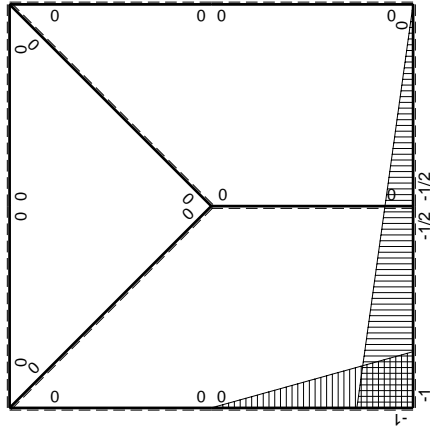
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ + (-b + 1/2 b) \theta = 17/24 Fb^2/EJ$$



⊕ F_b



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	$-Fb/EJ$	0	0	0	0+0	0	
BI b	0	0	Fb/EJ	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

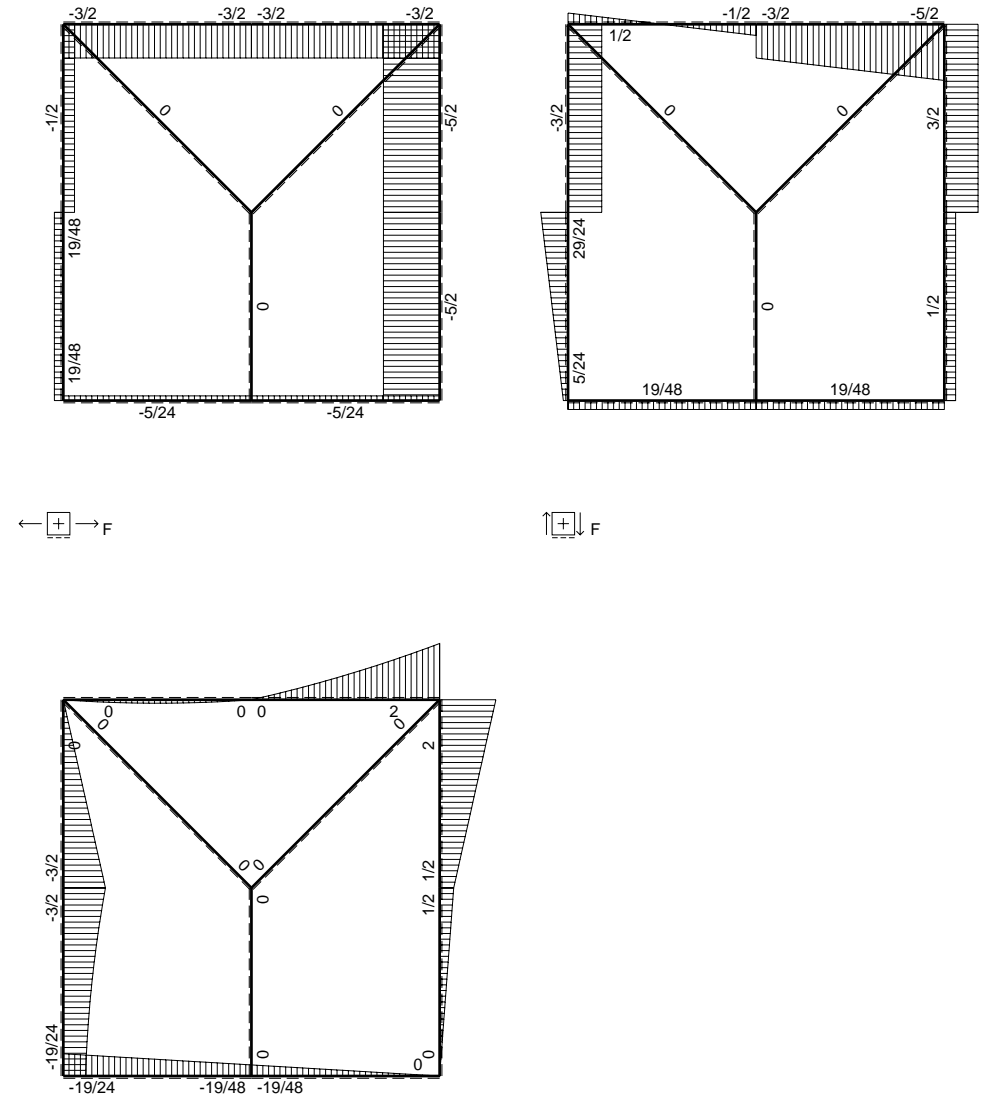
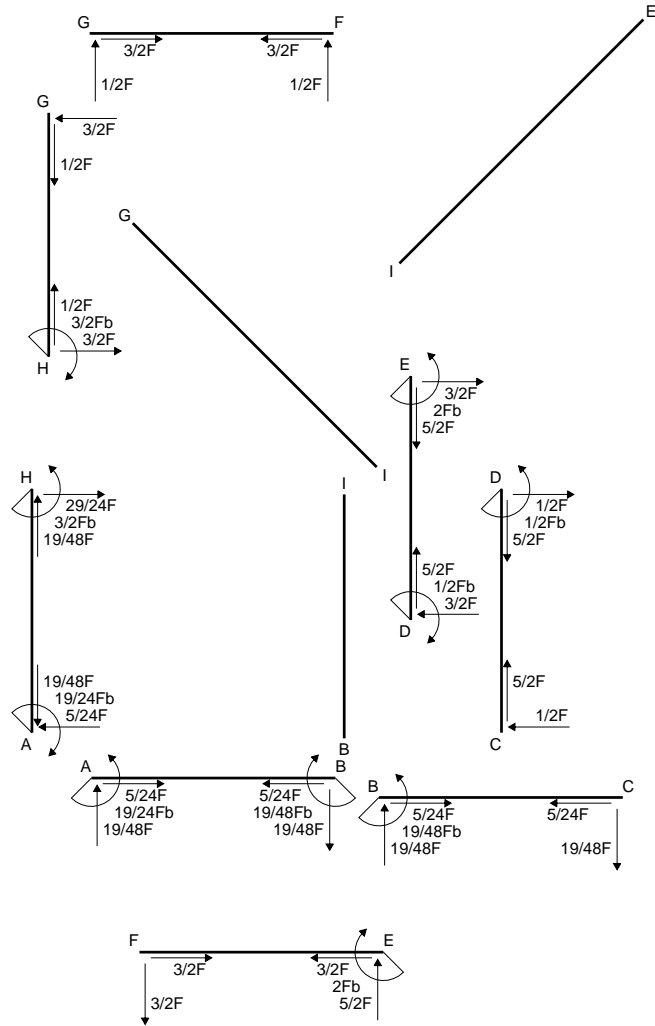
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

