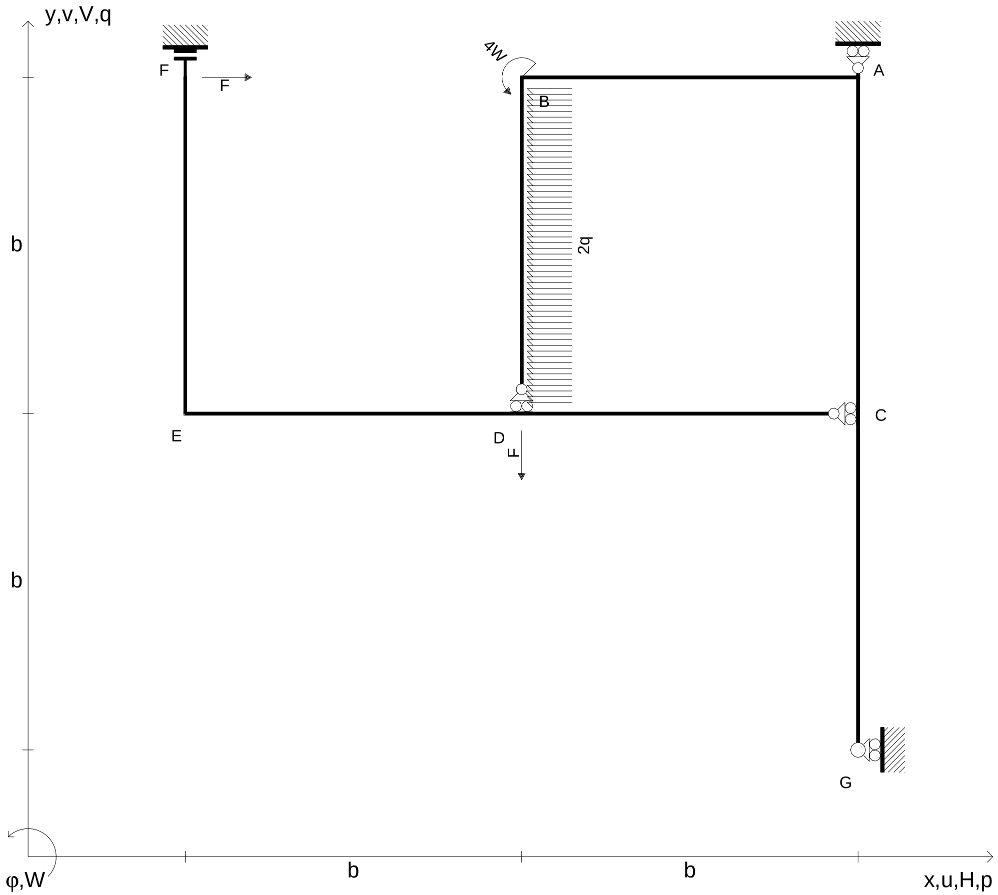
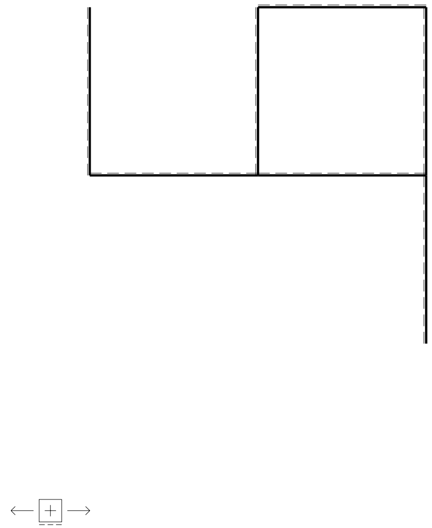
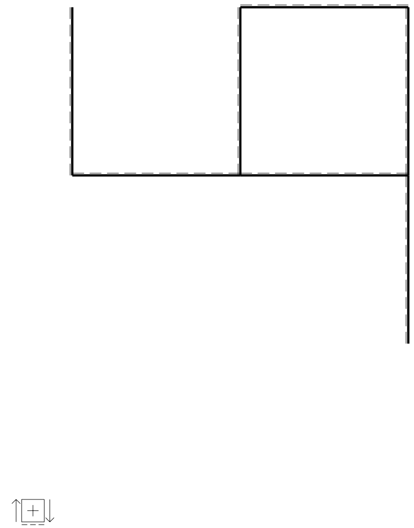


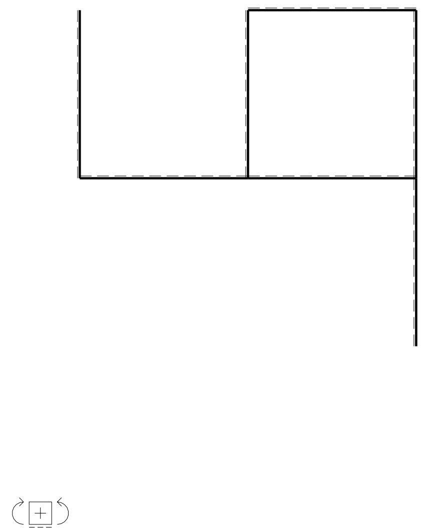
V_D = -F H_F = F W_B = 4W = 4Fb p_{BD} = -2q = -2F/b

Svolgere l'analisi cinematica.
Determinare matrice di congruenza e di equilibrio.
Determinare le reazioni vincolari a terra col PLV (Le=0).
Determinare le azioni interne in A col PLV (Le=0).
Carichi e deformazioni date hanno verso efficace in disegno.
Calcolare reazioni vincolari della struttura e delle aste.
Tracciare i diagrammi delle azioni interne nelle aste.

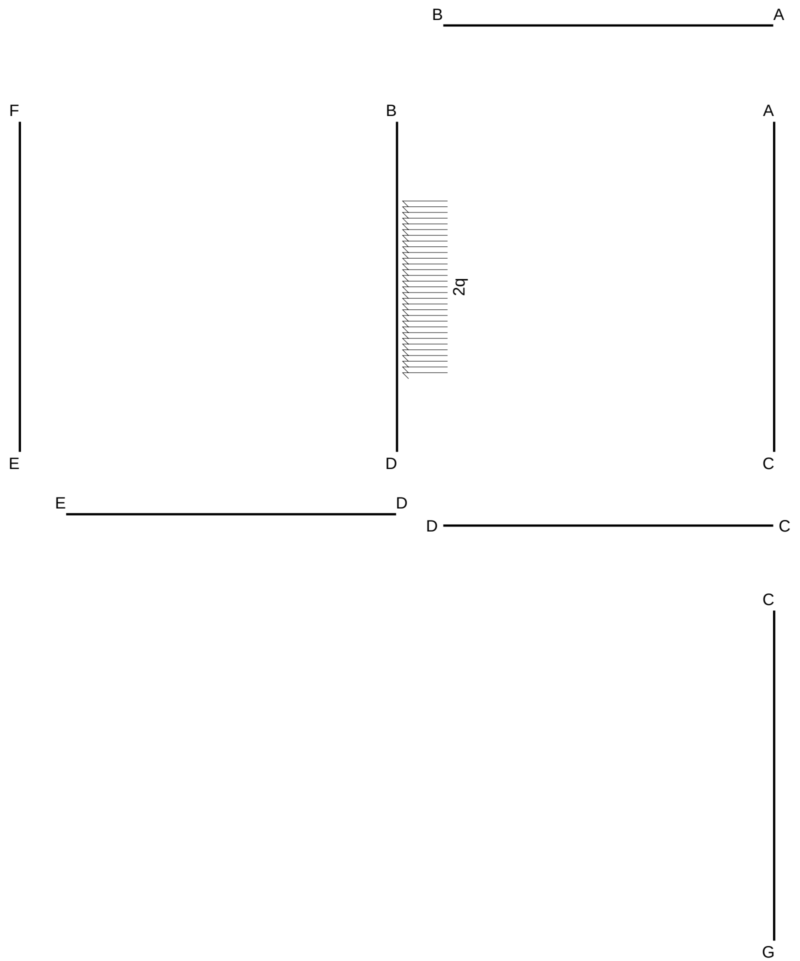
@ Adolfo Zavelani Rossi, Politecnico di Milano







@ Adolfo Zavelani Rossi, Politecnico di Milano



REAZIONI

V_A =
V_F =
W_F =
H_G =

H_{AB} =
V_{AB} =
W_{AB} =
H_{BA} =
V_{BA} =
W_{BA} =

H_{CD} =
V_{CD} =
W_{CD} =
H_{DC} =
V_{DC} =
W_{DC} =

H_{DE} =
V_{DE} =
W_{DE} =
H_{ED} =
V_{ED} =
W_{ED} =

H_{AC} =
V_{AC} =
W_{AC} =
H_{CA} =
V_{CA} =
W_{CA} =

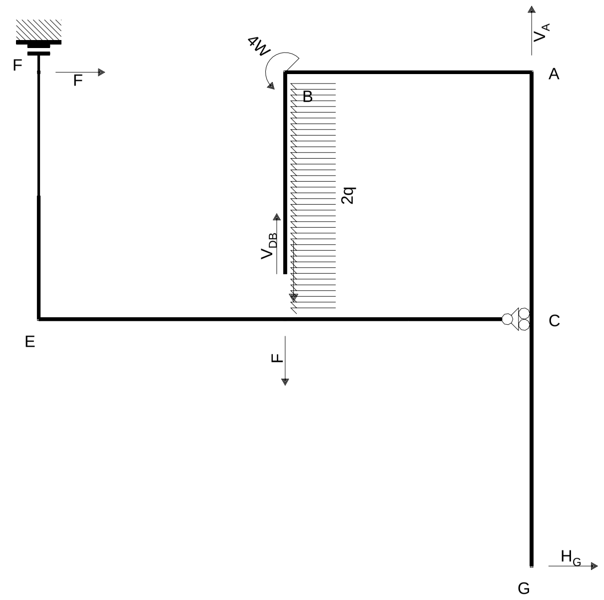
H_{BD} =
V_{BD} =
W_{BD} =
H_{DB} =
V_{DB} =
W_{DB} =

H_{FE} =
V_{FE} =
W_{FE} =
H_{EF} =
V_{EF} =
W_{EF} =

H_{CG} =
V_{CG} =
W_{CG} =
H_{GC} =
V_{GC} =
W_{GC} =

@ Adolfo Zavelani Rossi, Politecnico di Milano

@ Adolfo Zavelani Rossi, Politecnico di Milano



EQUAZIONI DI EQUILIBRIO

Traslazione orizzontale globale

$H_G = -F + 2qb$

Traslazione verticale: aste CA CG AB BD

$V_A + V_{DB} = 0$

Rotazione intorno a C: aste CA CG AB BD

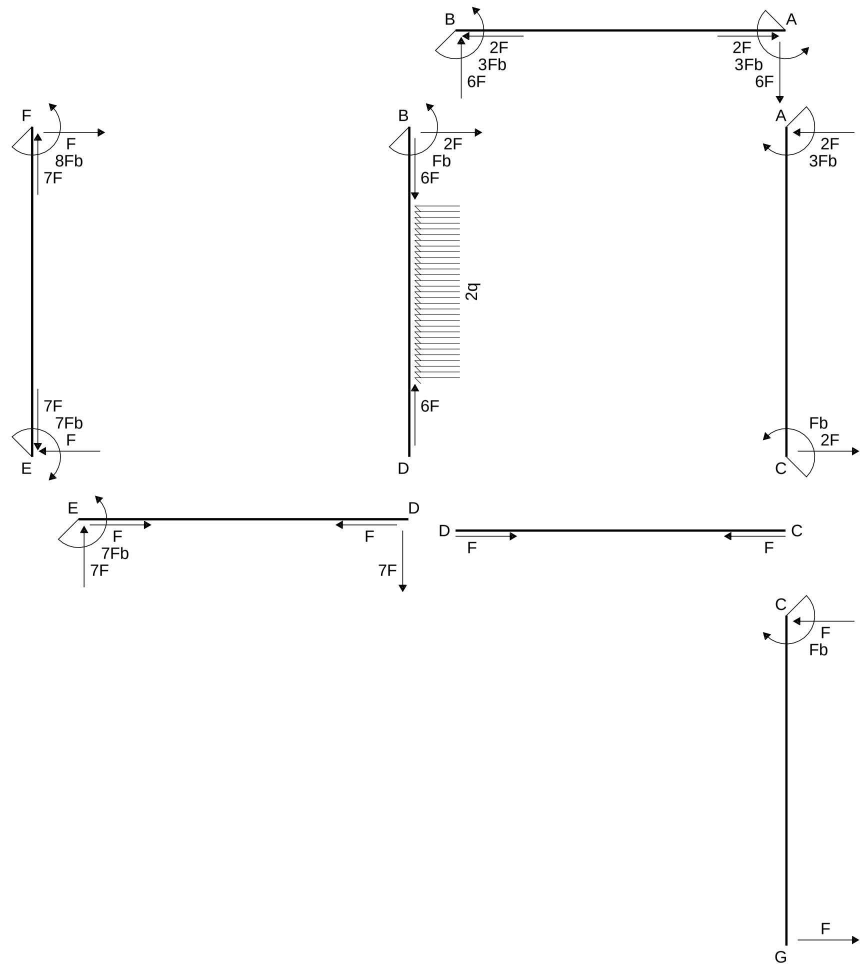
$H_G b - V_{DB} b = -4W - qb^2$

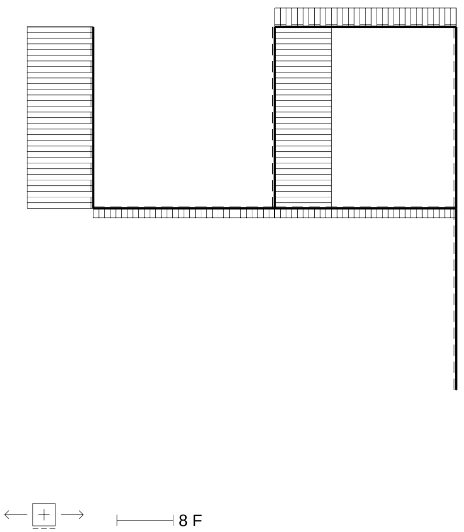
Matrice di equilibrio

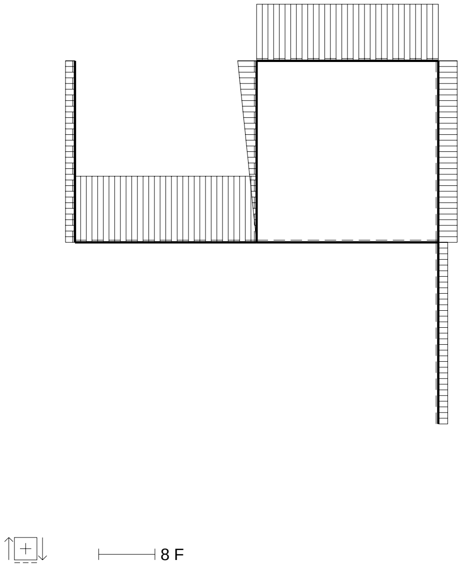
$$
\begin{array}{c} \\ u_F \\ v_{CD} \\ \varphi_{CD} \end{array}
\begin{array}{c} \begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix} \\ \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & -1 \end{bmatrix} \end{array}
=
\begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} -1 & 0 & 2 \\ 0 & 0 & 0 \\ 0 & -4 & -1 \end{bmatrix} \end{array}
$$

