

Regione Lombardia

Direzione Generale Infrastrutture, Trasporti e Mobilità sostenibile



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LINEA MILANO - VARESE - LAVENO RADDOPPIO SELETTIVO GEMONIO - CITTIGLIO *Progetto Definitivo*

RELAZIONI TECNICHE SPECIALISTICHE Relazione di calcolo ponte SS 394

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1. PREMESSA

La presente relazione costituisce la relazione di calcolo del Progetto Definitivo (PD) del ponte ferroviario sulla Strada Provinciale 394. L'opera d'arte fa parte dell'intervento di raddoppio della linea ferroviaria compresa tra le stazioni di Gemonio e Cittiglio, in Provincia di Varese.

La seguente relazione di calcolo presenta i risultati delle analisi effettuate sulla struttura metallica costituente l'impalcato ferroviario e le strutture in calcestruzzo armato costituenti le spalle e le fondazioni su pali.

La zona d'intervento è compresa interamente nel territorio comunale di Gemonio, in provincia di Varese.

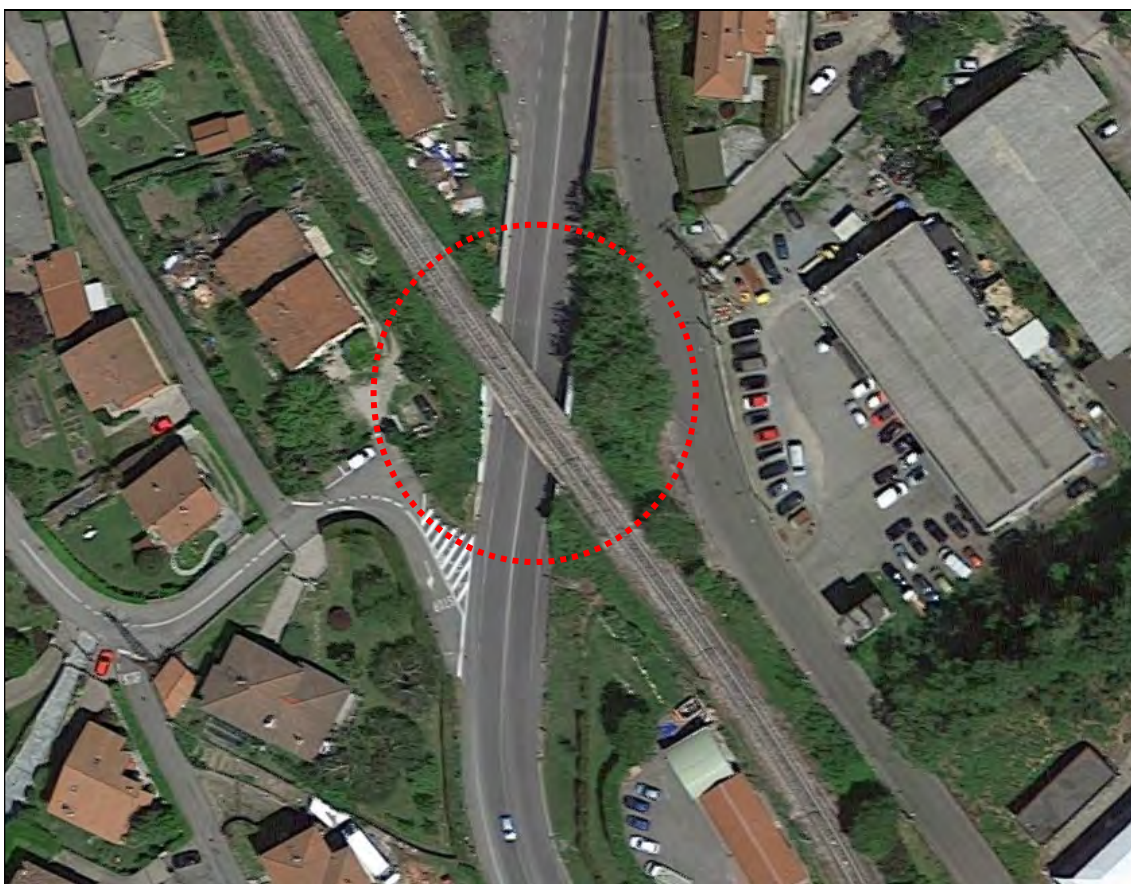


Figura 1 - Inquadramento geografico dell'area

Le analisi strutturali e le verifiche di sicurezza sono state effettuate secondo il metodo semiprobabilistico agli Stati Limite (S.L.) in accordo con le disposizioni vigenti in Italia e con riferimento alla classificazione sismica del territorio nazionale, approvate con Decreto Ministeriale del 17 gennaio 2018.

2. DESCRIZIONE DELL'OPERA

Il ponte in oggetto è realizzato con due travate metalliche a parete piena, di lunghezza complessiva pari a 20 m circa, di altezza 1.90 m, e disposte ad interasse di 5 m.

Le travi principali hanno uno schema statico di trave semplicemente appoggiata. La distanza tra gli assi di appoggio risulta pari a 18.8 m.

L'impalcato, sostenuto dalle due travi principali, è costituito da una piastra ortotropa costituita da traversi a T rovescia con interasse di 1.34 metri circa e piattini longitudinali con interasse di 0.63m.

Sul lato Nord-Est viene realizzato uno sbalzo, costituito da travi a doppio T incastrate alla trave principale, che sostiene una passerella per personale autorizzato ed una barriera antirumore.

L'impalcato presenta un angolo di inclinazione rispetto all'asse longitudinale pari a 43°.

L'andamento planimetrico dell'asse di progetto dei due binari si trova su un tratto in clotoide, pressoché rettilineo. La velocità di percorrenza dell'opera risulta pari a 70km/h.

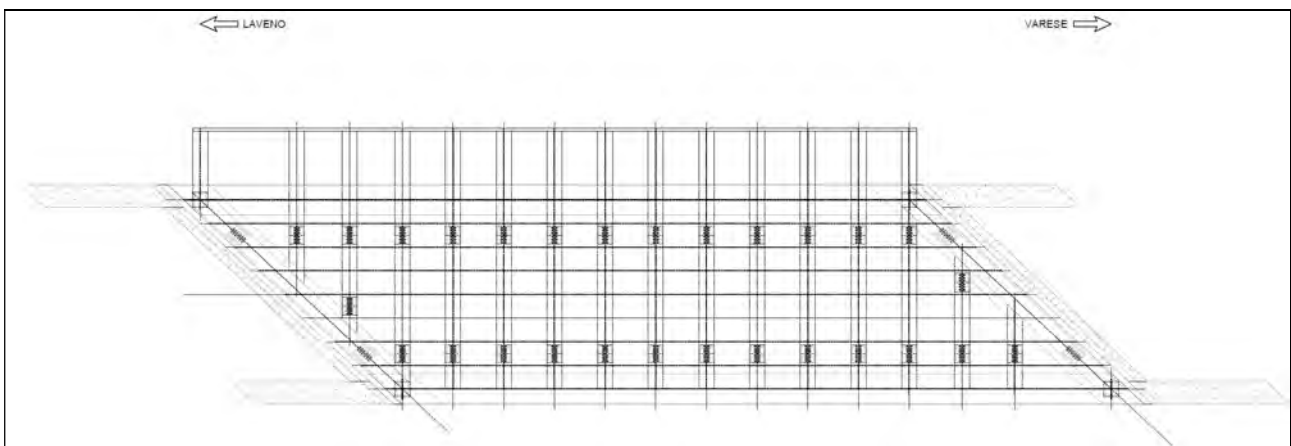


Figura 2 – Pianta impalcato

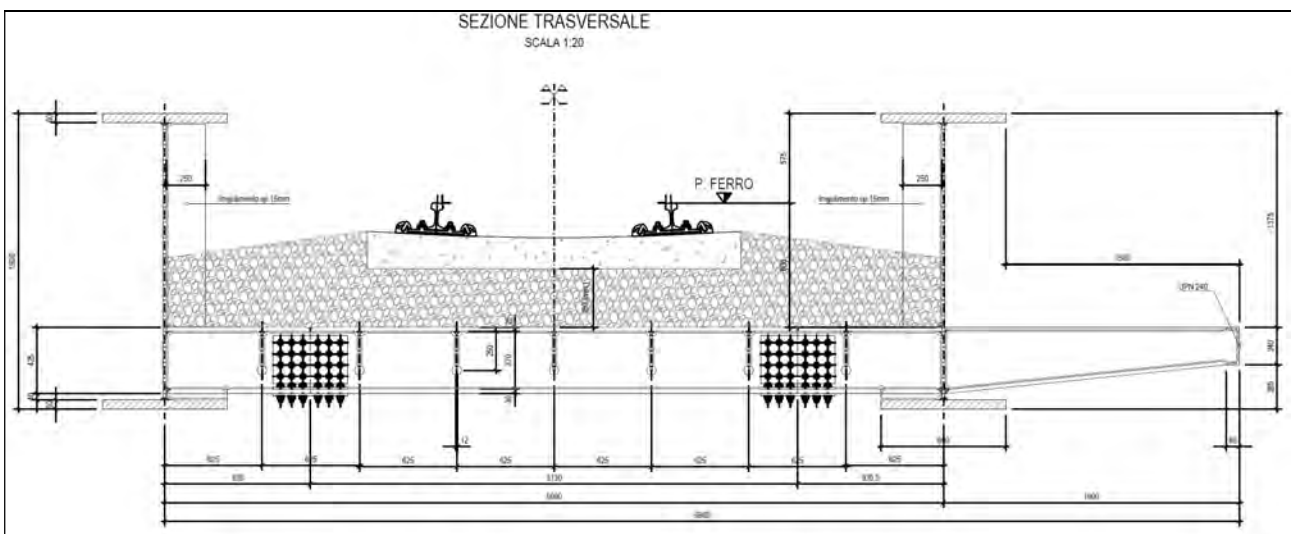


Figura 3 – Sezione trasversale impalcato

Le travi poggiano su spalle composte da muri frontali di altezza 8.2 m e muri andatori, paralleli all'asse dell'impalcato, di altezza pari a 9 m.

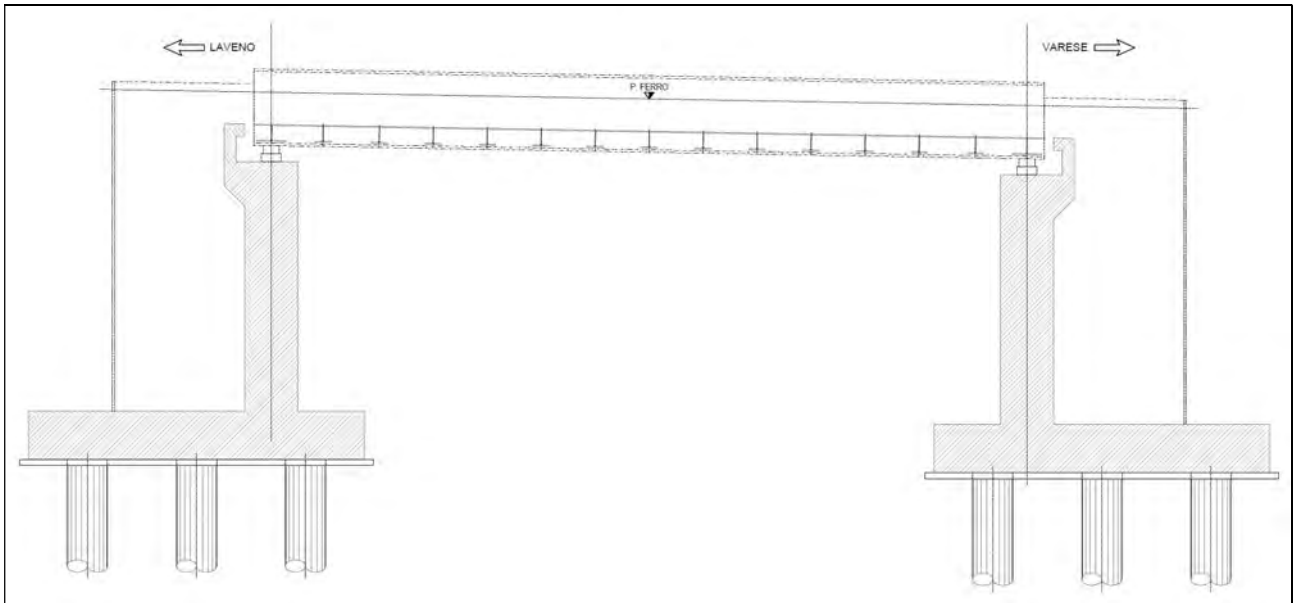


Figura 4 - Sezione in asse binario

Le spalle sono costituite da una piastra di fondazione su pali di diametro 1000mm e lunghezza pari a 23m.

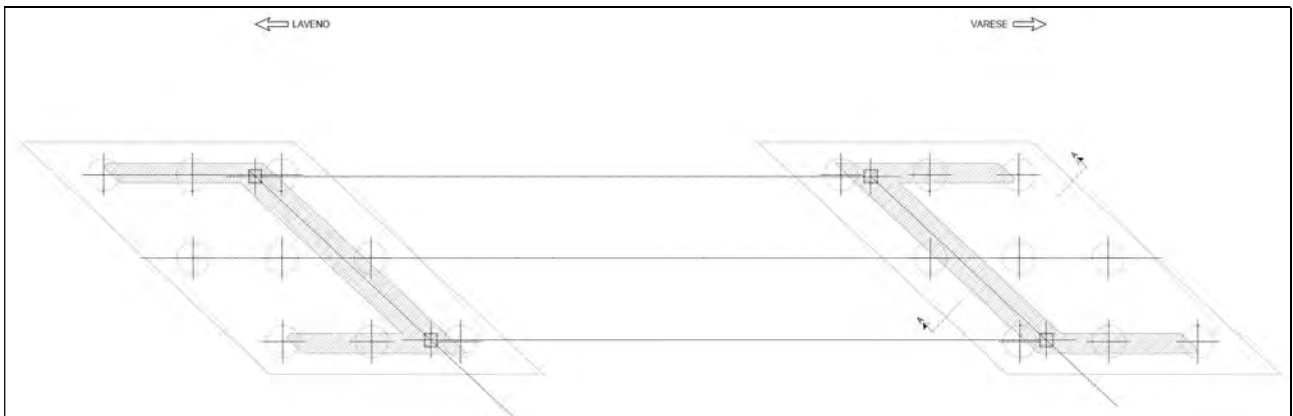


Figura 5 - Pianta fondazioni su pali

Per quanto riguarda i dispositivi di vincolo dell'impalcato alle sottostrutture, per ciascuna campata si prevede il seguente schema di vincoli:

- un appoggio fisso e uno mobile su un lato dell'impalcato: blocco di tutte le componenti di traslazione in corrispondenza dell'appoggio fisso, e la possibilità di traslazioni, sia trasversali che longitudinali, per l'appoggio mobile (multidirezionale).
- un appoggio unidirezionale (scorrevole in senso longitudinale) e un appoggio multidirezionale (scorrevole in senso longitudinale e trasversale) sul lato opposto.

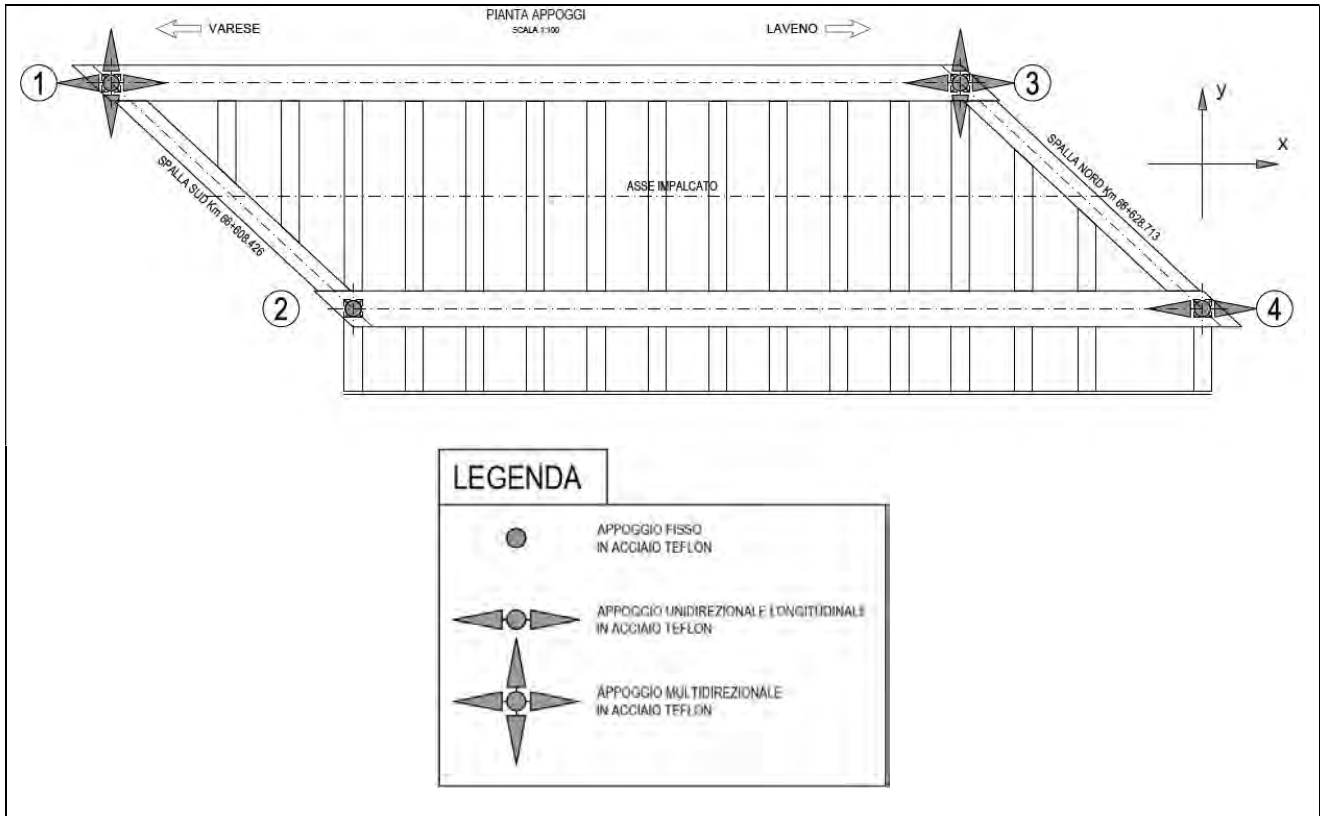


Figura 6 – Schema appoggi

3. DOCUMENTI DI RIFERIMENTO

3.1. Normative

Il calcolo della struttura è stato eseguito in ottemperanza alla vigente normativa, e più nello specifico:

- Legge 5/11/1971, n.1086 - Norme per la disciplina delle opere di conglomerato cementizio armato normale e precompresso e a struttura metallica (1);
- D.P.R. n. 380/2001 – Testo unico delle disposizioni legislative e regolamentari in materia edilizia (2)
- D.M. 17 gennaio 2018 – Aggiornamento delle “Norme tecniche per le costruzioni”. (G.U. 20-2-2018, n.42) (11);
- Circolare del 21.1.2019, n.7 C.S.LL.PP.: Istruzioni per l'applicazione dell'«Aggiornamento delle "Norme tecniche per le costruzioni"» di cui al decreto ministeriale 17 gennaio 2018 (3);
- UNI EN 1993-1-1:2006 “Eurocodice 3 - Progettazione delle strutture di acciaio – Parte 1-1: Regole generali e regole per gli edifici” (6);
- UNI EN 1991-1-4:2005 “Eurocodice 1 - Azioni sulle strutture - Parte 1-4: Azione del vento” (vento)” (4);
- UNI EN 1991-2:2005 “Eurocodice 1 - Azioni sulle strutture - Parte 2: Carichi da traffico sui ponti” (5);
- UNI EN 1993-1-5:2006 “Eurocodice 3 - Progettazione delle strutture di acciaio – Parte 1-5: Elementi strutturali a lastra” (12);
- UNI EN 1993-1-9:2006 “Eurocodice 3 - Progettazione delle strutture di acciaio – Parte 1-9: Fatica” (7);
- RFI DTC SI PS MA IFS 001 E (Manuale di progettazione delle opere civili di RFI - Ponti e strutture – ed. 2020) – non vincolante (8).

3.2. Documenti di progetto

Nella presente relazione, laddove necessario, si è fatto riferimento ai seguenti elaborati di progetto:

- F31Db005IG-R0_Relazione geologica – Geotecnica (9)

4. CARATTERISTICHE DEI MATERIALI

Si riassumono di seguito le caratteristiche principali dei materiali.

4.1. Acciaio da carpenteria metallica

Gli elementi strutturali dell'impalcato del ponte sono realizzati in acciaio **S355**, secondo EN10025, avente le seguenti caratteristiche di resistenza in funzione dello spessore dei piatti:

- $t \leq 16$ mm $f_{yk} = 355$ MPa, $f_u = 510$ MPa
- $16 < t \leq 40$ mm $f_{yk} = 345$ MPa e $f_u = 510$ MPa
- $40 < t \leq 63$ mm $f_{yk} = 335$ MPa e $f_u = 510$ MPa

E le seguenti caratteristiche meccaniche e fisiche:

- $E_s = 210\,000$ MPa
- $\alpha = 12 \times 10^{-6}$ °C⁻¹

4.2. Calcestruzzo per le sottostrutture (spalle e piastra di fondazione)

Per le spalle e le piastre di fondazione si prevede un calcestruzzo di classe minima (resistenza cubica caratteristica a 28 gg.):

- $R_{ck} = 40$ MPa (C32/40)

con le seguenti caratteristiche meccaniche e di resistenza:

- $f_{ck} = 33.20$ N/mm²
- $f_{ctm} = 3.01$ N/mm²
- $f_{ctk} = 2.17$ N/mm²
- $E_{cm} = 33643$ N/mm²

Tensioni allo stato limite ultimo:

- $f_{cd} = 18.81$ N/mm² ($\alpha_{cc} = 0.85$; $\gamma_c = 1.5$)
- $f_{ctd} = 1.45$ N/mm² ($\gamma_c = 1.5$)

Confezionato secondo le caratteristiche della **classe di esposizione XF2** come definite dalla Norma EN 206-1 UNI 11104/04, con **classe di consistenza S4**.

4.3. Calcestruzzo per i pali

Per le spalle e le piastre di fondazione si prevede un calcestruzzo di classe minima (resistenza cubica caratteristica a 28 gg.):

- $R_{ck} = 37.00$ MPa (C30/37)

con le seguenti caratteristiche meccaniche e di resistenza:

- $f_{ck} = 30.71$ N/mm²
- $f_{ctm} = 2.94$ N/mm²
- $f_{ctk} = 2.06$ N/mm²
- $E_{cm} = 32837$ N/mm²

Tensioni allo stato limite ultimo:

- $f_{cd} = 17.40 \text{ N/mm}^2$ ($\alpha_{cc} = 0.85$; $\gamma_c = 1.5$)
- $f_{ctd} = 1.37 \text{ N/mm}^2$ ($\gamma_c = 1.5$)

Confezionato secondo le caratteristiche della **classe di esposizione XF2** come definite dalla Norma EN 206-1 UNI 11104/04, con **classe di consistenza S5**.

4.4. Acciaio per le opere in calcestruzzo armato

Per le spalle e le opere di fondazione si prescrive l'impiego di un acciaio in barre del tipo **B450C** che soddisfi le seguenti condizioni ed i seguenti rapporti minimi definiti al punto 11.3.2.1. delle NTC 2018 (11):

- $f_{yk} \geq 450 \text{ MPa}$
- $f_{tk} \geq 540 \text{ MPa}$
- $f_{yd} = f_{yk} / \gamma_s > 450/1.15 = 391.3 \text{ MPa}$
- $A_{gt, k} \geq 7.5\%$
- $(f_y / f_{y, nom}) \leq 1.25$, dove $f_{y, nom} = 450 \text{ MPa}$
- $1.15 \leq (f_t / f_y)_k < 1.35$

5. CARATTERIZZAZIONE GEOTECNICA

Si rimanda alla Relazione geotecnica (9).

6. METODI DI ANALISI E CRITERI DI VERIFICA

L'analisi globale della struttura è effettuata con il metodo elastico; pertanto, si valutano gli effetti delle azioni nell'ipotesi che il legame tensione-deformazione del materiale sia infinitamente lineare.

La struttura viene verificata secondo il metodo semiprobabilistico degli stati limite, confrontando le tensioni calcolate con la tensione limite come definito nel § 4.2.4.1.2 delle NTC18 (11), ossia:

Per la verifica delle travi la resistenza di progetto da considerare dipende dalla classificazione delle sezioni.
La verifica in campo elastico è ammessa per tutti i tipi di sezione, con l'avvertenza di tener conto degli effetti di instabilità locale per le sezioni di classe 4.
Le verifiche in campo elastico, per gli stati di sforzo piani tipici delle travi, si eseguono con riferimento al seguente criterio:

$$\sigma_{x,Ed}^2 + \sigma_{z,Ed}^2 - \sigma_{z,Ed}\sigma_{x,Ed} + 3\tau_{Ed}^2 \leq (f_{yk} / \gamma_{M0})^2 \quad [4.2.4]$$

dove:
 $\sigma_{x,Ed}$ è il valore di progetto della tensione normale nel punto in esame, agente in direzione parallela all'asse della membratura;
 $\sigma_{z,Ed}$ è il valore di progetto della tensione normale nel punto in esame, agente in direzione ortogonale all'asse della membratura;
 τ_{Ed} è il valore di progetto della tensione tangenziale nel punto in esame, agente nel piano della sezione della membratura.

Figura 7 - estratto del § 4.2.4.1.2 "Resistenza delle membrature" delle NTC 2018 (11)

Per le verifiche di resistenza delle membrature si adottano i fattori parziali γ_{M0} indicati in tab.4.2.VII della normativa tecnica italiana (11).

Resistenza delle Sezioni di Classe 1-2-3-4	$\gamma_{M0} = 1,05$
Resistenza all'instabilità delle membrature	$\gamma_{M1} = 1,05$
Resistenza all'instabilità delle membrature di ponti stradali e ferroviari	$\gamma_{M1} = 1,10$
Resistenza, nei riguardi della frattura, delle sezioni tese (indebolite dai fori)	$\gamma_{M2} = 1,25$

Figura 8 - Coefficienti parziali di sicurezza - § 4.2.4.1 NTC2018 (11)

7. MODELLI DI CALCOLO

7.1. Impalcato

7.1.1. Software di calcolo

L'analisi strutturale dell'impalcato è stata condotta utilizzando il software agli elementi finiti Sofistik FEA (Versione: 2020, numero di serie: #1997, Produzione e Distribuzione: SOFiSTiK AG). Software per la modellazione e l'analisi strutturale ad elementi finiti e per la verifica degli elementi strutturali, tipo trave o piastra, in C.A., C.A.P., acciaio ed altri materiali da costruzione, secondo la normativa nazionale vigente.



Il software comprende un pre-post processore grafico interattivo destinato all'input della geometria di base (mediante Autocad) e all'interpretazione dei risultati di output, ed un risolutore ad elementi finiti lineare e non lineare.

Il modello geometrico viene discretizzato in elementi finiti (mesh) automaticamente dal software, tenendo conto delle geometrie reali di input grafico, della posizione dei carichi e della dimensione massima richiesta per gli elementi finiti.

Per la combinazione degli effetti dei carichi non è richiesta l'implementazione manuale di tutte le singole combinazioni di carico, in quanto il software esegue in automatico la "Superpositioning", sommando i valori sfavorevoli di ogni azione in base secondo regole di combinazione che rispettano le formule di normativa (NTC 2018 §2.5.3.) oppure altre personalizzate.

Il software applica i coefficienti di sicurezza di normativa definiti per ciascuna categoria di azione (ACTION) a cui appartiene il singolo caso di carico (LC). La modalità di combinazione è distinta per stato limite considerato e viene stabilita con specifica Regola di combinazione (SLU, SLV, QPER, FREQ, RARA. ECC. ...). Ovviamente è anche possibile comporre una combinazione specifica di carico di controllo.

I risultati della sovrapposizione vengono salvati in apposite LC convenzionali di involuppo che verranno impiegate nelle successive verifiche di resistenza e di esercizio. Il software permette di rintracciare, in ogni punto / sezione richiesti, la composizione di una determinata LC involuppo, evidenziando i fattori di combinazione utilizzati per le condizioni di carico elementari.

7.1.2. Modellazione dello schema statico (geometria e vincoli)

La struttura in carpenteria metallica è schematizzata mediante i seguenti elementi strutturali rappresentati con elementi "beam" (v. Figura 9):

- Travi principali;
- Traversi intermedi;
- Traversi intermedi di lunghezza variabile;
- Traversi di estremità;
- Irrigidimenti longitudinali;
- Travi a sbalzo;
- Trave di bordo sbalzo.

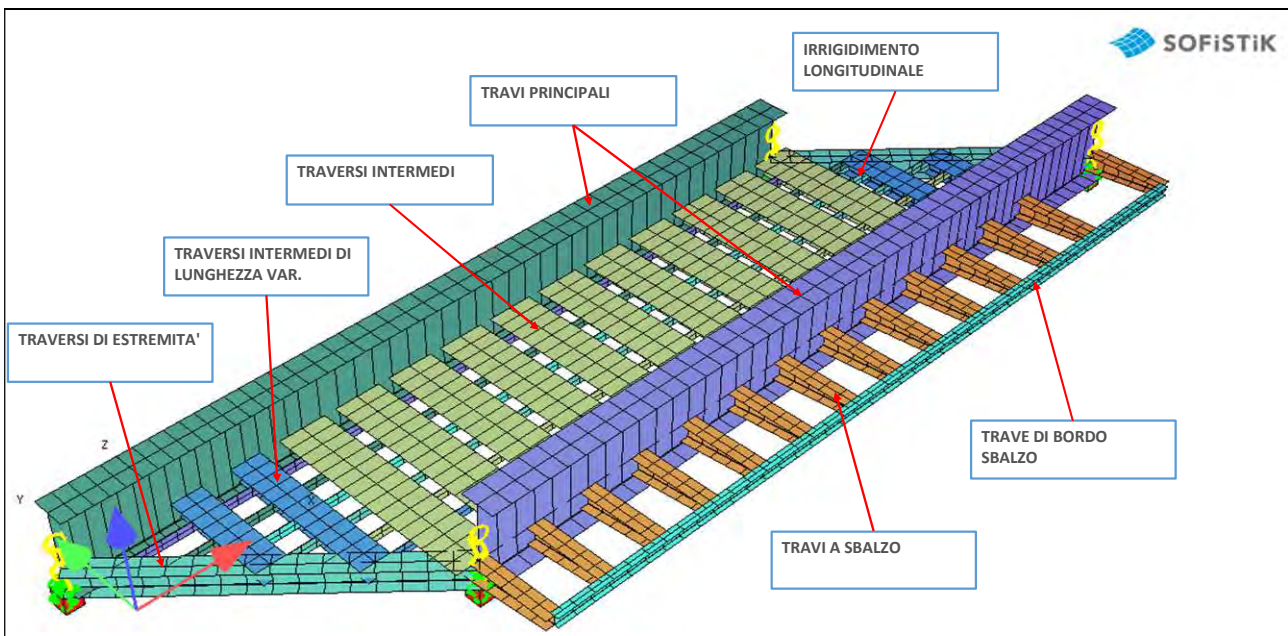


Figura 9 – Modello globale impalcato ferroviario

I traversi intermedi sono stati modellati per rappresentare il comportamento trasversale della piastra ortotropa. Al fine di cogliere in modo realistico la rigidità trasversale della piastra, sono state valutate, in accordo all'eurocodice 3 parte 1-5 (12), le larghezze efficaci per la definizione delle flange superiori. Tali flange sono state calcolate in funzione dell'interasse degli irrigidimenti a T rovescia e della larghezza della piastra, nonché dello schema statico.

Si riporta di seguito il calcolo effettuato per la valutazione delle larghezze efficaci delle flange, sia per i traversi intermedi di lunghezza 5m e interasse 1.34m, sia per i traversi di lunghezza variabile ed interasse 1.4m, che ha fornito i seguenti risultati:

- $B=1085\text{mm}$, per i traversi di 5m;
- $B = 692\text{mm}$, per i traversi di L var.

Effective width for elastic shear lag - § 3.2 / EN 1993-1-5

Effective width - § 3.2

$L_1 := 5 \text{ m}$ span length
 $L_e := 0.7 L_1$ span effective length

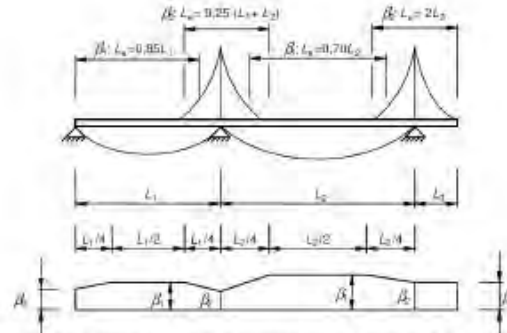
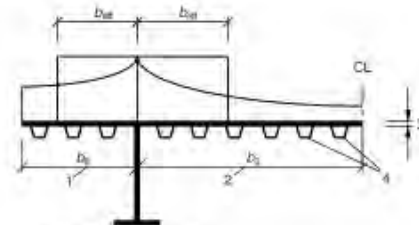


Figure 3.1: Effective length L_e for continuous beam and distribution of effective² width

$i := 1.34 \text{ m}$
 $b_0 := \frac{i}{2} = 670 \text{ mm}$



- 1 for flange outstand
- 2 for internal flange
- 3 plate thickness t
- 4 stiffeners with $A_{st} = \sum A_{st,i}$

Figure 3.2: Notations for shear lag

$t := 25 \text{ mm}$

$A_{st} := 0 \text{ mm}^2$

$$\alpha_0 := \sqrt{1 + \frac{A_{st}}{b_0 \cdot t}} = 1$$

$$k := \frac{\alpha_0 \cdot b_0}{L_e} = 0.191$$

$$\beta := \frac{1}{1 + 6.4 \cdot k^2} = 0.81$$

$$b_{eff} := \beta \cdot b_0 = 543 \text{ mm}$$

$$b := 2 \cdot b_{eff} = 1085 \text{ mm}$$

Table 3.1: Effective² width factor β

α	Verification	β - value:
$\alpha \leq 0.02$		$\beta = 1.0$
$0.02 < \alpha \leq 0.70$	sagging bending	$\beta = \beta_1 = \frac{1}{1 + 6.4 \cdot k^2}$
	hogging bending	$\beta = \beta_2 = \frac{1}{1 + 6.0 \left(k - \frac{1}{2500 \cdot k} \right) + 1.6 \cdot k^2}$
> 0.70	sagging bending	$\beta = \beta_1 = \frac{1}{5.9 \cdot k^2}$
	hogging bending	$\beta = \beta_2 = \frac{1}{8.6 \cdot k^2}$
all α	end support	$\beta_0 = (0.55 + 0.025 / \alpha) \beta_1$ but $\beta_0 < \beta_1$
all α	Cantilever	$\beta = \beta_1$ at support and at the end

$k = \alpha_0 \cdot b_0 / L_e$ with $\alpha_0 = \sqrt{1 + \frac{A_{st}}{b_0 \cdot t}}$
in which A_{st} is the area of all longitudinal stiffeners within the width b_0 and other symbols are as defined in Figure 3.1 and Figure 3.2.

Effective width for elastic shear lag - § 3.2 / EN 1993-1-5

Effective width - § 3.2

$L_1 := 2.5 \text{ m}$ span length
 $L_e := 0.7 L_1$ span effective length

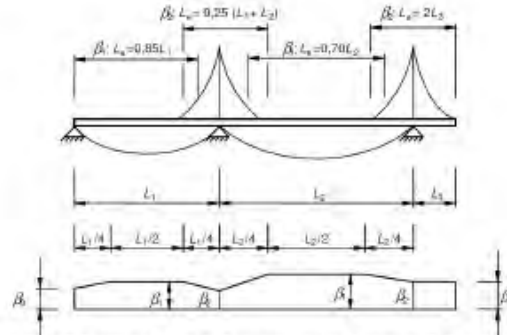
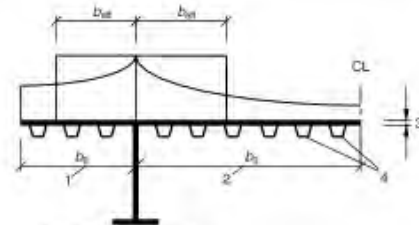


Figure 3.1: Effective length L_e for continuous beam and distribution of effective² width

$i := 1.4 \text{ m}$
 $b_0 := \frac{i}{2} = 700 \text{ mm}$



- 1 for flange outstand
- 2 for internal flange
- 3 plate thickness t
- 4 stiffeners with $A_{st} = \sum A_{st,i}$

Figure 3.2: Notations for shear lag

$t := 25 \text{ mm}$

$A_{st} := 0 \text{ mm}^2$

$$\alpha_0 := \sqrt{1 + \frac{A_{st}}{b_0 \cdot t}} = 1$$

$$k := \frac{\alpha_0 \cdot b_0}{L_e} = 0.4$$

$$\beta := \frac{1}{1 + 6.4 \cdot k^2} = 0.49$$

$$b_{eff} := \beta \cdot b_0 = 346 \text{ mm}$$

$$b := 2 \cdot b_{eff} = 692 \text{ mm}$$

Table 3.1: Effective² width factor β

α	Verification	β - value
$\alpha \leq 0.02$		$\beta = 1.0$
$0.02 < \alpha \leq 0.70$	sagging bending	$\beta = \beta_1 = \frac{1}{1 + 6.4 \cdot \kappa^2}$
	hogging bending	$\beta = \beta_2 = \frac{1}{1 + 6.0 \left(\kappa - \frac{1}{2500 \kappa} \right) + 1.6 \cdot \kappa^2}$
> 0.70	sagging bending	$\beta = \beta_1 = \frac{1}{5.9 \cdot \kappa}$
	hogging bending	$\beta = \beta_2 = \frac{1}{8.6 \cdot \kappa}$
all κ	end support	$\beta_0 = (0.55 + 0.025 / \kappa) \cdot \beta_1$, but $\beta_0 < \beta_1$
all κ	Cantilever	$\beta = \beta_2$ at support and at the end

$\kappa = \alpha_0 \cdot b_0 / L_e$ with $\alpha_0 = \sqrt{1 + \frac{A_{st}}{b_0 \cdot t}}$
 in which A_{st} is the area of all longitudinal stiffeners within the width b_0 and other symbols are as defined in Figure 3.1 and Figure 3.2.

Si riportano dunque le sezioni implementate nel modello numerico per ciascun elemento strutturale. Per ciascuna sezione si mostrano le proprietà statiche che caratterizzano il comportamento globale della struttura.

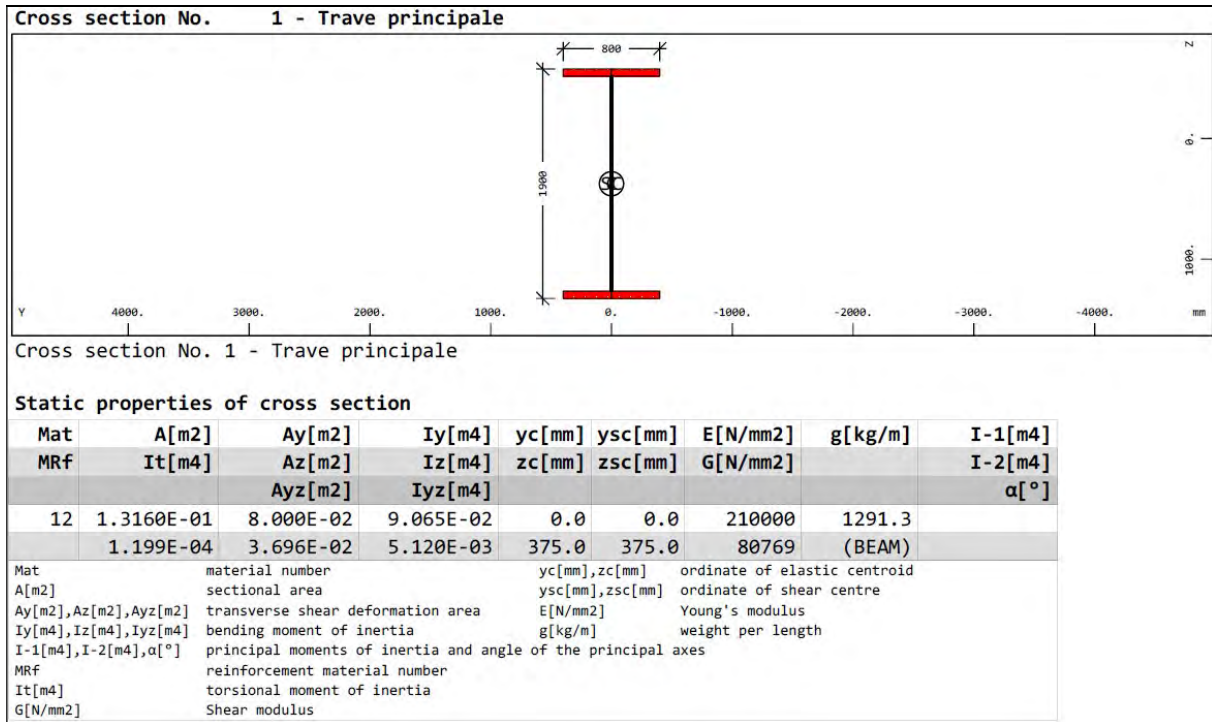


Figura 10 - Sezione Trave principale

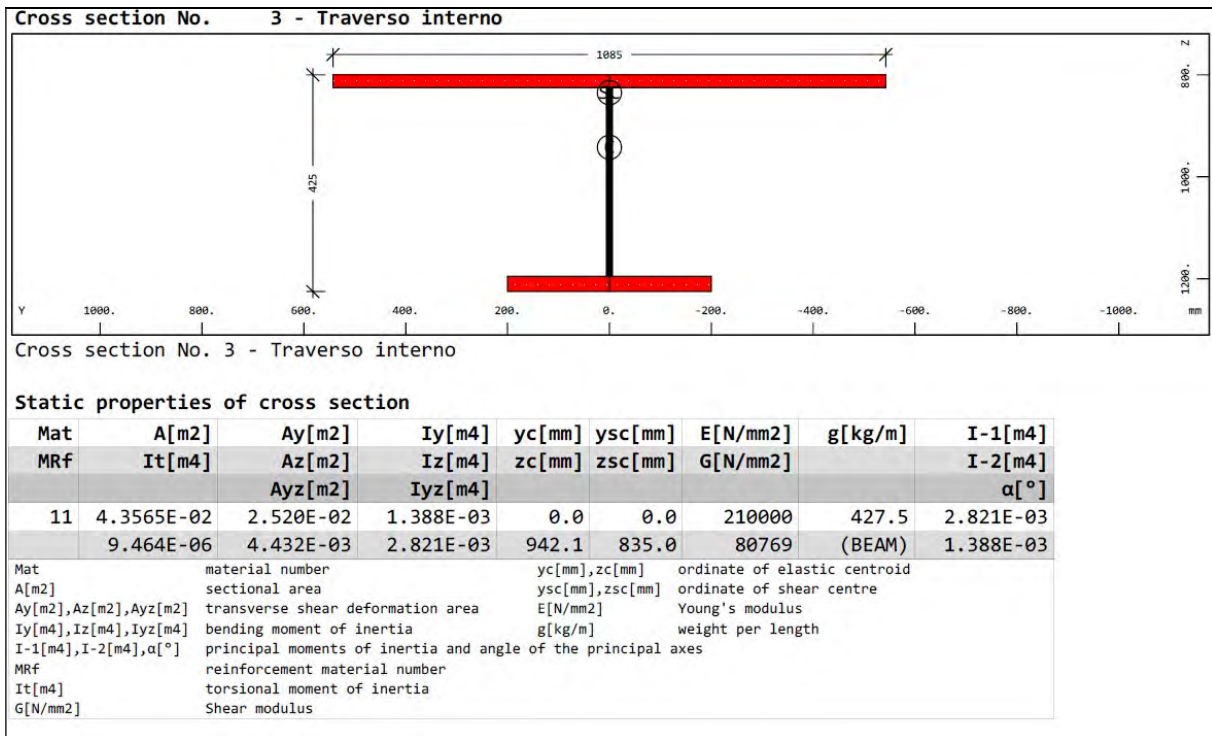


Figura 11 – Sezione Traverso intermedio di larghezza efficace L=1085mm

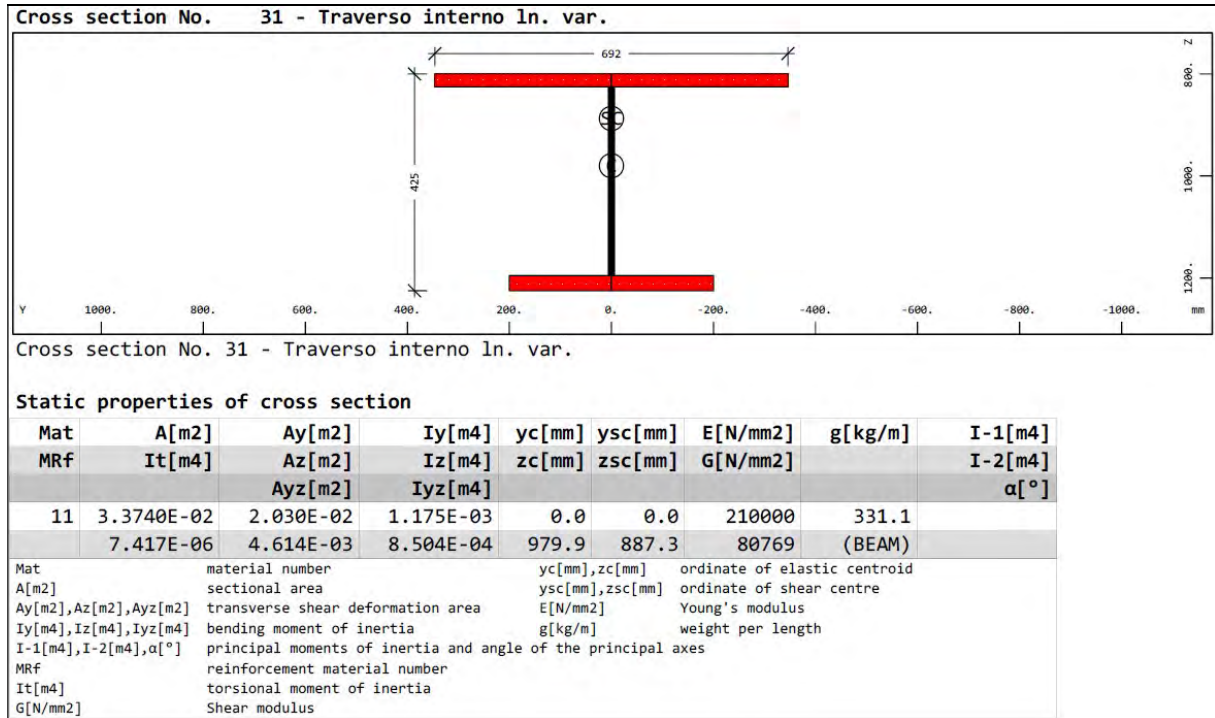


Figura 12 – Sezione di Traverso intermedio di larghezza efficace L=692mm e di lunghezza variabile

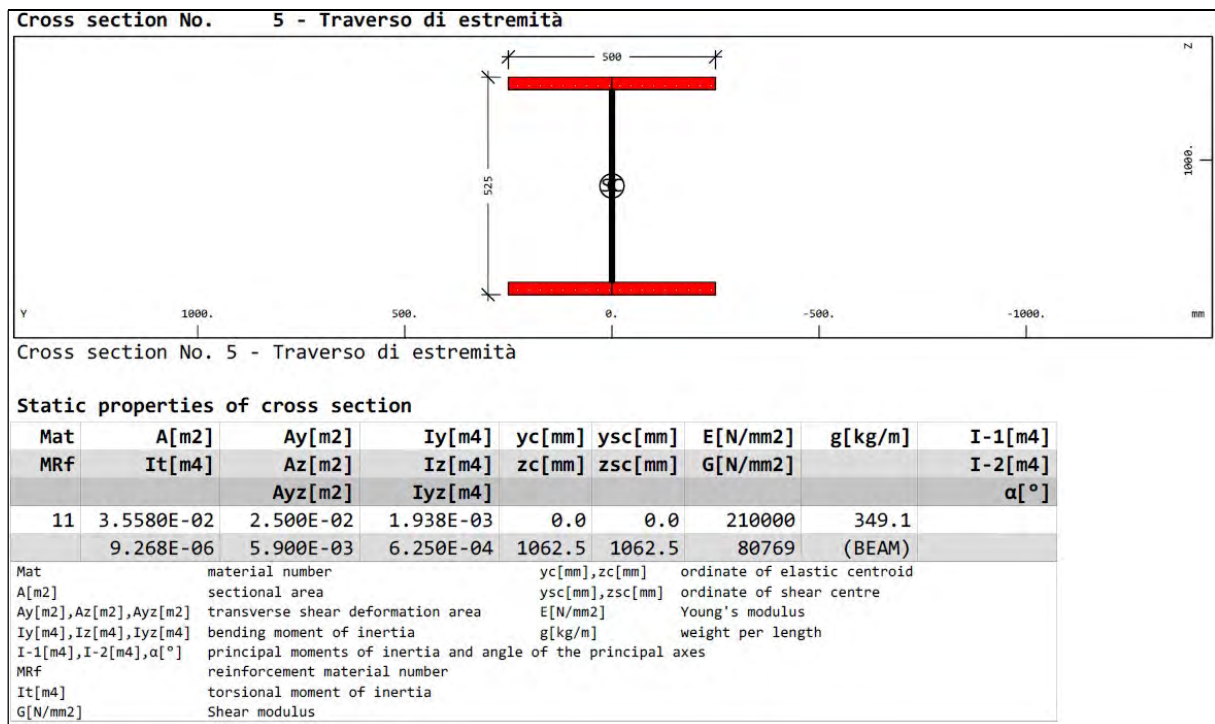


Figura 13 – Sezione Traverso di estremità

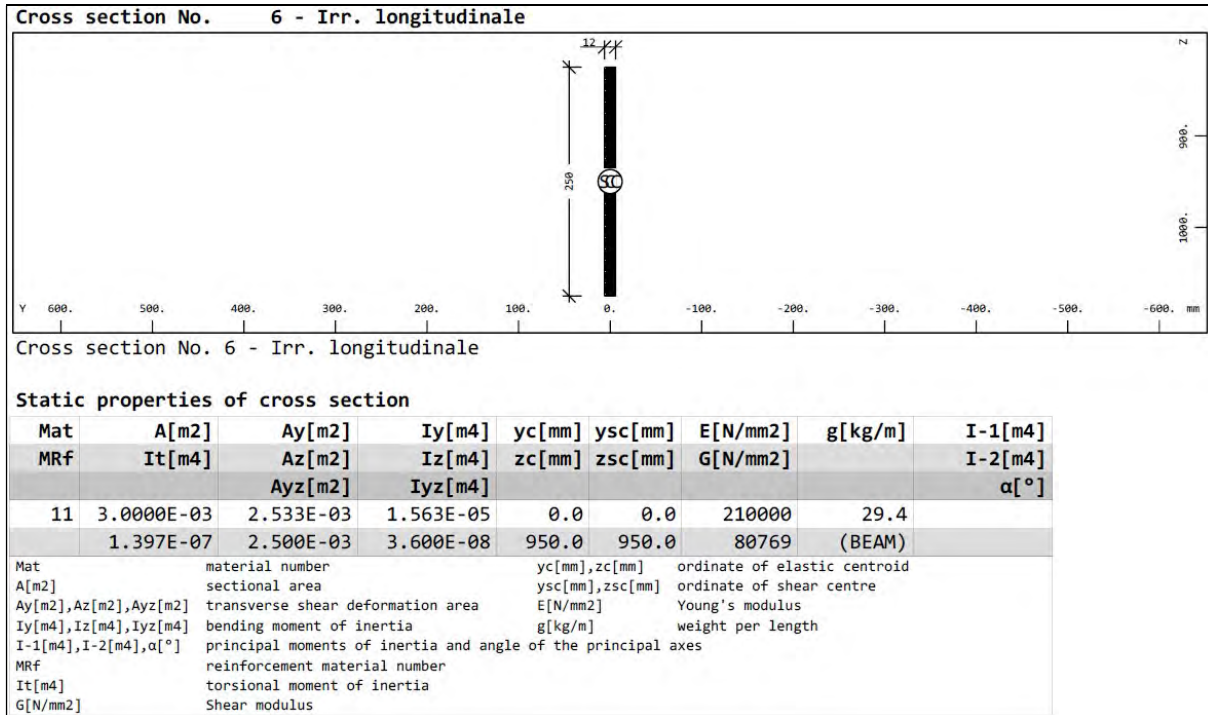


Figura 14 – Sezione dell'Irrigidimento longitudinale

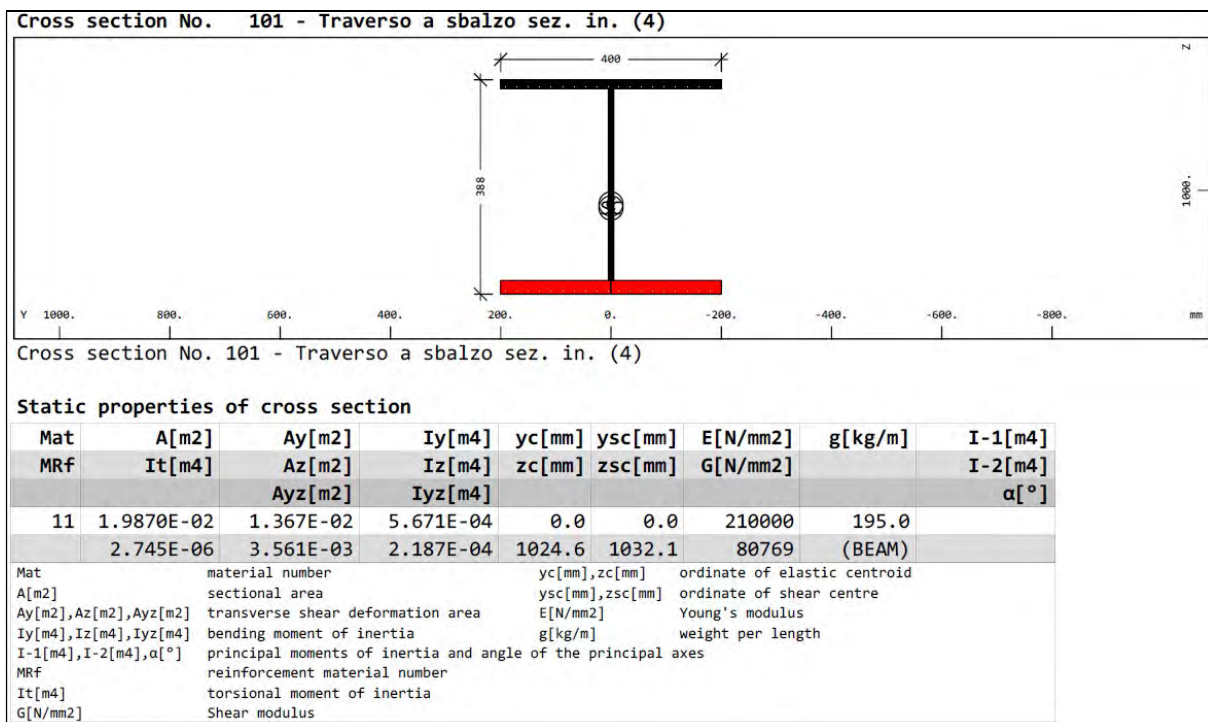


Figura 15 – Trave a sbalzo – “Sezione di altezza var.”

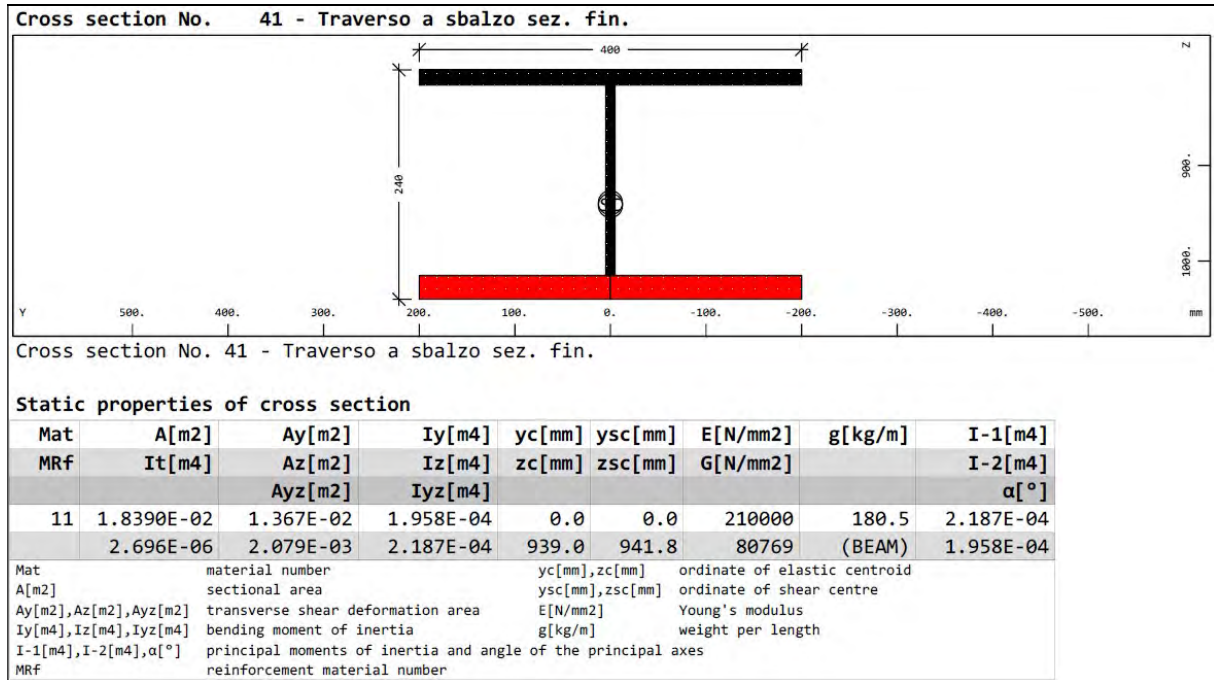


Figura 16 - Trave a sbalzo – “Sezione di estremo libero”

Come illustrato nella Figura 9, l’impalcato è stato analizzato senza modellare le sottostrutture che sono state trattate mediante un secondo modello numerico. I motivi principali di tale scelta sono riconducibili alle seguenti considerazioni:

- Nei ponti a travata la struttura portante dell’impalcato è collegata alle sottostrutture (spalle, pile) attraverso apparecchi di appoggio che esercitano vincoli alle sole traslazioni e non alle rotazioni, non si trasmettono momenti flettenti tra impalcato e sottostrutture. Trascurando, quindi, lecitamente, le deformazioni assiali per compressione delle spalle, le sollecitazioni provocate dalle azioni verticali sull’impalcato sono indipendenti dalle caratteristiche meccaniche delle sottostrutture.
- Le sollecitazioni provocate sull’impalcato da un’azione trasversale sono, nel caso più generale, funzione della rigidezza delle spalle e delle pile. È però vero che tale rigidezza è solitamente molto grande e le azioni trasversali nei ponti di luce piccola, come nel caso in esame, modeste. Con buona approssimazione, anche l’analisi delle sollecitazioni dovute a forze trasversali può essere effettuata trascurando le deformazioni orizzontali delle spalle.
- Lo schema degli appoggi è stato scelto in modo da consentire deformazioni termiche libere, rendendo nulle le azioni mutue tra sottostrutture ed impalcato.

A valle di ciò, è lecito modellare l’impalcato considerando le spalle come semplici vincoli alle traslazioni verticali e orizzontali. Si riporta di seguito lo schema degli appoggi assunto:

- un appoggio fisso e uno mobile su un lato dell’impalcato: blocco di tutte le componenti di traslazione in corrispondenza dell’appoggio fisso, e la possibilità di traslazioni, sia trasversali che longitudinali, per l’appoggio mobile (multidirezionale).
- un appoggio unidirezionale (scorrevole in senso longitudinale) e un appoggio multidirezionale (scorrevole in senso longitudinale e trasversale) sul lato opposto.

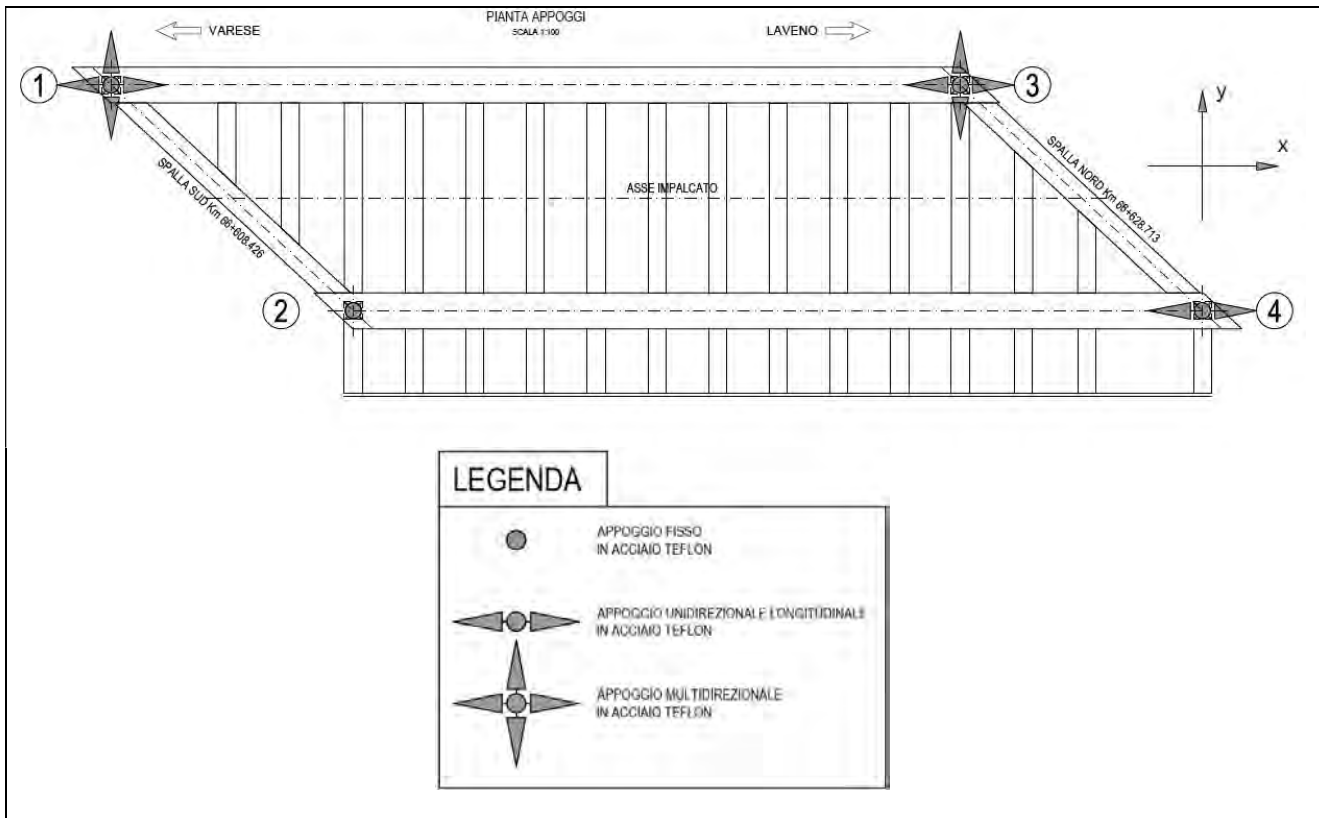


Figura 17 – Schema appoggi

I vincoli di appoggio sono stati modellati con elementi finiti chiamati “elastic link” che assumono nella direzione di vincolo un valore di rigidezza assiale elevato.

Nella schematizzazione si è tenuto conto dell’eccentricità tra la quota del baricentro dell’impalcato e la quota degli apparecchi di appoggio mediante elementi infinitamente rigidi chiamati “rigid link”.

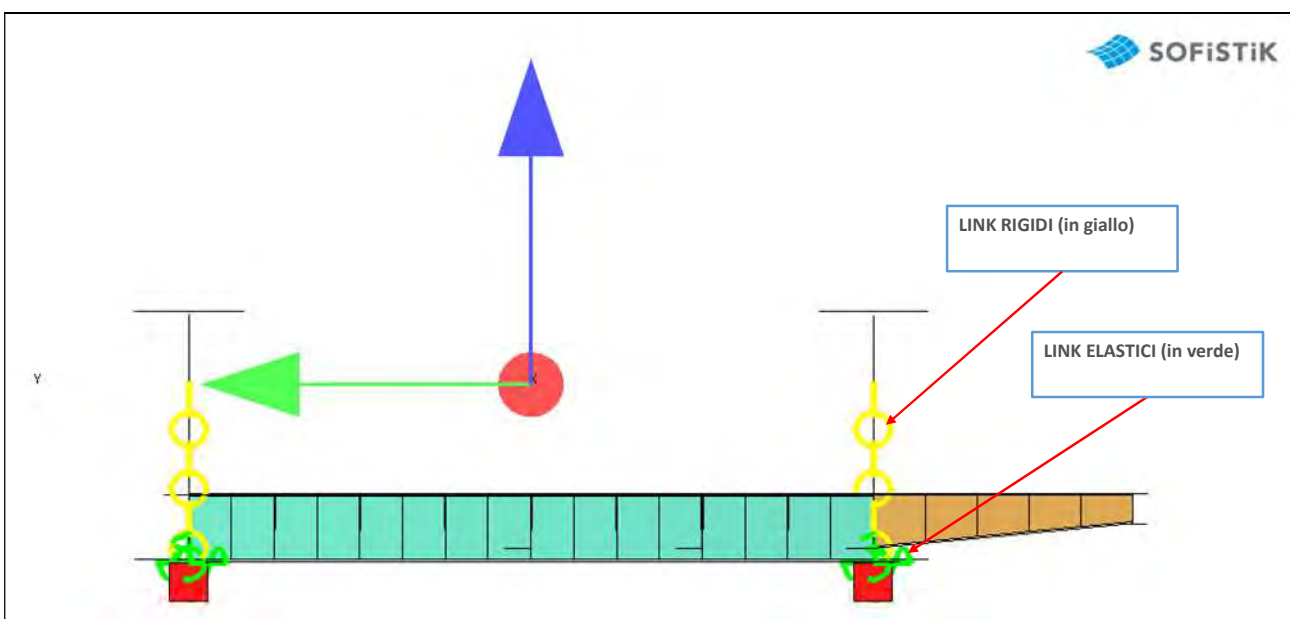


Figura 18 – Sezione trasversale del modello globale dell’impalcato ferroviario

7.1.3. Modellazione delle azioni

Per facilitare la lettura tra quanto calcolato e quanto implementato nel modello, si rimanda la modellazione delle azioni al capitolo dell'analisi dei carichi (v. par. 8).

7.2. Sottostrutture

7.2.1. Software di calcolo

Si rimanda al paragrafo 7.1.1.

7.2.2. Modellazione dello schema statico (geometria e vincoli)

Per la determinazione delle sollecitazioni agenti nei vari elementi strutturali, è stato sviluppato un modello di calcolo agli elementi finiti dove la struttura viene discretizzata in elementi tipo “plate”, per il muro centrale, i muri d’ala e la piastra di fondazione, e in elementi tipo “beam” per i pali di fondazione.

7.2.2.1. Geometria

Gli elementi “plate”, che discretizzano gli elementi piani, sono per lo più a quattro nodi con comportamento alla Midlin (thick).

Nelle successive immagini è rappresentato il modello di calcolo analizzato.

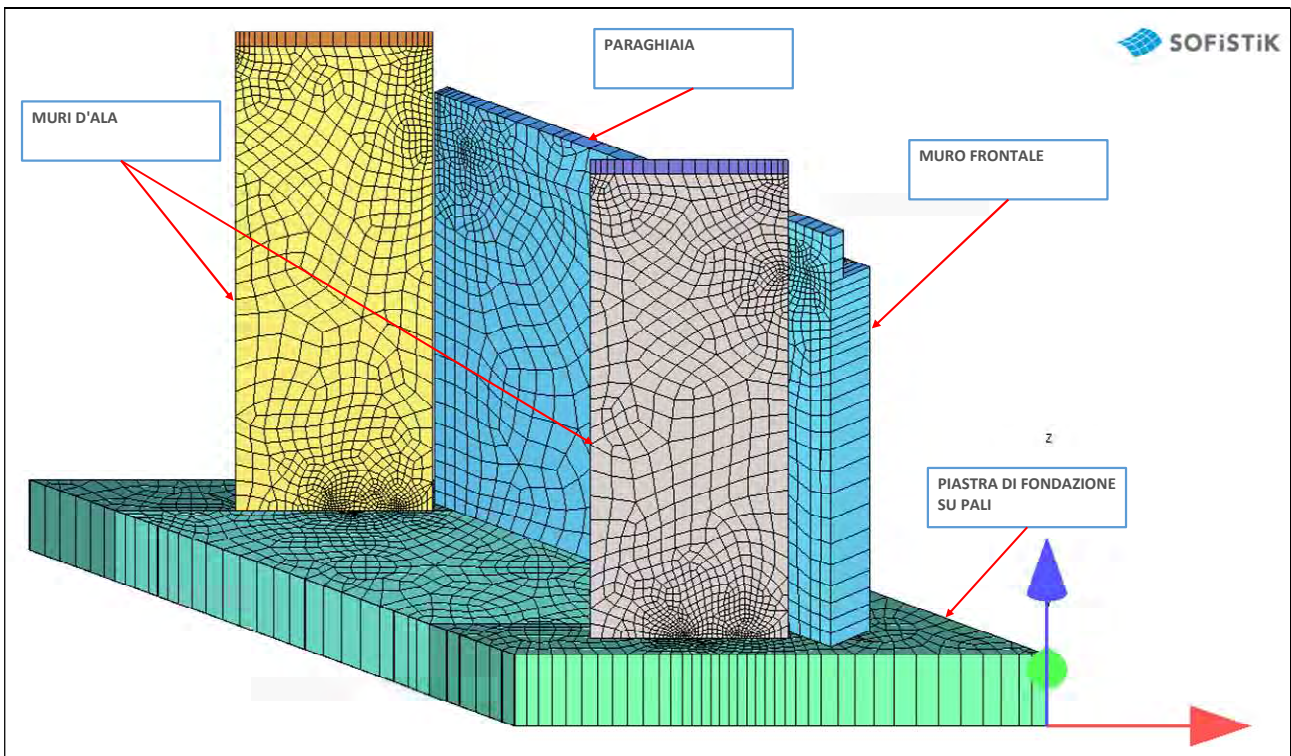


Figura 19 – Modello globale spalla: muro frontale, muri d’ala, paraghiaia, piastra di fondazione

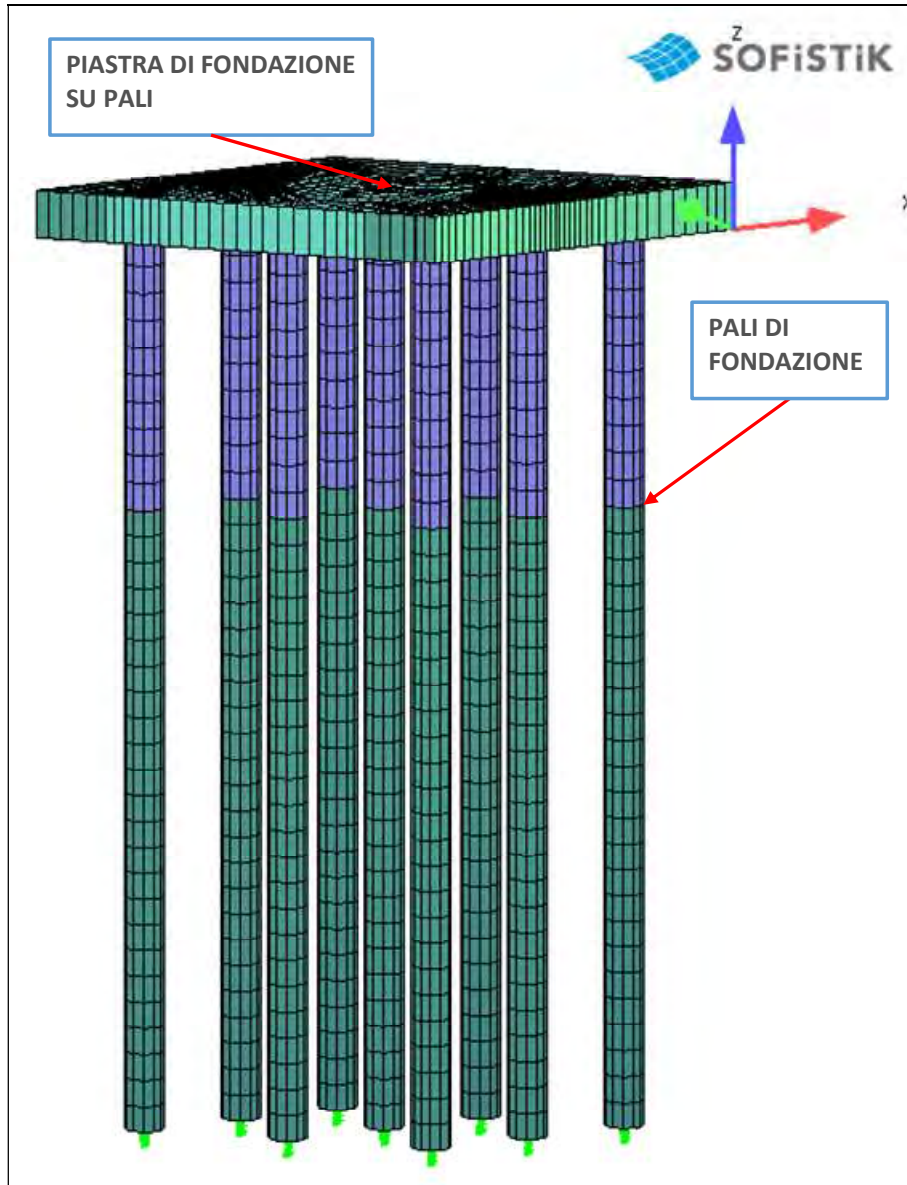


Figura 20 - Modello globale spalla: piastra e pali di fondazione

Sono stati inoltre introdotti degli elementi tipo “link rigidi” che collegano il muro frontale con il paraghiaia e lo stesso muro frontale con i muri d’ala e la piastra di fondazione su pali. Inoltre, attraverso opportuni collegamenti di tipo “link rigido”, viene simulata l’interazione tra impalcato e spalla, distribuendo in maniera realistica l’ingresso delle azioni che l’impalcato scarica su di essa.

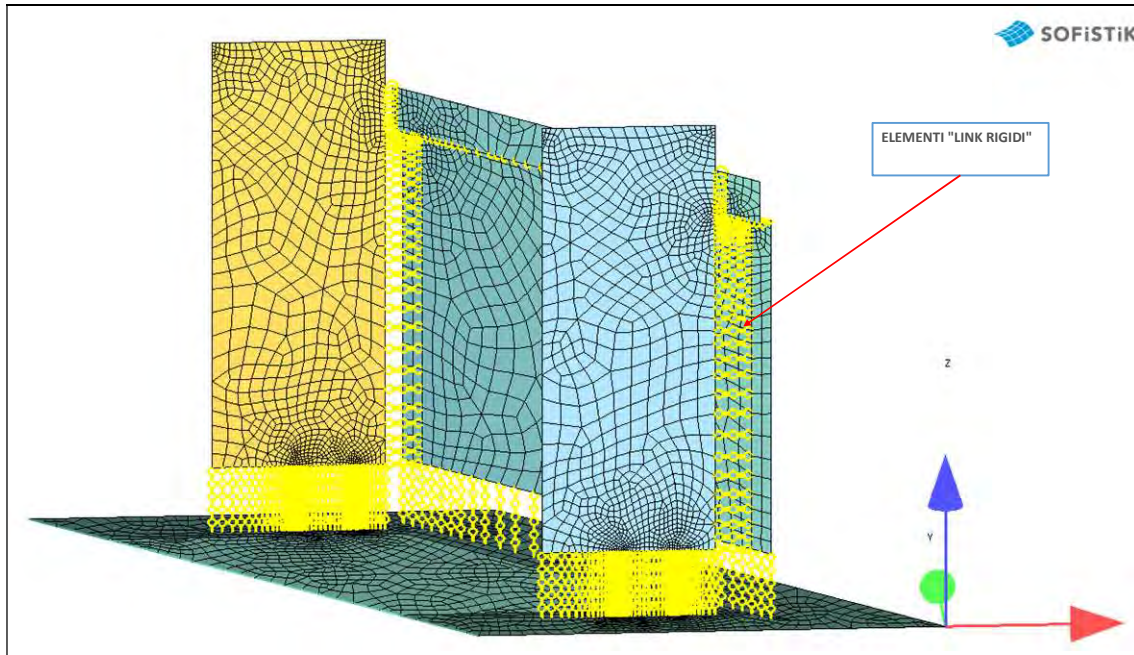


Figura 21 – Elementi “rigid link” che collegano i vari elementi strutturali: muro frontale, muri d’ala e piastra di fondazione

7.2.2.2. Definizione dei vincoli al contorno

Per l’opera oggetto di analisi, si assume che i carichi esterni si trasmettano integralmente al terreno attraverso i pali, trascurando il contributo della struttura di collegamento (piastra di fondazione).

I pali di fondazione sono stati modellati tramite elementi “beam”, mentre l’interazione pali-terreno, sulla base delle informazioni ricavate dalla relazione geologica-geotecnica (9), è stata modellata attraverso delle molle alla Winkler, sia per simulare il palo soggetto a carichi verticali che a carichi orizzontali.

Di seguito si riporta un’immagine del modello numerico e successivamente i metodi seguiti per il calcolo delle rigidezze delle molle elastiche alla Winkler.

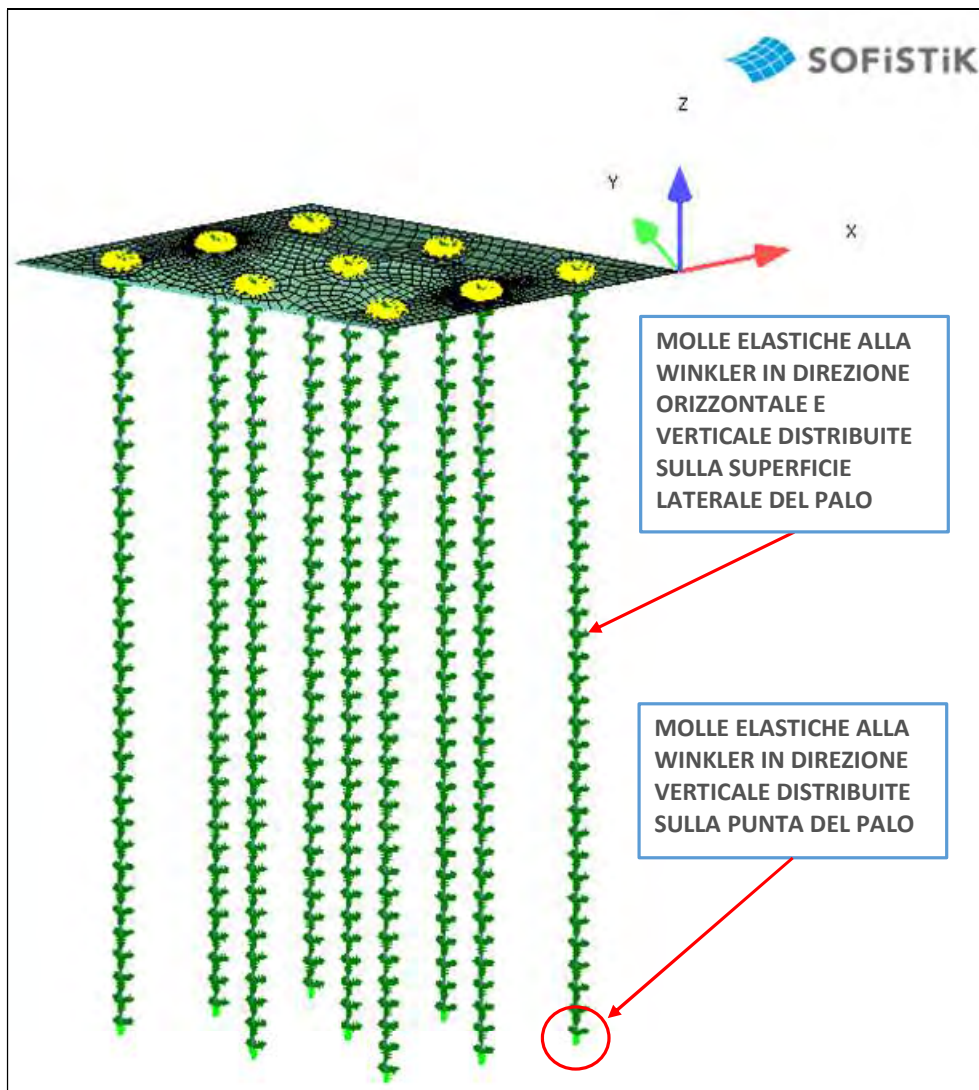


Figura 22 – Modellazione interazione struttura-terreno

Costante k_h di Winkler per pali soggetti a carichi orizzontali

Per la determinazione di k_h , rigidezza delle molle in direzione orizzontale sulla superficie laterale del palo, la procedura fa riferimento all'espressione di Matlock e Reese (1956), che nel caso di terreni incoerenti assume k variabile linearmente con la profondità.

Il calcolo viene eseguito attraverso i seguenti passi per ciascun strato i -esimo di terreno:

- Si calcola il valore del coefficiente A , funzione del numero di colpi per un avanzamento di 300mm (prova penetrometrica dinamica) N_{DL30} ;
- Si calcola il valore di n [N/cm^3] funzione di A e del peso di volume del terreno secondo la formula:

$$n_h = \frac{A \cdot \gamma}{1,35}$$

- Si calcola il corrispettivo valore di k_h [kg/cm^3] alle diverse profondità del singolo strato i -esimo di terreno secondo la formula:

$$K_h = n_h \cdot \frac{z}{d}$$

- Al fine di considerare l'effetto di gruppo, si riduce il valore di k_h adottando le indicazioni di Poulos e Davis (1980) valide per valori del rapporto fra interasse e diametro dell'ordine di 3.

Sulla base dei risultati riportati nella relazione geotecnica, e ipotizzando una profondità di posa della piastra di fondazione pari a 2 m dal piano campagna, si descrive il modello geotecnico adottato considerando 2 strati di terreno per una lunghezza del palo di 23 m (v. Figura 23):

- Primo strato di terreno (dalla profondità di $z=2$ m alla profondità di $z=9$ m):
 - Tipologia terreno: sabbia
 - $\gamma = 19\text{kN/m}^3$ (peso di volume saturo)
 - $N_{\text{SPT}} = 13$
 - $\phi = 28^\circ$ (angolo di resistenza a taglio)
- Secondo strato di terreno (dalla profondità di $z=9$ m alla profondità di $z=25$ m):
 - Tipologia terreno: ghiaia in matrice sabbiosa
 - $\gamma = 20\text{kN/m}^3$ (peso di volume saturo)
 - $N_{\text{SPT}} = 35$
 - $\phi = 37^\circ$ (angolo di resistenza a taglio)

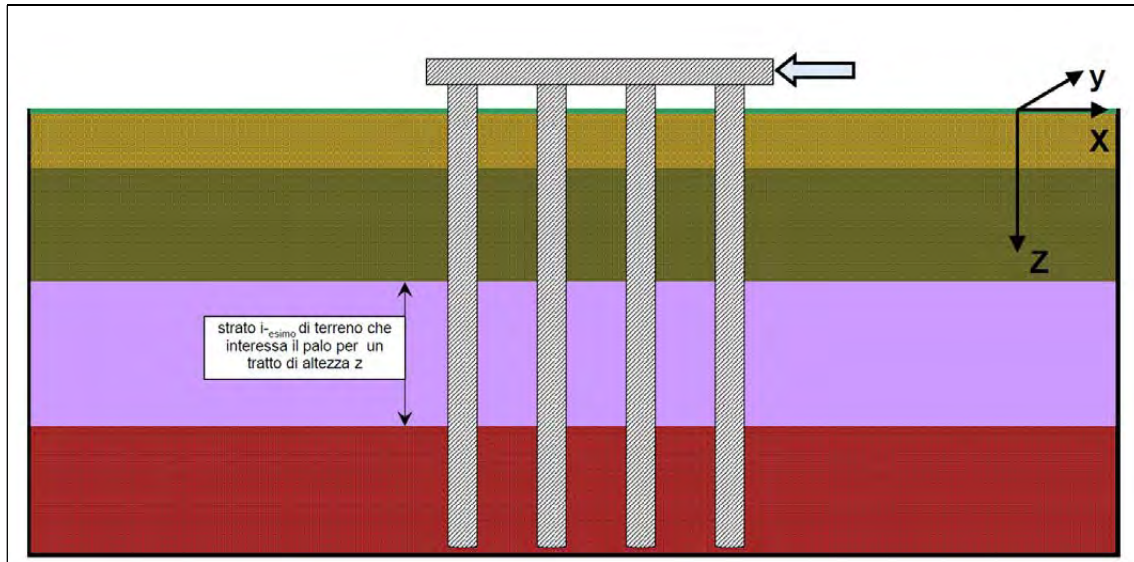


Figura 23 – Schema di riferimento per il modello geotecnico adottato

Si riportano di seguito i tabulati di calcolo per la determinazione delle rigidzze delle molle di Winkler nella posizione iniziale e finale di ciascun strato di terreno. Per i valori di profondità intermedi, il valore di k , secondo la teoria, si assume variabile linearmente.

DATI			
Peso unità di volume di terreno saturo		1900	kg/m ³
Strato i-esimo di terreno che interessa il palo per un tratto di altezza z		2	m
Diametro del palo		100	cm
Numero pali		9	-
Numero di colpi per un avanzamento di 300mm (PROVA PENETROMETRICA DINAMICA) N _{DL30}	Medio	13	-
RISULTATI			
Interpolazione coeff. A		405	-
Valore di n _h		5.70	N/cm ³
Valore di k _h		1.14	kg/cm ³
EFFETTO GRUPPO			
Moltiplicatore effetto gruppo		0.25	-
Valore di k _{h,g} per gruppo di pali		0.29	kg/cm ³

Figura 24 - k_h di Winkler alla profondità Z=2m, strato di terreno 1

DATI			
Peso unità di volume di terreno saturo		1900	kg/m ³
Strato i-esimo di terreno che interessa il palo per un tratto di altezza z		9	m
Diametro del palo		100	cm
Numero pali		9	-
Numero di colpi per un avanzamento di 300mm (PROVA PENETROMETRICA DINAMICA) N _{DL30}	Medio	13	-
RISULTATI			
Interpolazione coeff. A		405	-
Valore di n _h		5.70	N/cm ³
Valore di k _h		5.13	kg/cm ³
EFFETTO GRUPPO			
Moltiplicatore effetto gruppo		0.25	-
Valore di k _{h,g} per gruppo di pali		1.28	kg/cm ³

Figura 25 - k_h di Winkler alla profondità Z=9m, strato di terreno 1

DATI			
Peso unità di volume di terreno saturo		2000	kg/m ³
Strato i-esimo di terreno che interessa il palo per un tratto di altezza z		9	m
Diametro del palo		100	cm
Numero pali		9	-
Numero di colpi per un avanzamento di 300mm (PROVA PENETROMETRICA DINAMICA) N _{DL30}	Denso	35	-
RISULTATI			
Interpolazione coeff. A		1,500	-
Valore di n _h		22.22	N/cm ³
Valore di k _h		20.00	kg/cm ³
EFFETTO GRUPPO			
Moltiplicatore effetto gruppo		0.25	-
Valore di k _{h,g} per gruppo di pali		5.00	kg/cm ³

Figura 26- k_h di Winkler alla profondità Z=9m, strato di terreno 2

DATI			
Peso unità di volume di terreno saturo		2000	kg/m ³
Strato i-esimo di terreno che interessa il palo per un tratto di altezza z		25	m
Diametro del palo		100	cm
Numero pali		9	-
Numero di colpi per un avanzamento di 300mm (PROVA PENETROMETRICA DINAMICA) N _{DL30}	Denso	35	-
RISULTATI			
Interpolazione coeff. A		1,500	-
Valore di n _h		22.22	N/cm ³
Valore di k _h		55.56	kg/cm ³
EFFETTO GRUPPO			
Moltiplicatore effetto gruppo		0.25	-
Valore di k _{h,g} per gruppo di pali		13.89	kg/cm ³

Figura 27 - k_h di Winkler alla profondità Z=25m, strato di terreno 2

Costanti k_v di Winkler per pali soggetti a carichi verticali

Per la determinazione di k_{vL} , rigidezza delle molle in direzione verticale sulla superficie laterale del palo, e k_{vV} , rigidezza delle molle in direzione verticale sulla punta del palo, la procedura fa riferimento al metodo di Randolph e Wroth (1978), il quale considera il palo immerso in un mezzo elastico, ed esamina separatamente l'interazione con tale mezzo della superficie laterale e della base del palo; le due soluzioni vengono poi sovrapposte.

Il metodo, descritto in dettaglio nel tabulato seguente, ha come variabile di ingresso il valore medio del modulo di taglio del terreno laterale. Sulla base del modello geotecnico descritto nel paragrafo precedente, e sulla base dello schema di riferimento riportato nella Figura 28, sono stati assunti, cautelativamente, i seguenti valori per il modulo di taglio del terreno:

- Modulo di taglio del terreno laterale a profondità $z = 2m$: $G_0 = 3.6$ [MPa]
- Modulo di taglio del terreno laterale a profondità $z = L_{palo}$: $G_L = 16.7$ [MPa]
- Modulo di taglio terreno sotto la base del palo: $G_b = 16.7$ [MPa]

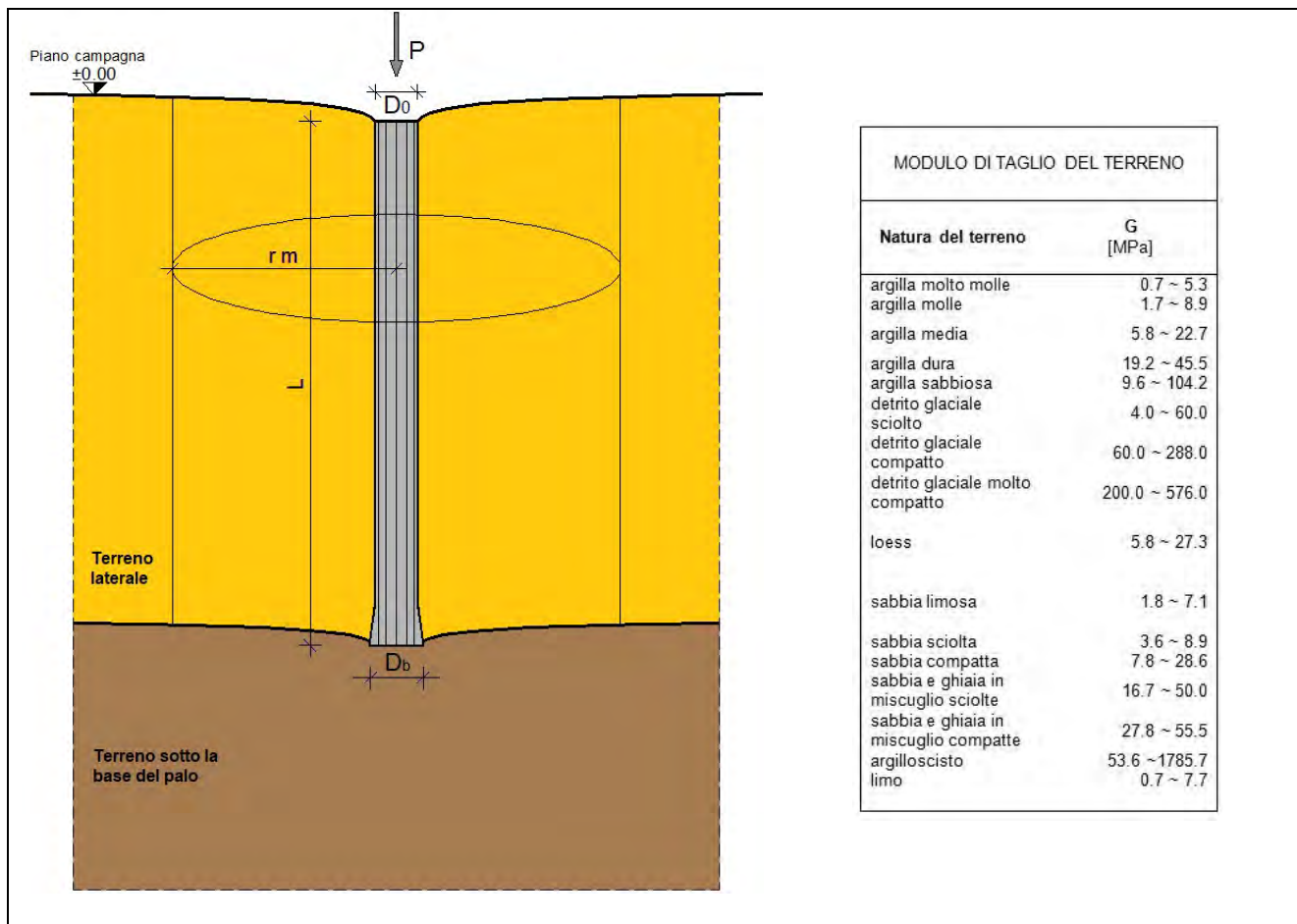


Figura 28 - Schema di riferimento per il modello geotecnico adottato

Si riportano di seguito i tabulati di calcolo per la determinazione delle rigidezze delle molle di Winkler per pali soggetti a carico verticale.

[Torna alla Home](#)

Calcolo della costante k_w di Winkler Ipotesi di palo immerso in un mezzo elastico

Il programma esegue il calcolo della costante k_w verticale di Winkler.

Per la determinazione di k_w la procedura fa riferimento al metodo di Randolph e Wroth (1978), il quale considera il palo immerso in un mezzo elastico, ed esamina separatamente l'interazione con tale mezzo della superficie laterale e della base del palo; le due soluzioni vengono poi sovrapposte.

Il calcolo viene eseguito dal programma attraverso i seguenti passi:

- Calcolo del valore medio del modulo di taglio del terreno laterale G_m [Mpa]
- Calcolo del rapporto ξ tra i moduli di taglio G_L e G_b alla profondità $z = L$ [-]

$$\xi = \frac{G_L}{G_b}$$

- Calcolo del fattore ρ di non omogeneità del terreno laterale (per pali immersi in un terreno con rigidità variabile) [-]

$$\rho = \frac{G_m}{G_L}$$

- Calcolo del raggio massimo al di là del quale non si ha più alcuna deformazione (distanza di estinzione)

$$r_m = [0,25 + [2,5 \cdot \rho \cdot (1 - \nu) - 0,25] \cdot \xi] \cdot L$$

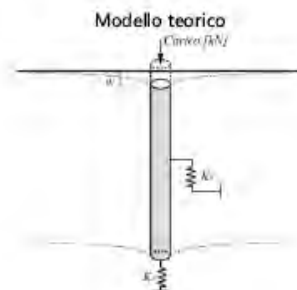
- Calcolo del coefficiente ζ che tiene conto dell'ampiezza r_m del campo deformativo che si sviluppa intorno al palo di raggio r_0 [-]

$$\zeta = \ln\left(\frac{2 \cdot r_m}{D}\right)$$

- Calcolo dei valori di rigidità delle molle che simulano la connessione tra palo e terreno lungo il fusto, k_s secondo Randolph e Wroth (1978), e alla base k_b , secondo Timoshenko e Goodier (1970)

$$k_s = \frac{2 \cdot \pi \cdot G_m \cdot L}{\zeta} \quad k_b = \frac{4 \cdot I_b \cdot G_b}{1 - \nu}$$

- Calcolo della rigidità totale $k_w = k_s + k_b$



N.B. Per riportare il valore della costante in $[F/L^3]$, si divide il k per l'area della sezione del palo A_p , così facendo si sta considerando il carico applicato sul palo non più come carico concentrato $[F]$, ma come forza su una superficie $[F/L^2]$.

DATI

Diametro del palo lungo il fusto D_0	1	m
Diametro del palo alla base D_b	1	m
Lunghezza del palo L	23	m

Modulo di taglio del terreno laterale a profondità $z = 0$ G_0	3.6	Mpa
Modulo di taglio del terreno laterale a profondità $z = L$ G_L	16.7	Mpa
Modulo di taglio terreno sotto la base del palo G_B	16.7	Mpa
Modulo di Poisson del terreno laterale ν_s	0.3	
Modulo di Poisson del terreno sotto la base del palo ν_b	0.3	
RISULTATI		
PARAMETRI MODELLO		
Valore medio del modulo di taglio del terreno laterale - G_m	10.15	Mpa
Rapporto tra i moduli di taglio alla profondità $z=L$ - ξ	1.00	-
Fattore di non omogeneità del terreno laterale - ρ	0.61	-
Distanza alla quale la deformazione è trascurabile - r_m	24.46	m
Coefficiente di influenza della deformazione - ζ	3.89	-
RIGIDEZZA MOLLE		
Rigidezza molla laterale k_s	377.04	MN/m
Rigidezza molla alla base k_b	47.71	MN/m
Rigidezza totale molla verticale k_w	424.75	MN/m
	48.95	kg/cm ³
	6.19	kg/cm ³
	55.15	kg/cm ³

7.2.3. Modellazione delle azioni

Per facilitare la lettura tra quanto calcolato e quanto implementato nel modello, si rimanda la modellazione delle azioni al capitolo dell'analisi dei carichi (v. par. 8).

8. ANALISI DEI CARICHI

Nel presente paragrafo si riportano i casi di carico elementare considerati per il progetto dell'impalcato e delle spalle. Per ciascun caso di carico viene rappresentata la modalità di applicazione nel modello di calcolo attraverso un'immagine esemplificativa.

Per la rappresentazione di tutti i casi di carico dell'impalcato si rimanda allo specifico allegato nel presente documento (v. allegato 1 - §13.1).

8.1. Pesì propri e carichi permanenti (G₁)

Il calcolo del peso proprio della struttura è eseguito in automatico dal programma di calcolo utilizzando i seguenti pesi specifici dei materiali:

Peso specifico del calcestruzzo armato: **25 kN/m³**

Peso specifico dell'acciaio per armatura ordinaria: **78.5 kN/m³**

Al fine di considerare il peso aggiuntivo degli elementi di collegamento, in carpenteria metallica, delle parti strutturali implementate nel modello numerico, il peso dell'acciaio è stato incrementato del **25%**.

8.2. Carichi permanenti non strutturali (G₂)

8.2.1. Peso della massicciata

In accordo al §2.5.1.3.2 del Manuale di Progettazione di RFI (8), per la determinazione dei carichi permanenti portati relativi al peso della massicciata, dell'armamento e della impermeabilizzazione (inclusa la protezione) è stato assunto, convenzionalmente, un peso di volume pari a **18.0 kN/m³** applicato su tutta la piastra ortotropa per una larghezza di **5 m** (interasse di calcolo tra le travi principali) e per una altezza fra piano del ferro (P.F.) ed estradosso piastra pari a **0.80 m**,

Al fine di considerare il peso aggiuntivo delle finiture e del sistema di smaltimento acque, il carico risultante è stato incrementato del **10%**:

$$G_{2, \text{ballast}} = 18.0 \text{ kN/m}^3 \times 0.8 \text{ m} \times 1.1 = \mathbf{15.8 \text{ kN/m}^2}$$

Si riporta di seguito lo schema di applicazione del carico estratto dal modello numerico:

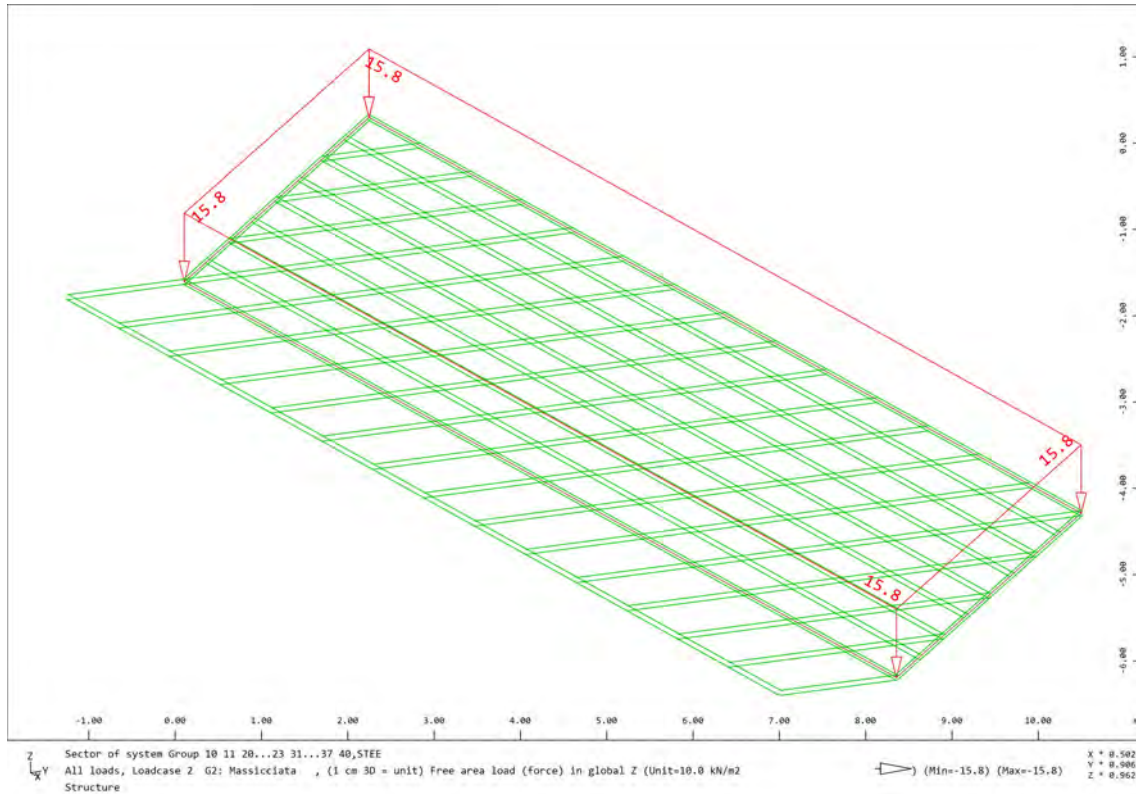


Figura 29 - G2: Ballast

Per quanto riguarda il peso delle barriere antirumore, in accordo al paragrafo sopracitato (8), si è assunto un valore pari a **3.2 kN/m²** ed un'altezza delle stesse di **4 m**, ottenendo il seguente valore di carico per unità di lunghezza:

$$G_{2, \text{barriere}} = 3.2 \text{ kN/m}^2 \times 4.0 \text{ m} \times 1.1 = \mathbf{14.1 \text{ kN/m}}$$

Il carico è stato applicato sulla trave di bordo dello sbalzo, considerando per esso la posizione più gravosa, come rappresentato nella figura seguente:

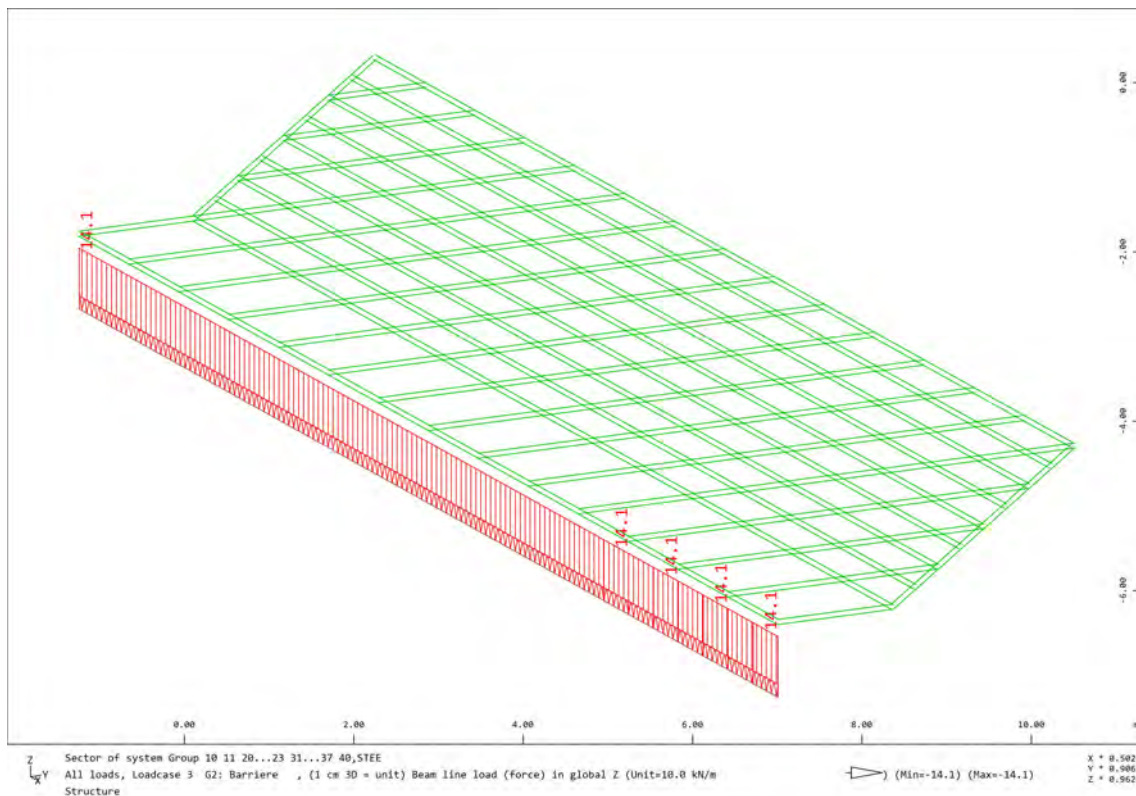


Figura 30 - G2: Barriera antirumore

8.3. Azioni variabili da traffico ferroviario

I carichi verticali associati al transito dei convogli ferroviari sono definiti mediante modelli di carico rappresentativi delle diverse tipologie di traffico ferroviario (normale e pesante), di cui al §5.2.2.2.1 delle NTC2018 (11) e al §2.5.1.4.1 del Manuale di Progettazione di RFI (8).

Nella progettazione dei ponti va considerata l'eventuale contemporaneità di più treni, in genere sia il traffico normale che il traffico pesante (11). Dal momento che, per l'opera in esame, è previsto un solo binario, sono stati considerati i seguenti carichi (v. Tab. 5.2.III delle NTC 2018 riportata di seguito):

Tab. 5.2.III - Carichi mobili in funzione del numero di binari presenti sul ponte

Numero di binari	Binari Carichi	Traffico normale		Traffico pesante ⁽²⁾
		caso a ⁽¹⁾	caso b ⁽¹⁾	
1	Primo	1,0 (LM 71 "+ SW/0)	-	1,0 SW/2
	Primo	1,0 (LM 71 "+ SW/0)	-	1,0 SW/2
2	secondo	1,0 (LM 71 "+ SW/0)	-	1,0 (LM 71 "+ SW/0)
	Primo	1,0 (LM 71 "+ SW/0)	0,75 (LM 71 "+ SW/0)	1,0 SW/2
≥3	secondo	1,0 (LM 71 "+ SW/0)	0,75 (LM 71 "+ SW/0)	1,0 (LM 71 "+ SW/0)
	Altri	-	0,75 (LM 71 "+ SW/0)	-

⁽¹⁾ LM71 "+ SW/0 significa considerare il più sfavorevole fra i treni LM 71, SW/0

⁽²⁾ Salvo i casi in cui sia esplicitamente escluso

8.3.1. Azioni variabili verticali

8.3.1.1. Treno di carico LM71

Il treno LM71 schematizza gli effetti statici prodotti dal traffico ferroviario normale ed è costituito da quattro assi da 250 kN su una lunghezza di 6.4 m e da un carico distribuito di 80 kN/m in entrambe le direzioni per una lunghezza illimitata:

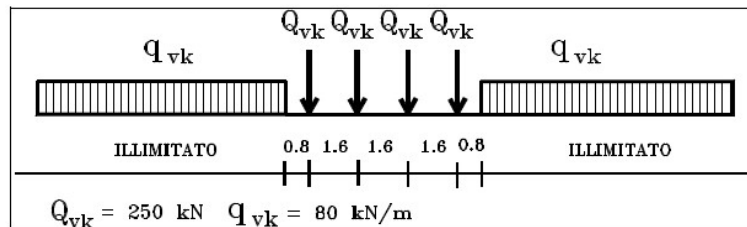


Figura 31 - Treno di carico LM71

Tutti i carichi di cui sopra sono moltiplicati per un coefficiente di adattamento “ α ”, variabile in ragione della tipologia dell’infrastruttura (ferrovie ordinarie, ferrovie leggere, metropolitane, ecc.). Il valore di “ α ” adottato è riportato nella tabella seguente (11):

MODELLO DI CARICO	COEFFICIENTE “ α ”
LM71	1,10
SW/0	1,10
SW/2	1,00

Tab. 2.5.1.4.1-1 Coefficiente “ α ”

Per questo modello di carico è prevista una eccentricità del carico rispetto all’asse del binario pari a 1/18 dello scartamento s ($1435\text{mm}/18 = 80\text{mm}$); tale eccentricità è stata considerata in entrambe le direzioni.

In accordo al §5.2.2.2.1.4 delle NTC 2018 (11), il carico viene distribuito in senso trasversale per mezzo della traversa e del ballast secondo lo schema seguente:

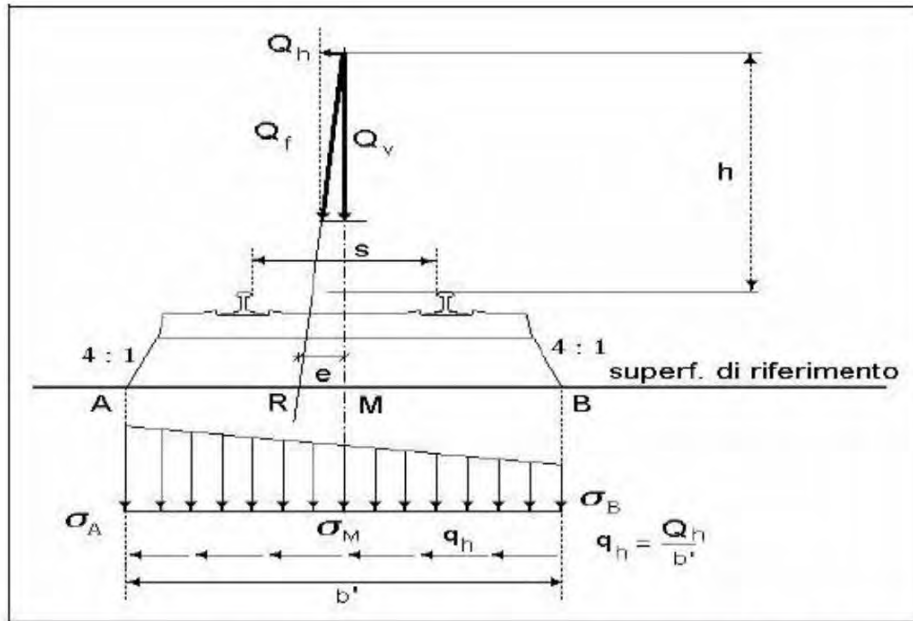


Fig. 5.2.5 Distribuzione trasversale in rettifilo delle azioni per mezzo delle traverse e del ballast. In figura, Q_b rappresenta la forza centrifuga definita al successivo §5.2.2.3.1

A vantaggio di sicurezza viene trascurata la diffusione delle azioni per mezzo del ballast, il cui spessore minimo risulta pari a 35cm.

Si riporta di seguito il calcolo effettuato per la determinazione dei valori di massimo e di minimo del carico distribuito con forma trapezoidale, in funzione dell'eccentricità del carico rispetto all'asse del binario.

Azioni variabili verticali - § 5.2.2.2 / NTC18

Modello di carico LM71 - § 5.2.2.2.1.1 / NTC18

$Q_{vk} := 250 \text{ kN}$	valore caratteristico del carico del singolo asse
$q_{vk} := 80 \frac{\text{kN}}{\text{m}}$	valore caratteristico del carico uniformemente distribuito
$\alpha := 1.1$	coefficiente di adattamento "α"

Distribuzione trasversale delle azioni per mezzo delle traverse e del ballast - §5.2.2.3.1 / NTC18

$s := 1.435 \text{ m}$	scartamento
$e := \frac{s}{18} = 79.7 \text{ mm}$	eccentricità del carico rispetto all'asse del binario
$L_t := 2.4 \text{ m}$	larghezza traversa
$q_{tr}(x, q) := \frac{\alpha \cdot q}{L_t} \cdot \left(1 + 6 \cdot \frac{e}{L_t} - 12 \cdot \frac{e \cdot x}{L_t^2} \right)$	distribuzione del carico trapezoidale per mezzo della traversa

Carico concentrato

$Q_{vk} = 250 \text{ kN}$	
$q(x, Q_{vk}) := \frac{\alpha \cdot Q_{vk}}{L_t} \cdot \left(1 + 6 \cdot \frac{e}{L_t} - 12 \cdot \frac{e \cdot x}{L_t^2} \right)$	distribuzione del carico trapezoidale per mezzo della traversa
$x := 0 \text{ m} \quad q_{max} := q_{tr}(x, Q_{vk}) = 137.4 \frac{\text{kN}}{\text{m}}$	valore massimo del carico trapezoidale
$x := L_t \quad q_{min} := q_{tr}(x, Q_{vk}) = 91.7 \frac{\text{kN}}{\text{m}}$	valore minimo del carico trapezoidale

Carico distribuito

$q_{vk} = 80 \frac{\text{kN}}{\text{m}}$	
$q_{tr}(x, q_{vk}) := \frac{\alpha \cdot q_{vk}}{L_t} \cdot \left(1 + 6 \cdot \frac{e}{L_t} - 12 \cdot \frac{e \cdot x}{L_t^2} \right)$	distribuzione del carico trapezoidale per mezzo della traversa
$x := 0 \text{ m} \quad q_{max} := q_{tr}(x, q_{vk}) = 44 \frac{\text{kN}}{\text{m}^2}$	valore massimo del carico trapezoidale
$x := L_t \quad q_{min} := q_{tr}(x, q_{vk}) = 29.4 \frac{\text{kN}}{\text{m}^2}$	valore minimo del carico trapezoidale

A titolo esemplificativo si riporta uno schema di applicazione del carico estratto dal modello di calcolo:

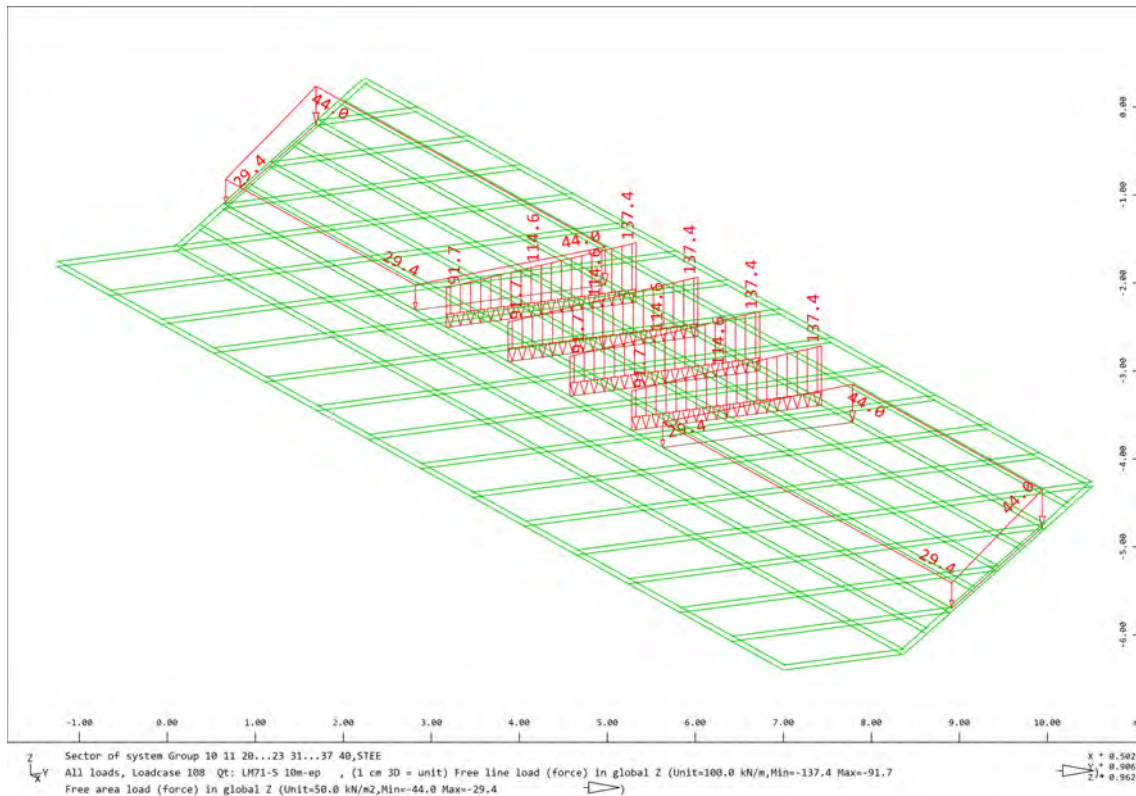


Figura 32 - Q: Treno di carico LM71- Eccentricità positiva

8.3.1.2. Treni di carico SW

Il modello di carico SW è schematizzato nella figura seguente. Per esso si considerano due distinte configurazioni denominate SW/0 ed SW/2.

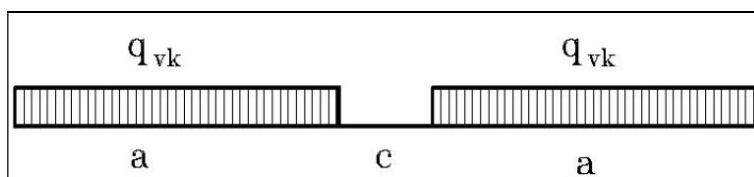


Figura 33 - Treni di carico SW

Il modello di carico SW/0 schematizza gli effetti statici prodotti dal traffico ferroviario normale per travi continue (esso è utilizzato solo per le travi continue qualora più sfavorevole dell'LM71). Il modello di carico SW/2 schematizza gli effetti statici prodotti dal traffico ferroviario pesante.

Le caratterizzazioni di entrambe queste configurazioni sono indicate nella tabella 5.2.I delle NTC2018:

Tipo di Carico	q_{vk} [kN/m]	a [m]	c [m]
SW/0	133	15,0	5,3
SW/2	150	25,0	7,0

Tutti i carichi di cui sopra dovranno essere moltiplicati per un coefficiente di adattamento “ α ”, variabile in ragione della tipologia dell’infrastruttura (ferrovie ordinarie, ferrovie leggere, metropolitane, ecc.), i cui valori sono riportati nella tabella seguente:

MODELLO DI CARICO	COEFFICIENTE “ α ”
LM71	1,10
SW/0	1,10
SW/2	1,00

Tab. 2.5.1.4.1-1 Coefficiente “ α ”

Nel caso in esame, trattandosi di un impalcato semplicemente appoggiato con una lunghezza di calcolo pari a **18.8m**, è stato considerando il solo modello di carico SW/2.

In accordo al §5.2.2.2.1.4 delle NTC18, il carico viene distribuito in senso trasversale secondo lo schema riportato nel paragrafo precedente (v. par. 8.3.1.1). A vantaggio di sicurezza, viene trascurata la diffusione delle azioni per mezzo del ballast, il cui spessore minimo risulta pari a 35cm.

Si riporta di seguito il calcolo effettuato per la determinazione dei valori di massimo e di minimo del carico distribuito a forma trapezoidale, in funzione dell’eccentricità del carico rispetto all’asse del binario.

Azioni variabili verticali - § 5.2.2.2 / NTC18

Modello di carico SW/2 - § 5.2.2.2.1.2 / NTC18

$$q_{vk} = 150 \frac{kN}{m}$$

valore caratteristico del carico uniformemente distribuito

$$\alpha = 1.0$$

coefficiente di adattamento "α"

Distribuzione trasversale delle azioni per mezzo delle traverse e del ballast - §5.2.2.3.1 / NTC18

$$s = 1.435 \text{ m}$$

scartamento

$$e = \frac{s}{18} = 79.7 \text{ mm}$$

eccentricità del carico rispetto all'asse del binario

$$L_t = 2.4 \text{ m}$$

larghezza traversa

$$q_{tr}(x, q) = \frac{\alpha \cdot q}{L_t} \cdot \left(1 + 6 \cdot \frac{e}{L_t} - 12 \cdot \frac{e \cdot x}{L_t^2} \right)$$

distribuzione del carico trapezoidale per mezzo della traversa

Carico distribuito

$$q_{vk} = 150 \frac{kN}{m}$$

$$q_{tr}(x, q_{vk}) = \frac{\alpha \cdot q_{vk}}{L_t} \cdot \left(1 + 6 \cdot \frac{e}{L_t} - 12 \cdot \frac{e \cdot x}{L_t^2} \right)$$

distribuzione del carico trapezoidale per mezzo della traversa

$$x = 0 \text{ m} \quad q_{max} := q_{tr}(x, q_{vk}) = 75 \frac{kN}{m^2}$$

valore massimo del carico trapezoidale

$$x = L_t \quad q_{min} := q_{tr}(x, q_{vk}) = 50 \frac{kN}{m^2}$$

valore minimo del carico trapezoidale

A titolo esemplificativo si riporta uno schema di applicazione del carico estratto dal modello di calcolo:

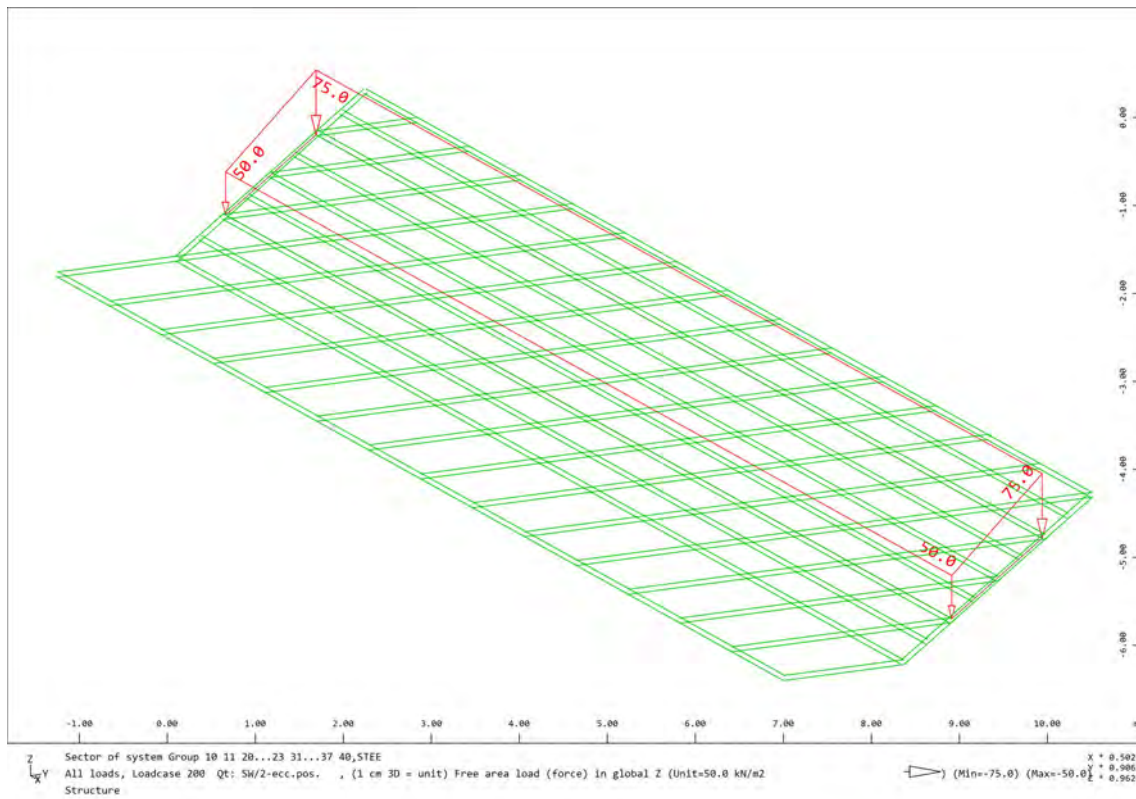


Figura 34 -Q: Treno di carico SW/2 - Eccentricità positiva

8.3.1.3. Carichi sui marciapiedi

Il carico accidentale sui marciapiedi è stato definito in accordo al §5.2.2.2.2 delle NTC 2018 (11). Tali carichi accidentali sono schematizzati da un carico uniformemente distribuito del valore di 10 kN/m². Tale carico, come riportato nel sopracitato paragrafo (11), non viene considerato contemporaneo al transito dei convogli ferroviari.

Si riporta lo schema di applicazione del carico estratto dal modello numerico:

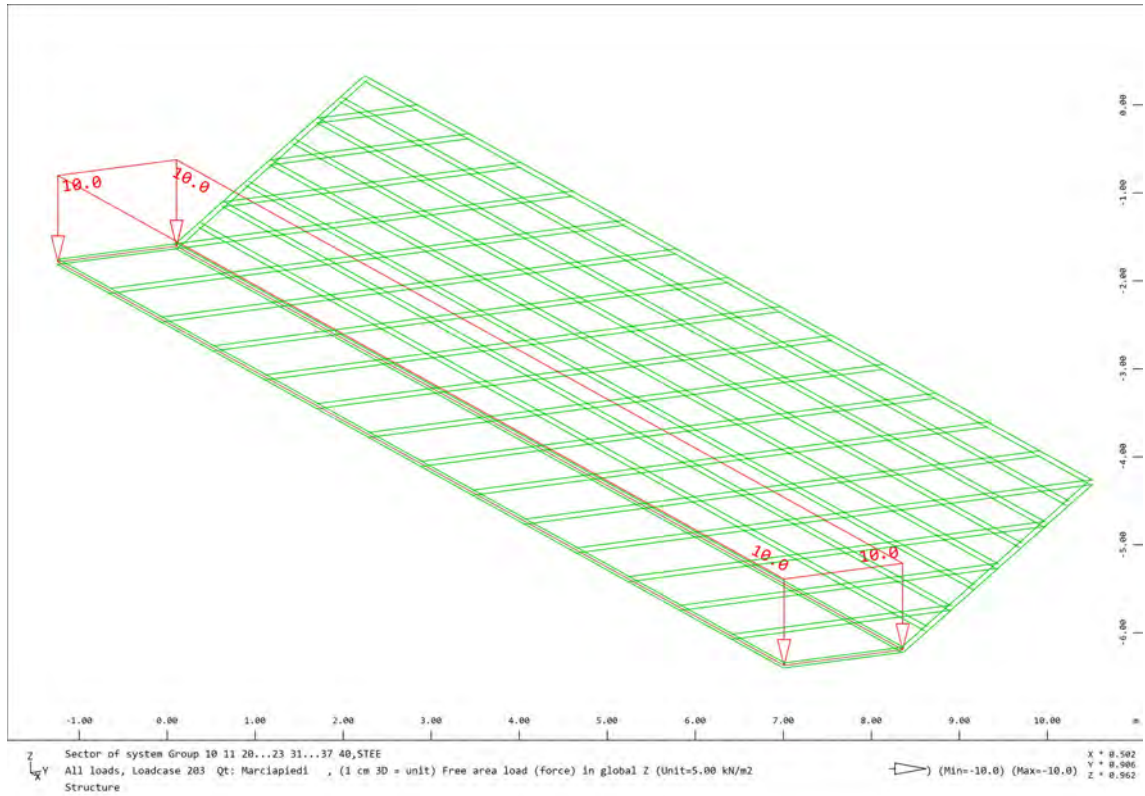
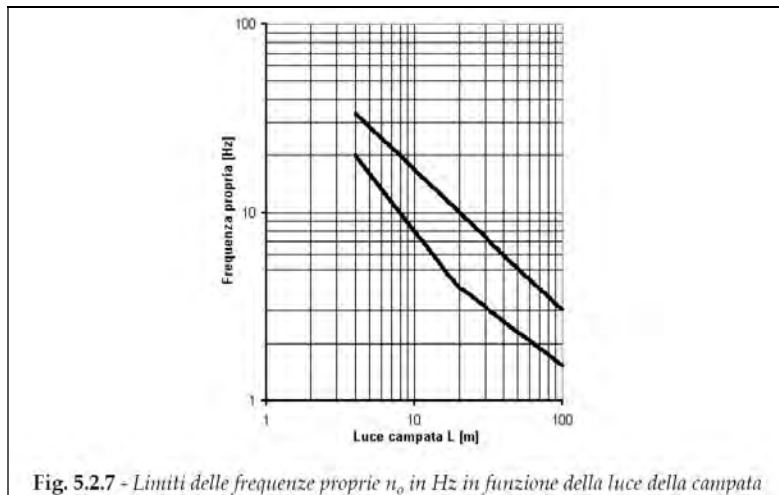


Figura 35 - Q: Carico sui marciapiedi

8.3.2. Incremento dinamico

In accordo al §5.2.2.2.3 delle NTC2018, i modelli di carico verticali LM71 e SW descritti sinteticamente nei paragrafi precedenti, devono essere amplificati di un coefficiente di incremento dinamico ϕ secondo la seguente procedura semplificativa.

Per le usuali tipologie di ponti e per velocità di percorrenza non superiore a 200 km/h, tale procedura semplificativa di amplificazione dinamica è lecita quando la frequenza propria della struttura ricade all'interno del fuso indicato nella figura seguente (Fig. 5.2.7 delle NTC2018):



Dal momento che il ponte in esame, avente luce di calcolo pari a **18.8 m** e prima frequenza flessionale pari a **6.46Hz**, ricade all'interno del fuso, si riportano i coefficienti di amplificazione dinamica adottati per i diversi elementi strutturali:

- Travi principali;
- Traversi intermedi;
- Traversi intermedi di lunghezza variabile;
- Traversi di estremità;

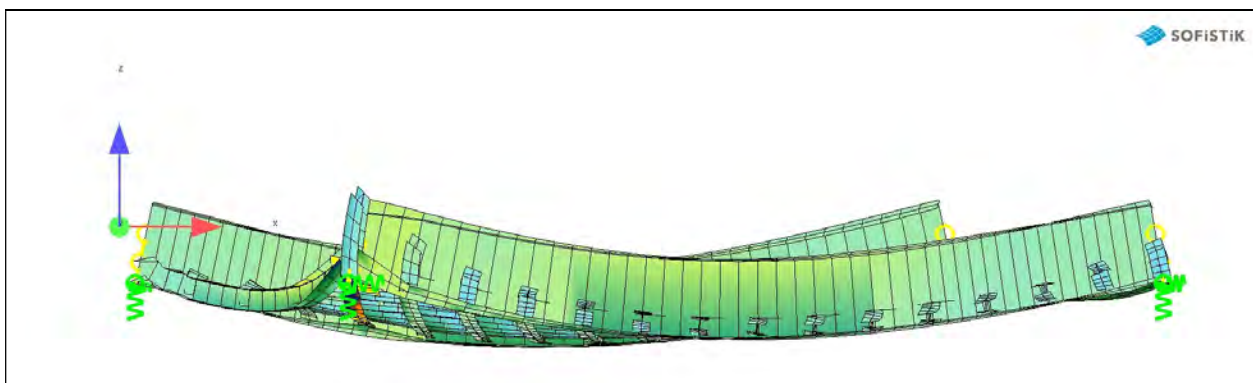


Figura 36 - Primo modo flessionale, $f = 6.46 \text{ Hz}$

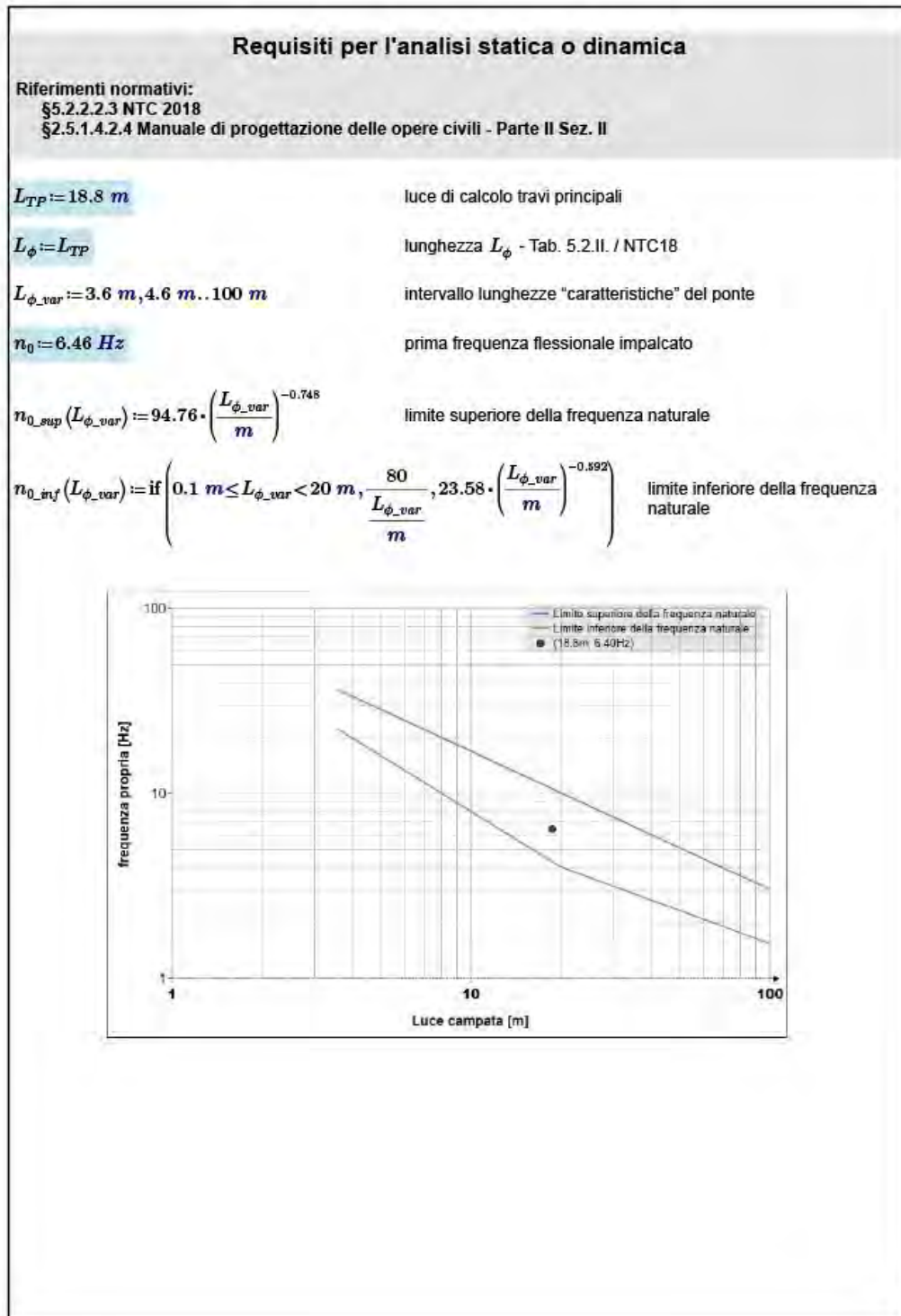


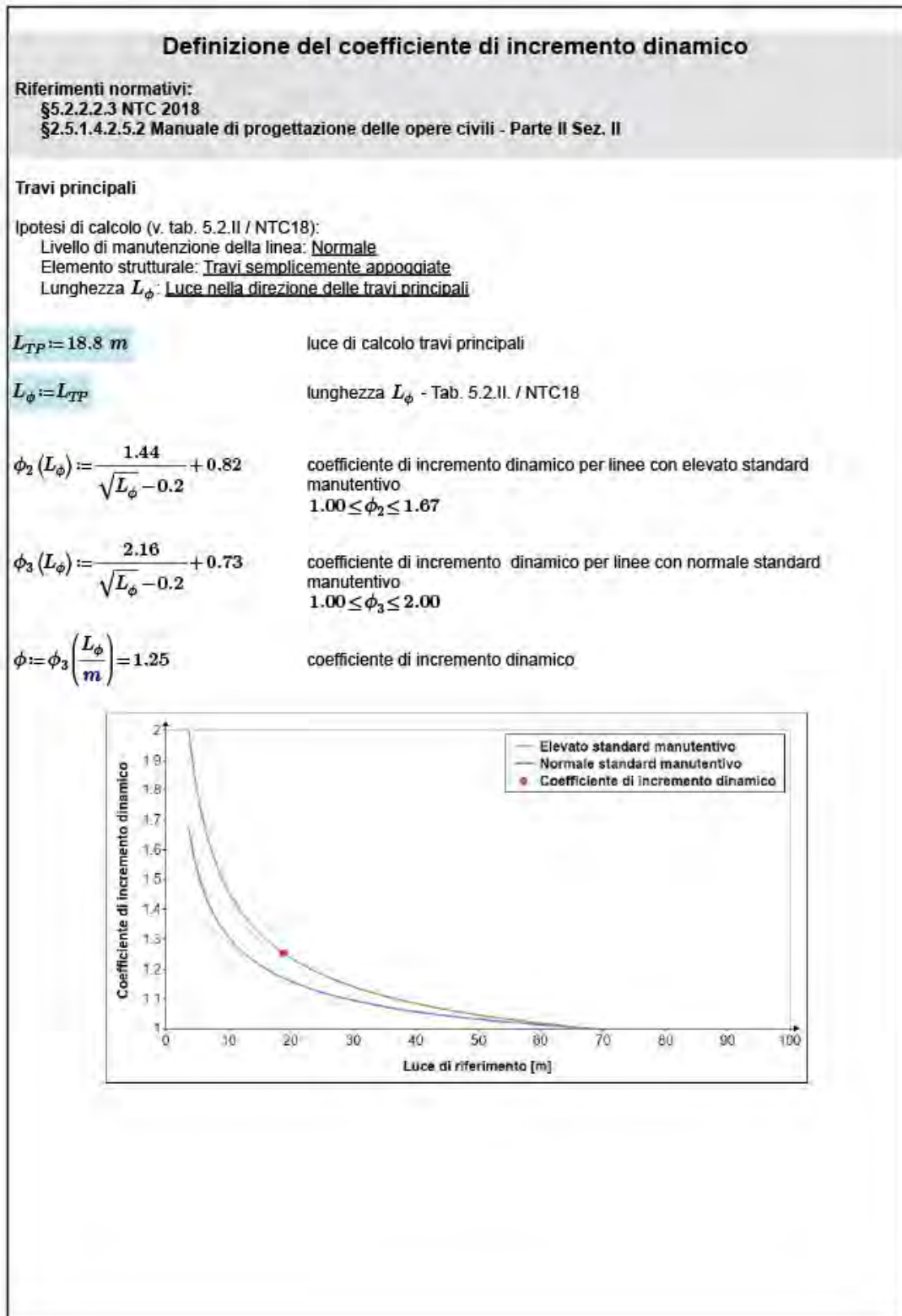
Figura 37 – Dominio del fuso

8.3.2.1. Calcolo dei coefficienti di incremento dinamico

Si riporta di seguito il tabulato di calcolo per la valutazione dei coefficienti di incremento dinamico per ciascun elemento strutturale che ha fornito i seguenti risultati:

- $\phi = 1.25$ per le travi principali;
- $\phi = 1.46$ per i traversi intermedi di lunghezza 5m;

- $\phi = 2$ per i traversi intermedi di lunghezza variabile e i traversi di estremità.



Traversi intermedi

Ipotesi di calcolo (v. tab. 5.2.II / NTC18):

Livello di manutenzione della linea: **Normale**

Elemento strutturale: **Travi trasversali intermedie**

Lunghezza L_ϕ : **2 volte la luce delle travi trasversali**

$$L_{Tr,i} := 5 \text{ m}$$

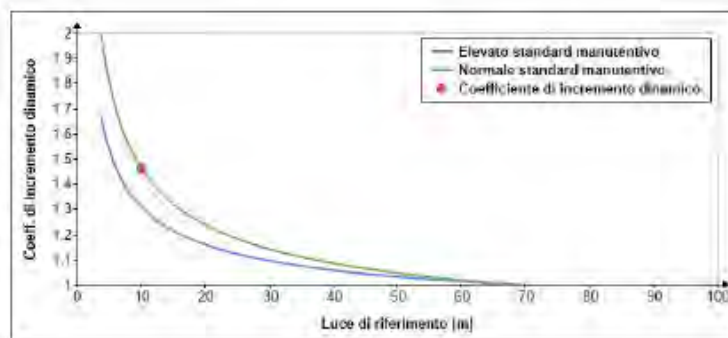
luce di calcolo travi trasversali intermedie

$$L_\phi := 2 \cdot L_{Tr,i} = 10 \text{ m}$$

lunghezza L_ϕ - Tab. 5.2.II. / NTC18

$$\phi := \phi_3 \left(\frac{L_\phi}{m} \right) = 1.46$$

coefficiente di incremento dinamico



Traversi di estremità

Ipotesi di calcolo (v. tab. 5.2.II / NTC18):

Livello di manutenzione della linea: **Normale**

Elemento strutturale: **Travi trasversali di estremità**

Lunghezza L_ϕ : **Caso più sfavorevole tra 2 volte la luce delle travi trasversali e 3.60m.**

$$L_{Tr,e} := 7.3 \text{ m}$$

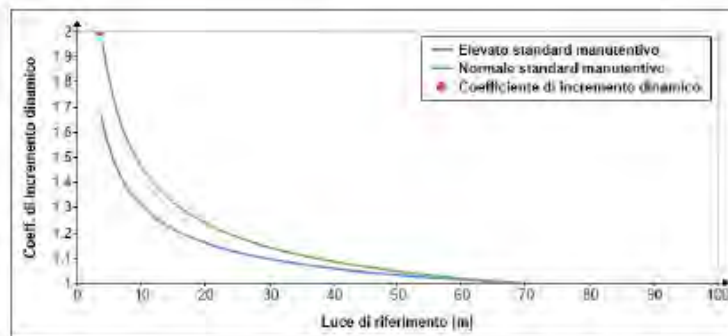
luce di calcolo travi trasversali intermedie - Tab. 5.2.II. / NTC18

$$L_\phi := \min(2 L_{Tr,e}, 3.6 \text{ m}) = 3.6 \text{ m}$$

lunghezza L_ϕ - Tab. 5.2.II. / NTC18

$$\phi := \phi_3 \left(\frac{L_\phi}{m} \right) = 2$$

coefficiente di incremento dinamico



8.3.3. Azioni variabili orizzontali

8.3.3.1. Forze centrifughe

L'azione variabile associata alla forza centrifuga, definita al §5.2.2.3.1 delle NTC 2018 (11), unitamente al §2.5.1.4.3.1 del Manuale di Progettazione di RFI (8), viene trascurata in quanto il tracciato, al di sopra del ponte, non risulta in curva.

8.3.3.2. Azione laterale (serpeggio)

L'azione variabile di serpeggio è stata definita in accordo al §5.2.2.3.2 delle NTC 2018 (11) e al §2.5.1.4.3.1.1 del Manuale di Progettazione di RFI (8). Il valore caratteristico di tale forza risulta pari a **100 kN**.

In accordo ai paragrafi sopracitati, tale azione è stata applicata in più punti dell'impalcato come una forza agente orizzontalmente e distribuita per mezzo della traversa, applicata alla sommità della rotaia più alta, e perpendicolarmente all'asse del binario (v. allegato 1 - §13.1).

Il valore è stato moltiplicato per il coefficiente di adattamento "α", ma non per il coefficiente di incremento dinamico Φ (11).

Si riporta di seguito il calcolo effettuato.

Azioni variabili orizzontali - § 5.2.2.3 / NTC18

Azione laterale (Serpeggio) - § 5.2.2.3.2 / NTC18

$Q_{sk} := 100 \text{ kN}$ valore caratteristico della forza concentrata

$\alpha := 1.1$ coefficiente di adattamento " α "

Distribuzione trasversale delle azioni per mezzo della traversa

$L_t := 2.4 \text{ m}$ larghezza traversa

$q_s := \frac{Q_{sk} \cdot \alpha}{L_t} = 45.8 \frac{\text{kN}}{\text{m}}$ distribuzione uniforme del carico per mezzo della traversa

Azioni variabili orizzontali - § 5.2.2.3 / NTC18

Azioni di avviamento e frenatura - § 5.2.2.3.3 / NTC18

$Q_{la,k} := 33 \frac{\text{kN}}{\text{m}}$ valore caratteristico dell'azione di avviamento per modelli di carico LM71, SW/0, SW/2

$Q_{lb,k} := 20 \frac{\text{kN}}{\text{m}}$ valore caratteristico dell'azione di frenatura per modelli di carico LM71, SW/0

$Q_{lb,k,SW2} := 35 \frac{\text{kN}}{\text{m}}$ valore caratteristico dell'azione di frenatura per modello di carico SW/2

$\alpha := 1.1$ coefficiente di adattamento " α " per modelli di carico LM71, SW/0

$\alpha_{SW2} := 1.0$ coefficiente di adattamento " α " per modello di carico LM71

Distribuzione longitudinale delle azioni agenti sulla singola trave longitudinale

$L_{TP} := 18.8 \text{ m}$ lunghezza di calcolo trave principale

$n_{TP} := 2$ numero travi principali

$Q_{la} := \frac{Q_{la,k} \cdot \alpha}{n_{TP}} = 18.2 \frac{\text{kN}}{\text{m}}$ carico uniforme dell'avviamento per modelli di carico LM71, SW/0

$Q_{la,SW2} := \frac{Q_{la,k} \cdot \alpha_{SW2}}{n_{TP}} = 16.5 \frac{\text{kN}}{\text{m}}$ carico uniforme dell'avviamento per modello di carico SW/2

$Q_{lb} := \frac{Q_{lb,k} \cdot \alpha}{n_{TP}} = 11 \frac{\text{kN}}{\text{m}}$ carico uniforme della frenatura per modelli di carico LM71, SW/0

$Q_{lb,SW2} := \frac{Q_{lb,k,SW2} \cdot \alpha_{SW2}}{n_{TP}} = 17.5 \frac{\text{kN}}{\text{m}}$ carico uniforme della frenatura per modello di carico SW/2

A titolo esemplificativo si riporta uno schema di applicazione del carico estratto dal modello numerico:

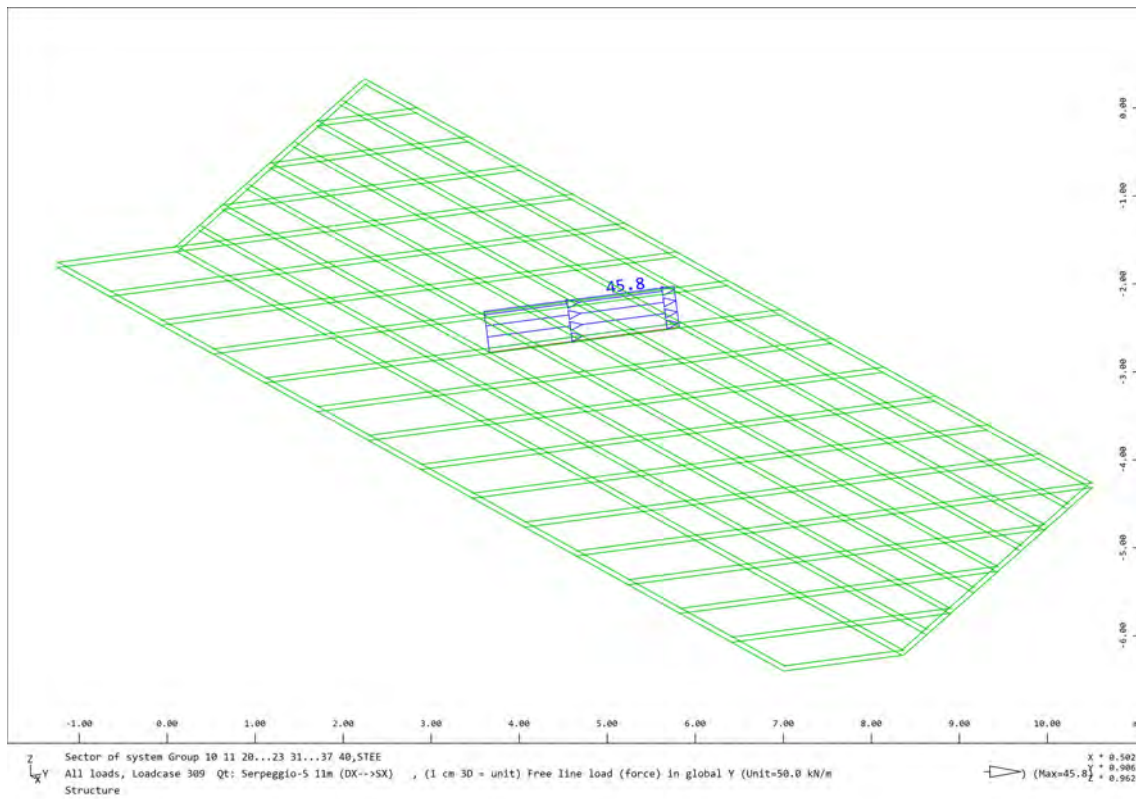


Figura 38 - Q: Azione laterale (serpeggio) applicata in mezzeria

8.3.3.3. Azioni di avviamento e frenatura

Le azioni di avviamento e frenatura sono state definite in accordo al §5.2.2.3.3 delle NTC 2018 (11) e al § 2.5.1.4.3.2 del Manuale di Progettazione di RFI (8).

In accordo a tali paragrafi le forze sono state considerate applicate sulla sommità del binario, nella direzione longitudinale dello stesso in modo tale da ottenere l'effetto più gravoso sull'elemento strutturale considerato.

Nel seguente tabulato si riportano i valori caratteristici delle azioni e la modalità di calcolo conseguita per ricavare i valori applicati nel modello di calcolo.

I valori caratteristici dell'azione di frenatura e di quella di avviamento devono essere moltiplicati per " α " e non devono essere moltiplicati per ϕ (11).

Azioni variabili orizzontali - § 5.2.2.3 / NTC18

Azione laterale (Serpeggio) - § 5.2.2.3.2 / NTC18

$Q_{sk} := 100 \text{ kN}$ valore caratteristico della forza concentrata

$\alpha := 1.1$ coefficiente di adattamento " α "

Distribuzione trasversale delle azioni per mezzo della traversa

$L_t := 2.4 \text{ m}$ larghezza traversa

$q_s := \frac{Q_{sk} \cdot \alpha}{L_t} = 45.8 \frac{\text{kN}}{\text{m}}$ distribuzione uniforme del carico per mezzo della traversa

Azioni variabili orizzontali - § 5.2.2.3 / NTC18

Azioni di avviamento e frenatura - § 5.2.2.3.3 / NTC18

$Q_{la,k} := 33 \frac{\text{kN}}{\text{m}}$ valore caratteristico dell'azione di avviamento per modelli di carico LM71, SW/0, SW/2

$Q_{lb,k} := 20 \frac{\text{kN}}{\text{m}}$ valore caratteristico dell'azione di frenatura per modelli di carico LM71, SW/0

$Q_{lb,k,SW2} := 35 \frac{\text{kN}}{\text{m}}$ valore caratteristico dell'azione di frenatura per modello di carico SW/2

$\alpha := 1.1$ coefficiente di adattamento " α " per modelli di carico LM71, SW/0

$\alpha_{SW2} := 1.0$ coefficiente di adattamento " α " per modello di carico LM71

Distribuzione longitudinale delle azioni agenti sulla singola trave longitudinale

$L_{TP} := 18.8 \text{ m}$ lunghezza di calcolo trave principale

$n_{TP} := 2$ numero travi principali

$Q_{la} := \frac{Q_{la,k} \cdot \alpha}{n_{TP}} = 18.2 \frac{\text{kN}}{\text{m}}$ carico uniforme dell'avviamento per modelli di carico LM71, SW/0

$Q_{la,SW2} := \frac{Q_{la,k} \cdot \alpha_{SW2}}{n_{TP}} = 16.5 \frac{\text{kN}}{\text{m}}$ carico uniforme dell'avviamento per modello di carico SW/2

$Q_{lb} := \frac{Q_{lb,k} \cdot \alpha}{n_{TP}} = 11 \frac{\text{kN}}{\text{m}}$ carico uniforme della frenatura per modelli di carico LM71, SW/0

$Q_{lb,SW2} := \frac{Q_{lb,k,SW2} \cdot \alpha_{SW2}}{n_{TP}} = 17.5 \frac{\text{kN}}{\text{m}}$ carico uniforme della frenatura per modello di carico SW/2

A titolo esemplificativo si riporta per ciascun caso di carico, uno schema di applicazione dell'azione estratto dal modello di calcolo.

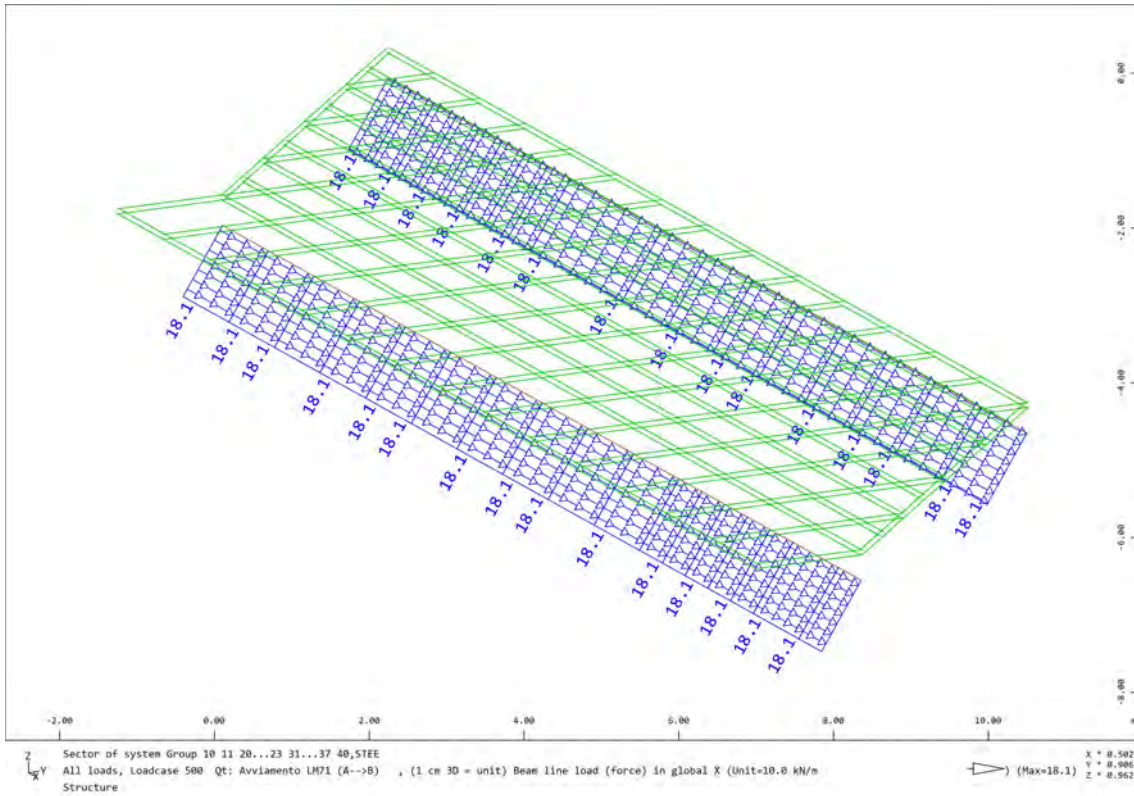


Figura 39 – Q: Azione di avviamento per modello di carico LM71

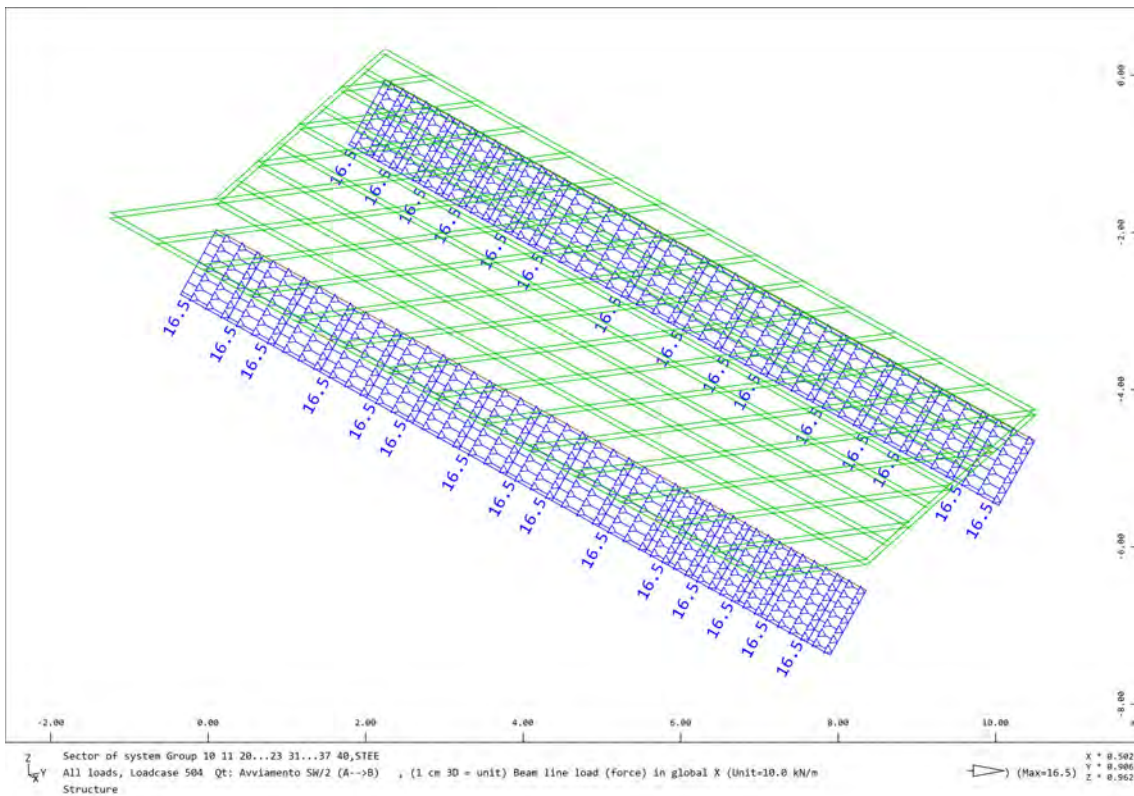


Figura 40 - Q: Azione di avviamento per modello di carico SW/2

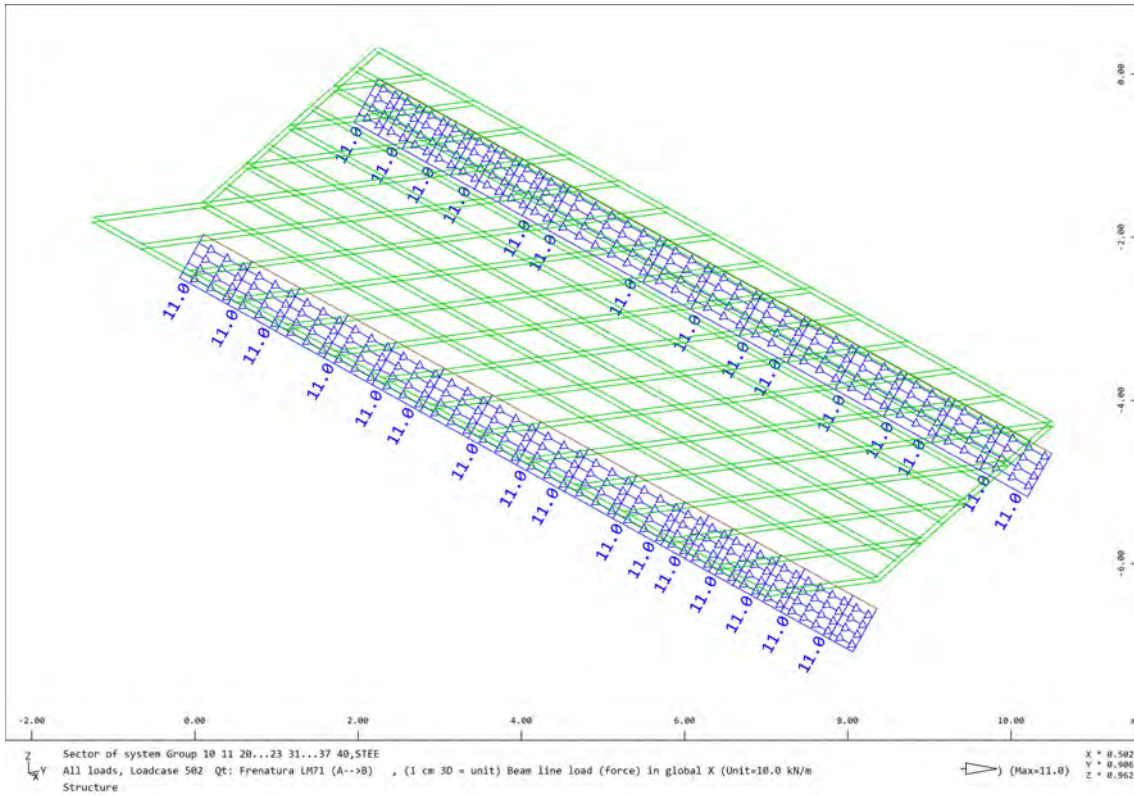


Figura 41 - Q: Azione di frenatura per modello di carico LM71

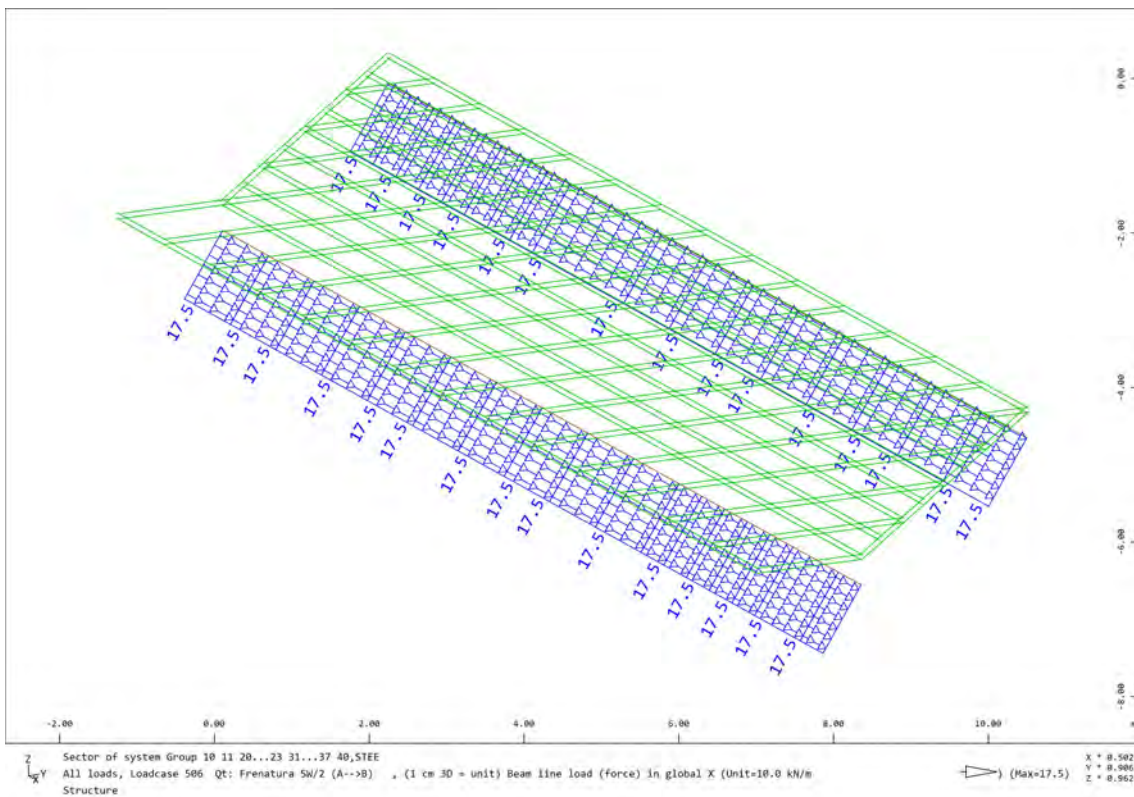


Figura 42 - Q: Azione di frenatura per modello di carico SW/2

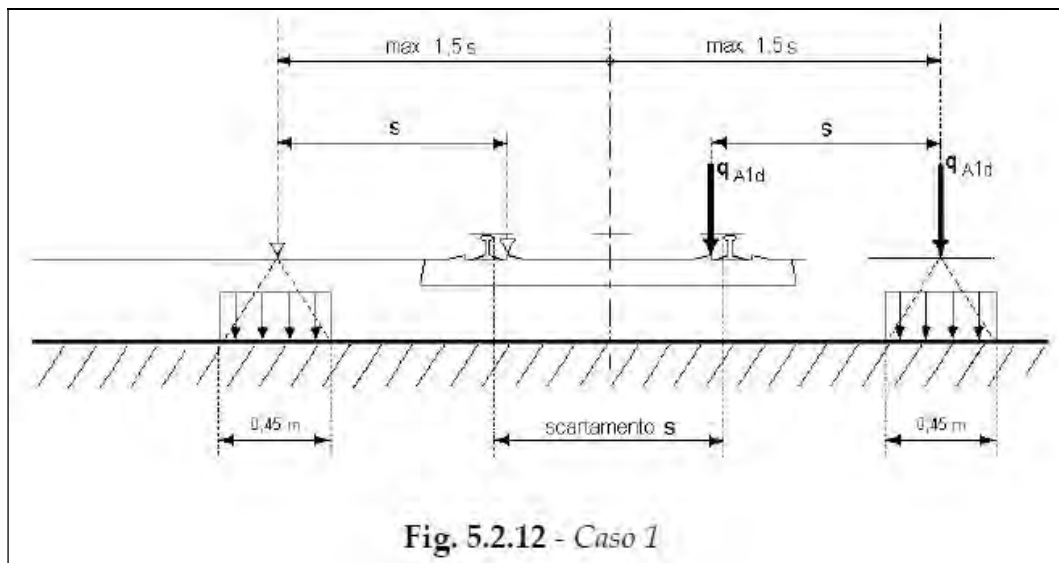
8.3.4. Azioni eccezionali

8.3.4.1. Deragliamento al di sopra del ponte

L'azione eccezionale di deragliamento del convoglio ferroviario sul viadotto è stata definita in accordo al §5.2.2.9.2 delle NTC 2018 (11) e al §2.5.1.5.1 del Manuale di Progettazione di RFI (8). Si definiscono le seguenti condizioni di carico:

Situazione di progetto 1

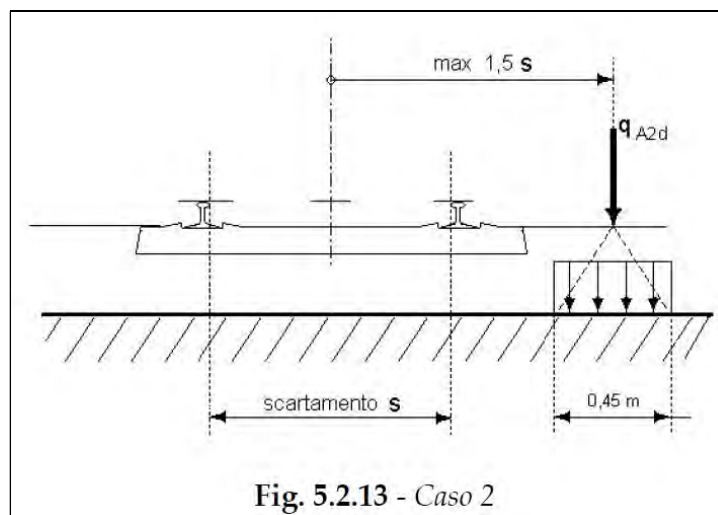
Si considerano due carichi verticali lineari $q_{A1d} = 60 \text{ kN/m}$ (comprensivo dell'effetto dinamico) ciascuno. Essi sono posizionati longitudinalmente su una lunghezza di 6.40 m e possono assumere tutte le posizioni comprese entro i limiti indicati in figura seguente:



Dove "s" è lo scartamento del binario; $s = 1435 \text{ mm}$.

Situazione di progetto 2

Si considera un unico carico lineare $q_{A2d} = 80 \text{ kN/m} \times 1.4 = 112 \text{ kN/m}$ esteso longitudinalmente per 20 m e disposto con una eccentricità massima, lato esterno, di 1.5 s rispetto all'asse del binario.



Per il caso in esame, è stata considerata la sola situazione di progetto "2" essendo quest'ultima la condizione di carico più gravosa per il ponte in esame.

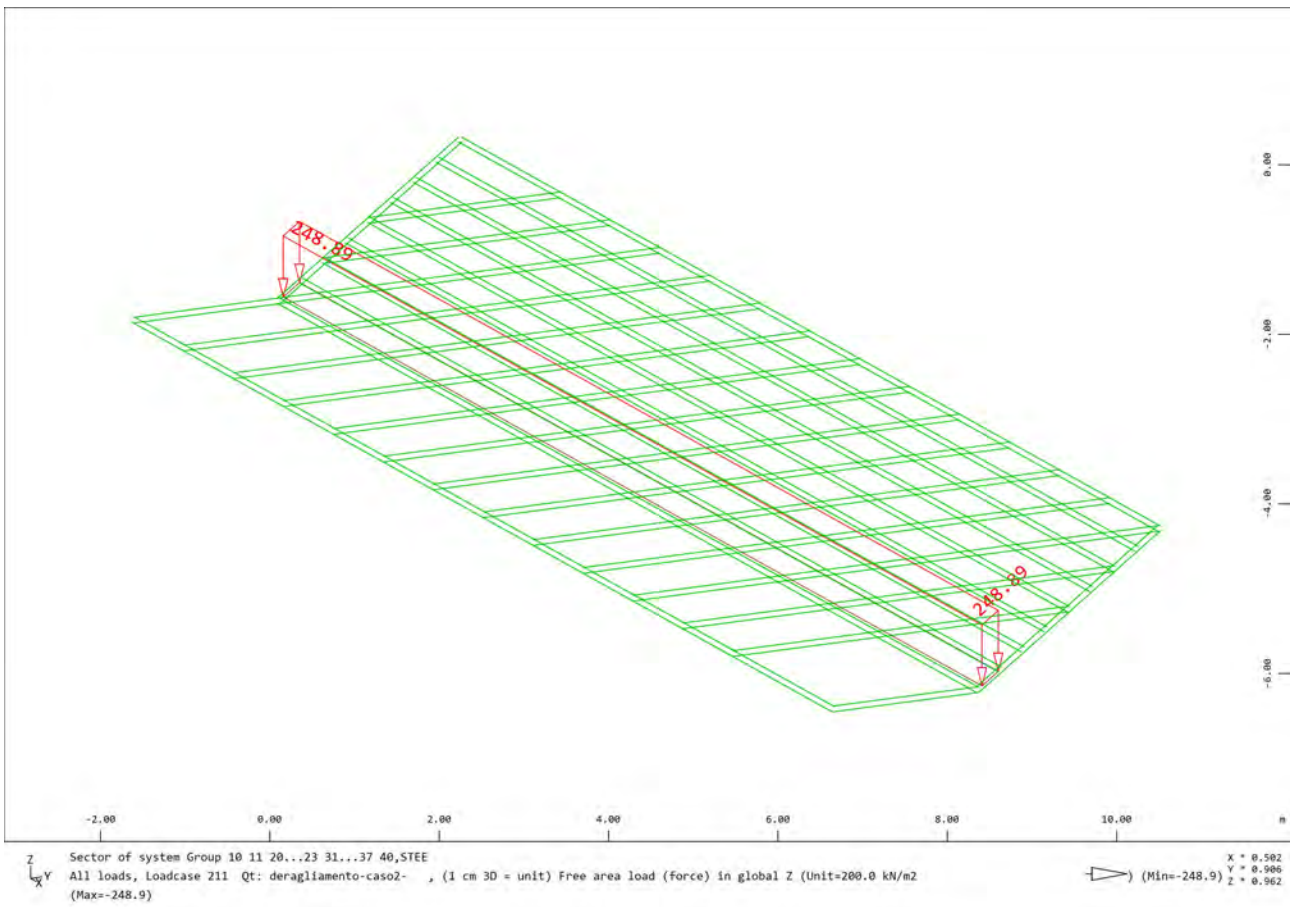


Figura 43- Situazione di progetto 2: deragliamento al di sopra del ponte con eccentricità negativa

8.4. Azioni climatiche

8.4.1. Variazione termica uniforme

Le variazioni termiche uniformi, rispetto alla temperatura media del sito, sugli impalcati con **strutture in acciaio ed armamento su ballast** sono valutate secondo il §2.5.1.4.4.1.1 del Manuale di Progettazione RFI, adottando un $\Delta T_N = \pm 20 \text{ °C}$

Secondo il sopracitato paragrafo, esclusivamente per il calcolo delle escursioni dei giunti e degli apparecchi d'appoggio, la variazione di temperatura è stata incrementata del **50 %**.

8.4.2. Variazione termica non uniforme

Secondo il §2.5.1.4.4.1.1 del Manuale di Progettazione RFI, in aggiunta alla variazione termica uniforme, è stato considerato un gradiente di temperatura di **5 °C** fra estradosso ed intradosso di impalcato

Per la verifica delle deformazioni orizzontali e verticali degli impalcati, con l'esclusione delle analisi di comfort, sono state considerate delle differenze di temperatura fra estradosso ed intradosso e fra le superfici laterali più esterne degli impalcati di **10 °C**.

Per tali differenze di temperatura è stato assunto un andamento lineare fra i detti estremi, considerando gli stessi gradienti termici diretti sia in un verso che nell'altro.

8.4.3. Azione del vento

L'azione del vento viene calcolata nel rispetto delle NTC 2018 (11) e in accordo all'eurocodice 1 - Parte 1-4 (4);

Si riporta nel seguente tabulato il calcolo eseguito per la determinazione delle azioni e la modalità di applicazione nel modello numerico.

1265D03 - Azione del vento per ponti_v.0.0.mcdx

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Azioni del vento - § 3.3 - NTC 2018

Velocità base di riferimento - § 3.3.1.

Zona := "1"

Tab. 3.3.I - Valori dei parametri $v_{b,0}$, a_0 , k_s

Zona	Descrizione	$v_{b,0}$ [m/s]	a_0 [m]	k_s
1	Valle d'Aosta, Piemonte, Lombardia, Trentino Alto Adige, Veneto, Friuli Venezia Giulia (con l'eccezione della provincia di Trieste)	25	1000	0,40
2	Emilia Romagna	25	750	0,45
3	Toscana, Marche, Umbria, Lazio, Abruzzo, Molise, Puglia, Campania, Basilicata, Calabria (esclusa la provincia di Reggio Calabria)	27	500	0,37
4	Sicilia e provincia di Reggio Calabria	28	500	0,36
5	Sardegna (zona a oriente della retta congiungente Capo Teulada con l'Isola di Maddalena)	28	750	0,40
6	Sardegna (zona a occidente della retta congiungente Capo Teulada con l'Isola di Maddalena)	28	500	0,36
7	Liguria	28	1000	0,54
8	Provincia di Trieste	30	1500	0,50
9	Isole (con l'eccezione di Sicilia e Sardegna) e mare aperto	31	500	0,32

$V_{b0} := 25 \frac{m}{s}$

velocità base di riferimento al livello del mare (Tab. 3.3.I): funzione della zona in cui sorge la costruzione

$a_0 := 1000 \text{ m}$

altitudine sul livello del mare della "zona" ove sorge la costruzione

$k_s := 0.4$

$a_s := 300 \text{ m}$

altitudine sul livello del mare del sito ove sorge la costruzione

$C_a := \text{if} \left(a_s \leq a_0, 1, 1 + k_s \left(\frac{a_s}{a_0} - 1 \right) \right) = 1$

coefficiente di altitudine

$V_b := V_{b0} \cdot C_a = 25 \frac{m}{s}$

velocità di riferimento riferito ad un periodo di ritorno pari a $T_R = 50$ anni: è il valore medio su 10 minuti, a 10 m di altezza dal suolo su un terreno pianeggiante e omogeneo di categoria di esposizione II (v. Tab. 3.3.II)

Tab. 3.3.II - Parametri per la definizione del coefficiente di esposizione

Categoria di esposizione del sito	K_r	z_0 [m]	z_{min} [m]
I	0,17	0,01	2
II	0,19	0,05	4
III	0,20	0,10	5
IV	0,22	0,30	8
V	0,23	0,70	12

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Velocità di riferimento - § 3.3.1.

$T_R := 75$

periodo di ritorno di progetto T_R - § 2.5.1.1.1 / MDP RFI

$c_r := 0.75 \cdot \sqrt{1 - 0.2 \cdot \ln\left(-\ln\left(1 - \frac{1}{T_R}\right)\right)} = 1.02$

coefficiente di ritorno: funzione del periodo di ritorno di progetto T_R

$V_r := V_b \cdot c_r = 25.59 \frac{m}{s}$

velocità di riferimento riferito ad un periodo di ritorno pari a T_R : è il valore medio su 10 minuti, a 10 m di altezza dal suolo su un terreno pianeggiante e omogeneo di categoria di esposizione II (v. Tab. 3.3.II)

Pressione cinetica di riferimento - § 3.3.6.

$V_r = 25.59 \frac{m}{s}$

velocità di riferimento

$\rho := 1.25 \frac{kg}{m^3}$

densità dell'aria

$q_r := \frac{1}{2} \cdot \rho \cdot V_r^2 = 0.41 \frac{kN}{m^2}$

pressione cinetica di riferimento (energia cinetica per unità di volume)

Coefficiente di esposizione - § 3.3.7.

Il coefficiente di esposizione c_e dipende dall'altezza z sul suolo del punto considerato, dalla topografia del terreno e dalla categoria di esposizione del sito ove sorge la costruzione.

La classe di esposizione dipende a sua volta dalla posizione geografica del sito ove sorge la costruzione e della classe di rugosità del terreno definita in Tab. 3.3.III.

In assenza di analisi specifiche che tengano in conto la direzione di provenienza del vento e l'effettiva scabrezza e topografia del terreno che circonda la costruzione, per altezze sul suolo non maggiori di $z = 200$ m, esso è dato dalla formula:

$c_e(z_e, K_r, z_0, z_{min}, c_t) := \left\| \begin{array}{l} \text{if } z_e \geq z_{min} \\ \left\| K_r^2 \cdot c_t \cdot \ln\left(\frac{z_e}{z_0}\right) \cdot \left(7 + c_t \cdot \ln\left(\frac{z_e}{z_0}\right)\right) \right\| \\ \text{else if } z_e \leq z_{min} \\ \left\| K_r^2 \cdot c_t \cdot \ln\left(\frac{z_{min}}{z_0}\right) \cdot \left(7 + c_t \cdot \ln\left(\frac{z_{min}}{z_0}\right)\right) \right\| \end{array} \right\|$ coefficiente di esposizione

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$z_e := 7 \text{ m}$

altezza tra il punto più basso del piano campagna e l'asse baricentrico della trave

Definizione classe di ruqosità del terreno

Tab. 3.3.III - *Classi di ruqosità del terreno*

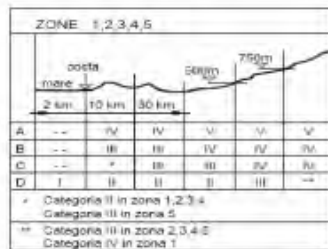
Classe di ruqosità del terreno	Descrizione
A	Aree urbane in cui almeno il 15% della superficie sia coperto da edifici la cui altezza media superi i 15 m.
B	Aree urbane (non di classe A), suburbane, industriali e boschive
C	Aree con ostacoli diffusi (alberi, case, muri, recinzioni,...); aree con ruqosità non riconducibile alle classi A, B, D
D	a) Mare e relativa fascia costiera (entro 2 km dalla costa); b) Lago (con larghezza massima pari ad almeno 1 km) e relativa fascia costiera (entro 1 km dalla costa); c) Aree prive di ostacoli o con al più rari ostacoli isolati (aperta campagna, aeroporti, aree agricole, pascoli, zone paludose o sabbiose, superfici innevate o ghiacciate, ...)

L'assegnazione della classe di ruqosità non dipende dalla conformazione orografica e topografica del terreno. Si può assumere che il sito appartenga alla Classe A o B, purché la costruzione si trovi nell'area relativa per non meno di 1 km e comunque per non meno di 20 volte l'altezza della costruzione, per tutti i settori di provenienza del vento ampi almeno 30°. Si deve assumere che il sito appartenga alla Classe D, qualora la costruzione sorga nelle aree indicate con le lettere a) o b), oppure entro un raggio di 1 km da essa vi sia un settore ampio 30°, dove il 90% del terreno sia del tipo indicato con la lettera c). Laddove sussistano dubbi sulla scelta della classe di ruqosità, si deve assegnare la classe più sfavorevole (l'azione del vento è in genere minima in Classe A e massima in Classe D).

$C_R := "C"$

classe di ruqosità del terreno

Definizione delle categorie di esposizione



Zona = "1"

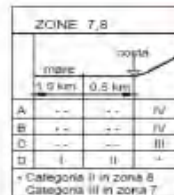
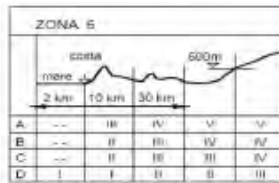
zona ove sorge il sito

$C_R := "C"$

classe di ruqosità del terreno

$d := 6 \text{ km}$

distanza dalla costa



$C_E := "II"$

Fig. 3.3.2 - *Definizione delle categorie di esposizione*

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Parametri per la definizione del coefficiente di esposizione

Tab. 3.3.11 - Parametri per la definizione del coefficiente di esposizione

Categoria di esposizione del sito	K_E	z_0 [m]	z_{min} [m]
I	0,17	0,01	2
II	0,19	0,05	4
III	0,20	0,10	5
IV	0,22	0,30	8
V	0,23	0,70	12

$C_E = \text{"II"}$ classe di esposizione

$K_E := \text{if } C_E = \text{"I"} \quad = 0.19$
 $\quad \parallel 0.17$
 else if $C_E = \text{"II"}$
 $\quad \parallel 0.19$
 else if $C_E = \text{"III"}$
 $\quad \parallel 0.20$
 else if $C_E = \text{"IV"}$
 $\quad \parallel 0.22$
 else if $C_E = \text{"V"}$
 $\quad \parallel 0.23$

$z_0 := \text{if } C_E = \text{"I"} \quad = 0.05 \text{ m}$
 $\quad \parallel 0.01 \text{ m}$
 else if $C_E = \text{"II"}$
 $\quad \parallel 0.05 \text{ m}$
 else if $C_E = \text{"III"}$
 $\quad \parallel 0.10 \text{ m}$
 else if $C_E = \text{"IV"}$
 $\quad \parallel 0.30 \text{ m}$
 else if $C_E = \text{"V"}$
 $\quad \parallel 0.70 \text{ m}$

$z_{min} := \text{if } C_E = \text{"I"} \quad = 4 \text{ m}$
 $\quad \parallel 2 \text{ m}$
 else if $C_E = \text{"II"}$
 $\quad \parallel 4 \text{ m}$
 else if $C_E = \text{"III"}$
 $\quad \parallel 5 \text{ m}$
 else if $C_E = \text{"IV"}$
 $\quad \parallel 8 \text{ m}$
 else if $C_E = \text{"V"}$
 $\quad \parallel 12 \text{ m}$

$C_t := 1$ coefficiente di topografia
 $Zona = \text{"1"}$ zona ove sorge il sito
 $C_R = \text{"C"}$ classe di rugosità del terreno
 $C_E := C_E(z_E, K_E, z_0, z_{min}, C_t) = 2.13$ coefficiente di esposizione

Azioni del vento per impalcati da ponte - § 8.1- UNI EN 1991-1-4:2005

Le azioni del vento, in questa analisi, vengono implementate come una azione statica equivalente. Sono costituite da pressioni e depressioni agenti normalmente alle superfici, sia esterne che interne, degli elementi che compongono la costruzione.

Azione del vento in direzione trasversale - § 8.3.2

Azione del vento agente sull'impalcato in direzione trasversale secondo il metodo semplificato (analisi statica equivalente)

$F_{wk,x}(C_s, A_{ref,x}) := q_r \cdot C_s \cdot A_{ref,x}$ azione del vento in direzione X trasversale dell'impalcato

$q_r = 0.41 \text{ kPa}$ pressione cinetica di riferimento (energia cinetica per unità di volume)

$L_{tp} := 18.8 \text{ m}$ lunghezza impalcato

$b := 6.9 \text{ m}$ larghezza impalcato compreso larghezza sbalzo

$d := 1900 \text{ mm}$ altezza trave principale

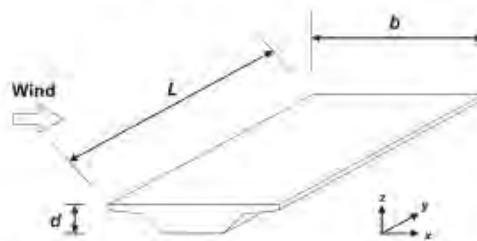


Figure 8.2— Directions of wind actions on bridges

Calcolo area di riferimento $A_{ref,xA}$ in assenza di traffico ferroviario

$d_1 := 4 \text{ m}$ altezza barriera antrumore (presento solo su un lato)

$d_{tot,A} := 5.325 \text{ m}$ altezza investita dall'azione del vento (analoga alla somma $d_1 + d$)

$A_{ref,xA} := L_{tp} \cdot d_{tot,A} = 100.11 \text{ m}^2$ area in assenza di traffico ferroviario



Fig. 1. Depth to be used in evaluation of $A_{ref,xA}$

Calcolo area di riferimento $A_{ref,xB}$ in presenza di traffico ferroviario

- $d_2 = 4 \text{ m}$ altezza convoglio ferroviario
- $d_{tot_B} = 5.325 \text{ m}$ altezza investita dall'azione del vento (analoga alla somma $d_1 + d$)
- $A_{ref_xB} = L_{sp} \cdot d_{tot_B} = 100.11 \text{ m}^2$ area in presenza di traffico ferroviario

Calcolo coefficiente $C(c_e, c_{fx})$ per l'azione del vento

- $z_e = 7 \text{ m}$ altezza tra il punto più basso del piano campagna e l'asse baricentrico della trave
- $c_e = 2.13$
- $C(c_e, c_{fx}) = c_e \cdot c_{fx}$ coefficiente funzione di:
 - coefficiente di esposizione
 - coefficiente di pressione

$b = 6.9 \text{ m}$

$d_{tot} := \max(d_{tot_A}, d_{tot_B}) = 5.33 \text{ m}$

$c_{fx} := \min\left(2.4, \max\left(2.5 - 0.3 \cdot \frac{b}{d_{tot}}, 1.3\right)\right) = 2.11$

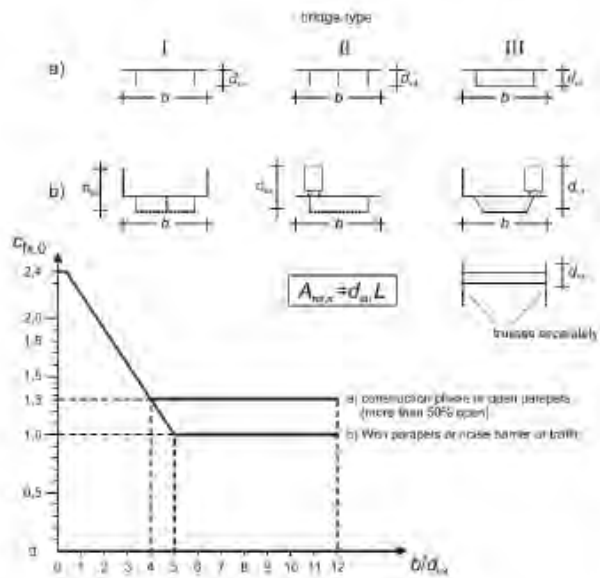


Figure 8.3 — Force coefficient for bridges, c_{fx}

$C(c_e, c_{fx}) = 4.5$

1265D03 - Azione del vento per ponti_v.0.0.mcdx

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Calcolo coefficiente C minimo per l'azione del vento

$$z_e = 7 \text{ m}$$

$$\frac{b}{d_{tot}} = 1.3$$

$$C_{min} := 6.7 - \frac{6.7 - 3.6}{4 - 0.5} \cdot \left(\frac{b}{d_{tot}} - 0.5 \right) = 6$$

Table 8.2 — Recommended values of the force factor C for bridges

b/d_{tot}	$z_e \leq 20 \text{ m}$	$z_e = 50 \text{ m}$
≤ 0.5	6,7	8,3
$\geq 4,0$	3,6	4,5

This table is based on the following assumptions:

— terrain category II according to Table 4.1

— force coefficient c_s , according to 8.3.1 (1)

— $c_t = 1.0$

— $k_1 = 1.0$

For intermediate values of b/d_{tot} , and of z_e linear interpolation may be used

Calcolo azione del vento in direzione trasversale

l'area di riferimento A_{ref_x} considerata nel calcolo è la maggiore tra:

- A_{ref_xA} calcolata in caso di assenza di traffico
- A_{ref_xB} calcolata in caso di presenza di traffico

$$V_b := V_r = 25.59 \frac{\text{m}}{\text{s}}$$

$$A_{ref_x} := \max(A_{ref_xA}, A_{ref_xB}) = 100.11 \text{ m}^2$$

$$C := \max(C(c_e, c_{fx}), C_{min}) = 6$$

$$F_{wk_x}(C, A_{ref_x}) = 245.57 \text{ kN}$$

$$\frac{F_{wk_x}(C, A_{ref_x})}{L_{tp}} = 13 \frac{\text{kN}}{\text{m}}$$

carico uniformemente distribuito lungo l'impalcato

Azione del vento in direzione verticale - § 8.3.3

Azione del vento agente sull'impalcato in direzione verticale secondo il metodo semplificato (analisi statica equivalente).

$$F_{wk_z}(C, A_{ref_z}) := q_r \cdot C \cdot A_{ref_z} \quad \text{azione del vento in direzione Z}$$

$$c_{fz} := 0.9$$

$$C := c_{fz} \cdot c_e = 1.92$$

$$A_{ref_z} := b \cdot L_{tp} = 129.72 \text{ m}^2$$

$$F_{wk_z} := F_{wk_z}(C, A_{ref_z}) = 101.76 \text{ kN}$$

1265D03 - Azione del vento per ponti_v.0.0.mcdx

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Distribuzione trasversale delle azioni per effetto dell'eccentricità

$$b_{tp} := 5 \text{ m}$$

interasse travi principali

$$e := \frac{b_{tp}}{4} = 1.25 \text{ m}$$

eccentricità carico rispetto all'asse del binario

$$q_{tr}(x) := \frac{F_{wk,z}}{L_{tp} \cdot b_{tp}} \cdot \left(1 + 6 \cdot \frac{e}{b_{tp}} - 12 \cdot \frac{e \cdot x}{b_{tp}^2} \right)$$

distribuzione del carico trapezoidale considerando una larghezza pari all'interasse delle travi principali (scelta a vantaggio di sicurezza)

$$x := 0 \text{ m} \quad q_{max} := q_{tr}(x) = 2.71 \frac{\text{kN}}{\text{m}^2}$$

valore massimo del carico trapezoidale

$$x := b_{tp} \quad q_{min} := q_{tr}(x) = -0.54 \frac{\text{kN}}{\text{m}^2}$$

valore minimo del carico trapezoidale

Le azioni da vento trasversali sono state applicate nel modello numerico come un carico uniformemente distribuito, per unità di lunghezza, lungo l'impalcato, in corrispondenza dell'asse baricentro dell'altezza investita dalle pressioni.

Nelle immagini seguenti si riportano, in via esemplificativa, alcuni schemi di carico estratti dal modello di calcolo, sia per le azioni da vento in direzione trasversale che per le azioni da vento in direzione verticale.