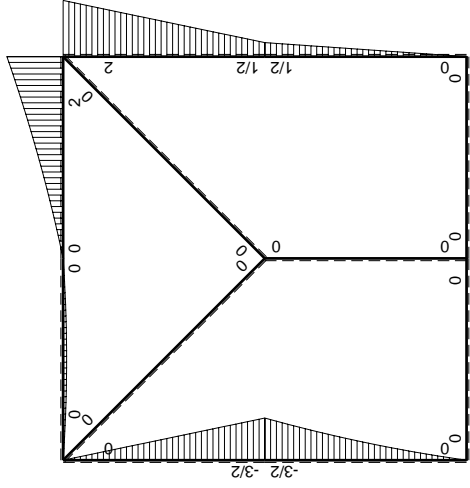
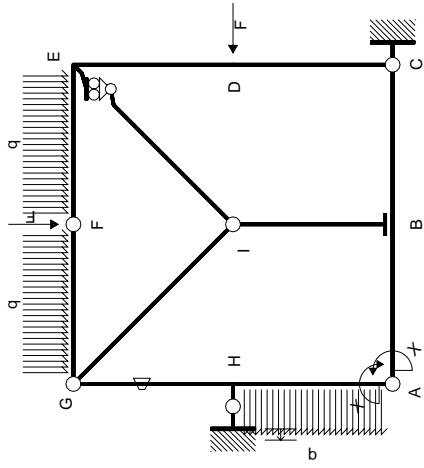
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

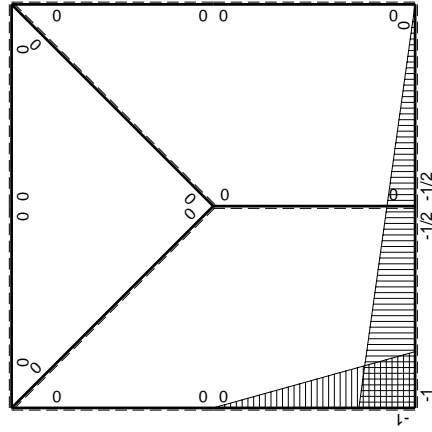
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



$\left[\begin{matrix} + \\ \leftarrow \end{matrix} \right] F$



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	$-Fb/EJ$	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	Fb/EJ	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