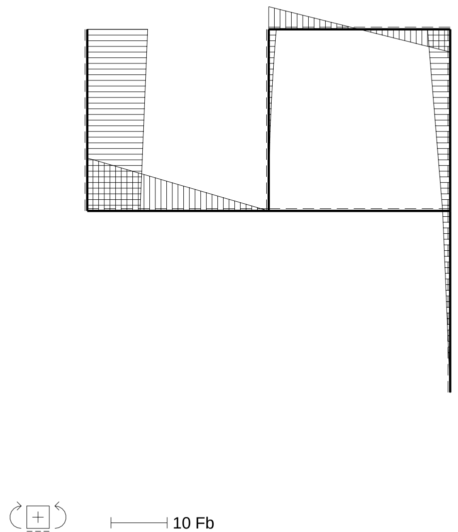
Soluzione del sistema

$$
\begin{bmatrix} H_G b \\ V_A b \\ V_{DB} b \end{bmatrix}
=
\begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} -1 & 0 & 2 \\ 1 & -4 & -3 \\ -1 & 4 & 3 \end{bmatrix} \end{array}
$$









REAZIONI

V_A = F -4(W/b) -3qb = -6F

V_F = 4(W/b) +3qb = 7F

W_F = Fb +4W +3qb^2 = 8Fb

H_G = -F +2qb = F

H_{AB} = 2qb = 2F
V_{AB} = F -4(W/b) -3qb = -6F
W_{AB} = -Fb +4qb^2 = 3Fb
H_{BA} = -2qb = -2F
V_{BA} = -F +4(W/b) +3qb = 6F
W_{BA} = 4W -qb^2 = 3Fb

H_{AC} = -2qb = -2F
V_{AC} = 0
W_{AC} = Fb -4qb^2 = -3Fb
H_{CA} = 2qb = 2F
V_{CA} = 0
W_{CA} = -Fb +2qb^2 = Fb

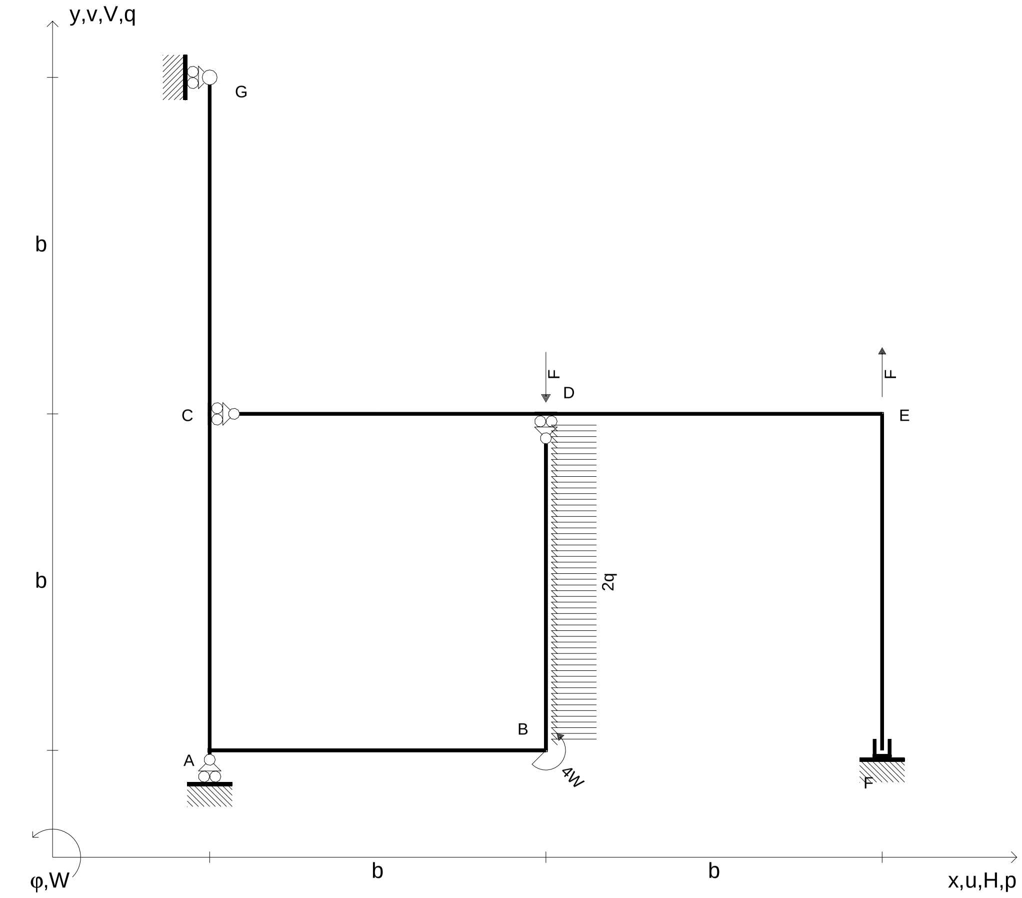
H_{CG} = F -2qb = -F
V_{CG} = 0
W_{CG} = Fb -2qb^2 = -Fb
H_{GC} = -F +2qb = F
V_{GC} = 0
W_{GC} = 0

H_{CD} = -F = -F
V_{CD} = 0
W_{CD} = 0
H_{DC} = F = F
V_{DC} = 0
W_{DC} = 0

H_{BD} = 2qb = 2F
V_{BD} = F -4(W/b) -3qb = -6F
W_{BD} = qb^2 = Fb
H_{DB} = 0
V_{DB} = -F +4(W/b) +3qb = 6F
W_{DB} = 0

H_{DE} = -F = -F
V_{DE} = -4(W/b) -3qb = -7F
W_{DE} = 0
H_{ED} = F = F
V_{ED} = 4(W/b) +3qb = 7F
W_{ED} = 4W +3qb^2 = 7Fb

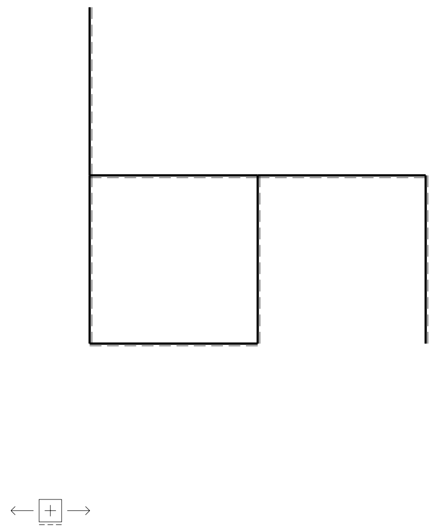
H_{FE} = F = F
V_{FE} = 4(W/b) +3qb = 7F
W_{FE} = Fb +4W +3qb^2 = 8Fb
H_{EF} = -F = -F
V_{EF} = -4(W/b) -3qb = -7F
W_{EF} = -4W -3qb^2 = -7Fb

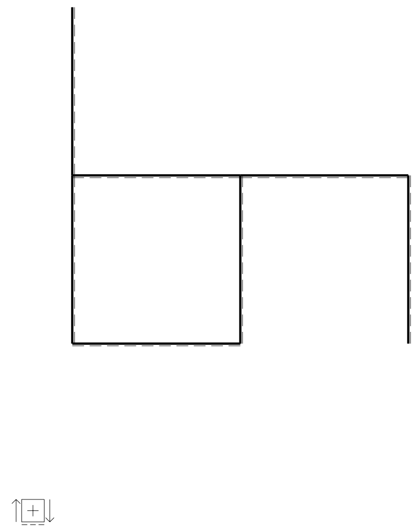


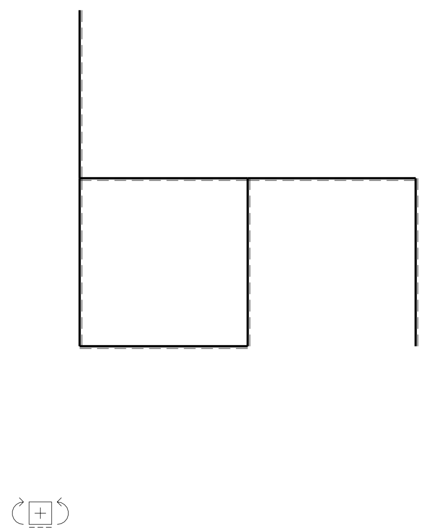
$V_D = -F$ $V_E = F$ $W_B = 4W = 4Fb$ $p_{BD} = -2q = -2F/b$

Svolgere l'analisi cinematica.
Determinare matrice di congruenza e di equilibrio.
Determinare le reazioni vincolari a terra col PLV (Le=0).
Determinare le azioni interne in A col PLV (Le=0).
Carichi e deformazioni date hanno verso efficace in disegno.
Calcolare reazioni vincolari della struttura e delle aste.
Tracciare i diagrammi delle azioni interne nelle aste.

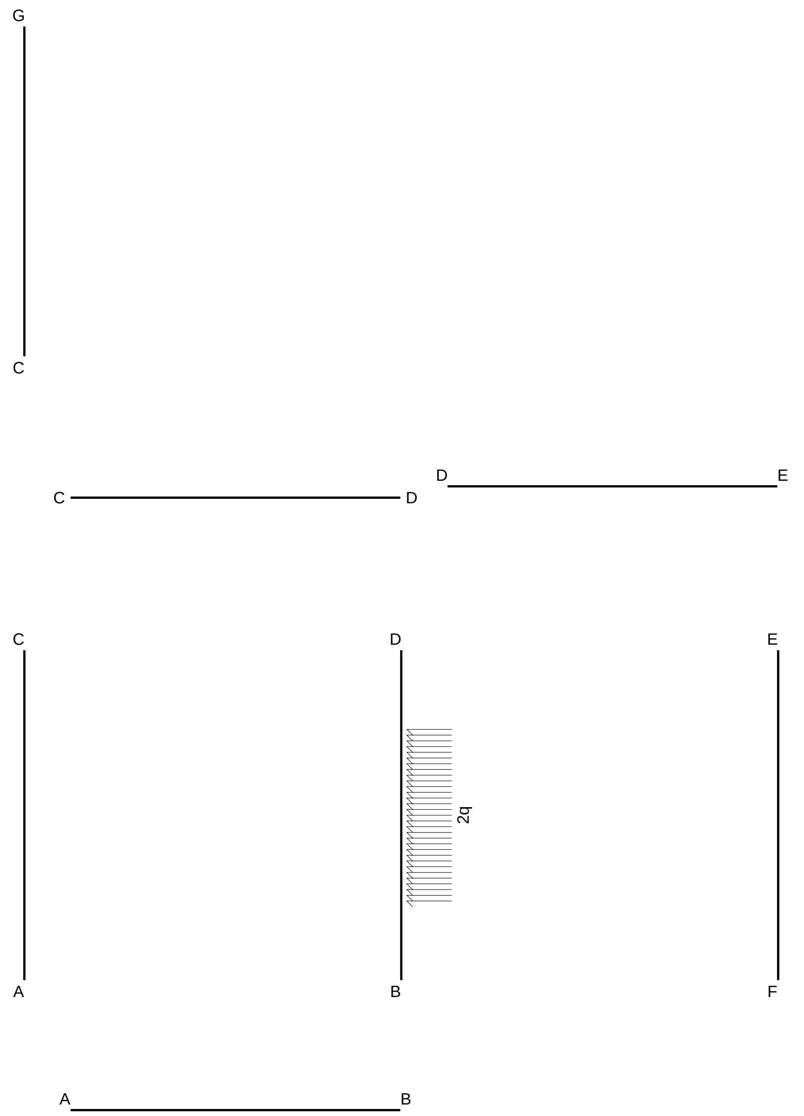
@ Adolfo Zavelani Rossi, Politecnico di Milano







@ Adolfo Zavelani Rossi, Politecnico di Milano



REAZIONI

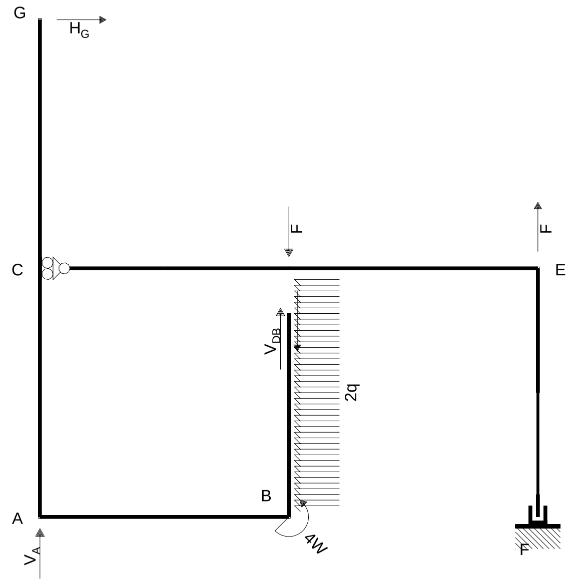
V_A = W_F =
H_F = H_G =

H_{AB} = H_{CD} = H_{DE} =
V_{AB} = V_{CD} = V_{DE} =
W_{AB} = W_{CD} = W_{DE} =
H_{BA} = H_{DC} = H_{ED} =
V_{BA} = V_{DC} = V_{ED} =
W_{BA} = W_{DC} = W_{ED} =