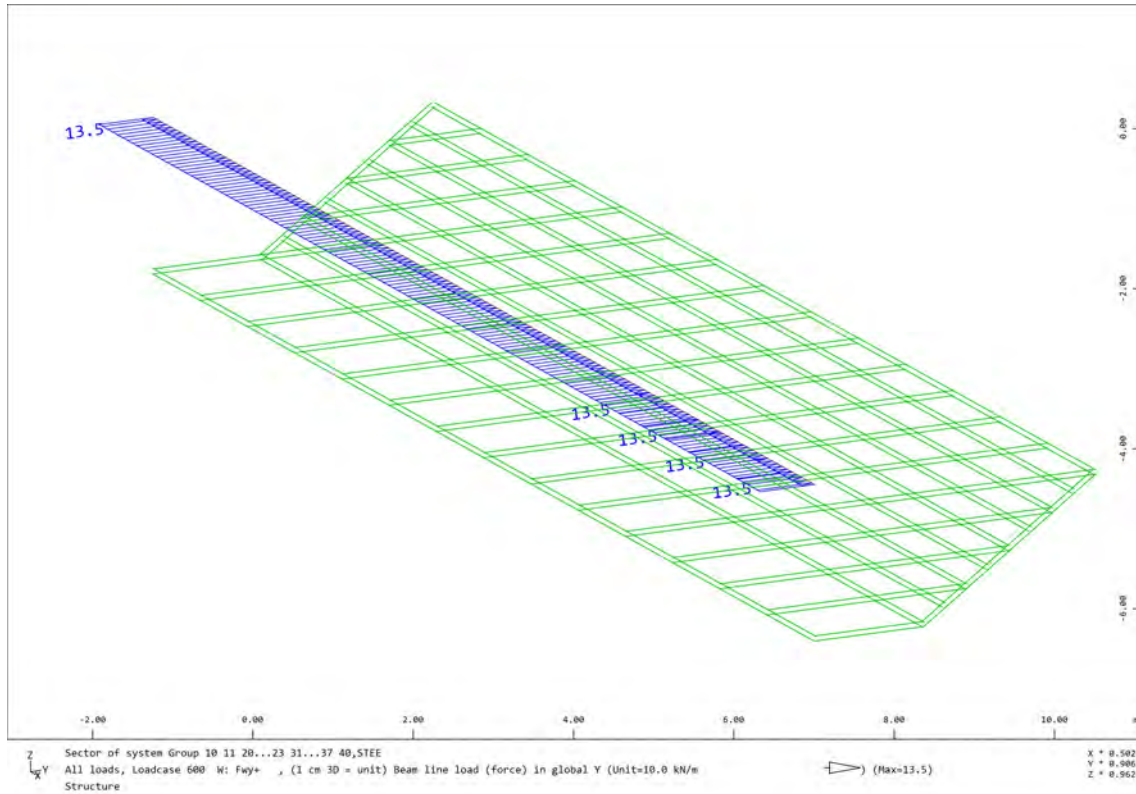


Figura 44 – Azione del vento in direzione trasversale positiva, agente in assenza di traffico

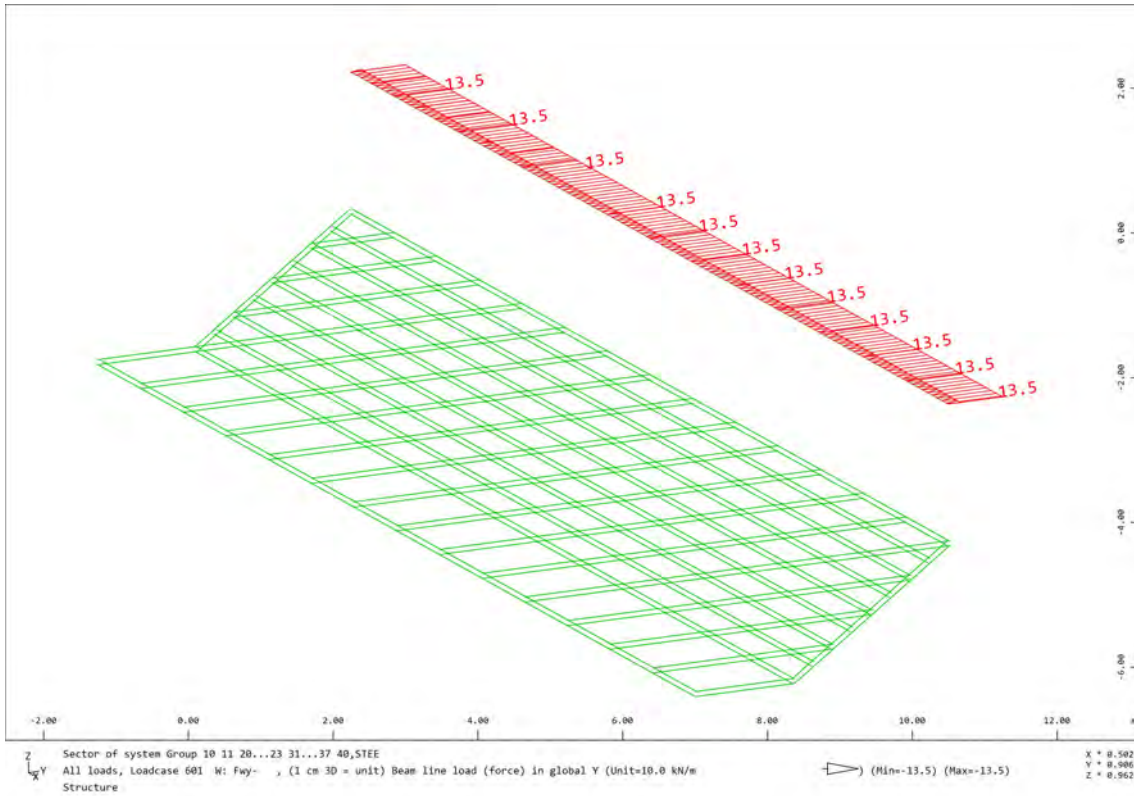


Figura 45 - Azione del vento in direzione trasversale positiva, agente in presenza di traffico

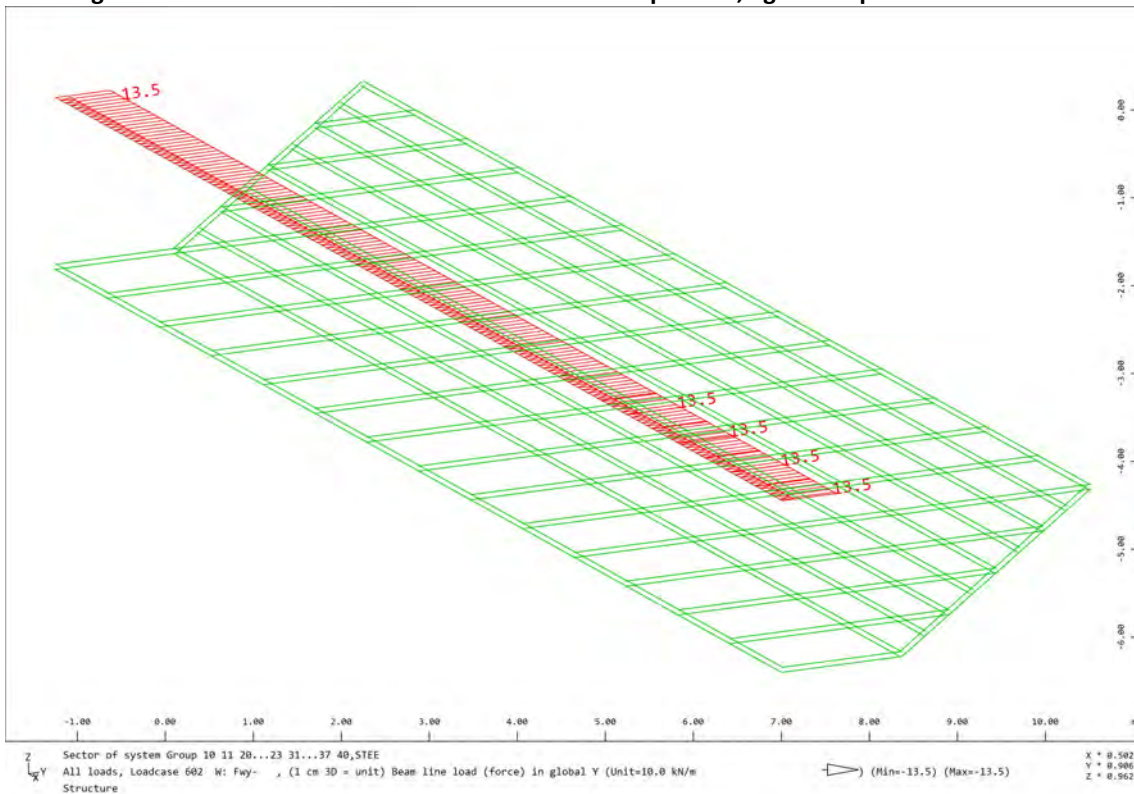


Figura 46 - Azione del vento in direzione trasversale negativa, agente in assenza di traffico

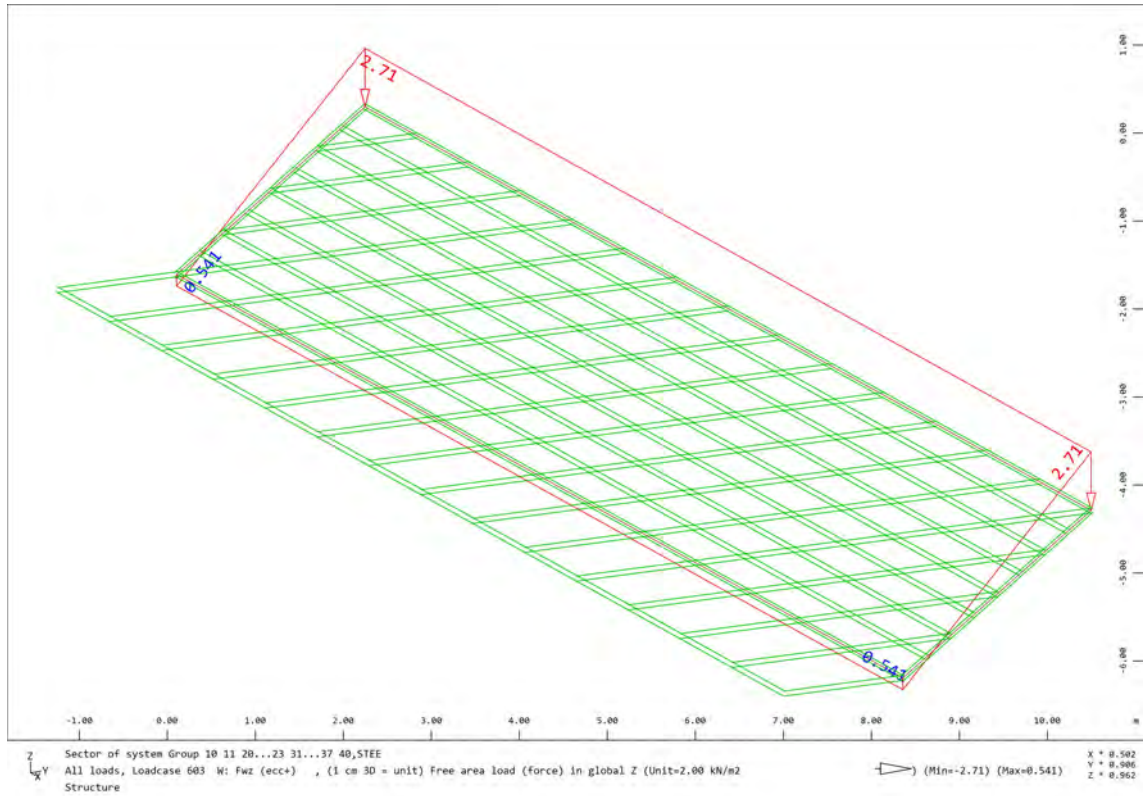


Figura 47 - Azione del vento in direzione verticale, agente con eccentricità positiva

8.5. Spinta delle terre

La determinazione della spinta del terreno sulle spalle è stata effettuata sulla base delle caratteristiche geotecniche del terreno, con particolare riferimento all'eventuale presenza ed all'ubicazione, anche variabile, della falda acquifera (11).

La spinta delle terre presenta quattro contributi:

- spinta statica delle terre in condizione di spinta a riposo;
- sovraspinta permanente delle terre;
- sovraspinta accidentale delle terre;
- sovraspinta sismica delle terre.

In generale ogni contributo presenta una componente di spinta orizzontale ed una componente verticale dettata dai pesi gravanti sulla zattera di fondazione.

8.5.1. Spinta statica delle terre in condizione di spinta a riposo

La spinta orizzontale statica del terreno è caratterizzata dalle successive grandezze:

Peso specifico del rilevato:	$\gamma_t = 18.00 \text{ kN/m}^3$
Angolo di attrito del rilevato:	$\phi = 35.00^\circ$
Coefficiente di spinta a riposo: $k_0 = (1 - \sin \phi)$	$k_0 = 0.426$
Pendenza retta delle pressioni litostatiche:	$b = \gamma_t \times k_0 = 7.67 \text{ kN/m}^3$

La pressione orizzontale delle terre agisce sul muro posteriore e sui muri laterali dall'esterno della spalla stessa. Ha una distribuzione triangolare con pendenza b ed è nulla alla quota di superficie del rilevato.

Per la parte interna della platea di fondazione, viene considerato un ricoprimento pari all'altezza del rilevato (7 m), la presenza del quale viene considerato nel modello come una pressione verticale:

Pressione verticale: $(18.00 \text{ kN/m}^3 \times 7.00 \text{ m})$ 126.00 kN/m^2

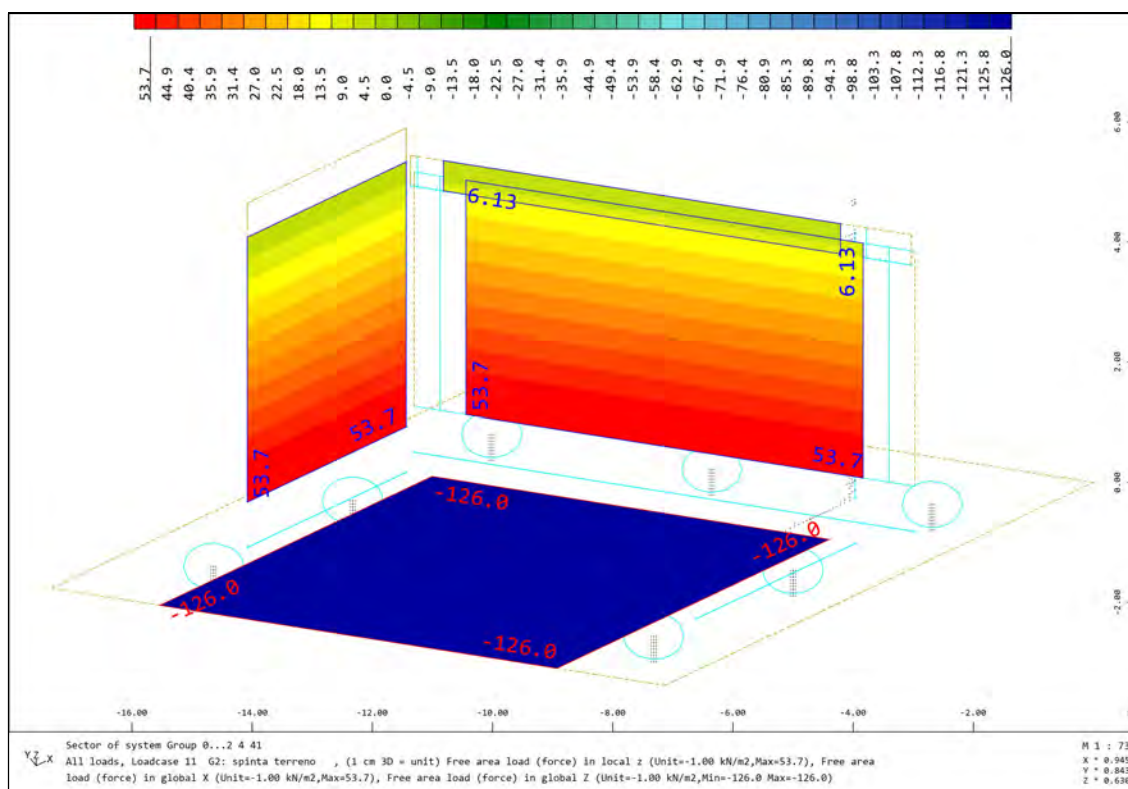


Figura 48 - Pressioni verticali e orizzontali derivanti dal terreno a tergo della spalla in condizioni di riposo

8.5.2. Sovrappinta permanente delle terre

La sovrappinta permanente del terreno deriva dal peso della sezione ferroviaria sopra il terreno; con riferimento ai capitoli precedenti:

Peso ballast:	$g_{ba} = 18.00 \text{ kN/m}^3$
Spessore ballast:	$h_{ba} = 0.8 \text{ m}$
Angolo di attrito del rilevato:	$\phi = 35.00^\circ$
Coefficiente di spinta a riposo: $k_0 = (1 - \text{sen } \phi)$	$k_0 = 0.426$
Sovrappinta permanente: $(18.00 \times 0.426 \times 0.8)$	$g = 6.13 \text{ kN/m}^2$

La sovrappressione permanente orizzontale agisce sul muro posteriore dall'esterno della spalla stessa. Ha una distribuzione rettangolare.

Per la parte interna della platea di fondazione, viene considerato un ricoprimento pari all'altezza dello spessore del ballast (0.8 m), la presenza del quale viene considerato nel modello come una pressione verticale:

Pressione verticale: $(18.00 \text{ kN/m}^3 \times 0.80 \text{ m})$ 14.40 kN/m^2

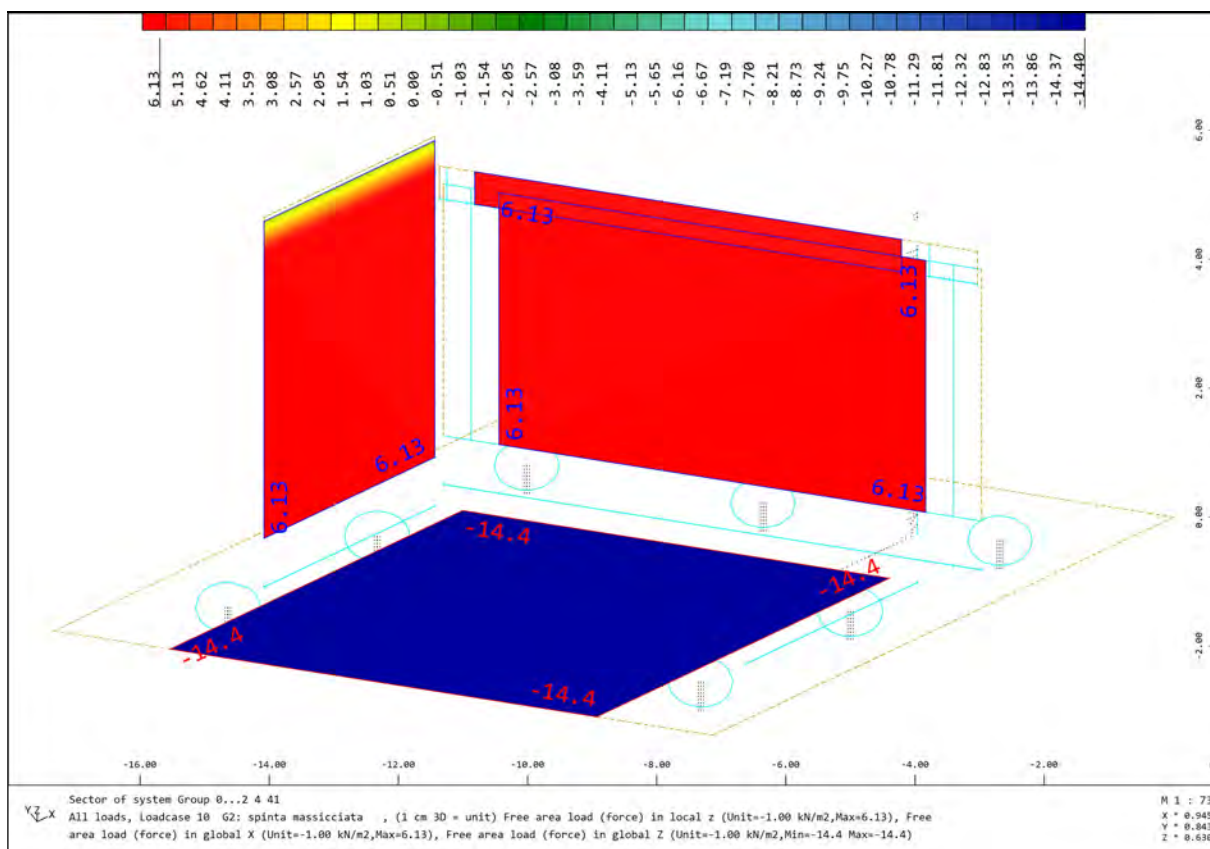


Figura 49 – Pressioni verticali e orizzontali derivanti dallo strato di ballast

8.5.3. Sovrappinta accidentale delle terre

La sovrappinta accidentale delle terre legata al traffico ferroviario è calcolata in maniera semplificata e conservativa con riferimento ai capitoli precedenti.

SW2:	$q_{SW2} = 150.0 \text{ kN/m}$
Larghezza traversa	$b_t = 2.4 \text{ m}$
Larghezza ballast a tergo delle spalle:	$b_{ba} = 4.6 \text{ m}$
Sovrapressione verticale trasmessa dal ballast	$q_v = 150 / 2.4 = 62.5 \text{ kN/m}^2$
Angolo di diffusione carico nel terreno:	$\phi = 30.00^\circ$
Sovrapressione verticale trasmessa dal terreno nel punto di massima diffusione:	$q_v = 150 / 4.6 = 32.6 \text{ kN/m}^2$
Angolo di attrito del rilevato:	$\phi = 35.00^\circ$
Coefficiente di spinta a riposo: $k_0 = (1 - \text{sen } \phi)$	$k_0 = 0.426$
Sovrappinta orizzontale permanente nel ballast:	$q_h = 62.5 \times 0.426 = 26.63 \text{ kN/m}^2$
Sovrappinta orizzontale trasmessa dal terreno nel punto di massima diffusione:	$q_h = 32.6 \times 0.426 = 13.89 \text{ kN/m}^2$

La sovrappressione accidentale orizzontale agisce sul muro posteriore dall'esterno della spalla stessa. Ha una distribuzione rettangolare.

Per la parte interna della platea di fondazione, viene considerato una pressione verticale pari:

Pressione verticale: $(150 \text{ kN/m} / 4.6 \text{ m})$ 32.6 kN/m^2

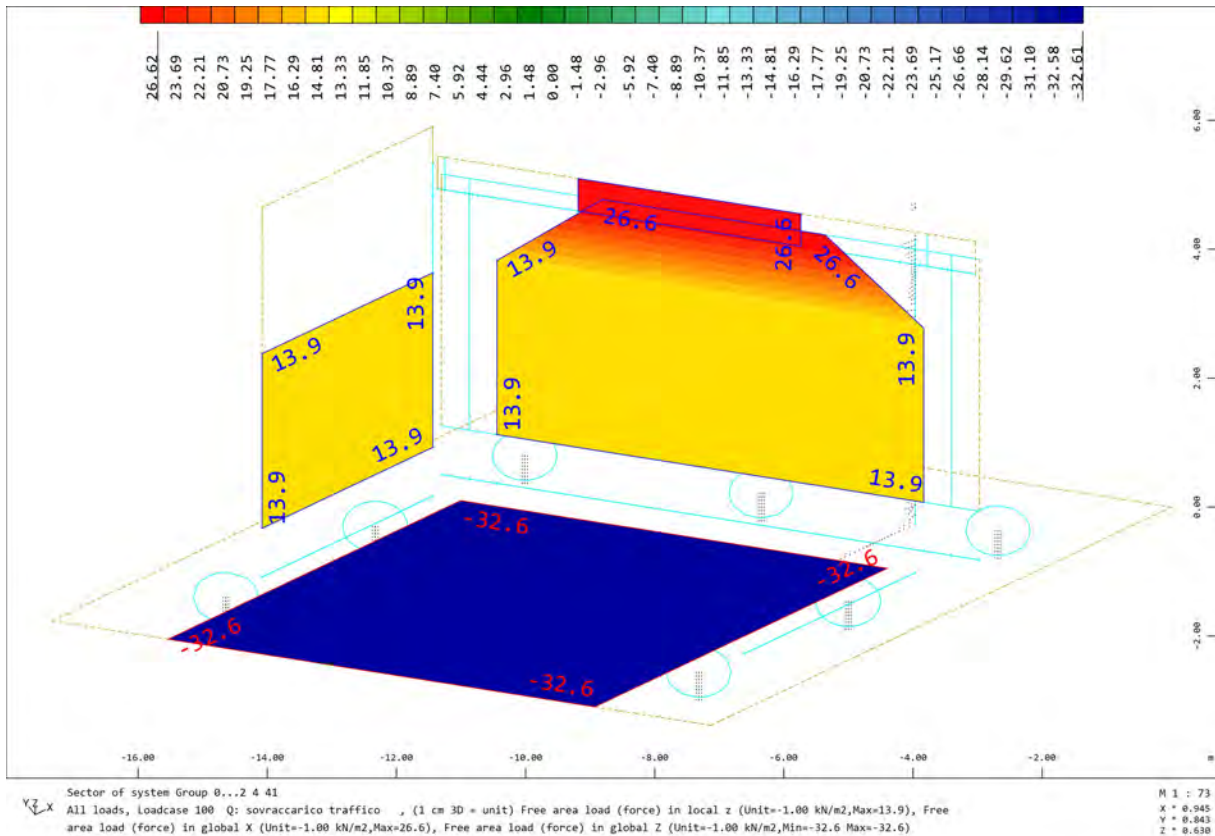


Figura 50 - 8.5.3. Sovrappinta accidentale delle terre dovuta al carico da traffico pesante SW/2

8.6. Azioni sismiche

L'area oggetto del presente intervento è situata in comune di Gemonio (VA), inserito in zona sismica denominata "Zona 4" indicata nell'Ordinanza del Presidente del Consiglio dei ministri n. 3274/2003, aggiornata con la Delibera della Giunta Regionale della Lombardia dell'11 luglio 2014 n.2129, entrata in vigore il 10 aprile 2016.

I criteri per l'aggiornamento della mappa di pericolosità sismica sono stati definiti nell'Ordinanza del PCM n. 3519/2006, che ha suddiviso l'intero territorio nazionale in quattro zone sismiche sulla base del valore dell'accelerazione orizzontale massima (a_g) su suolo rigido o pianeggiante, che ha una probabilità del 10% di essere superata in 50 anni.

Ai fini della determinazione delle azioni sismiche di progetto, in accordo al par. 3.2 delle NTC2018, si espongono nei paragrafi successivi:

- Le coordinate geografiche del sito;
- Le categorie di sottosuolo e le condizioni topografiche del sito;
- La vita nominale e la classe d'uso della struttura in esame.

8.6.1. Vita nominale e classe d'uso

Per l'individuazione del segnale sismico si è fatto riferimento ai parametri caratteristici di seguito esposti, scelti in osservanza alle disposizioni contenute nella normativa approvata nel D.M. 17/01/2018 (11) e nel manuale di progettazione di RFI (8).

Per quanto riguarda la vita nominale, con riferimento al §2.5.1.1.1 del manuale di progettazione di RFI (8) e in particolare alla tabella 2.5.1.1.1 di seguito riportata, si fa riferimento alla categoria "ALTRE OPERE NUOVE A VELOCITÀ $V < 250$ Km/h". assumendo una vita nominale pari a $V_N = 75$ anni.

TIPO DI COSTRUZIONE ⁽¹⁾	Vita Nominale V_N [Anni] ⁽²⁾
OPERE NUOVE SU INFRASTRUTTURE FERROVIARIE PROGETTATE CON LE NORME VIGENTI PRIMA DEL DM 14.01.2008 A VELOCITÀ CONVENZIONALE ($V < 250$ Km/h)	50
ALTRE OPERE NUOVE A VELOCITÀ $V < 250$ Km/h	75
ALTRE OPERE NUOVE A VELOCITÀ $V \geq 250$ km/h	100
OPERE DI GRANDI DIMENSIONI: PONTI E VIADOTTI CON CAMPATE DI LUCE MAGGIORE DI 150 m	≥ 100 ⁽²⁾
(1) - La stessa V_N si applica anche ad apparecchi di appoggio, coprigiunti e impermeabilizzazione delle stesse opere.	
(2) - Da definirsi per il singolo progetto a cura di FERROVIE.	

Tab. 2.5.1.1.1-1 - Vita nominale delle infrastrutture ferroviarie

Figura 51 - tabella 2.5.1.1.1 del manuale di progettazione di RFI (8)

Pertanto i parametri di progetto risultano così definiti:

- Vita nominale: $V_N = 75$ anni
- Classe d'uso: II (ai sensi del §2.4.2 del D.M.2018)
- Coefficiente d'uso: $CU = 1.0$
- Periodo di riferimento: $VR = V_N \times CU = 75$ anni

8.6.2. Parametri sismici

Per la struttura in oggetto, ubicata nel Comune di Gemonio in provincia di Varese (VA), si procede alla valutazione dei parametri sismici mediando i valori dei seguenti siti di riferimento:

latitudine: 45,883476 [°]
 longitudine: 8,672299 [°]
 Classe d'uso: II. Costruzioni il cui uso preveda normali affollamenti, senza contenuti pericolosi per l'ambiente e senza funzioni pubbliche e sociali essenziali. Industrie con attività non pericolose per l'ambiente. Ponti, opere infrastrutturali, reti viarie non ricadenti in Classe d'uso III o in Classe d'uso IV, reti ferroviarie la cui interruzione non provochi situazioni di emergenza. Dighe il cui collasso non provochi conseguenze rilevanti.
 Vita nominale: 75 [anni]
 Tipo di interpolazione: Media ponderata

Figura 52 - Sito in esame

	ID	Latitudine [°]	Longitudine [°]	Distanza [m]
Sito 1	10255	45,887120	8,612033	4682,3
Sito 2	10256	45,889970	8,683510	1128,9
Sito 3	10478	45,840040	8,687671	4974,4
Sito 4	10477	45,837200	8,616181	6735,1

Figura 53 - Siti di riferimento

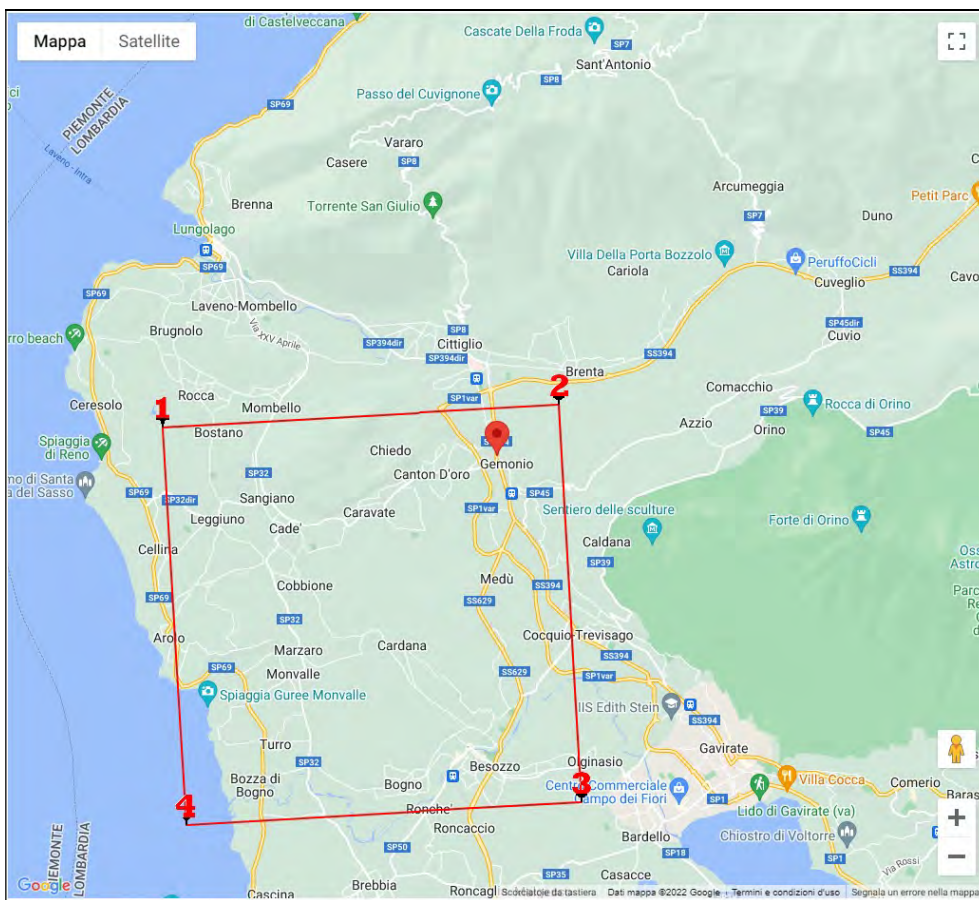


Figura 54 - Inquadramento del sito in esame e dei siti di riferimento

Sulla base delle coordinate geografiche del sito, le categorie di sottosuolo e le condizioni topografiche del sito si ricavano i seguenti parametri sismici (vedi par. 5):

Categoria sottosuolo: B Categoria topografica: T1 Periodo di riferimento: 75 anni Coefficiente cu: 1					
	Prob. superamento [%]	Tr [anni]	ag [g]	Fo [-]	Tc* [s]
Operatività (SLO)	81	45	0,018	2,557	0,165
Danno (SLD)	63	75	0,022	2,536	0,196
Salvaguardia della vita (SLV)	10	712	0,044	2,694	0,293
Prevenzione dal collasso (SLC)	5	1462	0,052	2,785	0,315

Figura 55 - Parametri sismici

8.6.3. Spettri di risposta elastica

In base ai parametri caratteristici sopra individuati, considerando un fattore di smorzamento viscoso $\xi = 5\%$, si valutano gli spettri di risposta orizzontale e verticale, secondo NTC 2018 (11), relativi allo stato limite SLV:

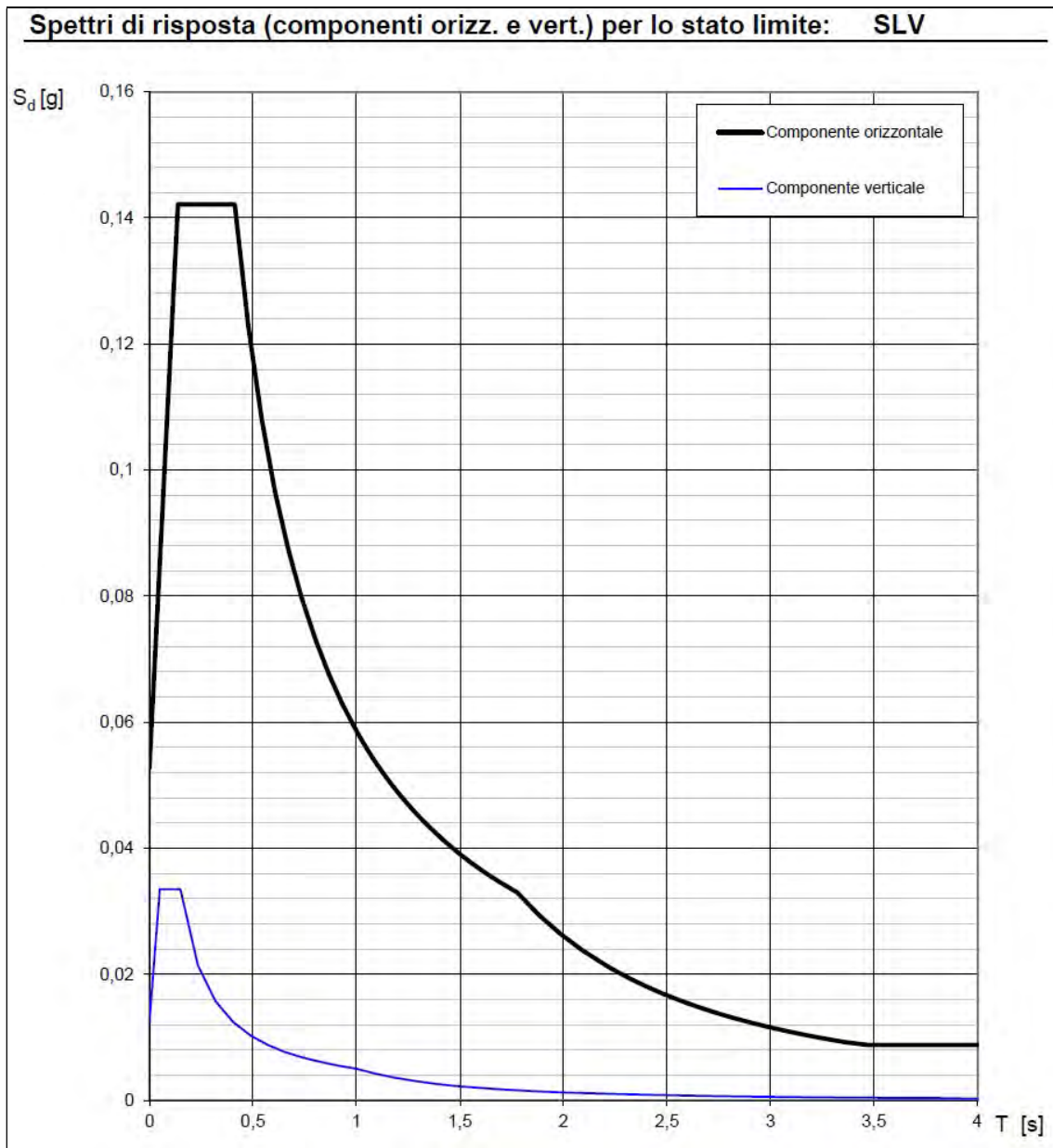


Figura 56 -Spettri di risposta per lo stato limite SLV

Parametri e punti dello spettro di risposta orizzontale per lo stato limite: SLV

Parametri indipendenti

STATO LIMITE	SLV
a_g	0,044 g
F_0	2,694
T_C	0,293 s
S_S	1,200
C_C	1,406
S_T	1,000
q	1,000

Parametri dipendenti

S	1,200
η	1,000
T_B	0,137 s
T_C	0,412 s
T_D	1,776 s

Espressioni dei parametri dipendenti

$$S = S_S \cdot S_T \quad (\text{NTC-08 Eq. 3.2.5})$$

$$\eta = \sqrt{10 / (5 + \xi)} \geq 0,55; \eta = 1/q \quad (\text{NTC-08 Eq. 3.2.6; §. 3.2.3.5})$$

$$T_B = T_C / 3 \quad (\text{NTC-07 Eq. 3.2.8})$$

$$T_C = C_C \cdot T_C^* \quad (\text{NTC-07 Eq. 3.2.7})$$

$$T_D = 4,0 \cdot a_g / g + 1,6 \quad (\text{NTC-07 Eq. 3.2.9})$$

Espressioni dello spettro di risposta (NTC-08 Eq. 3.2.4)

$$0 \leq T < T_B \quad S_e(T) = a_g \cdot S \cdot \eta \cdot F_0 \cdot \left[\frac{T}{T_B} + \frac{1}{\eta \cdot F_0} \left(1 - \frac{T}{T_B} \right) \right]$$

$$T_B \leq T < T_C \quad S_e(T) = a_g \cdot S \cdot \eta \cdot F_0$$

$$T_C \leq T < T_D \quad S_e(T) = a_g \cdot S \cdot \eta \cdot F_0 \cdot \left(\frac{T_C}{T} \right)$$

$$T_D \leq T \quad S_e(T) = a_g \cdot S \cdot \eta \cdot F_0 \cdot \left(\frac{T_C T_D}{T^2} \right)$$

Lo spettro di progetto $S_d(T)$ per le verifiche agli Stati Limite Ultimi è ottenuto dalle espressioni dello spettro elastico $S_e(T)$ sostituendo η con $1/q$, dove q è il fattore di struttura. (NTC-08 § 3.2.3.5)

Punti dello spettro di risposta

	T [s]	S_e [g]
	0,000	0,053
$T_B \leftarrow$	0,137	0,142
$T_C \leftarrow$	0,412	0,142
	0,477	0,123
	0,542	0,108
	0,607	0,097
	0,672	0,087
	0,737	0,080
	0,802	0,073
	0,867	0,068
	0,932	0,063
	0,997	0,059
	1,062	0,055
	1,127	0,052
	1,192	0,049
	1,256	0,047
	1,321	0,044
	1,386	0,042
	1,451	0,040
	1,516	0,039
	1,581	0,037
	1,646	0,036
	1,711	0,034
$T_D \leftarrow$	1,776	0,033
	1,882	0,029
	1,988	0,026
	2,094	0,024
	2,199	0,022
	2,305	0,020
	2,411	0,018
	2,517	0,016
	2,623	0,015
	2,729	0,014
	2,835	0,013
	2,941	0,012
	3,047	0,011
	3,153	0,010
	3,259	0,010
	3,365	0,009
	3,470	0,009
	3,576	0,009
	3,682	0,009
	3,788	0,009
	3,894	0,009
	4,000	0,009

Parametri e punti dello spettro di risposta verticale per lo stato limite: SLV

Parametri indipendenti

STATO LIMITE	SLV
a_{gv}	0,012 g
S_S	1,000
S_T	1,000
q	1,000
T_B	0,050 s
T_C	0,150 s
T_D	1,000 s

Parametri dipendenti

F_v	0,763
S	1,000
η	1,000

Espressioni dei parametri dipendenti

$$S = S_S \cdot S_T \quad (\text{NTC-08 Eq. 3.2.5})$$

$$\eta = 1/q \quad (\text{NTC-08 §. 3.2.3.5})$$

$$F_v = 1.35 \cdot F_o \cdot \left(\frac{a_g}{g} \right)^{0.5} \quad (\text{NTC-08 Eq. 3.2.11})$$

Espressioni dello spettro di risposta (NTC-08 Eq. 3.2.10)

$$0 \leq T < T_B \quad S_e(T) = a_g \cdot S \cdot \eta \cdot F_v \cdot \left[\frac{T}{T_B} + \frac{1}{\eta \cdot F_o} \left(1 - \frac{T}{T_B} \right) \right]$$

$$T_B \leq T < T_C \quad S_e(T) = a_g \cdot S \cdot \eta \cdot F_v$$

$$T_C \leq T < T_D \quad S_e(T) = a_g \cdot S \cdot \eta \cdot F_v \cdot \left(\frac{T_C}{T} \right)$$

$$T_D \leq T \quad S_e(T) = a_g \cdot S \cdot \eta \cdot F_v \cdot \left(\frac{T_C T_D}{T^2} \right)$$

Punti dello spettro di risposta

	T [s]	Se [g]
	0,000	0,012
$T_B \leftarrow$	0,050	0,034
$T_C \leftarrow$	0,150	0,034
	0,235	0,021
	0,320	0,016
	0,405	0,012
	0,490	0,010
	0,575	0,009
	0,660	0,008
	0,745	0,007
	0,830	0,006
	0,915	0,005
$T_D \leftarrow$	1,000	0,005
	1,094	0,004
	1,188	0,004
	1,281	0,003
	1,375	0,003
	1,469	0,002
	1,563	0,002
	1,656	0,002
	1,750	0,002
	1,844	0,001
	1,938	0,001
	2,031	0,001
	2,125	0,001
	2,219	0,001
	2,313	0,001
	2,406	0,001
	2,500	0,001
	2,594	0,001
	2,688	0,001
	2,781	0,001
	2,875	0,001
	2,969	0,001
	3,063	0,001
	3,156	0,001
	3,250	0,000
	3,344	0,000
	3,438	0,000
	3,531	0,000
	3,625	0,000
	3,719	0,000
	3,813	0,000
	3,906	0,000
	4,000	0,000

8.6.4. Azione sismica

8.6.4.1. Fattore di comportamento

La struttura è stata progettata secondo un comportamento strutturale non dissipativo, caratterizzato da un fattore di comportamento $q=1$.

8.6.4.2. Metodo di analisi

Impalcato ferroviario

Per l'impalcato ferroviario si adotta l'analisi dinamica lineare con spettro di risposta elastico allo SLV (NTC2018 §7.3.3.1).

In accordo al par. 5.2.2.8 delle NTC2018, per la determinazione degli effetti di tali azioni si farà di regola riferimento alle sole masse corrispondenti ai pesi propri ed ai carichi permanenti e considerando con un coefficiente $\Psi_2 = 0,2$ il valore quasi permanente delle masse corrispondenti ai carichi da traffico ferroviario.

Si considerano i modi di vibrare con una massa partecipante totale superiore allo 85 % escludendo i modi con massa partecipante inferiore al 5% (NTC 2018 - §7.3.3.1 (11)).

Per tenere conto della variabilità spaziale del moto sismico, nonché di eventuali incertezze, in accordo al §7.9.3 delle NTC2018 (11) è stata considerata un'eccentricità accidentale del centro di massa dell'impalcato pari a 0,05 volte la dimensione dell'impalcato stesso, misurata perpendicolarmente alla direzione dell'azione sismica.

Spalle

Le azioni sismiche di progetto agenti sugli elementi strutturali delle spalle vengono valutate conformemente a quanto previsto dal punto 3.2.3. e 7.11 delle NTC 2018 (11).

Per il caso in esame si procede con l'analisi "pseudo-statica" definita al punto 7.11.6.2.1. delle norme tecniche citate (11).

Nell'analisi pseudo-statica, l'azione sismica è rappresentata da una forza statica equivalente pari al prodotto delle forze di gravità per un opportuno coefficiente sismico.

Nelle verifiche, i valori dei coefficienti sismici orizzontale k_h e verticale k_v possono essere valutati mediante le espressioni riportate nella seguente immagine:

$$k_h = \beta_m \cdot \frac{a_{max}}{g} \quad [7.11.6]$$

$$k_v = \pm 0,5 \cdot k_h \quad [7.11.7]$$

dove
 β_m = coefficiente di riduzione dell'accelerazione massima attesa al sito;
 a_{max} = accelerazione orizzontale massima attesa al sito;
 g = accelerazione di gravità.

In assenza di analisi specifiche della risposta sismica locale, l'accelerazione massima può essere valutata con la relazione

$$a_{max} = S \cdot a_g = (S_S \cdot S_T) \cdot a_g \quad [7.11.8]$$

dove
 S = coefficiente che comprende l'effetto dell'amplificazione stratigrafica (S_S) e dell'amplificazione topografica (S_T), di cui al § 3.2.3.2;
 a_g = accelerazione orizzontale massima attesa su sito di riferimento rigido.

Figura 57 – par. 7.11.6.2.1 delle NTC 2018 (11)

Nel caso in esame, poiché si fa l'ipotesi che i muri non sono liberi di subire spostamenti relativi rispetto al terreno, il coefficiente β_m assume valore unitario. Si ottengono dunque, per i diversi stati limite, i seguenti coefficienti sismici:

	Ss [-]	Cc [-]	St [-]	Kh [-]	Kv [-]	Amax [m/s ²]	Beta [-]
SLO	1,200	1,580	1,000	0,021	0,011	0,209	1,000
SLD	1,200	1,520	1,000	0,026	0,013	0,259	1,000
SLV	1,200	1,410	1,000	0,053	0,026	0,517	1,000
SLC	1,200	1,390	1,000	0,063	0,031	0,615	1,000

Figura 58 - Coefficienti Sismici Opere di sostegno NTC 2018 (11)

Le spinte sismiche orizzontali implementate nel modello numerico si dividono in due contributi:

- Forza di inerzia dei pesi propri strutturali ($k_h \cdot \gamma_{g1}$);
- Sovrappinta sismica del terreno secondo la Teoria di Wood.

La sovrappinta dovuta all'inerzia del terreno è stata calcolata considerando i seguenti parametri:

Peso specifico del rilevato:	$\gamma_t = 18.00 \text{ kN/m}^3$
Altezza rilevato rispetto estradosso fondazione:	$h = 8.2 \text{ m}$
Coefficiente di spinta sismica:	$k_h = 0.053$
Sovrappinta sismica delle terre: $q_E = \gamma_t \times h \times k_h$	$q_E = 7.8 \text{ kN/m}^2$

Secondo la teoria di Wood, la sovrappinta sismica del terreno agisce sul muro con una distribuzione rettangolare su tutta l'altezza della spalla.

9. COMBINAZIONI DI CARICO

Le combinazioni di carico, considerate ai fini delle verifiche, sono stabilite in modo da garantire la sicurezza in conformità a quanto prescritto al cap. 2 e 5 del D.M. 17/01/2018.

9.1. Requisiti concernenti gli SLU

Le azioni sull'opera d'arte sono state cumulate in modo da determinare condizioni di carico tali da risultare più sfavorevoli ai fini delle singole verifiche, tenendo conto della probabilità ridotta di intervento simultaneo di tutte le azioni con i rispettivi valori più sfavorevoli, come consentito dalle norme vigenti.

Per gli stati limite ultimi sono state adottate le combinazioni del tipo:

$$\gamma_{G1} \cdot G_1 + \gamma_{G2} \cdot G_2 + \gamma_P \cdot P + \gamma_{Q1} \cdot Q_{k1} + \gamma_{Q2} \cdot \psi_{02} \cdot Q_{k2} + \gamma_{Q3} \cdot \psi_{03} \cdot Q_{k3} + \dots \dots \dots$$

dove:

- G_1 peso proprio di tutti gli elementi strutturali;
- G_2 peso proprio di tutti gli elementi non strutturali;
- P pretensione e precompressione (non presenti per il caso in esame);
- Q_{ki} valore caratteristico della i-esima azione variabile;
- $\gamma_g, \gamma_q, \gamma_p$ coefficienti parziali come definiti nel DM 17 gennaio 2018 e mostrati nel seguito;
- ψ_{0i} coefficienti di combinazione per tenere conto della ridotta probabilità di concomitanza delle azioni variabili con i rispettivi valori caratteristici.

Per le verifiche agli stati limite ultimi si adottano i valori dei coefficienti parziali γ riportati in tab. 5.2.V. della normativa vigente.

Si consideri, per le verifiche allo stato limite ultimo, l'approccio: A1+M1+R3.

Per le verifiche agli stati limite ultimi si adottano i valori dei coefficienti parziali γ in Tab. 5.2.V e i coefficienti di combinazione Ψ in Tab. 5.2.VI.”

Tab. 5.2.V - Coefficienti parziali di sicurezza per le combinazioni di carico agli SLU

Coefficiente			EQU ⁽¹⁾	A1	A2
Azioni permanenti	favorevoli	γ_{G1}	0,90	1,00	1,00
	sfavorevoli		1,10	1,35	1,00
Azioni permanenti non strutturali ⁽²⁾	favorevoli	γ_{G2}	0,00	0,00	0,00
	sfavorevoli		1,50	1,50	1,30
Ballast ⁽³⁾	favorevoli	γ_B	0,90	1,00	1,00
	sfavorevoli		1,50	1,50	1,30
Azioni variabili da traffico ⁽⁴⁾	favorevoli	γ_Q	0,00	0,00	0,00
	sfavorevoli		1,45	1,45	1,25
Azioni variabili	favorevoli	γ_{Qi}	0,00	0,00	0,00
	sfavorevoli		1,50	1,50	1,30
Precompressione	favorevole	γ_P	0,90	1,00	1,00
	sfavorevole		1,00 ⁽⁵⁾	1,00 ⁽⁶⁾	1,00
Ritiro, viscosità e cedimenti non imposti appositamente	favorevole	γ_{Ced}	0,00	0,00	0,00
	sfavorevole		1,20	1,20	1,00

⁽¹⁾ Equilibrio che non coinvolga i parametri di deformabilità e resistenza del terreno; altrimenti si applicano i valori della colonna A2.

⁽²⁾ Nel caso in cui l'intensità dei carichi permanenti non strutturali, o di una parte di essi (ad esempio carichi permanenti portati), sia ben definita in fase di progetto, per detti carichi o per la parte di essi nota si potranno adottare gli stessi coefficienti validi per le azioni permanenti.

⁽³⁾ Quando si prevedano variazioni significative del carico dovuto al ballast, se ne dovrà tener conto esplicitamente nelle verifiche.

⁽⁴⁾ Le componenti delle azioni da traffico sono introdotte in combinazione considerando uno dei gruppi di carico gr della Tab. 5.2.IV.

⁽⁵⁾ 1,30 per instabilità in strutture con precompressione esterna

⁽⁶⁾ 1,20 per effetti locali

Nella Tab. 5.2.V il significato dei simboli è il seguente:

γ_{G1} coefficiente parziale del peso proprio della struttura, del terreno e dell'acqua, quando pertinente;

γ_{G2} coefficiente parziale dei pesi propri degli elementi non strutturali;

γ_B coefficiente parziale del peso proprio del ballast;

γ_Q coefficiente parziale delle azioni variabili da traffico;

γ_{Qi} coefficiente parziale delle azioni variabili

γ_P coefficiente parziale delle azioni di precompressione

γ_{Ced} coefficiente parziale delle azioni di ritiro, viscosità e cedimenti non imposti appositamente.

Cedimenti o coazioni appositamente imposti devono essere trattati come la precompressione.

Più specificamente, per le opere sotto binario, si definiscono come Q_{ki} (azioni variabili da traffico) i seguenti gruppi di carico rappresentati nella seguente tabella (v. tab. 5.2.V.) delle norme tecniche.

Nella tabella vengono inoltre riportati i coefficienti di combinazione dei singoli carichi elementari costituenti il rispettivo gruppo:

Tab. 5.2.IV -Valutazione dei carichi da traffico

TIPO DI CARICO	Azioni verticali		Azioni orizzontali			Commenti
	Gruppi di carico	Carico verticale (1)	Treno scarico	Frenatura e avviamento	Centrifuga	
Gruppo 1 (2)	1,0	-	0,5 (0,0)	1,0 (0,0)	1,0 (0,0)	massima azione verticale e laterale
Gruppo 2 (2)	-	1,0	0,0	1,0 (0,0)	1,0 (0,0)	stabilità laterale
Gruppo 3 (2)	1,0 (0,5)	-	1,0	0,5 (0,0)	0,5 (0,0)	massima azione longitudinale
Gruppo 4	0,8 (0,6;0,4)	-	0,8 (0,6;0,4)	0,8 (0,6;0,4)	0,8 (0,6;0,4)	Fessurazione

(1) Includendo tutti i valori (F; a; etc..)

(2) La simultaneità di due o tre valori caratteristici interi (assunzione di diversi coefficienti pari ad 1.0), sebbene improbabile, è stata considerata come semplificazione per i gruppi di carico 1,2 e 3 senza che ciò abbia significative conseguenze progettuali

I valori campiti in grigio rappresentano l'azione dominante.

Nella tabella sopra riportata è indicato un coefficiente per gli effetti a sfavore di sicurezza e, tra parentesi, un coefficiente, minore del precedente, per gli effetti a favore di sicurezza.

Relativamente al Gruppo 3 si puntualizza che il valore tra parentesi nella colonna "carico verticale" da traffico dovrà assumersi pari a 0.5 per modelli di carico tipo "treno reale" e 0.7 per modelli di carico "teorico".

In fase di combinazione, ai fini delle verifiche per il controllo delle tensioni, si sono considerati i soli Gruppo 1 e 3.

9.2. Requisiti concernenti gli SLV

In zona sismica, oltre alle sollecitazioni derivanti dalle generiche condizioni di carico statiche, devono essere considerate anche le sollecitazioni derivanti dal sisma. L'azione sismica è stata combinata con le altre azioni secondo la seguente relazione:

$$G_1 + G_2 + P + E + \sum_i \psi_{2i} \cdot Q_{ki}$$

dove:

- E azione sismica per lo stato limite e per la classe di importanza in esame;
- G_1 peso proprio di tutti gli elementi strutturali;
- G_2 peso proprio di tutti gli elementi non strutturali;
- P pretensione e precompressione (non presente nel caso in esame);
- ψ_{2i} coefficiente di combinazione delle azioni variabili Q_{ki} ;
- Q_{ki} valore caratteristico dell'azione variabile.

Gli effetti dell'azione sismica sono valutati tenendo conto delle masse associate ai seguenti carichi gravitazionali:

$$G_k + \sum_i \psi_{2i} \cdot Q_{ki}$$

Nel caso specifico la verifica in combinazione SLV non risulta significativa per la struttura in oggetto

9.3. Requisiti concernenti gli SLE

I coefficienti di combinazione ψ per i singoli carichi elementari e per i gruppi di carico sopra definiti sono riportati nelle tabelle seguenti:

Tab. 5.2.VI - Coefficienti di combinazione Ψ delle azioni

Azioni		ψ_0	ψ_1	ψ_2
Azioni singole	Carico sul rilevato a tergo delle spalle	0,80	0,50	0,0
da traffico	Azioni aerodinamiche generate dal transito dei convogli	0,80	0,50	0,0
	g_{r1}	0,80 ⁽²⁾	0,80 ⁽¹⁾	0,0
Gruppi di	g_{r2}	0,80 ⁽²⁾	0,80 ⁽¹⁾	-
carico	g_{r3}	0,80 ⁽²⁾	0,80 ⁽¹⁾	0,0
	g_{r4}	1,00	1,00 ⁽¹⁾	0,0
Azioni del vento	F_{wk}	0,60	0,50	0,0
Azioni da	in fase di esecuzione	0,80	0,0	0,0
neve	SLU e SLE	0,0	0,0	0,0
Azioni termiche	T_k	0,60	0,60	0,50

⁽¹⁾ 0,80 se è carico solo un binario, 0,60 se sono carichi due binari e 0,40 se sono carichi tre o più binari.
⁽²⁾ Quando come azione di base venga assunta quella del vento, i coefficienti ψ_0 relativi ai gruppi di carico delle azioni da traffico vanno assunti pari a 0,0.

Tab. 5.2.VII - Ulteriori coefficienti di combinazione ψ delle azioni

	Azioni	ψ_0	ψ_1	ψ_2
Azioni singole da traffico	Treno di carico LM 71	0,80 ⁽³⁾	⁽¹⁾	0,0
	Treno di carico SW /0	0,80 ⁽³⁾	0,80	0,0
	Treno di carico SW/2	0,00 ⁽³⁾	0,80	0,0
	Treno scarico	1,00 ⁽³⁾	-	-
	Centrifuga	⁽²⁾ ⁽³⁾	⁽²⁾	⁽²⁾
	Azione laterale (serpeggio)	1,00 ⁽³⁾	0,80	0,0

⁽¹⁾ 0,80 se è carico solo un binario, 0,60 se sono carichi due binari e 0,40 se sono carichi tre o più binari.
⁽²⁾ Si usano gli stessi coefficienti ψ adottati per i carichi che provocano dette azioni.
⁽³⁾ Quando come azione di base venga assunta quella del vento, i coefficienti ψ_0 relativi ai gruppi di carico delle azioni da traffico vanno assunti pari a 0,0.

I valori del coefficiente ψ_{2i} sono quelli riportati nelle tabelle 5.2.VI e 5.2.VII delle NTC2018; la stessa normativa propone nel caso di ponti, e più in generale per opere ferroviarie, di assumere per il treno di carico LM71 $\psi_{2i} = 0.2$ (condizione cautelativa).

10. VERIFICHE ELEMENTI STRUTTURALI ACCIAIO

La verifica della struttura sarà effettuata mediante il metodo semiprobabilistico agli stati limite, eseguendo un confronto tra le resistenze e le sollecitazioni di calcolo in particolari sezioni strategiche della struttura.

Le verifiche effettuate riguardano sia gli SLU (stati limite ultimi), sia gli SLE (stati limite di esercizio e verifiche a fatica).

10.1. Convenzioni

Le unità di misura adottate corrispondono a quelle relative al sistema internazionale (SI). Si riportano le u. di m. per le seguenti grandezze:

- Lunghezze: m
- Forze – Coppie: kN – kNm
- Tensioni: MPa

Si farà riferimento di norma a sistemi di tipo cartesiano ortogonale, in cui, in generale, si ha il piano x-y orizzontale, con x parallelo all'asse longitudinale del ponte, y parallelo all'asse trasversale del ponte e z parallelo all'asse verticale.

Per quanto riguarda le convenzioni di segno, si considerano, in generale, positive le trazioni. Eventuali convenzioni diverse saranno di volta in volta specificate.

10.2. Risultati modello di calcolo

Per ciascun caso di carico, precedentemente descritto, si riportano i risultati atti a descrivere il comportamento della struttura. In particolare:

- Le reazioni vincolari;
- Gli spostamenti nodali;
- Le caratteristiche di sollecitazione (N, M_y , M_z , V_z , V_y , T) dei seguenti elementi strutturali:
 - Travi principali;
 - Traversi intermedi;
 - Traversi intermedi di lunghezza variabile;
 - Traversi di estremità;
 - Irrigidimenti longitudinali;
 - Travi a sbalzo.

I risultati ottenuti per tutti i casi di carico elementari implementati nel modello di calcolo, sono riportati nell'allegato 2 (v. allegato 2 - §13.2).

I risultati ottenuti dal modello numerico, per le principali condizioni di carico, vengono riportati nel paragrafo successivo (v. par. 10.2.1) al fine di validarne i valori.

10.2.1. Validazione modello di calcolo

Il paragrafo 10.2 delle NTC 2018 (11) prescrive che qualora l'analisi strutturale e le relative verifiche siano condotte con l'ausilio di codici di calcolo automatico, il progettista dovrà controllare l'affidabilità dei codici utilizzati e verificare l'attendibilità dei risultati ottenuti.

Di seguito si riportano i controlli effettuati sul modello di calcolo per verificare il corretto input dei dati e la correttezza dei risultati numerici ottenuti.

In particolare, nel presente paragrafo, si riportano per i seguenti casi di carico principali:

- G1, carichi permanenti strutturali;
- G1+G2, carichi permanenti non strutturali;
- Treno di carico LM71, per la condizione di carico che massimizza il momento flettente nel piano (M_y) delle travi principali;
- Treno di carico SW/2.

Un confronto fra i risultati del modello numerico e del calcolo a mano (che in alcuni casi consiste nell'ausilio di un software per analisi 2D, "Ftool") è stato effettuato per le seguenti grandezze:

- Reazioni vincolari;
- Spostamenti travi principali.

Inoltre, per la combinazione di carico G1+G2, che include tutti i carichi permanenti della struttura, si riporta il confronto, tra modello numerico e calcolo a mano, in termini di prima frequenza flessionale.

10.2.1.1.G1, carichi permanenti strutturali

Nelle immagini seguenti si riportano i grafici ottenuti dal modello di calcolo che includono i valori da convalidare per il caso di carico in esame.

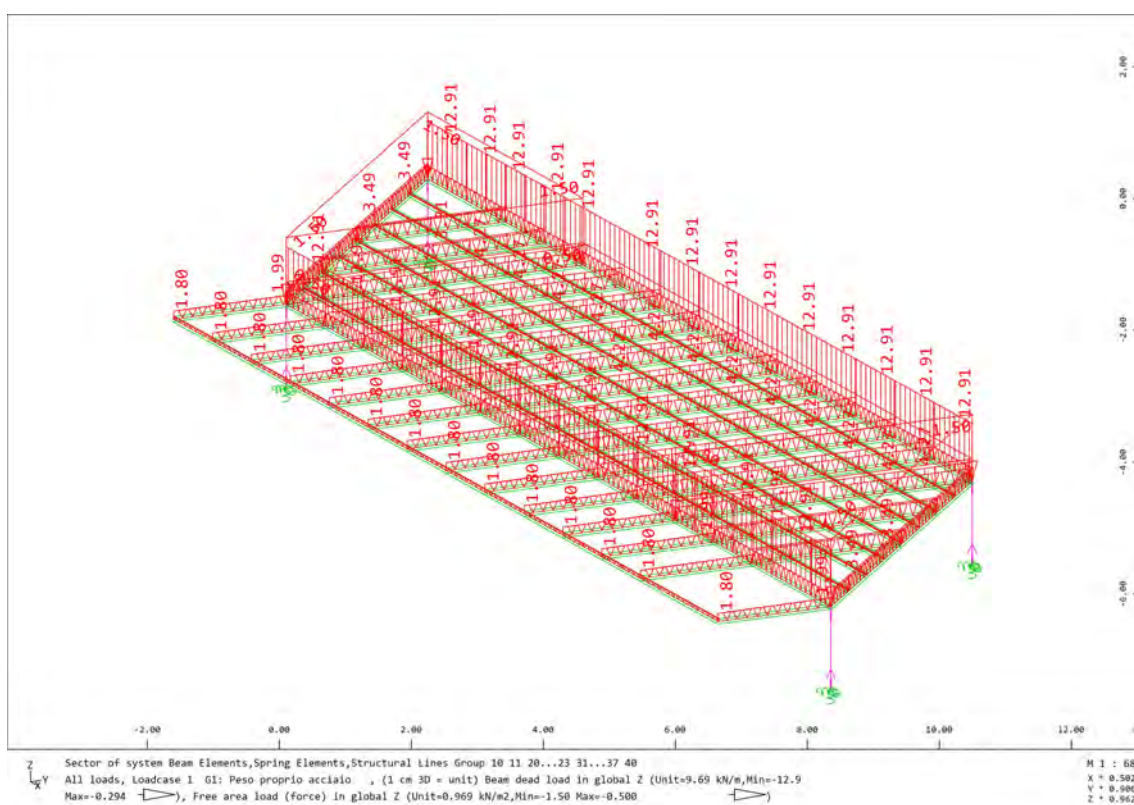


Figura 59 – Carichi per G1



Figura 60 – Reazioni vincolari per G1

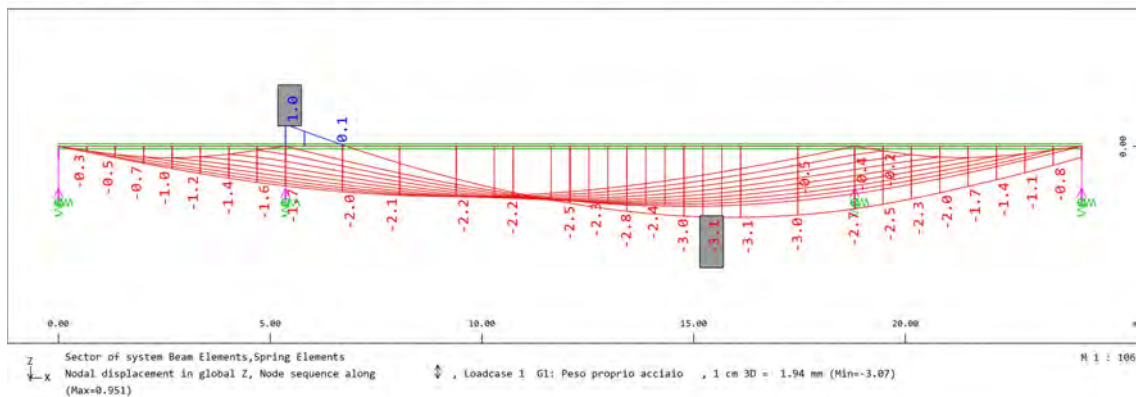
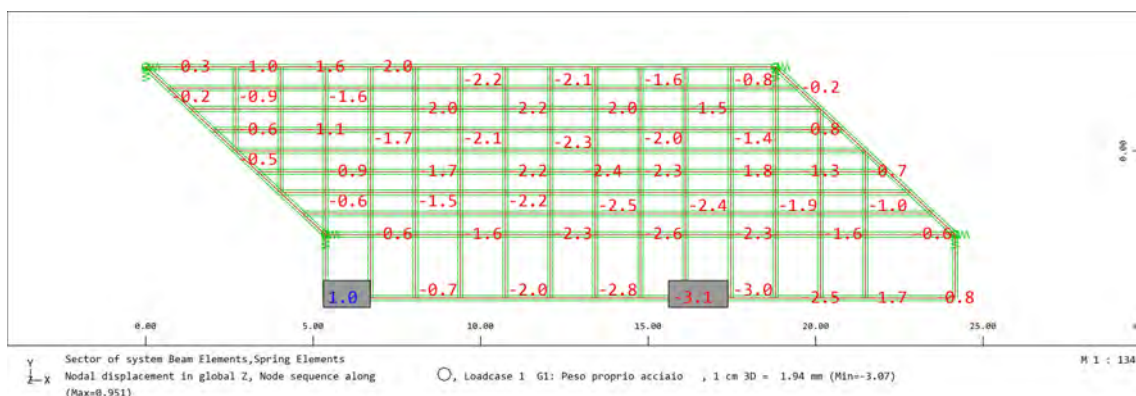


Figura 61 – Spostamenti nodali per G1

Nel seguente tabulato si riporta il confronto, in termini di reazioni vincolari e spostamenti, tra il modello numerico e il calcolo a mano.

Controllo reazioni vincolari

Caso di carico: G1, Carichi permanenti strutturali

Calcolo a mano pesi

Materiali

$$\gamma_a := 1.25 \cdot 78.5 \frac{kN}{m^3} \quad \text{peso unità di volume acciaio (maggiorato del 25% per tener conto delle parti non modellate)}$$

Trave principale

$$h_{tp} := 1900 \text{ mm} \quad \text{altezza}$$

$$b_{tp} := 800 \text{ mm} \quad \text{larghezza piattabanda}$$

$$t_{w,tp} := 20 \text{ mm} \quad \text{spessore piatto d'anima}$$

$$t_{f,sup,tp} := 60 \text{ mm} \quad \text{spessore piattabanda superiore}$$

$$t_{f,inf,tp} := 60 \text{ mm} \quad \text{spessore piattabanda inferiore}$$

$$L_{tpp} := 2 \cdot 18.8 \text{ m} \quad \text{lunghezza di calcolo totale travi}$$

$$A_{tp} := (h_{tp} - t_{f,sup,tp} - t_{f,inf,tp}) \cdot t_{w,tp} + b_{tp} \cdot t_{f,sup,tp} + b_{tp} \cdot t_{f,inf,tp} = 131600 \text{ mm}^2 \quad \text{area sezione trave composta}$$

$$F_{z,G1,tpp} := A_{tp} \cdot L_{tpp} \cdot \gamma_a = 485,5 \text{ kN} \quad \text{peso totale per elemento strutturale}$$

Traversi interni

$$h_{tr} := 425 \text{ mm} \quad \text{altezza}$$

$$b_{tr,inf} := 400 \text{ mm} \quad \text{larghezza piattabanda inferiore}$$

$$t_{w,tr} := 12 \text{ mm} \quad \text{spessore piatto d'anima}$$

$$t_{f,inf,tr} := 30 \text{ mm} \quad \text{spessore piattabanda inferiore}$$

$$t_{po} := 25 \text{ mm} \quad \text{spessore piastra}$$

$$L_{tr} := 5 \text{ m} \quad \text{lunghezza di calcolo singolo traverso}$$

$$A_{tr} := (h_{tr} - t_{po} - t_{f,inf,tr}) \cdot t_{w,tr} + b_{tr,inf} \cdot t_{f,inf,tr} = 16440 \text{ mm}^2 \quad \text{area della sezione a T rovescia}$$

$$n_{tr} := 11 \quad \text{numero traversi interni}$$

$$n_{trv} := 4 \quad \text{numero traversi di lunghezza variabile}$$

$$L_{trv} := (2.5 \text{ m} + 3.75 \text{ m}) \cdot 2 = 12.5 \text{ m} \quad \text{lunghezza totale traversi di lunghezza variabile}$$

$A_{po} := L_{tr} \cdot \frac{L_{tpp}}{2} = 94 \text{ m}^2$	area piastra ortotropa
$F_{z_G1_tr} := (n_{tr} \cdot A_{tr} \cdot L_{tr} + A_{tr} \cdot L_{trvu} + A_{po} \cdot t_{po}) \cdot \gamma_a = 339.5 \text{ kN}$	peso totale per elemento strutturale
<u>Irrigidimenti longitudinali</u>	
$h_{ir} := 250 \text{ mm}$	altezza
$t_{ir} := 12 \text{ mm}$	spessore
$A_{ir} := h_{ir} \cdot t_{ir} = 3000 \text{ mm}^2$	area sezione
$L_{ir} := 18.8 \text{ m}$	lunghezza di calcolo singolo irrigidimento
$n_{ir} := 7$	numero irrigidimenti
$F_{z_G1_ir} := n_{ir} \cdot A_{ir} \cdot \gamma_a \cdot L_{ir} = 38.7 \text{ kN}$	peso totale per elemento strutturale
<u>Traversi di estremità</u>	
$h_{te} := 525 \text{ mm}$	altezza
$b_{te_sup} := 500 \text{ mm}$	larghezza piattabanda superiore
$b_{te_inf} := 500 \text{ mm}$	larghezza piattabanda inferiore
$t_{w_te} := 12 \text{ mm}$	spessore piatto d'anima
$t_{f_sup_te} := 30 \text{ mm}$	spessore piattabanda superiore
$t_{f_inf_te} := 30 \text{ mm}$	spessore piattabanda inferiore
$A_{te} := (h_{te} - t_{f_sup_te} - t_{f_inf_te}) \cdot t_{w_te} + b_{te_sup} \cdot t_{f_sup_te} + b_{te_inf} \cdot t_{f_inf_te} = 35580 \text{ mm}^2$	area della sezione composta
$L_{te} := 7.33 \text{ m}$	lunghezza di calcolo singolo traverso di estremità
$n_{te} := 2$	numero traversi di estremità
$F_{z_G1_te} := n_{te} \cdot A_{te} \cdot L_{te} \cdot \gamma_a = 51.2 \text{ kN}$	peso totale per elemento strutturale

Travi a sbalzo

$h_{ts_i} := 425 \text{ mm}$ altezza sezione iniziale

$h_{ts_f} := 250 \text{ mm}$ altezza sezione finale

$b_{ts_sup} := 400 \text{ mm}$ larghezza piattabanda superiore

$b_{ts_inf} := 400 \text{ mm}$ larghezza piattabanda inferiore

$t_{w_ts} := 10 \text{ mm}$ spessore piatto d'anima

$t_{f_sup_ts} := 16 \text{ mm}$ spessore piattabanda superiore

$t_{f_inf_ts} := 25 \text{ mm}$ spessore piattabanda inferiore

$A_{ts_i} := (h_{ts_i} - t_{f_sup_ts} - t_{f_inf_ts}) \cdot t_{w_ts} + b_{ts_sup} \cdot t_{f_sup_ts} + b_{ts_inf} \cdot t_{f_inf_ts} = 20240 \text{ mm}^2$ Area sezione composta iniziale

$A_{ts_f} := (h_{ts_f} - t_{f_sup_ts} - t_{f_inf_ts}) \cdot t_{w_ts} + b_{ts_sup} \cdot t_{f_sup_ts} + b_{ts_inf} \cdot t_{f_inf_ts} = 18490 \text{ mm}^2$ Area sezione composta finale

$L_{ts} := 1.9 \text{ m}$ lunghezza di calcolo singola trave a sbalzo

$n_b := 14$ numero traversi a sbalzo

$F_{z_Gl_ts} := n_b \cdot (A_{ts_i} + A_{ts_f}) \cdot \frac{L_{ts}}{2} \cdot \gamma_a = 50.5 \text{ kN}$

Trave di bordo

$h_{tpe} := 240 \text{ mm}$ altezza

$i_{tpe} = 240 \text{ mm}$

$b_{tpe_sup} := 200 \text{ mm}$ larghezza piattabanda superiore

$h_{tpe_sup} = 85 \text{ mm}$

$b_{tpe_inf} := 200 \text{ mm}$ larghezza piattabanda inferiore

$b_{tpe_inf} = 85 \text{ mm}$

$t_{w_tpe} := 8 \text{ mm}$ spessore piatto d'anima

$t_{w_tpe} = 11.5 \text{ mm}$

$t_{f_sup_tpe} := 15 \text{ mm}$ spessore piattabanda superiore

$t_{f_sup_tpe} = 13 \text{ mm}$

$t_{f_inf_tpe} := 15 \text{ mm}$ spessore piattabanda inferiore

$t_{f_inf_tpe} = 11 \text{ mm}$

$L_{tpe} := 18.8 \text{ m}$ luce di calcolo

$n_{tpe} := 1$ numero trave

$A_{tpe} := (h_{tpe} - t_{f_sup_tpe} - t_{f_inf_tpe}) \cdot t_{w_tpe} + b_{tpe_sup} \cdot t_{f_sup_tpe} + b_{tpe_inf} \cdot t_{f_inf_tpe} = 7680 \text{ mm}^2$ Area sezione composta

$F_{z_Gl_tpe} := n_{tpe} \cdot A_{tpe} \cdot \gamma_a \cdot L_{tpe} = 14.2 \text{ kN}$

Somma contributi

$$F_{z,G1} = F_{z,G1,ipp} + F_{z,G1,fr} + F_{z,G1,ir} + F_{z,G1,tc} + F_{z,G1,ta} + F_{z,G1,tip} = 979.7 \text{ kN}$$

Controllo risultati

$$F_{z,G1} = 979.7 \text{ kN} \quad \text{peso acciaio da calcolo a mano}$$

$$F_{z,G1,FEM} = 990.3 \text{ kN} \quad \text{peso acciaio ricavato da modello numerico}$$

$$\rho_{G1} = \frac{F_{z,G1,FEM} - F_{z,G1}}{F_{z,G1,FEM}} = 1.1\% \quad \text{variazione percentuale}$$

Controllo spostamenti trave principale

Caso di carico: G1, carichi permanenti strutturali

Calcolo carico a metro lineare agente sulla trave principale più caricata

NB: i pesi degli sbalzi gravano, a vantaggio di sicurezza, sulla trave principale adiacente

$$F_{z,G1,tp1} := \frac{F_{z,G1,tpp}}{2} + \frac{F_{z,G1,tr}}{2} + \frac{F_{z,G1,te}}{2} + \frac{F_{z,G1,ir}}{2} + F_{z,G1,ta} + F_{z,G1,tpc} = 522.2 \text{ kN}$$

$$L_{tp} := 18.8 \text{ m}$$

$$q_{G1} := \frac{F_{z,G1,tp1}}{L_{tp}} = 27.8 \frac{\text{kN}}{\text{m}}$$

Calcolo a mano spostamenti

NB: la trave principale risulta semplicemente appoggiata

$$E_a := 210 \text{ GPa} \quad \text{modulo elastico acciaio}$$

$$I_{tp} := \left(\frac{h_{tp}}{2} - t_{f,sup,tp} \right)^2 \cdot b_{tp} \cdot t_{f,sup,tp} + \left(\frac{h_{tp}}{2} - t_{f,inf,tp} \right)^2 \cdot b_{tp} \cdot t_{f,inf,tp} + \frac{t_{w,tp} \cdot (h_{tp} - t_{f,sup,tp})^3}{12} = (8.64 \cdot 10^{10}) \text{ mm}^4$$

inerzia approssimata rispetto all'asse forte

$$q_{G1} = 27.8 \frac{\text{kN}}{\text{m}} \quad \text{carico a metro lineare per la singola trave principale}$$

$$\delta_{G1} := \frac{5}{384} \cdot \frac{q_{G1} \cdot L_{tp}^4}{E_a \cdot I_{tp}} = 2.5 \text{ mm} \quad \text{spostamento massimo}$$

Controllo risultati

$$\delta_{G1} = 2.5 \text{ mm} \quad \text{spostamento massimo da calcolo a mano}$$

$$\delta_{G1,FEM} = 2.6 \text{ mm} \quad \text{spostamento massimo da modello numerico}$$

$$\rho_{G1} := \frac{\delta_{G1,FEM} - \delta_{G1}}{\delta_{G1,FEM}} = 4.3\% \quad \text{variazione percentuale}$$

10.2.1.2.G1+G2, carichi permanenti

Nelle immagini seguenti si riportano i grafici ottenuti dal modello di calcolo che includono i valori da convalidare per il caso di carico in esame.

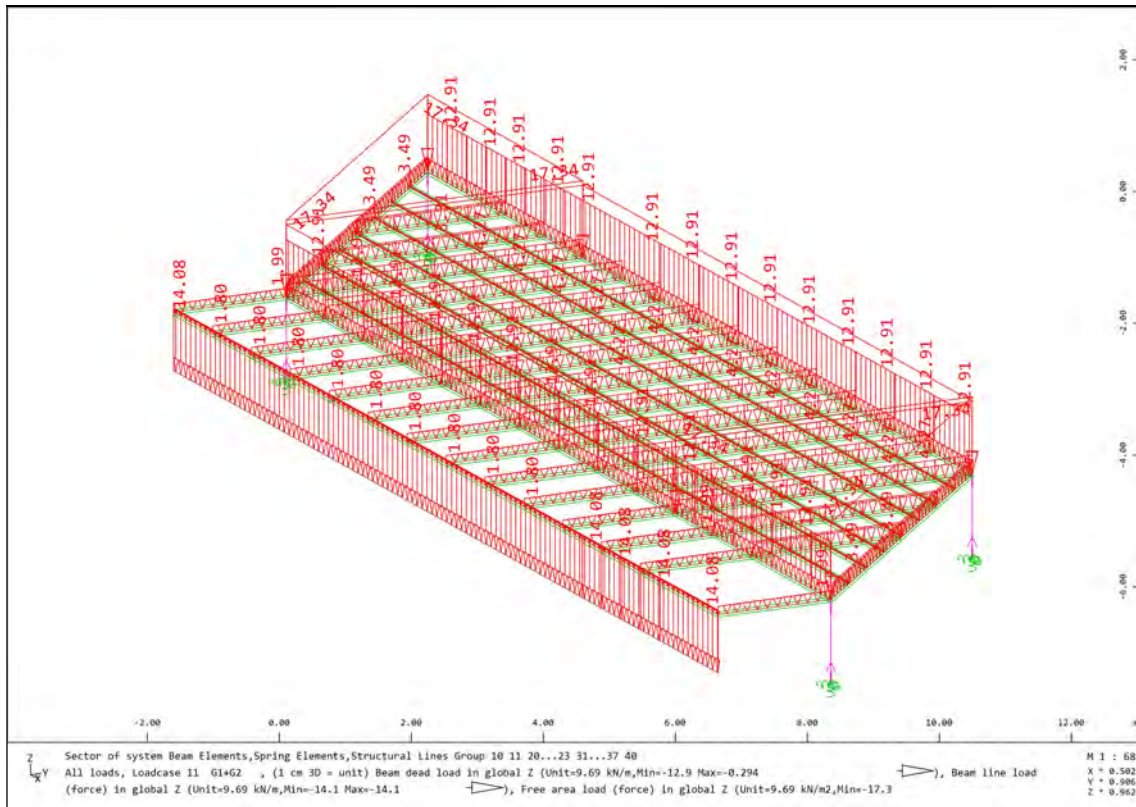


Figura 62 – Carichi per comb. G1+G2

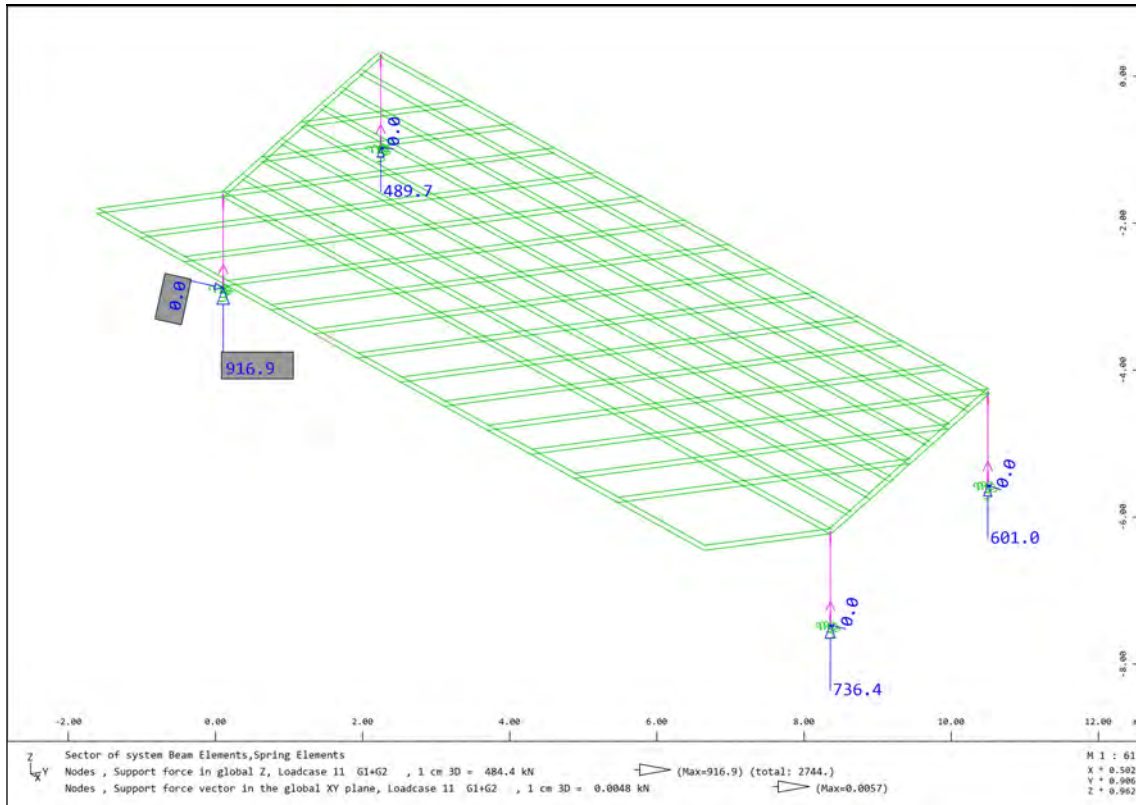


Figura 63 - Reazioni vincolari per comb. G1+G2

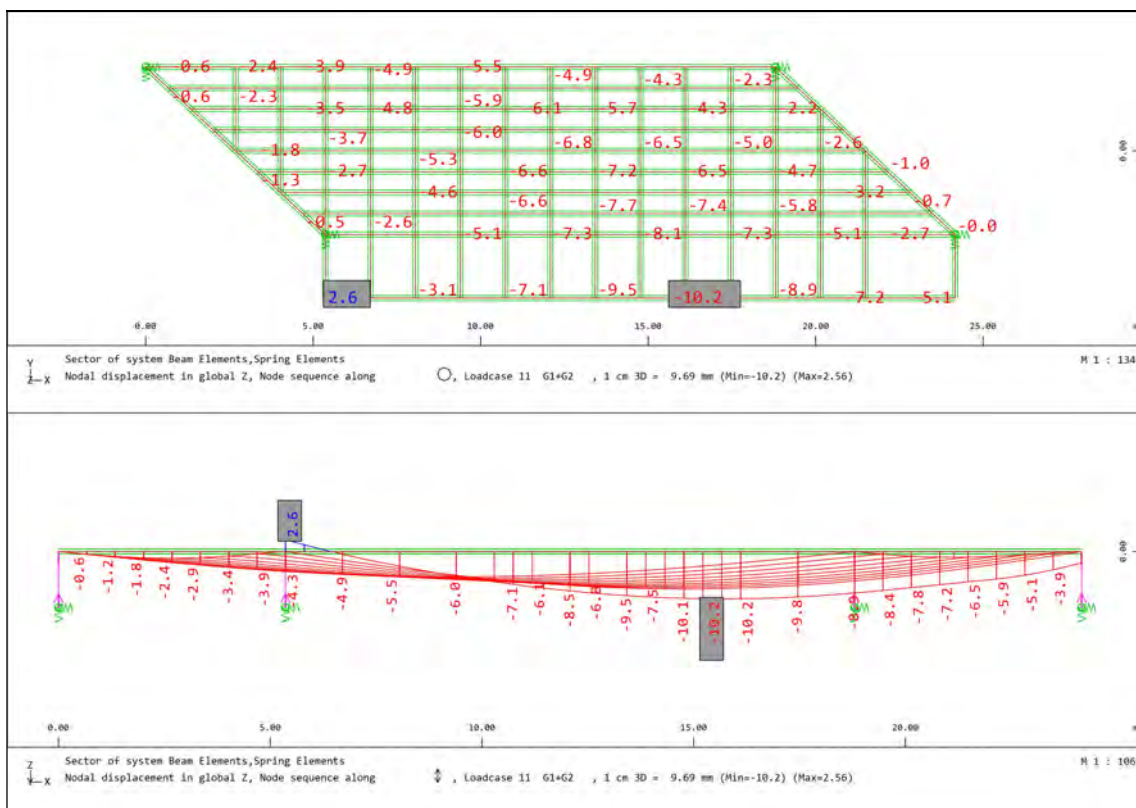


Figura 64 - Spostamenti nodali per comb. G1+G2

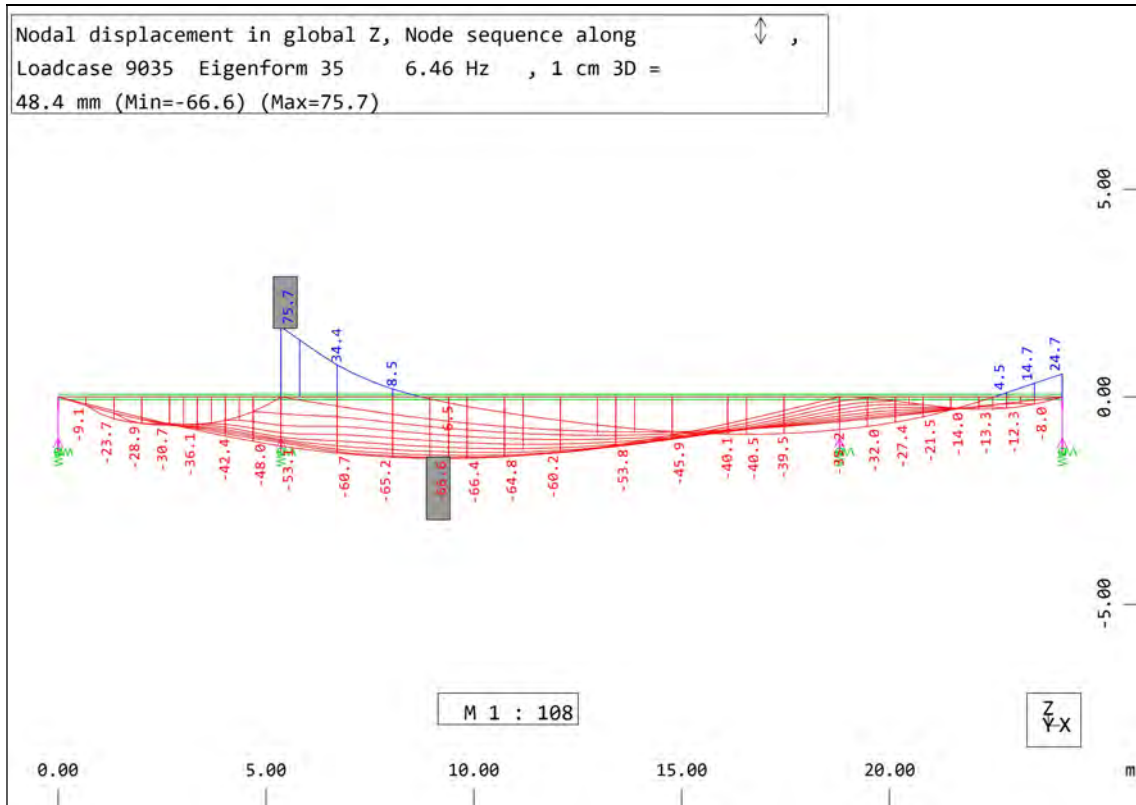


Figura 65 - Primo modo di vibrare flessionale per comb. G1+G2

Nel seguente tabulato si riporta il confronto, in termini di reazioni vincolari, spostamenti e frequenze, tra il modello numerico e il calcolo a mano.

Controllo reazioni vincolari

Caso di carico: G1+G2, carichi permanenti

Calcolo a mano risultante carichi G2, permanenti non strutturali

$d_{tp} := 5 \text{ m}$	interasse travi principali
$A_{po} = 94 \text{ m}^2$	area di calcolo della piastra ortotropa su cui poggia il ballast
$\gamma_{G2_ba} := 18 \frac{\text{kN}}{\text{m}^3}$	peso di volume che comprende massicciata, armamento, impermeabilizzazioni
$h_{G2_ba} := 0.80 \text{ m}$	altezza media fra piano del ferro (P.F.) ed estradosso impalcato
$q_{G2_ba} := \gamma_{G2_ba} \cdot h_{G2_ba} = 14.4 \frac{\text{kN}}{\text{m}^2}$	peso per unità di superficie del ballast
$F_{z_G2_ba} := q_{G2_ba} \cdot A_{po} \cdot 1.1 = 1489 \text{ kN}$	peso risultante dei ballast maggiorato del 10% al fine di considerare il peso di eventuali finiture
$h_b := 4 \text{ m}$	altezza barriera antirumore
$q_b := 3.2 \frac{\text{kN}}{\text{m}^2}$	peso barriera antirumore
$F_{z_G2_br} := h_b \cdot q_b \cdot L_{tp} \cdot 1.1 = 264.7 \text{ kN}$	peso risultante delle barriere antirumore maggiorato del 10% al fine di considerare il peso di eventuali finiture.
$F_{z_G2} := F_{z_G2_ba} + F_{z_G2_br} = 1753.7 \text{ kN}$	peso risultante dei carichi permanenti non strutturali

Controllo risultati

$F_{z_G} := F_{z_G1} + F_{z_G2} = 2733.3 \text{ kN}$	peso da calcolo a mano
$F_{z_G_FEM} := 2744 \text{ kN} = 2744 \text{ kN}$	peso ricavato da modello numerico
$\rho_G := \frac{F_{z_G_FEM} - F_{z_G}}{F_{z_G_FEM}} = 0.4\%$	variazione percentuale

Controllo spostamenti trave principale

Caso di carico: G1+G2, carichi permanenti

Calcolo carico a metro lineare agente sulla trave principale più caricata

NB: i pesi degli sbalzi gravano, a vantaggio di sicurezza, sulla trave principale adiacente

$$F_{z_{G,tp1}} := F_{z_{G1,tp1}} + \frac{F_{z_{G2,ba}}}{2} + F_{z_{G2,br}} = 1531.4 \text{ kN}$$

$$L_{tp} = 18.8 \text{ m}$$

$$q_G := \frac{F_{z_{G,tp1}}}{L_{tp}} = 81.5 \frac{\text{kN}}{\text{m}}$$

Calcolo a mano spostamenti

NB: la trave principale risulta semplicemente appoggiata

$$E_a = 210000 \text{ MPa} \quad \text{modulo elastico acciaio}$$

$$I_{tp} := \left(\frac{h_{tp}}{2} - t_{f_sup_tp} \right)^2 \cdot b_{tp} \cdot t_{f_sup_tp} + \left(\frac{h_{tp}}{2} - t_{f_inf_tp} \right)^2 \cdot b_{tp} \cdot t_{f_inf_tp} + \frac{t_{w_tp} \cdot (h_{tp} - t_{f_sup_tp})^3}{12} = (8.64 \cdot 10^{10}) \text{ mm}^4$$

inerzia approssimata rispetto all'asse forte

$$q_G = 81.5 \frac{\text{kN}}{\text{m}} \quad \text{carico a metro lineare per la singola trave principale}$$

$$\delta_G := \frac{5}{384} \cdot \frac{q_G \cdot L_{tp}^4}{E_a \cdot I_{tp}} = 7.3 \text{ mm} \quad \text{spostamento massimo}$$

Controllo risultati

$$\delta_G = 7.3 \text{ mm} \quad \text{spostamento massimo da calcolo a mano}$$

$$\delta_{G_FEM} = 8.1 \text{ mm} \quad \text{spostamento massimo da modello numerico}$$

$$\rho_G := \frac{\delta_{G_FEM} - \delta_G}{\delta_{G_FEM}} = 9.9\% \quad \text{variazione percentuale}$$

Controllo prima frequenza flessionale dell'impalcato

Caso di carico: G1+G2, carichi permanenti

Calcolo approssimato della frequenza flessionale dell'impalcato nel caso di schema statico in semplice appoggio

$$q_{perm} := q_G = 81.5 \frac{kN}{m}$$

carico a metro lineare per azioni permanenti per la singola trave principale

$$\delta_0 := \frac{5}{384} \cdot \frac{q_{perm} \cdot L_{tp}^4}{E_a \cdot I_{tp}} = 7.3 \text{ mm}$$

freccia valutata in mezzeria e dovuta alle azioni permanenti

$$n_0 := \frac{\pi}{2} \cdot \sqrt{\frac{5 \cdot g}{384 \cdot \delta_0}} = 6.57 \text{ Hz}$$

frequenza flessionale struttura nel caso di schema statico in semplice appoggio

Controllo risultati

$$n_0 = 6.57 \text{ Hz}$$

frequenza flessionale da calcolo a mano

$$n_{0_FEM} := 6.46 \text{ Hz}$$

frequenza flessionale da modello numerico

$$\rho_{nG} := \frac{n_{0_FEM} - n_0}{n_{0_FEM}} = -1.7\%$$

variazione percentuale

10.2.1.3. Treno di carico LM71

Nelle immagini seguenti si riportano i grafici ottenuti dal modello di calcolo che includono i valori da convalidare per il caso di carico in esame.

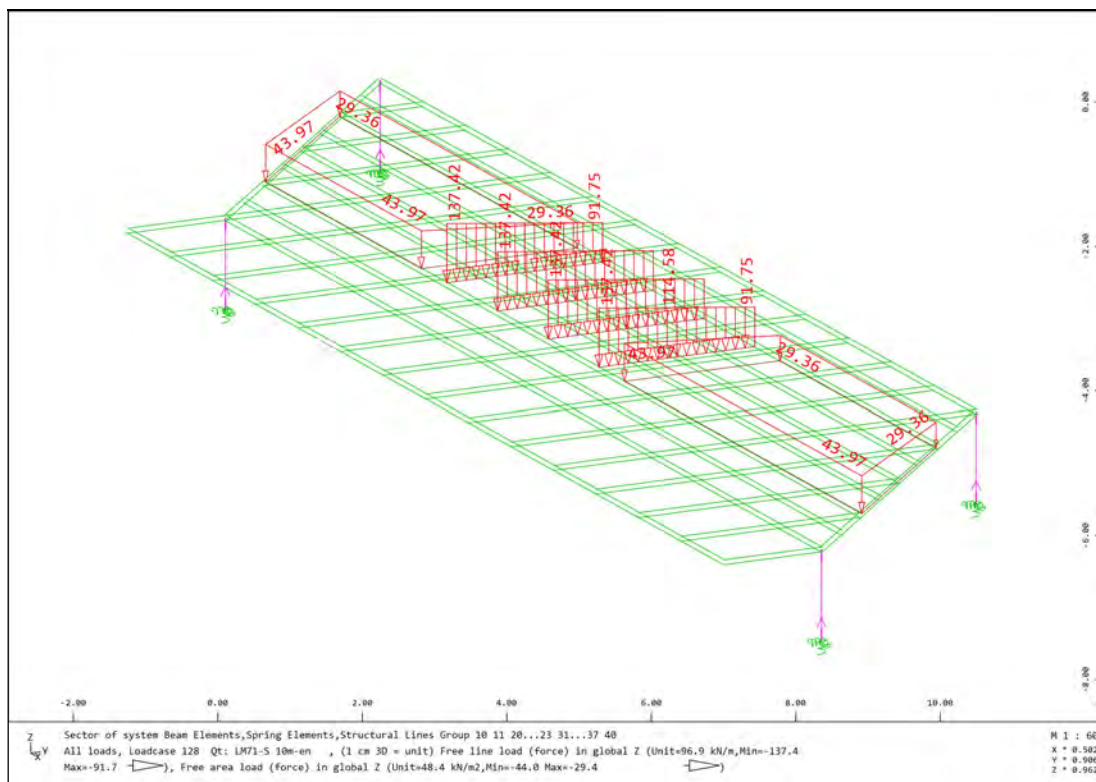


Figura 66 - Carichi per il treno "LM71"

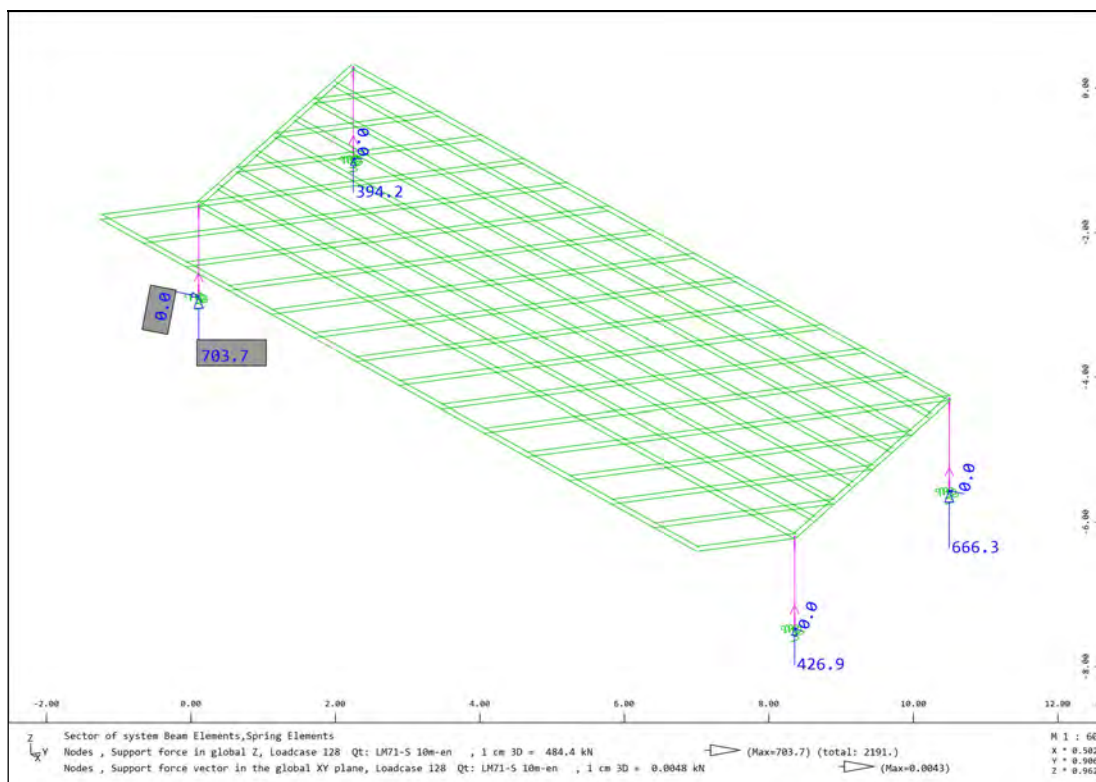


Figura 67 - Reazioni vincolari per il treno "LM71"

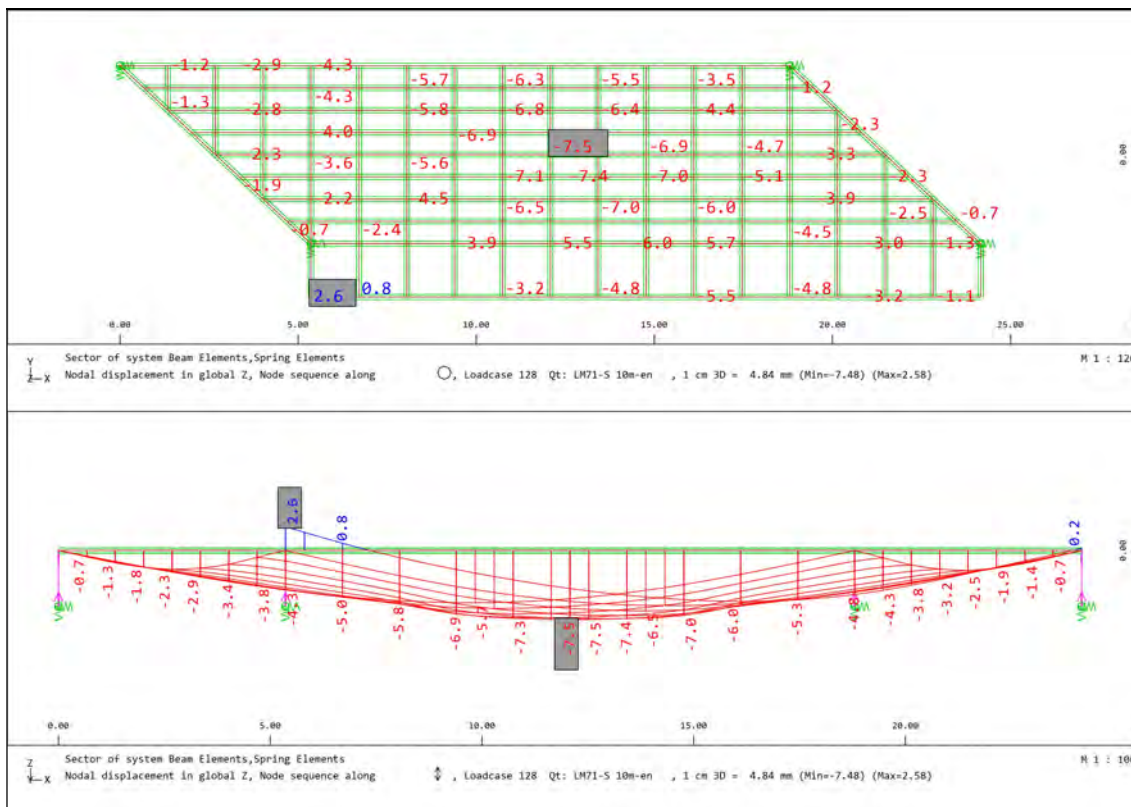


Figura 68 – Spostamenti nodali per il treno “LM71”

Nel seguente tabulato si riporta il confronto, in termini di reazioni vincolari e spostamenti, tra il modello numerico e il calcolo a mano.

Controllo reazioni vincolari

Caso di carico: modello LM71

Calcolo a mano risultante carichi modello LM71

$\alpha_{LM71} := 1.1$	coefficiente di adattamento "α"
$Q_{ok} := 250 \text{ kN}$	valore caratteristico del carico del singolo asse
$q_{ok} := 80 \frac{\text{kN}}{\text{m}}$	valore caratteristico del carico uniformemente distribuito
$i_Q := 1.6 \text{ m}$	interasse singolo asse
$l_q := 0.8 \text{ m}$	distanza tra estremo carico distribuito e carico concentrato

$$F_{z_LM71} := \alpha_{LM71} (q_{ok} \cdot (L_{tp} - 3 \cdot i_Q - 2 \cdot l_q) + 4 \cdot Q_{ok}) = 2191.2 \text{ kN} \quad \text{risultante carico}$$

Controllo risultati

$F_{z_LM71} = 2191.2 \text{ kN}$	peso da calcolo a mano
$F_{z_LM71_FEM} := 2191 \text{ kN}$	peso ricavato da modello numerico
$\rho_{LM71} := \frac{F_{z_LM71_FEM} - F_{z_LM71}}{F_{z_LM71_FEM}} = 0$	variazione percentuale

Controllo spostamenti trave principale

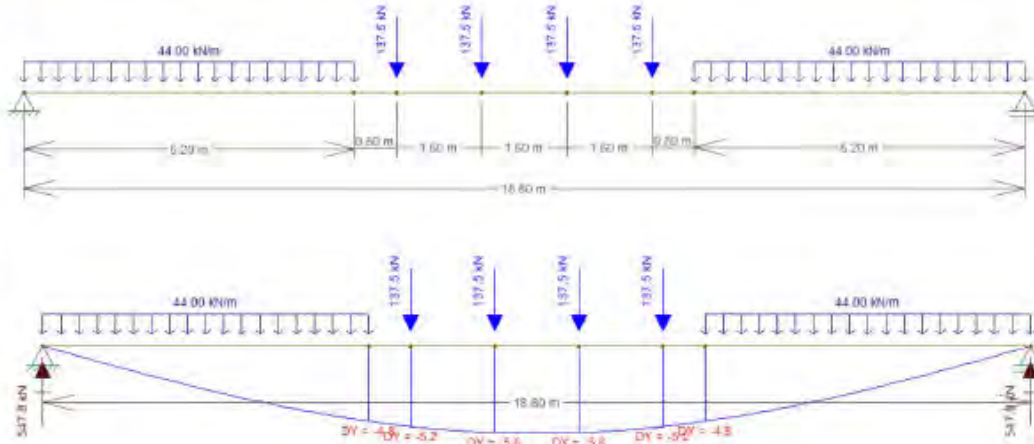
Caso di carico: modello LM71

Calcolo carico a metro lineare agente sulla trave principale più caricata

$\frac{Q_{ok}}{2} \cdot \alpha_{LM71} = 137.5 \text{ kN}$	carico asse singolo gravante su singola trave
$\frac{q_{ok}}{2} \cdot \alpha_{LM71} = 44 \frac{\text{kN}}{\text{m}}$	carico distribuito gravante su singola trave

Calcolo spostamenti

NB: il calcolo degli spostamenti è stato effettuato tramite software che analizza schemi in 2D ("Ftool"). L'elemento beam implementato corrisponde alla sezione composta della trave principale. Il calcolo sottostima leggermente lo spostamento in quanto non tiene conto dell'eccentricità spaziale del carico rispetto all'asse del binario



Section Properties
trave principale

I-shape

d: 1400 mm
 b: 300 mm
 tw: 20 mm
 st: 60 mm
 ft: 1700 mm
 F: 950 mm
 A: 1.3160e+05 mm²
 As: 1.0000e+04 mm²
 I: 5.0000e+08 mm⁴

Controllo risultati

$\delta_{LM71} := 5.6 \text{ mm}$

spostamento massimo da calcolo con "ftool"

$\delta_{LM71_FEM} := 6.0 \text{ mm}$

spostamento massimo da modello numerico

$\rho_G := \frac{\delta_{LM71_FEM} - \delta_{LM71}}{\delta_{LM71_FEM}} = 6.7\%$

variazione percentuale

10.2.1.4. Treno di carico SW/2

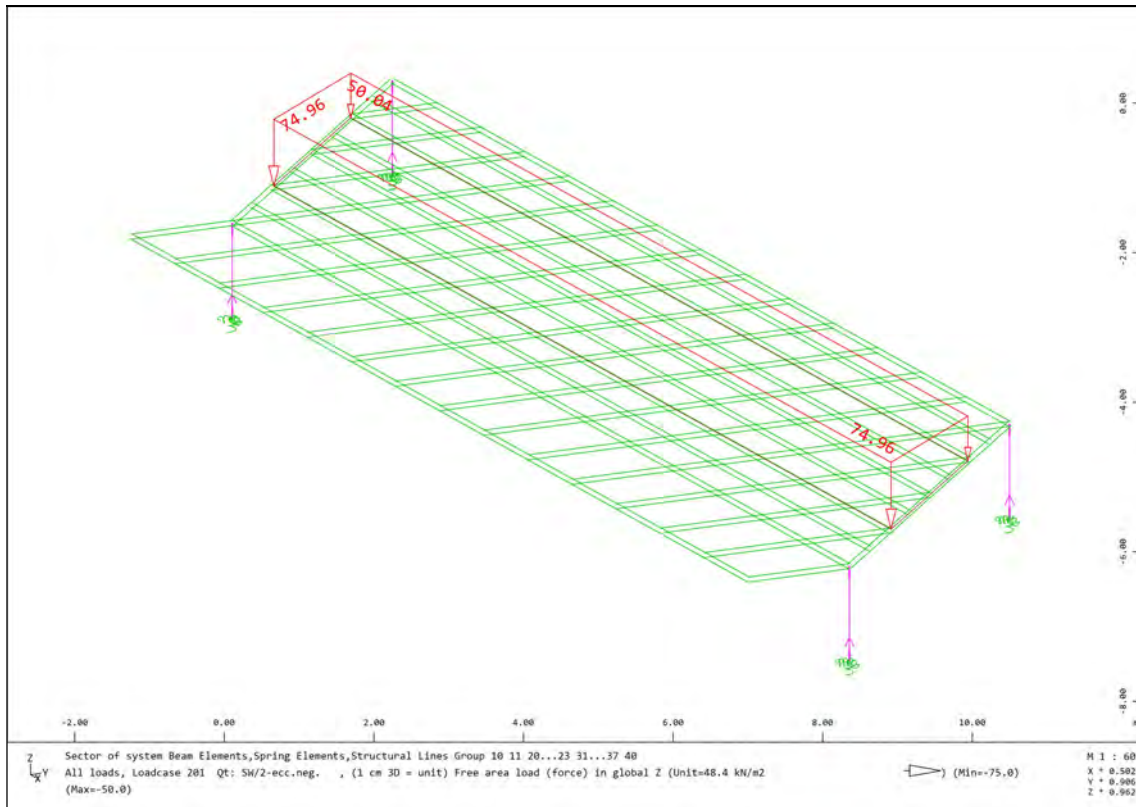


Figura 69 – Carichi per il treno pesante SW/2

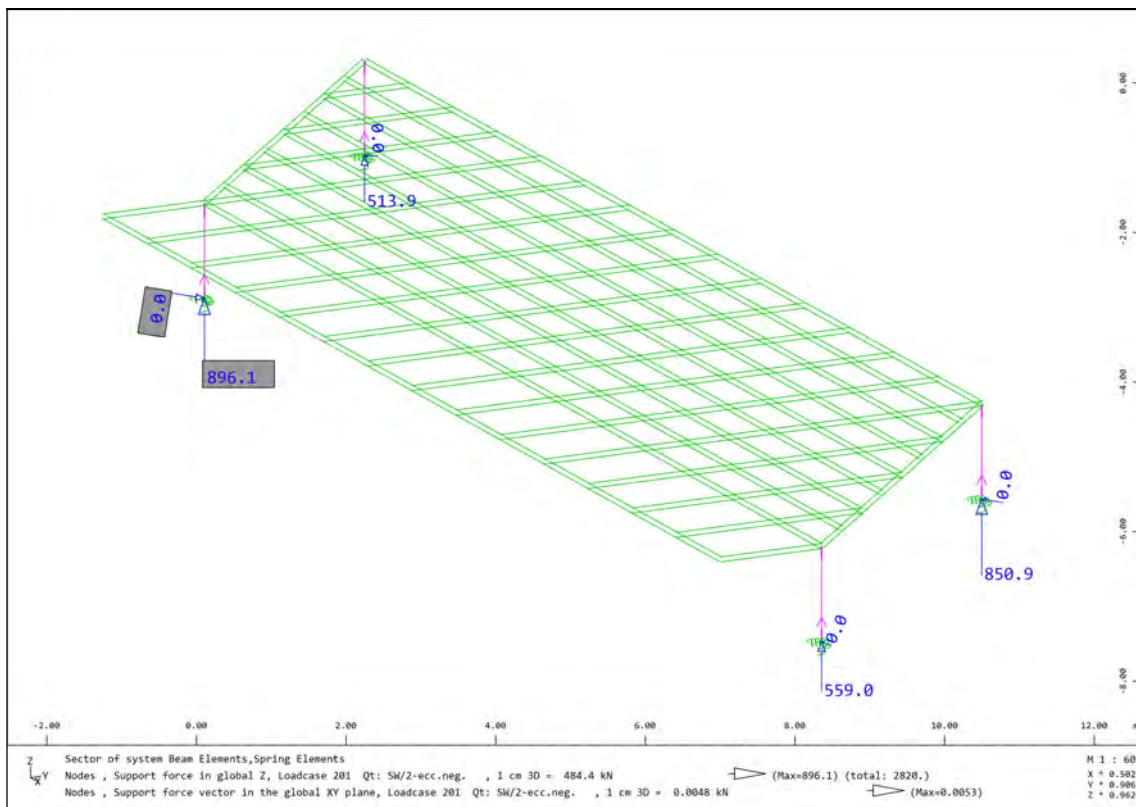


Figura 70 - Reazioni vincolari per il treno pesante SW/2

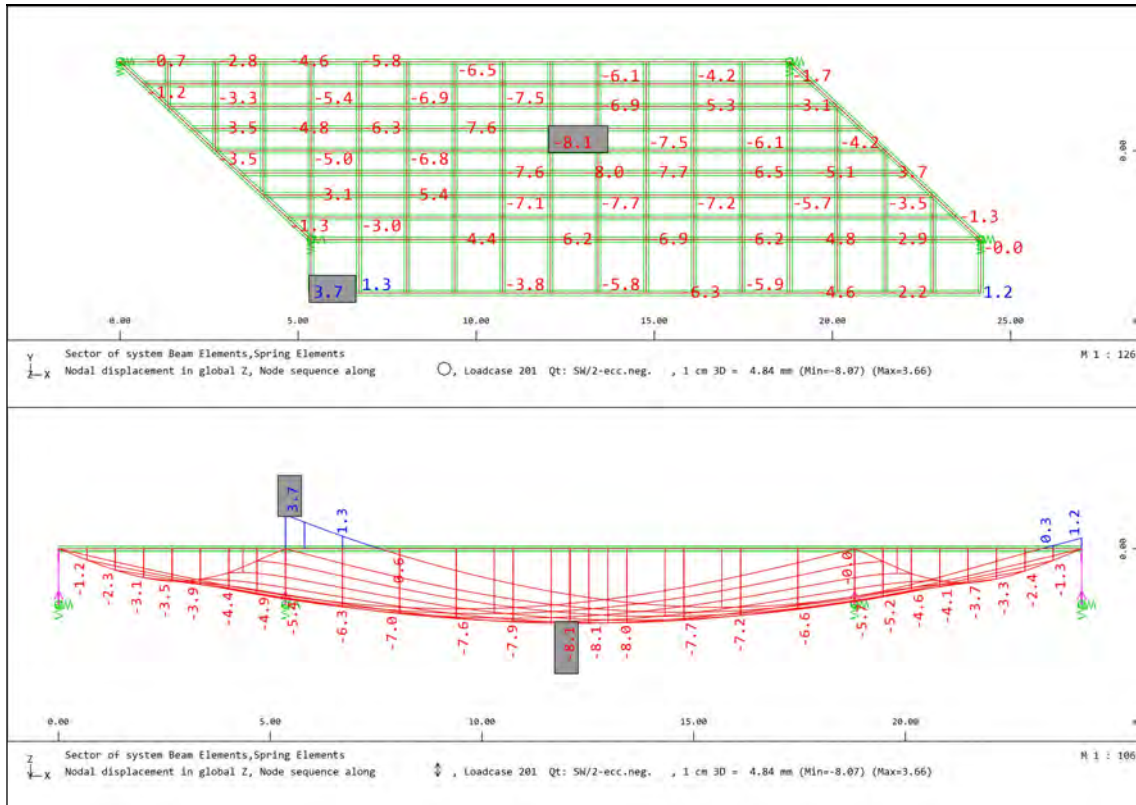


Figura 71 – Spostamenti nodali per il treno pesante SW/2

Controllo reazioni vincolari

Caso di carico: modello SW/2

Calcolo a mano risultante carichi modello SW/2

$\alpha_{SW2} := 1.0$	coefficiente di adattamento "α"
$q_{wk_SW2} := 150 \frac{kN}{m}$	valore caratteristico del carico uniformemente distribuito
$F_{z_SW2} := q_{wk_SW2} \cdot L_{tp} \cdot \alpha_{SW2} = 2820 \text{ kN}$	risultante carico

Controllo risultati

$F_{z_SW2} = 2820 \text{ kN}$	peso da calcolo a mano
$F_{z_SW2_FEM} := 2820 \text{ kN}$	peso ricavato da modello numerico
$\rho_{SW2} := \frac{F_{z_SW2_FEM} - F_{z_SW2}}{F_{z_SW2_FEM}} = 0$	variazione percentuale

Controllo spostamenti trave principale

Caso di carico: modello SW/2

Calcolo carico a metro lineare agente sulla trave principale più caricata

$q_{v_SW2} := \frac{q_{wk_SW2}}{2} \cdot \alpha_{SW2} = 75 \frac{kN}{m}$	carico asse singolo gravante su singola trave
--	---

Calcolo a mano spostamenti

NB: la trave principale risulta semplicemente appoggiata

$E_a = 210000 \text{ MPa}$	modulo elastico acciaio
$I_{tp} := \left(\frac{h_{tp}}{2} - t_{f_sup_tp} \right)^2 \cdot b_{tp} \cdot t_{f_sup_tp} + \left(\frac{h_{tp}}{2} - t_{f_inf_tp} \right)^2 \cdot b_{tp} \cdot t_{f_inf_tp} + \frac{t_{w_tp} \cdot (h_{tp} - t_{f_sup_tp})^3}{12} = (8,64 \cdot 10^{10}) \text{ mm}^4$	inerzia approssimata rispetto all'asse forte
$q_{v_SW2} = 75 \frac{kN}{m}$	carico a metro lineare per la singola trave principale
$\delta_{SW2} := \frac{5}{384} \cdot \frac{q_{v_SW2} \cdot L_{tp}^4}{E_a \cdot I_{tp}} = 6.7 \text{ mm}$	spostamento massimo

Controllo risultati

$$\delta_{SW2} = 6.7 \text{ mm}$$

spostamento massimo da calcolo a mano

$$\delta_{SW2_FEM} = 6.9 \text{ mm}$$

spostamento massimo da modello numerico

$$\rho_G := \frac{\delta_{SW2_FEM} - \delta_{SW2}}{\delta_{SW2_FEM}} = 2.6\%$$

variazione percentuale

10.3. Verifiche statiche agli SLU

Si riporta di seguito la verifica degli elementi in acciaio condotta al limite elastico facendo riferimento a quanto riportato al §4.2.4.1.2 delle NTC 2018 (11).

Per ciascun elemento strutturale modellato si riporta il coefficiente di utilizzo calcolato mediante il software agli elementi finti.

Per l'elemento maggiormente sollecitato di ogni categoria, che mostra il tasso di utilizzo più alto, si elencano le condizioni di carico elementari e i rispettivi coefficienti di combinazione che contribuiscono alla combinazione di carico più gravosa. Per tale combinazione si mostrano le tensioni di Von Mises, per ogni piatto componente la sezione di verifica (flange, anima), e le caratteristiche di sollecitazione risultanti.

10.3.1.Travi principali

10.3.1.1.Verifiche di resistenza

Si riportano, nel presente paragrafo, i risultati delle verifiche allo Stato Limite Ultimo effettuate per le travi principali.

Per le caratteristiche statiche delle sezioni riferirsi al paragrafo 7.1.2.

Per le combinazioni di carico adottate riferirsi al paragrafo 9.1.

Per le caratteristiche di sollecitazione dei carichi elementari in combinazione riferirsi al paragrafo 10.2

Per il coefficiente di incremento dinamico dei carichi da traffico, adottato per tali elementi strutturali, riferirsi al paragrafo 8.3.2.

La seguente immagine mostra le caratteristiche di sollecitazione allo SLU per le seguenti grandezze principali:

- M_y , momento flettente rispetto all'asse forte;
- V_z , taglio in direzione verticale.

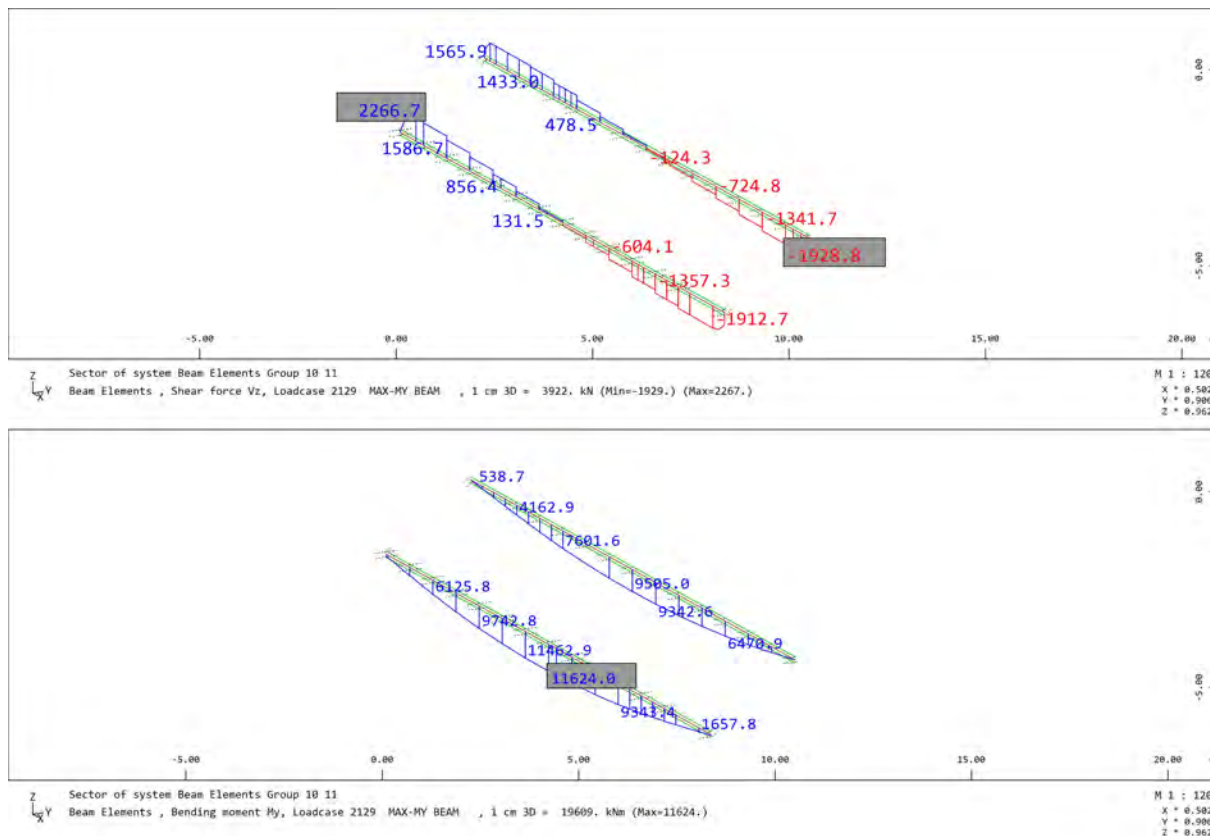


Figura 72 – Diagrammi di sollecitazione allo SLU (V_z , M_y)

La seguente immagine mostra le massime tensioni di Von Mises per le parti d'anima e le flange costituenti le travi principali.

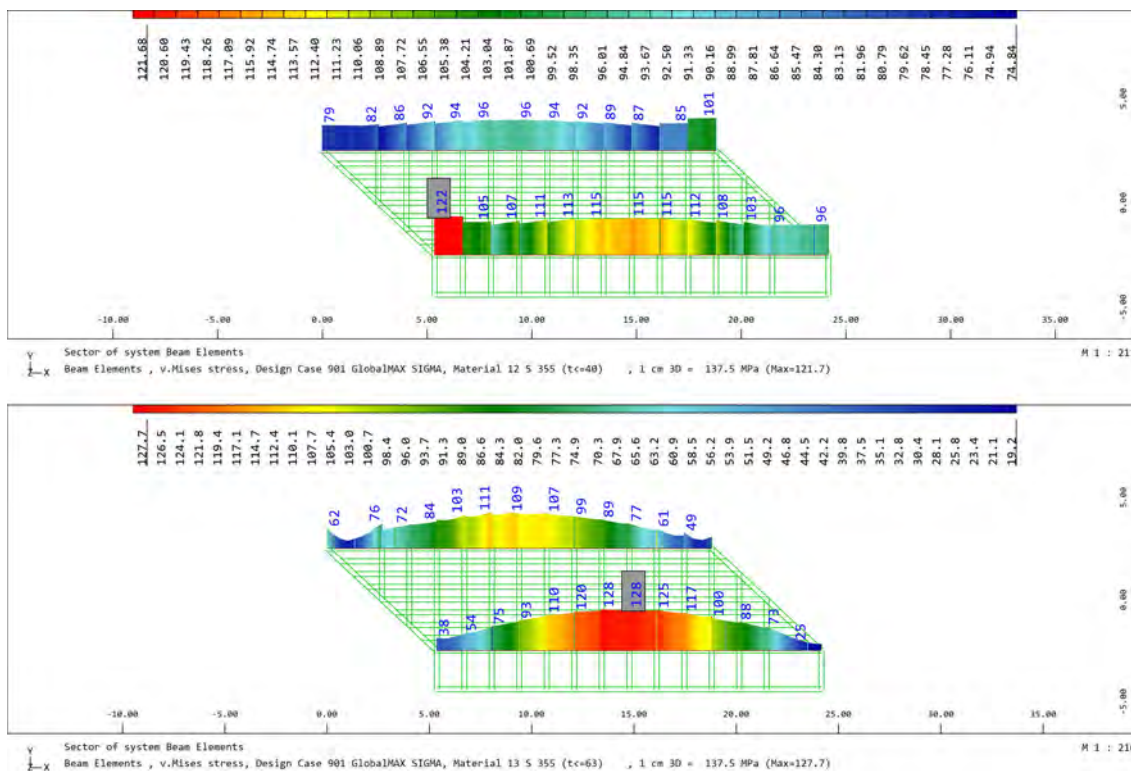


Figura 73 - Tensioni MAX di Von Mises (in alto per le anime, in basso per le flange)

La seguente immagine mostra il coefficiente di utilizzo delle sezioni appartenenti alla categoria delle travi principali.

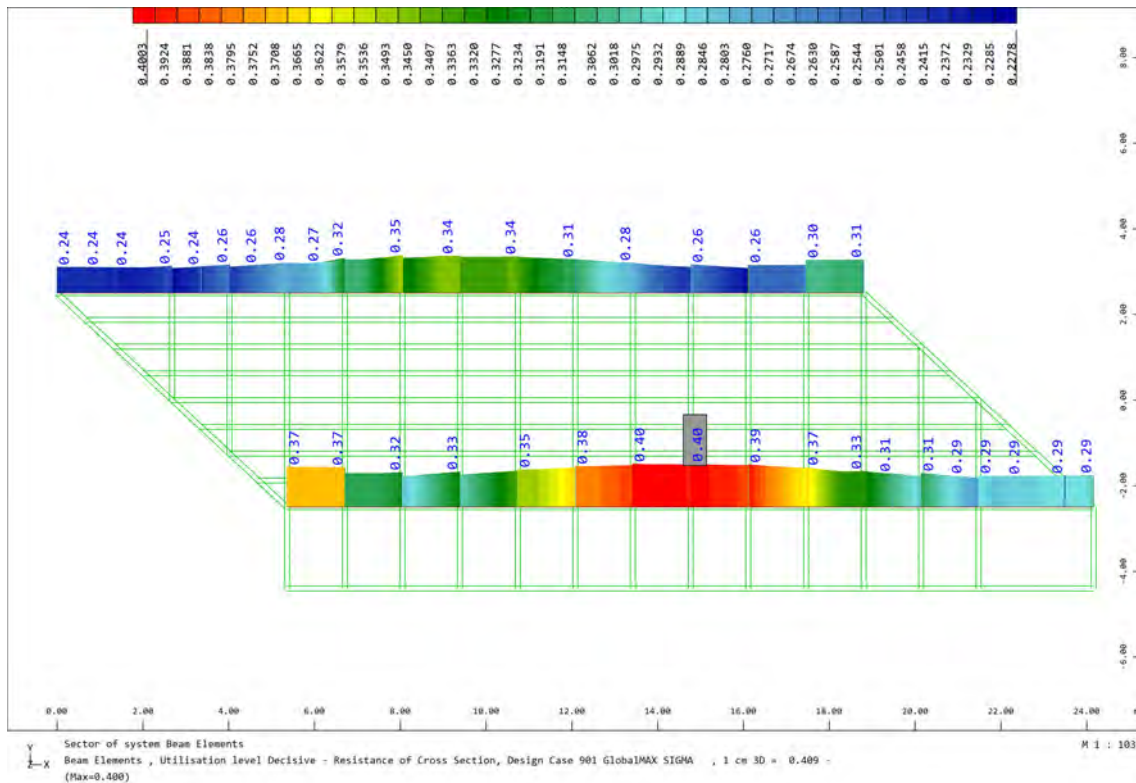


Figura 74 – Massimo coefficiente di utilizzo delle sezioni

Poiché il tasso di utilizzo è minore dell'unità le verifiche risultano soddisfatte.

10.3.1.2. Verifica di instabilità

La verifica di instabilità è stata condotta per via numerica mediante la modellazione agli elementi finiti di una trave principale inflessa, al fine di effettuare un'analisi di buckling (analisi agli autovalori) in campo elastico.

La trave è stata discretizzata con elementi piani di tipo "shell" al fine di simulare il comportamento tridimensionale delle sue componenti, ali, anima e piatti di irrigidimento.

Nell'immagine seguente si riporta il modello di calcolo implementato. La trave risulta vincolata sia in corrispondenza degli appoggi, tramite elementi "elastic link" reagenti solo a compressione, sia lungo il suo sviluppo longitudinale tramite molle reagenti in direzione trasversale in grado di simulare il contrasto svolto dalla piastra ortotropa.

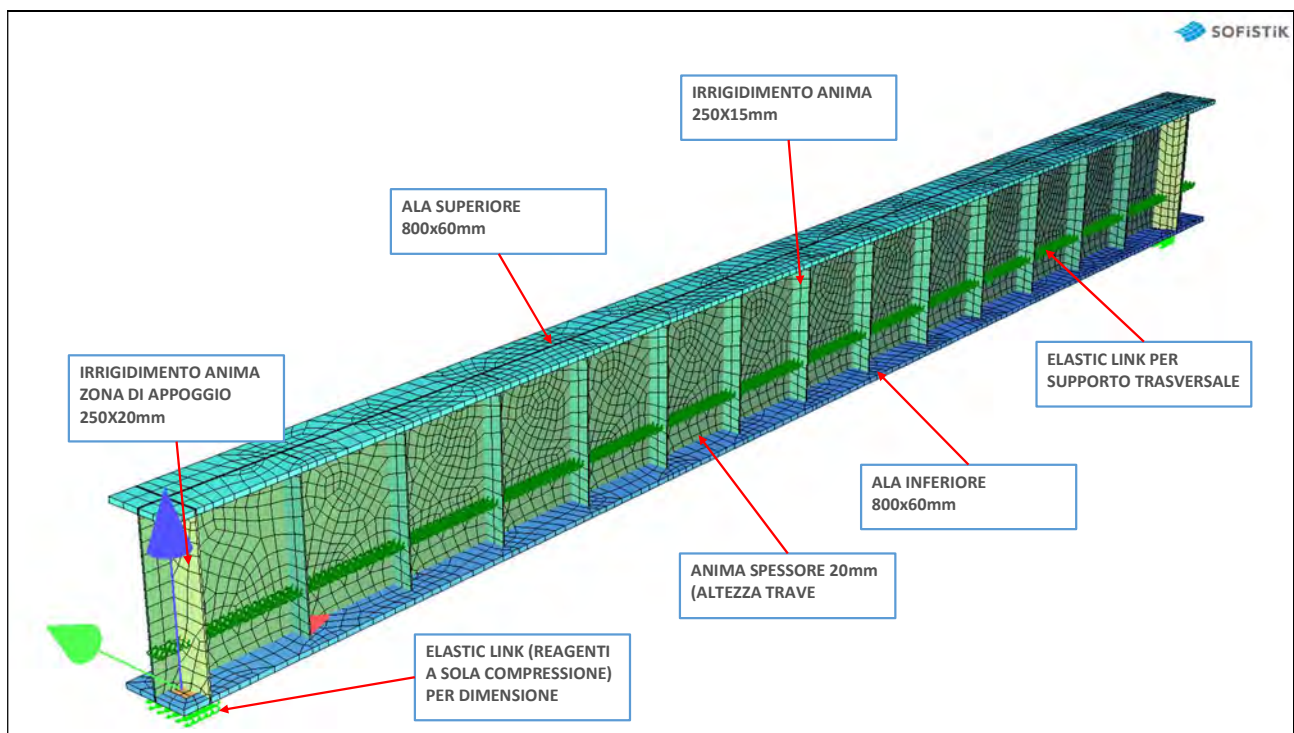


Figura 75 -Modello tridimensionale con elementi "PLATE" per analisi di buckling

Per la verifica di instabilità sono stati implementati i seguenti carichi a metro lineare che massimizzano il momento flettente della trave:

- G1: Carichi permanenti strutturali;
- G2: Carichi permanenti non strutturali;
- Q: Treno di carico SW/2 amplificato del coefficiente di incremento dinamico delle travi principali.

Al fine di massimizzare l'effetto torcente dovuto ai carichi, quest'ultimi, in combinazione allo Stato Limite Ultimo (SLU), sono stati applicati in corrispondenza del massimo braccio ottenibile e pari a metà della larghezza delle ali, come mostrato nelle immagini seguenti.

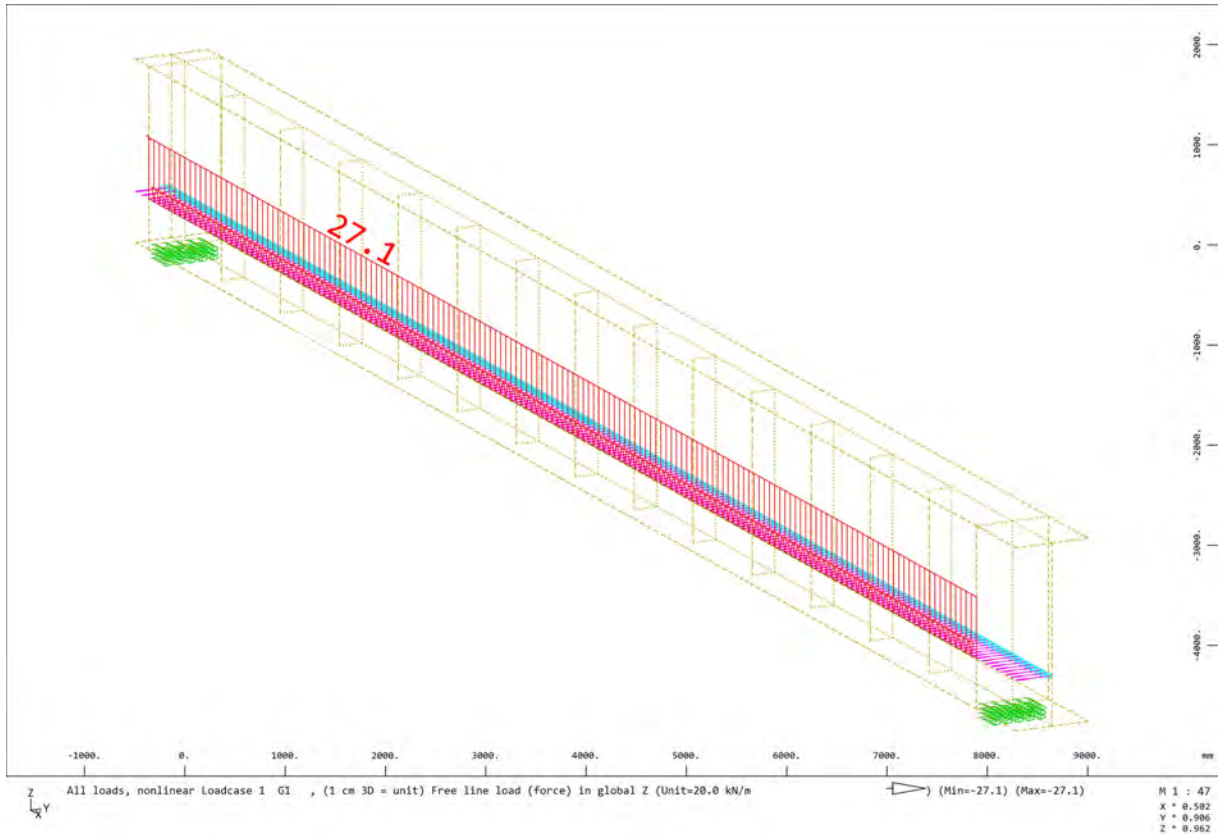


Figura 76 – Carico G1

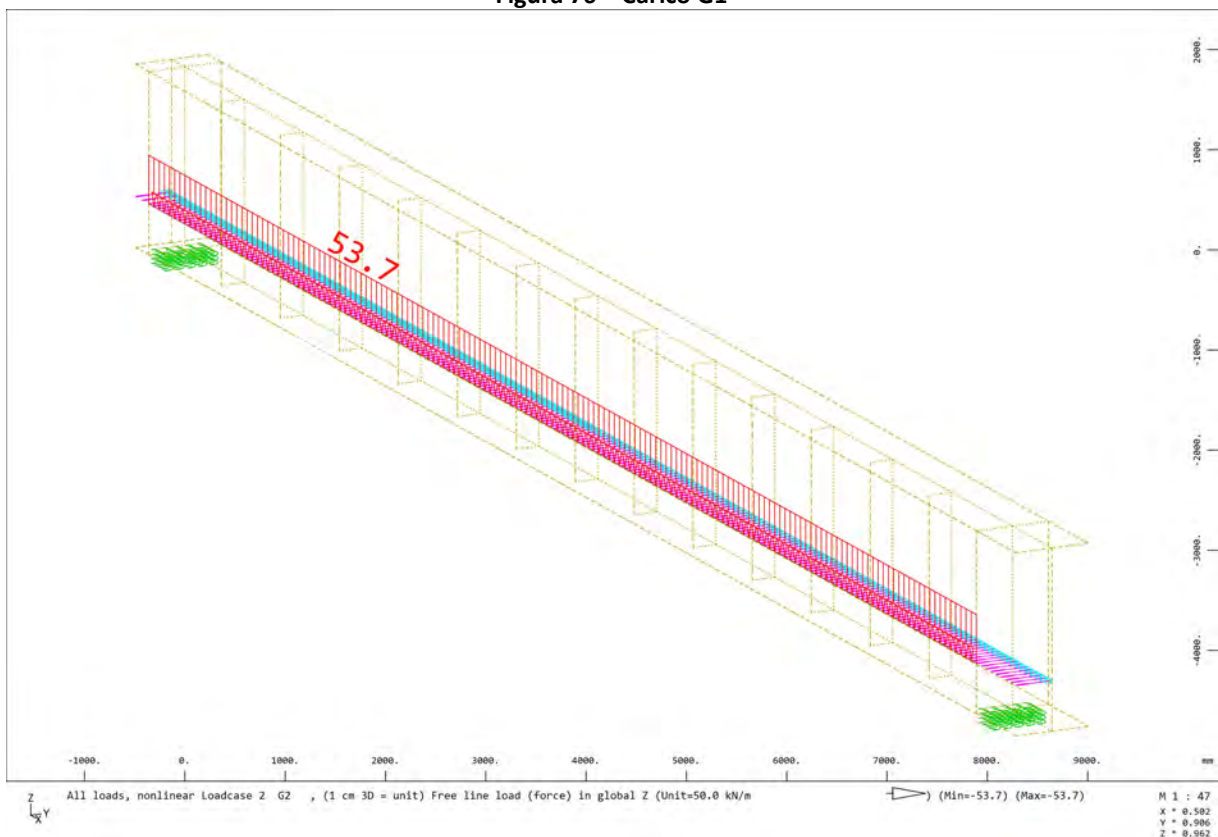


Figura 77 - Carico G2

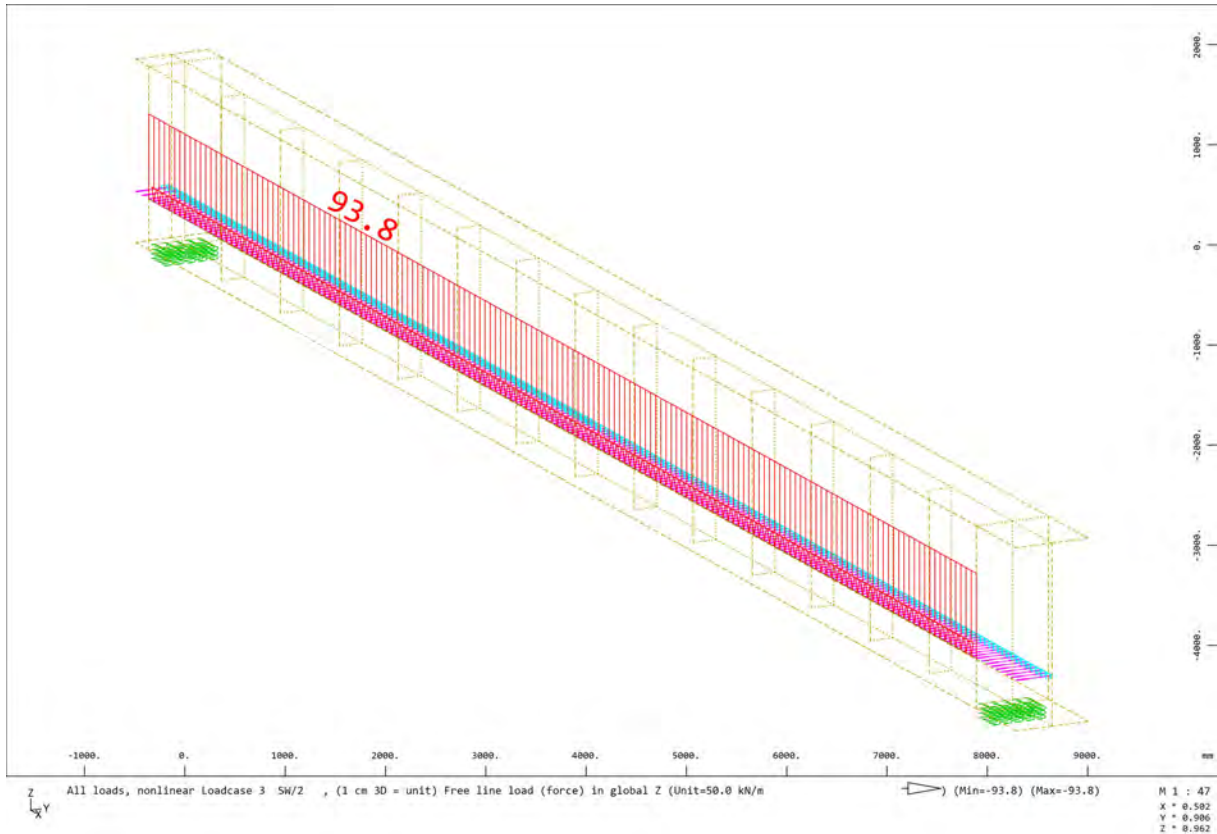


Figura 78 - Carico SW/2

Si riporta di seguito la prima deformata critica per instabilità flesso-torsionale corrispondente ad un moltiplicatore dei carichi, amplificati quest'ultimi allo SLU, pari a $\lambda = 6.77$. La verifica risulta dunque soddisfatta.

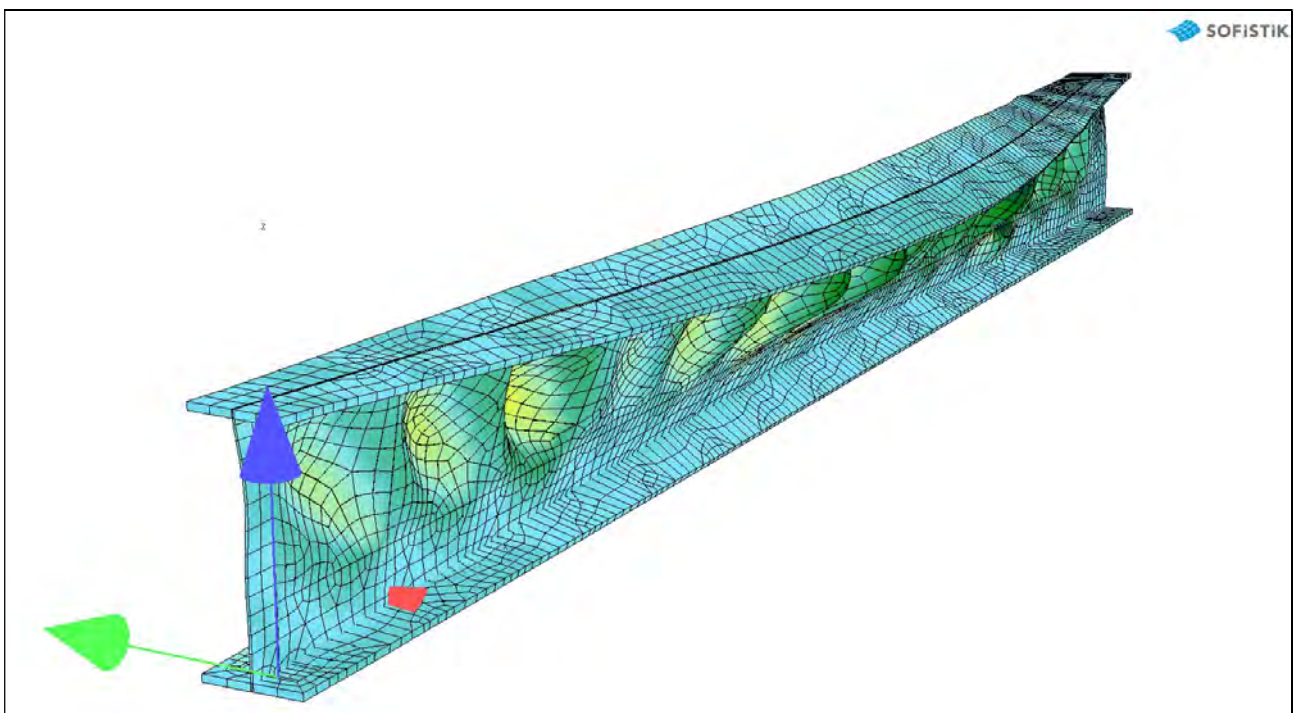


Figura 79 – Deformata critica per instabilità flesso-torsionale ottenuta dall'analisi di buckling - $\lambda = 6.77$

10.3.2. Traversi intermedi

Si riportano, nel presente paragrafo, i risultati delle verifiche allo Stato Limite Ultimo effettuate per i traversi intermedi.

Per le caratteristiche statiche delle sezioni riferirsi al paragrafo 7.1.2.

Per le combinazioni di carico adottate riferirsi al paragrafo 9.1.

Per le caratteristiche di sollecitazione dei carichi elementari in combinazione riferirsi al paragrafo 10.2

Per il coefficiente di incremento dinamico dei carichi da traffico, adottato per tali elementi strutturali, riferirsi al paragrafo 8.3.2.

La seguente immagine mostra le caratteristiche di sollecitazione allo SLU per le seguenti grandezze principali:

- M_y , momento flettente rispetto all'asse forte;
- V_z , taglio in direzione verticale.

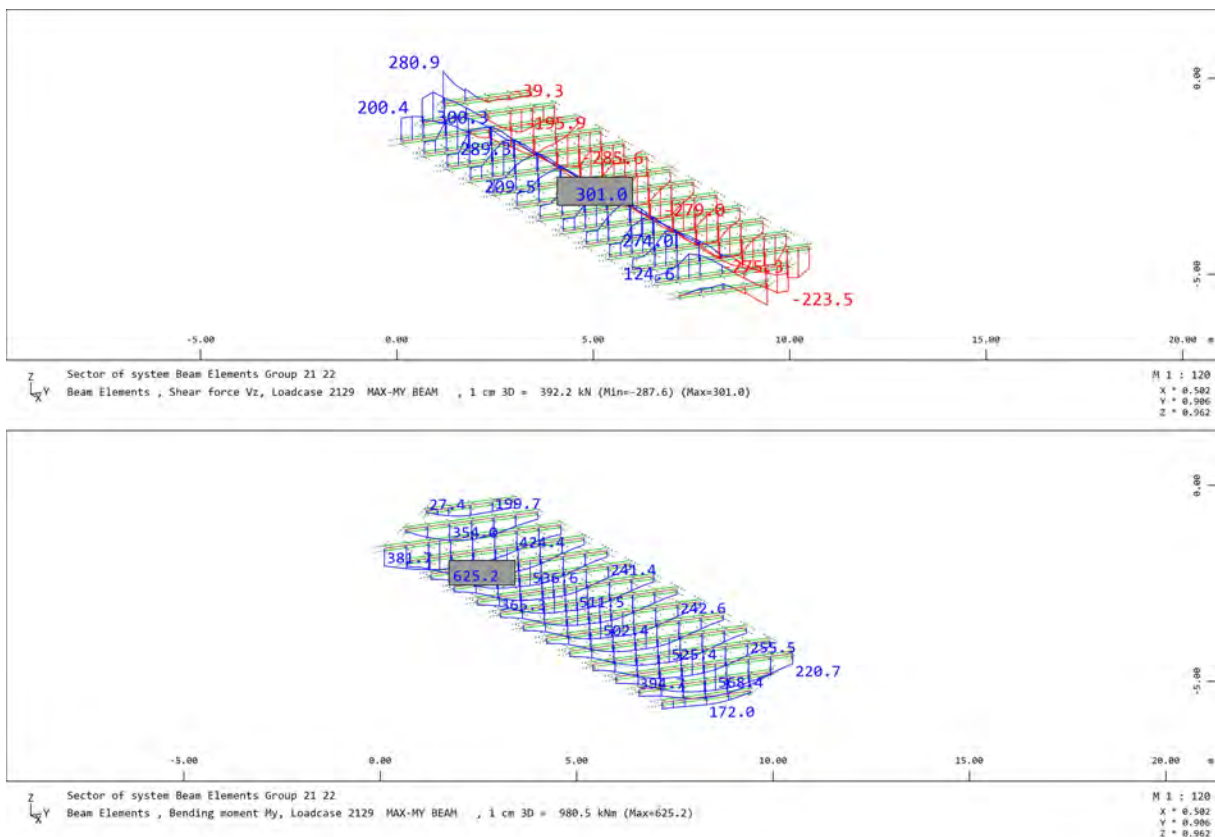


Figura 80 - Diagrammi di sollecitazione allo SLU (V_z , M_y)

La seguente immagine mostra le tensioni di Von Mises per le parti d'anima e le flange costituenti i traversi intermedi.

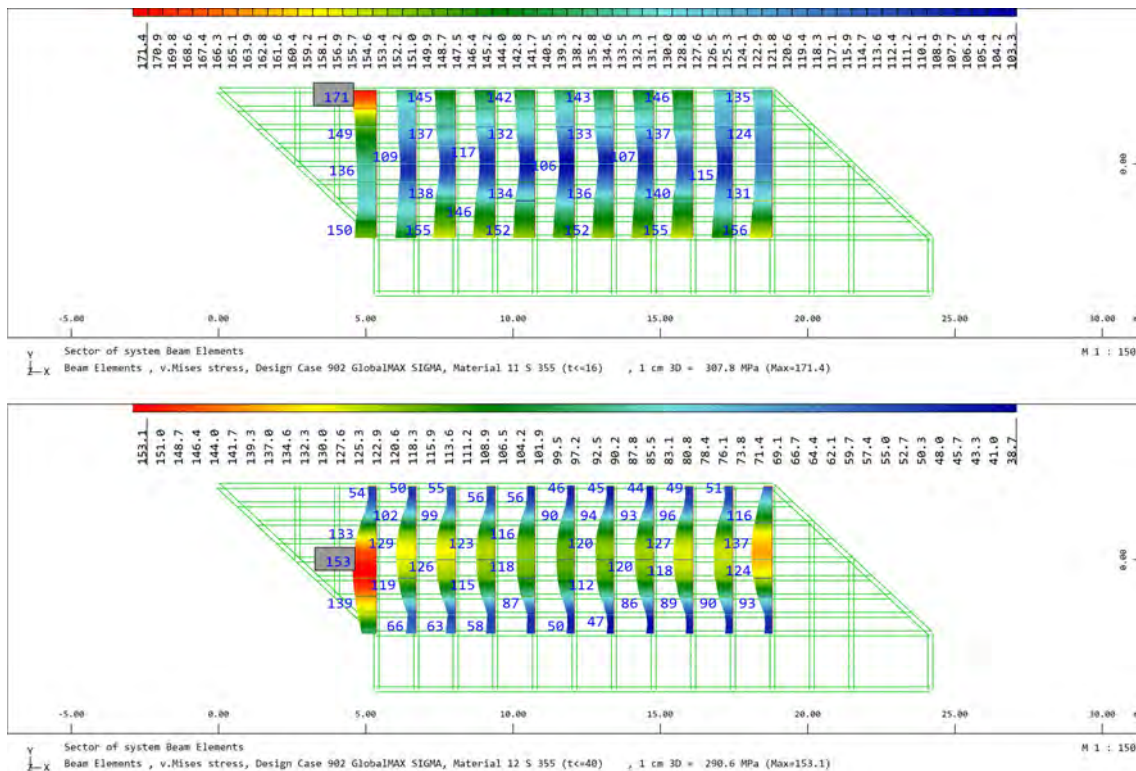


Figura 81 - Tensioni MAX di Von Mises (in alto per le anime, in basso per le flange)

La seguente immagine mostra il coefficiente di utilizzo delle sezioni appartenenti alla categoria dei traversi intermedi.

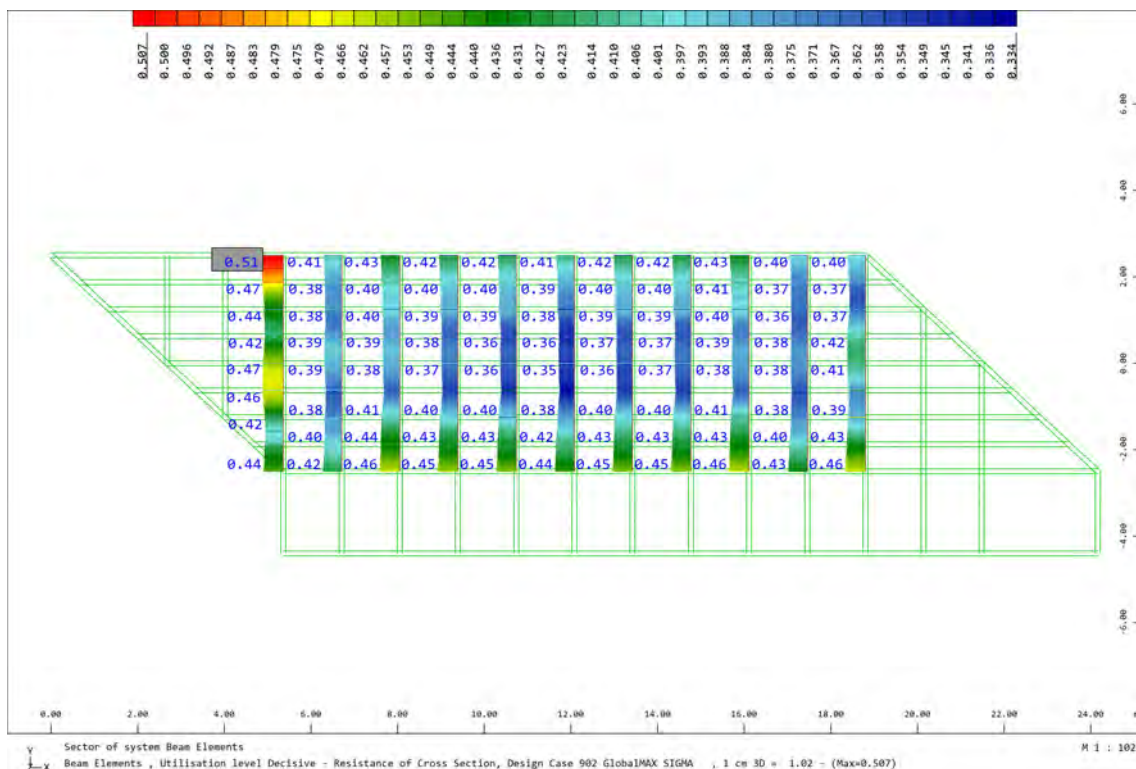


Figura 82 - Massimo coefficiente di utilizzo delle sezioni

Poiché il tasso di utilizzo è minore dell'unità le verifiche risultano soddisfatte.

10.3.3. Traversi intermedi di lunghezza variabile e traversi di estremità

Si riportano, nel presente paragrafo, i risultati delle verifiche allo Stato Limite Ultimo effettuate per i traversi intermedi di lunghezza variabile e i traversi di estremità.

Per le caratteristiche statiche delle sezioni riferirsi al paragrafo 7.1.2.

Per le combinazioni di carico adottate riferirsi al paragrafo 9.1.

Per le caratteristiche di sollecitazione dei carichi elementari in combinazione riferirsi al paragrafo 10.2

Per il coefficiente di incremento dinamico dei carichi da traffico, adottato per tali elementi strutturali, riferirsi al paragrafo 8.3.2.

La seguente immagine mostra le caratteristiche di sollecitazione allo SLU per le seguenti grandezze principali:

- M_y , momento flettente rispetto all'asse forte;
- V_z , taglio in direzione verticale.

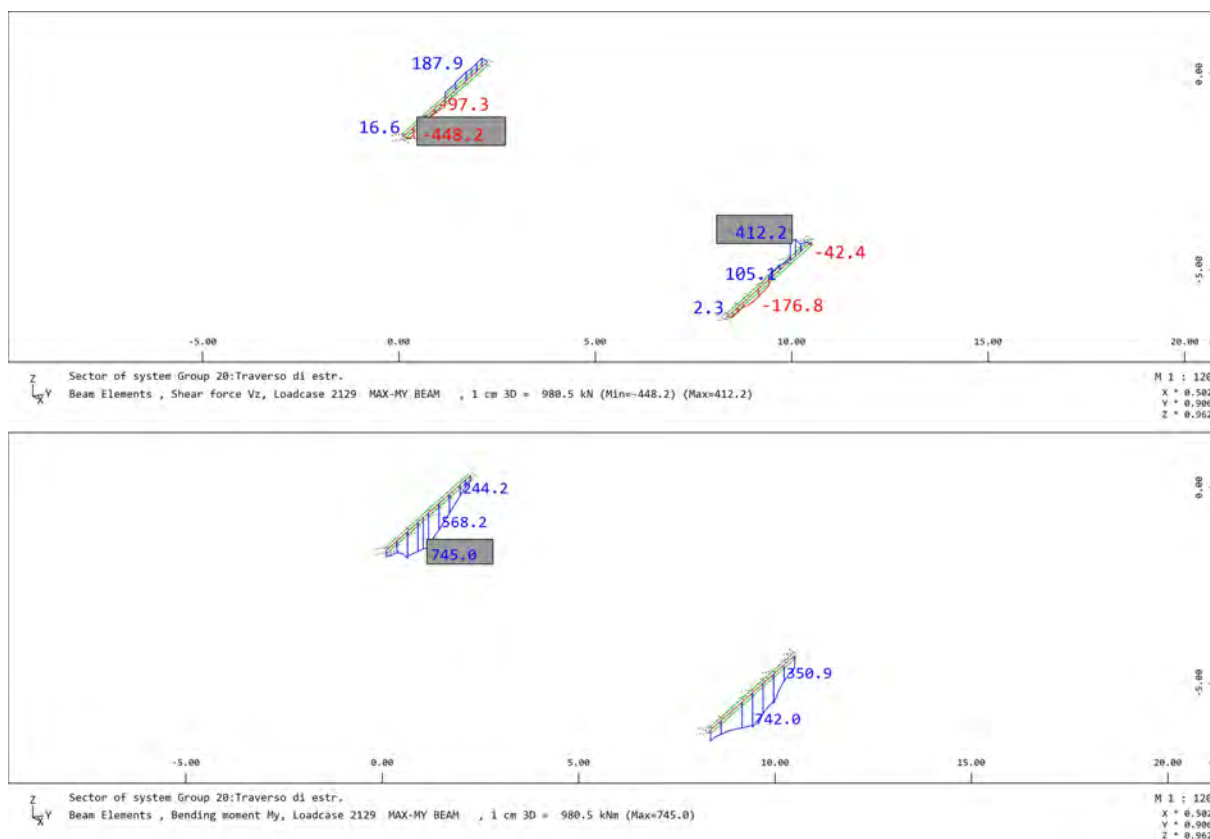


Figura 83 - Diagrammi di sollecitazione allo SLU (V_z , M_y)

La seguente immagine mostra le tensioni di Von Mises per le parti d'anima e le flange costituenti gli elementi strutturali sopracitati.

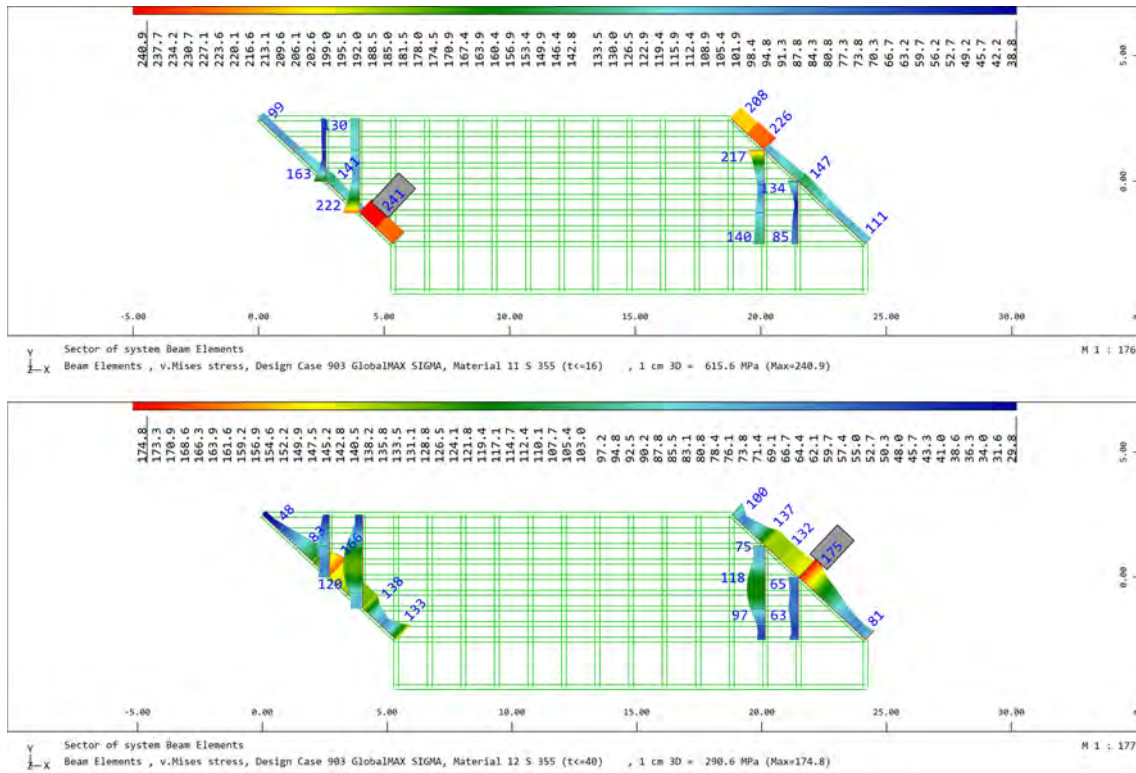


Figura 84 - Tensioni MAX di Von Mises (in alto per le anime, in basso per le flange)

La seguente immagine mostra il coefficiente di utilizzo delle sezioni appartenenti alla categoria dei traversi intermedi di lunghezza variabile e dei traversi di estremità.

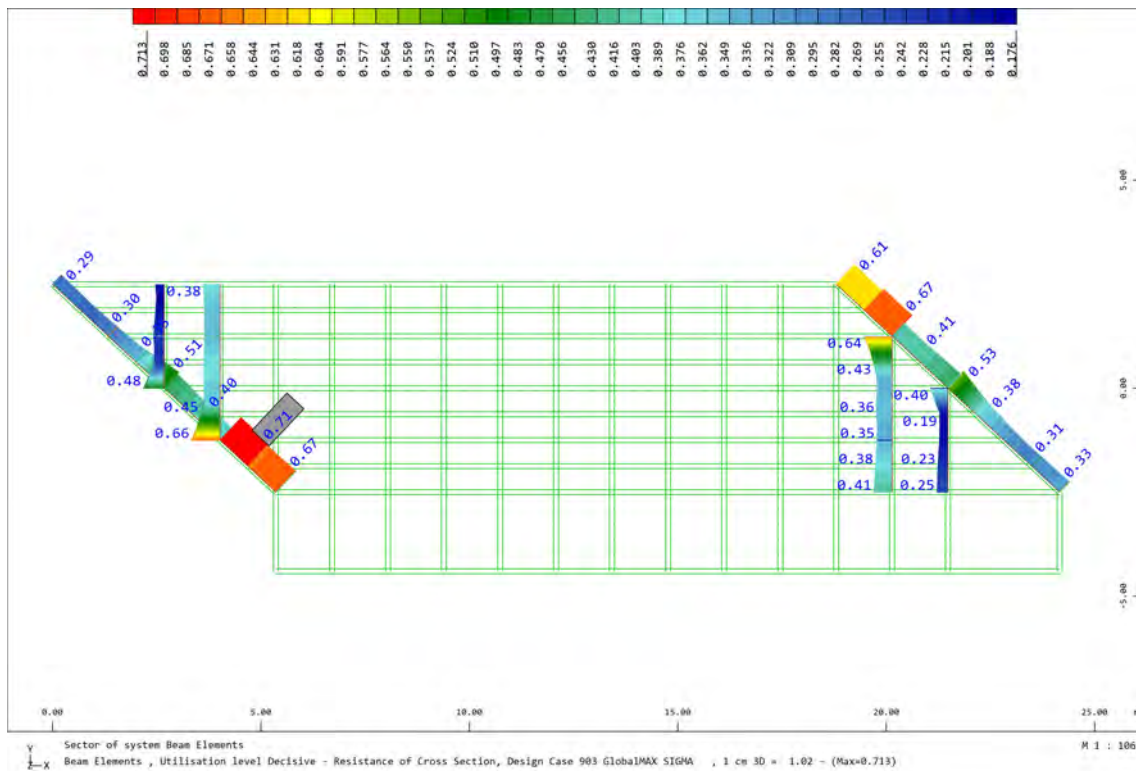


Figura 85 - Massimo coefficiente di utilizzo delle sezioni

Poiché il tasso di utilizzo è minore dell'unità le verifiche risultano soddisfatte.

10.3.4. Irrigidimenti longitudinali

Si riportano, nel presente paragrafo, i risultati delle verifiche allo Stato Limite Ultimo effettuate per gli irrigidimenti longitudinali.

Per le caratteristiche statiche delle sezioni riferirsi al paragrafo 7.1.2.

Per le combinazioni di carico adottate riferirsi al paragrafo 9.1.

Per le caratteristiche di sollecitazione dei carichi elementari in combinazione riferirsi al paragrafo 10.2.

Per il coefficiente di incremento dinamico dei carichi da traffico, adottato per tali elementi strutturali, riferirsi al paragrafo 8.3.2.

La seguente immagine mostra le caratteristiche di sollecitazione allo SLU per le seguenti grandezze principali:

- M_y , momento flettente rispetto all'asse forte;
- V_z , taglio in direzione verticale.

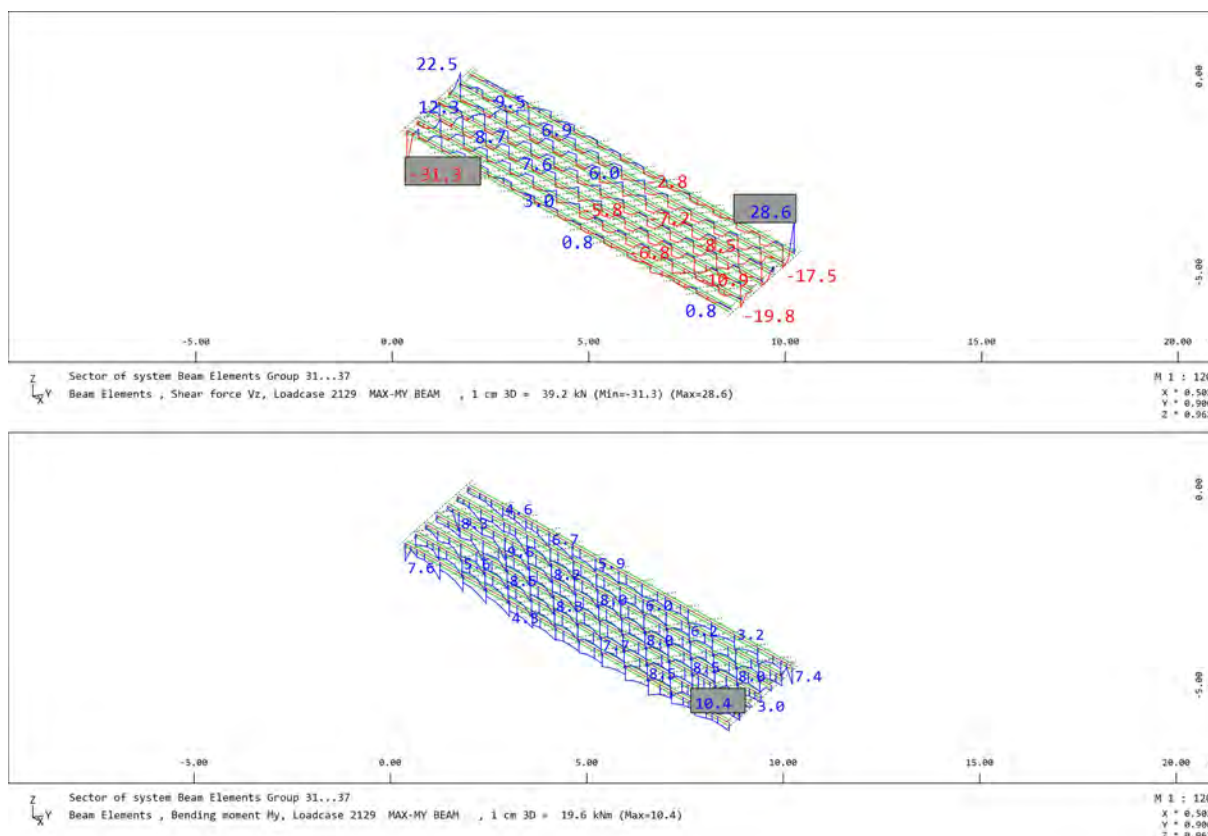


Figura 86 - Diagrammi di sollecitazione allo SLU (V_z , M_y)

La seguente immagine mostra le tensioni di Von Mises degli irrigidimenti.

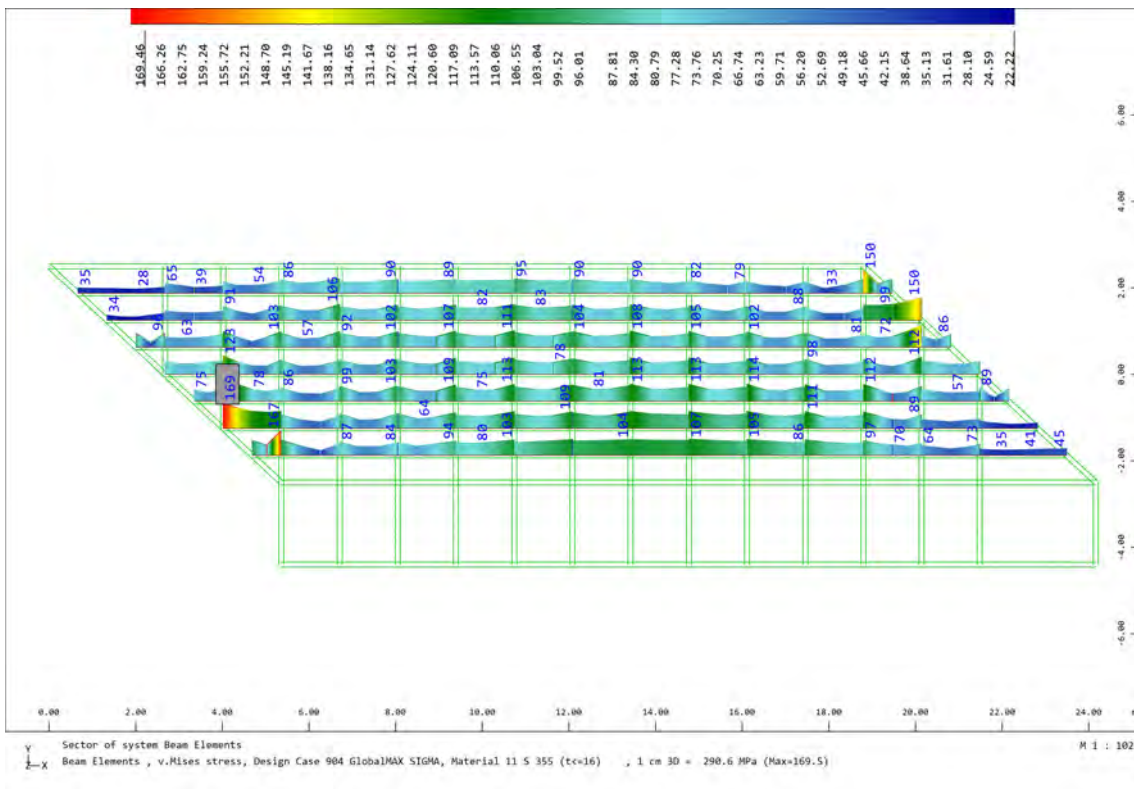


Figura 87- Tensioni MAX di Von Mises

La seguente immagine mostra il coefficiente di utilizzo delle sezioni appartenenti alla categoria degli irrigidimenti.

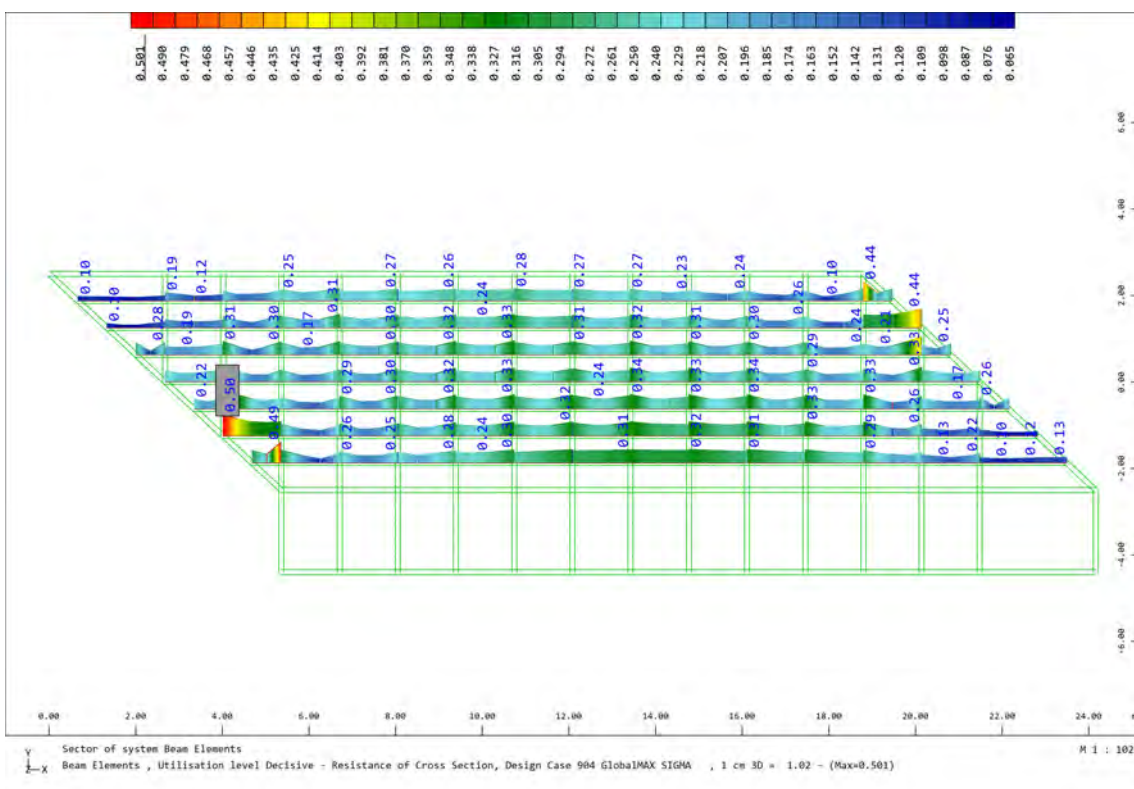


Figura 88 - Massimo coefficiente di utilizzo delle sezioni

Poiché il tasso di utilizzo è minore dell'unità le verifiche risultano soddisfatte.

10.3.5. Travi a sbalzo

Si riportano, nel presente paragrafo, i risultati delle verifiche allo Stato Limite Ultimo effettuate per le travi a sbalzo che sostengono la passerella e le barriere antirumore.

Per le caratteristiche statiche delle sezioni riferirsi al paragrafo 7.1.2.

Per le combinazioni di carico adottate riferirsi al paragrafo 9.1.

Per le caratteristiche di sollecitazione dei carichi elementari in combinazione riferirsi al paragrafo 10.2.

La seguente immagine mostra le caratteristiche di sollecitazione allo SLU per le seguenti grandezze principali:

- M_y , momento flettente rispetto all'asse forte;
- V_z , taglio in direzione verticale.

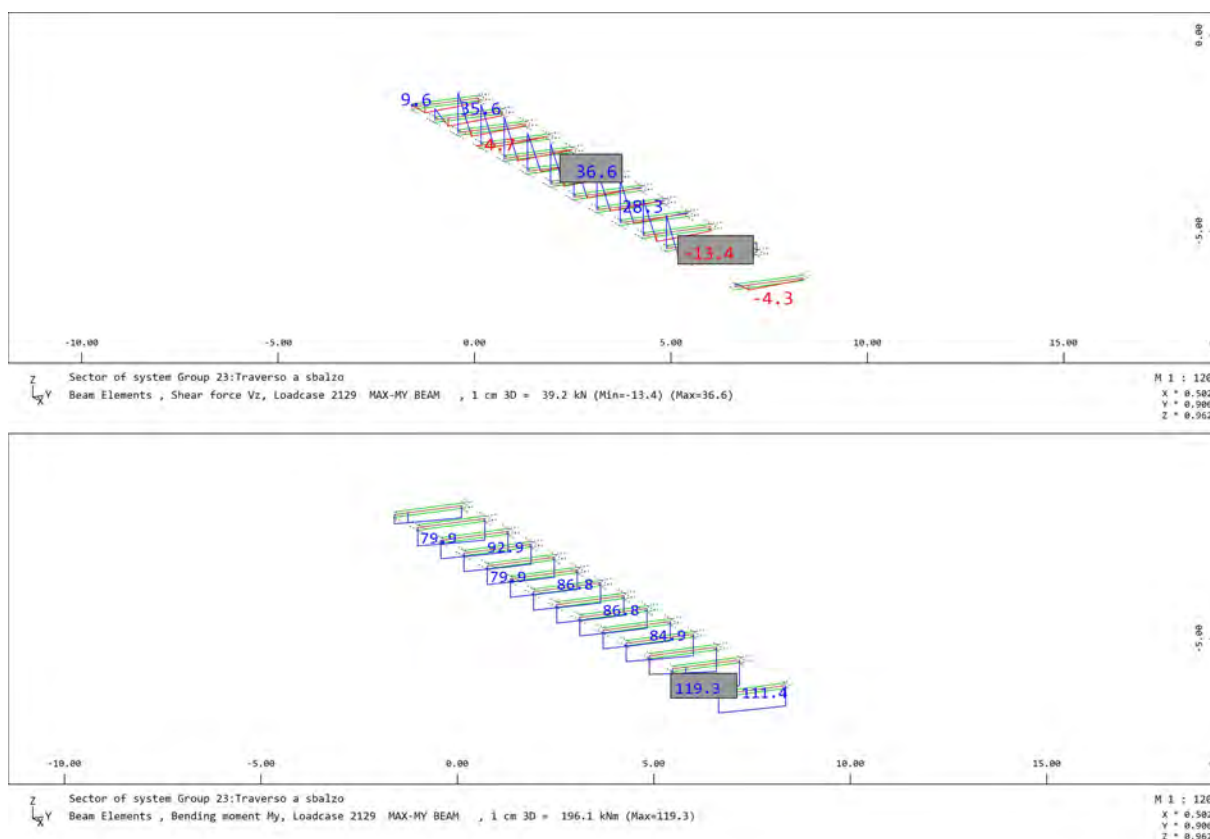


Figura 89 - Diagrammi di sollecitazione allo SLU (V_z , M_y)

Per il coefficiente di incremento dinamico dei carichi da traffico, adottato per tale categoria, riferirsi al paragrafo 8.3.2.

La seguente immagine mostra le tensioni di Von Mises per le parti d'anima e le flange costituenti le travi a sbalzo.

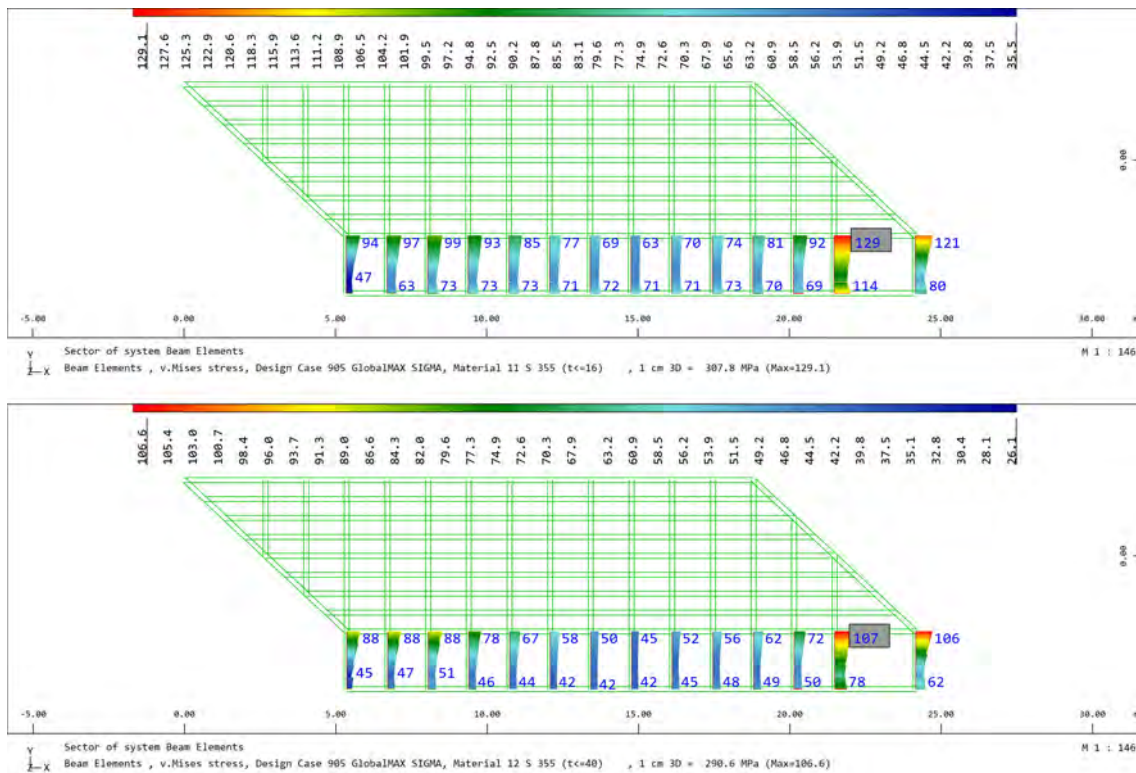


Figura 90 - Tensioni MAX di Von Mises (in alto per le anime, in basso per le flange)

La seguente immagine mostra il coefficiente di utilizzo delle sezioni appartenenti alla categoria delle travi a sbalzo.

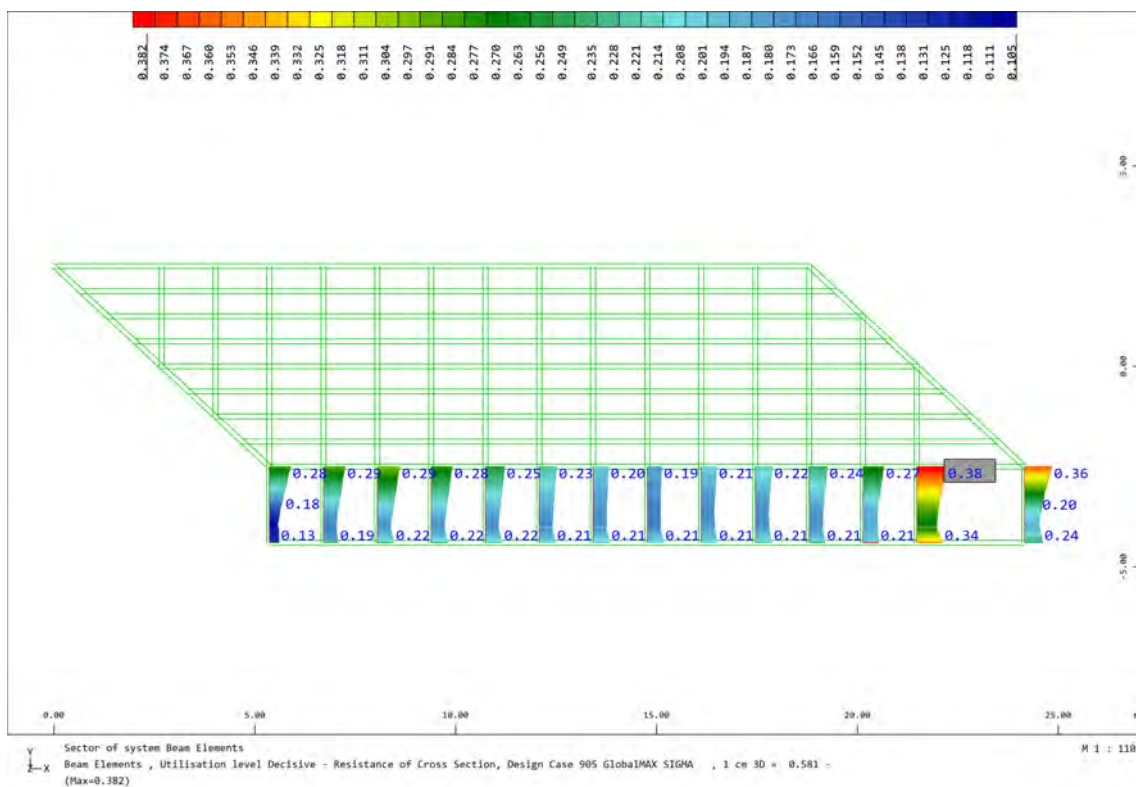


Figura 91 - Massimo coefficiente di utilizzo delle sezioni

Poiché il tasso di utilizzo è minore dell'unità le verifiche risultano soddisfatte.

10.4. Verifiche sismiche allo SLV

Dal momento che le sollecitazioni derivanti dalle combinazioni allo Stato Limite di Salvaguardia della Vita (SLV) risultano meno gravose dello Stato Limite Ultimo (SLU), si omettono le verifiche per quest'ultime combinazioni di carico.

Al fine di confrontare le sollecitazioni principali (V_z , M_y) derivanti dallo SLV con quelle derivanti dallo SLU, si riportano nei successivi paragrafi i diagrammi per ogni elemento strutturale.

10.4.1. Travi principali

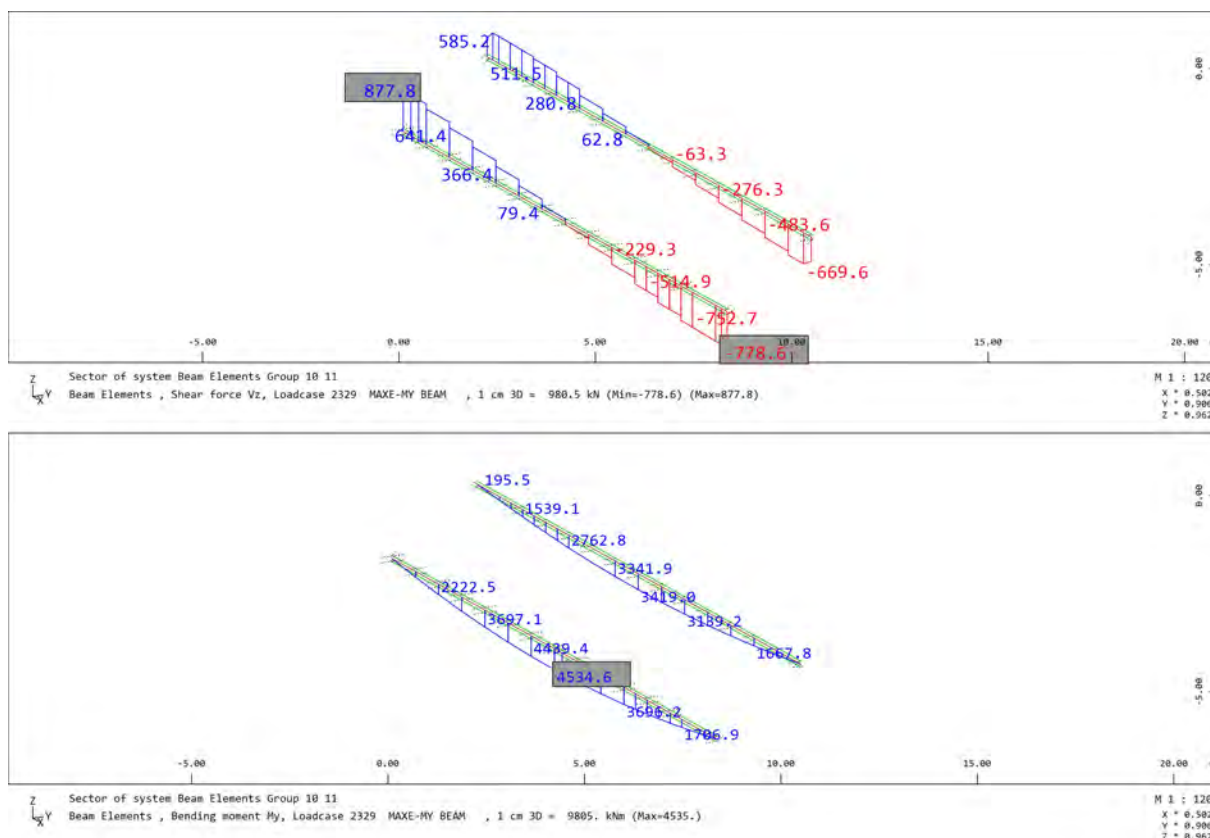


Figura 92 - Diagrammi di sollecitazione allo SLV (V_z , M_y)

10.4.2. Traversi intermedi

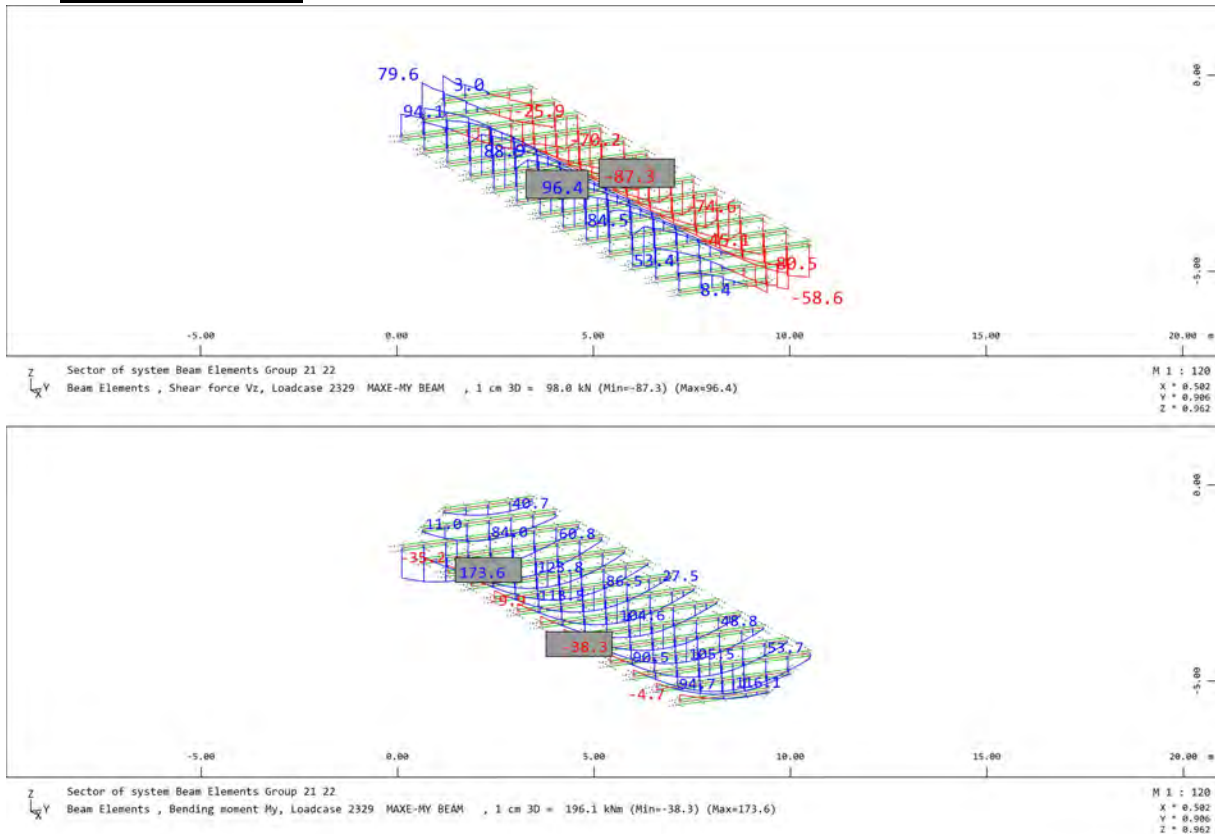


Figura 93 - Diagrammi di sollecitazione allo SLV (V_z , M_y)

10.4.3. Traversi intermedi di lunghezza variabile e traversi di estremità

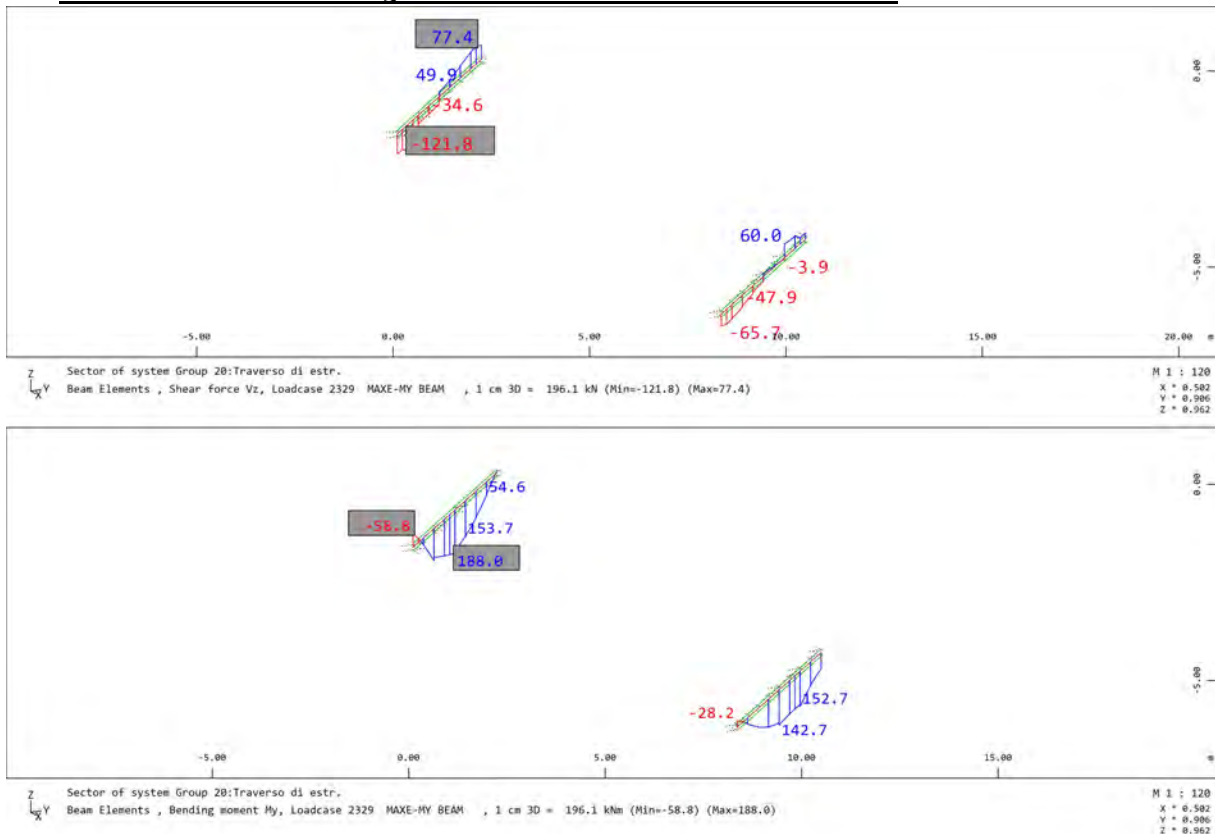


Figura 94 - Diagrammi di sollecitazione allo SLV (V_z , M_y)

10.4.4. Irrigidimenti longitudinali

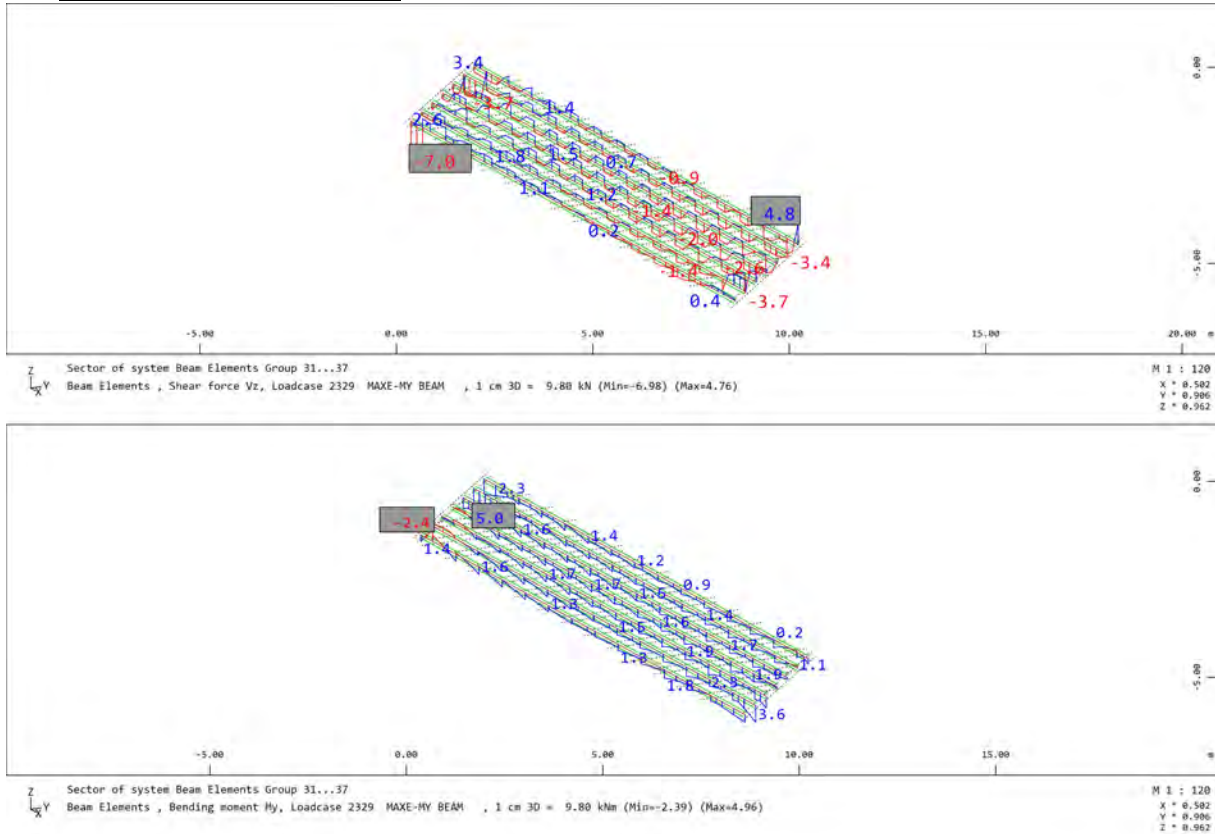


Figura 95 - Diagrammi di sollecitazione allo SLV (V_z , M_y)

10.4.5. Travi a sbalzo

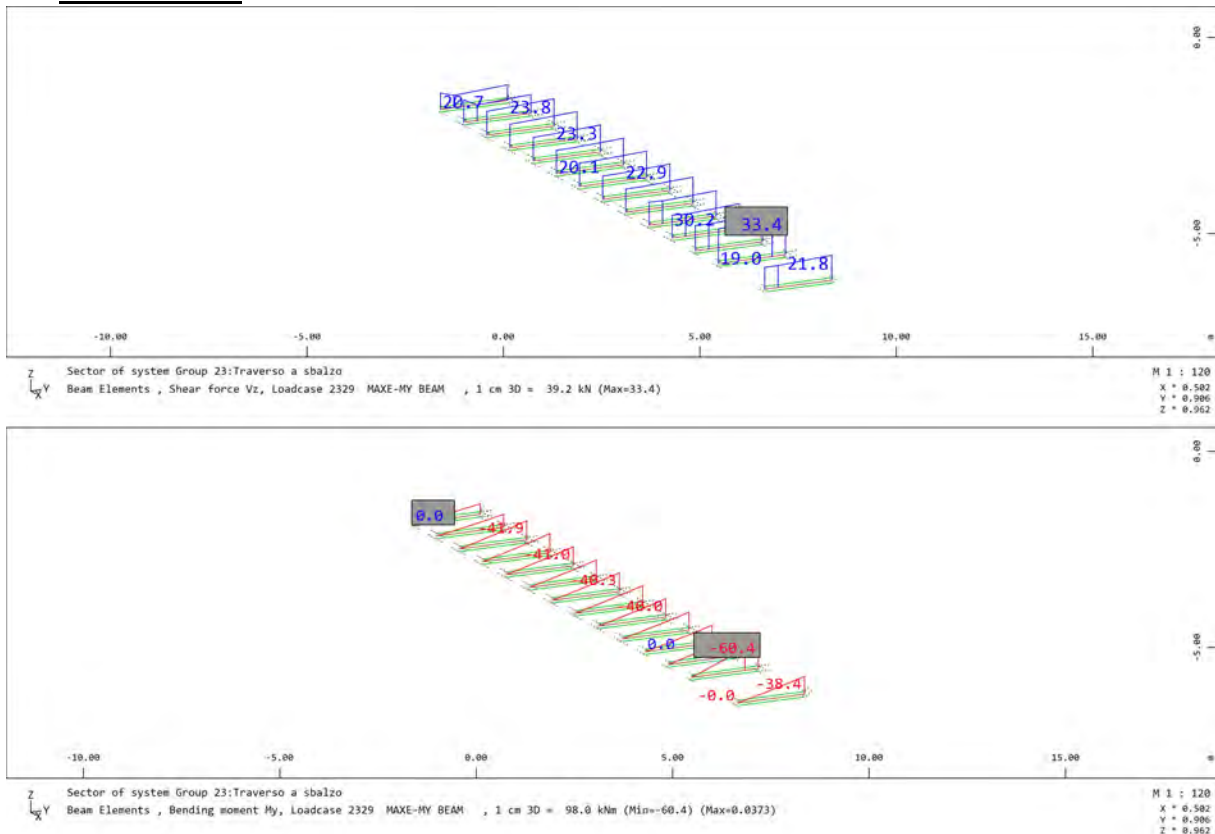


Figura 96 - Diagrammi di sollecitazione allo SLV (V_z , M_y)

10.5. Verifiche agli SLE

In accordo al par. 2.5.1.8.3.2.2 del manuale di progettazione di RFI (8), “eccessive deformazioni e/o vibrazioni del ponte possono indurre inaccettabili variazioni di geometria al binario. Queste possono avere ripercussioni sui convogli ferroviari e ridurre il comfort ai passeggeri”.