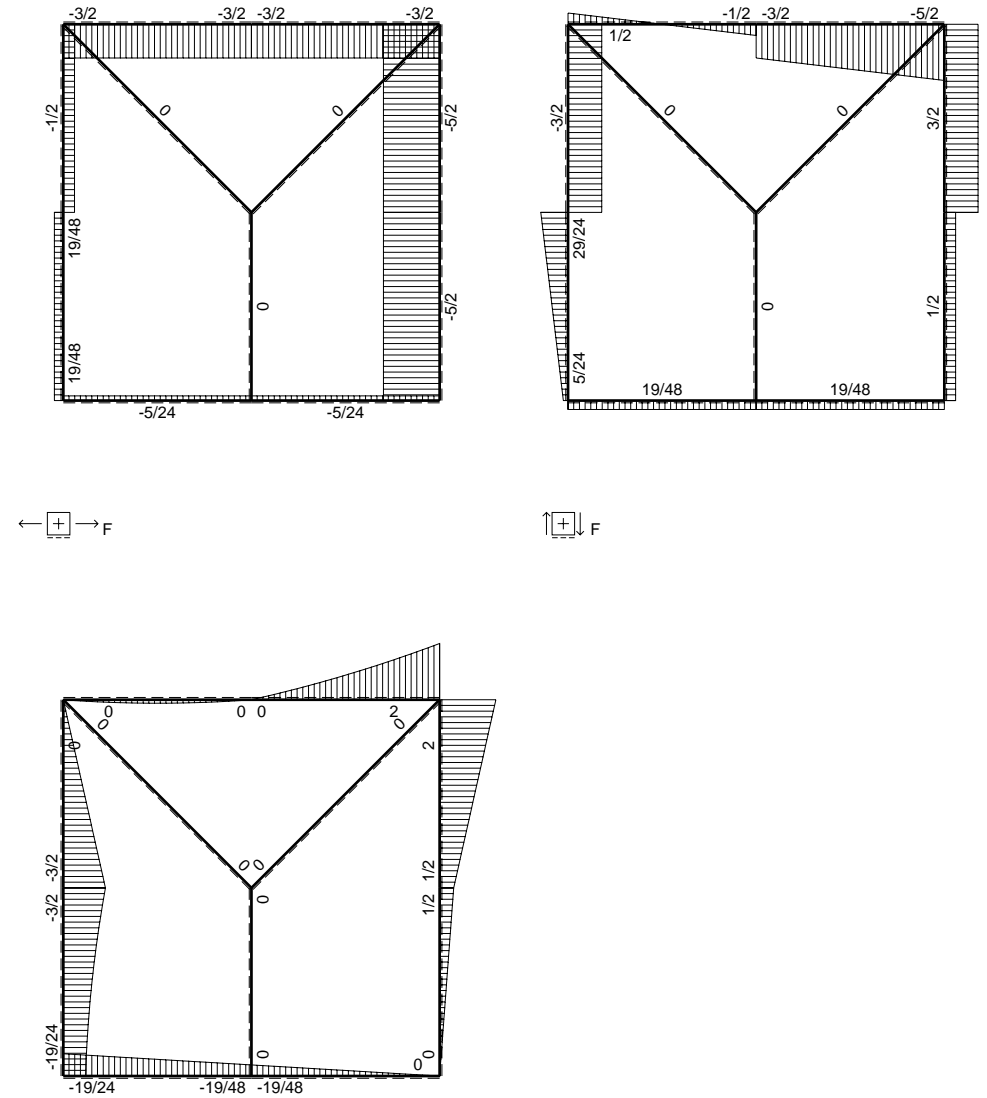
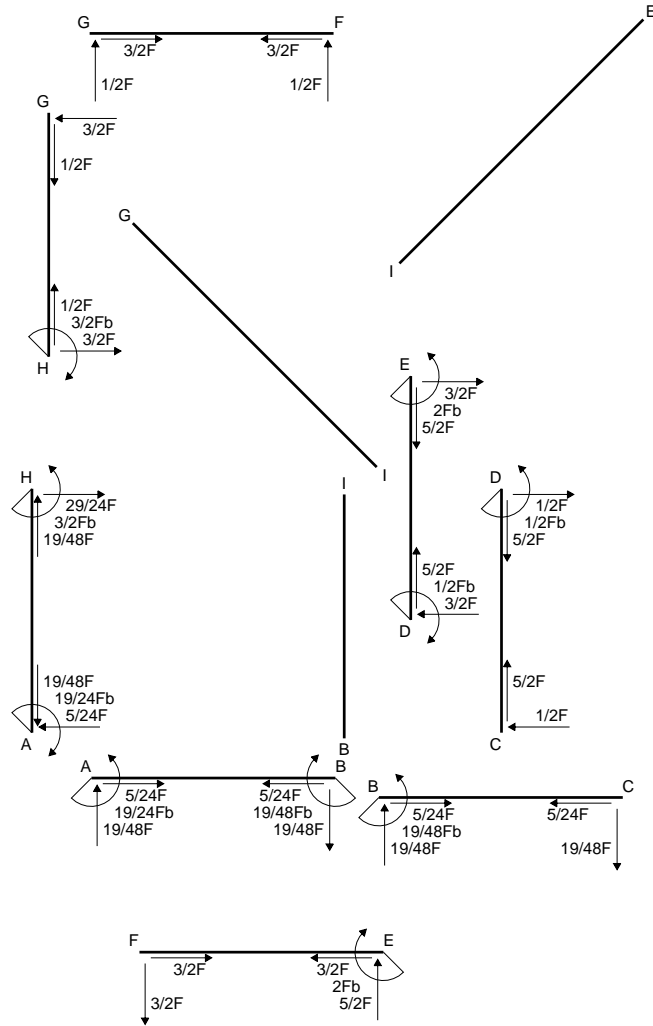
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