H_{AC} = H_{BD} = H_{FE} =
V_{AC} = V_{BD} = V_{FE} =
W_{AC} = W_{BD} = W_{FE} =
H_{CA} = H_{DB} = H_{EF} =
V_{CA} = V_{DB} = V_{EF} =
W_{CA} = W_{DB} = W_{EF} =

H_{CG} =
V_{CG} =
W_{CG} =
H_{GC} =
V_{GC} =
W_{GC} =

EQUILIBRIO Nome: Es.N.036



EQUAZIONI DI EQUILIBRIO
Traslazione verticale globale
$V_A = 0$
Traslazione verticale: aste CA CG AB BD
$V_A + V_{DB} = 0$
Rotazione intorno a C: aste CA CG AB BD
$-H_G b + V_{DB} b = -4W + qb^2$

Matrice di equilibrio

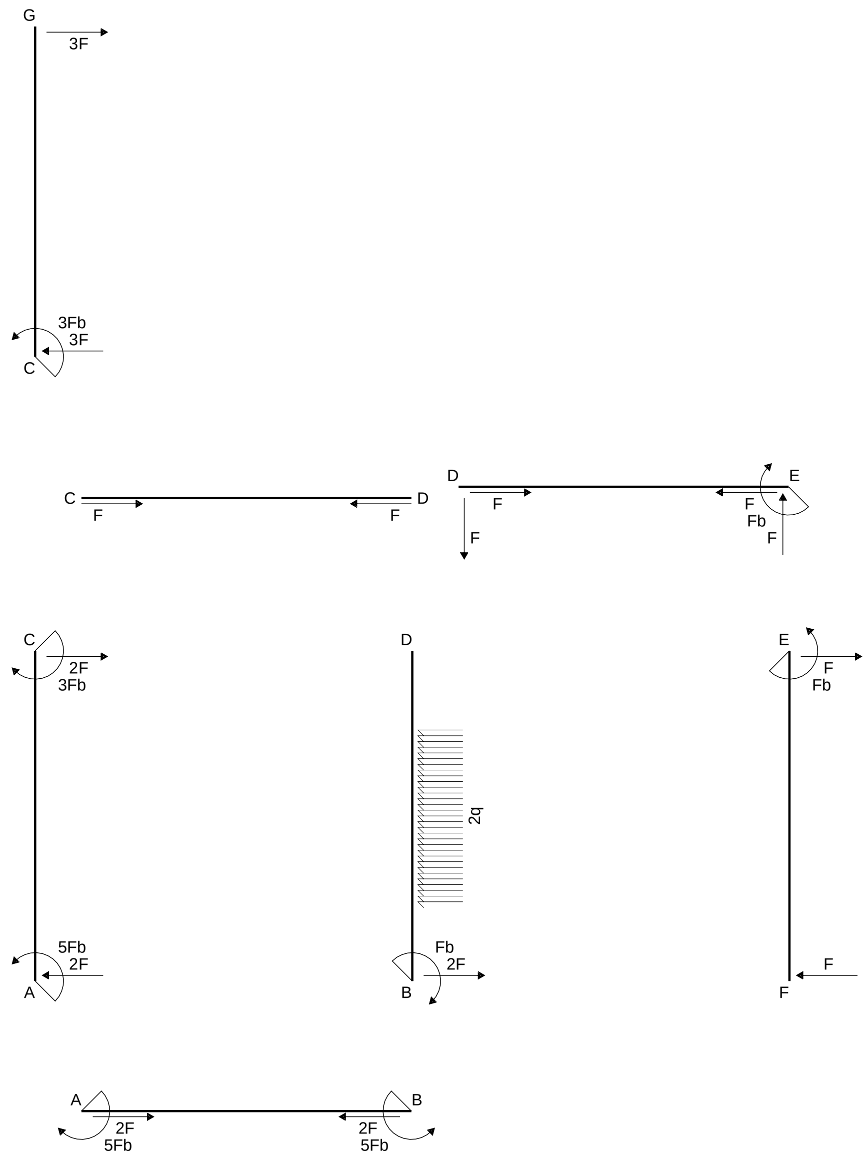
$$\begin{array}{c} \\ v_F \\ v_{CD} \\ \varphi_{CD} \end{array} \begin{array}{c} \begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix} \\ \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & -1 & 1 \end{bmatrix} \end{array} = \begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & -4 & 1 \end{bmatrix} \end{array}$$

Soluzione del sistema

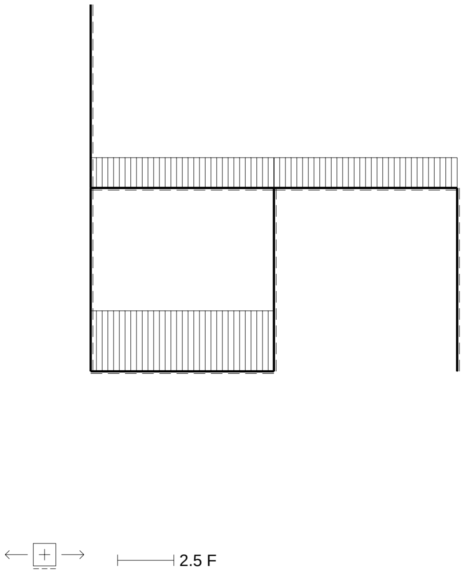
$$\begin{bmatrix} V_A b \\ V_{DB} b \\ H_G b \end{bmatrix} = \begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 4 & -1 \end{bmatrix} \end{array}$$

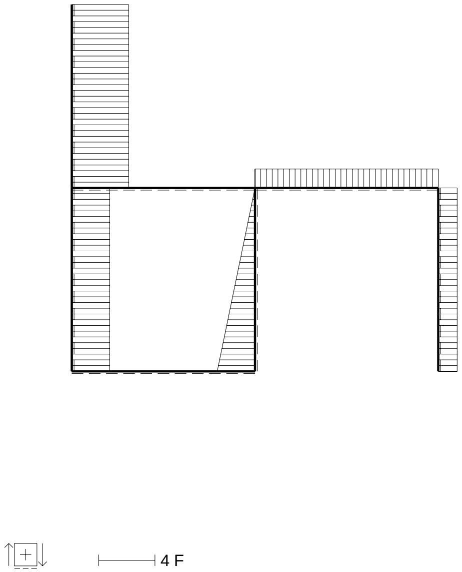
@ Adolfo Zavelani Rossi, Politecnico di Milano

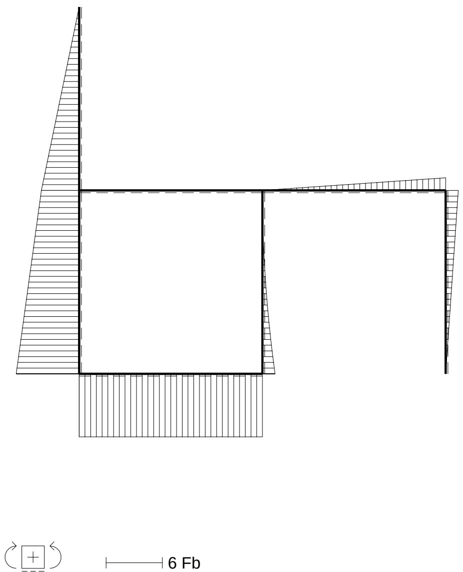
REAZIONI Nome: Es.N.036



@ Adolfo Zavelani Rossi, Politecnico di Milano







REAZIONI

$V_A = 0$
$H_F = -4(W/b) +3qb = -F$
$W_F = -Fb +4W -3qb^2 = 0$
$H_G = 4(W/b) -qb = 3F$

$H_{AB} = 2qb = 2F$
$V_{AB} = 0$
$W_{AB} = -4W -qb^2 = -5Fb$
$H_{BA} = -2qb = -2F$
$V_{BA} = 0$
$W_{BA} = 4W +qb^2 = 5Fb$

$H_{CD} = 4(W/b) -3qb = F$
$V_{CD} = 0$
$W_{CD} = 0$
$H_{DC} = -4(W/b) +3qb = -F$
$V_{DC} = 0$
$W_{DC} = 0$

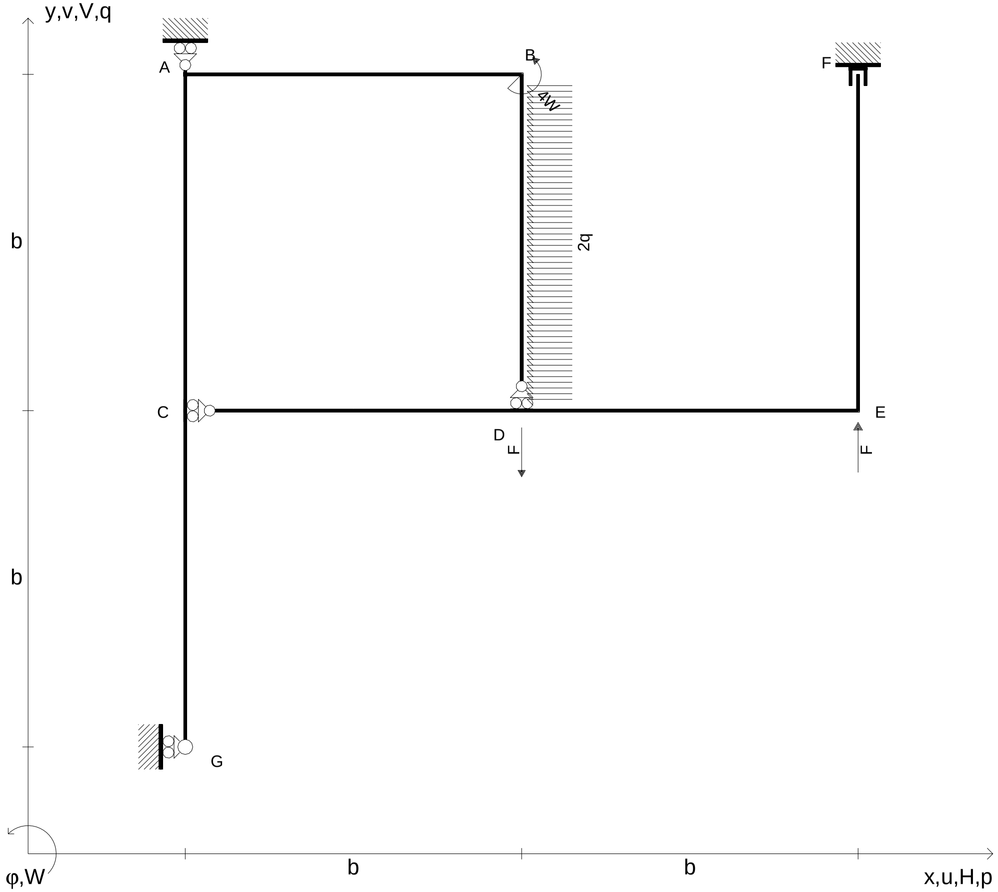
$H_{DE} = 4(W/b) -3qb = F$
$V_{DE} = -F = -F$
$W_{DE} = 0$
$H_{ED} = -4(W/b) +3qb = -F$
$V_{ED} = F = F$
$W_{ED} = -Fb = -Fb$

$H_{AC} = -2qb = -2F$
$V_{AC} = 0$
$W_{AC} = 4W +qb^2 = 5Fb$
$H_{CA} = 2qb = 2F$
$V_{CA} = 0$
$W_{CA} = -4W +qb^2 = -3Fb$

$H_{BD} = 2qb = 2F$
$V_{BD} = 0$
$W_{BD} = -qb^2 = -Fb$
$H_{DB} = 0$
$V_{DB} = 0$
$W_{DB} = 0$

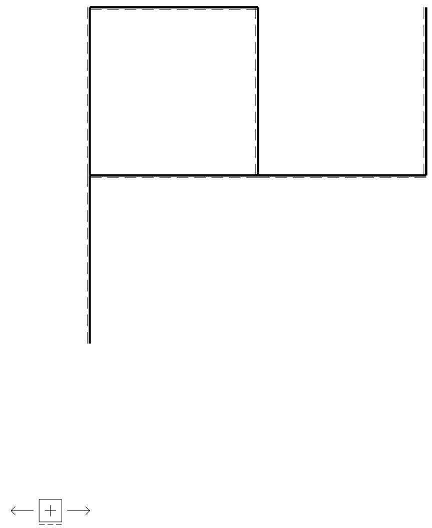
$H_{FE} = -4(W/b) +3qb = -F$
$V_{FE} = 0$
$W_{FE} = -Fb +4W -3qb^2 = 0$
$H_{EF} = 4(W/b) -3qb = F$
$V_{EF} = 0$
$W_{EF} = Fb = Fb$

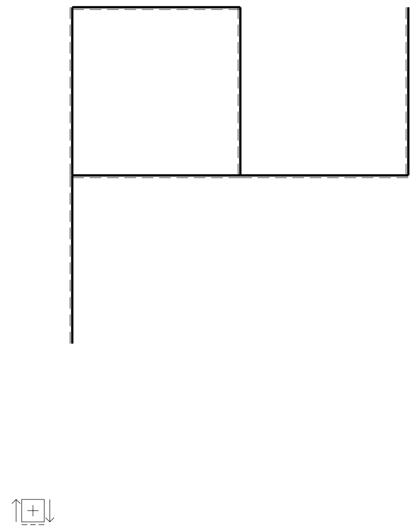
$H_{CG} = -4(W/b) +qb = -3F$
$V_{CG} = 0$
$W_{CG} = 4W -qb^2 = 3Fb$
$H_{GC} = 4(W/b) -qb = 3F$
$V_{GC} = 0$
$W_{GC} = 0$