Nei paragrafi successivi si riportano la valutazione e quindi la verifica dei parametri di deformazione dell’impalcato, utilizzando, come indicato nel paragrafo citato, la combinazione caratteristica (rara) degli SLE.

10.5.1. Accelerazione verticale dell’impalcato

Nel caso in esame, la velocità di percorrenza della linea è inferiore a 220 Km/h e la frequenza propria della struttura è compresa nei limiti descritti al par. 8.3.2. Per evitare il rischio di deformazioni eccessive è sufficiente quindi verificare il rispetto dei limiti sulla freccia verticale analizzato di seguito (8).

10.5.2. Torsione dell’impalcato

La valutazione dello sghembo ammissibile è stata condotta considerando la deformata delle rotaie nel piano verticale, soggette al passaggio di un treno di carico tipo LM71 incrementato con il corrispondente coefficiente dinamico.

In particolare, Il treno di carico LM71 è stato amplificato per il coefficiente di incremento dinamico corrispondente ai traversi intermedi (v. par. 8.3.2.1).

Per la geometria dell’impalcato, avente un angolo di inclinazione rispetto all’asse longitudinale pari a 43°, la valutazione dello sghembo risulta più penalizzante in corrispondenza dell’asse trasversale passante per gli appoggi B e C, indicati nelle seguenti figure:

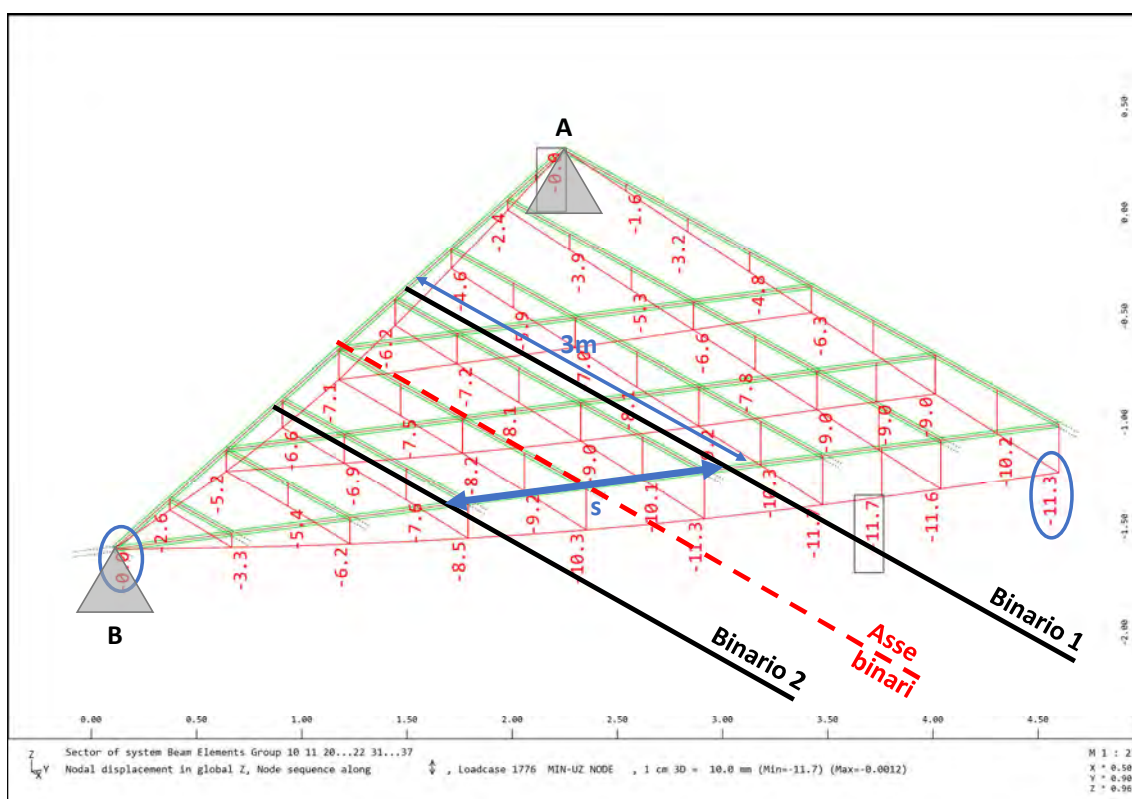


Figura 97 -Spostamenti per verifica dello sghembo ammissibile in prossimità degli appoggi A-B

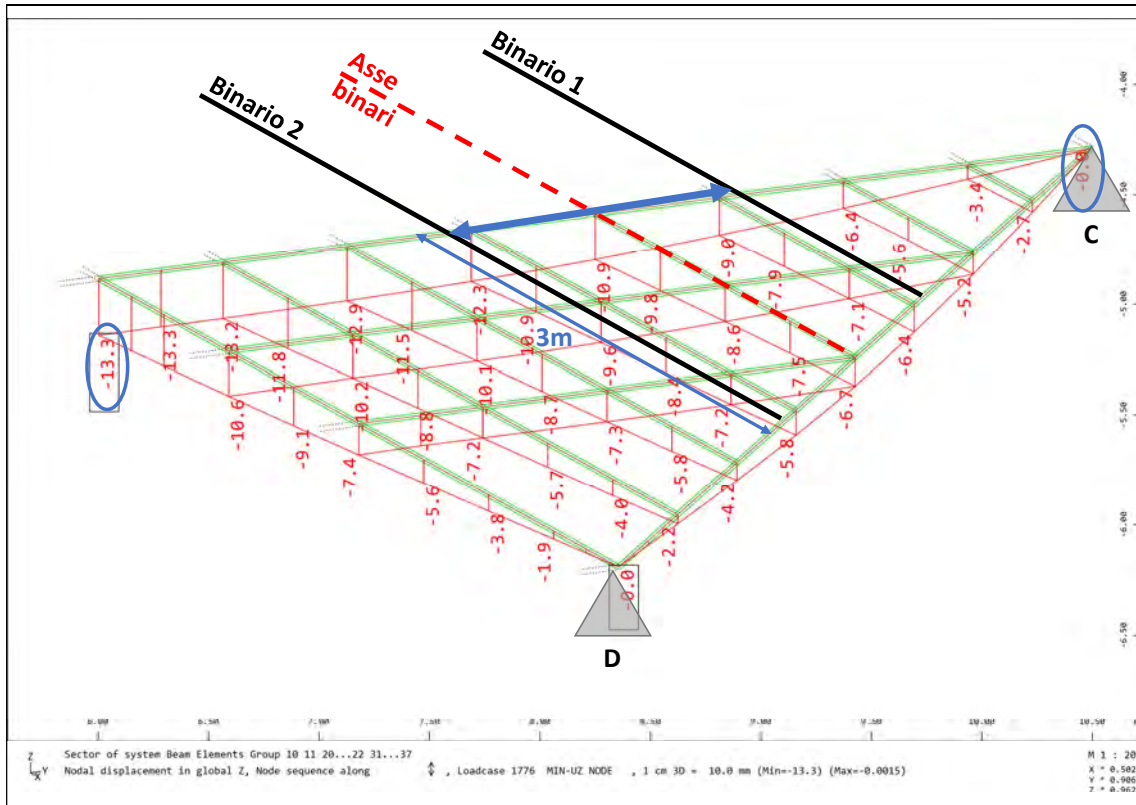


Figura 98 - Spostamenti per verifica dello sghembo ammissibile in prossimità degli appoggi C-D

Si riporta quindi la verifica della torsione dell'impalcato nella zona di estremità dal lato degli appoggi C-D, risultando da questo lato maggiormente sfavorevole.

Stati limite di esercizio per la sicurezza del traffico ferroviario
§ 5.2.3.2.2.1 NTC18 - § 2.5.1.8.3.2.2 MDP RFI 2021

Calcolo deformazioni torsionali dell'impalcato

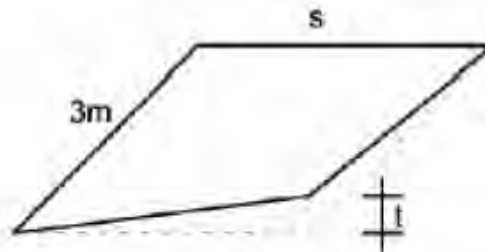


Fig. 5.2.14 - Sghembo ammissibile

$i_{TP} = 5 \text{ m}$	interasse travi principali
$s = 1.435 \text{ m}$	scartamento
$\delta_1 = 13.3 \text{ mm}$	spostamento verticale della trave 1
$\delta_2 = 0 \text{ mm}$	spostamento verticale della trave 2
$\theta = \frac{\delta_1 - \delta_2}{i_{TP}} = 0.003$	quota parte della rotazione trasversale dell'impalcato dovuta alla sola torsione
$t = \theta \cdot s = 3.817 \text{ mm}$	sghembo di progetto misurato su una lunghezza di 3m

Verifica deformazioni torsionali dell'impalcato

$t_{lim} = 4.5 \text{ mm}$	massimo sghembo, misurato su una lunghezza di 3m
if ($t < t_{lim}$, "verificato", "non verificato") = "verificato"	

10.5.3. Inflessione dell'impalcato nel piano orizzontale

L'inflessione dell'impalcato nel piano orizzontale deve essere valutata considerando gli effetti prodotti dal modello relativo al treno di carico LM 71, dall'azione del vento, dal serpeggio e dalla forza centrifuga (ove presente), nonché agli effetti prodotti da una variazione termica lineare pari a $\pm 10^{\circ}\text{C}$ fra i due lati dell'impalcato (11).

In particolare, il treno di carico LM71 è stato amplificato per il coefficiente di incremento dinamico corrispondente alle travi principali (v. par. 8.3.2.1).

Dal momento che la velocità di percorrenza della linea è inferiore a 120 Km/h si farà riferimento ai seguenti valori in tabella:

Tab. 5.2.VIII - Massima variazione angolare e minimo raggio di curvatura

Velocità [km/h]	Variazione Angolare massima	Raggio minimo di curvatura	
		Singola campata	Più campate
$V \leq 120$	0,0035 rd	1700 m	3500 m
$120 < V \leq 200$	0,0020 rd	6000 m	9500 m
$200 < V$	0,0015 rd	14000 m	17500 m

Nelle figure successive si riportano i valori di massimo e minimo in termini di variazione angolare e spostamento nel piano orizzontale, in direzione trasversale, ottenuti dal modello di calcolo.

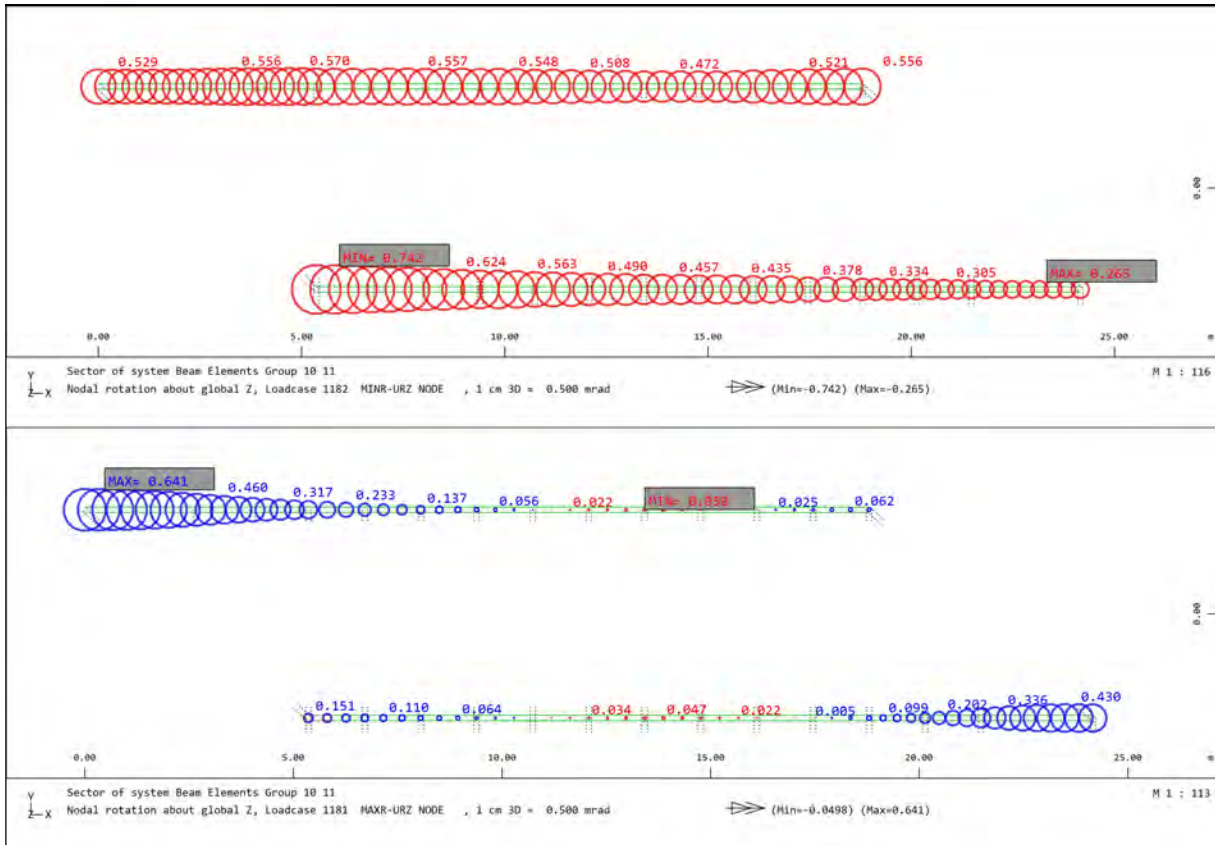


Figura 99 – Minime e massime rotazioni rispetto all’asse verticale Z

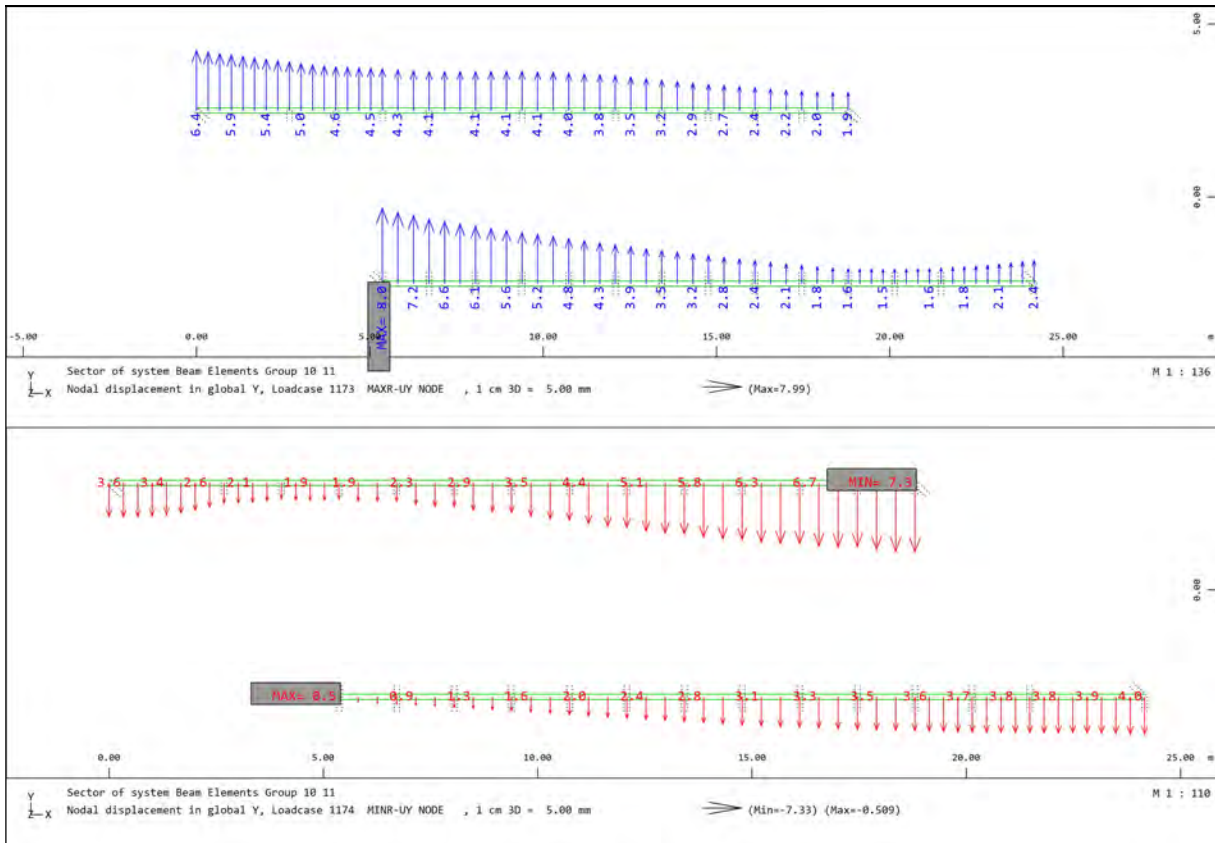


Figura 100 - Minimi e massimi spostamenti in direzione trasversale

A partire dai valori ottenuti dal modello numerico, si riporta la verifica nel successivo tabulato di calcolo:

Stati limite di esercizio per la sicurezza del traffico ferroviario	
§ 5.2.3.2.2.1 NTC18 - § 2.5.1.8.3.2.2 MDP RFI 2021	
Inflessione dell'impalcato nel piano orizzontale	
$r := \frac{0.742}{1000} \cdot rad = 7.4 \cdot 10^{-4}$	massima rotazione all'appoggio ricavata dal modello numerico
$r_{lim} := 0.0035 \text{ rad}$	variazione angolare massima per velocità di progetto (V) < di 120 km/h
if ($r < r_{lim}$, "verificato", "non verificato") = "verificato"	
$l_{tp} := 18.8 \text{ m}$	luce di calcolo della trave principale in semplice appoggio
$R_{min} := 1700 \text{ m}$	raggio minimo di curvatura per singola campata
$\delta_{amm.h} := \frac{l_{tp}^2}{8 \cdot R_{min}} = 26 \text{ mm}$	freccia orizzontale ammissibile per velocità di progetto (V) < di 120 km/h

Dal momento che la freccia orizzontale ammissibile è maggiore dei massimi e minimi spostamenti ricavati dal modello numerico, la verifica risulta soddisfatta.

10.5.4. Inflessione dell'impalcato nel piano verticale

Considerando la presenza dei treni di carico LM71, SW/2, incrementati con il corrispondente coefficiente dinamico, il massimo valore di inflessione per effetto di tali carichi ferroviari non deve eccedere il valore di L/600. In particolare, per ciascun elemento strutturale, si ottiene:

- Per le travi principali (luce di calcolo pari a 18.8m) lo spostamento limite deve essere pari a **31mm**
- Per i traversi intermedi (luce di calcolo pari a 5.0m) lo spostamento limite deve essere pari a **8mm**
- Per i traversi di estremità (luce di calcolo pari a 7.3m) lo spostamento limite deve essere pari a **12mm**

Si riportano di seguito i massimi valori degli spostamenti verticali ottenuti dal modello numerico per la combinazione SLE RARA.

Nella valutazione degli spostamenti massimi, sono stati considerati i coefficienti di incremento dinamico corrispondenti all'elemento strutturale oggetto di verifica (v. par. 8.3.2.1).

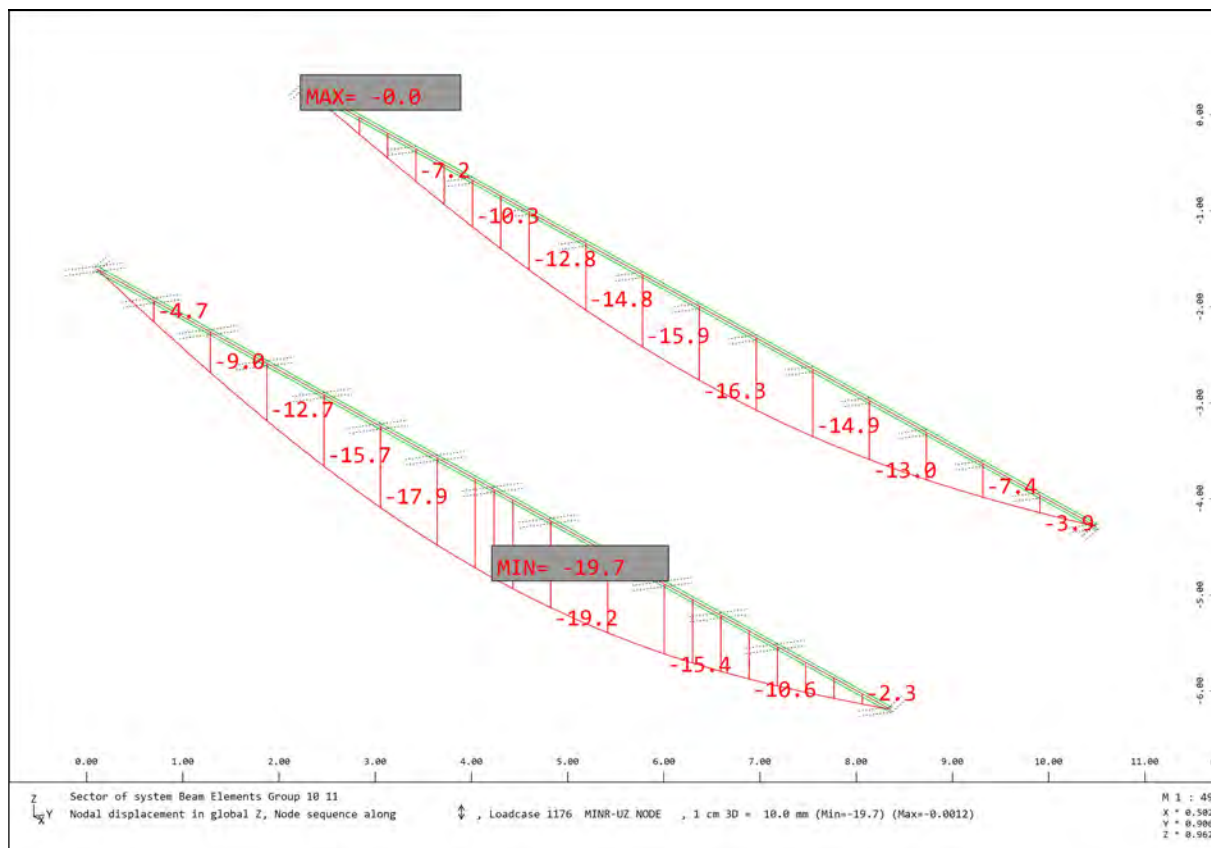


Figura 101 – Spostamenti verticali in combinazione SLE RARA per le travi principali

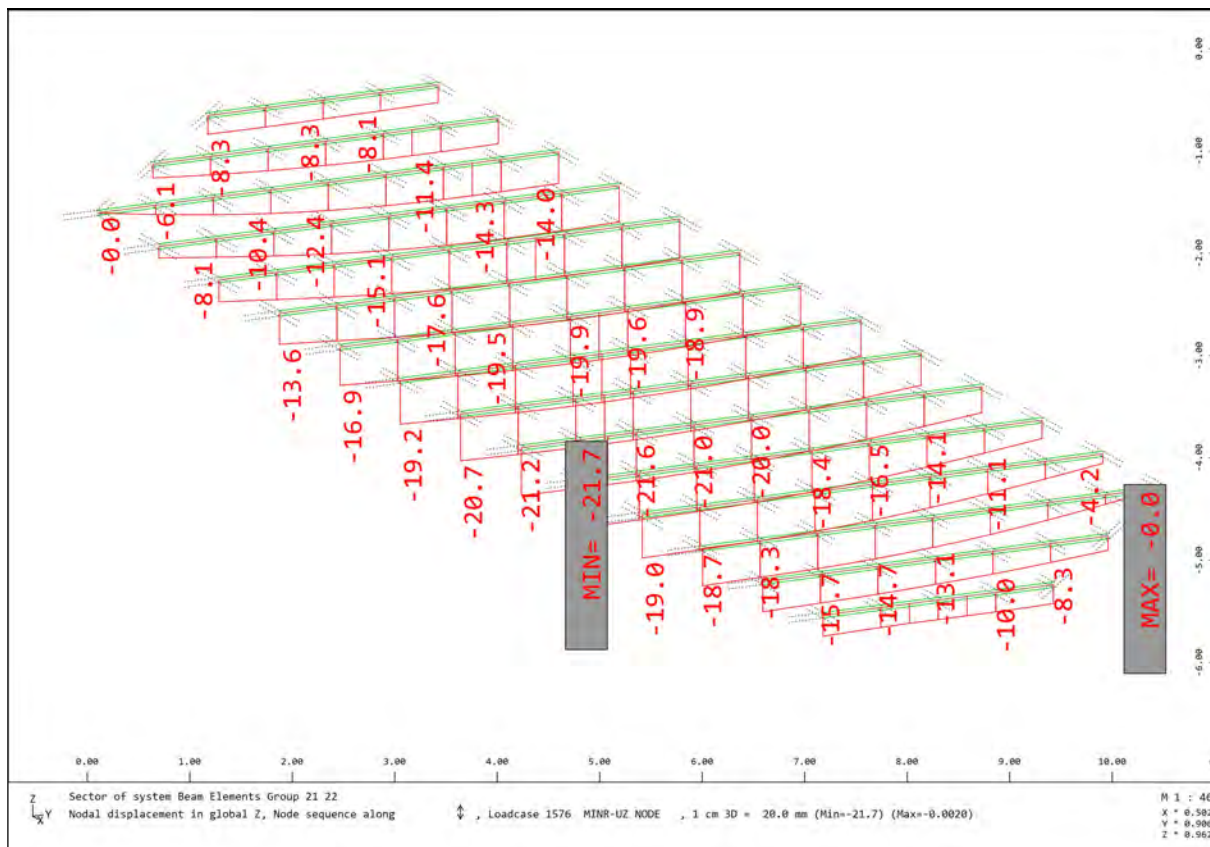


Figura 102 -- Spostamenti verticali in combinazione SLE RARA per i traversi principali

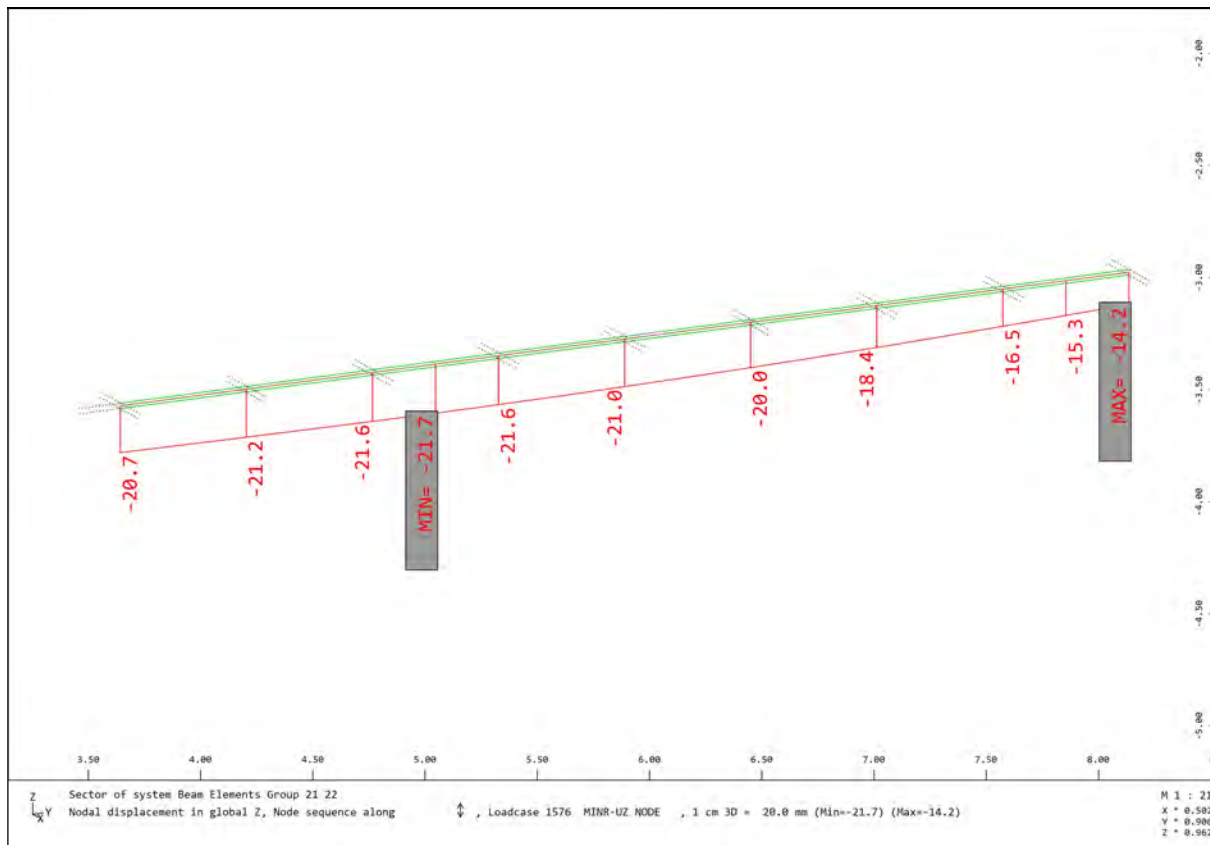


Figura 103 - Spostamenti verticali in combinazione SLE RARA per il traverso maggiormente deformabile

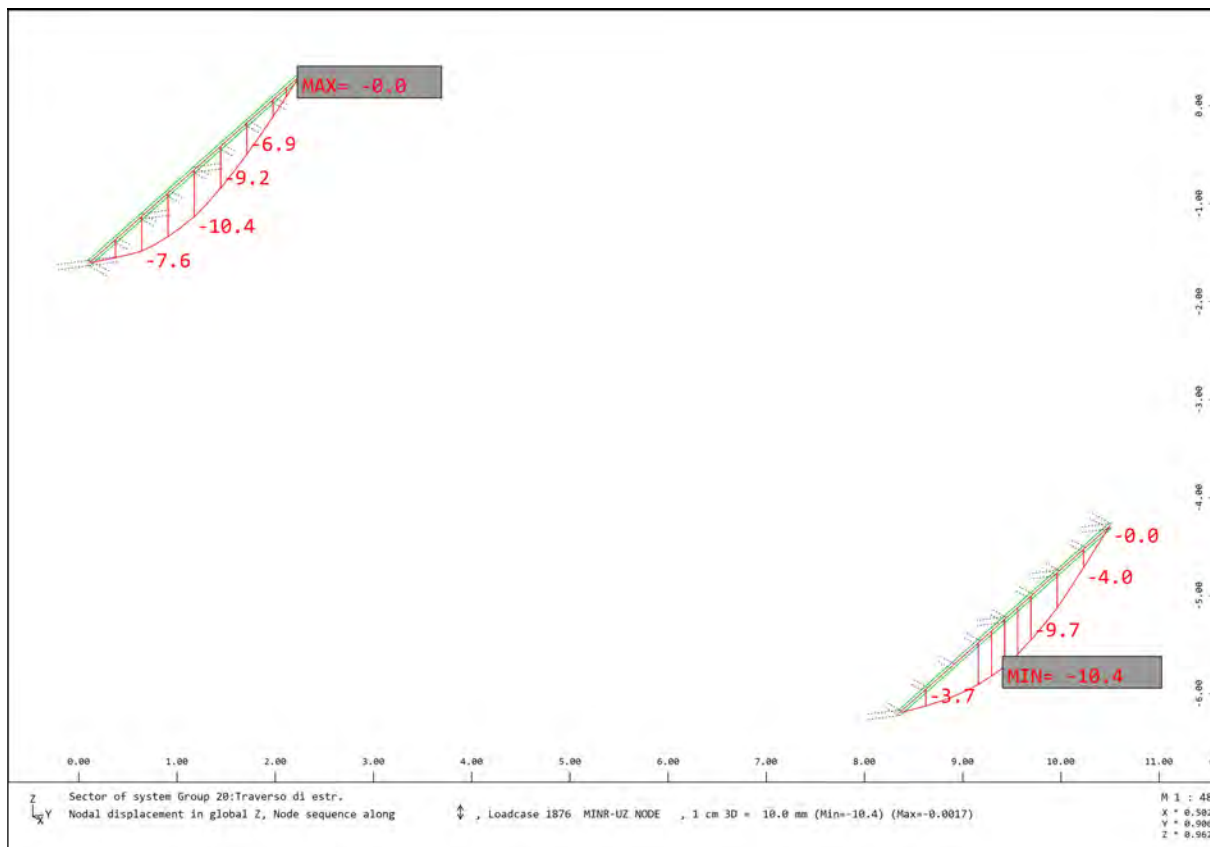


Figura 104 - Spostamenti verticali in combinazione SLE RARA per i traversi di estremità

Per ciascun elemento strutturale si riporta di seguito il controllo dei parametri di deformabilità dell'impalcato.

Stati limite di esercizio per la sicurezza del traffico ferroviario
§ 5.2.3.2.2.1 NTC18 - § 2.5.1.8.3.2.2 MDP RFI 2021

Inflessione dell'impalcato nel piano verticale

Travi principali

$l_{tp} := 18.8 \text{ m}$ luce di calcolo della trave principale

$\delta_{max} := 19.7 \text{ mm}$ spostamento verticale ottenuto dal modello numerico per la combinazione SLE (rara)

$\delta_{lim} := \frac{l_{tp}}{600} = 31.3 \text{ mm}$ spostamento verticale massimo ammissibile

if ($\delta_{max} < \delta_{lim}$, "verificato", "non verificato") = "verificato"

Traversi intermedi

$l_{tr} := 5 \text{ m}$ luce di calcolo della trave principale

$\delta_{T1} := 20.7 \text{ mm}$ spostamento verticale primo estremo

$\delta_{T2} := 14.2 \text{ mm}$ spostamento verticale secondo estremo

$\delta_m := \frac{\delta_{T1} + \delta_{T2}}{2} = 17.5 \text{ mm}$

$\delta_{max, tr} := 21.7 \text{ mm}$ spostamento verticale massimo assoluto ottenuto dal modello numerico per la combinazione SLE (rara)

$\delta_{max} := \delta_{max, tr} - \delta_m = 4.3 \text{ mm}$ spostamento verticale di pura flessione ottenuto dal modello numerico per la combinazione SLE (rara)

$\delta_{lim} := \frac{l_{tr}}{600} = 8.3 \text{ mm}$ spostamento verticale massimo ammissibile

if ($\delta_{max} < \delta_{lim}$, "verificato", "non verificato") = "verificato"

Traversi di estremità

$l_{tr, est} := 7.33 \text{ m}$ luce di calcolo dei traversi intermedi

$\delta_{max} := 10.4 \text{ mm}$ spostamento verticale ottenuto dal modello numerico per la combinazione SLE (rara)

$\delta_{lim} := \frac{l_{tr, est}}{600} = 12.2 \text{ mm}$ spostamento verticale massimo ammissibile

if ($\delta_{max} < \delta_{lim}$, "verificato", "non verificato") = "verificato"

In accordo al par 5.2.3.2.2.1 del manuale di progettazione di RFI (8), per tutte le tipologie di ponti e per qualsiasi velocità lo spostamento orizzontale, conseguente all'inflessione per carichi verticali, del piano di regolamento o di posa del ballast deve risultare non superiore a 8 mm.

Si riporta nell'immagine seguente il massimo spostamento orizzontale concomitante con il massimo spostamento verticale per la combinazione SLE (rara.)

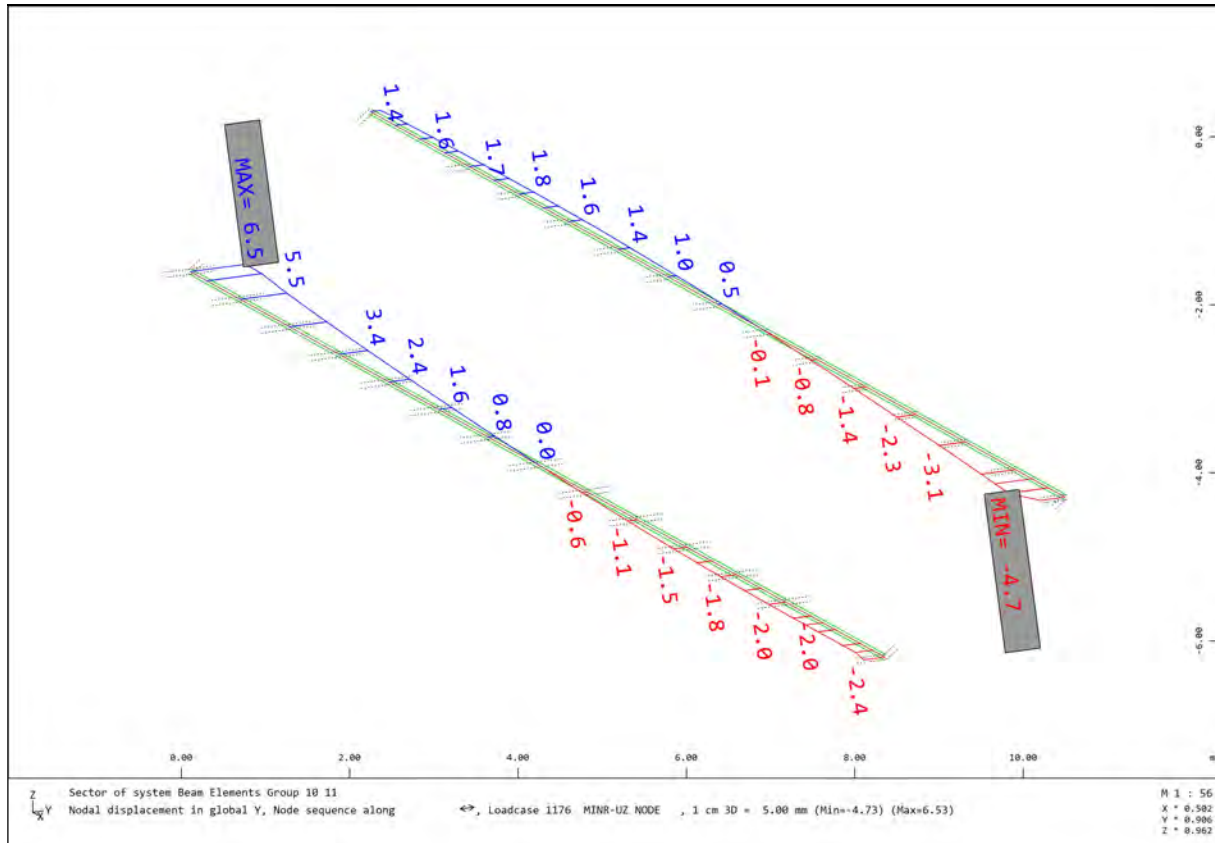


Figura 105 – Spostamenti trasversali nel piano del ferro concomitanti ai massimi spostamenti verticali per la combinazione SLE RARA

Dal momento che tale spostamento orizzontale risulta inferiore a 8mm, la verifica risulta soddisfatta.

10.5.5. Stati limite per il comfort dei passeggeri

In accordo al par 5.2.3.2.2.1 del manuale di progettazione di RFI (8), Il comfort di marcia per i passeggeri è controllato limitando i valori della freccia verticale dei ponti ferroviari in funzione della luce e del numero delle campate consecutive, dello schema statico del ponte e della velocità V di percorrenza del convoglio.

Per il caso in esame valgono le seguenti condizioni per la definizione del valore limite di deformabilità:

- Ponte a singola luce (L = 18.8m)
- Impalcato in semplice appoggio;
- Velocità di percorrenza della linea inferiore a 160 Km/h

Per il caso in esame L/δ non può essere inferiore a 1000

L'inflessione verticale deve calcolarsi in asse al binario, considerando il modello di carico LM71 con il relativo incremento dinamico e con il coefficiente α (11).

Nel caso in esame, Il treno di carico LM71 è stato amplificato per il coefficiente di incremento dinamico corrispondente ai traversi intermedi (v. par. 8.3.2.1).

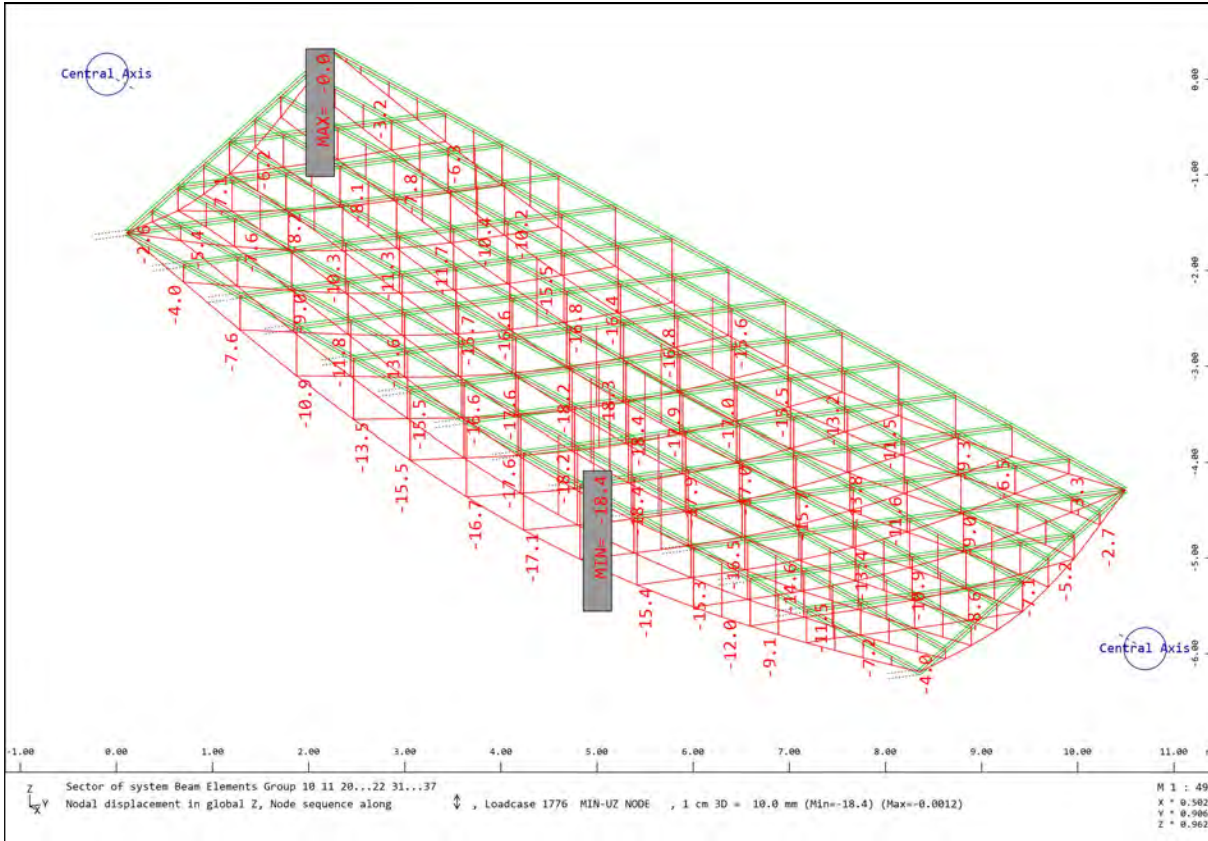


Figura 106 –Spostamenti verticali per la verifica del comfort dei passeggeri

Si riporta nel seguente tabulato la verifica effettuata.

Stati limite di esercizio per la sicurezza del traffico ferroviario
§ 5.2.3.2.2.1 NTC18 - § 2.5.1.8.3.2.2 MDP RFI 2021

Stato limite per il comfort dei passeggeri

Impalcato

$l_{tp} := 18.8 \text{ m}$ luce di calcolo della trave principale

$\delta_{max} := 18.4 \text{ mm}$ spostamento verticale ottenuto dal modello numerico

$\delta_{lim} := \frac{l_{tp}}{1000} = 18.8 \text{ mm}$ spostamento verticale massimo ammissibile

if ($\delta_{max} < \delta_{lim}$, "verificato", "non verificato") = "verificato"

10.6. Verifiche a fatica

Nel presente paragrafo si riportano le verifiche a fatica su sezioni strategiche dell'impalcato ferroviario, eseguite mediante il metodo dei coefficienti λ (v. par. 2.7.1.2 del MDP di RFI (8)).

10.6.1. Travi principali

Si riportano di seguito le verifiche a fatica per le travi principali considerando, tra le sezioni saldate, i seguenti dettagli costruttivi:

- DET. 112: Nella sezione di massima sollecitazione flettente corrispondente alla sezione di mezzeria;
- DET. 71: Nella sezione di giunzione tra i conci di trave, assunta a vantaggio di sicurezza in corrispondenza della massima sollecitazione flettente.

Verifiche allo stato limite di fatica

Trave principale: Sezione in mezzzeria

§ 5.2.3.2.3 NTC18 - § 2.7 MDP RFI 2021 - EN 1993-1-9

Metodo dei coefficienti - § 2.7.1.2 MDP RFI

Categoria particolare costruttivo - § 8 Prospetto 8.2 / EN 1993-1-9

112		<p>3) Saldature automatiche a cordoni d'angolo o di testa eseguite da entrambi i lati, ma contenenti interruzioni/punti di ripresa.</p> <p>4) Saldature automatiche di testa eseguite da un solo lato, con piatto posteriore, ma senza interruzioni/punti di ripresa.</p>	<p>4) Quando questo particolare contiene interruzioni/punti di ripresa, utilizzare la categoria 100.</p>
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$\Delta\sigma_c := 112 \text{ MPa}$

resistenza a fatica corrispondente a $2 \cdot 10^6$ cicli

Input

$L_{tp} := 18.8 \text{ m}$

lunghezza trave

$L_\phi := \frac{L_{tp}}{m} = 18.8$

lunghezza caratteristica; trave semplicemente appoggiata

$\phi_2(L_\phi) := \frac{1.44}{\sqrt{L_\phi - 0.2}} + 0.82$

coefficiente di incremento dinamico del sovraccarico LM71

$\phi_2 := \phi_2(L_\phi) = 1.168$

$\sigma_{max_71} := 32.9 \text{ MPa}$

tensione massima dovuto a sovraccarico LM71

$\sigma_{min_71} := 0 \text{ MPa}$

tensione minima dovuto a sovraccarico LM71

$\Delta\sigma_{71} := \sigma_{max_71} - \sigma_{min_71} = 32.9 \text{ MPa}$

differenza di tensione tra i valori estremi

Delta di tensione convenzionale

$\Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{71}) := \lambda \cdot \phi_2 \cdot \Delta\sigma_{71}$

delta di tensione convenzionale

$\lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) := \min(\lambda_1 \cdot \lambda_2 \cdot \lambda_3 \cdot \lambda_4, 1.4)$

fattore di correzione

$\lambda_{1,17.5} := 0.70$

valore di λ_1 per una lunghezza di influenza caratteristica dell'elemento pari a 17.5m


$\lambda_1 := \lambda_{1,17.5}$

$\lambda_2 := 1$	valore di λ_2 per un traffico annuo di $25 \cdot 10^6 \cdot \text{tonne}$
$\lambda_3 := 1$	valore di λ_3 per una vita a fatica di 100 anni
$\lambda_4 := 1$	valore di λ_4 per binario singolo
$\lambda = \lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) = 0.7$	valore del fattore di correzione
$\Delta\sigma_{Ed} := \Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{\gamma_1}) = 26.903 \text{ MPa}$	valore di progetto del delta di tensione convenzionale
Verifica a fatica	
$t := 60 \text{ mm}$	spessore elemento considerato
$k_s(t) := \sqrt[4]{\frac{25}{t}}$	coefficiente correttivo che tiene conto dell'influenza dello spessore
$k_s := k_s\left(\frac{t}{\text{mm}}\right) = 0.803$	
$\Delta\sigma_{c,red} := \Delta\sigma_c \cdot k_s = 89.98 \text{ MPa}$	resistenza a fatica ridotta in funzione dello spessore del piatto
$\gamma_{Mf} := 1.35$	coefficiente di sicurezza
$\Delta\sigma_{Ed} = 26.903 \text{ MPa}$	delta di tensione convenzionale
$\frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 66.655 \text{ MPa}$	
$\Delta\sigma_{Ed} \leq \frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 1$	Verifica a fatica in termini di tensioni assiali

Verifiche allo stato limite di fatica
Trave principale: Sezione di giunzione
§ 5.2.3.2.3 NTC18 - § 2.7 MDP RFI 2021 - EN 1993-1-9

Metodo dei coefficienti - § 2.7.1.2 MDP RFI

Categoria particolare costruttivo - § 8 Prospetto 8.2 / EN 1993-1-9

71		<p>9) Saldature longitudinali di testa, a cordoni d'angolo o alternate con un'altezza del foro di scarico non maggiore di 60 mm. Per fori di scarico con un'altezza >60 mm vedere particolare 1) nel prospetto 8.4.</p>	<p>9) $\Delta\sigma$ basato sulla tensione normale nell'ala.</p>
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$\Delta\sigma_{e,71} := 71 \text{ MPa}$

resistenza a fatica corrispondente a $2 \cdot 10^6$ cicli

Input

$L_{tp} := 18.8 \text{ m}$

lunghezza trave

$L_{\phi} := \frac{L_{tp}}{m} = 18.8$

lunghezza caratteristica: trave semplicemente appoggiata

$\phi_2(L_{\phi}) := \frac{1.44}{\sqrt{L_{\phi} - 0.2}} + 0.82$

coefficiente di incremento dinamico del sovraccarico LM71

$\phi_2 := \phi_2(L_{\phi}) = 1.17$

$\sigma_{max,71} := 32.9 \text{ MPa}$

tensione massima dovuto a sovraccarico LM71

$\sigma_{min,71} := 0 \text{ MPa}$

tensione minima dovuto a sovraccarico LM71

$\Delta\sigma_{71} := \sigma_{max,71} - \sigma_{min,71} = 32.9 \text{ MPa}$

differenza di tensione tra i valori estremi

Delta di tensione convenzionale

$\Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{71}) := \lambda \cdot \phi_2 \cdot \Delta\sigma_{71}$

delta di tensione convenzionale

$\lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) := \min(\lambda_1 \cdot \lambda_2 \cdot \lambda_3 \cdot \lambda_4, 1.4)$

fattore di correzione

$\lambda_{1,17.8} := 0.70$

valore di λ_1 per una lunghezza di influenza caratteristica dell'elemento pari a 17.5m

$\lambda_1 := \lambda_{1,17.8}$

$\lambda_2 := 1$

valore di λ_2 per un traffico annuo di $25 \cdot 10^6 \cdot \text{tonne}$

$\lambda_3 := 1$

valore di λ_3 per una vita a fatica di 100 anni

$\lambda_4 := 1$	valore di λ_4 per binario singolo
$\lambda = \lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) = 0.7$	valore del fattore di correzione
$\Delta\sigma_{Ed} := \Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{\tau 1}) = 26.903 \text{ MPa}$	valore di progetto del delta di tensione convenzionale
Verifica a fatica	
$t := 60 \text{ mm}$	spessore elemento considerato
$k_s(t) := \sqrt[4]{\frac{25}{t}}$	coefficiente correttivo che tiene conto dell'influenza dello spessore
$k_s := k_s\left(\frac{t}{\text{mm}}\right) = 0.803$	
$\Delta\sigma_{c,red} := \Delta\sigma_c \cdot k_s = 57.04 \text{ MPa}$	resistenza a fatica ridotta in funzione dello spessore del piatto
$\gamma_{Mf} := 1.35$	coefficiente di sicurezza
$\Delta\sigma_{Ed} = 26.903 \text{ MPa}$	delta di tensione convenzionale
$\frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 42.254 \text{ MPa}$	
$\Delta\sigma_{Ed} \leq \frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 1$	Verifica a fatica in termini di tensioni assiali

10.6.2.Traversi intermedi

Si riportano di seguito le verifiche a fatica per i traversi intermedi considerando, tra le sezioni saldate, i seguenti dettagli costruttivi:

- DET. 112: Nella sezione di massima sollecitazione flettente corrispondente alla sezione di mezzeria
- DET. 71: Nella sezione di giunzione bullonata (v. Figura 3).

Verifiche allo stato limite di fatica - Traverso intermedio
Traverso intermedio: Sezione in mezzzeria (flangia inferiore-anima)
 § 5.2.3.2.3 NTC18 - § 2.7 MDP RFI 2021 - EN 1993-1-9

Metodo dei coefficienti - § 2.7.1.2 MDP RFI

Categoria particolare costruttivo - § 8 Prospetto 8.2 / EN 1993-1-9

112		<p>3) Saldature automatiche a cordoni d'angolo o di testa eseguite da entrambi i lati, ma contenenti interruzioni/punti di ripresa.</p> <p>4) Saldature automatiche di testa eseguite da un solo lato, con piatto posteriore, ma senza interruzioni/punti di ripresa.</p>	<p>4) Quando questo particolare contiene interruzioni/punti di ripresa, utilizzare la categoria 100.</p>
-----	--	---	--

$\Delta\sigma_c := 112 \text{ MPa}$

resistenza a fatica corrispondente a $2 \cdot 10^6$ cicli

Input

$L_{Tr} := 5 \text{ m}$

luce di calcolo travi trasversali intermedie

$L_\phi := \frac{2 \cdot L_{Tr}}{m} = 10$

lunghezza L_ϕ - Tab. 5.2.II. / NTC18

$\phi_2(L_\phi) := \frac{1.44}{\sqrt{L_\phi - 0.2}} + 0.82$

coefficiente di incremento dinamico del sovraccarico LM71

$\phi_2 := \phi_2(L_\phi) = 1.306$

$\sigma_{max_71} := 46.4 \text{ MPa}$

tensione massima dovuto a sovraccarico LM71

$\sigma_{min_71} := 0 \text{ MPa}$

tensione minima dovuto a sovraccarico LM71

$\Delta\sigma_{71} := \sigma_{max_71} - \sigma_{min_71} = 46.4 \text{ MPa}$

differenza di tensione tra i valori estremi

Delta di tensione convenzionale

$\Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{71}) := \lambda \cdot \phi_2 \cdot \Delta\sigma_{71}$

delta di tensione convenzionale

$\lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) := \min(\lambda_1 \cdot \lambda_2 \cdot \lambda_3 \cdot \lambda_4, 1.4)$

fattore di correzione

$\lambda_{1.5} := 1.03$

valore di λ_1 per una lunghezza di influenza caratteristica dell'elemento pari a 5 m

$\lambda_1 := \lambda_{1.5}$


$\lambda_2 := 1$	valore di λ_2 per un traffico annuo di $25 \cdot 10^6 \cdot \text{tonne}$
$\lambda_3 := 1$	valore di λ_3 per una vita a fatica di 100 anni
$\lambda_4 := 1$	valore di λ_4 per binario singolo
$\lambda = \lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) = 1.03$	valore del fattore di correzione
$\Delta\sigma_{Ed} := \Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{\gamma_1}) = 62.422 \text{ MPa}$	valore di progetto del delta di tensione convenzionale
Verifica a fatica	
$t := 30 \text{ mm}$	spessore elemento considerato
$k_s(t) := \sqrt[4]{\frac{25}{t}}$	coefficiente correttivo che tiene conto dell'influenza dello spessore
$k_s := k_s\left(\frac{t}{\text{mm}}\right) = 0.955$	
$\Delta\sigma_{c,red} := \Delta\sigma_c \cdot k_s = 107.01 \text{ MPa}$	resistenza a fatica ridotta in funzione dello spessore del piatto
$\gamma_{Mf} := 1.35$	coefficiente di sicurezza
$\Delta\sigma_{Ed} = 62.422 \text{ MPa}$	delta di tensione convenzionale
$\frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 79.266 \text{ MPa}$	
$\Delta\sigma_{Ed} \leq \frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 1$	Verifica a fatica in termini di tensioni assiali

Verifiche allo stato limite di fatica

Traverso intermedio: sezione di giunzione (saldatura flangia superiore-anima)
§ 5.2.3.2.3 NTC18 - § 2.7 MDP RFI 2021 - EN 1993-1-9

Metodo dei coefficienti - § 2.7.1.2 MDP RFI

Categoria particolare costruttivo - § 8 Prospetto 8.2 / EN 1993-1-9

71		<p>9) Saldature longitudinali di testa, a cordoni d'angolo o alternate con un'altezza del foro di scarico non maggiore di 60 mm. Per fori di scarico con un'altezza >60 mm vedere particolare 1) nel prospetto 8.4.</p>	<p>9) $\Delta\sigma$ basato sulla tensione normale nell'ala.</p>
----	---	--	---

$\Delta\sigma_{e,71} := 71 \text{ MPa}$

resistenza a fatica corrispondente a $2 \cdot 10^6$ cicli

Input

$L_{Tr} := 5 \text{ m}$

luce di calcolo travi trasversali intermedi

$L_{\phi} := \frac{2 \cdot L_{Tr}}{m} = 10$

lunghezza L_{ϕ} - Tab. 5.2.II. / NTC18

$\phi_2(L_{\phi}) := \frac{1.44}{\sqrt{L_{\phi} - 0.2}} + 0.82$

coefficiente di incremento dinamico del sovraccarico LM71

$\phi_2 := \phi_2(L_{\phi}) = 1.31$

$\sigma_{max,71} := 26.5 \text{ MPa}$

tensione massima dovuto a sovraccarico LM71

$\sigma_{min,71} := 0 \text{ MPa}$

tensione minima dovuto a sovraccarico LM71

$\Delta\sigma_{71} := \sigma_{max,71} - \sigma_{min,71} = 26.5 \text{ MPa}$

differenza di tensione tra i valori estremi

Delta di tensione convenzionale

$\Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{71}) := \lambda \cdot \phi_2 \cdot \Delta\sigma_{71}$

delta di tensione convenzionale

$\lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) := \min(\lambda_1 \cdot \lambda_2 \cdot \lambda_3 \cdot \lambda_4, 1.4)$

fattore di correzione

$\lambda_{1,5} := 1.03$

valore di λ_1 per una lunghezza di influenza caratteristica dell'elemento pari a 5m

$\lambda_1 := \lambda_{1,5}$

$\lambda_2 := 1$

valore di λ_2 per un traffico annuo di $25 \cdot 10^6 \cdot \text{tonne}$

$\lambda_3 := 1$

valore di λ_3 per una vita a fatica di 100 anni

$\lambda_4 := 1$	valore di λ_4 per binario singolo
$\lambda = \lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) = 1.03$	valore del fattore di correzione
$\Delta\sigma_{Ed} := \Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{71}) = 35.65 \text{ MPa}$	valore di progetto del delta di tensione convenzionale
Verifica a fatica	
$t := 25 \text{ mm}$	spessore elemento considerato
$k_s(t) := \sqrt[4]{\frac{25}{t}}$	coefficiente correttivo che tiene conto dell'influenza dello spessore
$k_s := k_s\left(\frac{t}{\text{mm}}\right) = 1$	
$\Delta\sigma_{c,red} := \Delta\sigma_c \cdot k_s = 71 \text{ MPa}$	resistenza a fatica ridotta in funzione dello spessore del piatto
$\gamma_{Mf} := 1.35$	coefficiente di sicurezza
$\Delta\sigma_{Ed} = 35.65 \text{ MPa}$	delta di tensione convenzionale
$\frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 52.593 \text{ MPa}$	
$\Delta\sigma_{Ed} \leq \frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 1$	Verifica a fatica in termini di tensioni assiali

10.6.3.Traversi di estremità

Si riportano di seguito la verifica a fatica per il traverso di estremità considerando, tra le sezioni saldate, il seguente dettaglio costruttivo:

- DET. 112: Nella sezione di massima sollecitazione flettente corrispondente alla sezione di mezzeria

Verifiche allo stato limite di fatica
Traverso intermedio di estremità: Sezione in mezzeria
§ 5.2.3.2.3 NTC18 - § 2.7 MDP RFI 2021 - EN 1993-1-9

Metodo dei coefficienti - § 2.7.1.2 MDP RFI

Categoria particolare costruttivo - § 8 Prospetto 8.2 / EN 1993-1-9

112		<p>3) Saldature automatiche a cordoni d'angolo o di testa eseguite da entrambi i lati, ma contenenti interruzioni/punti di ripresa.</p> <p>4) Saldature automatiche di testa eseguite da un solo lato, con piatto posteriore, ma senza interruzioni/punti di ripresa.</p>	<p>4) Quando questo particolare contiene interruzioni/punti di ripresa, utilizzare la categoria 100.</p>
-----	--	---	--

$\Delta\sigma_c := 112 \text{ MPa}$

resistenza a fatica corrispondente a $2 \cdot 10^6$ cicli

Input

$L_{Tr,c} := 7.3 \text{ m}$

luce di calcolo travi trasversali intermedie - Tab. 5.2.II. / NTC18

$L_\phi := \frac{\min(2 L_{Tr,c}, 3.6 \text{ m})}{m} = 3.6$

lunghezza L_ϕ - Tab. 5.2.II. / NTC18

$\phi_2(L_\phi) := \frac{1.44}{\sqrt{L_\phi - 0.2}} + 0.82$

coefficiente di incremento dinamico del sovraccarico LM71

$\phi_2 := \phi_2(L_\phi) = 1.67$

$\sigma_{max,71} := 40.9 \text{ MPa}$

tensione massima dovuto a sovraccarico LM71

$\sigma_{min,71} := 0 \text{ MPa}$

tensione minima dovuto a sovraccarico LM71

$\Delta\sigma_{71} := \sigma_{max,71} - \sigma_{min,71} = 40.9 \text{ MPa}$

differenza di tensione tra i valori estremi

Delta di tensione convenzionale

$\Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{71}) := \lambda \cdot \phi_2 \cdot \Delta\sigma_{71}$

delta di tensione convenzionale

$\lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) := \min(\lambda_1 \cdot \lambda_2 \cdot \lambda_3 \cdot \lambda_4, 1.4)$

fattore di correzione

$\lambda_{1,7} := 0.97$

valore di λ_1 per una lunghezza di influenza caratteristica dell'elemento pari a 7m

$\lambda_1 := \lambda_{1,7}$

$\lambda_2 := 1$	valore di λ_2 per un traffico annuo di $25 \cdot 10^6 \cdot \text{tonne}$
$\lambda_3 := 1$	valore di λ_3 per una vita a fatica di 100 anni
$\lambda_4 := 1$	valore di λ_4 per binario singolo
$\lambda := \lambda(\lambda_1, \lambda_2, \lambda_3, \lambda_4) = 0.97$	valore del fattore di correzione
$\Delta\sigma_{Ed} := \Delta\sigma_{Ed}(\lambda, \phi_2, \Delta\sigma_{\tau_1}) = 66.189 \text{ MPa}$	valore di progetto del delta di tensione convenzionale
Verifica a fatica	
$t := 30 \text{ mm}$	spessore elemento considerato
$k_s(t) := \sqrt[4]{\frac{25}{t}}$	coefficiente correttivo che tiene conto dell'influenza dello spessore
$k_s := k_s\left(\frac{t}{\text{mm}}\right) = 0.955$	
$\Delta\sigma_{c,red} := \Delta\sigma_c \cdot k_s = 107.01 \text{ MPa}$	resistenza a fatica ridotta in funzione dello spessore del piatto
$\gamma_{Mf} := 1.35$	coefficiente di sicurezza
$\Delta\sigma_{Ed} = 66.189 \text{ MPa}$	delta di tensione convenzionale
$\frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 79.266 \text{ MPa}$	
$\Delta\sigma_{Ed} \leq \frac{\Delta\sigma_{c,red}}{\gamma_{Mf}} = 1$	Verifica a fatica in termini di tensioni assiali

10.7. Incidenza acciaio per carpenteria metallica

Si riporta di seguito il valore di incidenza dell'acciaio (kg/m^2) per l'impalcato oggetto di analisi.

Al fine di considerare il peso aggiuntivo degli elementi di collegamento, in carpenteria metallica, delle parti strutturali implementate nel modello numerico, il peso dell'acciaio è stato incrementato del **25%**.

Note quindi le seguenti grandezze:

P = 99.1 ton, peso acciaio strutturale

A = 142.9 m^2 , area nel piano dell'impalcato

Si ottiene una incidenza pari **693 kg/m^2** .

11. STIMA INCIDENZE ACCIAIO PER C.A.

Nella seguente tabella si riportano le stime delle incidenze per le fondazioni e le elevazioni della spalla ottenute dal modello di calcolo descritto nel paragrafo 7.2.

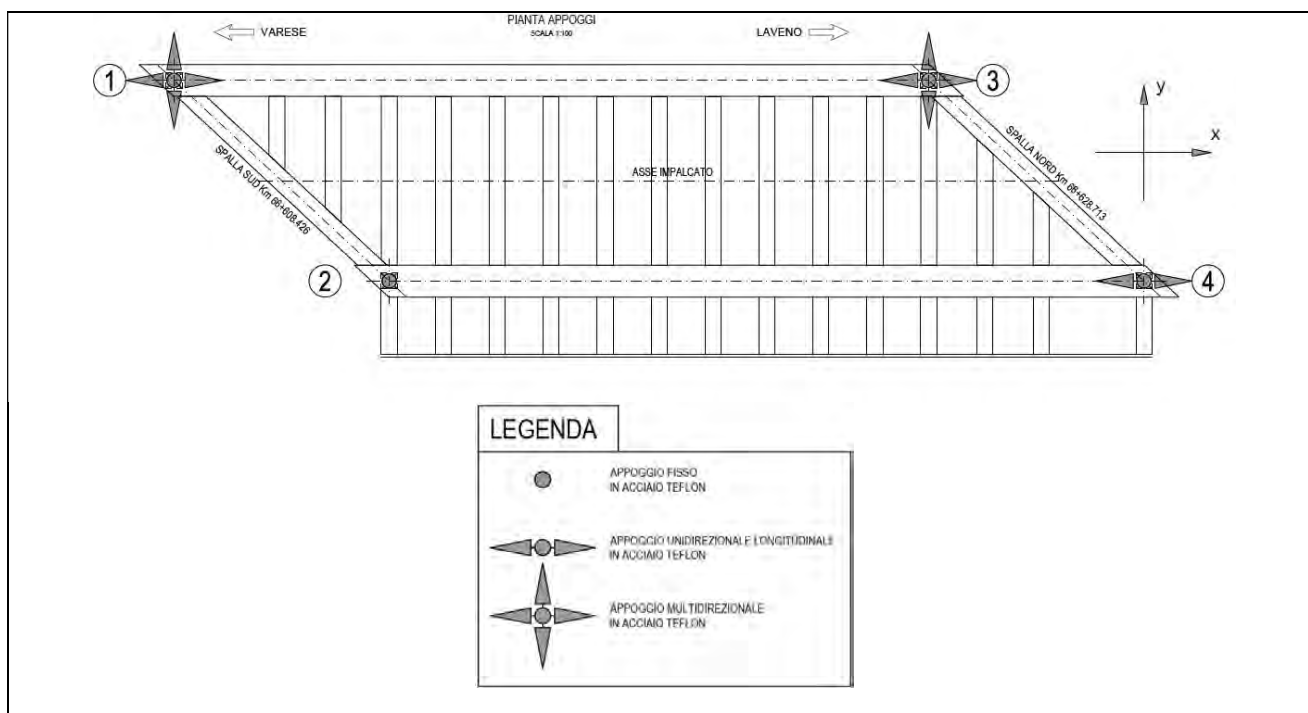
Incidenza barre di armatura		
Muro frontale	Paraghiaia	Muri d'ala
Incidenza [kg/m ³] = 160	Incidenza [kg/m ³] = 200	Incidenza [kg/m ³] = 130
Baggiolo	Piastra di fondazione	Pali
Incidenza [kg/m ³] = 350	Incidenza [kg/m ³] = 150	Incidenza [kg/m ³] = 170

12. AZIONI SUGLI APPOGGI

Di seguito si riepilogano i valori delle reazioni agli appoggi per le seguenti combinazioni di carico:

- Stato Limite Ultimo (SLU)
- Stato Limite di Esercizio (SLE, Rara)
- Stato Limite di Salvaguardia della Vita (SLV)
- Permanenti (G₁+G₂)

Per la valutazione delle azioni massime sugli appoggi non si è tenuto conto dell'interazione binario-struttura. Pertanto, i carichi derivanti dalla frenatura e/o dall'avviamento sono considerati al 100% (l'interazione comporta una riduzione di detti carichi).



Per ogni combinazione, i valori massimi delle reazioni e degli spostamenti sono riportati nelle caselle colorate; i valori concomitanti ai massimi valori delle reazioni sono riportati nelle relative caselle adiacenti.

APPOGGIO 1 - MULTIDIREZIONALE IN ACCIAIO TEFLON						
COMB	Reazioni degli apparecchi di appoggio			Rotazioni e spostamenti degli apparecchi di appoggio		
	N	T _L	T _T	θ	S _L	S _T
	[kN]	[kN]	[kN]	[mrad]	[mm]	[mm]
SLU	1801	0	0	3,80		
	-	-	-		8,25	
	-	-	-			9,79
SLE	1246	0	0	2,66		
	-	-	-		5,56	
	-	-	-			6,63
SISMICA	674	0	0	1,12		
	-	-	-		1,29	
	-	-	-			1,79
PERMANENTE	490	0	0	0,78	0,83	1,16

APPOGGIO 2 - FISSO IN ACCIAIO TEFLON						
COMB	Reazioni degli apparecchi di appoggio			Rotazioni e spostamenti degli apparecchi di appoggio		
	N	T _L	T _T	θ	S _L	S _T
	[kN]	[kN]	[kN]	[mrad]	[mm]	[mm]
SLU	3156	954	391	9,68		
	2692	990	246		0,00	
	2679	396	488			0,00
SLE	2172	658	266	6,64		
	1854	683	167		0,00	
	1842	273	330			0,00
SISMICA	1165	48	140	2,81		
	1112	201	56		0,00	
	1147	59	191			0,00
PERMANENTE	917	0	0			

APPOGGIO 3 - MULTIDIREZIONALE IN ACCIAIO TEFLON						
COMB	Reazioni degli apparecchi di appoggio			Rotazioni e spostamenti degli apparecchi di appoggio		
	N	T _L	T _T	θ	S _L	S _T
	[kN]	[kN]	[kN]	[mrad]	[mm]	[mm]
SLU	2643			9,04		
	-	-	-		16,71	
	-	-	-			7,78
SLE	1824	0	0	6,21		
	-	-	-		11,31	
	-	-	-			5,26
SISMICA	856	0	0	2,46		
	-	-	-		3,06	
	-	-	-			1,47
PERMANENTE	601	0	0			

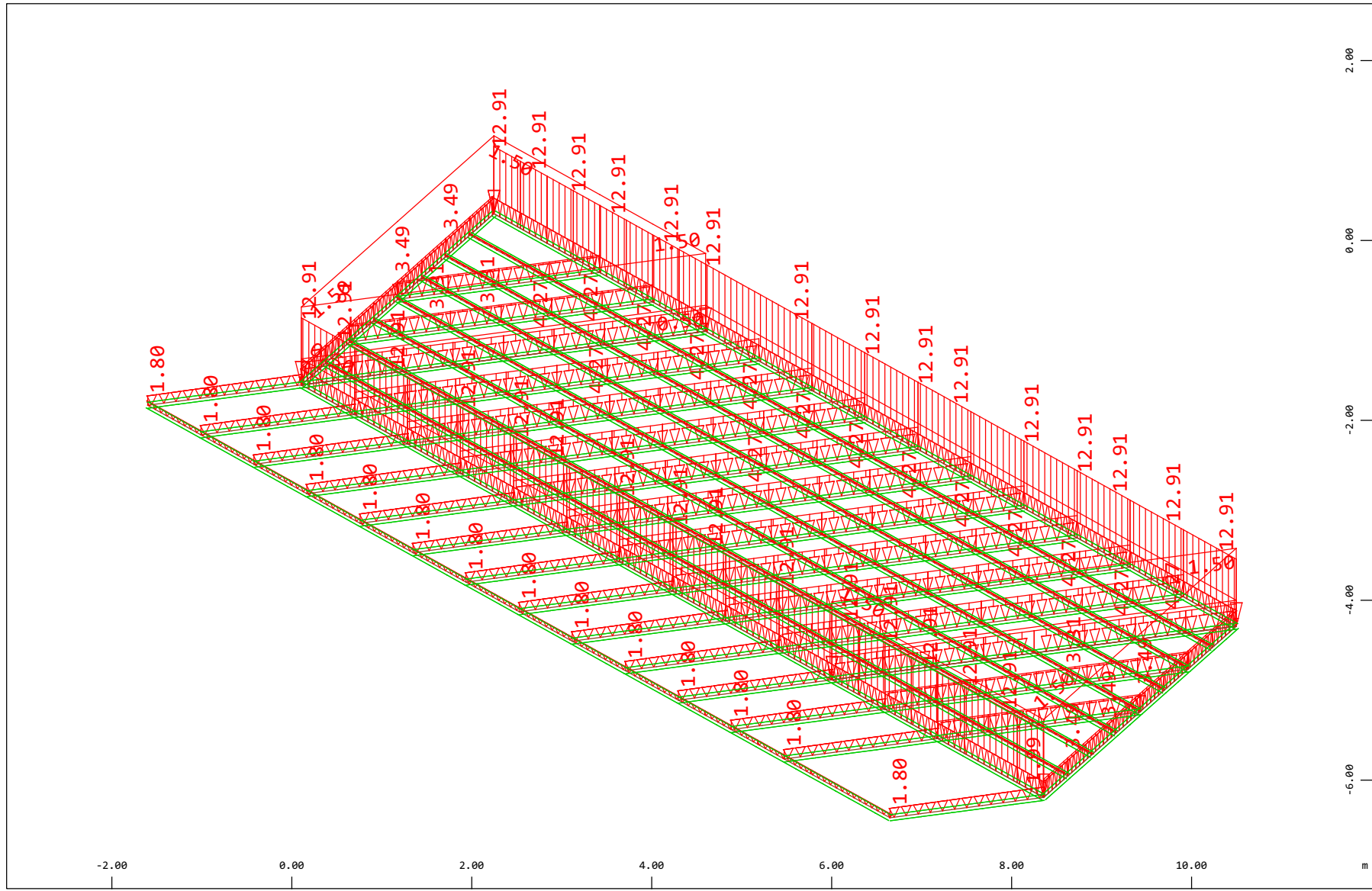
APPOGGIO 4 - UNIDIREZIONALE LONGITUDINALE IN ACCIAIO TEFLON						
COMB	Reazioni degli apparecchi di appoggio			Rotazioni e spostamenti degli apparecchi di appoggio		
	N	T _L	T _T	θ	S _L	S _T
	[kN]	[kN]	[kN]	[mrad]	[mm]	[mm]
SLU	1996	0	260	4,82		
	-	-	-		18,26	
	901	0	345			0,00
SLE	1375	0	177	3,30		
	-	-	-		12,32	
	847	0	234			0,00
SISMICA	903	0	110	1,88		
	-	-	-		2,76	
	776	0	138			0,00
PERMANENTE	736	0	0			

13. ALLEGATI

13.1. Allegato 1 – Carichi elementari impalcato

Definition of Axis
 Result Graphics

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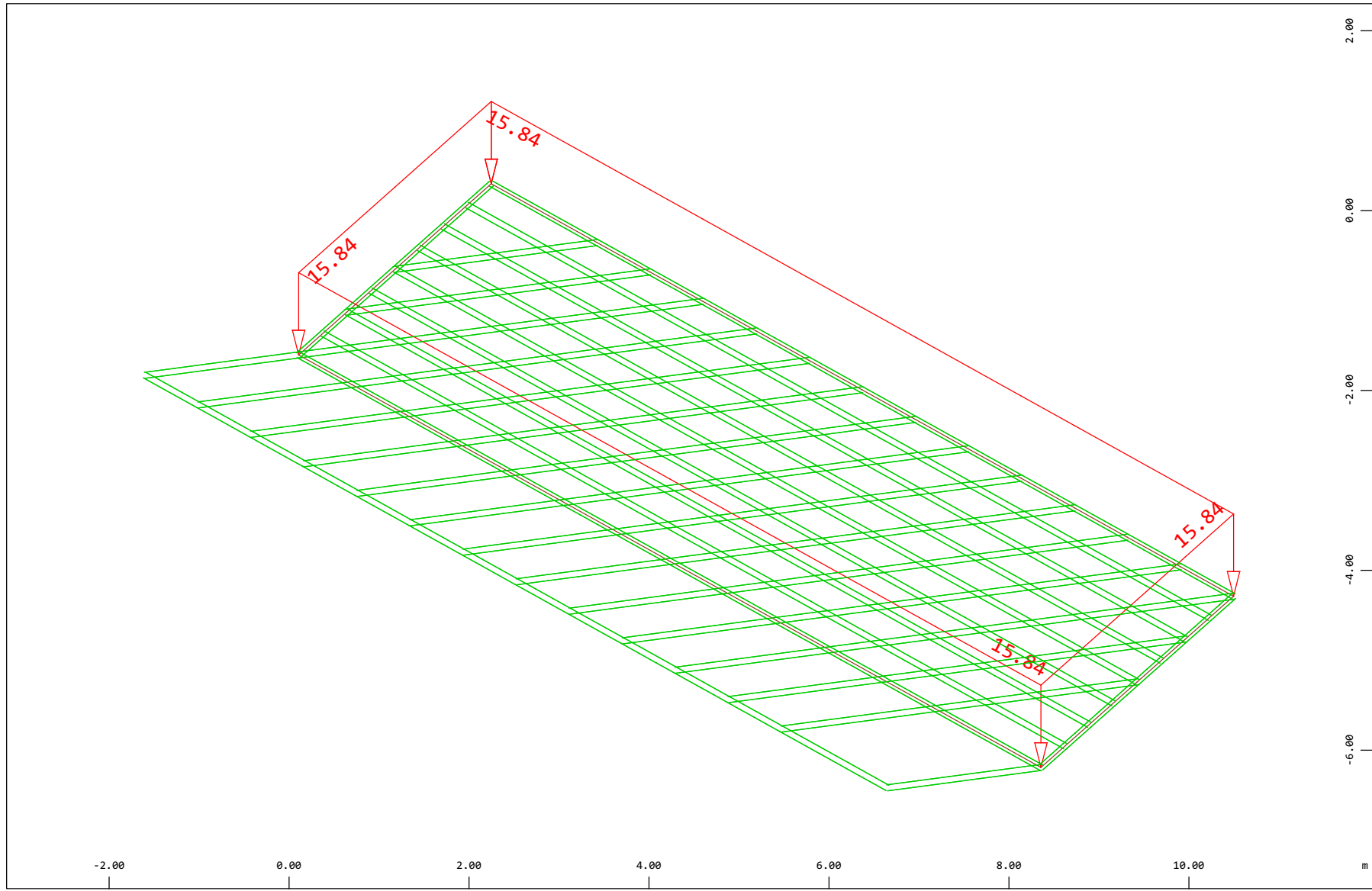
Z
 X
 Y

Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 1 G1: Peso proprio acciaio , (1 cm 3D = unit) Beam dead load in global Z (Unit=10.0 kN/m,Min=-12.9 Max=-0.294
 area load (force) in global Z (Unit=1.00 kN/m2,Min=-1.50 Max=-0.500

X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Result Graphics

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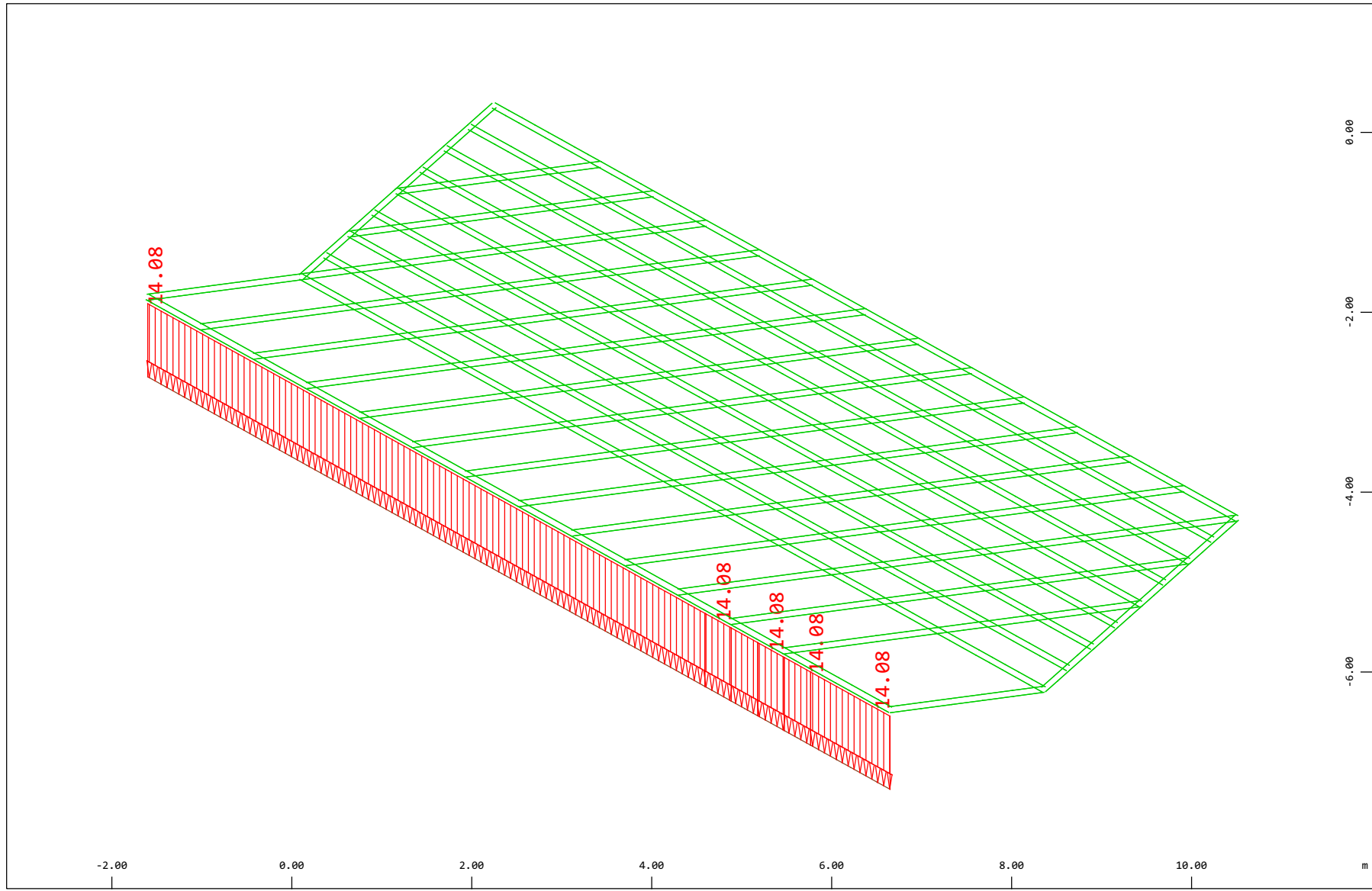
Z Sector of system Group 10 11 20...23 31...37 40,STEE
Y All loads, Loadcase 2 G2: Massiccata , (1 cm 3D = unit) Free area load (force) in global Z (Unit=10.0 kN/m2)
X Structure

(Min=-15.8) (Max=-15.8)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

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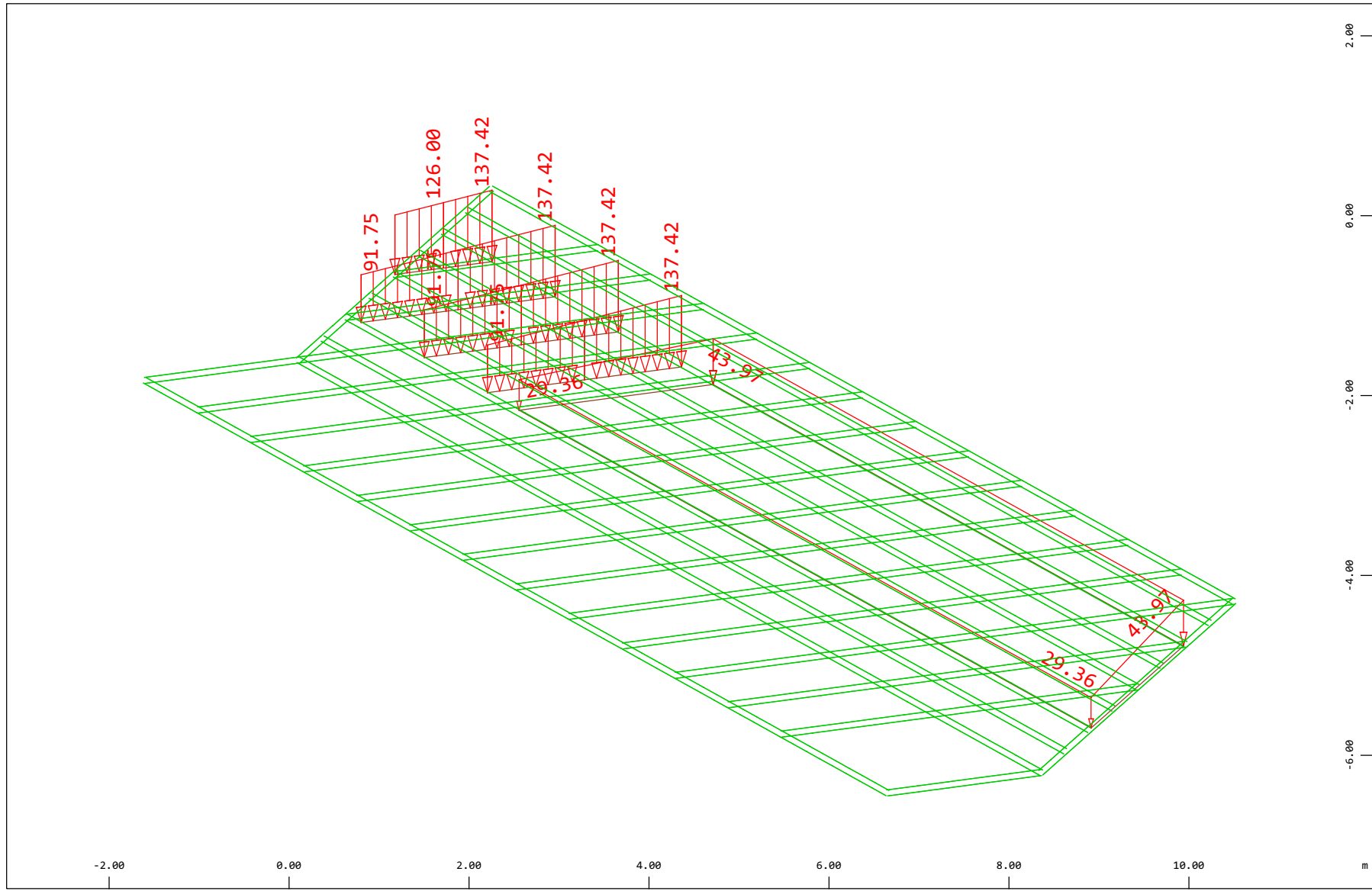
Z Sector of system Group 10 11 20...23 31...37 40,STEE
Y All loads, Loadcase 3 G2: Barriere , (1 cm 3D = unit) Beam line load (force) in global Z (Unit=10.0 kN/m)
X Structure

(Min=-14.1) (Max=-14.1)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Result Graphics

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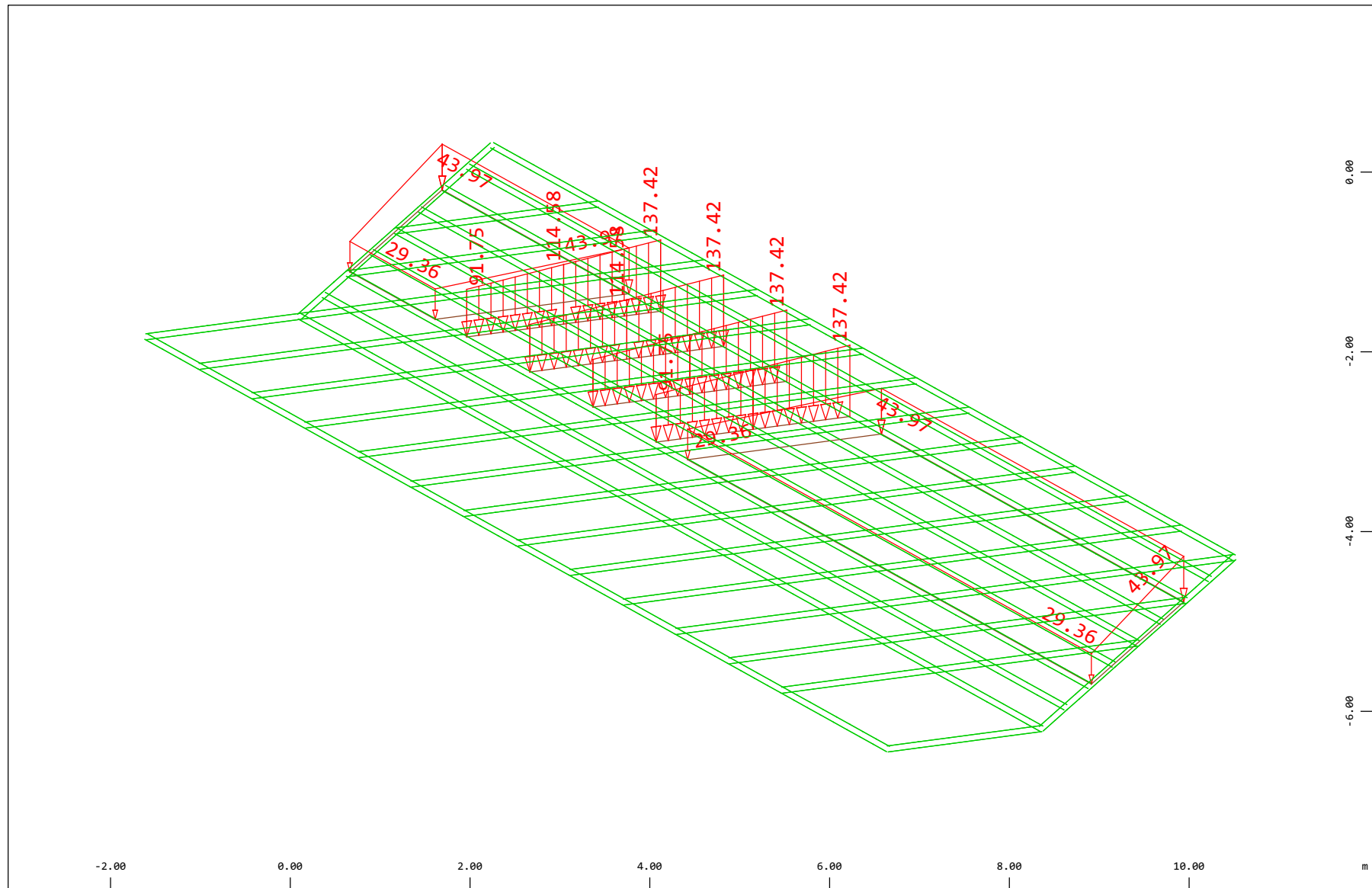


Z Sector of system Group 10 11 20...23 31...37 40, STEE
 X All loads, Loadcase 100 Qt: LM71-S 3m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=100.0 kN/m, Min=-137.4 Max=-91.7
 Y Free area load (force) in global Z (Unit=50.0 kN/m2, Min=-44.0 Max=-29.4)

X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

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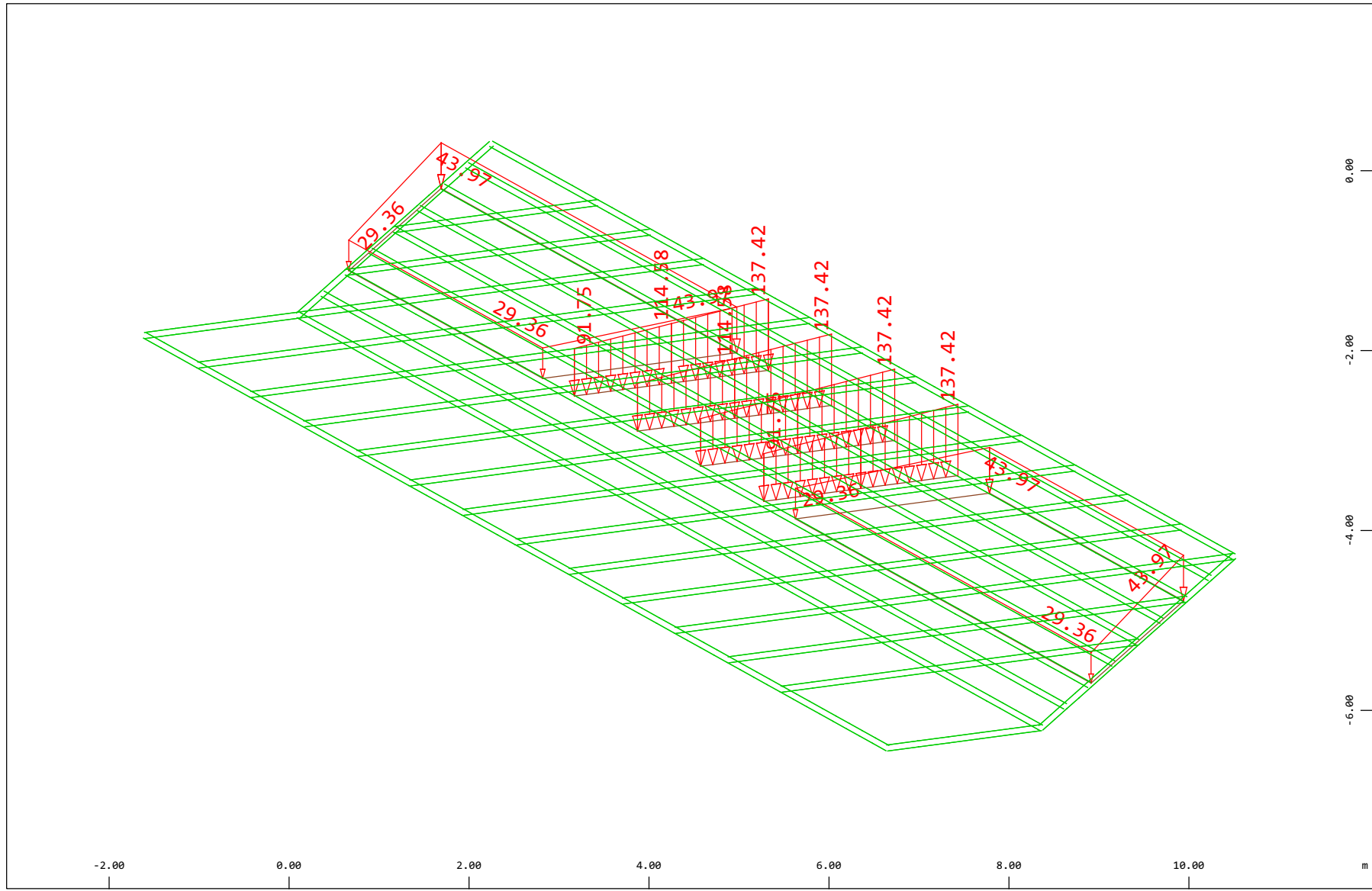


Sector of system Group 10 11 20...23 31...37 40, STEE
 All loads, Loadcase 104 Qt: LM71-S 7m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=100.0 kN/m, Min=-137.4 Max=-91.7
 Free area load (force) in global Z (Unit=50.0 kN/m2, Min=-44.0 Max=-29.4

X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

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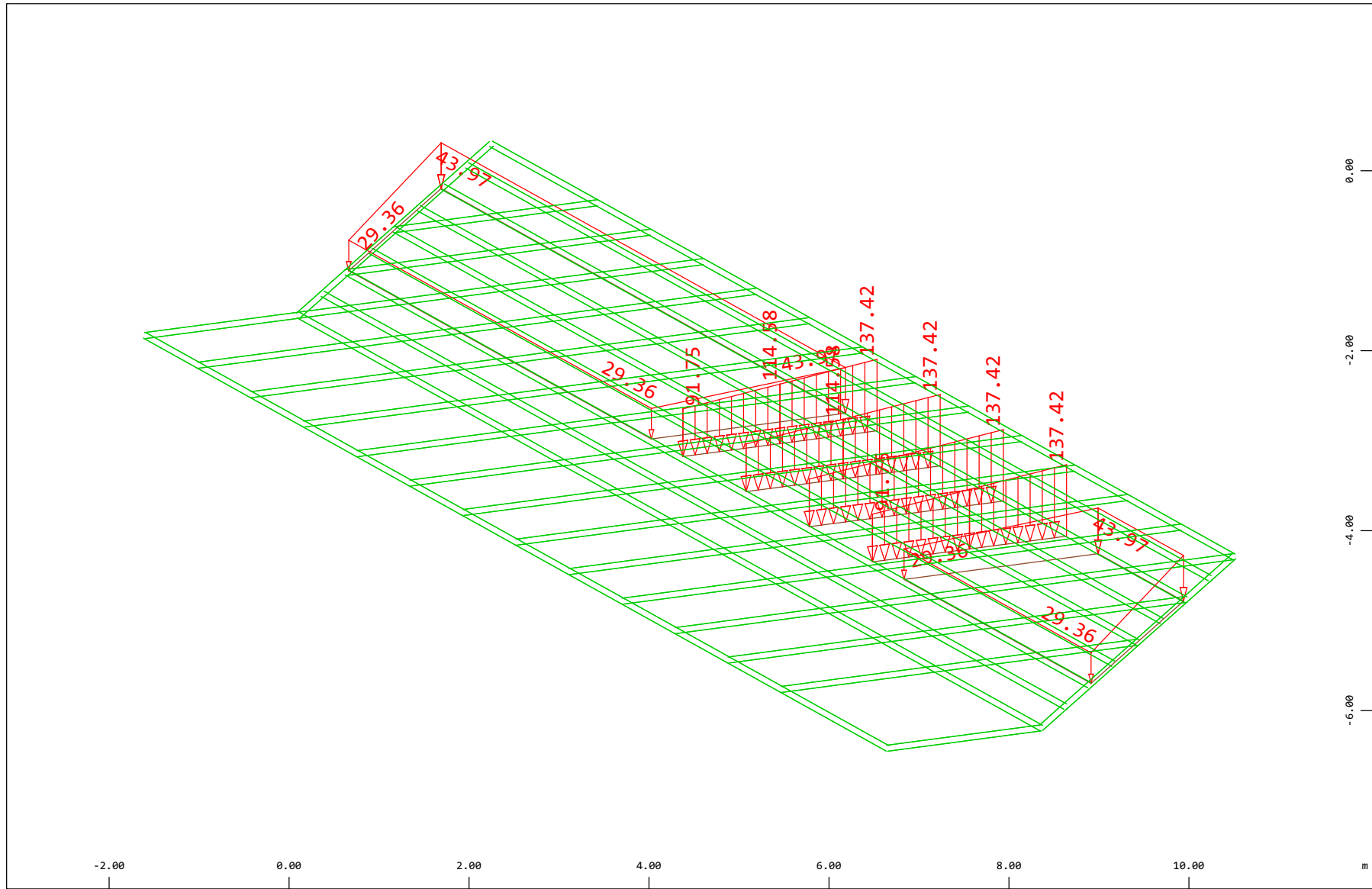


$\begin{matrix} Z \\ | \\ X \end{matrix}$ Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 108 Qt: LM71-S 10m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=100.0 kN/m,Min=-137.4 Max=-91.7
 Free area load (force) in global Z (Unit=50.0 kN/m2,Min=-44.0 Max=-29.4) \triangle

$\begin{matrix} X * 0.502 \\ Y * 0.906 \\ Z * 0.962 \end{matrix}$

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

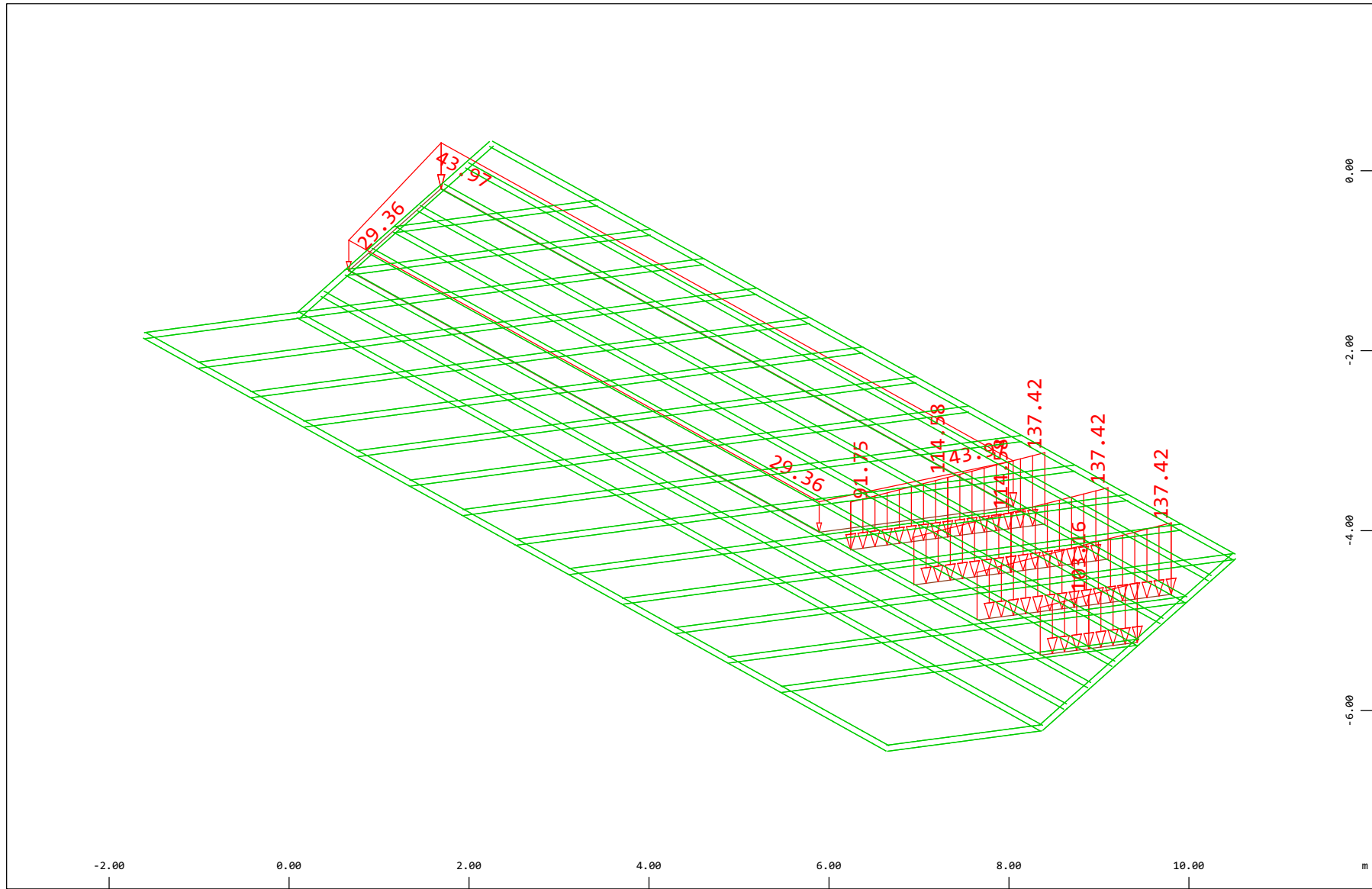


Z Sector of system Group 10 11 20...23 31...37 40,STEE
 Y All loads, Loadcase 112 Qt: LM71-S 12m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=100.0 kN/m,Min=-137.4 Max=-91.7
 X Free area load (force) in global Z (Unit=50.0 kN/m2,Min=-44.0 Max=-29.4

X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

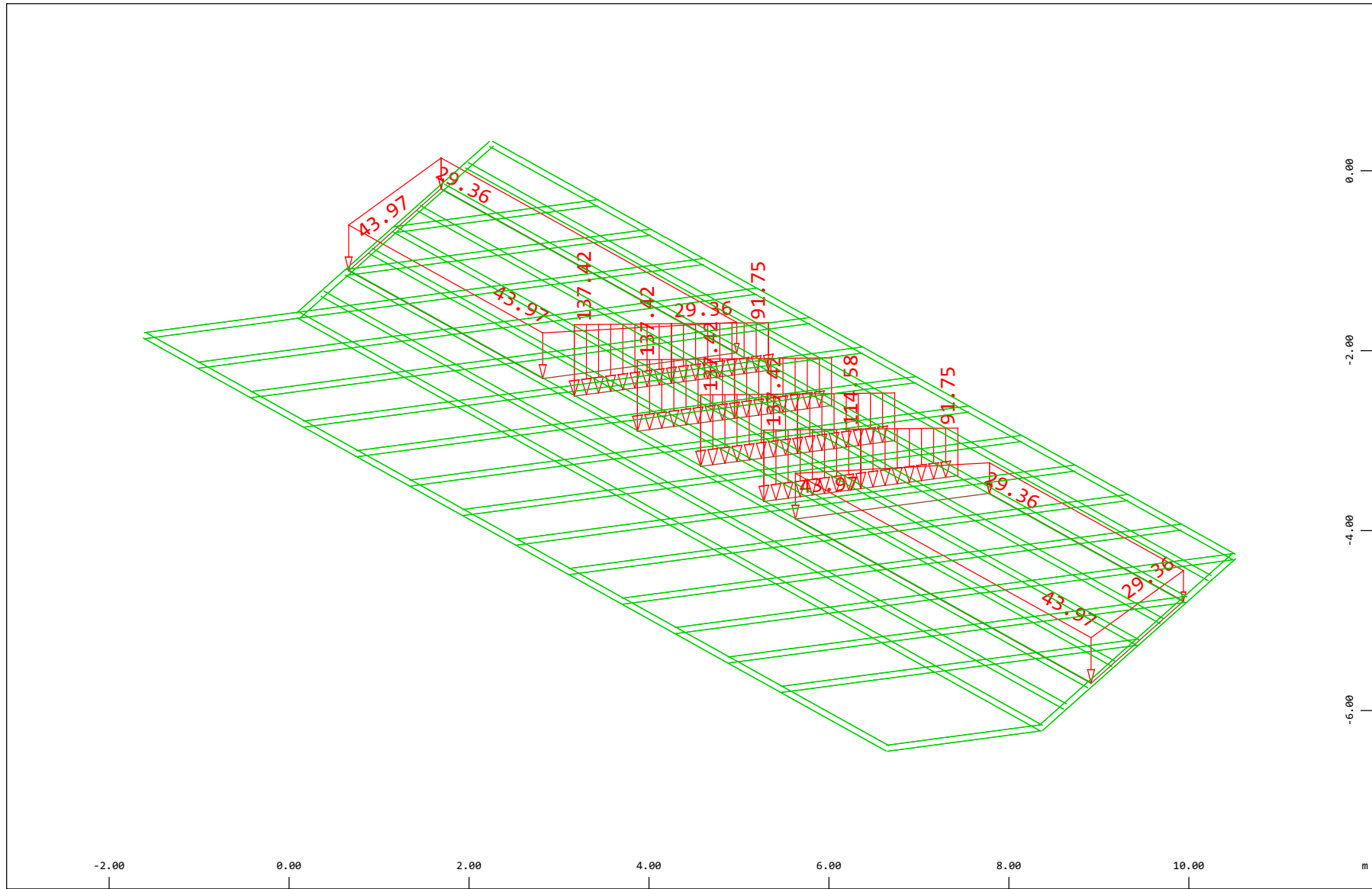


Z Sector of system Group 10 11 20...23 31...37 40,STEE
Y All loads, Loadcase 116 Qt: LM71-S 17m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=100.0 kN/m,Min=-137.4 Max=-91.7
X Free area load (force) in global Z (Unit=50.0 kN/m2,Min=-44.0 Max=-29.4

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

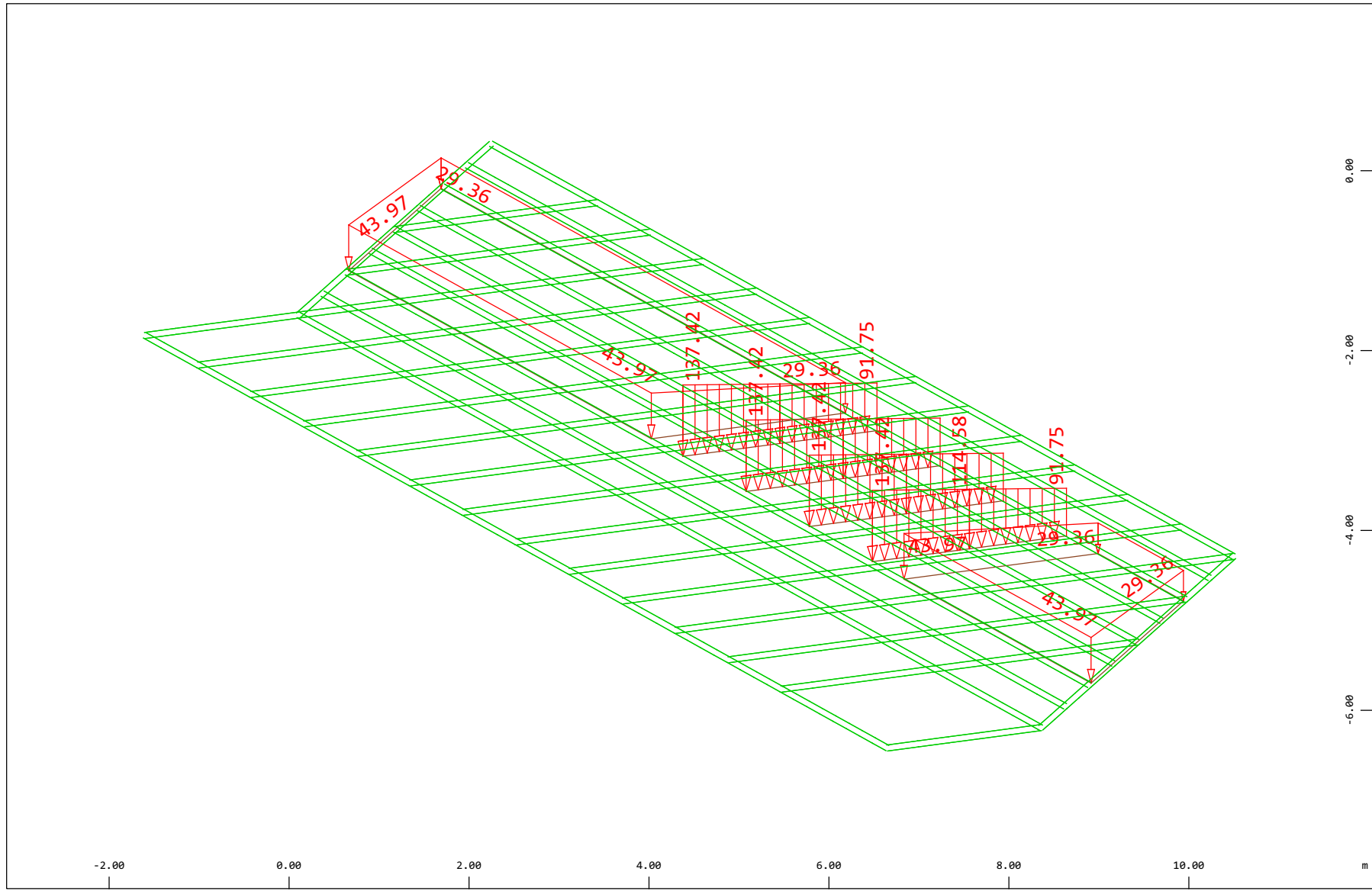


$\begin{matrix} Z \\ | \\ X \end{matrix}$ Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 128 Qt: LM71-S 10m-en , (1 cm 3D = unit) Free line load (force) in global Z (Unit=100.0 kN/m,Min=-137.4 Max=-91.7
 Free area load (force) in global Z (Unit=50.0 kN/m2,Min=-44.0 Max=-29.4) $\begin{matrix} \triangle \\ \square \end{matrix}$

$\begin{matrix} X * 0.502 \\ Y * 0.906 \\ Z * 0.962 \end{matrix}$

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

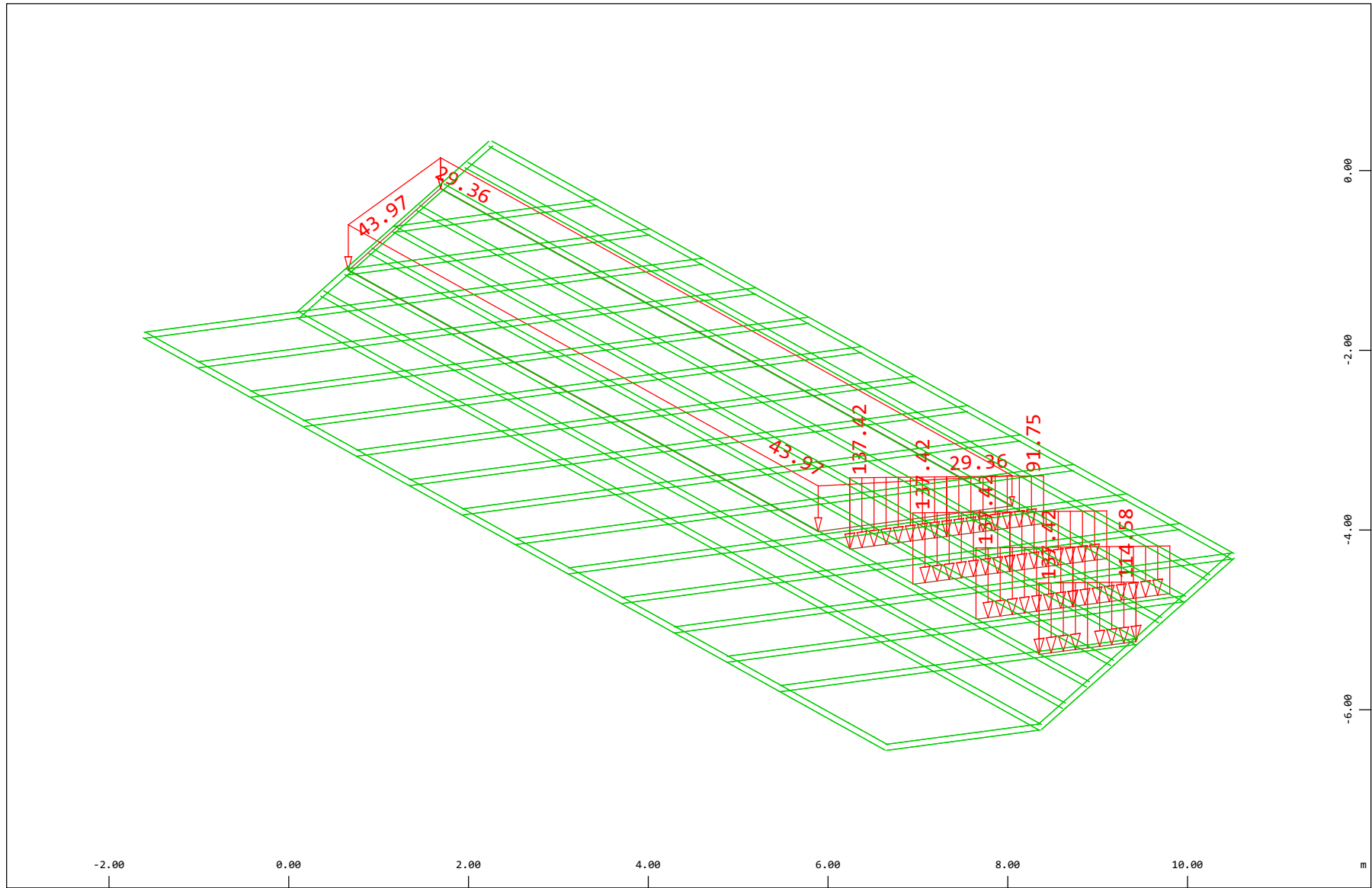


Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 132 Qt: LM71-S 12m-en , (1 cm 3D = unit) Free line load (force) in global Z (Unit=100.0 kN/m,Min=-137.4 Max=-91.7
 Free area load (force) in global Z (Unit=50.0 kN/m2,Min=-44.0 Max=-29.4

X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Result Graphics

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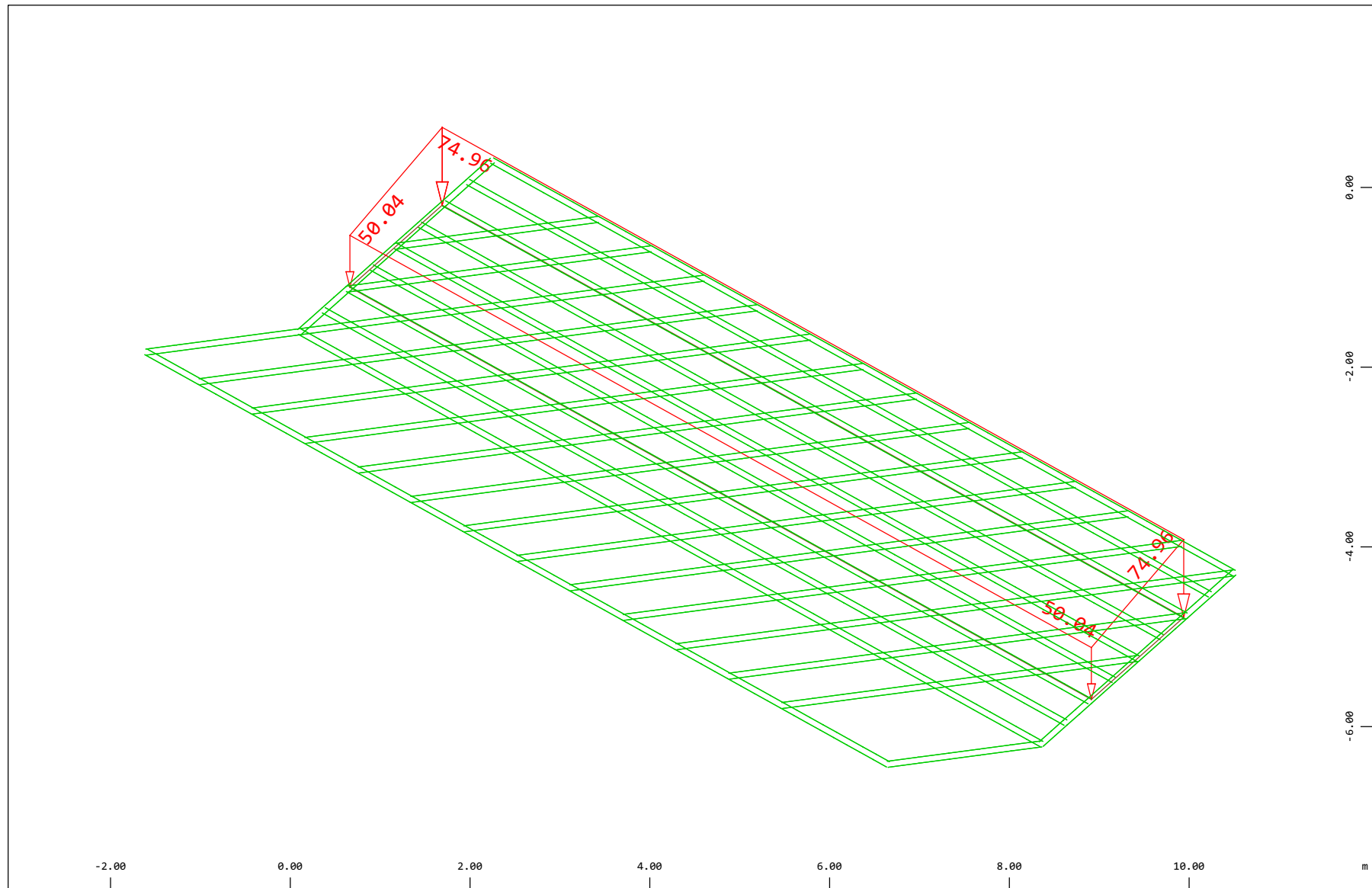
z Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 136 Qt: LM71-S 17m-en , (1 cm 3D = unit) Free line load (force) in global Z (Unit=100.0 kN/m,Min=-137.4 Max=-91.7
Free area load (force) in global Z (Unit=50.0 kN/m2,Min=-44.0 Max=-29.4)

X * 0.502
Y * 0.906
Z * 0.962

reduced scale factor 0.936

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

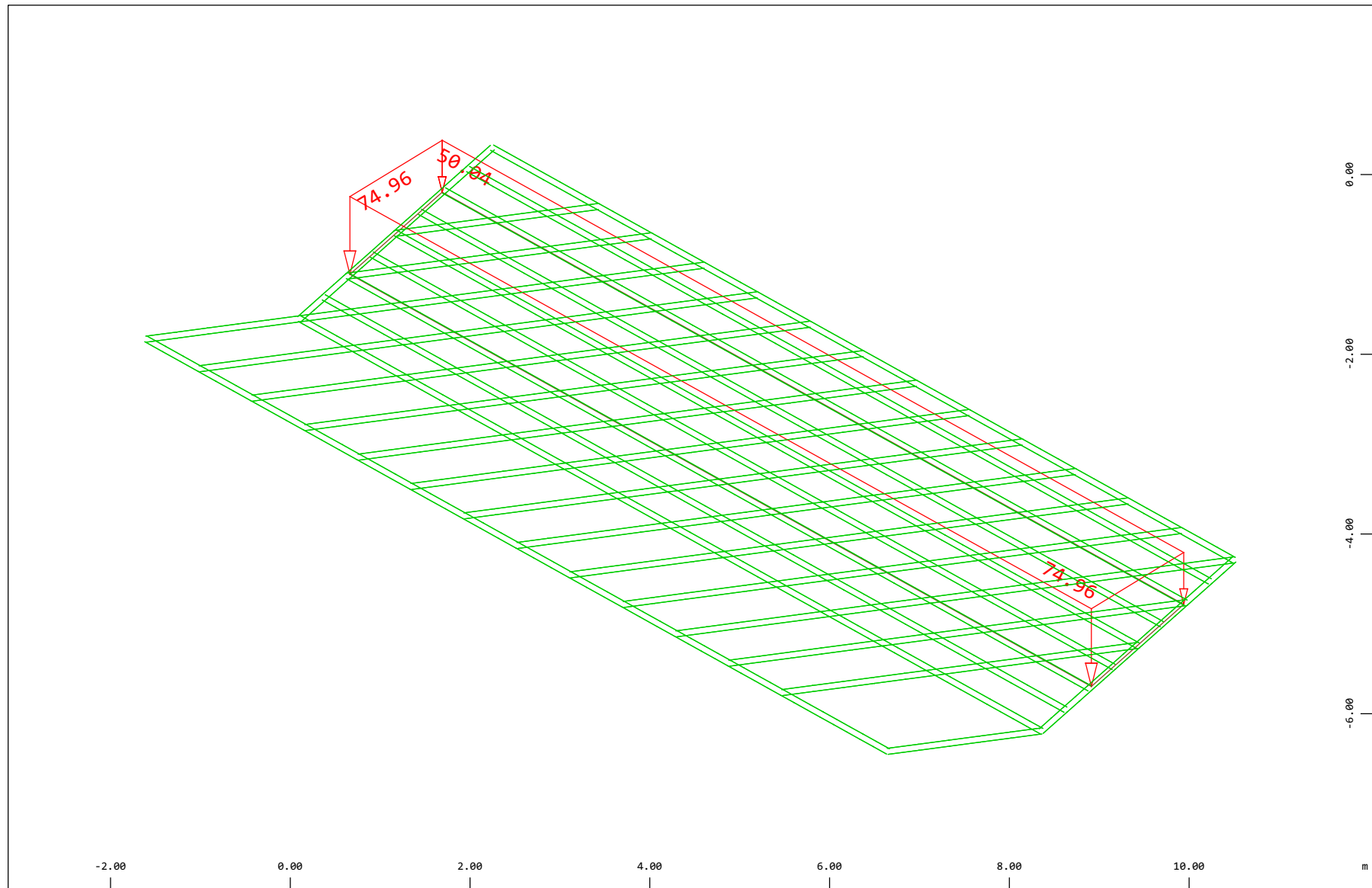


Z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 200 Qt: SW/2-ecc.pos. , (1 cm 3D = unit) Free area load (force) in global Z (Unit=50.0 kN/m2)
Structure

(Min=-75.0) (Max=-50.0)
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

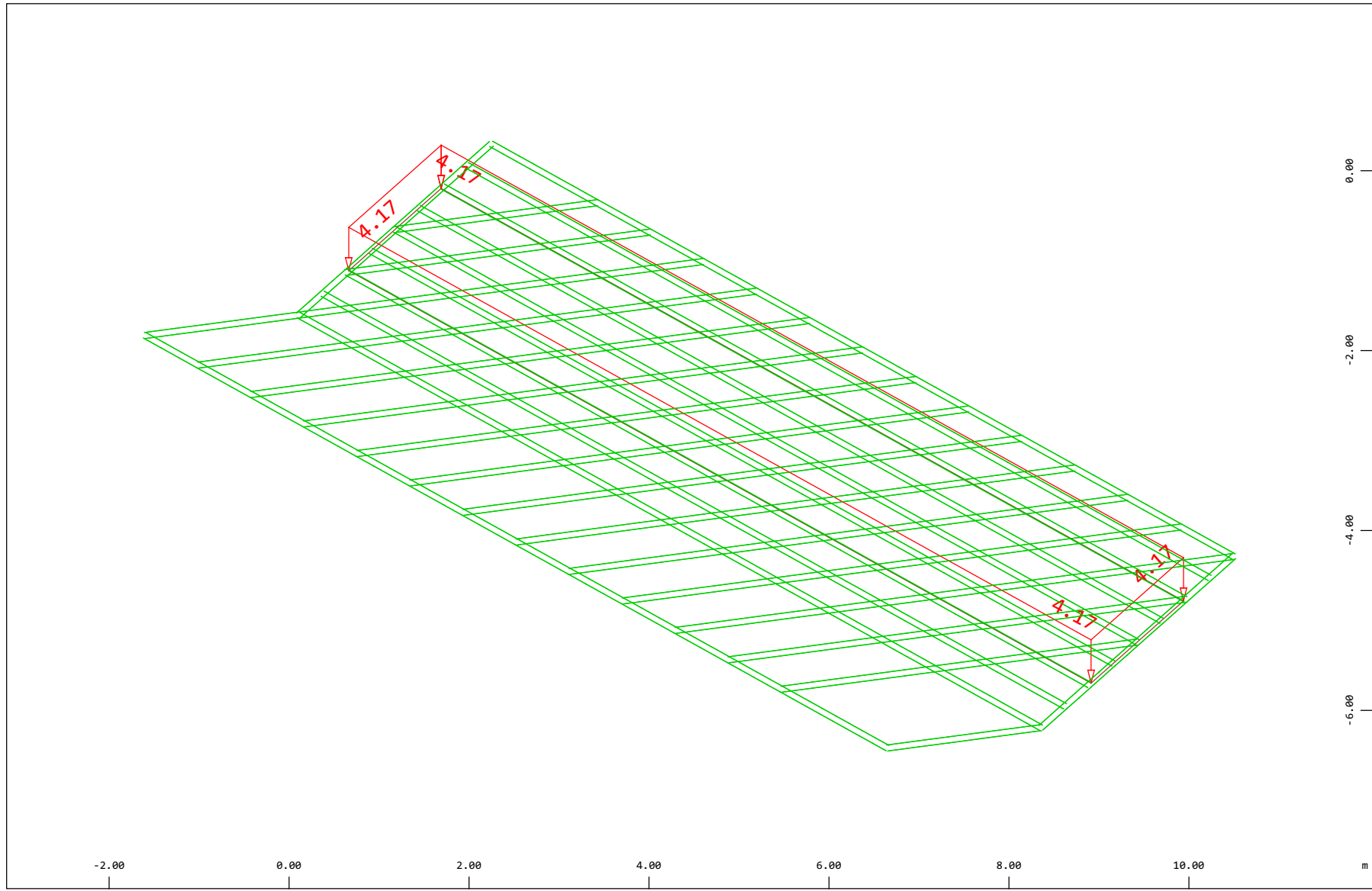


Z Sector of system Group 10 11 20...23 31...37 40,STEE
Y All loads, Loadcase 201 Qt: SW/2-ecc.neg. , (1 cm 3D = unit) Free area load (force) in global Z (Unit=50.0 kN/m2)
X Structure

(Min=-75.0) (Max=-50.0)
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

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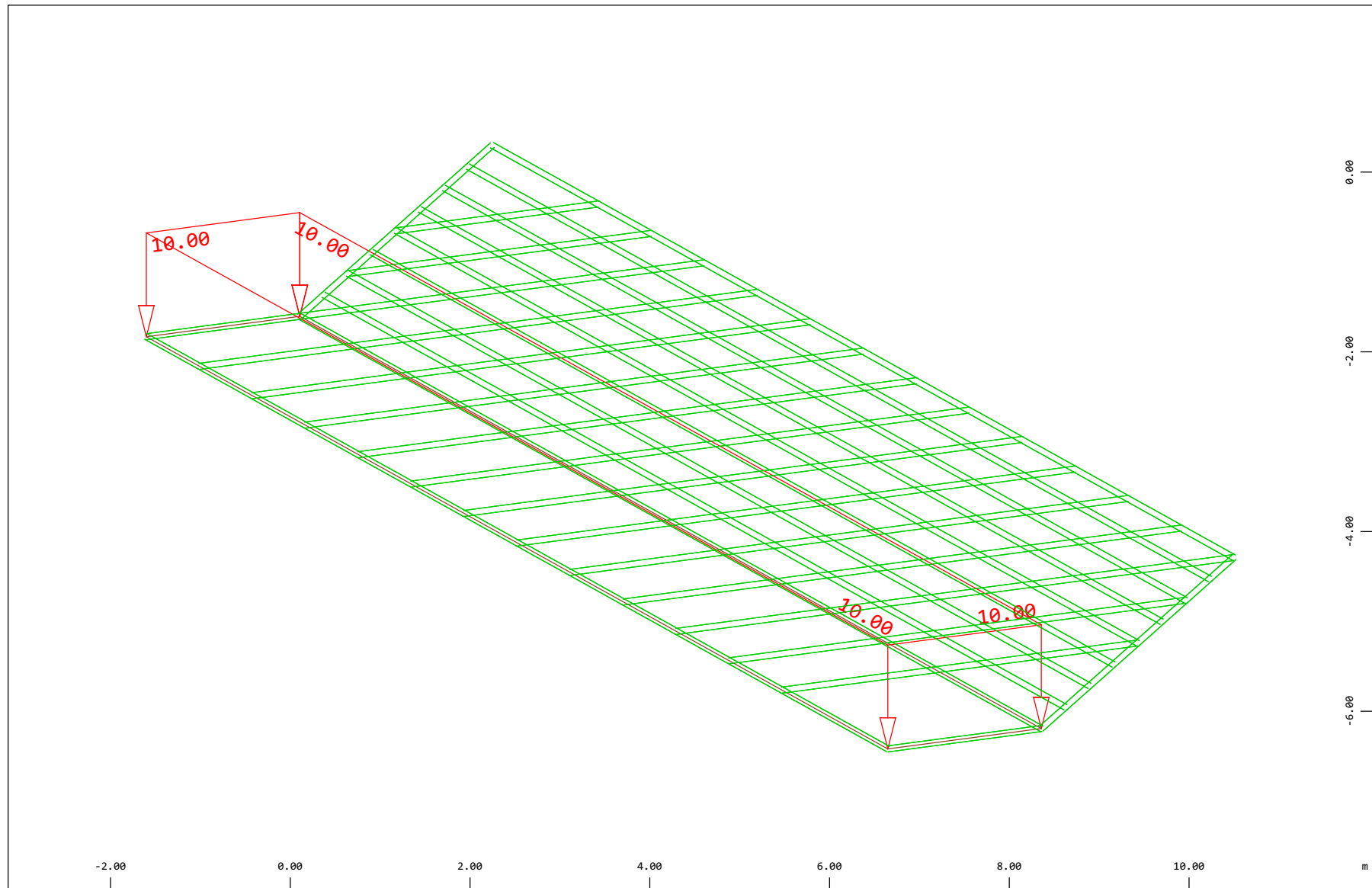


Z Sector of system Group 10 11 20...23 31...37 40,STEE
Y All loads, Loadcase 202 Qt: Treno Scarico , (1 cm 3D = unit) Free area load (force) in global Z (Unit=5.00 kN/m2)
X Structure

(Min=-4.17) (Max=-4.17)
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFiSTiK AG - www.sofistik.de

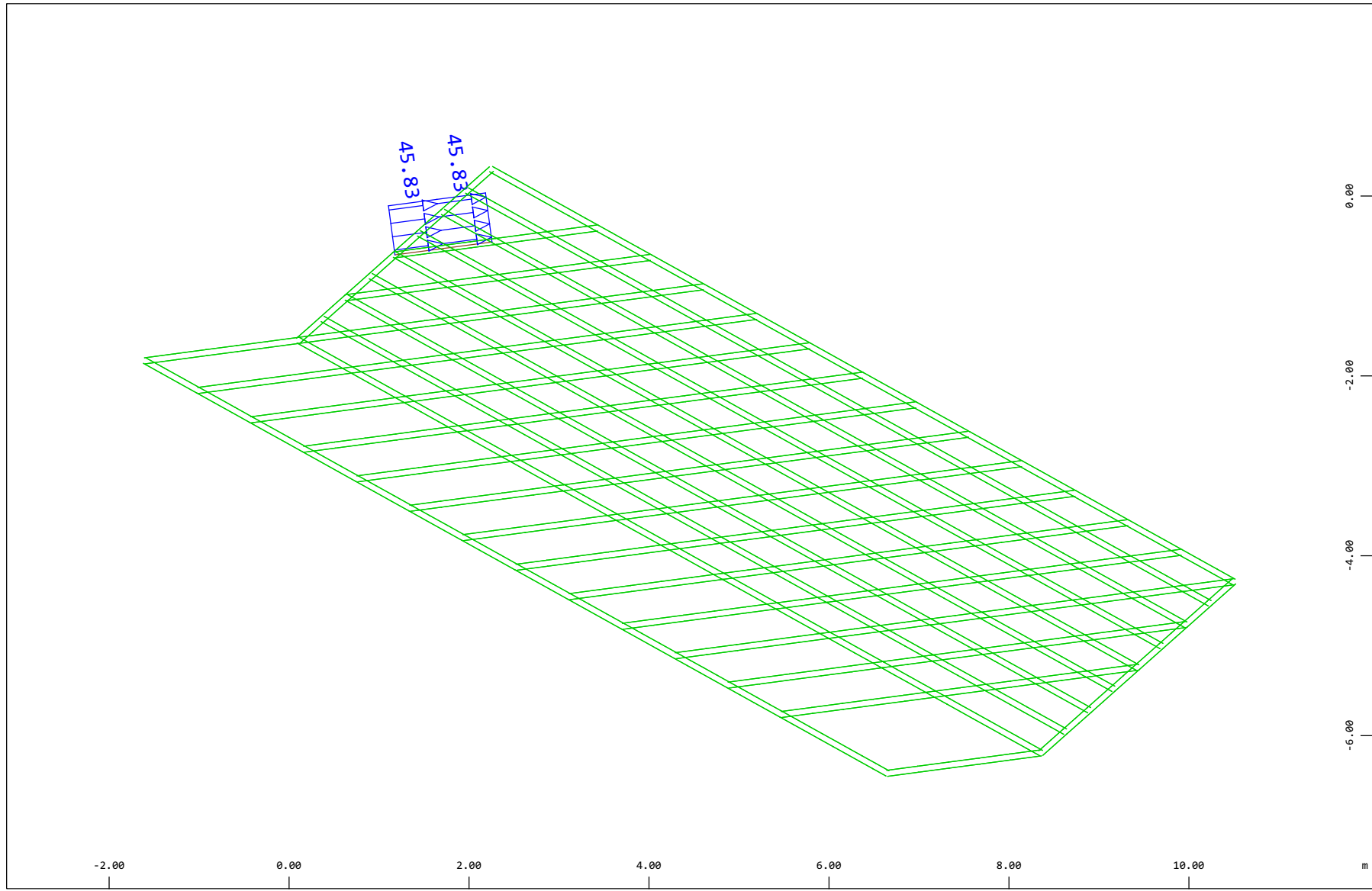


Z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 203 Qt: Marciapiedi , (1 cm 3D = unit) Free area load (force) in global Z (Unit=5.00 kN/m2)
Structure

(Min=-10.0) (Max=-10.0)
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

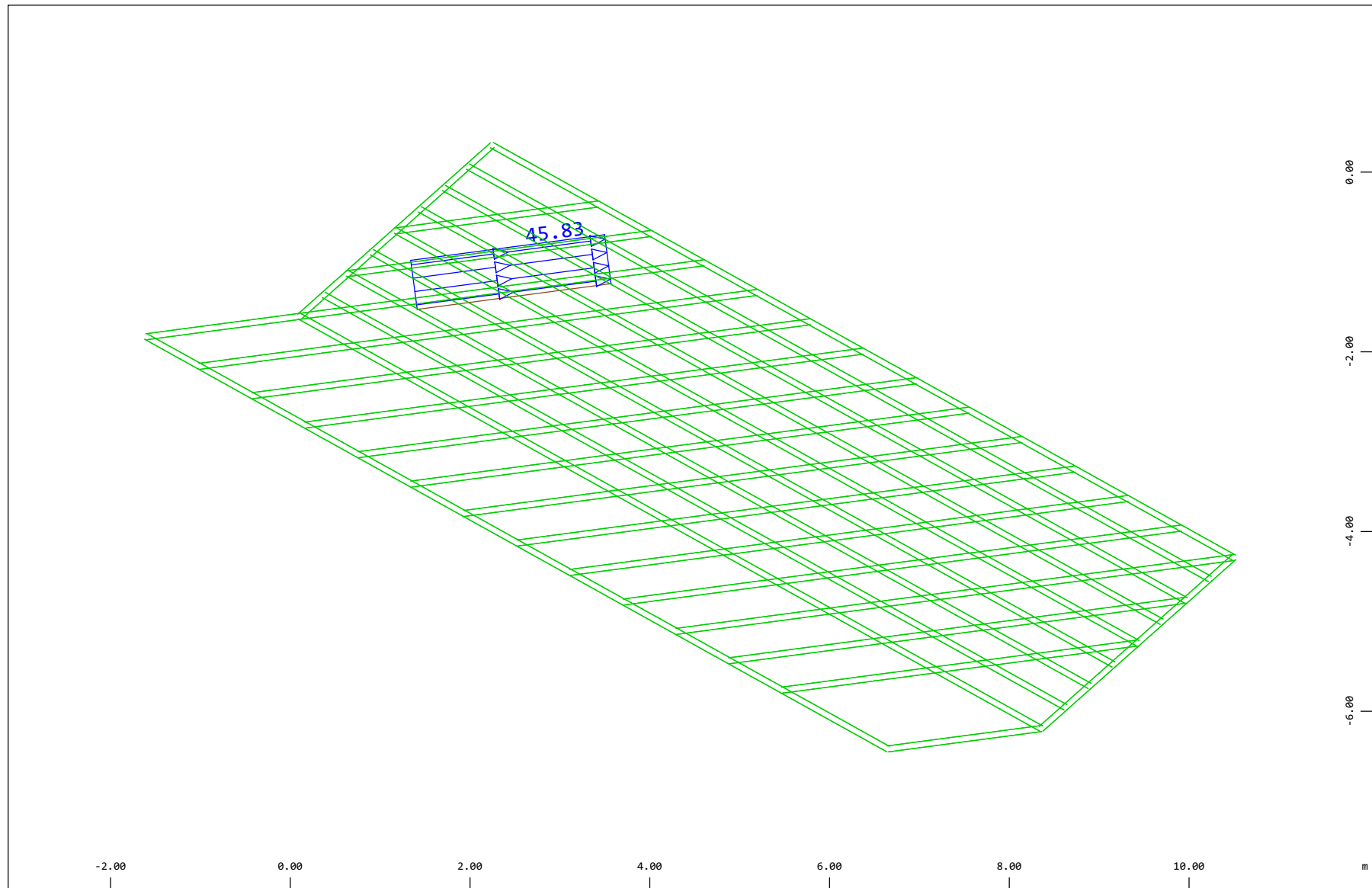


Z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
Structure

(Max=45.8) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

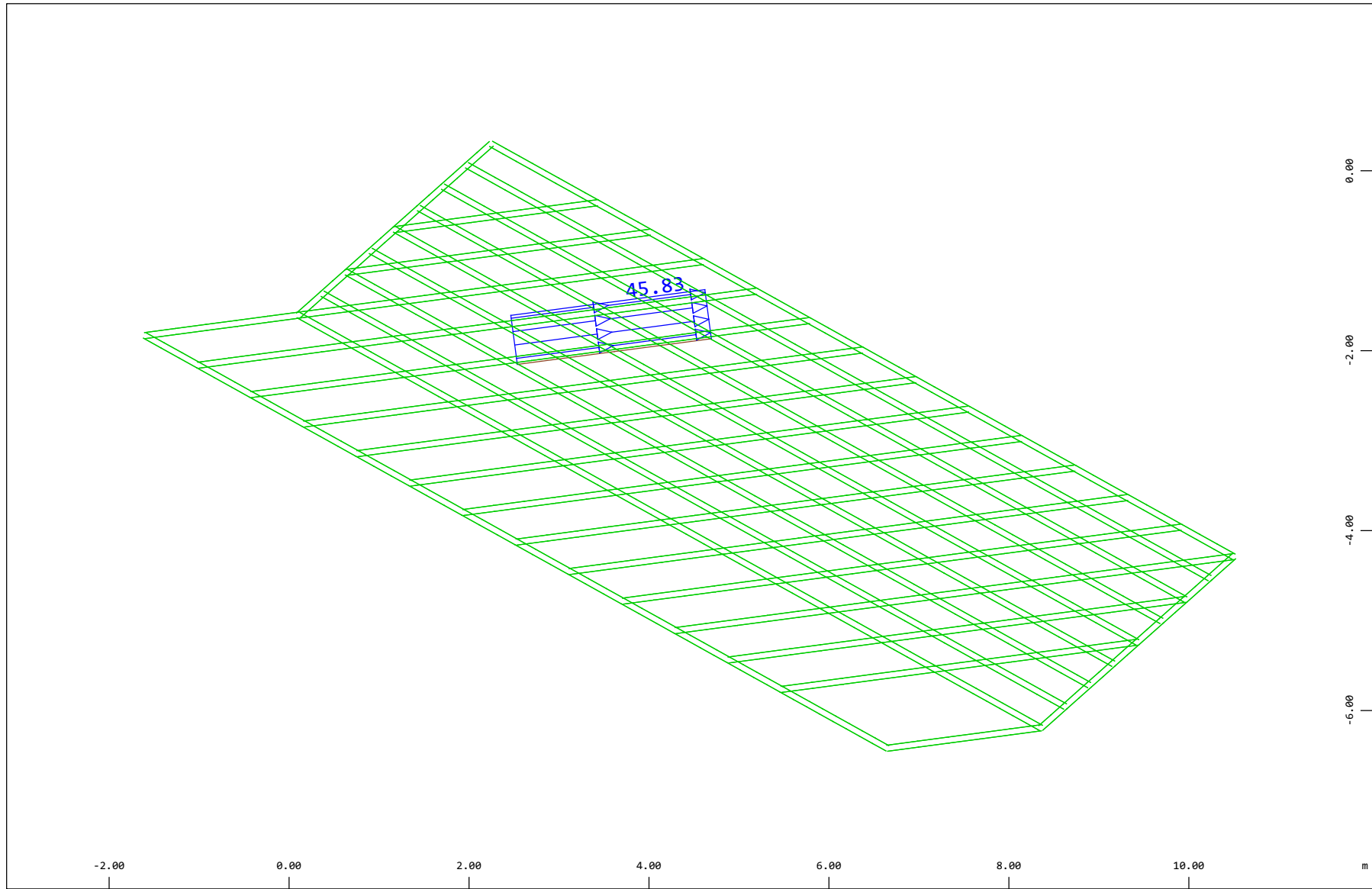


Z
X Y
Sector of system Group 10 11 20...23 31...37 40, STEE
All loads, Loadcase 303 Qt: Serpeggio-S 6m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
Structure

X * 0.502
Y * 0.906
Z * 0.962
Max=45.8

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

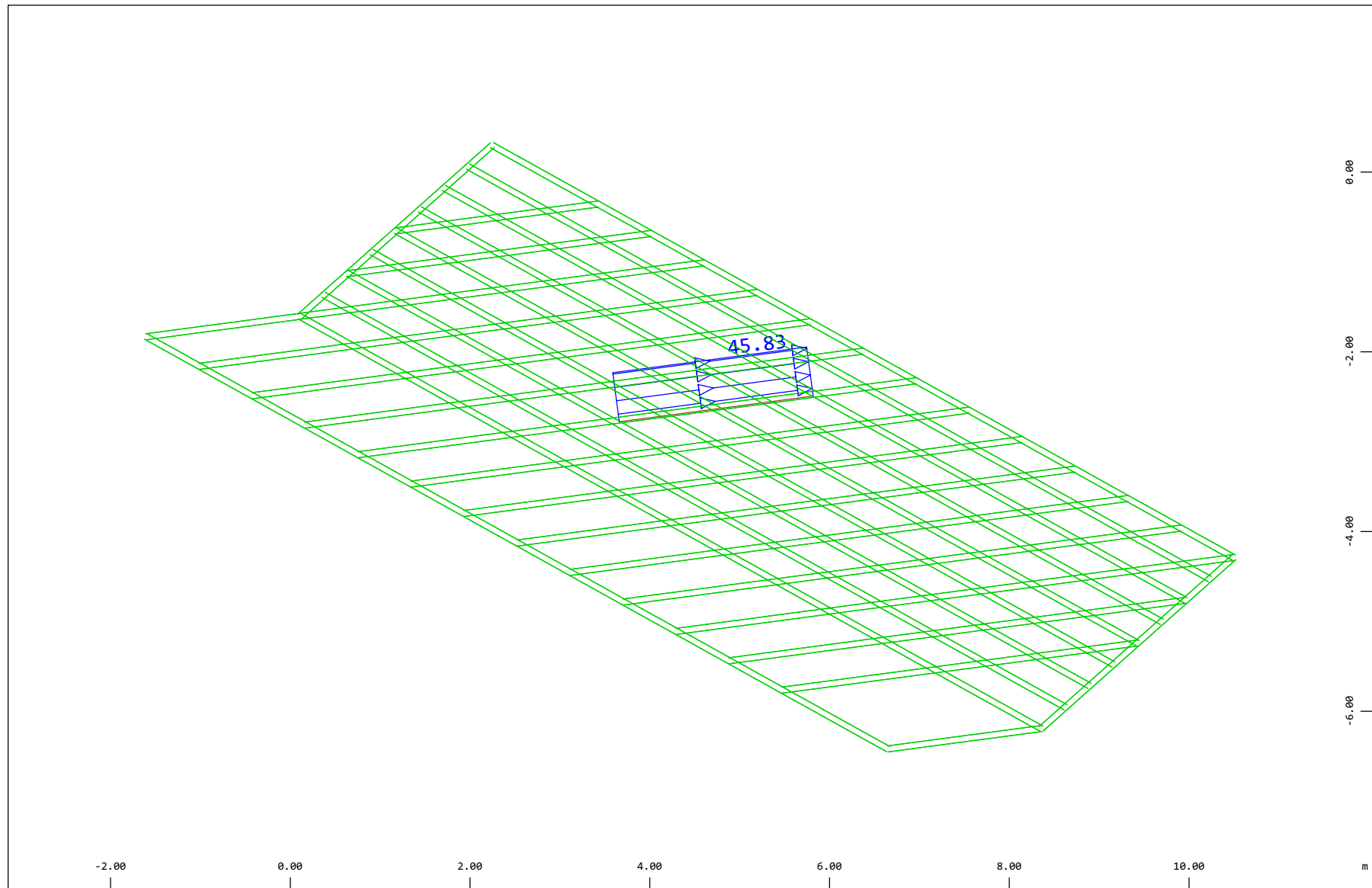


z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 306 Qt: Serpeggio-S 8m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m
Structure

(Max=45.8) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

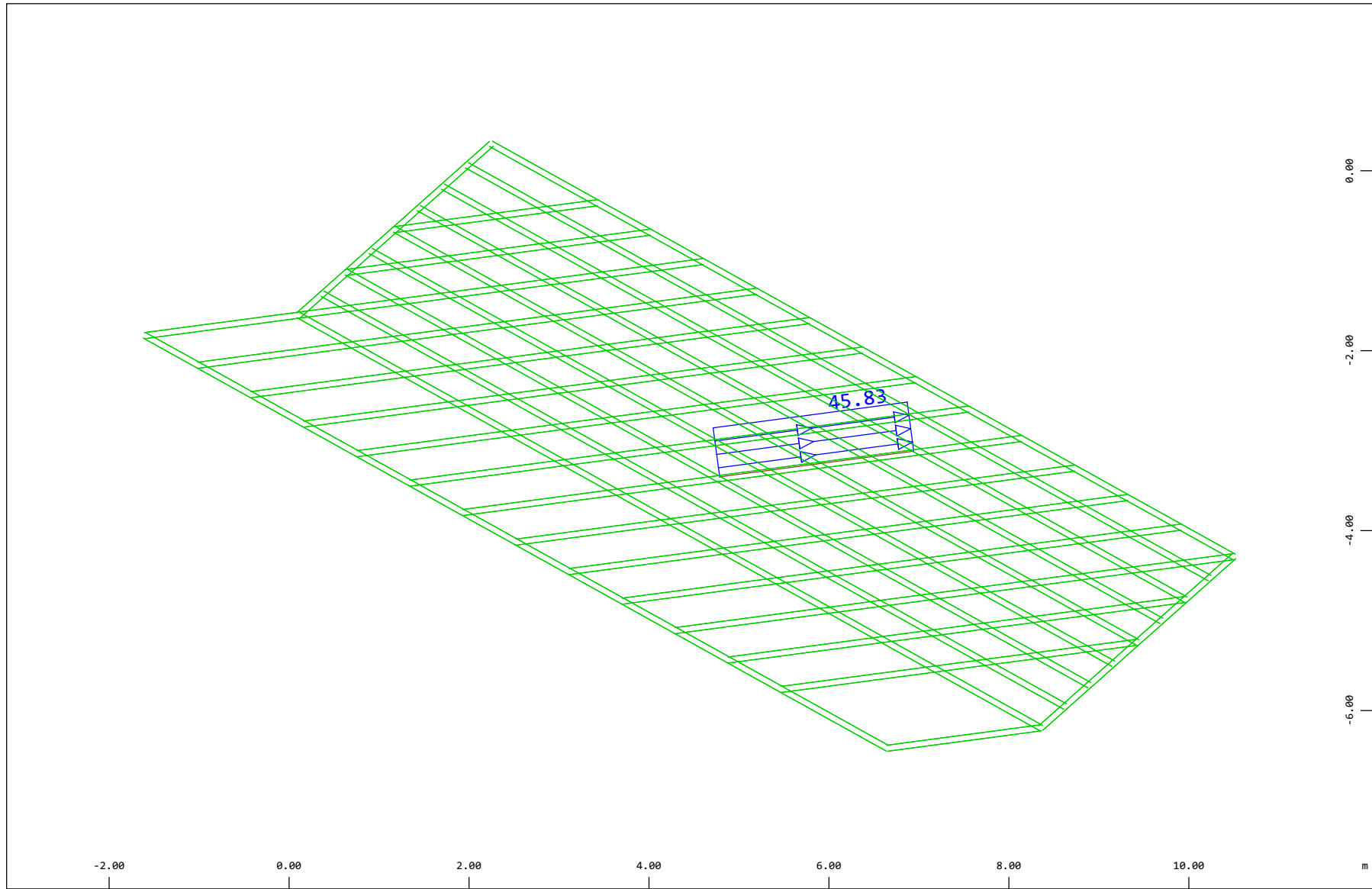


Z
Y
X
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 309 Qt: Serpeggio-S 11m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
Structure

X * 0.502
Y * 0.906
Z * 0.962
(Max=45.83)

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

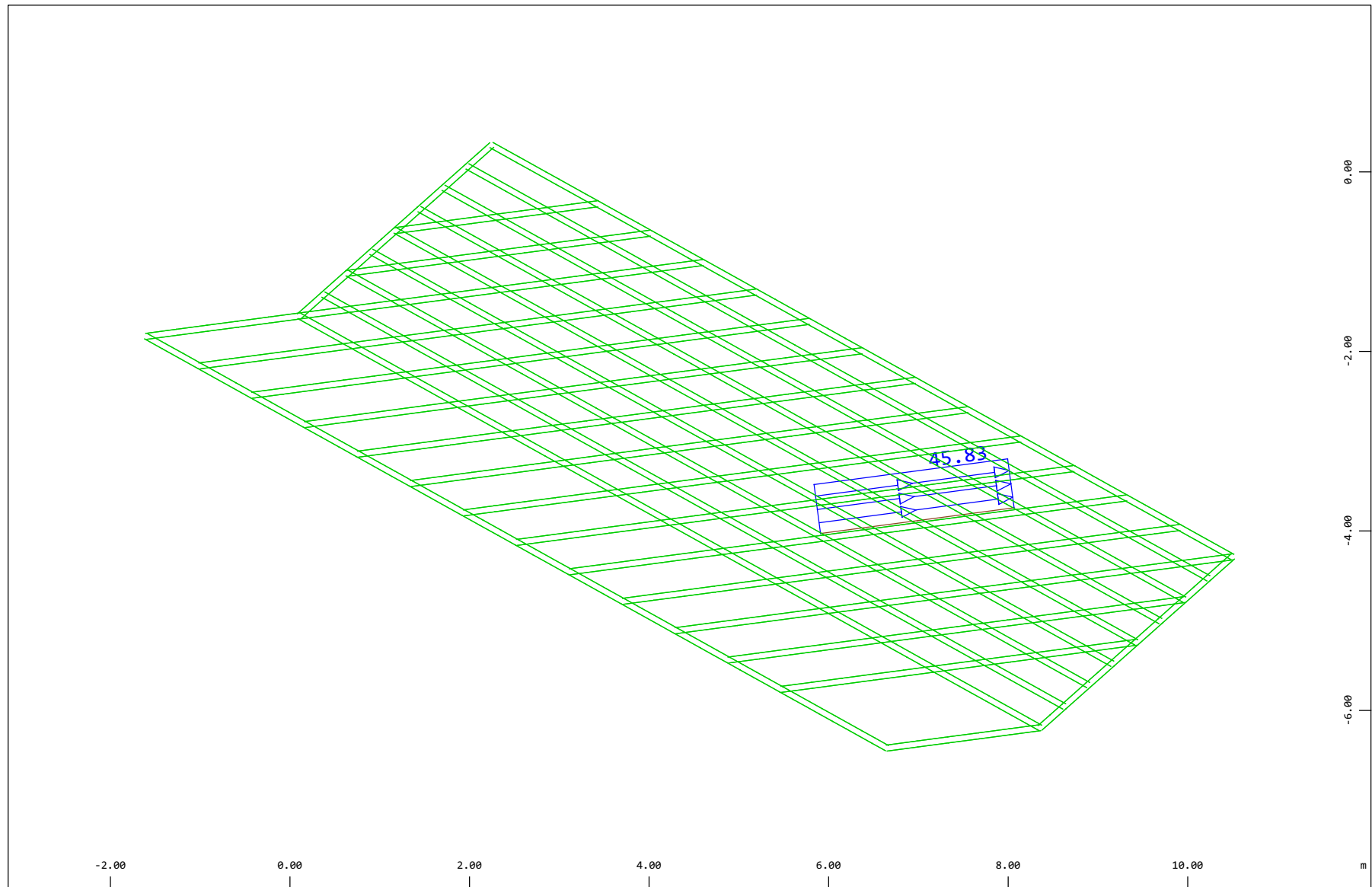


Z
Y
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 312 Qt: Serpeggio-S 13m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
Structure

(Max=45.83) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

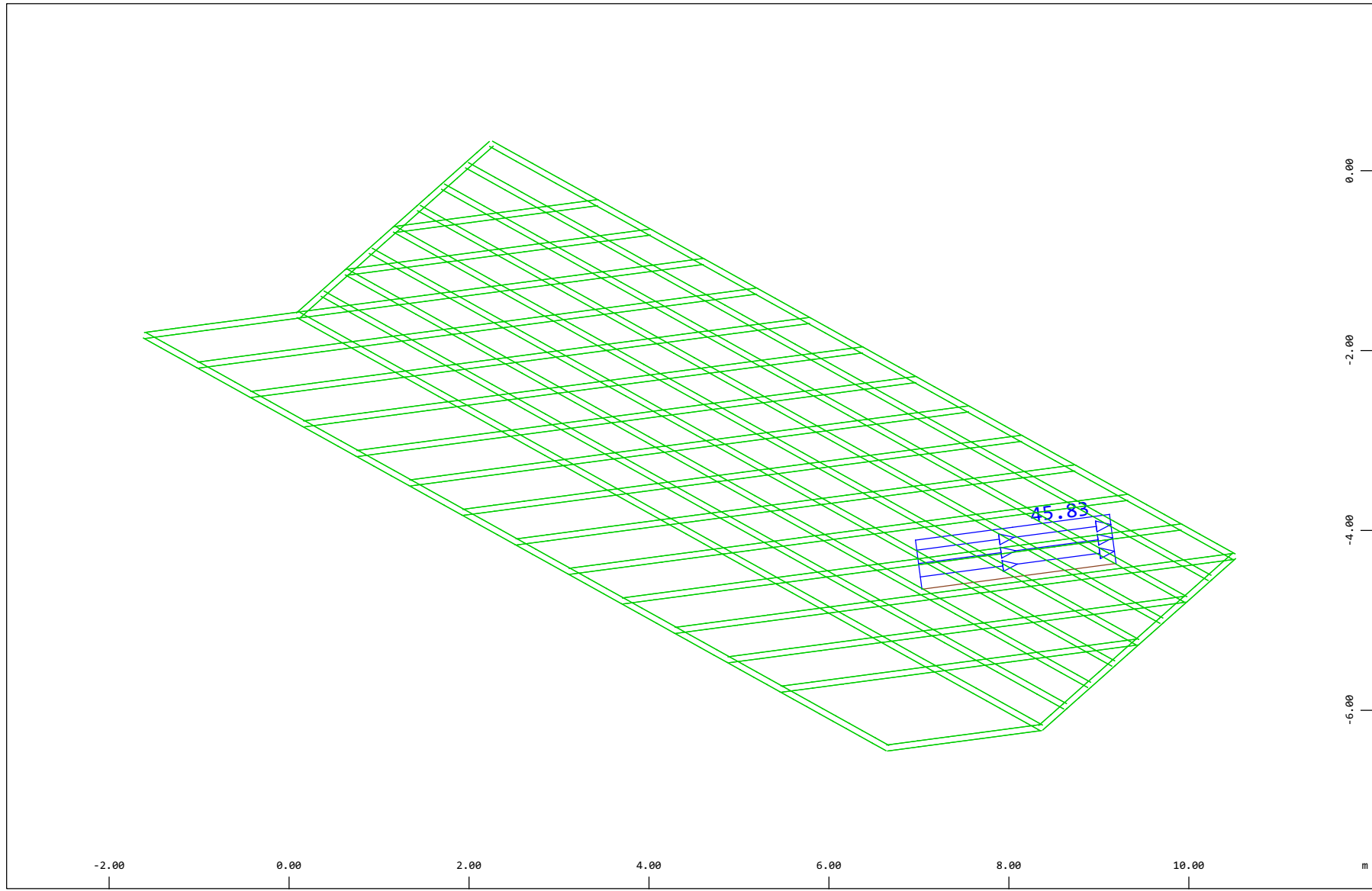


Z
Y
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 315 Qt: Serpeggio-S 16m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
Structure

(Max=45.83) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

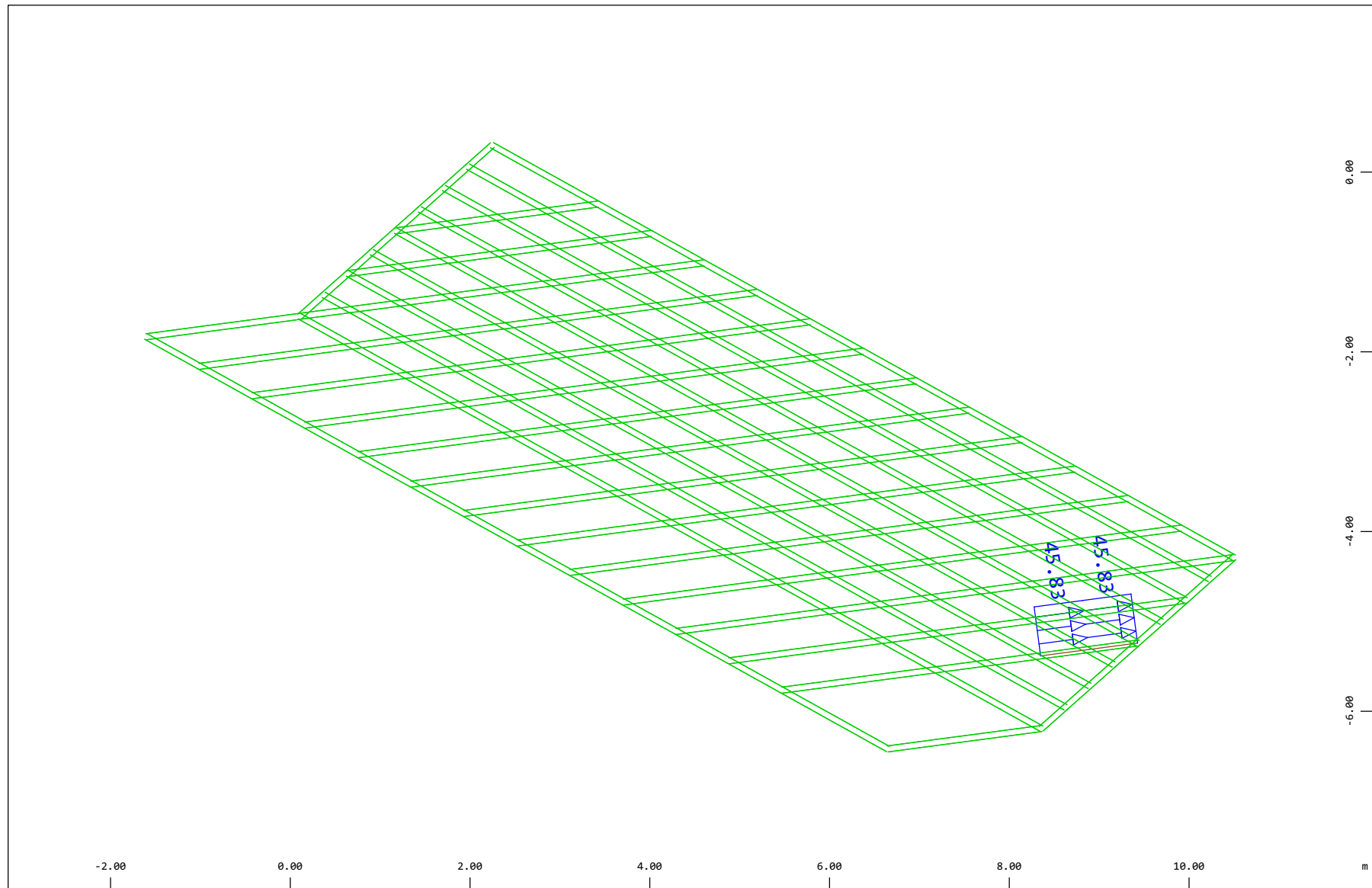


z
y
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 318 Qt: Serpeggio-S 18m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
Structure

(Max=45.83) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

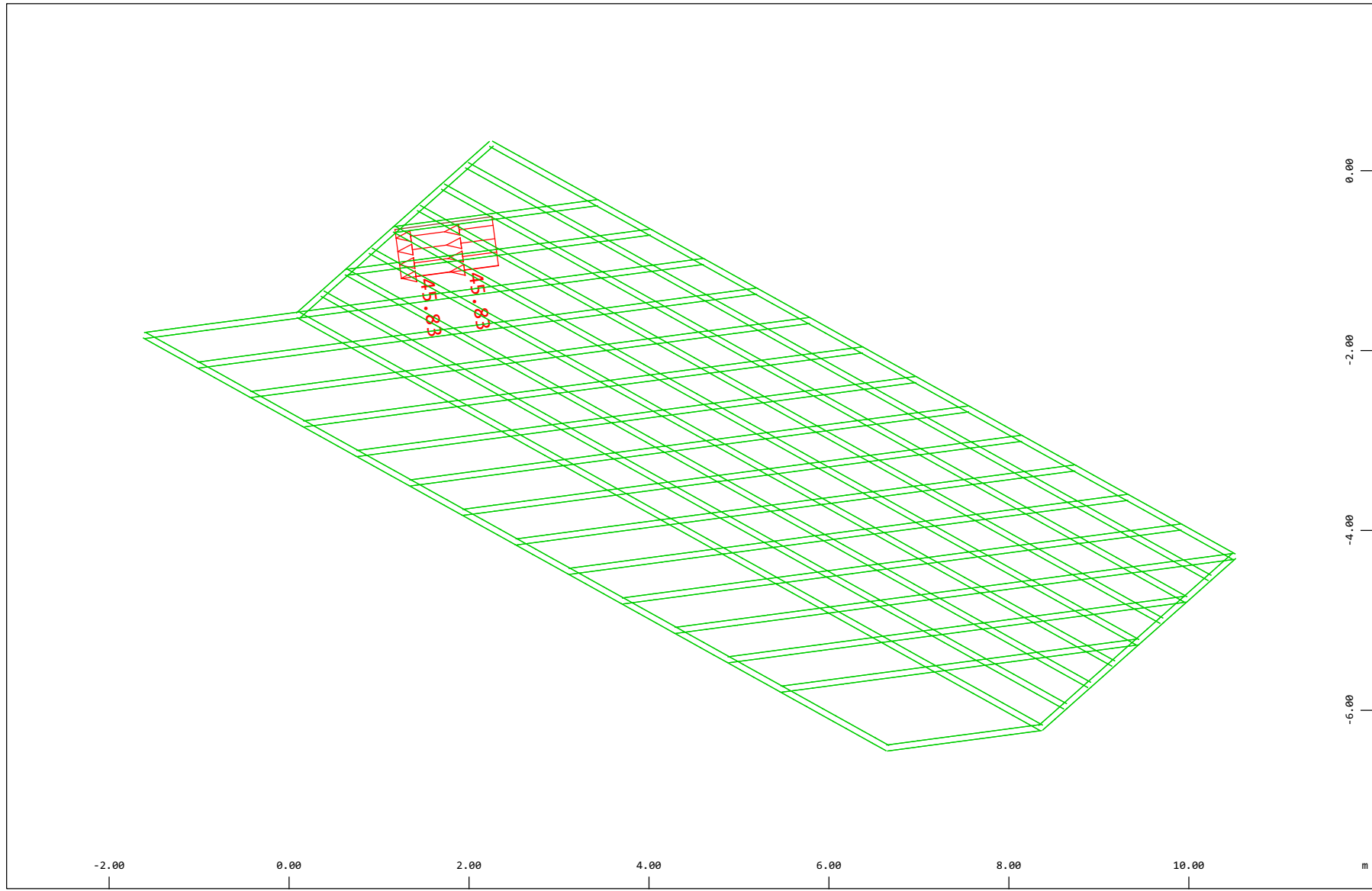


z
y
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
Structure

X * 0.502
Y * 0.906
Z * 0.962
(Max=45.83)

Definition of Axis
Result Graphics

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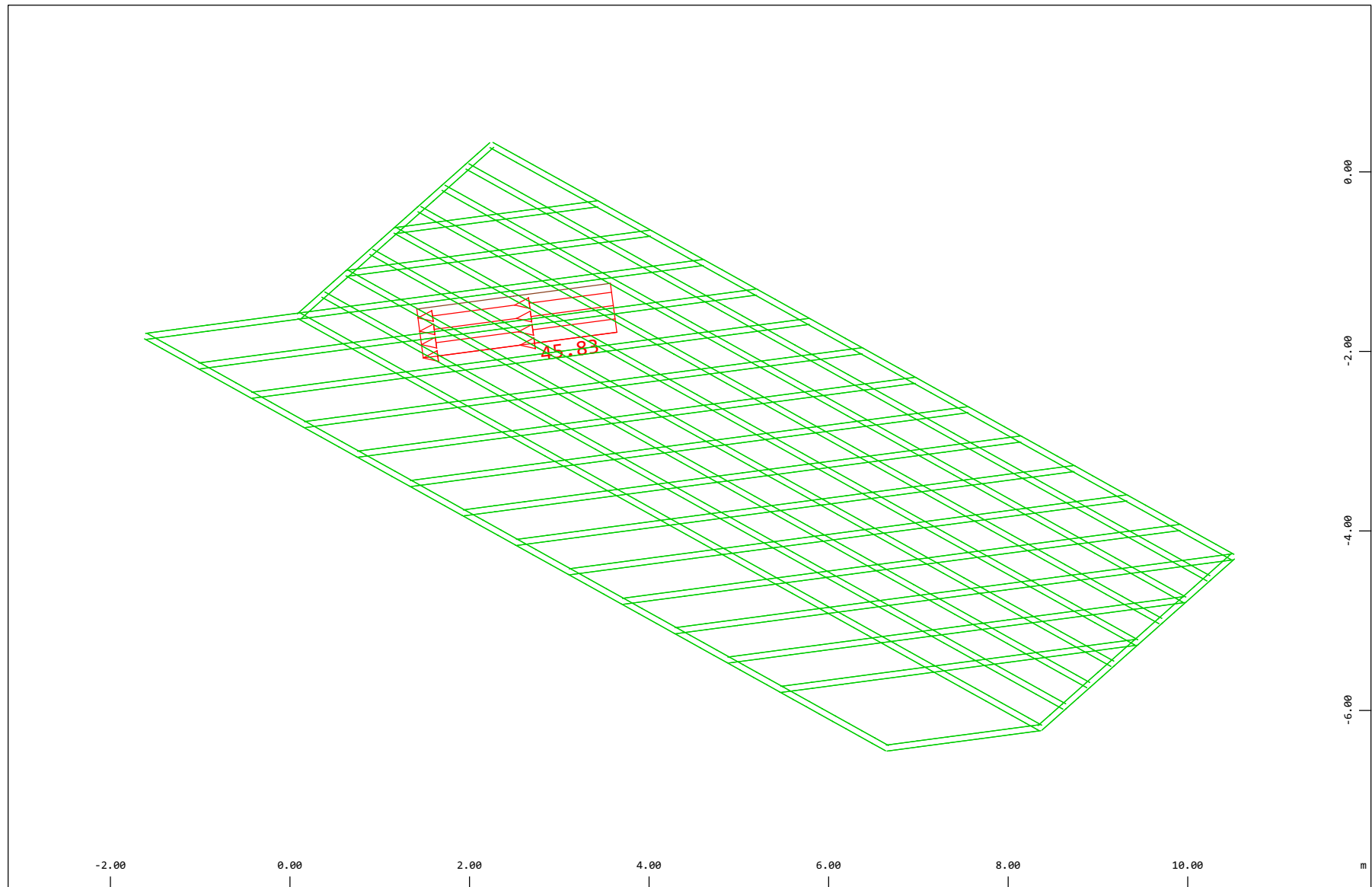
Z
Y
X

Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
(Max=-45.8)

(Min=-45.8) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

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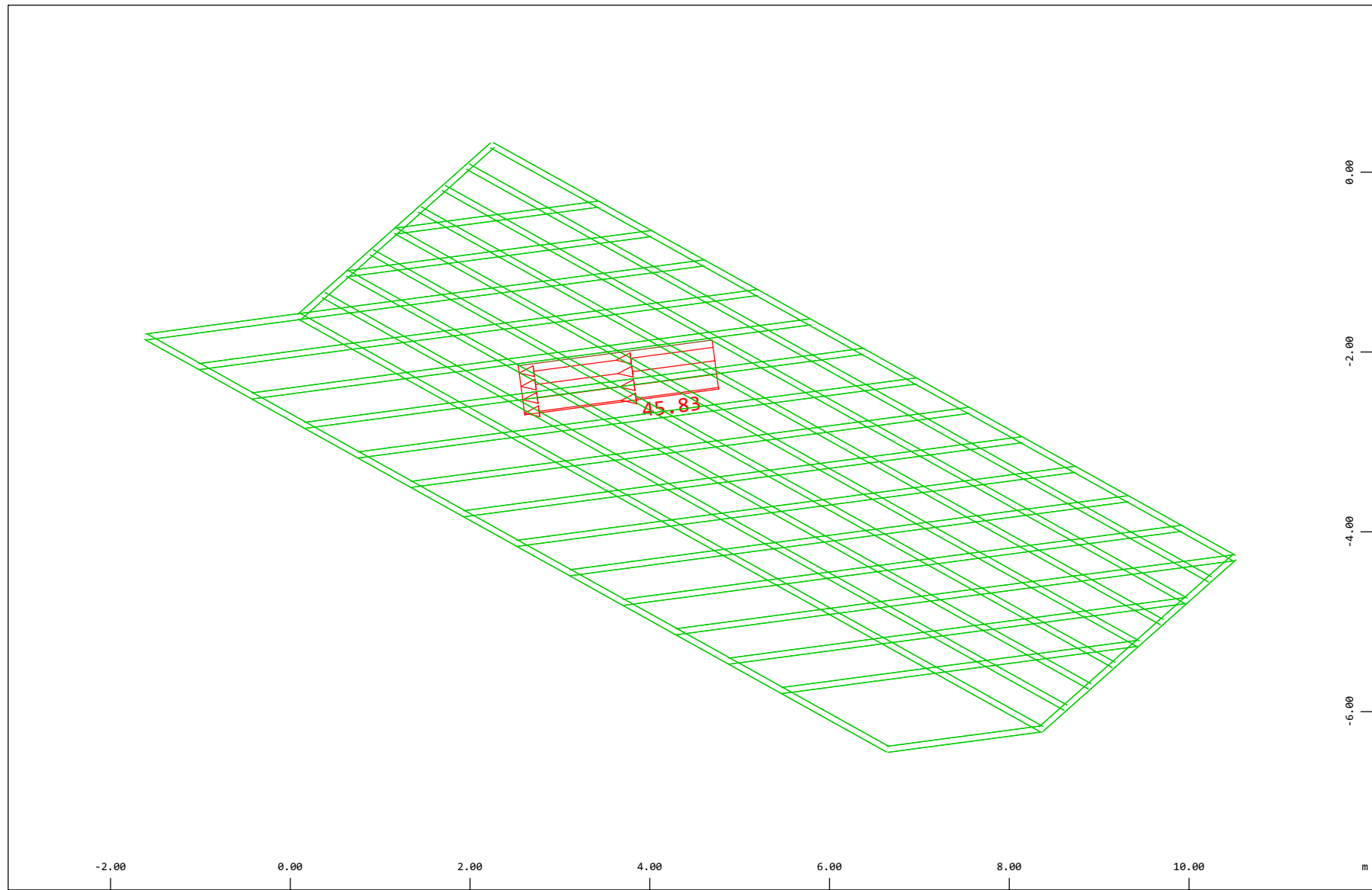
Z
Y
X

Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 403 Qt: Serpeggio-S 6m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
(Max=-45.8)

(Min=-45.8) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

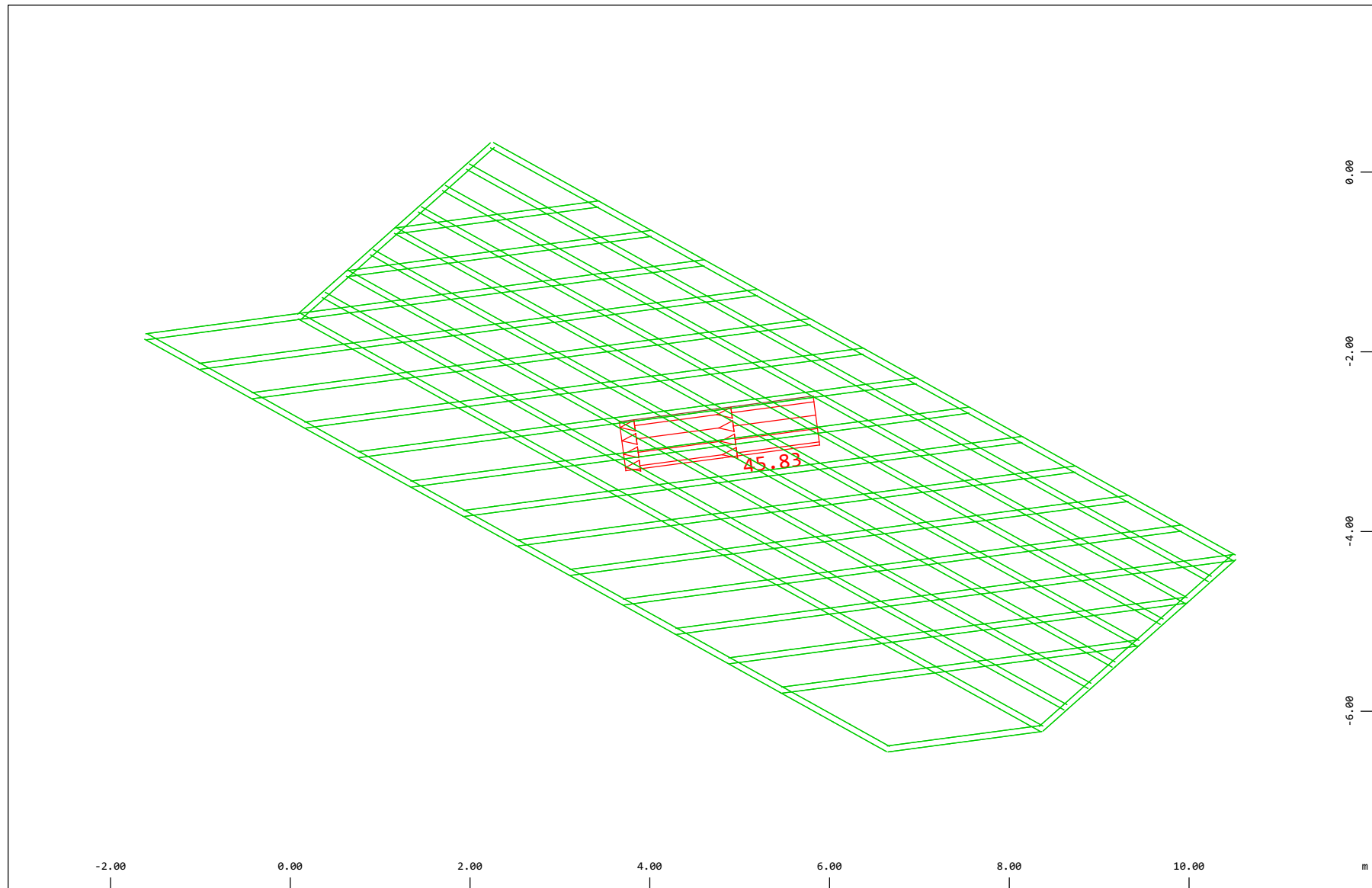


Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 406 Qt: Serpeggio-S 8m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m
(Max=-45.8)

(Min=-45.8) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

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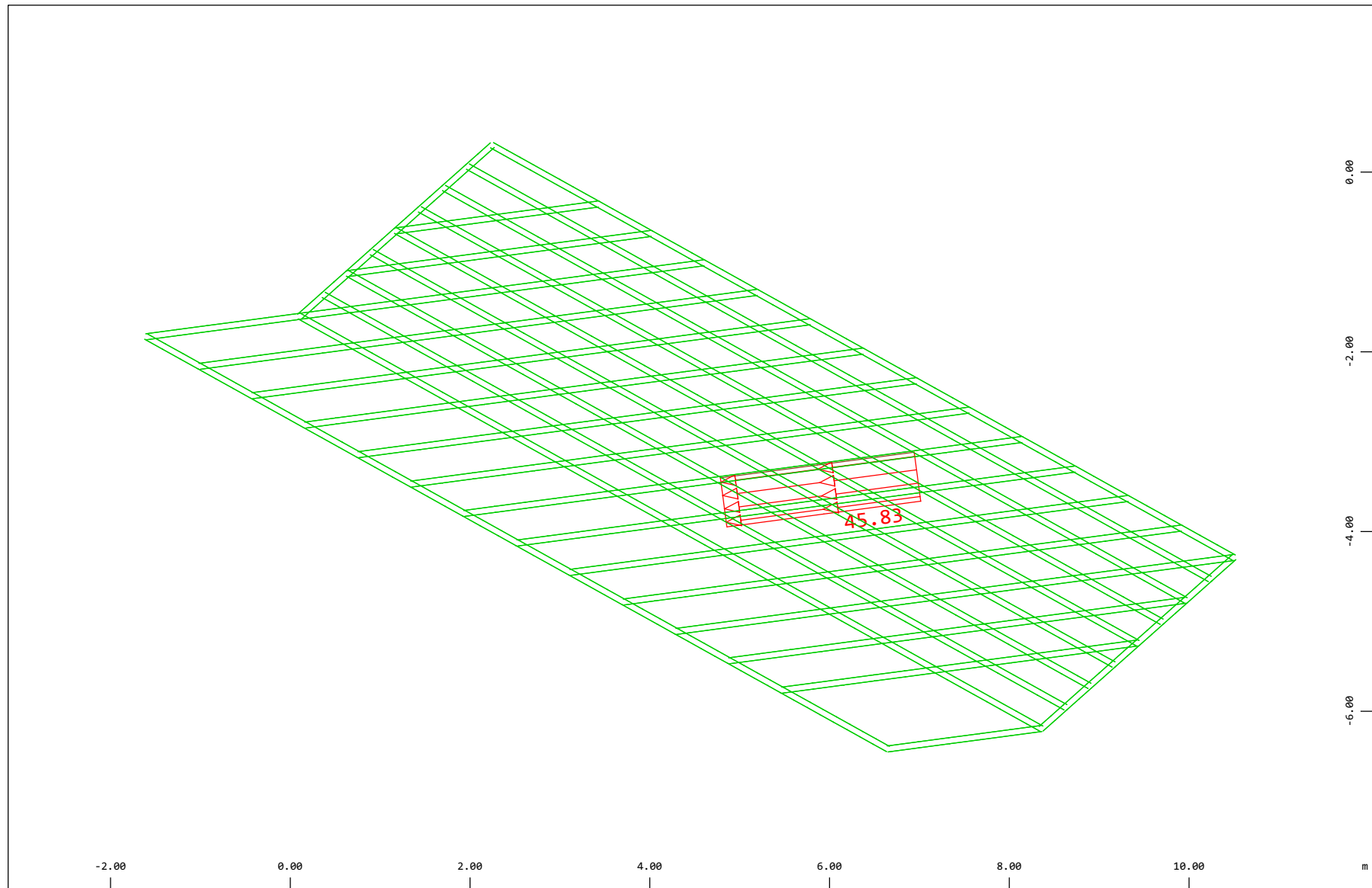


Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 409 Qt: Serpeggio-S 11m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m)
(Max=-45.8)

X * 0.502
Y * 0.906
Z * 0.962
(Min=-45.8) (Max=45.8)

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

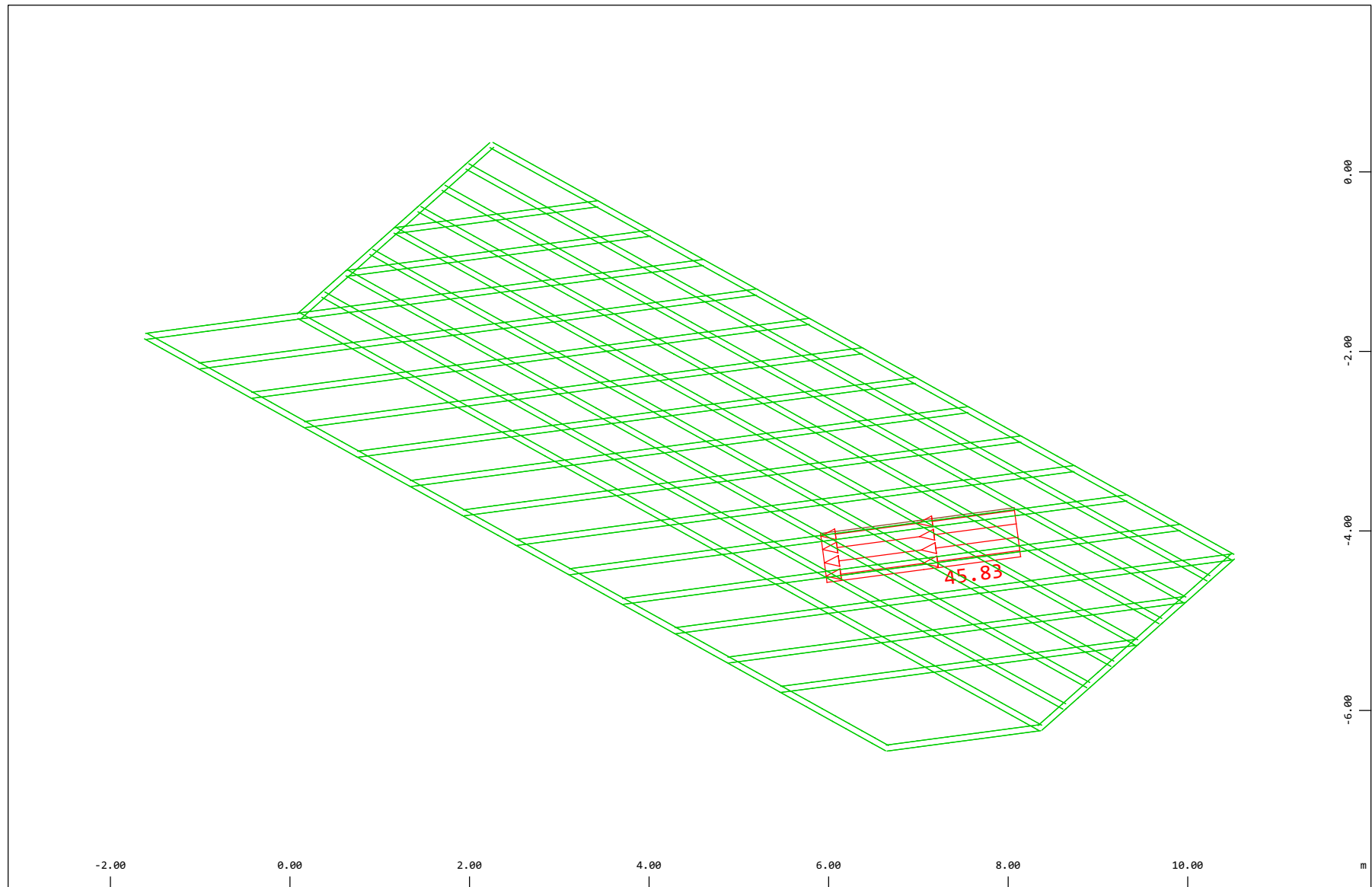


Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 412 Qt: Serpeggio-S 13m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m
(Max=-45.8)

X * 0.502
Y * 0.906
Z * 0.962
(Min=-45.8)

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

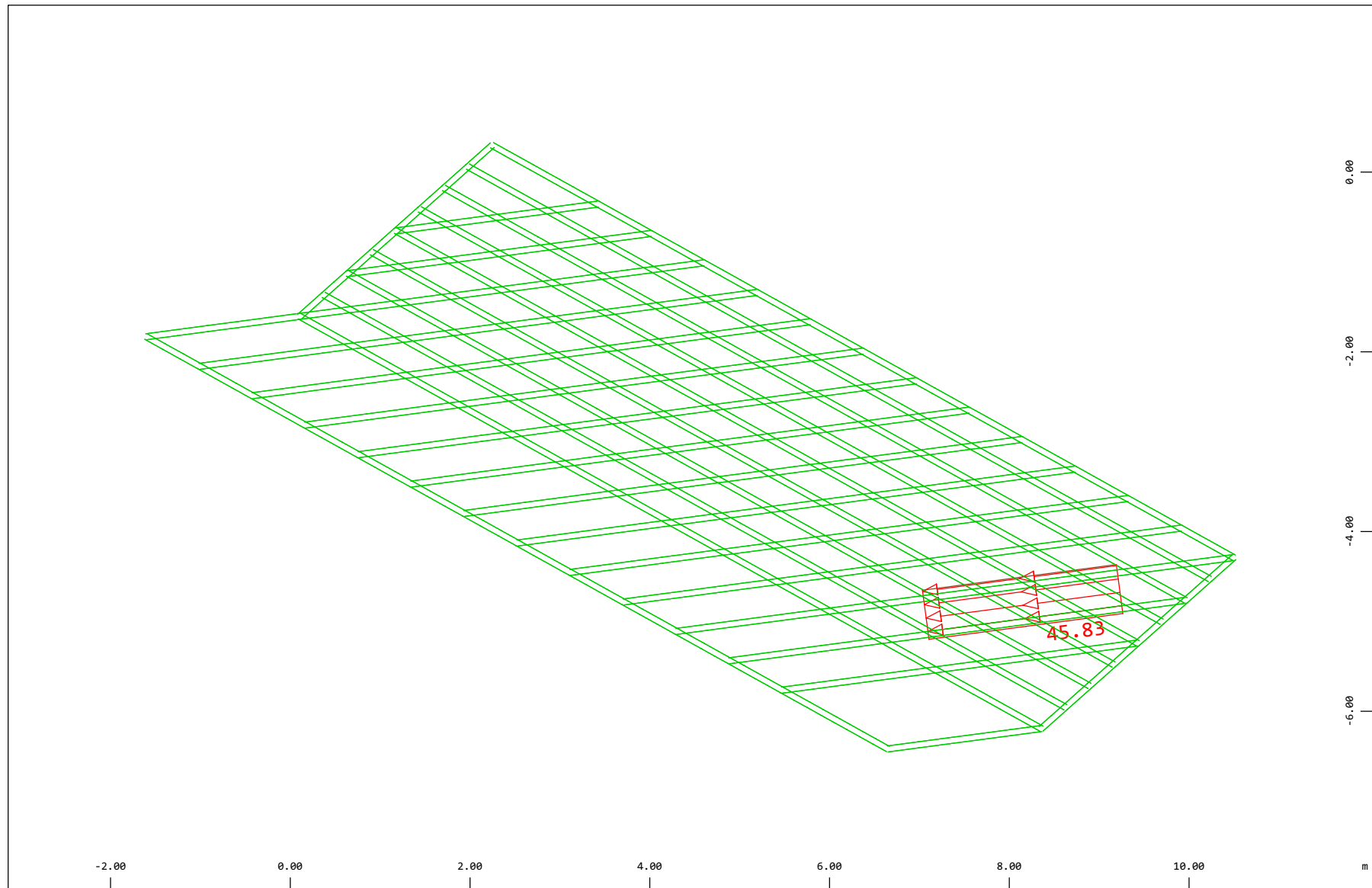


Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 415 Qt: Serpeggio-S 16m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m
(Max=-45.8)

X * 0.502
Y * 0.906
Z * 0.962
(Min=-45.8)

Definition of Axis
Result Graphics

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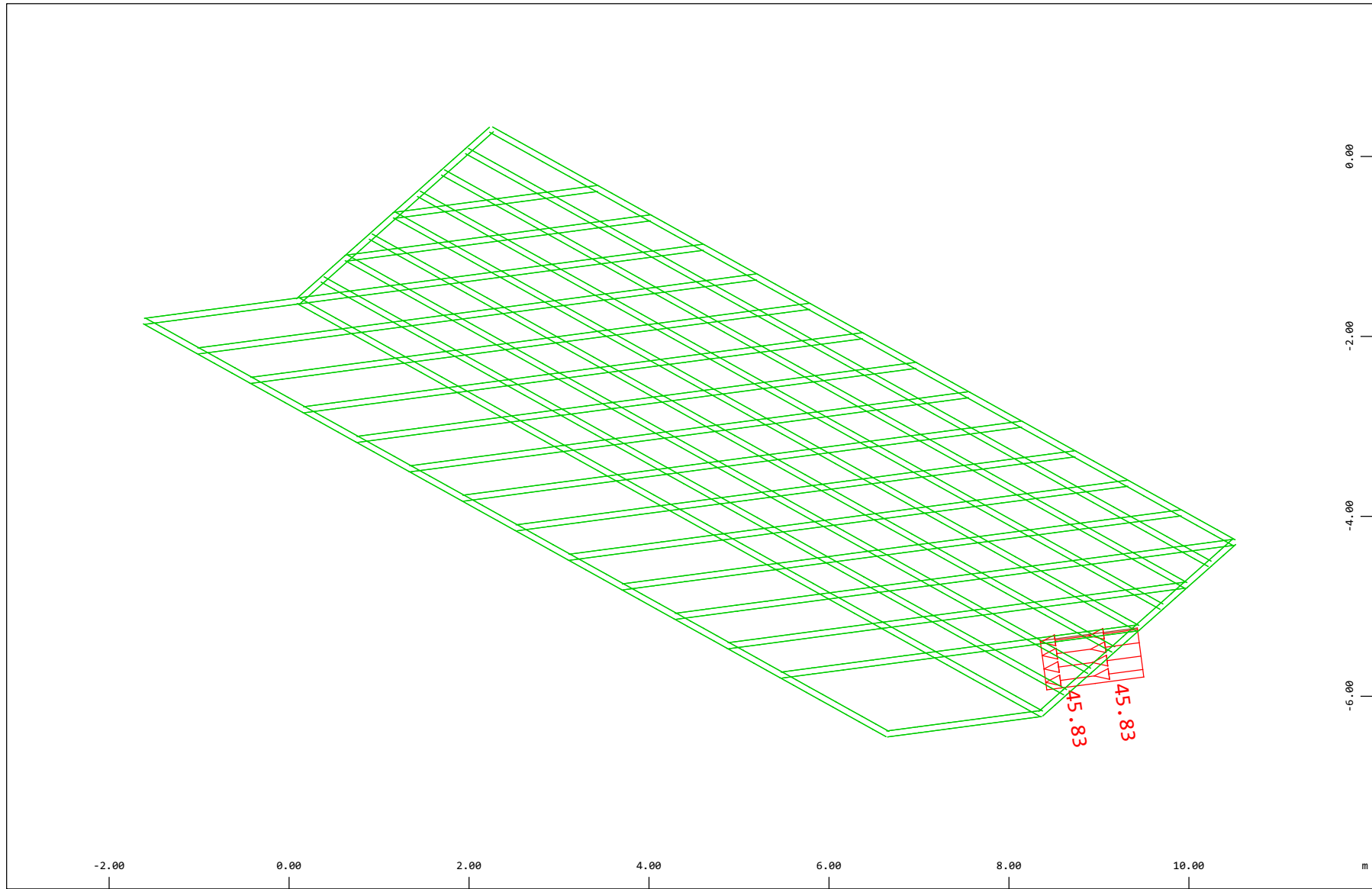
Z
Y

Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 418 Qt: Serpeggio-S 18m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m
(Max=-45.8)

X * 0.502
Y * 0.906
Z * 0.962
(Min=-45.8)