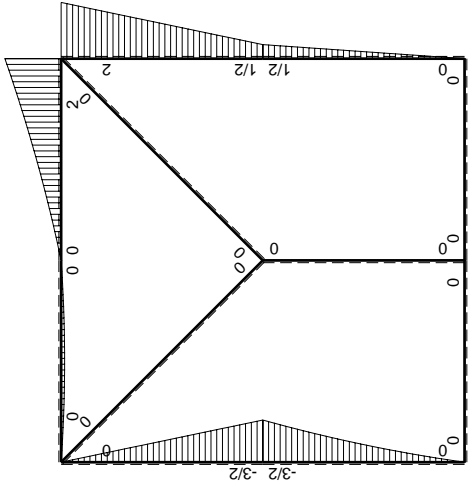
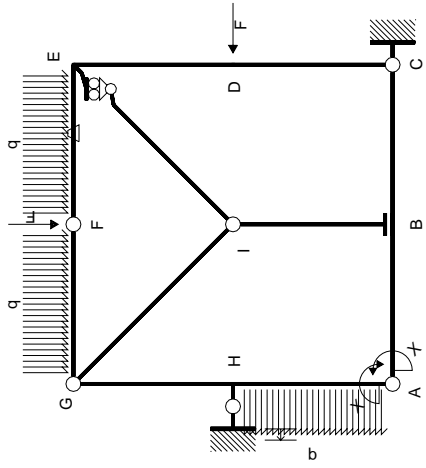
$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

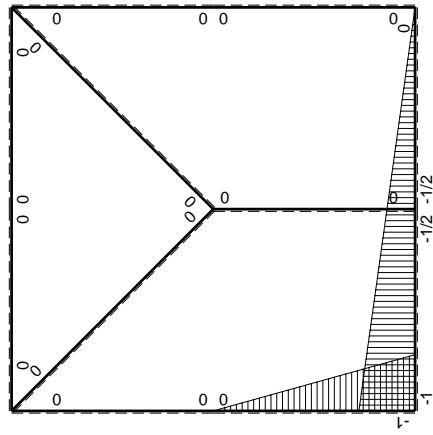
$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$



⊕ Fb



M_0 flessione da carichi assegnati



M_x flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	0	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	0	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	$-Fb/EJ$	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	Fb/EJ	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