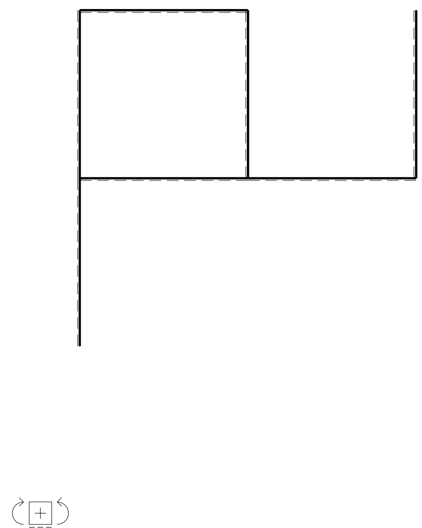


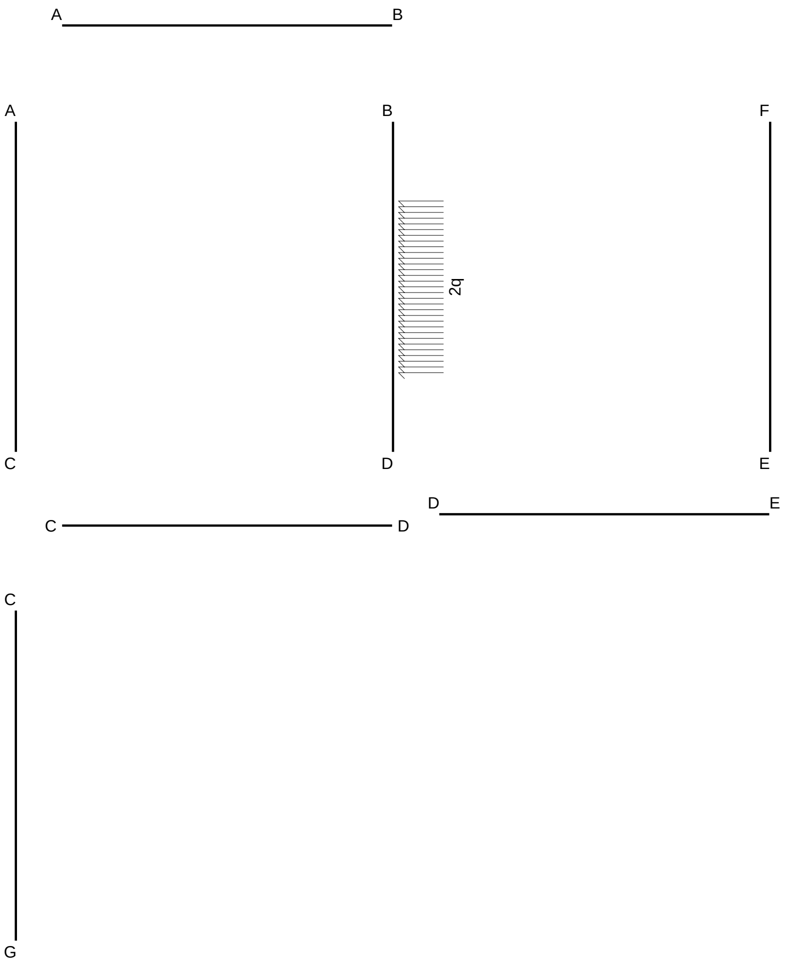
$V_D = -F$ $V_E = F$ $W_B = 4W = 4Fb$ $p_{BD} = -2q = -2F/b$

Svolgere l'analisi cinematica.
Determinare matrice di congruenza e di equilibrio.
Determinare le reazioni vincolari a terra col PLV (Le=0).
Determinare le azioni interne in A col PLV (Le=0).
Carichi e deformazioni date hanno verso efficace in disegno.
Calcolare reazioni vincolari della struttura e delle aste.
Tracciare i diagrammi delle azioni interne nelle aste.
@ Adolfo Zavelani Rossi, Politecnico di Milano









REAZIONI

V_A =
W_F =
H_F =
H_G =

H_{AB} =
V_{AB} =
W_{AB} =
H_{BA} =
V_{BA} =
W_{BA} =

H_{CD} =
V_{CD} =
W_{CD} =
H_{DC} =
V_{DC} =
W_{DC} =

H_{DE} =
V_{DE} =
W_{DE} =
H_{ED} =
V_{ED} =
W_{ED} =

H_{AC} =
V_{AC} =
W_{AC} =
H_{CA} =
V_{CA} =
W_{CA} =

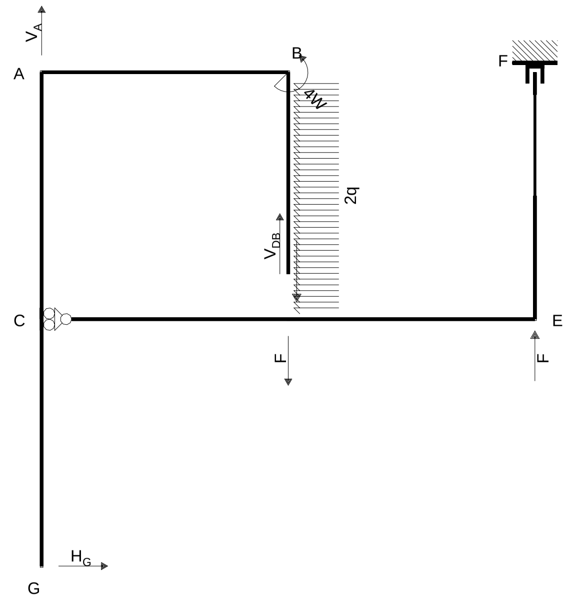
H_{BD} =
V_{BD} =
W_{BD} =
H_{DB} =
V_{DB} =
W_{DB} =

H_{FE} =
V_{FE} =
W_{FE} =
H_{EF} =
V_{EF} =
W_{EF} =

H_{CG} =
V_{CG} =
W_{CG} =
H_{GC} =
V_{GC} =
W_{GC} =

@ Adolfo Zavelani Rossi, Politecnico di Milano

@ Adolfo Zavelani Rossi, Politecnico di Milano



EQUAZIONI DI EQUILIBRIO

Traslazione verticale globale

$V_A = 0$

Traslazione verticale: aste CA CG AB BD

$V_A + V_{DB} = 0$

Rotazione intorno a C: aste CA CG AB BD

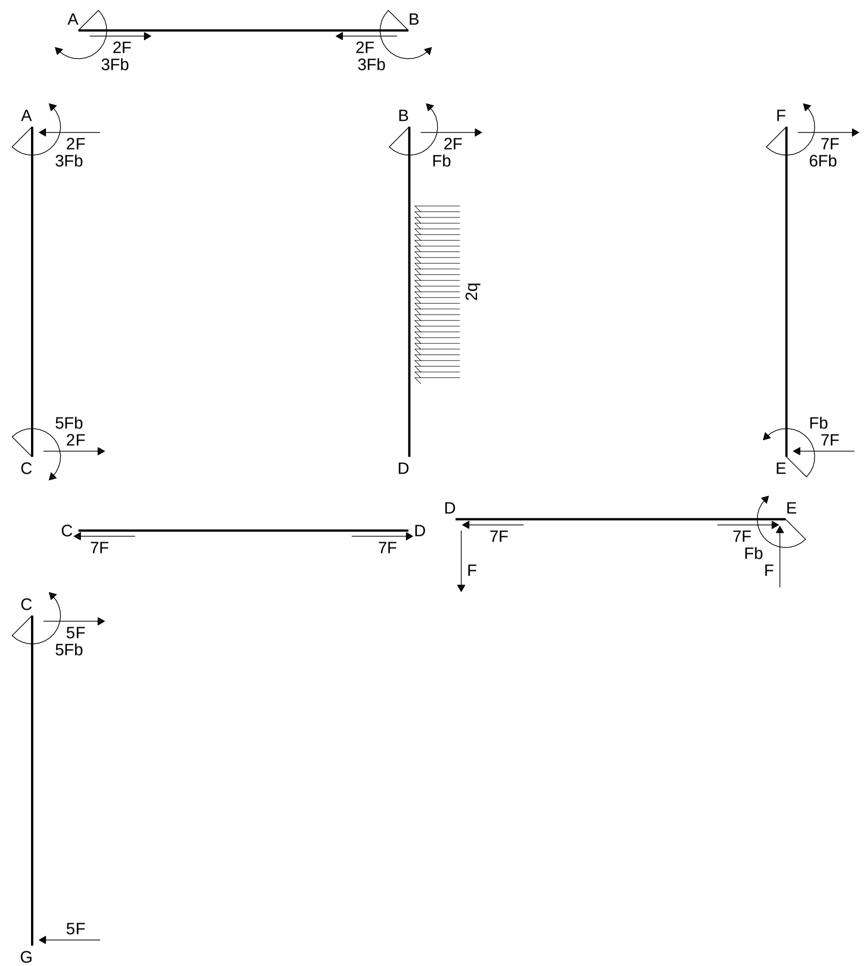
$H_G b + V_{DB} b = -4W - qb^2$

Matrice di equilibrio

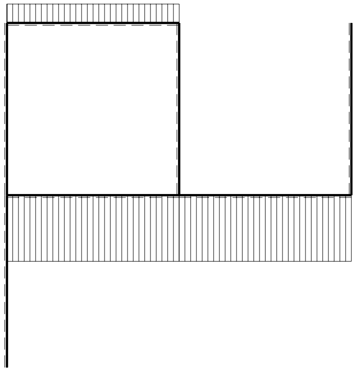
$$\begin{array}{c} \\ v_F \\ v_{CD} \\ \varphi_{CD} \end{array} \begin{array}{c} \begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix} \\ \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix} \end{array} = \begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & -4 & -1 \end{bmatrix} \end{array}$$

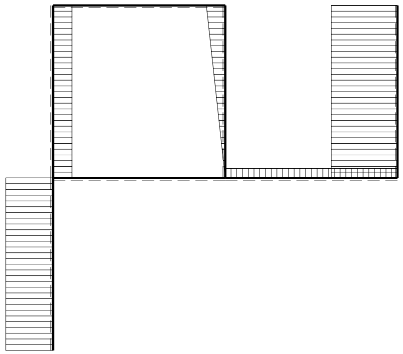
Soluzione del sistema

$$\begin{bmatrix} V_A b \\ V_{DB} b \\ H_G b \end{bmatrix} = \begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & -4 & -1 \end{bmatrix} \end{array}$$



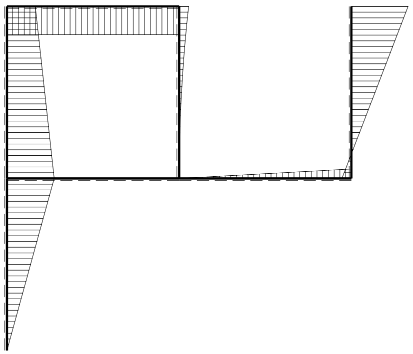
AZIONI INTERNE Nome: Es.N.037





8 F

8 F



8 Fb

PROCEDIMENTO E RISULTATI Nome: Es.N.037

REAZIONI

$V_A = 0$
$H_F = 4(W/b) + 3qb = 7F$

$W_F = -Fb + 4W + 3qb^2 = 6Fb$
$H_G = -4(W/b) - qb = -5F$

$H_{AB} = 2qb = 2F$
$V_{AB} = 0$
$W_{AB} = -4W + qb^2 = -3Fb$
$H_{BA} = -2qb = -2F$
$V_{BA} = 0$
$W_{BA} = 4W - qb^2 = 3Fb$

$H_{CD} = -4(W/b) - 3qb = -7F$
$V_{CD} = 0$
$W_{CD} = 0$
$H_{DC} = 4(W/b) + 3qb = 7F$
$V_{DC} = 0$
$W_{DC} = 0$

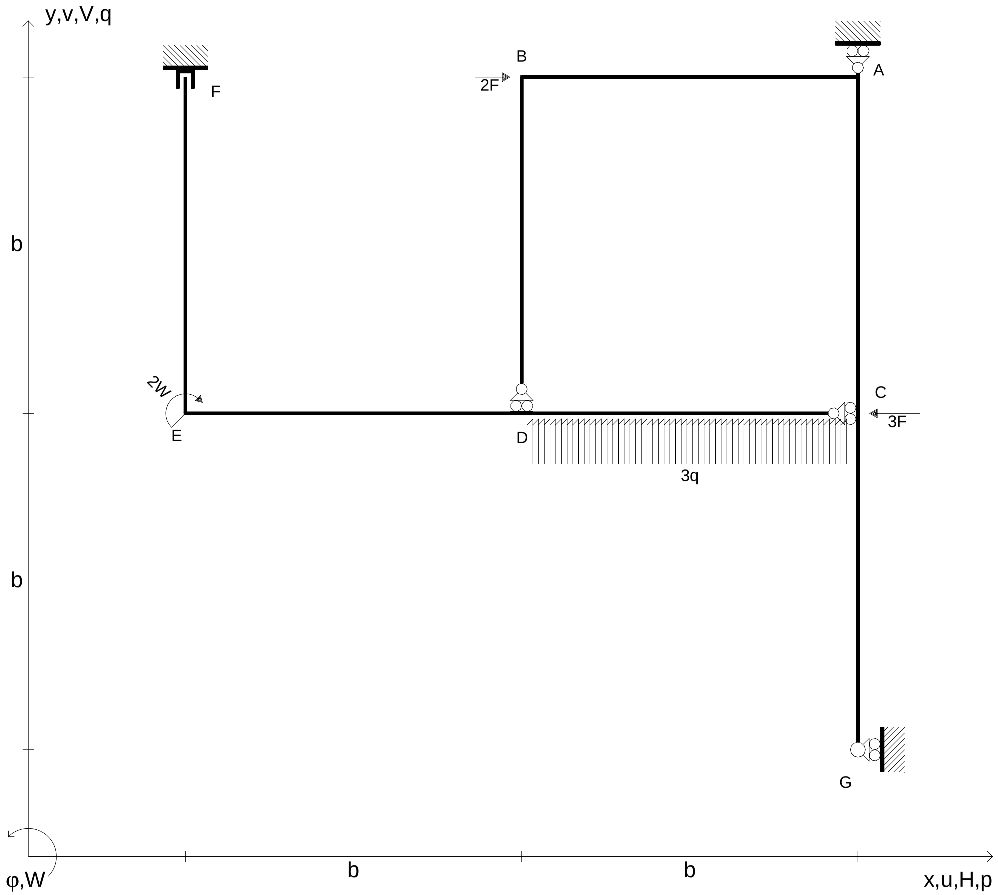
$H_{DE} = -4(W/b) - 3qb = -7F$
$V_{DE} = -F = -F$
$W_{DE} = 0$
$H_{ED} = 4(W/b) + 3qb = 7F$
$V_{ED} = F = F$
$W_{ED} = -Fb = -Fb$

$H_{AC} = -2qb = -2F$
$V_{AC} = 0$
$W_{AC} = 4W - qb^2 = 3Fb$
$H_{CA} = 2qb = 2F$
$V_{CA} = 0$
$W_{CA} = -4W - qb^2 = -5Fb$