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

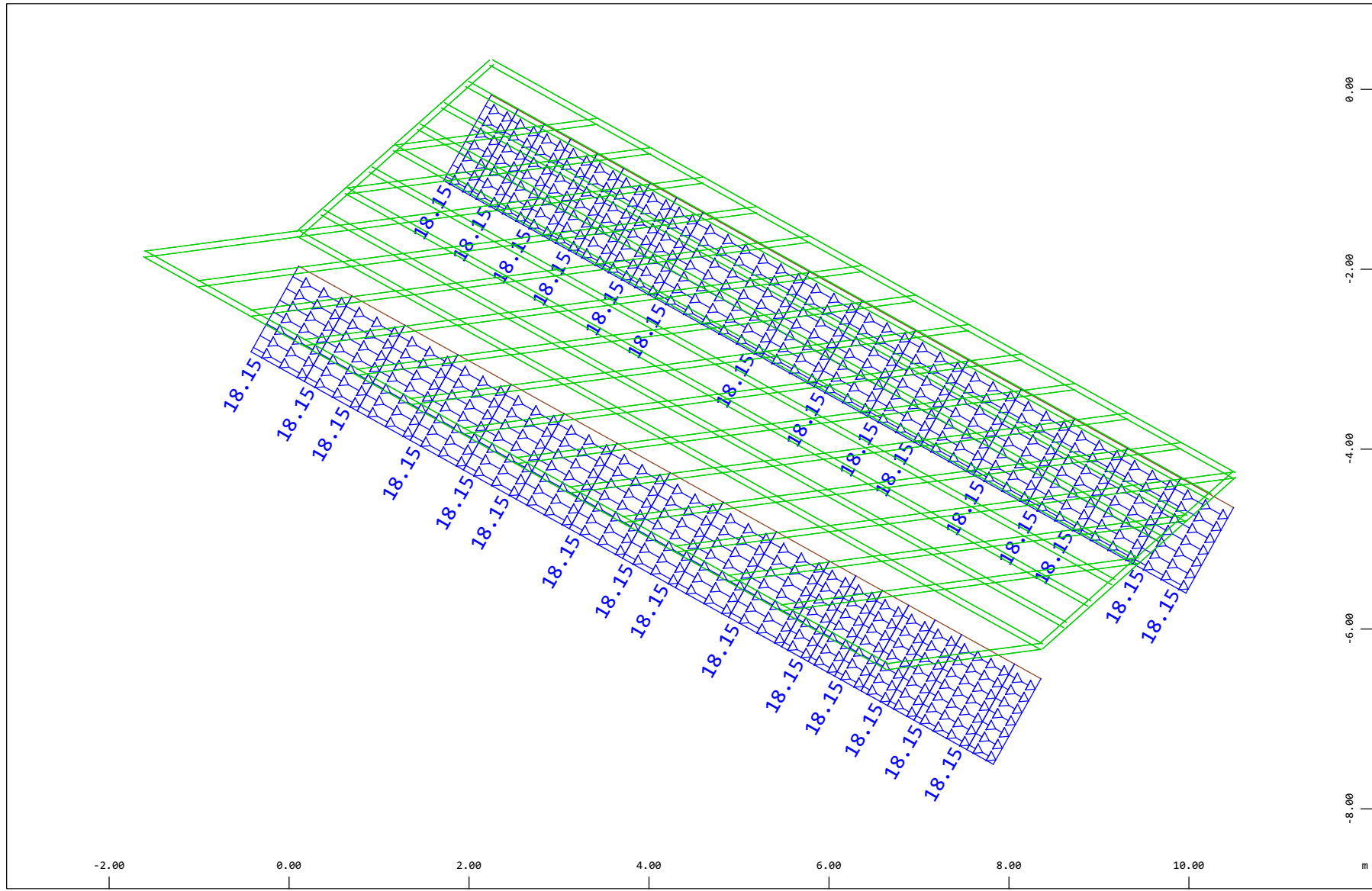


z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=50.0 kN/m
(Max=-45.8)

(Min=-45.8) X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Result Graphics

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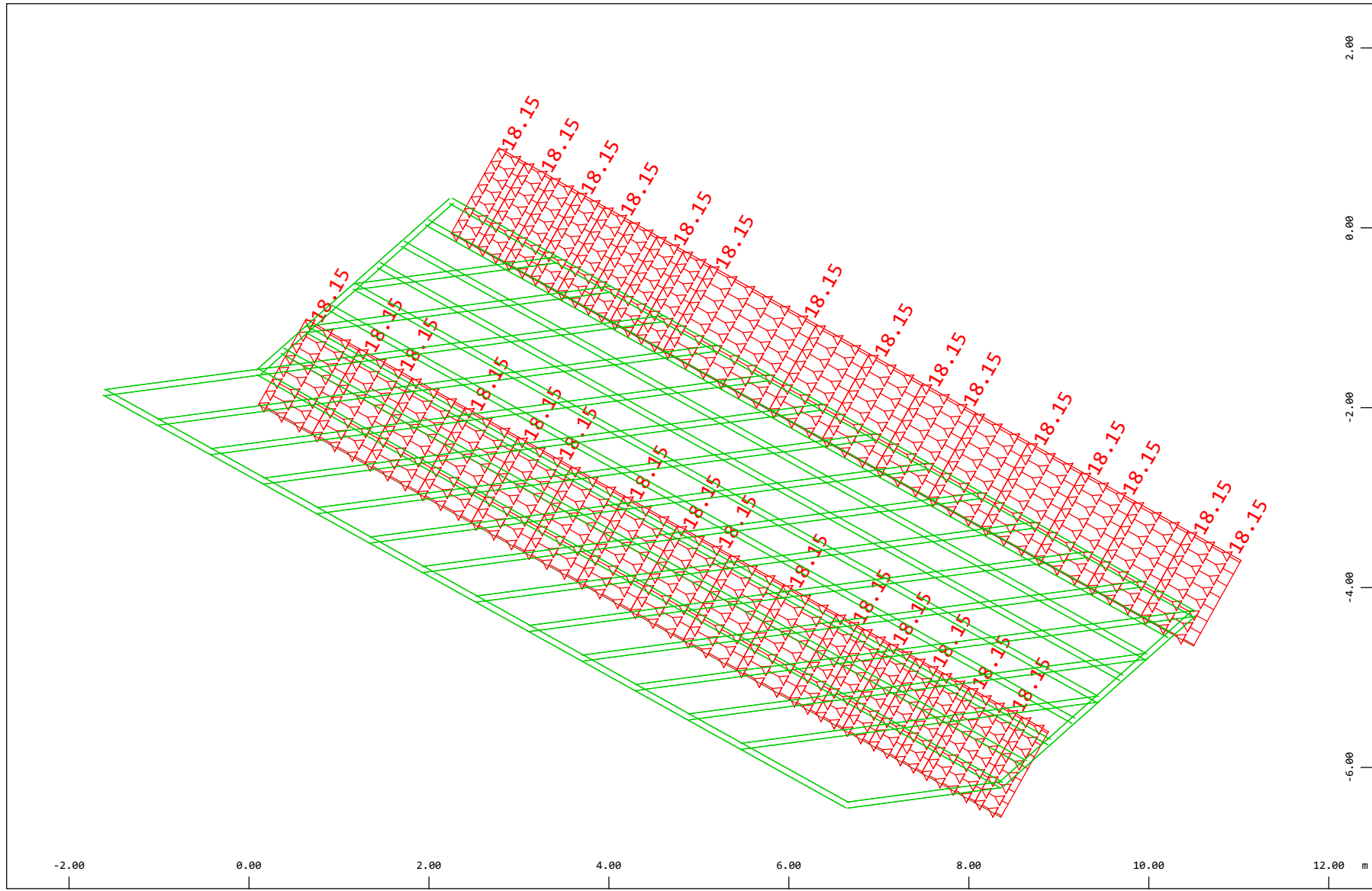


Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 500 Qt: Avviamento LM71 (A-->B) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=10.0 kN/m
 Structure

(Max=18.1)
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

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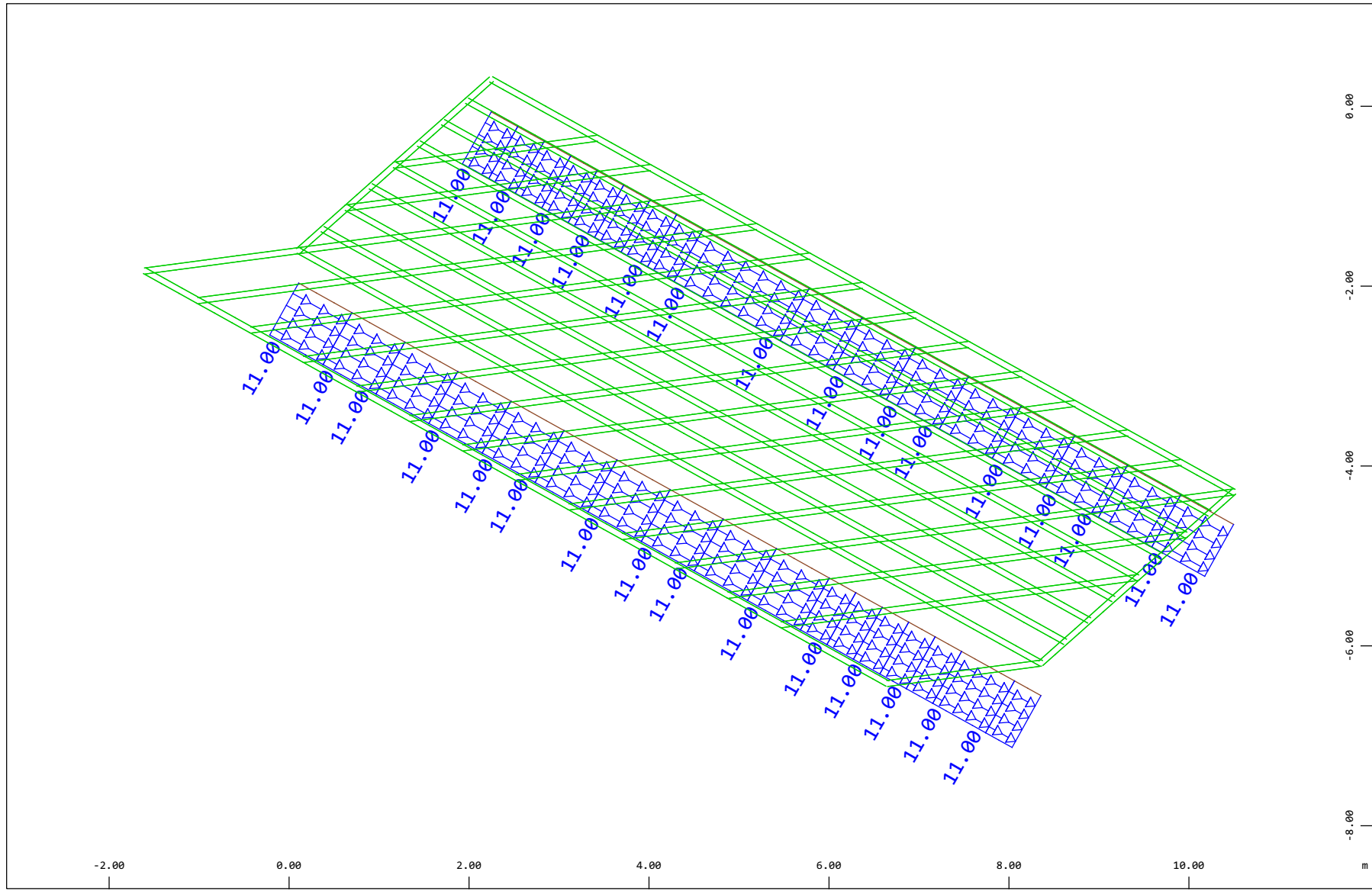


$\begin{matrix} Z \\ | \\ X \end{matrix}$ Y
 Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 501 Qt: Avviamento LM71 (B-->A) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=10.0 kN/m
 (Max=-18.1)

∇ (Min=-18.1) X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Result Graphics

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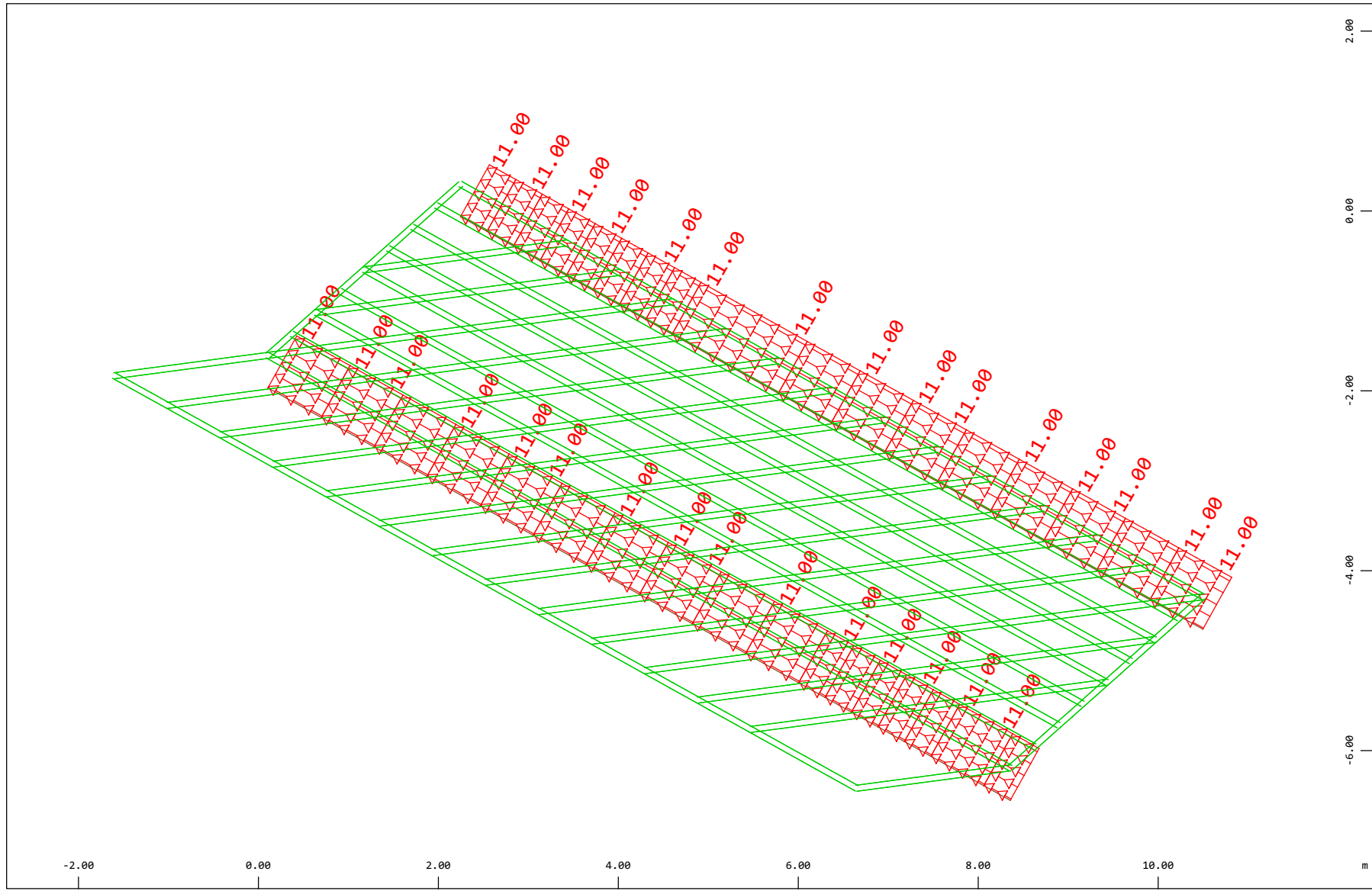


Z Sector of system Group 10 11 20...23 31...37 40,STEE
Y All loads, Loadcase 502 Qt: Frenatura LM71 (A-->B) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=10.0 kN/m)
X Structure


(Max=11.0)
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Result Graphics

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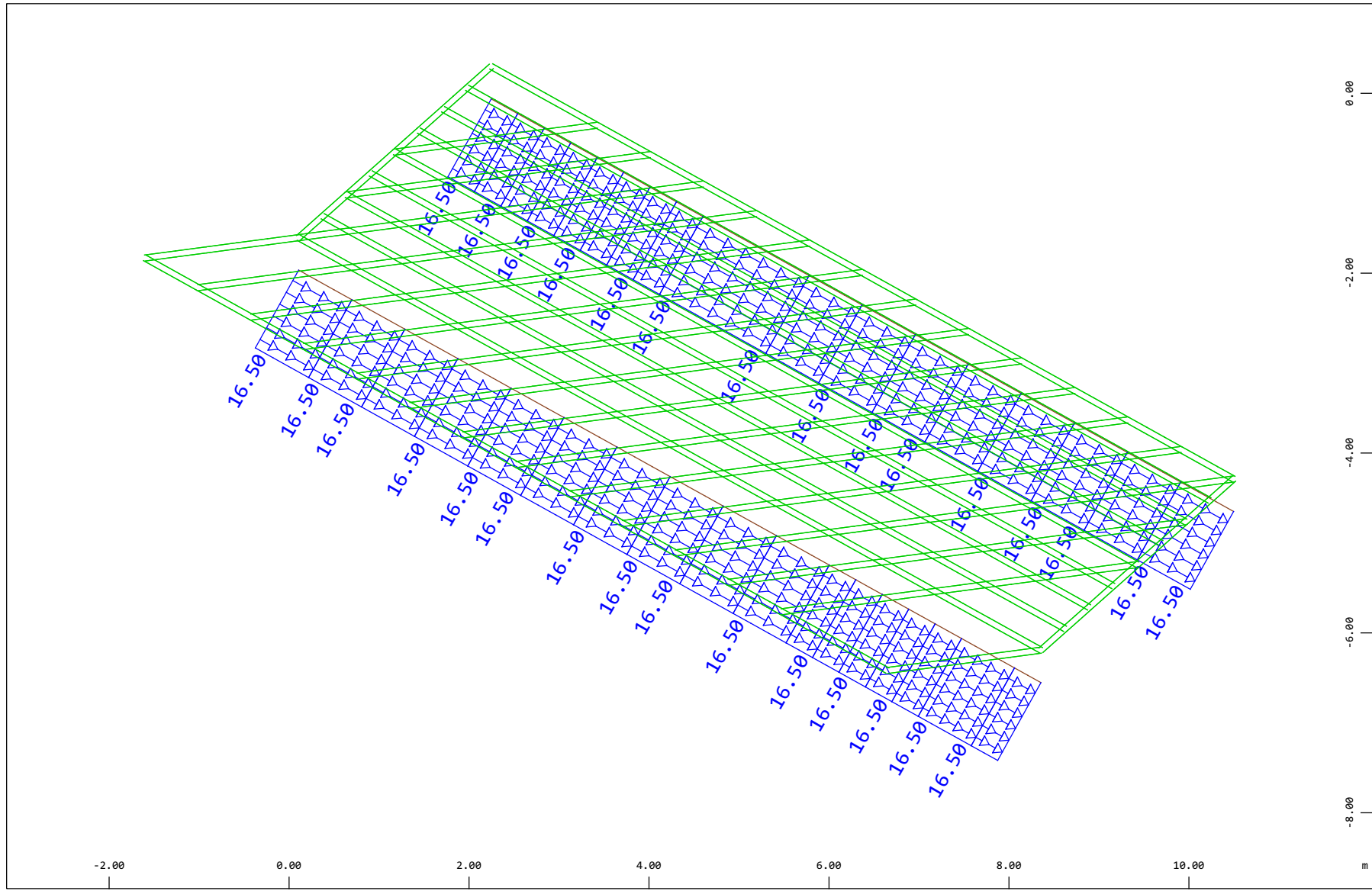


z
 X Y
 Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 503 Qt: Frenatura LM71 (B-->A) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=10.0 kN/m
 (Max=-11.0)

 (Min=-11.0)
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

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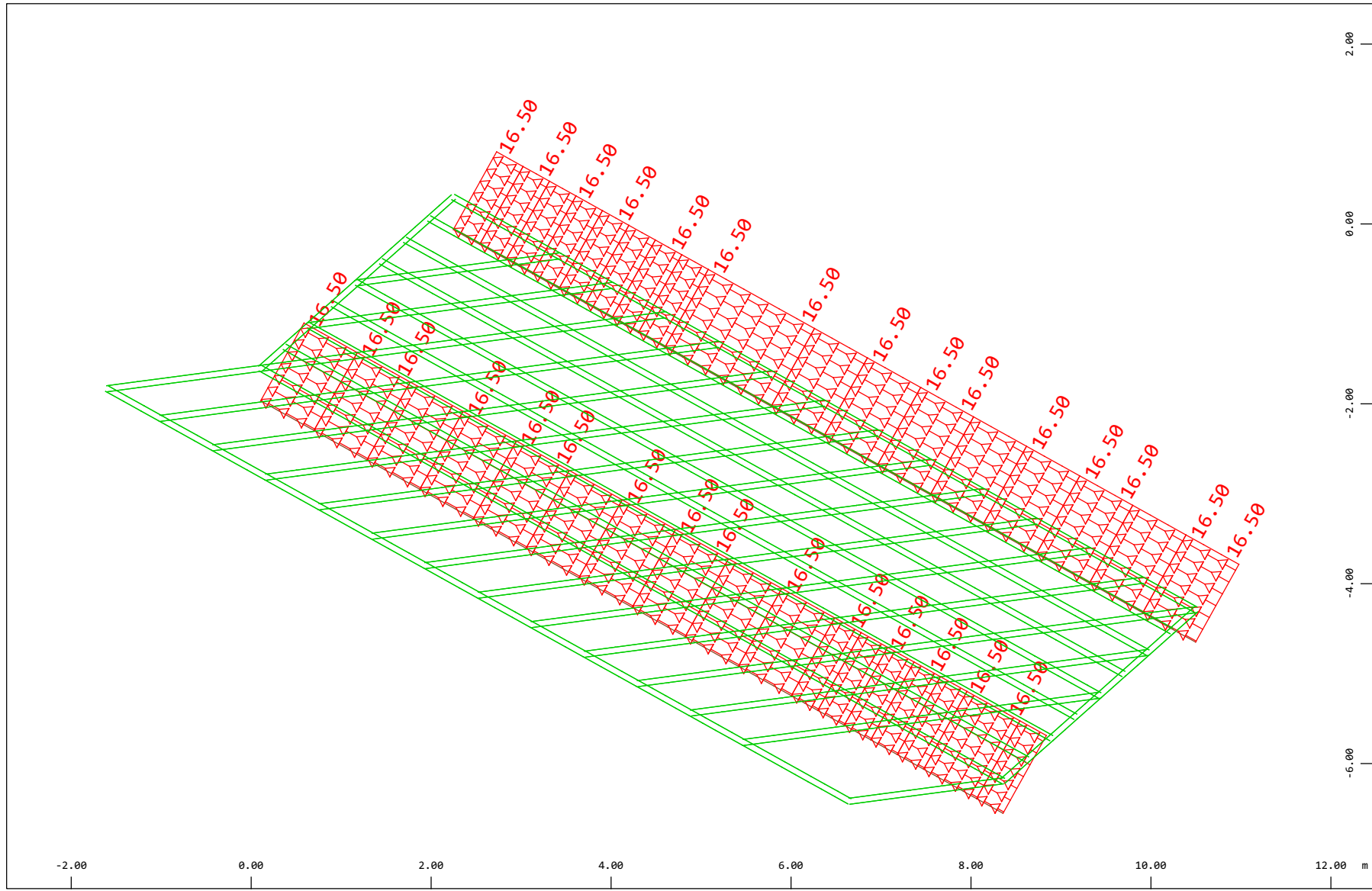


$\begin{matrix} Z \\ | \\ X-Y \end{matrix}$ Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=10.0 kN/m
 Structure

∇ (Max=16.5) X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

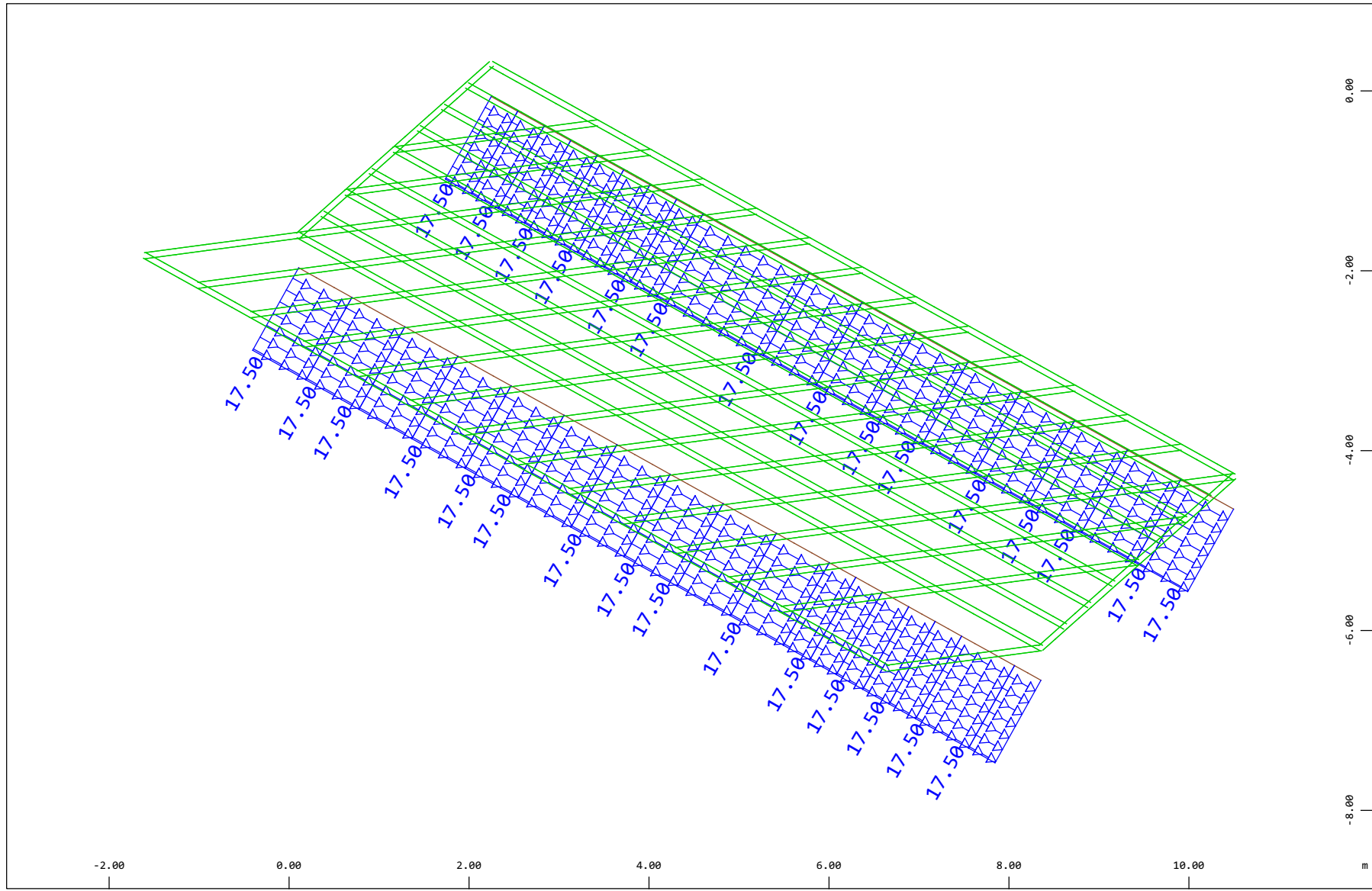


z Sector of system Group 10 11 20...23 31...37 40,STEE
 Y All loads, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=10.0 kN/m
 X (Max=-16.5)


(Min=-16.5) Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

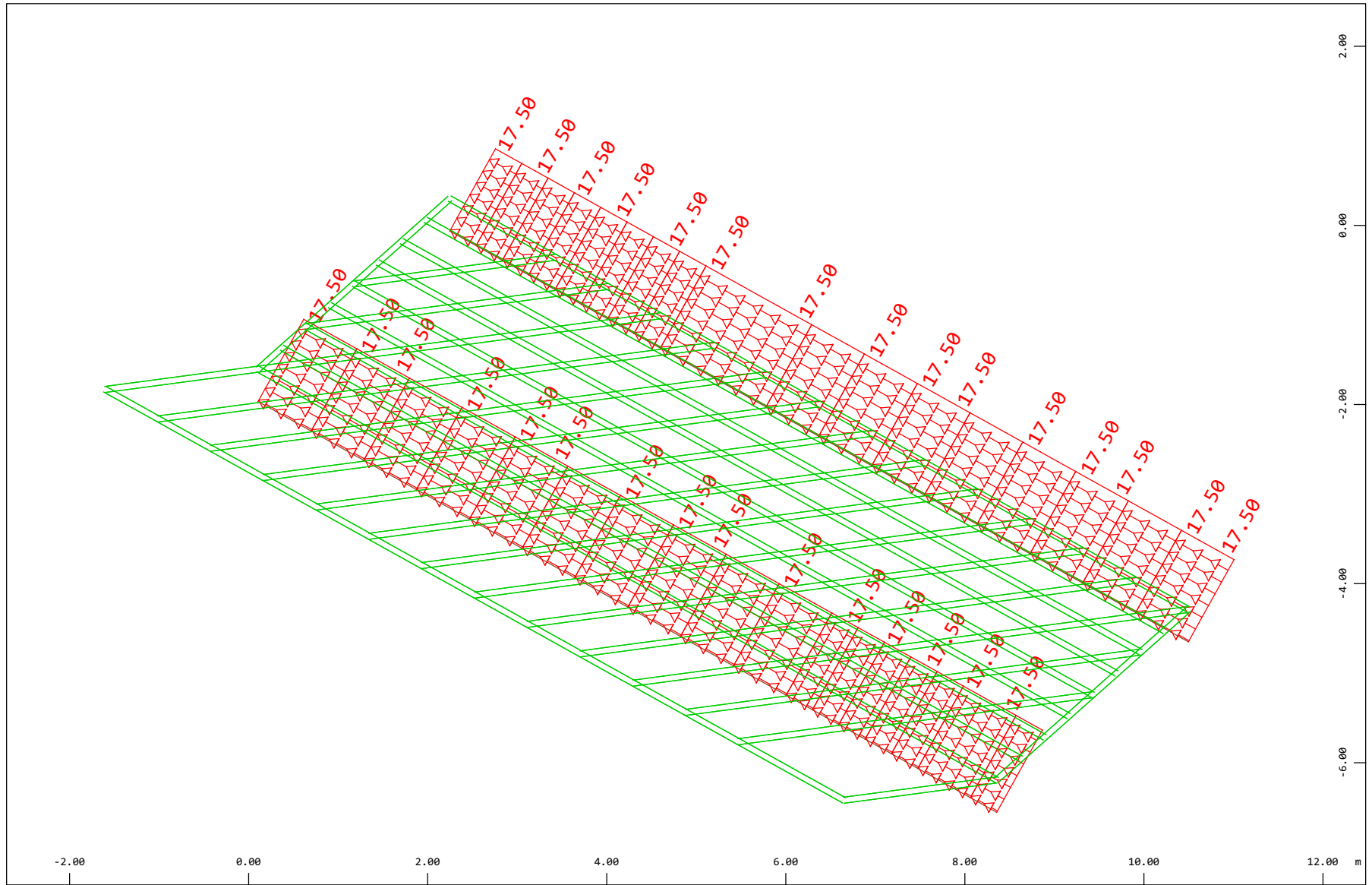


z Sector of system Group 10 11 20...23 31...37 40,STEE
 Y All loads, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=10.0 kN/m)
 X Structure

 (Max=17.5)
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

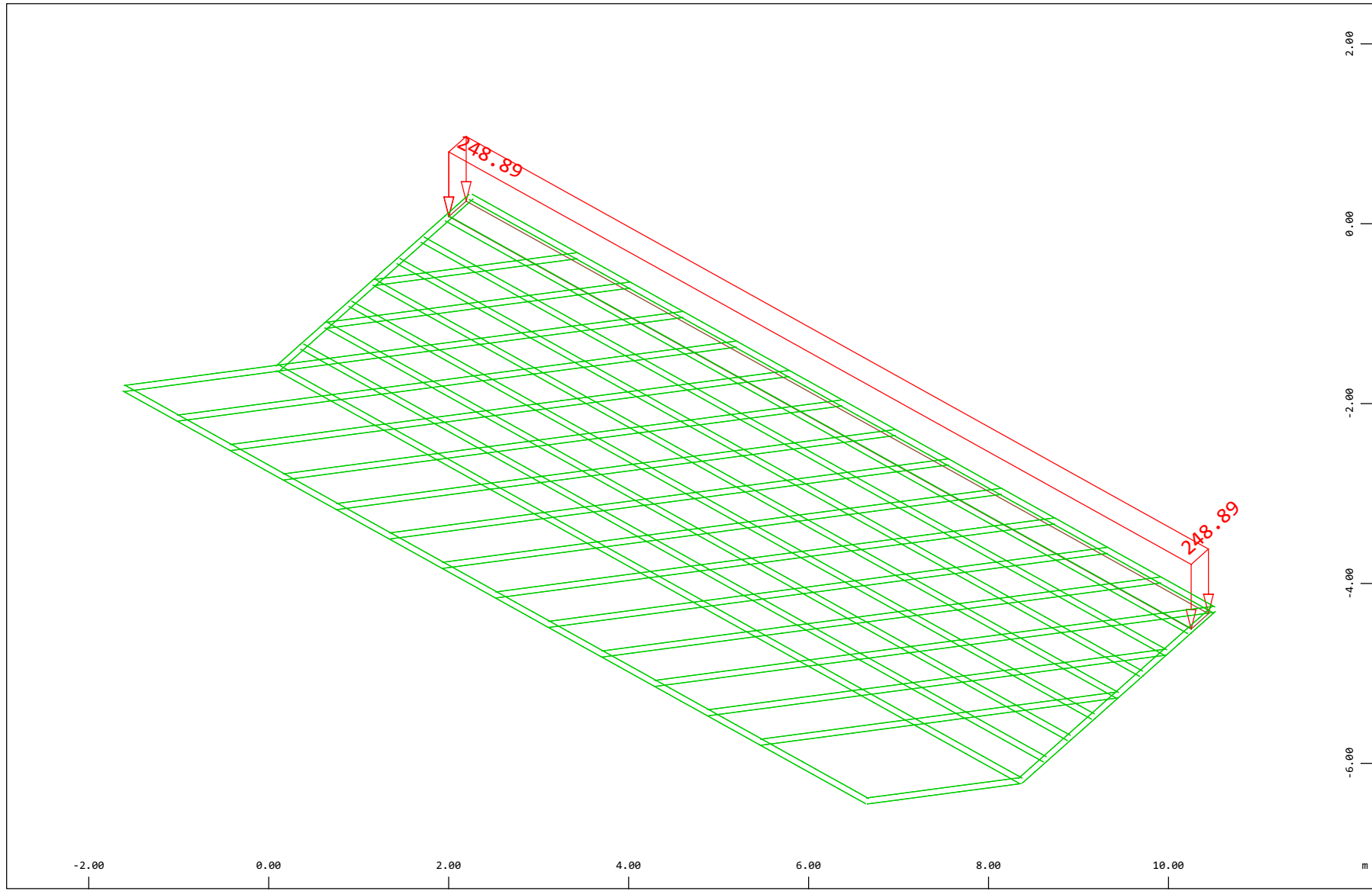


z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=10.0 kN/m
(Max=-17.5)

Min=-17.5
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

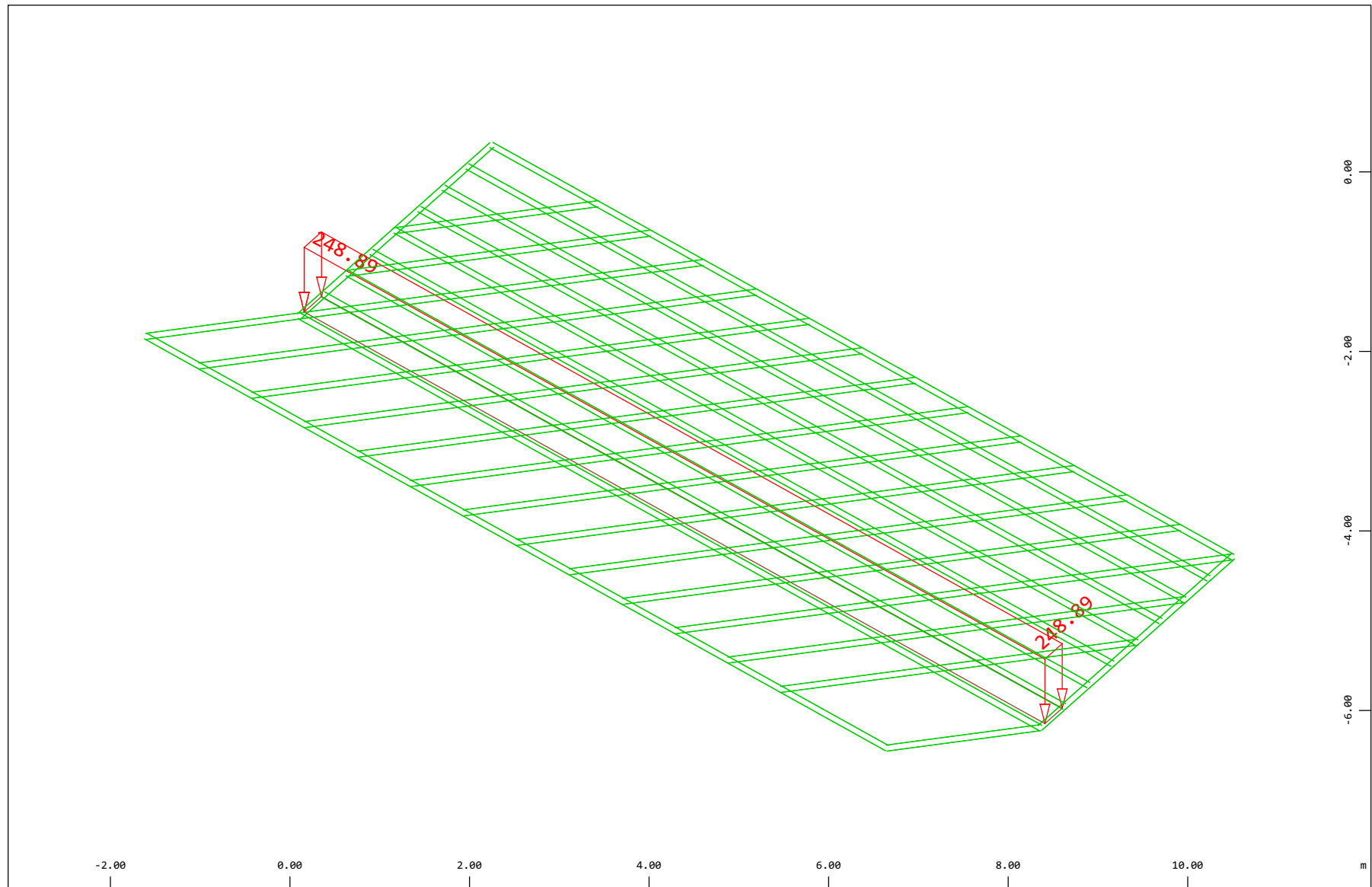


Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 210 Qt: deragliament-caso2+ , (1 cm 3D = unit) Free area load (force) in global Z (Unit=200.0 kN/m2)
(Max=-248.9)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

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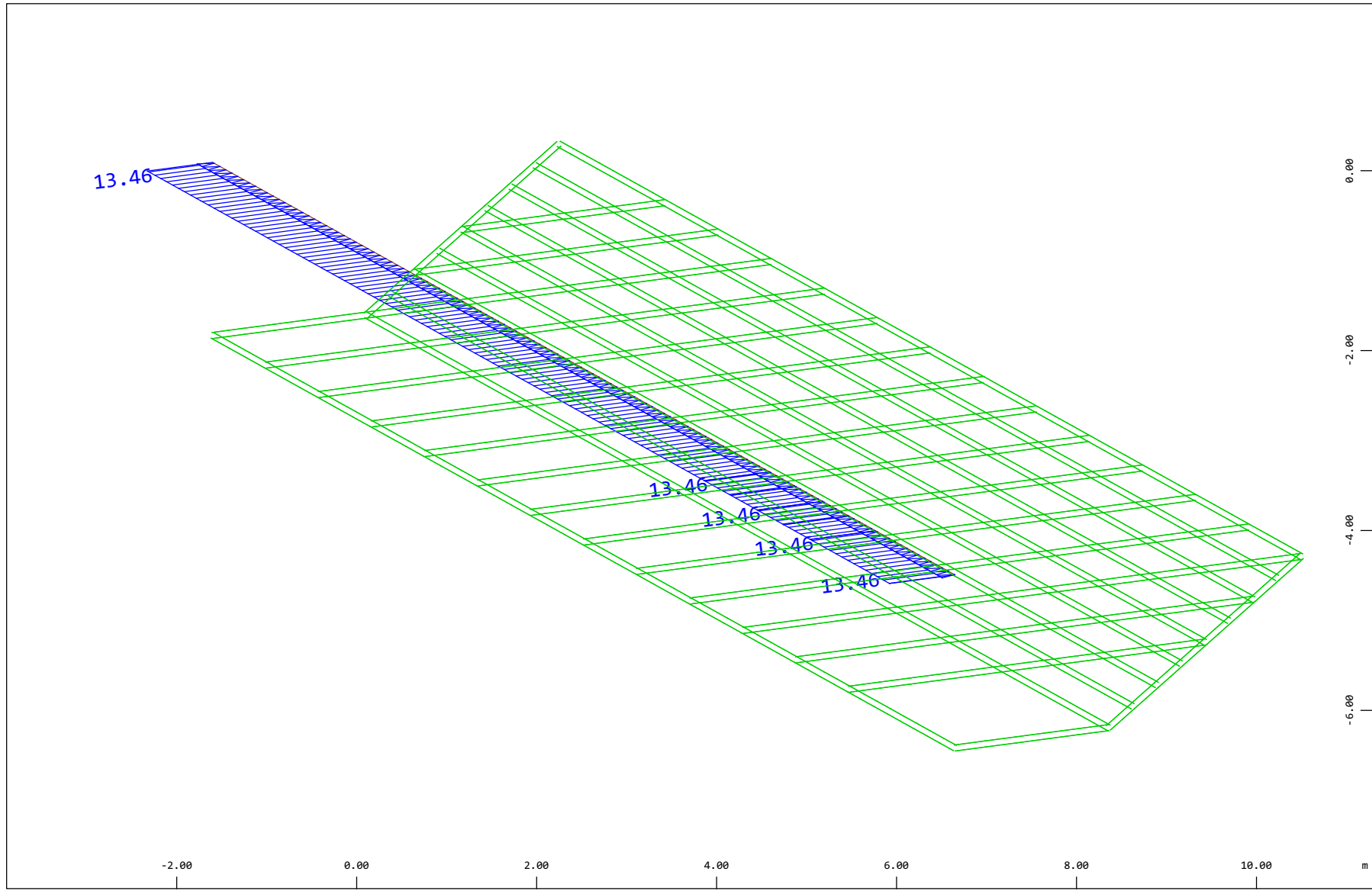


Z
X Y
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 211 Qt: deragliamento-caso2- , (1 cm 3D = unit) Free area load (force) in global Z (Unit=200.0 kN/m2)
(Max=-248.9)

(Min=-248.9)
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

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Z
Y
X

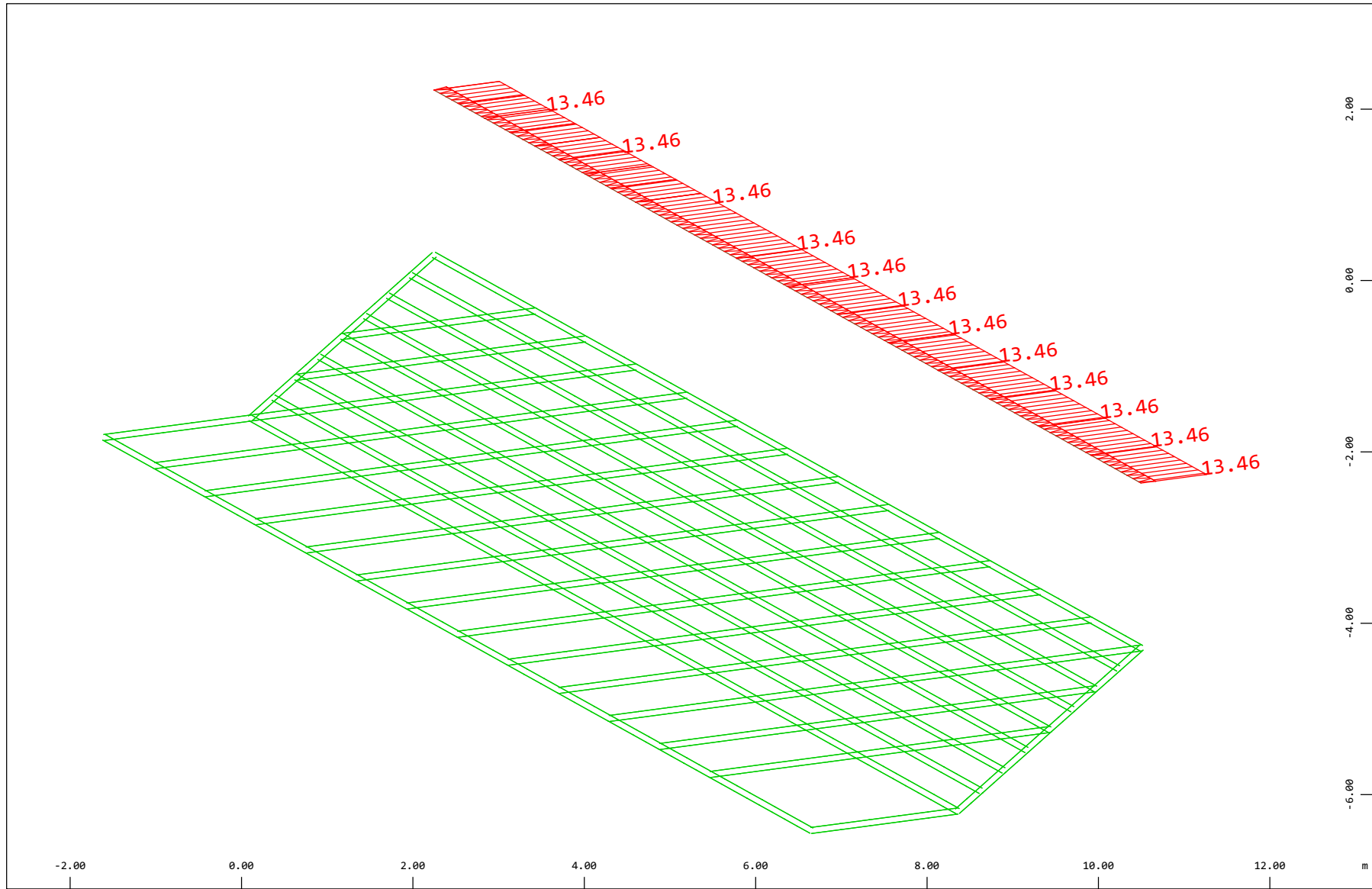
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 600 W: Fwy+ , (1 cm 3D = unit) Beam line load (force) in global Y (Unit=10.0 kN/m
Structure

(Max=13.5)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

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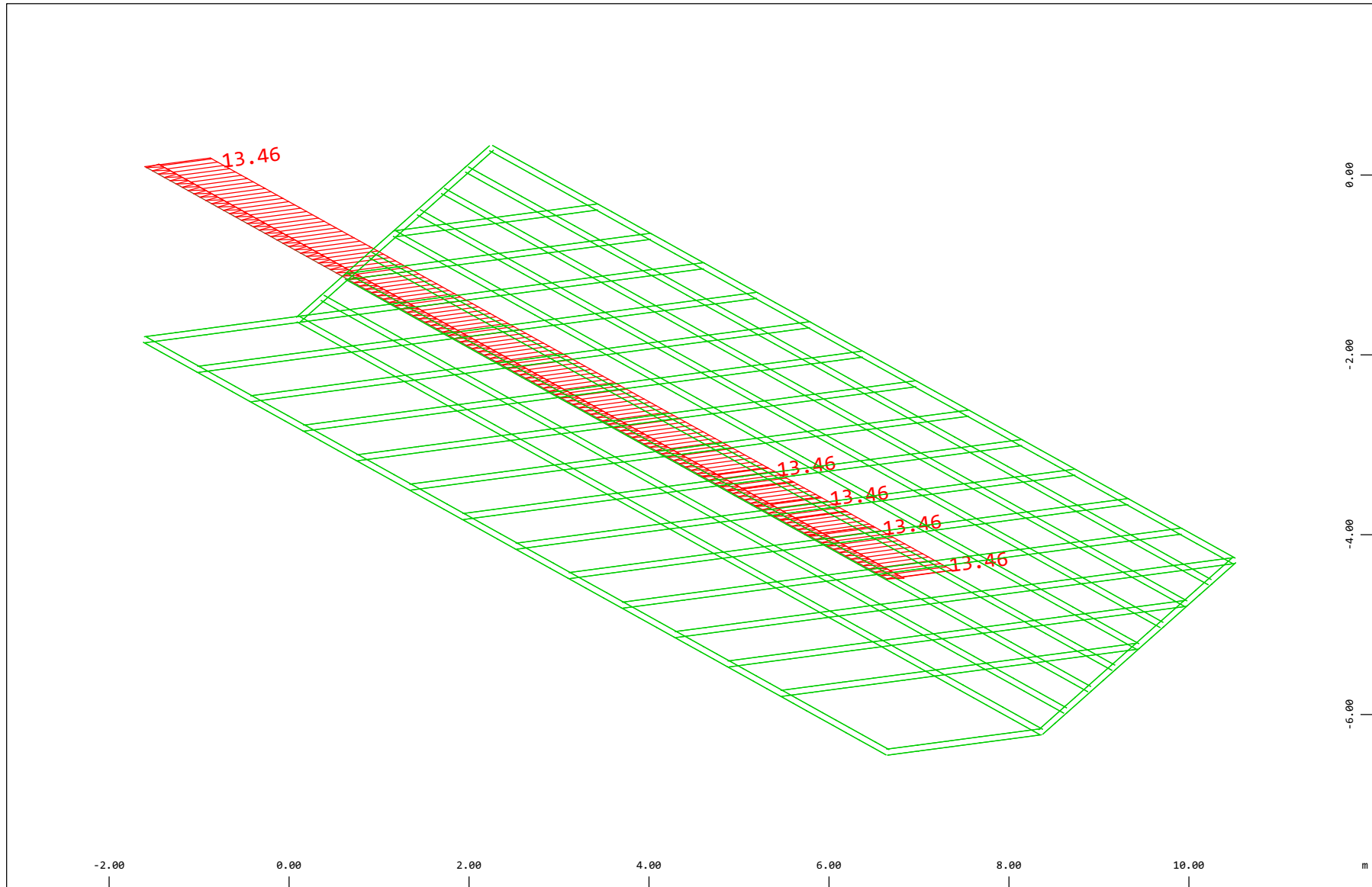
Z
Y
X
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 601 W: Fwy- , (1 cm 3D = unit) Beam line load (force) in global Y (Unit=10.0 kN/m)
Structure

(Min=-13.5) (Max=-13.5)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de



Z
Y
X

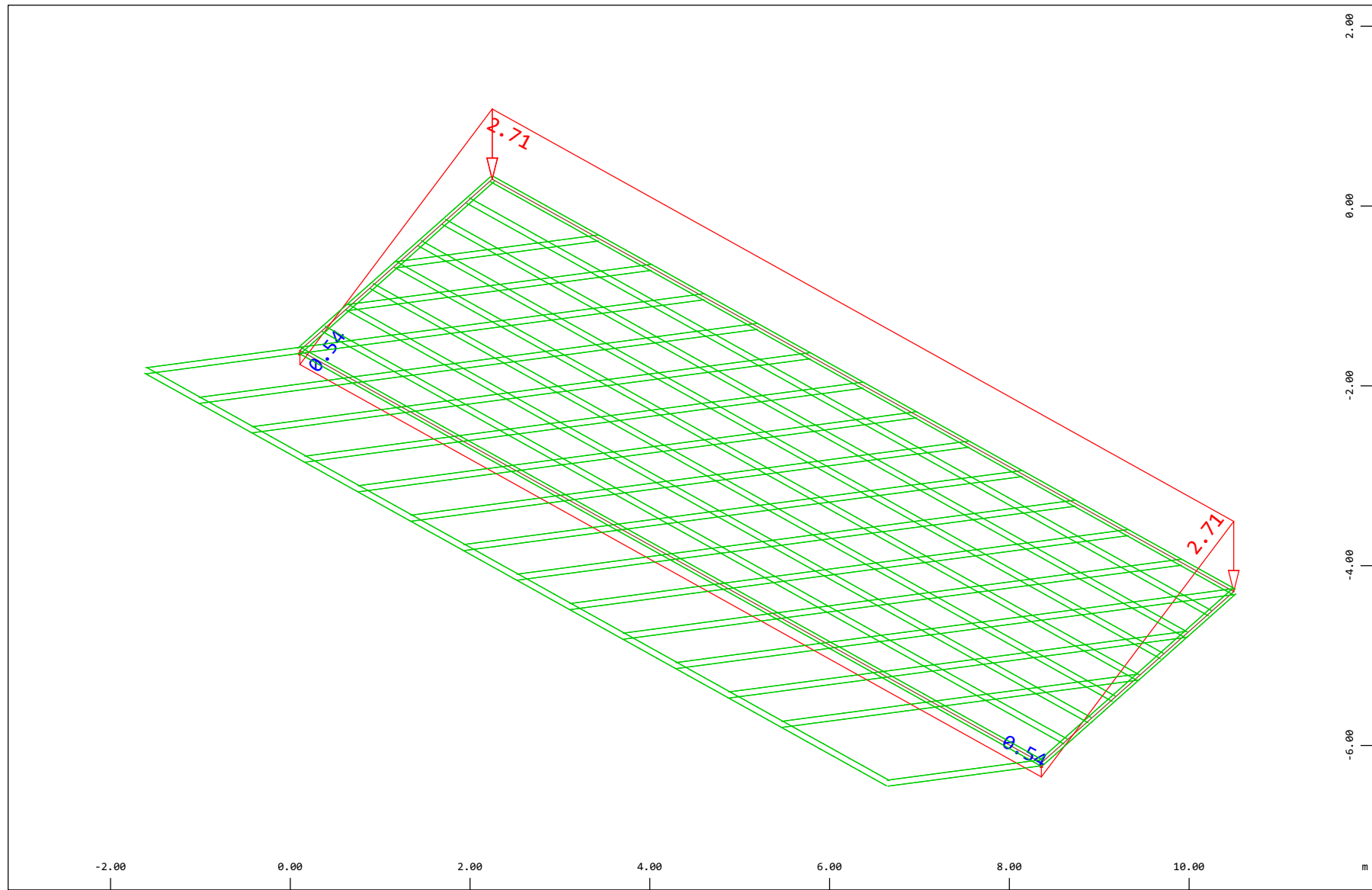
Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 602 W: Fwy- , (1 cm 3D = unit) Beam line load (force) in global Y (Unit=10.0 kN/m)
Structure

(Min=-13.5) (Max=-13.5)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de



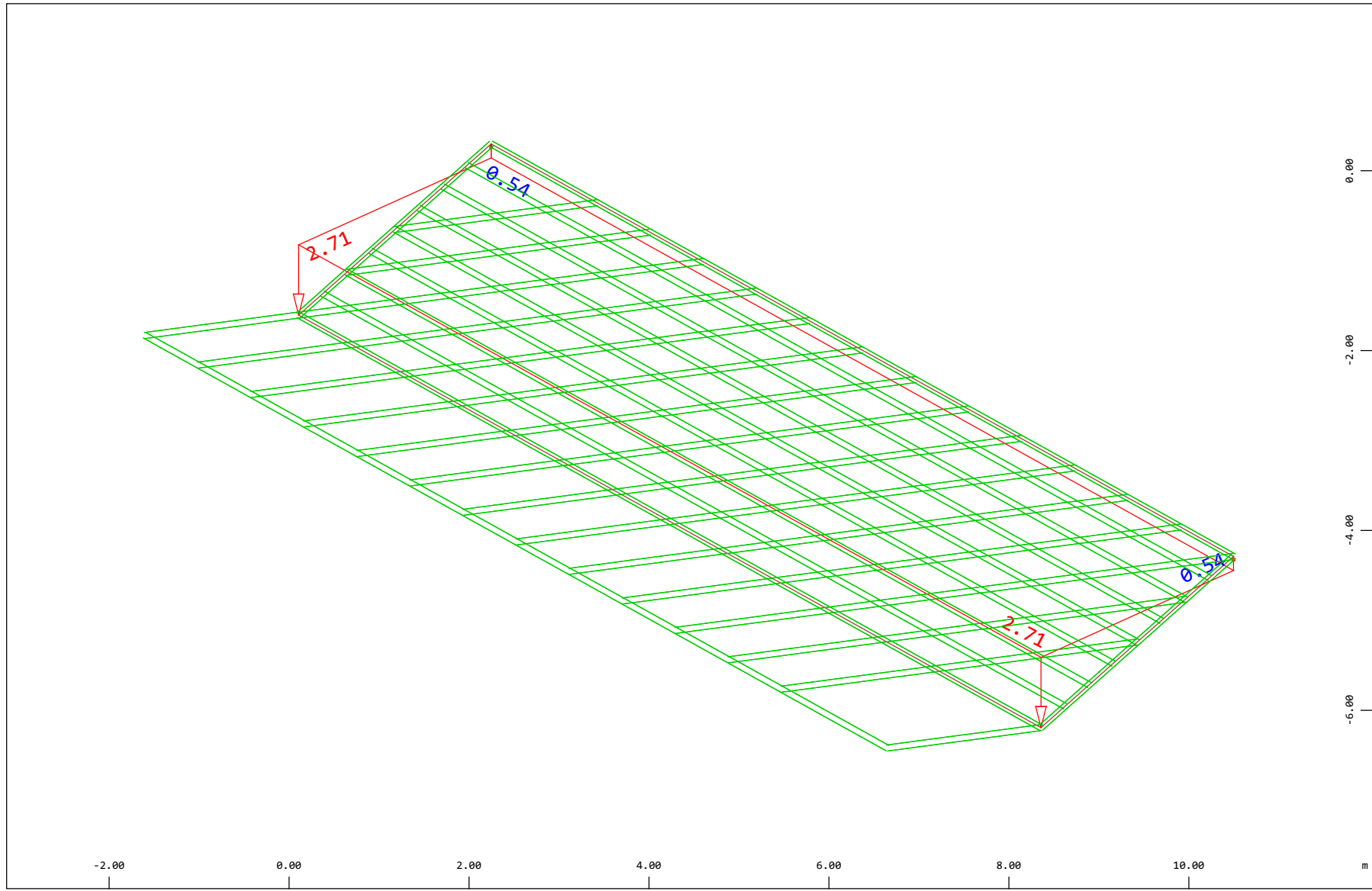
Z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 603 W: Fwz (ecc+) , (1 cm 3D = unit) Free area load (force) in global Z (Unit=2.00 kN/m2)
Structure

(Min=-2.71) (Max=0.541)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

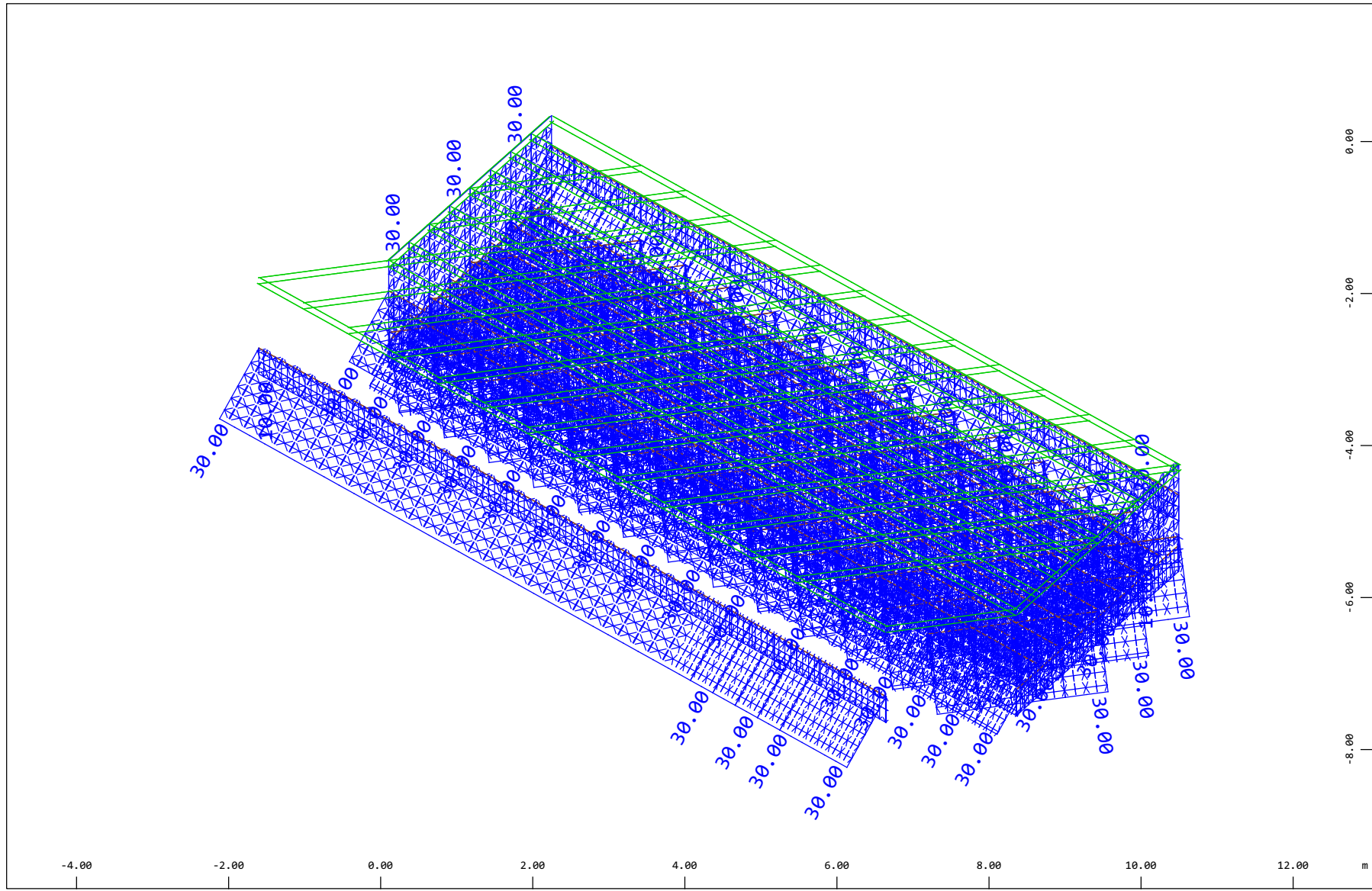


Z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 604 W: Fwz (ecc-) , (1 cm 3D = unit) Free area load (force) in global Z (Unit=2.00 kN/m2)
Structure

(Min=-2.71) (Max=0.541)
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

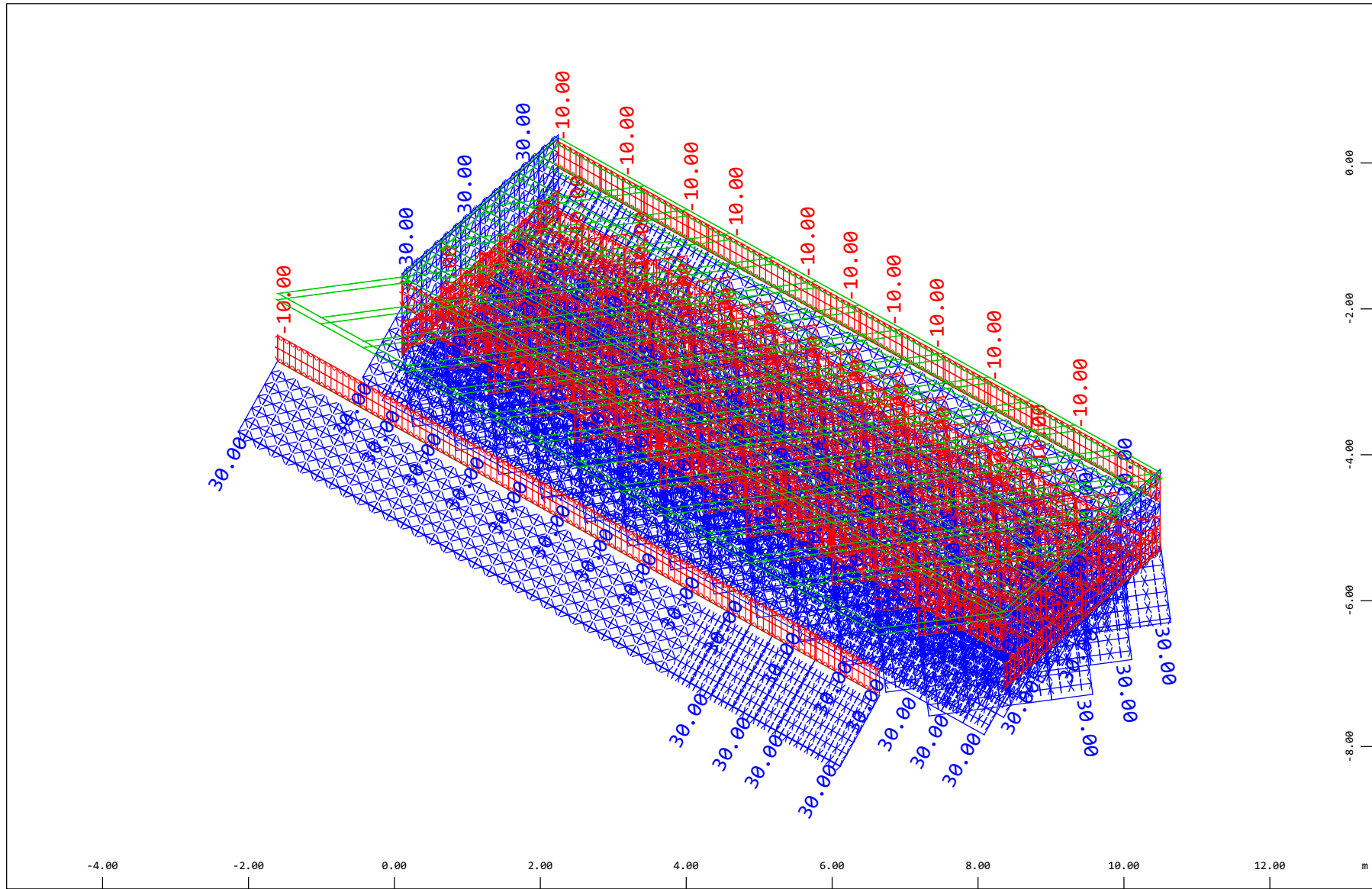


z Sector of system Group 10 11 20...23 31...37 40,STEE
 X Y All loads, Loadcase 710 T: Exp & Z+ , (1 cm 3D = unit) Beam line load (uniform temperature change) (Unit=20.0 °C,Max=30.0
 load (temperature increase) in local z (Unit=20.0 °C,Max=10.0

←→), Beam line X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

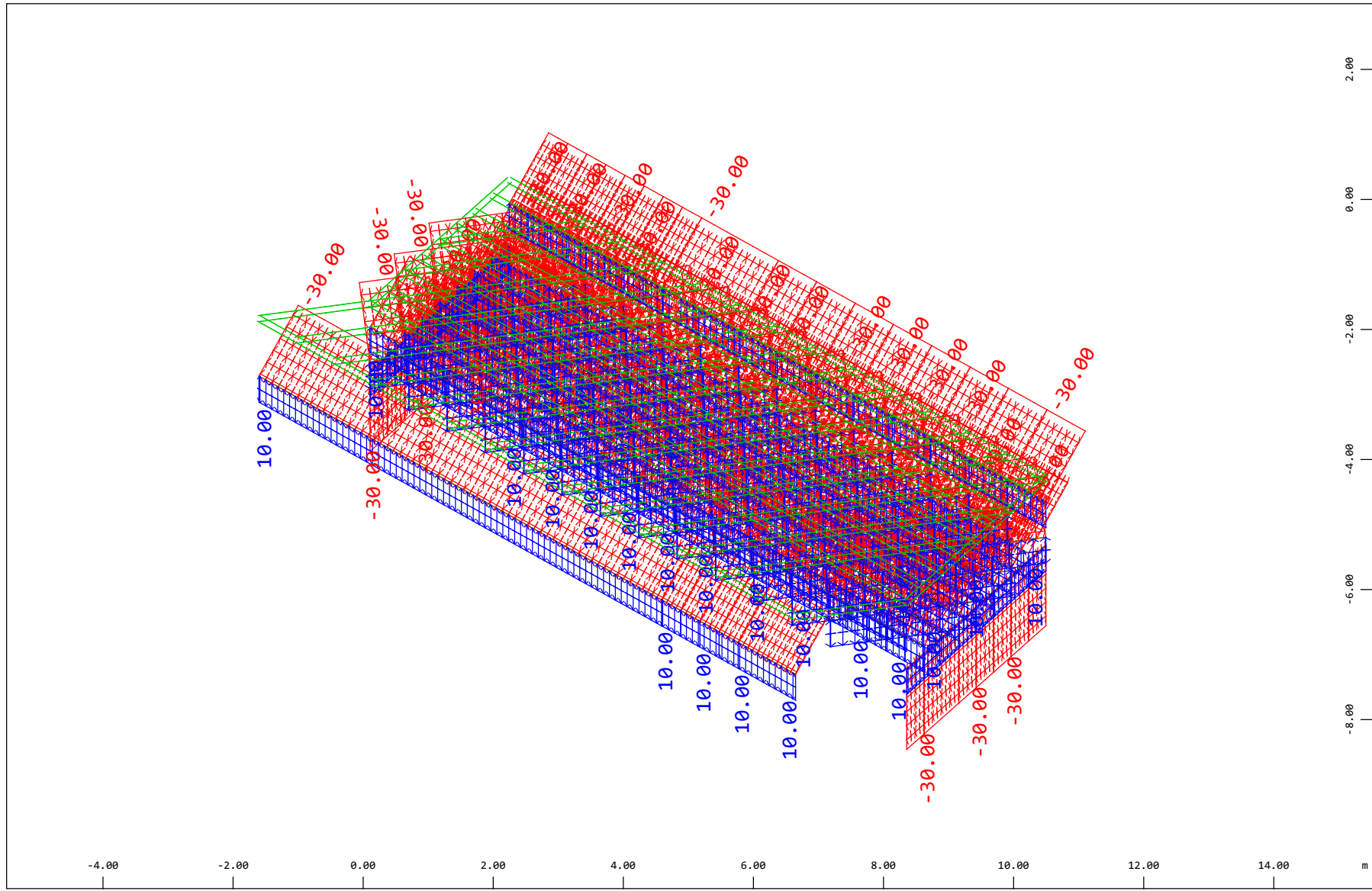


$\begin{matrix} Z \\ | \\ X \end{matrix}$ Y
 Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 711 T: Exp & Z- , (1 cm 3D = unit) Beam line load (uniform temperature change) (Unit=20.0 °C,Max=30.0
 load (temperature increase) in local z (Unit=20.0 °C,Min=-10.0 Max=-10.0

$\leftarrow \rightarrow$, Beam line
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

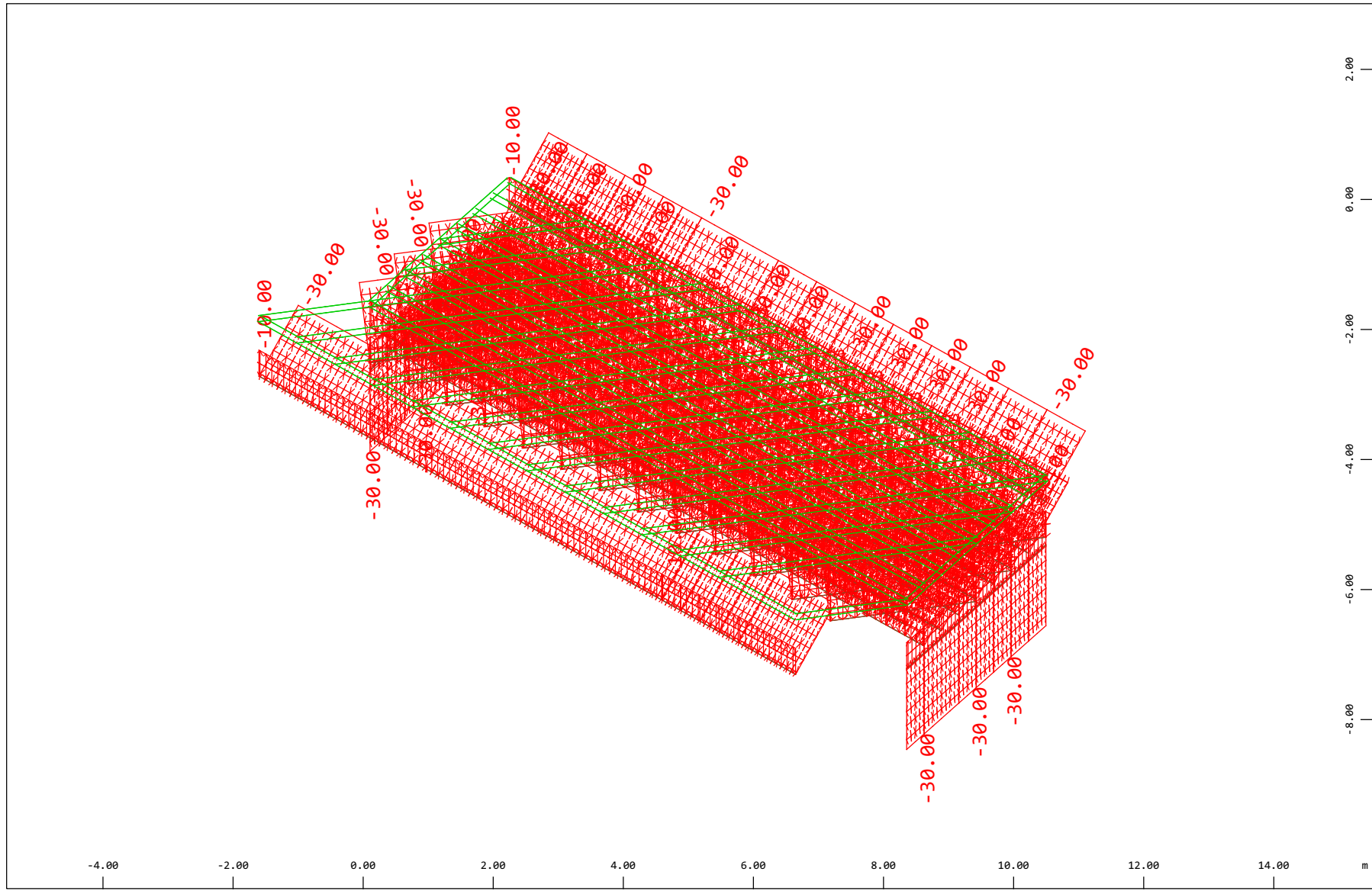


Sector of system Group 10 11 20...23 31...37 40, STEE
 All loads, Loadcase 712 T: Con & Z+ , (1 cm 3D = unit) Beam line load (uniform temperature change) (Unit=20.0 °C, Min=-30.0 Max=-30.0
 Beam line load (temperature increase) in local z (Unit=20.0 °C, Max=10.0

X * 0.502
 * 0.906
 * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de

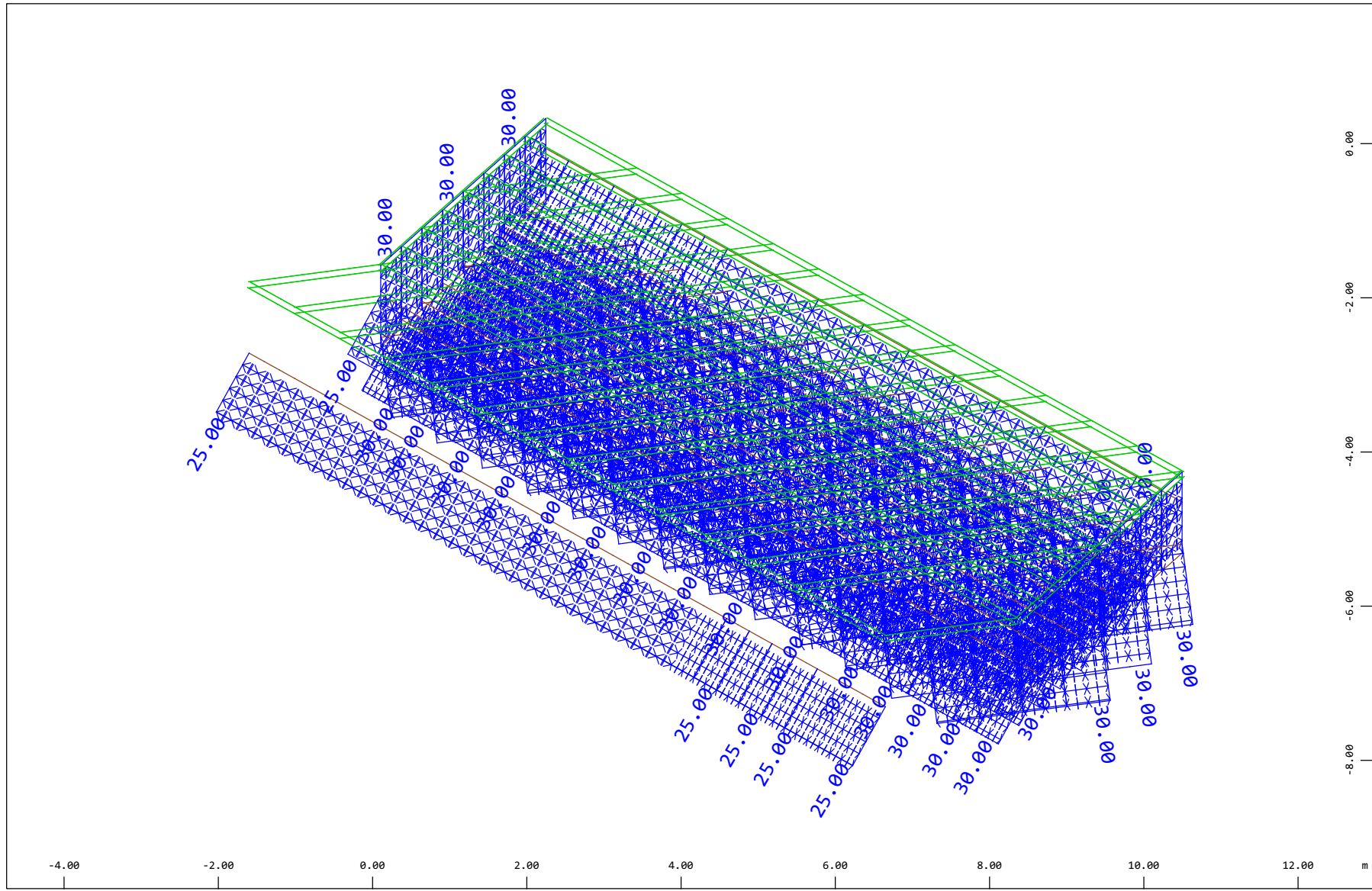


Sector of system Group 10 11 20...23 31...37 40,STEE
All loads, Loadcase 713 T: Con & Z- , (1 cm 3D = unit) Beam line load (uniform temperature change) (Unit=20.0 °C,Min=-30.0 Max=-30.0
Beam line load (temperature increase) in local z (Unit=20.0 °C,Min=-10.0 Max=-10.0

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de



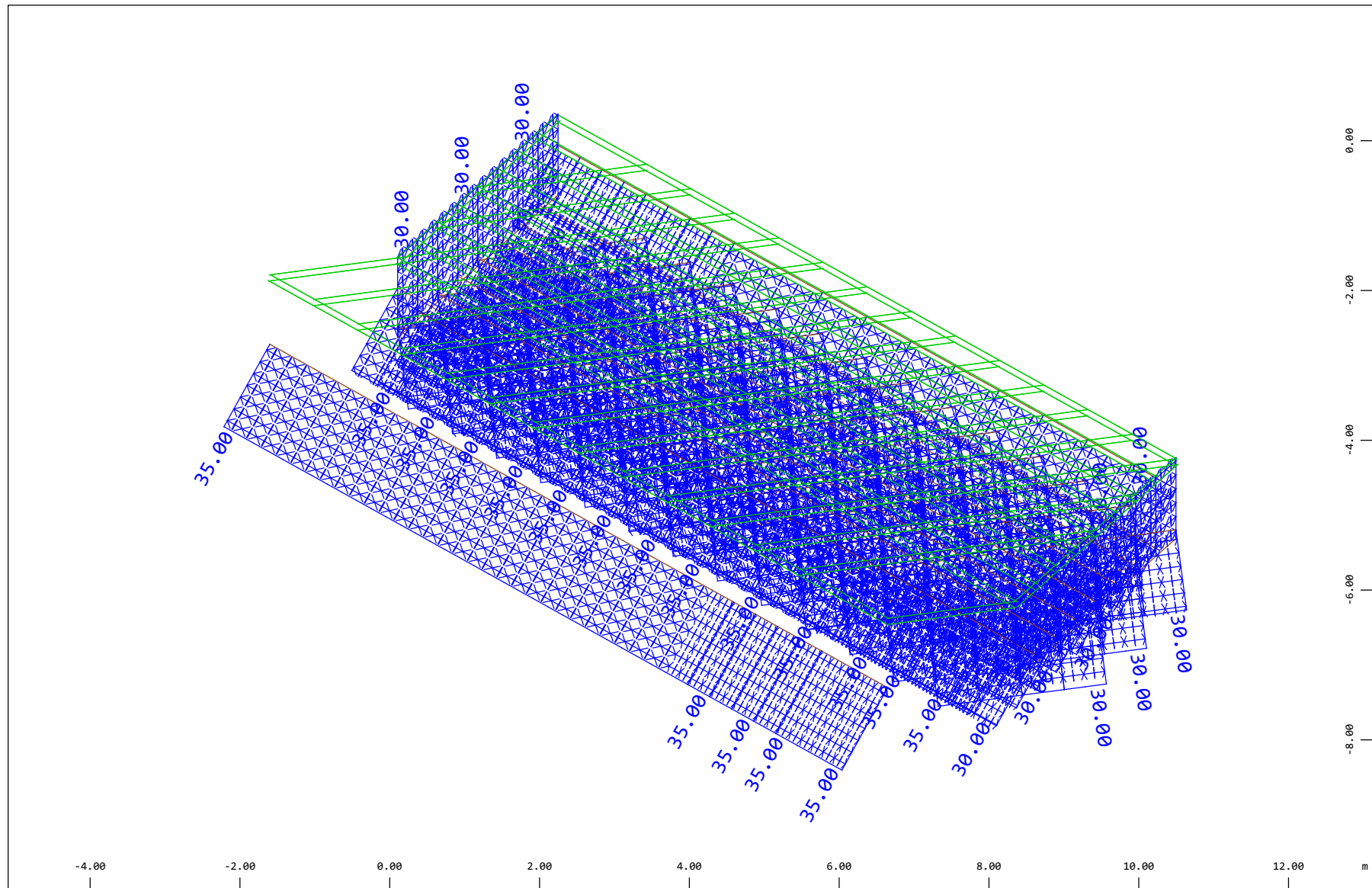
z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 714 T: Exp & Y+ , (1 cm 3D = unit) Beam line load (uniform temperature change) (Unit=20.0 °C
Structure

←→ (Max=35.0)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de



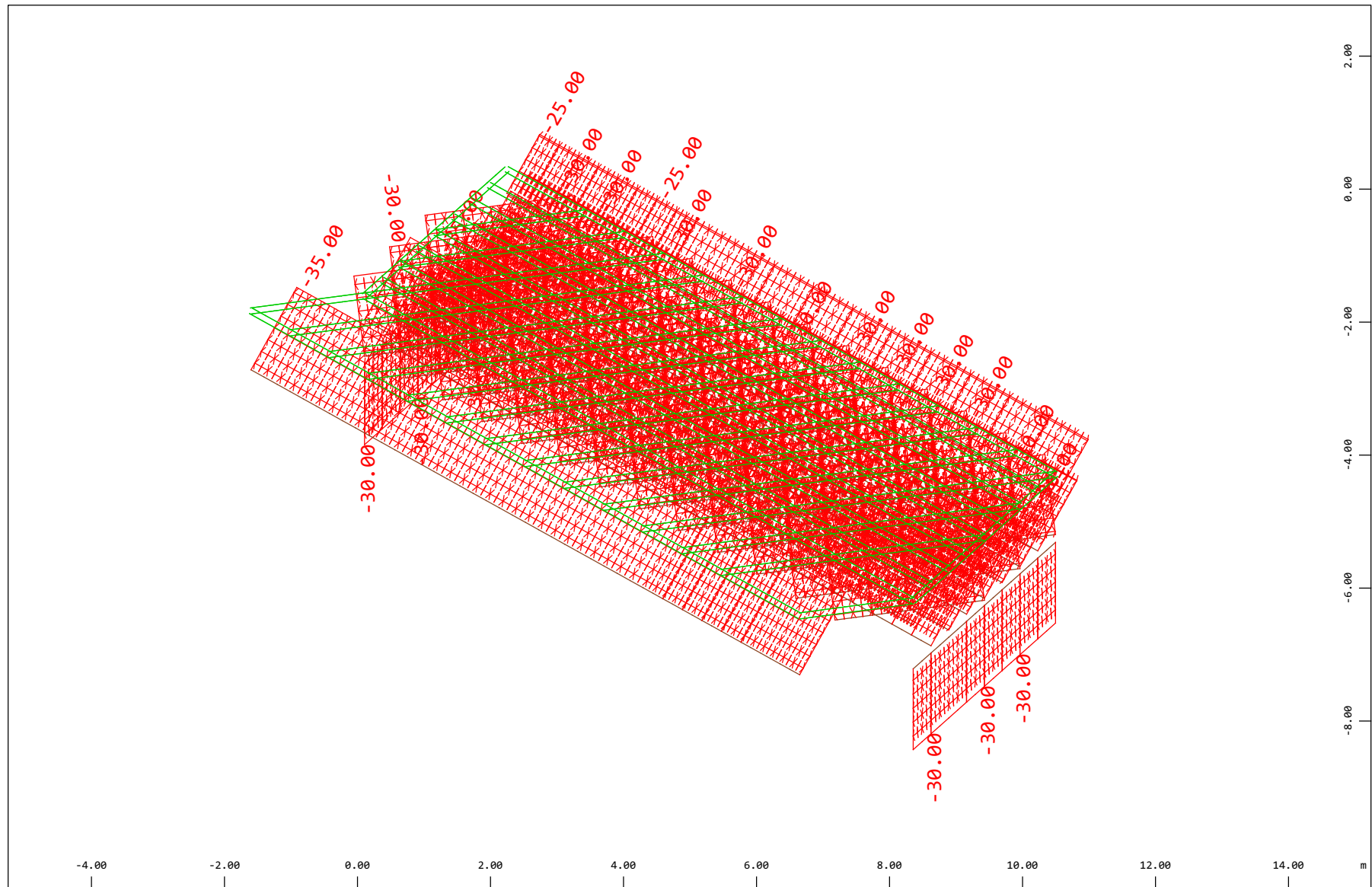
z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 715 T: Exp & Y- , (1 cm 3D = unit) Beam line load (uniform temperature change) (Unit=20.0 °C
Structure

←→ (Max=35.0)

X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Result Graphics

SOFISTIK AG - www.sofistik.de

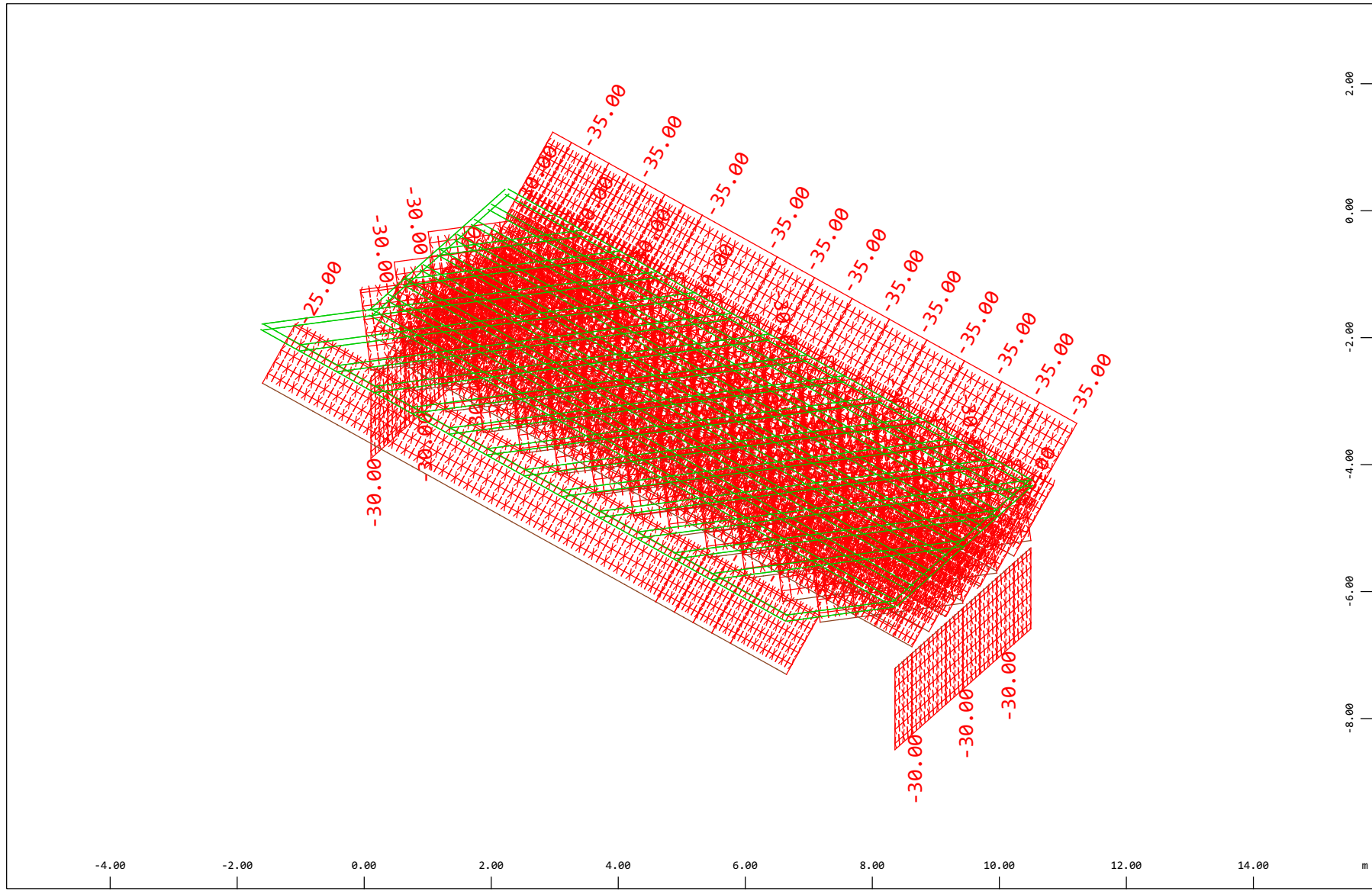


$\begin{matrix} Z \\ | \\ X \end{matrix}$ Y
 Sector of system Group 10 11 20...23 31...37 40,STEE
 All loads, Loadcase 716 T: Con & Y+ , (1 cm 3D = unit) Beam line load (uniform temperature change) (Unit=20.0 °C
 Structure

$\leftarrow \rightarrow$ (Min=-35.0) (Max=-25.0)
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Result Graphics

SOFISTIK AG - www.sofistik.de



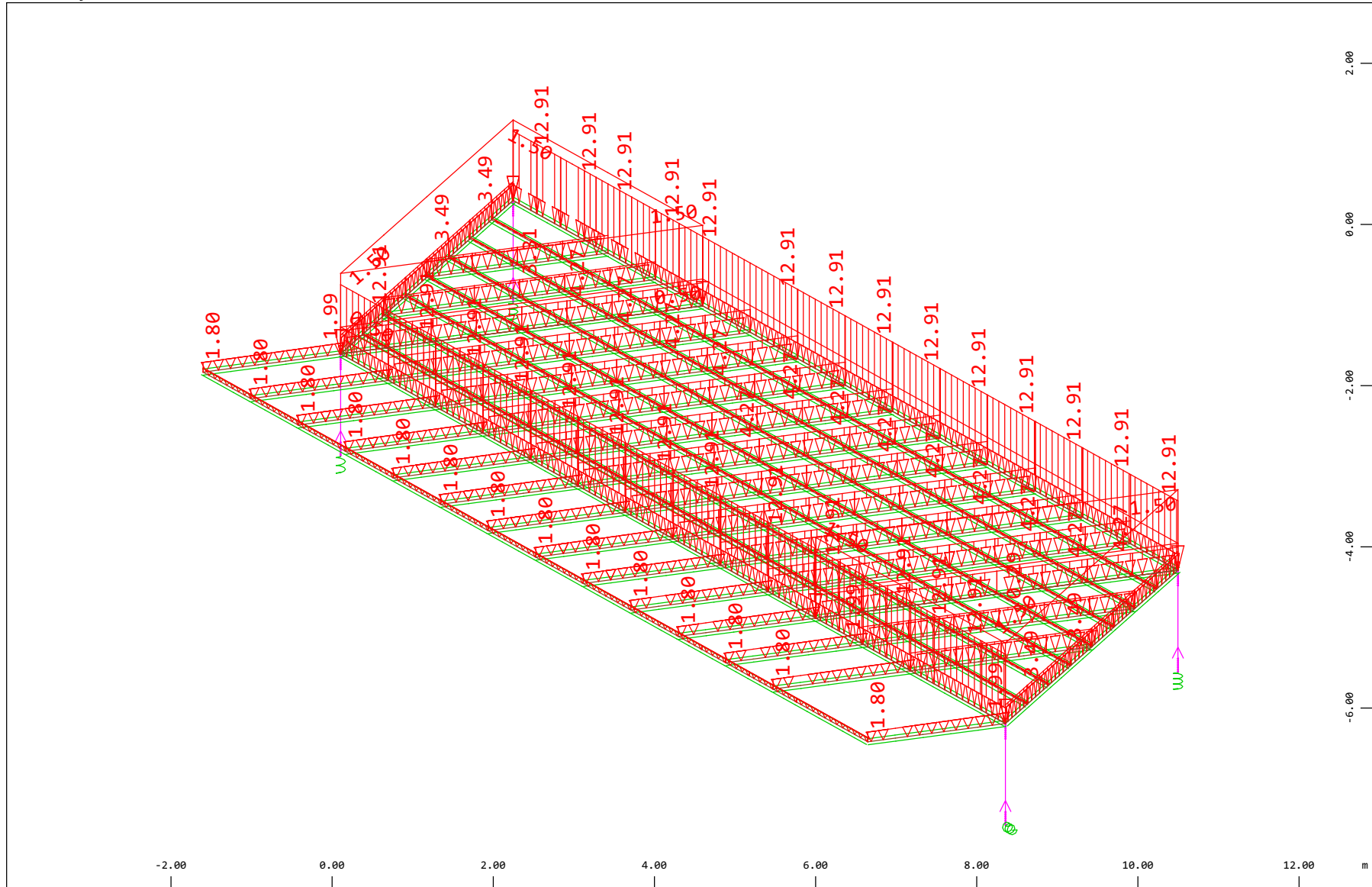
z Sector of system Group 10 11 20...23 31...37 40,STEE
X Y All loads, Loadcase 717 T: Con & Y- , (1 cm 3D = unit) Beam line load (uniform temperature change) (Unit=20.0 °C
Structure

←→ (Min=-35.0) (Max=-25.0) X * 0.502
Y * 0.906
Z * 0.962

13.2. Allegato 2 – Risultati carichi elementari impalcato

Definition of Axis
 Results elementay loads

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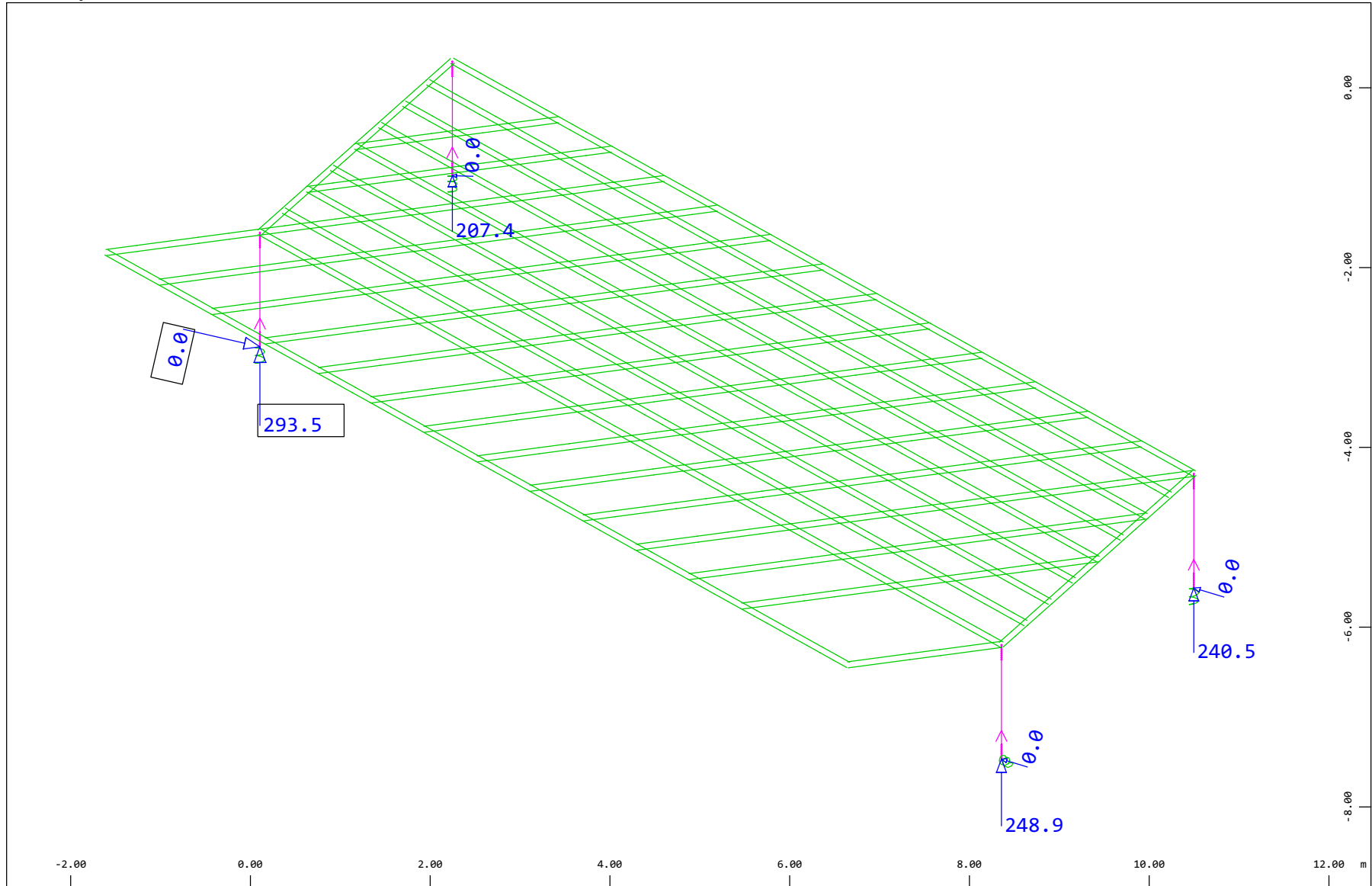
Z
 X Y

Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 1 G1: Peso proprio acciaio , (1 cm 3D = unit) Beam dead load in global Z (Unit=9.69 kN/m, Min=-12.9
 Max=-0.294 ∇), Free area load (force) in global Z (Unit=0.969 kN/m², Min=-1.50 Max=-0.500 ∇)

M 1 : 67
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 193.8 kN

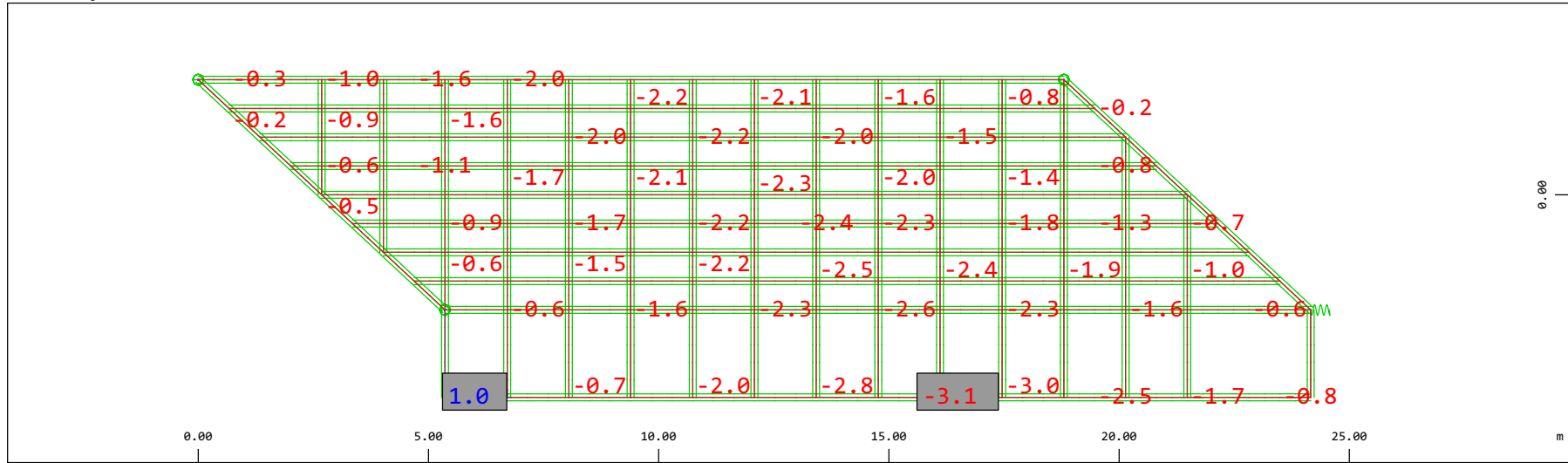
Nodes , Support force vector in the global XY plane, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 9.6875e-04 kN

▾ (Max=293.5) (total: 990.3)

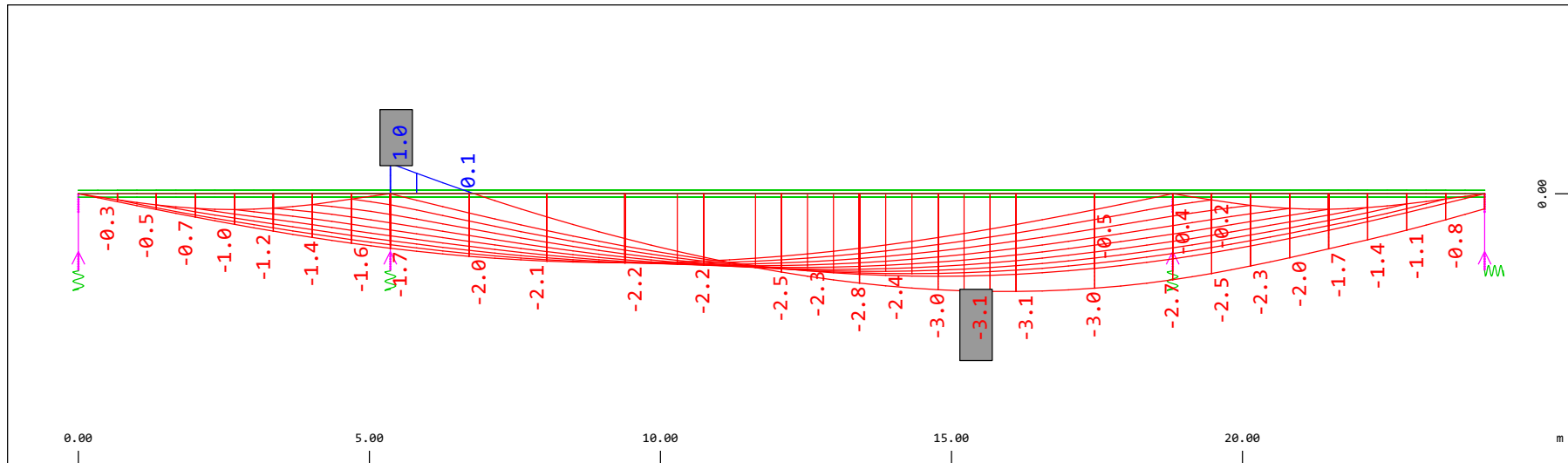
▾ (Max=0.0018)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

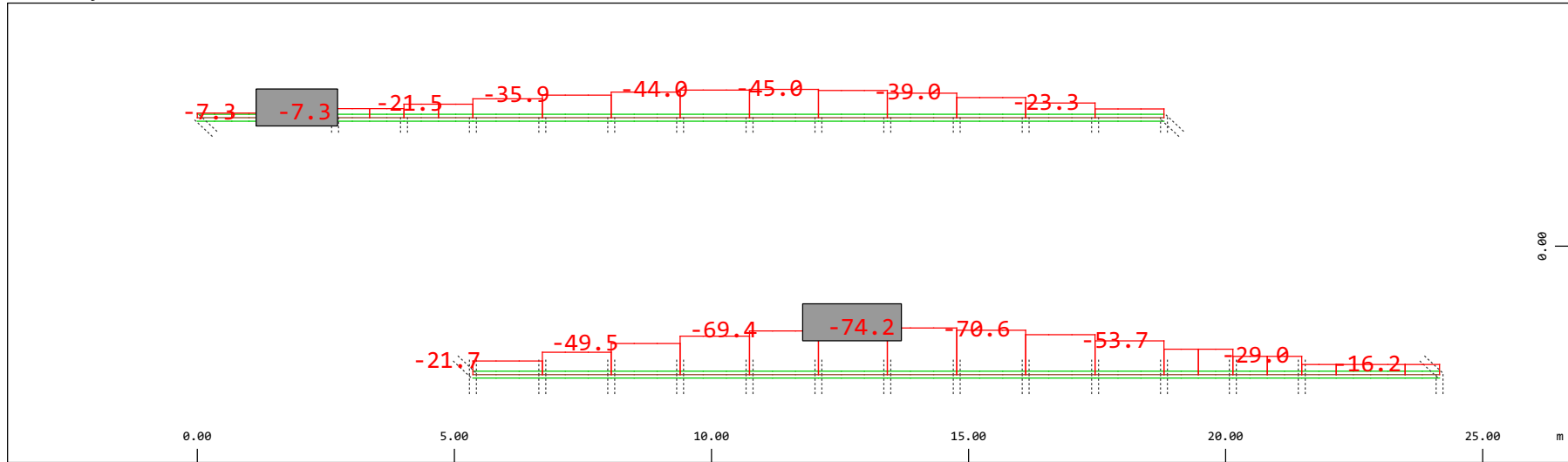


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along (Max=0.951) ○, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 1.94 mm (Min=-3.07) M 1 : 134



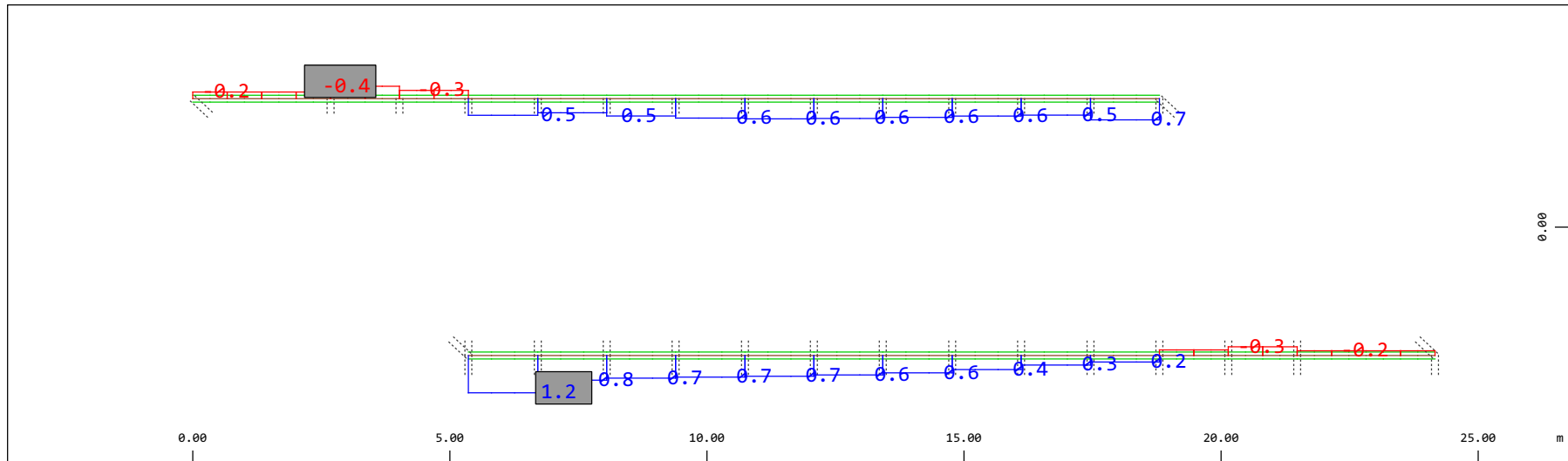
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along (Max=0.951) ↕, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 1.94 mm (Min=-3.07) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 98.0 kN (Min=-74.2) (Max=-7.30)

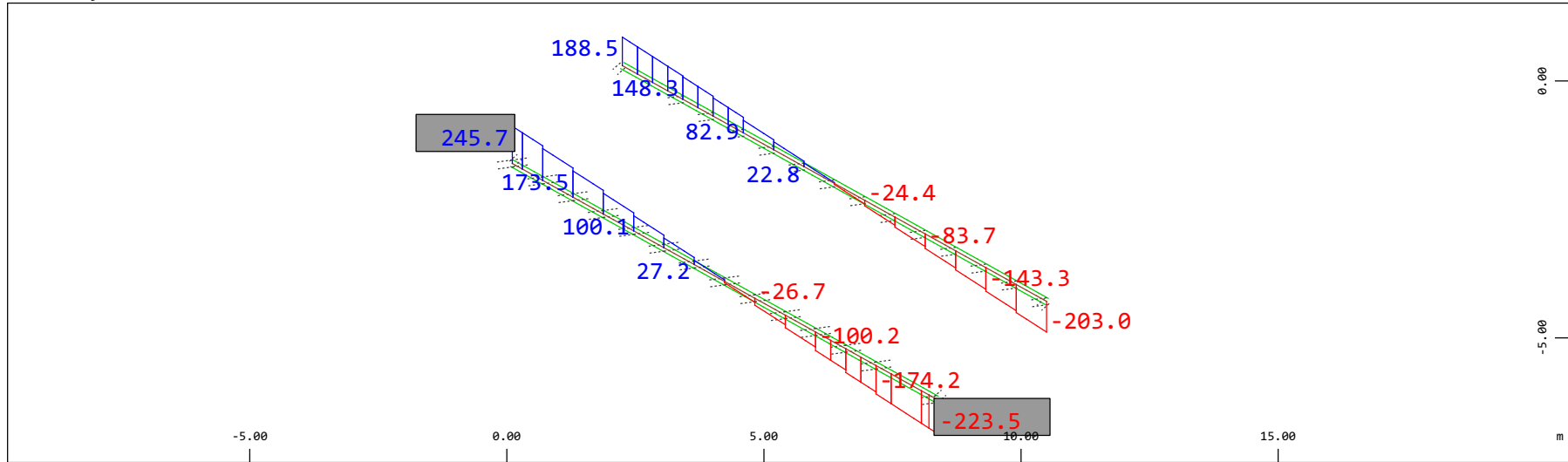
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 1.96 kNm (Min=-0.395) (Max=1.19)

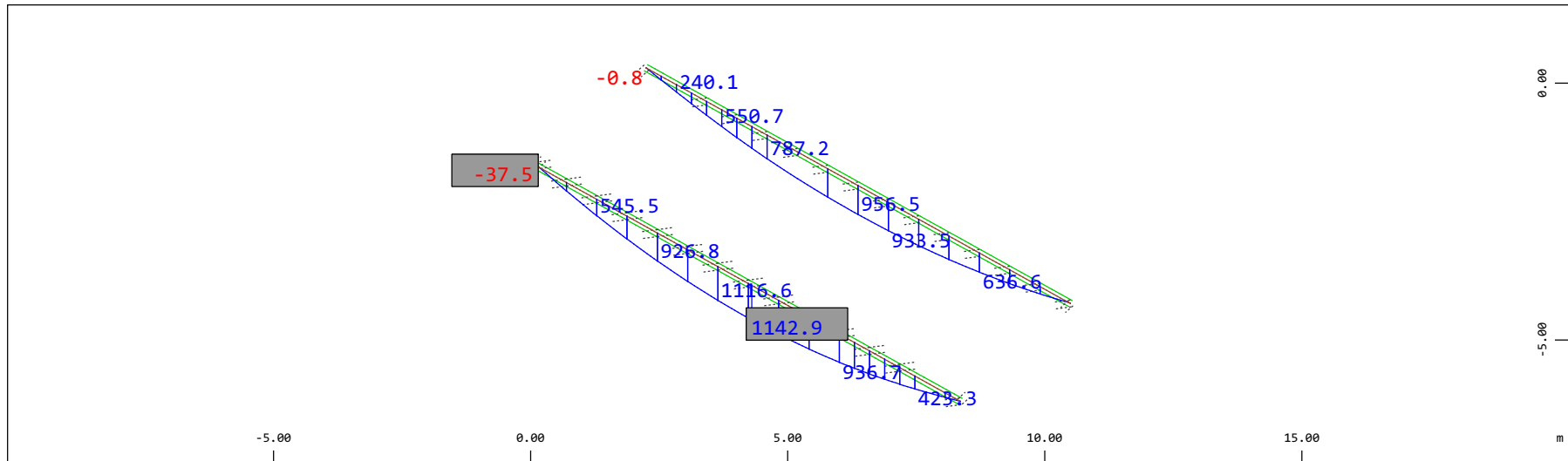
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 392.2 kN (Min=-223.5) (Max=245.7)

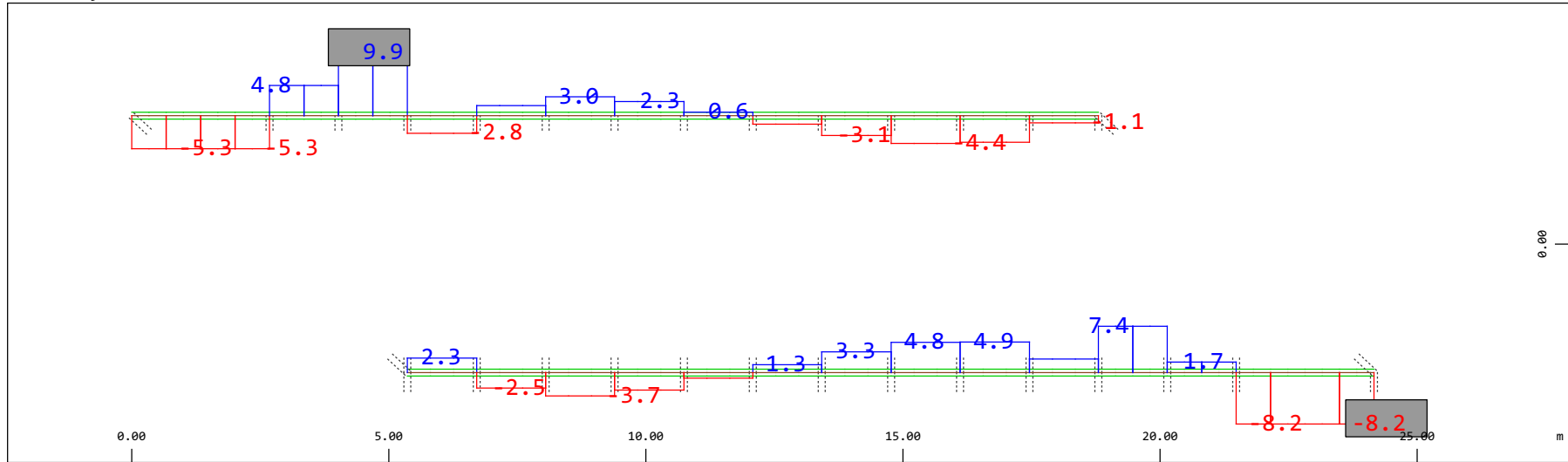
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 1961. kNm (Min=-37.5) (Max=1143.)

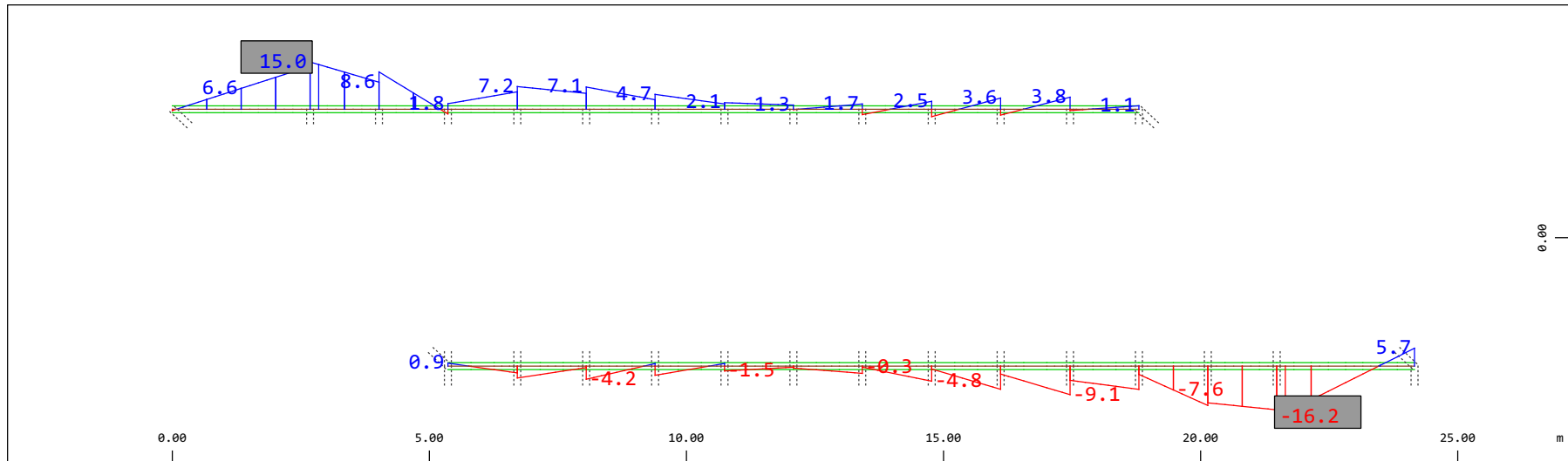
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 9.80 kN (Min=-8.17) (Max=9.97)

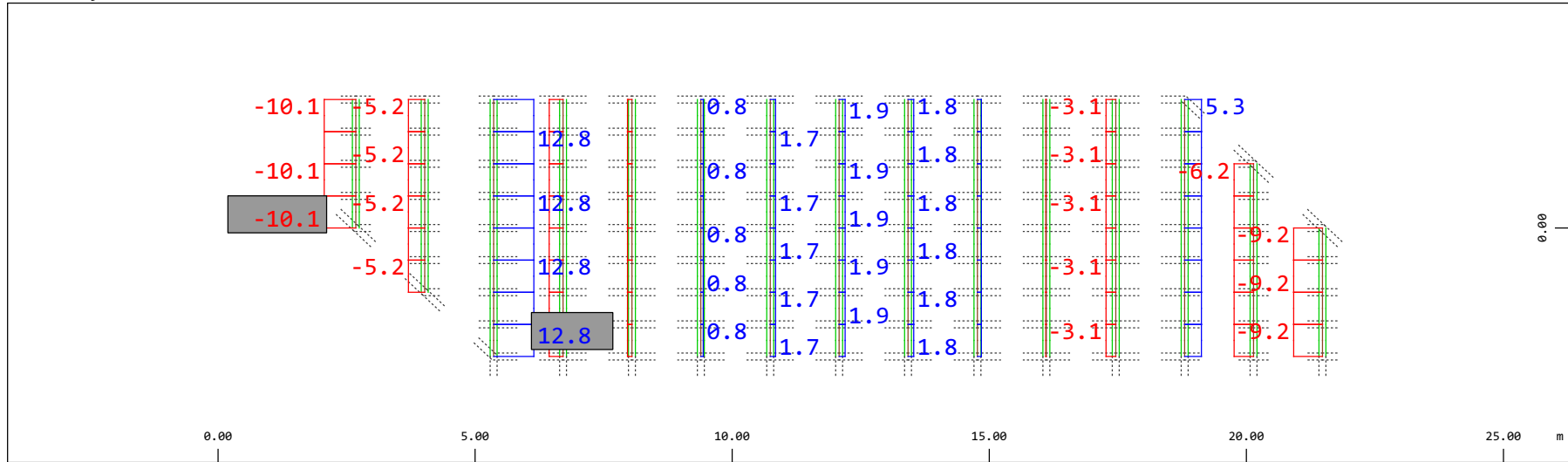
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 19.6 kNm (Min=-16.2) (Max=15.0)

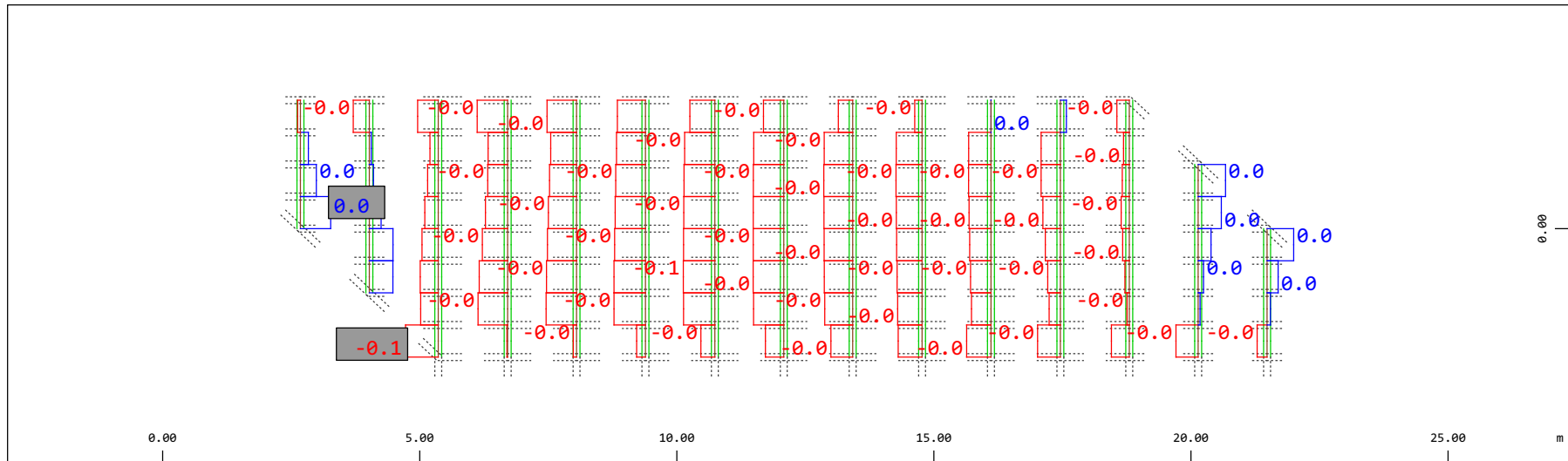
M 1 : 120

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 21 22
Beam Elements , Normal force N_x , Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 19.6 kN (Min=-10.1) (Max=12.8)

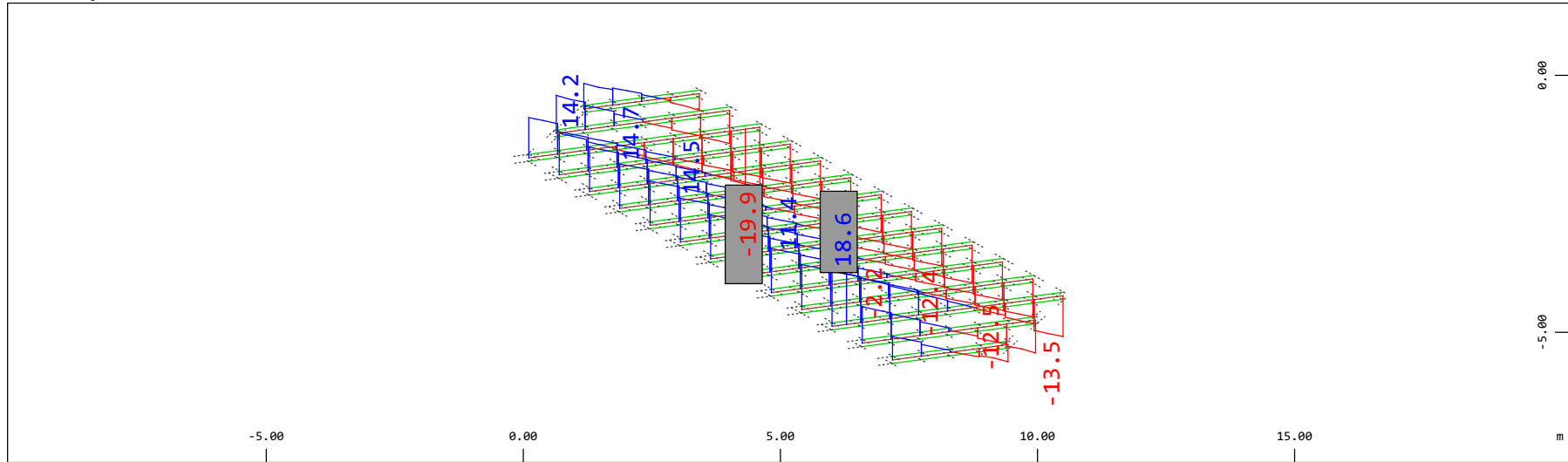
M 1 : 120



Sector of system Beam Elements Group 21 22
Beam Elements , Torsional moment M_t , Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 0.0980 kNm (Min=-0.0520) (Max=0.0481)

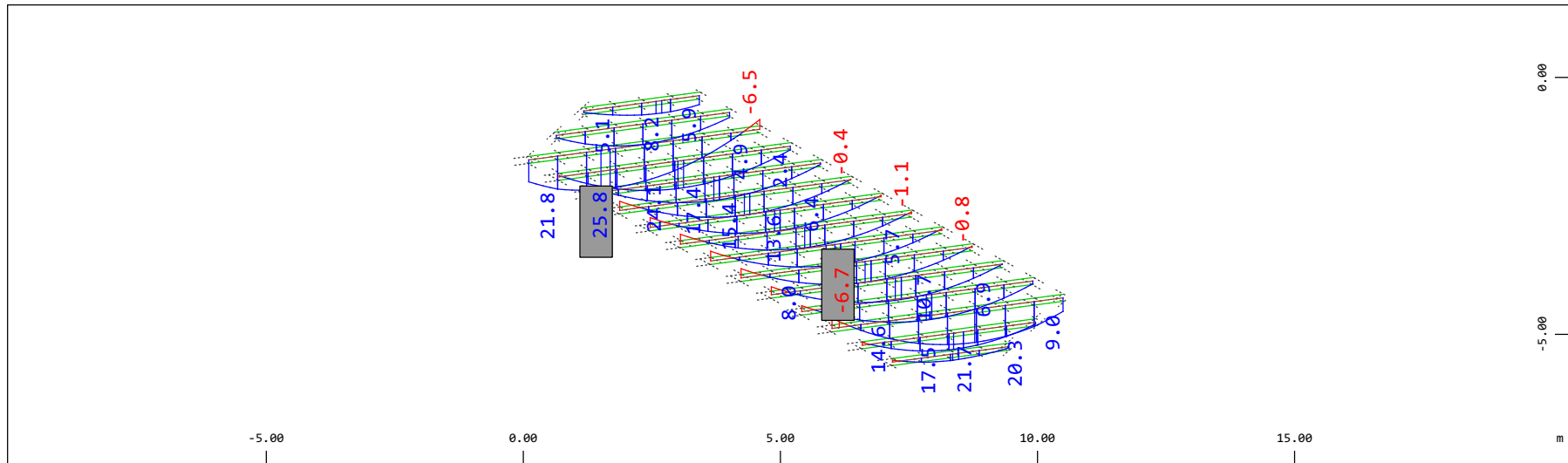
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 19.6 kN (Min=-19.9) (Max=18.6)

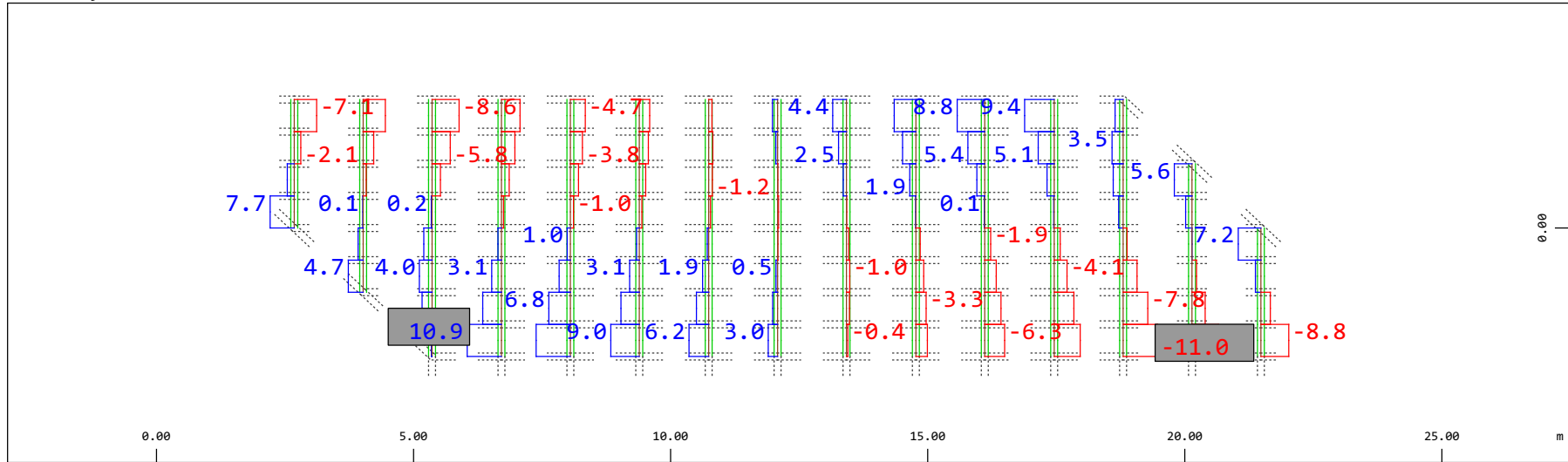
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 39.2 kNm (Min=-6.73) (Max=25.8)

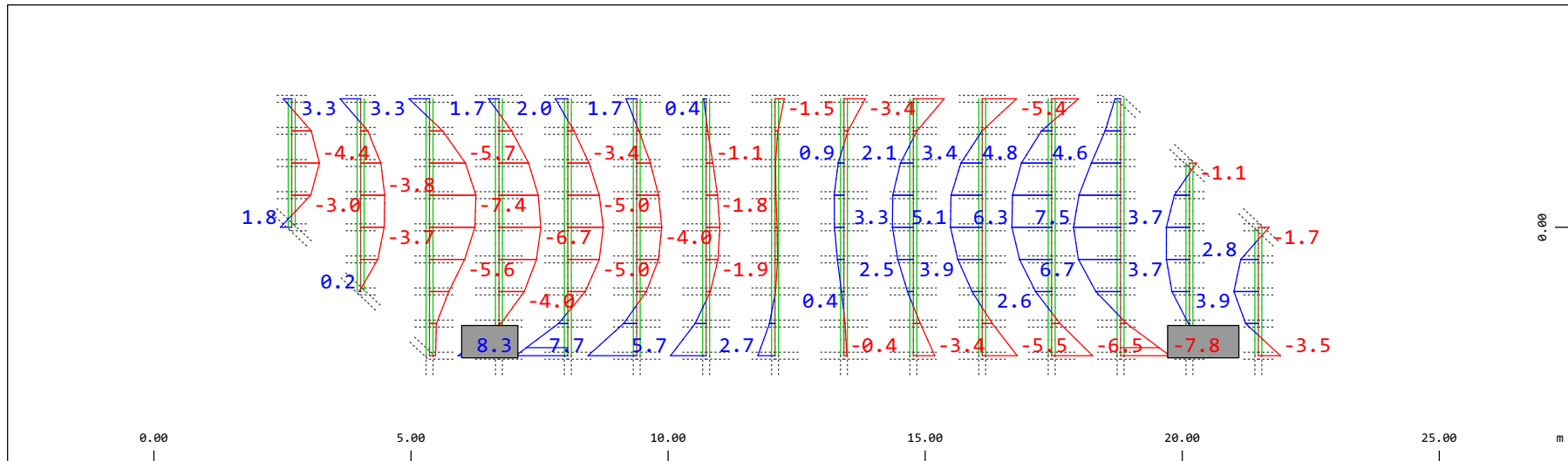
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 19.6 kN (Min=-11.0) (Max=10.9)

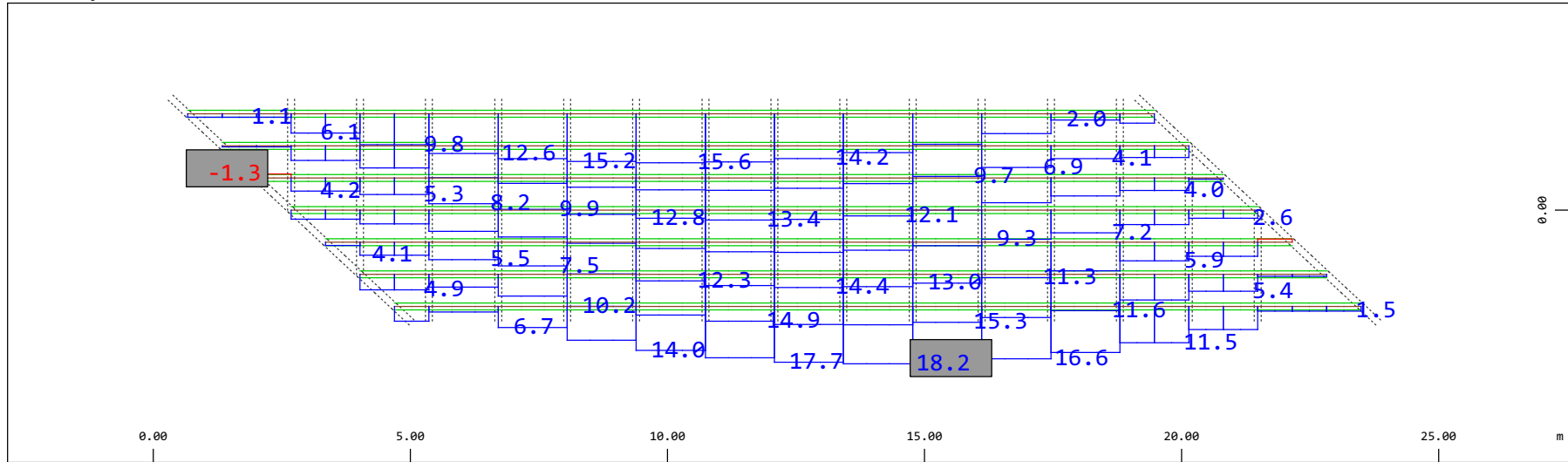
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 9.80 kNm (Min=-7.82) (Max=8.29)

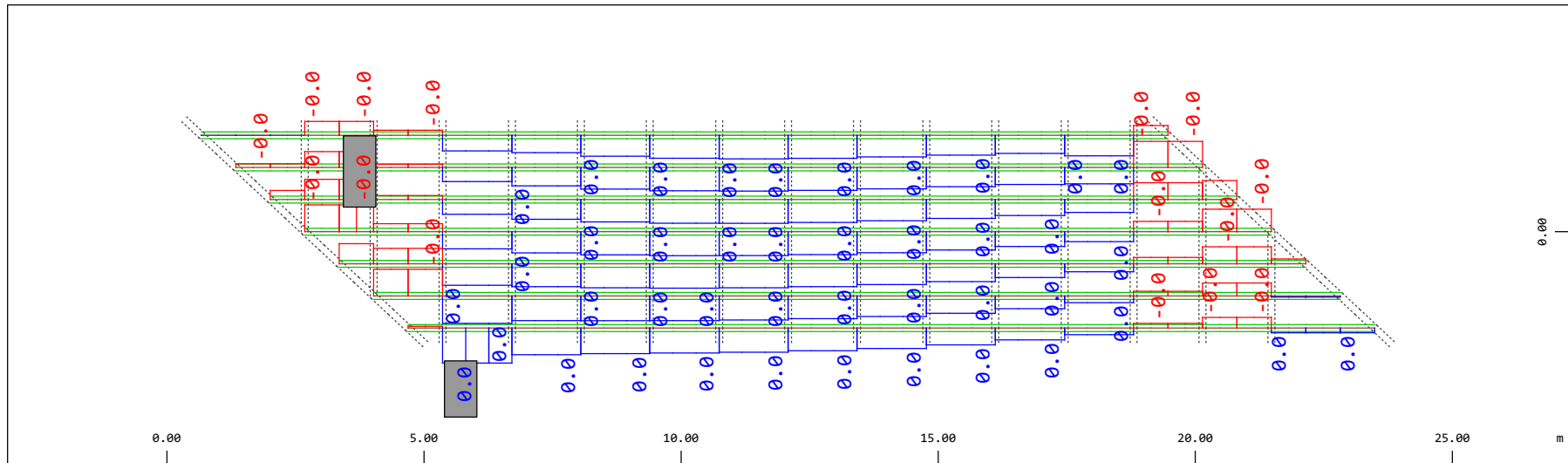
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 19.6 kN (Min=-1.27) (Max=18.2)

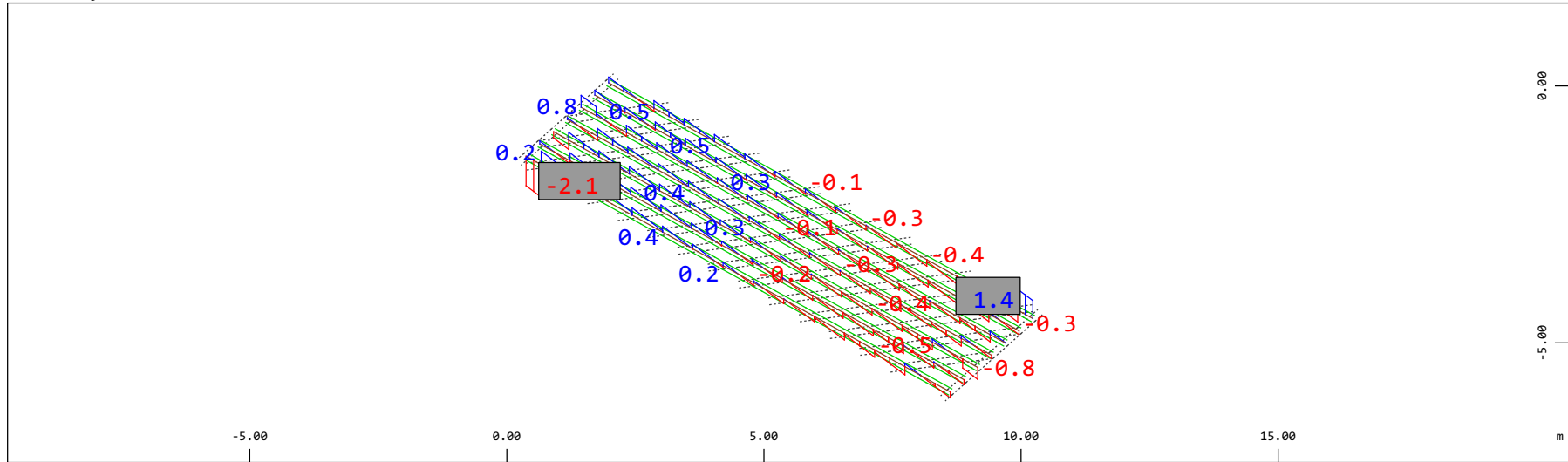
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 0.0020 kNm (Min=-8.5116e-04) (Max=0.0011)

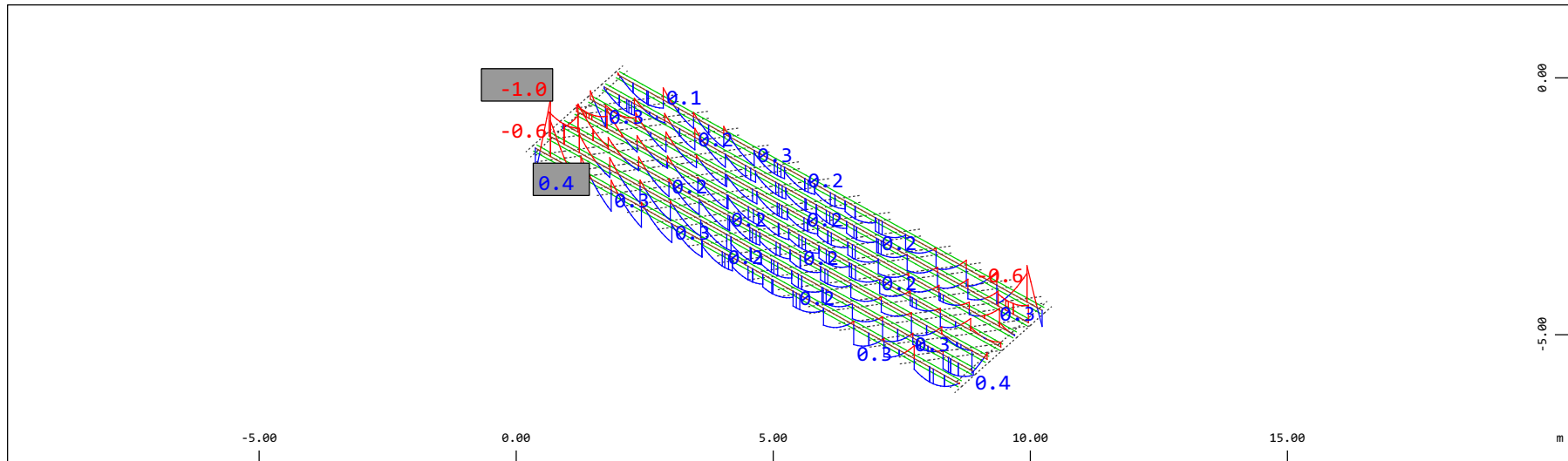
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 3.92 kN (Min=-2.15) (Max=1.39)

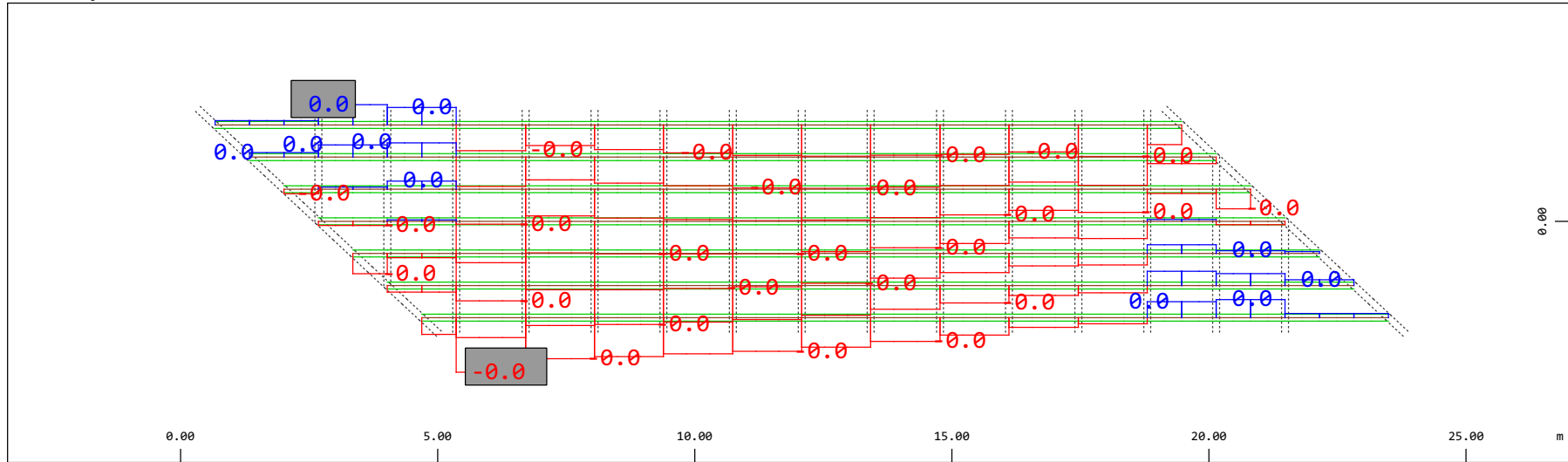
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 0.980 kNm (Min=-0.952) (Max=0.420)

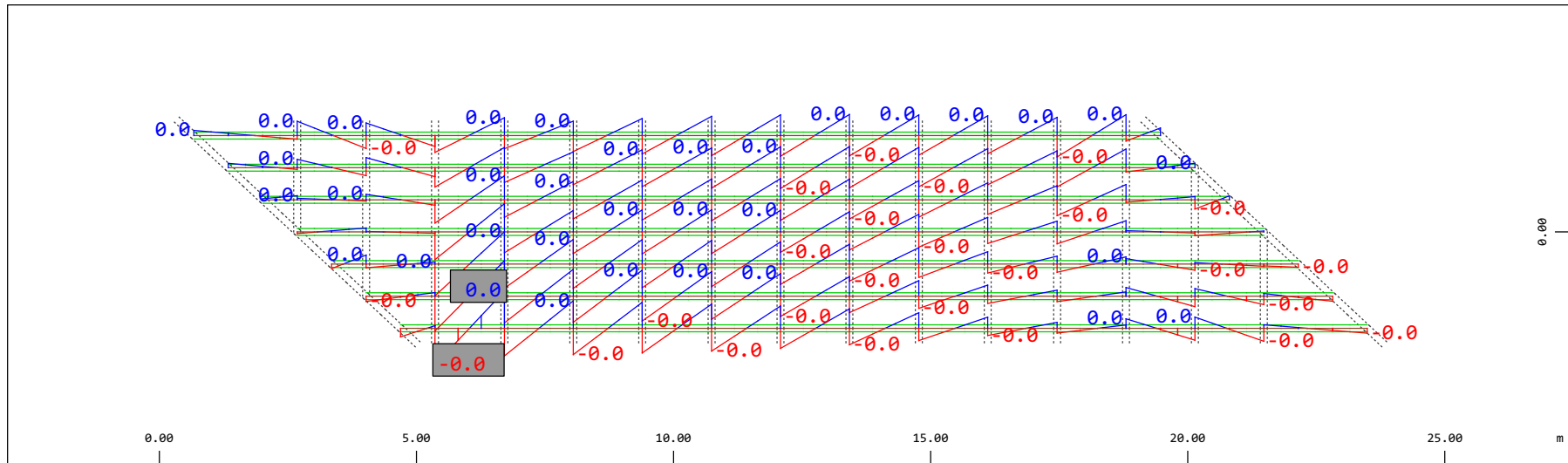
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Shear force Vy, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 0.0039 kN (Min=-0.0035) (Max=0.0013)

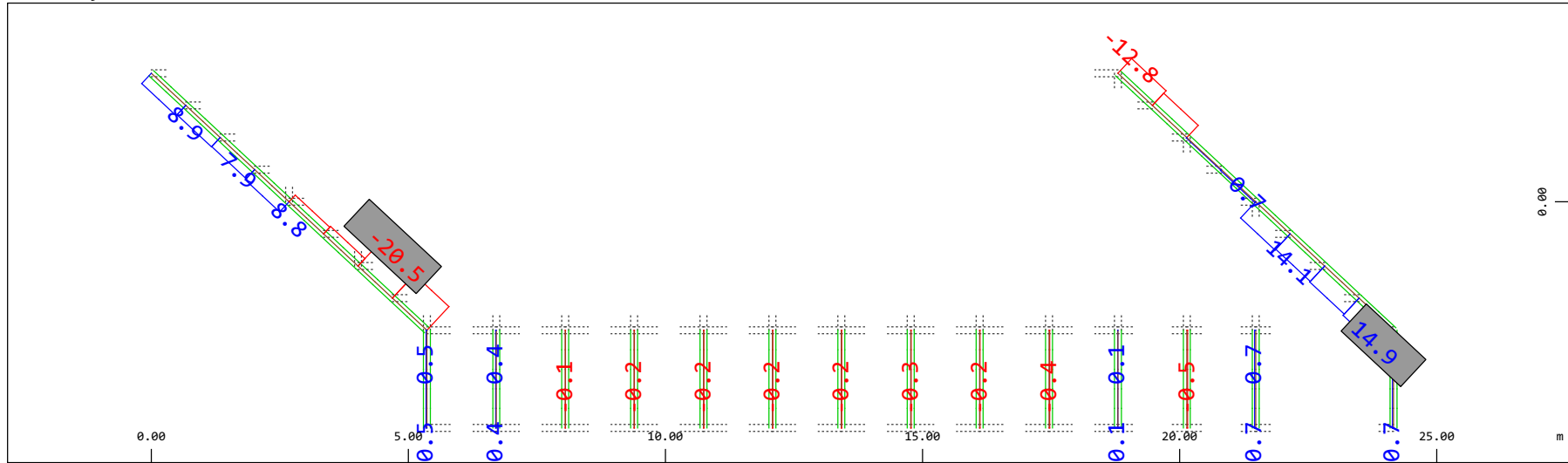
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Bending moment Mz, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 0.0039 kNm (Min=-0.0023) (Max=0.0024)

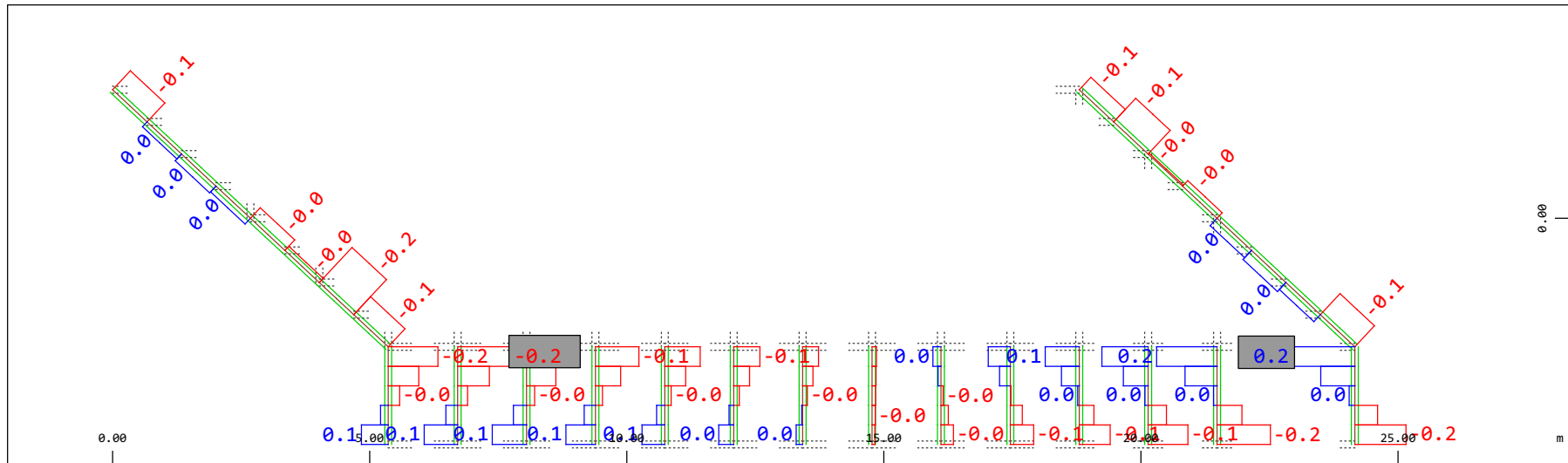
M 1 : 120

Definition of Axis
 Results elementay loads



Y
 X
 Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 39.2 kN (Min=-20.5) (Max=14.9)

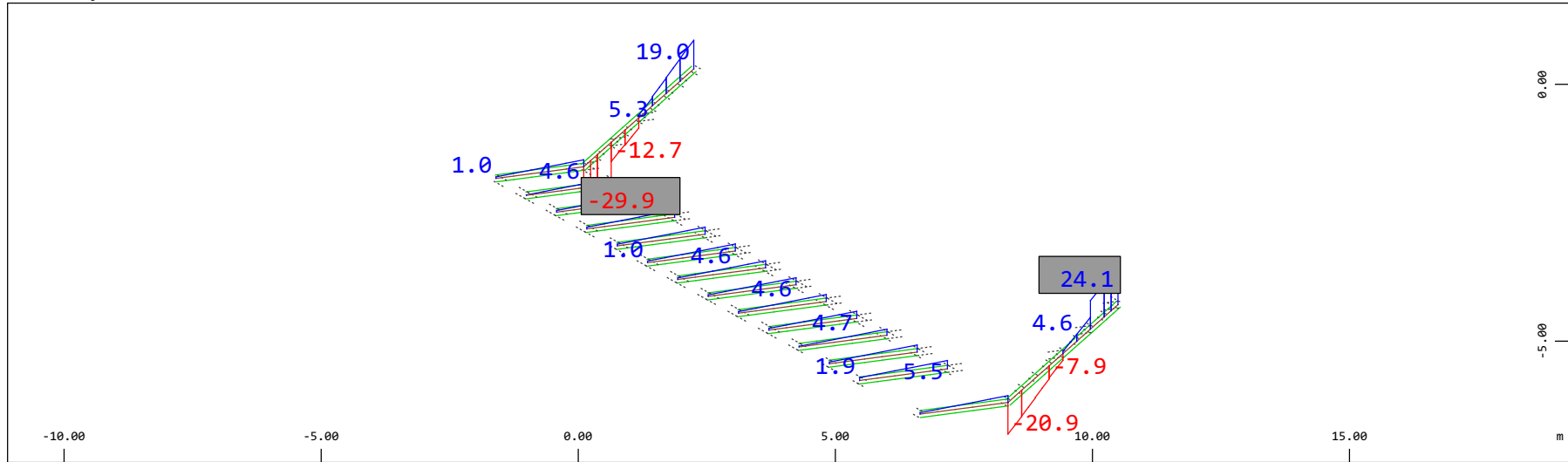
M 1 : 120



Y
 X
 Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 0.196 kNm (Min=-0.170) (Max=0.199)

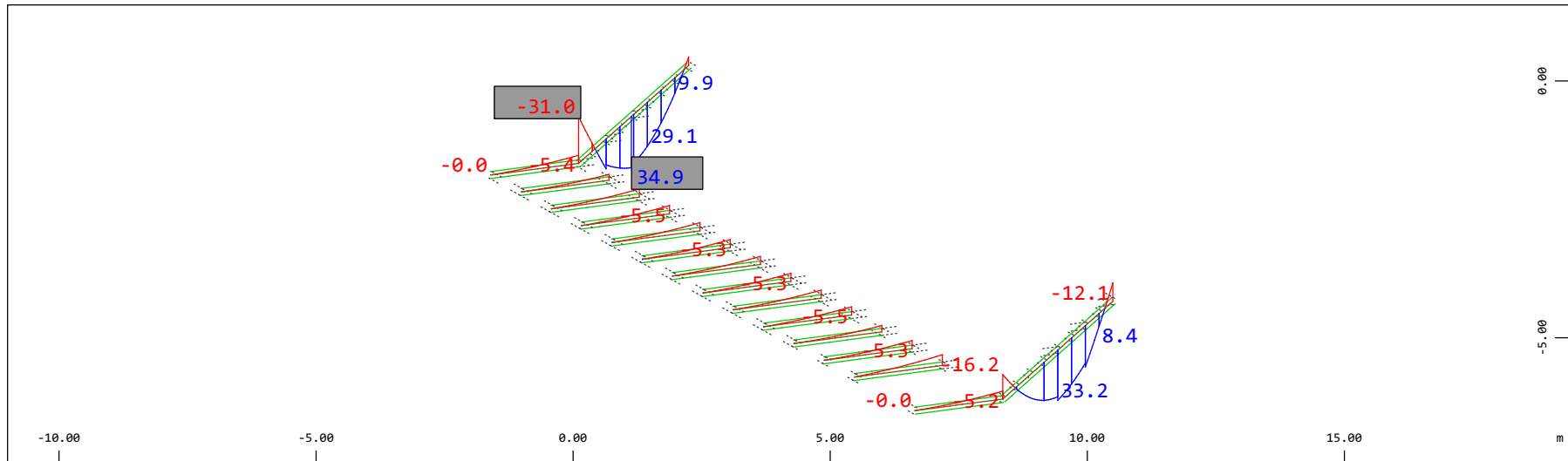
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 39.2 kN (Min=-29.9) (Max=24.1)

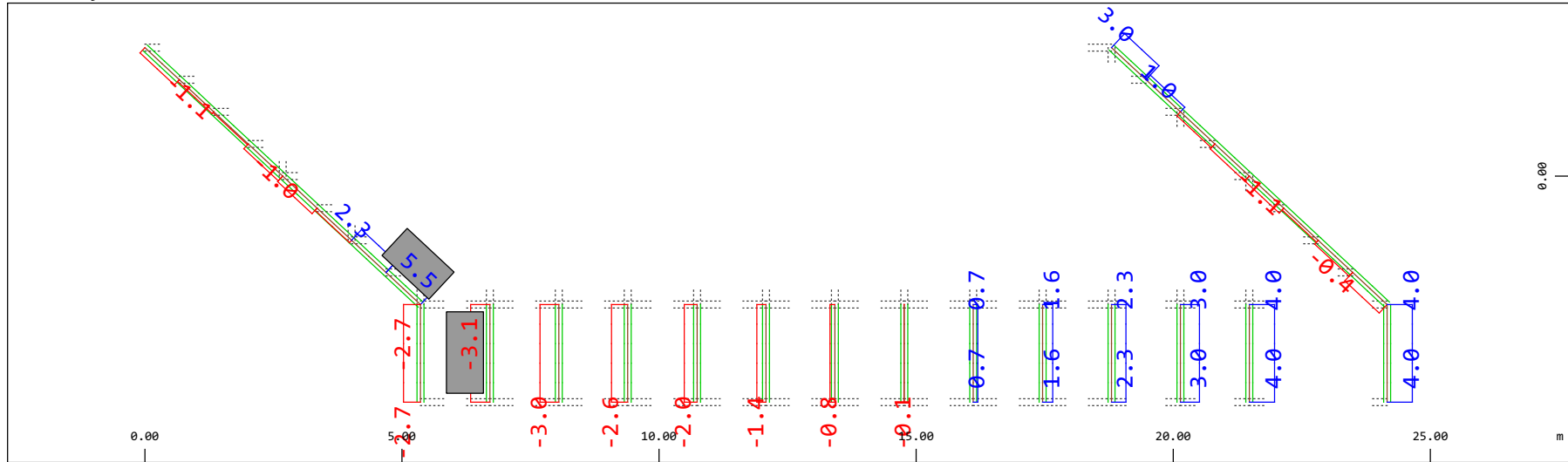
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 39.2 kNm (Min=-31.0) (Max=34.9)

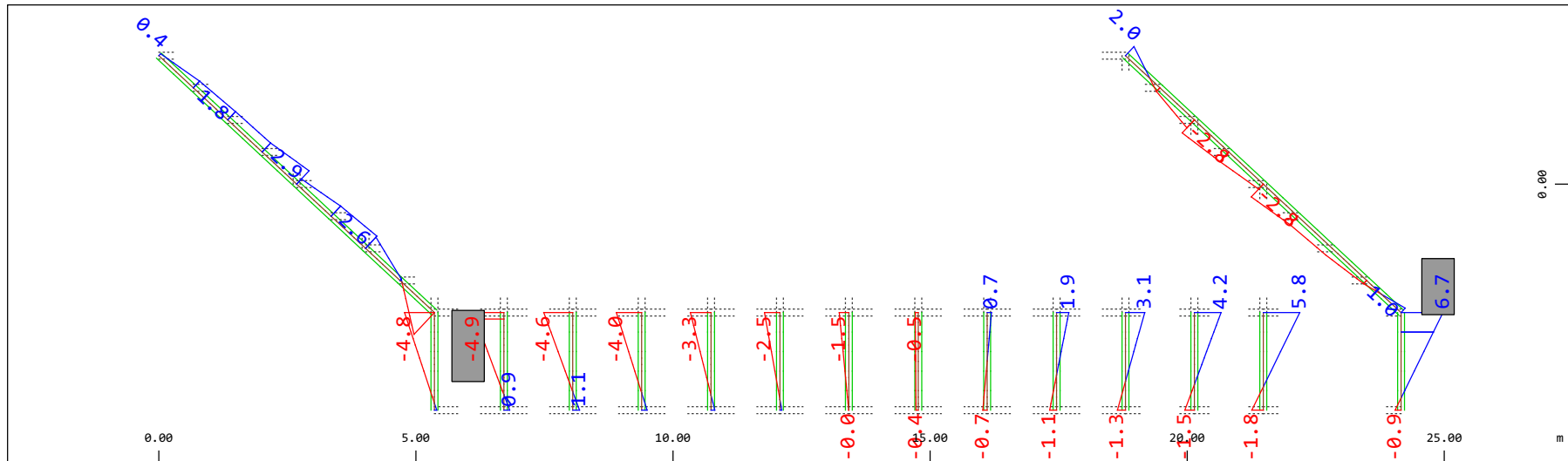
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementary loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 9.80 kN (Min=-3.06) (Max=5.53)

M 1 : 120

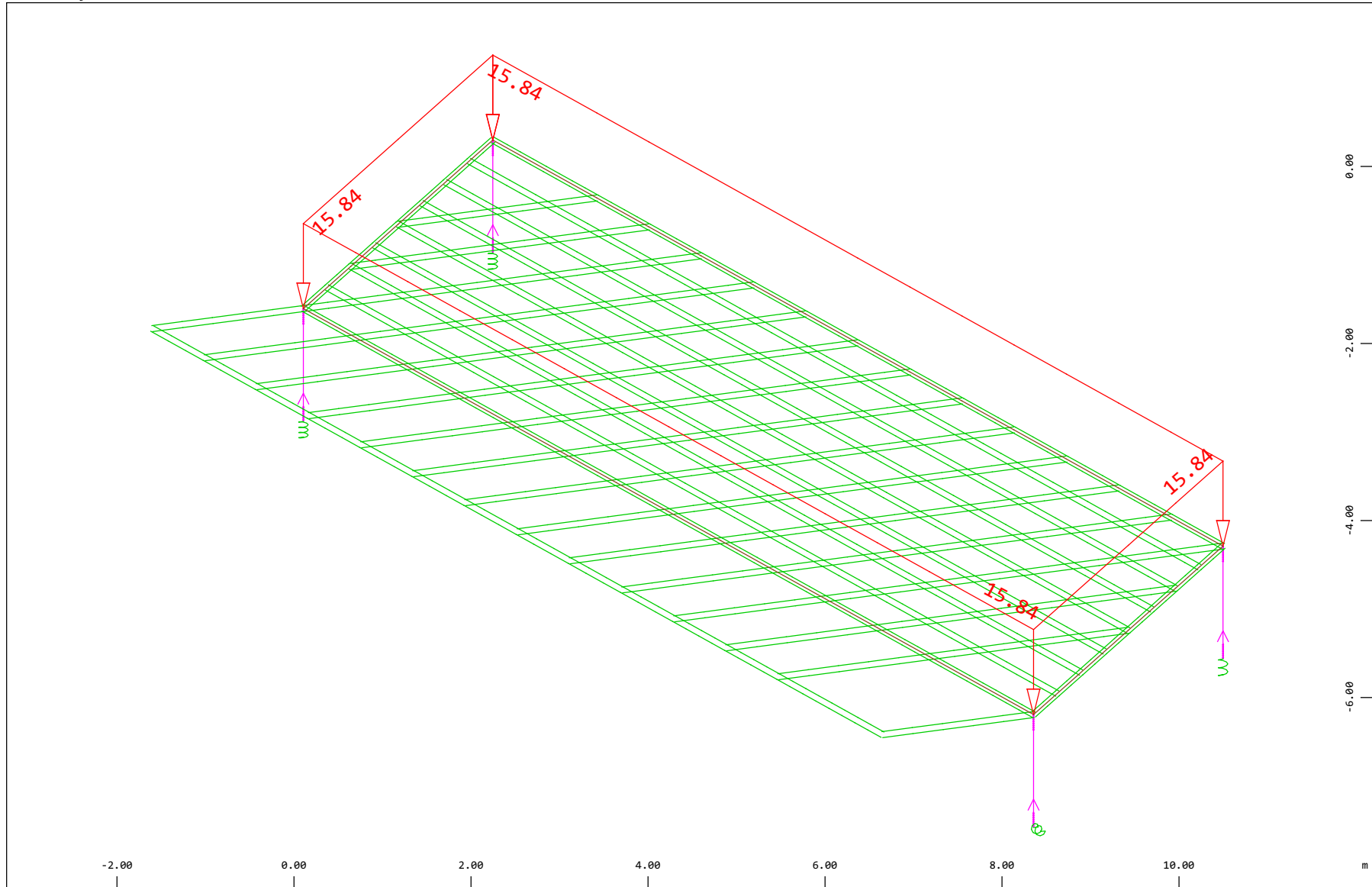


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 1 G1: Peso proprio acciaio , 1 cm 3D = 9.80 kNm (Min=-4.89) (Max=6.66)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

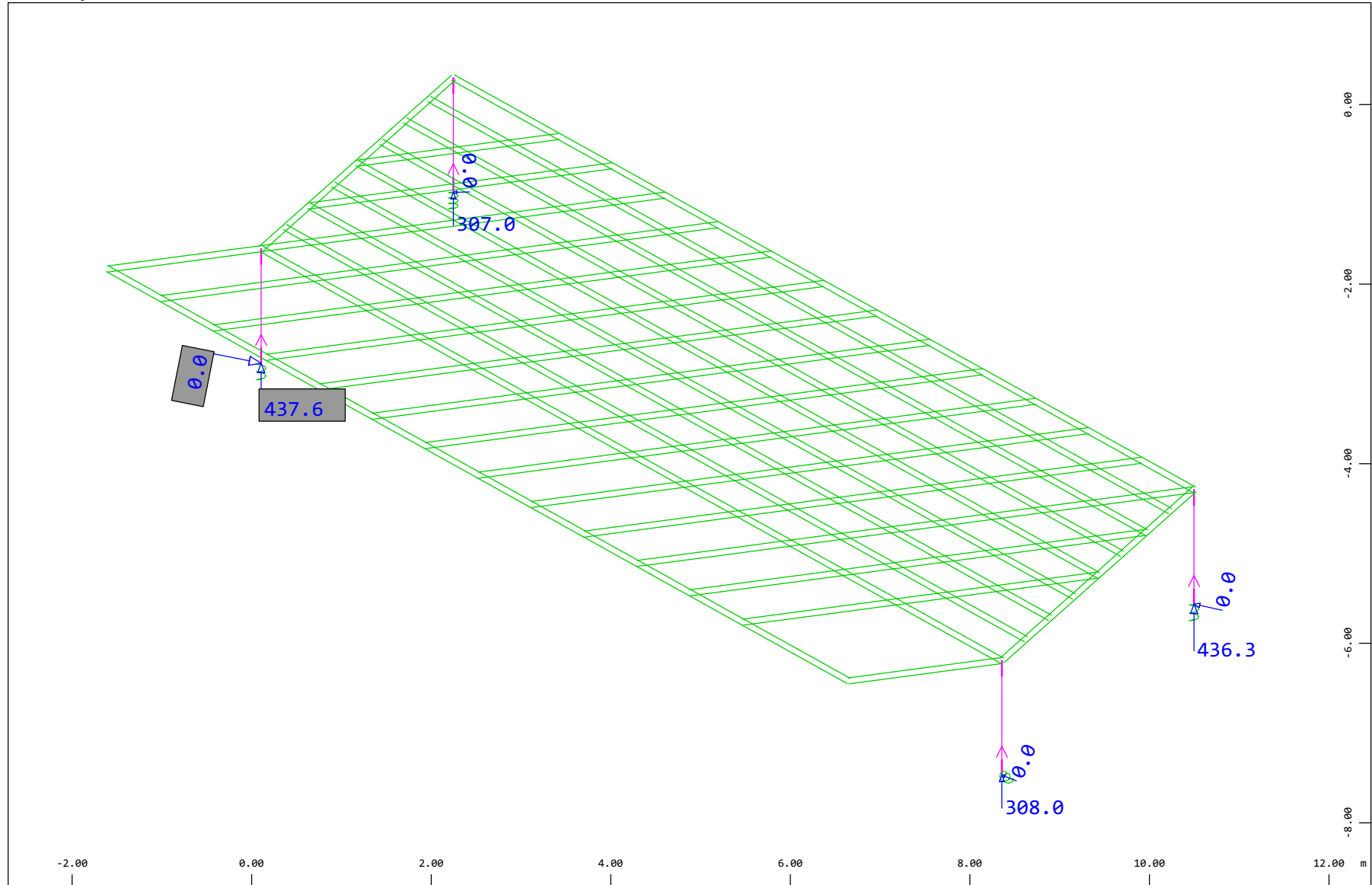
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 2 G2: Massiccata , (1 cm 3D = unit) Free area load (force) in global Z (Unit=9.69 kN/m2)
 (Max=-15.8)

⤴ (Min=-15.8)

M 1 : 61
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y
 Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 2 G2: Massicciata , 1 cm 3D = 484.4 kN

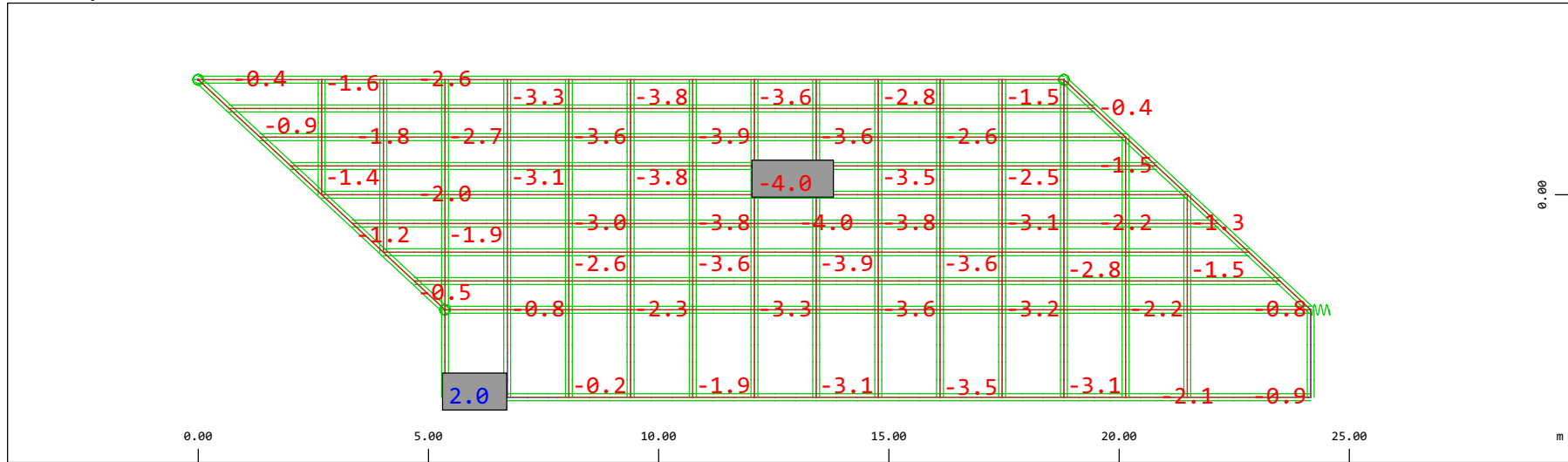
Nodes , Support force vector in the global XY plane, Loadcase 2 G2: Massicciata , 1 cm 3D = 0.0019 kN

▬ (Max=437.6) (total: 1489.)

▬ (Max=0.0026)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

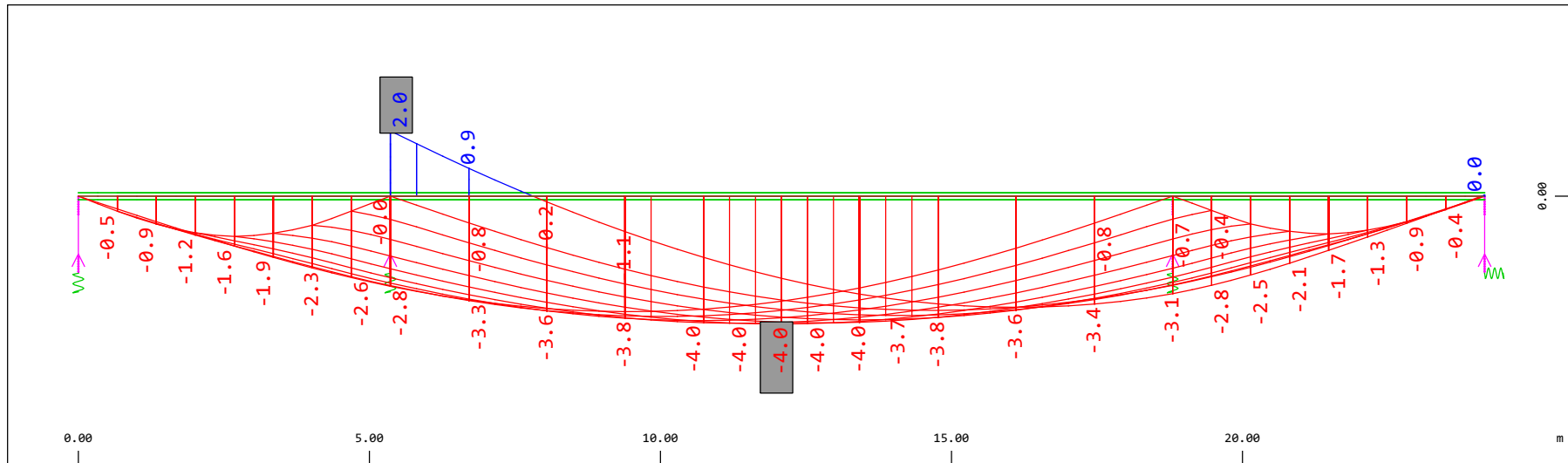
Definition of Axis
 Results elementay loads



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \circ , Loadcase 2 G2: Massicciata , 1 cm 3D = 1.94 mm (Min=-4.02) (Max=2.05)

M 1 : 134

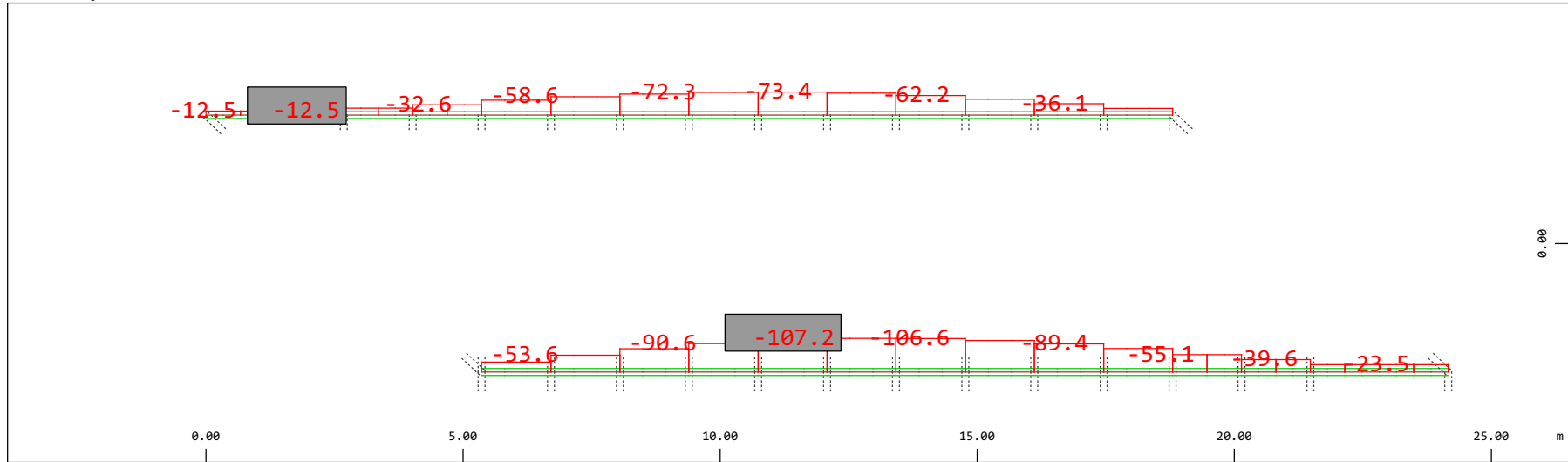
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Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 2 G2: Massicciata , 1 cm 3D = 1.94 mm (Min=-4.02) (Max=2.05)

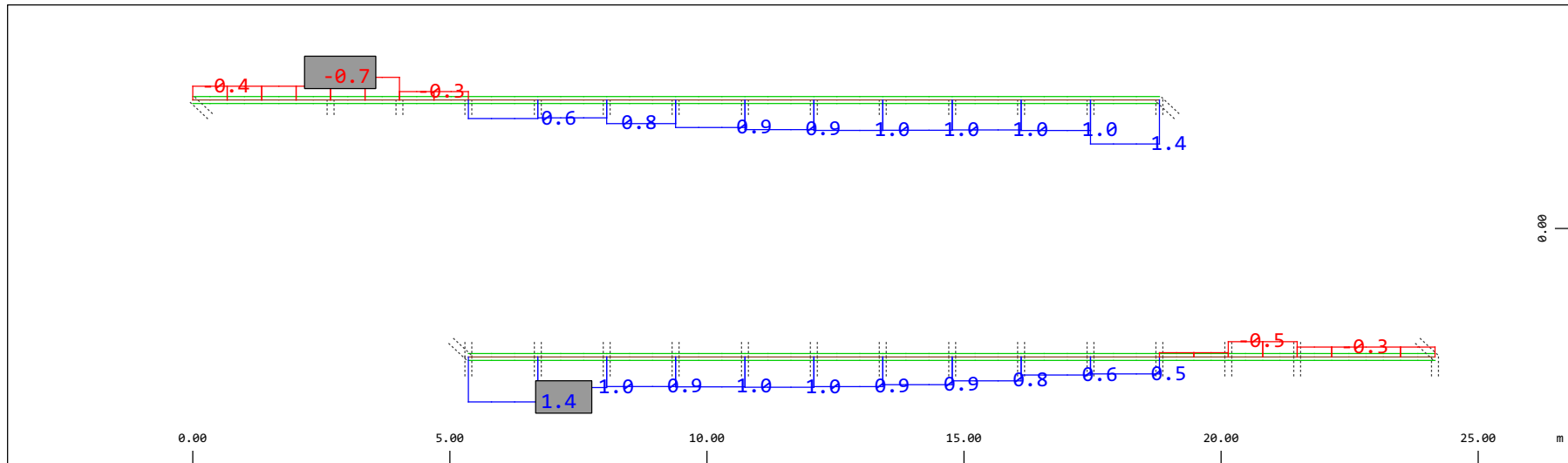
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 2 G2: Massiccata , 1 cm 3D = 196.1 kN (Min=-107.2) (Max=-12.5)

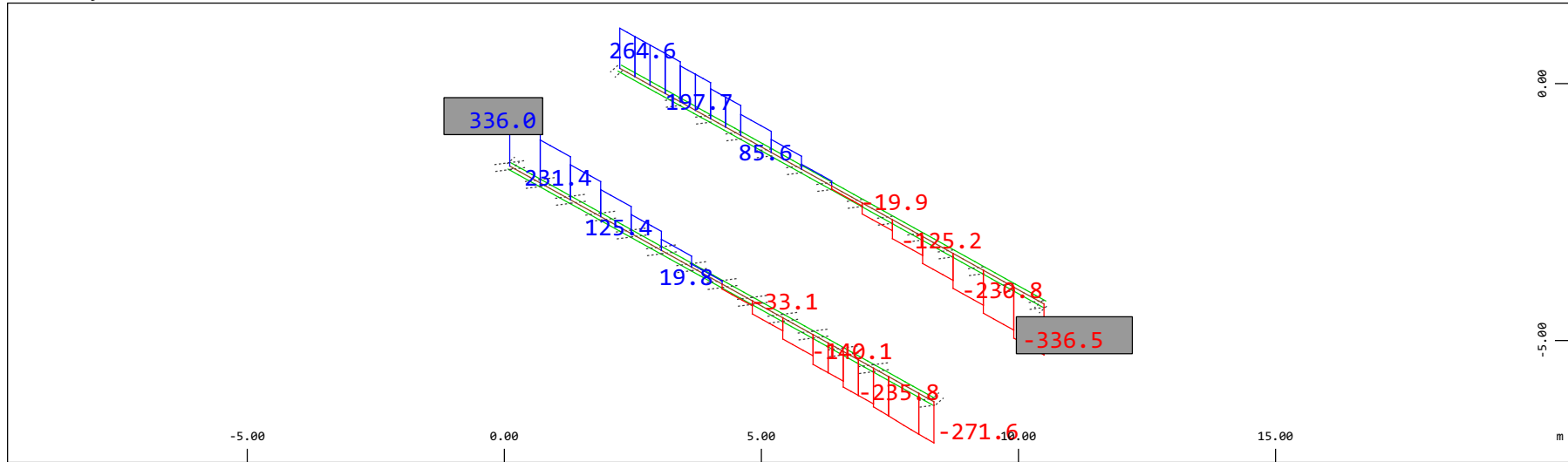
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 2 G2: Massiccata , 1 cm 3D = 1.96 kNm (Min=-0.720) (Max=1.43)

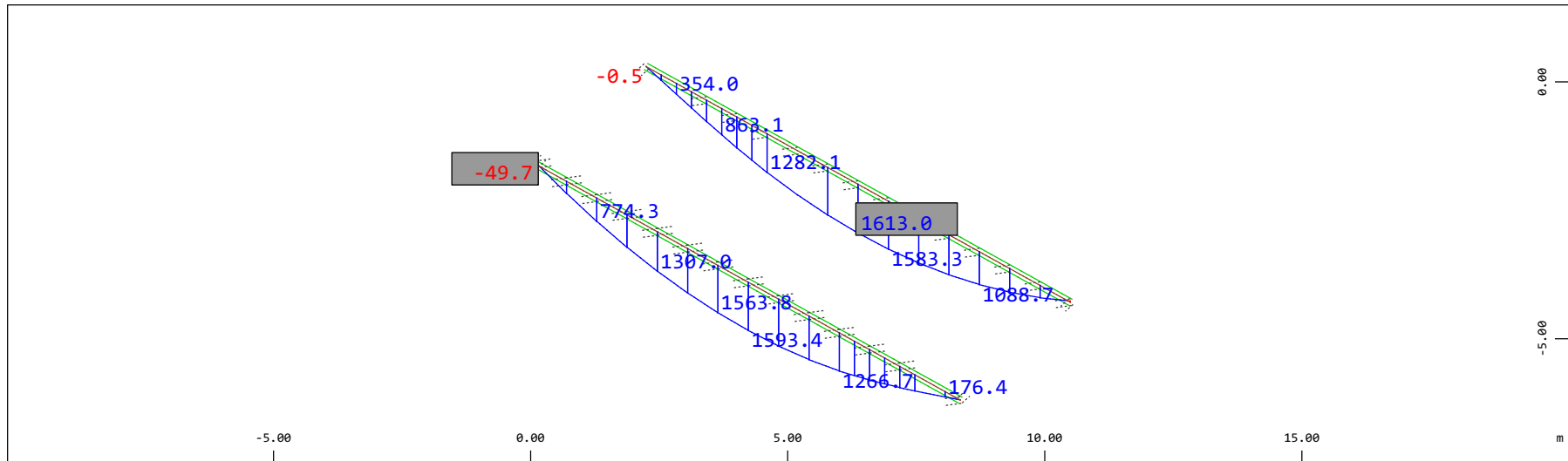
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 2 G2: Massicciata , 1 cm 3D = 392.2 kN (Min=-336.5) (Max=336.0)

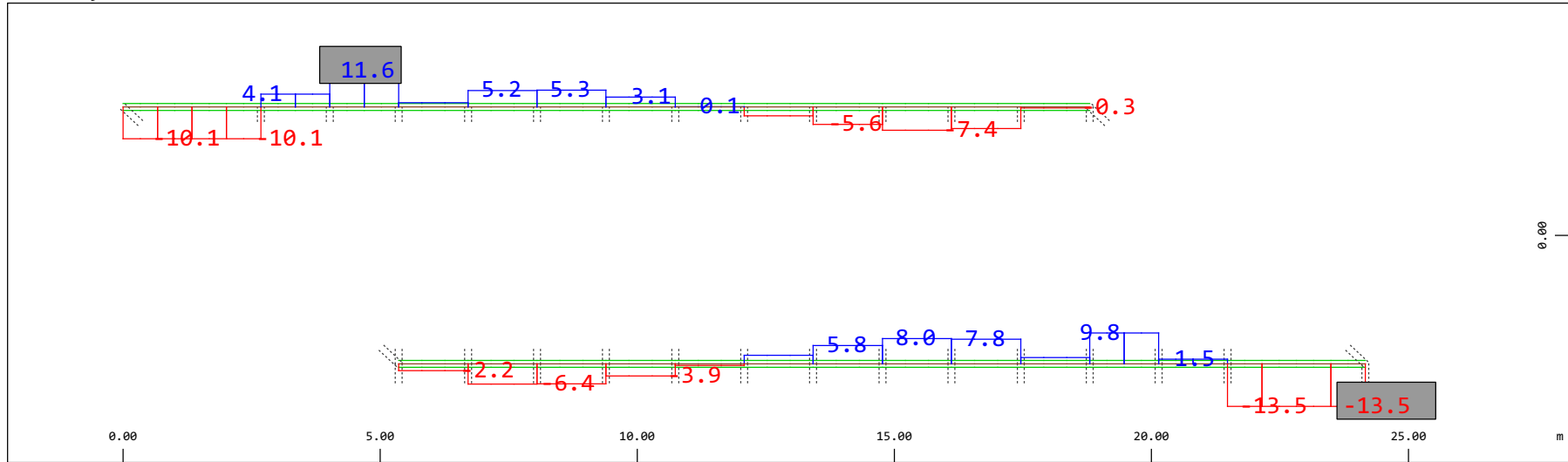
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 2 G2: Massicciata , 1 cm 3D = 1961. kNm (Min=-49.7) (Max=1613.)