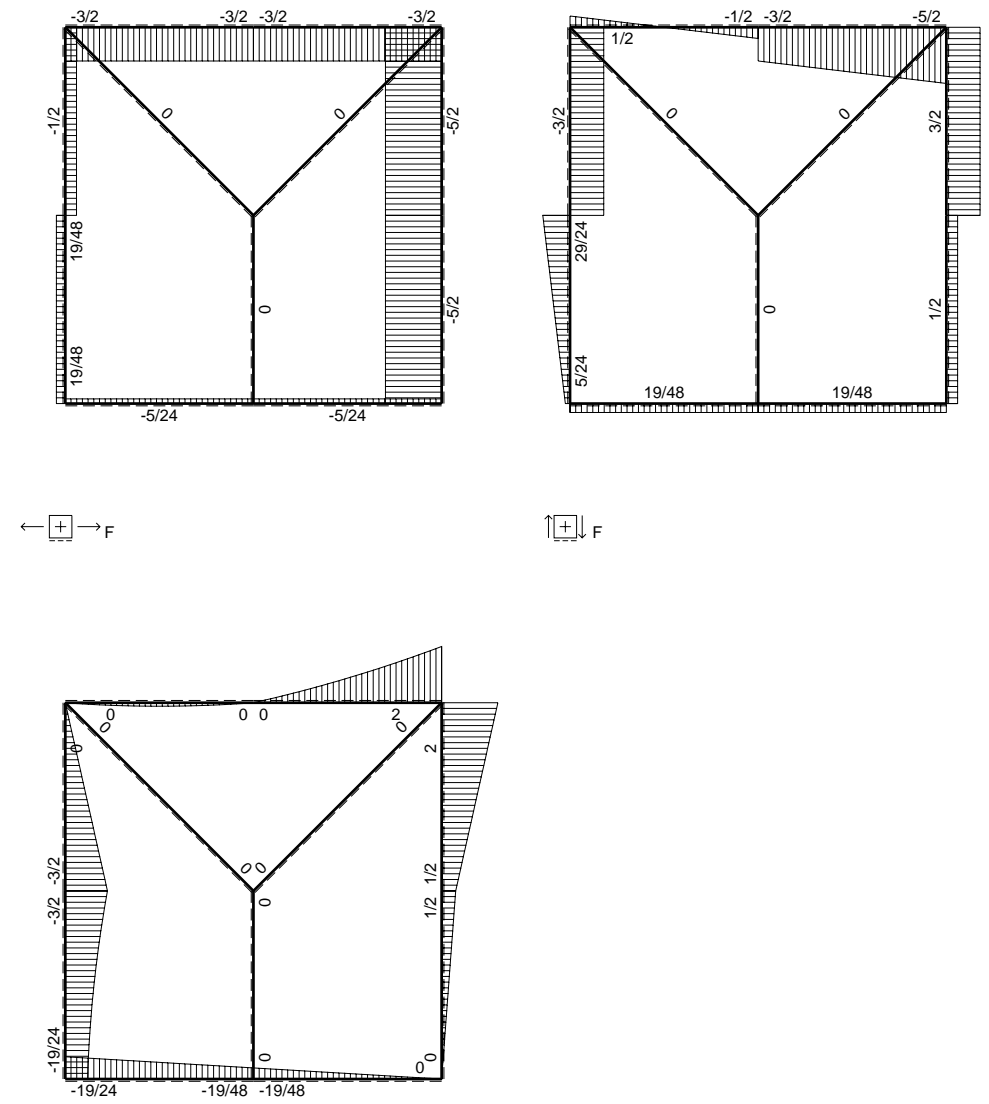
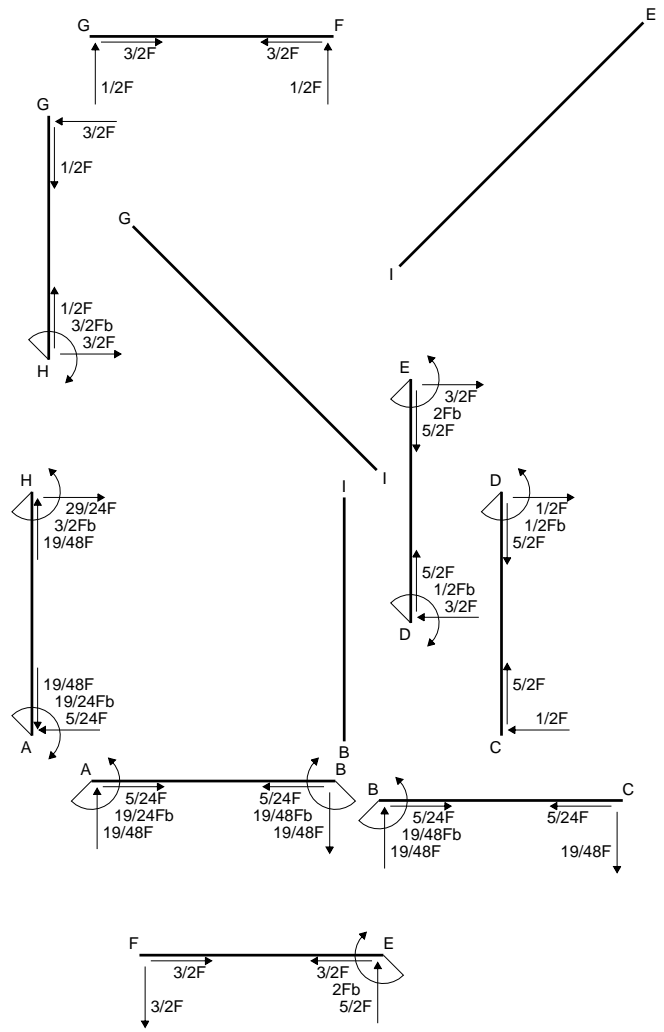
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

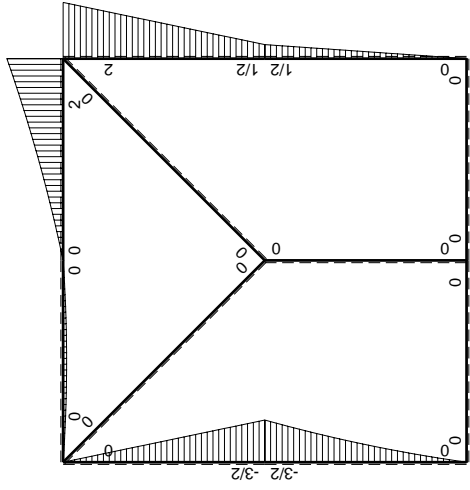
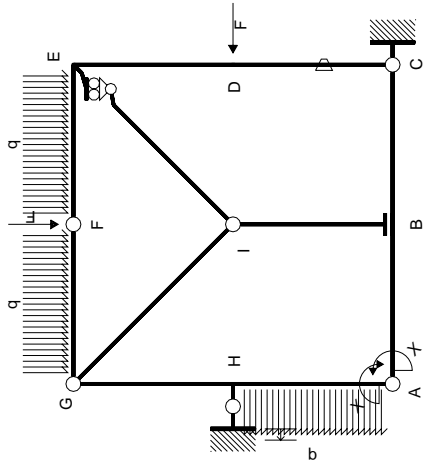
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