$H_{BD} = 2qb = 2F$
$V_{BD} = 0$
$W_{BD} = qb^2 = Fb$
$H_{DB} = 0$
$V_{DB} = 0$
$W_{DB} = 0$

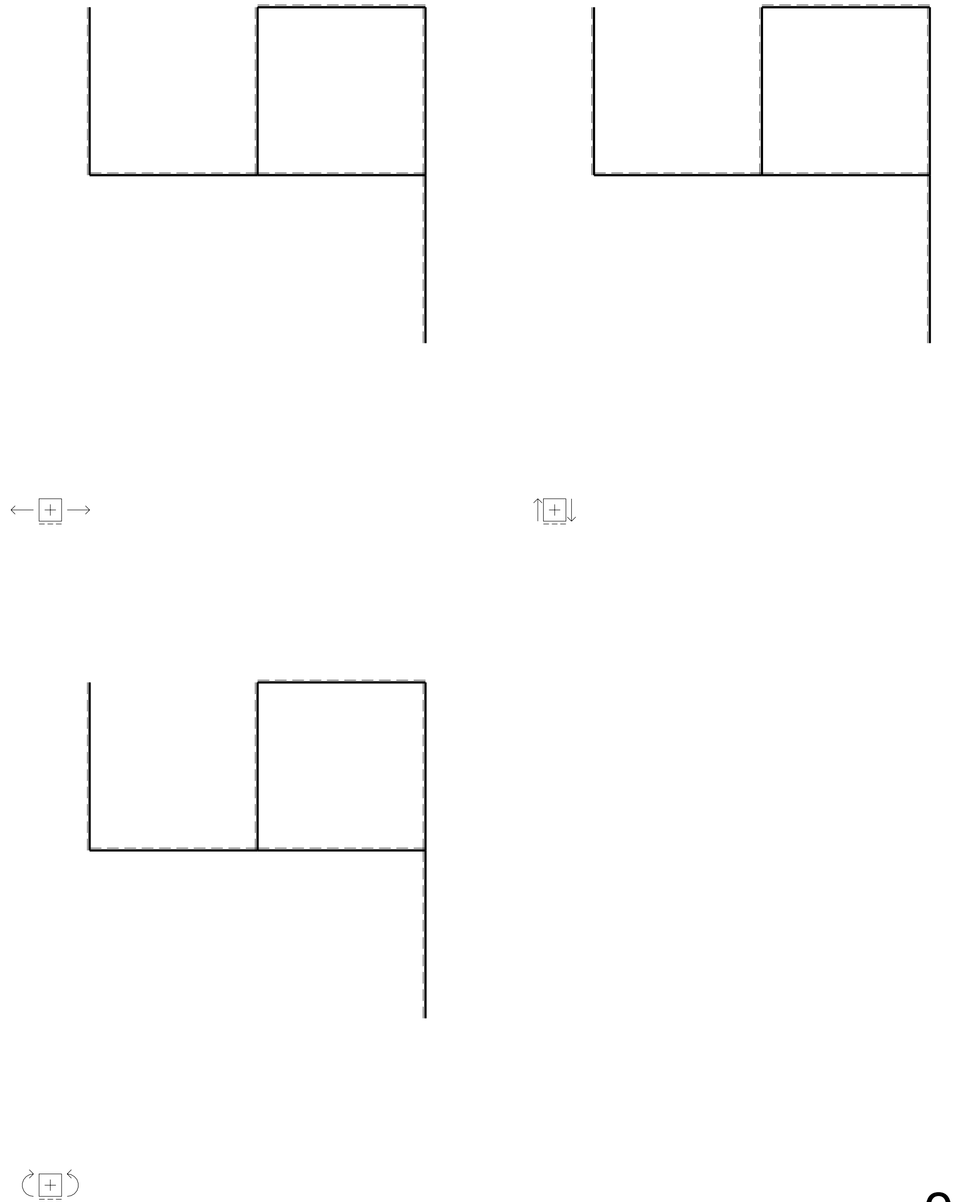
$H_{FE} = 4(W/b) + 3qb = 7F$
$V_{FE} = 0$
$W_{FE} = -Fb + 4W + 3qb^2 = 6Fb$
$H_{EF} = -4(W/b) - 3qb = -7F$
$V_{EF} = 0$
$W_{EF} = Fb = Fb$

$H_{CG} = 4(W/b) + qb = 5F$
$V_{CG} = 0$
$W_{CG} = 4W + qb^2 = 5Fb$
$H_{GC} = -4(W/b) - qb = -5F$
$V_{GC} = 0$
$W_{GC} = 0$

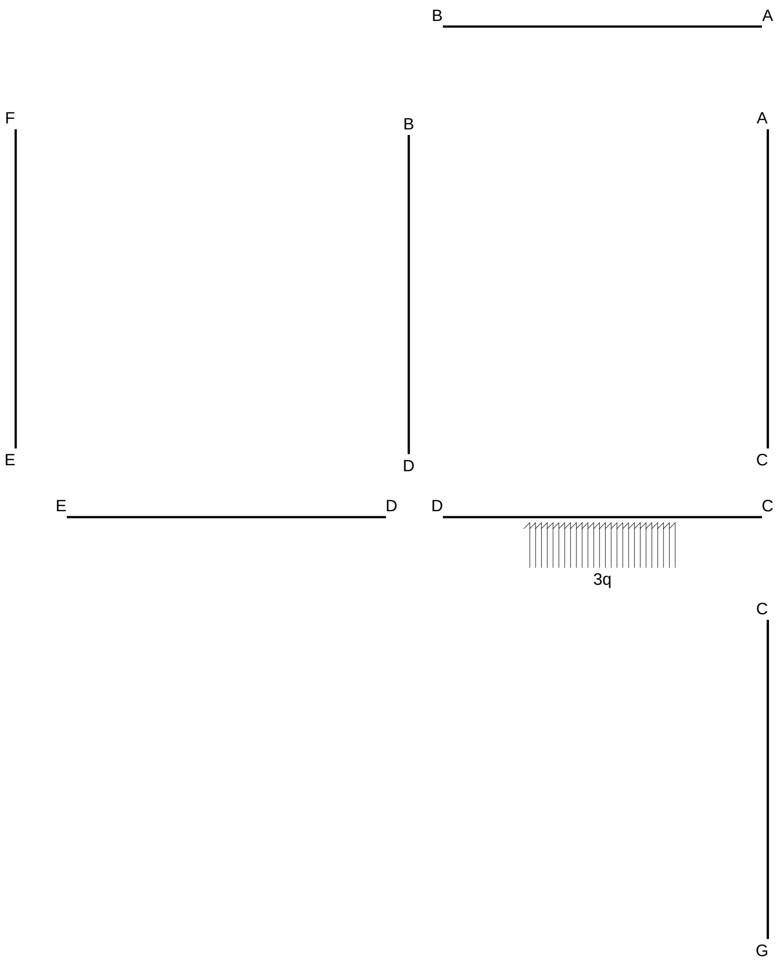


$H_B = 2F$ $H_C = -3F$ $W_E = -2W = -2Fb$ $q_{CD} = 3q = 3F/b$

Svolgere l'analisi cinematica.
Determinare matrice di congruenza e di equilibrio.
Determinare le reazioni vincolari a terra col PLV (Le=0).
Determinare le azioni interne in A col PLV (Le=0).
Carichi e deformazioni date hanno verso efficace in disegno.
Calcolare reazioni vincolari della struttura e delle aste.
Tracciare i diagrammi delle azioni interne nelle aste.
@ Adolfo Zavelani Rossi, Politecnico di Milano



@ Adolfo Zavelani Rossi, Politecnico di Milano



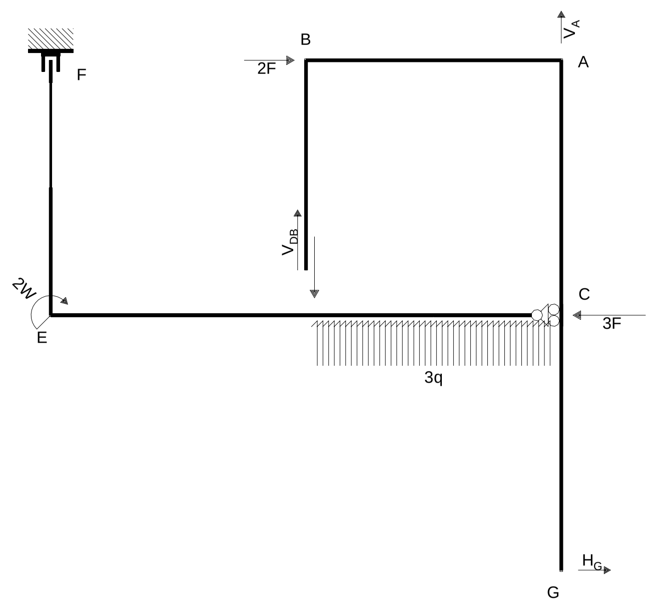
REAZIONI

V_A =	W_F =
H_F =	H_G =

H_{AB} =	H_{CD} =	H_{DE} =
V_{AB} =	V_{CD} =	V_{DE} =
W_{AB} =	W_{CD} =	W_{DE} =
H_{BA} =	H_{DC} =	H_{ED} =
V_{BA} =	V_{DC} =	V_{ED} =
W_{BA} =	W_{DC} =	W_{ED} =

H_{AC} =	H_{BD} =	H_{FE} =
V_{AC} =	V_{BD} =	V_{FE} =
W_{AC} =	W_{BD} =	W_{FE} =
H_{CA} =	H_{DB} =	H_{EF} =
V_{CA} =	V_{DB} =	V_{EF} =
W_{CA} =	W_{DB} =	W_{EF} =

H_{CG} =
V_{CG} =
W_{CG} =
H_{GC} =
V_{GC} =
W_{GC} =



EQUAZIONI DI EQUILIBRIO

Traslazione verticale globale

$V_A = -3qb$

Traslazione verticale: aste CA CG AB BD

$V_A + V_{DB} = 0$

Rotazione intorno a C: aste CA CG AB BD

$H_G b - V_{DB} b = 2Fb$

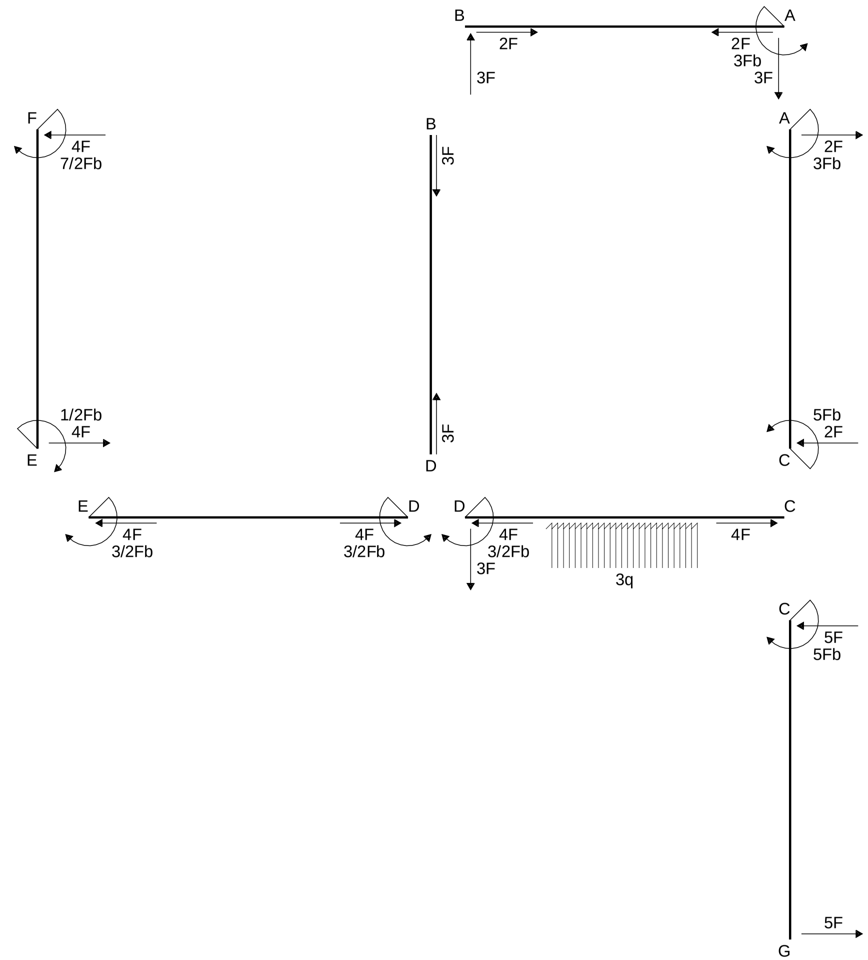
Matrice di equilibrio

$$\begin{array}{c} \\ v_F \\ v_{CD} \\ \varphi_{CD} \end{array} \begin{array}{c} \begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix} \\ \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & -1 \end{bmatrix} \end{array} = \begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} 0 & 0 & -3 \\ 0 & 0 & 0 \\ 2 & 0 & 0 \end{bmatrix} \end{array}$$

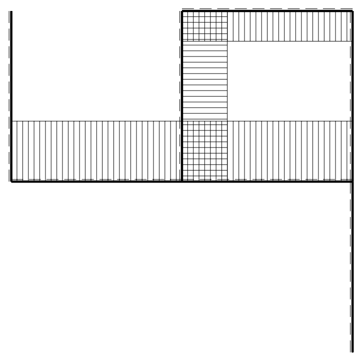
Soluzione del sistema

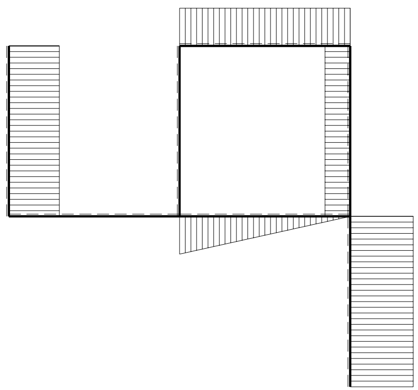
$$\begin{bmatrix} V_A b \\ V_{DB} b \\ H_G b \end{bmatrix} = \begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} 0 & 0 & -3 \\ 0 & 0 & 3 \\ 2 & 0 & 3 \end{bmatrix} \end{array}$$