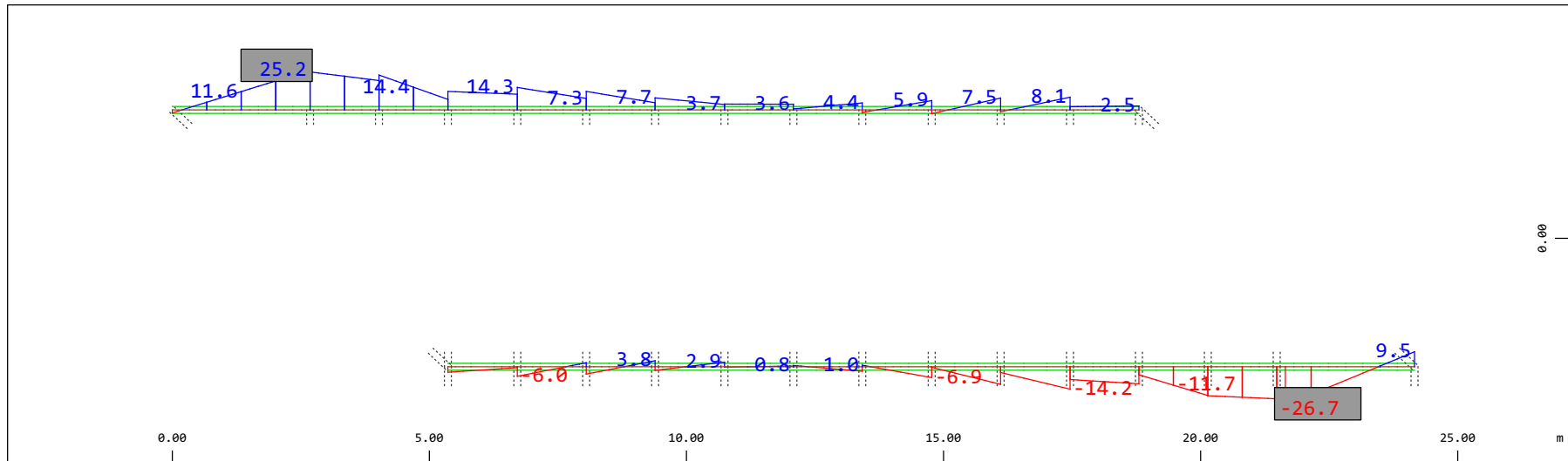
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 2 G2: Massicciata , 1 cm 3D = 19.6 kN (Min=-13.5) (Max=11.6)

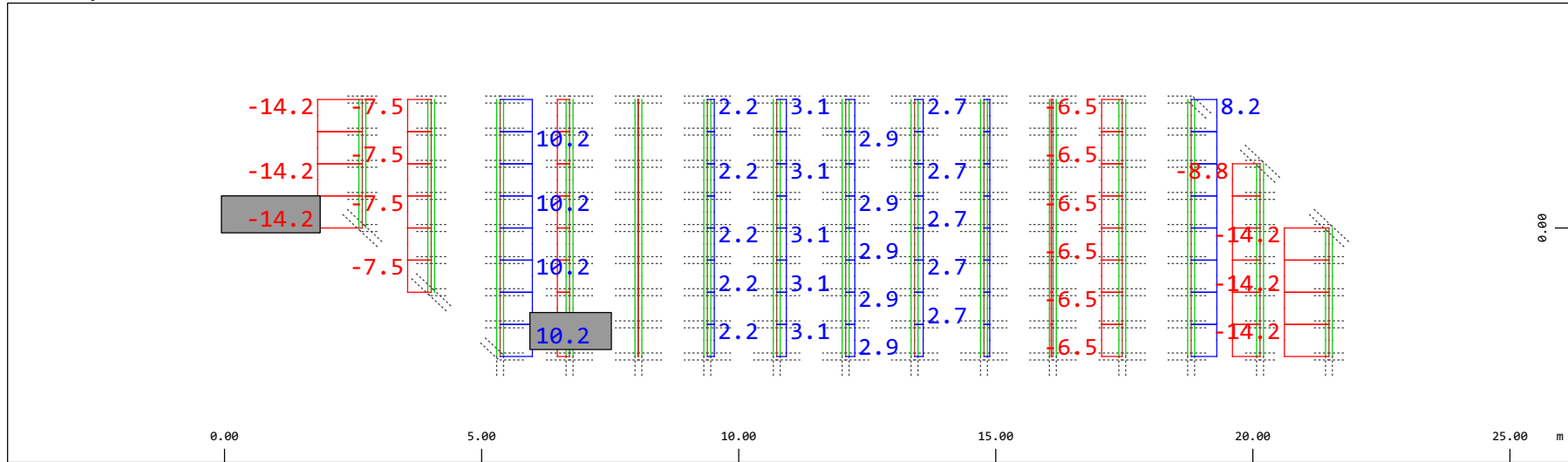
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 2 G2: Massicciata , 1 cm 3D = 39.2 kNm (Min=-26.7) (Max=25.2)

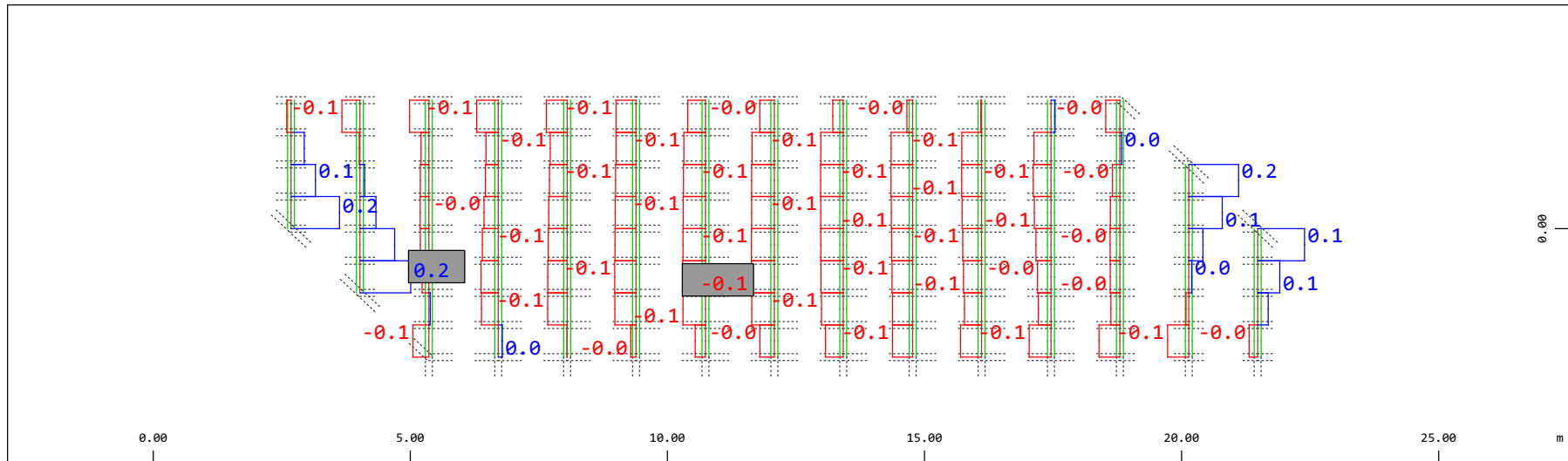
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force N_x , Loadcase 2 G2: Massiccata , 1 cm 3D = 19.6 kN (Min=-14.2) (Max=10.2)

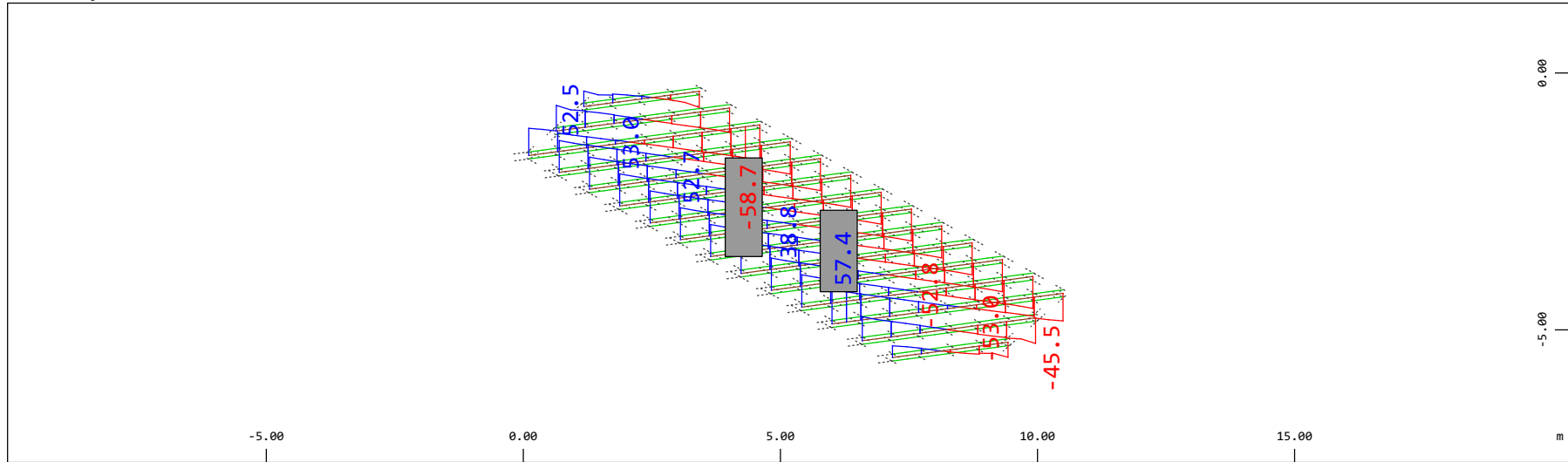
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment M_t , Loadcase 2 G2: Massiccata , 1 cm 3D = 0.196 kNm (Min=-0.0729) (Max=0.161)

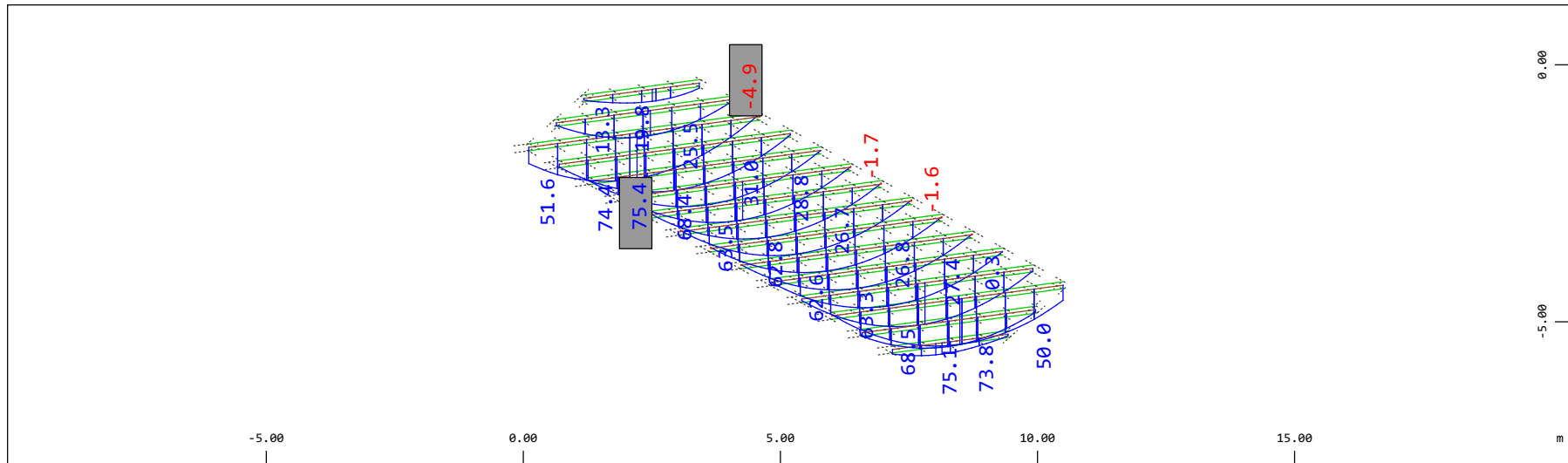
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 2 G2: Massicciata , 1 cm 3D = 98.0 kN (Min=-58.7) (Max=57.4)

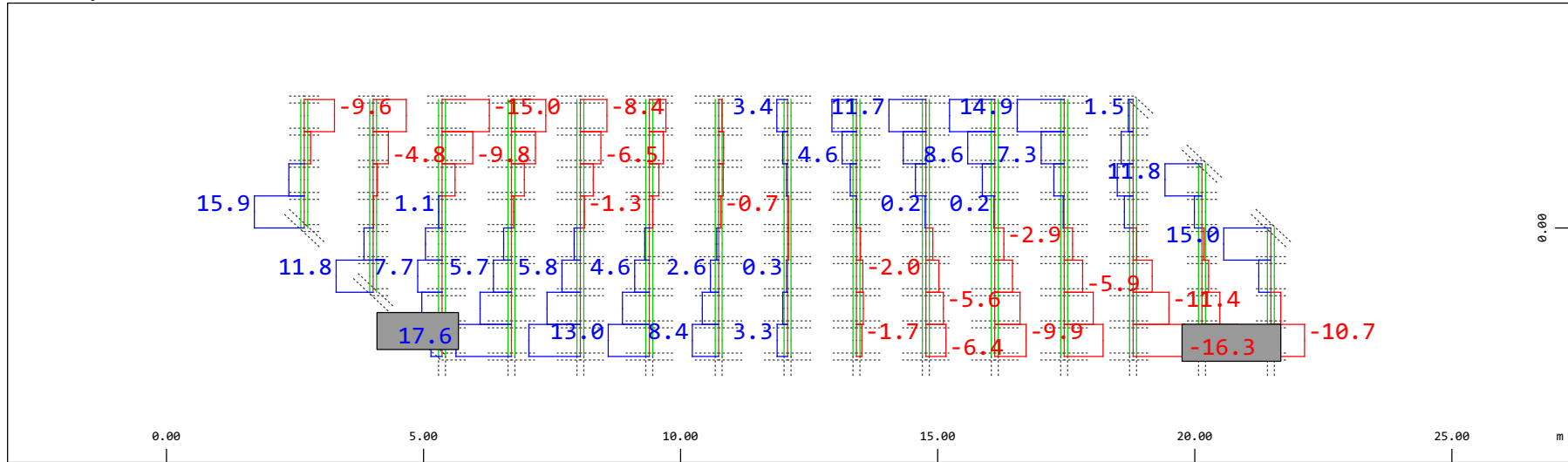
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 2 G2: Massicciata , 1 cm 3D = 98.0 kNm (Min=-4.94) (Max=75.4)

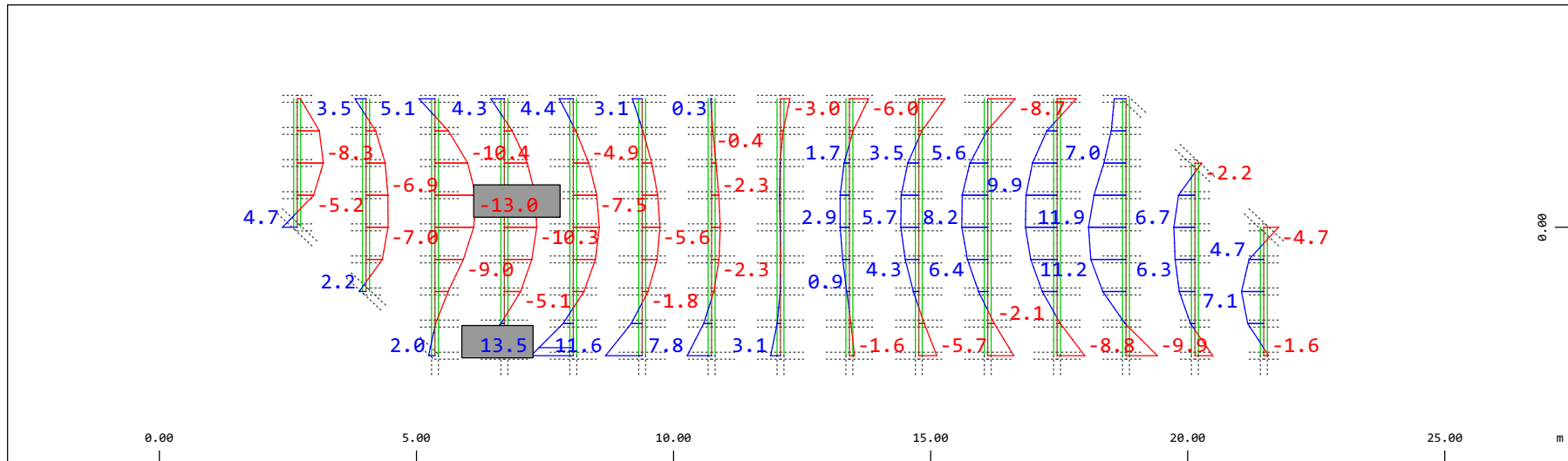
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 2 G2: Massicciata , 1 cm 3D = 19.6 kN (Min=-16.3) (Max=17.6)

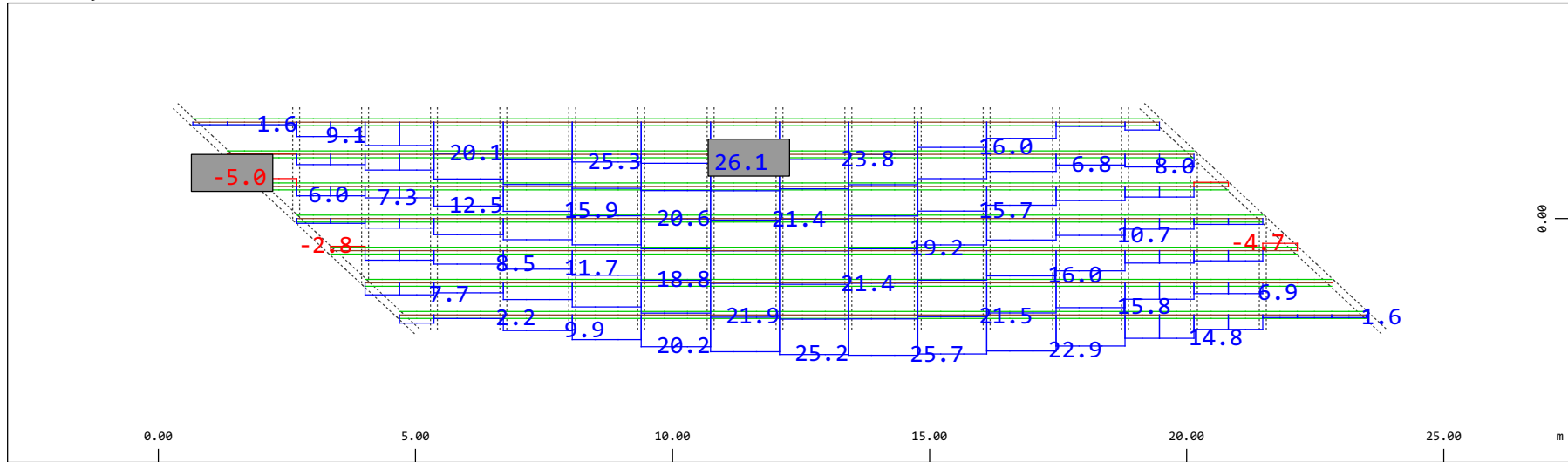
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 2 G2: Massicciata , 1 cm 3D = 19.6 kNm (Min=-13.0) (Max=13.5)

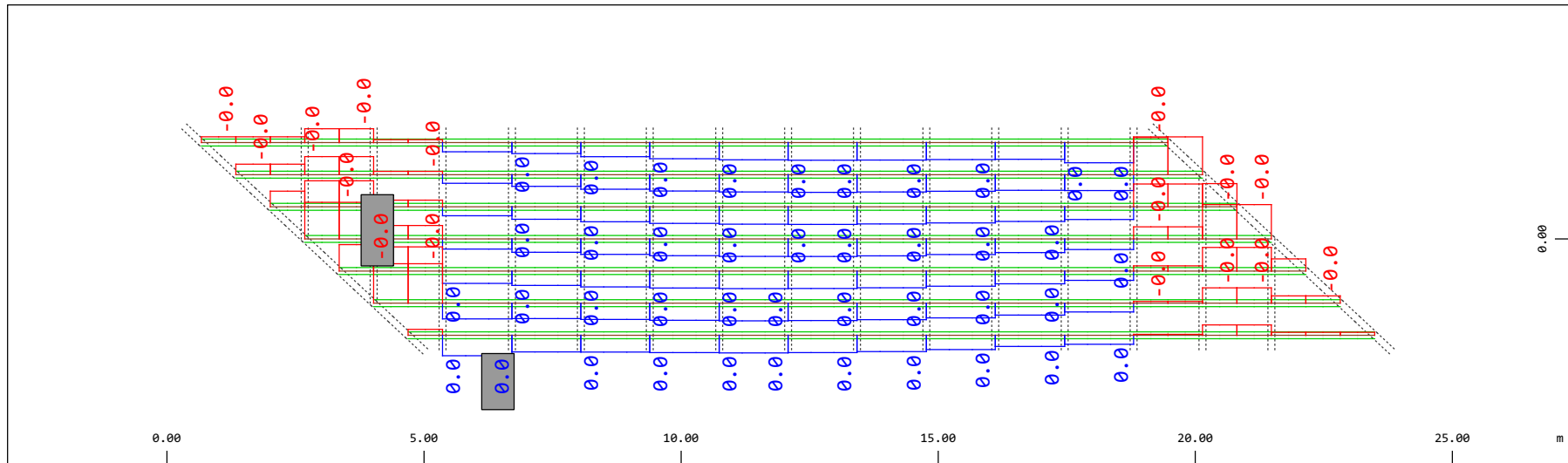
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force N_x , Loadcase 2 G2: Massiccata , 1 cm 3D = 39.2 kN (Min=-5.00) (Max=26.1)

M 1 : 120

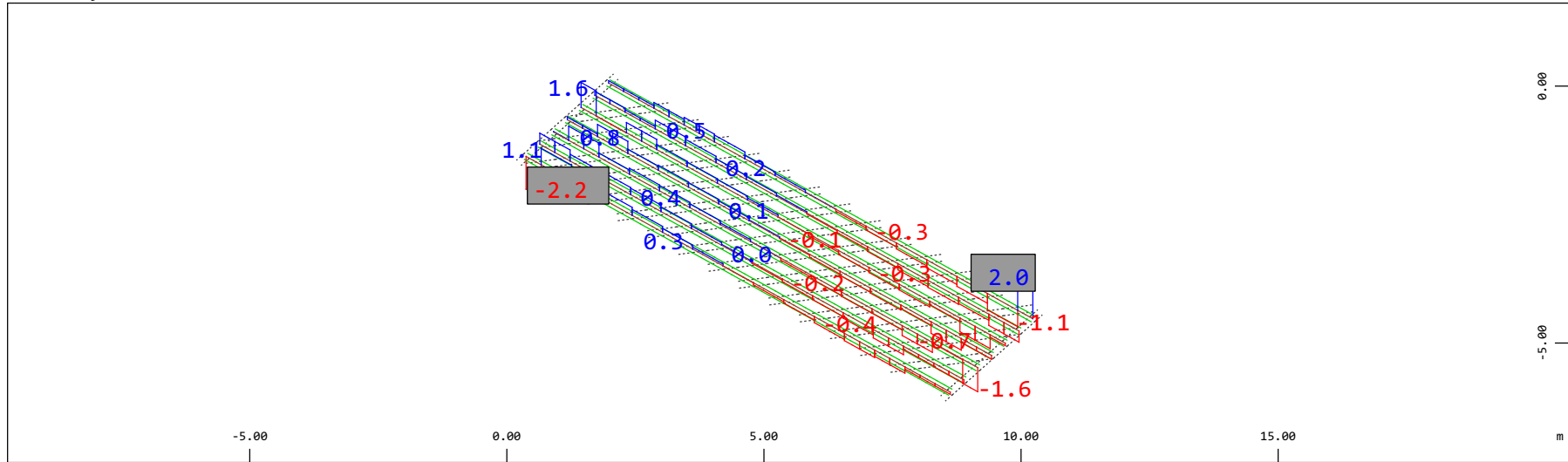


Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment M_t , Loadcase 2 G2: Massiccata , 1 cm 3D = 0.0039 kNm (Min=-0.0025) (Max=0.0013)

M 1 : 120

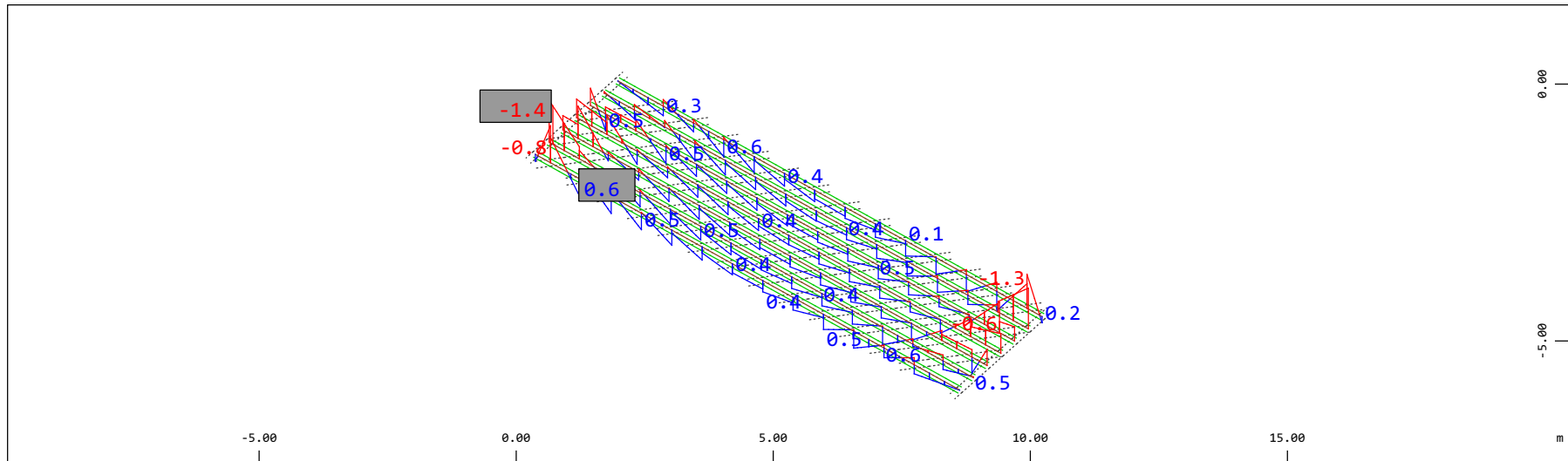
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 2 G2: Massicciata , 1 cm 3D = 3.92 kN (Min=-2.16) (Max=1.98)

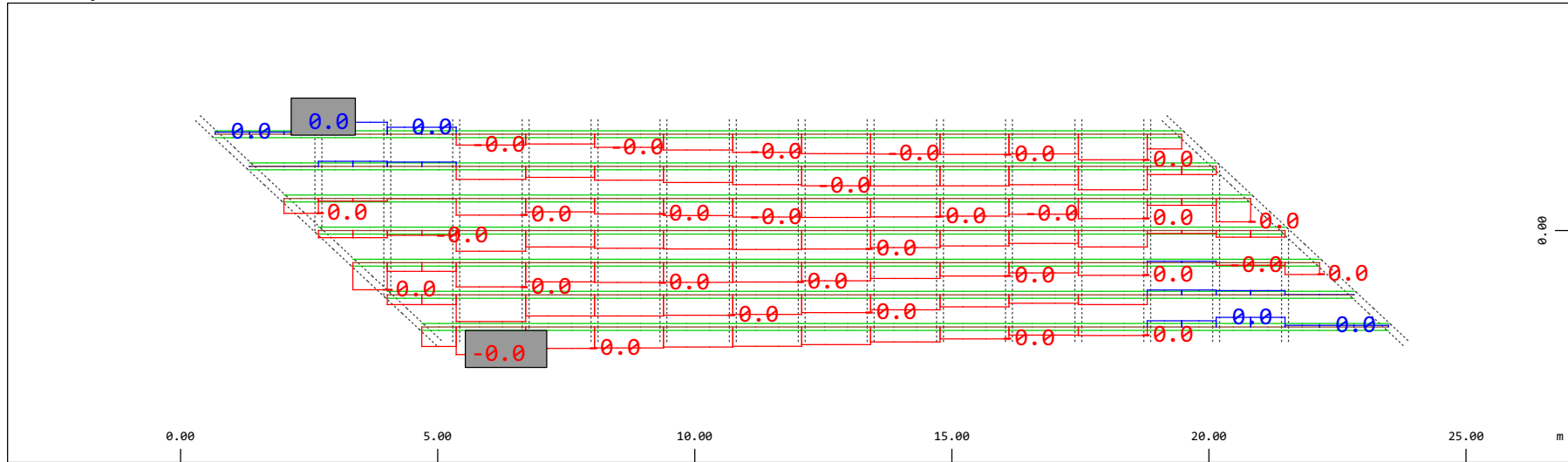
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 2 G2: Massicciata , 1 cm 3D = 1.96 kNm (Min=-1.38) (Max=0.642)

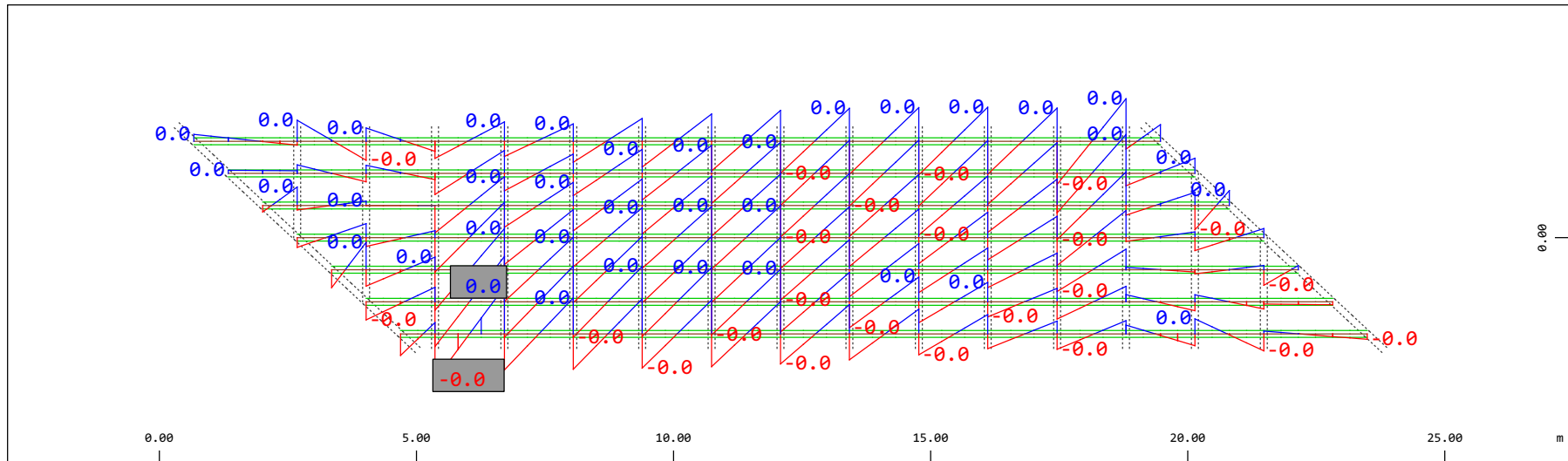
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Y
X
Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 2 G2: Massicciata , 1 cm 3D = 0.0098 kN (Min=-0.0044) (Max=0.0019)

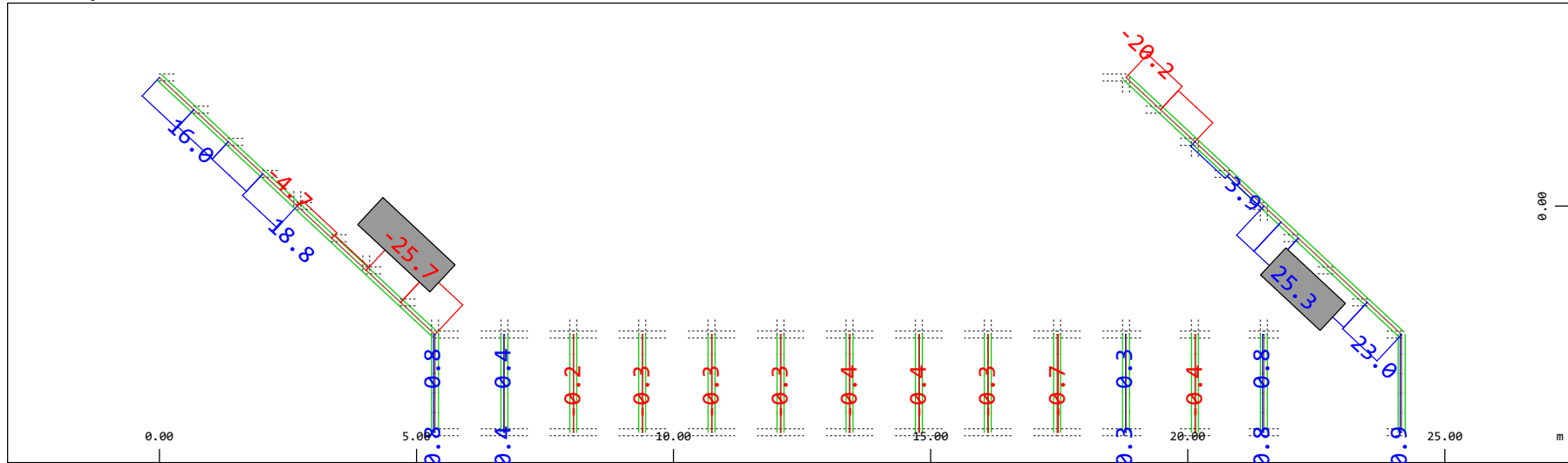
M 1 : 120



Y
X
Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 2 G2: Massicciata , 1 cm 3D = 0.0039 kNm (Min=-0.0030) (Max=0.0030)

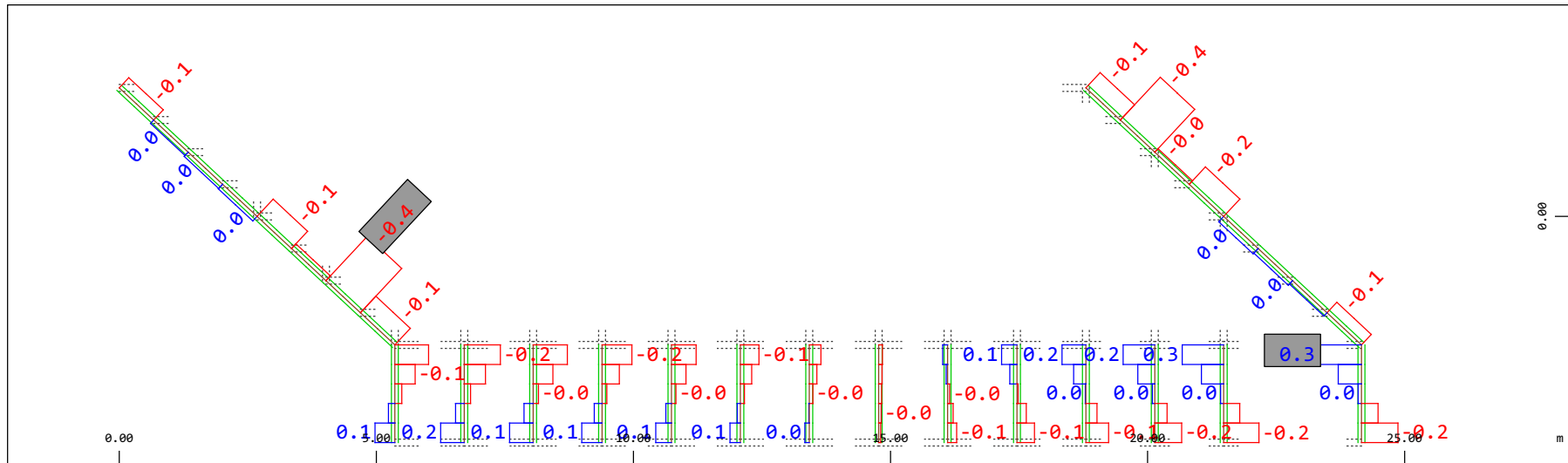
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 2 G2: Massiccata , 1 cm 3D = 39.2 kN (Min=-25.7) (Max=25.3)

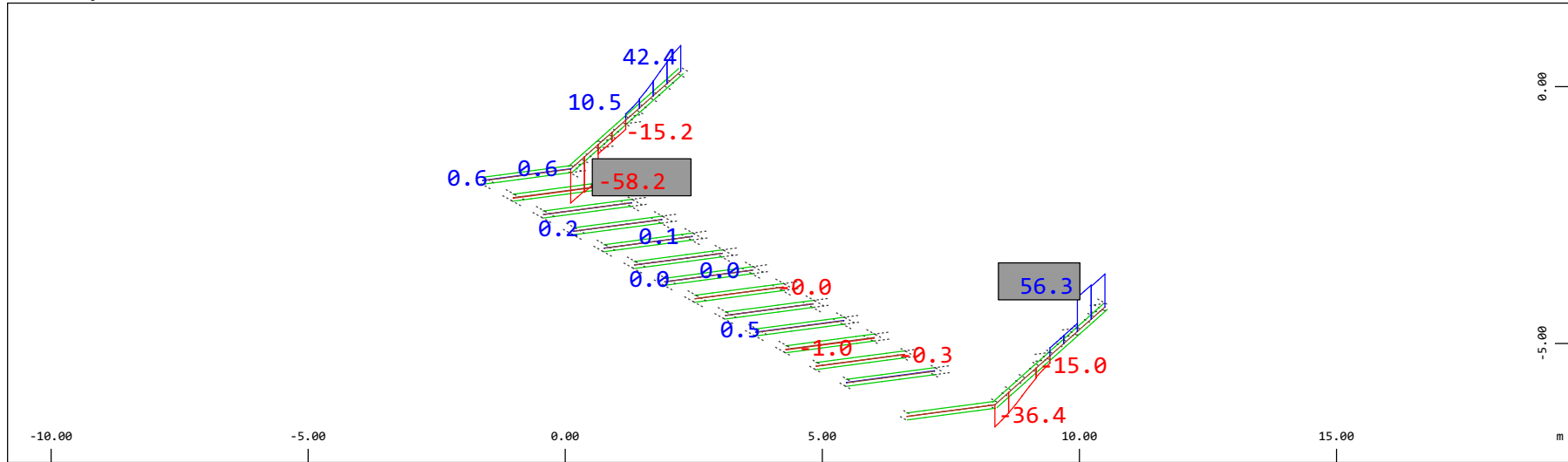
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 2 G2: Massiccata , 1 cm 3D = 0.392 kNm (Min=-0.385) (Max=0.274)

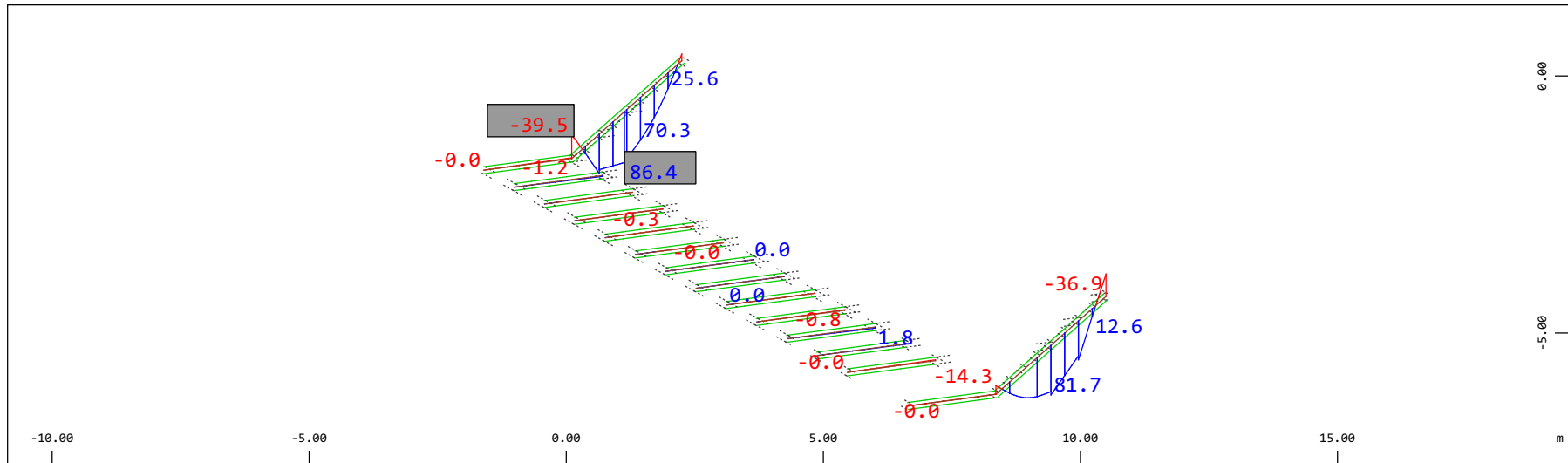
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 2 G2: Massicciata , 1 cm 3D = 98.0 kN (Min=-58.2) (Max=56.3)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

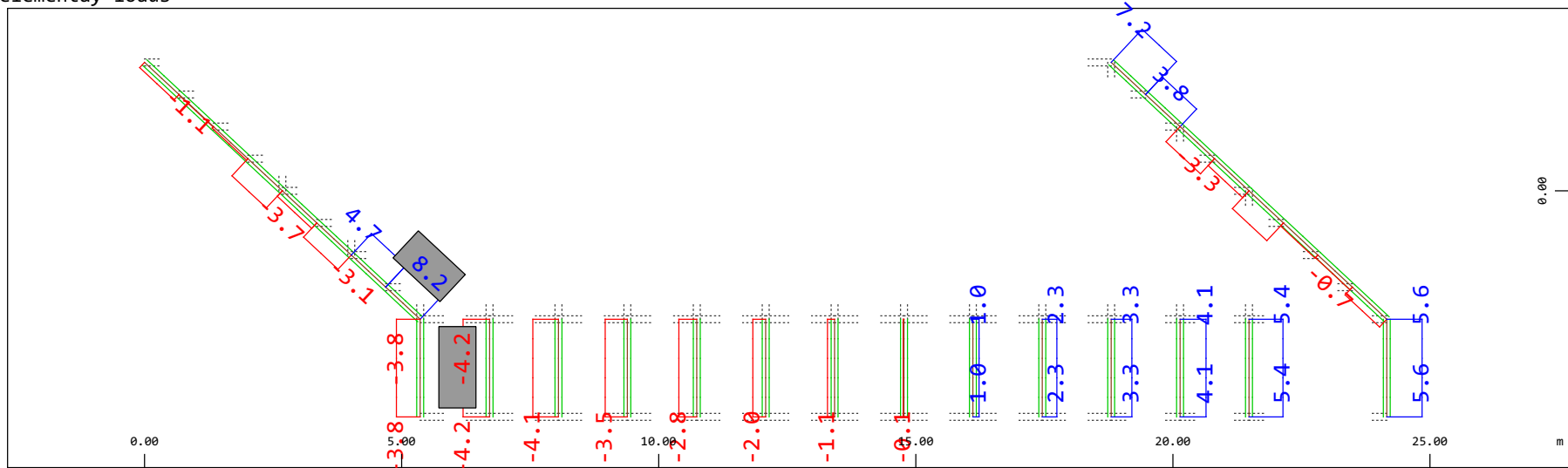


Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 2 G2: Massicciata , 1 cm 3D = 98.0 kNm (Min=-39.5) (Max=86.4)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

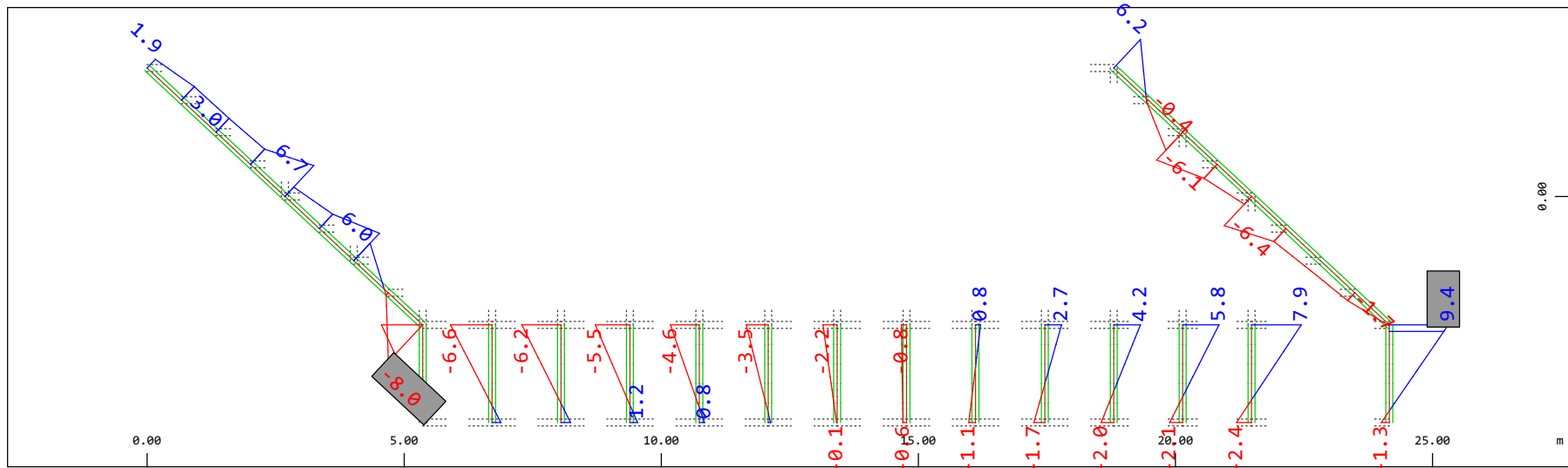
Definition of Axis
 Results elementay loads

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Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 2 G2: Massicciata , 1 cm 3D = 9.80 kN (Min=-4.21) (Max=8.20)

M 1 : 120

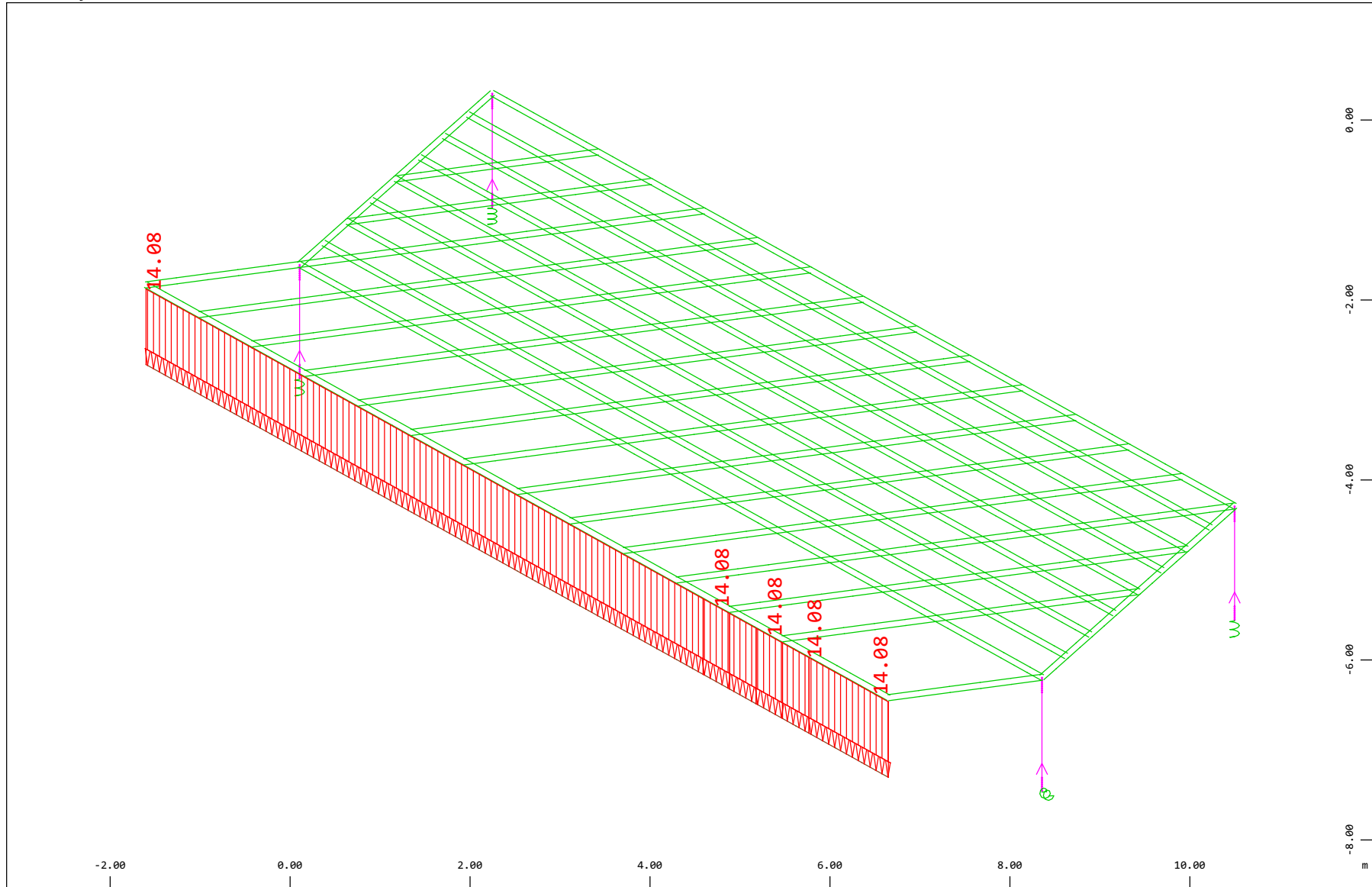


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 2 G2: Massicciata , 1 cm 3D = 9.80 kNm (Min=-8.01) (Max=9.37)

M 1 : 120

Definition of Axis
 Results elementay loads

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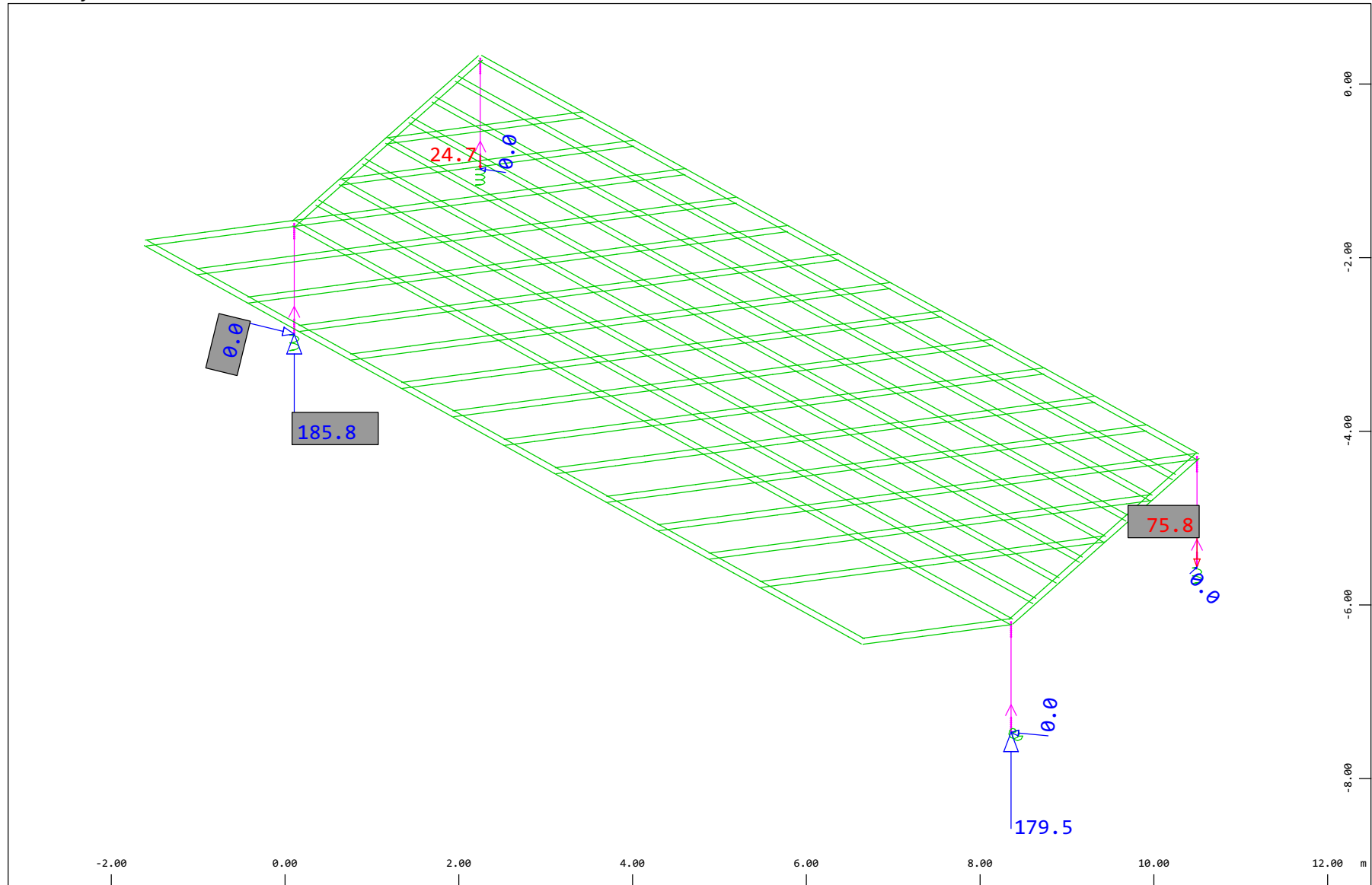
Z
 X Y Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 3 G2: Barriere , (1 cm 3D = unit) Beam line load (force) in global Z (Unit=9.69 kN/m)

⏏ (Min=-14.1) (Max=-14.1)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y
 Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 3 G2: Barriere , 1 cm 3D = 96.9 kN

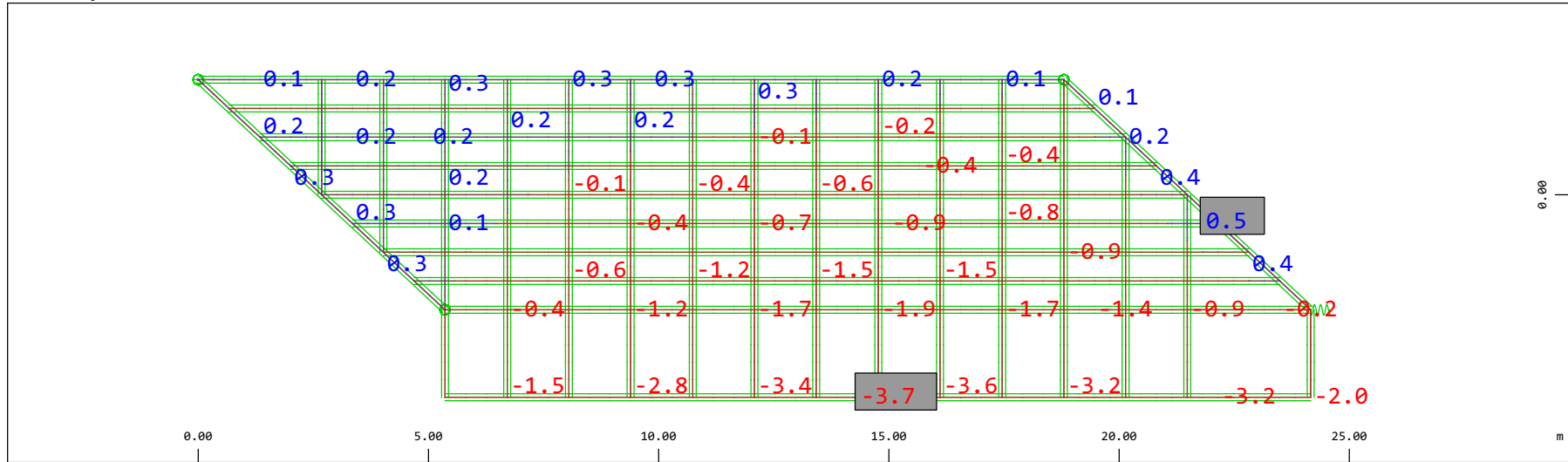
Nodes , Support force vector in the global XY plane, Loadcase 3 G2: Barriere , 1 cm 3D = 9.6875e-04 kN

▬ (Min=-75.8) (Max=185.8) (total: 264.7)

▬ (Max=0.0013)

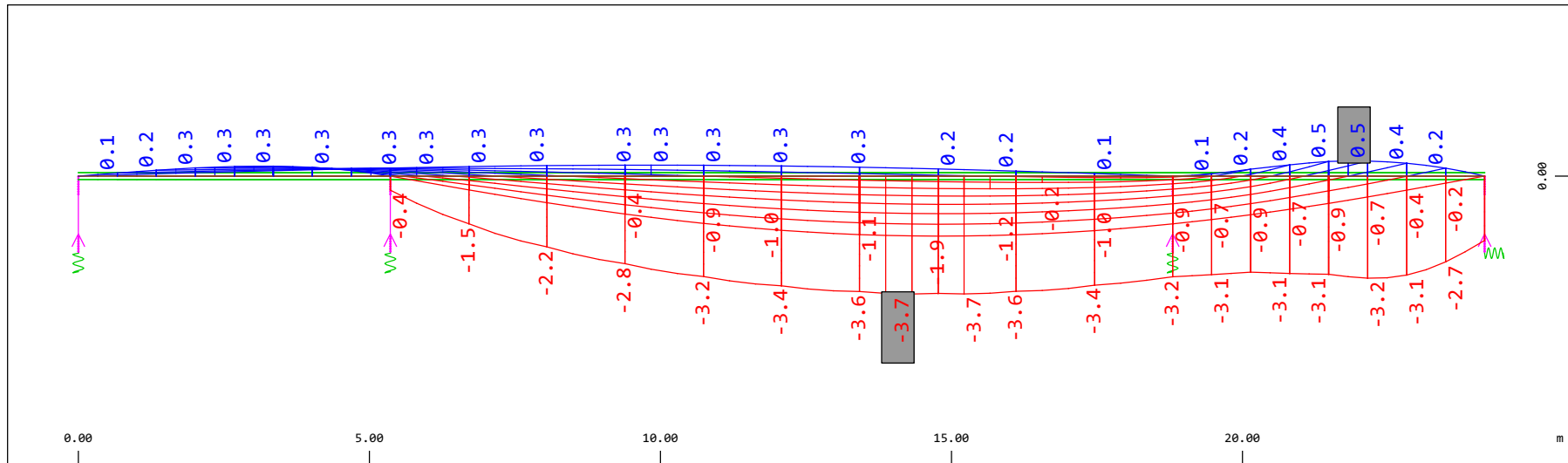
M 1 : 62
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 3 G2: Barriere , 1 cm 3D = 1.94 mm (Min=-3.70) (Max=0.475)

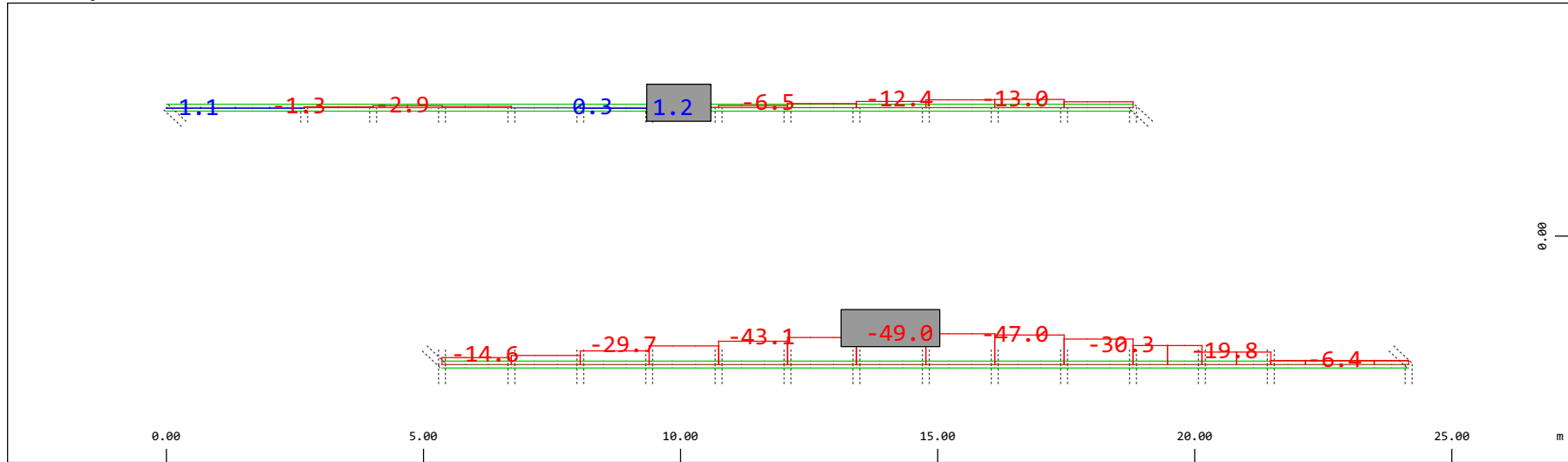
M 1 : 134



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 3 G2: Barriere , 1 cm 3D = 1.94 mm (Min=-3.70) (Max=0.475)

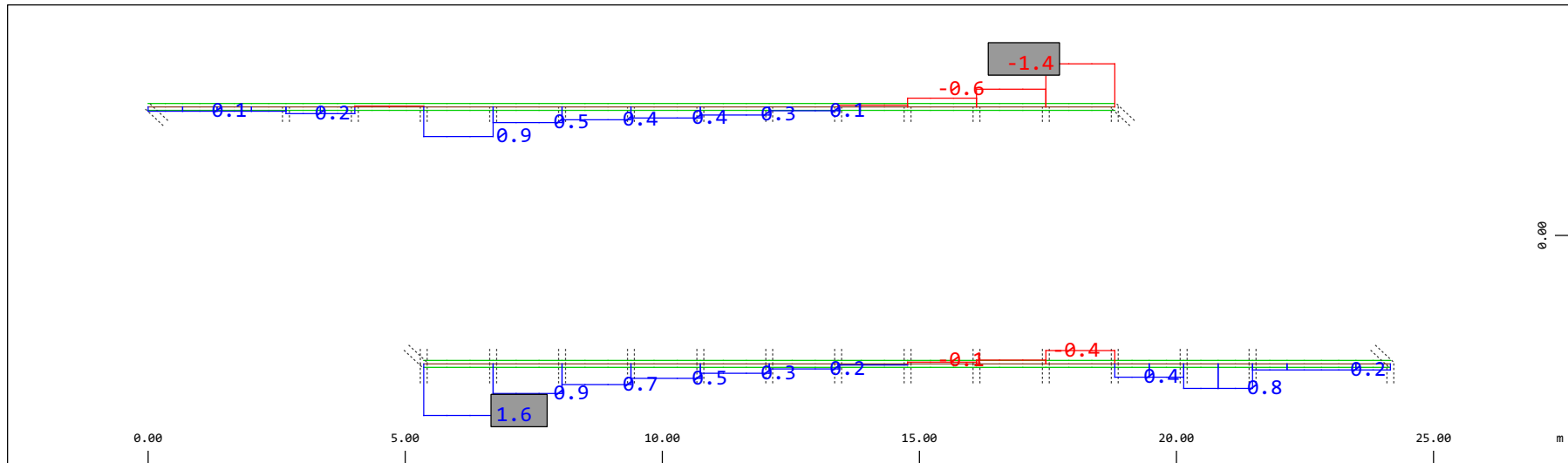
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 3 G2: Barriere , 1 cm 3D = 98.0 kN (Min=-49.0) (Max=1.23)

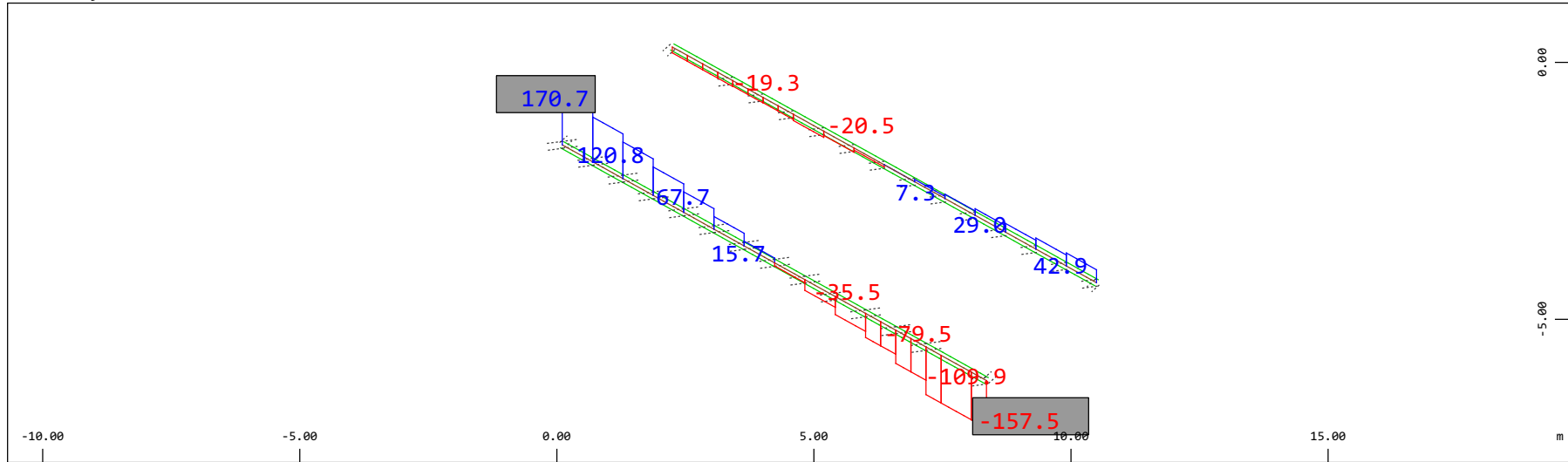
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 3 G2: Barriere , 1 cm 3D = 1.96 kNm (Min=-1.37) (Max=1.64)

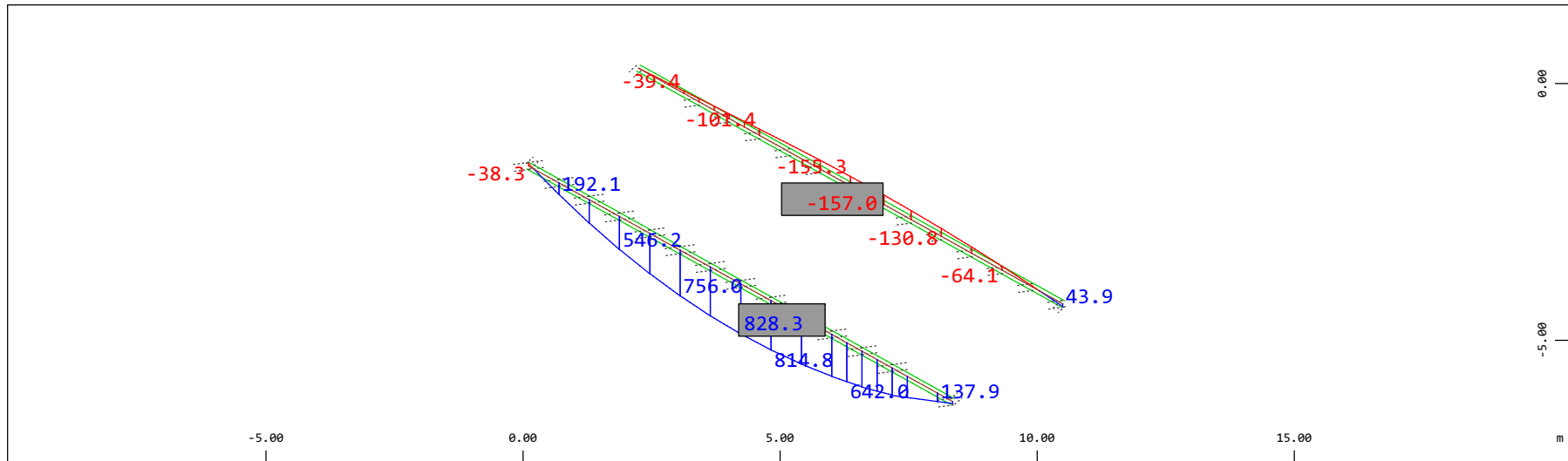
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 3 G2: Barriere , 1 cm 3D = 196.1 kN (Min=-157.5) (Max=170.7)

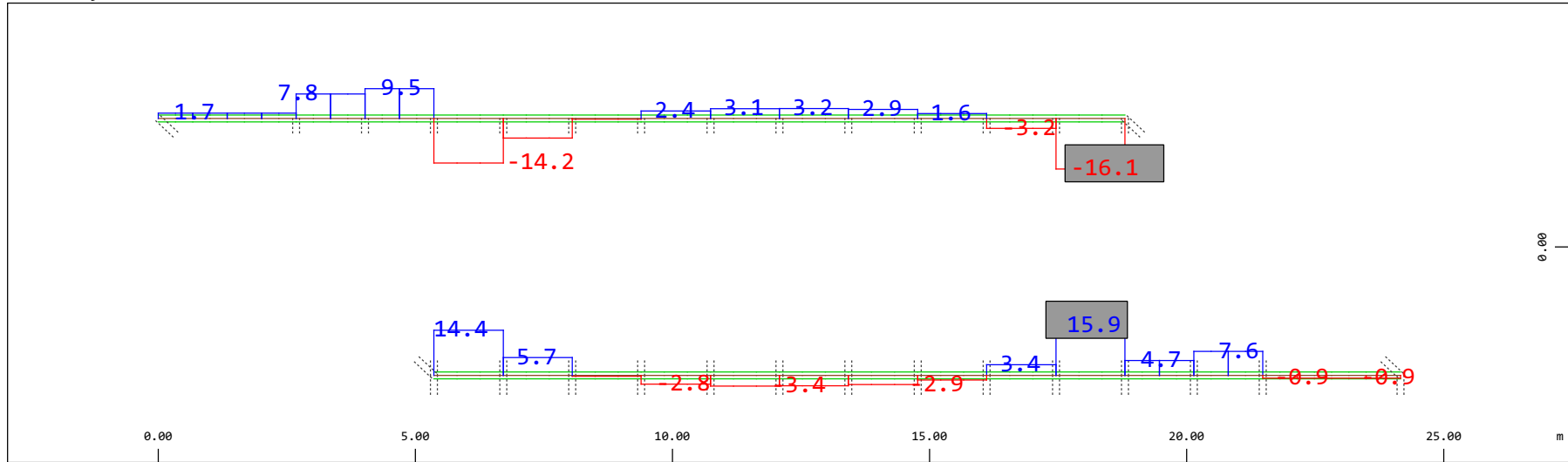
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 3 G2: Barriere , 1 cm 3D = 980.5 kNm (Min=-157.0) (Max=828.3)

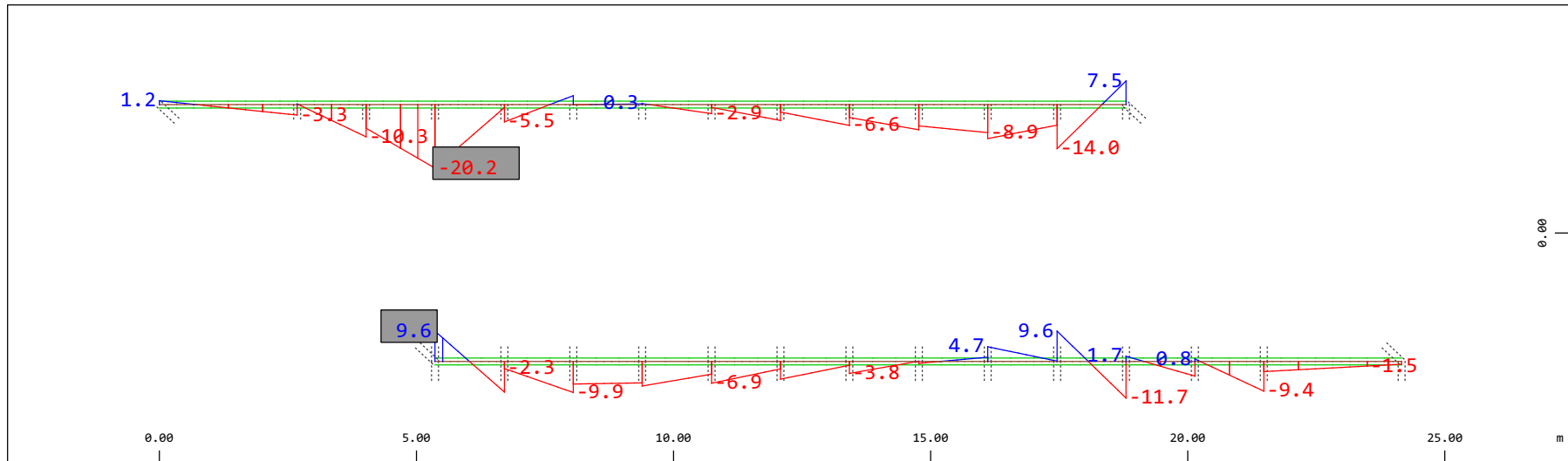
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 3 G2: Barriere , 1 cm 3D = 19.6 kN (Min=-16.1) (Max=15.9)

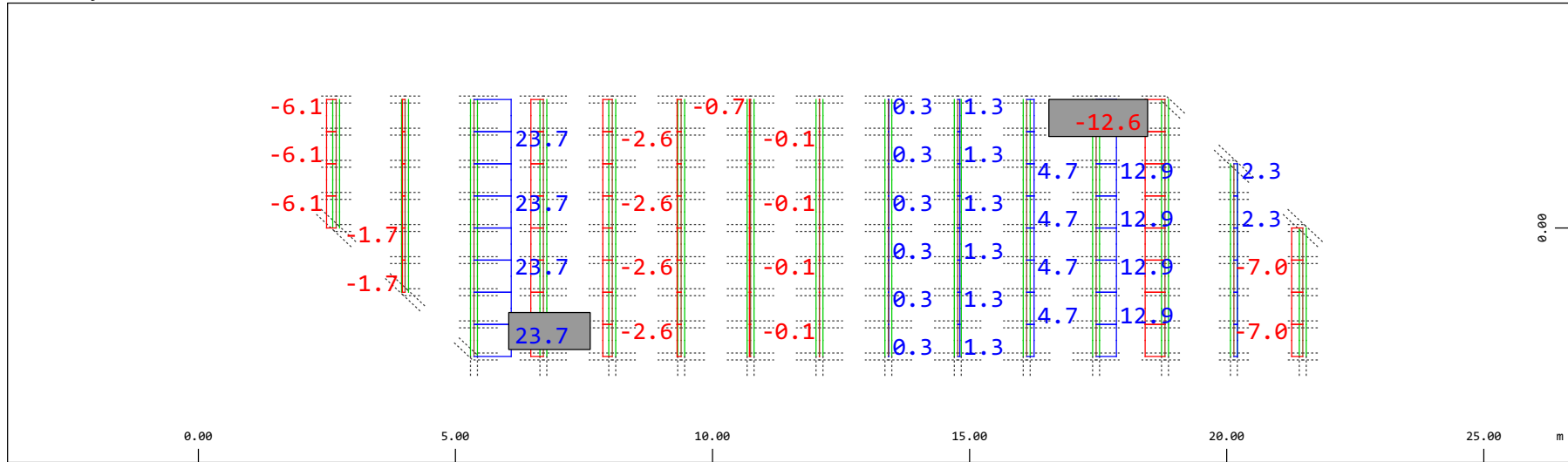
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 3 G2: Barriere , 1 cm 3D = 19.6 kNm (Min=-20.2) (Max=9.64)

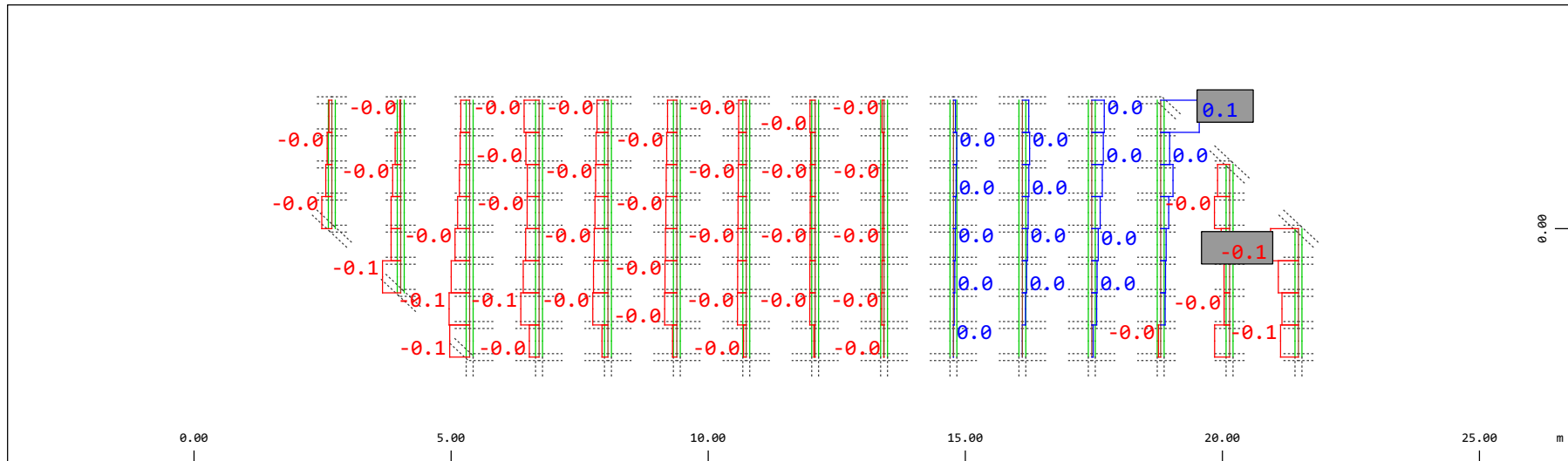
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 3 G2: Barriere , 1 cm 3D = 39.2 kN (Min=-12.6) (Max=23.7)

M 1 : 120

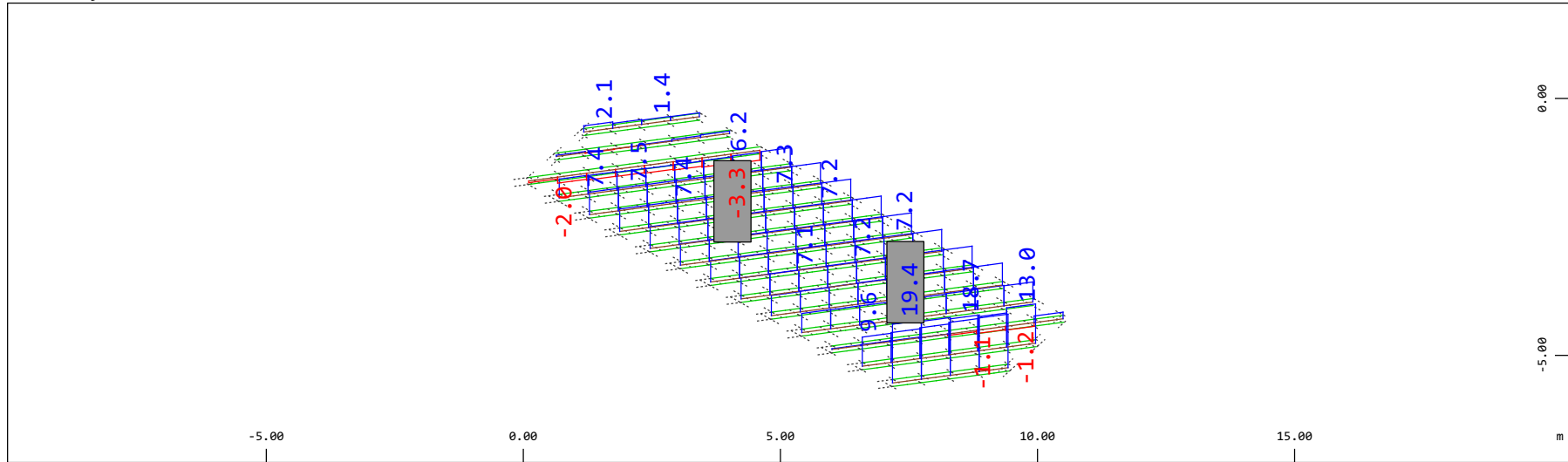


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 3 G2: Barriere , 1 cm 3D = 0.196 kNm (Min=-0.0886) (Max=0.123)

M 1 : 120

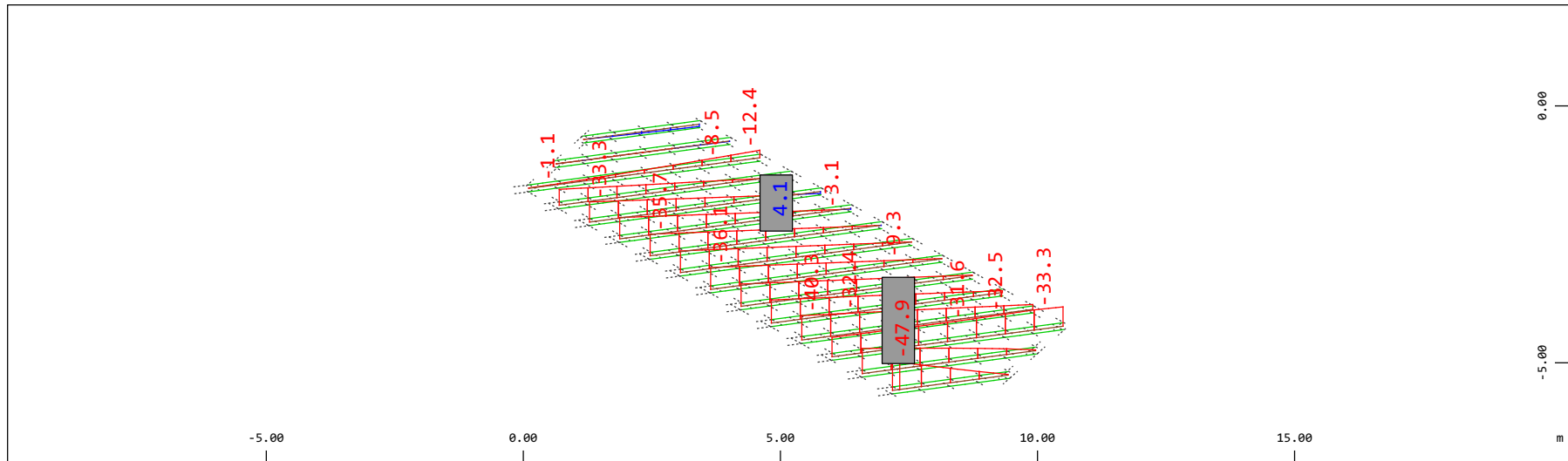
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 3 G2: Barriere , 1 cm 3D = 19.6 kN (Min=-3.28) (Max=19.4)

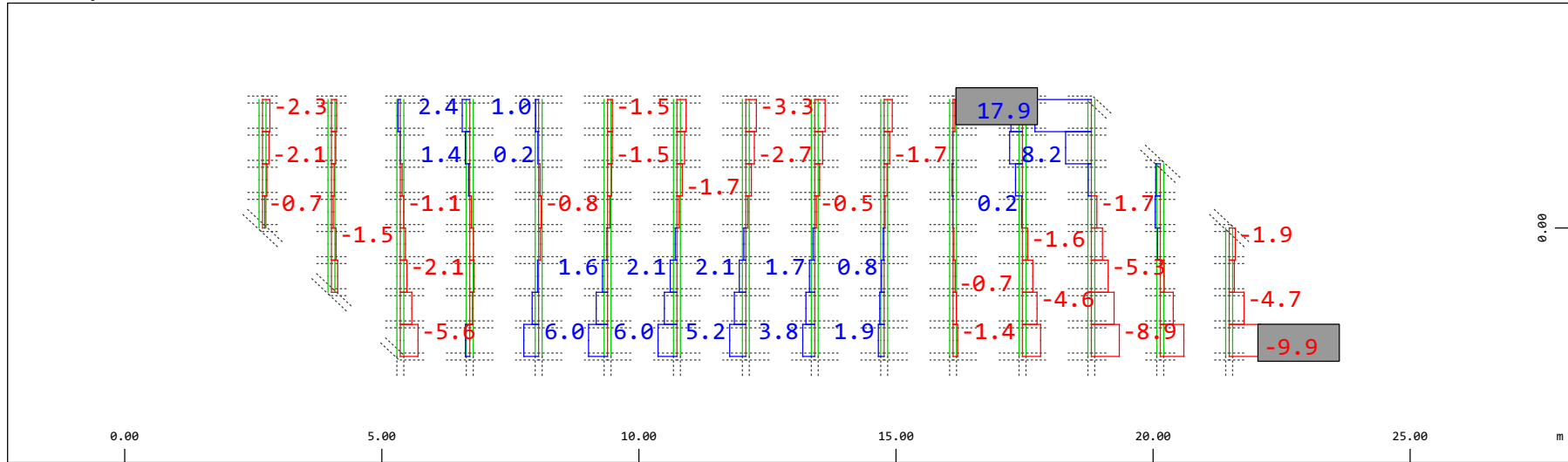
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 3 G2: Barriere , 1 cm 3D = 98.0 kNm (Min=-47.9) (Max=4.07)

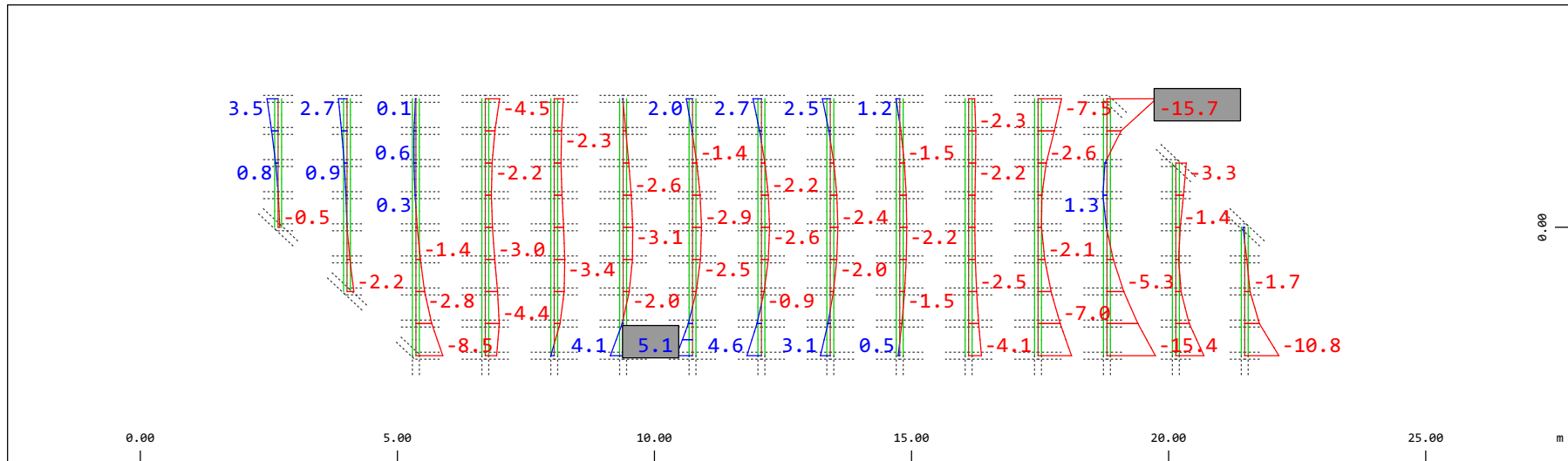
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 3 G2: Barriere , 1 cm 3D = 19.6 kN (Min=-9.92) (Max=17.9)

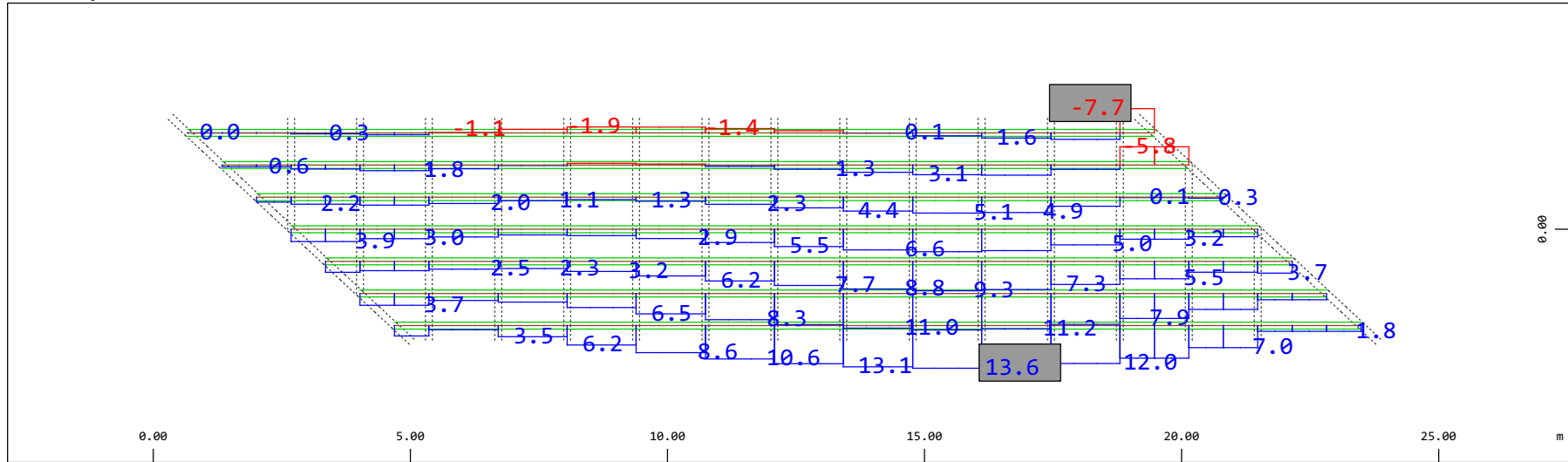
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 3 G2: Barriere , 1 cm 3D = 19.6 kNm (Min=-15.7) (Max=5.09)

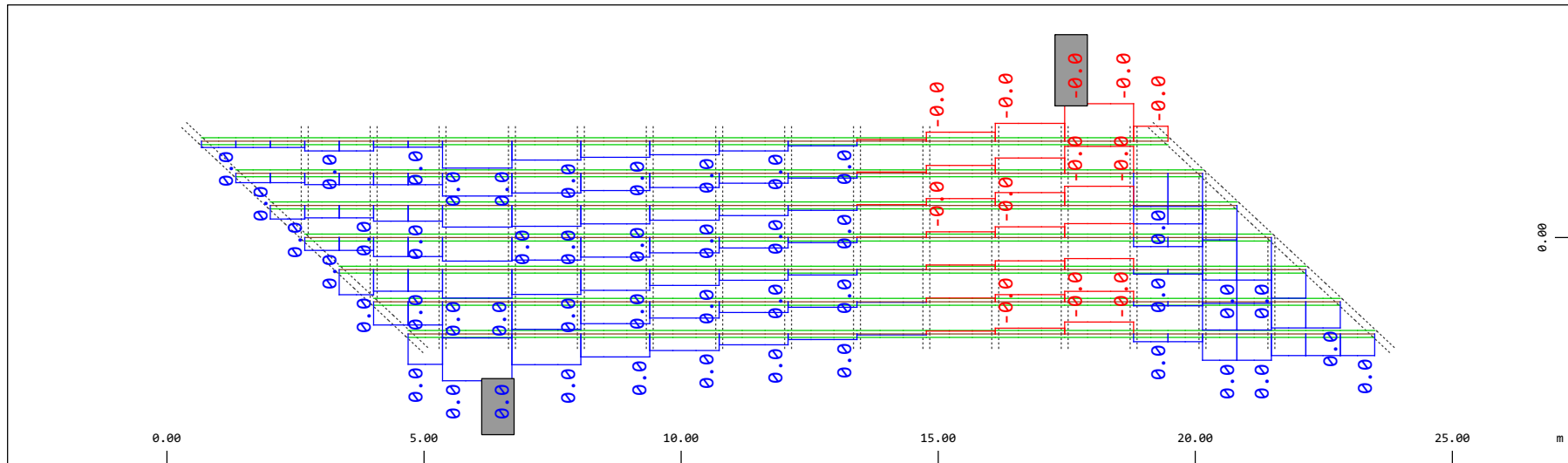
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 Z-X Beam Elements , Normal force Nx, Loadcase 3 G2: Barriere , 1 cm 3D = 19.6 kN (Min=-7.71) (Max=13.6)

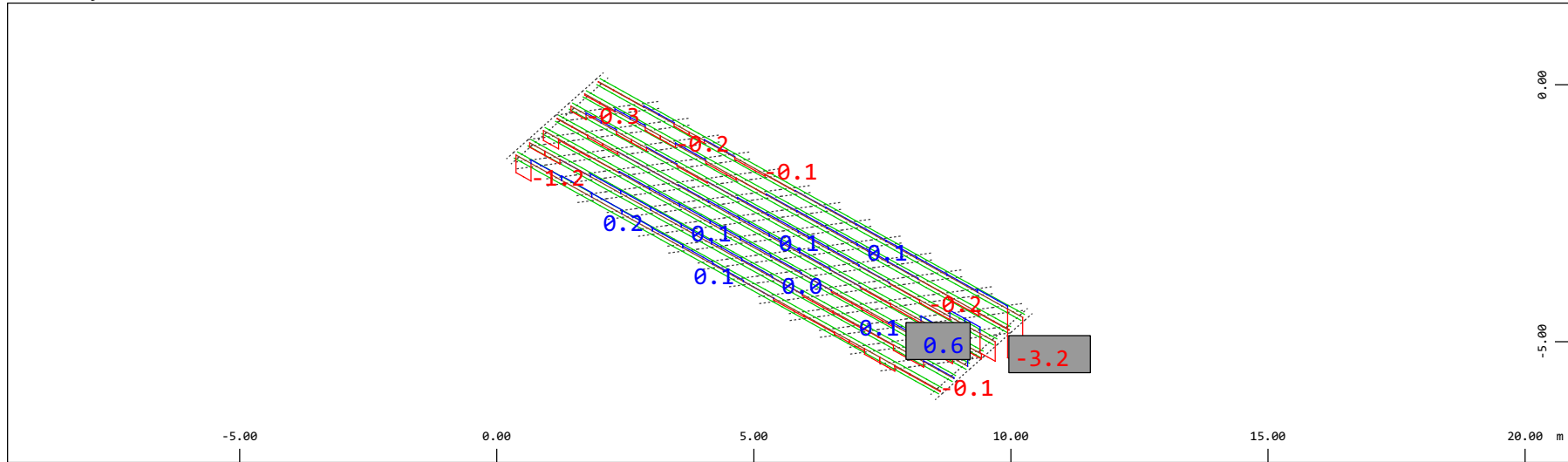
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 Z-X Beam Elements , Torsional moment Mt, Loadcase 3 G2: Barriere , 1 cm 3D = 0.0020 kNm (Min=-0.0012) (Max=0.0015)

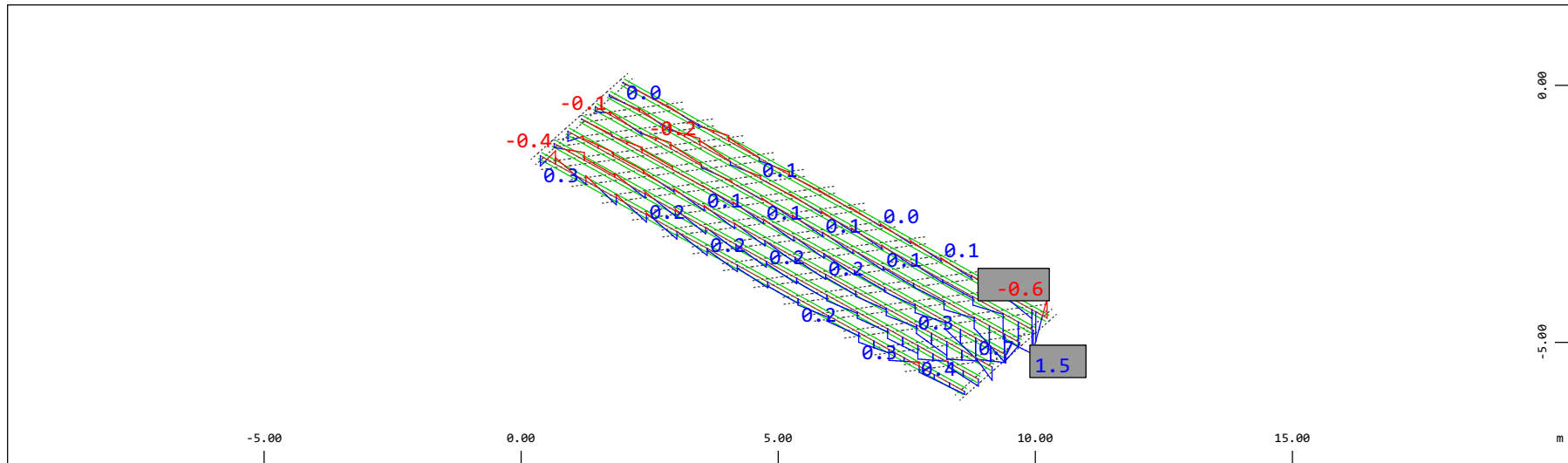
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 3 G2: Barriere , 1 cm 3D = 3.92 kN (Min=-3.22) (Max=0.609)

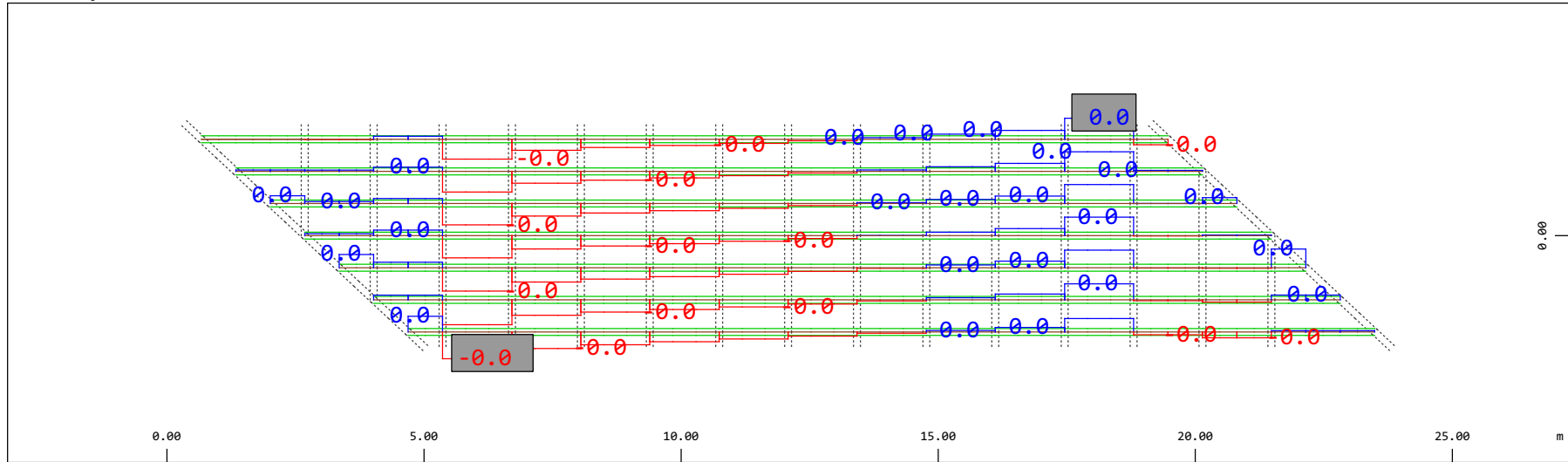
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 3 G2: Barriere , 1 cm 3D = 1.96 kNm (Min=-0.643) (Max=1.52)

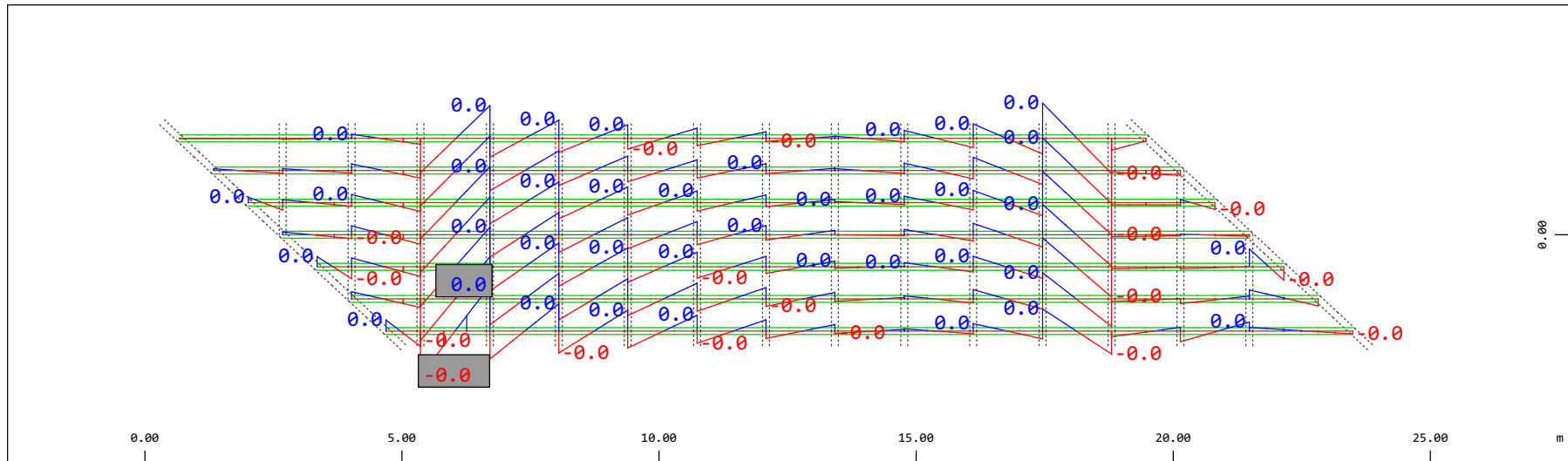
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Shear force Vy, Loadcase 3 G2: Barriere , 1 cm 3D = 0.0098 kN (Min=-0.0043) (Max=0.0033)

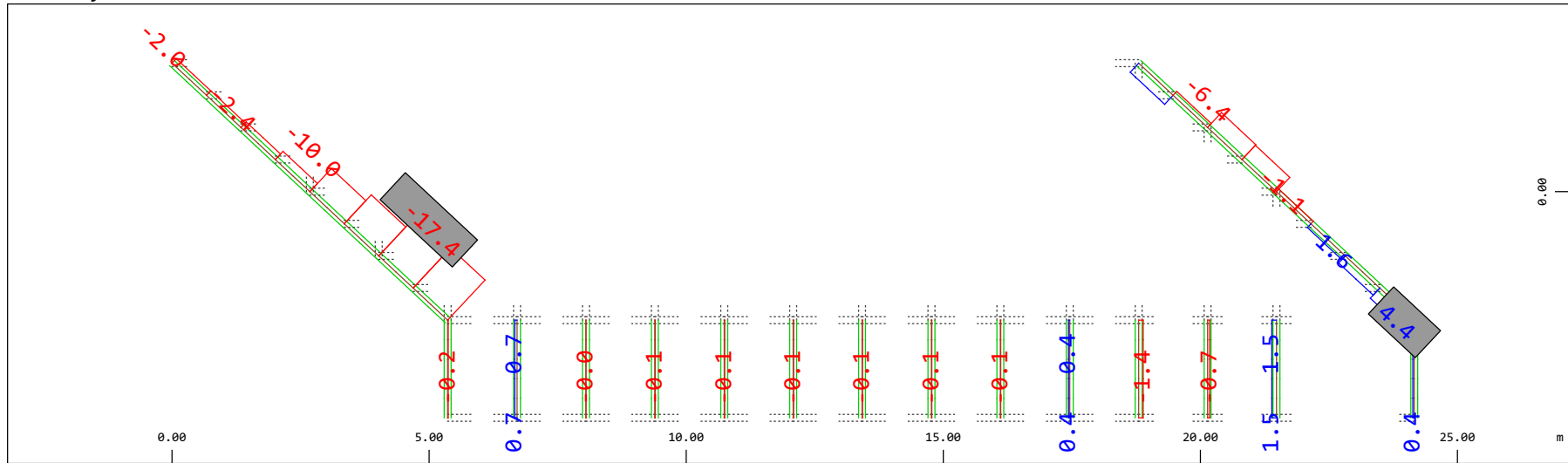
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Bending moment Mz, Loadcase 3 G2: Barriere , 1 cm 3D = 0.0039 kNm (Min=-0.0029) (Max=0.0029)

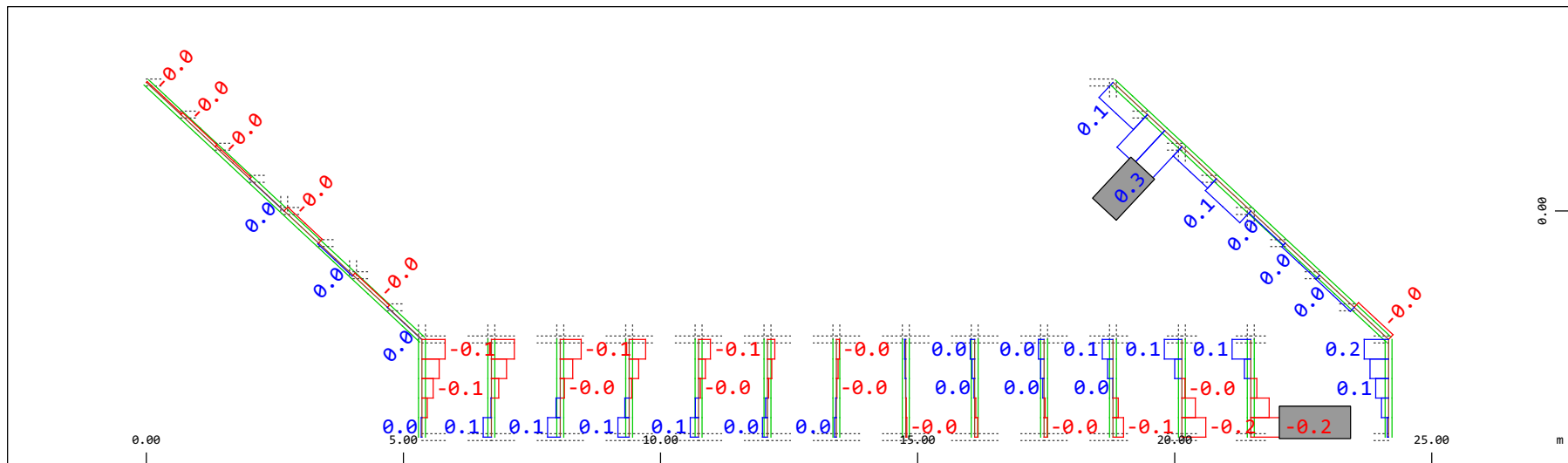
M 1 : 120

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 20 23
Beam Elements , Normal force Nx, Loadcase 3 G2: Barriere , 1 cm 3D = 19.6 kN (Min=-17.4) (Max=4.42)

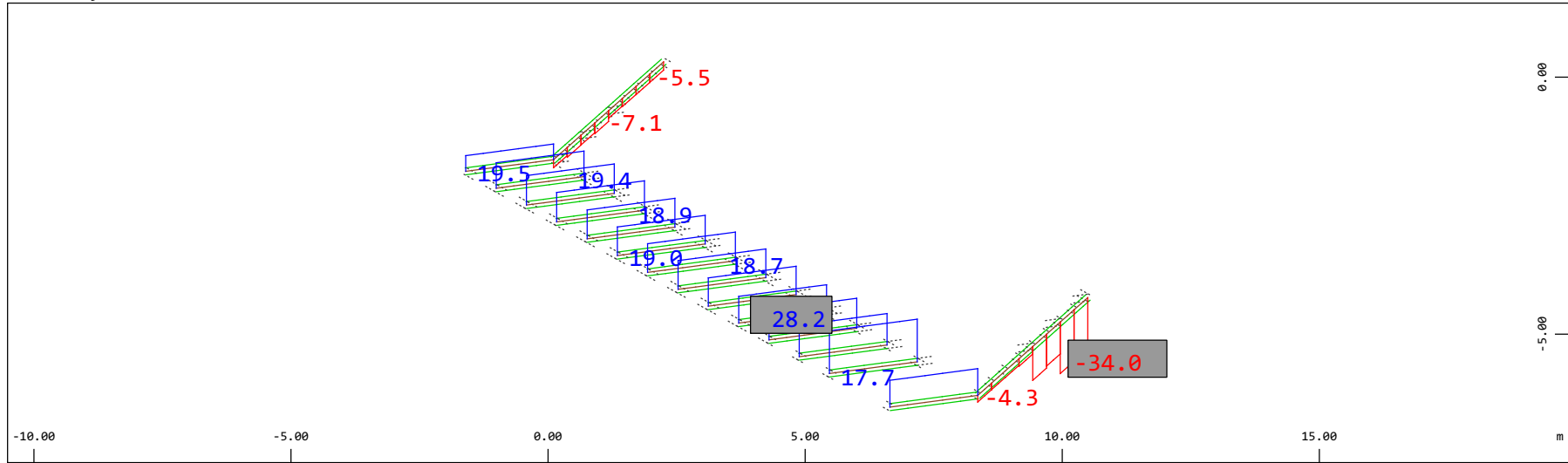
M 1 : 120



Sector of system Beam Elements Group 20 23
Beam Elements , Torsional moment Mt, Loadcase 3 G2: Barriere , 1 cm 3D = 0.392 kNm (Min=-0.195) (Max=0.283)

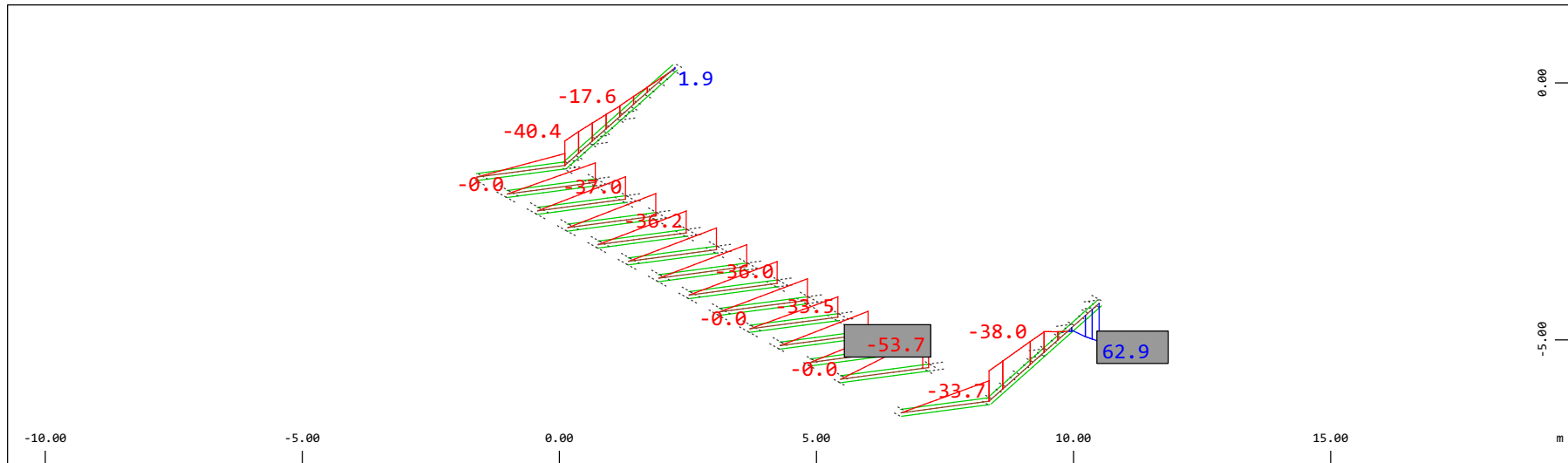
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 3 G2: Barriere , 1 cm 3D = 39.2 kN (Min=-34.0) (Max=28.2)

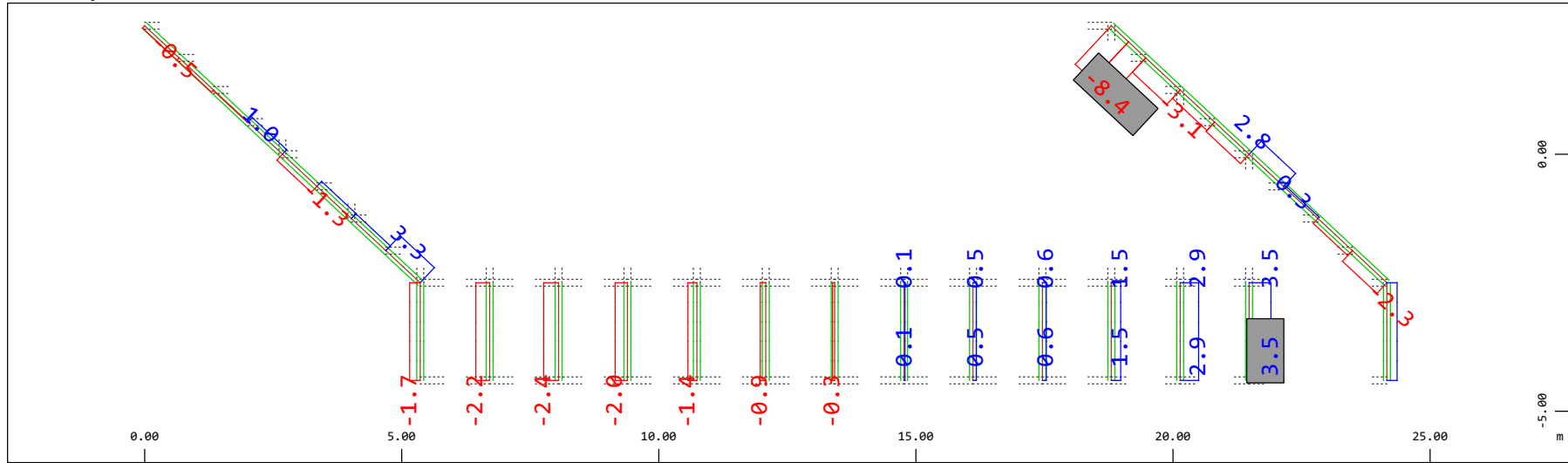
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 3 G2: Barriere , 1 cm 3D = 98.0 kNm (Min=-53.7) (Max=62.9)

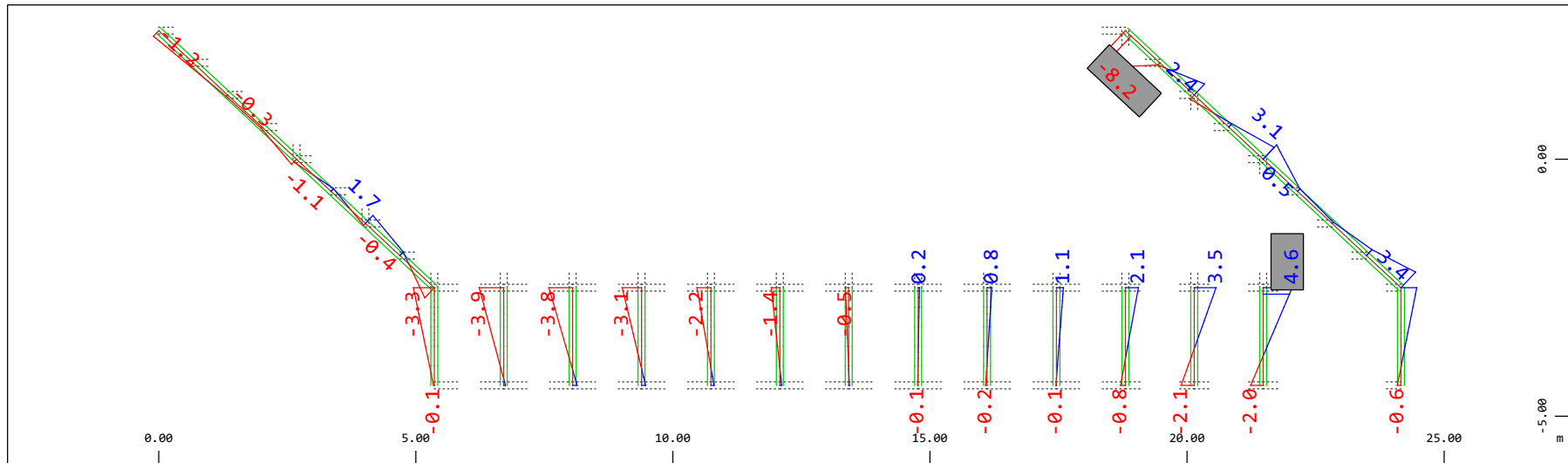
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 3 G2: Barriere , 1 cm 3D = 9.80 kN (Min=-8.39) (Max=3.48)

M 1 : 120

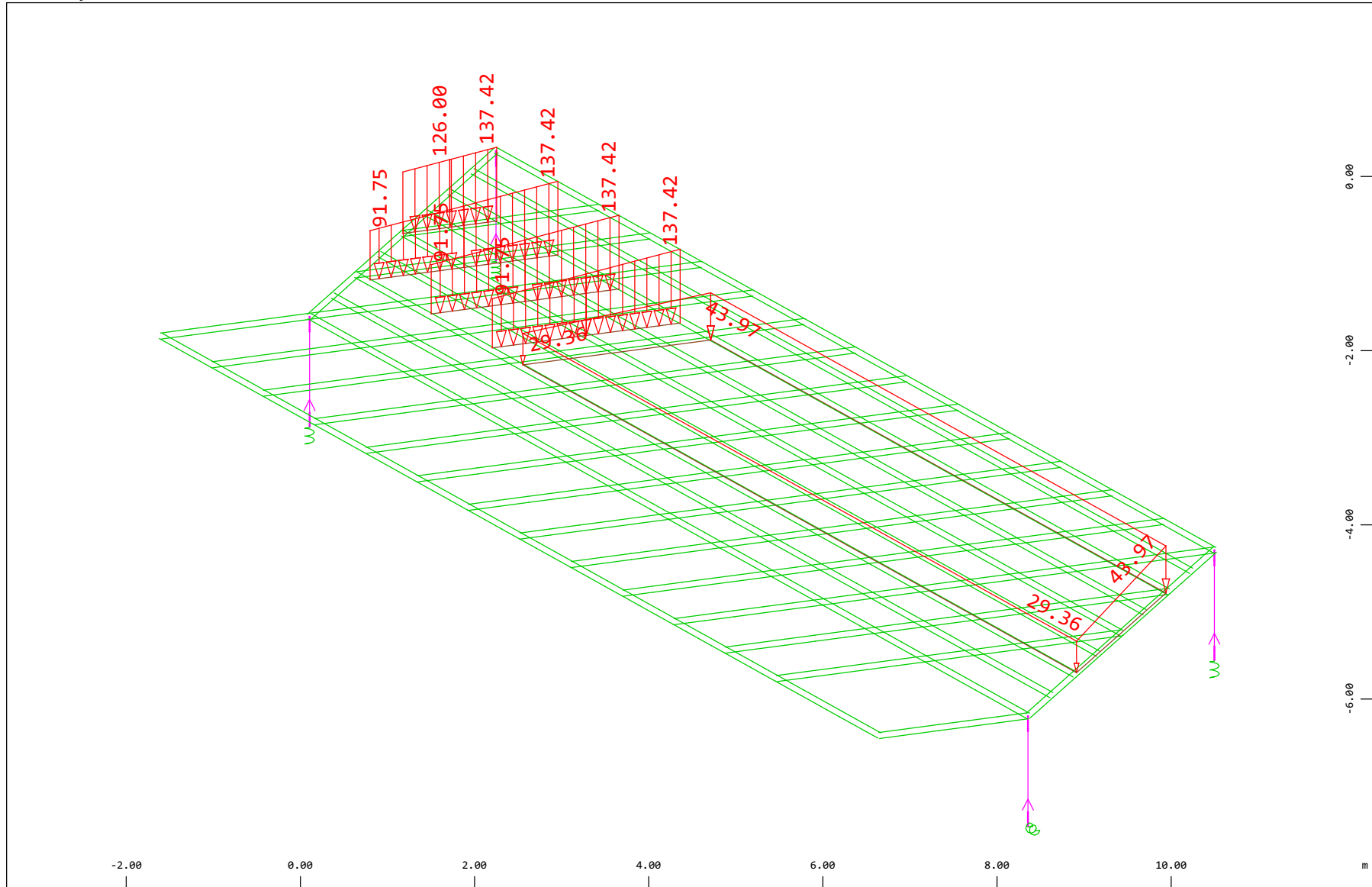


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 3 G2: Barriere , 1 cm 3D = 9.80 kNm (Min=-8.17) (Max=4.62)

M 1 : 120

Definition of Axis
 Results elementay loads

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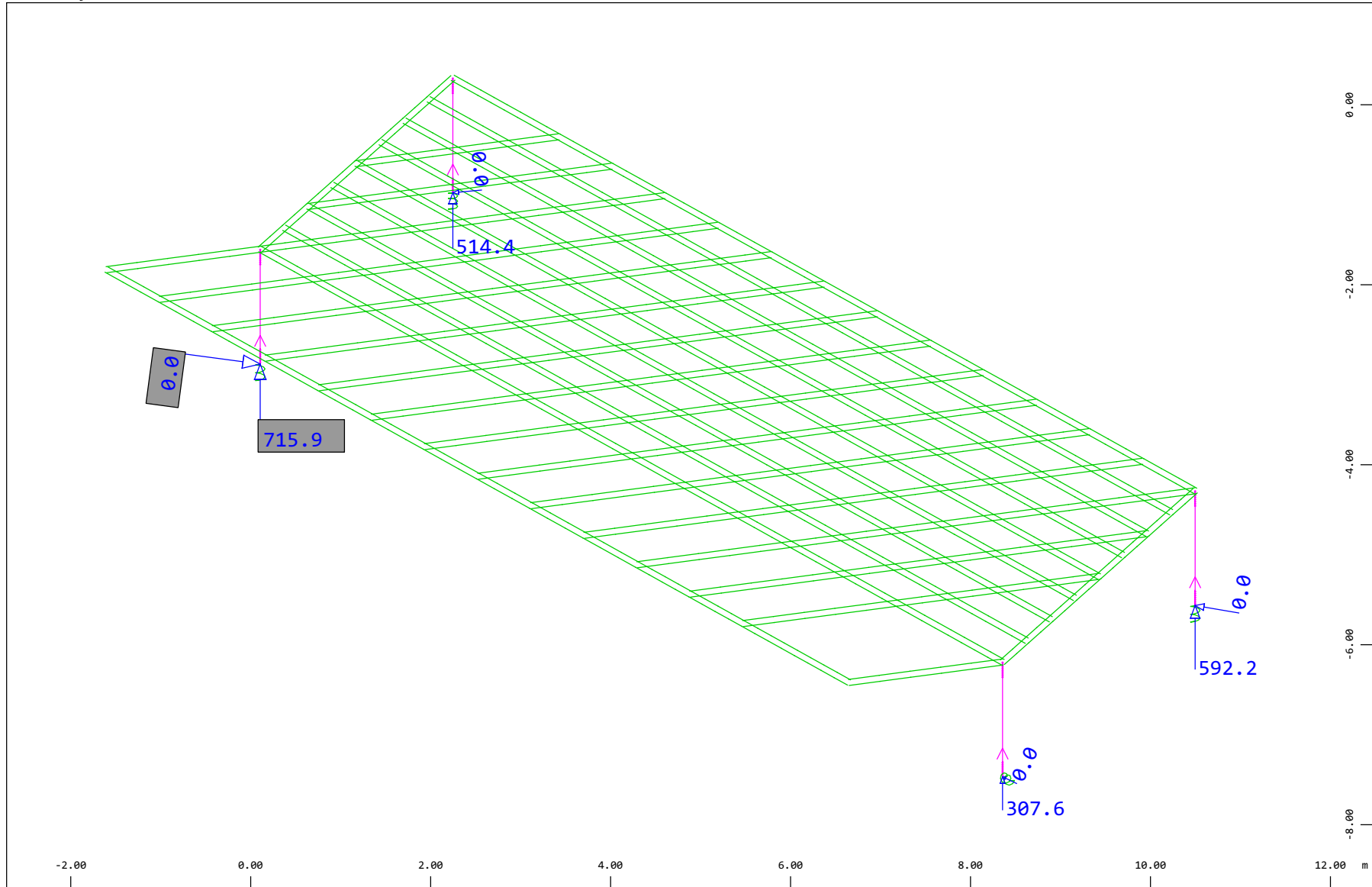


Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 100 Qt: LM71-S 3m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=96.9 kN/m, Min=-137.4
 Max=-91.7 ∇), Free area load (force) in global Z (Unit=48.4 kN/m², Min=-44.0 Max=-29.4 ∇)

M 1 : 62
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 484.4 kN

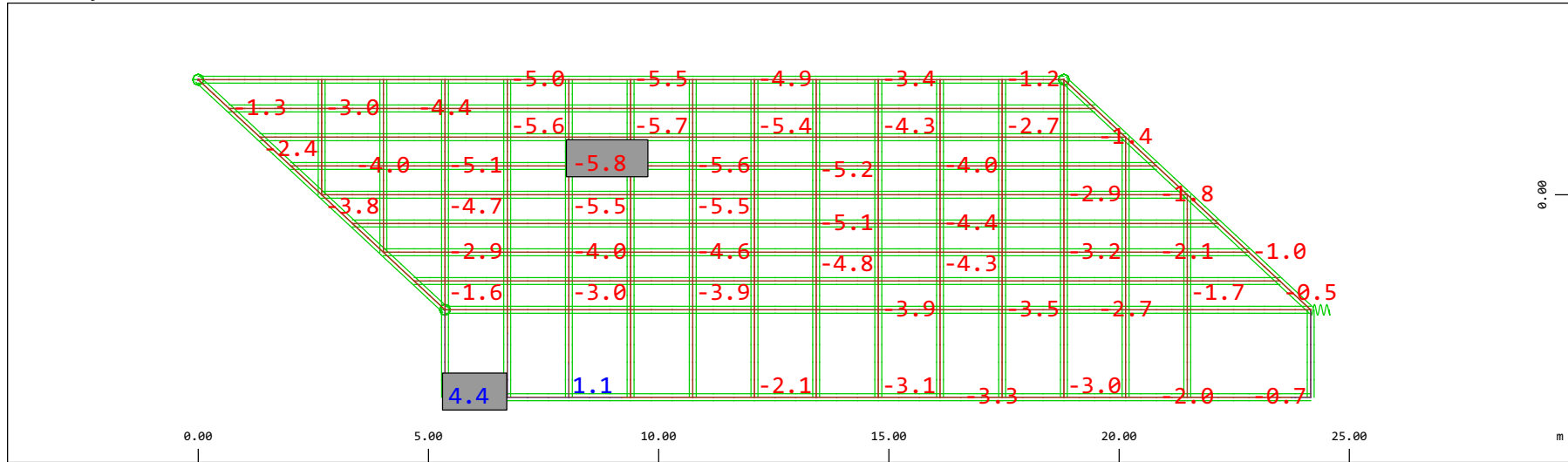
Nodes , Support force vector in the global XY plane, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.0019 kN

▴ (Max=715.9) (total: 2130.)

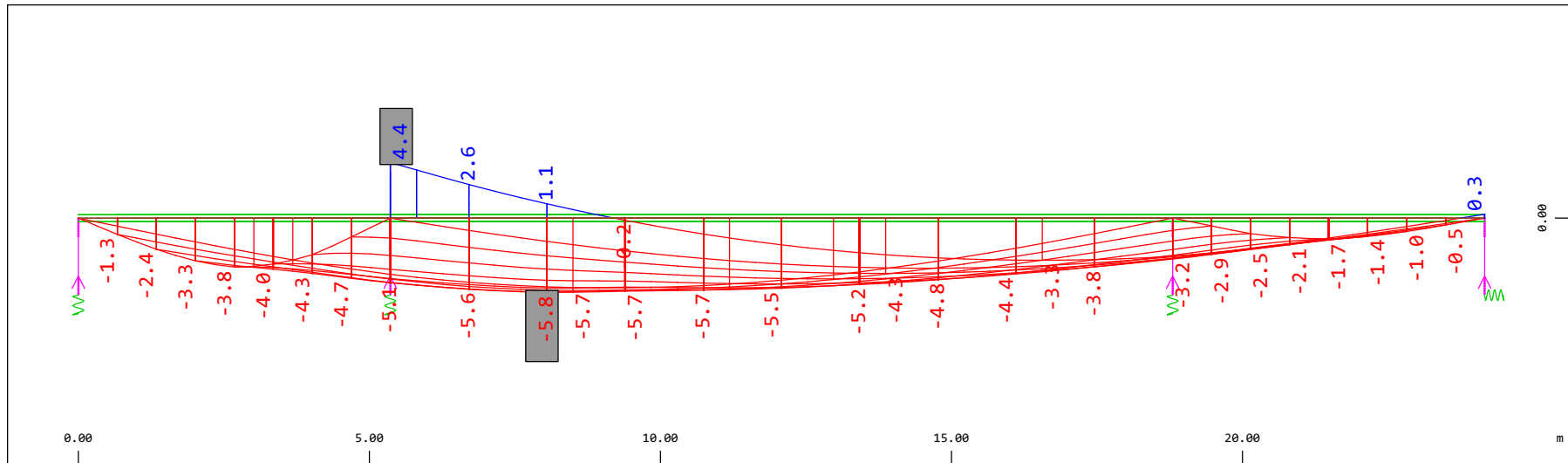
▴ (Max=0.0034)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

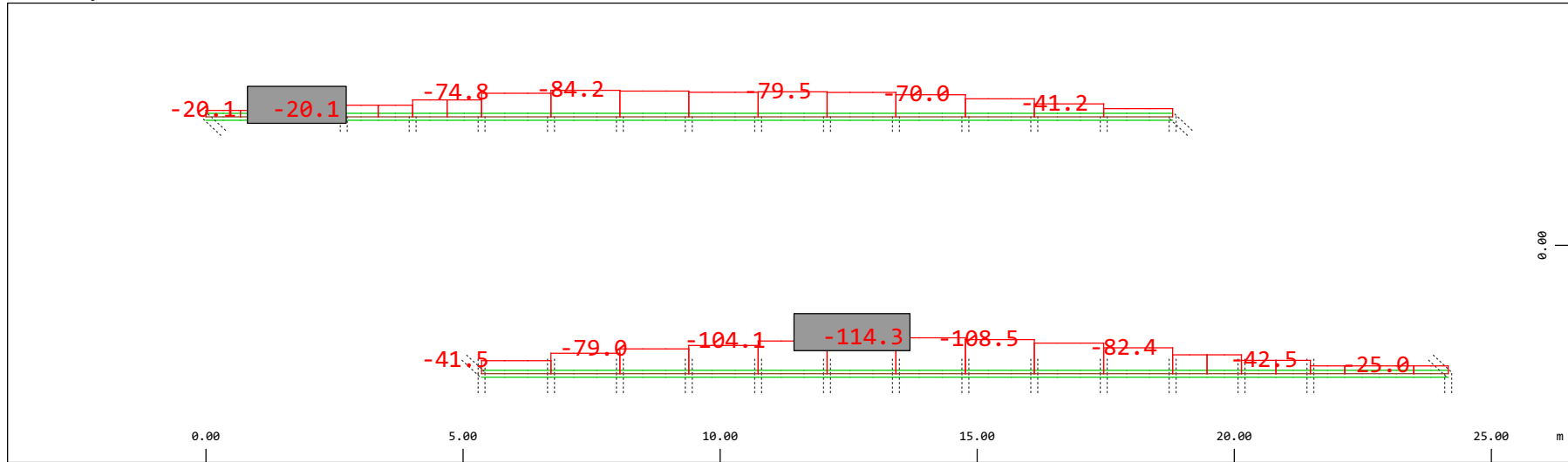


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 4.84 mm (Min=-5.84) (Max=4.37) M 1 : 134



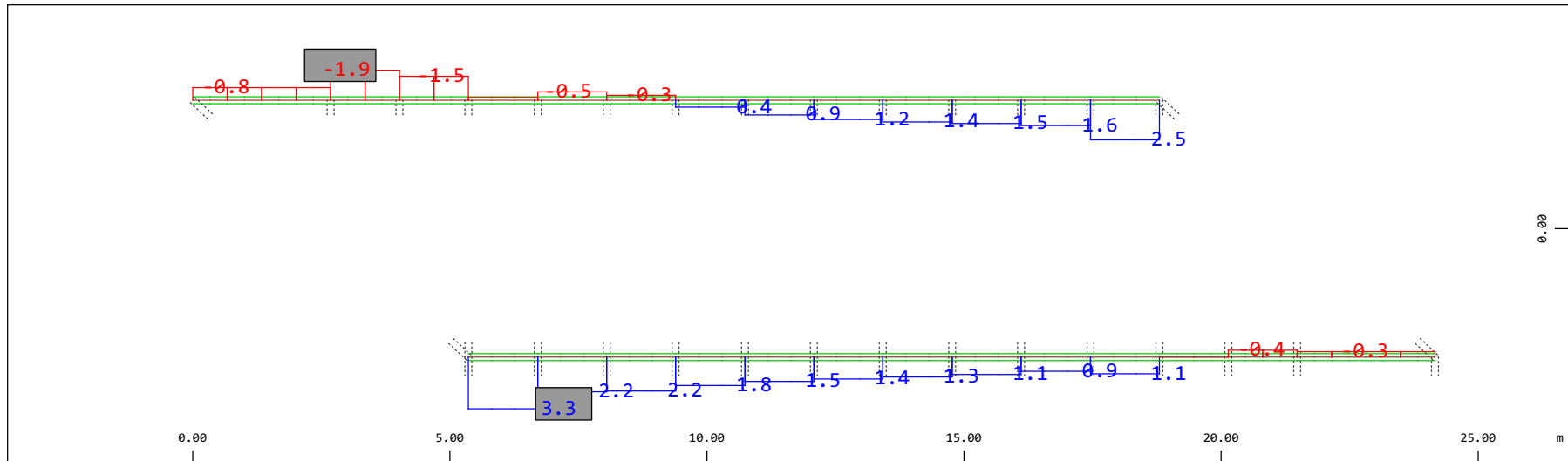
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 4.84 mm (Min=-5.84) (Max=4.37) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 196.1 kN (Min=-114.3) (Max=-20.1)

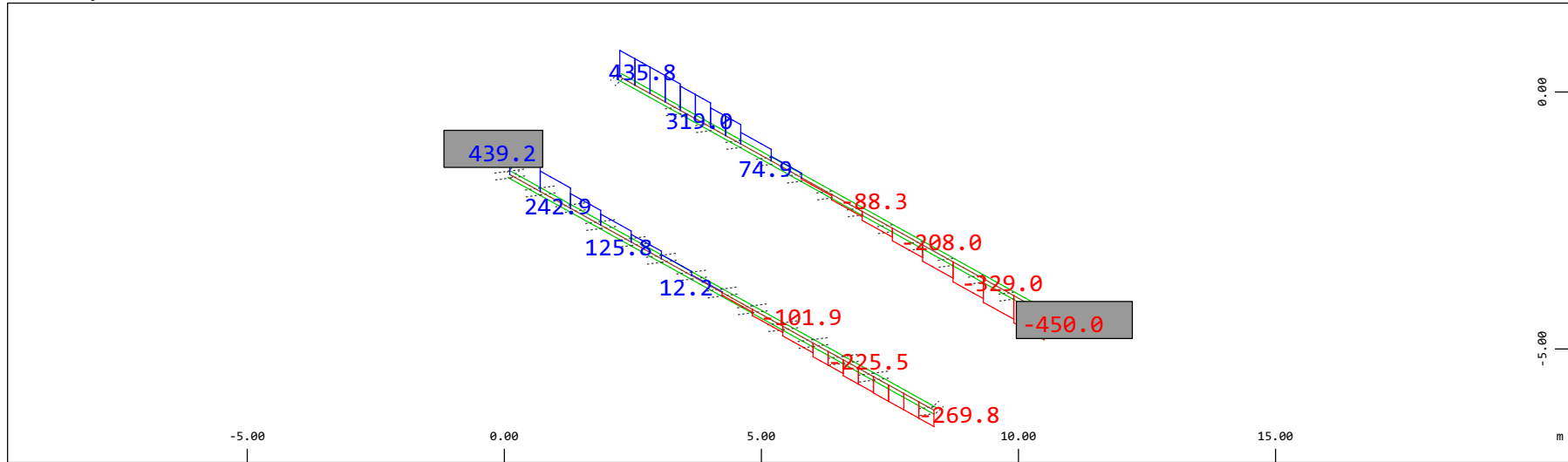
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 3.92 kNm (Min=-1.91) (Max=3.29)

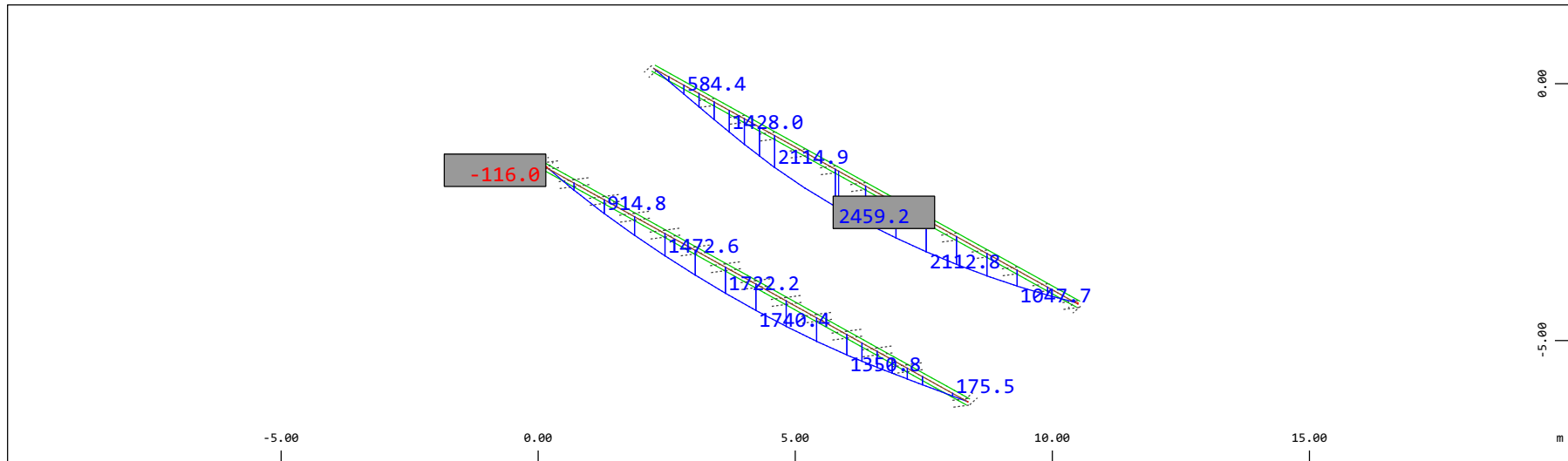
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 980.5 kN (Min=-450.0) (Max=439.2)

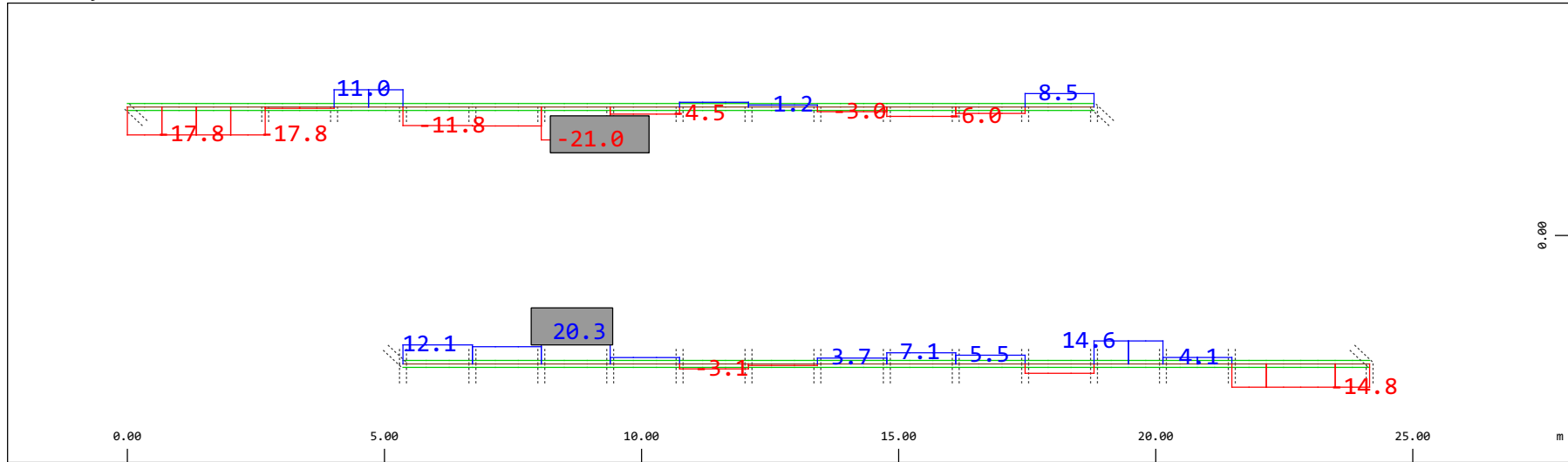
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 3922. kNm (Min=-116.0) (Max=2459.)

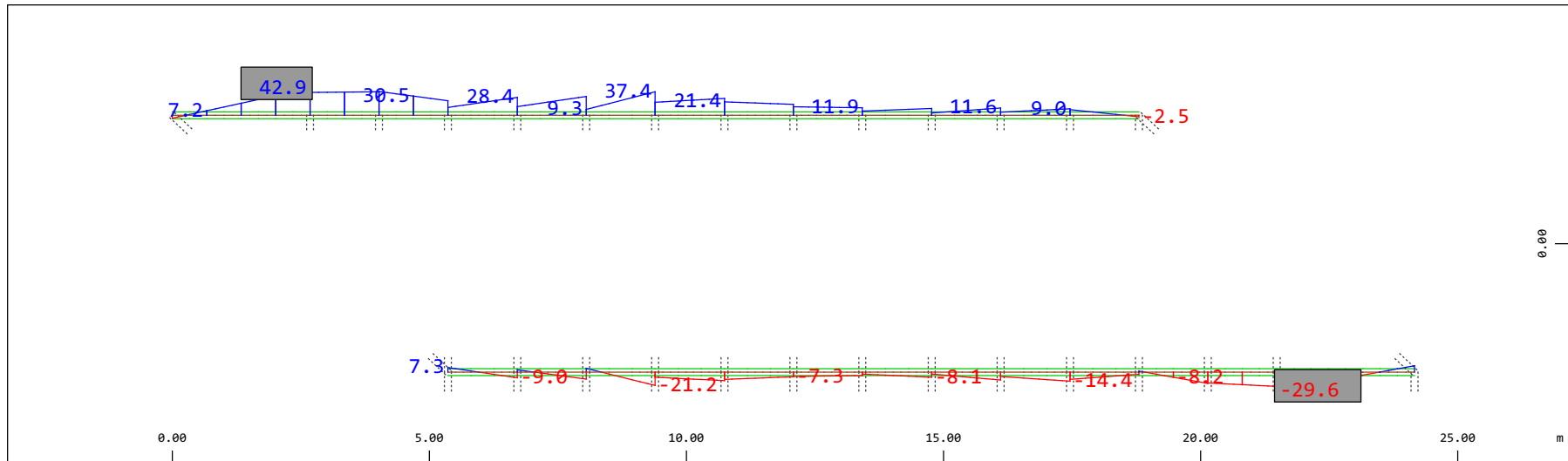
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kN (Min=-21.0) (Max=20.3)

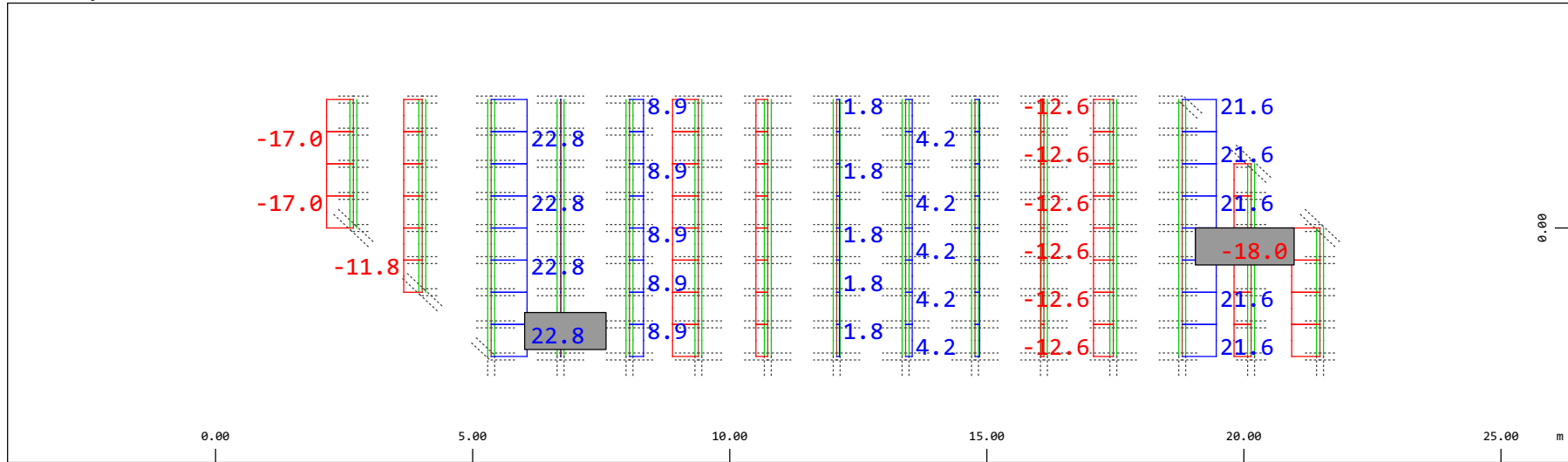
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 98.0 kNm (Min=-29.6) (Max=42.9)

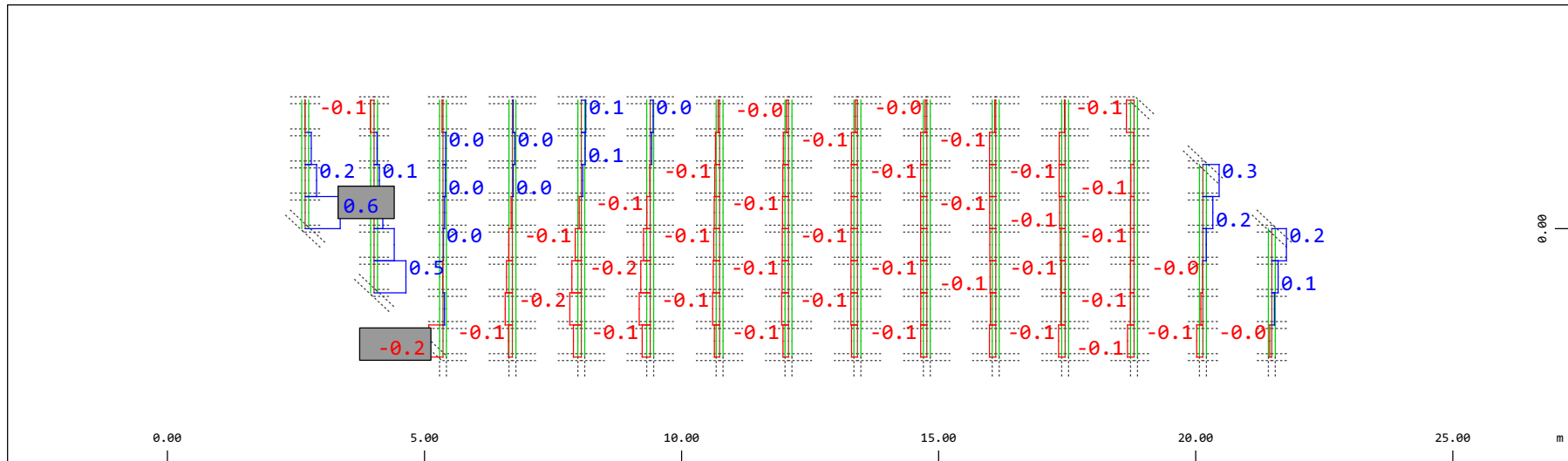
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kN (Min=-18.0) (Max=22.8)

M 1 : 120

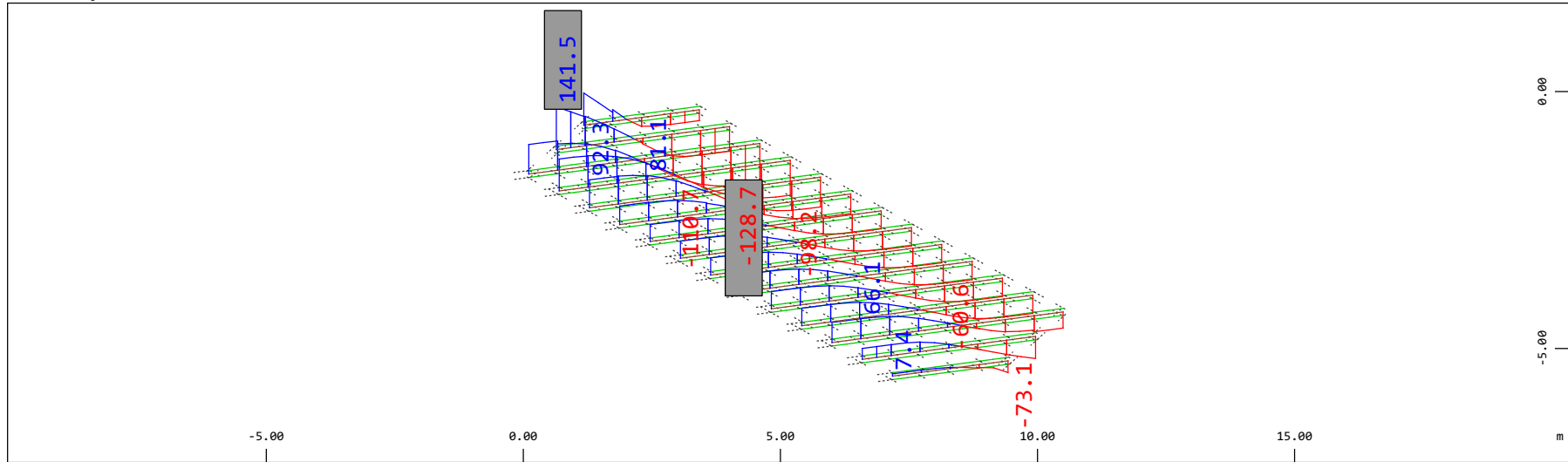


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.980 kNm (Min=-0.226) (Max=0.557)

M 1 : 120

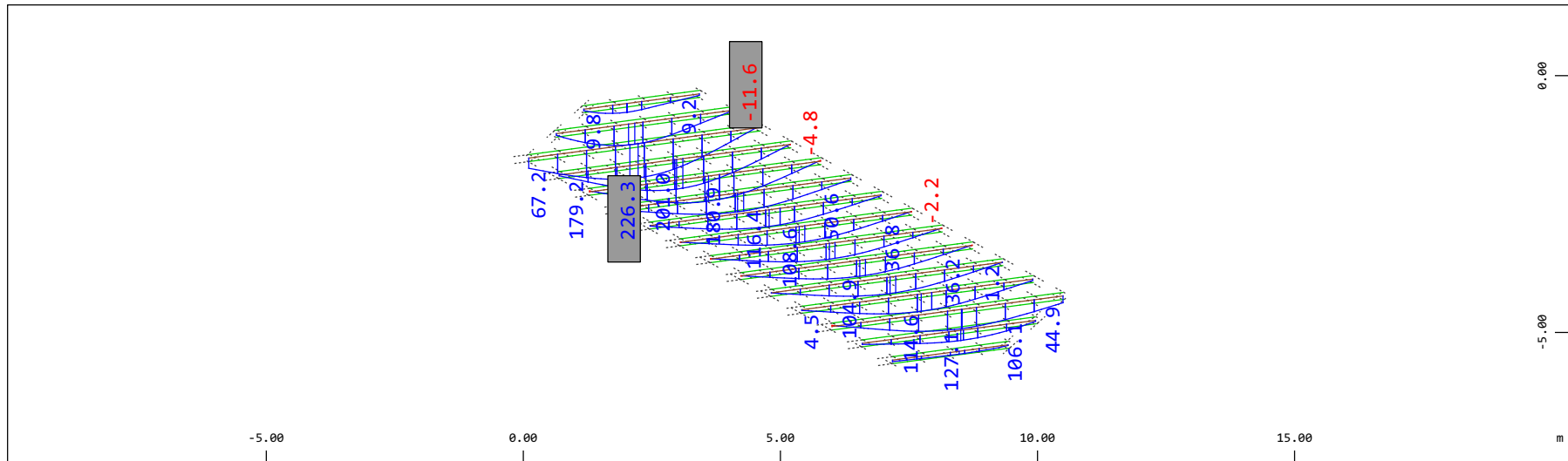
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 196.1 kN (Min=-128.7) (Max=141.5)

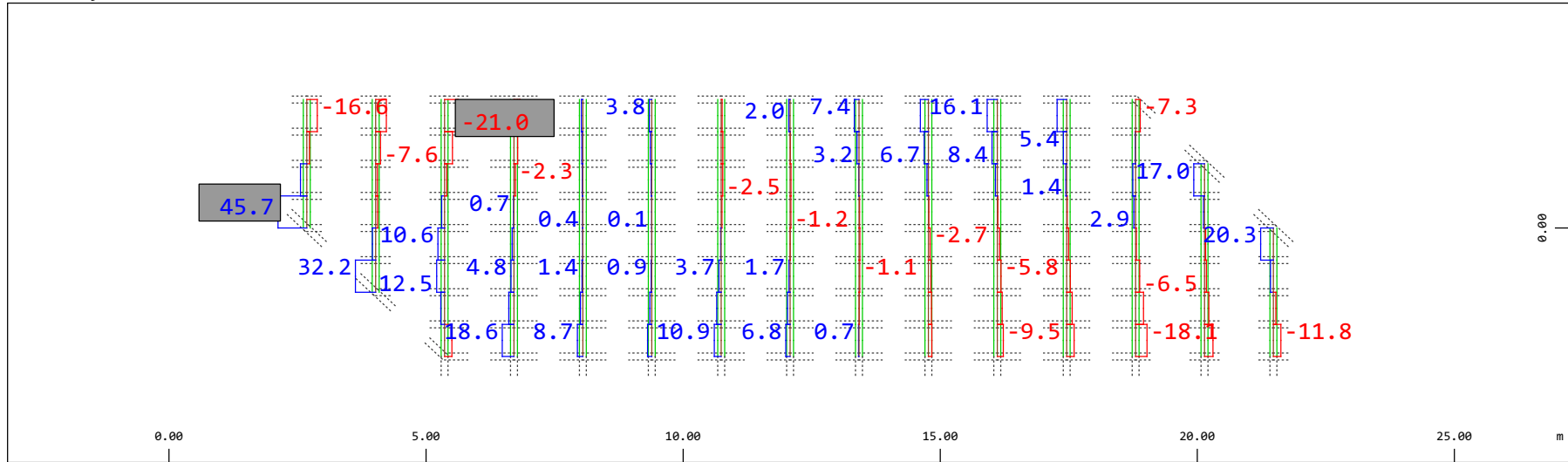
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 392.2 kNm (Min=-11.6) (Max=226.3)

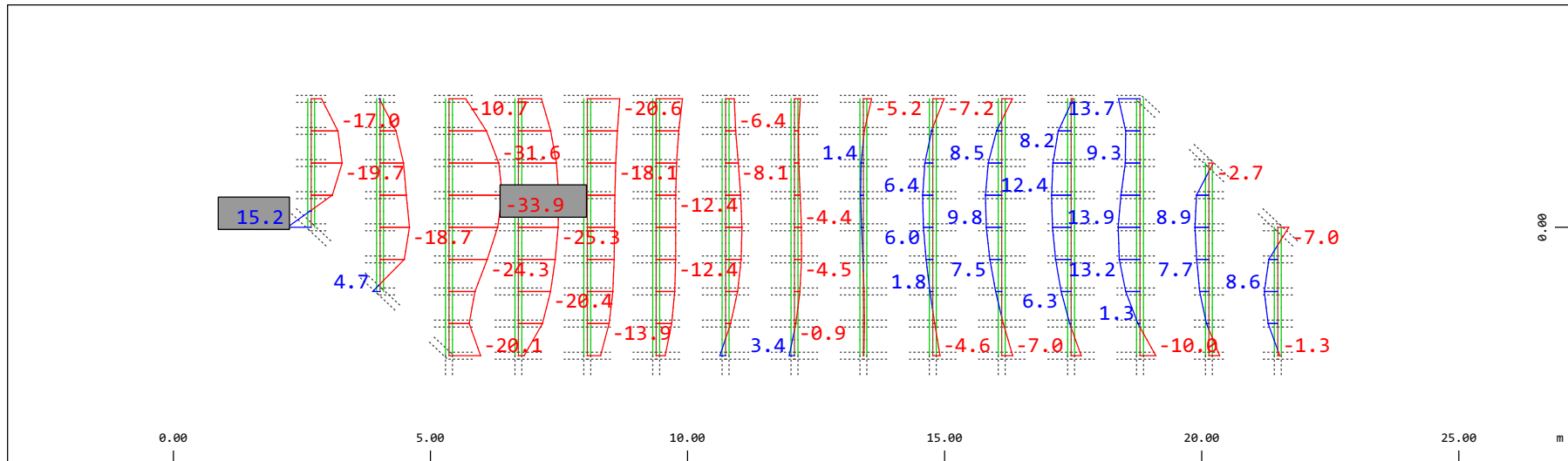
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 98.0 kN (Min=-21.0) (Max=45.7)

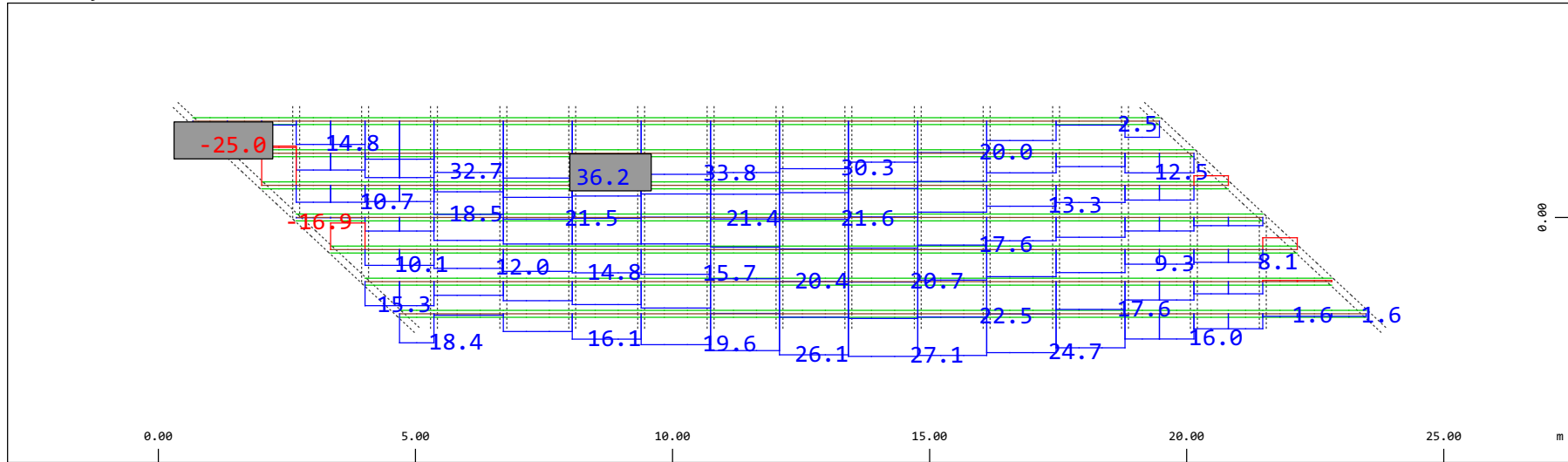
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kNm (Min=-33.9) (Max=15.2)

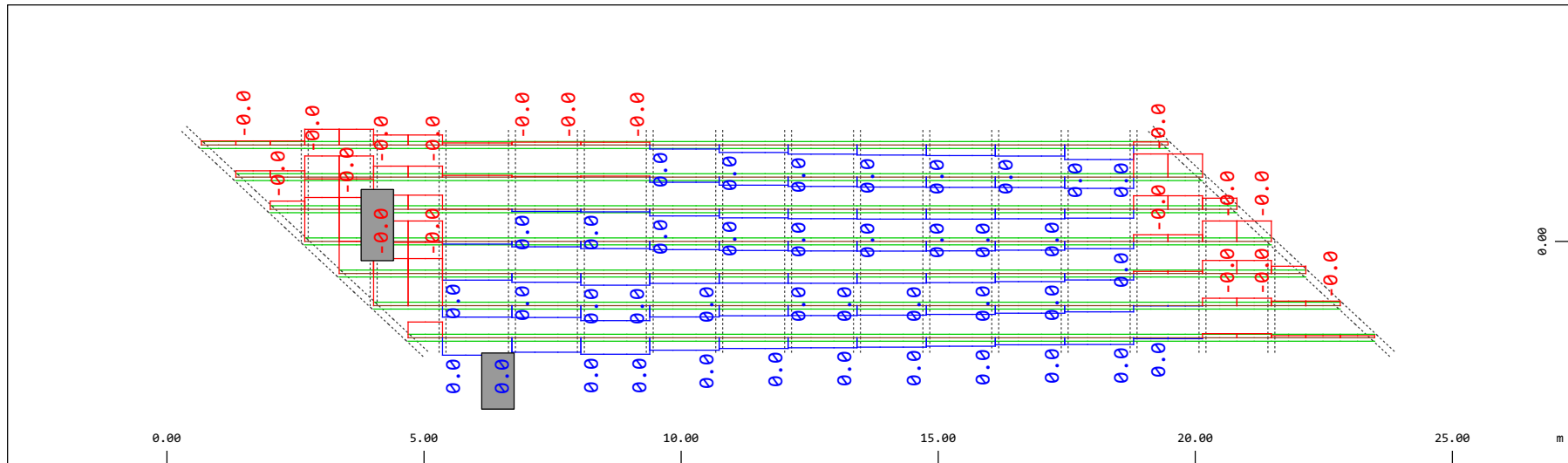
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force Nx, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kN (Min=-25.0) (Max=36.2)

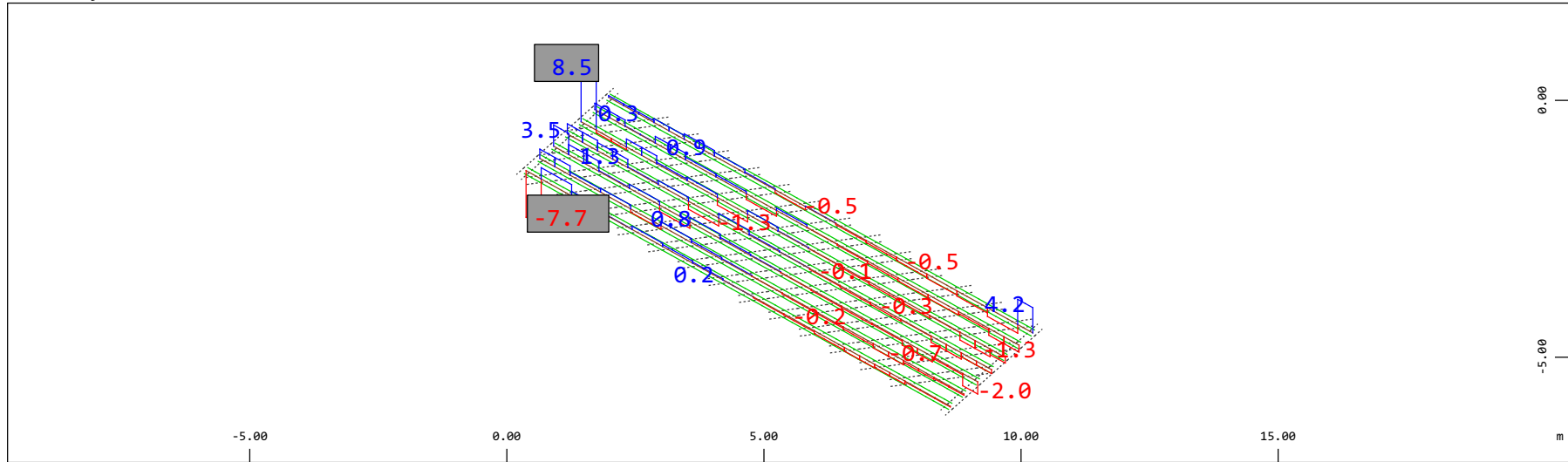
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment Mt, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.0098 kNm (Min=-0.0075) (Max=0.0028)

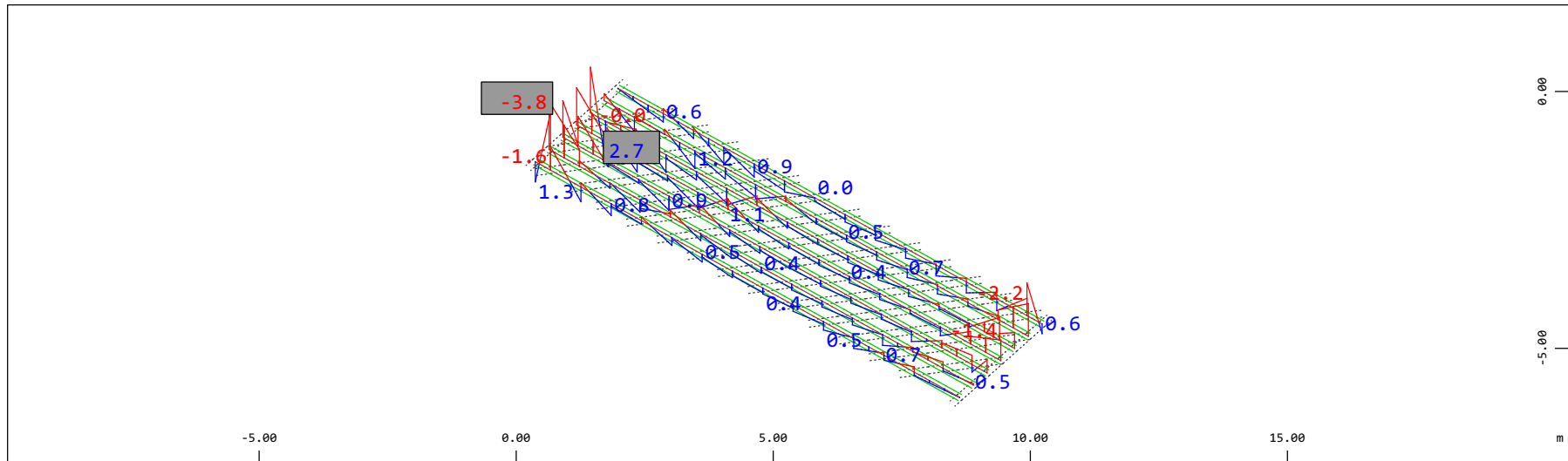
M 1 : 120

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 9.80 kN (Min=-7.70) (Max=8.45)

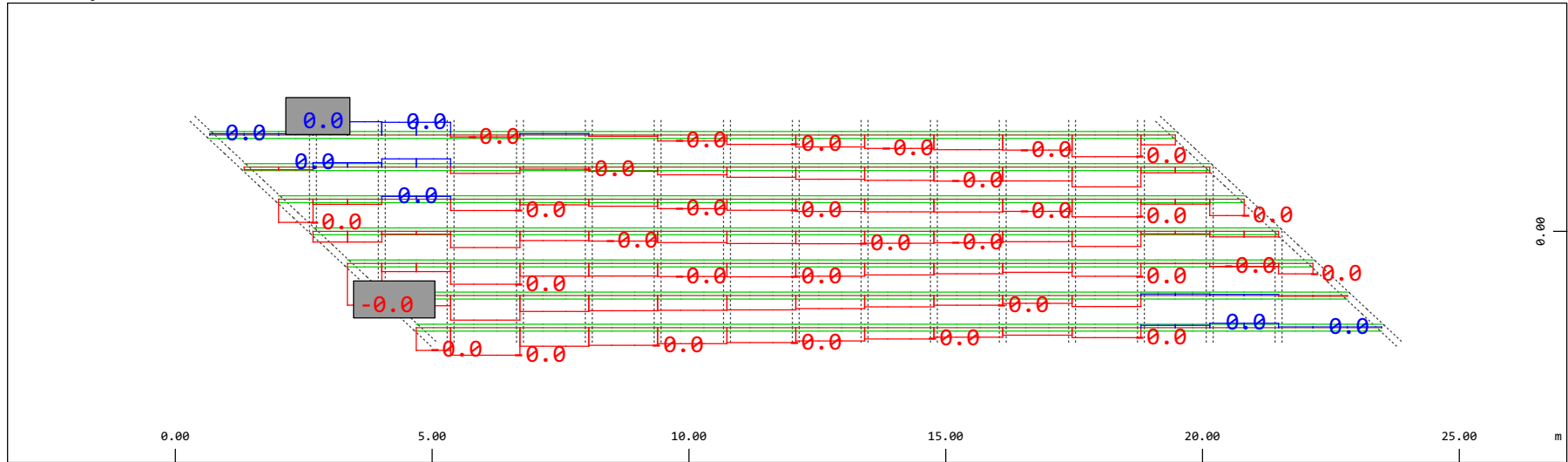
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment My, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 3.92 kNm (Min=-3.83) (Max=2.65)

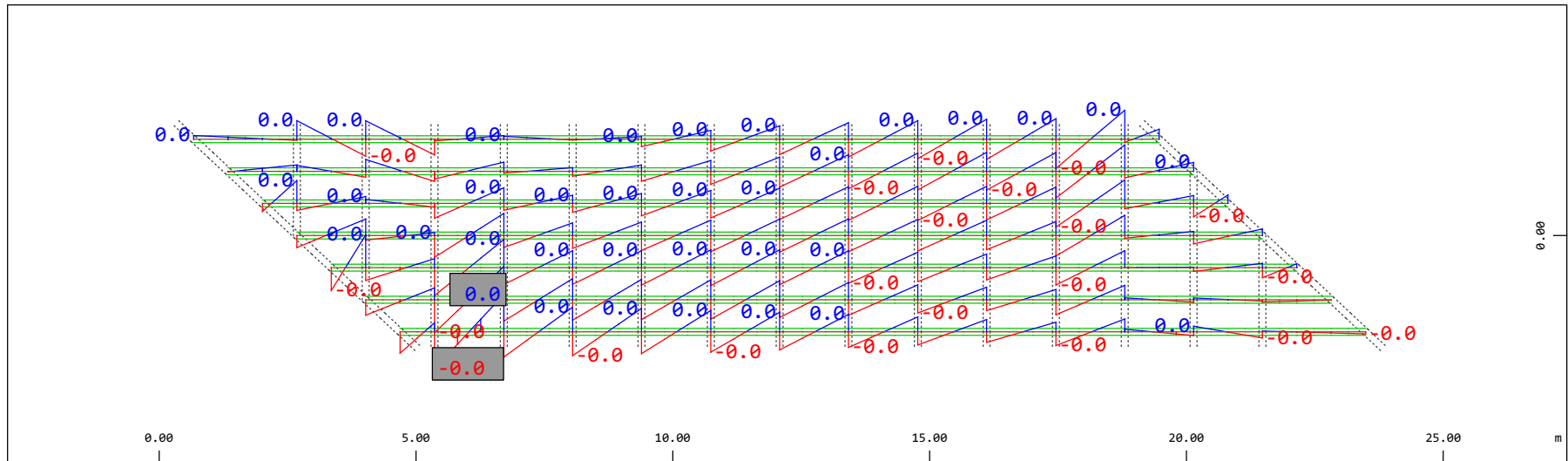
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Results elementay loads



Y
X
Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.0196 kN (Min=-0.0133) (Max=0.0042)

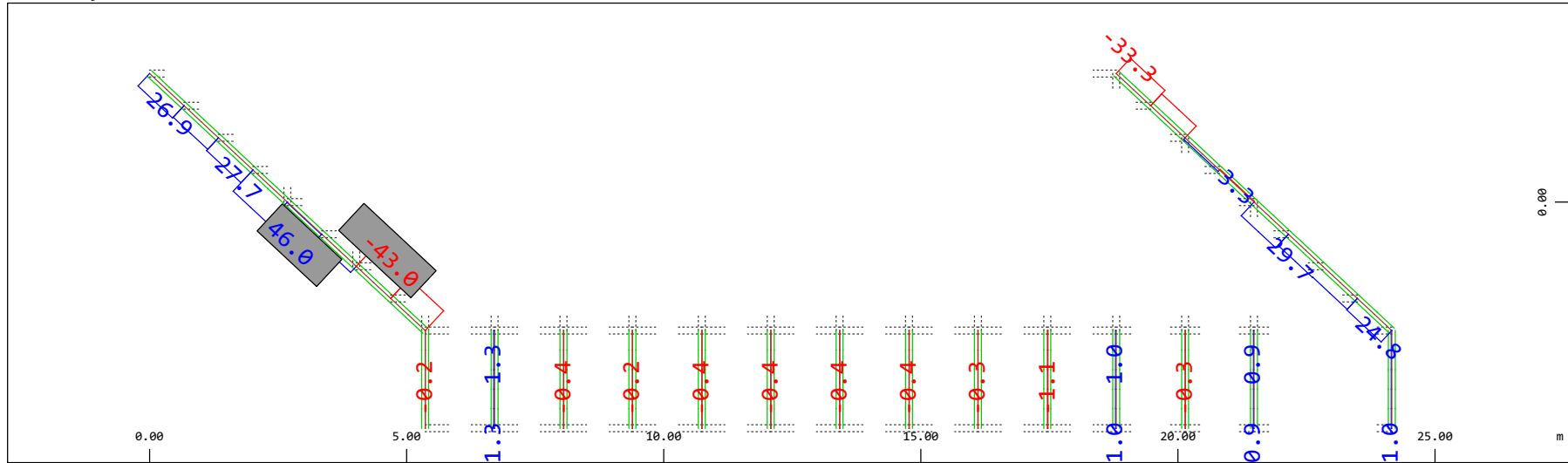
M 1 : 120



Y
X
Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.0098 kNm (Min=-0.0059) (Max=0.0059)

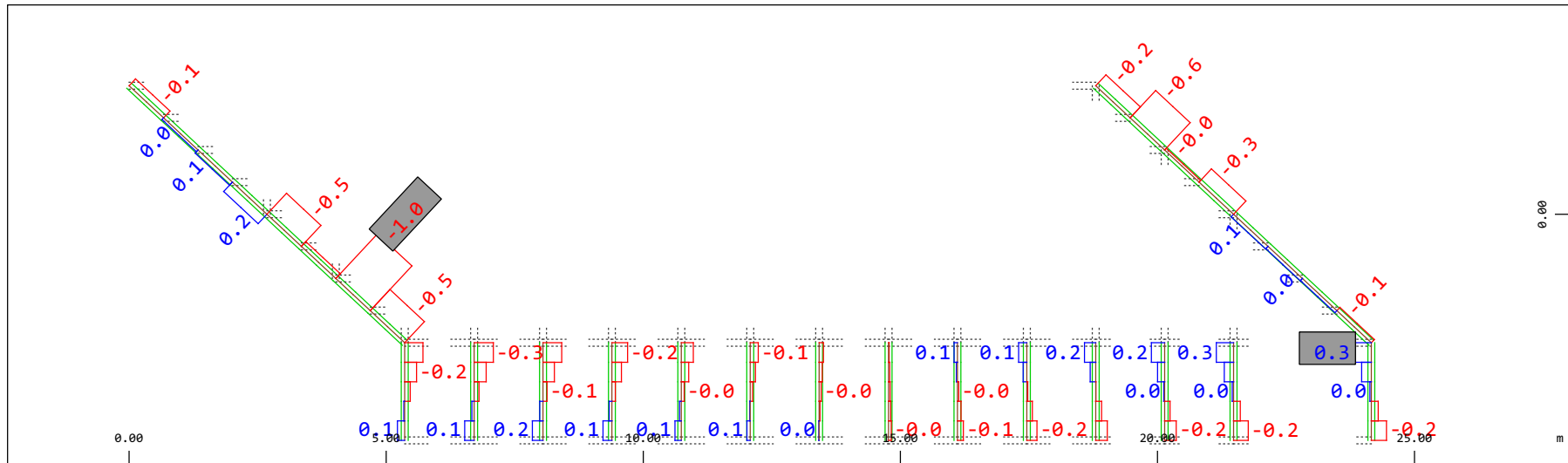
M 1 : 120

Definition of Axis
 Results elementay loads



Y
 X
 Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 98.0 kN (Min=-43.0) (Max=46.0)

M 1 : 120

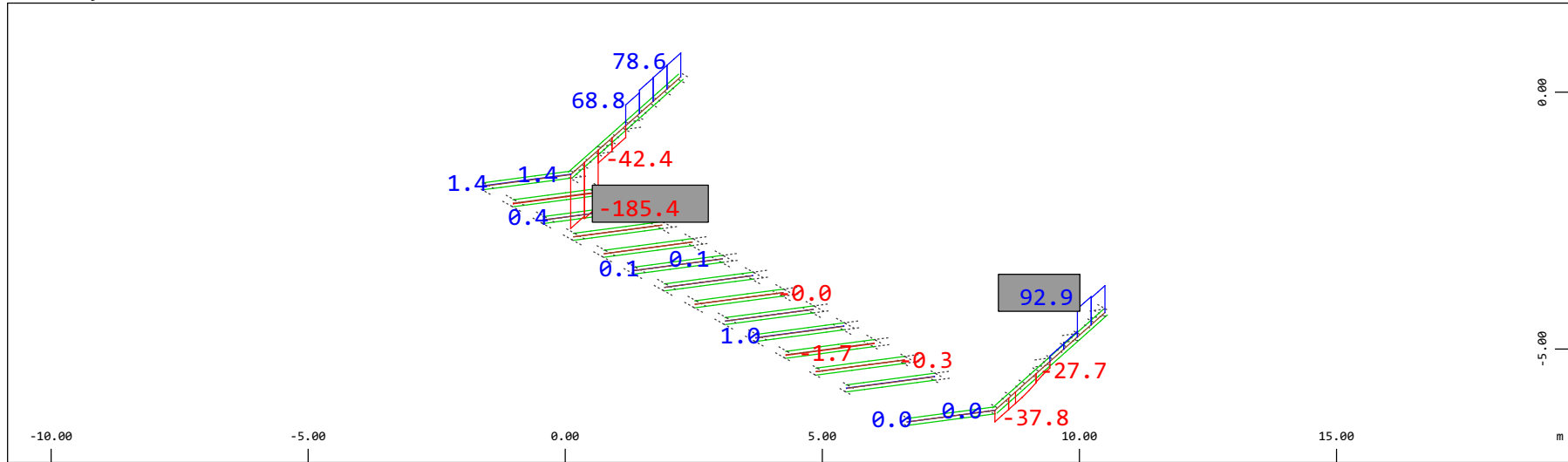


Y
 X
 Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.980 kNm (Min=-0.971) (Max=0.286)

M 1 : 120

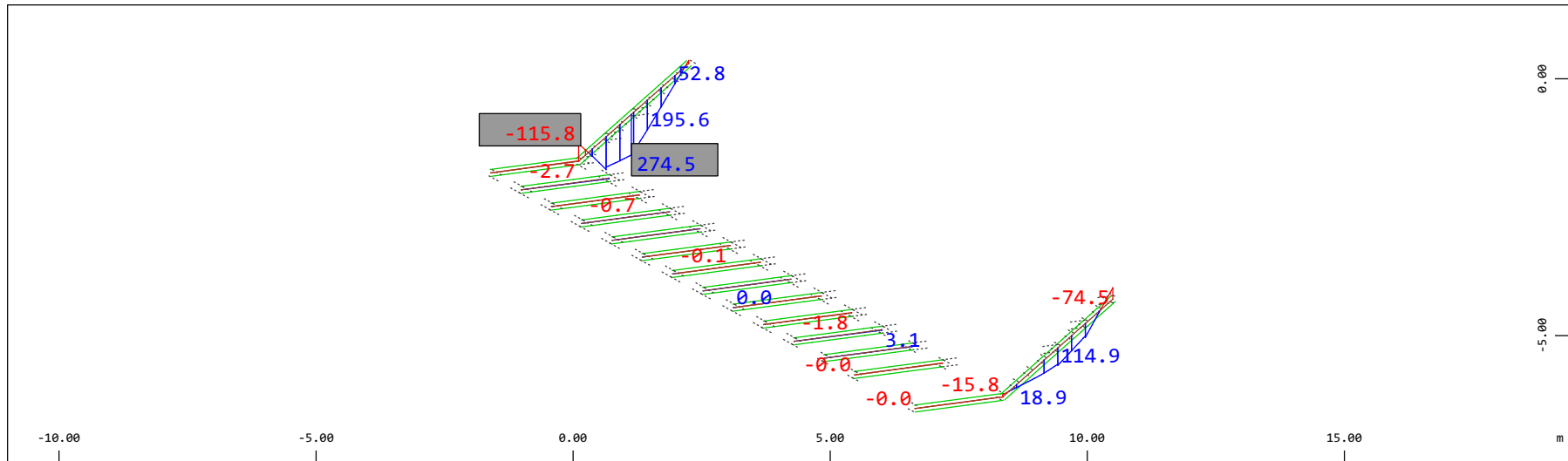
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 196.1 kN (Min=-185.4) (Max=92.9)

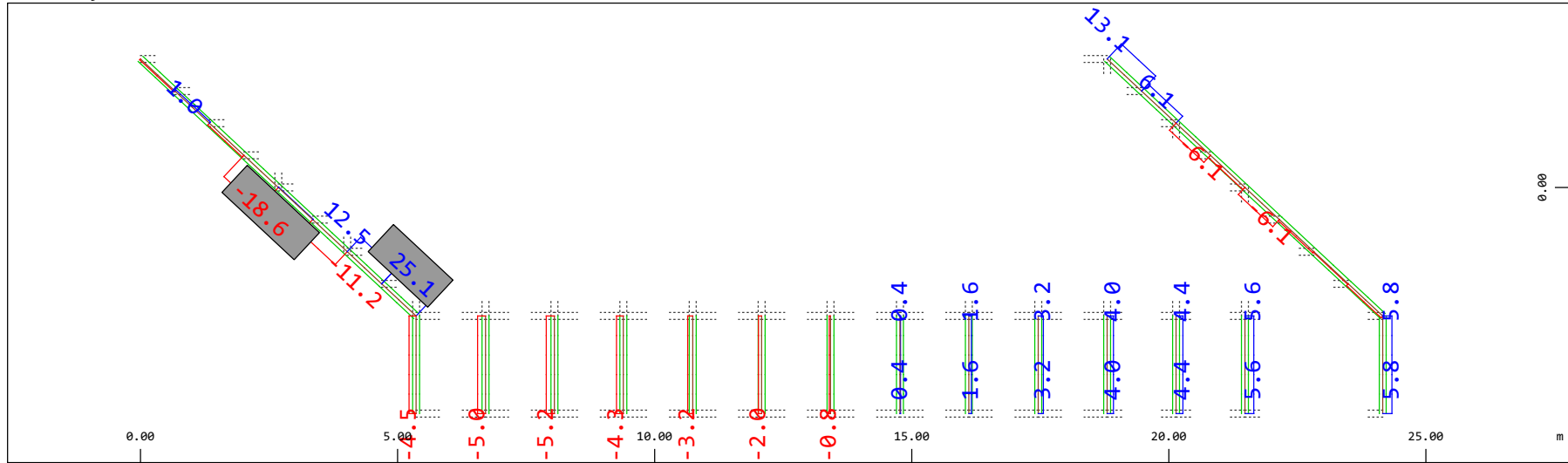
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 392.2 kNm (Min=-115.8) (Max=274.5)

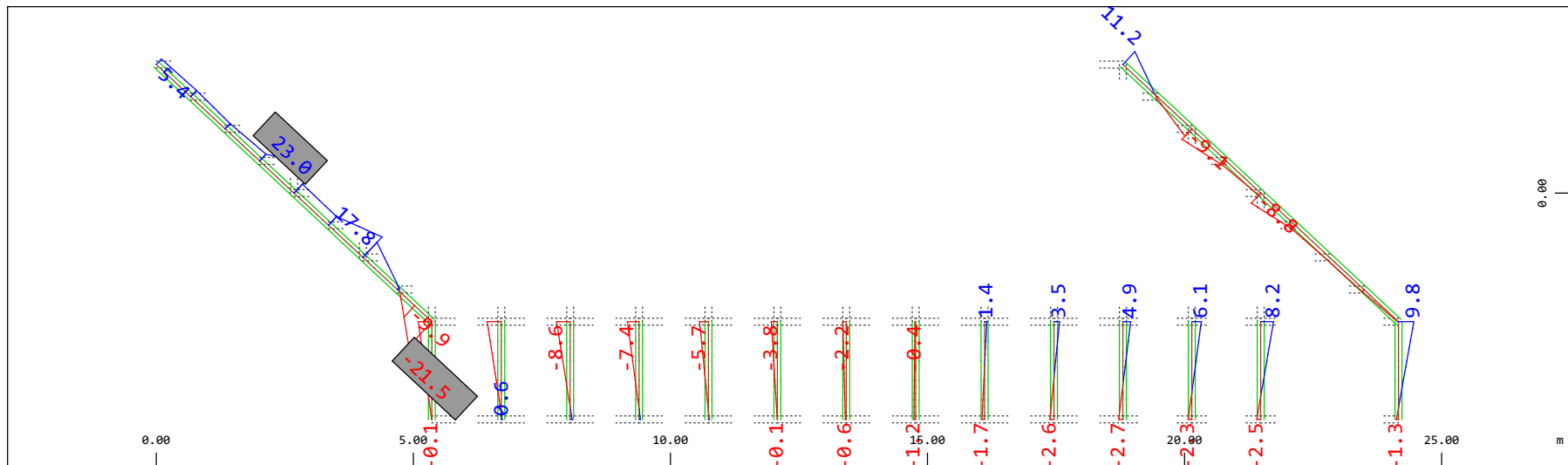
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kN (Min=-18.6) (Max=25.1)

M 1 : 120

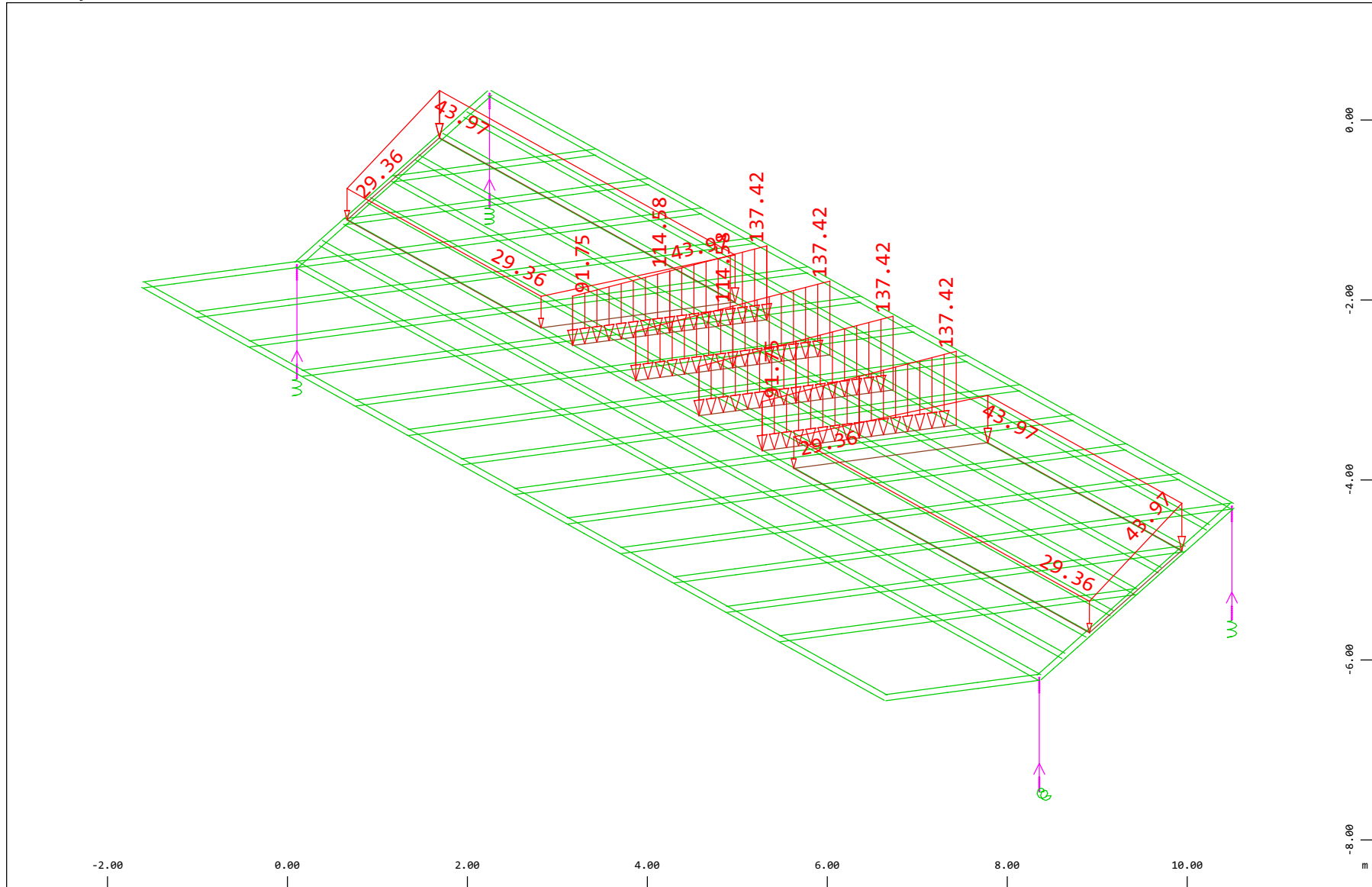


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kNm (Min=-21.5) (Max=23.0)

M 1 : 120

Definition of Axis
 Results elementay loads

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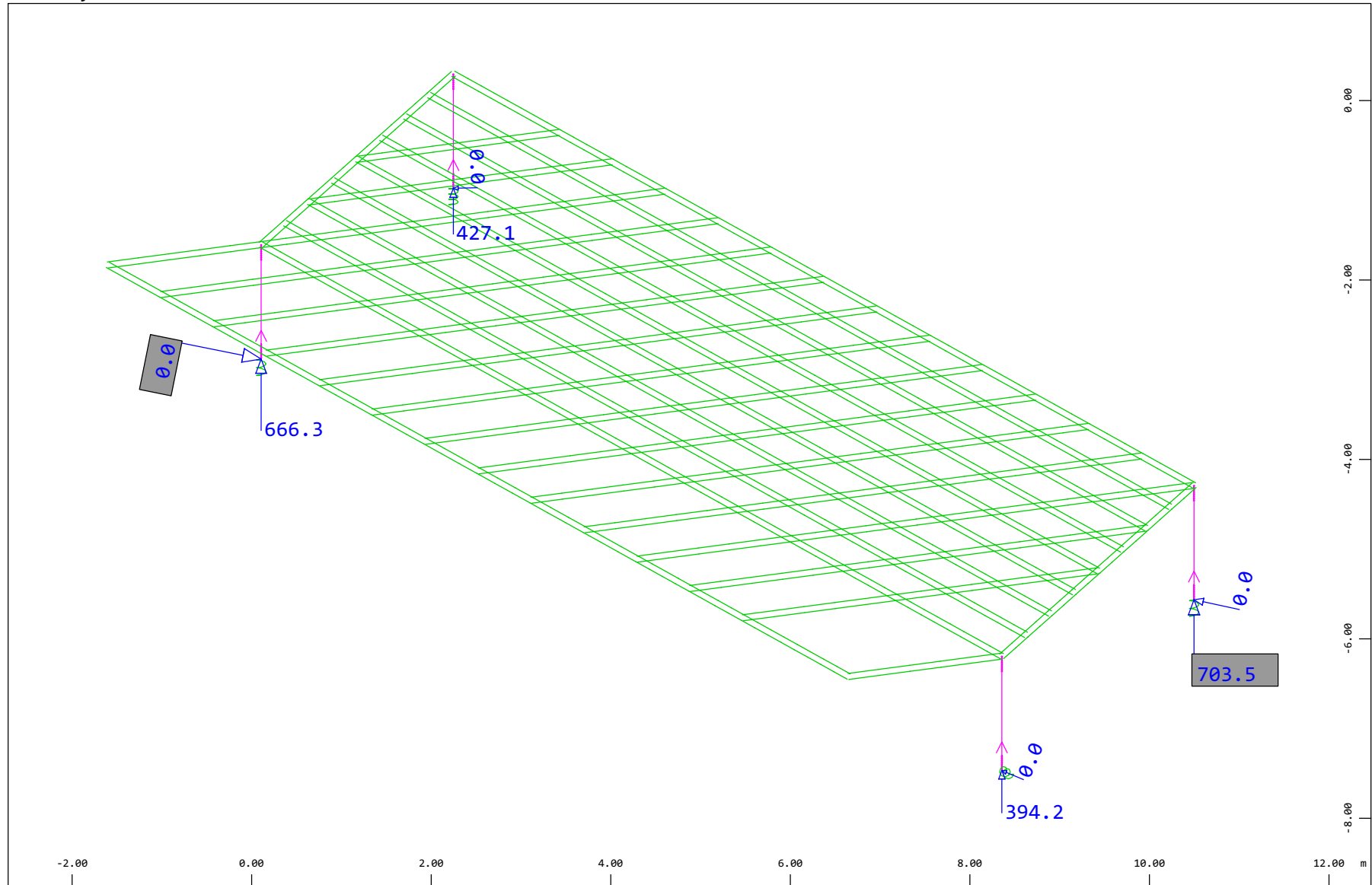
Z
 X
 Y

Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 108 Qt: LM71-S 10m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=96.9 kN/m, Min=-137.4
 Max=-91.7 ∇), Free area load (force) in global Z (Unit=48.4 kN/m², Min=-44.0 Max=-29.4 ∇)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 484.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.0019 kN

△ (Max=703.5) (total: 2191.)

▽ (Max=0.0040)

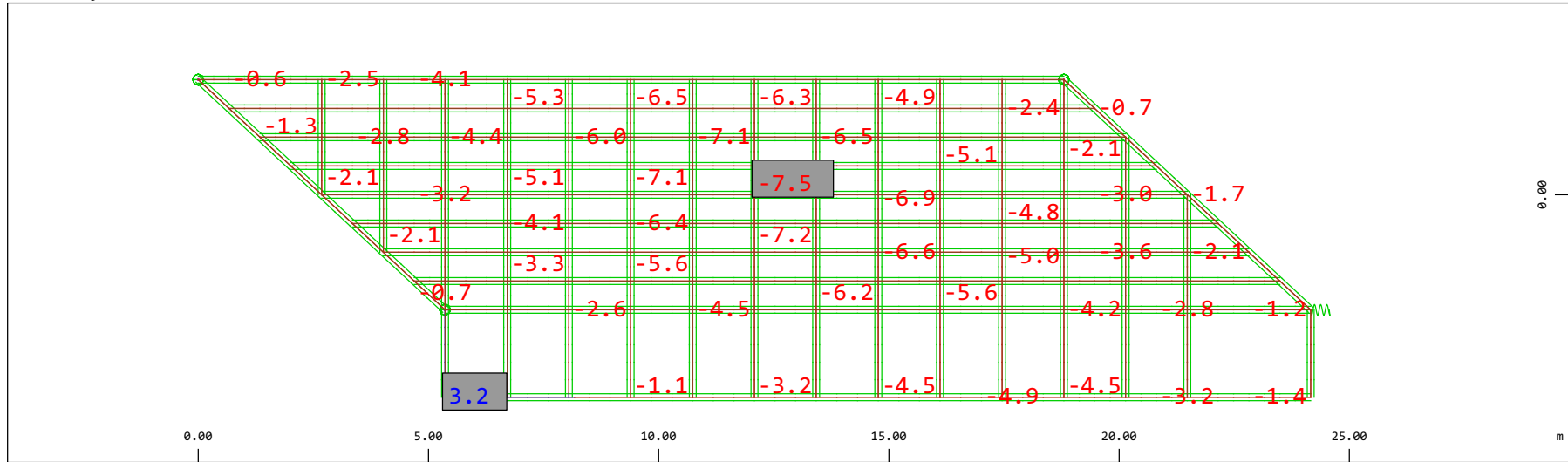
M 1 : 60

X * 0.502

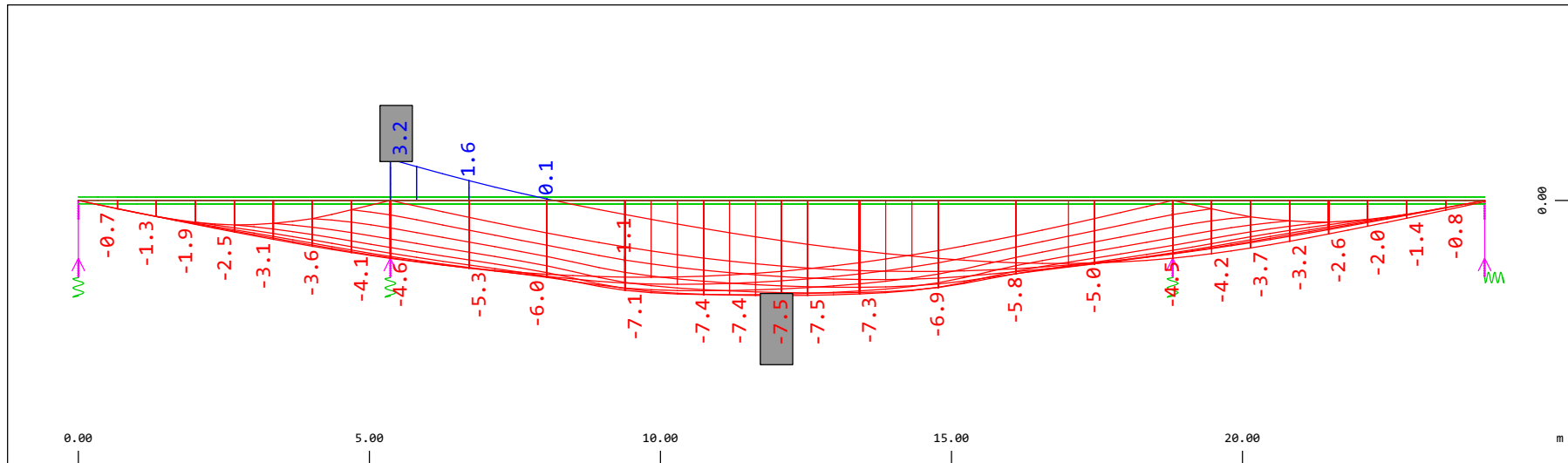
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

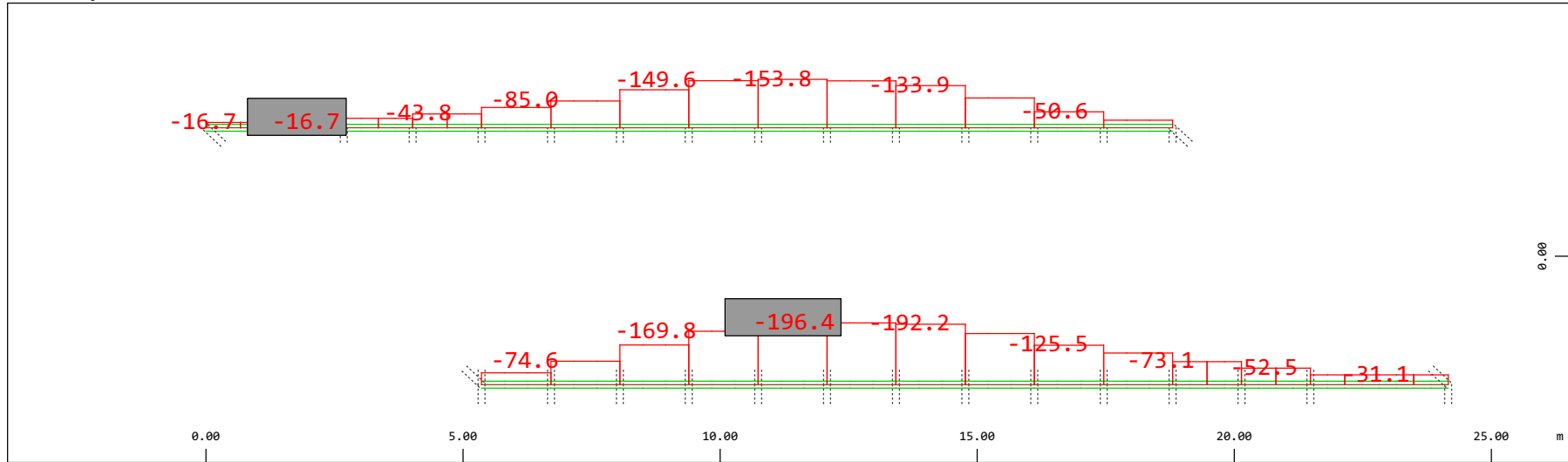


Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \bigcirc , Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 4.84 mm (Min=-7.47) (Max=3.23) M 1 : 134



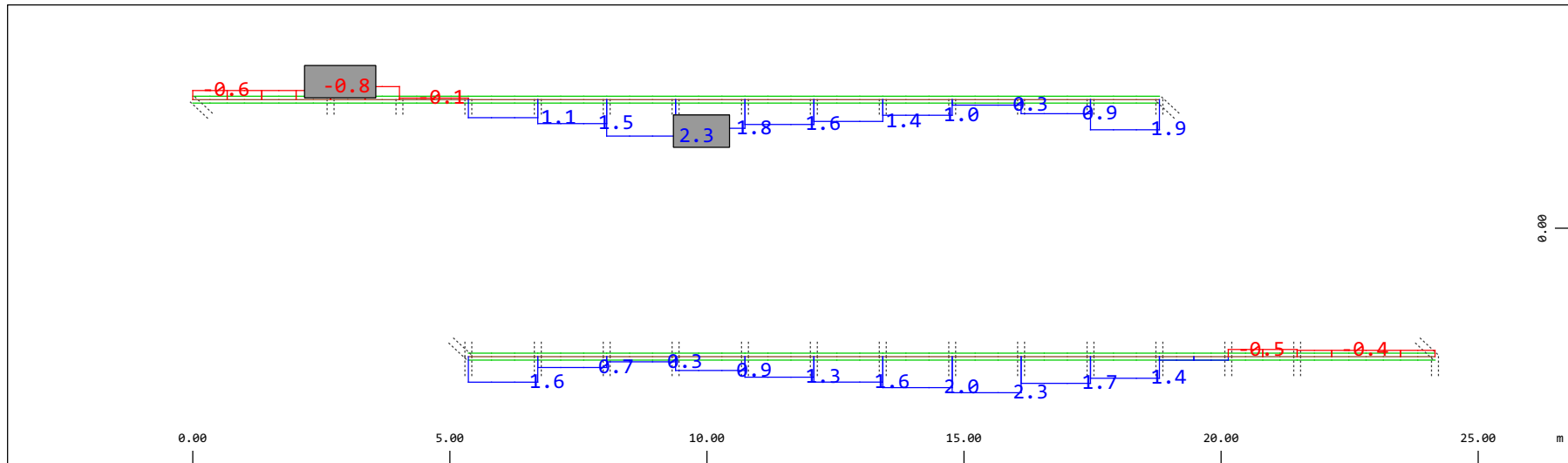
Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 4.84 mm (Min=-7.47) (Max=3.23) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 196.1 kN (Min=-196.4) (Max=-16.7)

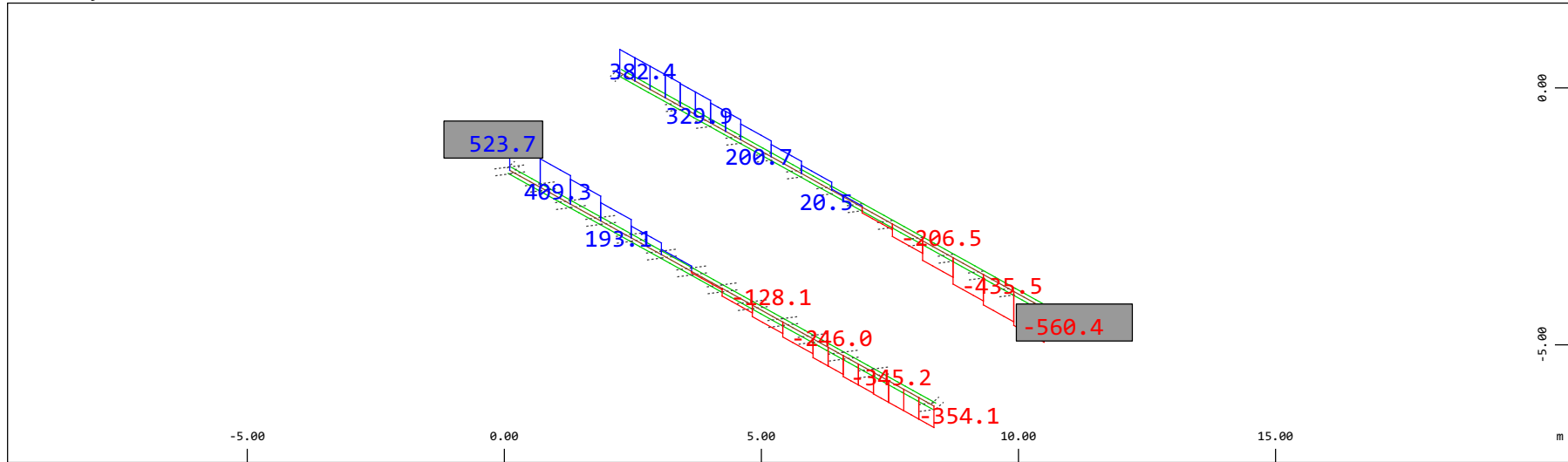
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 3.92 kNm (Min=-0.829) (Max=2.32)

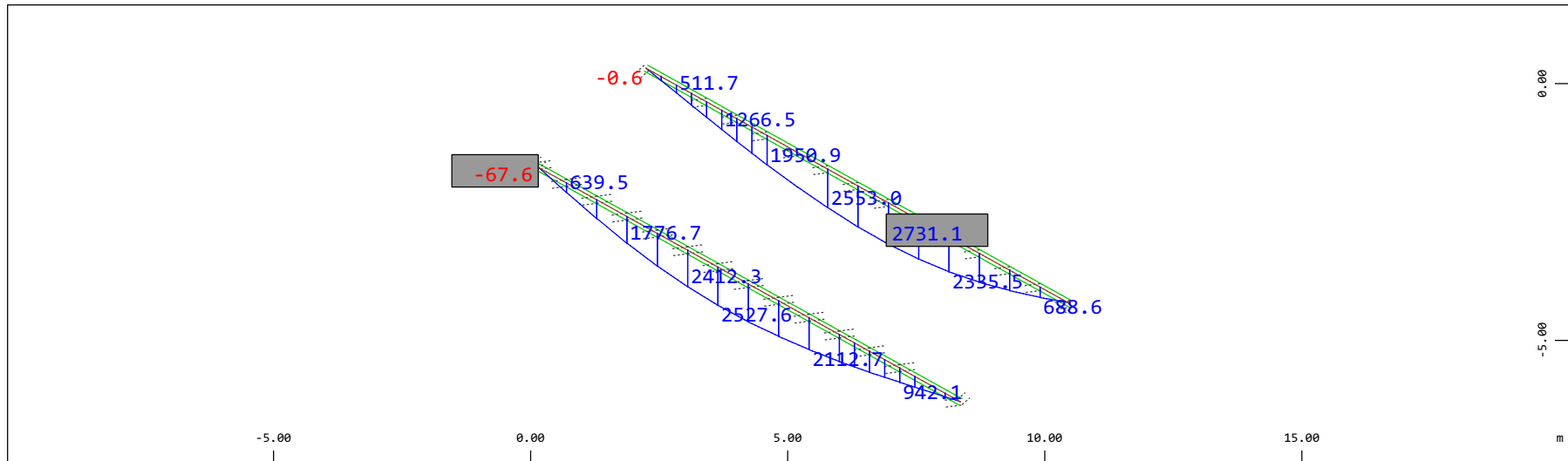
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 980.5 kN (Min=-560.4) (Max=523.7)

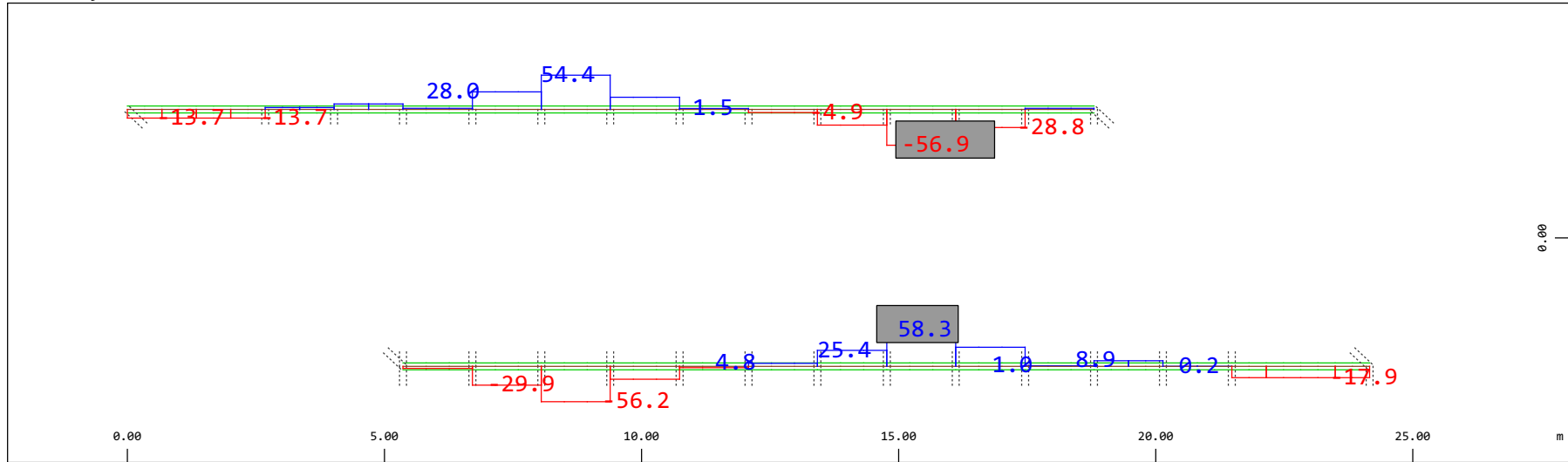
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 3922. kNm (Min=-67.6) (Max=2731.)