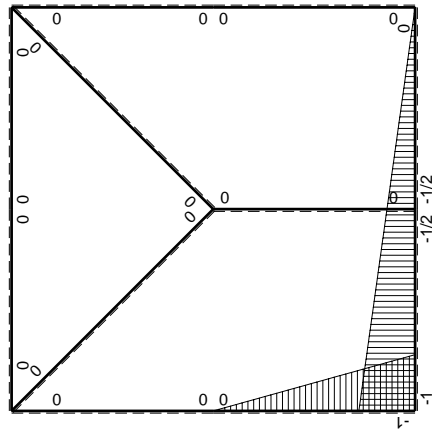
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	0	0	0	0	$1-x/b+1/4x^2/b^2$	0+0	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	0	0	0	0	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	0	0	0	0	$1/4-1/2x/b+1/4x^2/b^2$	0+0	$1/12Xb/EJ$	
CB b	$1/2x/b$	0	0	0	0	$1/4x^2/b^2$			
CD b	0	$1/2Fx$	$-Fb/EJ$	0	0	0	0+0	0	
DC b	0	$-1/2Fb+1/2Fx$	Fb/EJ	0	0	0			
DE b	0	$1/2Fb+3/2Fx$	0	0	0	0	0+0	0	
ED b	0	$-2Fb+3/2Fx$	0	0	0	0			
EF b	0	$2Fb-5/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
FE b	0	$-3/2Fx-1/2qx^2$	0	0	0	0			
FG b	0	$-1/2Fx+1/2qx^2$	0	0	0	0	0+0	0	
GF b	0	$1/2Fx-1/2qx^2$	0	0	0	0			
GH b	0	$-3/2Fx$	0	0	0	0	0+0	0	
HG b	0	$3/2Fb-3/2Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	0	0	0	0	0	0+0	0	
BI b	0	0	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-3/2Fb+2Fx-1/2qx^2$	0	$3/2Fx-2Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(5/24+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$Fx+1/2qx^2$	0	$Fx-1/2Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-19/24Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$19/24Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = \left[x - 1/2 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x + 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = \left[1/4 x - 1/4 x^2/b + 1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = \left[1/12 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = \left[1/3 x^3/b^2 \right]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = \left[x - x^2/b + 1/3 x^3/b^2 \right]_0^b 1/EJ$$

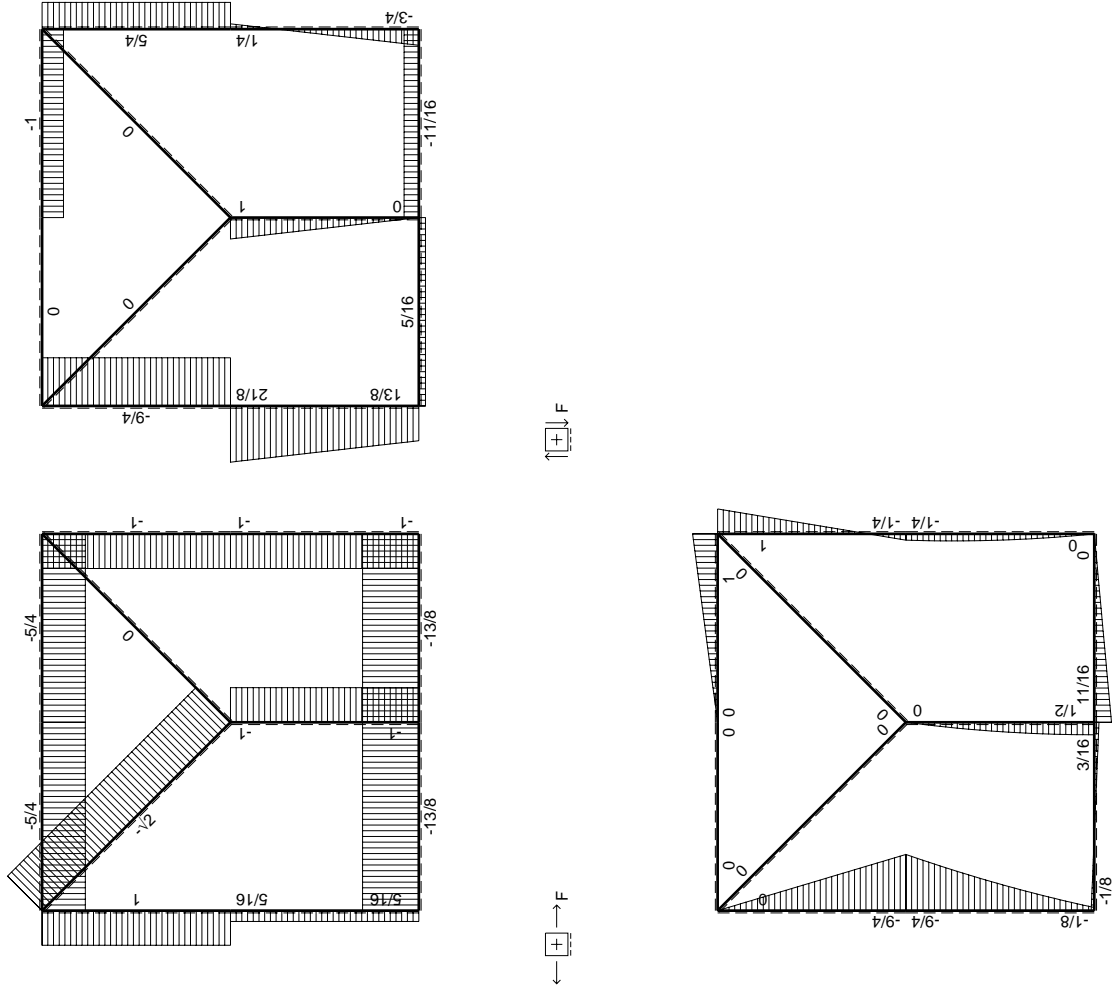
$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