@ Adolfo Zavelani Rossi, Politecnico di Milano



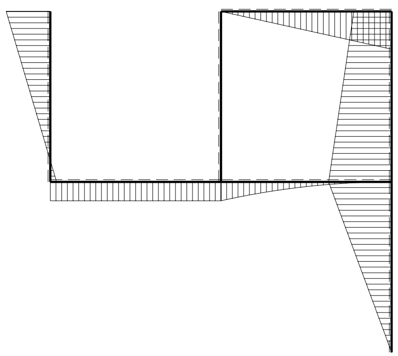
@ Adolfo Zavelani Rossi, Politecnico di Milano





5 F

6 F



6 Fb

REAZIONI

$V_A = -3qb = -3F$

$H_F = -F -3qb = -4F$

$W_F = -Fb +2W -9/2qb^2 = -7/2Fb$

$H_G = 2F +3qb = 5F$

$H_{AB} = -2F = -2F$

$V_{AB} = -3qb = -3F$

$W_{AB} = 3qb^2 = 3Fb$

$H_{BA} = 2F = 2F$

$V_{BA} = 3qb = 3F$

$W_{BA} = 0$

$H_{CD} = F +3qb = 4F$

$V_{CD} = 0$

$W_{CD} = 0$

$H_{DC} = -F -3qb = -4F$

$V_{DC} = -3qb = -3F$

$W_{DC} = -3/2qb^2 = -3/2Fb$

$H_{DE} = F +3qb = 4F$

$V_{DE} = 0$

$W_{DE} = 3/2qb^2 = 3/2Fb$

$H_{ED} = -F -3qb = -4F$

$V_{ED} = 0$

$W_{ED} = -3/2qb^2 = -3/2Fb$

$H_{AC} = 2F = 2F$

$V_{AC} = 0$

$W_{AC} = -3qb^2 = -3Fb$

$H_{CA} = -2F = -2F$

$V_{CA} = 0$

$W_{CA} = 2Fb +3qb^2 = 5Fb$

$H_{BD} = 0$

$V_{BD} = -3qb = -3F$

$W_{BD} = 0$

$H_{DB} = 0$

$V_{DB} = 3qb = 3F$

$W_{DB} = 0$

$H_{FE} = -F -3qb = -4F$

$V_{FE} = 0$

$W_{FE} = -Fb +2W -9/2qb^2 = -7/2Fb$

$H_{EF} = F +3qb = 4F$

$V_{EF} = 0$

$W_{EF} = -2W +3/2qb^2 = -1/2Fb$

$H_{CG} = -2F -3qb = -5F$

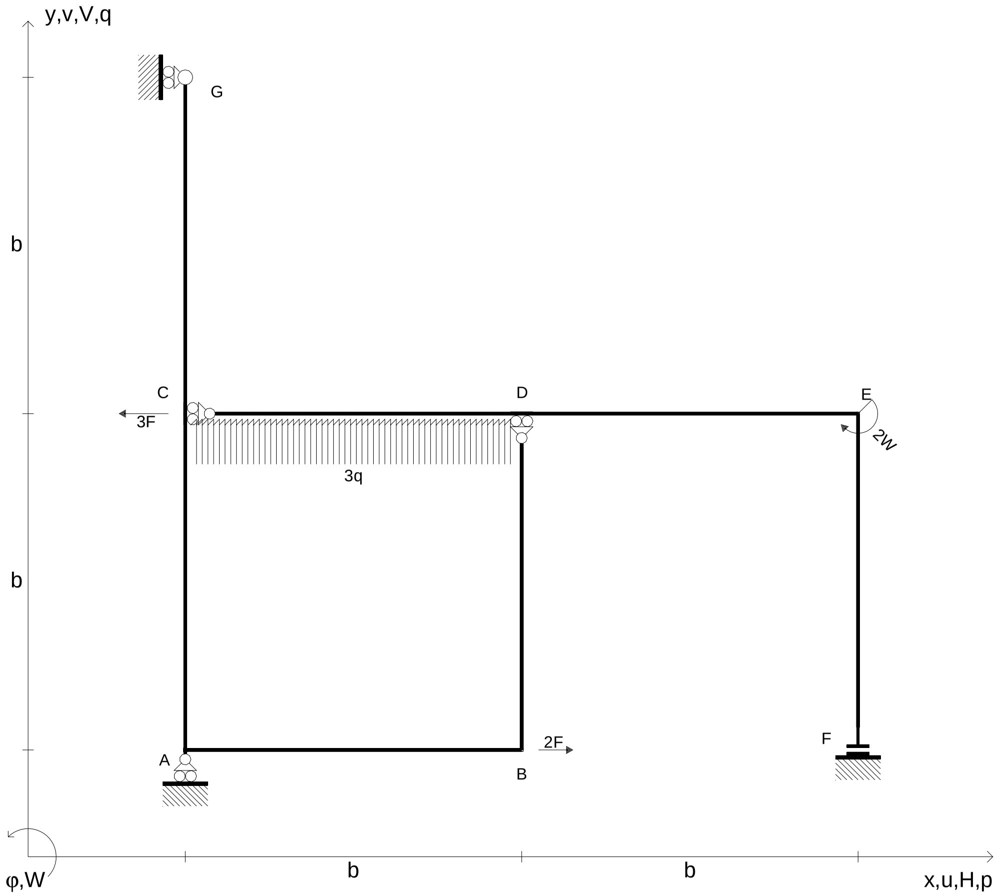
$V_{CG} = 0$

$W_{CG} = -2Fb -3qb^2 = -5Fb$

$H_{GC} = 2F +3qb = 5F$

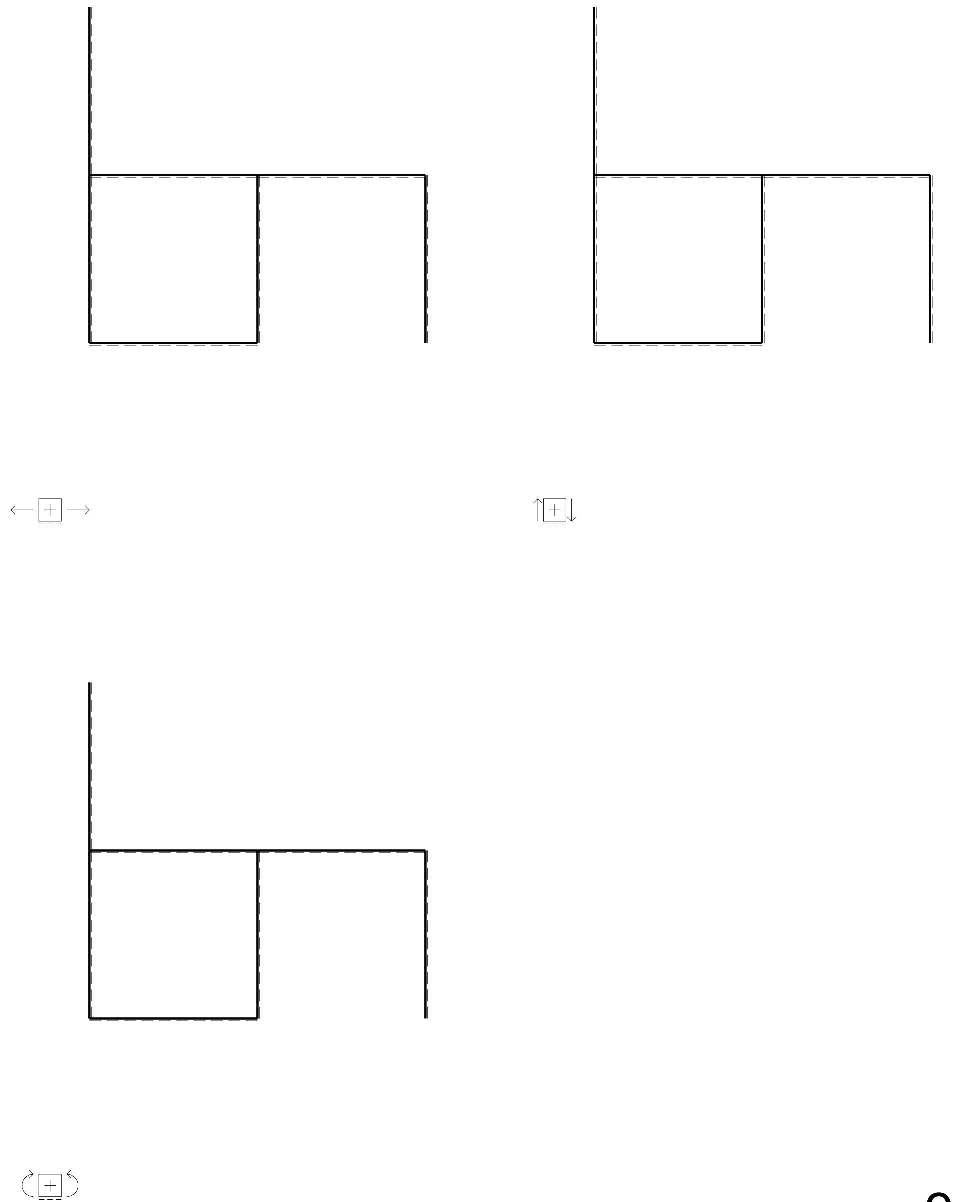
$V_{GC} = 0$

$W_{GC} = 0$



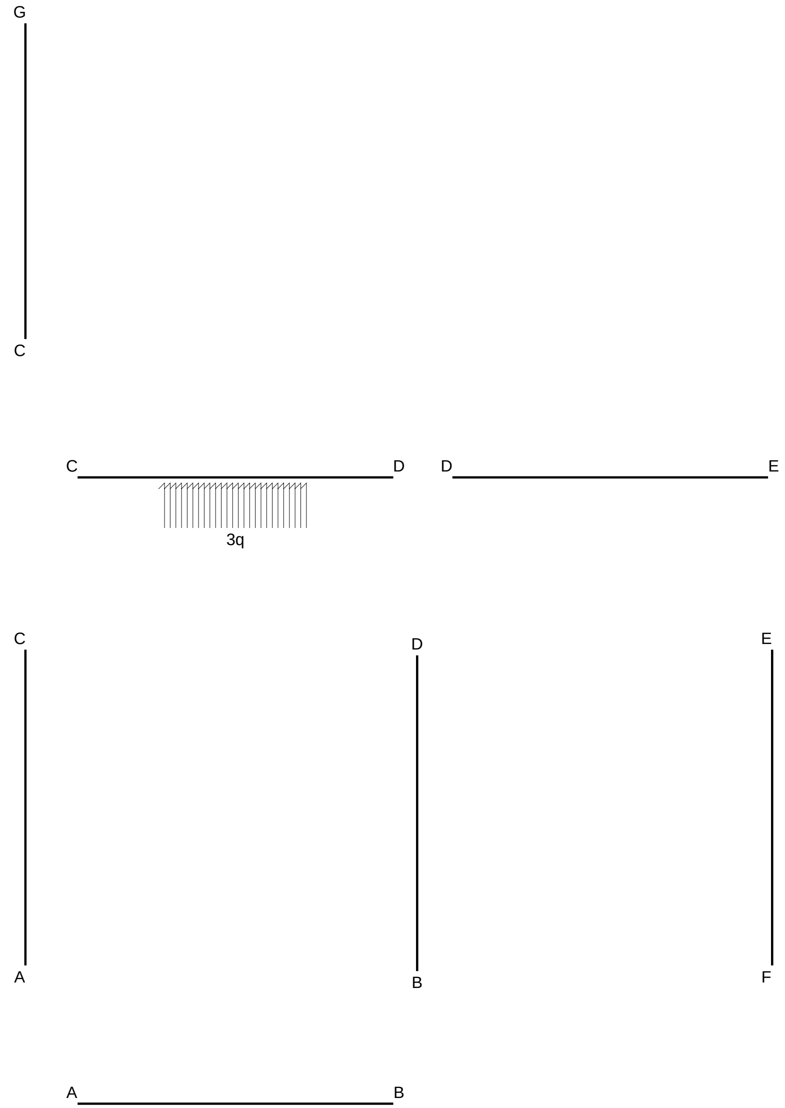
$H_B = 2F$ $H_C = -3F$ $W_E = -2W = -2Fb$ $q_{CD} = 3q = 3F/b$

Svolgere l'analisi cinematica.
Determinare matrice di congruenza e di equilibrio.
Determinare le reazioni vincolari a terra col PLV (Le=0).
Determinare le azioni interne in A col PLV (Le=0).
Carichi e deformazioni date hanno verso efficace in disegno.
Calcolare reazioni vincolari della struttura e delle aste.
Tracciare i diagrammi delle azioni interne nelle aste.
@ Adolfo Zavelani Rossi, Politecnico di Milano



@ Adolfo Zavelani Rossi, Politecnico di Milano

REAZIONI Nome: Es.N.039



RISULTATI NUMERICI Nome: Es.N.039

REAZIONI

V_A =
V_F =

W_F =
H_G =

H_{AB} =
V_{AB} =
W_{AB} =
H_{BA} =
V_{BA} =
W_{BA} =

H_{DE} =
V_{DE} =
W_{DE} =
H_{ED} =
V_{ED} =
W_{ED} =

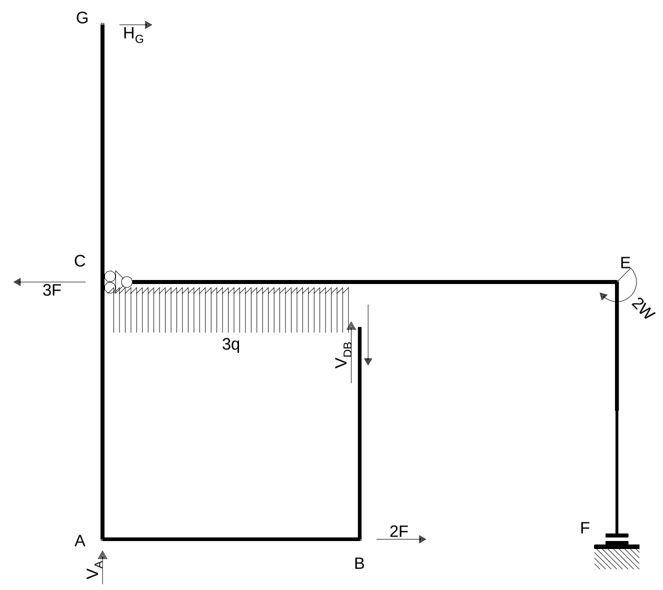
H_{BD} =
V_{BD} =
W_{BD} =
H_{DB} =
V_{DB} =
W_{DB} =