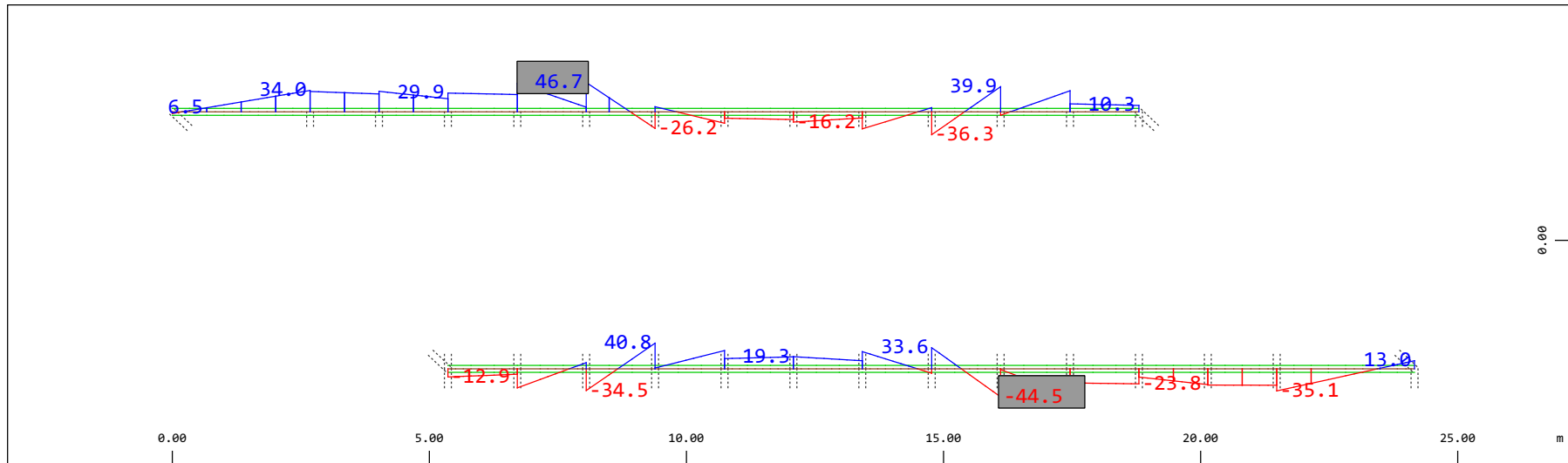
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kN (Min=-56.9) (Max=58.3)

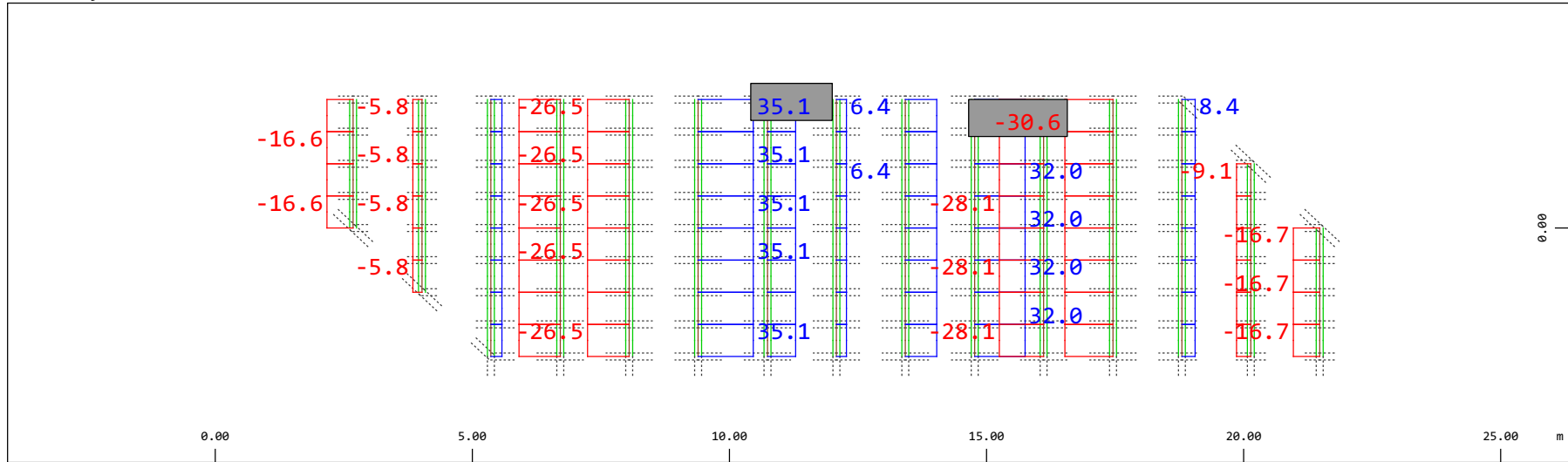
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kNm (Min=-44.5) (Max=46.7)

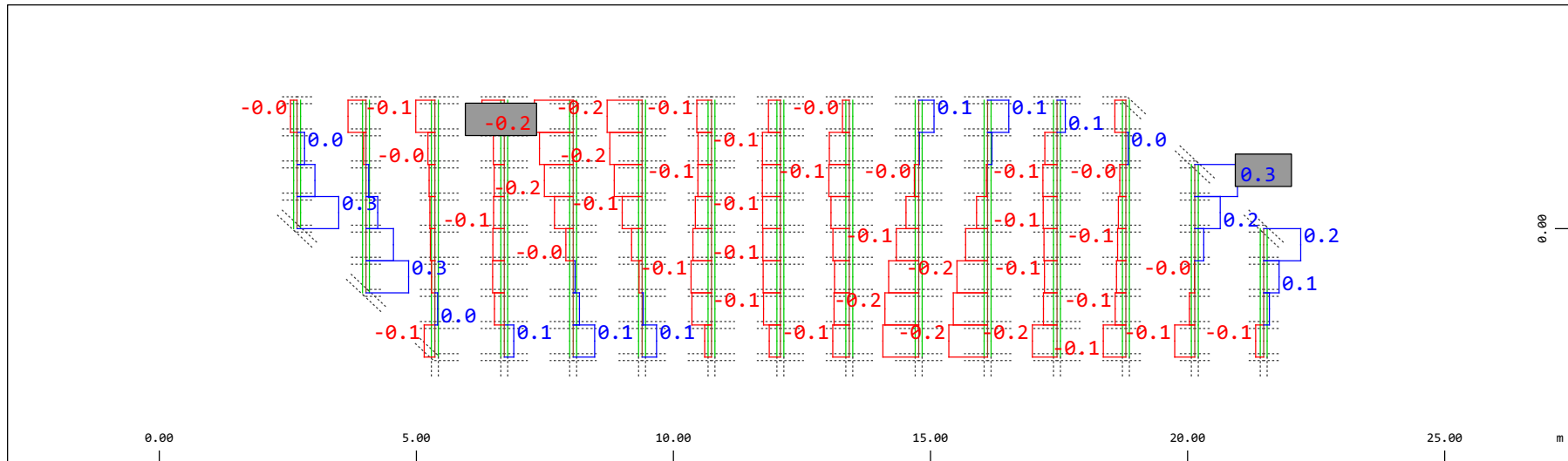
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force Nx, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 39.2 kN (Min=-30.6) (Max=35.1)

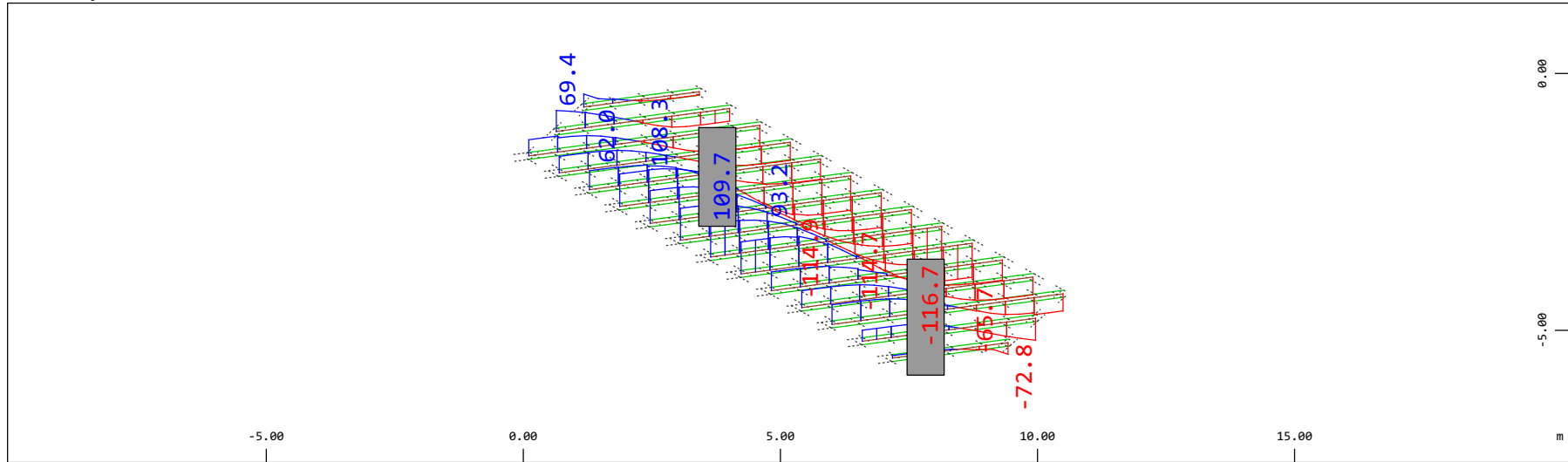
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment Mt, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.392 kNm (Min=-0.246) (Max=0.271)

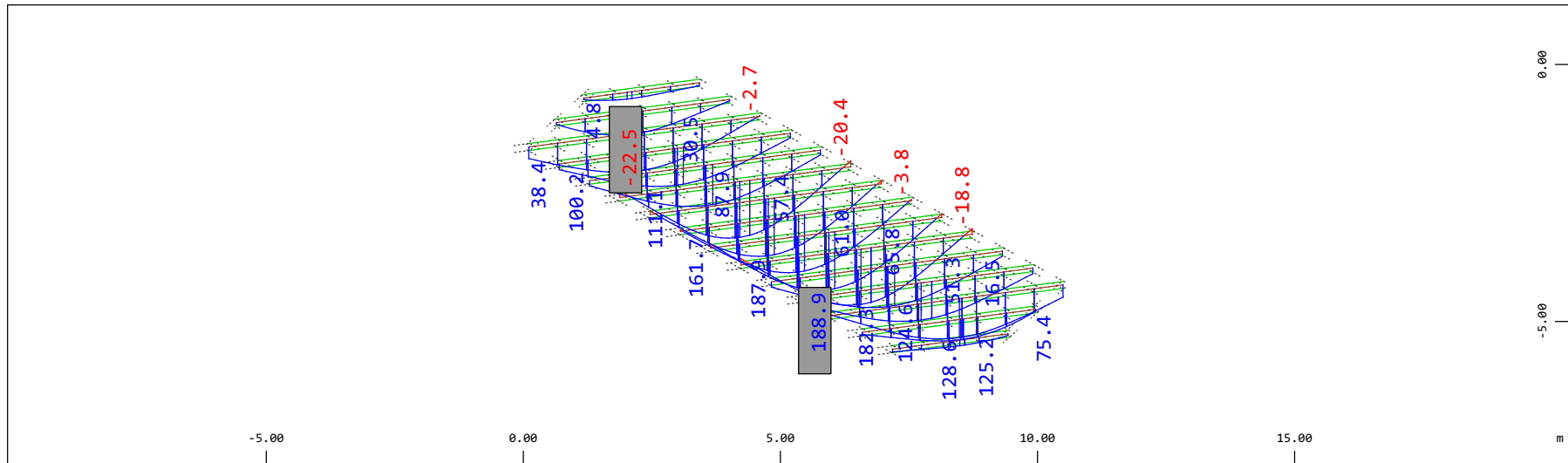
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 196.1 kN (Min=-116.7) (Max=109.7)

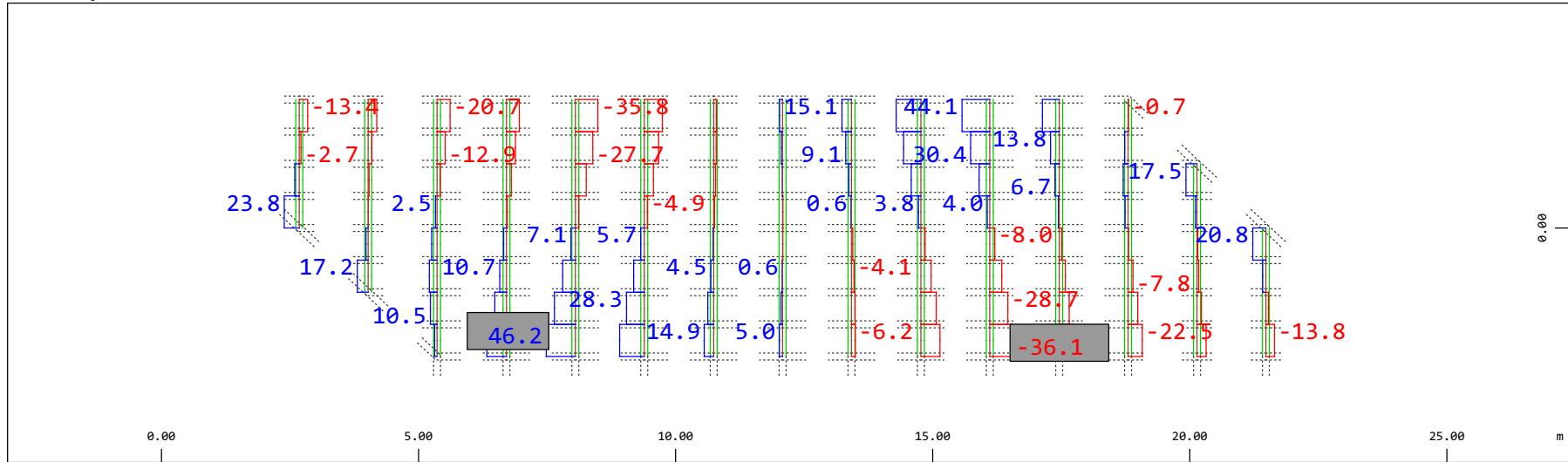
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 196.1 kNm (Min=-22.5) (Max=188.9)

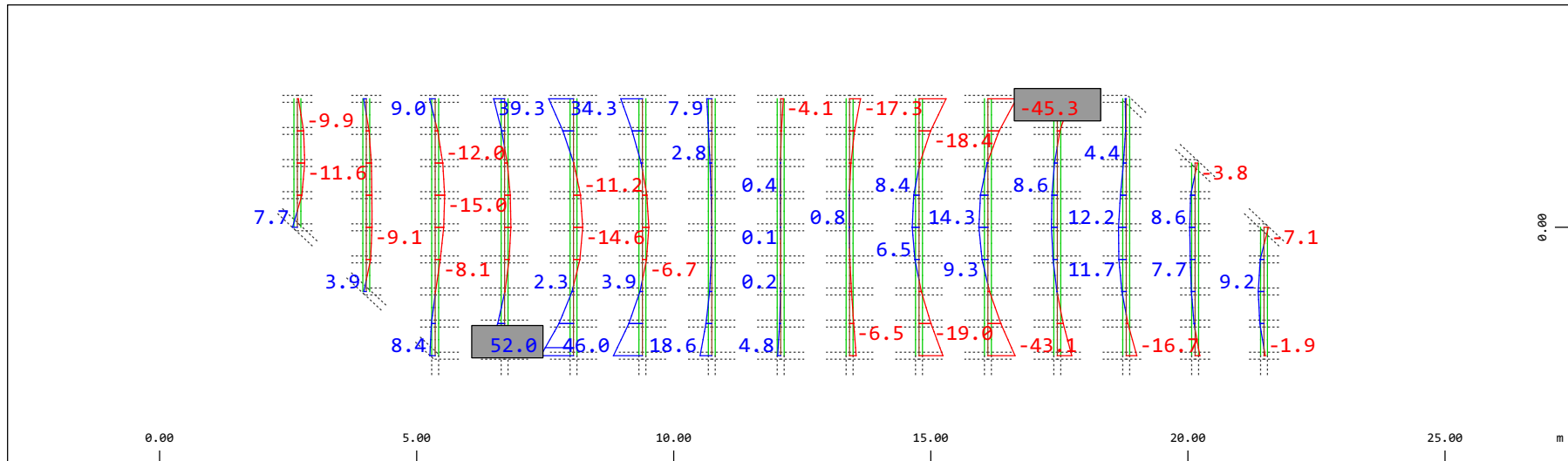
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kN (Min=-36.1) (Max=46.2)

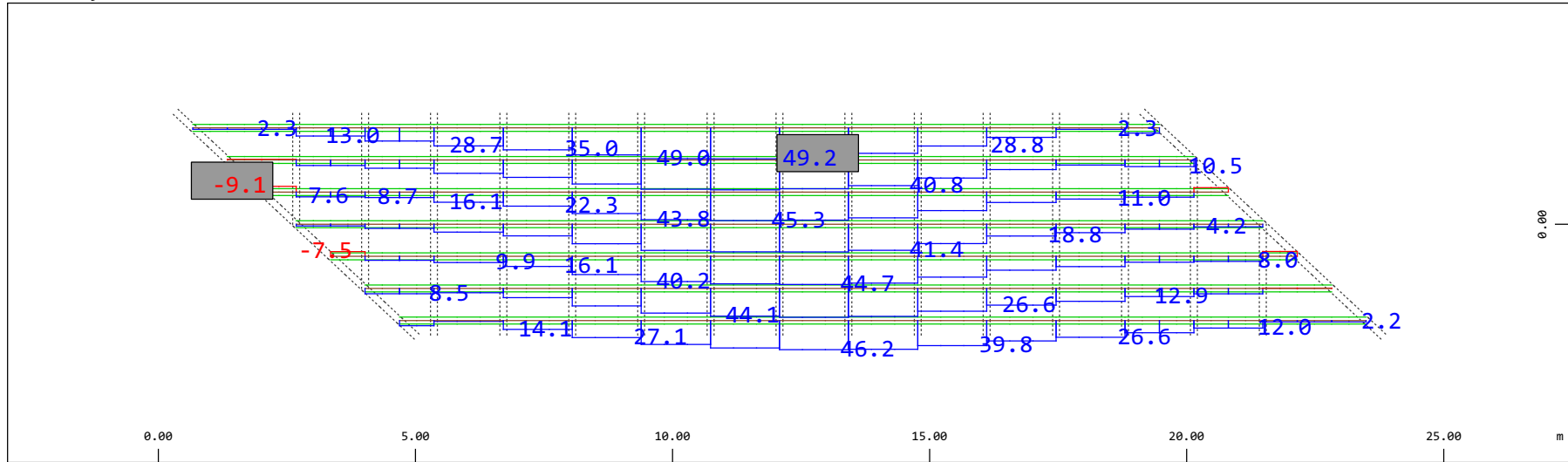
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kNm (Min=-45.3) (Max=52.0)

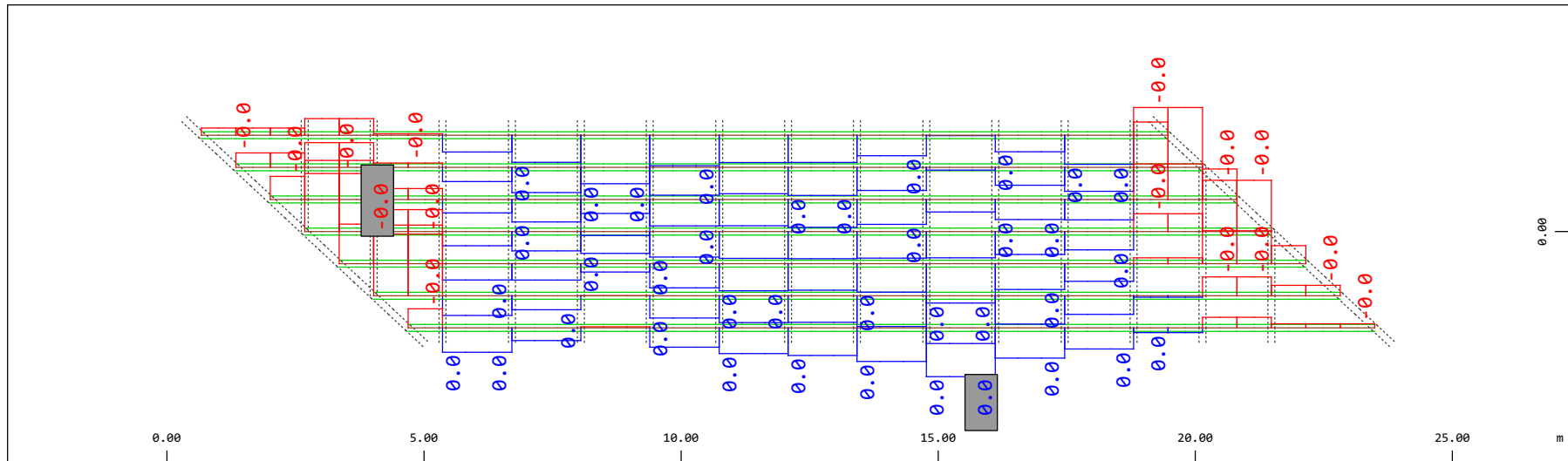
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force N_x , Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kN (Min=-9.14) (Max=49.2)

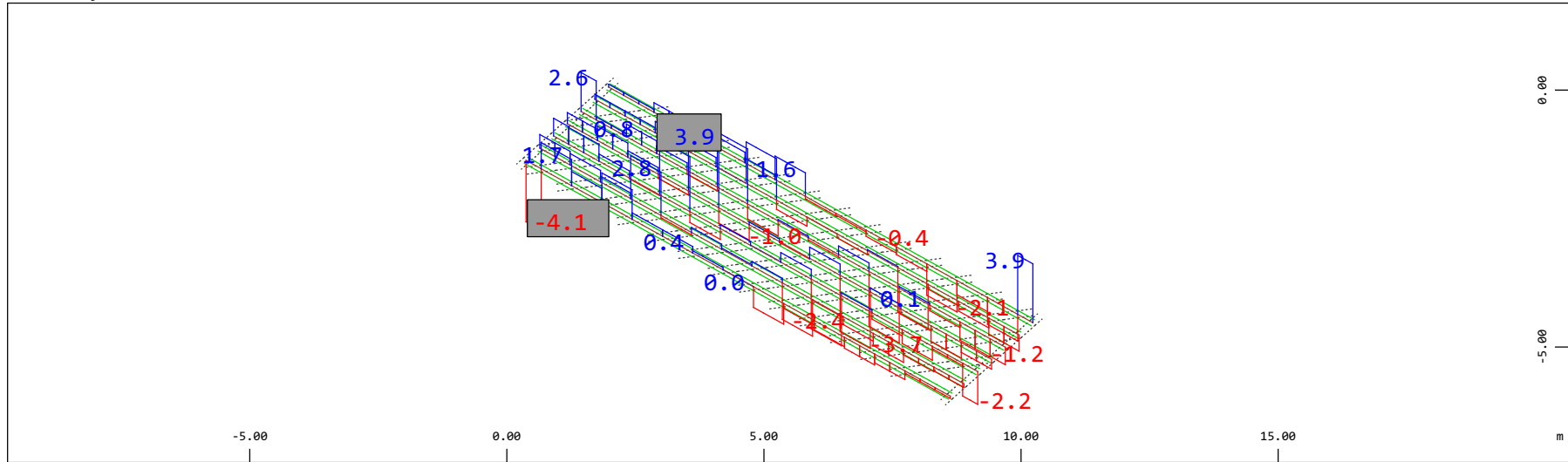
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment M_t , Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.0039 kNm (Min=-0.0039) (Max=0.0031)

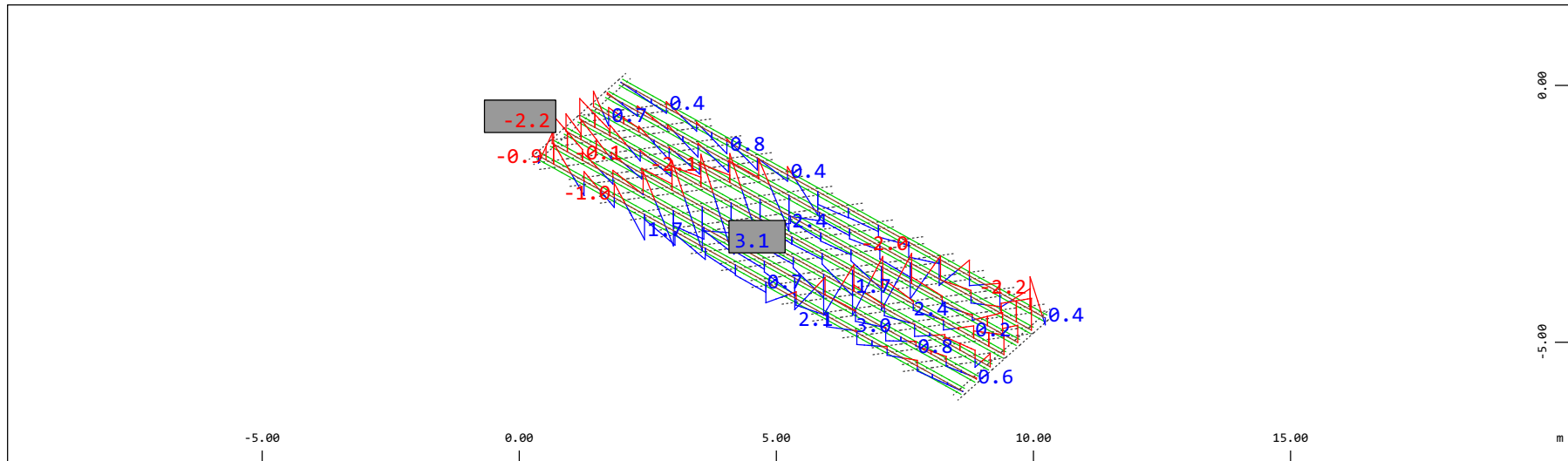
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 3.92 kN (Min=-4.06) (Max=3.92)

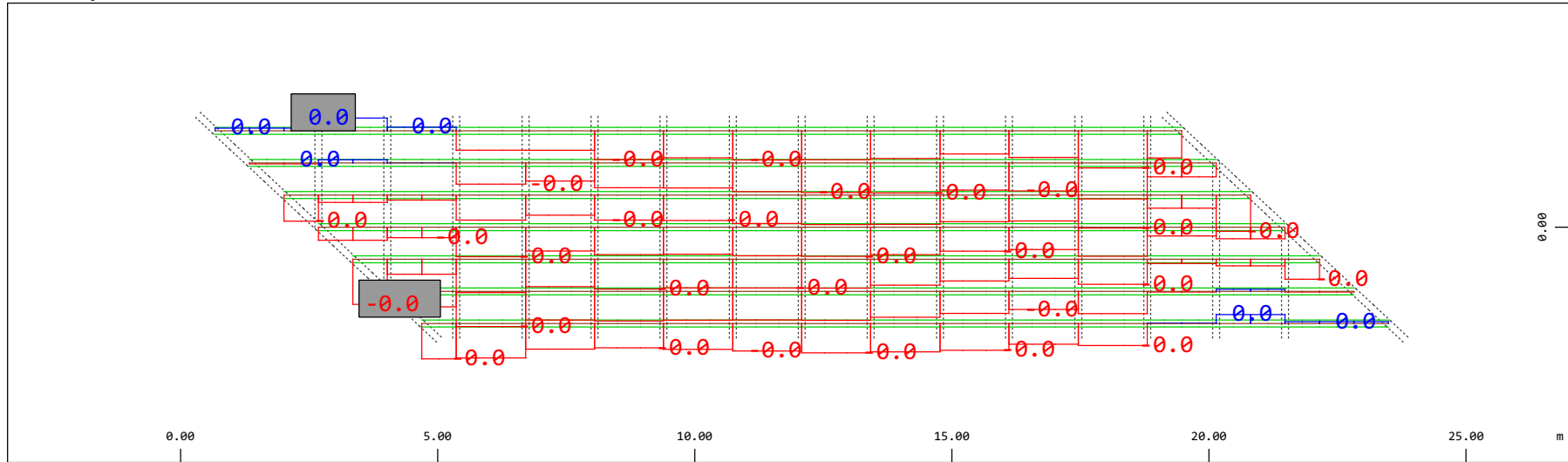
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 3.92 kNm (Min=-2.23) (Max=3.15)

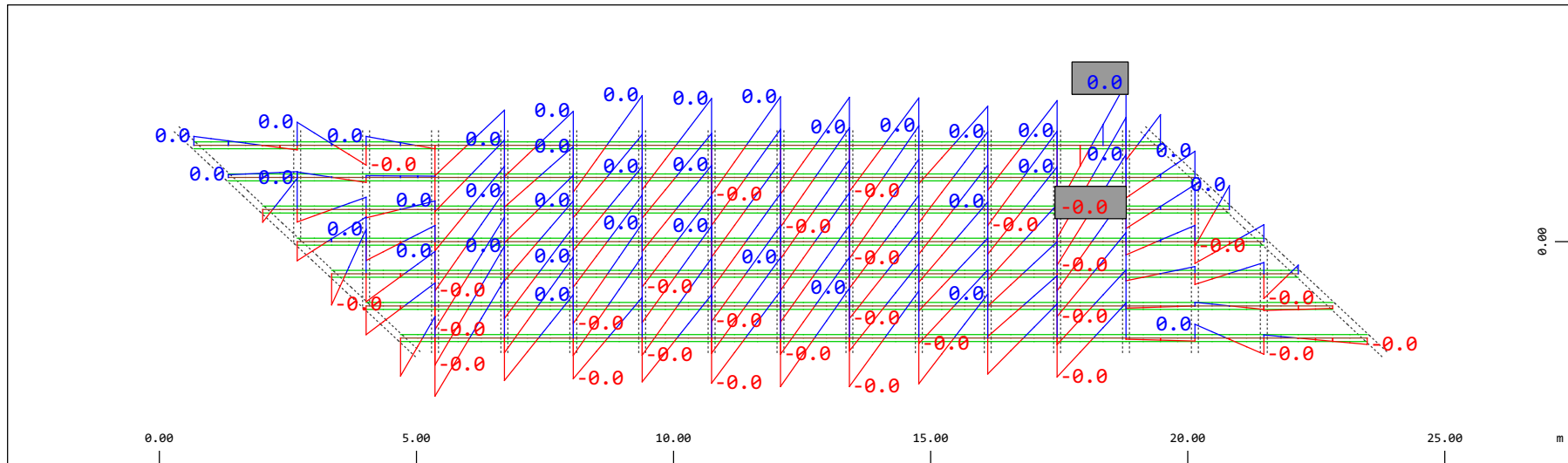
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Shear force Vy, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.0098 kN (Min=-0.0072) (Max=0.0020)

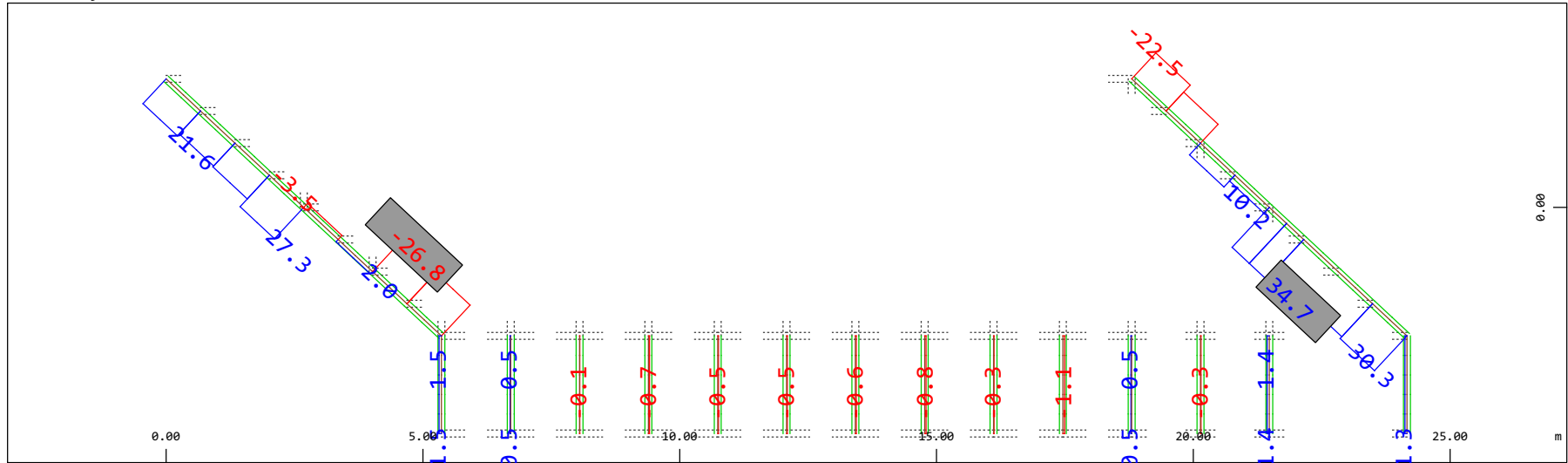
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Bending moment Mz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.0039 kNm (Min=-0.0040) (Max=0.0040)

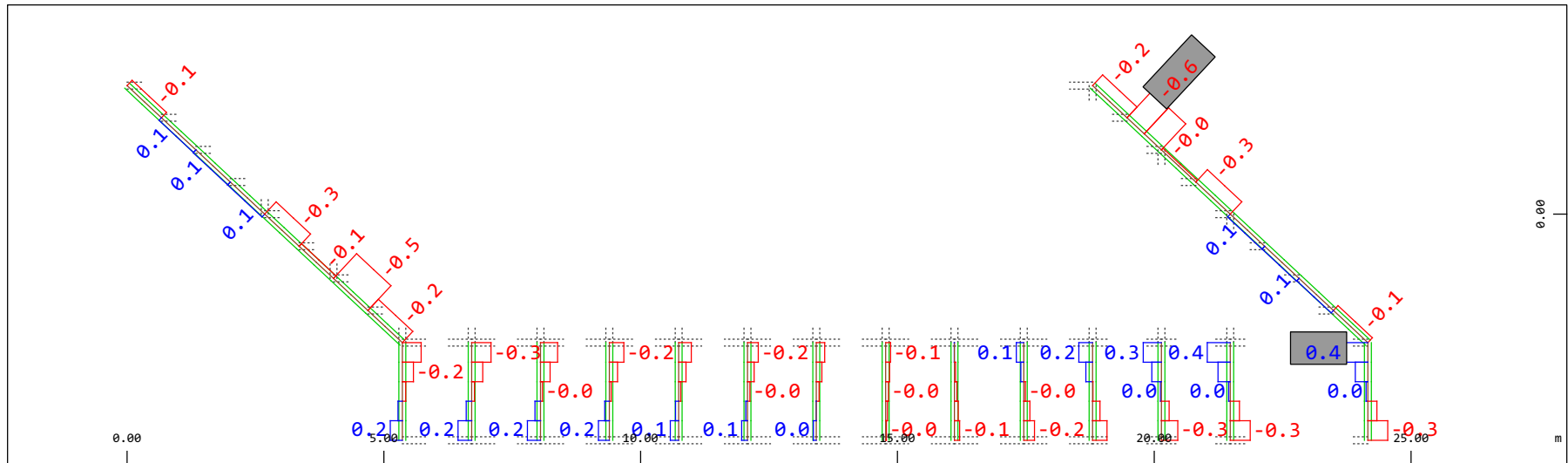
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 39.2 kN (Min=-26.8) (Max=34.7)

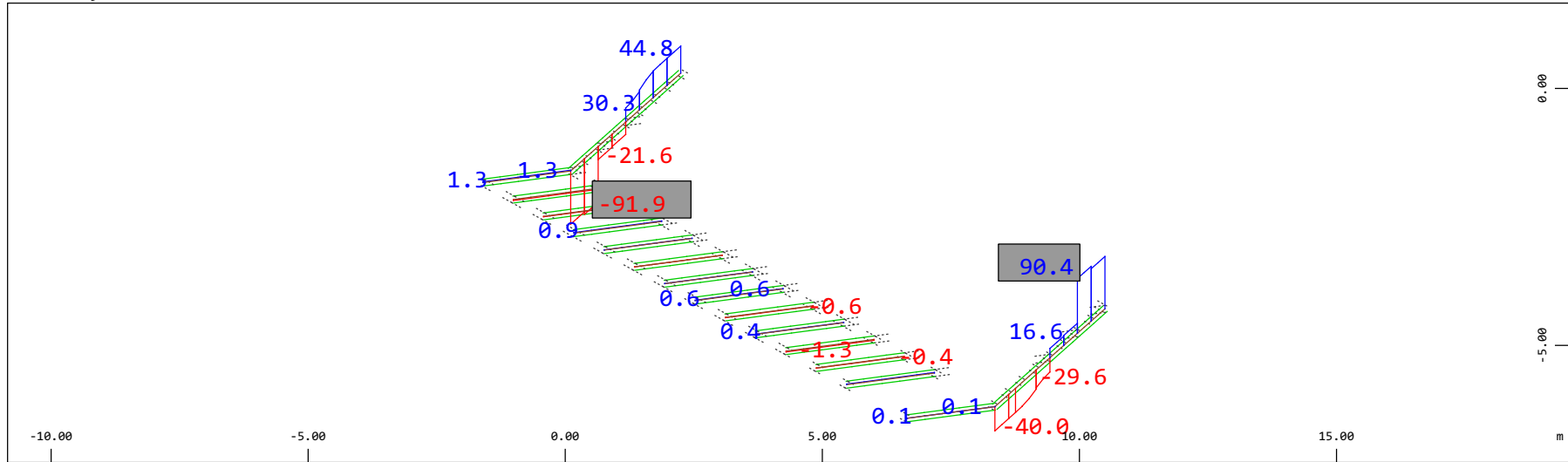
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.980 kNm (Min=-0.567) (Max=0.373)

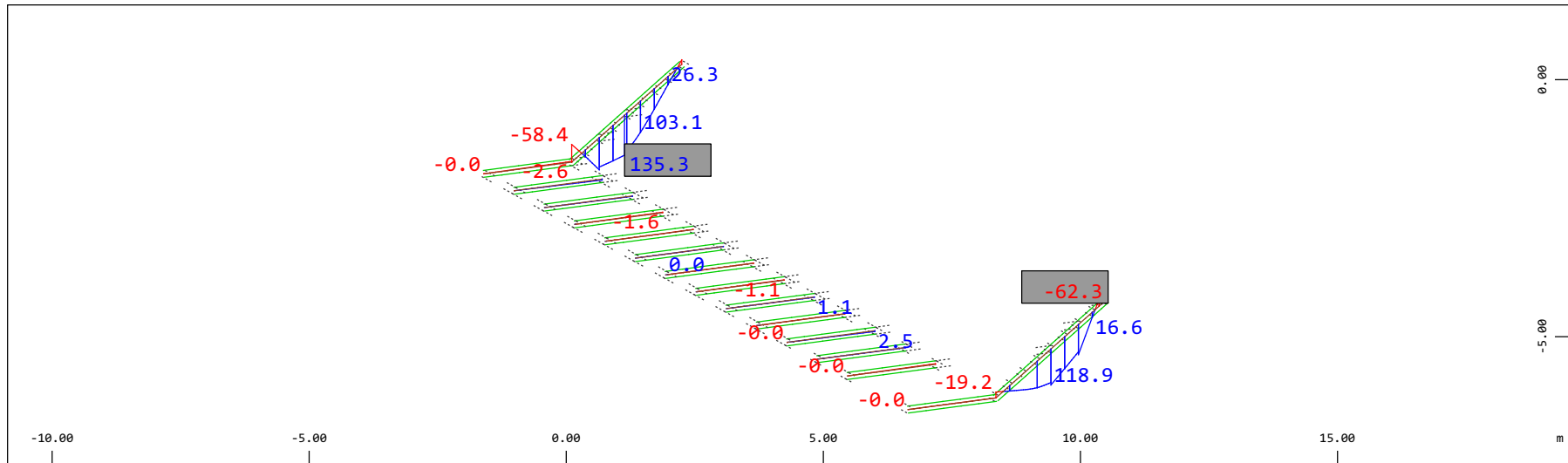
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kN (Min=-91.9) (Max=90.4)

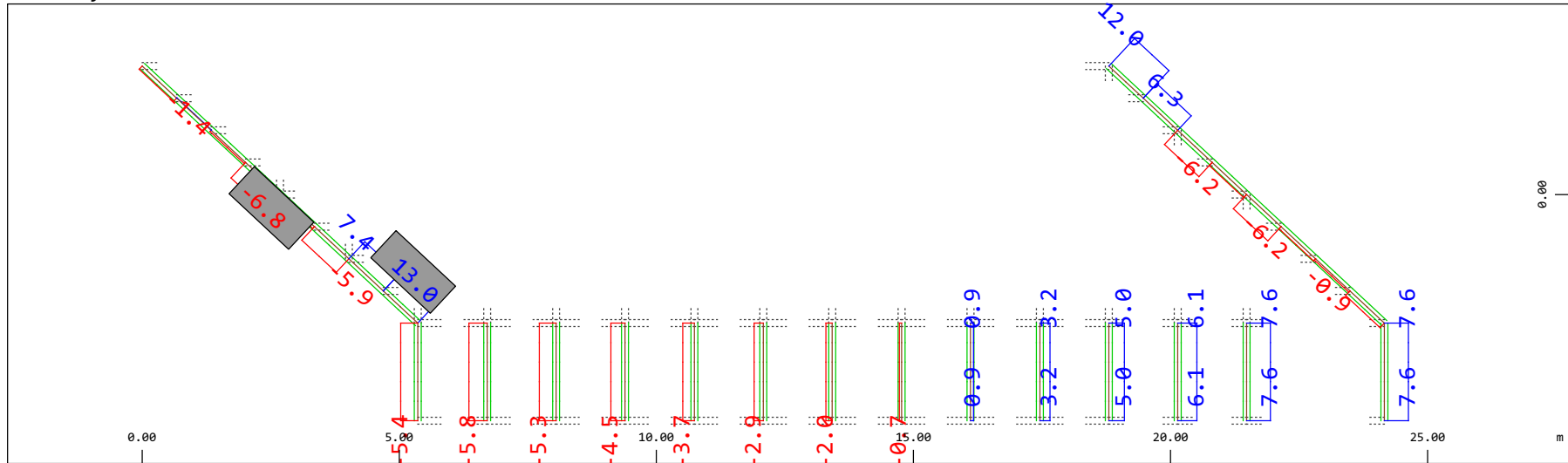
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 196.1 kNm (Min=-62.3) (Max=135.3)

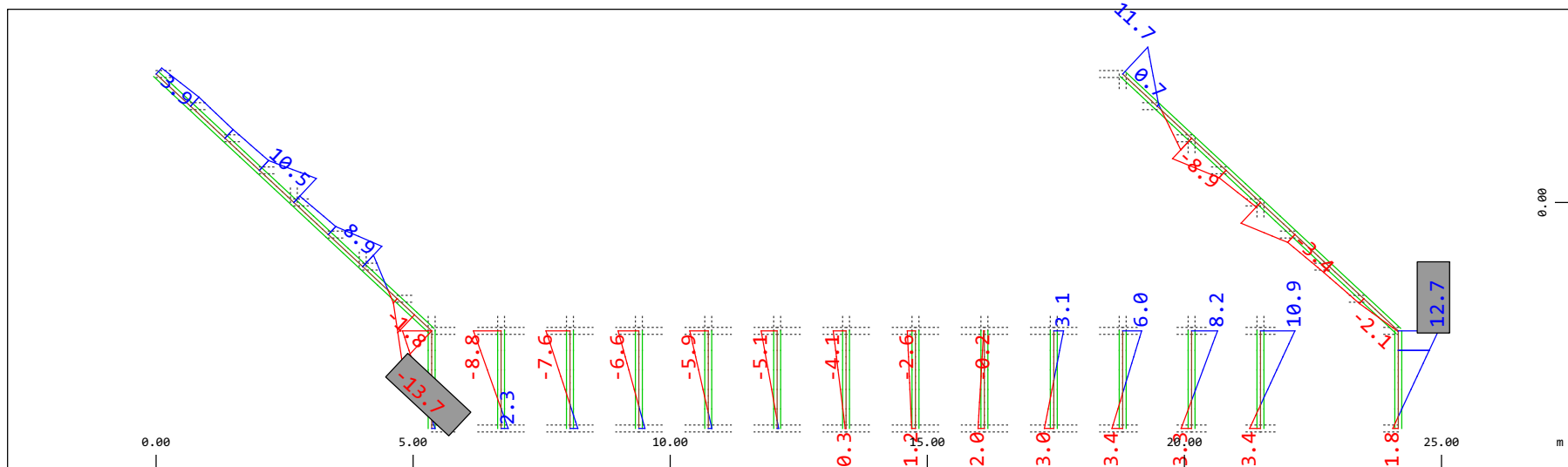
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 19.6 kN (Min=-6.76) (Max=13.0)

M 1 : 120

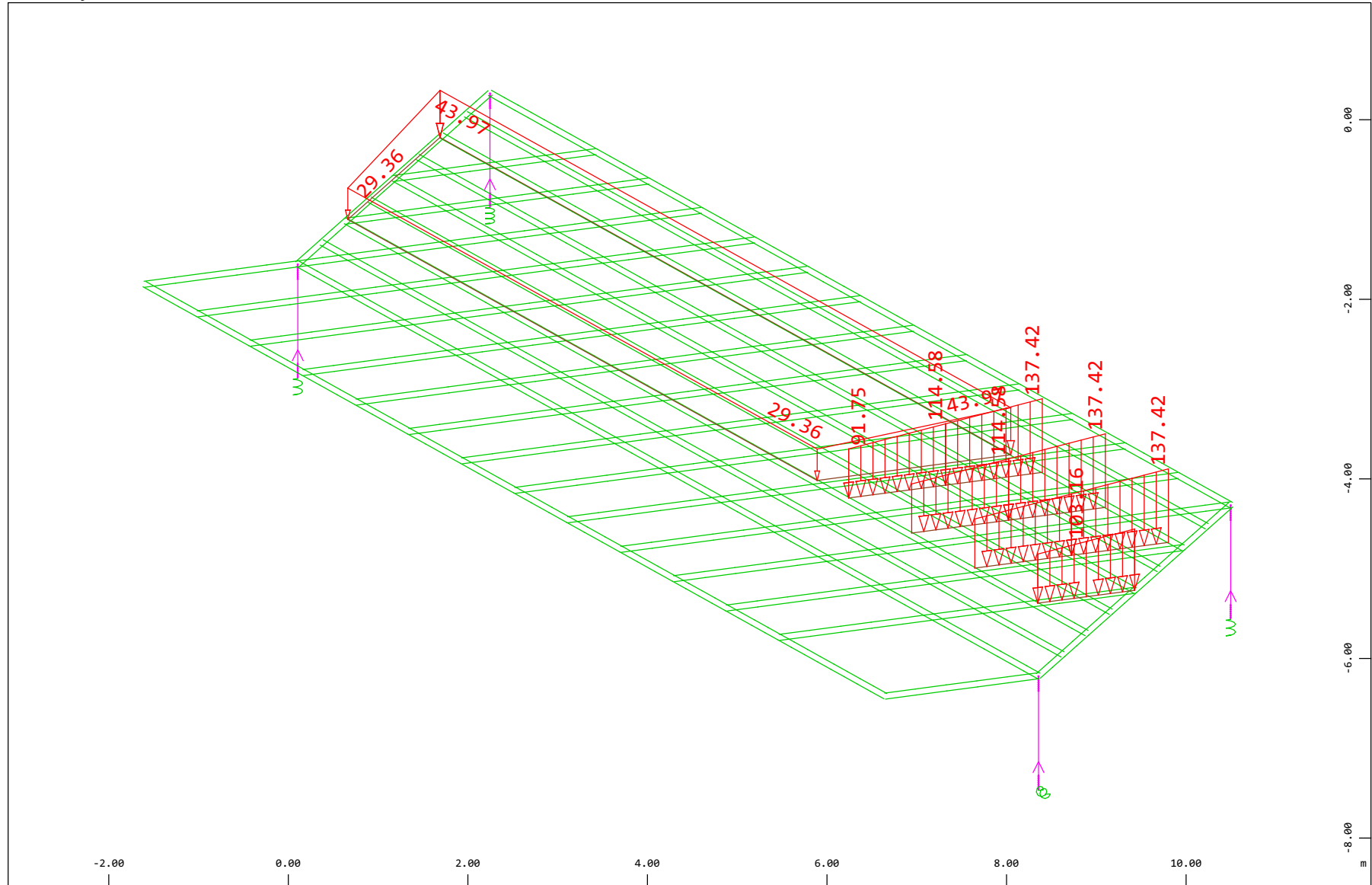


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 19.6 kNm (Min=-13.7) (Max=12.7)

M 1 : 120

Definition of Axis
 Results elementay loads

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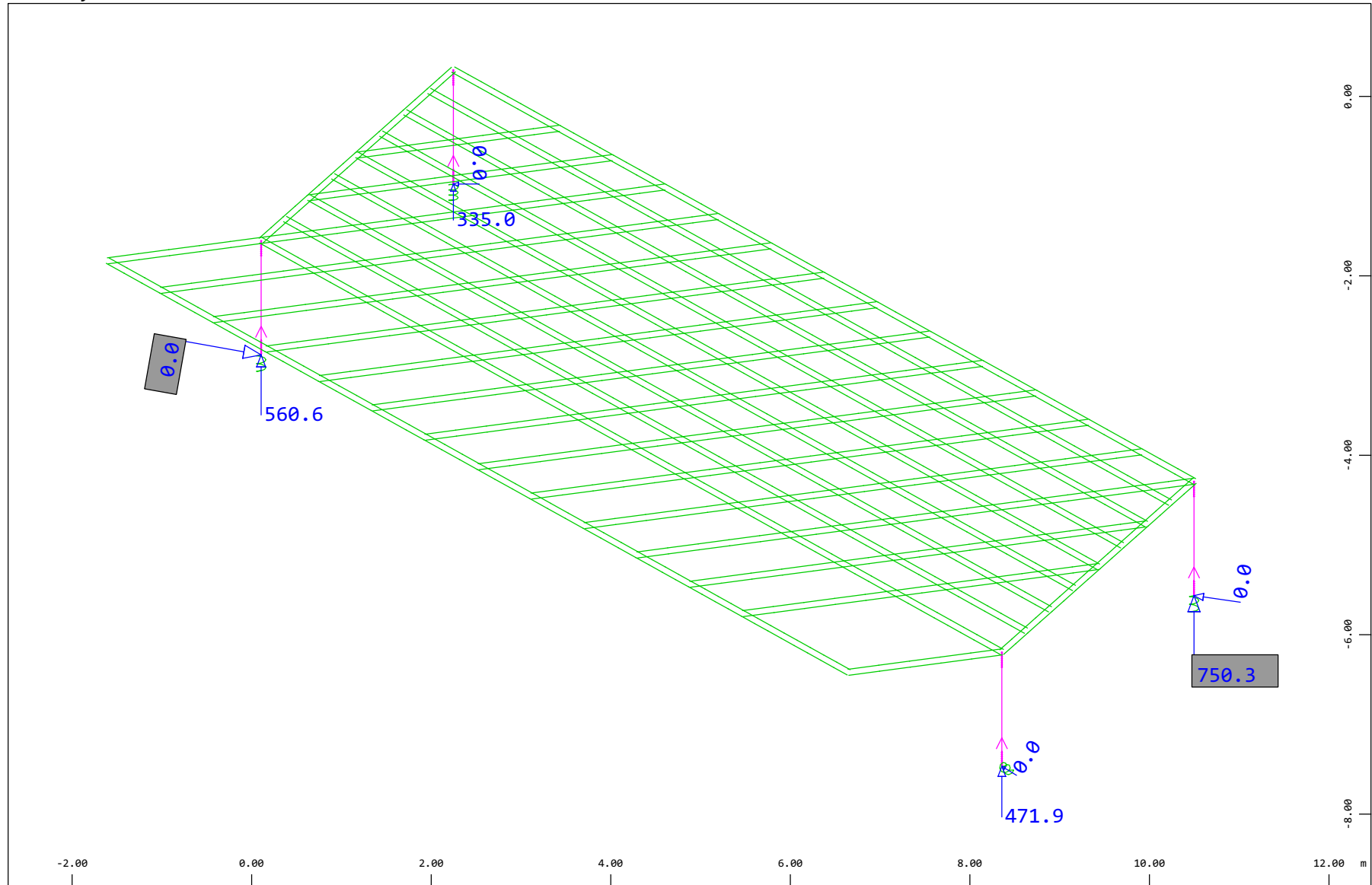
Z
 X Y

Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 116 Qt: LM71-S 17m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=96.9 kN/m, Min=-137.4
 Max=-91.7 ∇), Free area load (force) in global Z (Unit=48.4 kN/m², Min=-44.0 Max=-29.4 ∇)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 484.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.0019 kN

(Max=750.3) (total: 2118.)

(Max=0.0037)

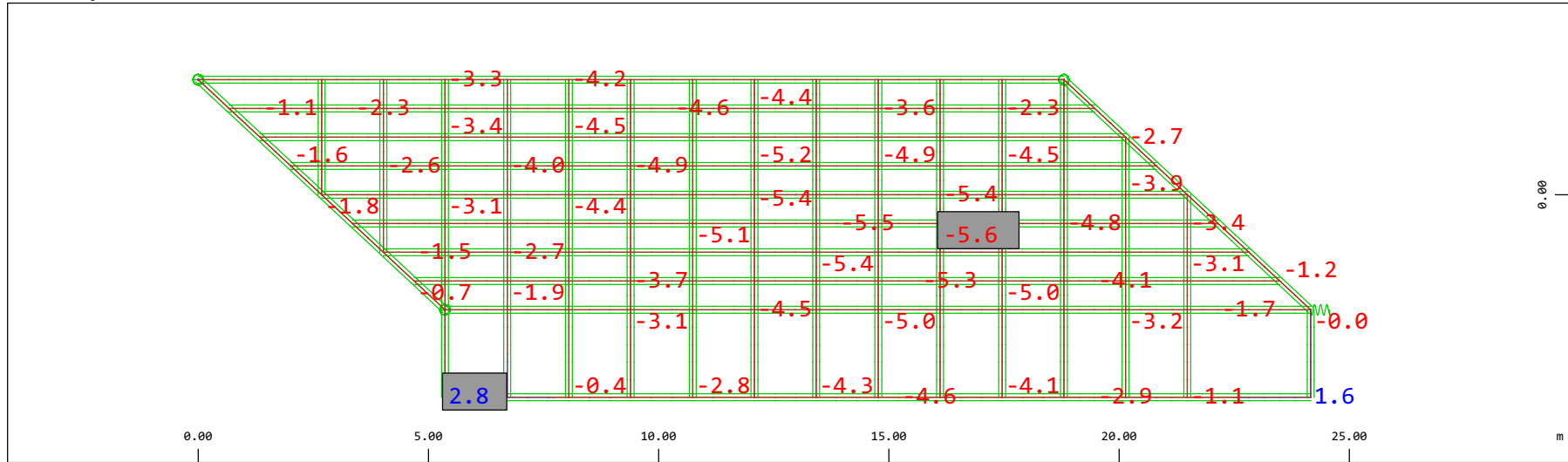
M 1 : 60

X * 0.502

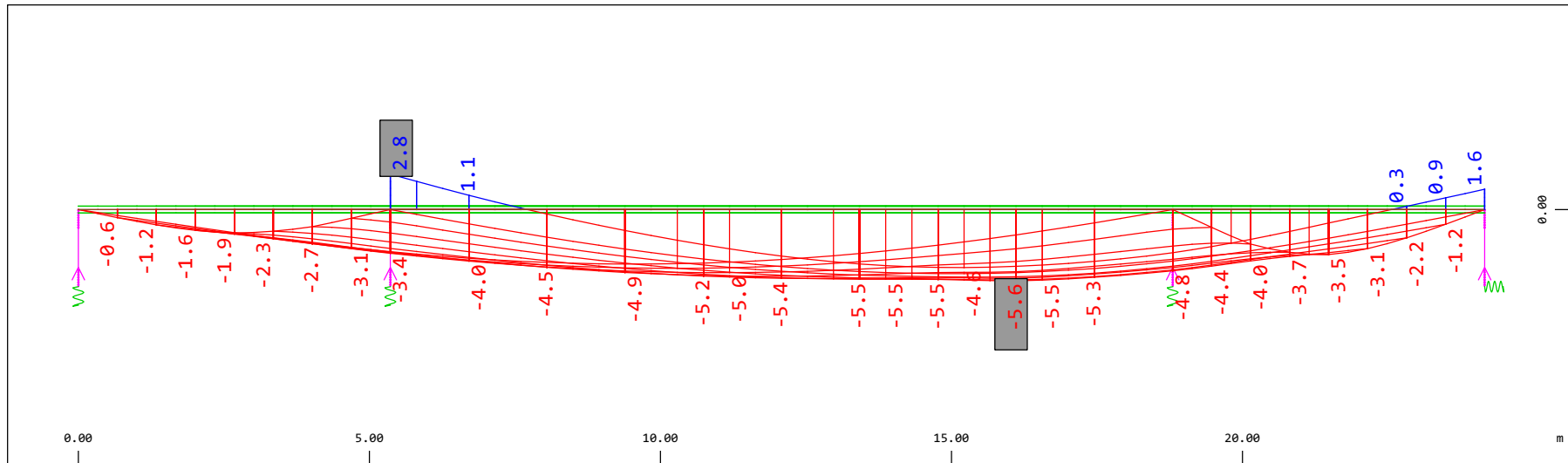
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

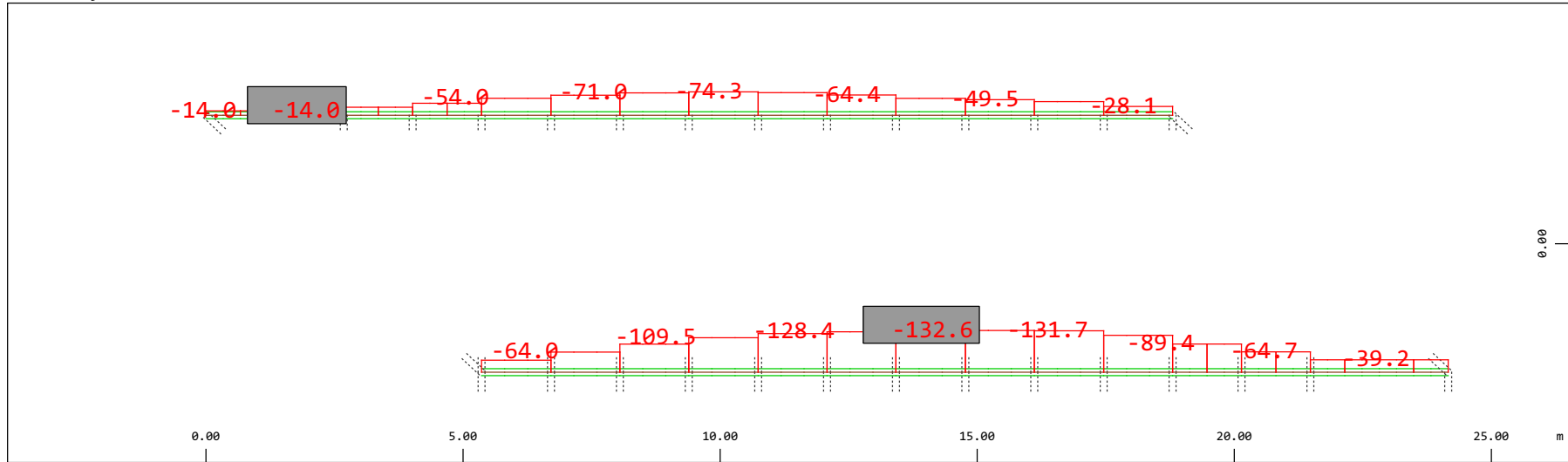


Y Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along ○, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 4.84 mm (Min=-5.59) (Max=2.78) M 1 : 134



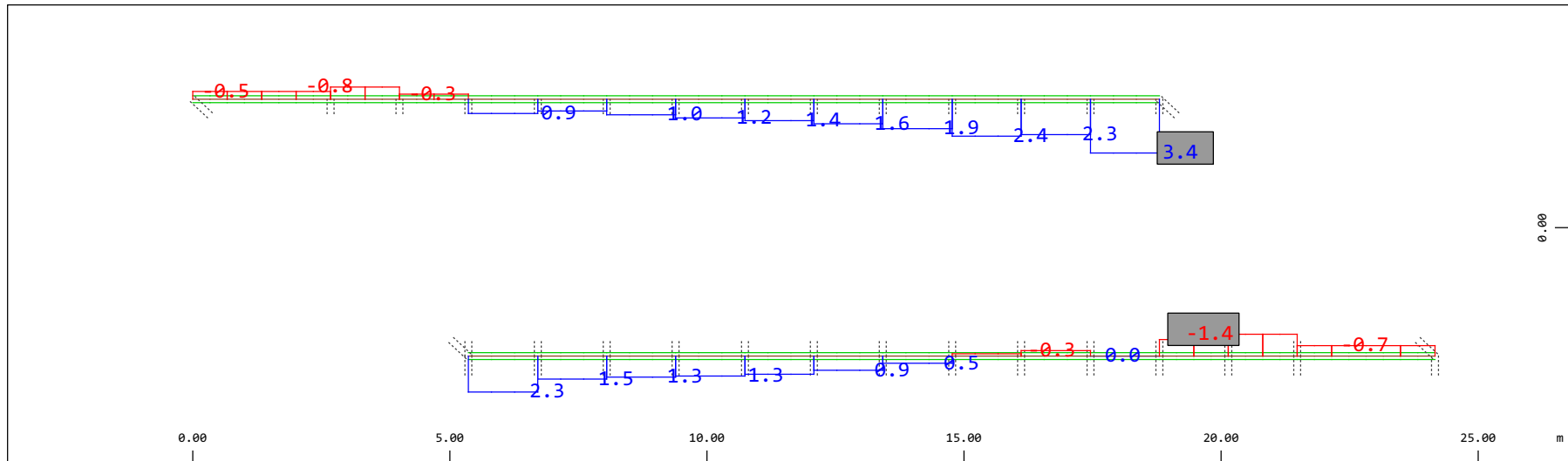
Z Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along ⇕, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 4.84 mm (Min=-5.59) (Max=2.78) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 196.1 kN (Min=-132.6) (Max=-14.0)

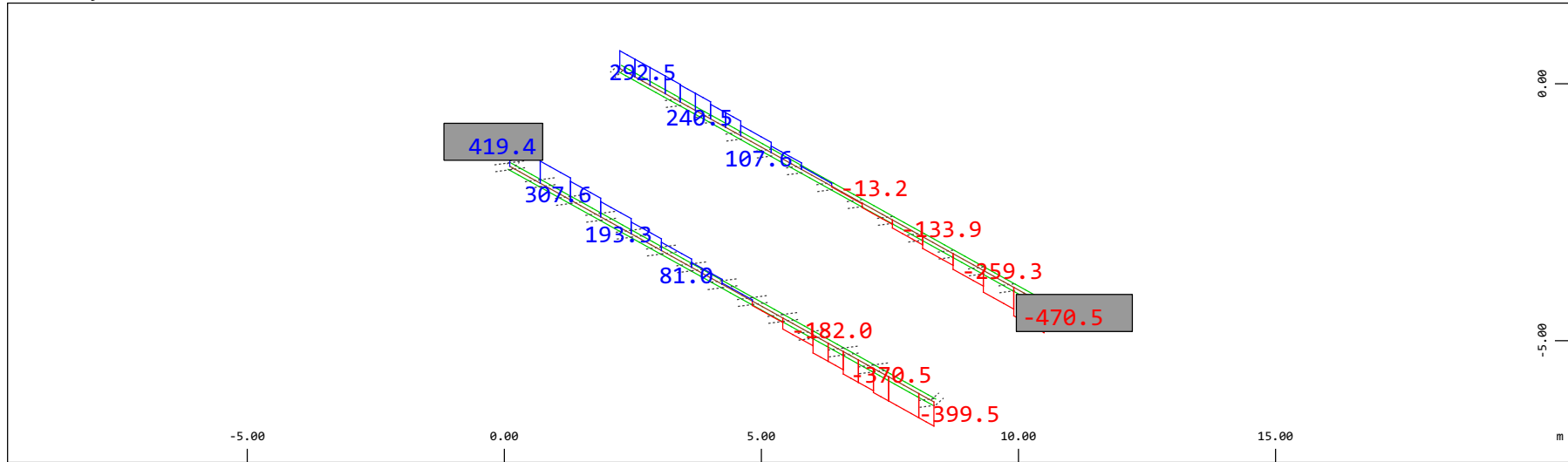
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 3.92 kNm (Min=-1.39) (Max=3.42)

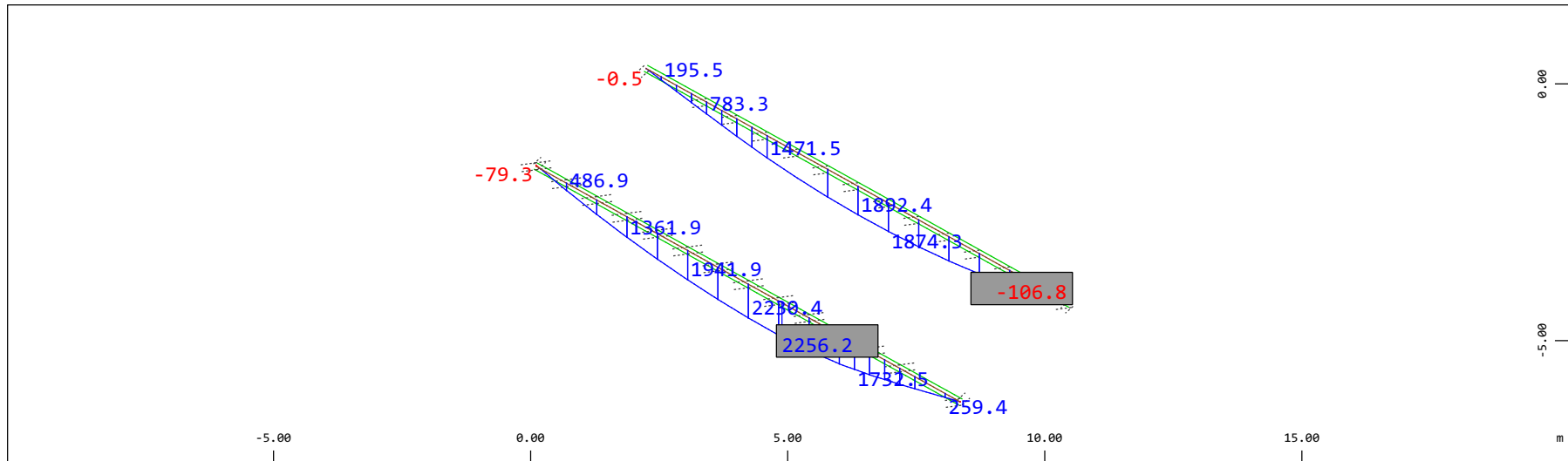
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 980.5 kN (Min=-470.5) (Max=419.4)

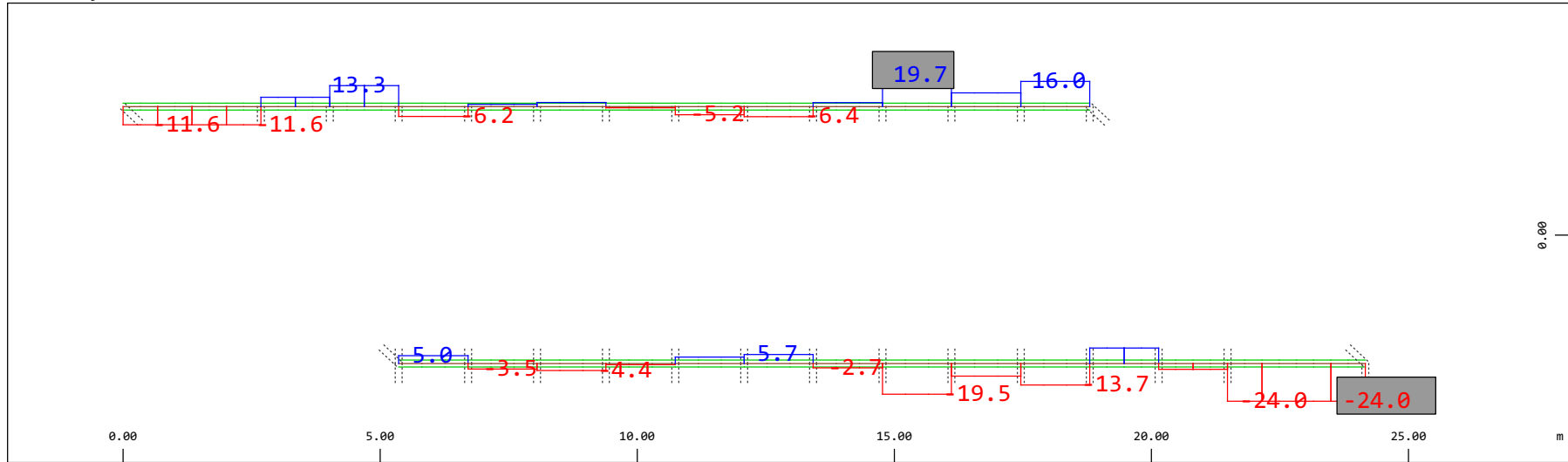
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 3922. kNm (Min=-106.8) (Max=2256.)

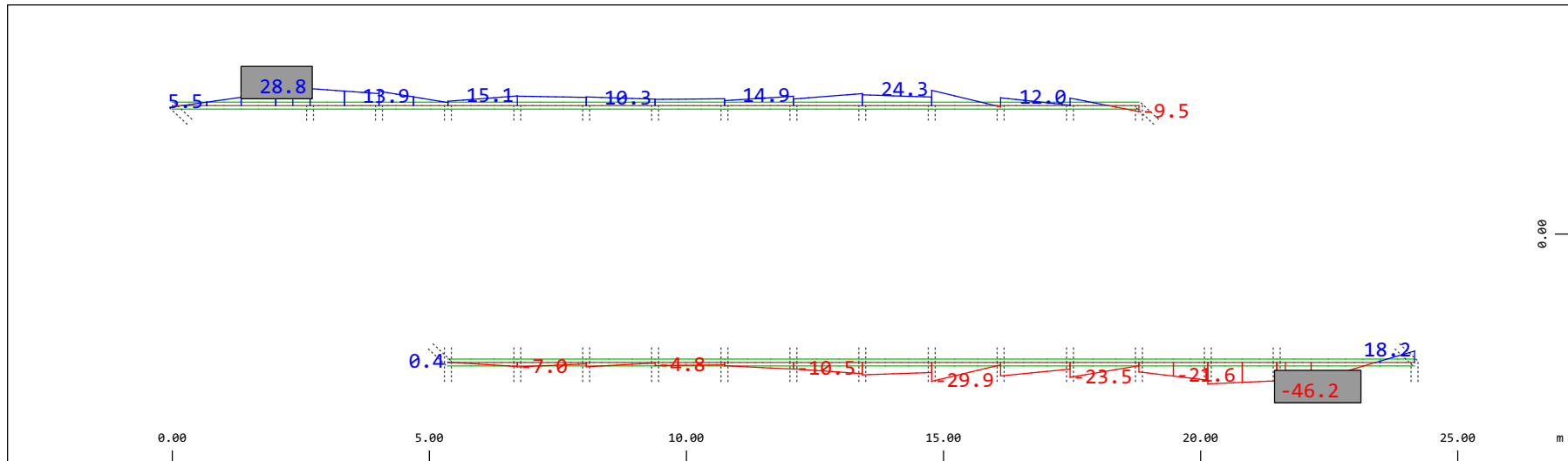
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Shear force Vy, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kN (Min=-24.0) (Max=19.7)

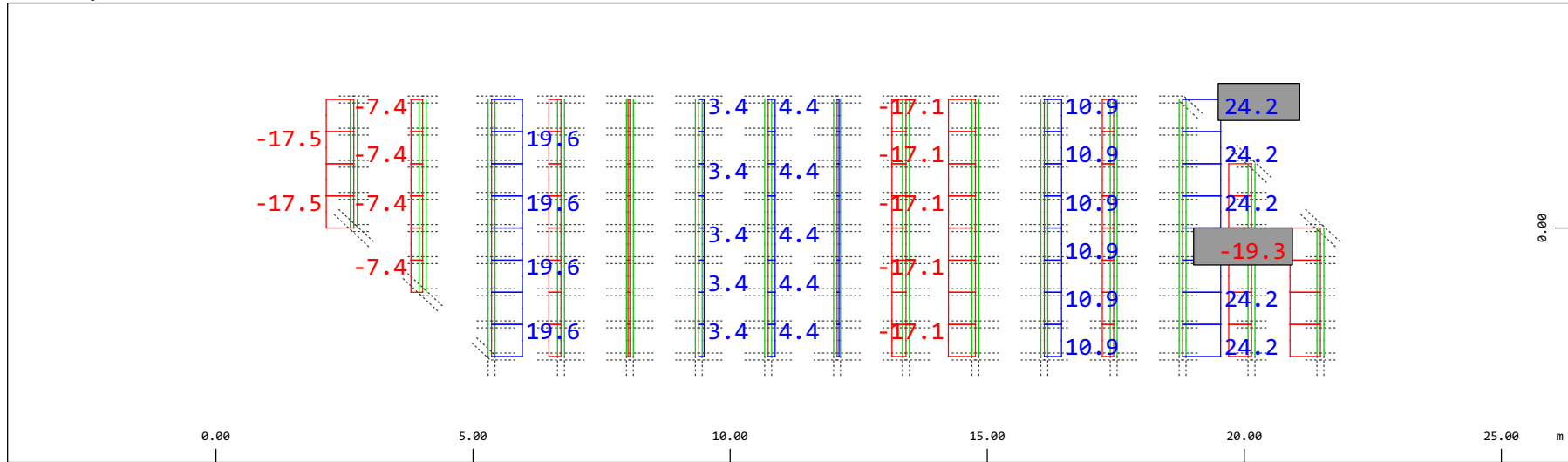
M 1 : 120



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Bending moment Mz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 98.0 kNm (Min=-46.2) (Max=28.8)

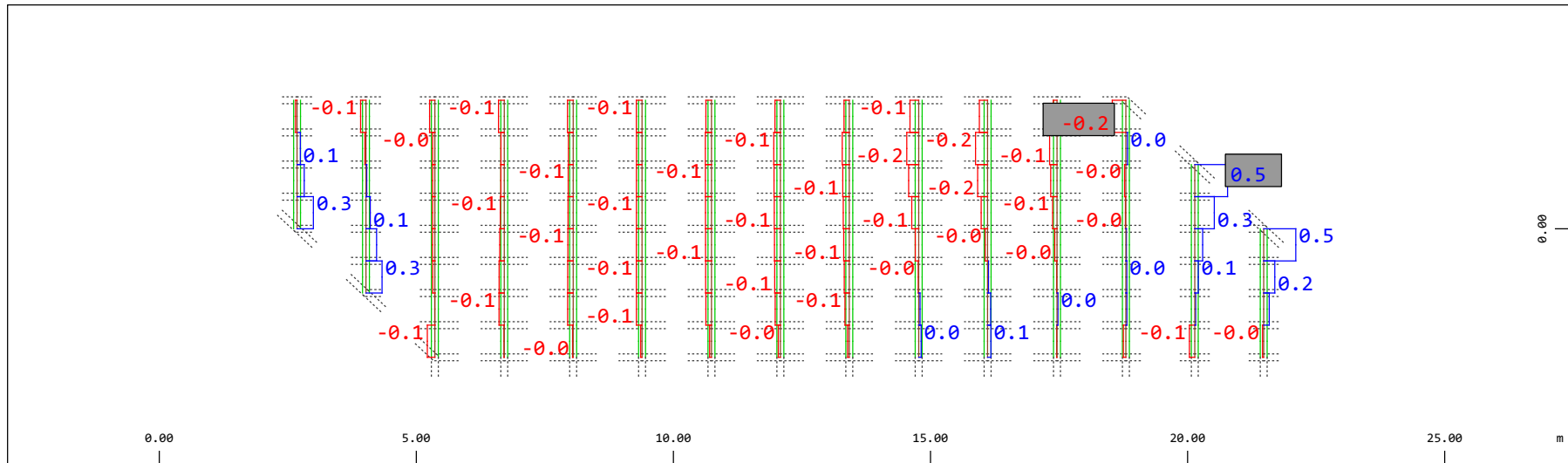
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kN (Min=-19.3) (Max=24.2)

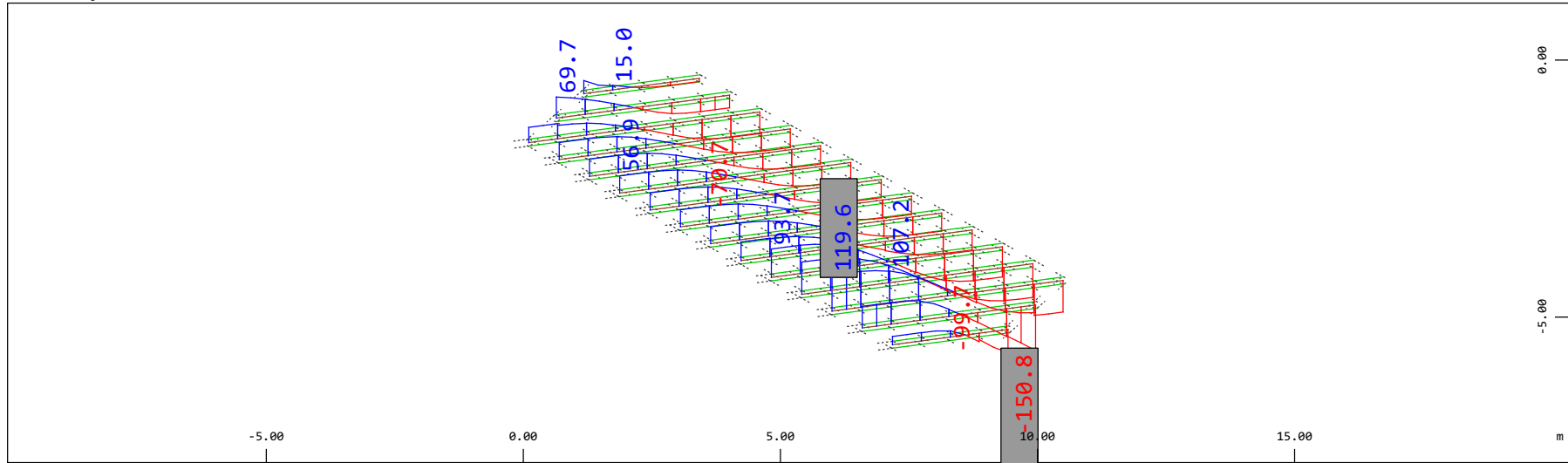
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.980 kNm (Min=-0.217) (Max=0.520)

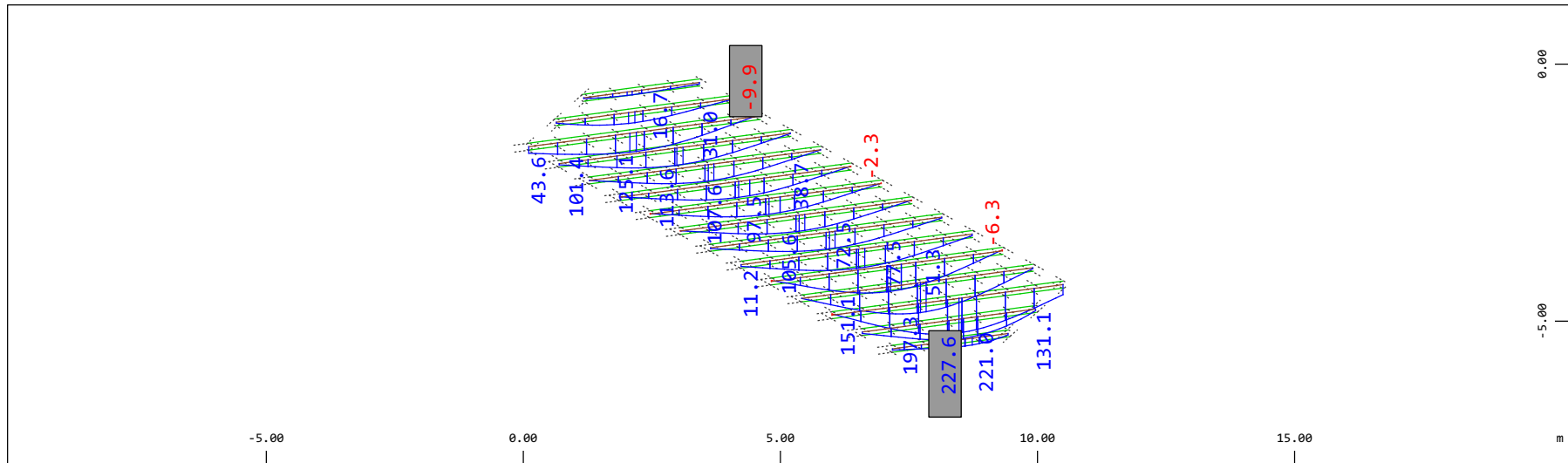
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 196.1 kN (Min=-150.8) (Max=119.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

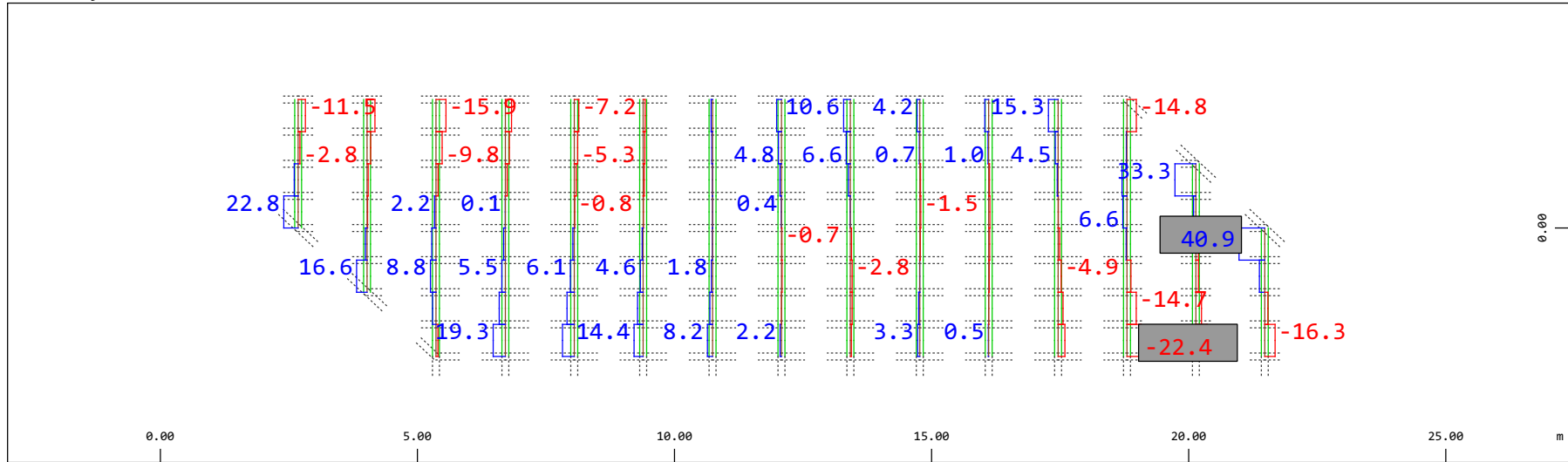


Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 392.2 kNm (Min=-9.88) (Max=227.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

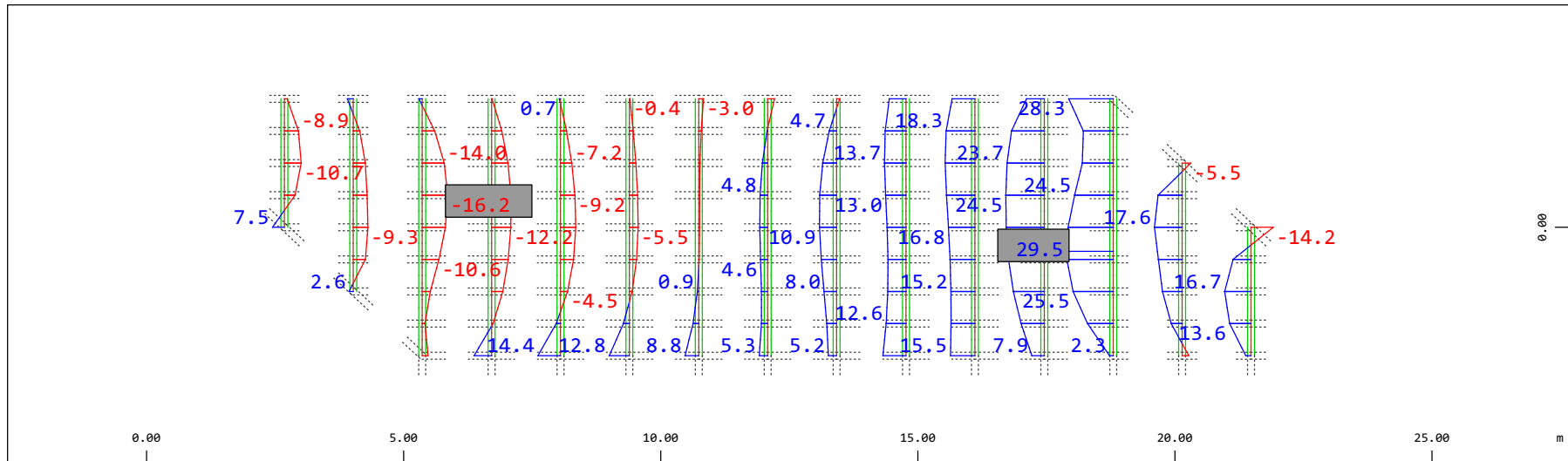
Definition of Axis

Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 98.0 kN (Min=-22.4) (Max=40.9)

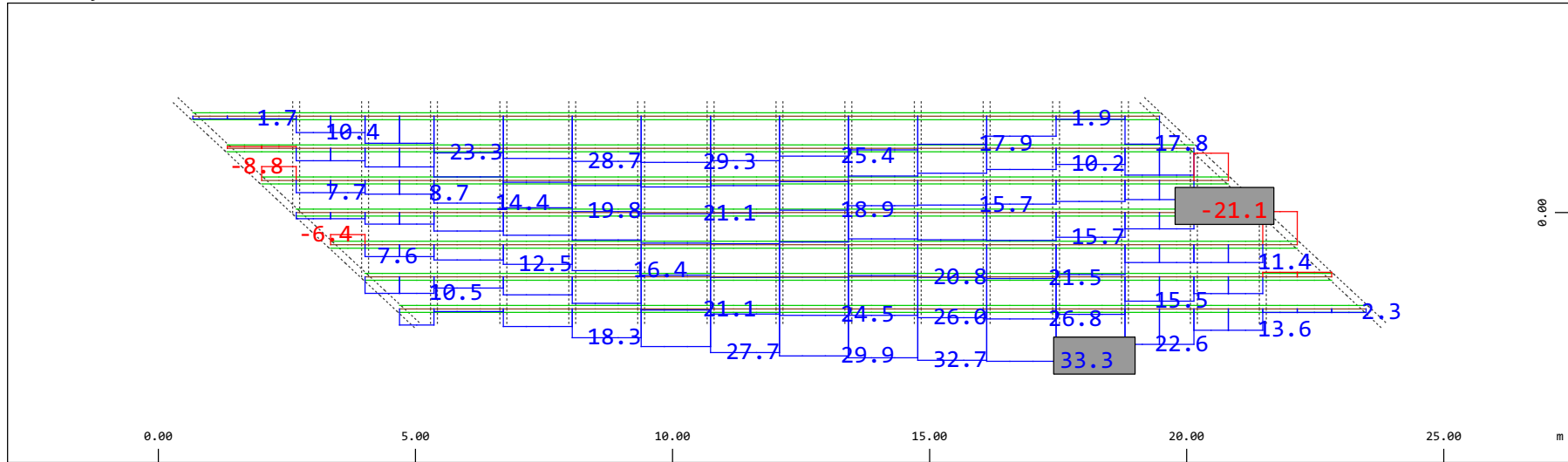
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kNm (Min=-16.2) (Max=29.5)

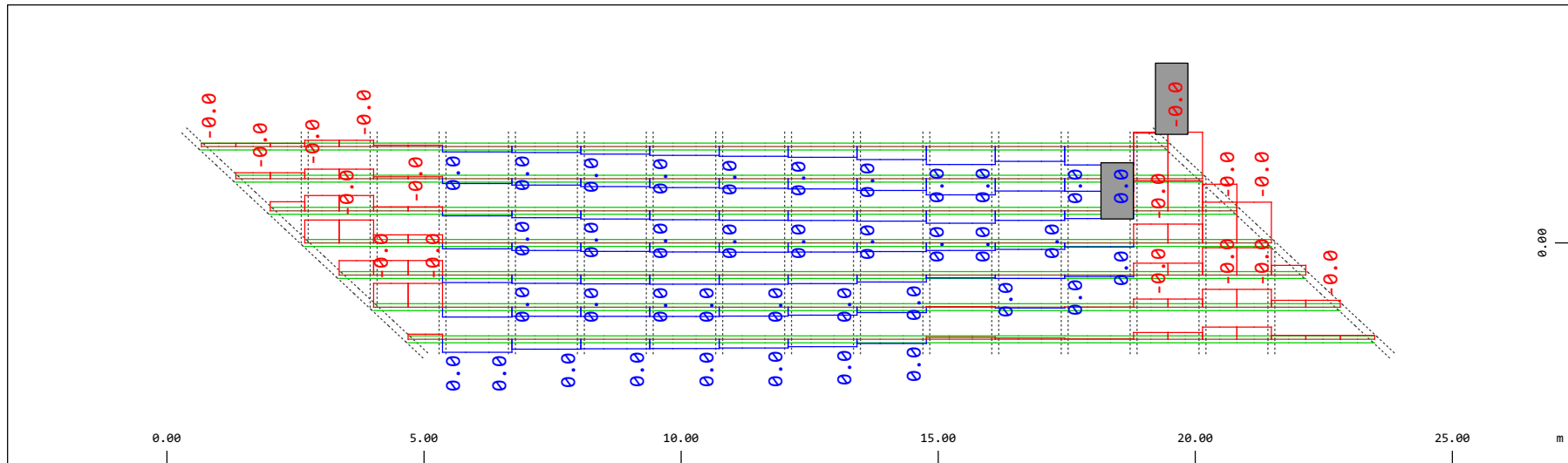
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force N_x , Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kN (Min=-21.1) (Max=33.3)

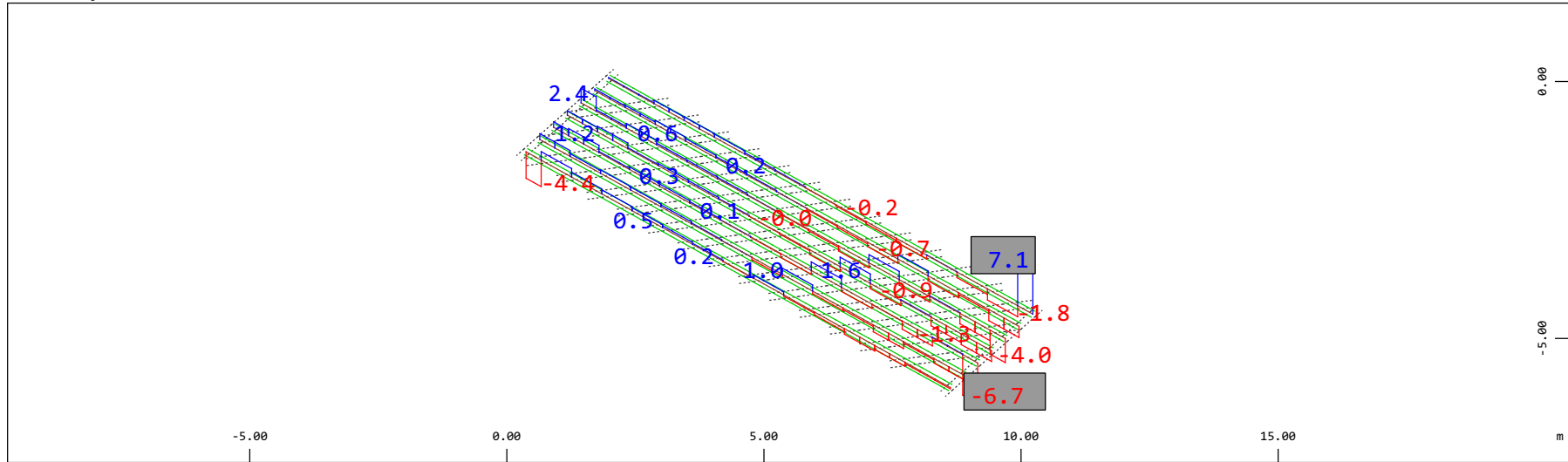
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment M_t , Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.0098 kNm (Min=-0.0074) (Max=0.0029)

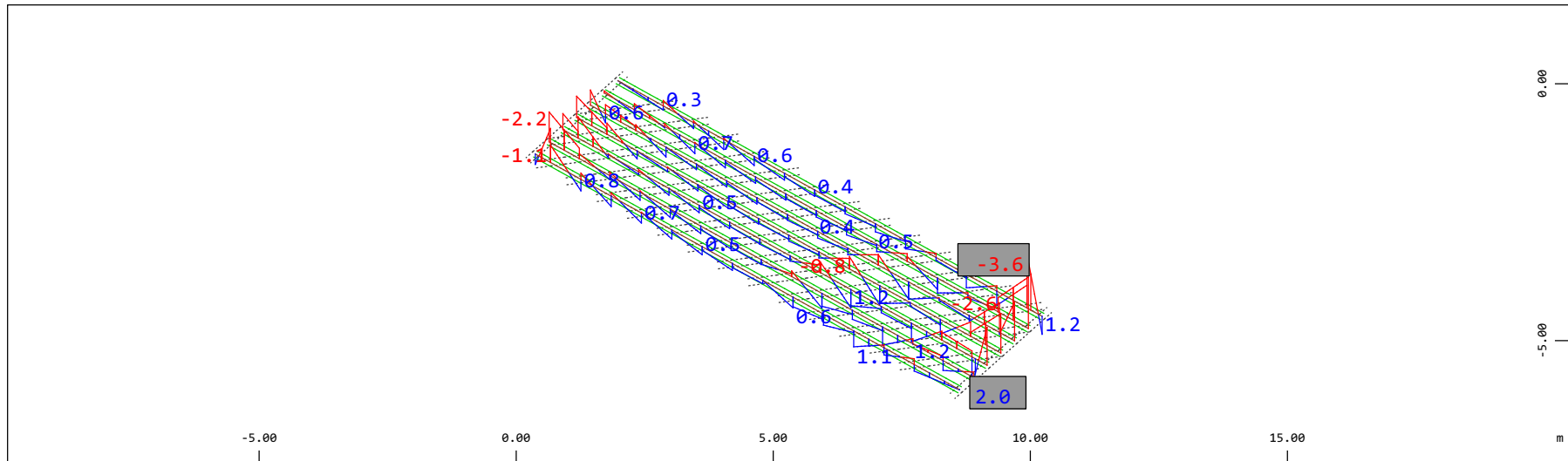
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 9.80 kN (Min=-6.69) (Max=7.09)

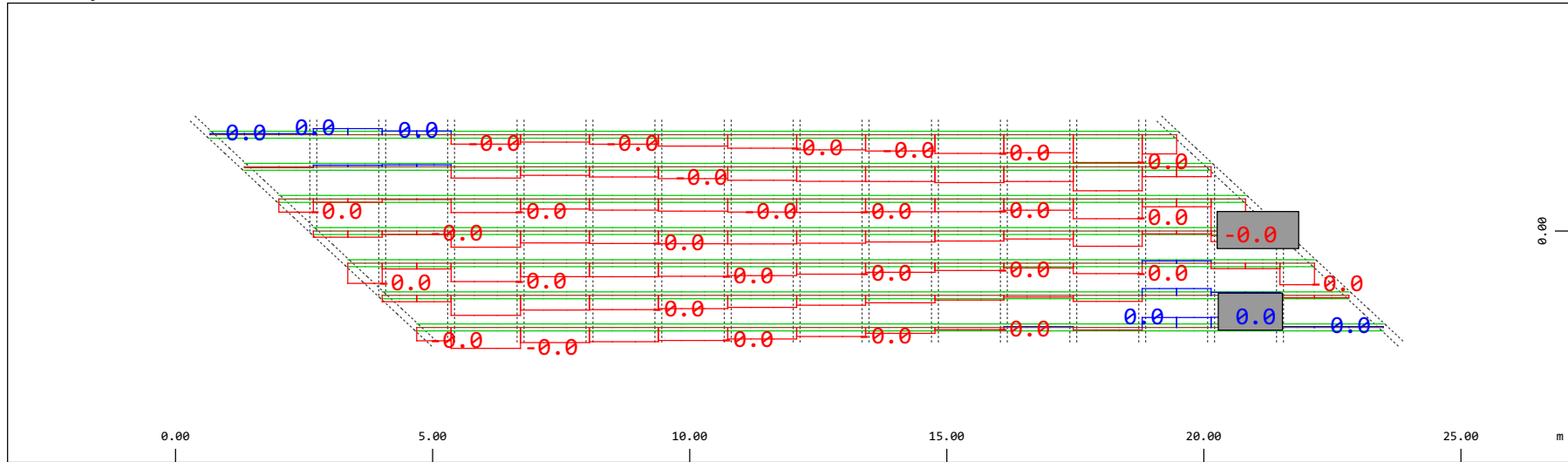
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 3.92 kNm (Min=-3.57) (Max=1.98)

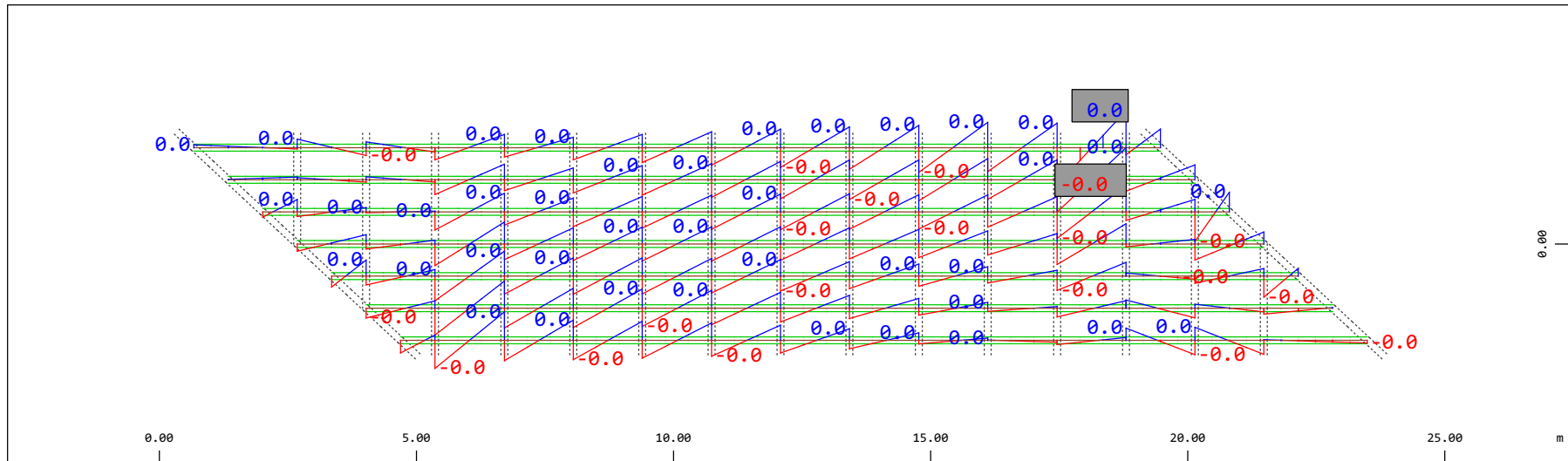
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.0196 kN (Min=-0.0117) (Max=0.0032)

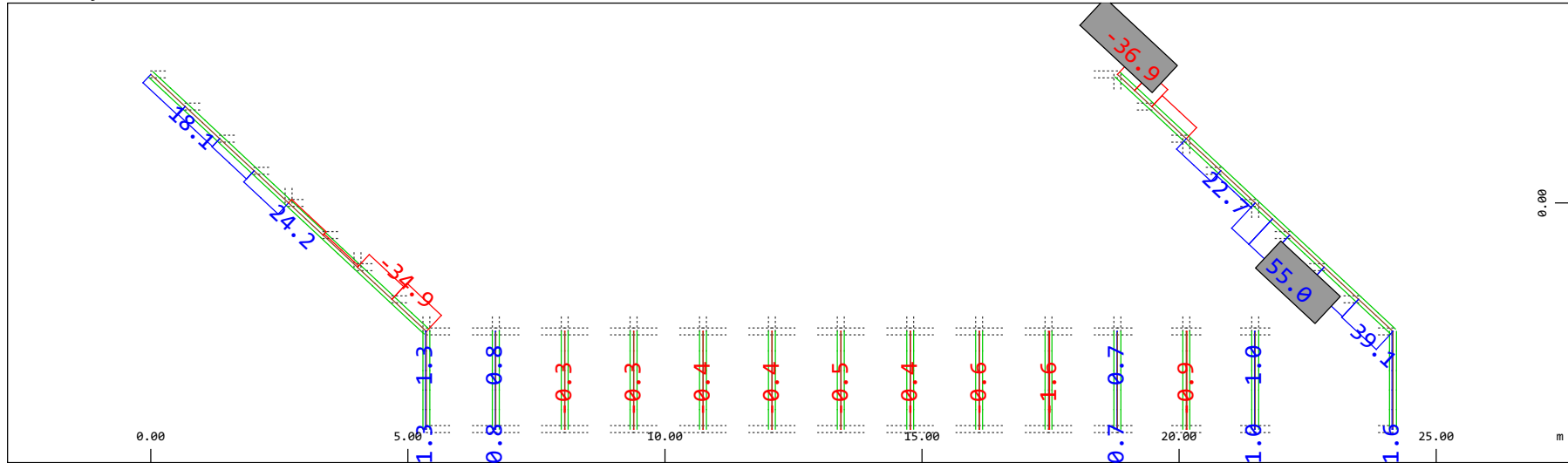
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.0098 kNm (Min=-0.0060) (Max=0.0059)

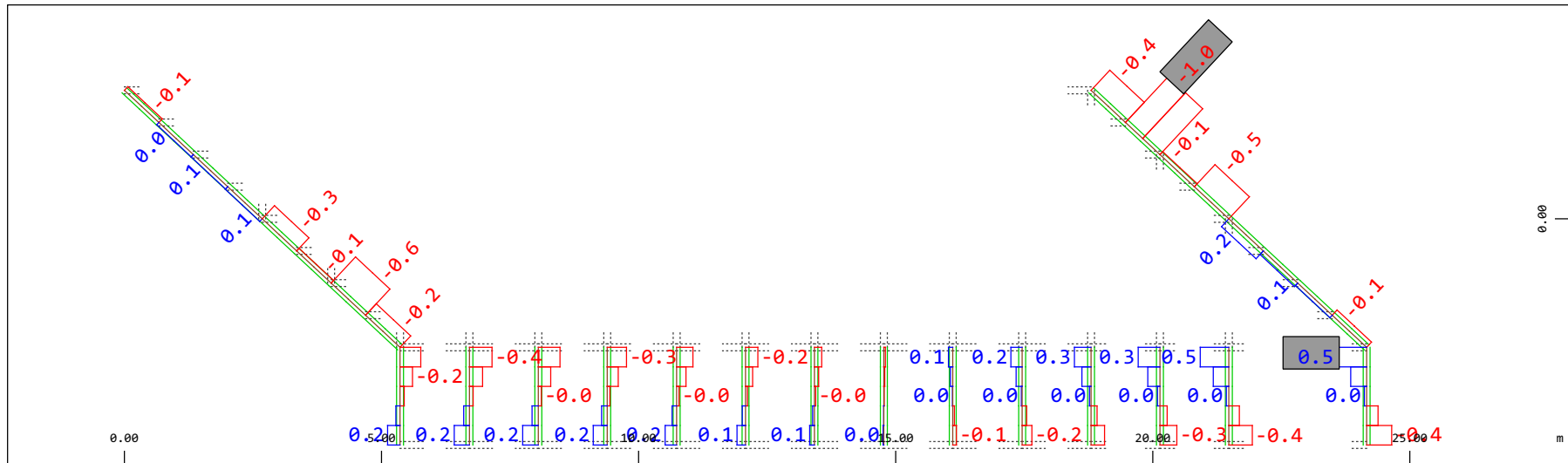
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 98.0 kN (Min=-36.9) (Max=55.0)

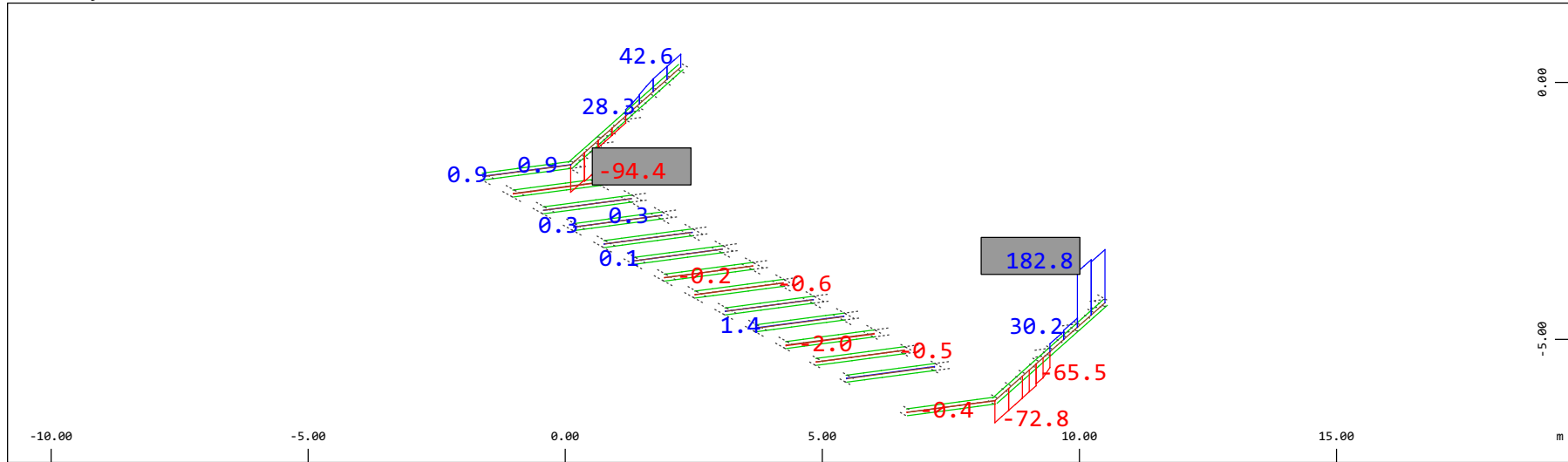
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.980 kNm (Min=-0.996) (Max=0.470)

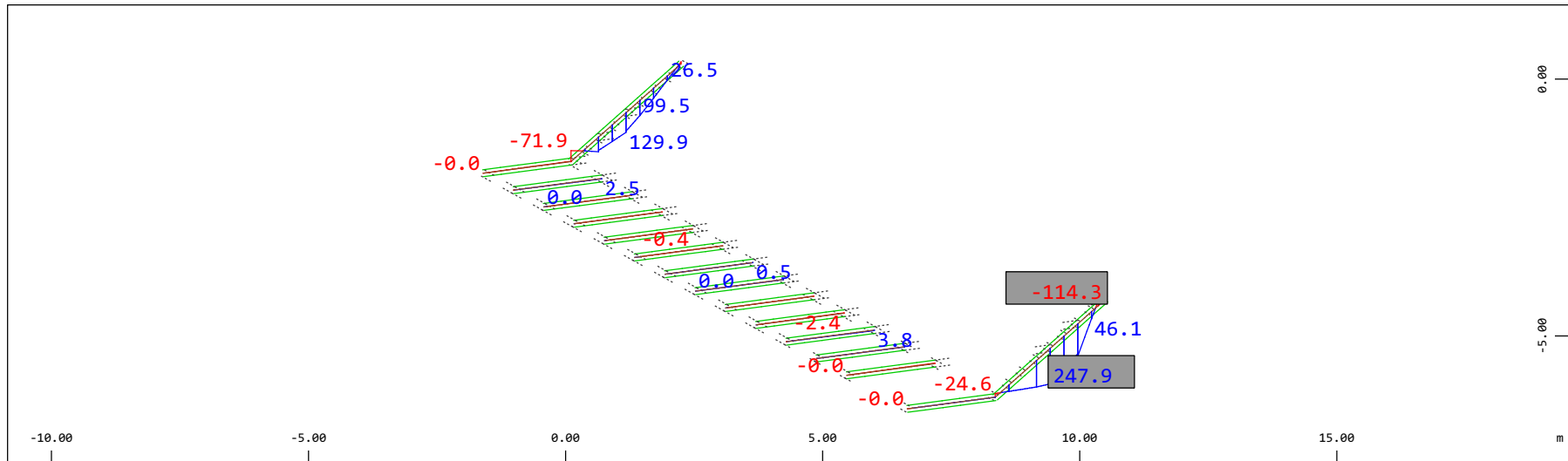
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 196.1 kN (Min=-94.4) (Max=182.8)

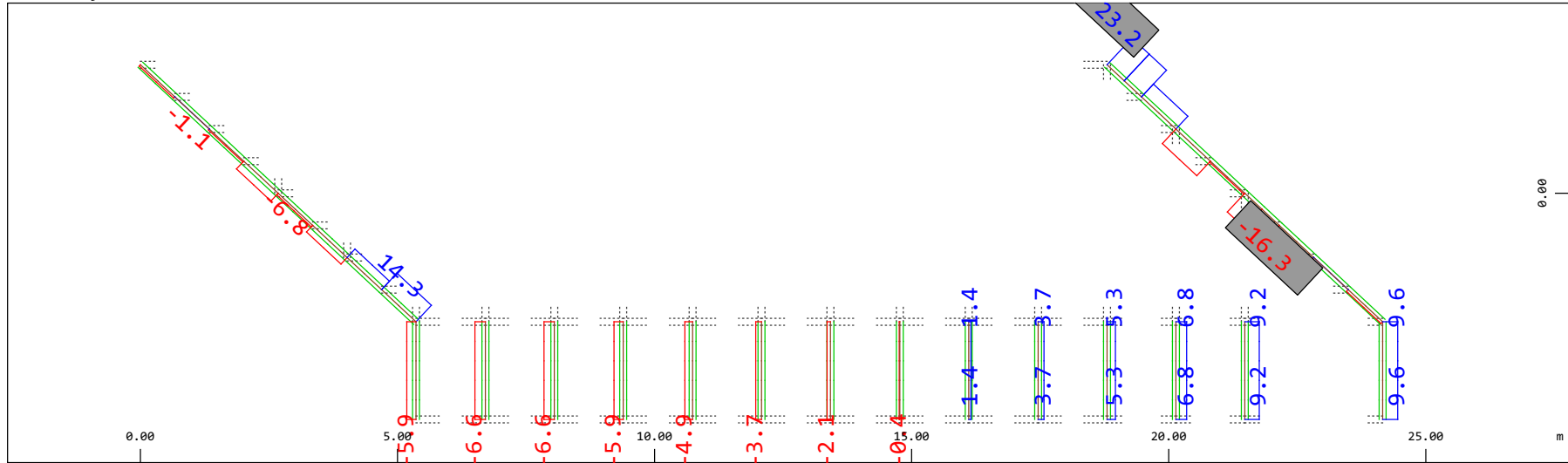
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 392.2 kNm (Min=-114.3) (Max=247.9)

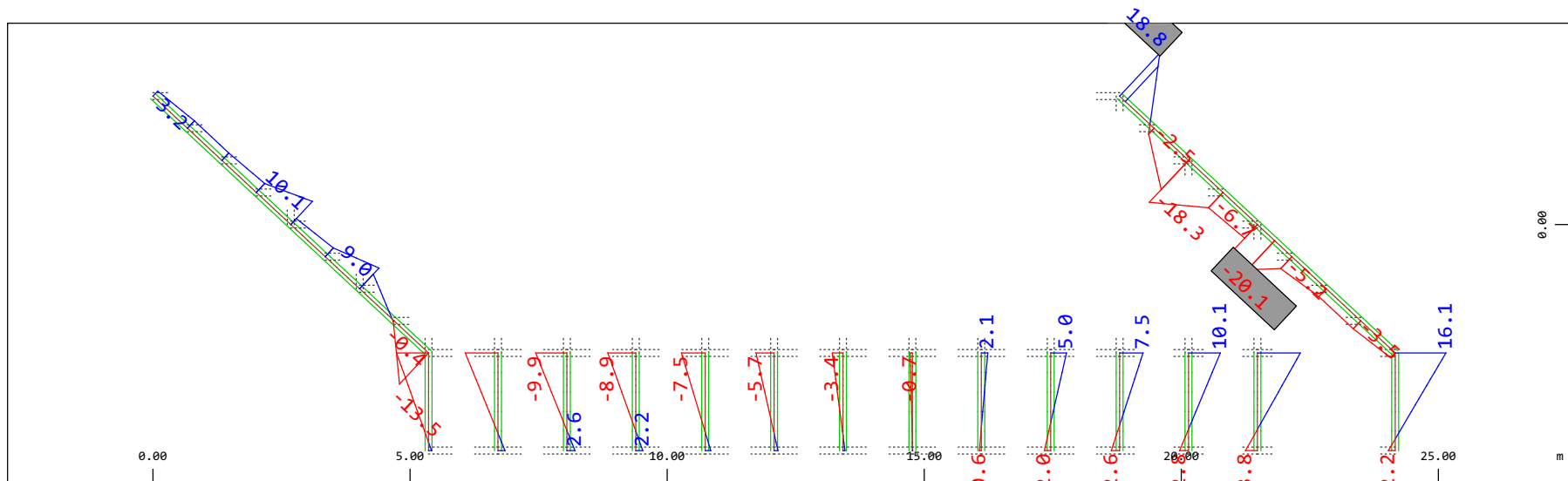
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kN (Min=-16.3) (Max=23.2)

M 1 : 120

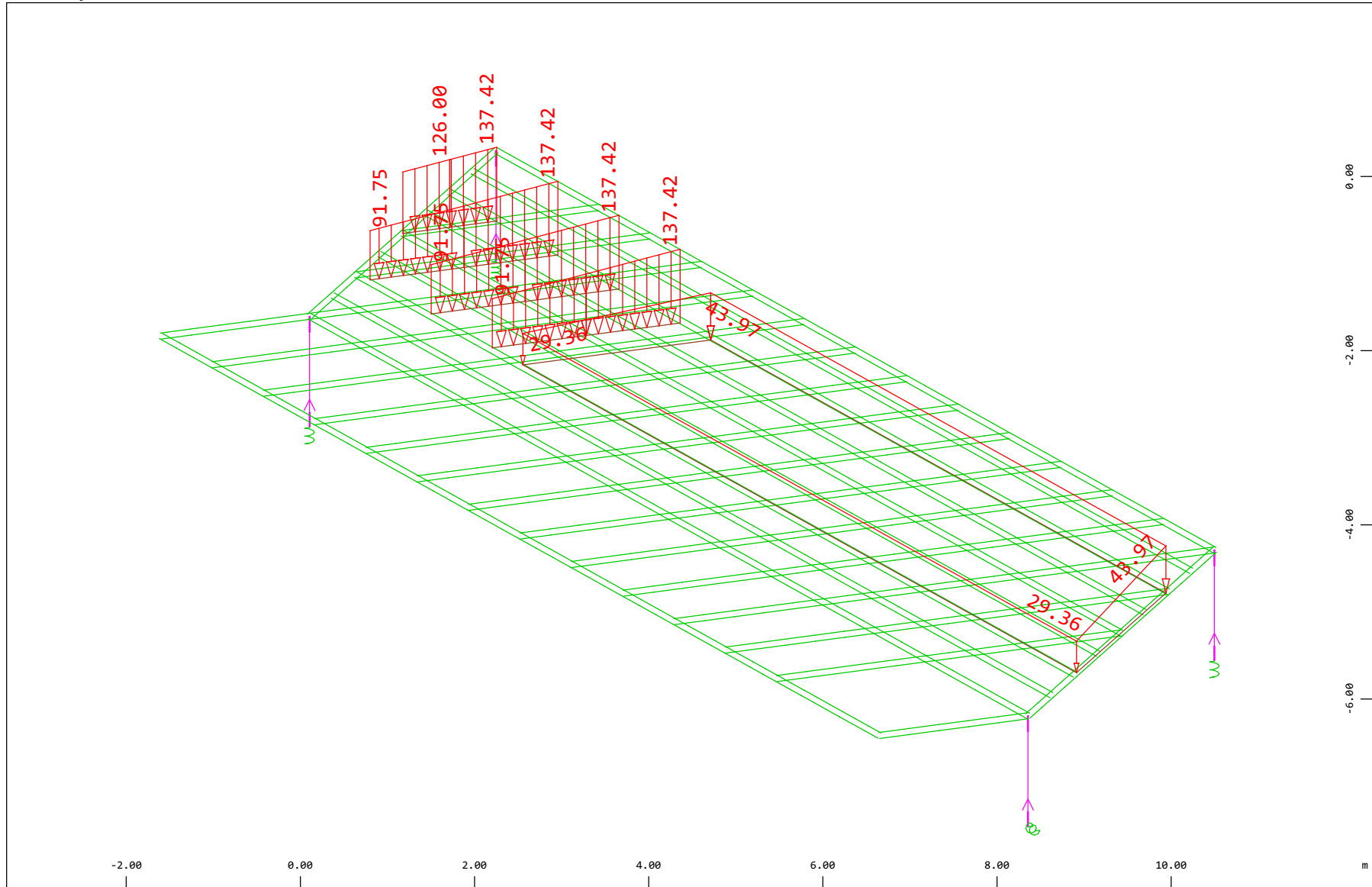


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 19.6 kNm (Min=-20.1) (Max=18.8)

M 1 : 120

Definition of Axis
 Results elementay loads

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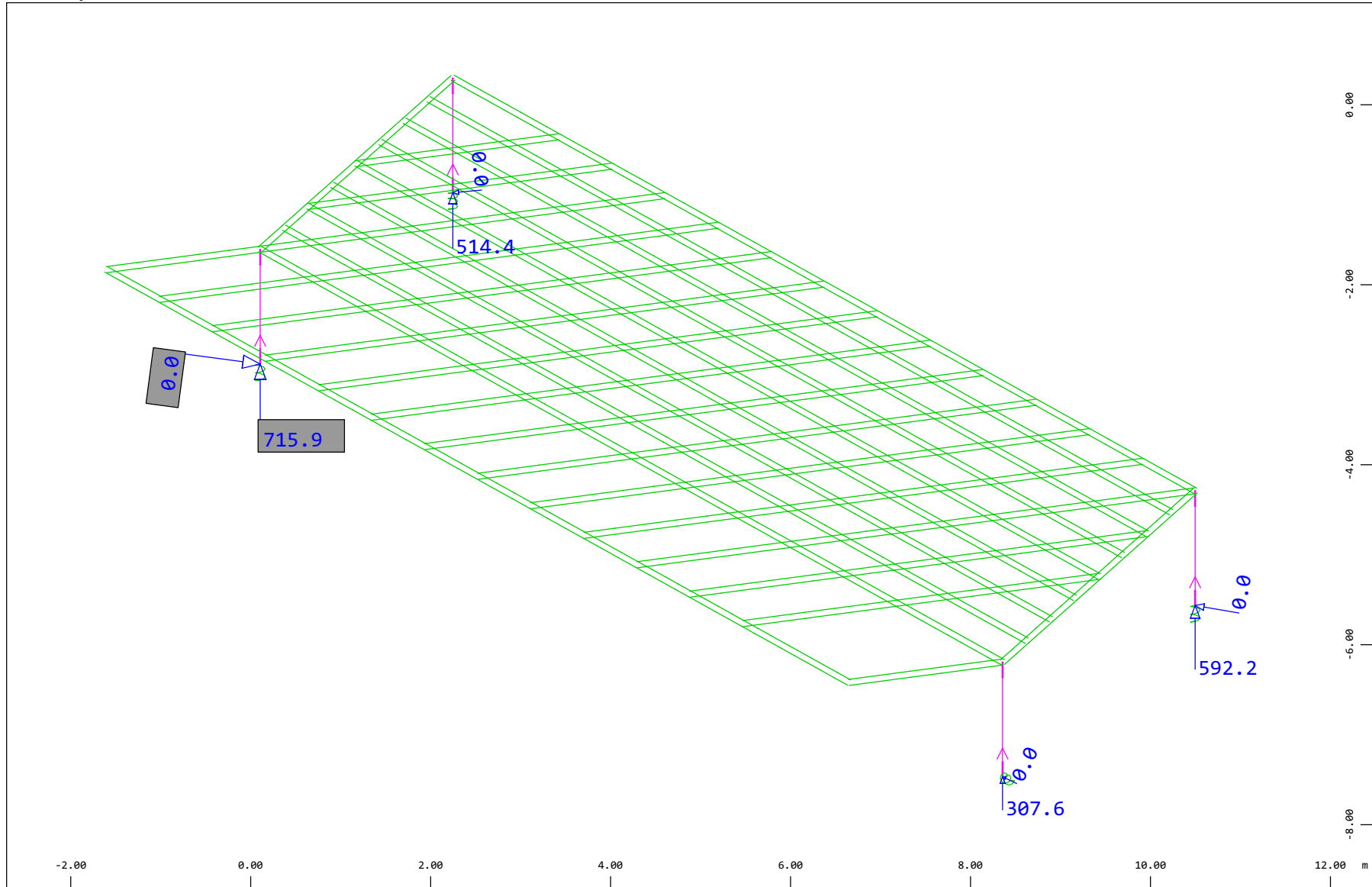


Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 100 Qt: LM71-S 3m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=96.9 kN/m, Min=-137.4
 Max=-91.7 ∇), Free area load (force) in global Z (Unit=48.4 kN/m², Min=-44.0 Max=-29.4 ∇)

M 1 : 62
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 484.4 kN

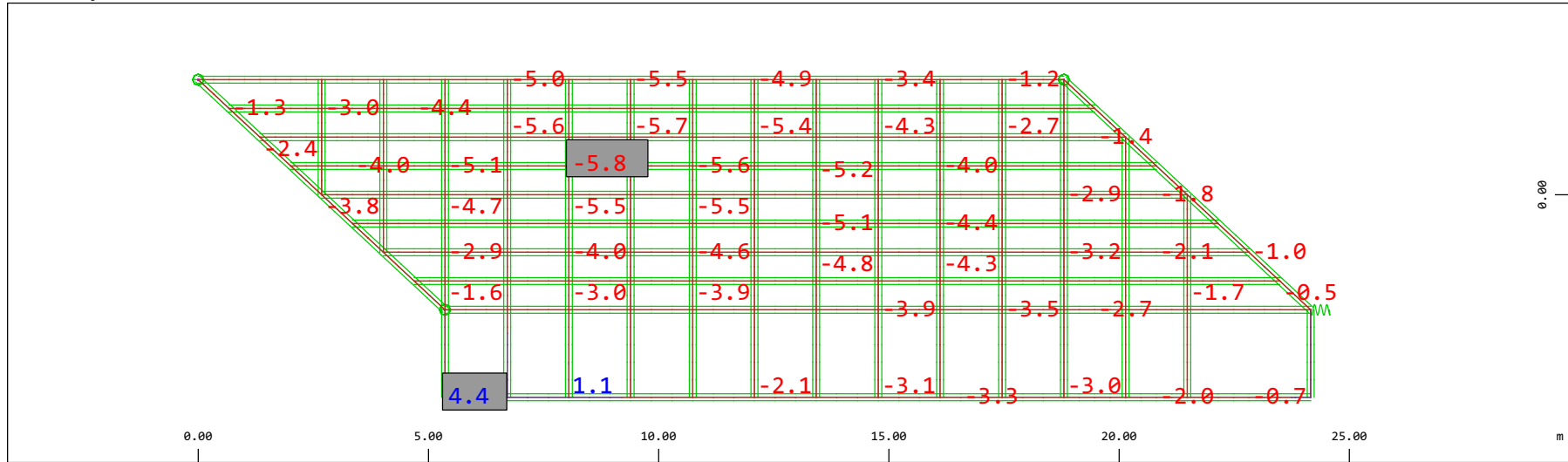
Nodes , Support force vector in the global XY plane, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.0019 kN

▬ (Max=715.9) (total: 2130.)

▬ (Max=0.0034)

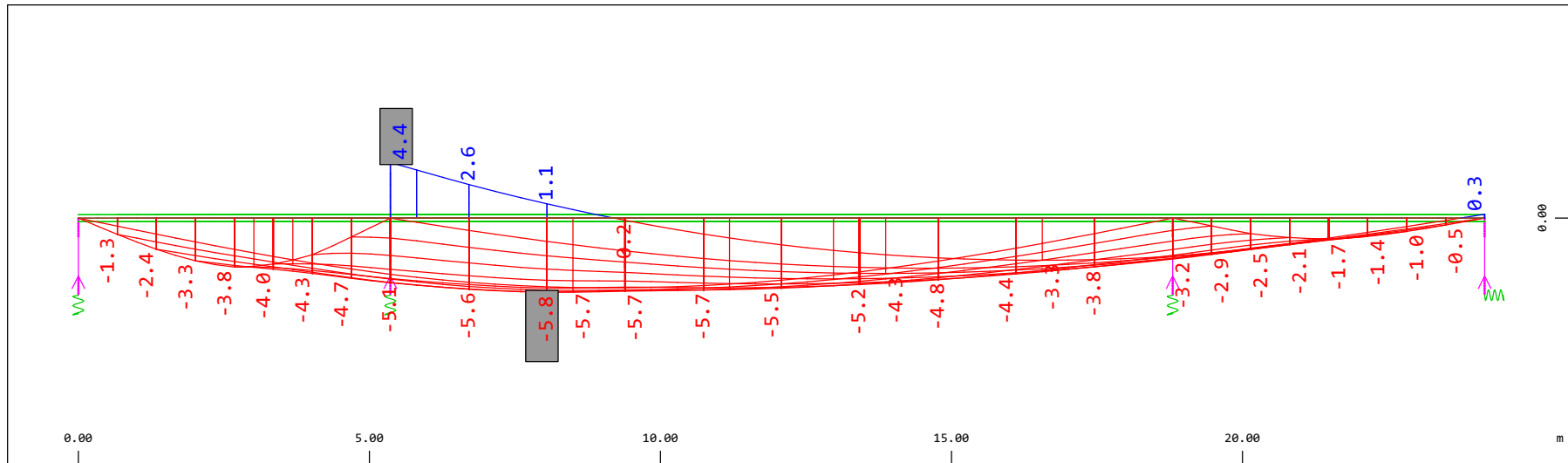
M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \bigcirc , Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 4.84 mm (Min=-5.84) (Max=4.37)

M 1 : 134

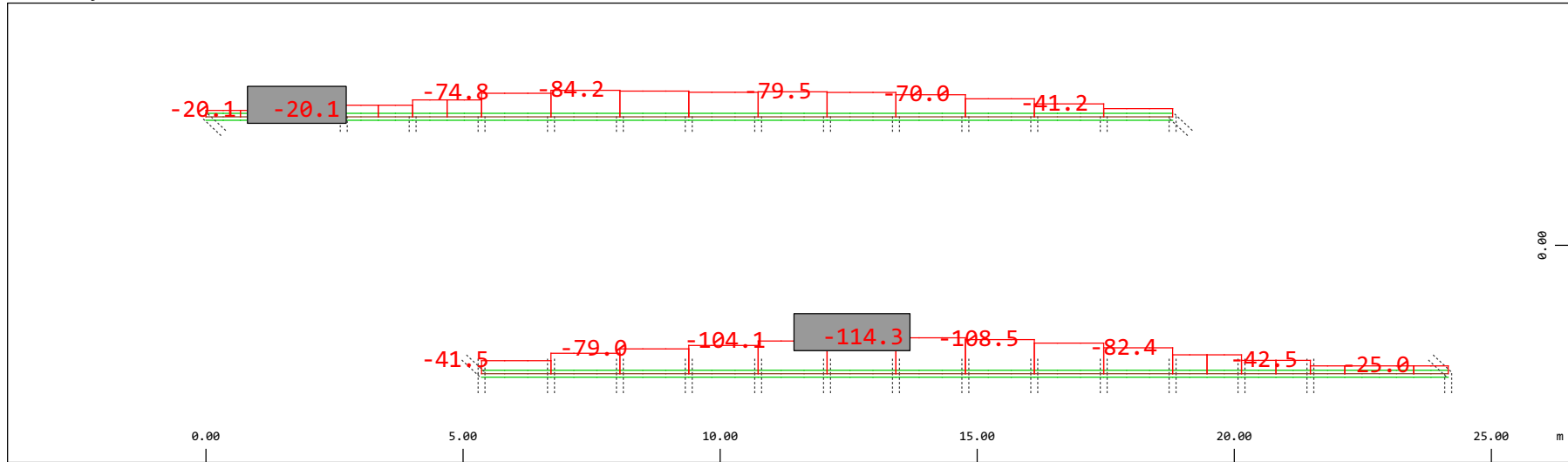


Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 4.84 mm (Min=-5.84) (Max=4.37)

M 1 : 106

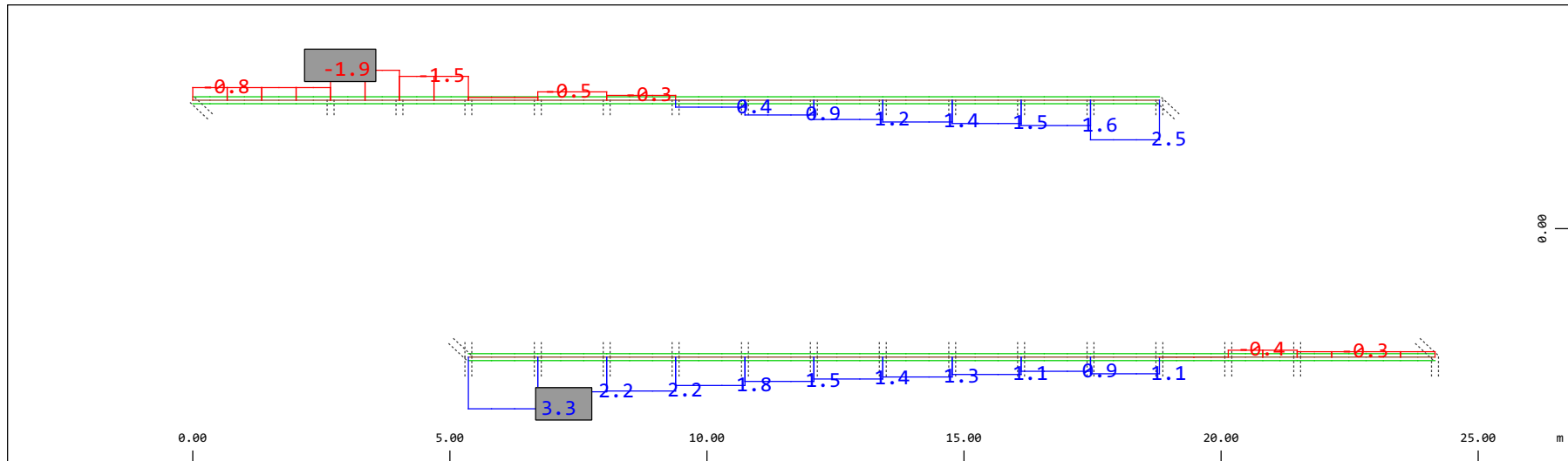
Definition of Axis

Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 196.1 kN (Min=-114.3) (Max=-20.1)

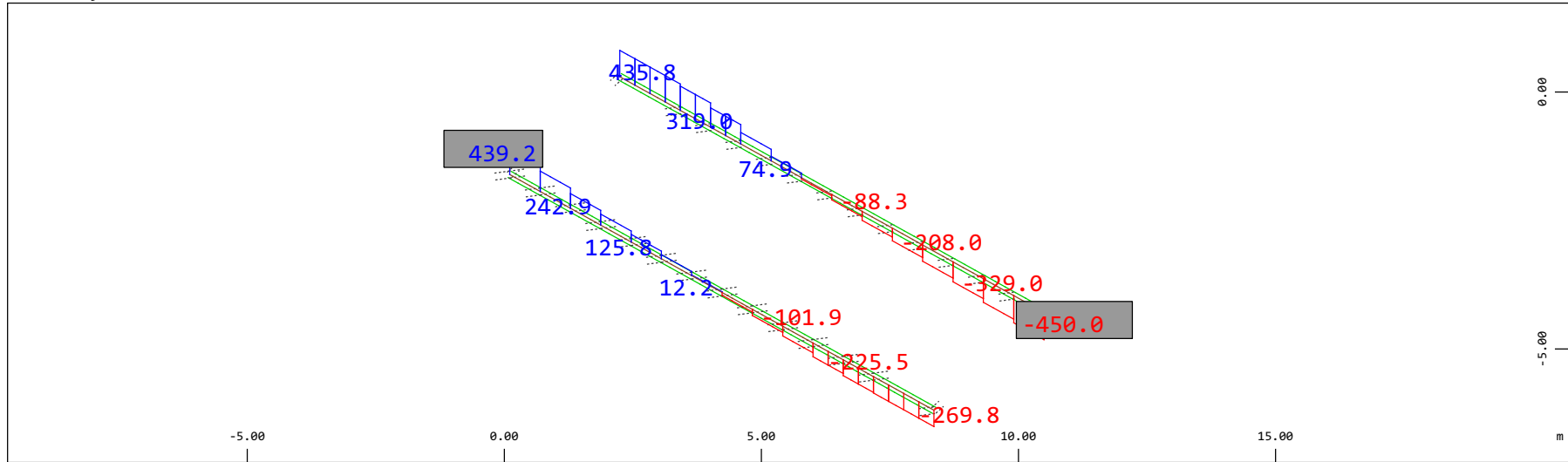
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 3.92 kNm (Min=-1.91) (Max=3.29)

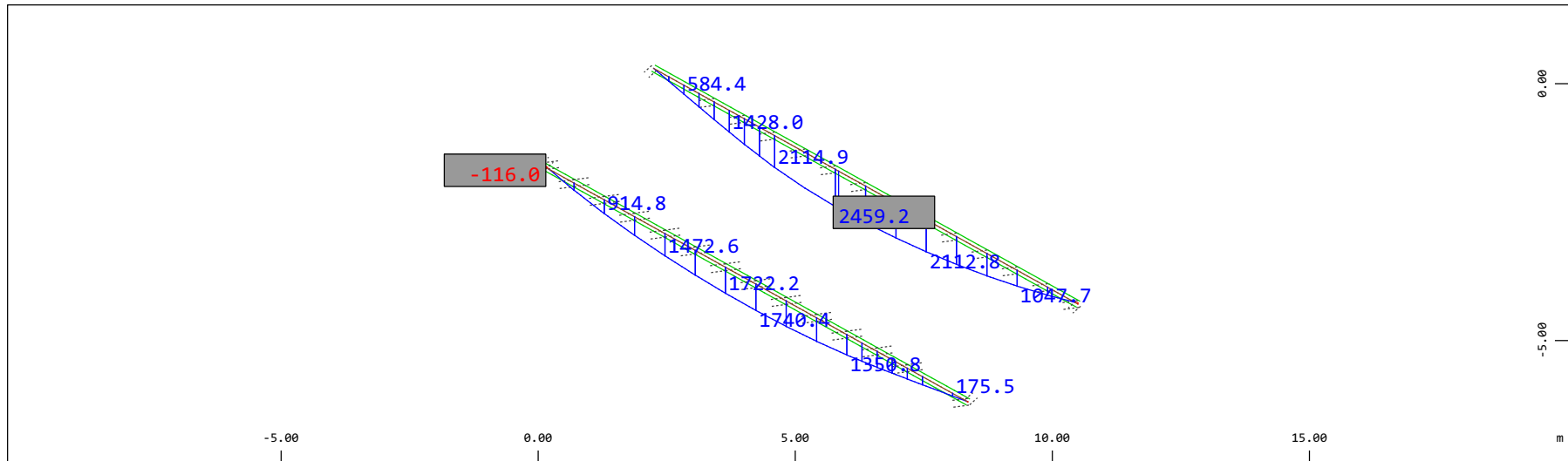
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 980.5 kN (Min=-450.0) (Max=439.2)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

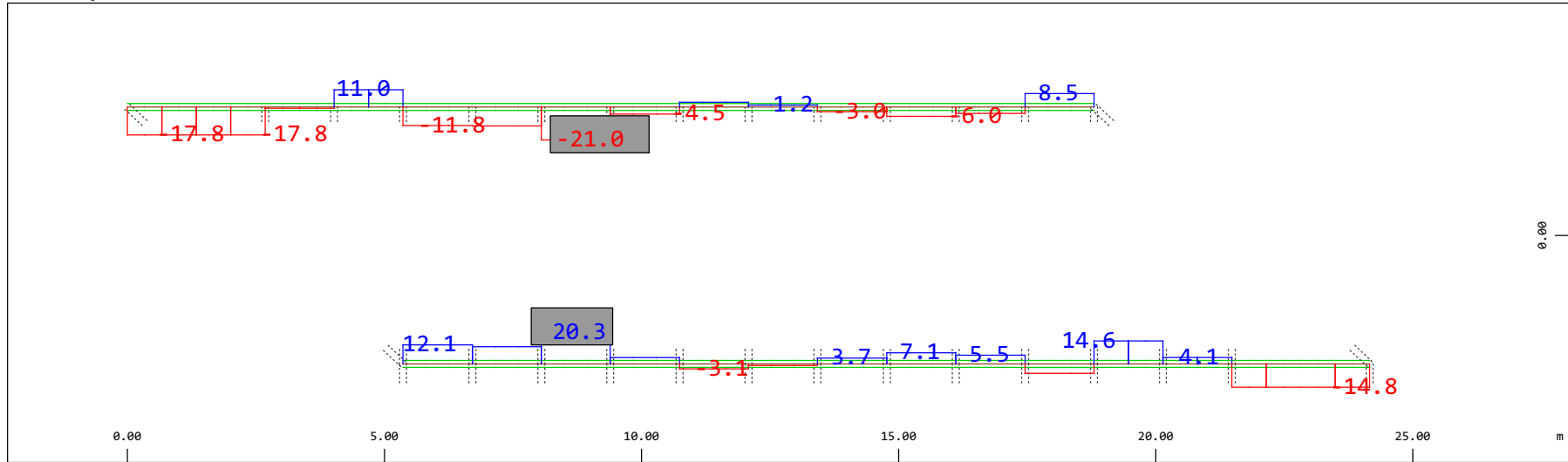


Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 3922. kNm (Min=-116.0) (Max=2459.)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

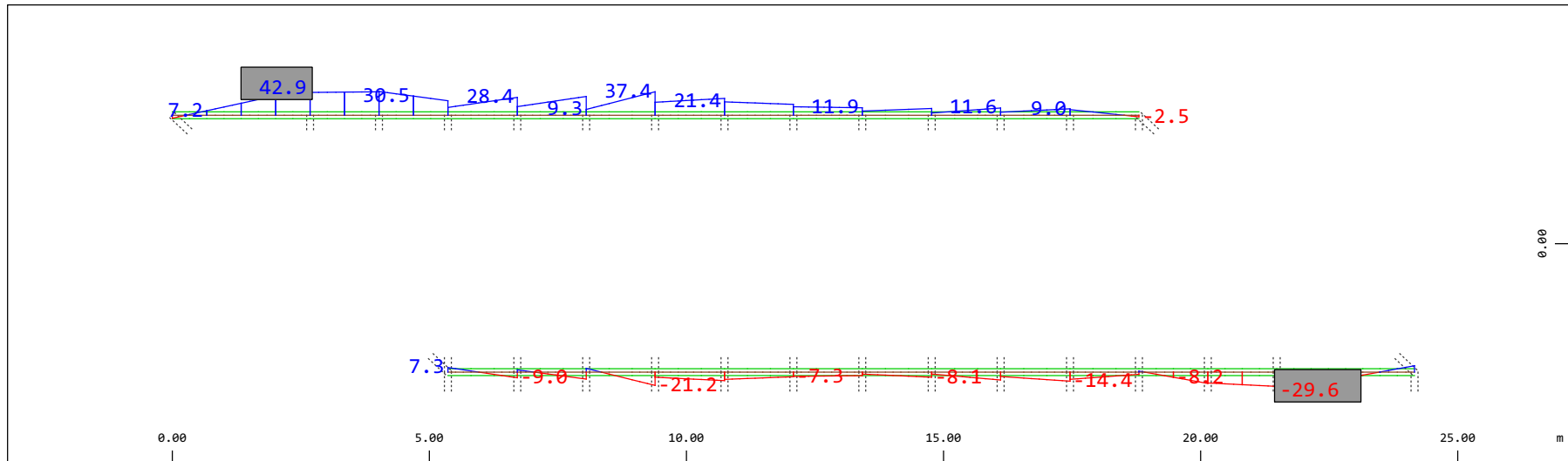
Definition of Axis

Results elementay loads



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Shear force Vy, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kN (Min=-21.0) (Max=20.3)

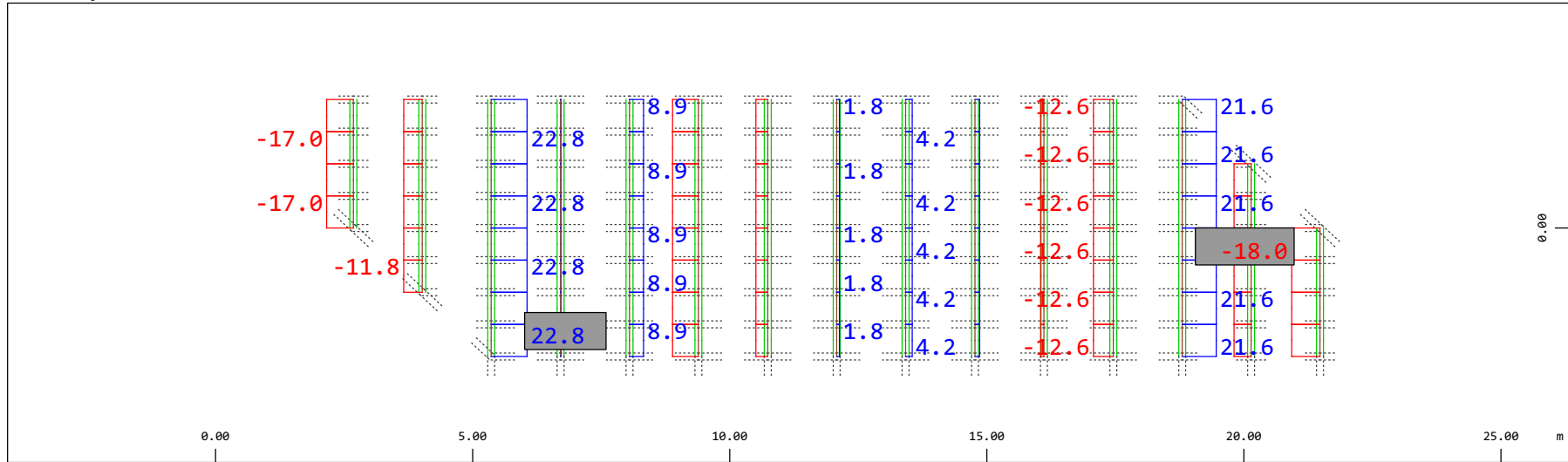
M 1 : 120



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Bending moment Mz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 98.0 kNm (Min=-29.6) (Max=42.9)

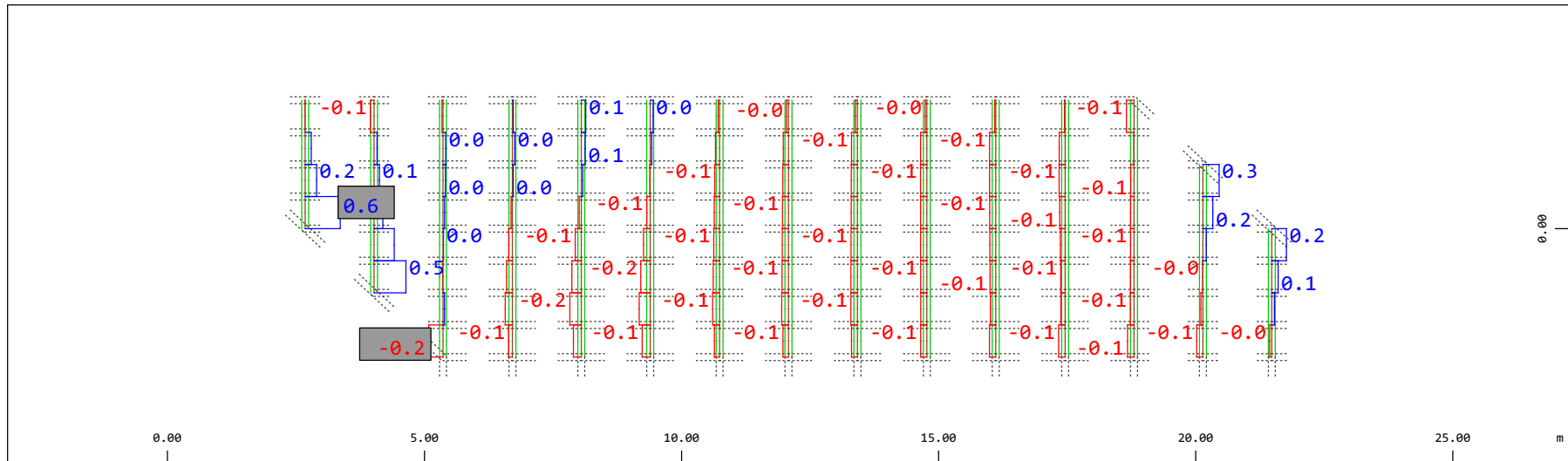
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kN (Min=-18.0) (Max=22.8)

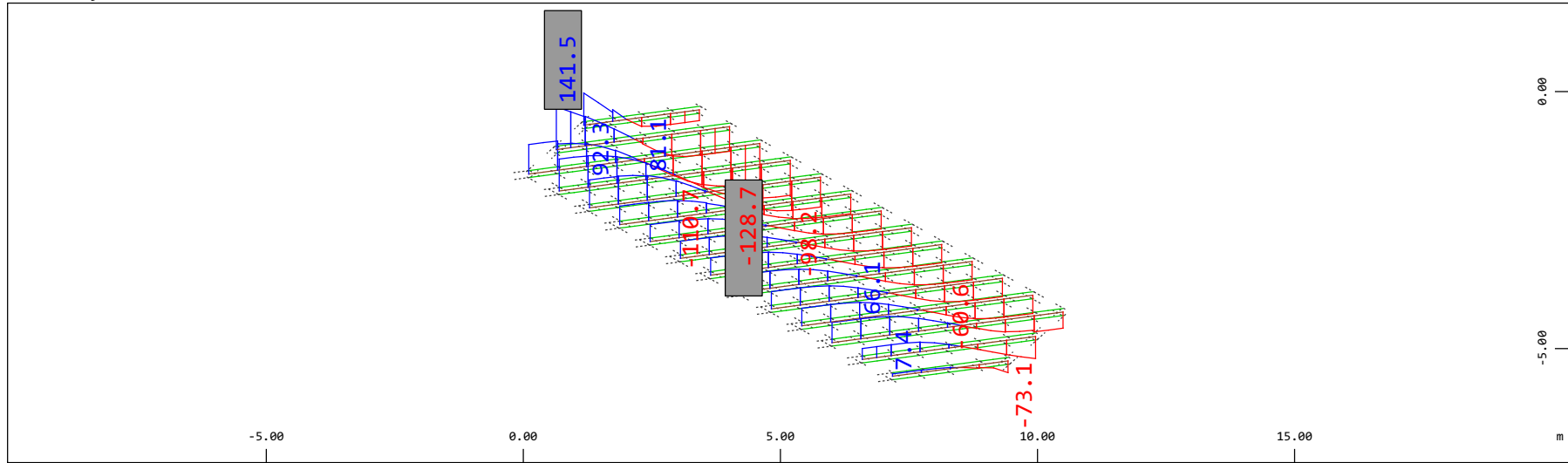
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.980 kNm (Min=-0.226) (Max=0.577)

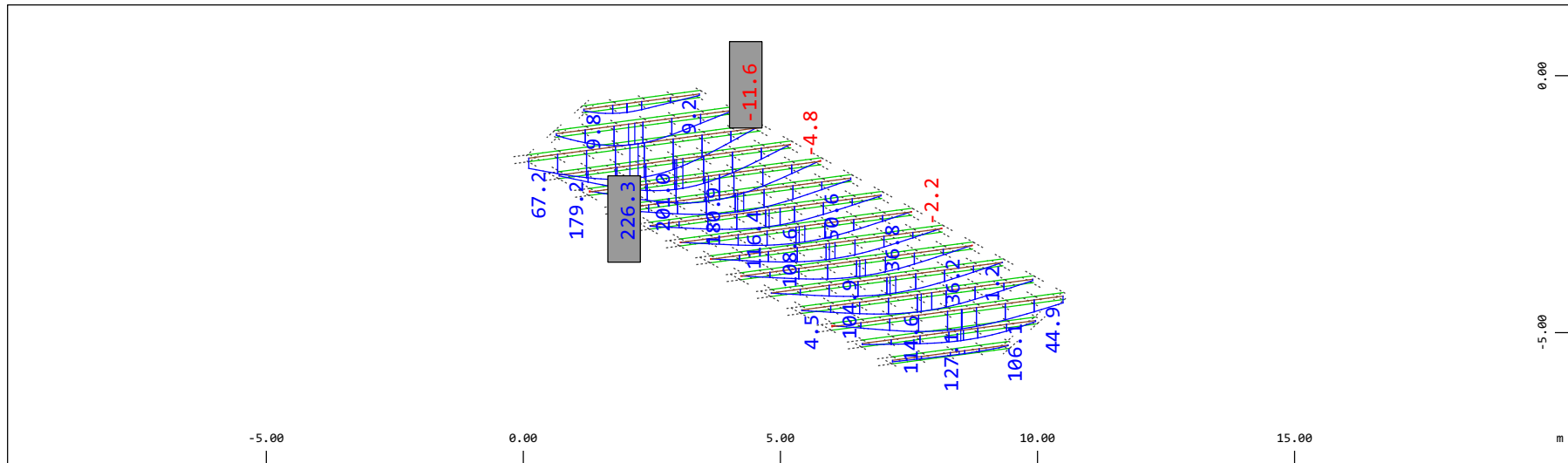
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 196.1 kN (Min=-128.7) (Max=141.5)

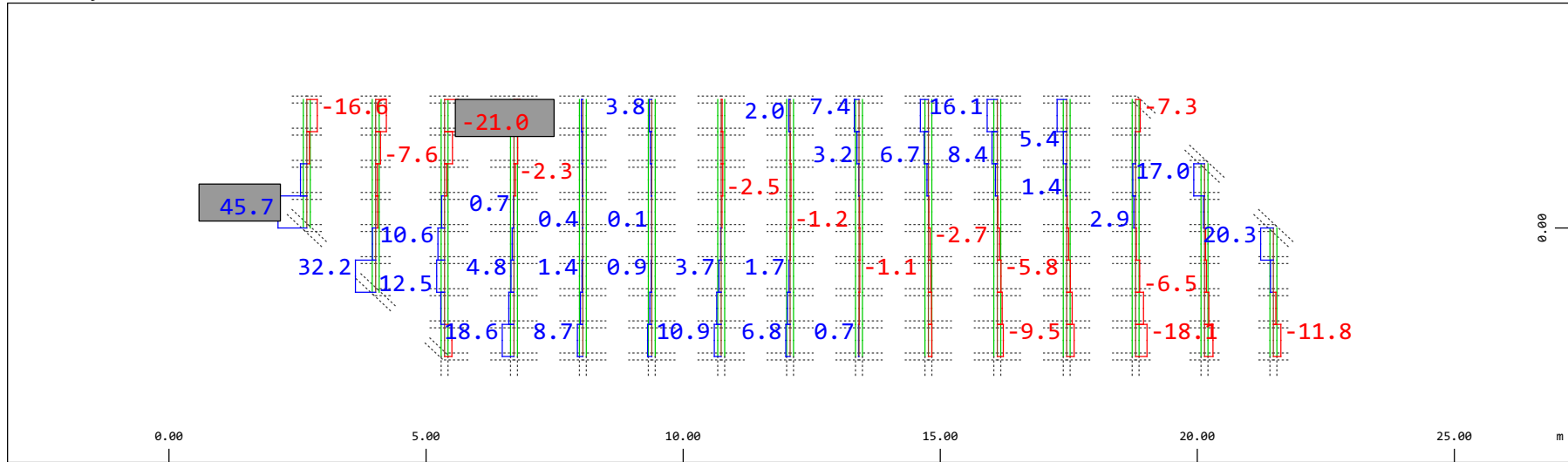
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 392.2 kNm (Min=-11.6) (Max=226.3)

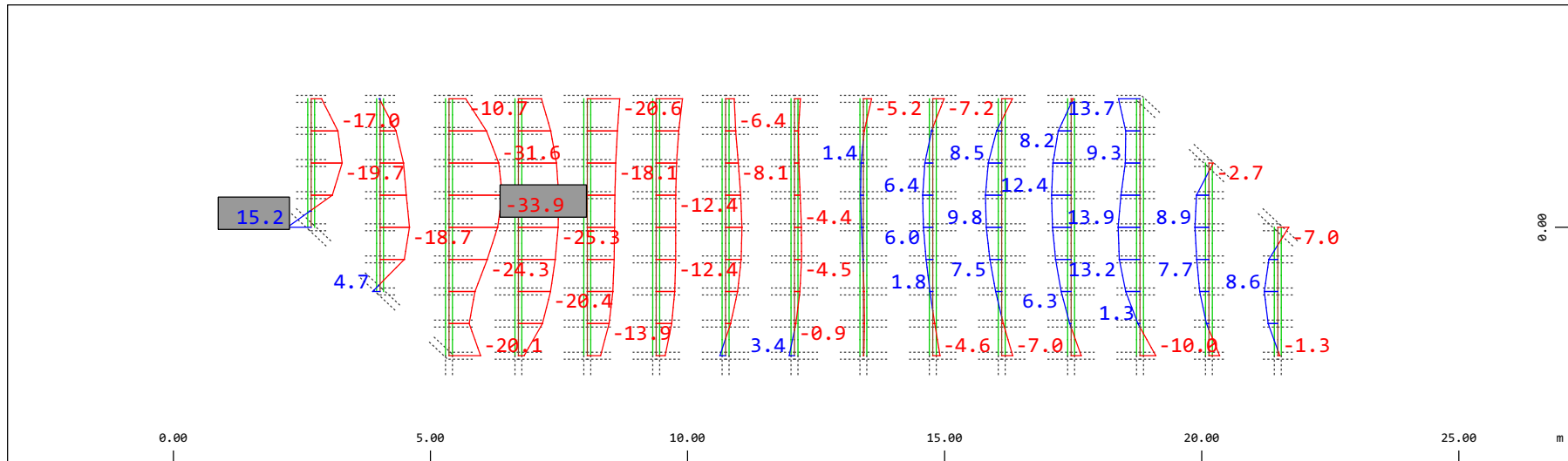
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 98.0 kN (Min=-21.0) (Max=45.7)

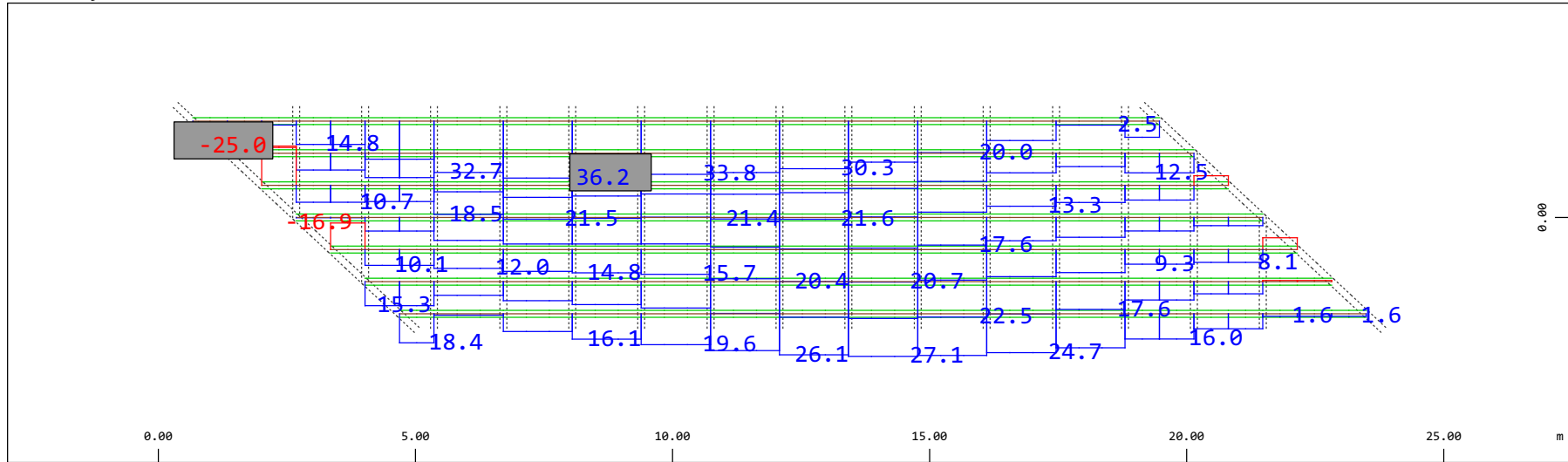
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kNm (Min=-33.9) (Max=15.2)

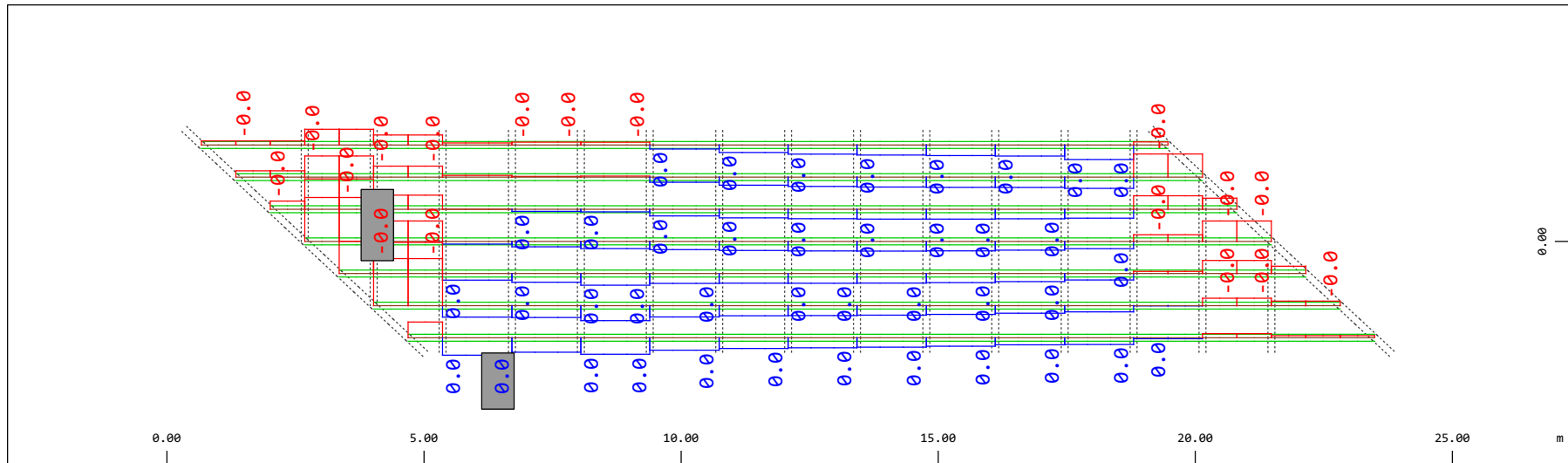
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force Nx, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kN (Min=-25.0) (Max=36.2)

M 1 : 120

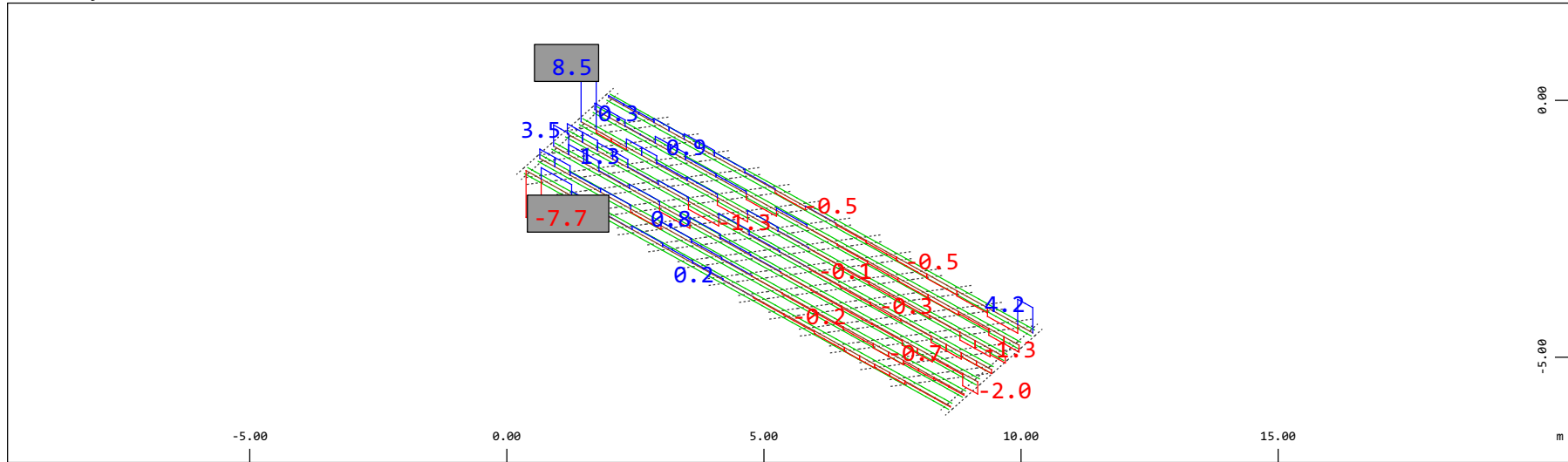


Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment Mt, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.0098 kNm (Min=-0.0075) (Max=0.0028)

M 1 : 120

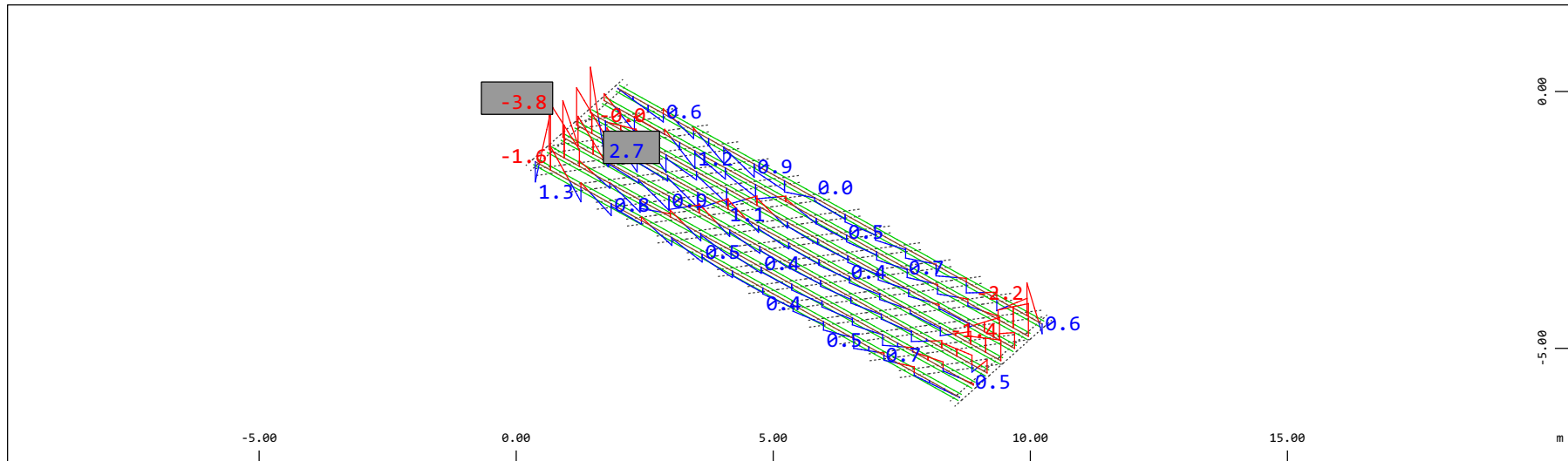
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 9.80 kN (Min=-7.70) (Max=8.45)

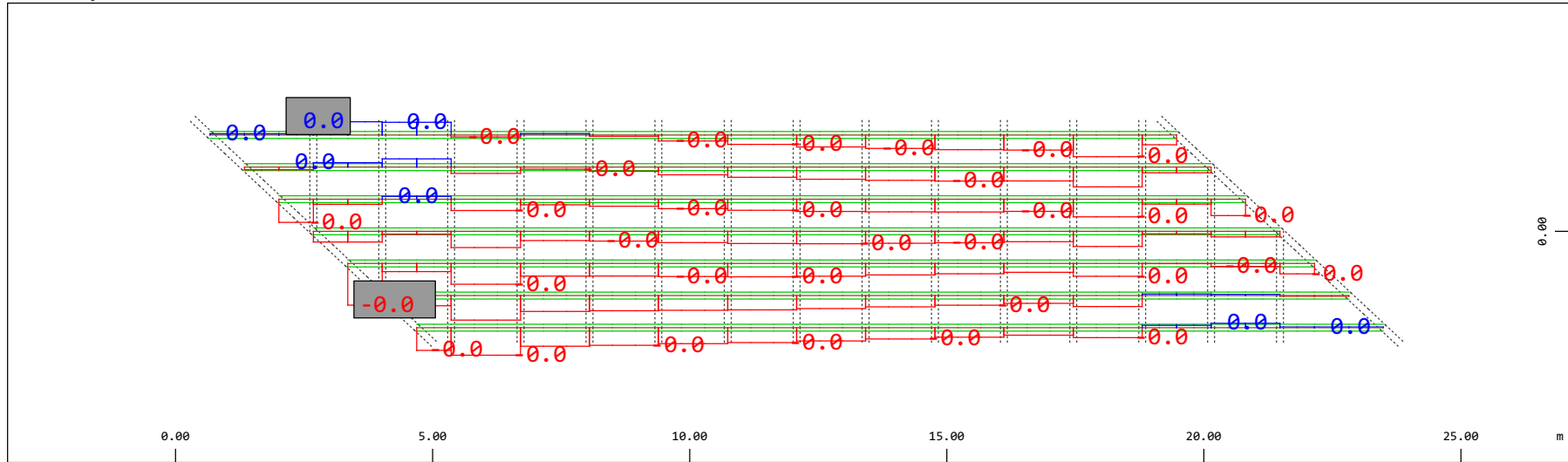
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 3.92 kNm (Min=-3.83) (Max=2.65)

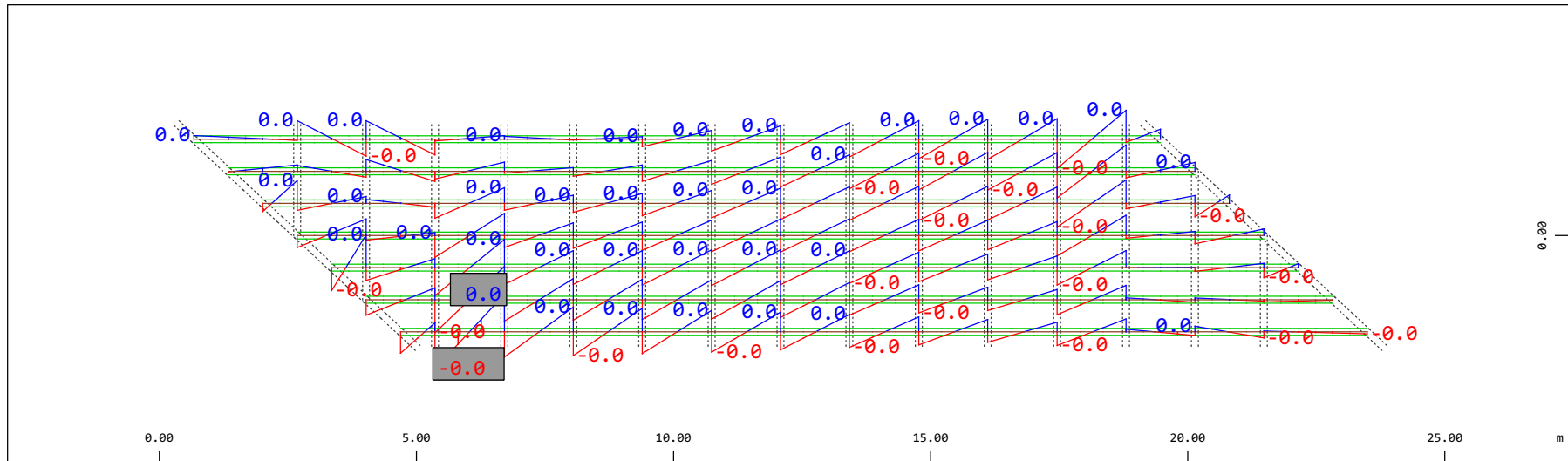
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Shear force Vy, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.0196 kN (Min=-0.0133) (Max=0.0042)

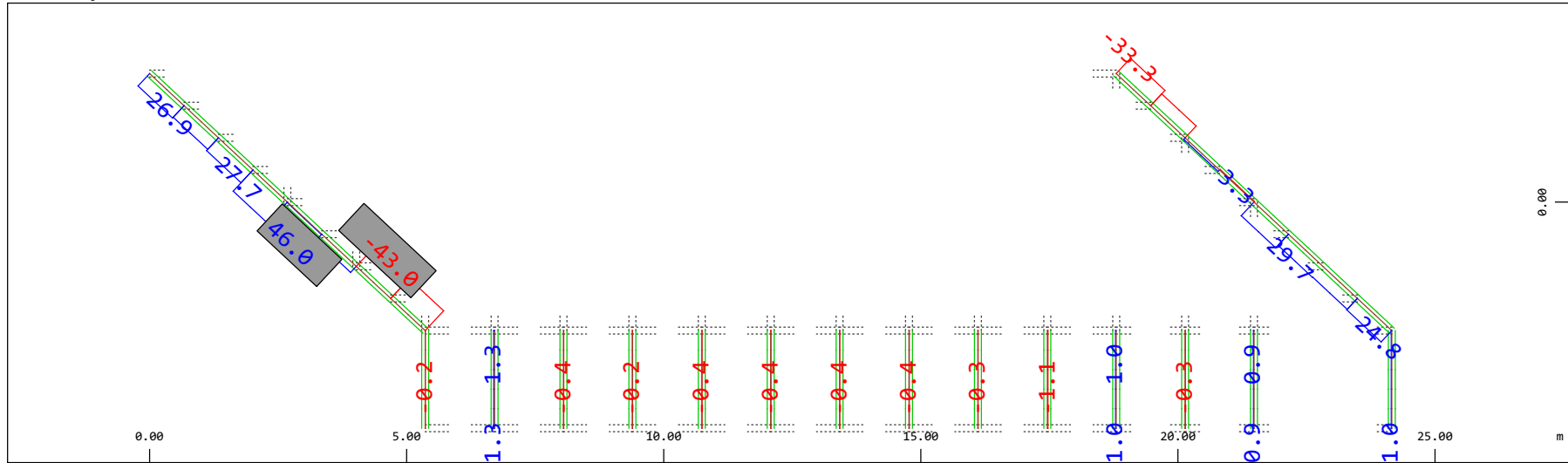
M 1 : 120



Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Bending moment Mz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.0098 kNm (Min=-0.0059) (Max=0.0059)

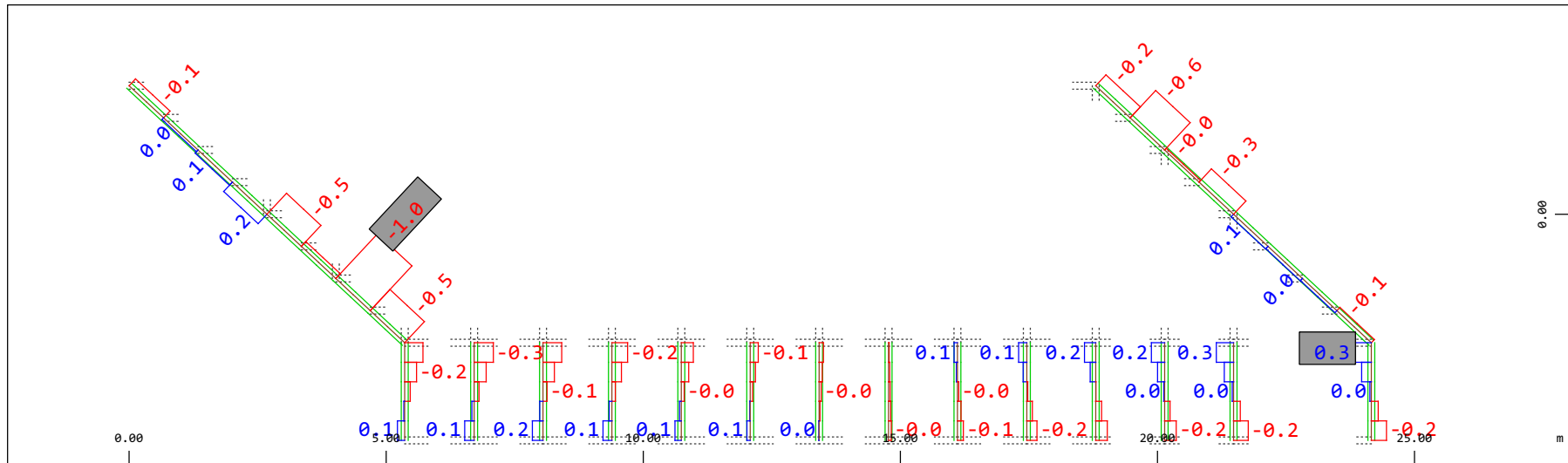
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 20 23
 X Beam Elements , Normal force Nx, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 98.0 kN (Min=-43.0) (Max=46.0)

M 1 : 120

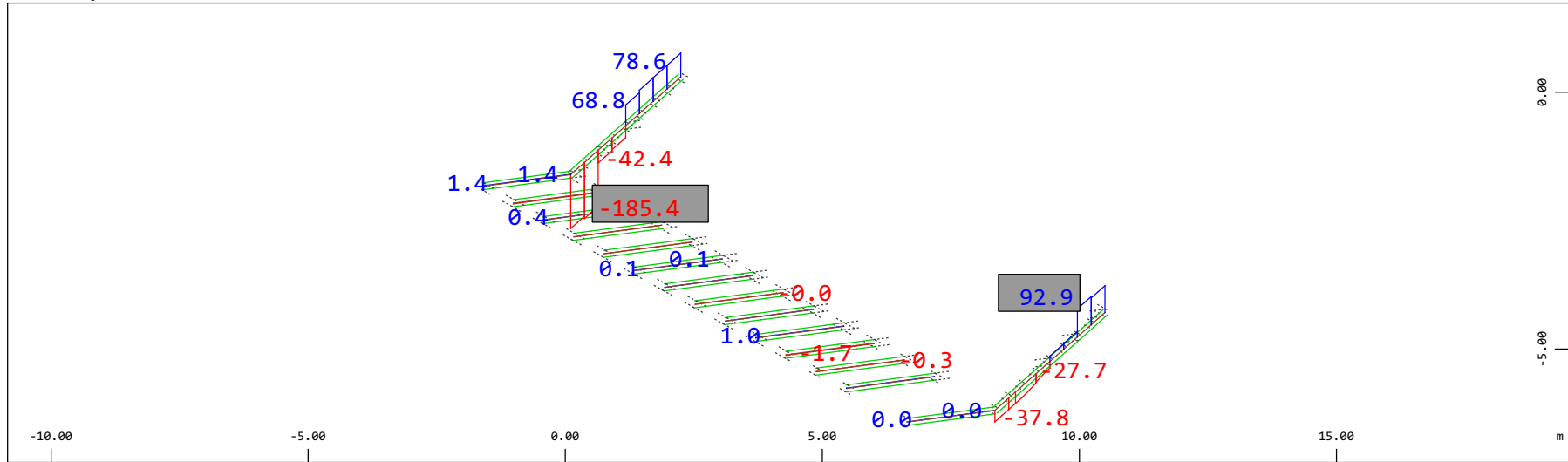


Y Sector of system Beam Elements Group 20 23
 X Beam Elements , Torsional moment Mt, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 0.980 kNm (Min=-0.971) (Max=0.286)

M 1 : 120

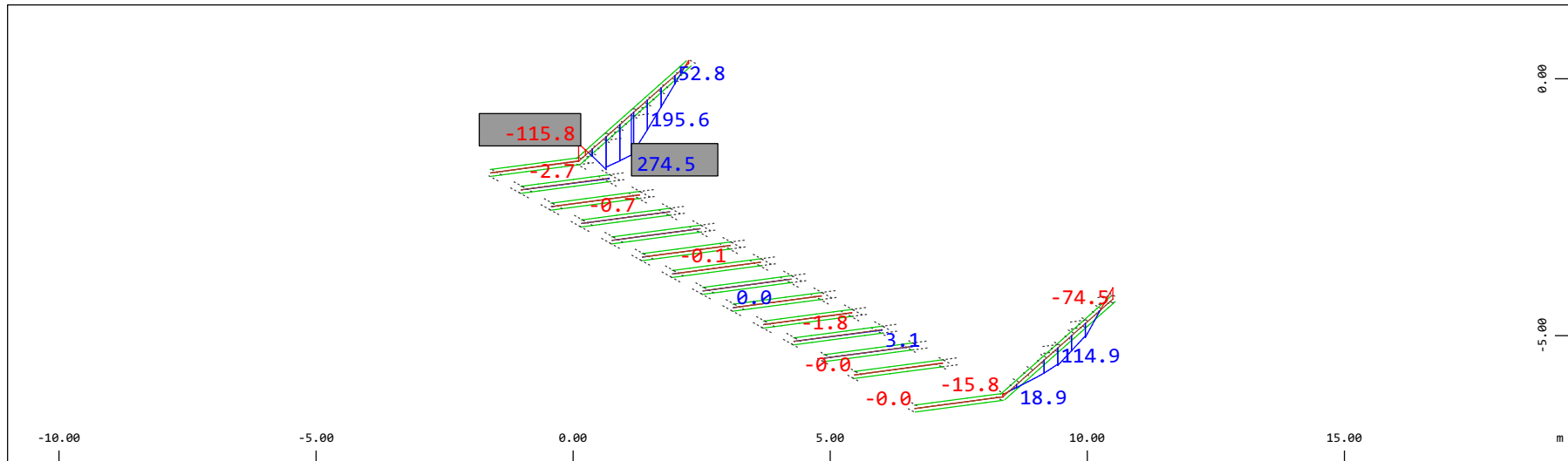
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 196.1 kN (Min=-185.4) (Max=92.9)

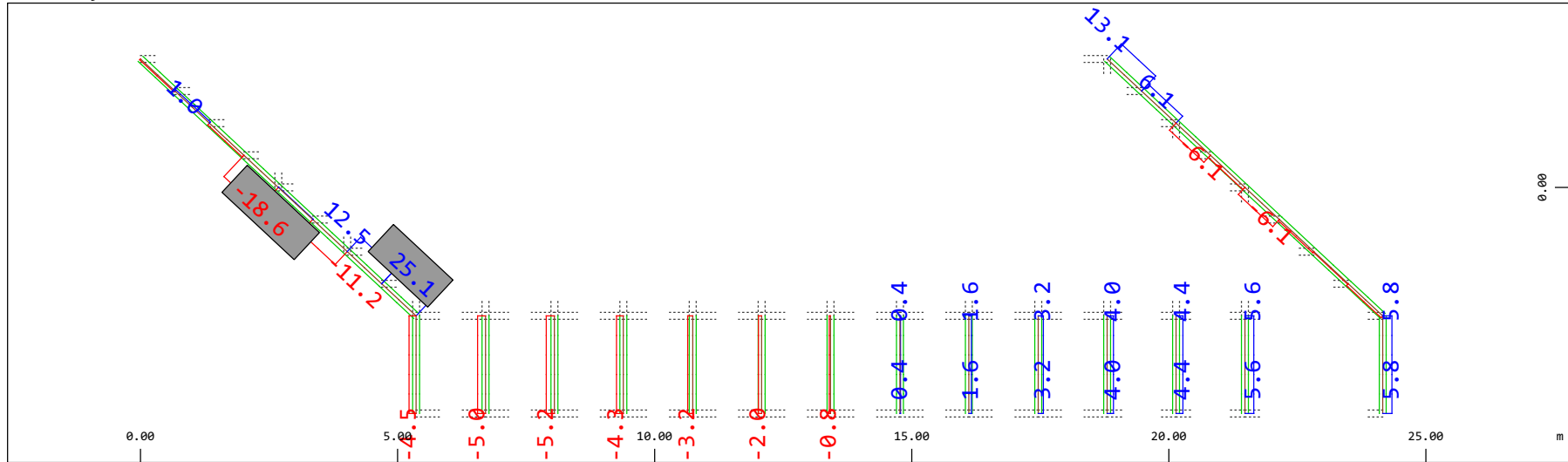
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 392.2 kNm (Min=-115.8) (Max=274.5)

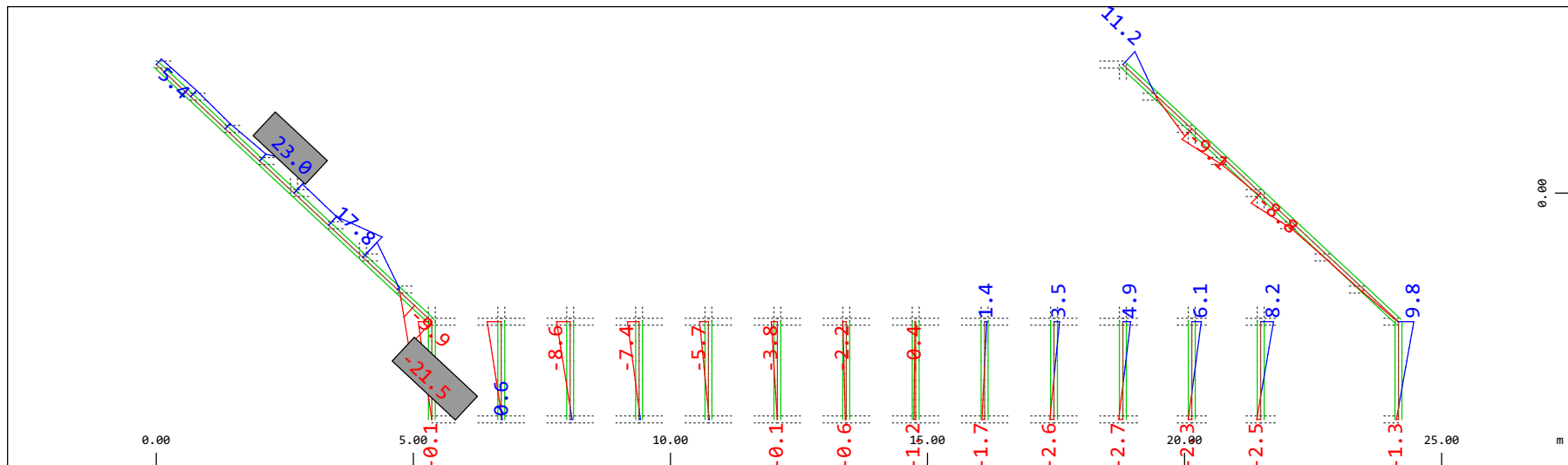
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kN (Min=-18.6) (Max=25.1)

M 1 : 120

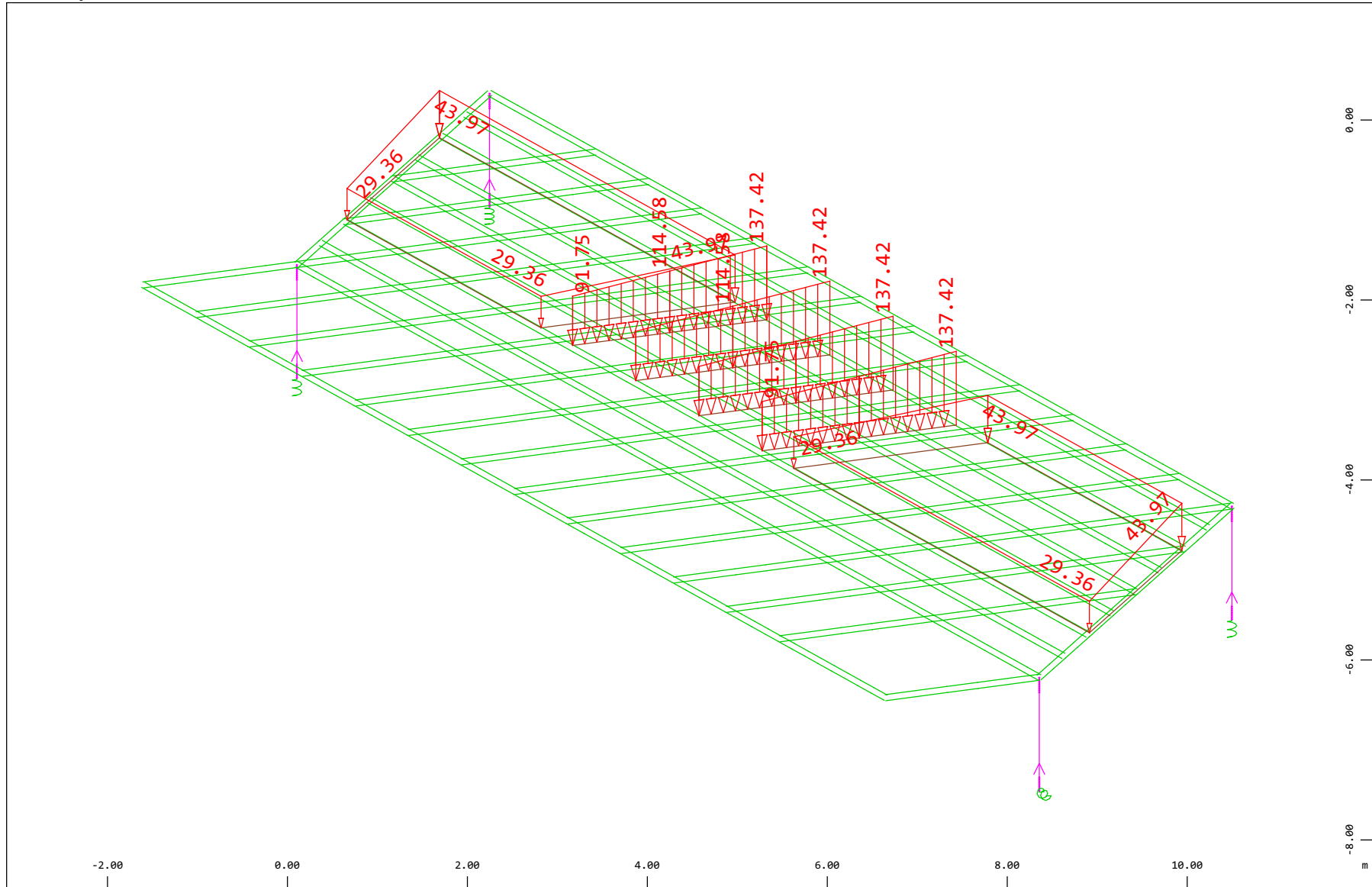


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 100 Qt: LM71-S 3m-ep , 1 cm 3D = 39.2 kNm (Min=-21.5) (Max=23.0)

M 1 : 120

Definition of Axis
 Results elementay loads

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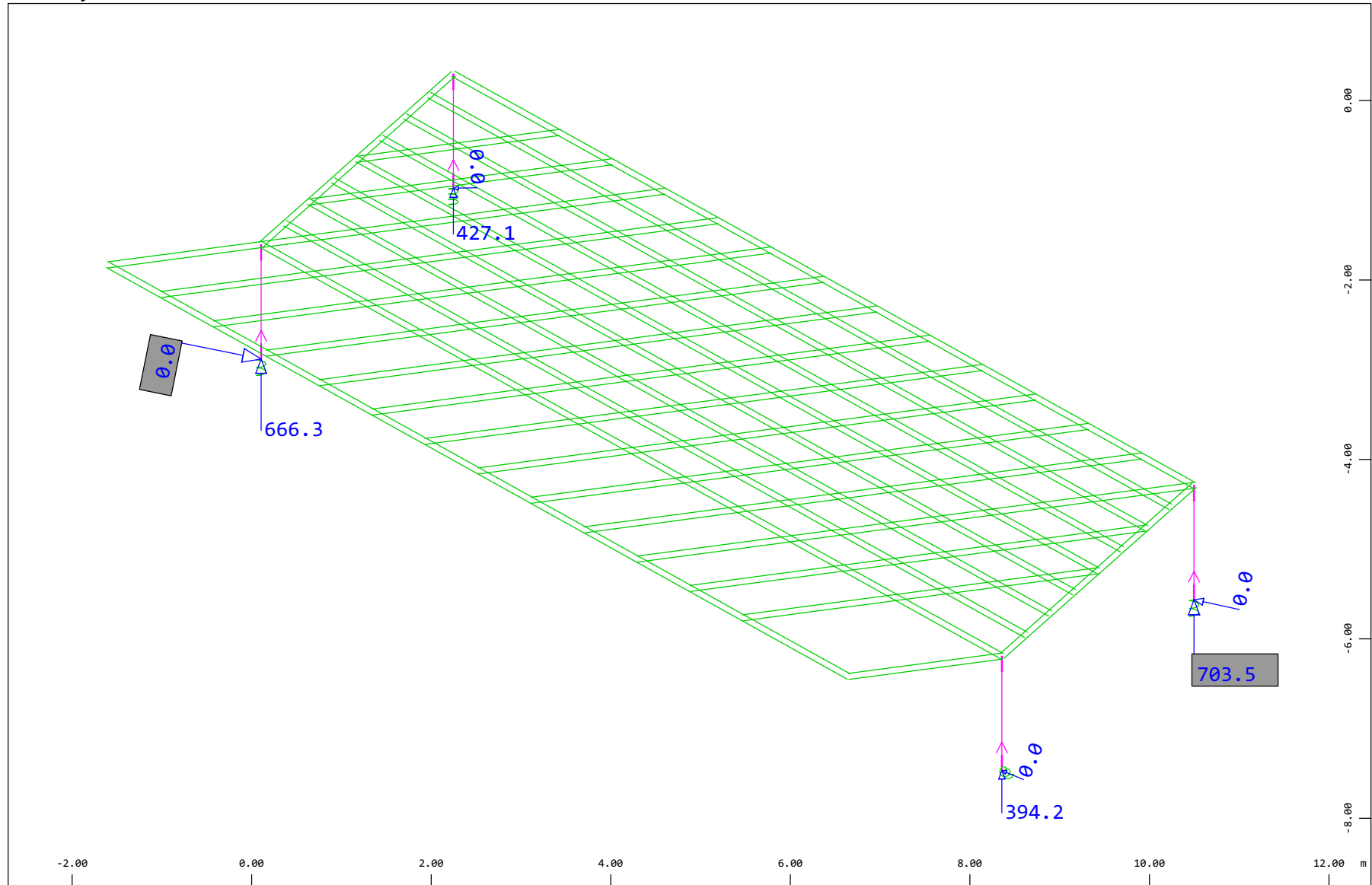
Z
 X Y

Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 108 Qt: LM71-S 10m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=96.9 kN/m, Min=-137.4
 Max=-91.7 ∇), Free area load (force) in global Z (Unit=48.4 kN/m², Min=-44.0 Max=-29.4 ∇)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 484.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.0019 kN

▴ (Max=703.5) (total: 2191.)