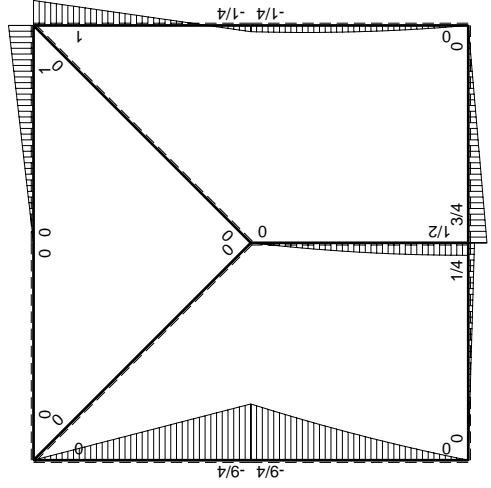
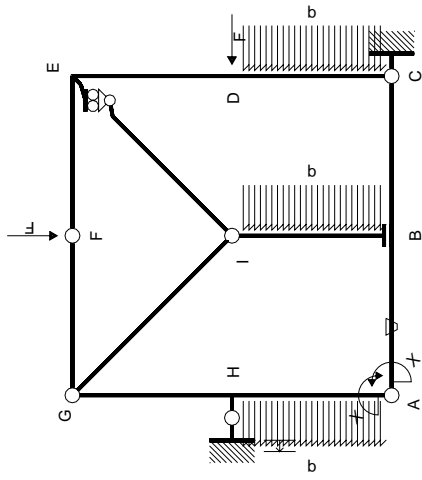
$$L_{HA}^{xo} = \int_0^b (3/2 x/b - 2 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = \left[3/4 x^2/b - 2/3 x^3/b^2 + 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (3/4 b - 2/3 b + 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$

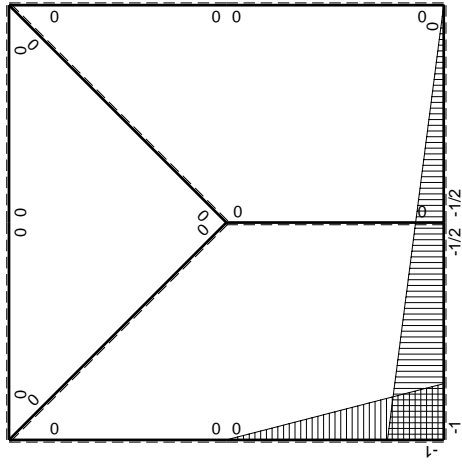
$$L_{AH}^{xo} = \int_0^b (x/b - 1/2 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = \left[1/2 x^2/b - 1/6 x^3/b^2 - 1/8 x^4/b^3 \right]_0^b Fb 1/EJ$$