H_{CG} =
V_{CG} =
W_{CG} =
H_{GC} =
V_{GC} =
W_{GC} =

H_{CD} =
V_{CD} =
W_{CD} =
H_{DC} =
V_{DC} =
W_{DC} =

H_{AC} =
V_{AC} =
W_{AC} =
H_{CA} =
V_{CA} =
W_{CA} =

H_{FE} =
V_{FE} =
W_{FE} =
H_{EF} =
V_{EF} =
W_{EF} =



EQUAZIONI DI EQUILIBRIO

Traslazione orizzontale globale

$H_G = F$

Traslazione verticale: aste CA CG AB BD

$V_A + V_{DB} = 0$

Rotazione intorno a C: aste CA CG AB BD

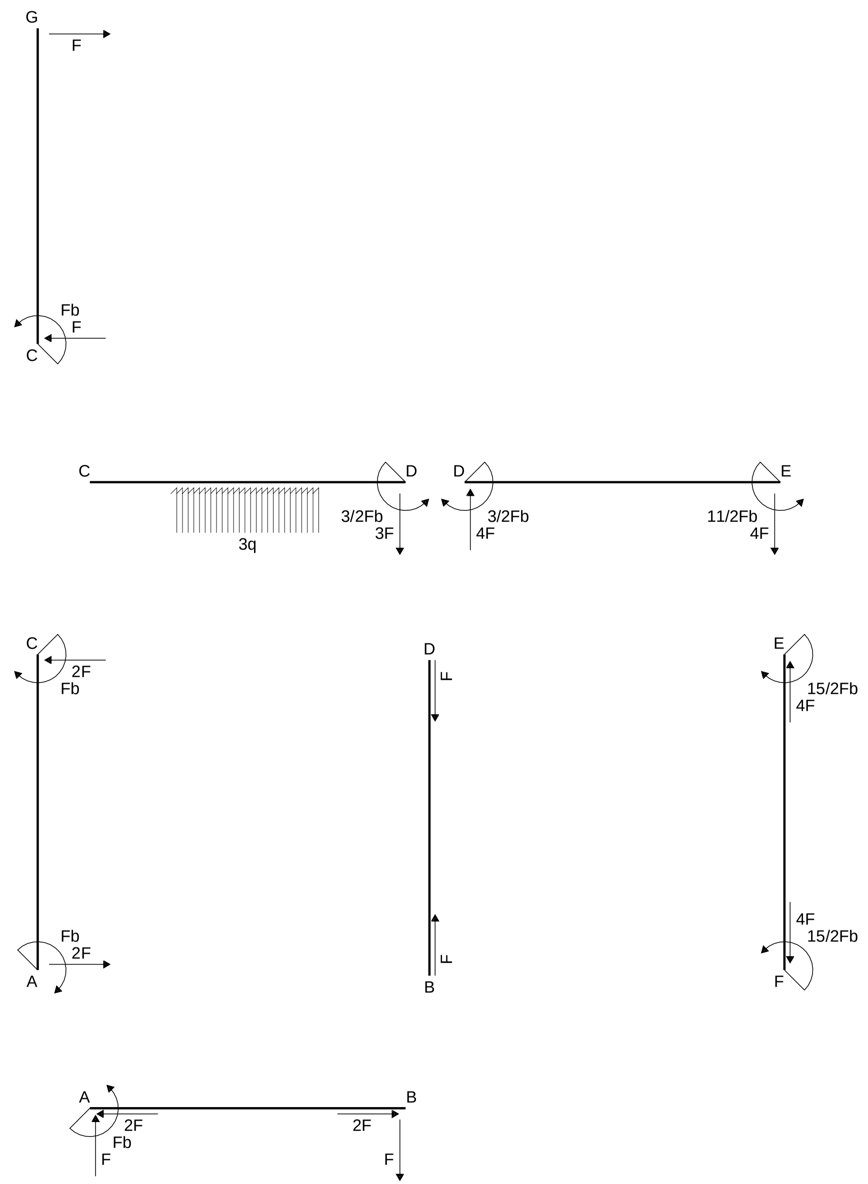
$-H_G b + V_{DB} b = -2Fb$

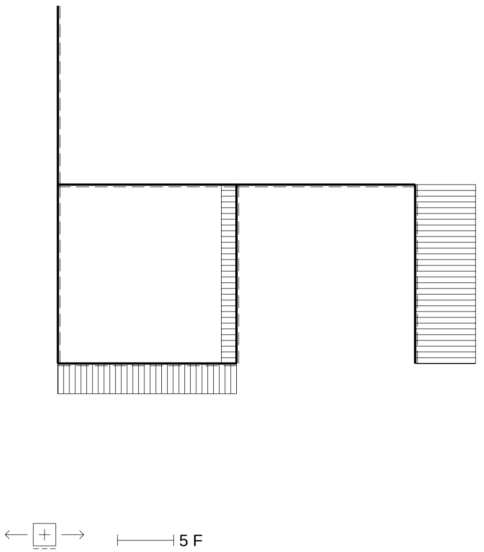
Matrice di equilibrio

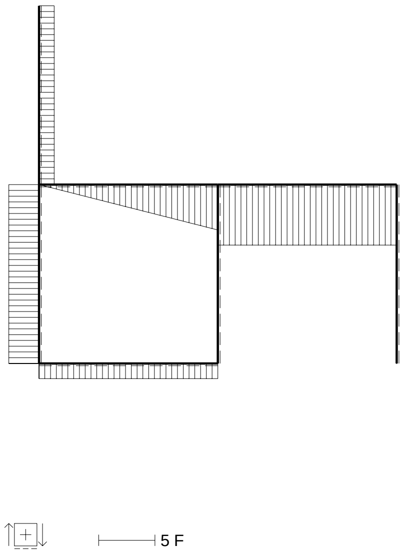
$$\begin{array}{c} \\ u_F \\ v_{CD} \\ \varphi_{CD} \end{array} \begin{bmatrix} V_A b & H_G b & V_{DB} b \\ 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} Fb & W & qb^2 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \\ -2 & 0 & 0 \end{bmatrix}$$

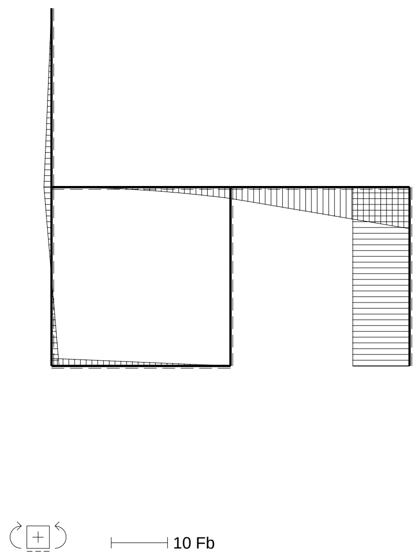
Soluzione del sistema

$$\begin{bmatrix} H_G b \\ V_A b \\ V_{DB} b \end{bmatrix} = \begin{bmatrix} Fb & W & qb^2 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \\ -1 & 0 & 0 \end{bmatrix}$$









REAZIONI

$V_A = F = F$

$V_F = -F -3qb = -4F$

$W_F = Fb +2W +9/2qb^2 = 15/2Fb$

$H_G = F = F$

$H_{AB} = -2F = -2F$
$V_{AB} = F = F$
$W_{AB} = Fb = Fb$
$H_{BA} = 2F = 2F$
$V_{BA} = -F = -F$
$W_{BA} = 0$

$H_{CD} = 0$
$V_{CD} = 0$
$W_{CD} = 0$
$H_{DC} = 0$
$V_{DC} = -3qb = -3F$
$W_{DC} = 3/2qb^2 = 3/2Fb$

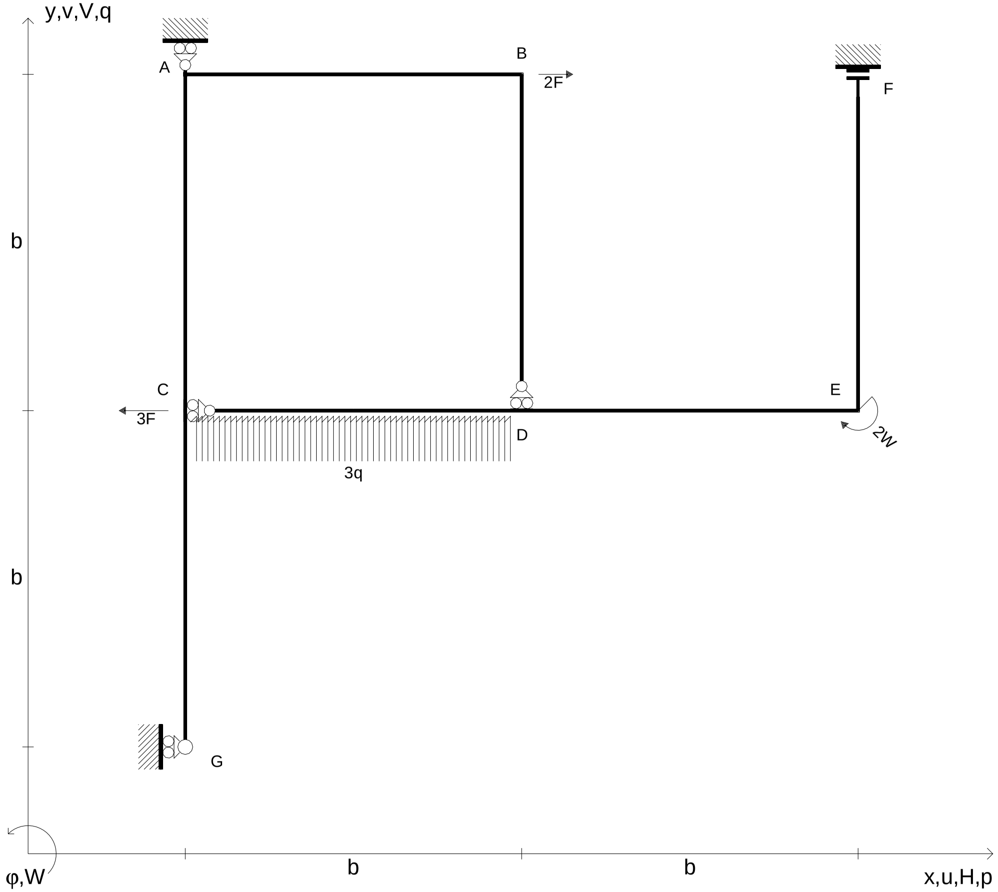
$H_{DE} = 0$
$V_{DE} = F +3qb = 4F$
$W_{DE} = -3/2qb^2 = -3/2Fb$
$H_{ED} = 0$
$V_{ED} = -F -3qb = -4F$
$W_{ED} = Fb +9/2qb^2 = 11/2Fb$

$H_{AC} = 2F = 2F$
$V_{AC} = 0$
$W_{AC} = -Fb = -Fb$
$H_{CA} = -2F = -2F$
$V_{CA} = 0$
$W_{CA} = -Fb = -Fb$

$H_{BD} = 0$
$V_{BD} = F = F$
$W_{BD} = 0$
$H_{DB} = 0$
$V_{DB} = -F = -F$
$W_{DB} = 0$

$H_{FE} = 0$
$V_{FE} = -F -3qb = -4F$
$W_{FE} = Fb +2W +9/2qb^2 = 15/2Fb$
$H_{EF} = 0$
$V_{EF} = F +3qb = 4F$
$W_{EF} = -Fb -2W -9/2qb^2 = -15/2Fb$

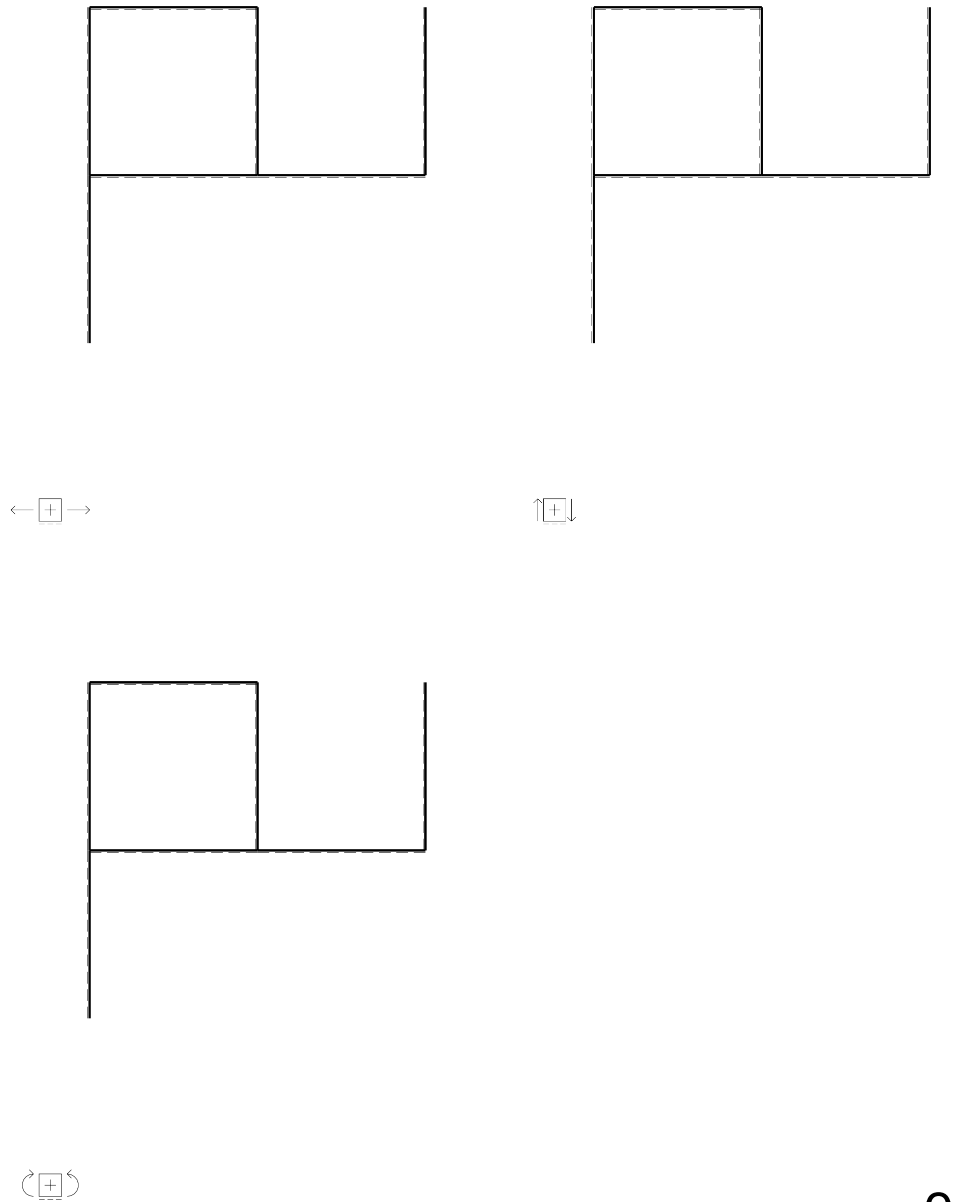
$H_{CG} = -F = -F$
$V_{CG} = 0$
$W_{CG} = Fb = Fb$
$H_{GC} = F = F$
$V_{GC} = 0$
$W_{GC} = 0$