▴ (Max=0.0040)

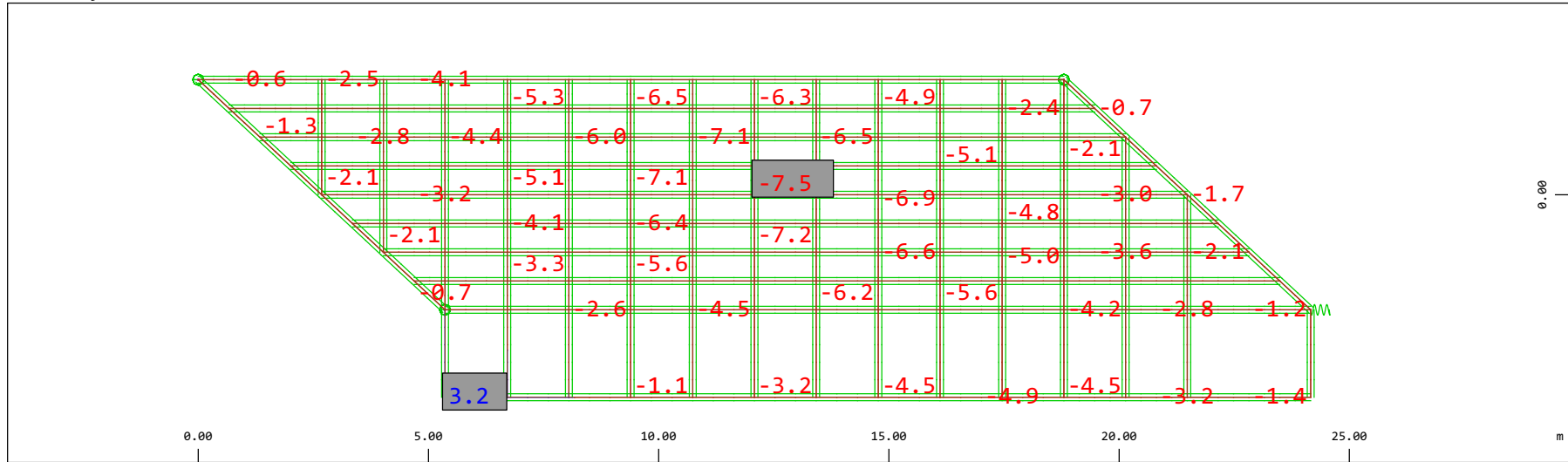
M 1 : 60

X * 0.502

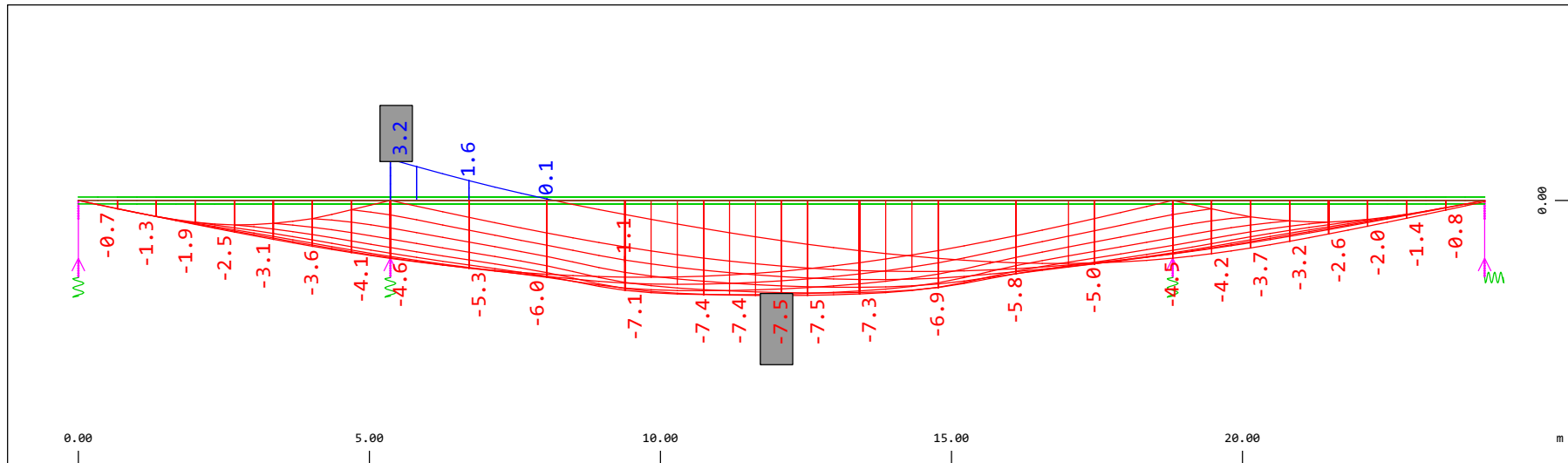
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

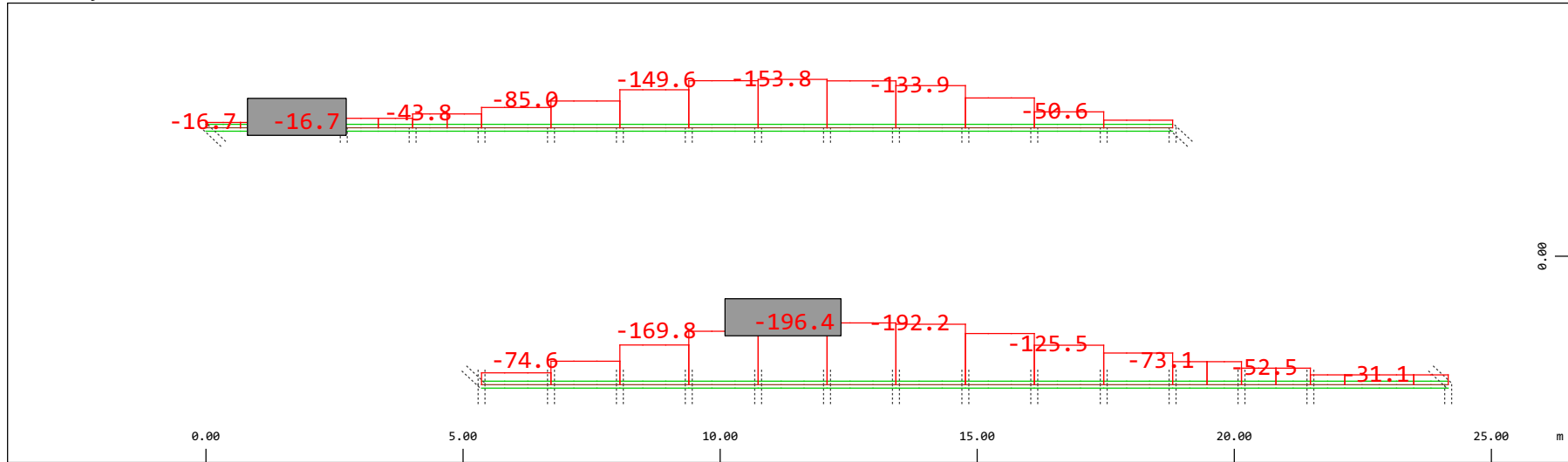


Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 4.84 mm (Min=-7.47) (Max=3.23) M 1 : 134



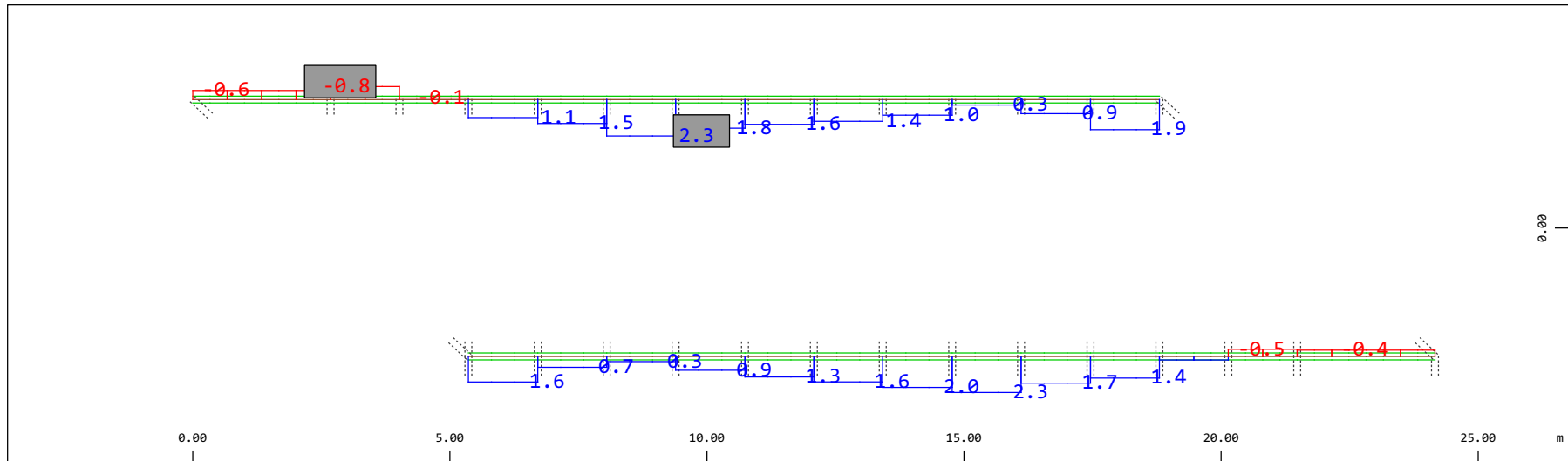
Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 4.84 mm (Min=-7.47) (Max=3.23) M 1 : 106

Definition of Axis
 Results elementay loads



Y
 Z-X Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 196.1 kN (Min=-196.4) (Max=-16.7)

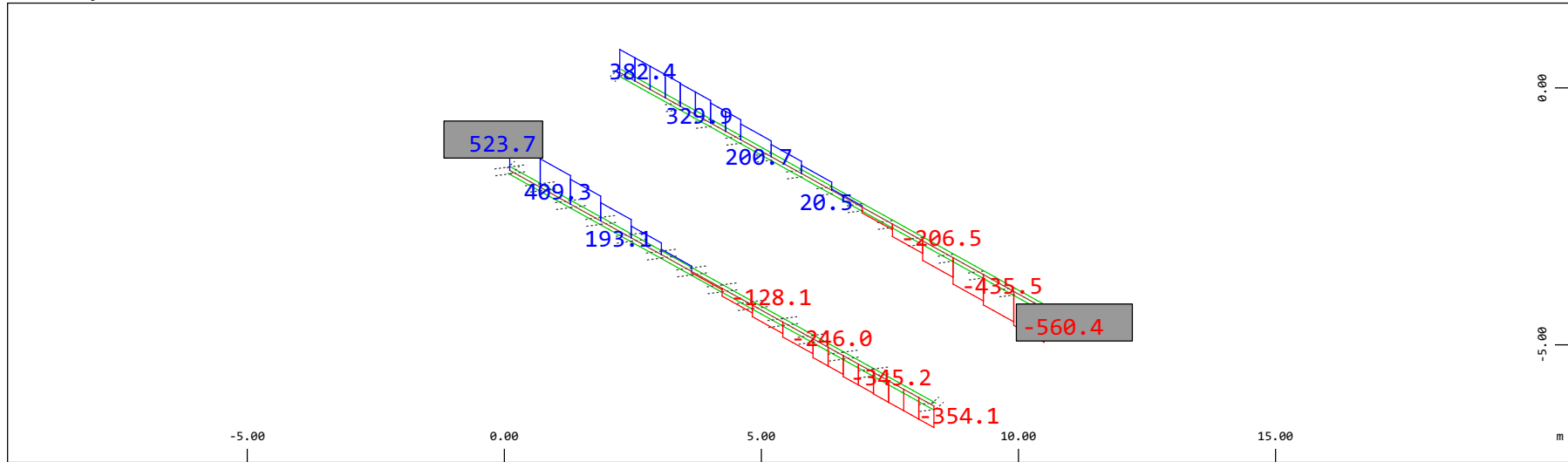
M 1 : 120



Y
 Z-X Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 3.92 kNm (Min=-0.829) (Max=2.32)

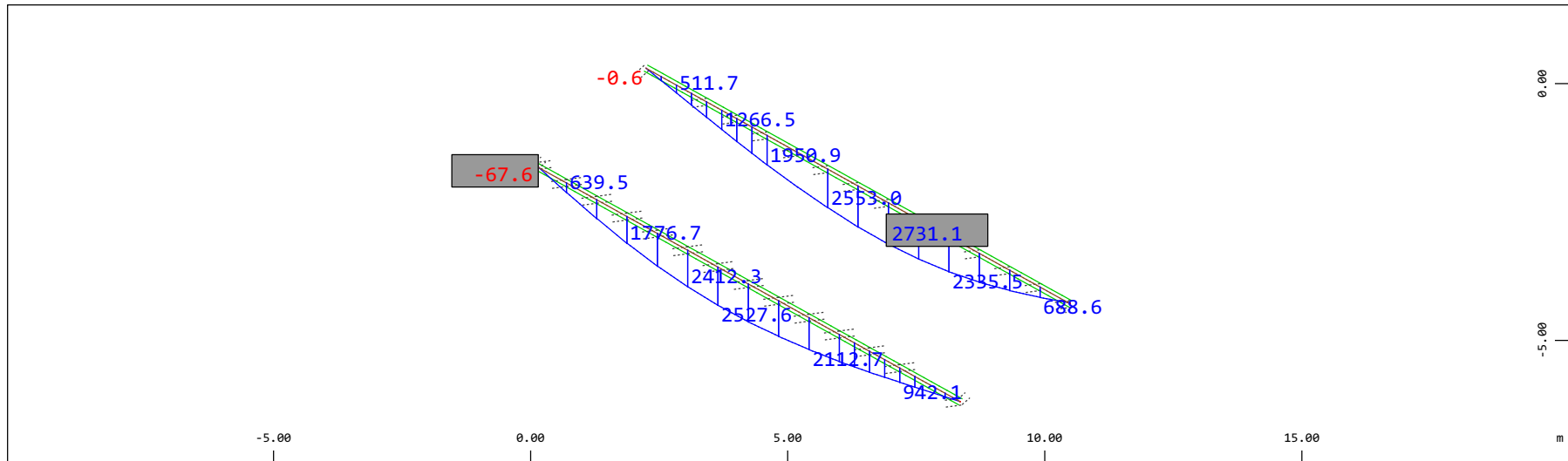
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 980.5 kN (Min=-560.4) (Max=523.7)

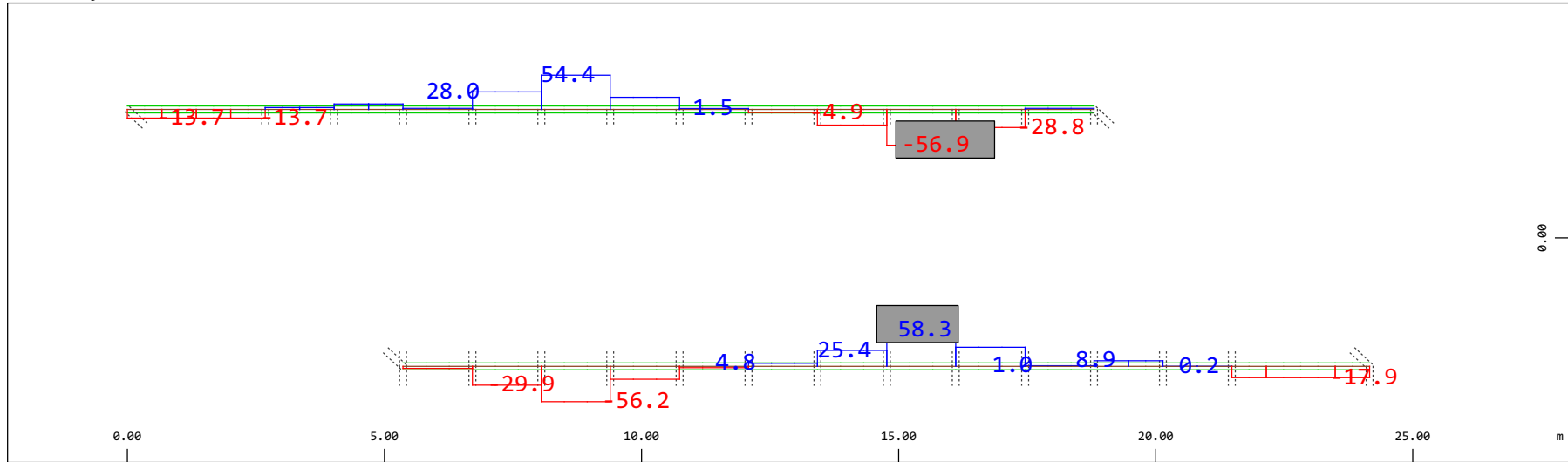
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 3922. kNm (Min=-67.6) (Max=2731.)

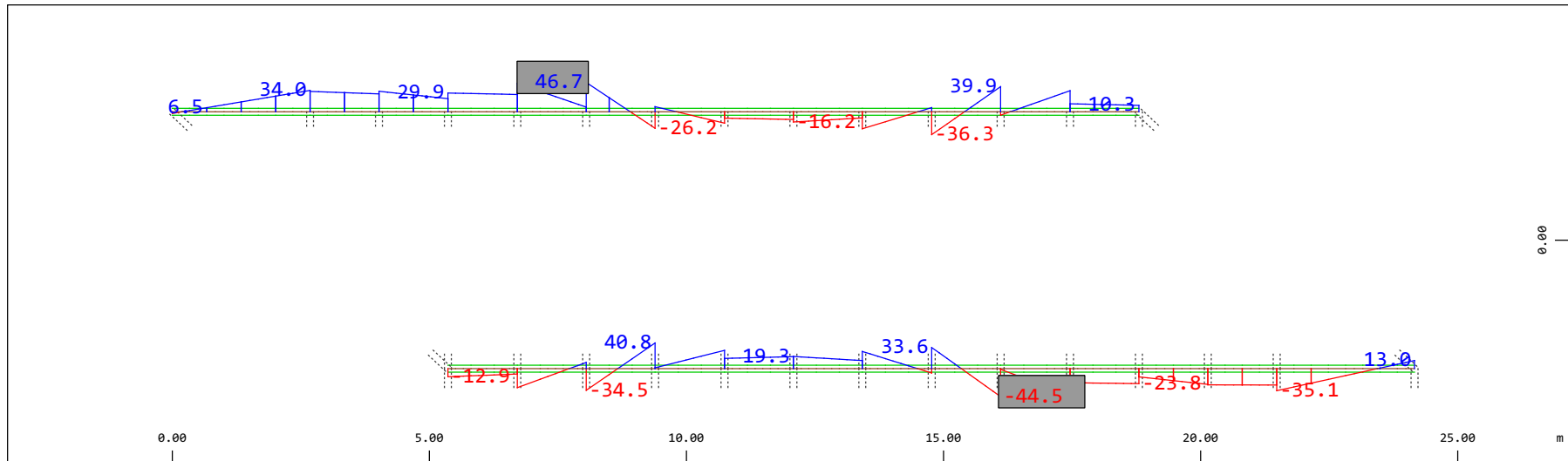
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Shear force Vy, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kN (Min=-56.9) (Max=58.3)

M 1 : 120

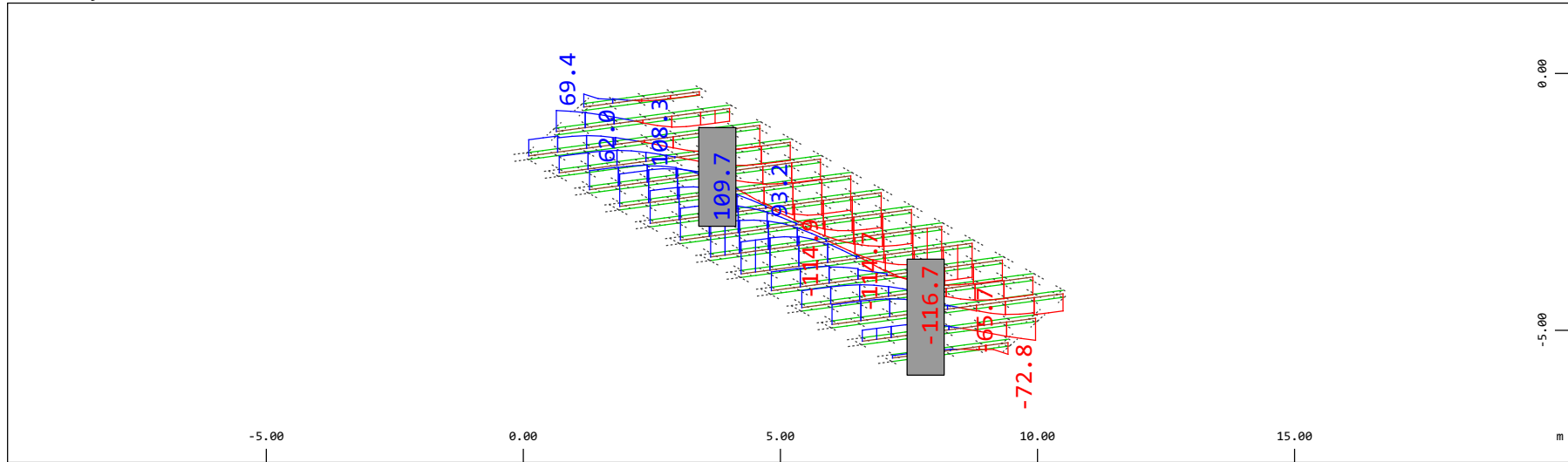


Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Bending moment Mz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kNm (Min=-44.5) (Max=46.7)

M 1 : 120

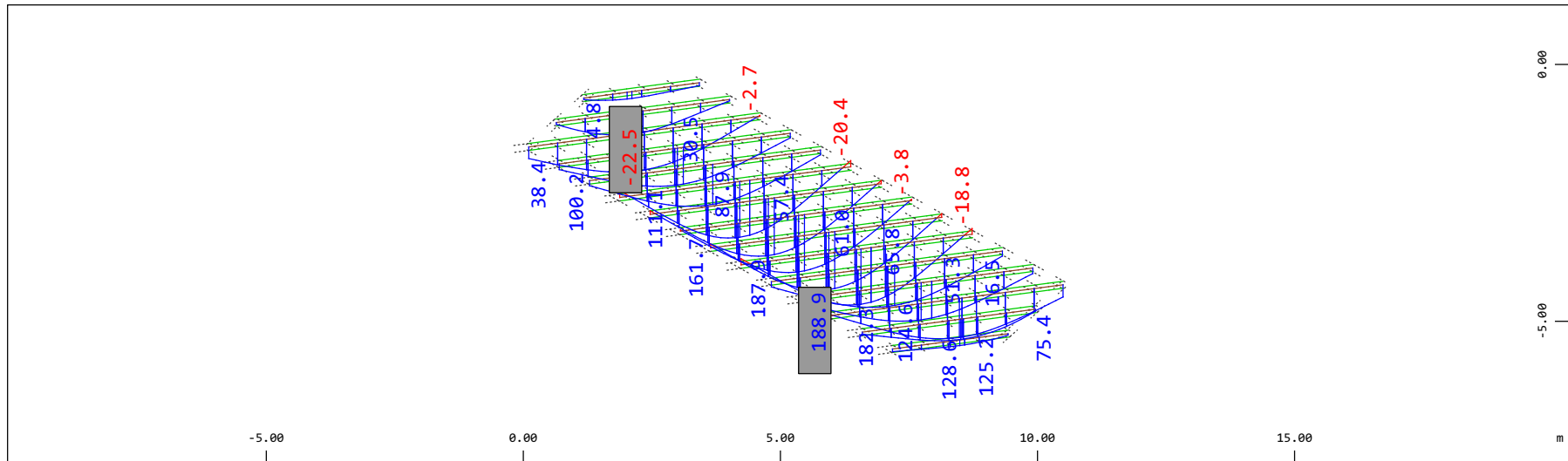
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 196.1 kN (Min=-116.7) (Max=109.7)

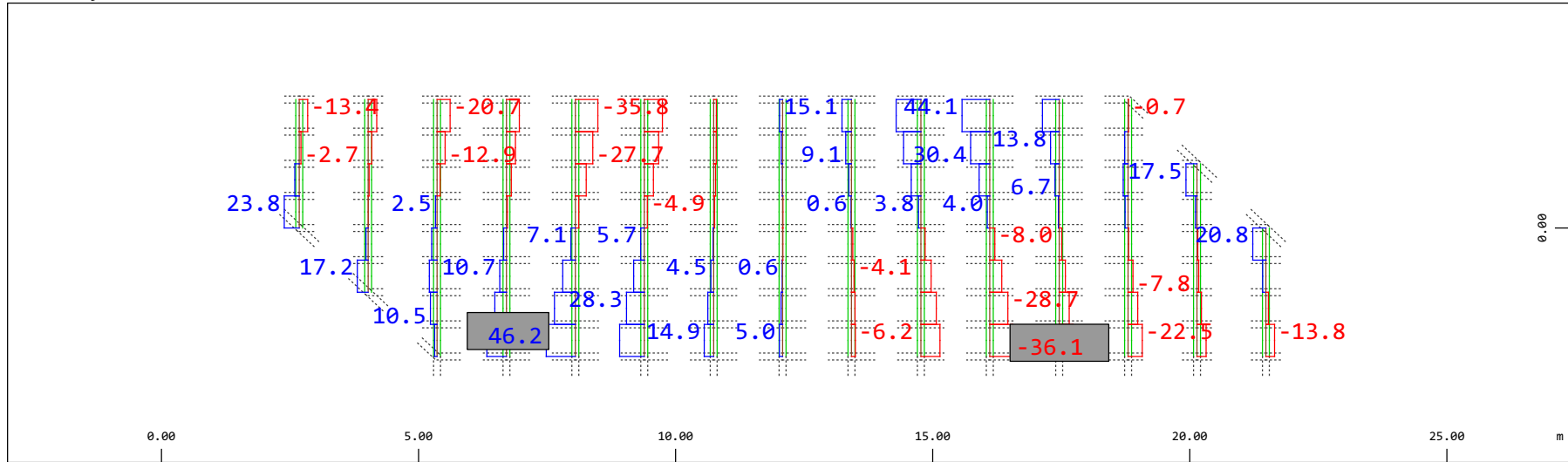
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 196.1 kNm (Min=-22.5) (Max=188.9)

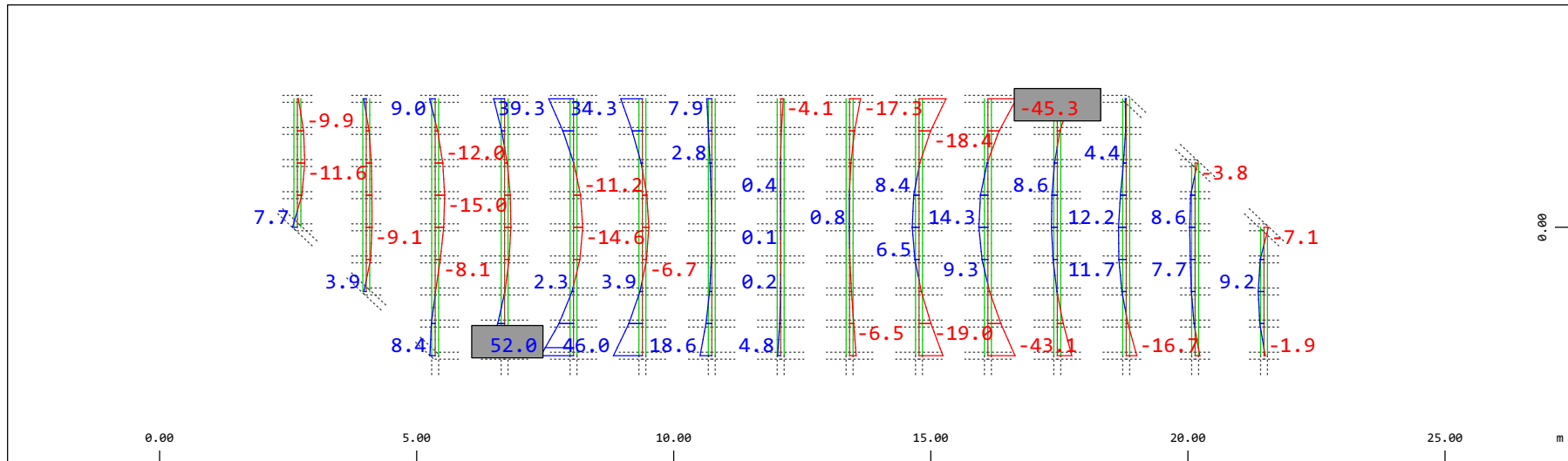
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kN (Min=-36.1) (Max=46.2)

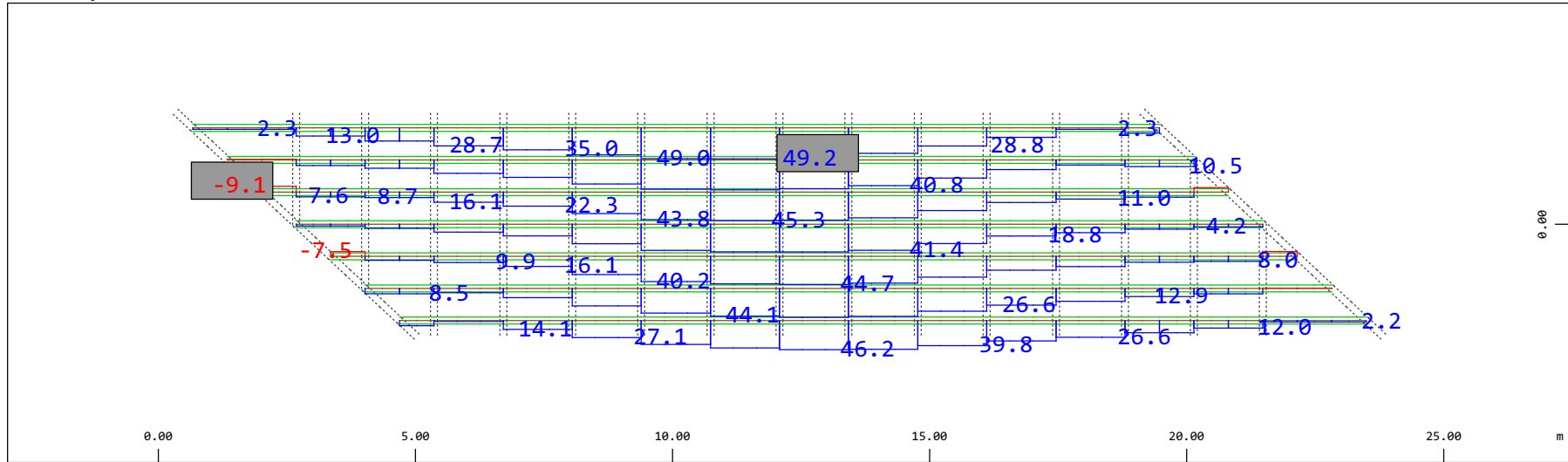
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kNm (Min=-45.3) (Max=52.0)

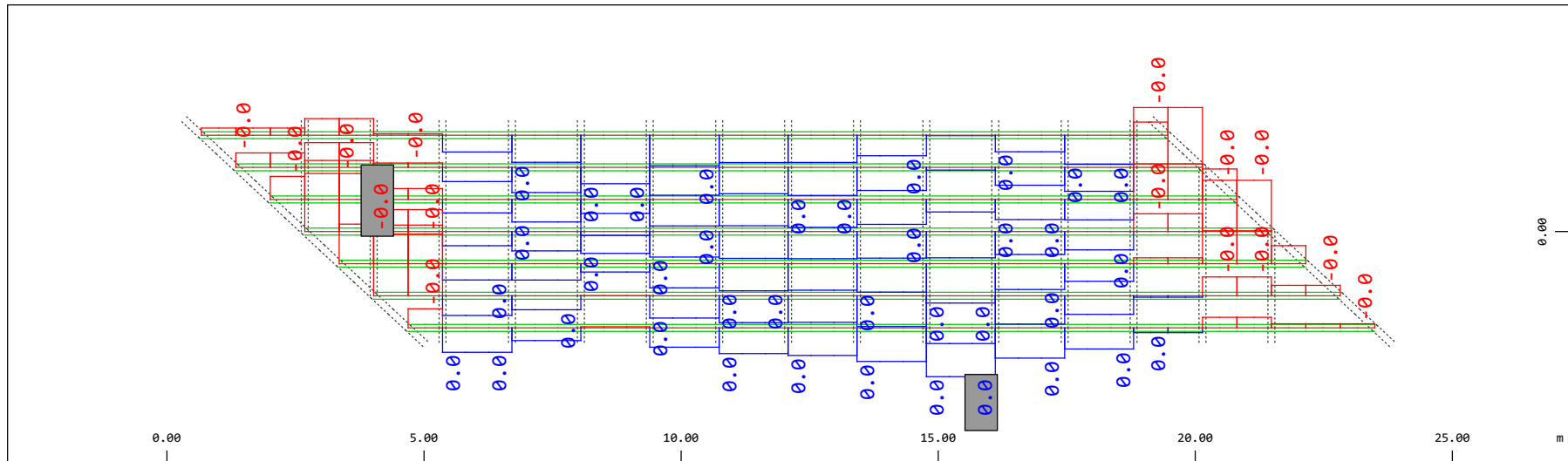
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force N_x , Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kN (Min=-9.14) (Max=49.2)

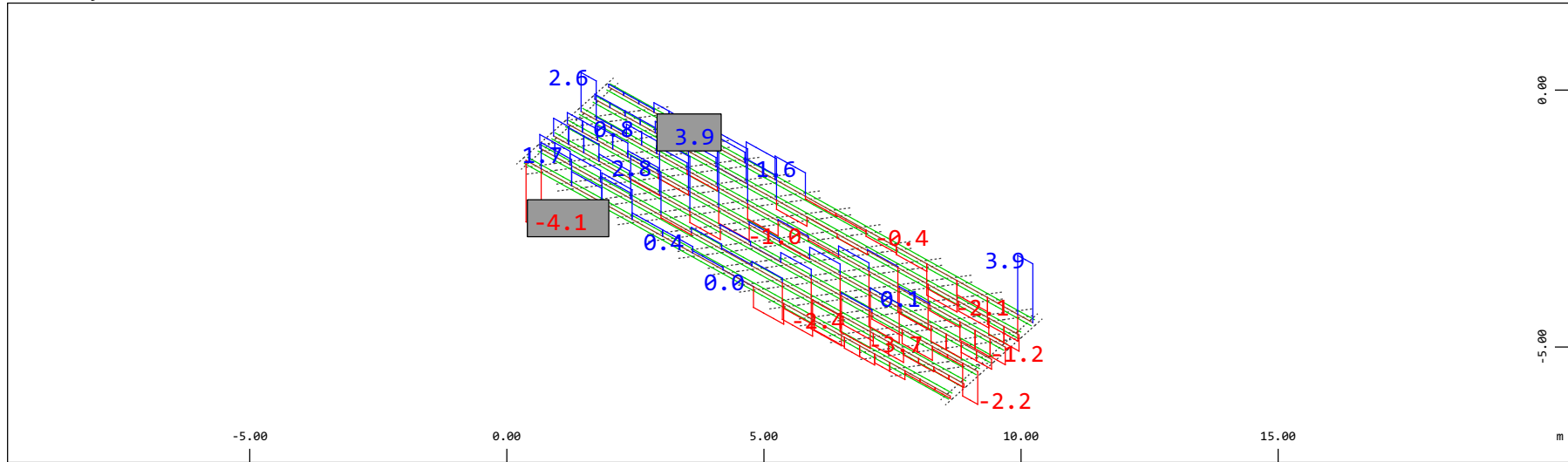
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment M_t , Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.0039 kNm (Min=-0.0039) (Max=0.0031)

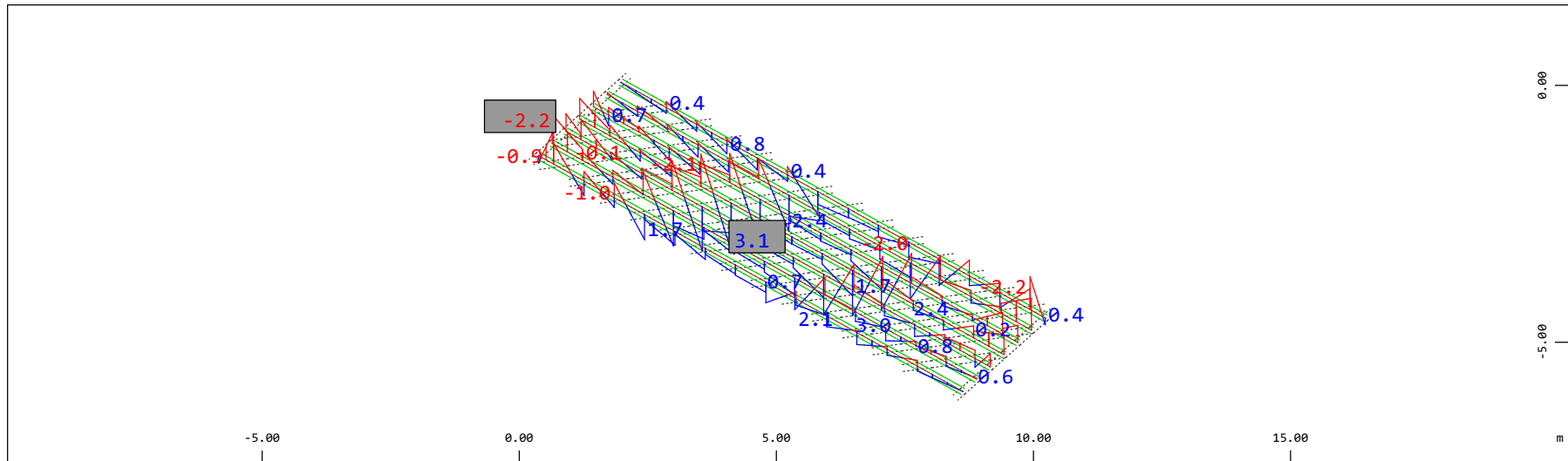
M 1 : 120

Definition of Axis
Results elementay loads



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Shear force Vz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 3.92 kN (Min=-4.06) (Max=3.92)

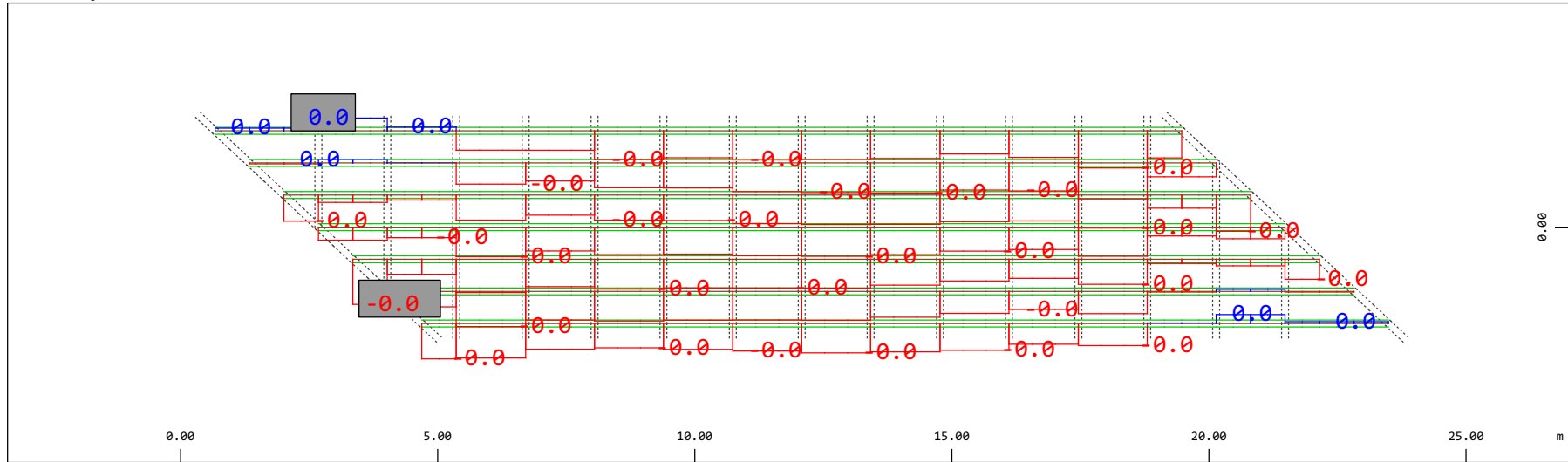
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Bending moment My, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 3.92 kNm (Min=-2.23) (Max=3.15)

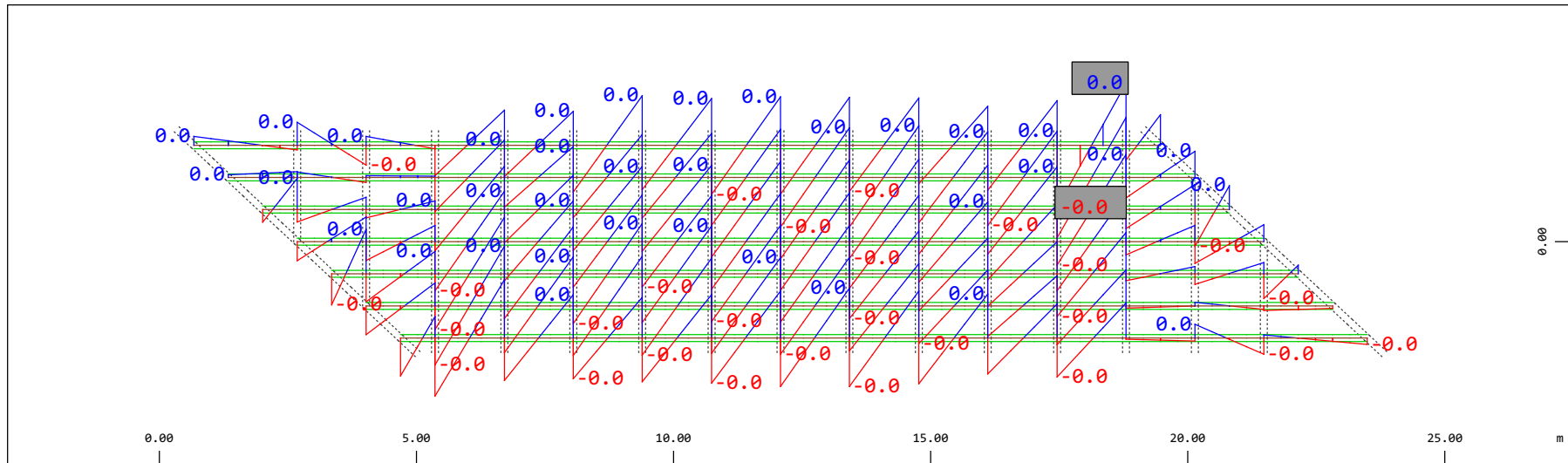
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.0098 kN (Min=-0.0072) (Max=0.0020)

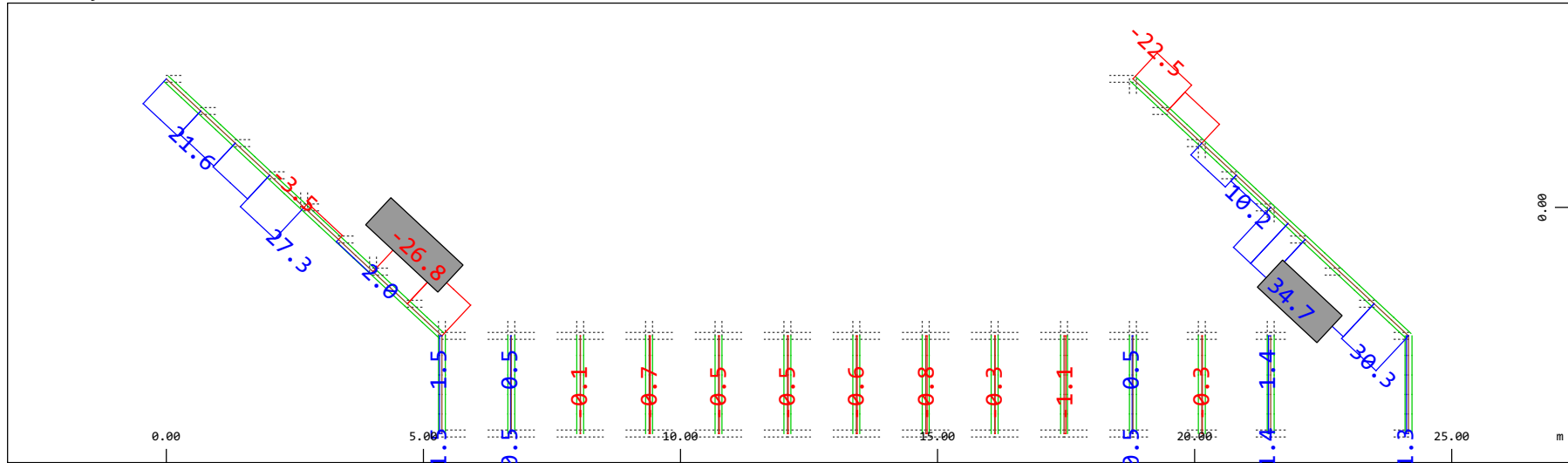
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.0039 kNm (Min=-0.0040) (Max=0.0040)

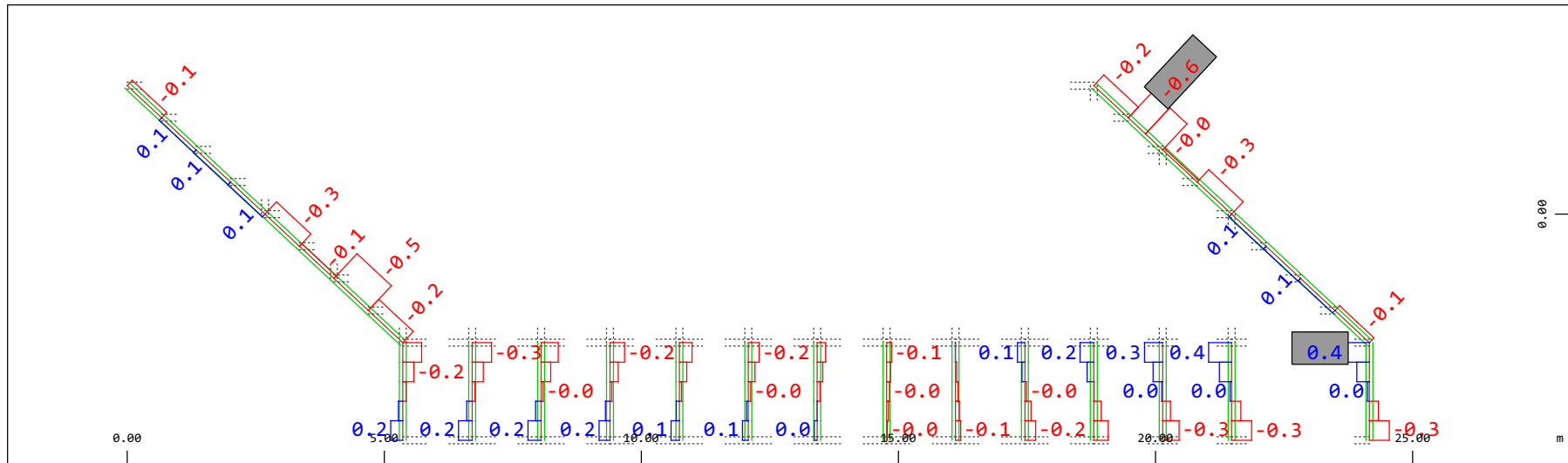
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 39.2 kN (Min=-26.8) (Max=34.7)

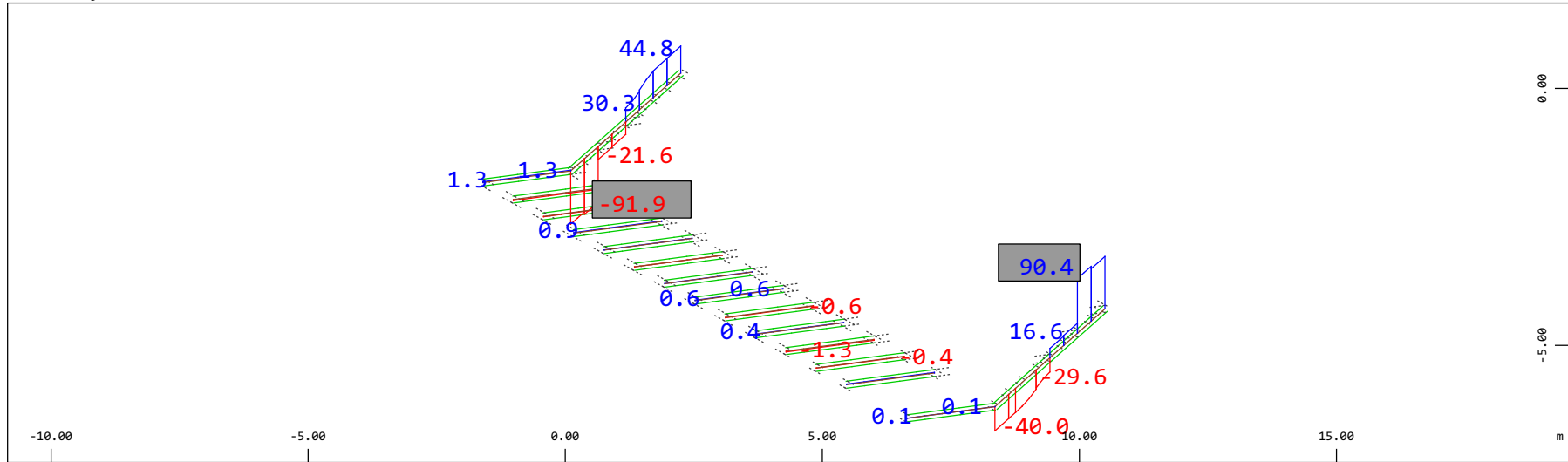
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 0.980 kNm (Min=-0.567) (Max=0.373)

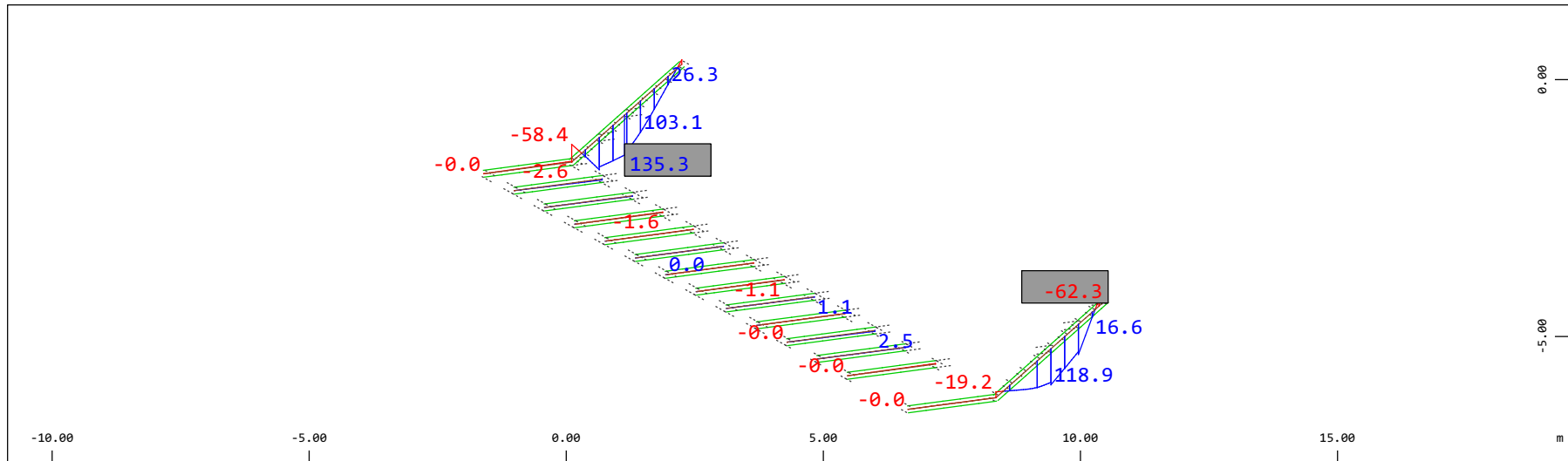
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 98.0 kN (Min=-91.9) (Max=90.4)

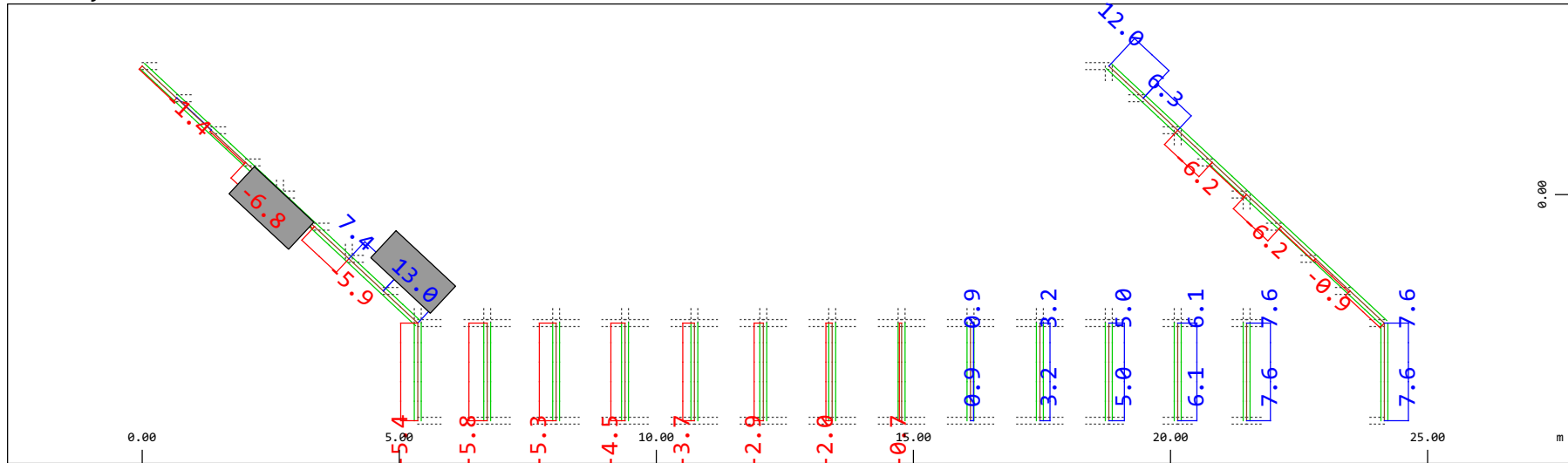
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 196.1 kNm (Min=-62.3) (Max=135.3)

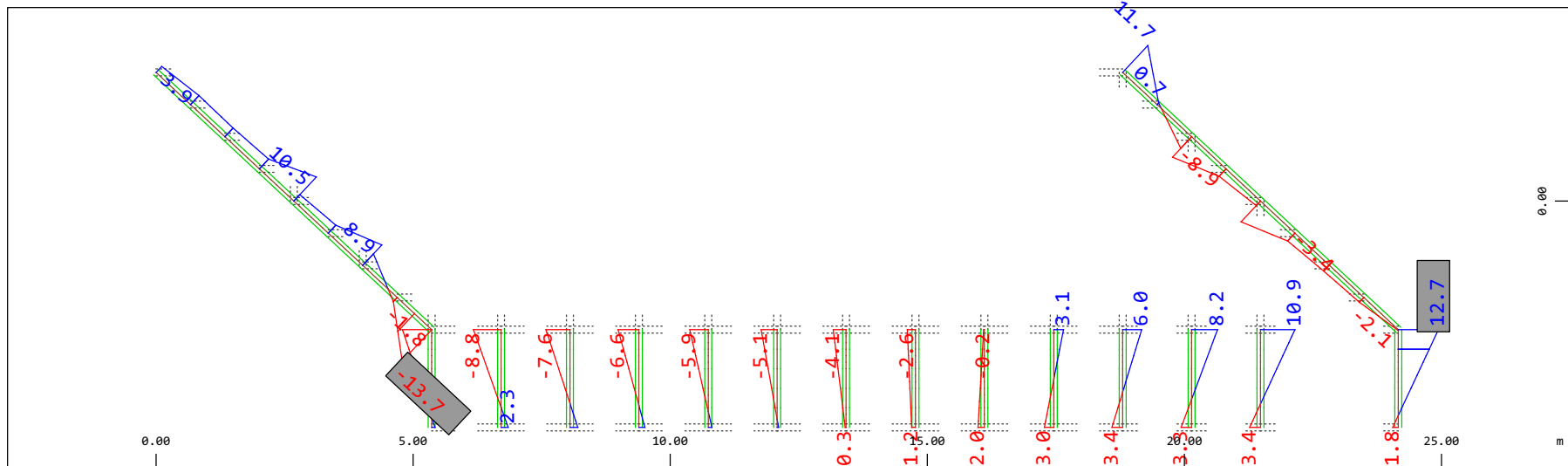
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 19.6 kN (Min=-6.76) (Max=13.0)

M 1 : 120

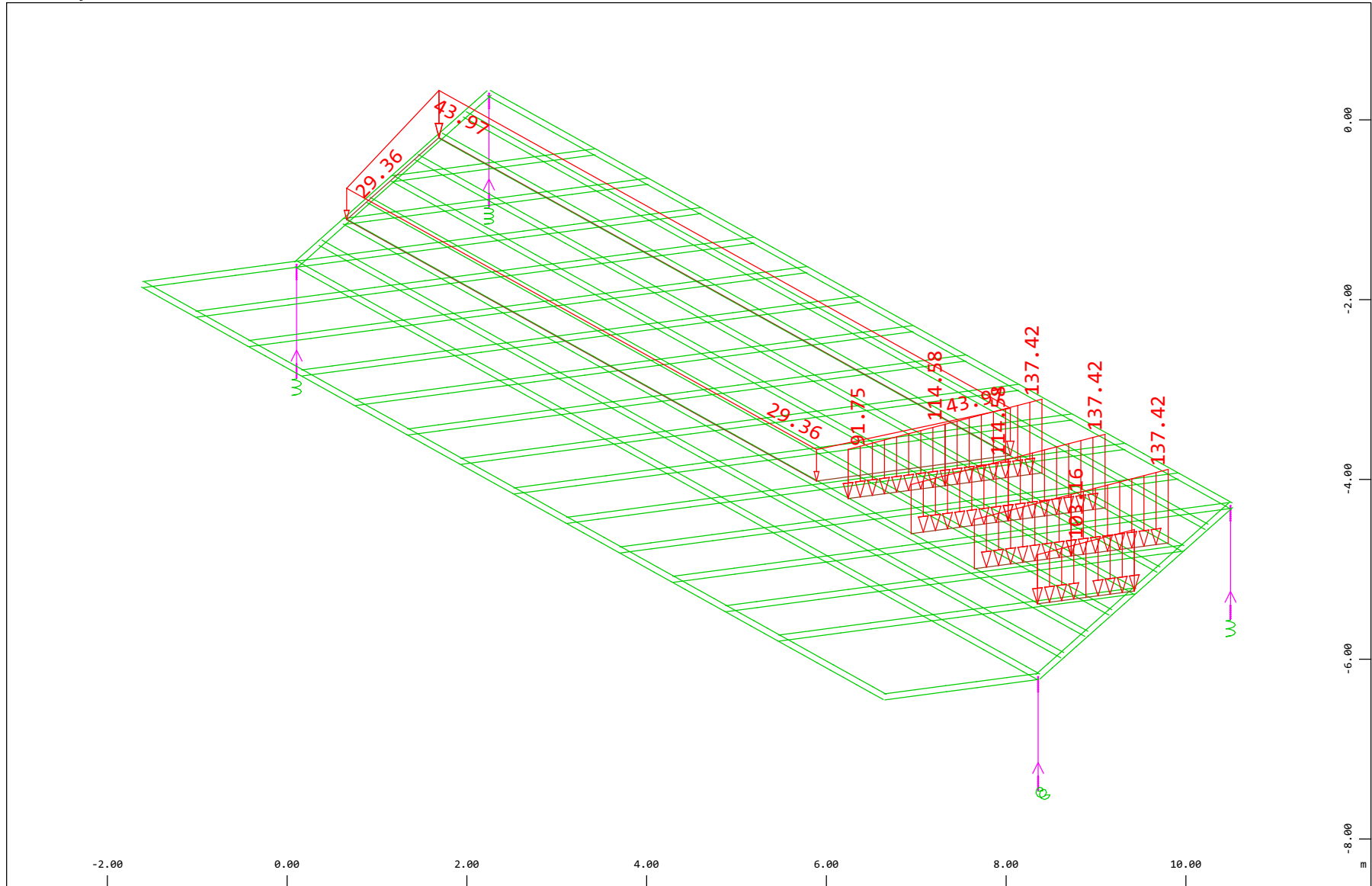


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 108 Qt: LM71-S 10m-ep , 1 cm 3D = 19.6 kNm (Min=-13.7) (Max=12.7)

M 1 : 120

Definition of Axis
 Results elementay loads

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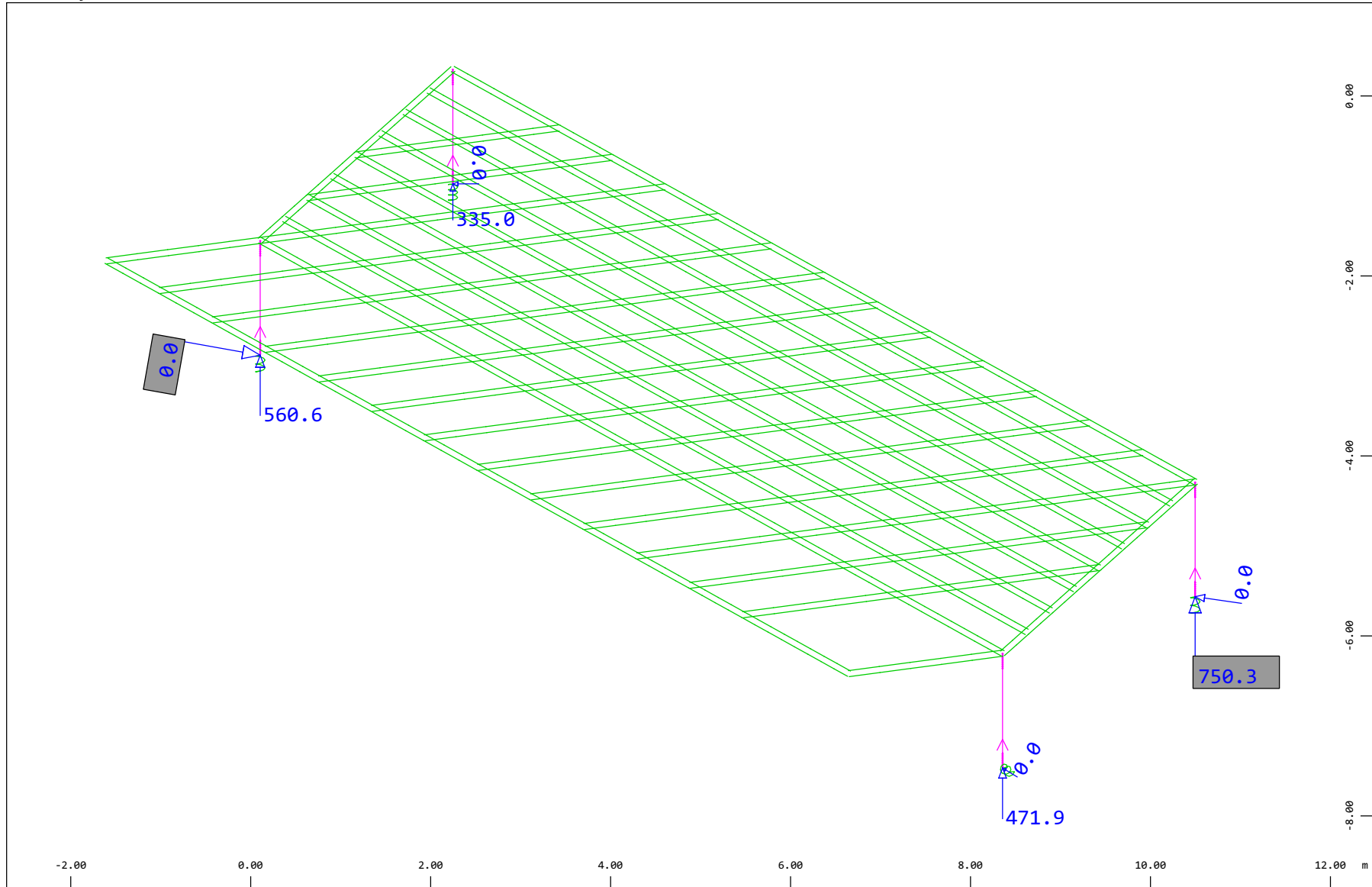
Z
 X Y

Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 116 Qt: LM71-S 17m-ep , (1 cm 3D = unit) Free line load (force) in global Z (Unit=96.9 kN/m, Min=-137.4
 Max=-91.7 ∇), Free area load (force) in global Z (Unit=48.4 kN/m², Min=-44.0 Max=-29.4 ∇)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 484.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.0019 kN

▬ (Max=750.3) (total: 2118.)

▬ (Max=0.0037)

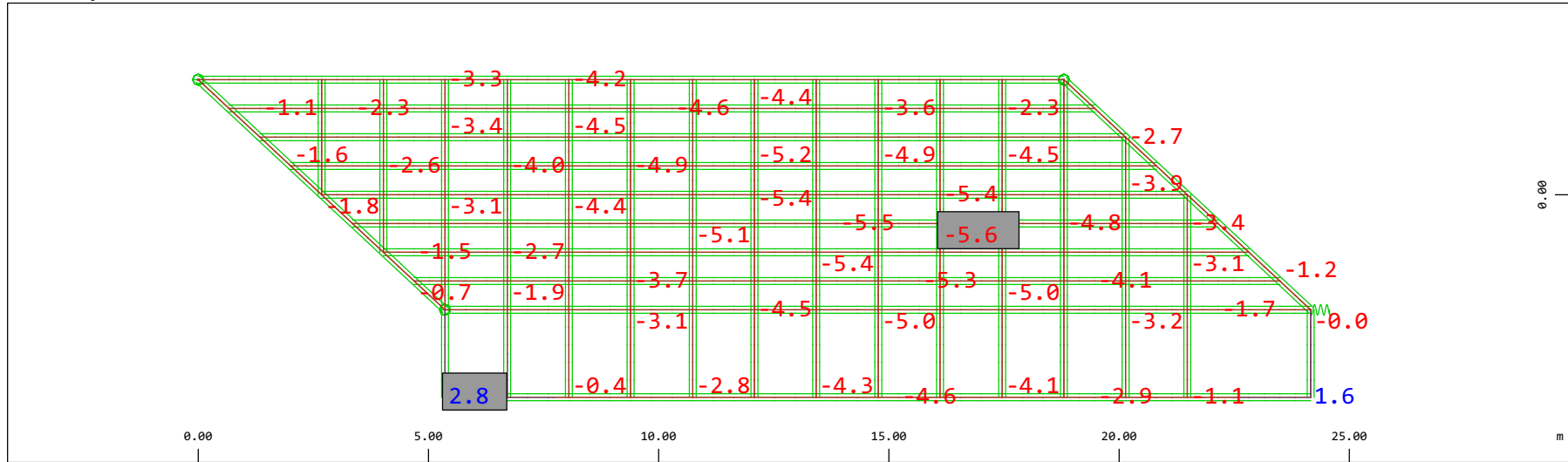
M 1 : 60

X * 0.502

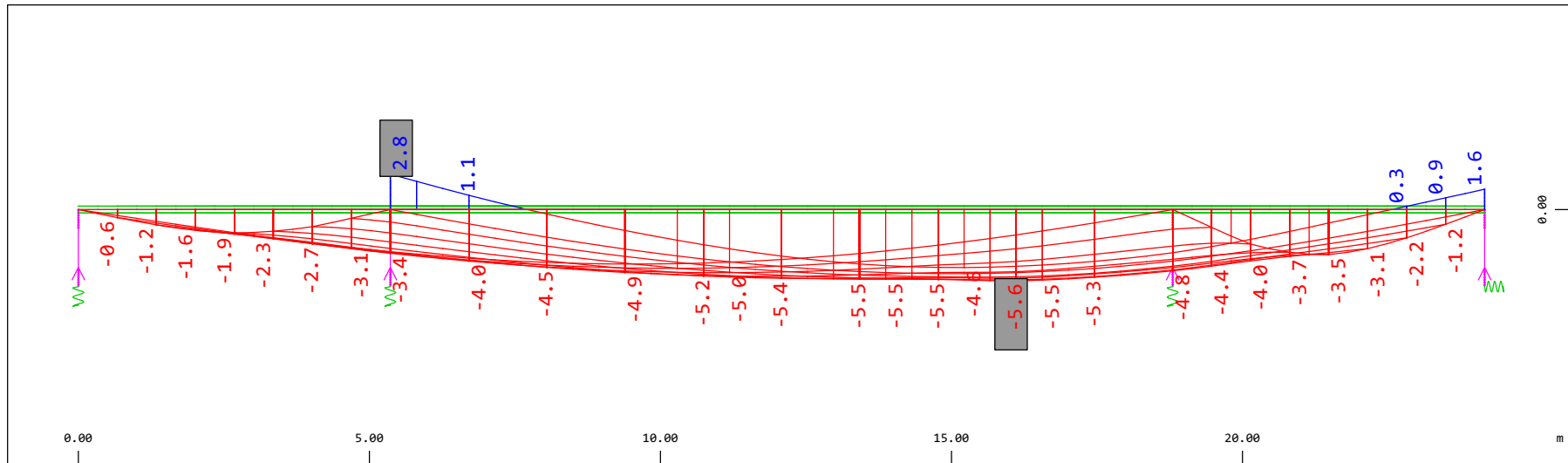
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

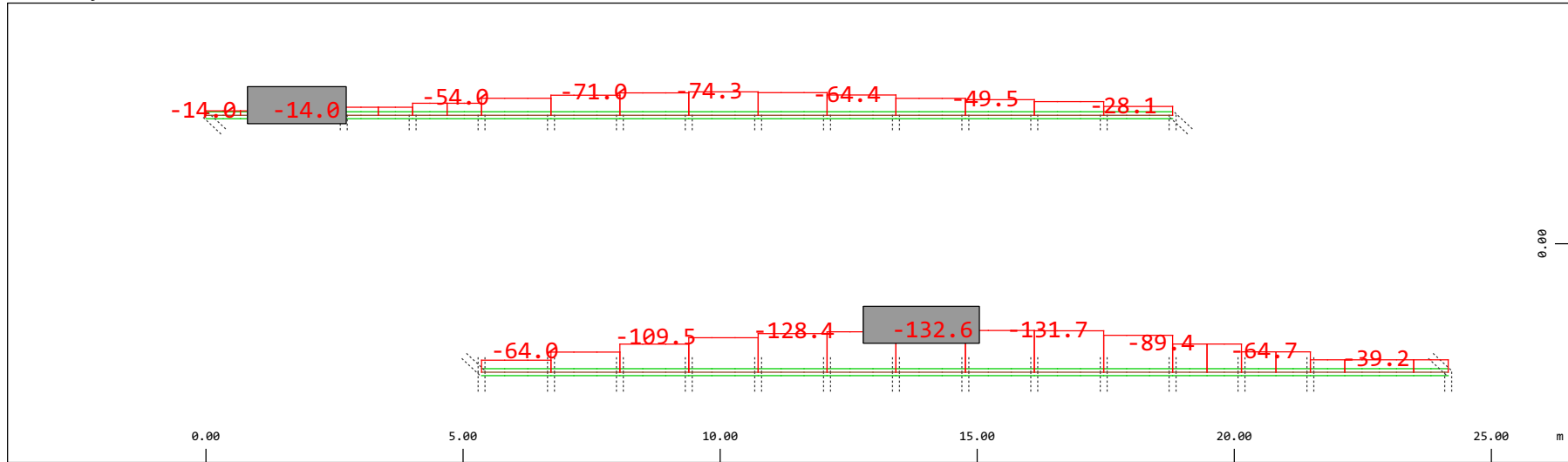


Y Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along M 1 : 134
 ○, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 4.84 mm (Min=-5.59) (Max=2.78)



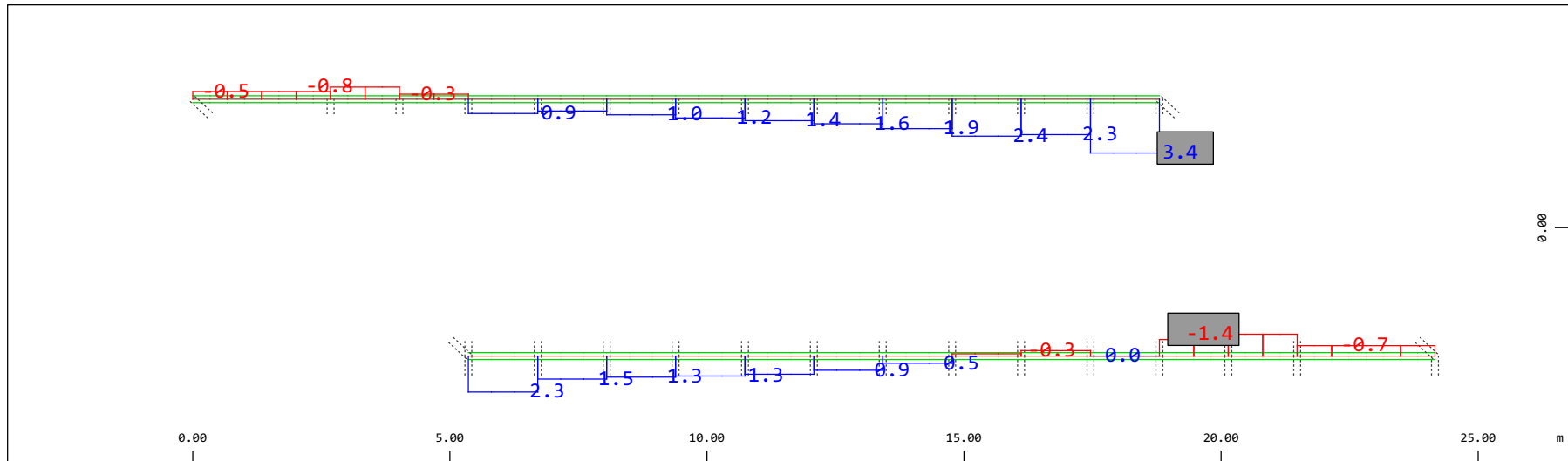
Z Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along M 1 : 106
 ↓, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 4.84 mm (Min=-5.59) (Max=2.78)

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 196.1 kN (Min=-132.6) (Max=-14.0)

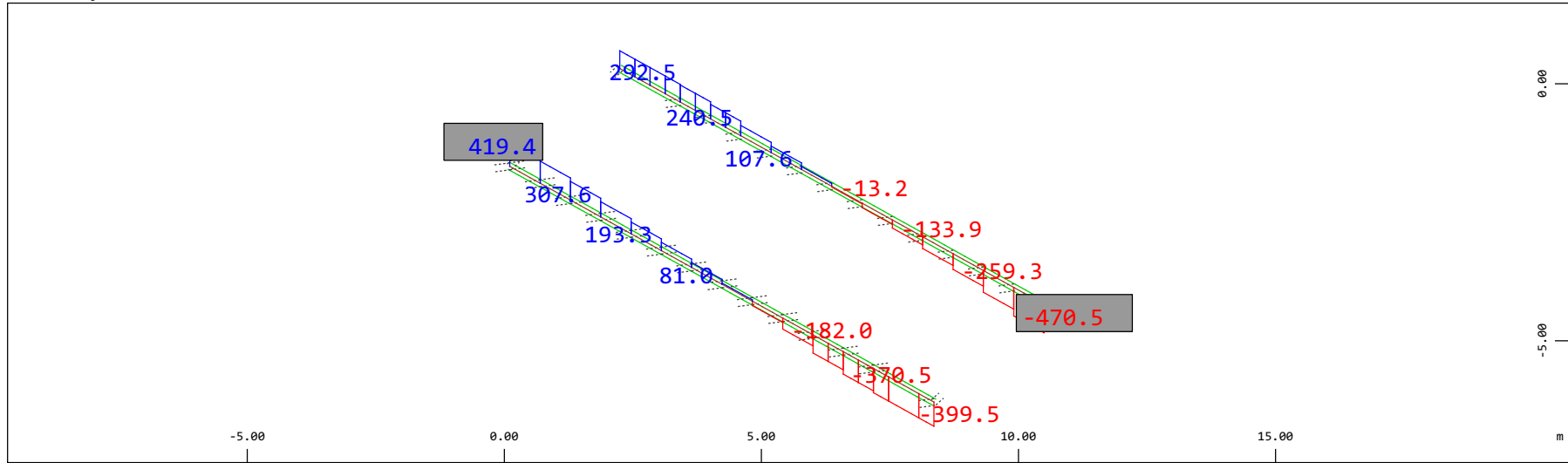
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 3.92 kNm (Min=-1.39) (Max=3.42)

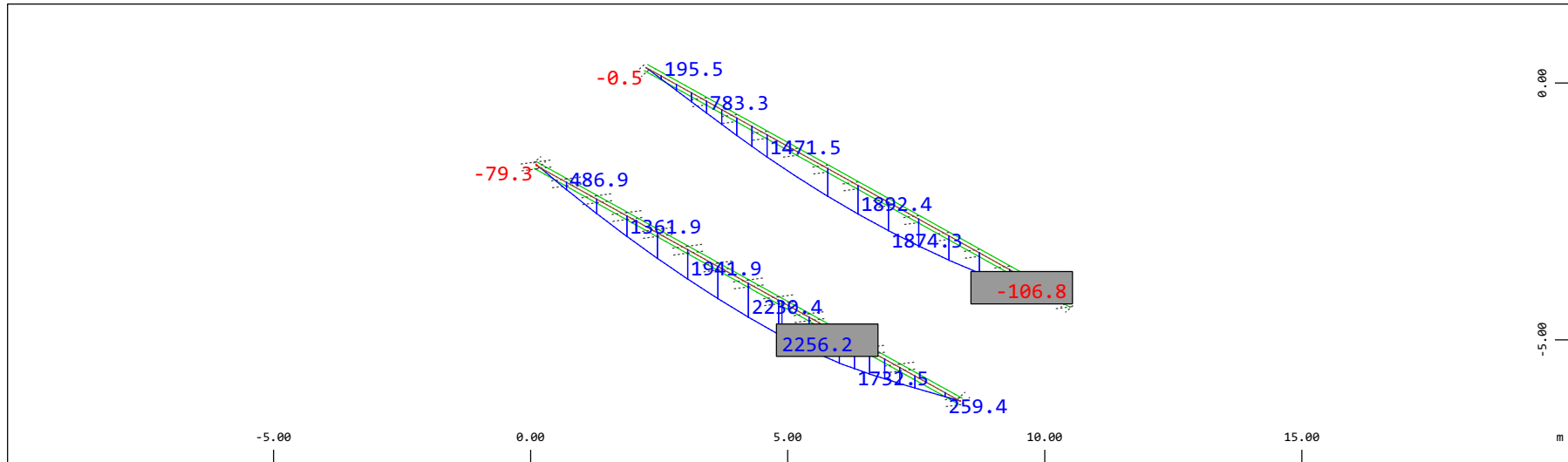
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 980.5 kN (Min=-470.5) (Max=419.4)

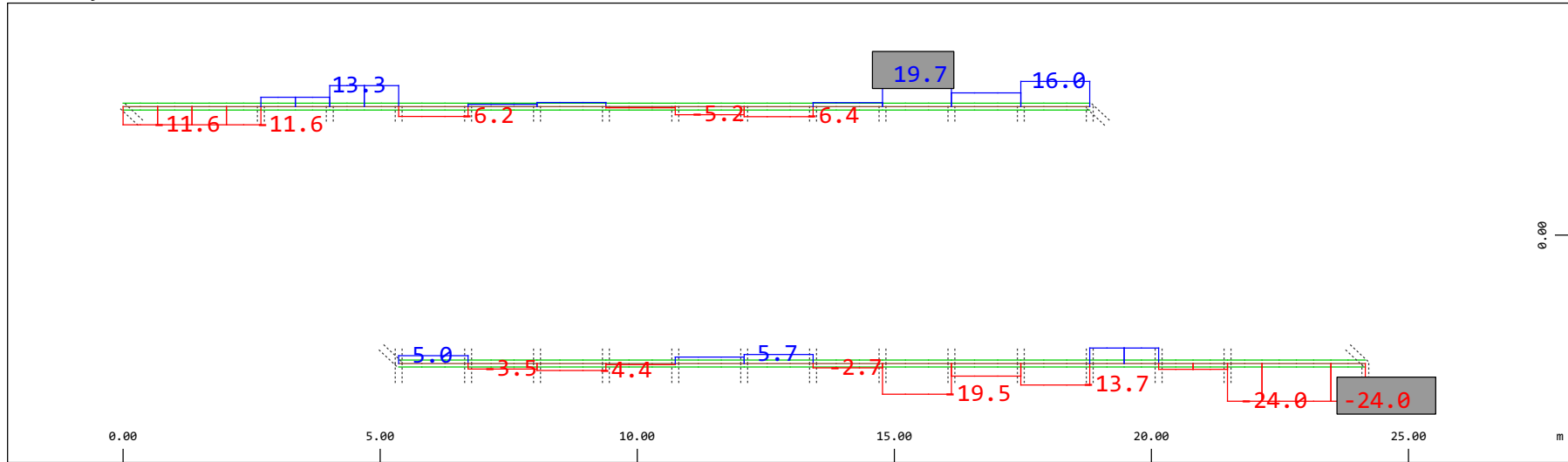
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 3922. kNm (Min=-106.8) (Max=2256.)

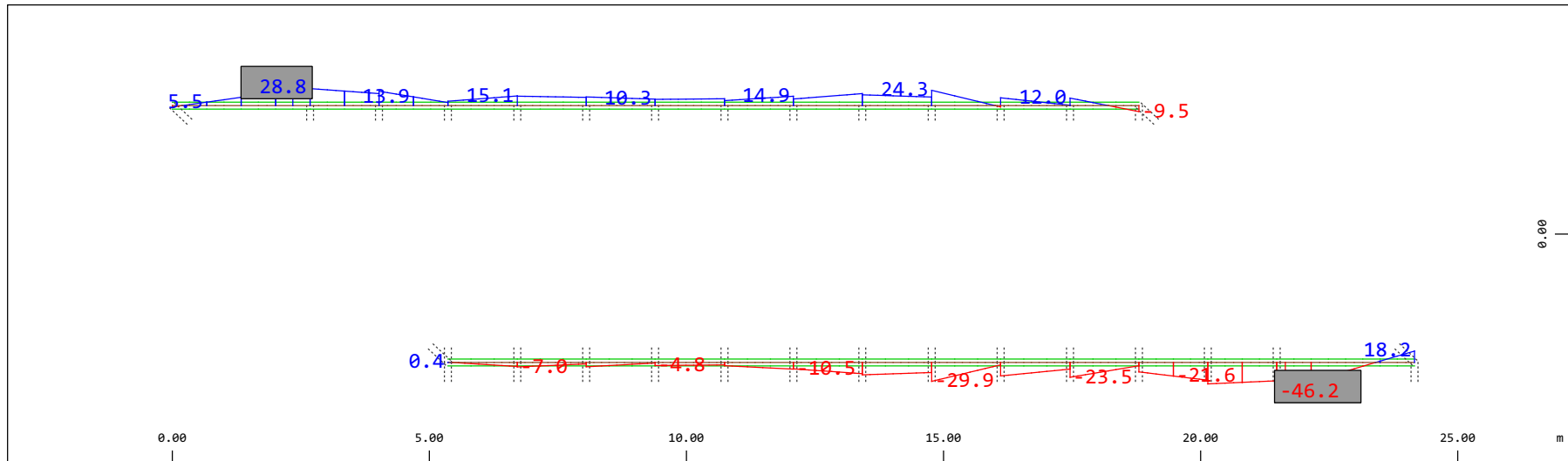
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kN (Min=-24.0) (Max=19.7)

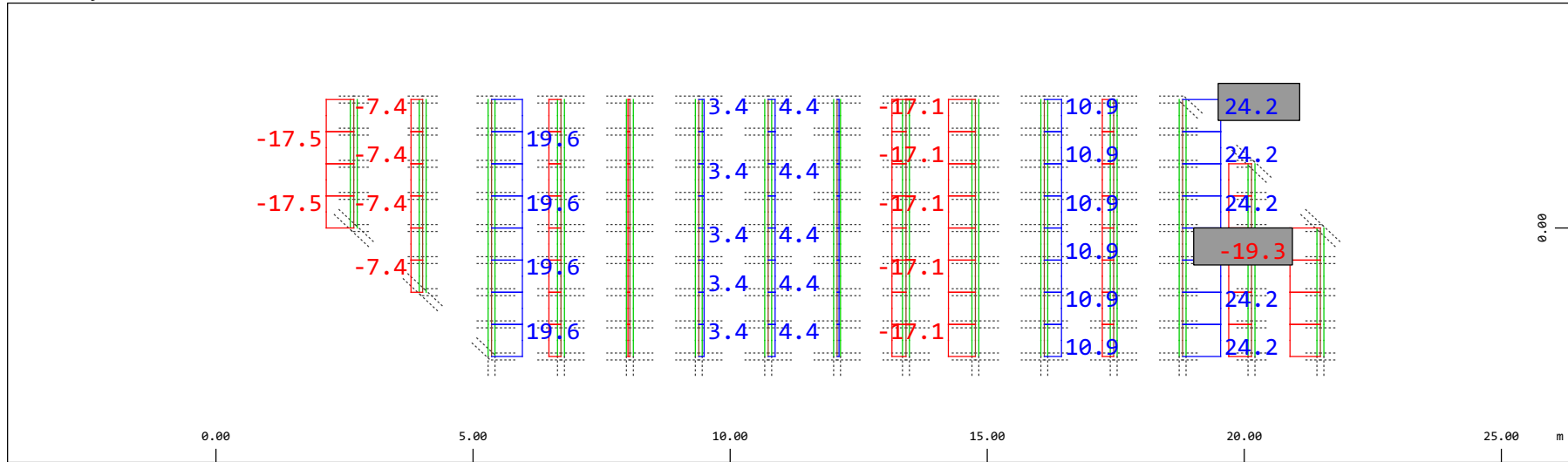
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 98.0 kNm (Min=-46.2) (Max=28.8)

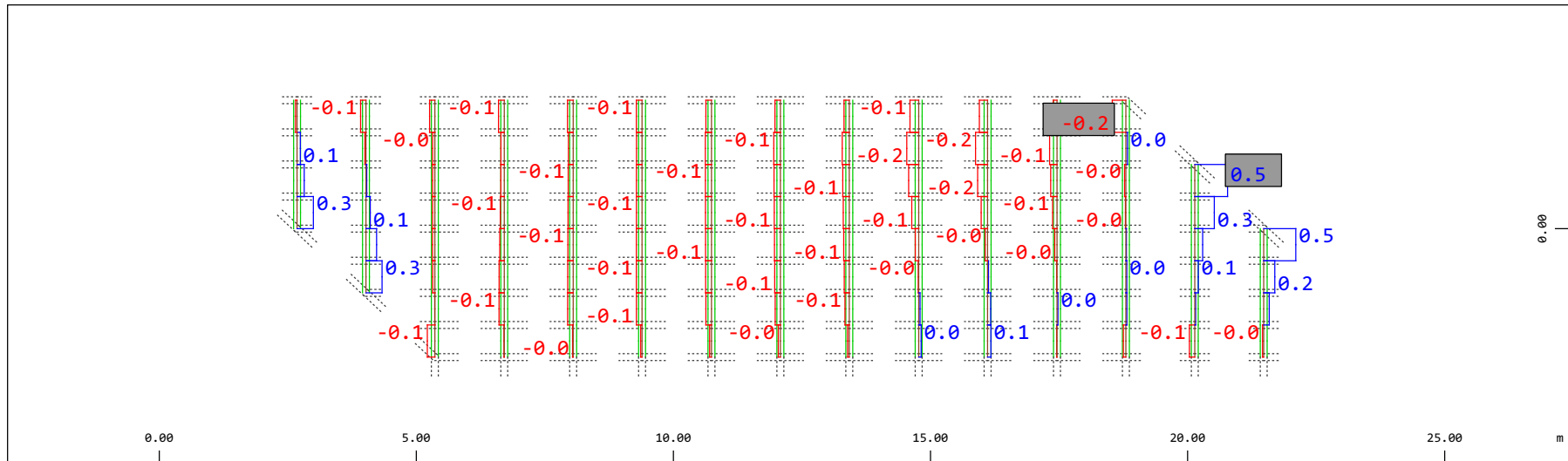
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kN (Min=-19.3) (Max=24.2)

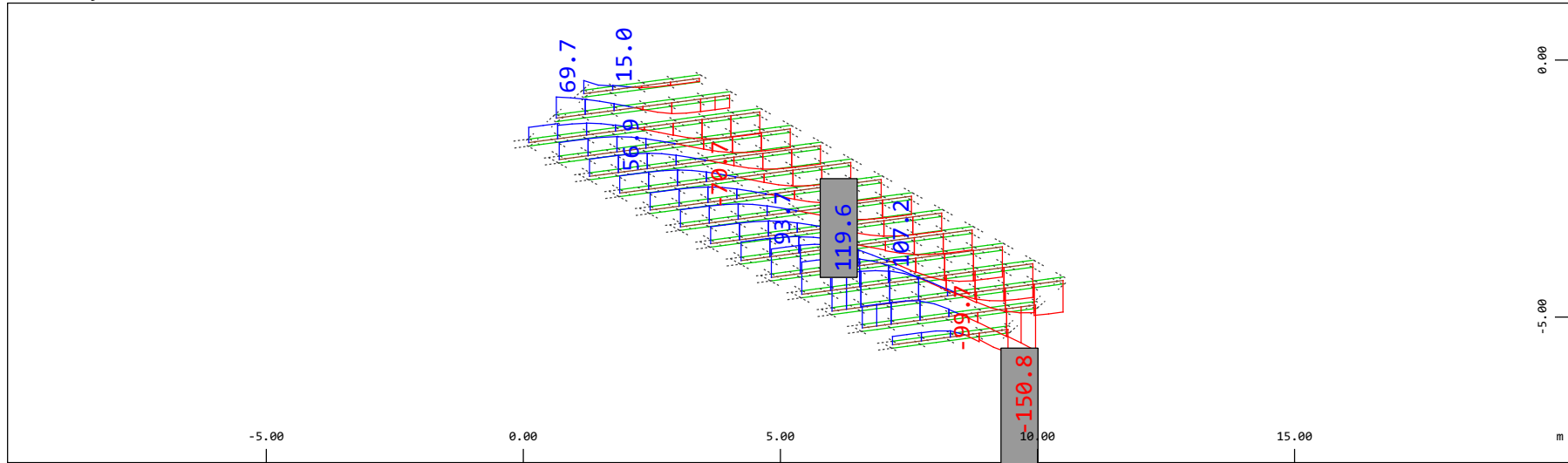
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.980 kNm (Min=-0.217) (Max=0.520)

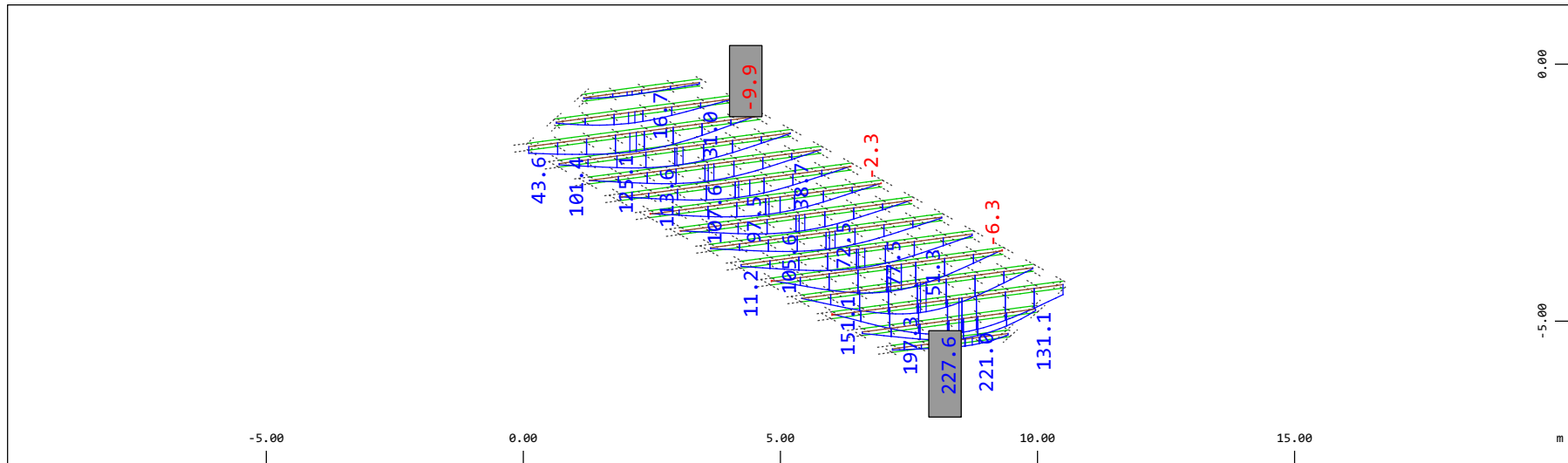
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 196.1 kN (Min=-150.8) (Max=119.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

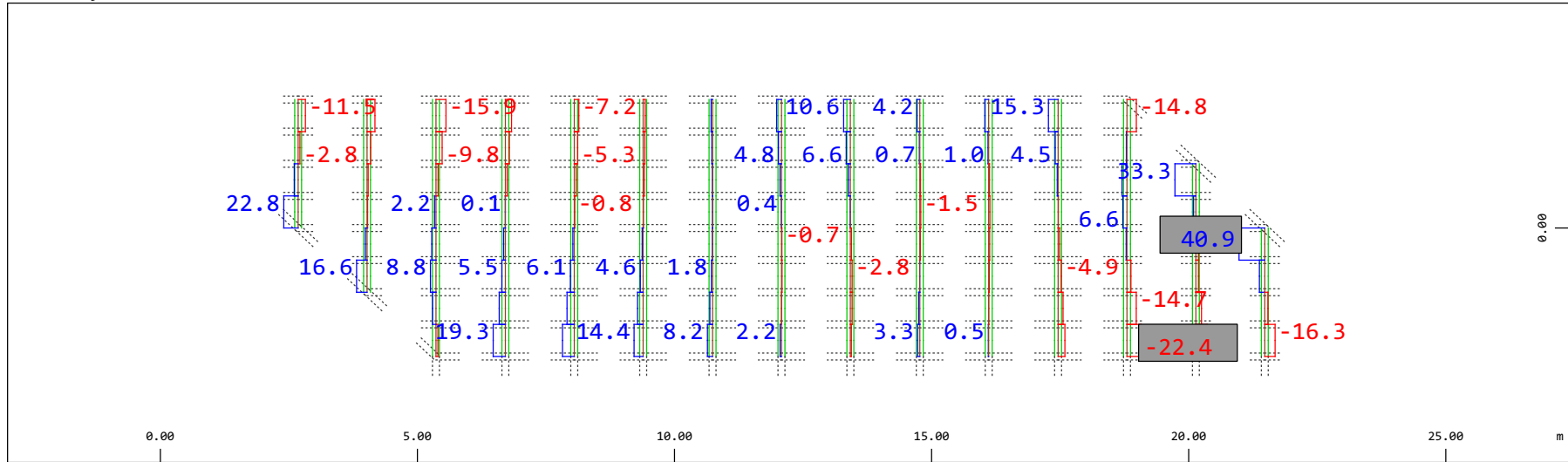


Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 392.2 kNm (Min=-9.88) (Max=227.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

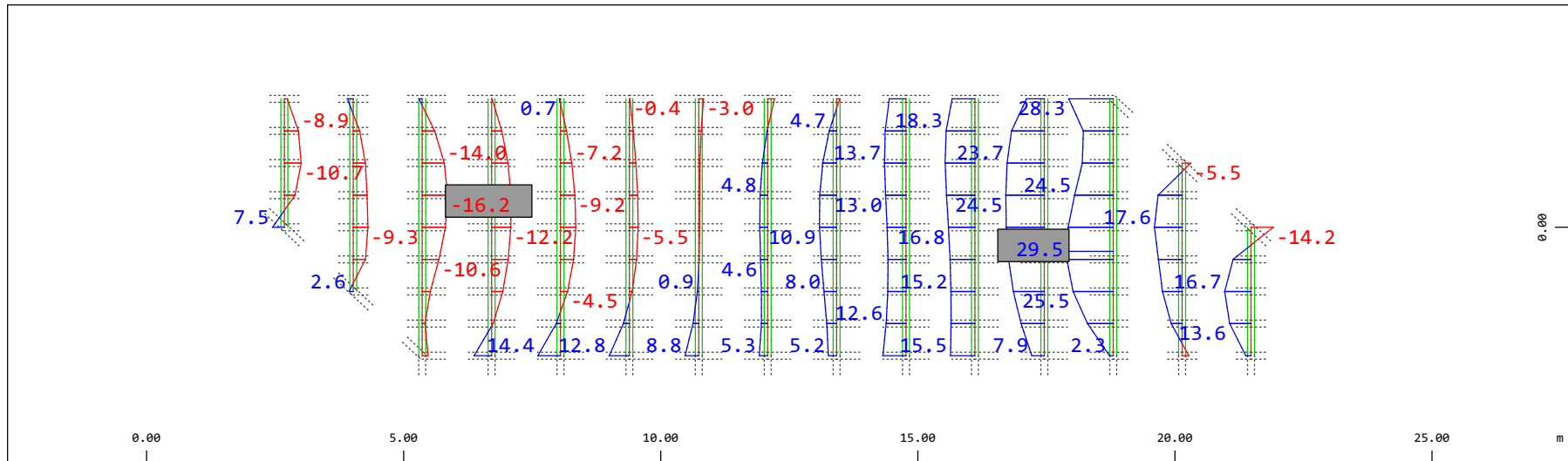
Definition of Axis

Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 98.0 kN (Min=-22.4) (Max=40.9)

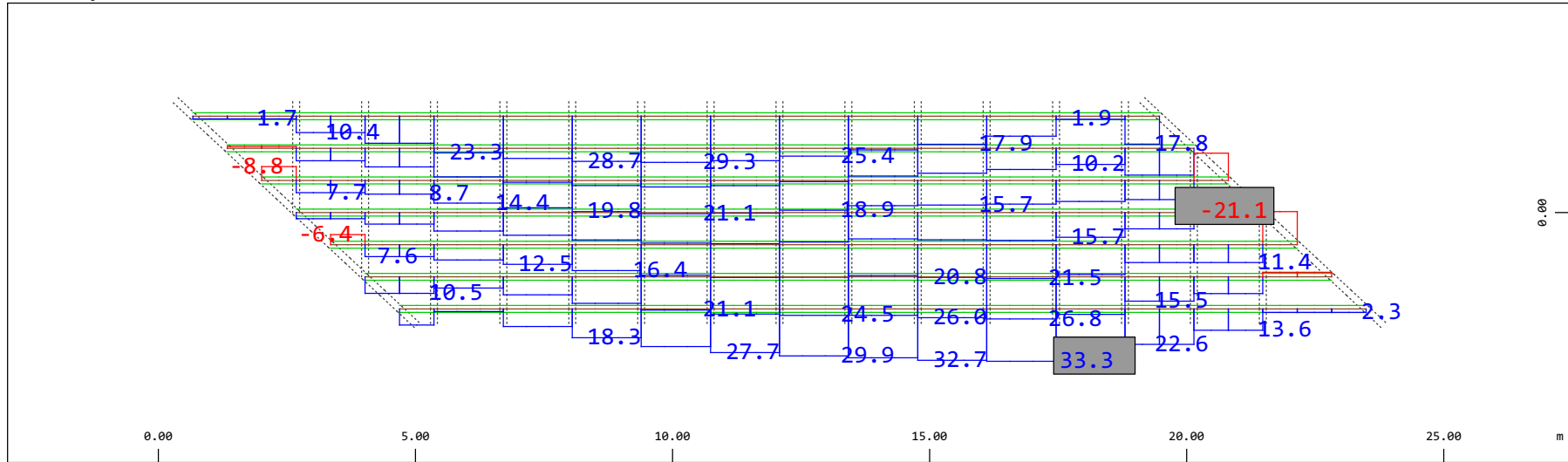
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kNm (Min=-16.2) (Max=29.5)

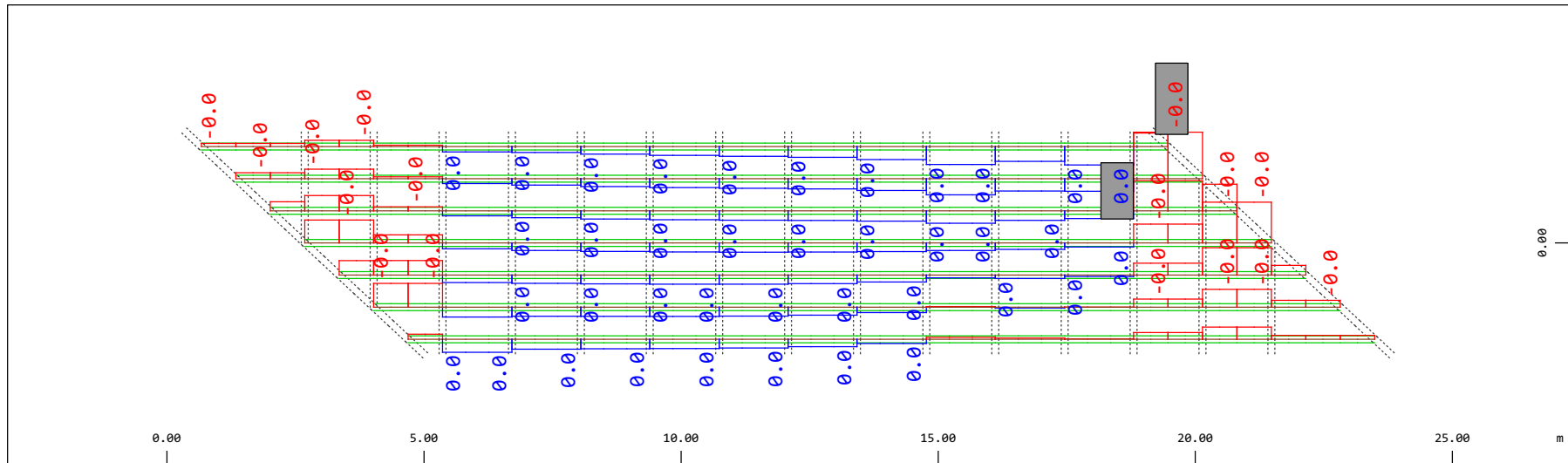
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force N_x , Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kN (Min=-21.1) (Max=33.3)

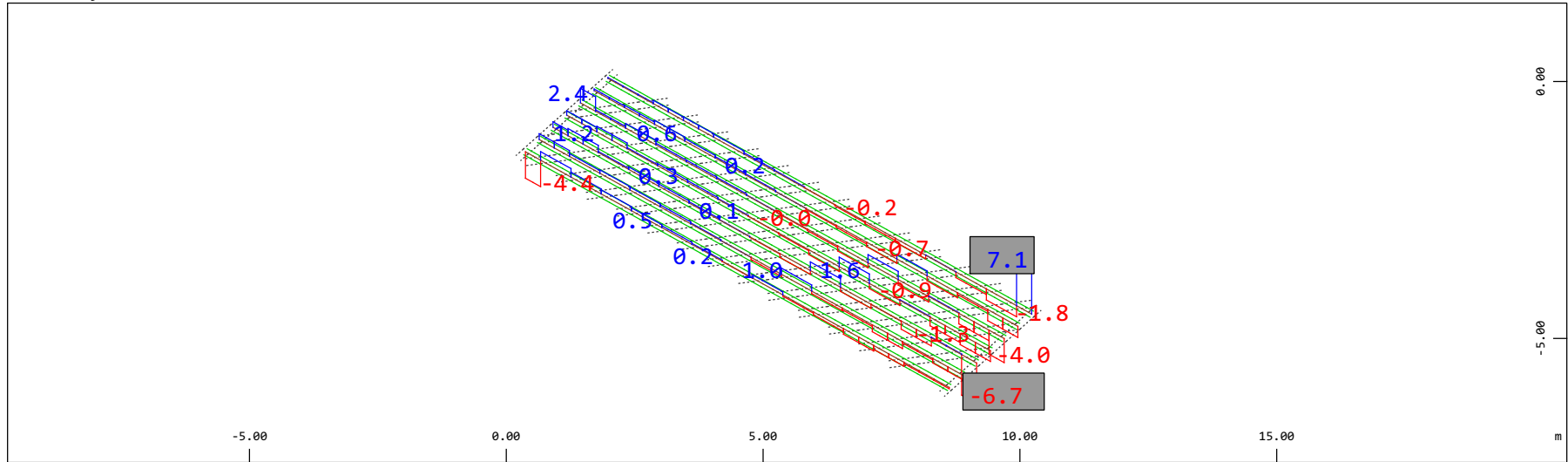
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment M_t , Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.0098 kNm (Min=-0.0074) (Max=0.0029)

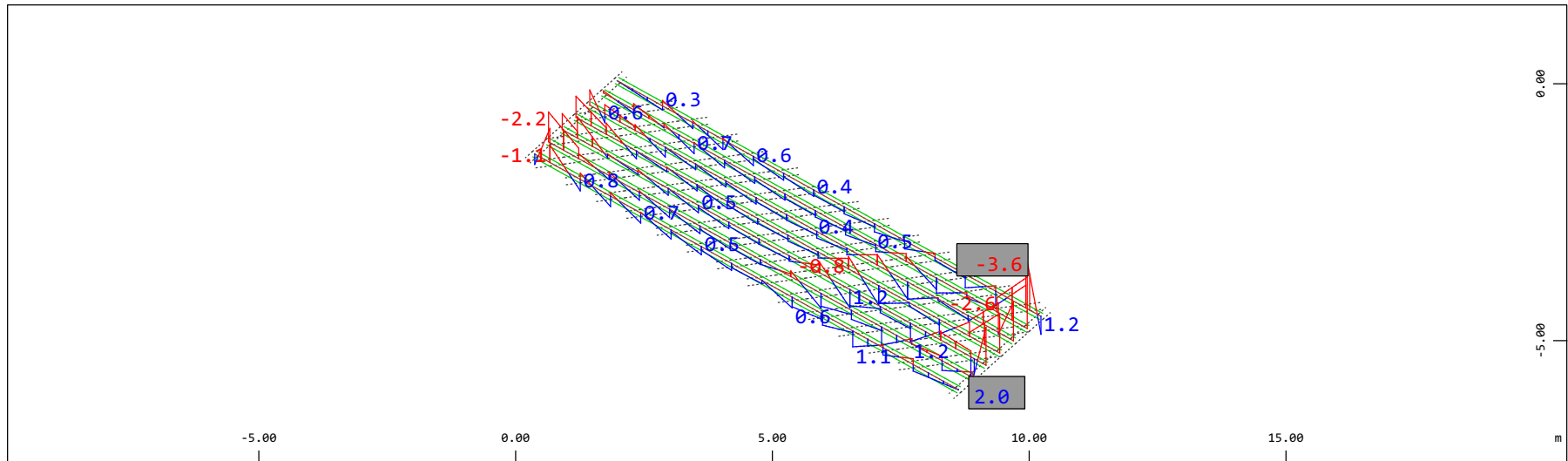
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 9.80 kN (Min=-6.69) (Max=7.09)

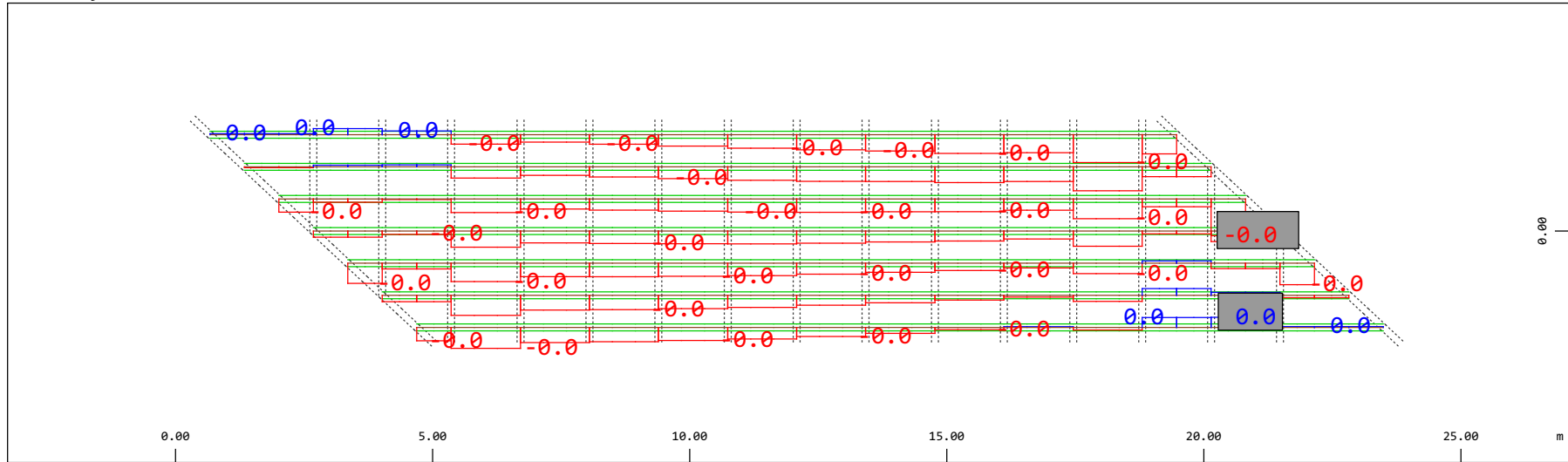
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 3.92 kNm (Min=-3.57) (Max=1.98)

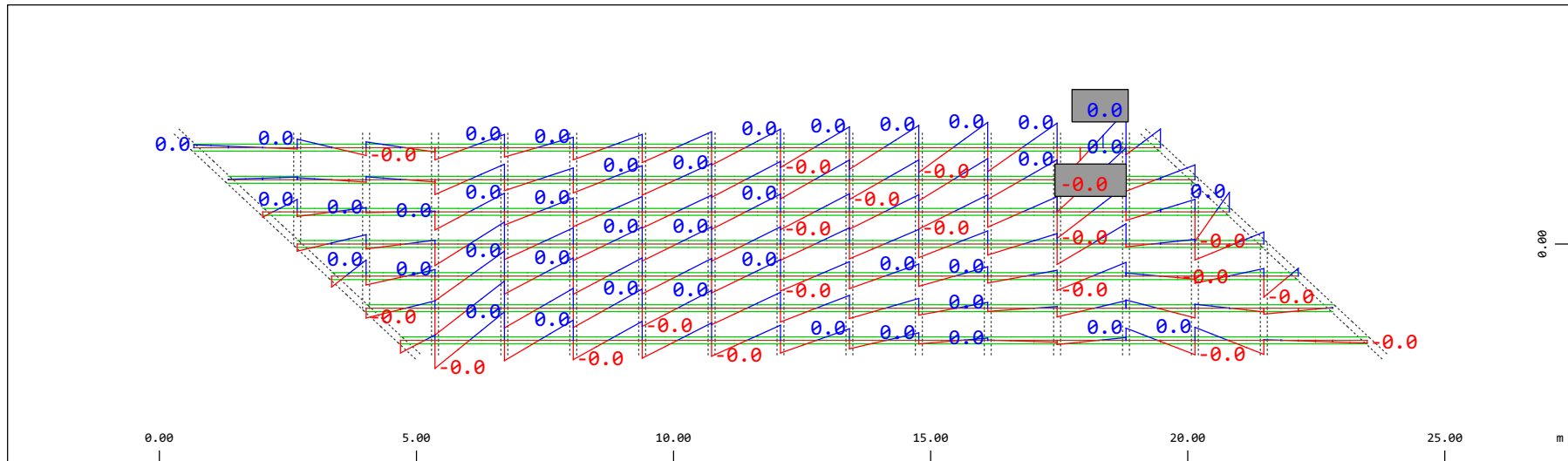
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Y
Z-X Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.0196 kN (Min=-0.0117) (Max=0.0032)

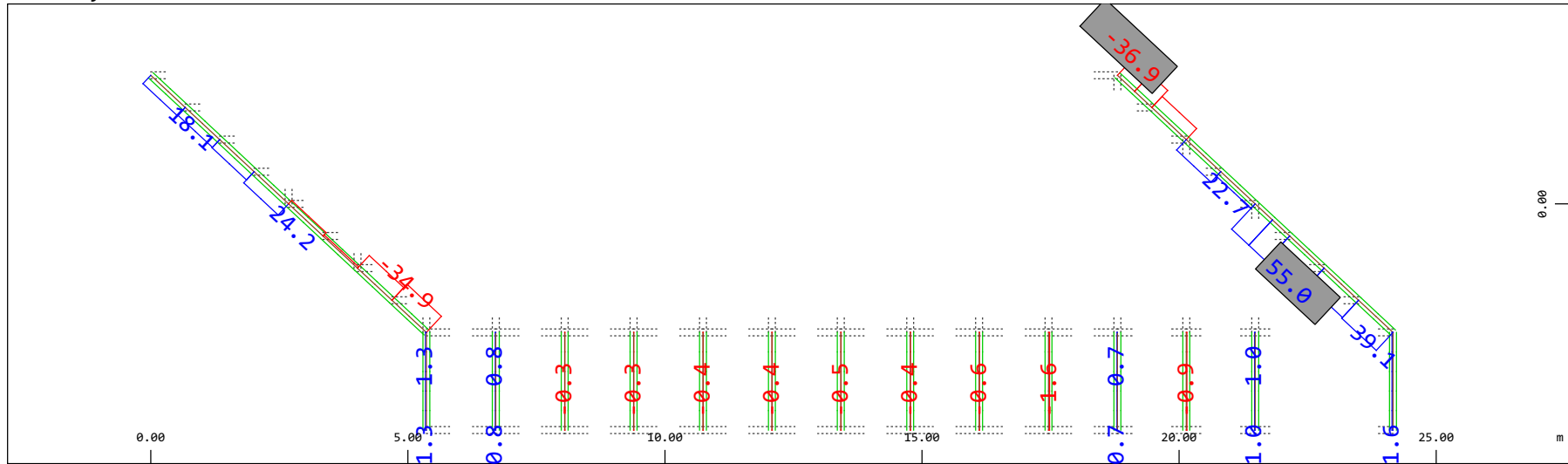
M 1 : 120



Y
Z-X Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.0098 kNm (Min=-0.0060) (Max=0.0059)

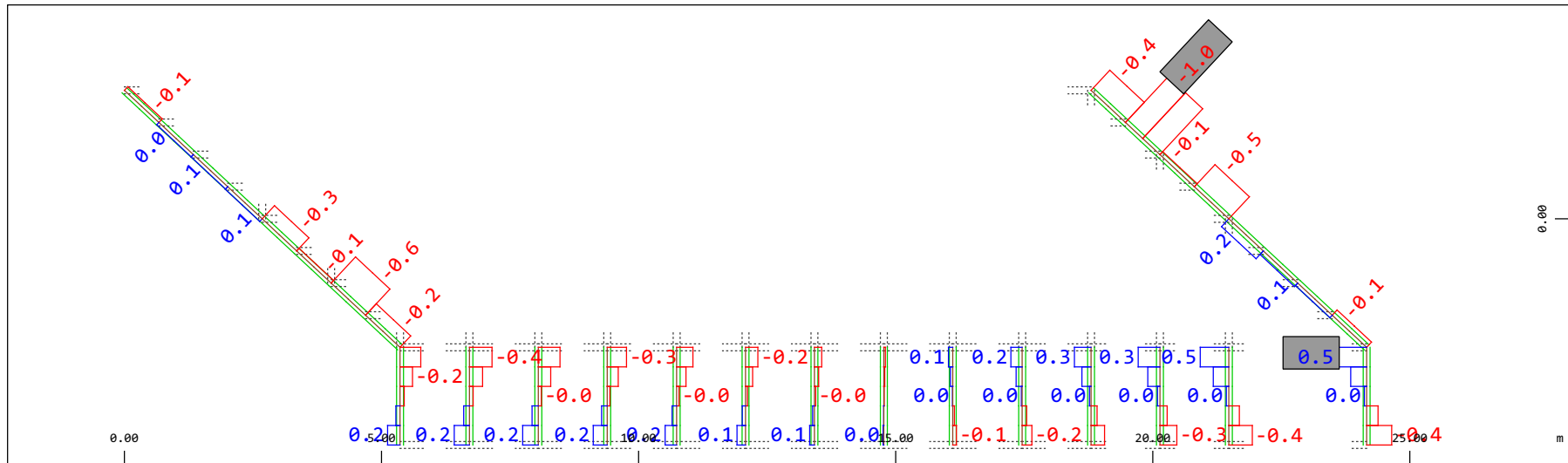
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 98.0 kN (Min=-36.9) (Max=55.0)

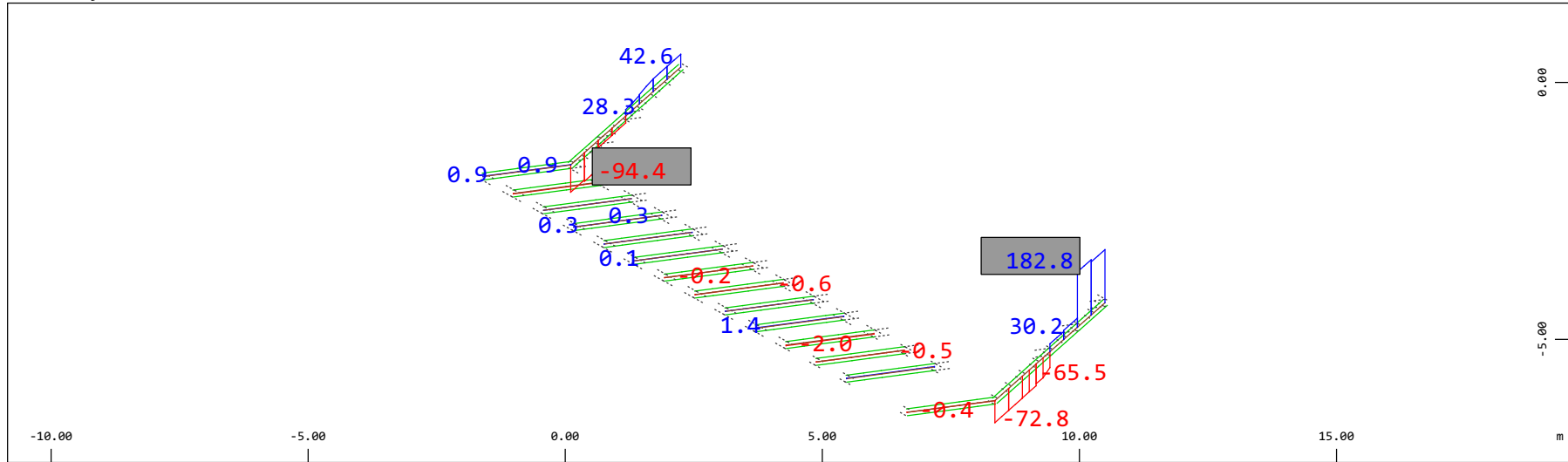
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 0.980 kNm (Min=-0.996) (Max=0.470)

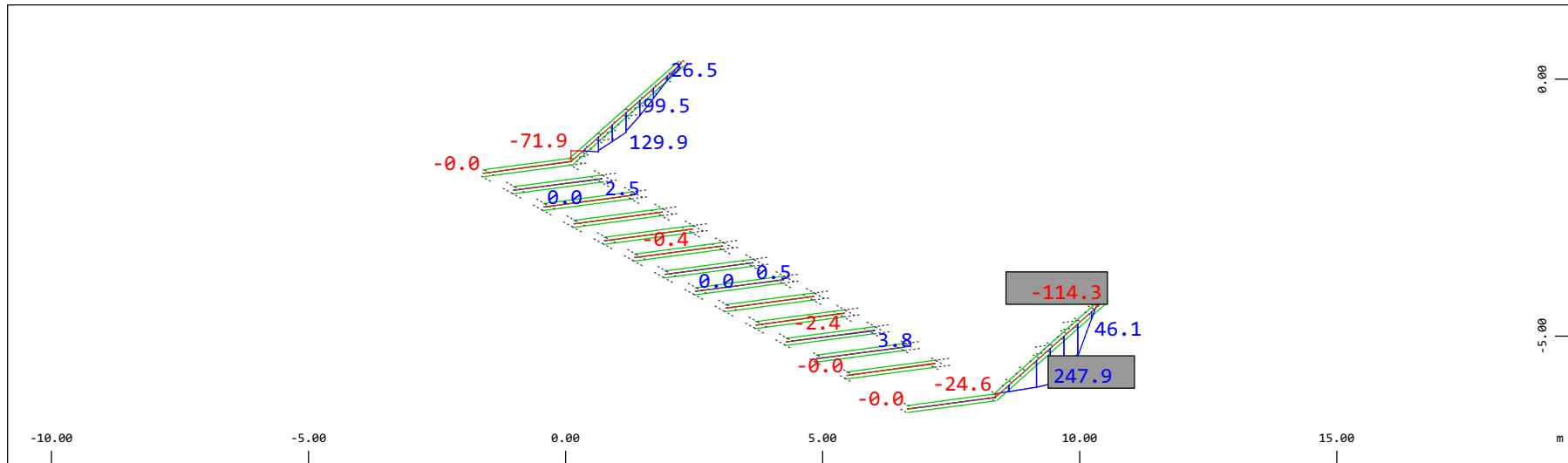
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 196.1 kN (Min=-94.4) (Max=182.8)

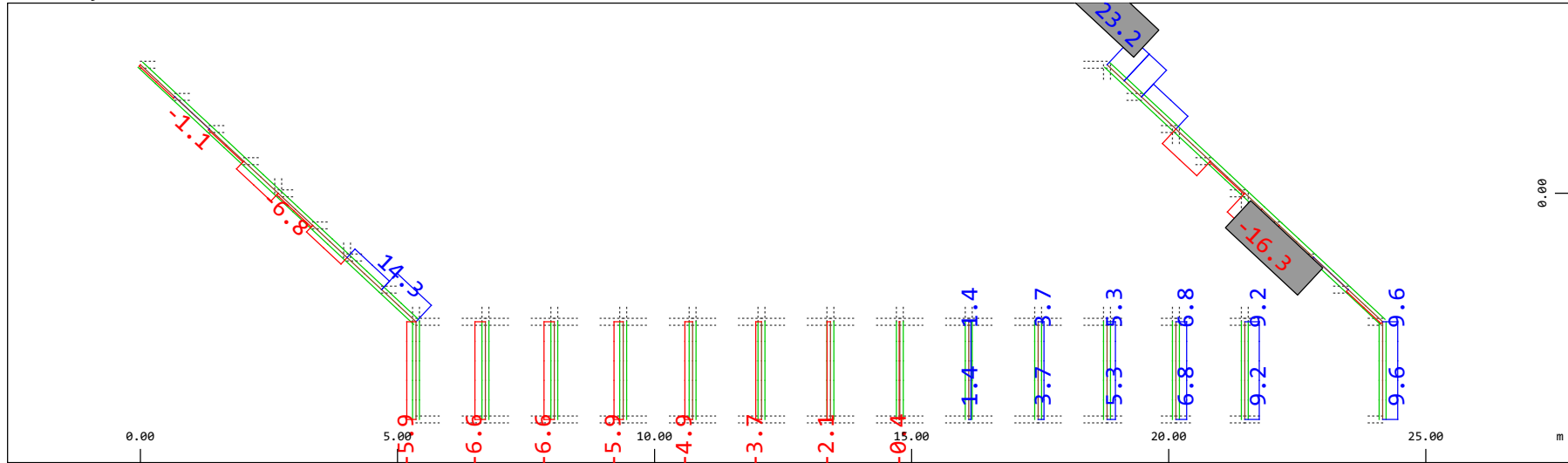
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 392.2 kNm (Min=-114.3) (Max=247.9)

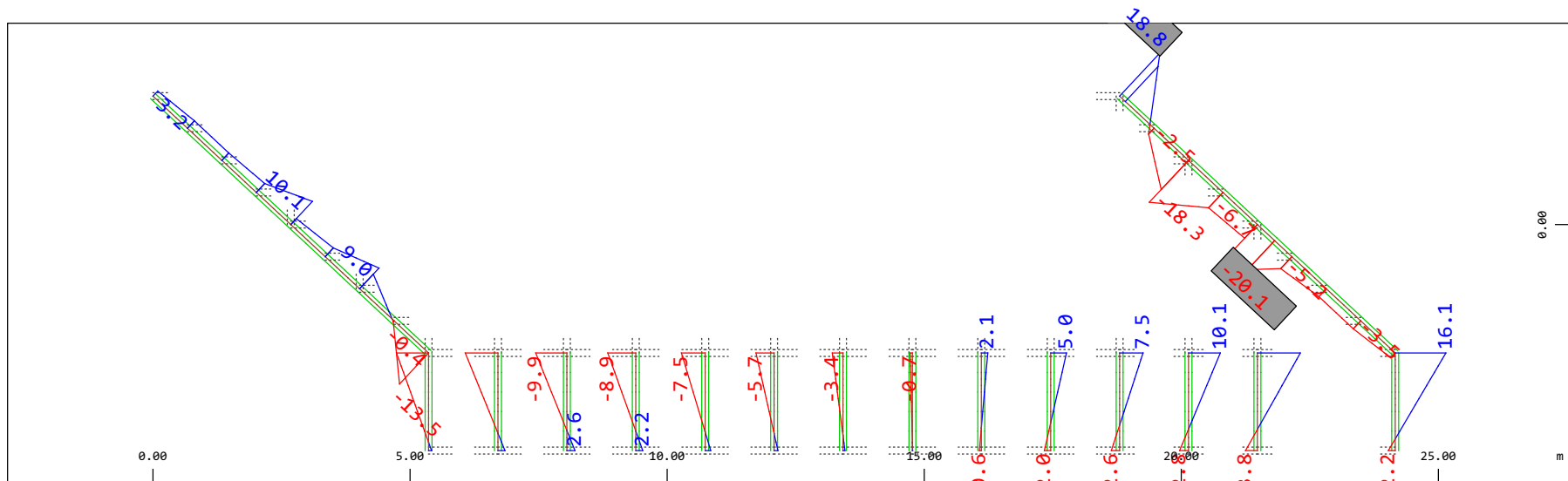
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 39.2 kN (Min=-16.3) (Max=23.2)

M 1 : 120

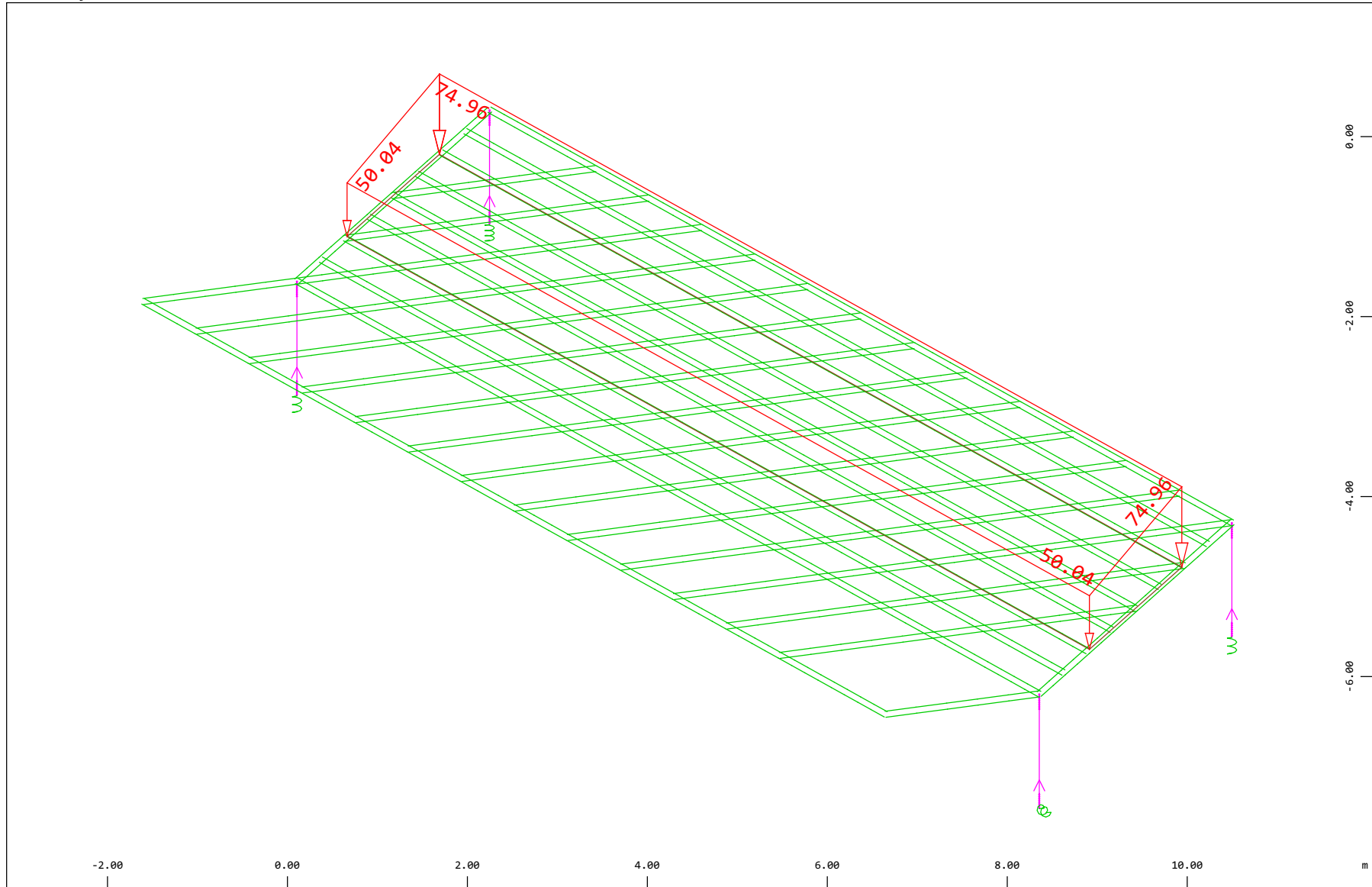


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 116 Qt: LM71-S 17m-ep , 1 cm 3D = 19.6 kNm (Min=-20.1) (Max=18.8)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 Y
 X

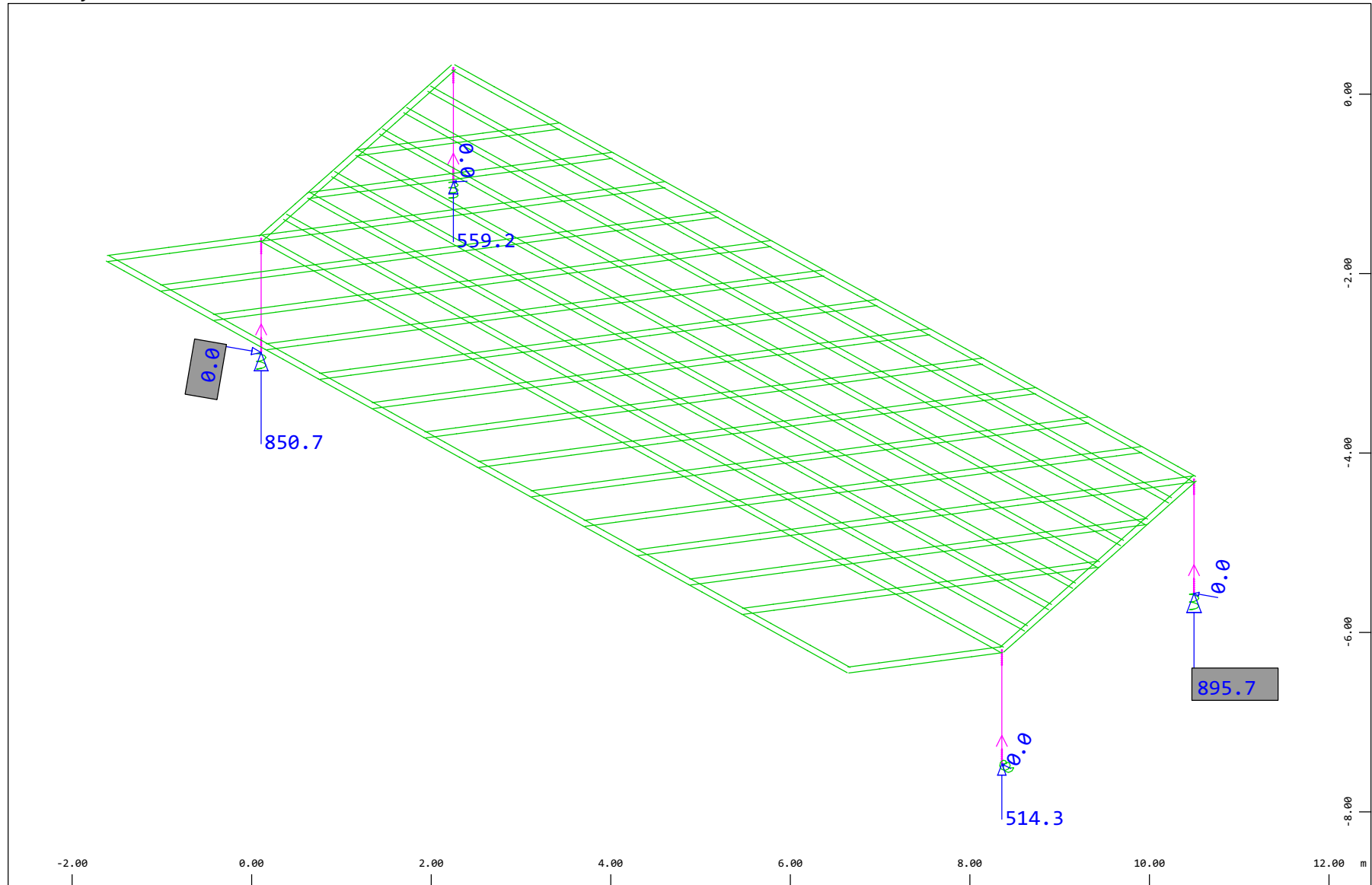
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 200 Qt: SW/2-ecc.pos. , (1 cm 3D = unit) Free area load (force) in global Z (Unit=48.4 kN/m2)
 (Max=-50.0)

→ (Min=-75.0)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 484.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 0.0048 kN

▬ (Max=895.7) (total: 2820.)

▬ (Max=0.0049)

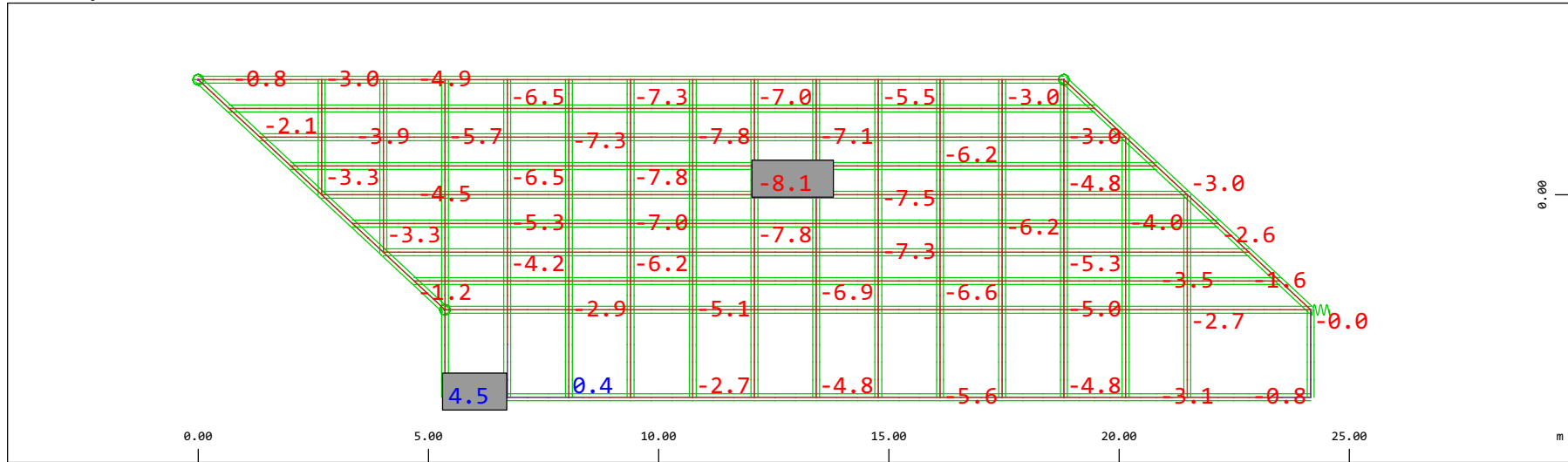
M 1 : 60

X * 0.502

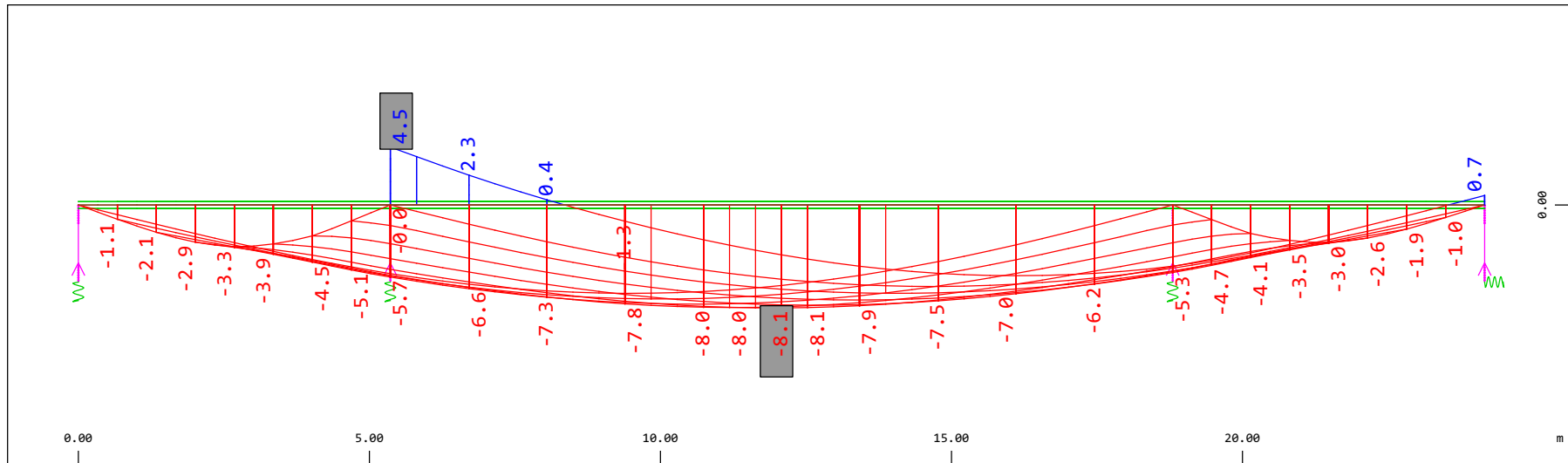
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

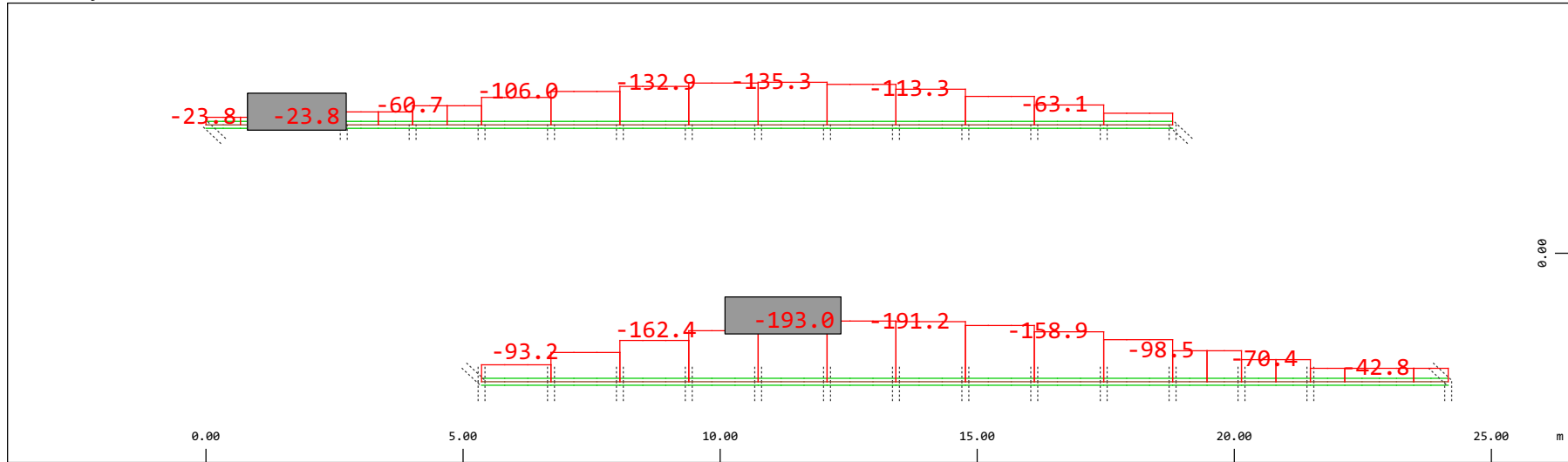


Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 4.84 mm (Min=-8.08) (Max=4.55) M 1 : 134



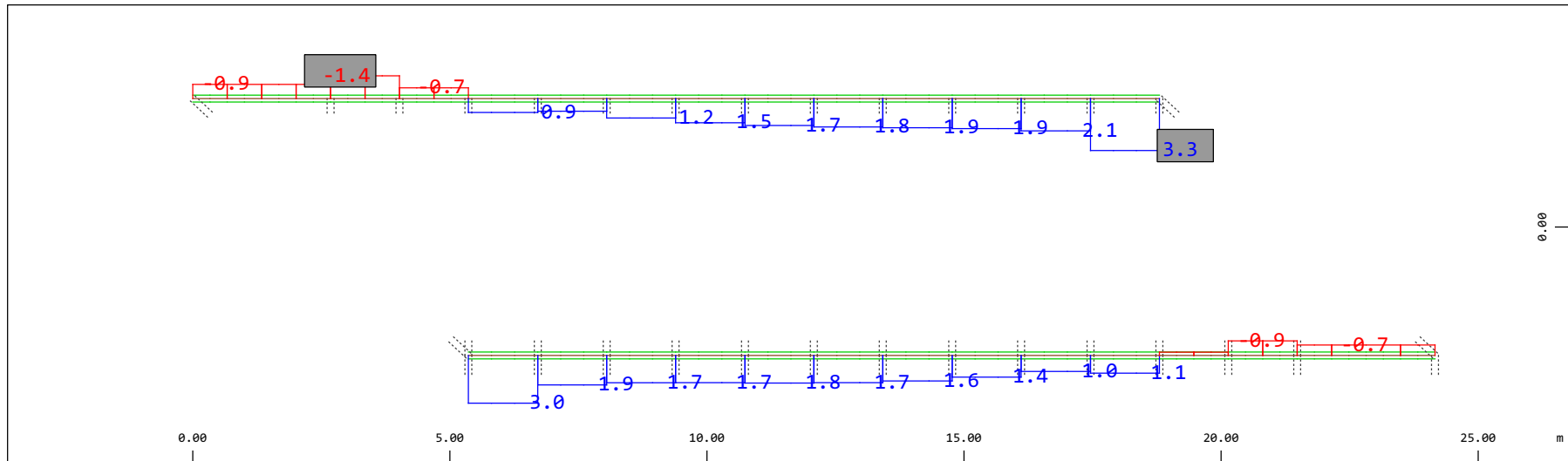
Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 4.84 mm (Min=-8.08) (Max=4.55) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 196.1 kN (Min=-193.0) (Max=-23.8)

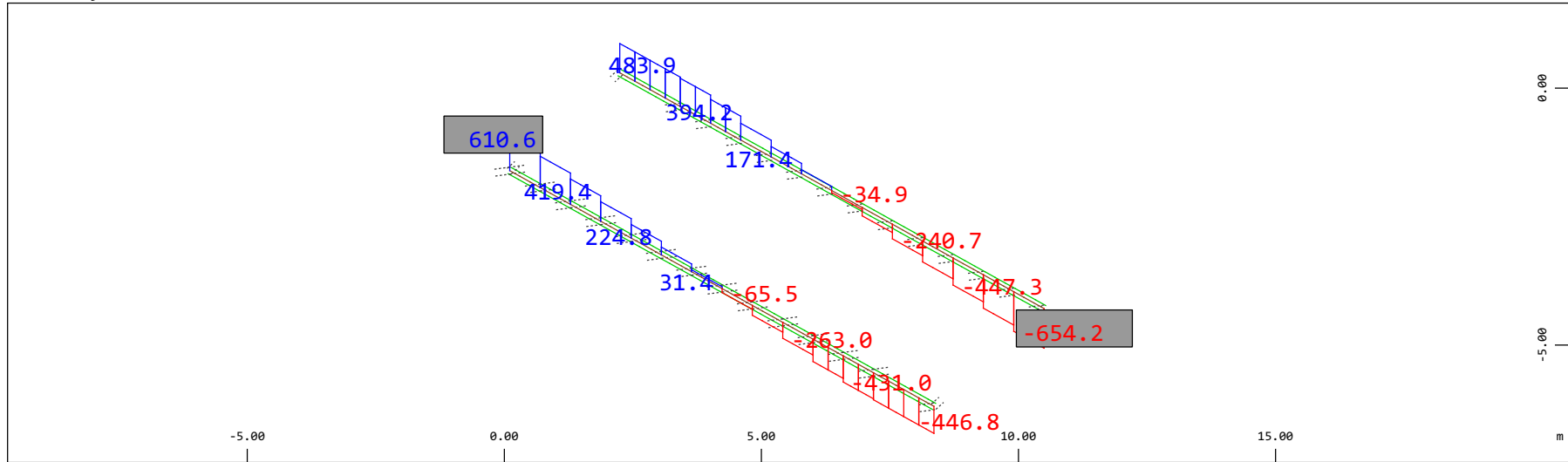
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 3.92 kNm (Min=-1.45) (Max=3.30)

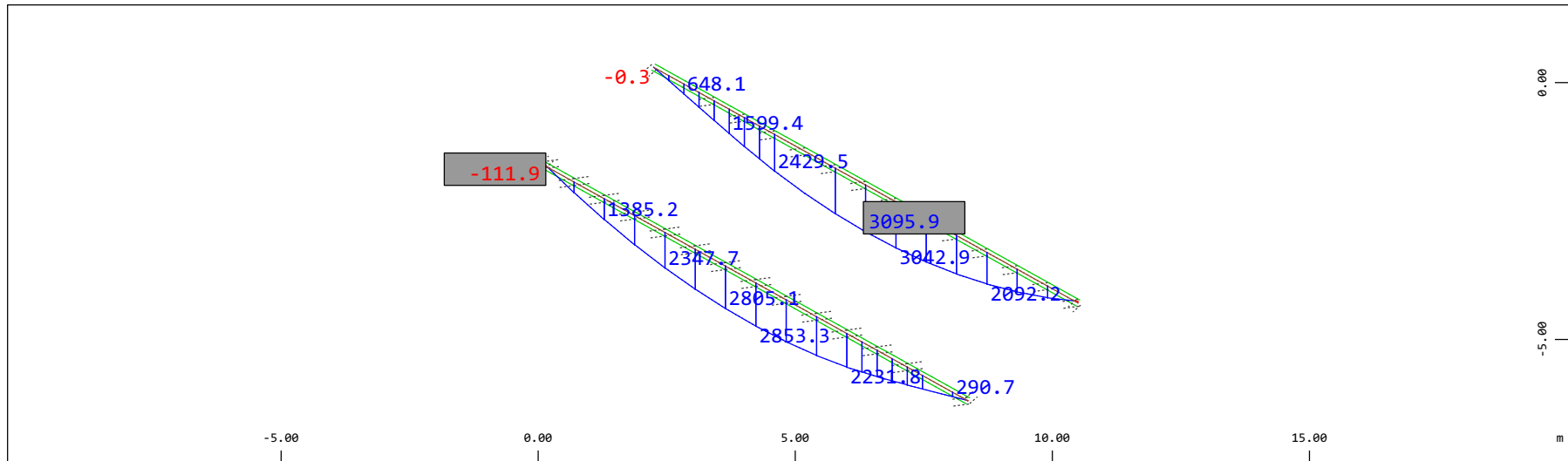
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 980.5 kN (Min=-654.2) (Max=610.6)

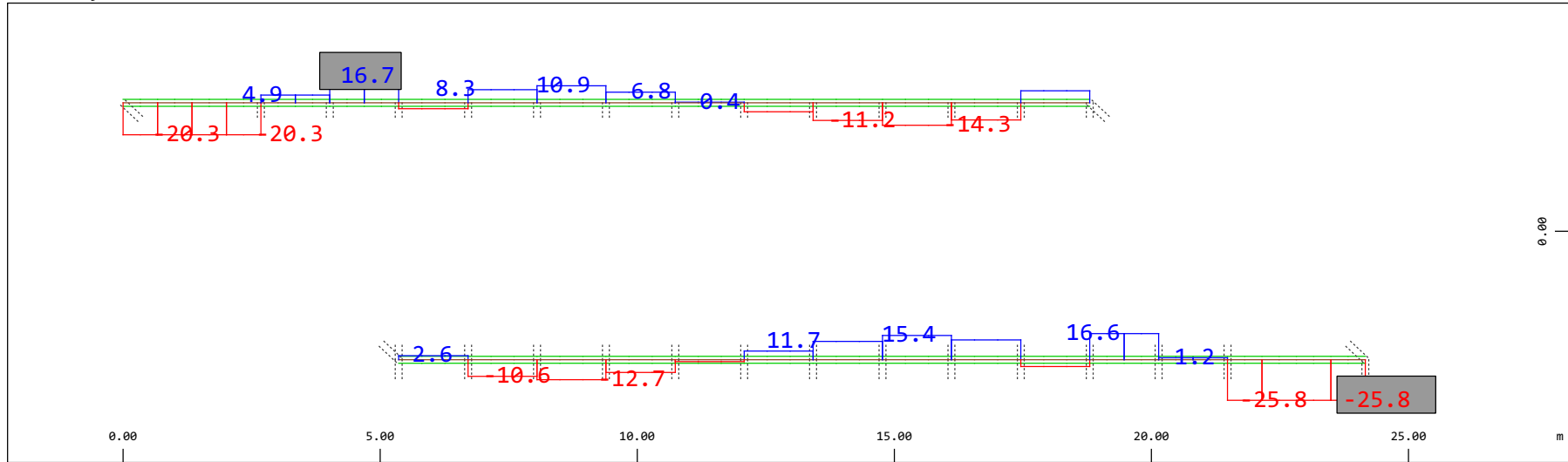
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 3922. kNm (Min=-111.9) (Max=3096.)

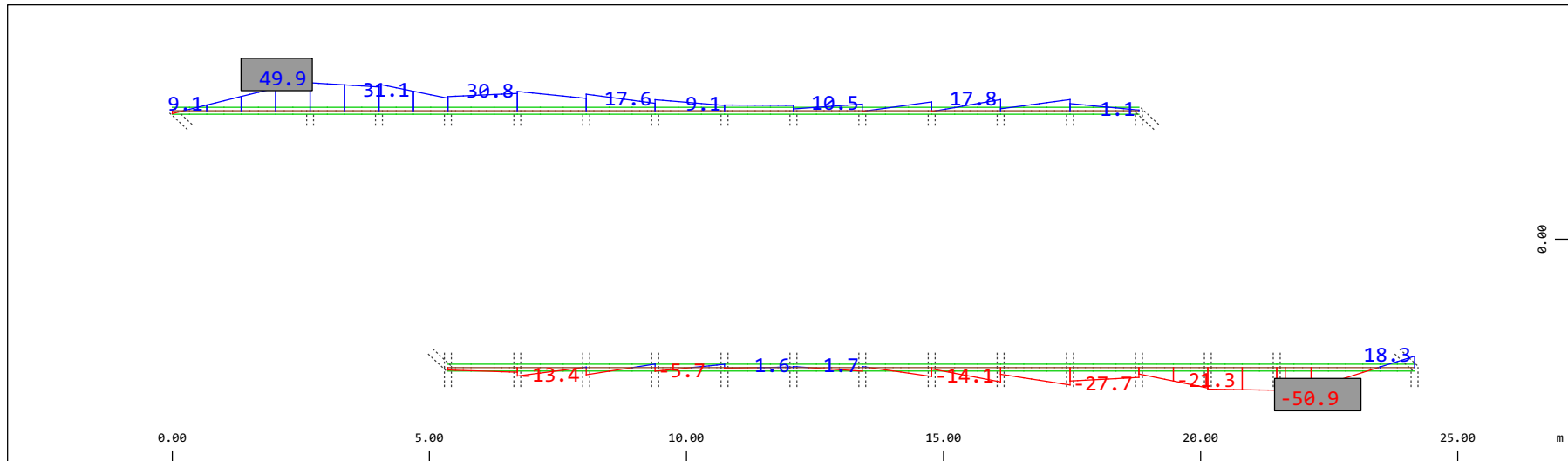
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 39.2 kN (Min=-25.8) (Max=16.7)

M 1 : 120

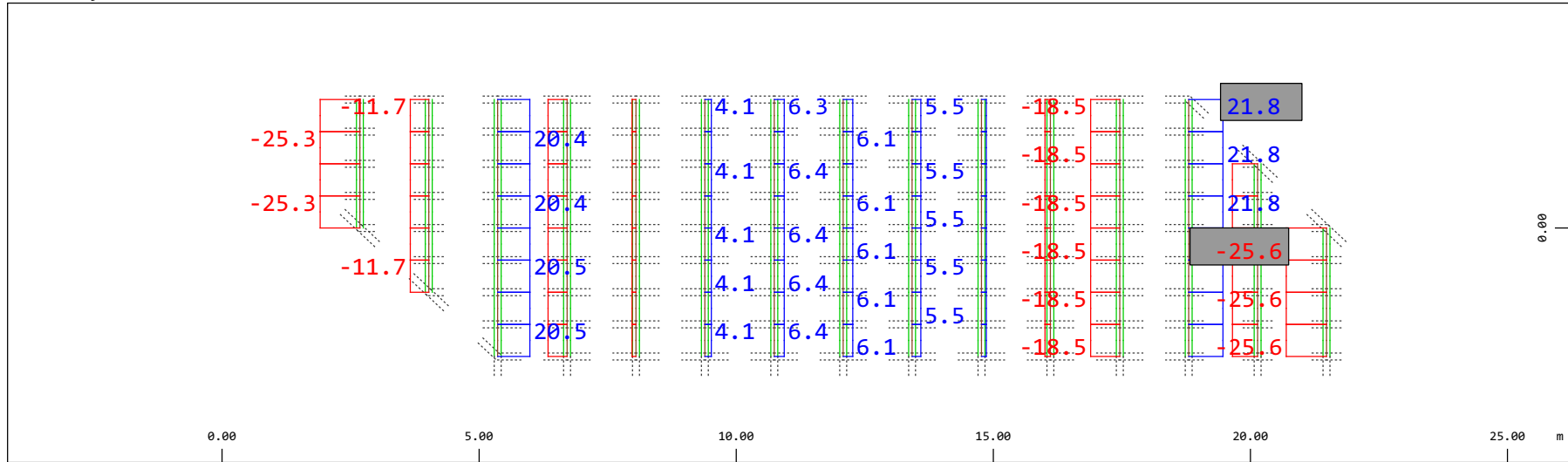


Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 98.0 kNm (Min=-50.9) (Max=49.9)

M 1 : 120

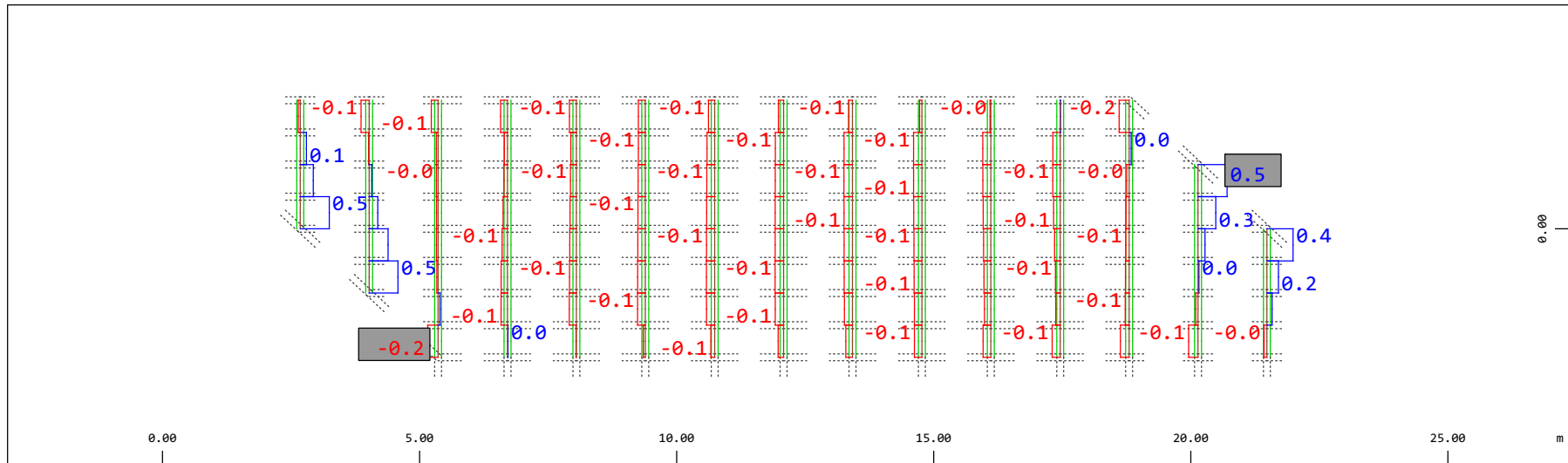
Definition of Axis

Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force Nx, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 39.2 kN (Min=-25.6) (Max=21.8)

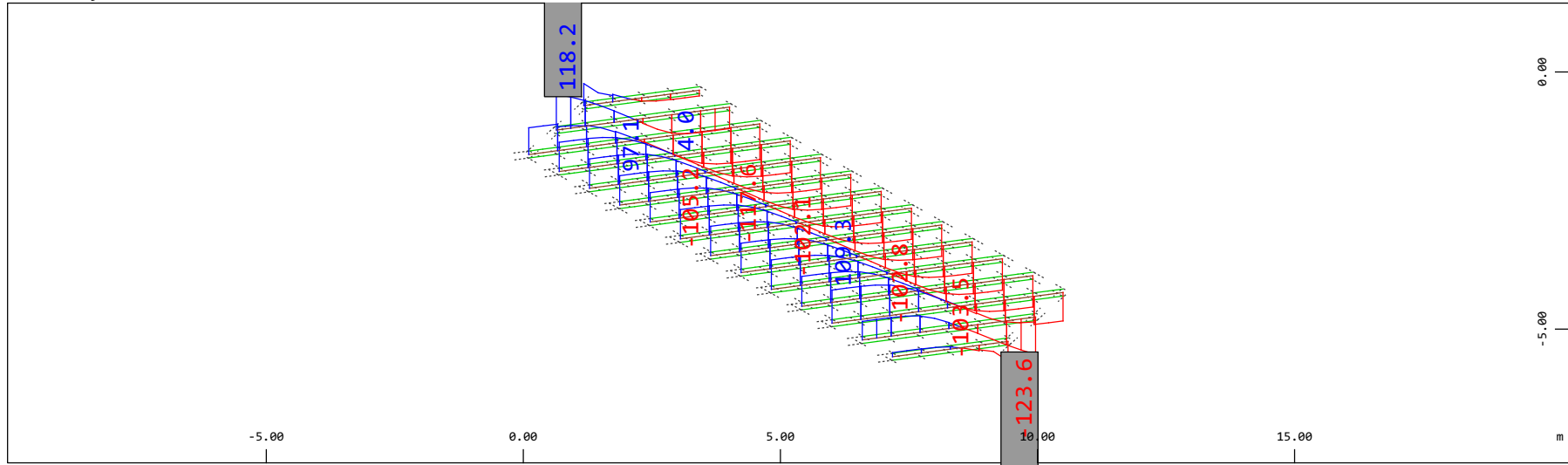
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment Mt, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 0.980 kNm (Min=-0.164) (Max=0.462)

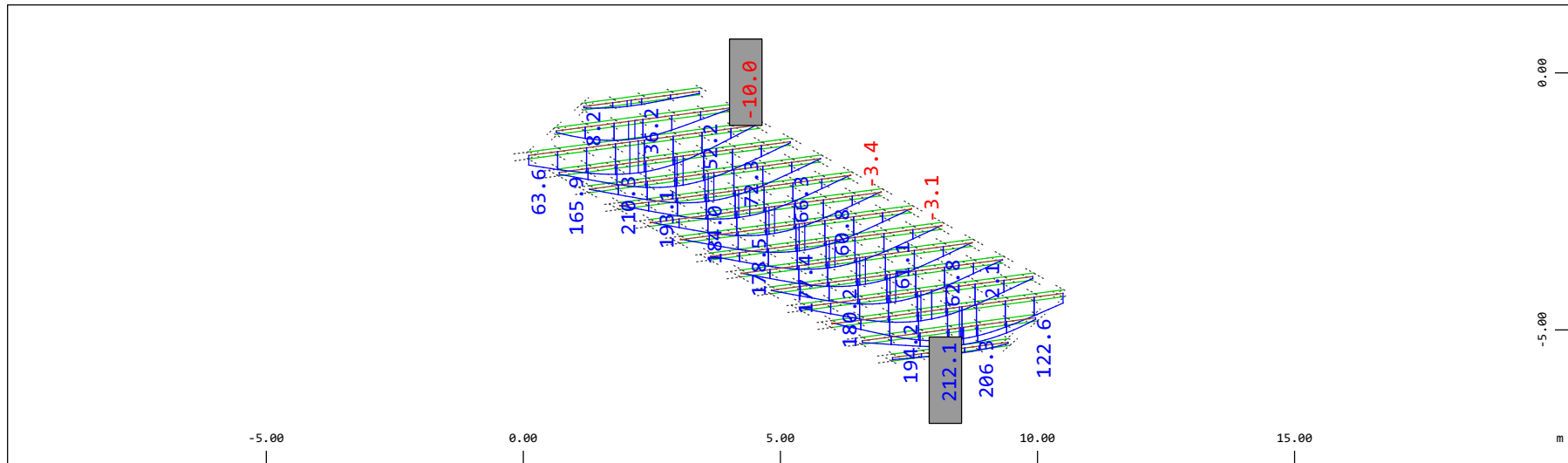
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 196.1 kN (Min=-123.6) (Max=118.2)

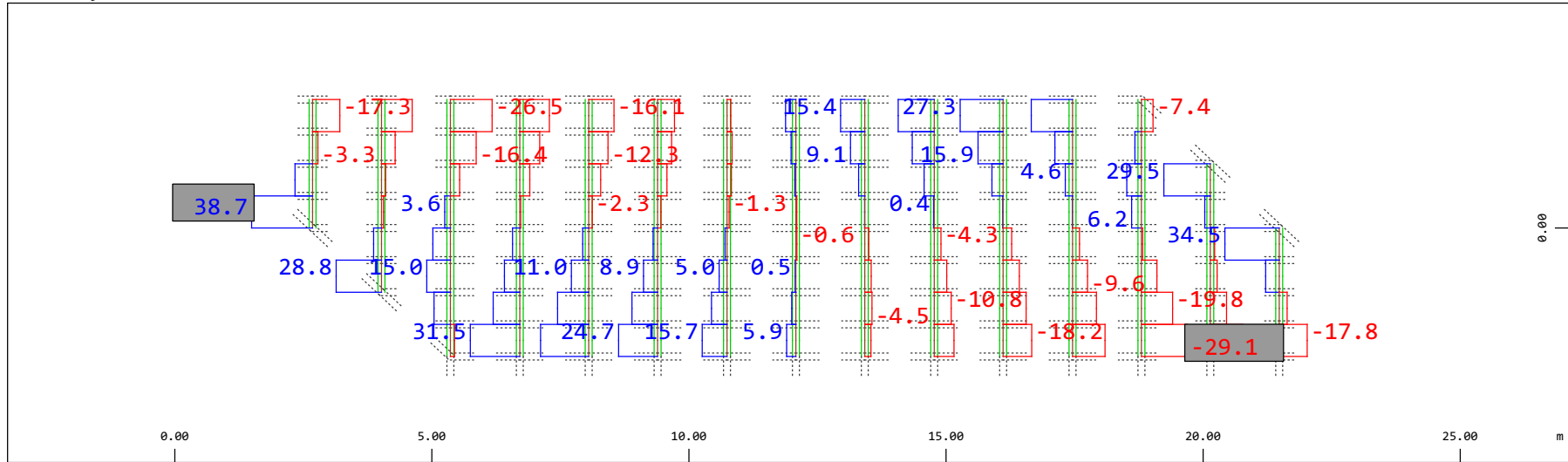
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 392.2 kNm (Min=-10.0) (Max=212.1)

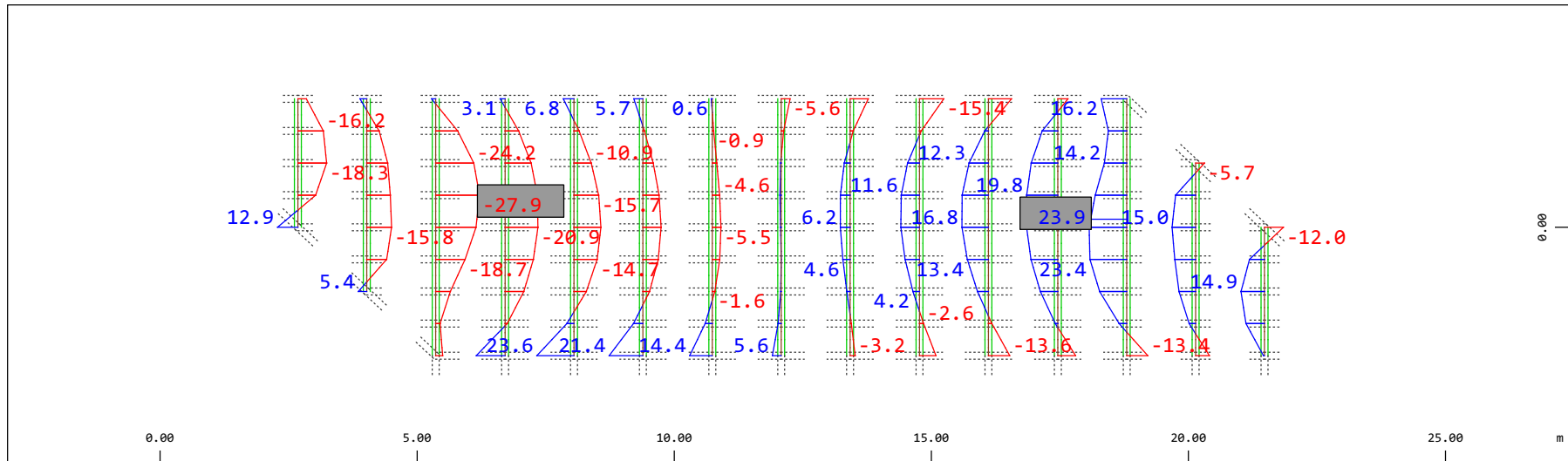
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 39.2 kN (Min=-29.1) (Max=38.7)

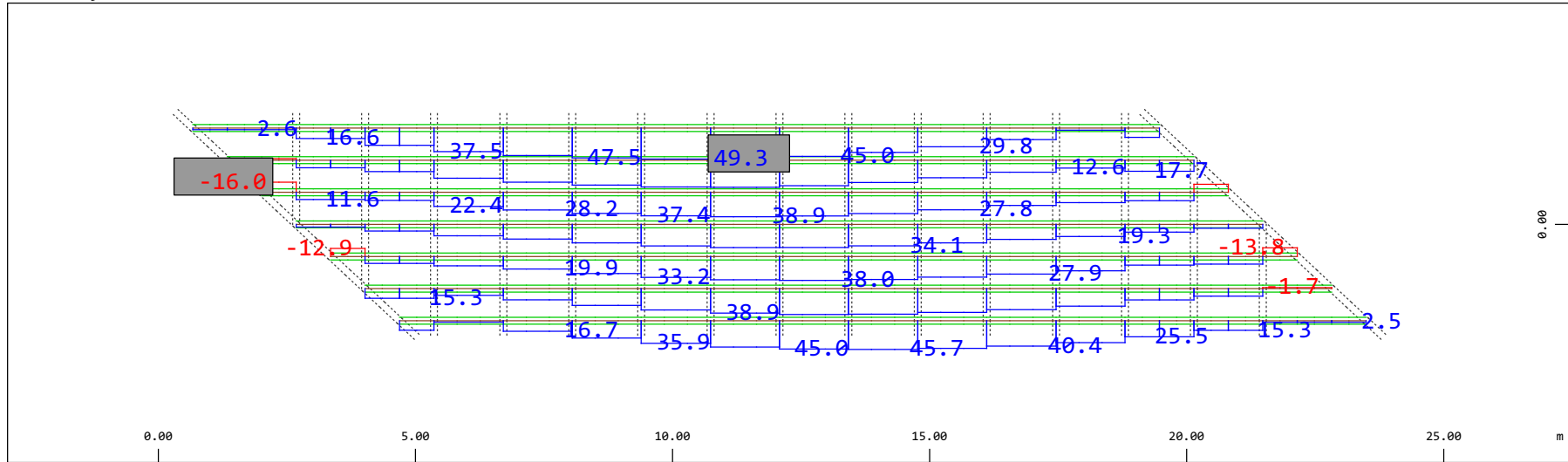
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 39.2 kNm (Min=-27.9) (Max=23.9)

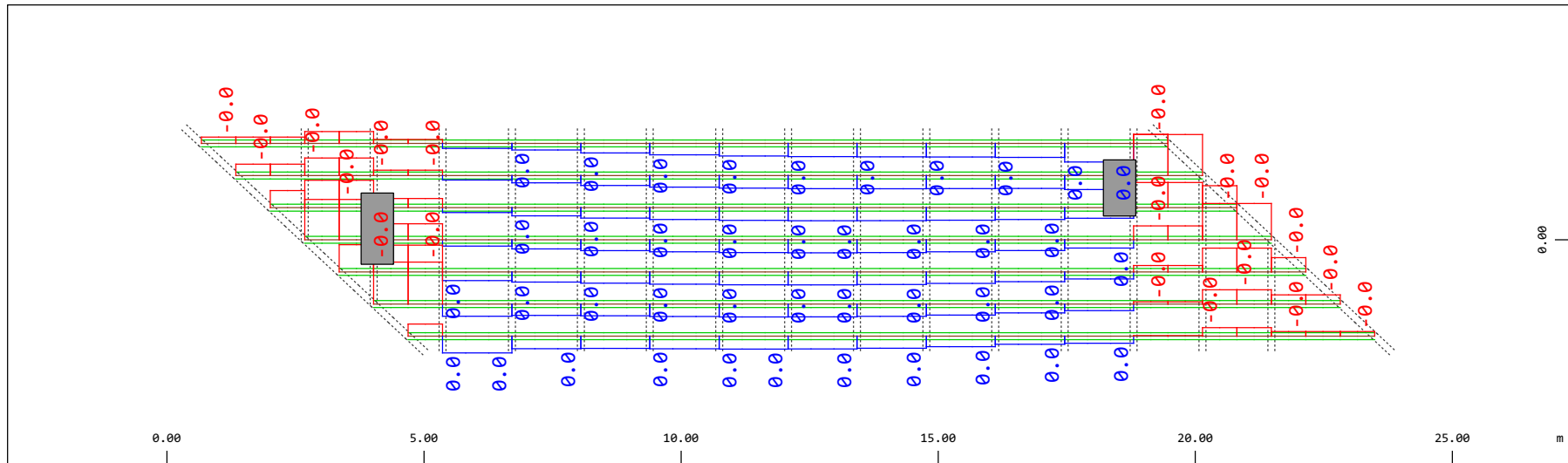
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 98.0 kN (Min=-16.0) (Max=49.3)

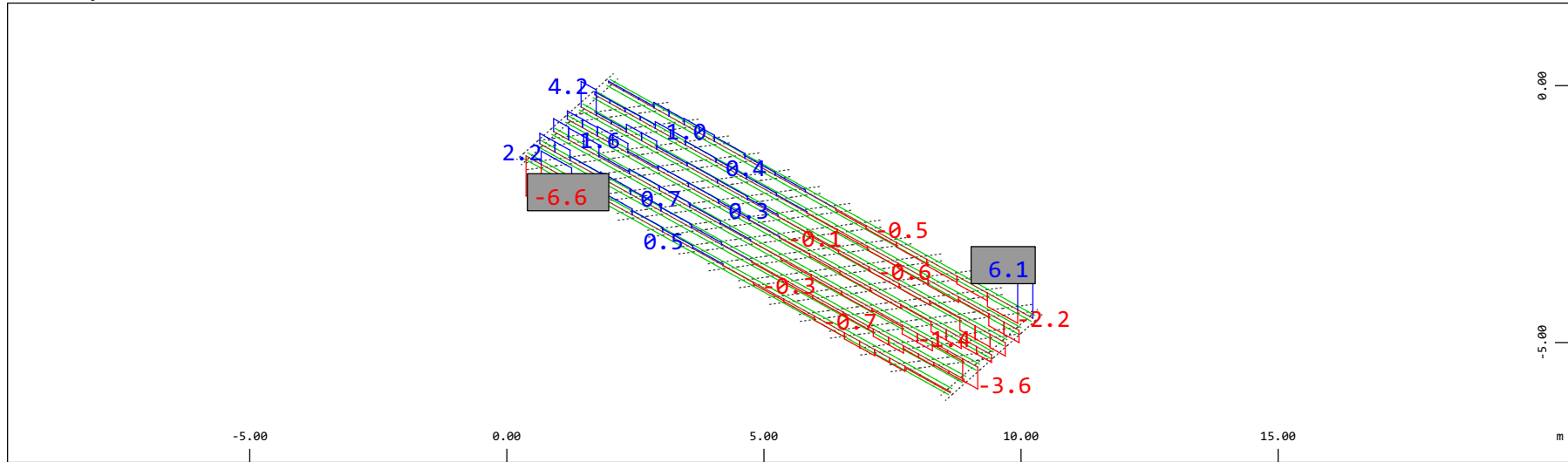
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 0.0098 kNm (Min=-0.0067) (Max=0.0030)

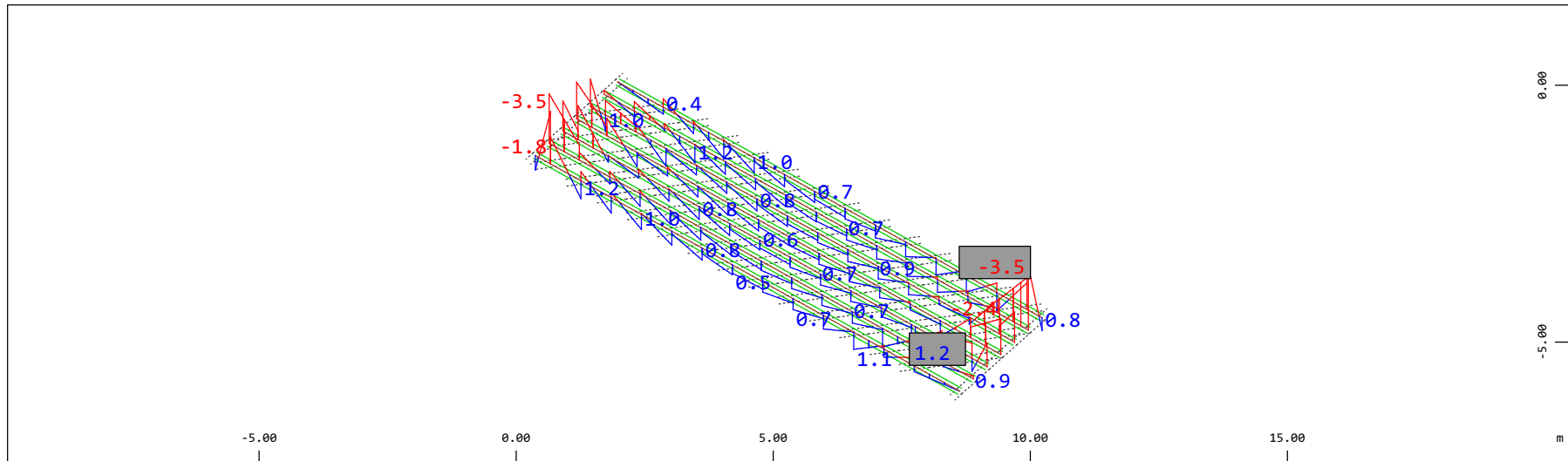
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 9.80 kN (Min=-6.59) (Max=6.12)

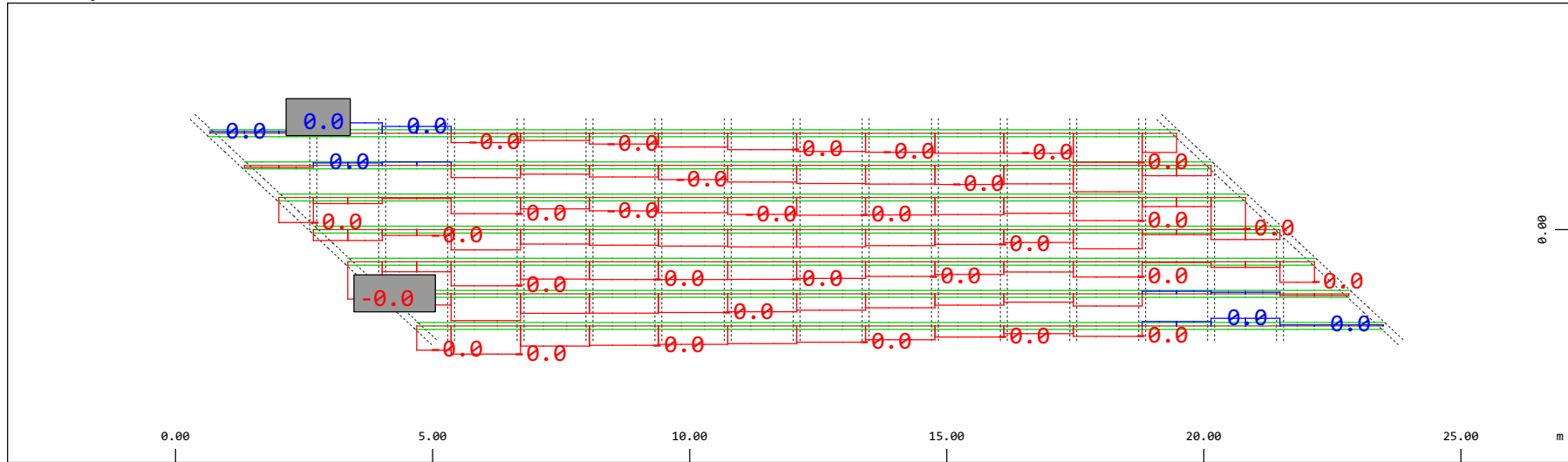
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 3.92 kNm (Min=-3.53) (Max=1.23)

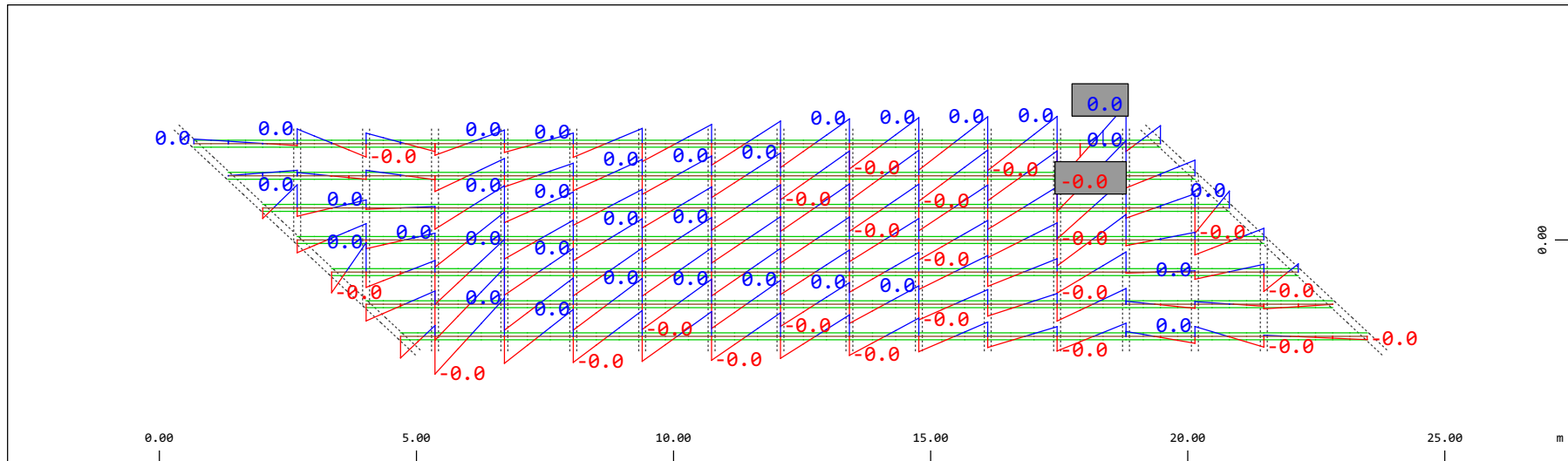
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 0.0196 kN (Min=-0.0119) (Max=0.0033)

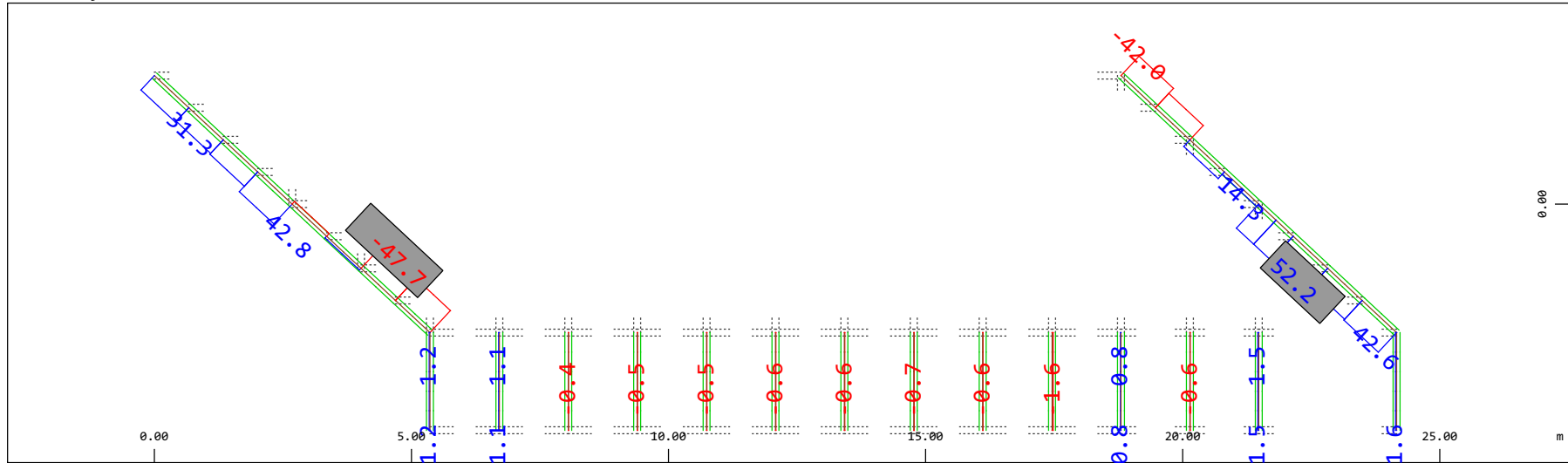
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 0.0098 kNm (Min=-0.0062) (Max=0.0062)

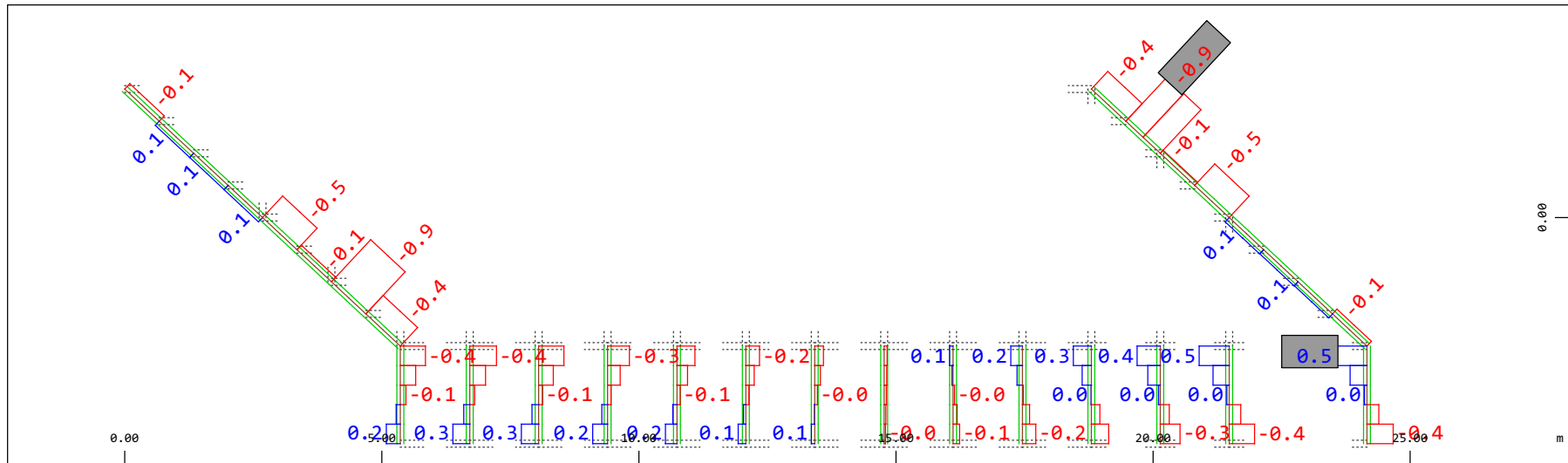
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 98.0 kN (Min=-47.7) (Max=52.2)

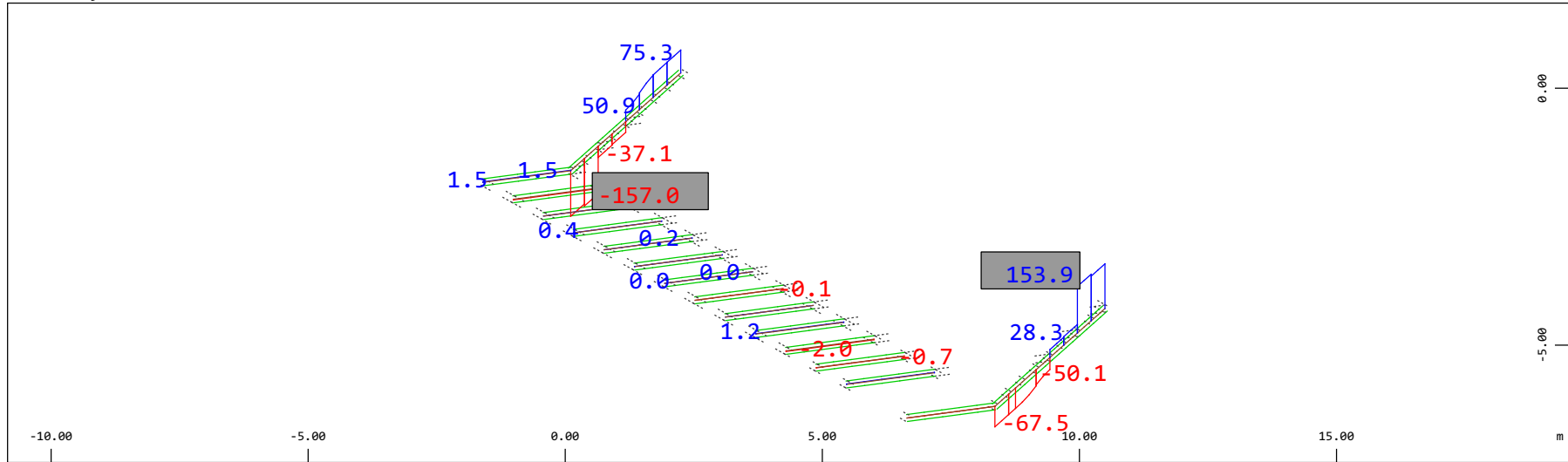
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 0.980 kNm (Min=-0.948) (Max=0.496)

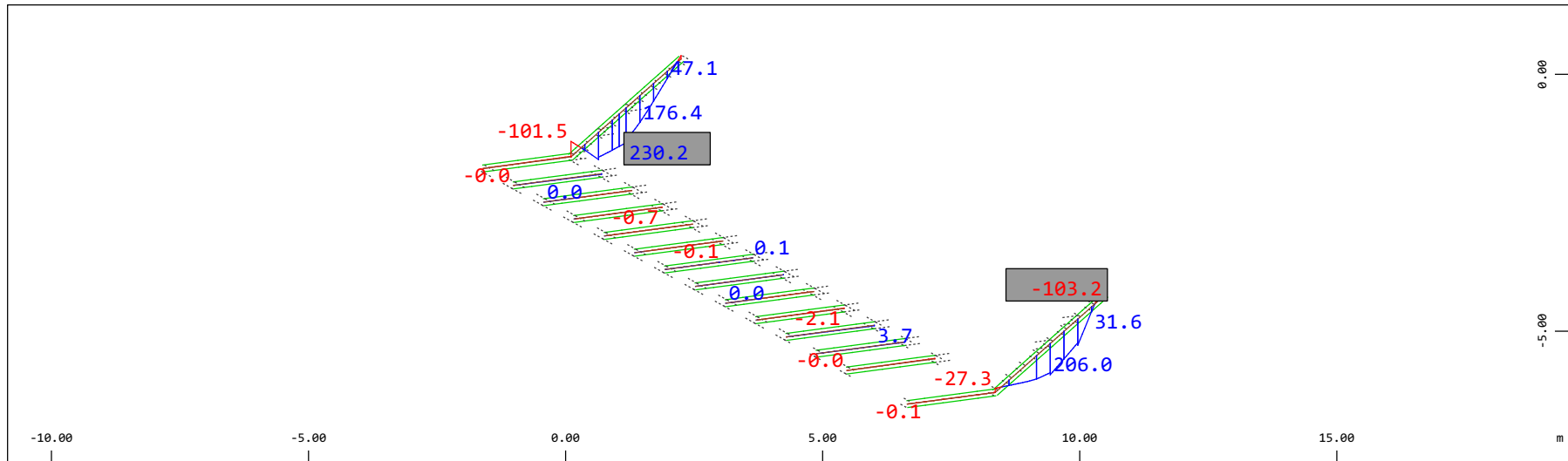
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 196.1 kN (Min=-157.0) (Max=153.9)

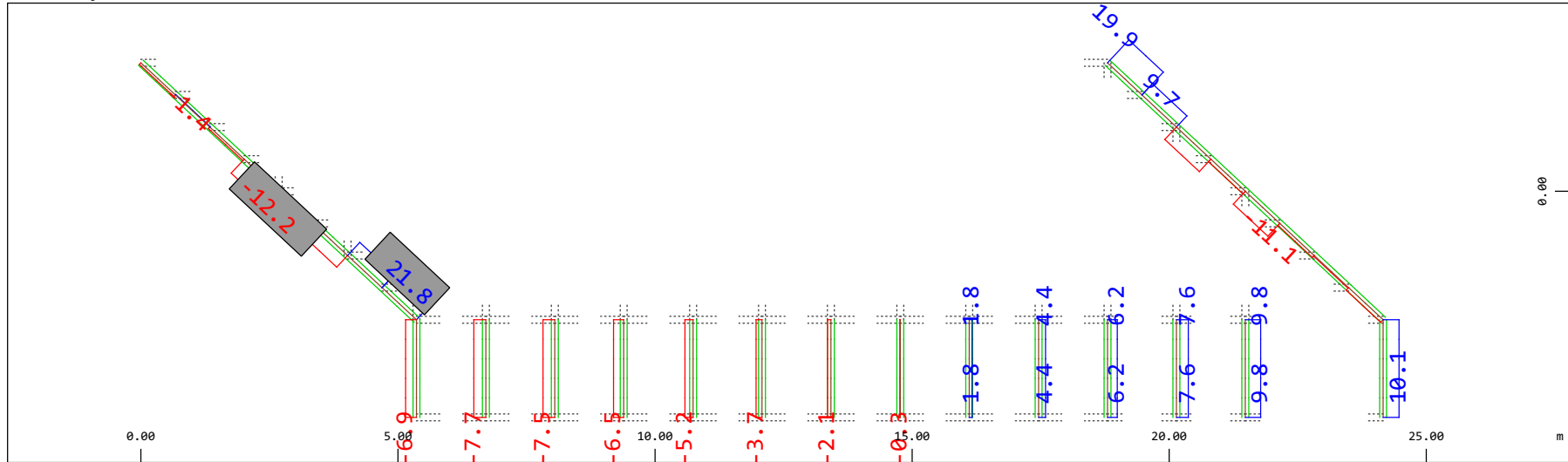
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 392.2 kNm (Min=-103.2) (Max=230.2)

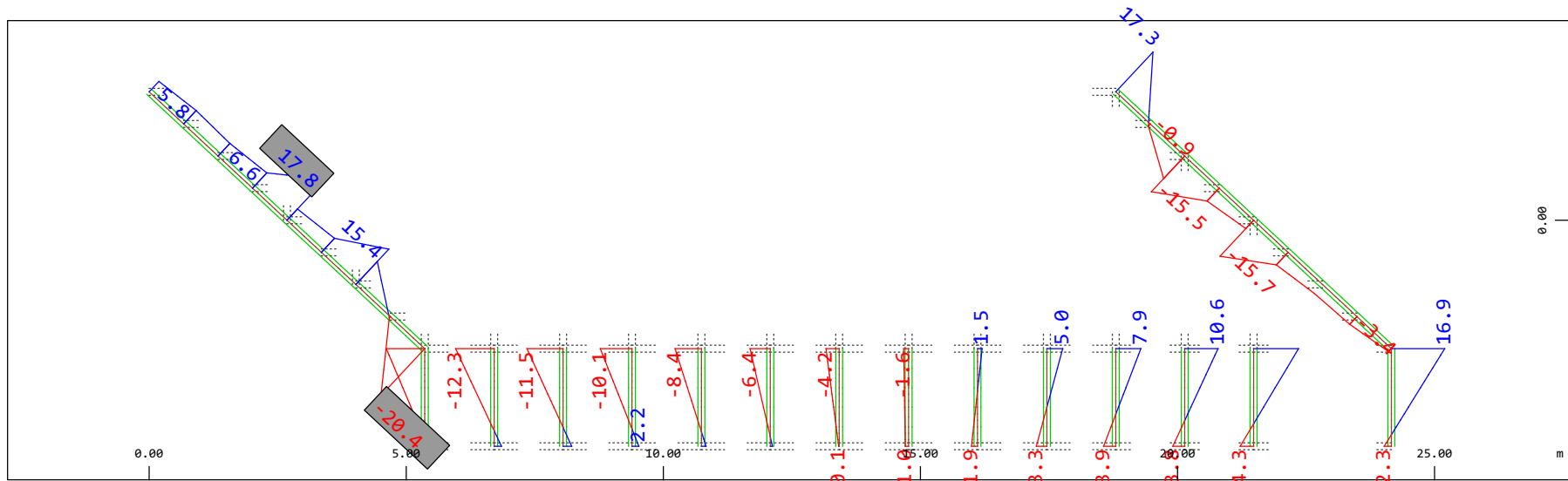
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 39.2 kN (Min=-12.2) (Max=21.8)

M 1 : 120

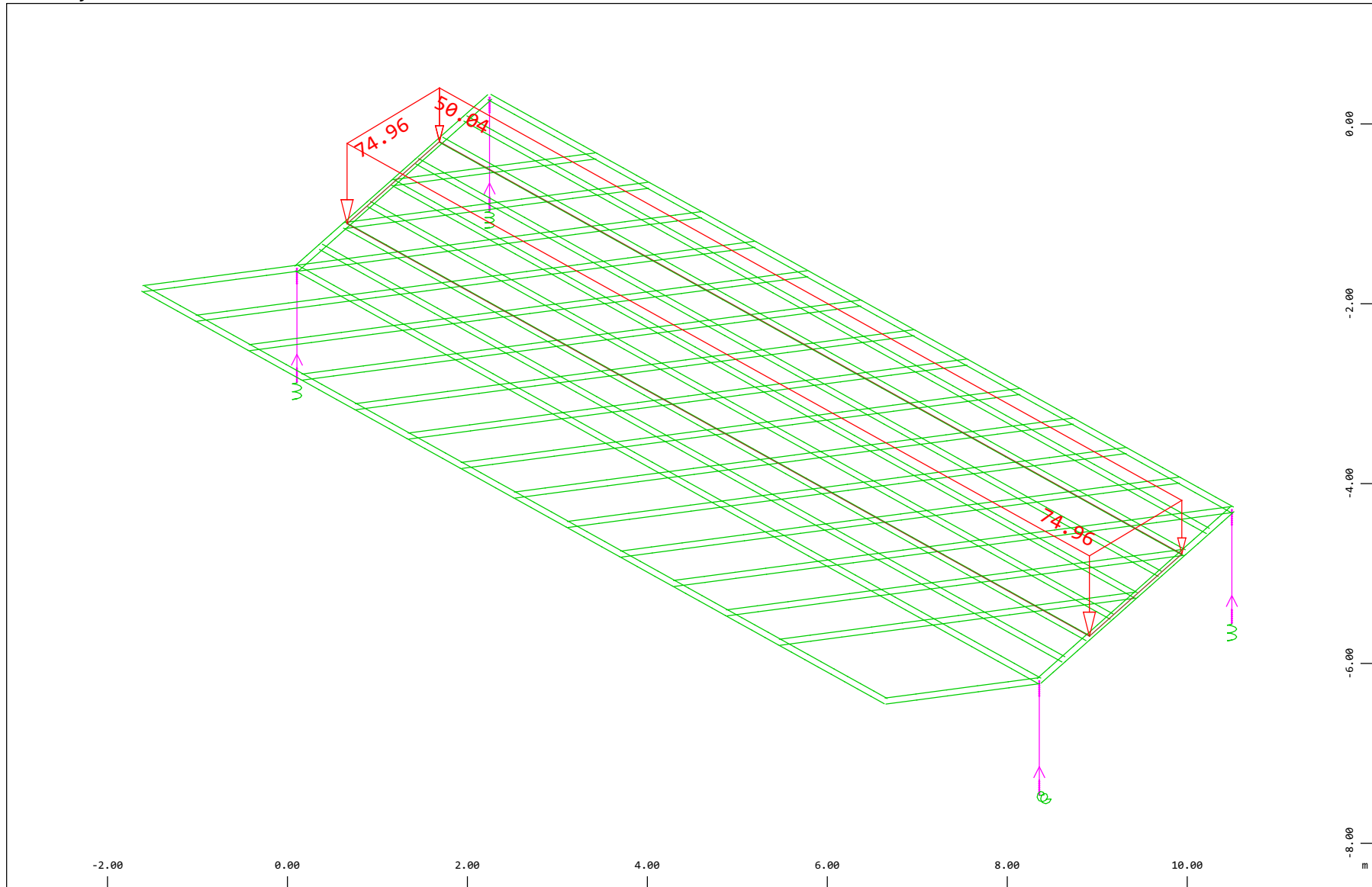


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 200 Qt: SW/2-ecc.pos. , 1 cm 3D = 19.6 kNm (Min=-20.4) (Max=17.8)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

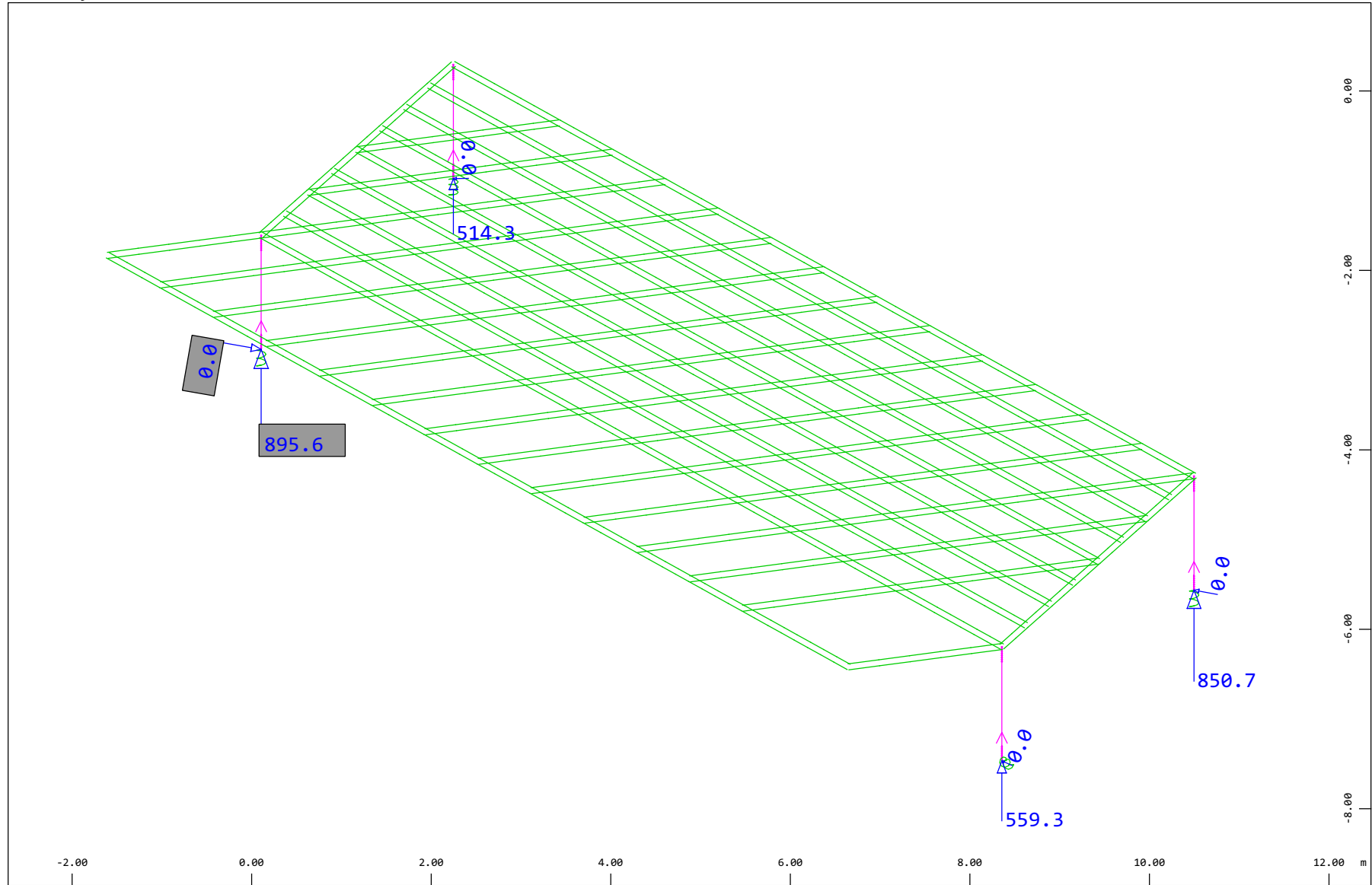
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 201 Qt: SW/2-ecc.neg. , (1 cm 3D = unit) Free area load (force) in global Z (Unit=48.4 kN/m2)
 (Max=-50.0)

▾ (Min=-75.0)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 484.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 0.0048 kN

△ (Max=895.6) (total: 2820.)