$$= (1/2 b - 1/6 b - 1/8 b) Fb 1/EJ = 5/24 Fb^2/EJ$$





M_0 flessione da carichi assegnati



M_X flessione da iperstatica $X=1$

Quadro contributi PLV per iperstatica $X=W_{AB}$

→	$M_x(x)$	$M_o(x)$	θ	$M_x M_o$	$M_x \theta$	$M_x M_x$	$\int M_x(M_o/EJ+\theta)dx$	$\int X M_x M_x/EJ dx$	
AB b	$-1+1/2x/b$	$1/4Fx$	$-Fb/EJ$	$-1/4Fx+1/8Fx^2/b$	$Fb/EJ-1/2Fx/EJ$	$1-x/b+1/4x^2/b^2$	$(-1/12+3/4)Fb^2/EJ$	$7/12Xb/EJ$	
BA b	$1/2+1/2x/b$	$-1/4Fb+1/4Fx$	Fb/EJ	$-1/8Fb+1/8Fx^2/b$	$1/2Fb/EJ+1/2Fx/EJ$	$1/4+1/2x/b+1/4x^2/b^2$			
BC b	$-1/2+1/2x/b$	$3/4Fb-3/4Fx$	0	$-3/8Fb+3/4Fx-3/8Fx^2/b$	0	$1/4-1/2x/b+1/4x^2/b^2$	$(-1/8+0)Fb^2/EJ$	$1/12Xb/EJ$	
CB b	$1/2x/b$	$-3/4Fx$	0	$-3/8Fx^2/b$	0	$1/4x^2/b^2$			
CD b	0	$-3/4Fx+1/2qx^2$	0	0	0	0	0+0	0	
DC b	0	$1/4Fb+1/4Fx-1/2qx^2$	0	0	0	0			
DE b	0	$-1/4Fb+5/4Fx$	0	0	0	0	0+0	0	
ED b	0	$-Fb+5/4Fx$	0	0	0	0			
EF b	0	$Fb-Fx$	0	0	0	0	0+0	0	
FE b	0	$-Fx$	0	0	0	0			
FG b	0	0	0	0	0	0	0+0	0	
GF b	0	0	0	0	0	0			
GH b	0	$-9/4Fx$	0	0	0	0	0+0	0	
HG b	0	$9/4Fb-9/4Fx$	0	0	0	0			
GI $\sqrt{2}b$	0	0	0	0	0	0	0	0	
IB b	0	$Fx-1/2qx^2$	0	0	0	0	0+0	0	
BI b	0	$-1/2Fb+1/2qx^2$	0	0	0	0			
IE $\sqrt{2}b$	0	0	0	0	0	0	0	0	
HA b	$-x/b$	$-9/4Fb+11/4Fx-1/2qx^2$	0	$9/4Fx-11/4Fx^2/b+1/2qx^3/b$	0	x^2/b^2	$(1/3+0)Fb^2/EJ$	$1/3Xb/EJ$	
AH b	$1-x/b$	$7/4Fx+1/2qx^2$	0	$7/4Fx-5/4Fx^2/b-1/2qx^3/b$	0	$1-2x/b+x^2/b^2$			
H	cedimento nodo $-H_{1H}u_H$							$-Fb^2/EJ$	
	totali							$-1/8Fb^2/EJ$	Xb/EJ
	iperstatica $X=W_{AB}$							$1/8Fb$	

Sviluppi di calcolo iperstatica

$$L_{AB}^{xx} = \int_0^b (1 - x/b + 1/4 x^2/b^2) 1/EJ dx = [x - 1/2 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (b - 1/2 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BA}^{xx} = \int_0^b (1/4 + 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x + 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b + 1/4 b + 1/12 b) 1/EJ = 7/12 b/EJ$$

$$L_{BC}^{xx} = \int_0^b (1/4 - 1/2 x/b + 1/4 x^2/b^2) 1/EJ dx = [1/4 x - 1/4 x^2/b + 1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/4 b - 1/4 b + 1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{CB}^{xx} = \int_0^b (1/4 x^2/b^2) 1/EJ dx = [1/12 x^3/b^2]_0^b 1/EJ$$

$$= (1/12 b) 1/EJ = 1/12 b/EJ$$

$$L_{HA}^{xx} = \int_0^b (x^2/b^2) 1/EJ dx = [1/3 x^3/b^2]_0^b 1/EJ$$

$$= (1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AH}^{xx} = \int_0^b (1 - 2x/b + x^2/b^2) 1/EJ dx = [x - x^2/b + 1/3 x^3/b^2]_0^b 1/EJ$$

$$= (b - b + 1/3 b) 1/EJ = 1/3 b/EJ$$

$$L_{AB}^{xo} = \int_0^b (-1/4 x/b + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (1 - 1/2 x/b) \theta dx$$

$$= [-1/8 x^2/b + 1/24 x^3/b^2]_0^b Fb 1/EJ + [x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BA}^{xo} = \int_0^b (-1/8 + 1/8 x^2/b^2) Fb 1/EJ dx + \int_0^b (-1/2 - 1/2 x/b) \theta dx$$

$$= [-1/8 x + 1/24 x^3/b^2]_0^b Fb 1/EJ + [-1/2 x - 1/4 x^2/b]_0^b \theta$$

$$= (-1/8 b + 1/24 b) Fb 1/EJ + (-1/2 b - 1/4 b) \theta = 2/3 Fb^2/EJ$$

$$L_{BC}^{xo} = \int_0^b (-3/8 + 3/4 x/b - 3/8 x^2/b^2) Fb 1/EJ dx = [-3/8 x + 3/8 x^2/b - 1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-3/8 b + 3/8 b - 1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{CB}^{xo} = \int_0^b (-3/8 x^2/b^2) Fb 1/EJ dx = [-1/8 x^3/b^2]_0^b Fb 1/EJ$$

$$= (-1/8 b) Fb 1/EJ = -1/8 Fb^2/EJ$$

$$L_{HA}^{xo} = \int_0^b (9/4 x/b - 11/4 x^2/b^2 + 1/2 x^3/b^3) Fb 1/EJ dx = [9/8 x^2/b - 11/12 x^3/b^2 + 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (9/8 b - 11/12 b + 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$

$$L_{AH}^{xo} = \int_0^b (7/4 x/b - 5/4 x^2/b^2 - 1/2 x^3/b^3) Fb 1/EJ dx = [7/8 x^2/b - 5/12 x^3/b^2 - 1/8 x^4/b^3]_0^b Fb 1/EJ$$

$$= (7/8 b - 5/12 b - 1/8 b) Fb 1/EJ = 1/3 Fb^2/EJ$$