$H_B = 2F$ $H_C = -3F$ $W_E = -2W = -2Fb$ $q_{CD} = 3q = 3F/b$

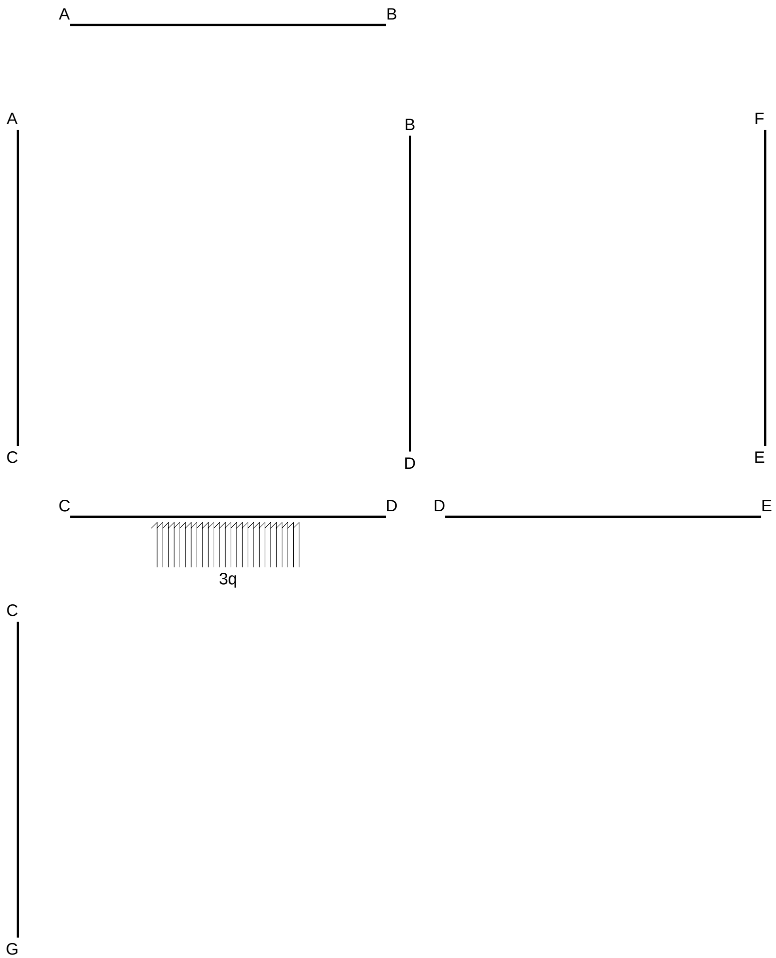
Svolgere l'analisi cinematica.
Determinare matrice di congruenza e di equilibrio.
Determinare le reazioni vincolari a terra col PLV (Le=0).
Determinare le azioni interne in A col PLV (Le=0).
Carichi e deformazioni date hanno verso efficace in disegno.
Calcolare reazioni vincolari della struttura e delle aste.
Tracciare i diagrammi delle azioni interne nelle aste.

@ Adolfo Zavelani Rossi, Politecnico di Milano



@ Adolfo Zavelani Rossi, Politecnico di Milano

REAZIONI Nome: Es.N.040



RISULTATI NUMERICI Nome: Es.N.040

REAZIONI

$V_A =$ $W_F =$
$V_F =$ $H_G =$

$H_{AB} =$
$V_{AB} =$
$W_{AB} =$
$H_{BA} =$
$V_{BA} =$
$W_{BA} =$

$H_{CD} =$
$V_{CD} =$
$W_{CD} =$
$H_{DC} =$
$V_{DC} =$
$W_{DC} =$

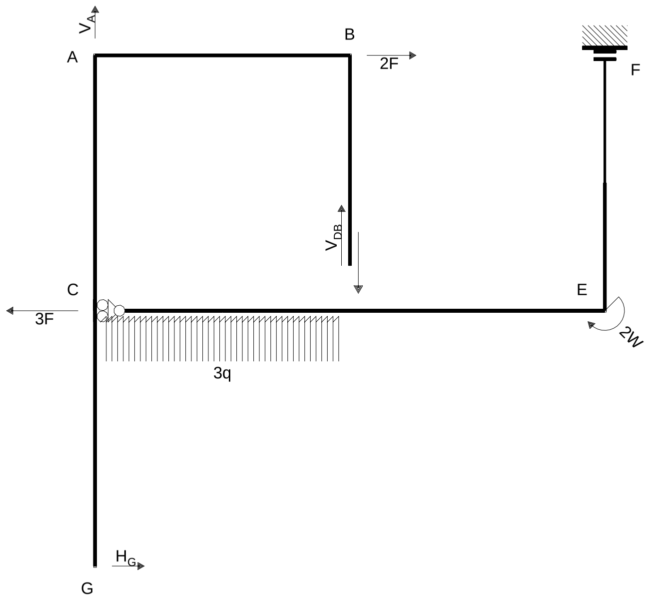
$H_{DE} =$
$V_{DE} =$
$W_{DE} =$
$H_{ED} =$
$V_{ED} =$
$W_{ED} =$

$H_{AC} =$
$V_{AC} =$
$W_{AC} =$
$H_{CA} =$
$V_{CA} =$
$W_{CA} =$

$H_{BD} =$
$V_{BD} =$
$W_{BD} =$
$H_{DB} =$
$V_{DB} =$
$W_{DB} =$

$H_{FE} =$
$V_{FE} =$
$W_{FE} =$
$H_{EF} =$
$V_{EF} =$
$W_{EF} =$

$H_{CG} =$
$V_{CG} =$
$W_{CG} =$
$H_{GC} =$
$V_{GC} =$
$W_{GC} =$



EQUAZIONI DI EQUILIBRIO

Traslazione orizzontale globale

$H_G = F$

Traslazione verticale: aste CA CG AB BD

$V_A + V_{DB} = 0$

Rotazione intorno a C: aste CA CG AB BD

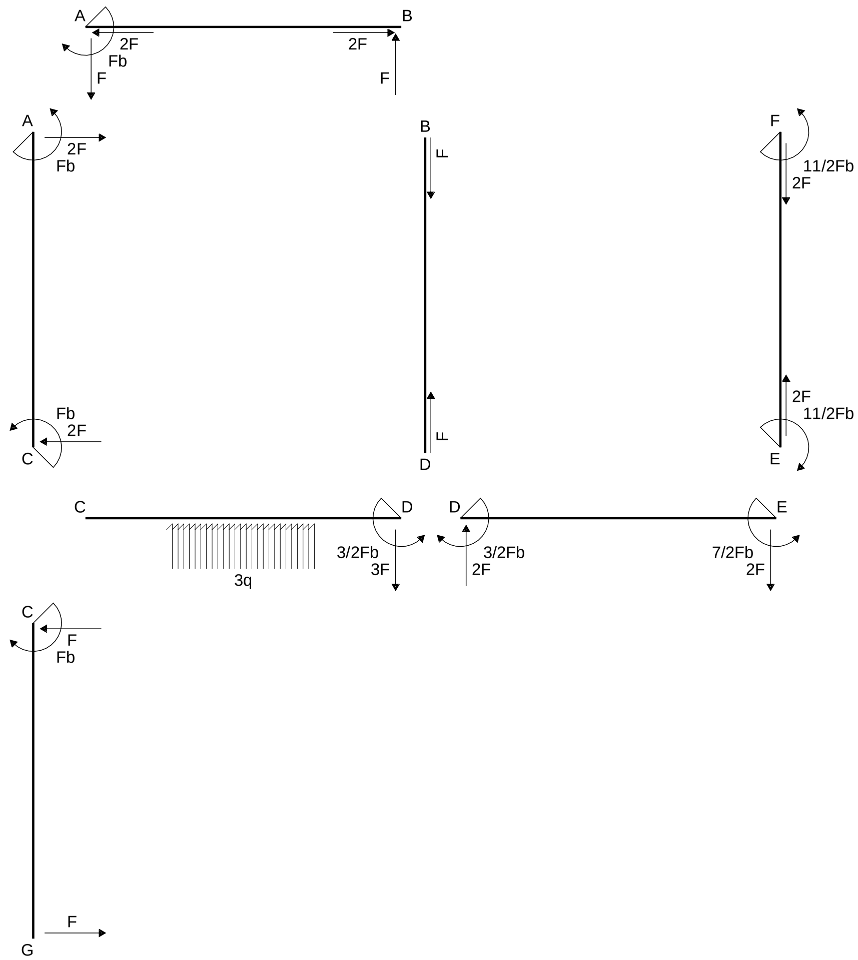
$H_G b + V_{DB} b = 2Fb$

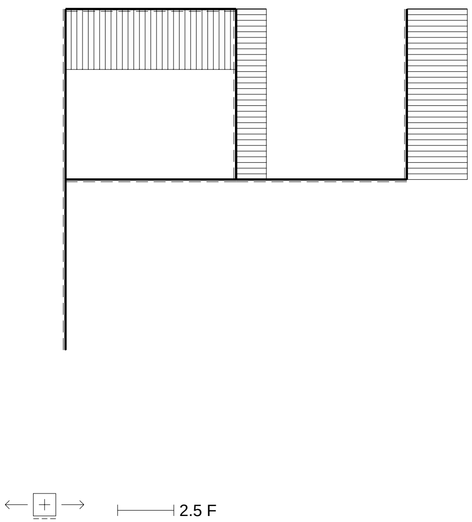
Matrice di equilibrio

$$\begin{array}{c} \\ u_F \\ v_{CD} \\ \varphi_{CD} \end{array} \begin{array}{c} \begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix} \\ \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix} \end{array} = \begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 2 & 0 & 0 \end{bmatrix} \end{array}$$

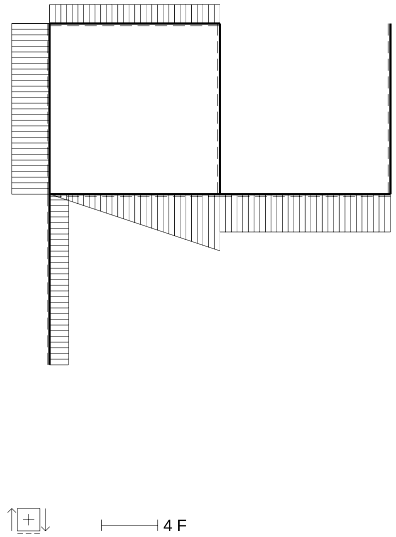
Soluzione del sistema

$$\begin{bmatrix} H_G b \\ V_A b \\ V_{DB} b \end{bmatrix} = \begin{array}{c} \begin{bmatrix} Fb & W & qb^2 \end{bmatrix} \\ \begin{bmatrix} 1 & 0 & 0 \\ -1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix} \end{array}$$

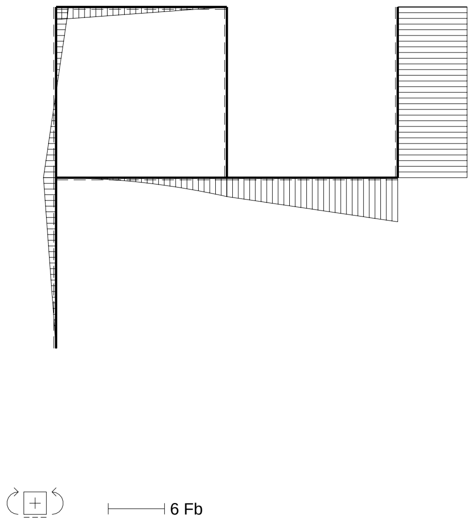




2.5 F



4 F



6 Fb

REAZIONI

V_A = -F = -F

V_F = F -3qb = -2F

W_F = -Fb +2W +9/2qb^2 = 11/2Fb

H_G = F = F

H_{AB} = -2F = -2F
V_{AB} = -F = -F
W_{AB} = -Fb = -Fb
H_{BA} = 2F = 2F
V_{BA} = F = F
W_{BA} = 0

H_{DE} = 0
V_{DE} = -F +3qb = 2F
W_{DE} = -3/2qb^2 = -3/2Fb
H_{ED} = 0
V_{ED} = F -3qb = -2F
W_{ED} = -Fb +9/2qb^2 = 7/2Fb

H_{BD} = 0
V_{BD} = -F = -F
W_{BD} = 0
H_{DB} = 0
V_{DB} = F = F
W_{DB} = 0

H_{CG} = -F = -F
V_{CG} = 0
W_{CG} = -Fb = -Fb
H_{GC} = F = F
V_{GC} = 0
W_{GC} = 0

H_{CD} = 0
V_{CD} = 0
W_{CD} = 0
H_{DC} = 0
V_{DC} = -3qb = -3F
W_{DC} = 3/2qb^2 = 3/2Fb

H_{AC} = 2F = 2F
V_{AC} = 0
W_{AC} = Fb = Fb
H_{CA} = -2F = -2F
V_{CA} = 0
W_{CA} = Fb = Fb

H_{FE} = 0
V_{FE} = F -3qb = -2F
W_{FE} = -Fb +2W +9/2qb^2 = 11/2Fb
H_{EF} = 0
V_{EF} = -F +3qb = 2F
W_{EF} = Fb -2W -9/2qb^2 = -11/2Fb