△ (Max=0.0052)

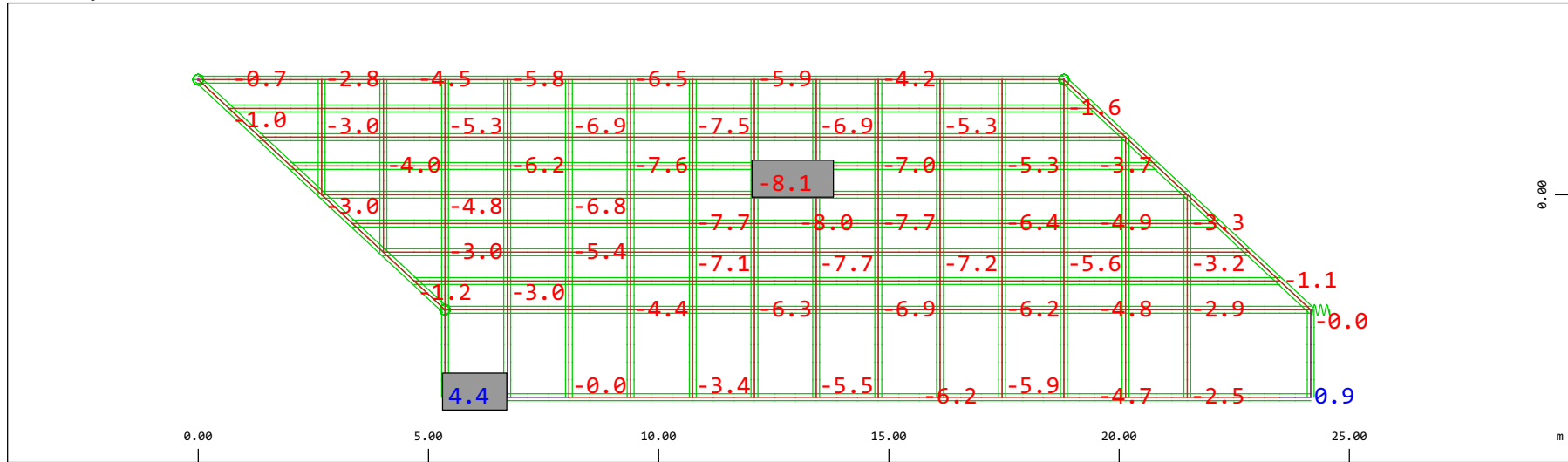
M 1 : 60

X * 0.502

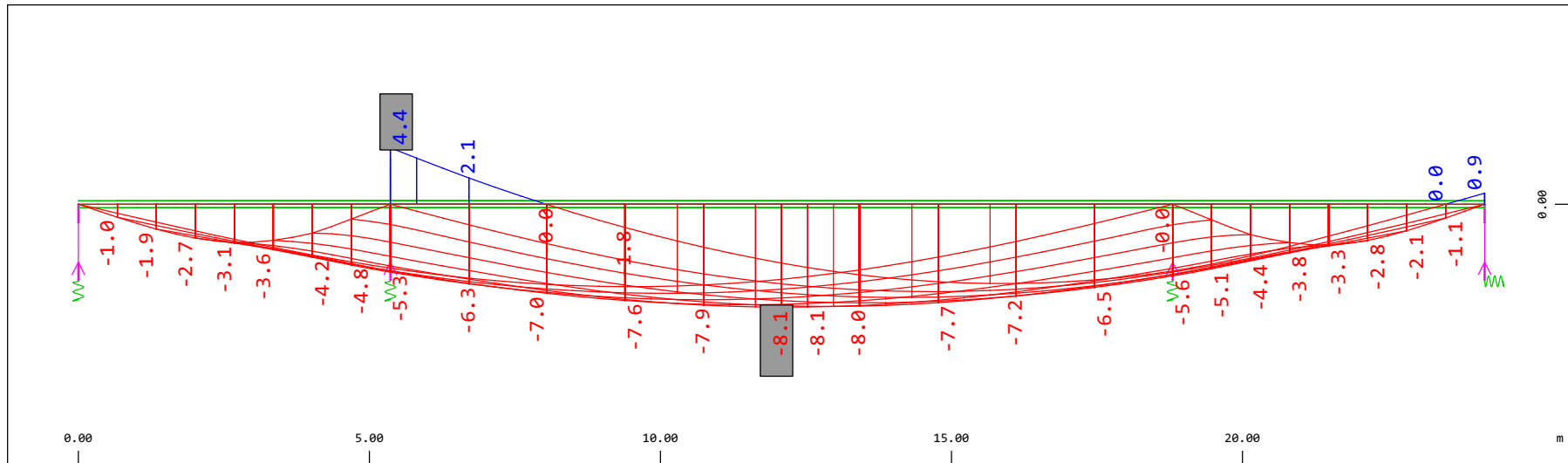
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

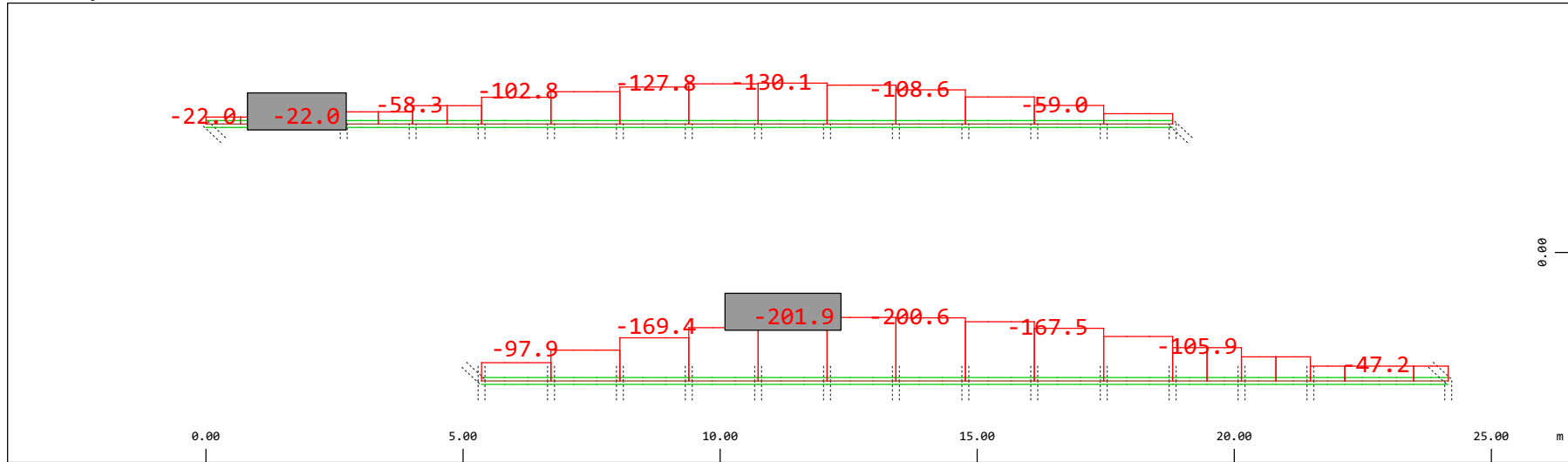


Y Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along \odot , Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 4.84 mm (Min=-8.08) (Max=4.43) M 1 : 134



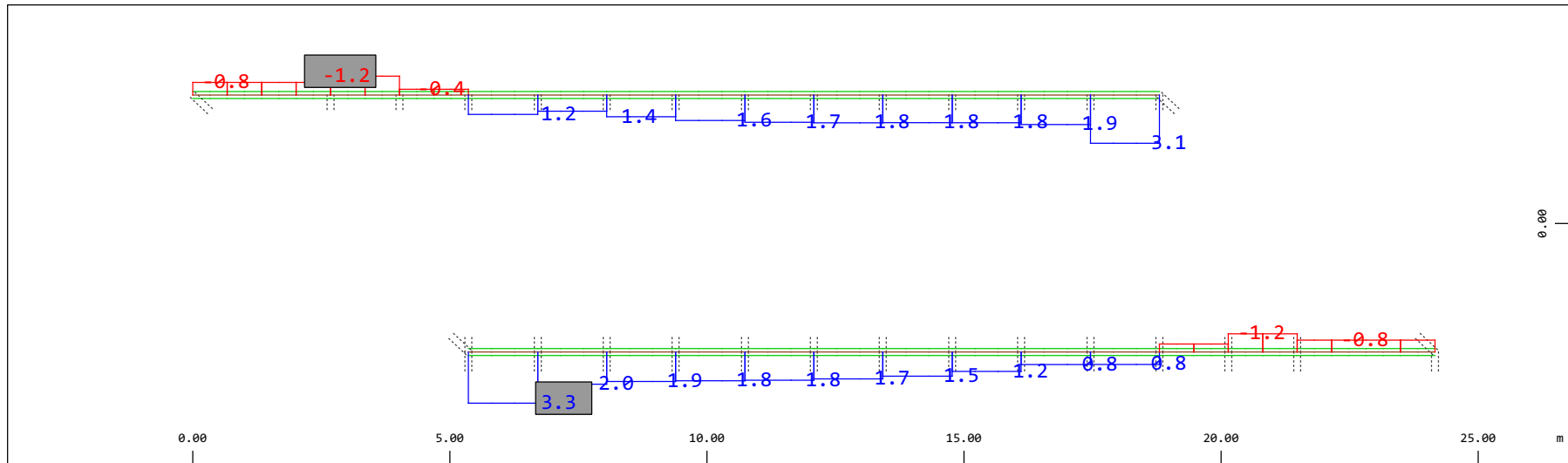
Z Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 4.84 mm (Min=-8.08) (Max=4.43) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 196.1 kN (Min=-201.9) (Max=-22.0)

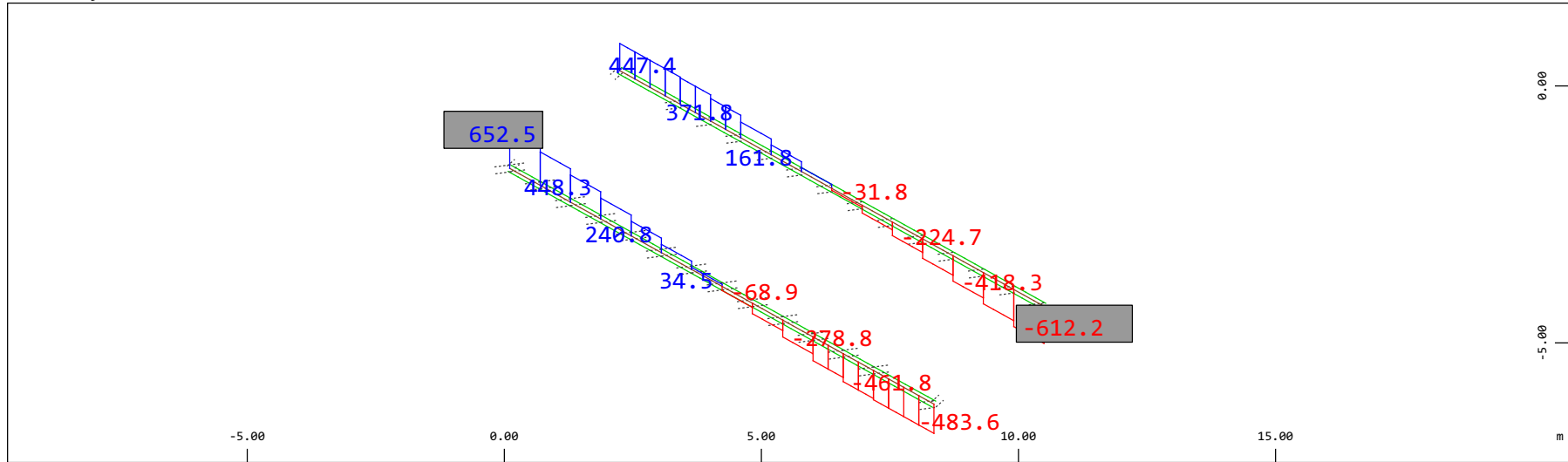
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 3.92 kNm (Min=-1.20) (Max=3.25)

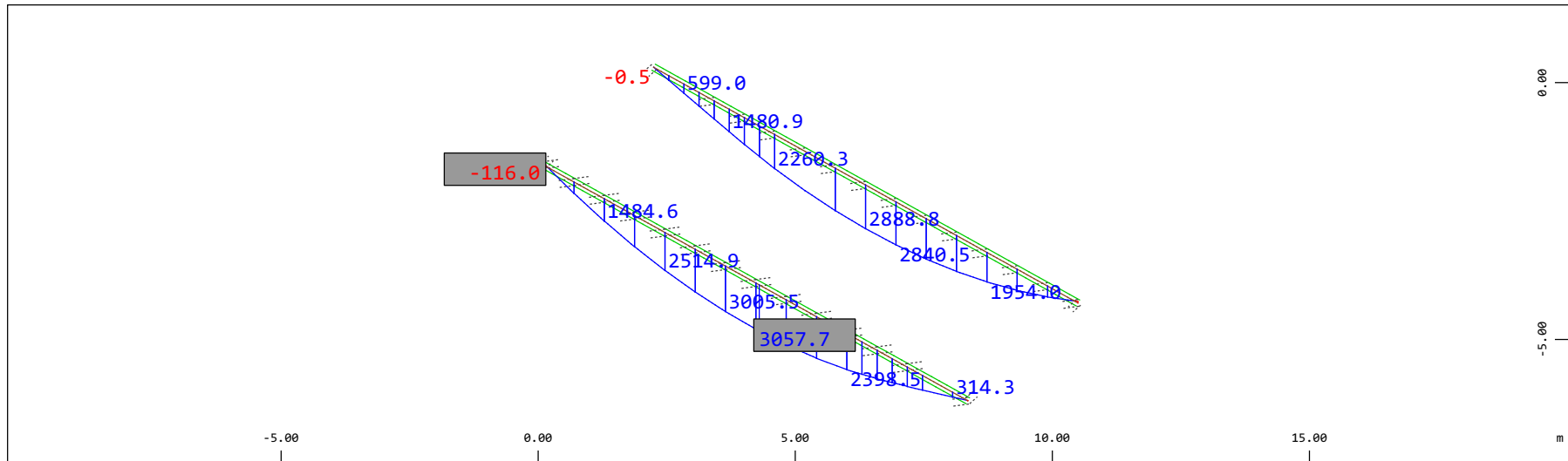
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 980.5 kN (Min=-612.2) (Max=652.5)

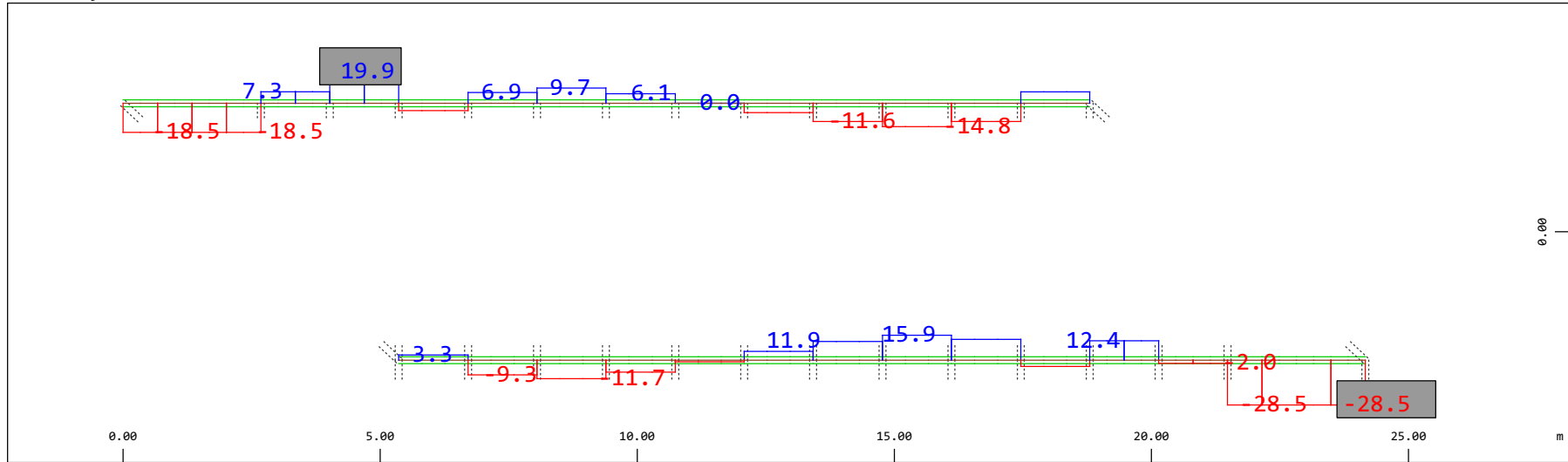
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 3922. kNm (Min=-116.0) (Max=3057.)

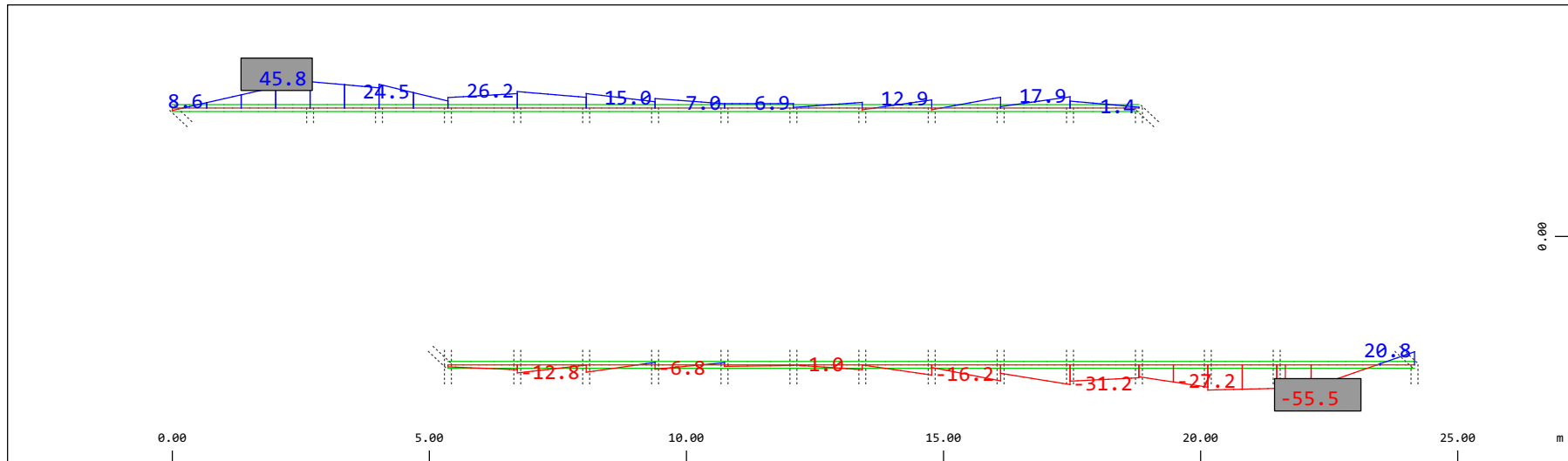
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 39.2 kN (Min=-28.5) (Max=19.9)

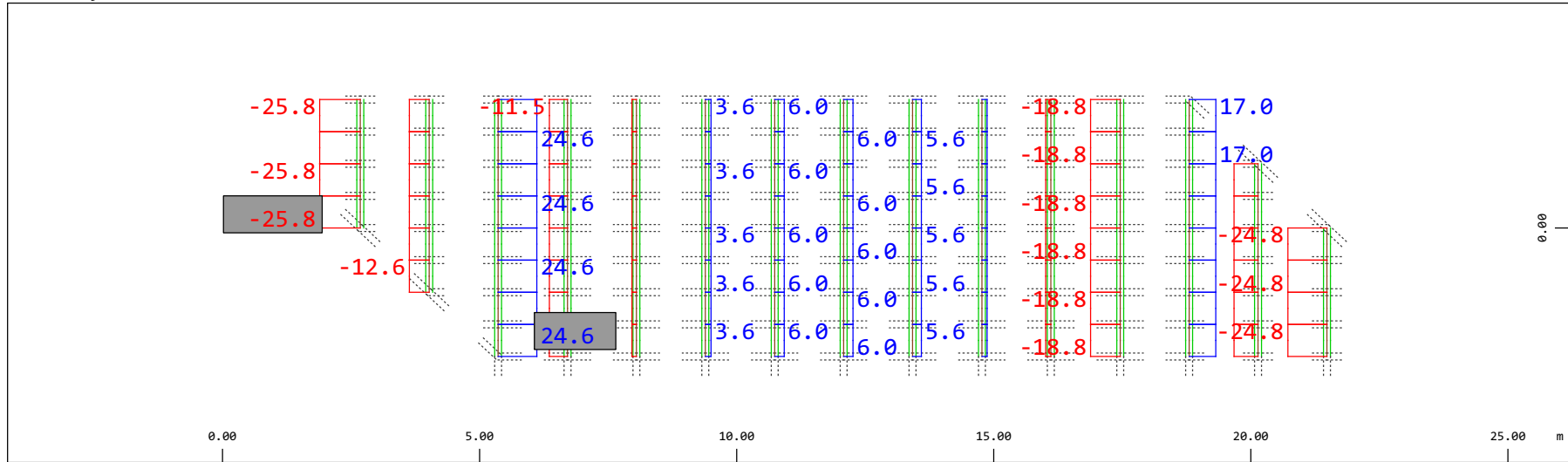
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 98.0 kNm (Min=-55.5) (Max=45.8)

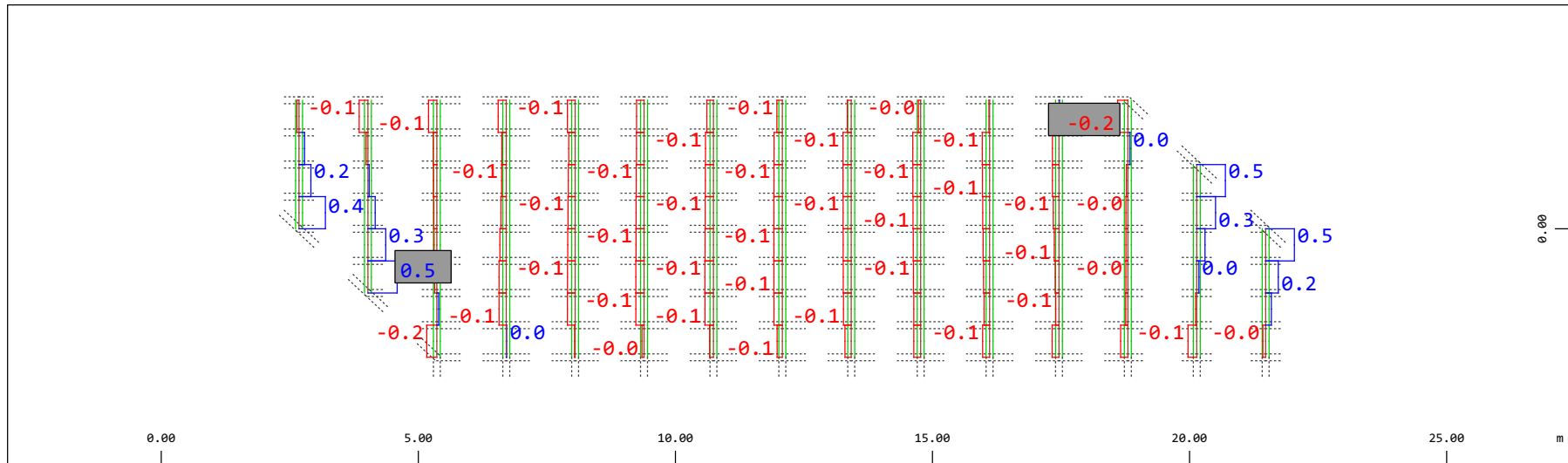
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 39.2 kN (Min=-25.8) (Max=24.6)

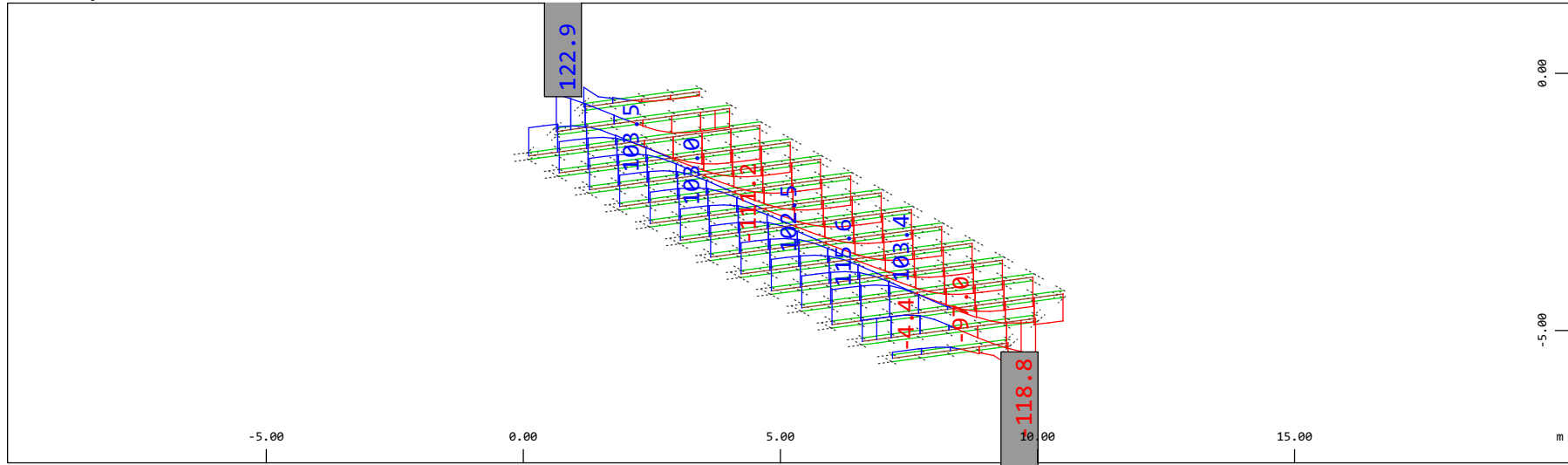
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 0.980 kNm (Min=-0.162) (Max=0.465)

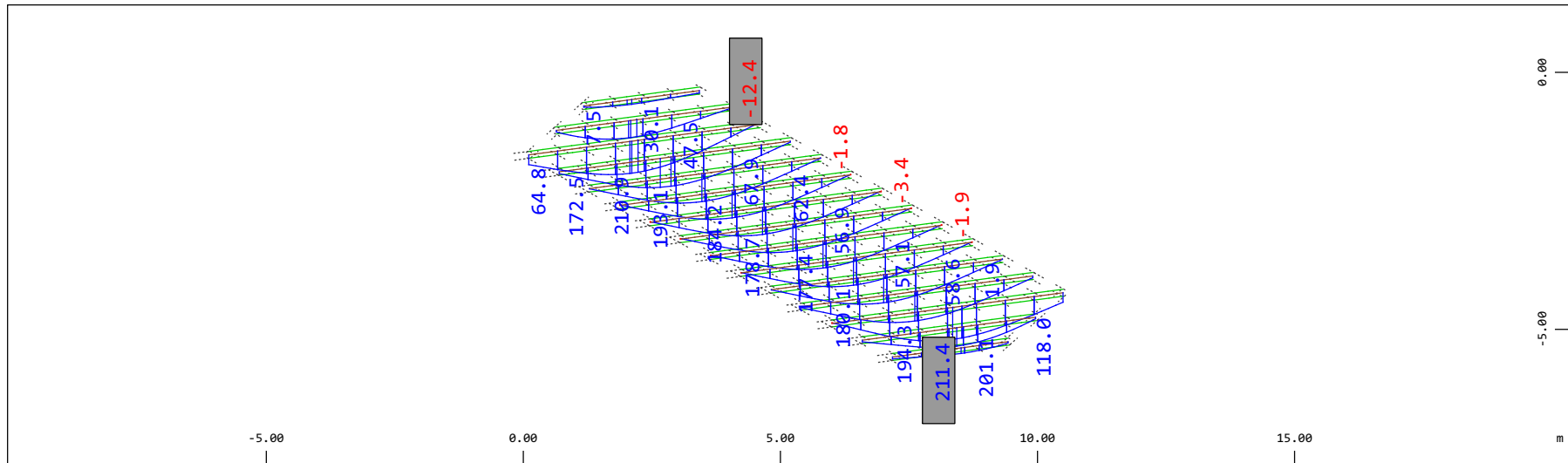
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 196.1 kN (Min=-118.8) (Max=122.9)

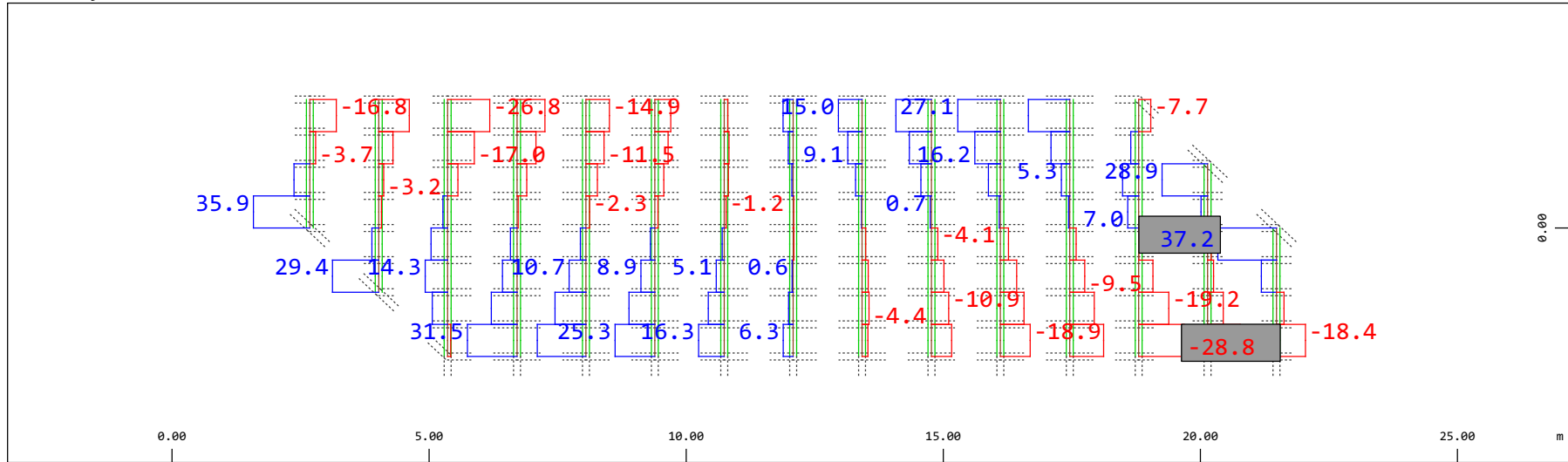
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 392.2 kNm (Min=-12.4) (Max=211.4)

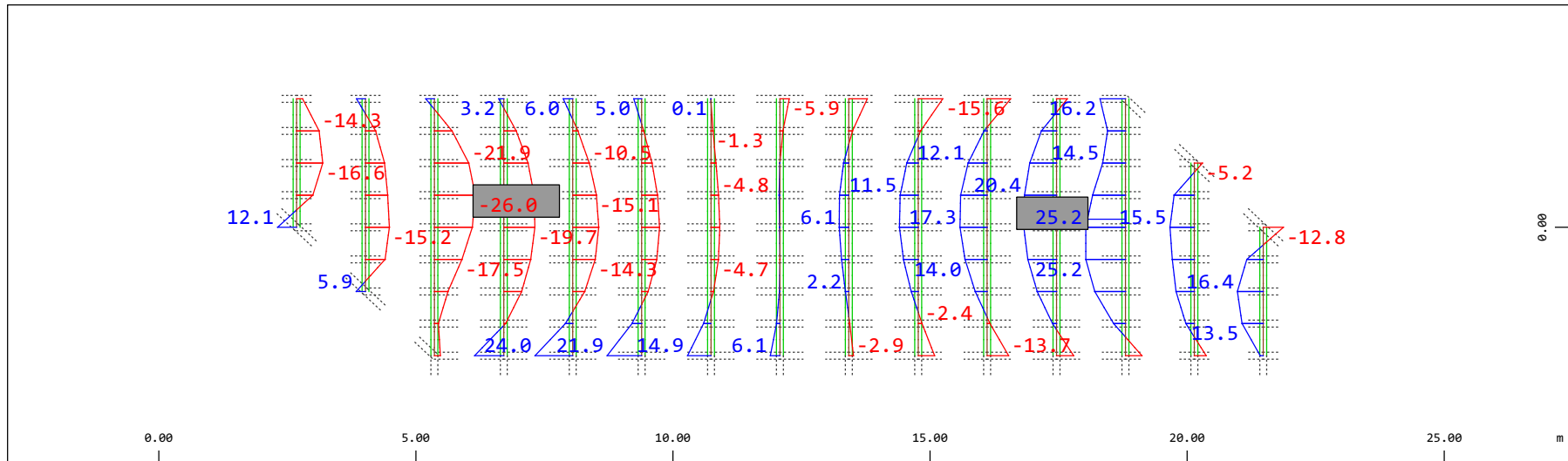
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 39.2 kN (Min=-28.8) (Max=37.2)

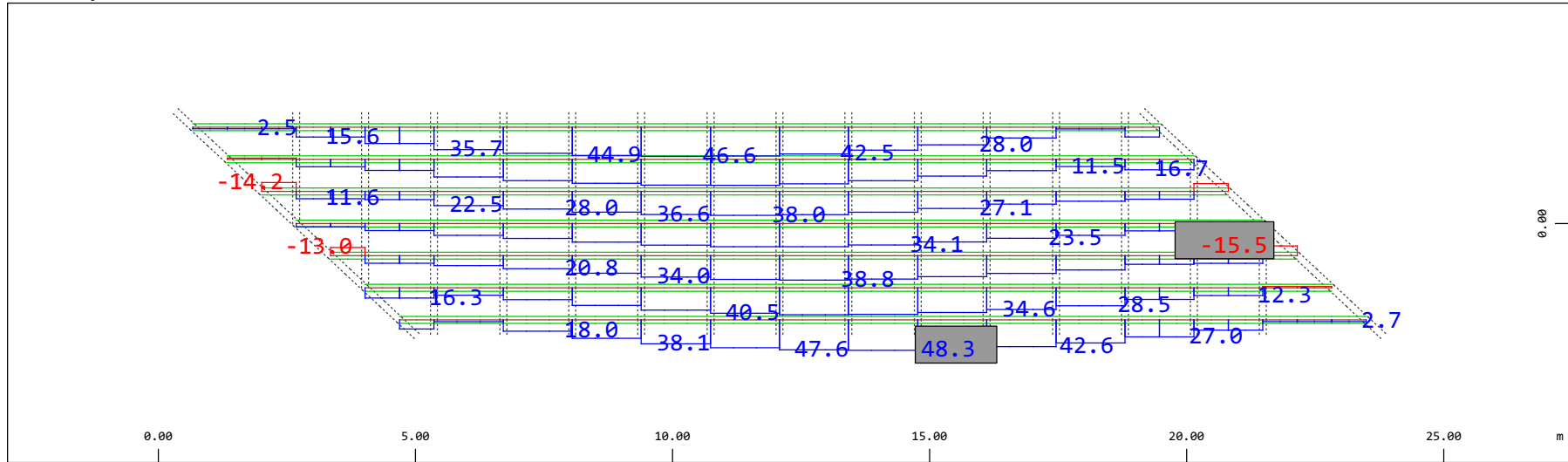
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 39.2 kNm (Min=-26.0) (Max=25.2)

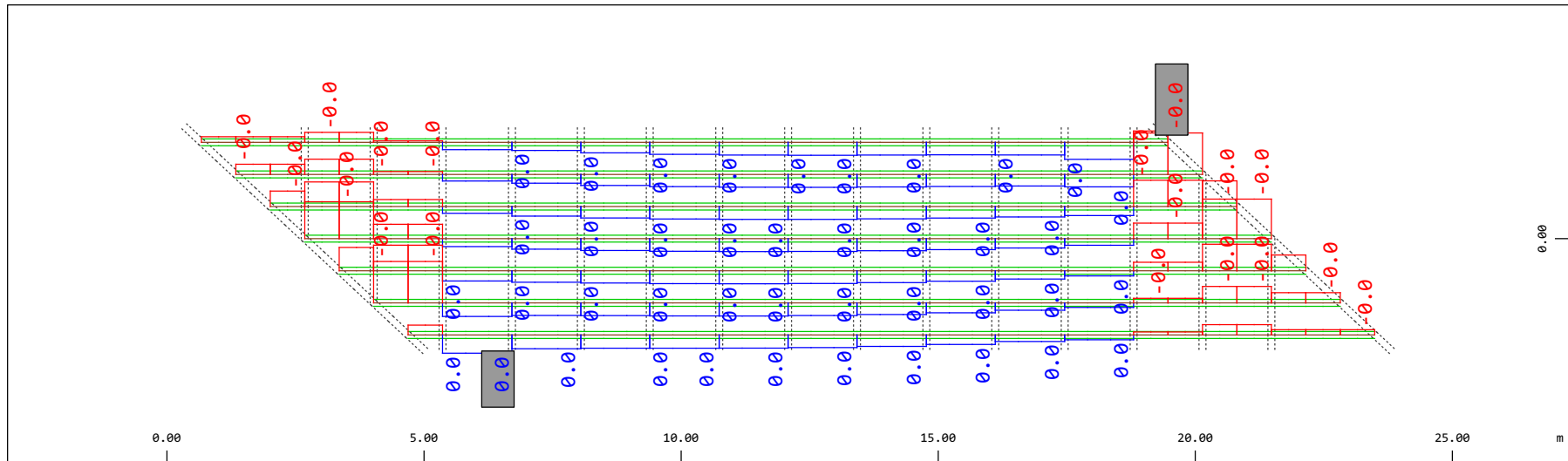
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 98.0 kN (Min=-15.5) (Max=48.3)

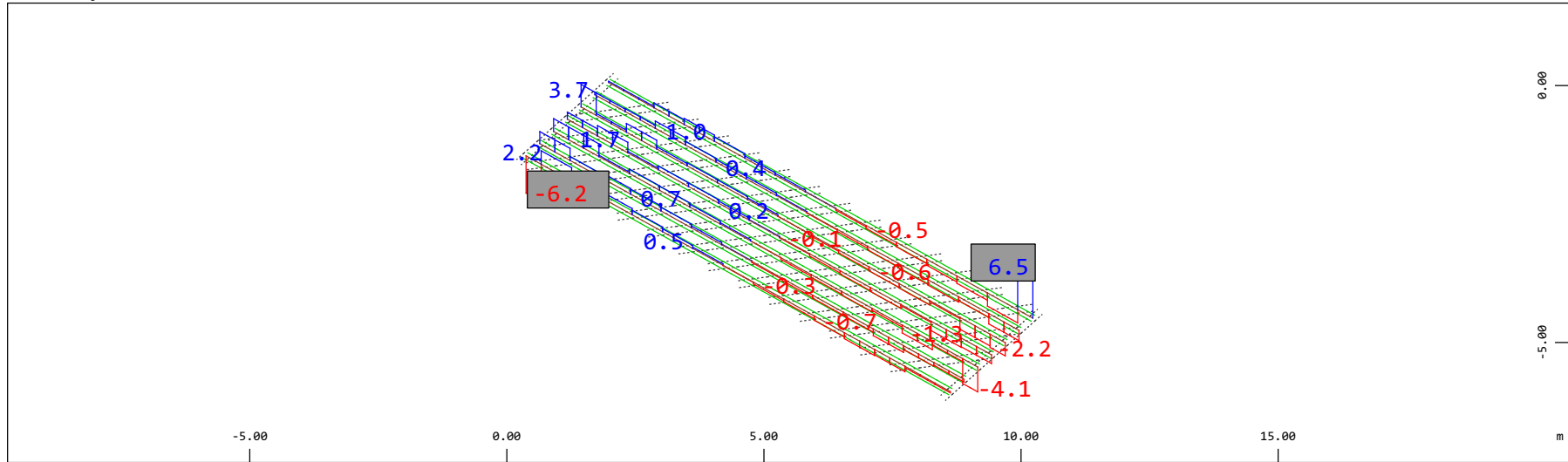
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 0.0098 kNm (Min=-0.0066) (Max=0.0029)

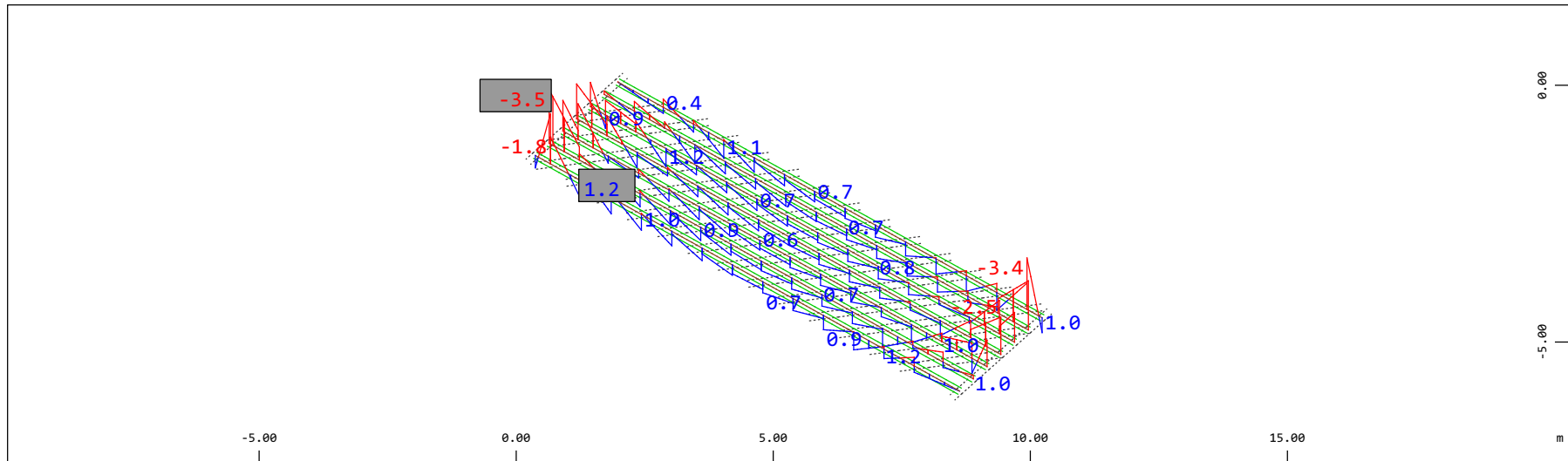
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 9.80 kN (Min=-6.15) (Max=6.54)

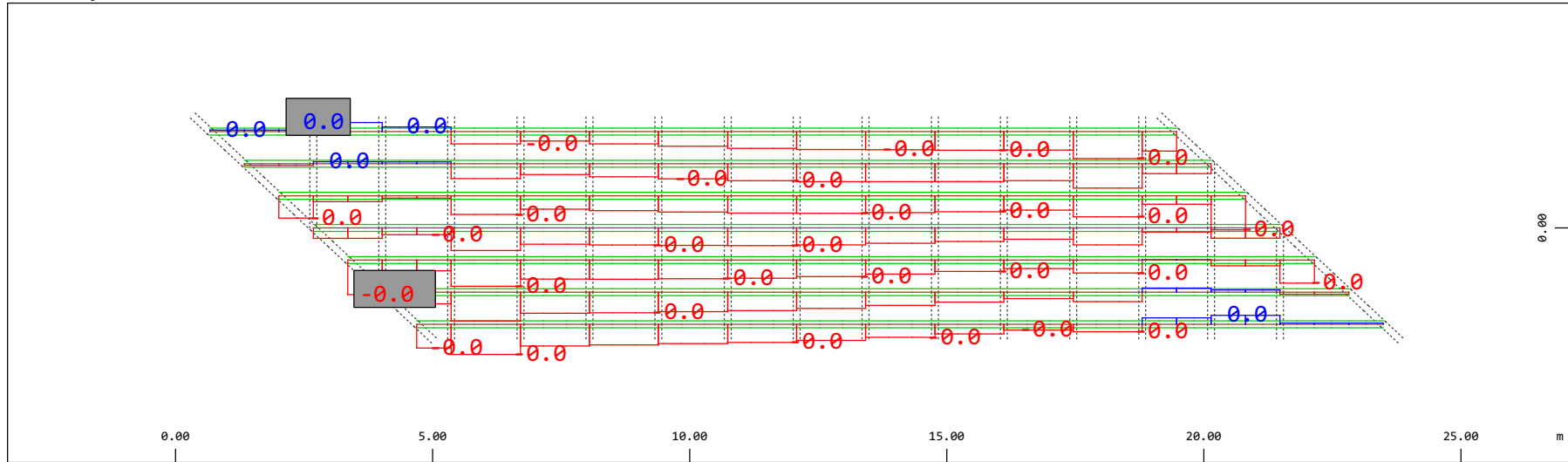
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 3.92 kNm (Min=-3.54) (Max=1.23)

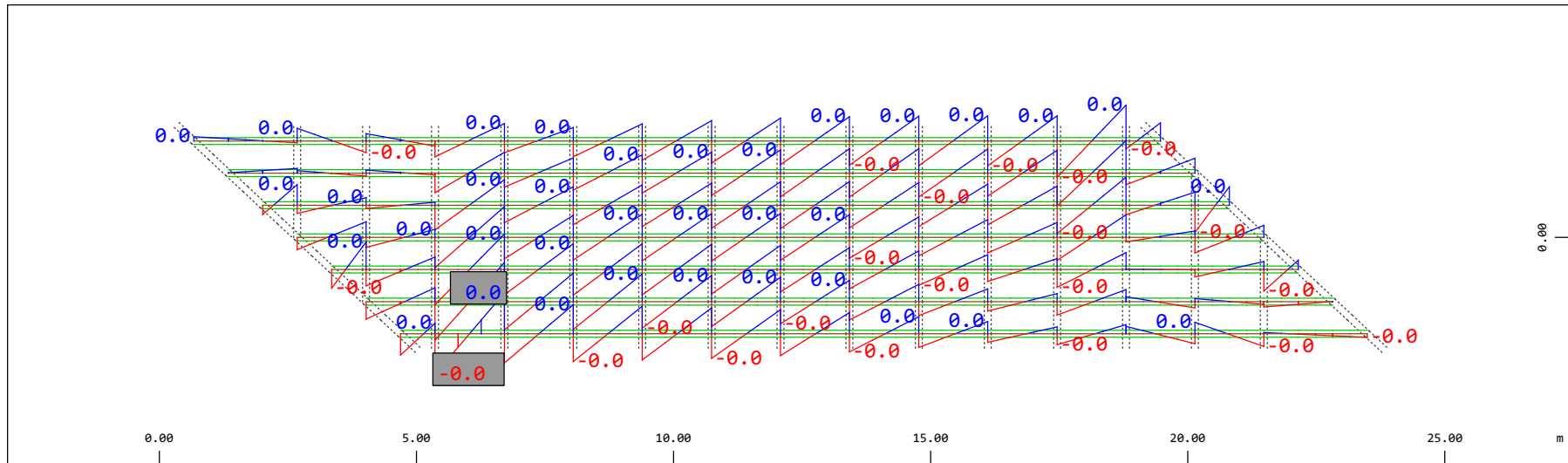
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 0.0196 kN (Min=-0.0110) (Max=0.0029)

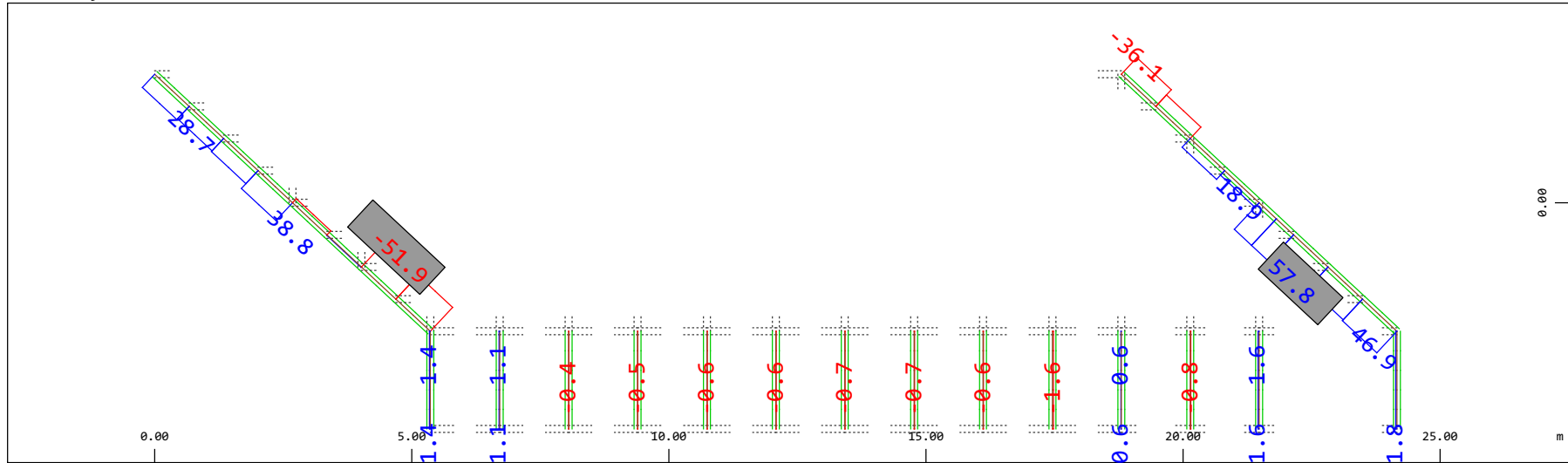
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 0.0098 kNm (Min=-0.0064) (Max=0.0065)

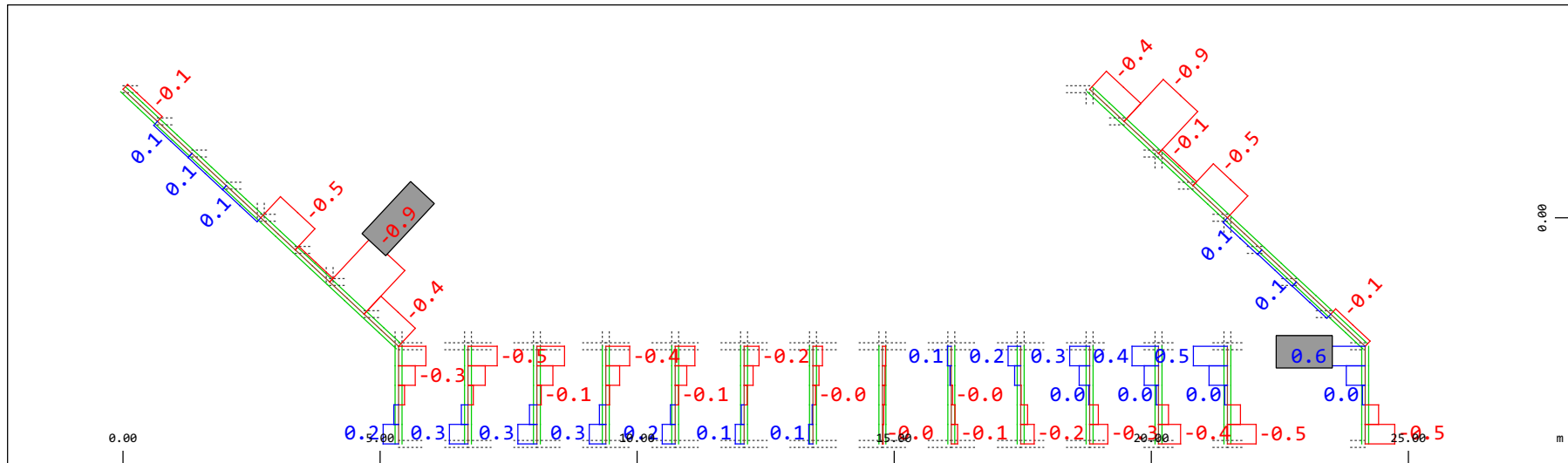
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force N_x , Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 98.0 kN (Min=-51.9) (Max=57.8)

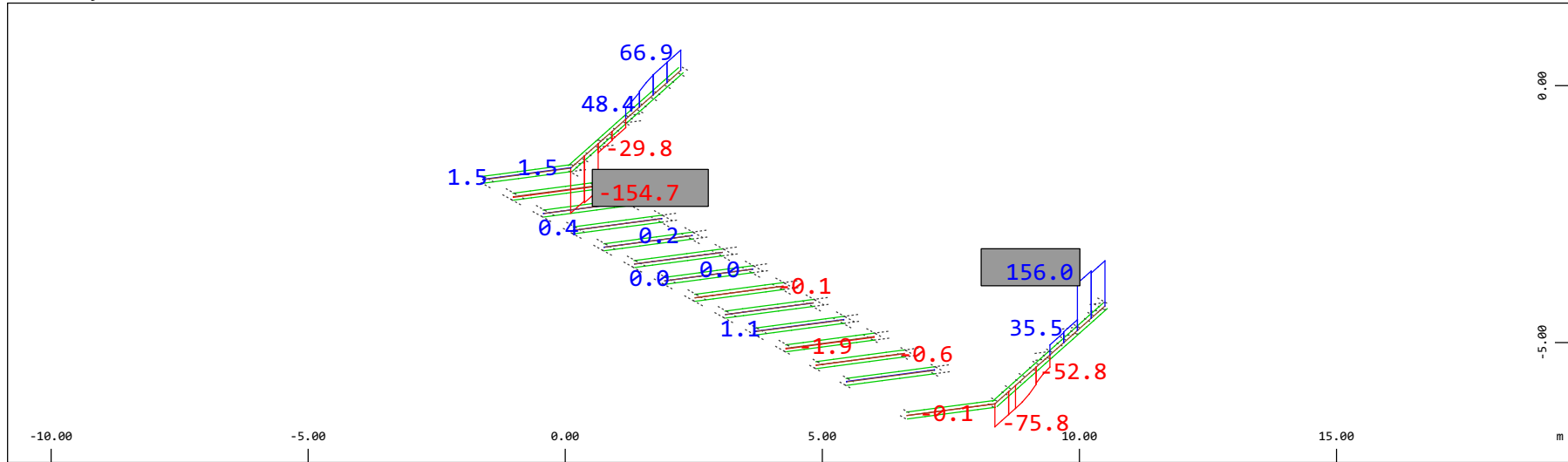
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment M_t , Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 0.980 kNm (Min=-0.948) (Max=0.557)

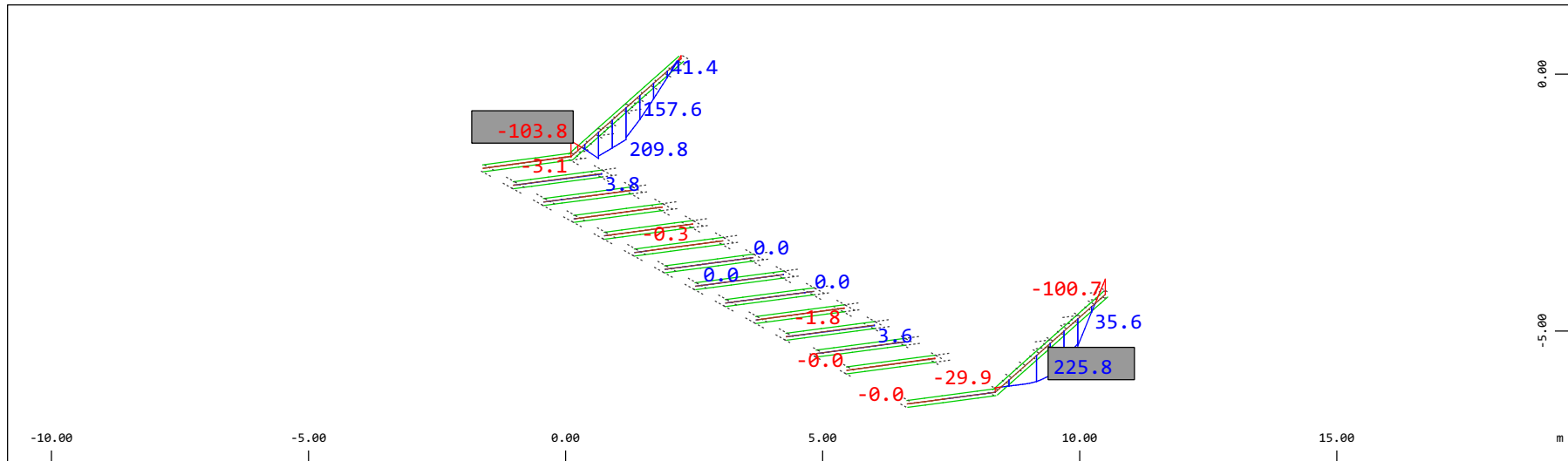
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force V_z , Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 196.1 kN (Min=-154.7) (Max=156.0)

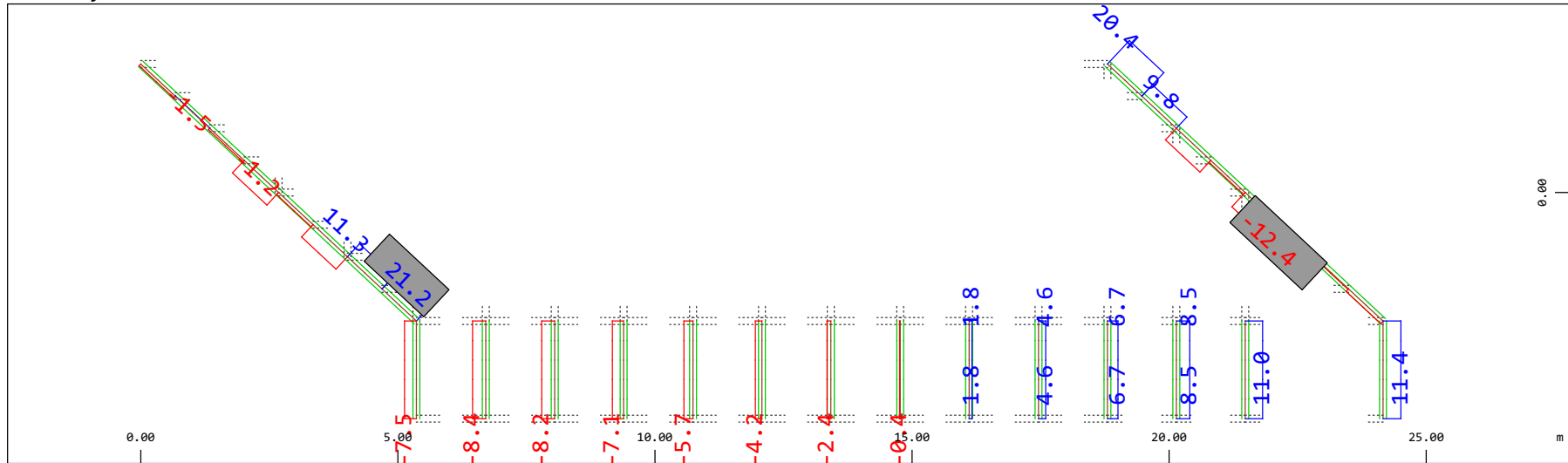
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment M_y , Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 392.2 kNm (Min=-103.8) (Max=225.8)

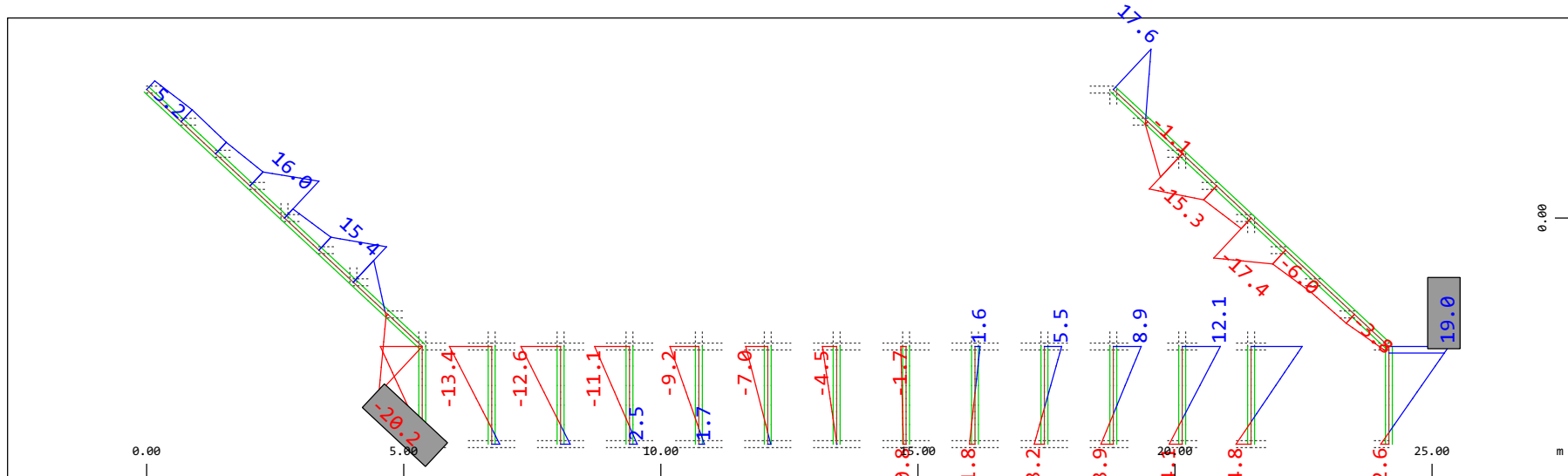
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 39.2 kN (Min=-12.4) (Max=21.2)

M 1 : 120

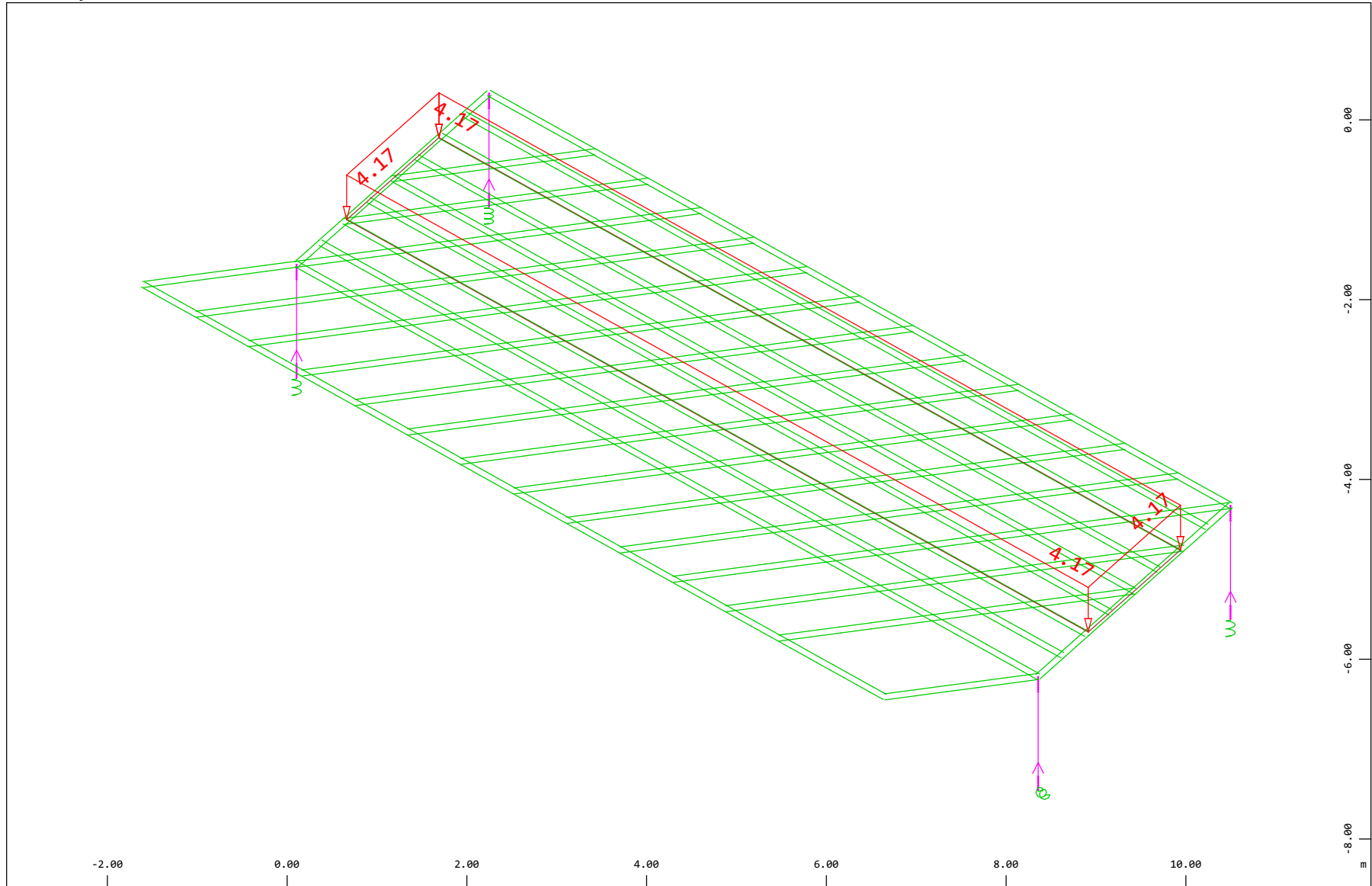


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 201 Qt: SW/2-ecc.neg. , 1 cm 3D = 19.6 kNm (Min=-20.2) (Max=19.0)

M 1 : 120

Definition of Axis
Results elementay loads

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Z
Y
X

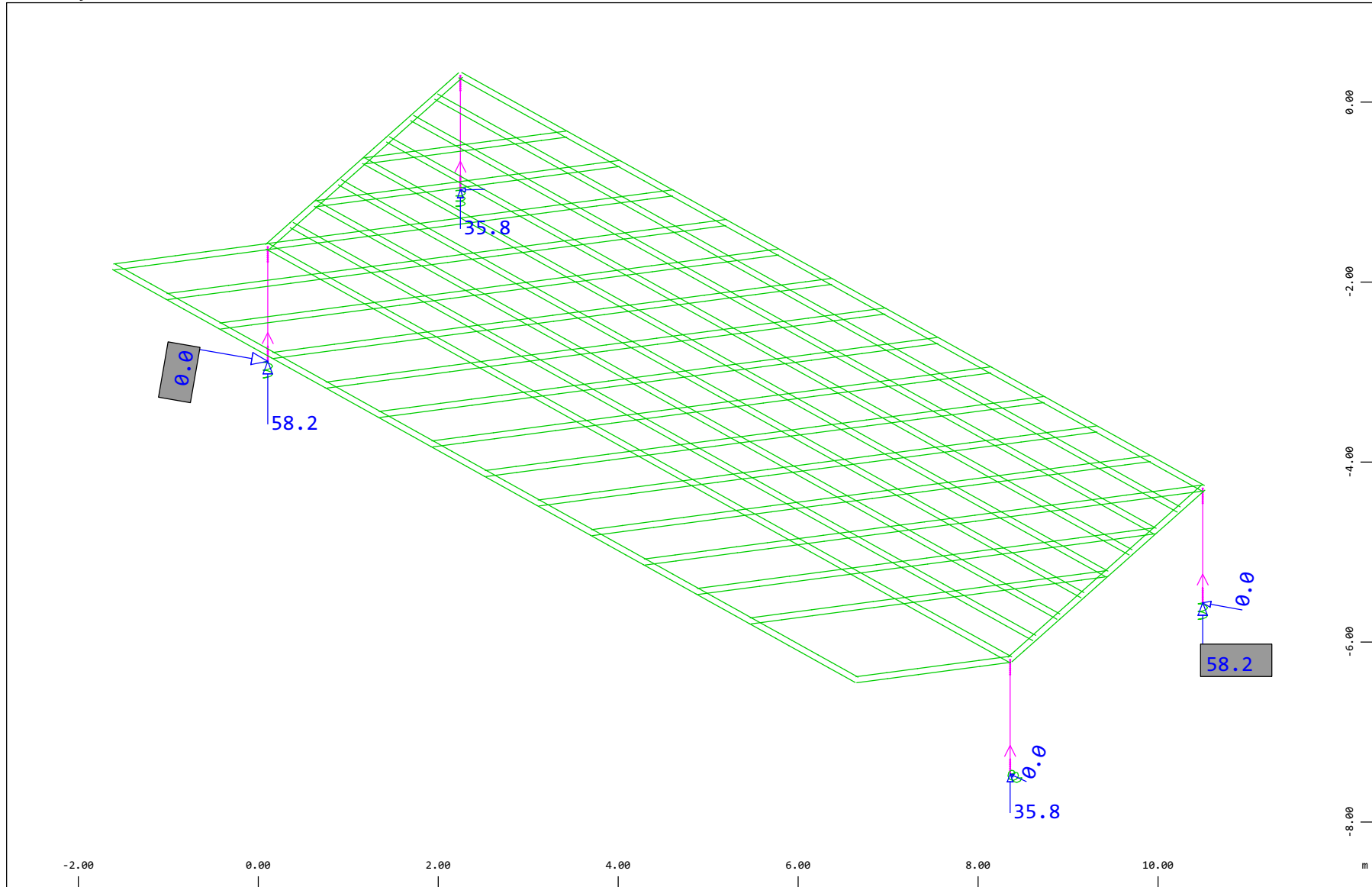
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
All loads, Loadcase 202 Qt: Treno Scarico , (1 cm 3D = unit) Free area load (force) in global Z (Unit=4.84 kN/m2)
(Max=-4.17)

→ (Min=-4.17)

M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementary loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 48.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 1.9375e-04 kN

▬ (Max=58.2) (total: 188.0)

▬ (Max= 3.3724e-04)

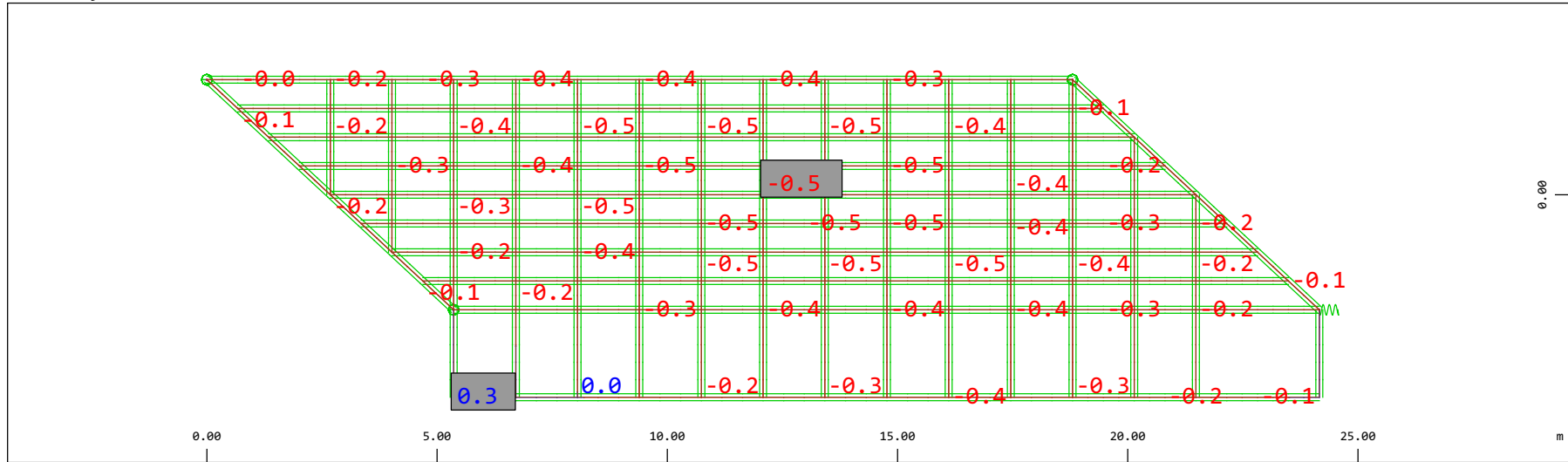
M 1 : 60

X * 0.502

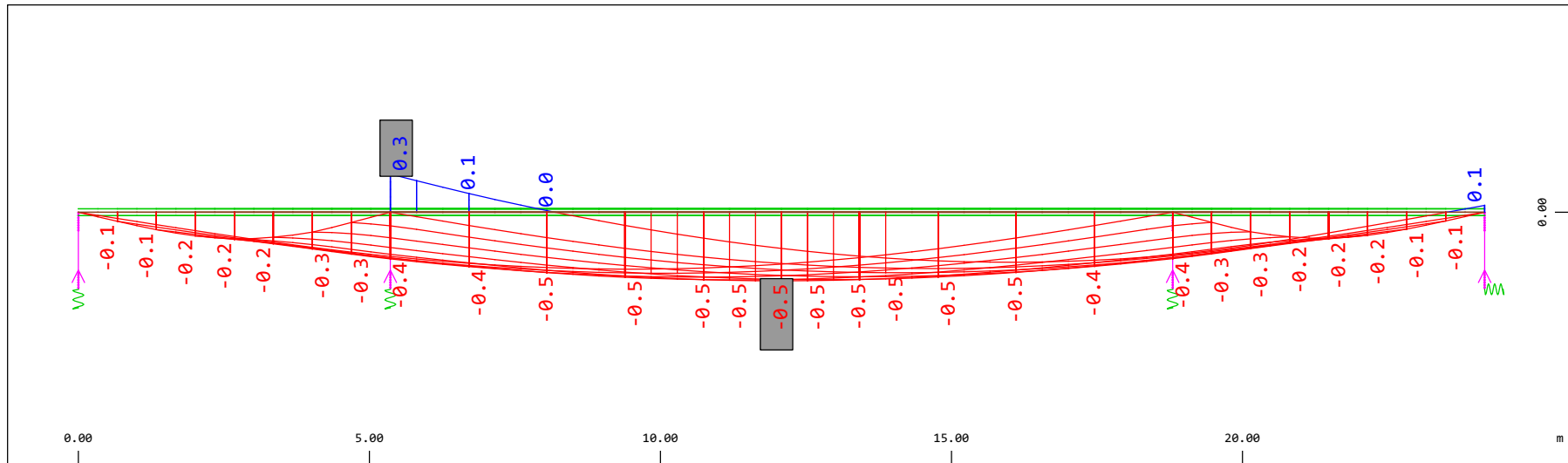
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

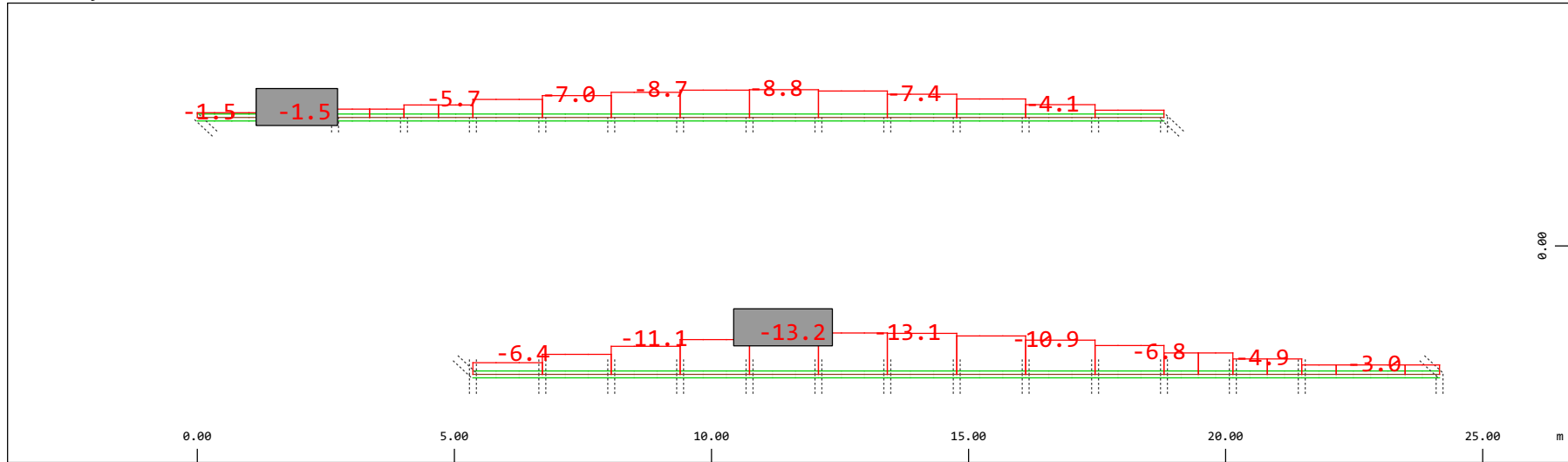


Y Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along \odot , Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 0.484 mm (Min=-0.539) (Max=0.299) M 1 : 134



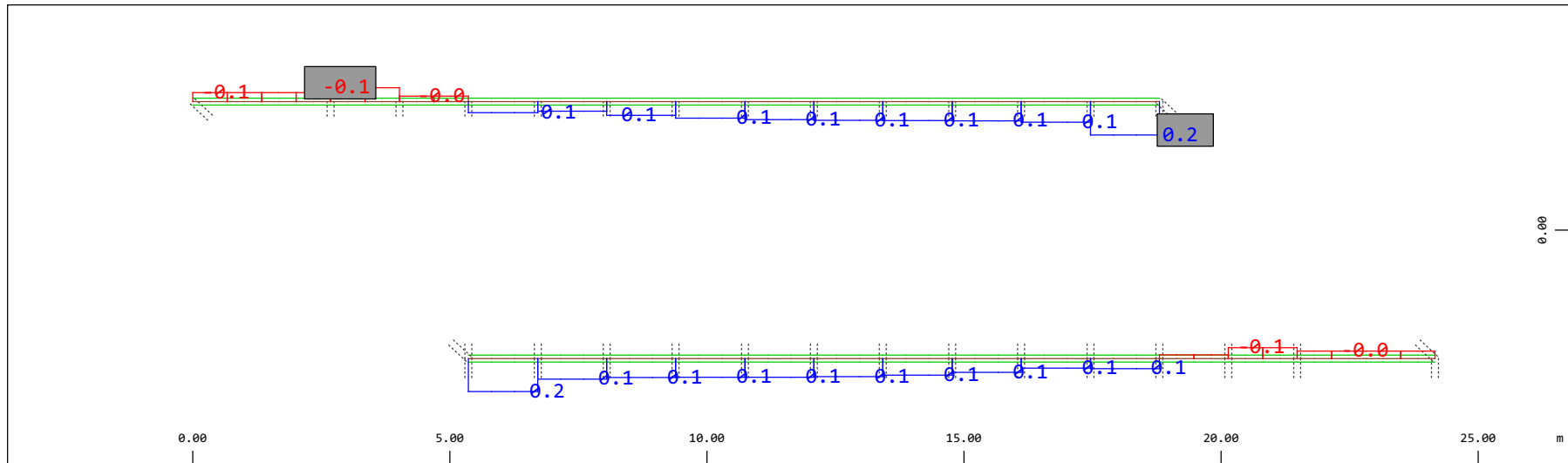
Z Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 0.484 mm (Min=-0.539) (Max=0.299) M 1 : 106

Definition of Axis
Results elementary loads



Sector of system Beam Elements Group 10 11
Beam Elements , Normal force Nx, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 19.6 kN (Min=-13.2) (Max=-1.53)

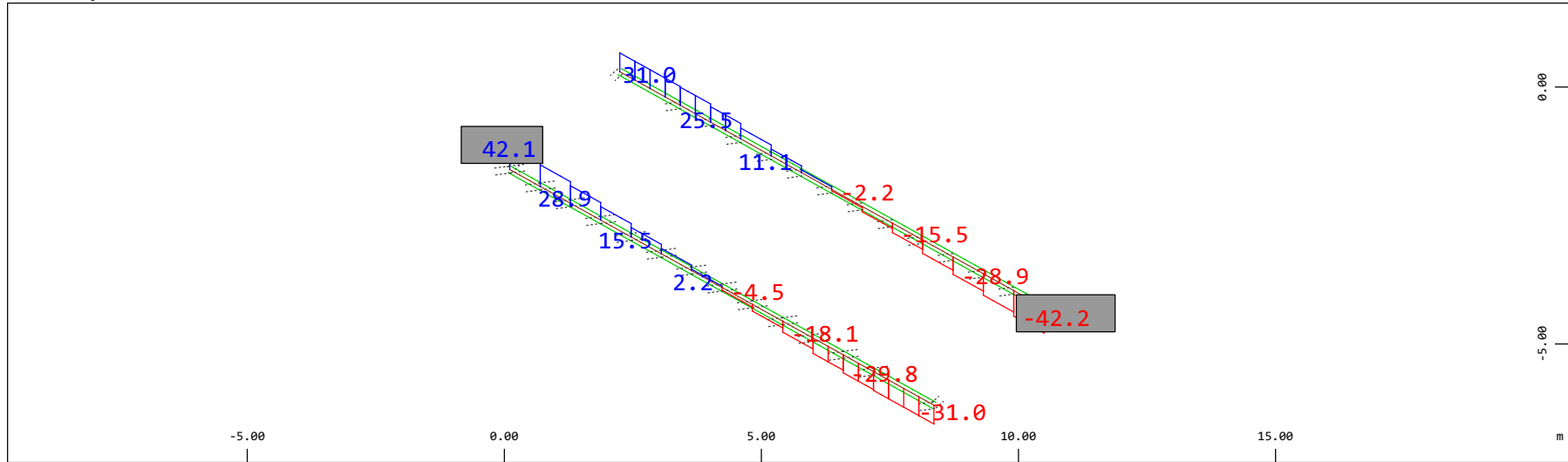
M 1 : 120



Sector of system Beam Elements Group 10 11
Beam Elements , Torsional moment Mt, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 0.392 kNm (Min=-0.0882) (Max=0.212)

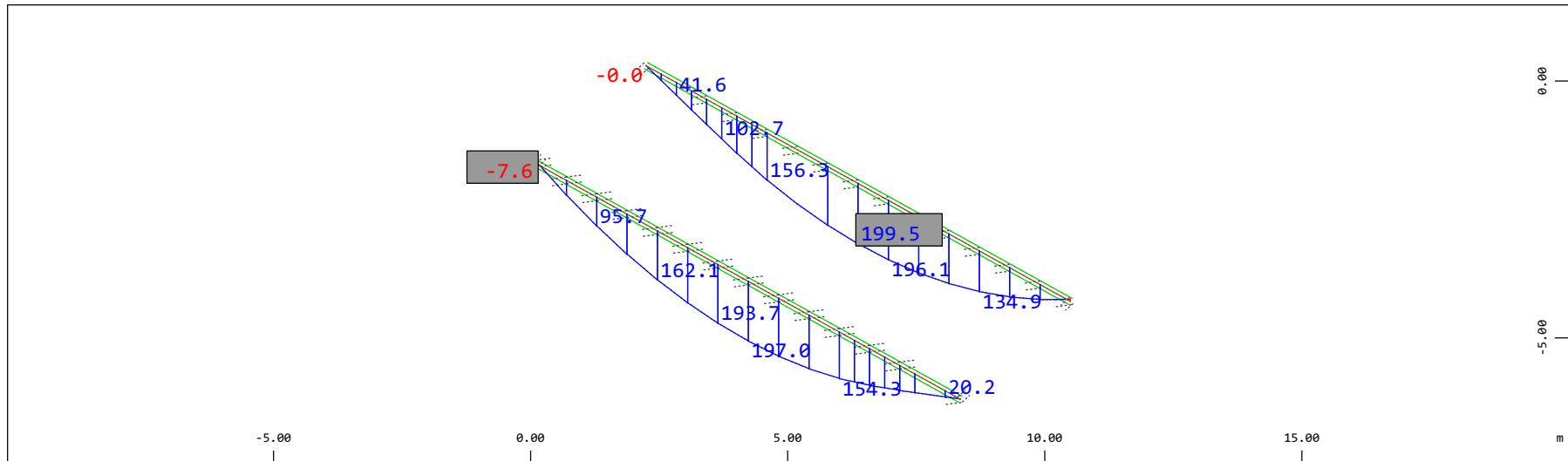
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 98.0 kN (Min=-42.2) (Max=42.1)

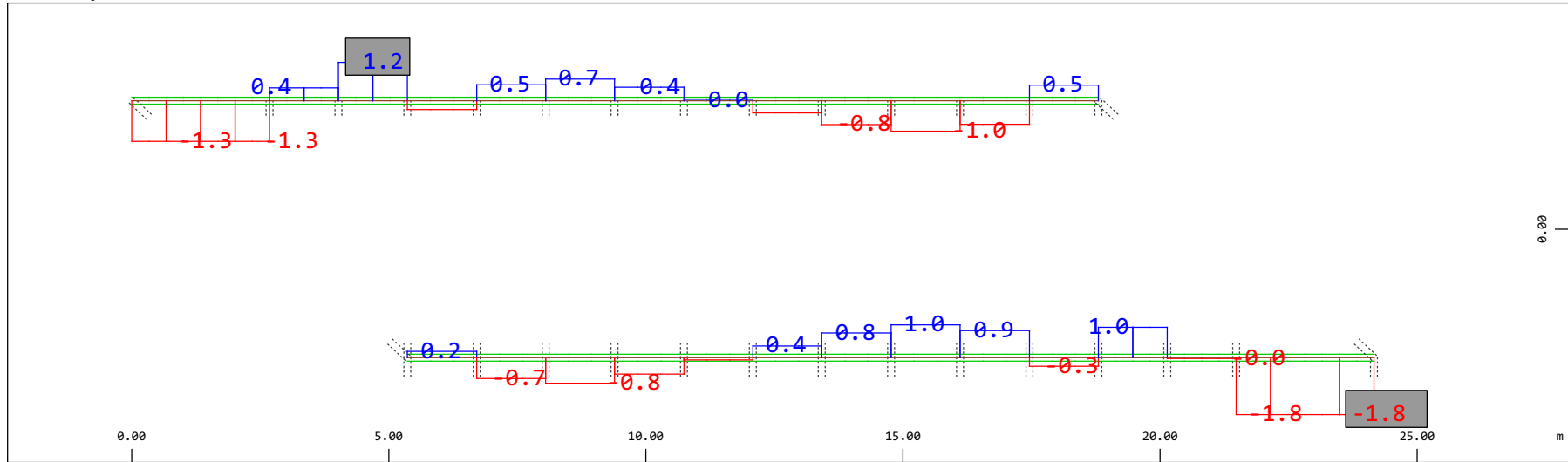
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 196.1 kNm (Min=-7.60) (Max=199.5)

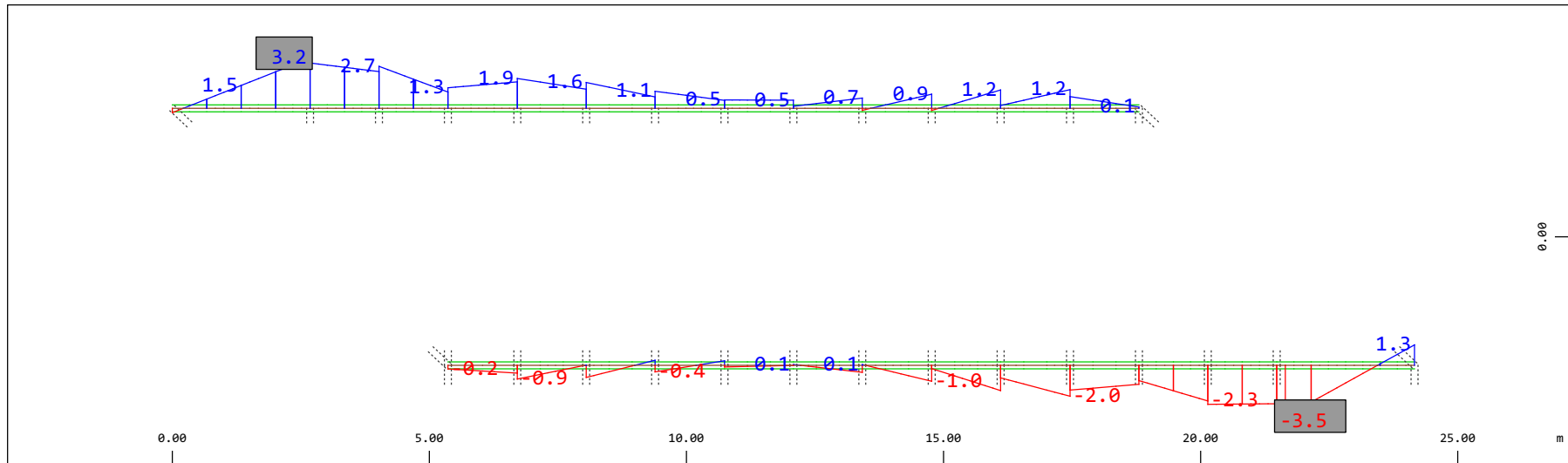
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementary loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 1.96 kN (Min=-1.81) (Max=1.22)

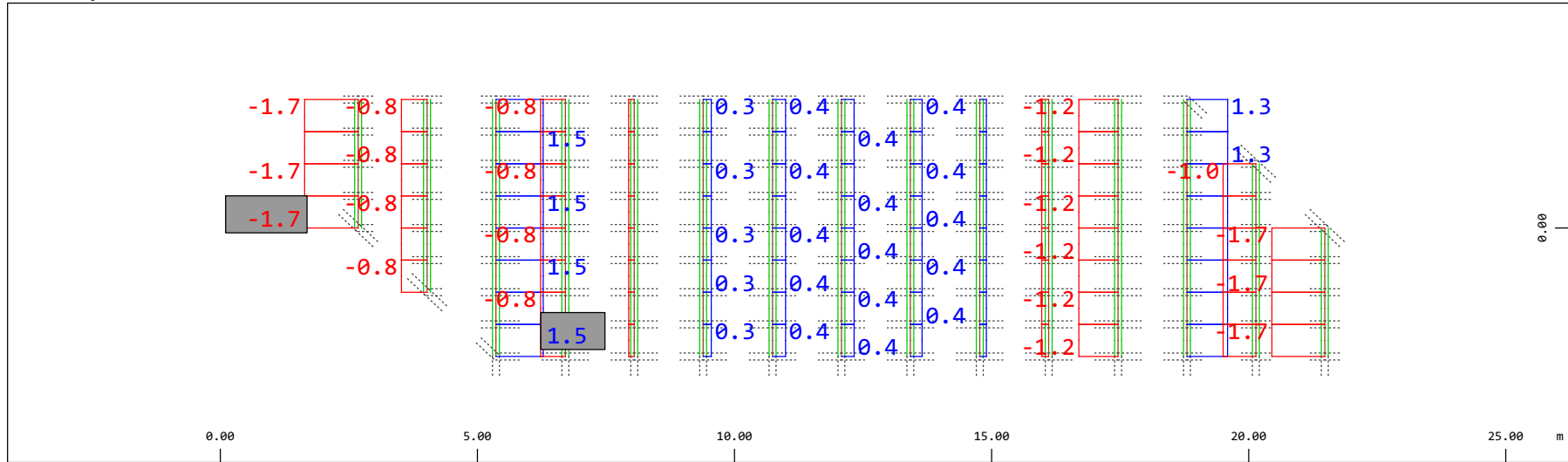
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 3.92 kNm (Min=-3.55) (Max=3.19)

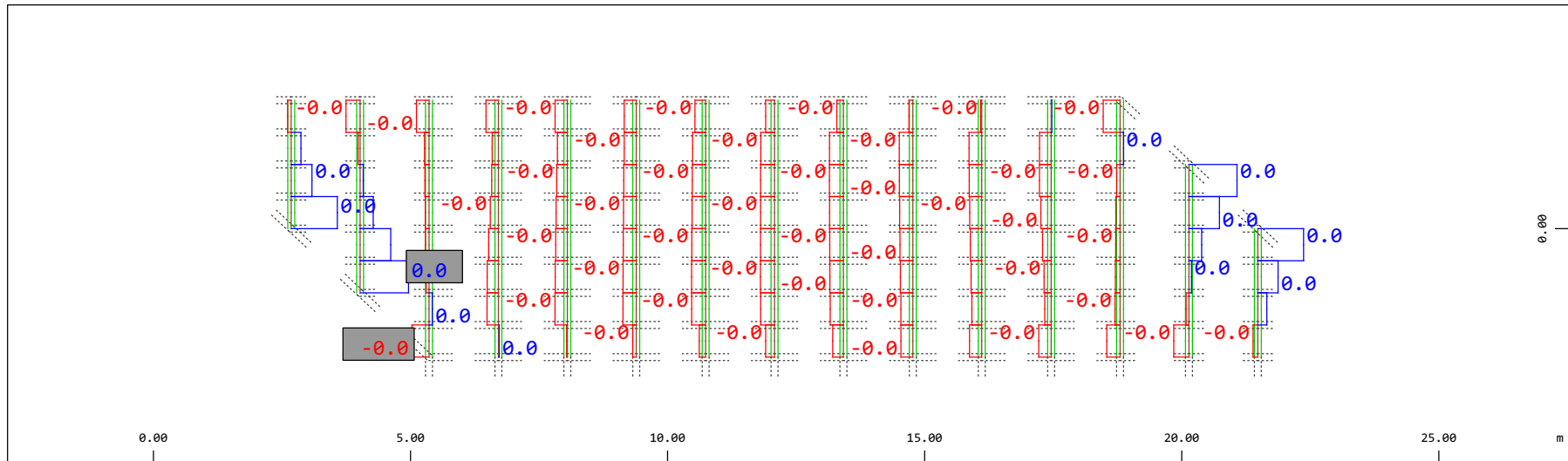
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force N_x , Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 1.96 kN (Min=-1.70) (Max=1.50)

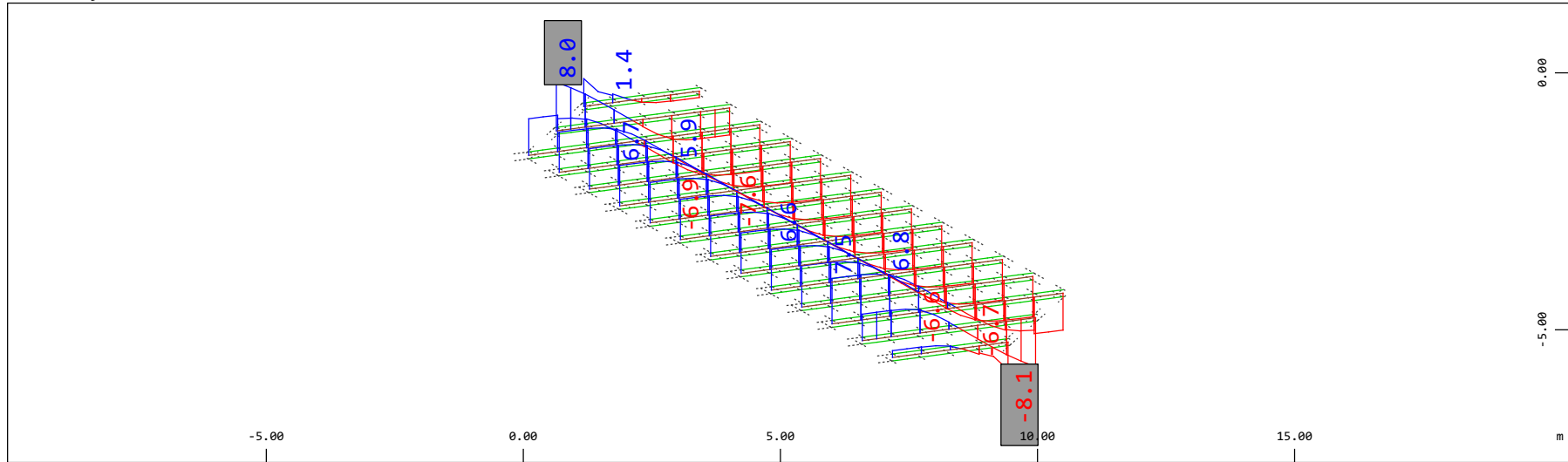
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment M_t , Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 0.0392 kNm (Min=-0.0108) (Max=0.0307)

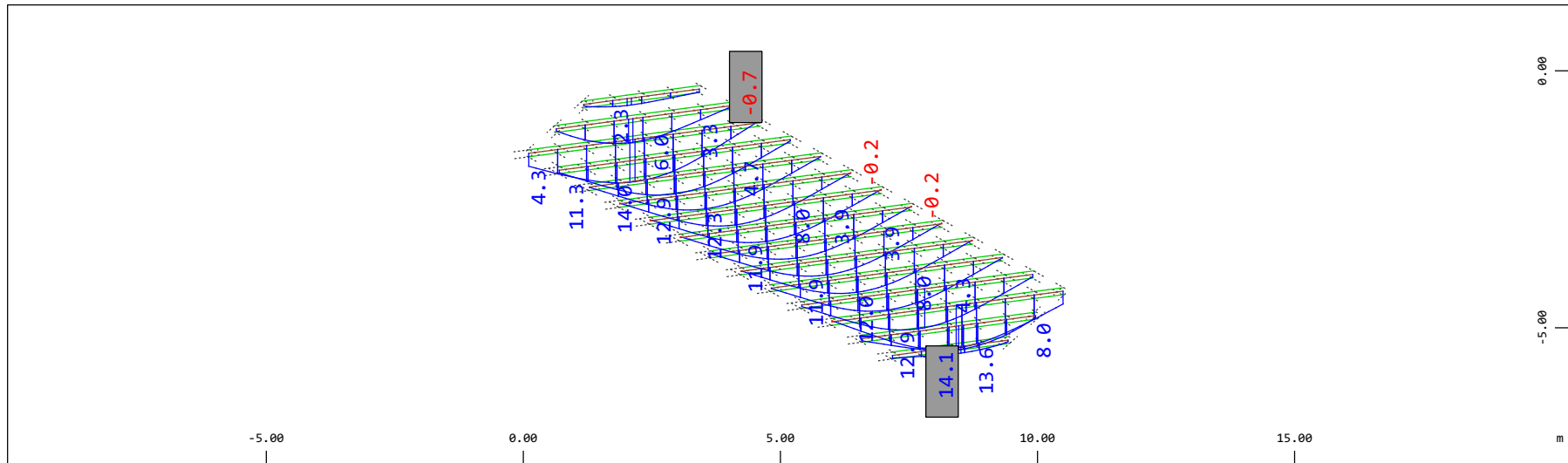
M 1 : 120

Definition of Axis
Results elementay loads



Z Sector of system Beam Elements Group 21 22
X Y Beam Elements , Shear force Vz, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 9.80 kN (Min=-8.08) (Max=8.03)

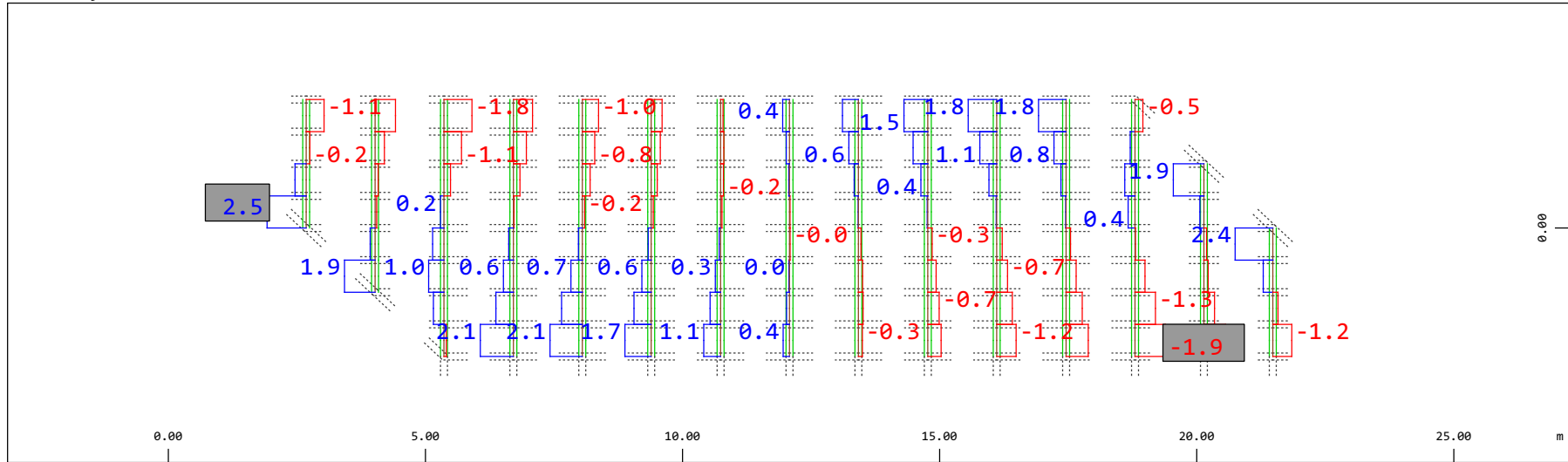
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Z Sector of system Beam Elements Group 21 22
X Y Beam Elements , Bending moment My, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 19.6 kNm (Min=-0.746) (Max=14.1)

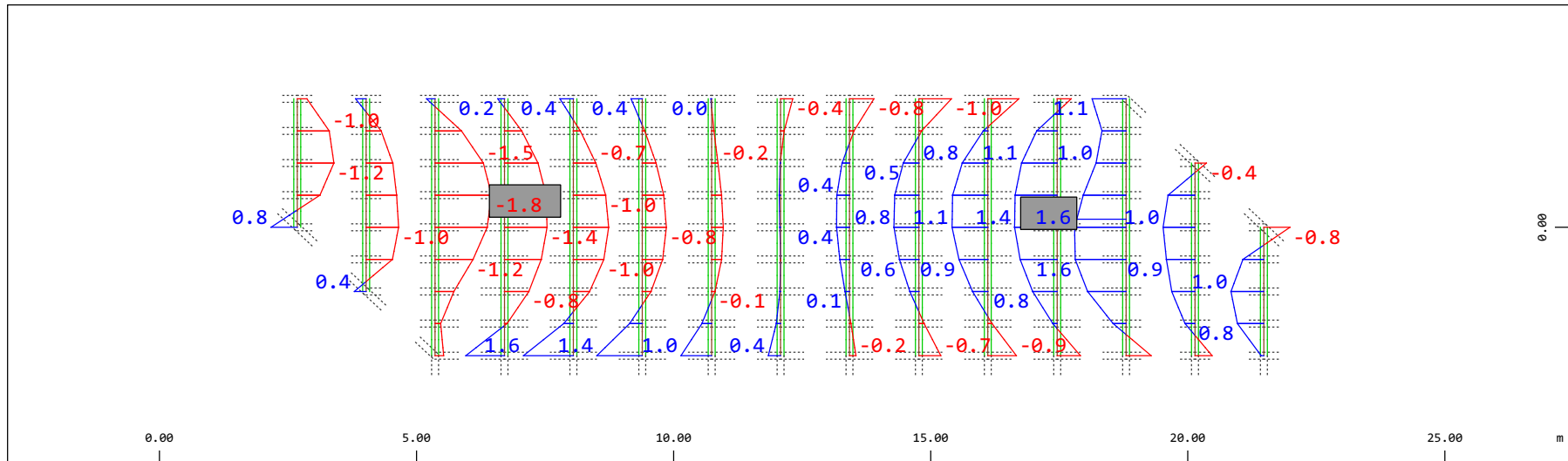
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 3.92 kN (Min=-1.93) (Max=2.49)

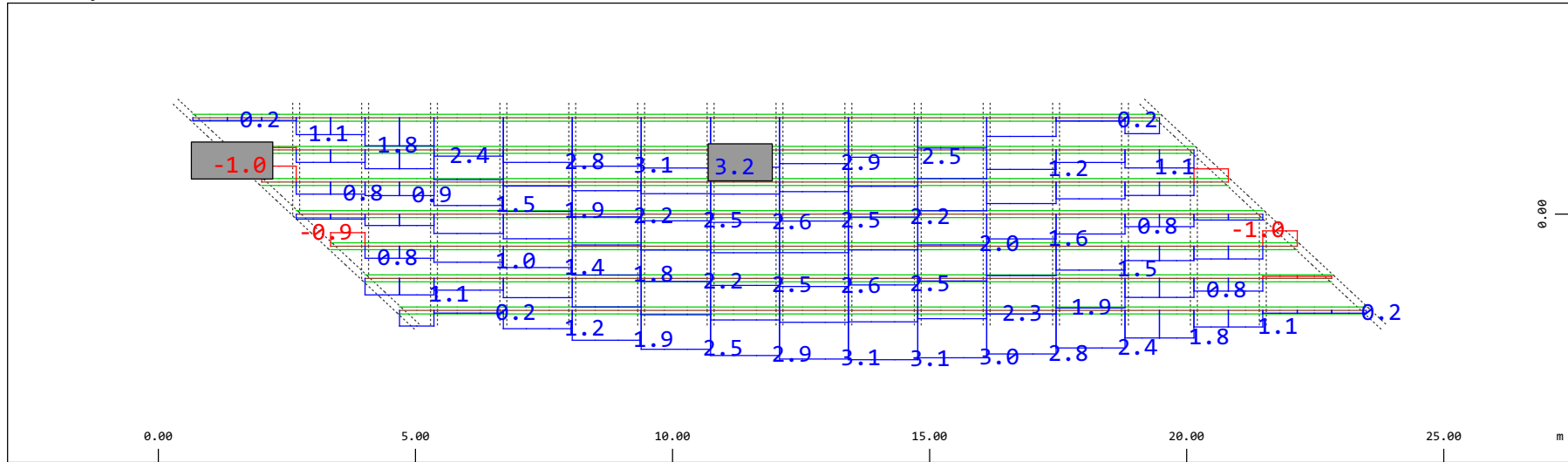
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 1.96 kNm (Min=-1.80) (Max=1.64)

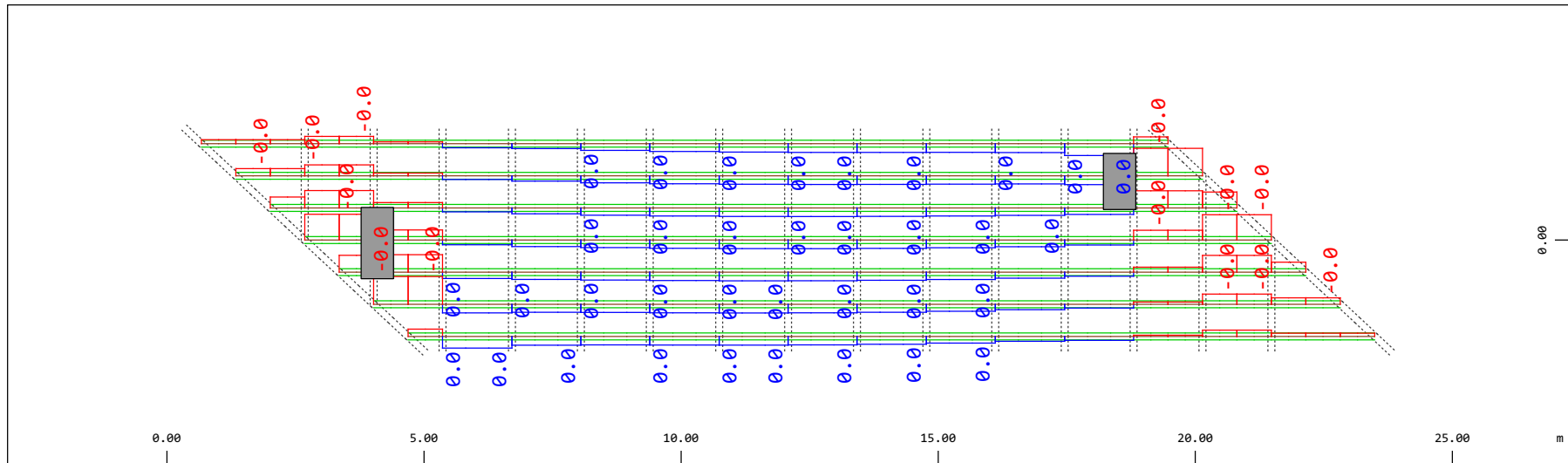
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 3.92 kN (Min=-1.01) (Max=3.20)

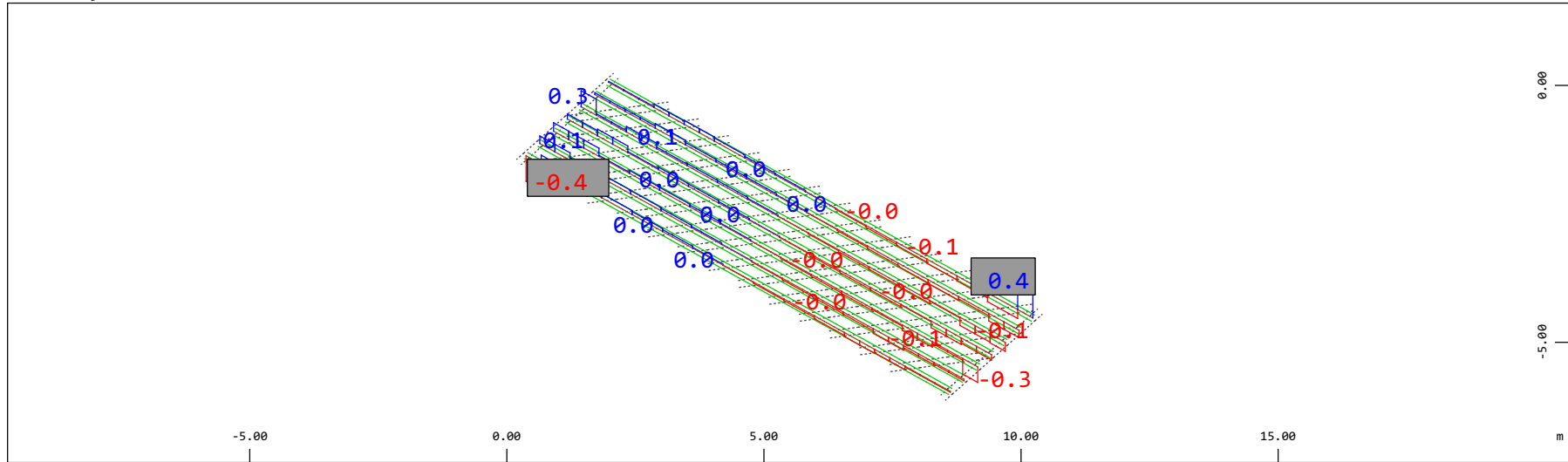
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 9.8047e-04 kNm (Min=-4.4136e-04) (Max= 1.8879e-04)

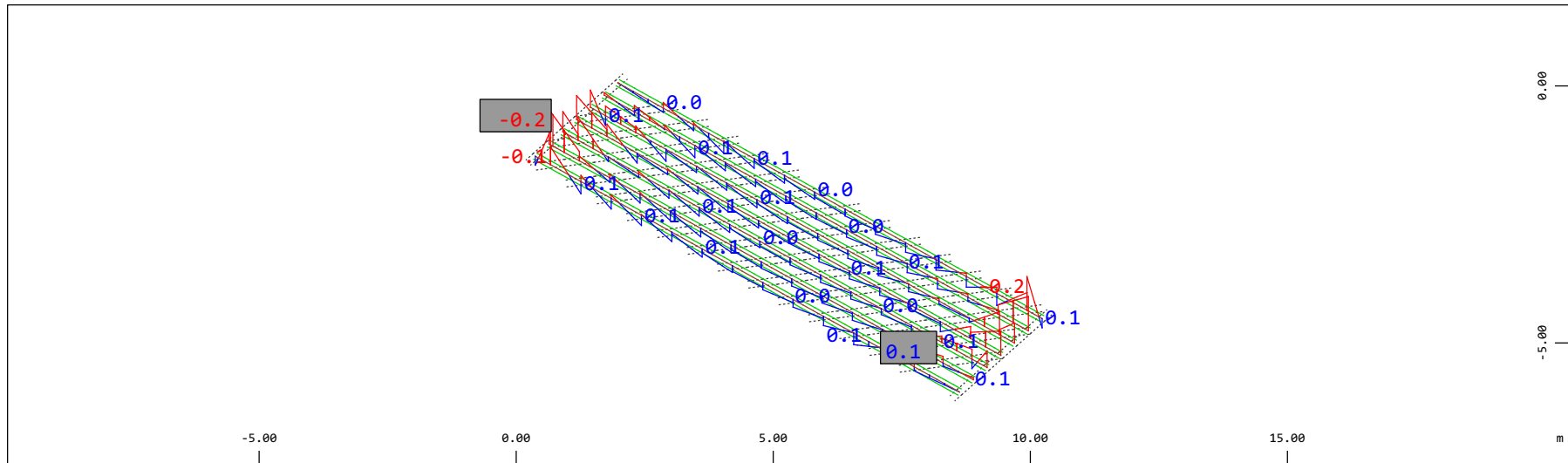
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force V_z , Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 0.980 kN (Min=-0.425) (Max=0.422)

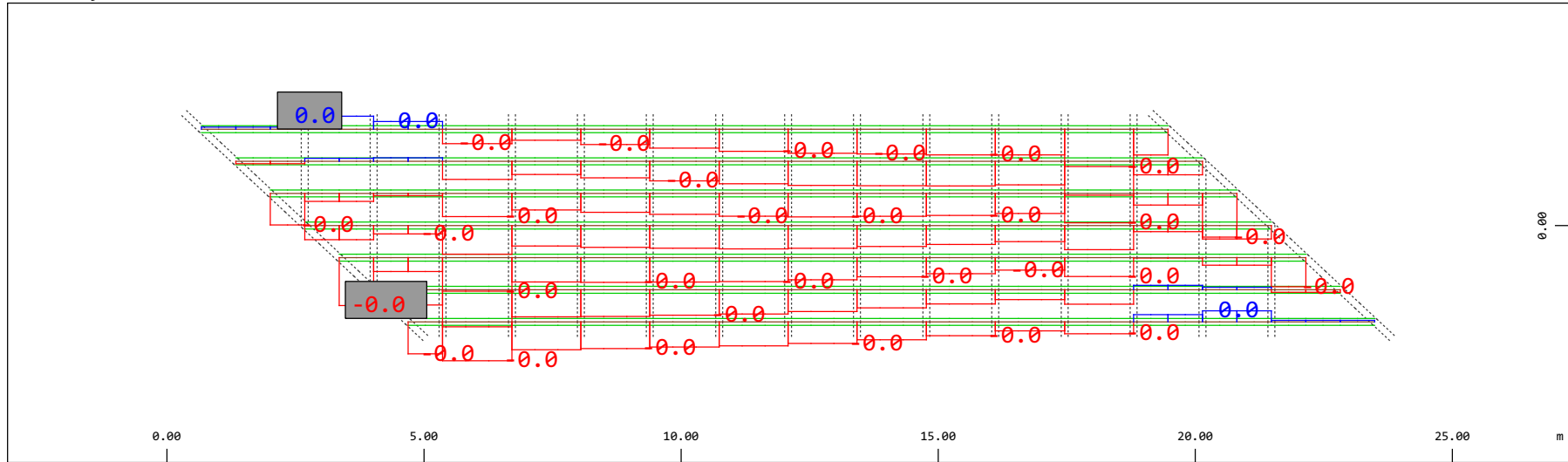
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment M_y , Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 0.392 kNm (Min=-0.227) (Max=0.0813)

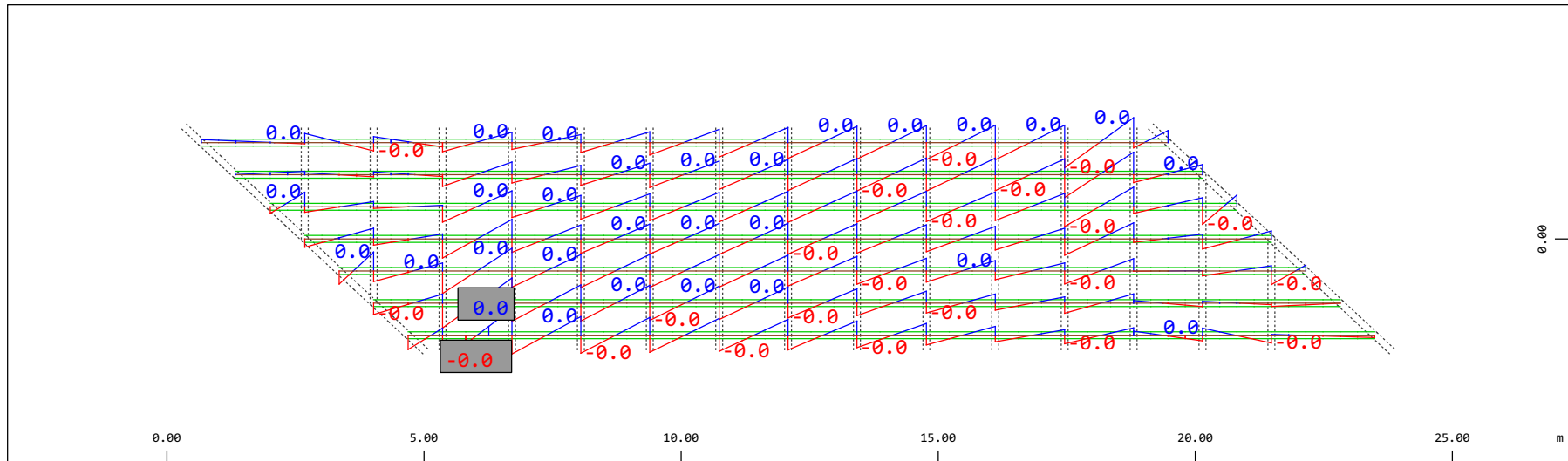
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 9.8047e-04 kN (Min=-7.6155e-04) (Max= 2.0694e-04)

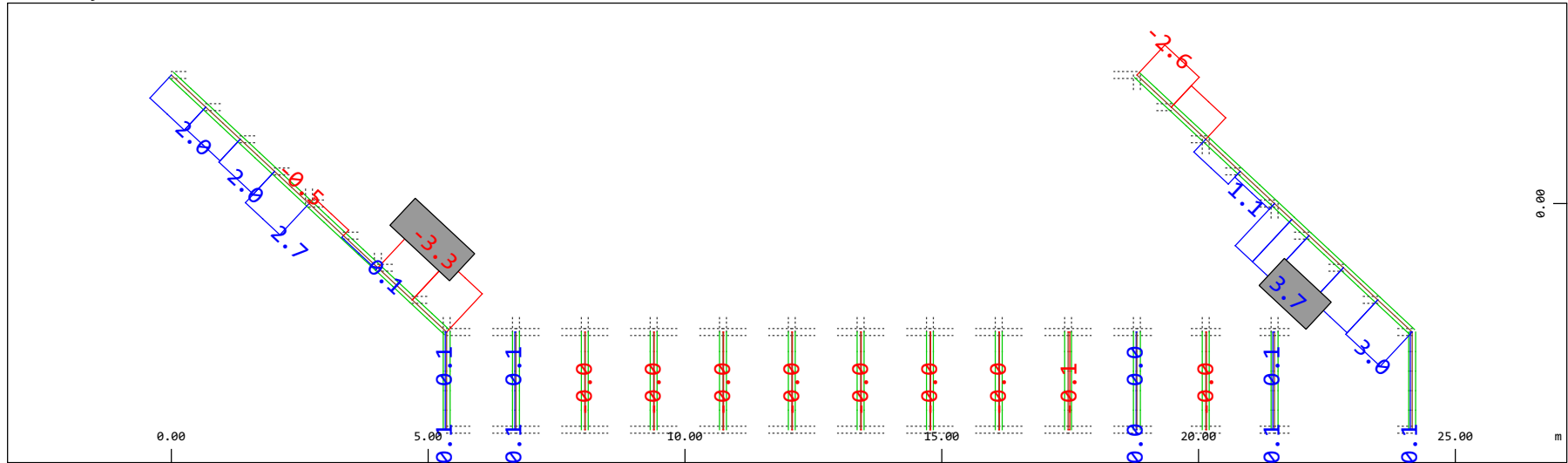
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 9.8047e-04 kNm (Min=-4.1470e-04) (Max= 4.1904e-04)

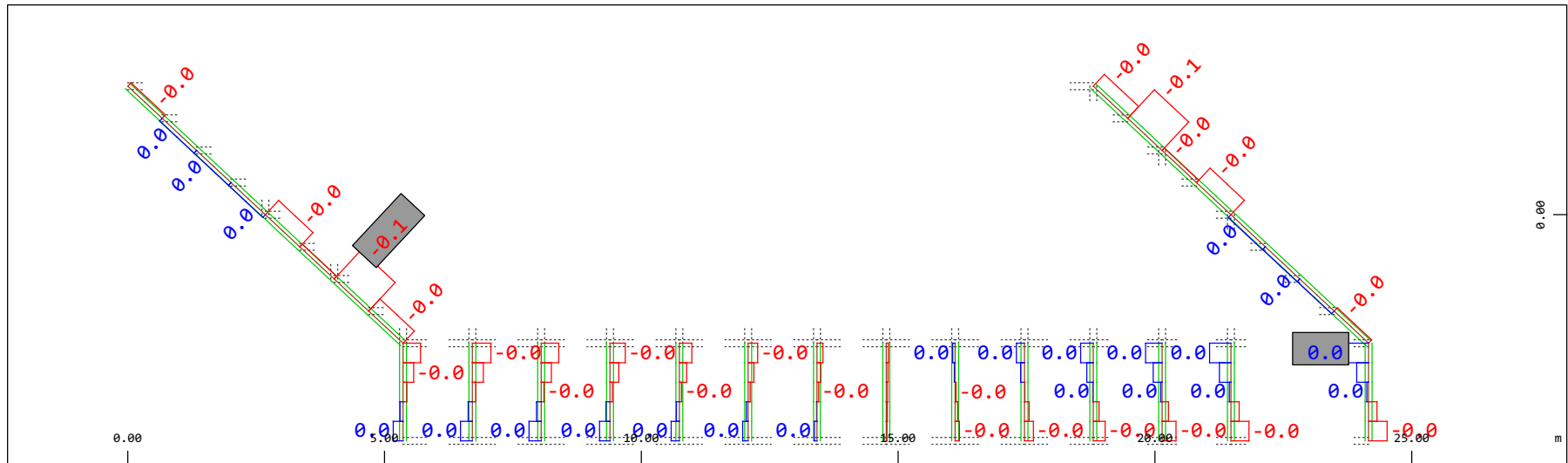
M 1 : 120

Definition of Axis
Results elementay loads



Y
Z-X Sector of system Beam Elements Group 20 23
Beam Elements , Normal force Nx, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 3.92 kN (Min=-3.32) (Max=3.67)

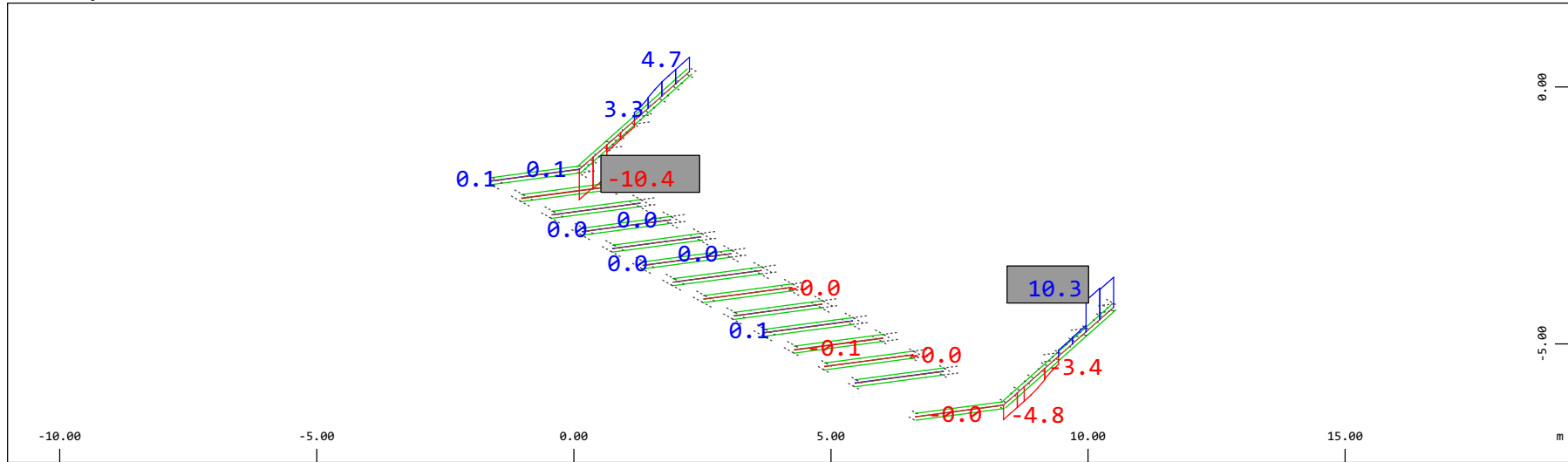
M 1 : 120



Y
Z-X Sector of system Beam Elements Group 20 23
Beam Elements , Torsional moment Mt, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 0.0980 kNm (Min=-0.0621) (Max=0.0351)

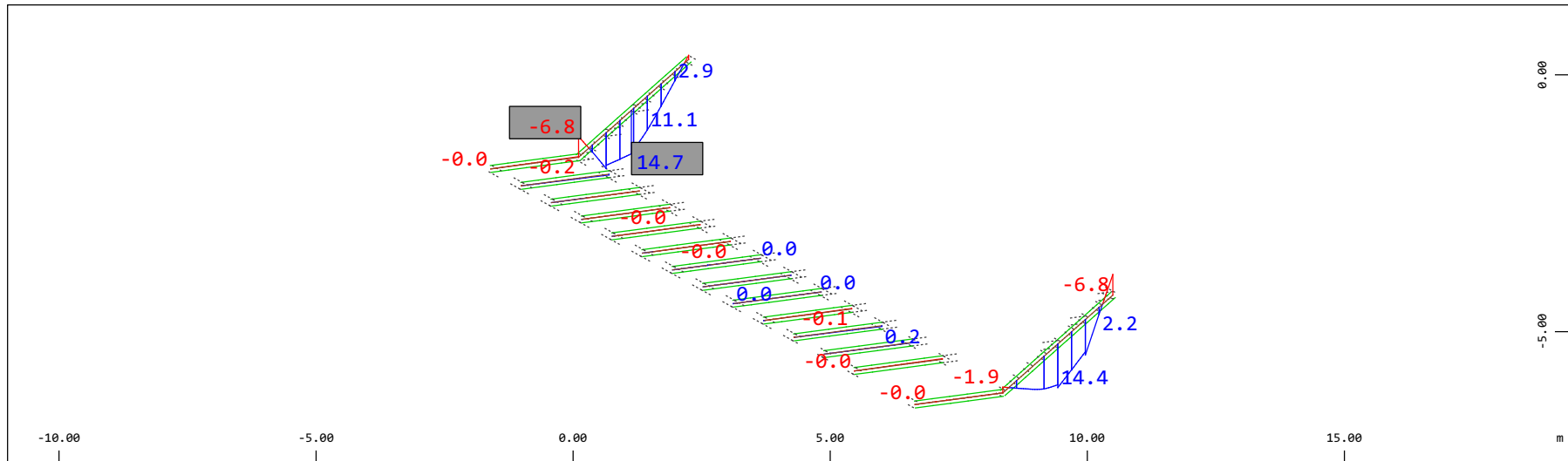
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 19.6 kN (Min=-10.4) (Max=10.3)

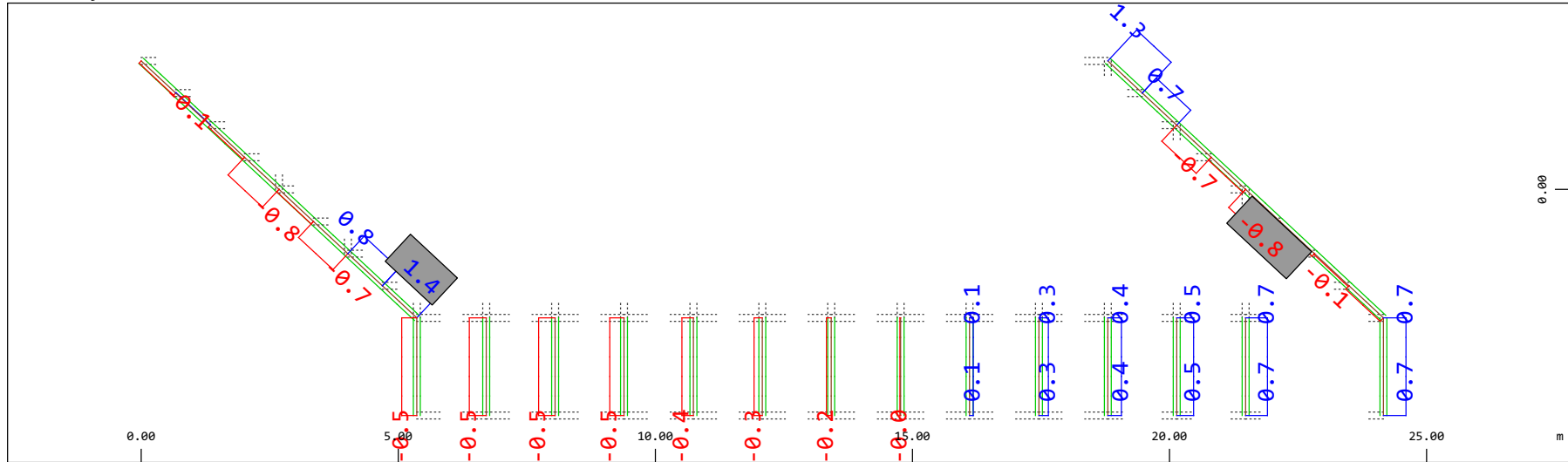
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 19.6 kNm (Min=-6.84) (Max=14.7)

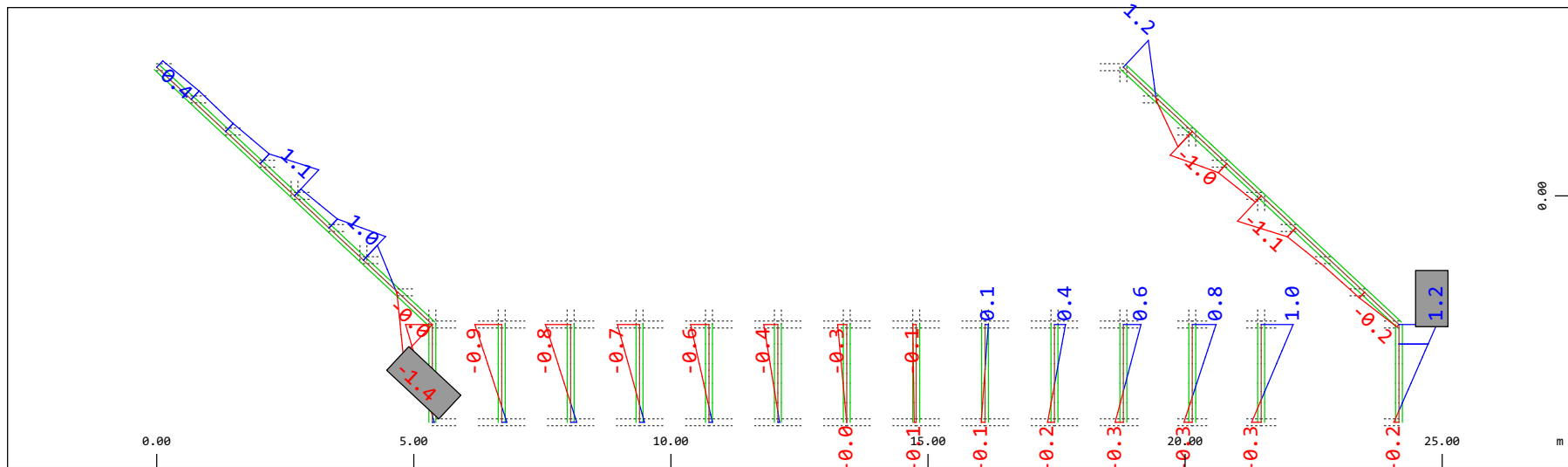
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 1.96 kN (Min=-0.786) (Max=1.43)

M 1 : 120

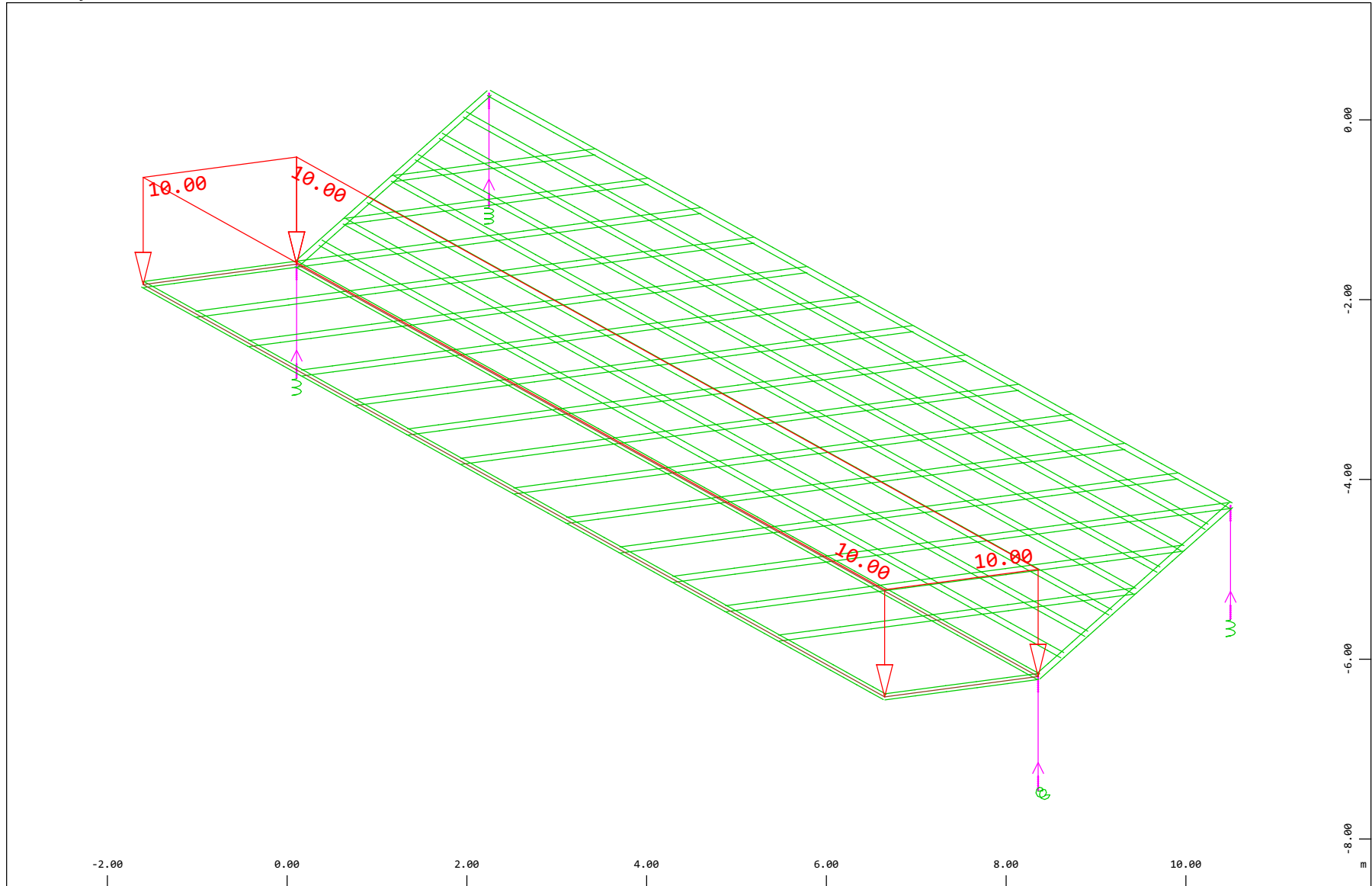


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 202 Qt: Treno Scarico , 1 cm 3D = 1.96 kNm (Min=-1.35) (Max=1.20)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 Y
 X

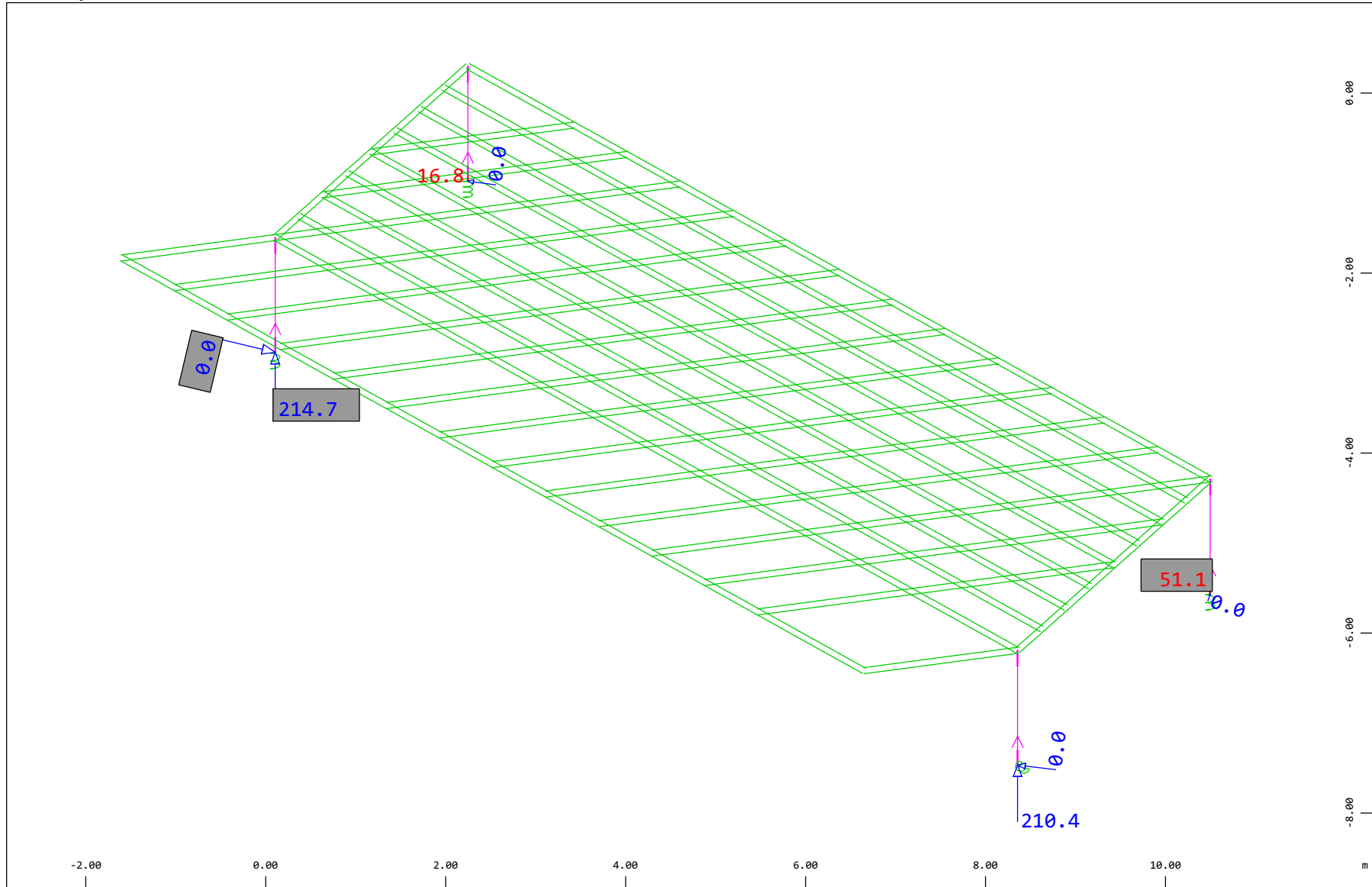
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 203 Qt: Marciapiedi , (1 cm 3D = unit) Free area load (force) in global Z (Unit=4.84 kN/m2)
 (Max=-10.0)

▾ (Min=-10.0)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementary loads

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Z
 X
 Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 193.8 kN

Nodes , Support force vector in the global XY plane, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 9.6875e-04 kN

▬ (Min=-51.1) (Max=214.7) (total: 357.2)

▬ (Max=0.0015)

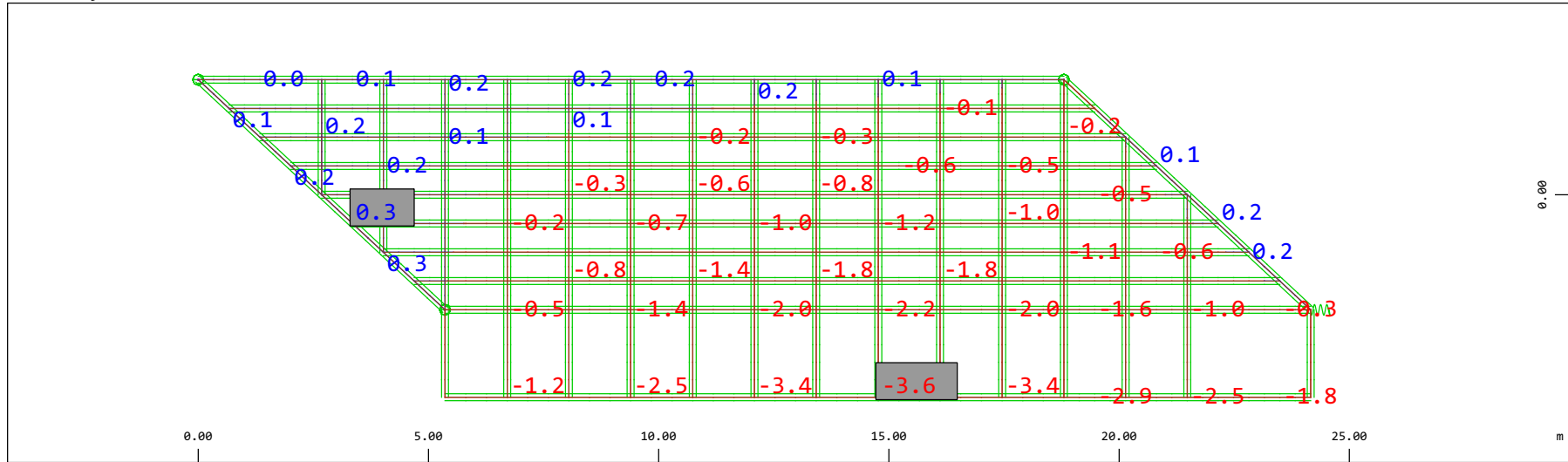
M 1 : 60

X * 0.502

Y * 0.906

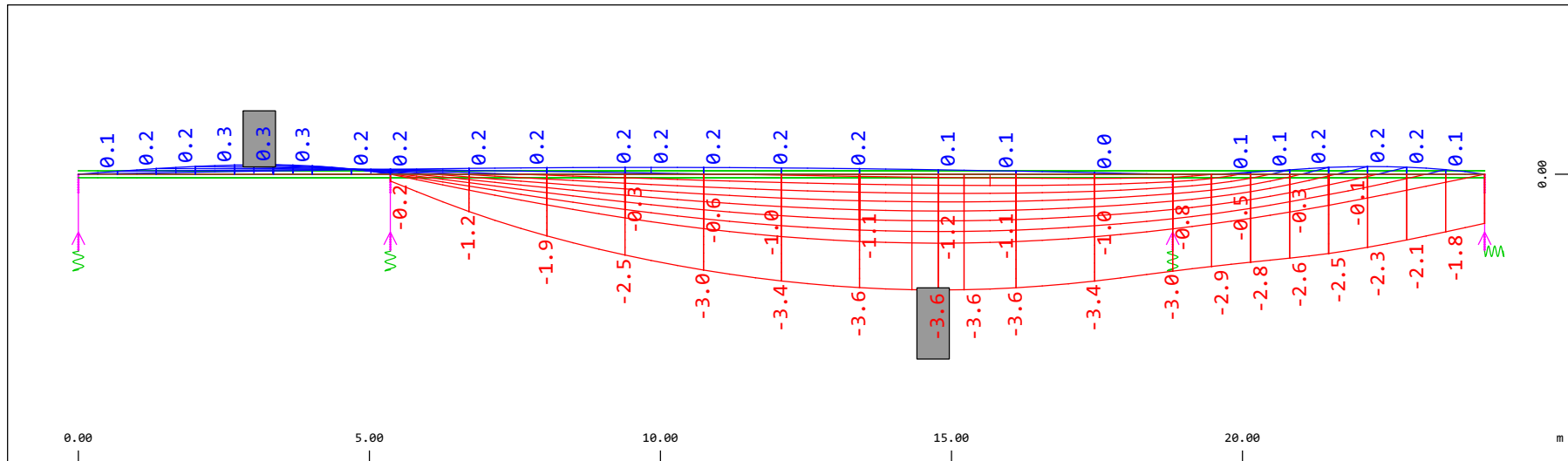
Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 1.94 mm (Min=-3.64) (Max=0.299)

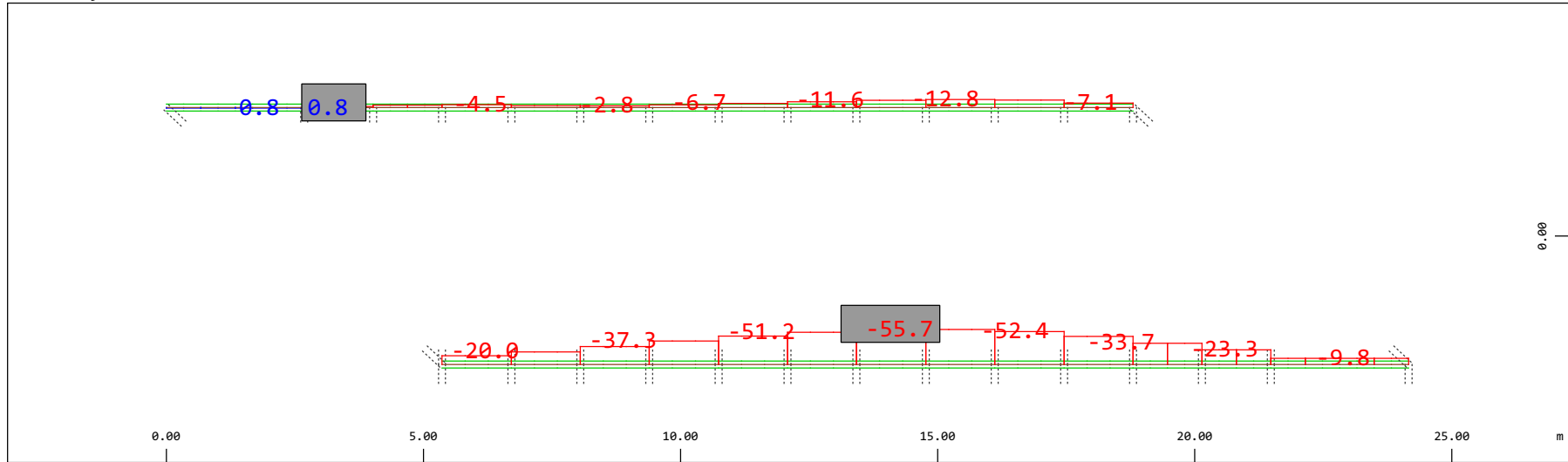
M 1 : 134



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 1.94 mm (Min=-3.64) (Max=0.299)

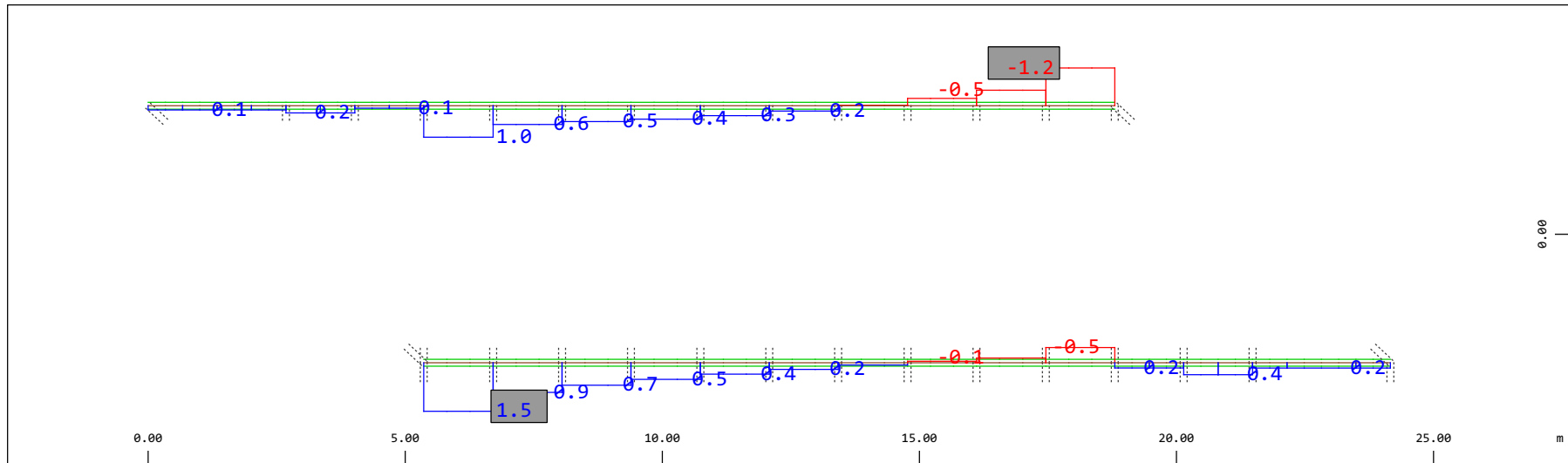
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 98.0 kN (Min=-55.7) (Max=0.799)

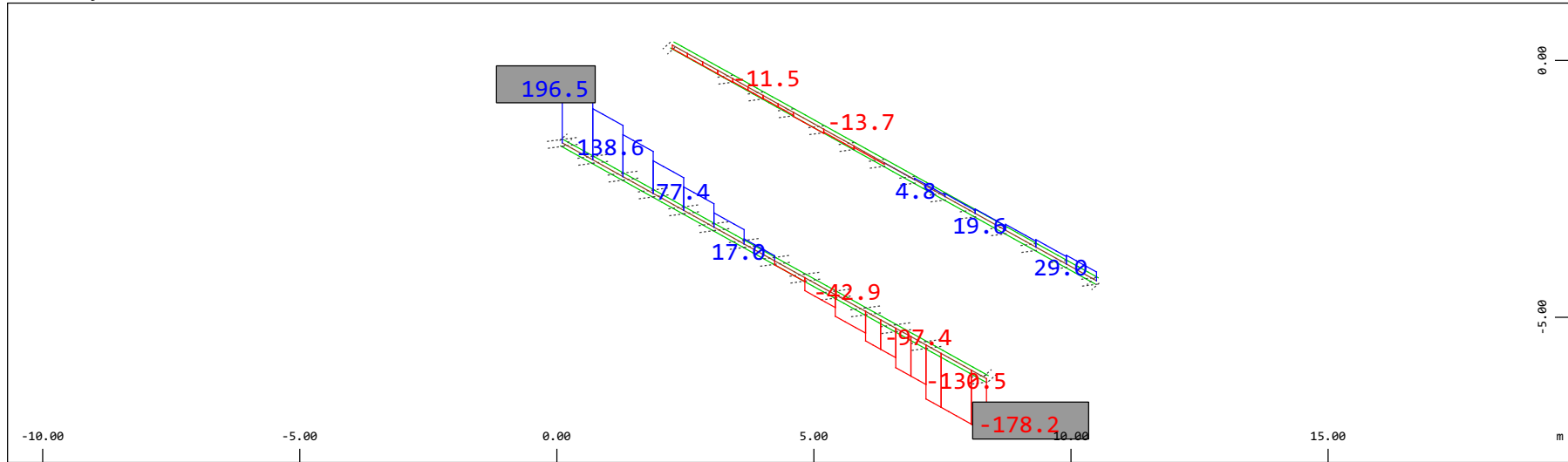
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 1.96 kNm (Min=-1.20) (Max=1.54)

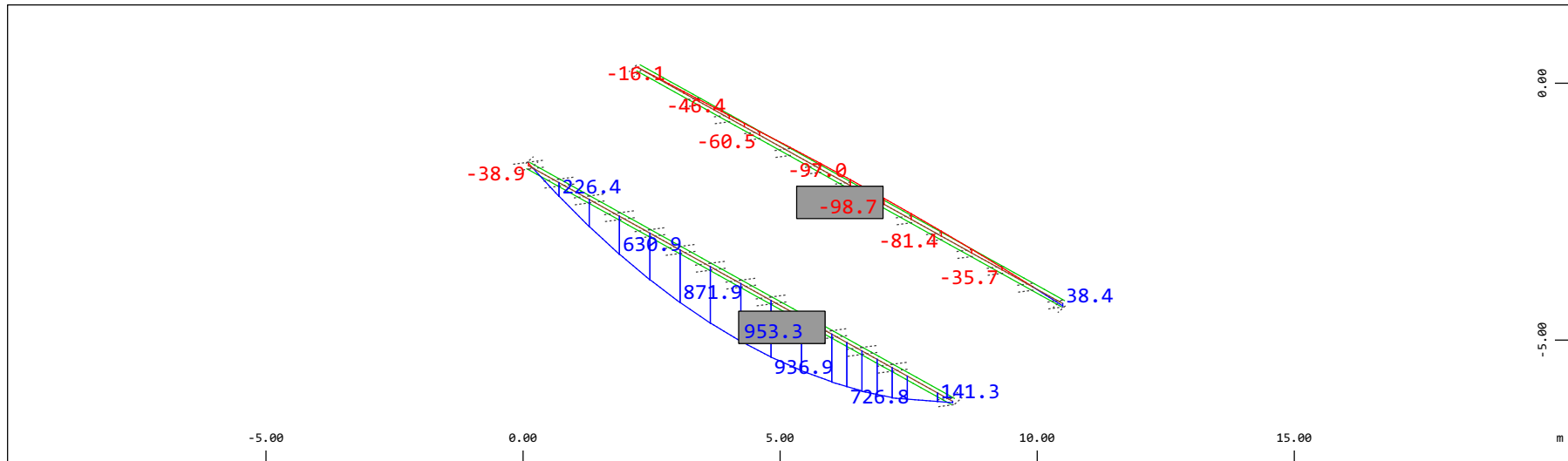
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 196.1 kN (Min=-178.2) (Max=196.5)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

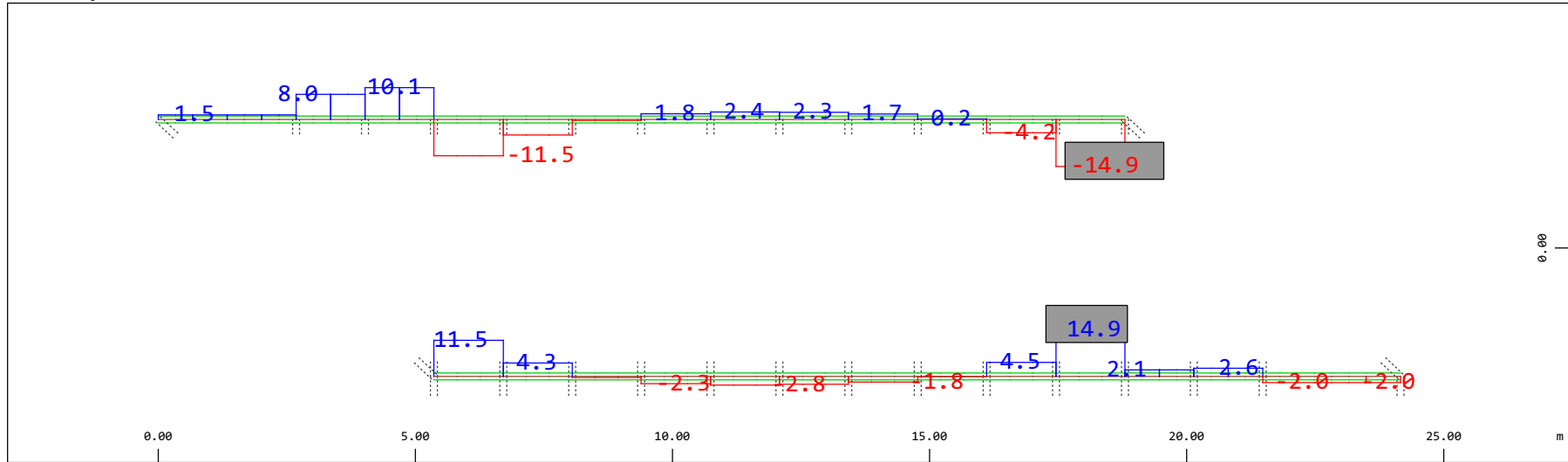


Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 980.5 kNm
 (Min=-98.7) (Max=953.3)

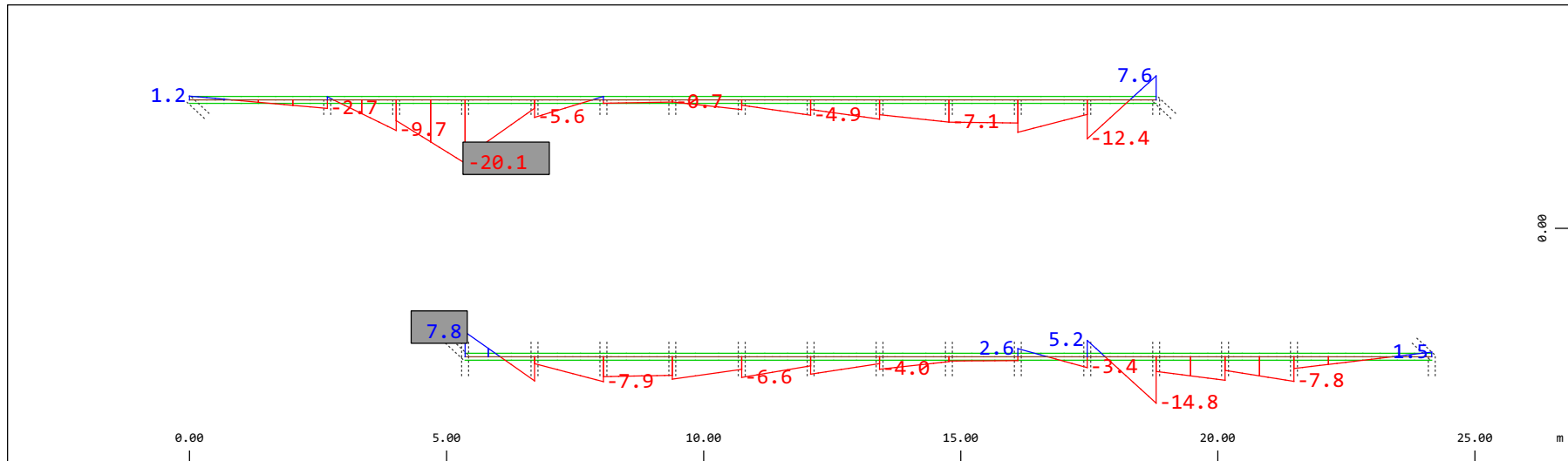
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis

Results elementay loads

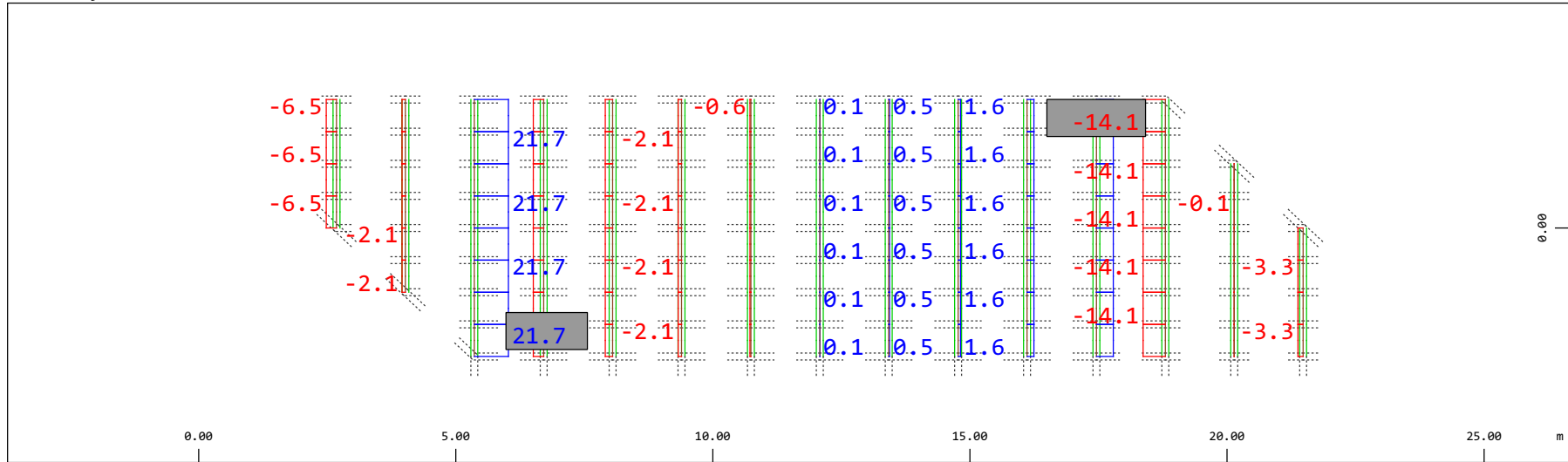


Y Sector of system Beam Elements Group 10 11
 X Beam Elements , Shear force Vy, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 19.6 kN (Min=-14.9) (Max=14.9) M 1 : 120



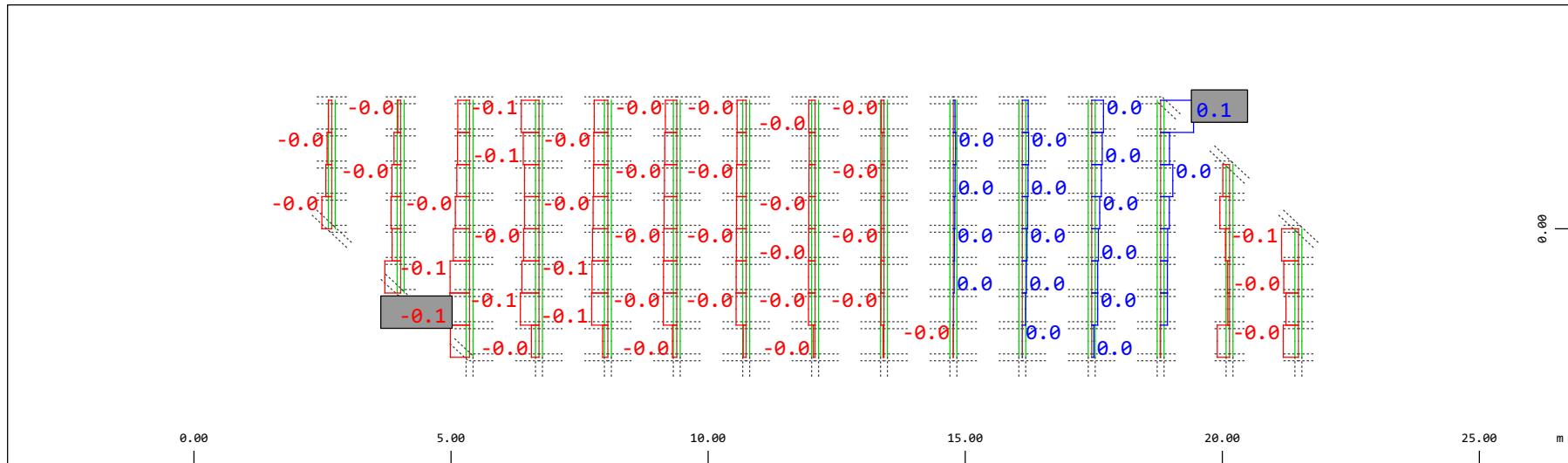
Y Sector of system Beam Elements Group 10 11
 X Beam Elements , Bending moment Mz, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 19.6 kNm (Min=-20.1) (Max=7.84) M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force N_x , Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 39.2 kN (Min=-14.1) (Max=21.7)

M 1 : 120

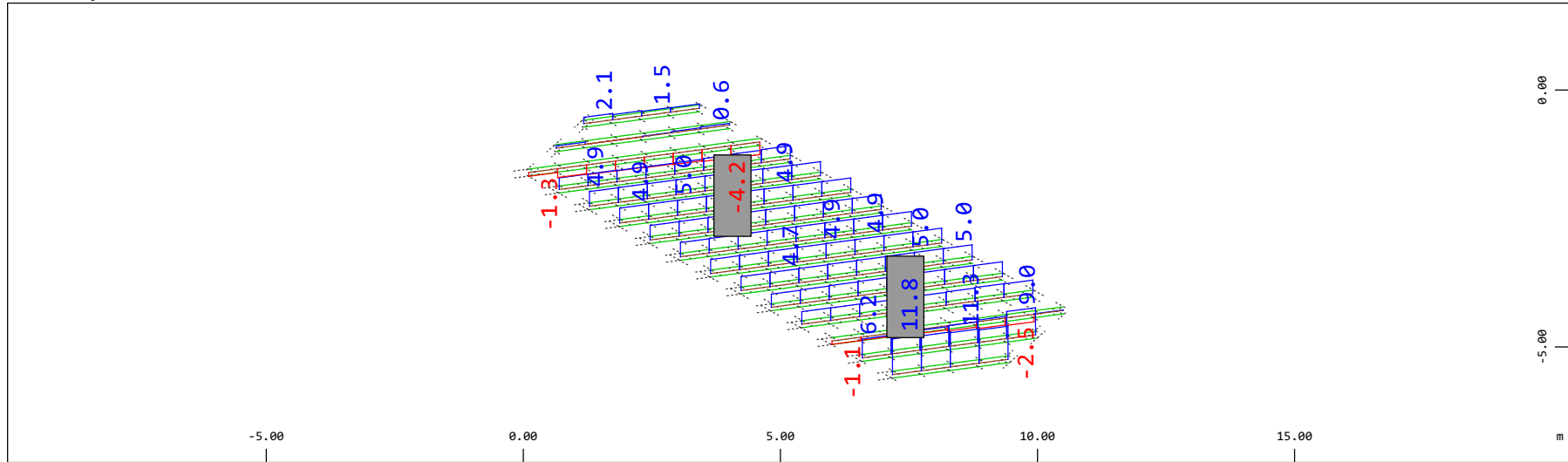


Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment M_t , Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 0.196 kNm (Min=-0.0624) (Max=0.105)

M 1 : 120

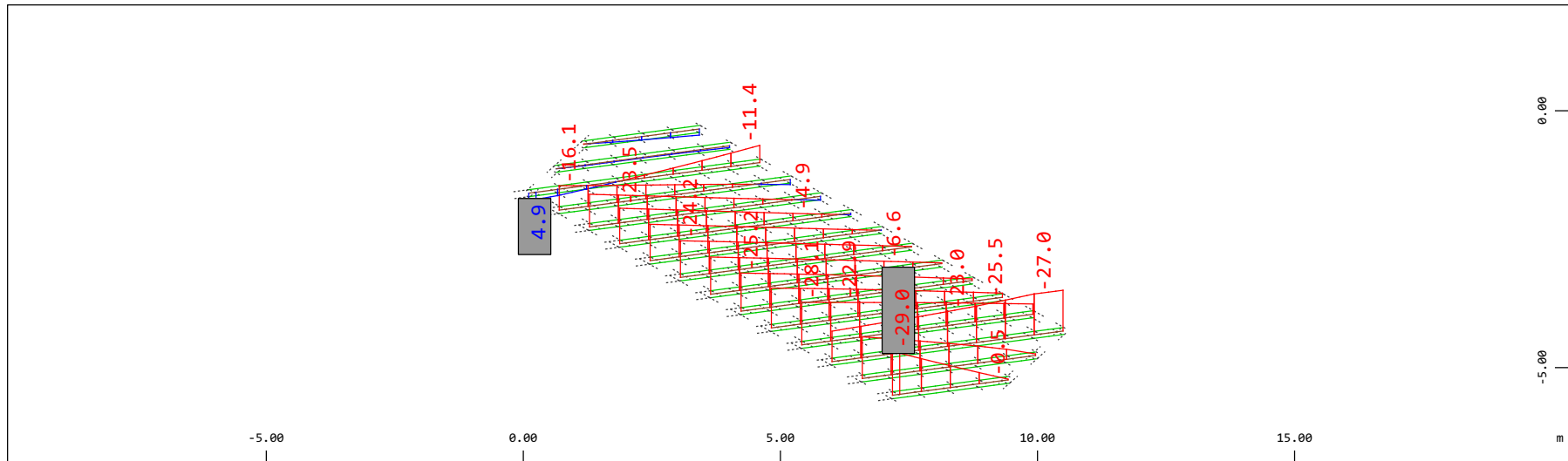
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 19.6 kN (Min=-4.17) (Max=11.8)

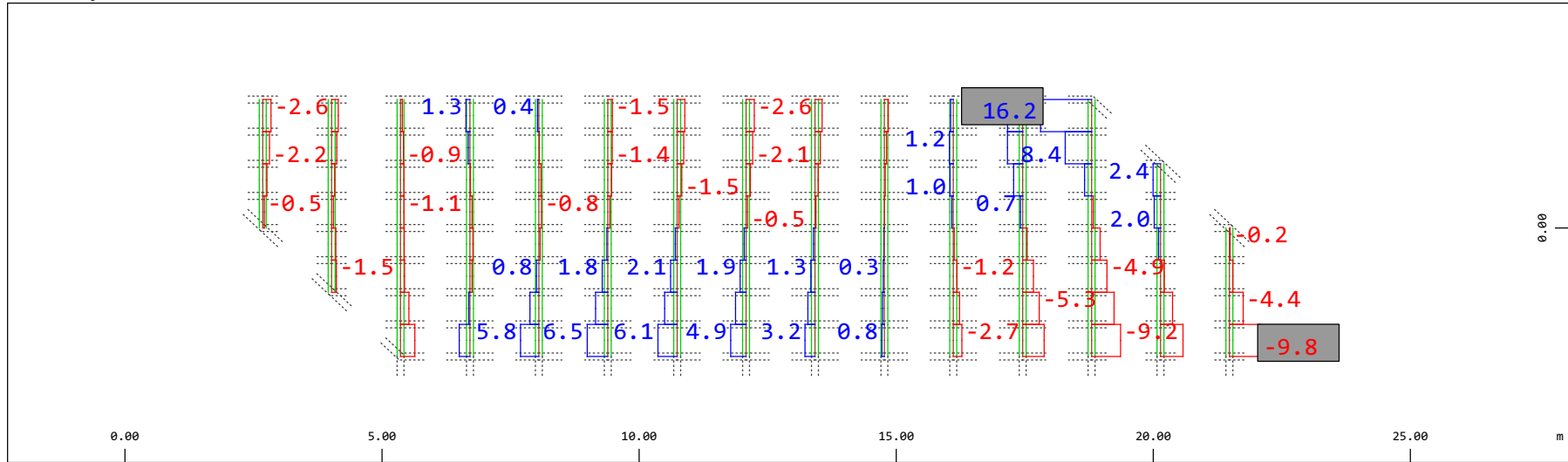
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 39.2 kNm (Min=-29.0) (Max=4.91)

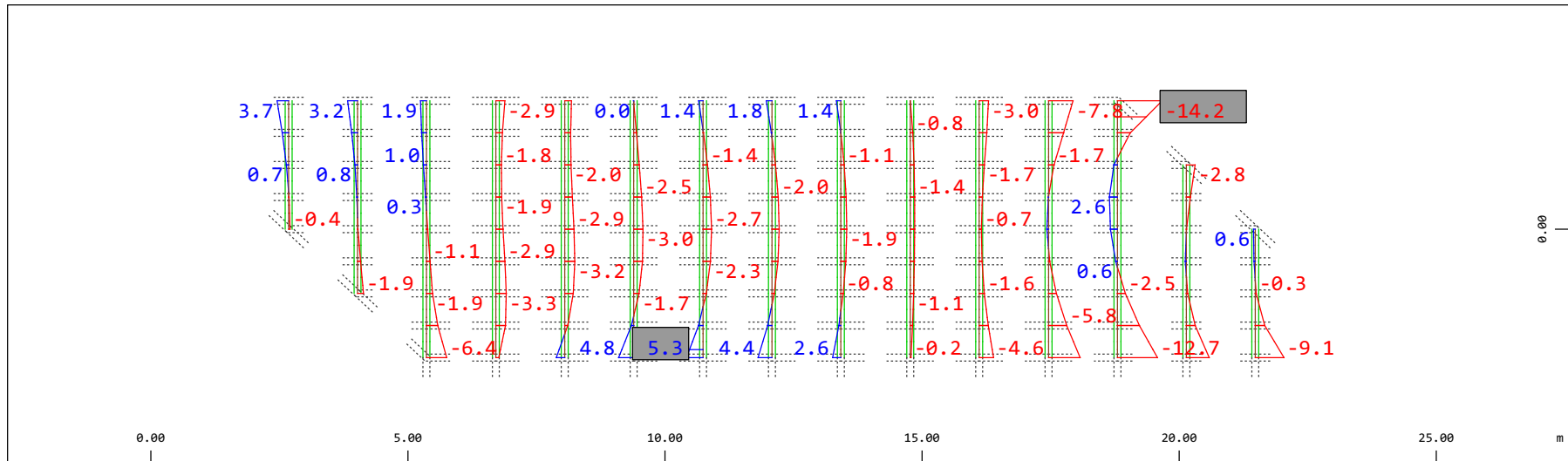
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementary loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 19.6 kN (Min=-9.78) (Max=16.2)

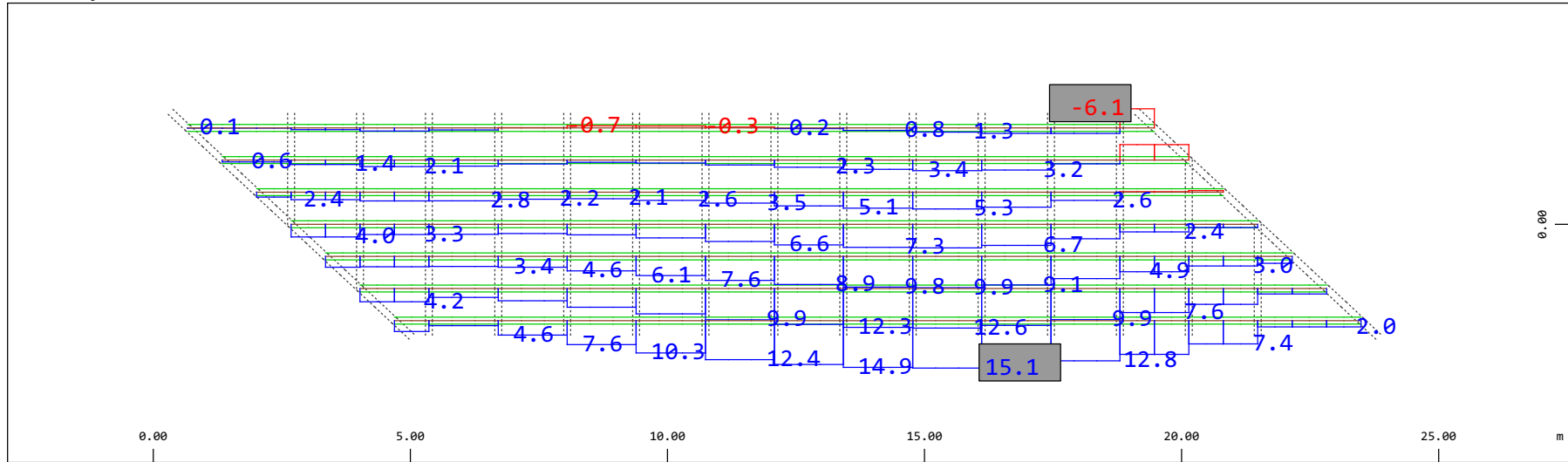
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 19.6 kNm (Min=-14.2) (Max=5.26)

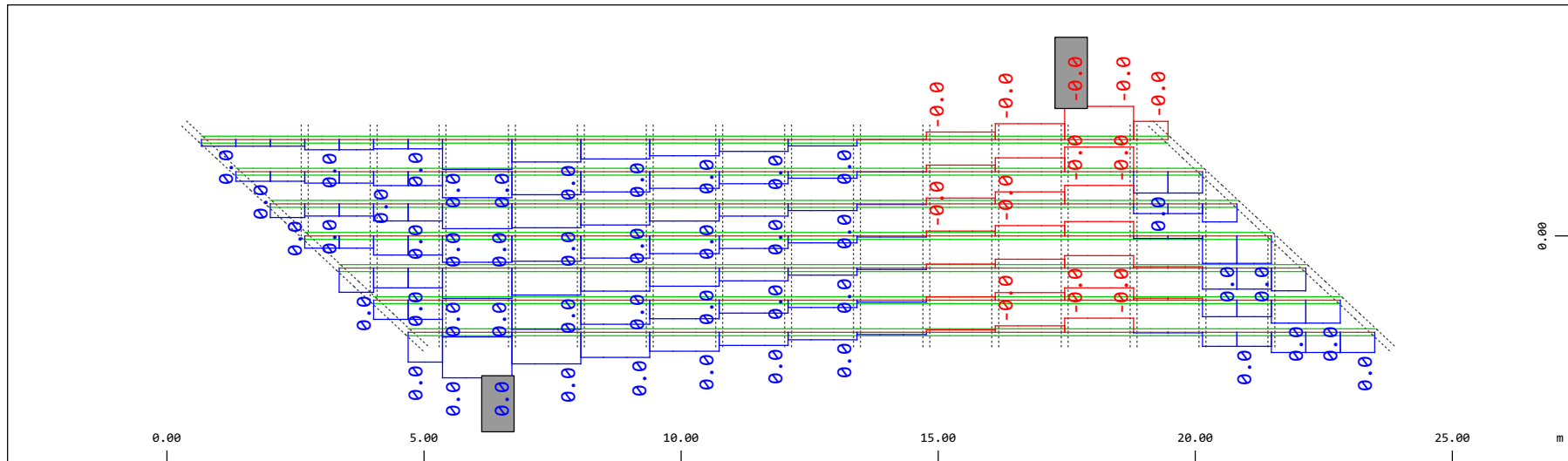
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force N_x , Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 19.6 kN (Min=-6.08) (Max=15.1)

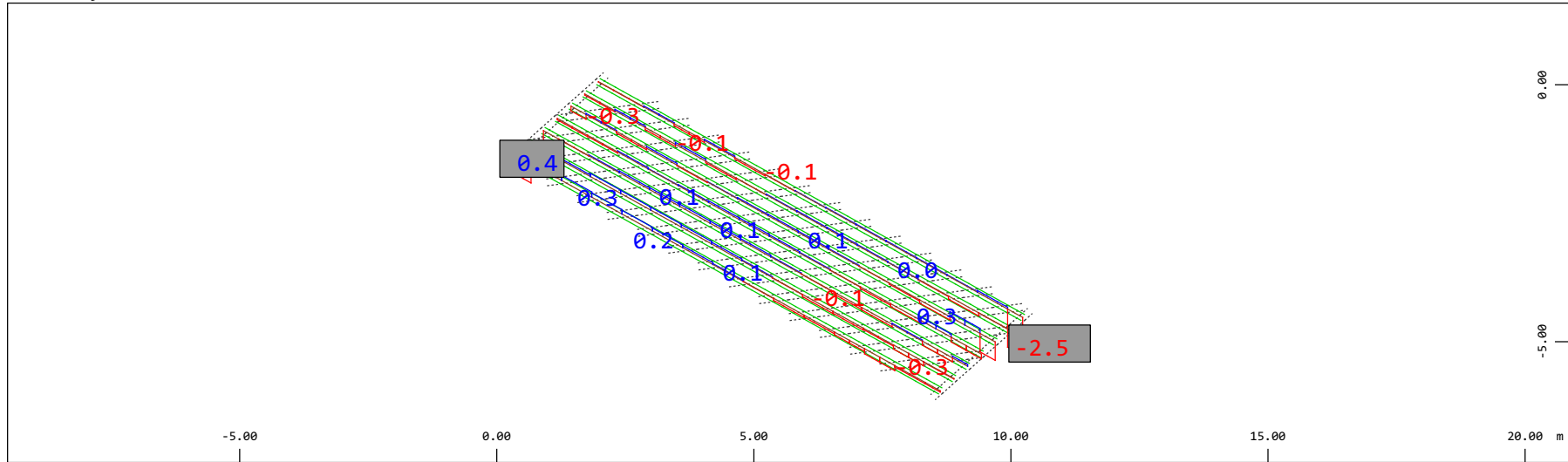
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment M_t , Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 0.0020 kNm (Min=-0.0011) (Max=0.0015)

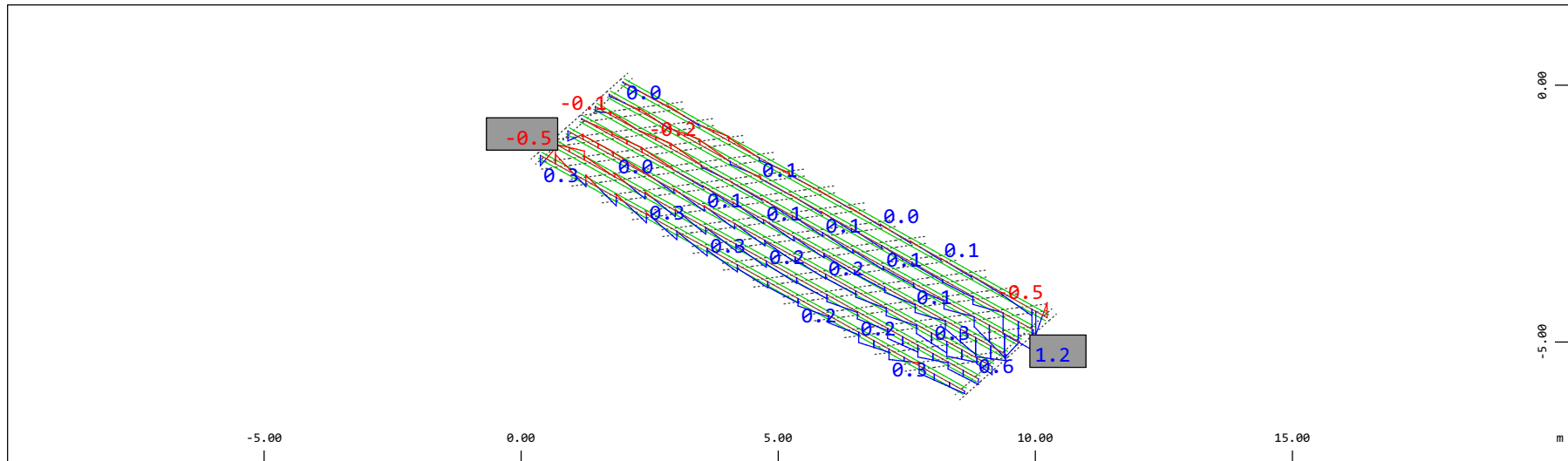
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 3.92 kN (Min=-2.52) (Max=0.371)

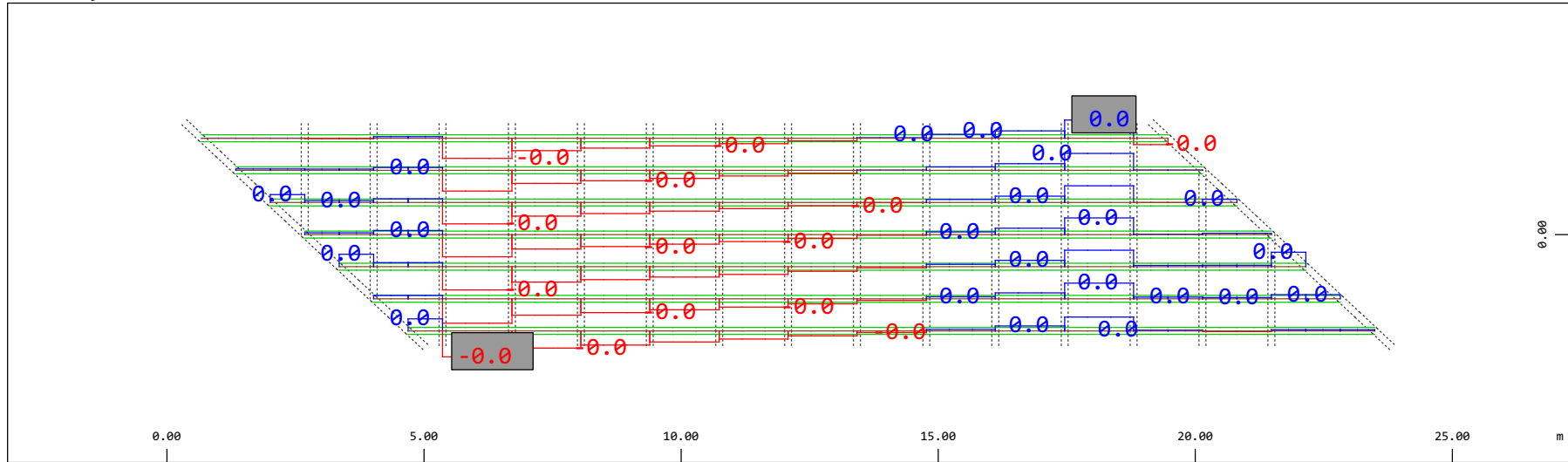
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 1.96 kNm
 (Min=-0.522) (Max=1.19)

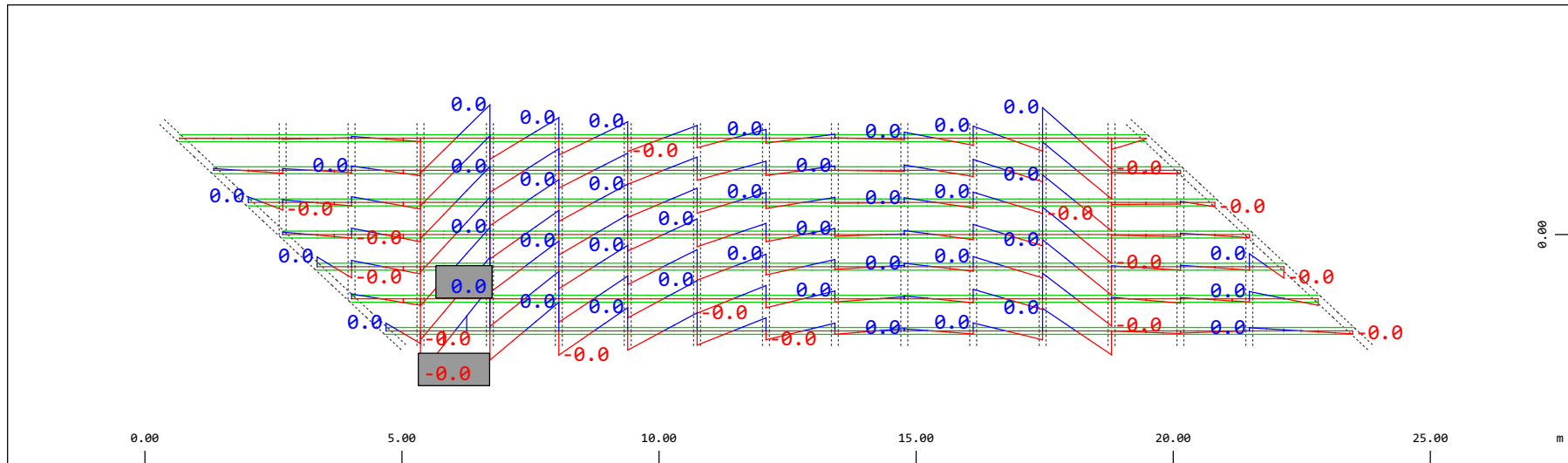
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 0.0098 kN (Min=-0.0041) (Max=0.0029)

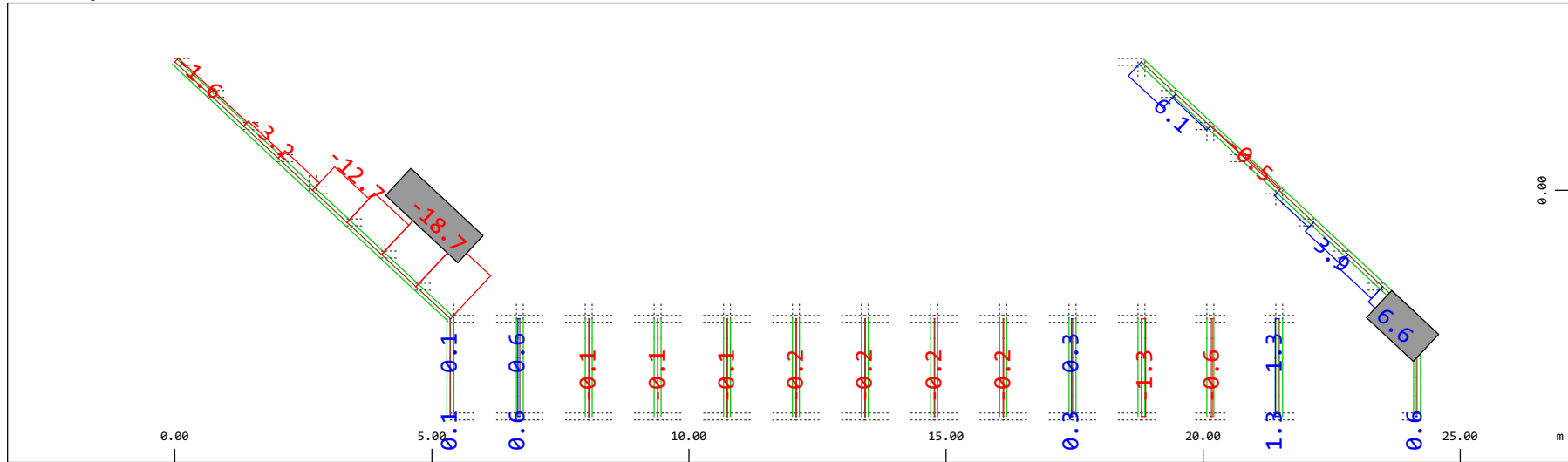
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 0.0039 kNm (Min=-0.0028) (Max=0.0028)

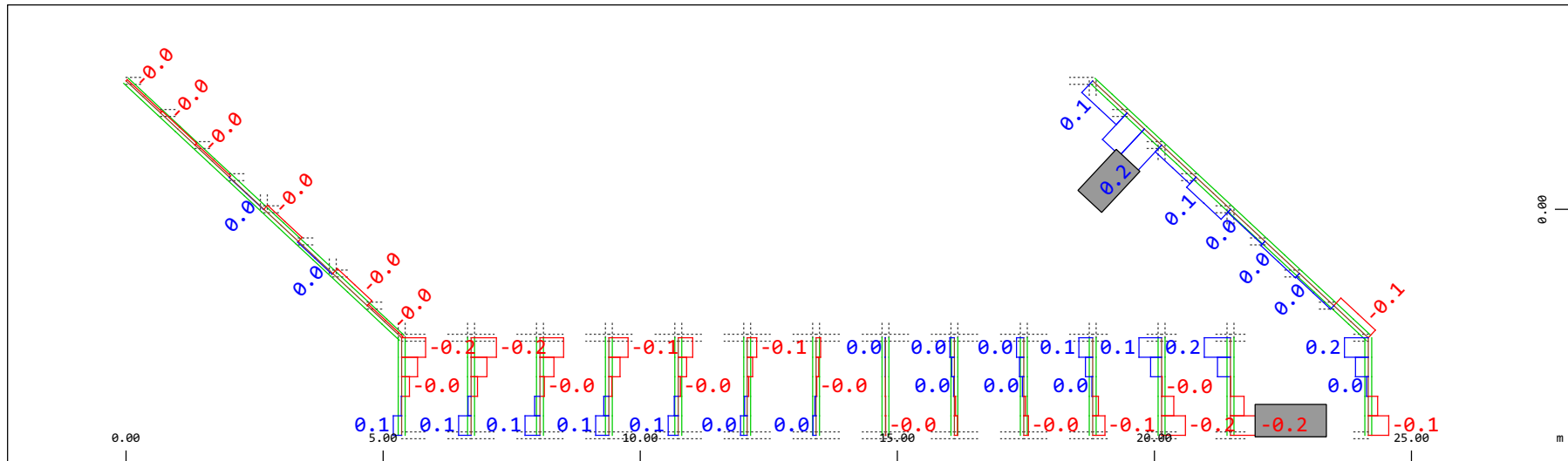
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 19.6 kN (Min=-18.7) (Max=6.62)

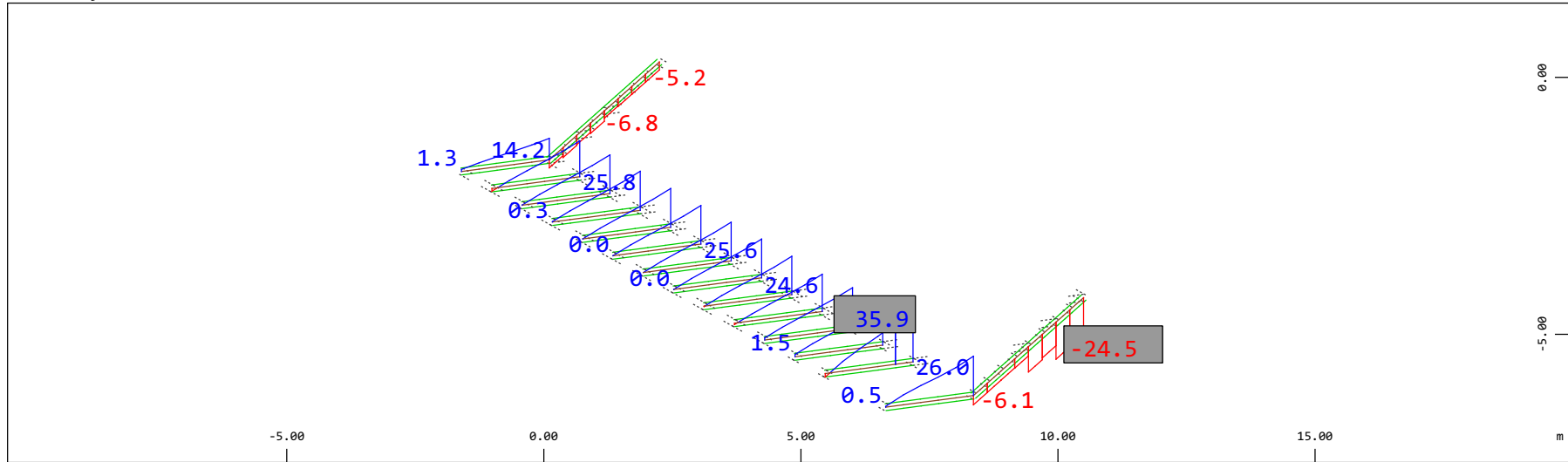
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 0.392 kNm (Min=-0.170) (Max=0.230)

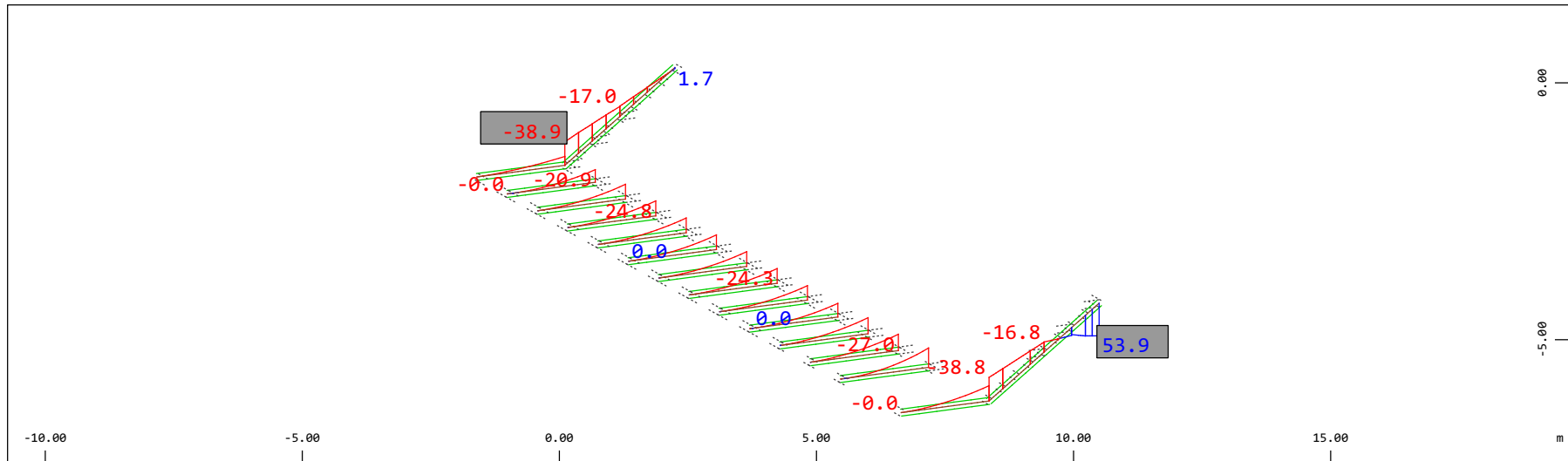
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 39.2 kN (Min=-24.5) (Max=35.9)

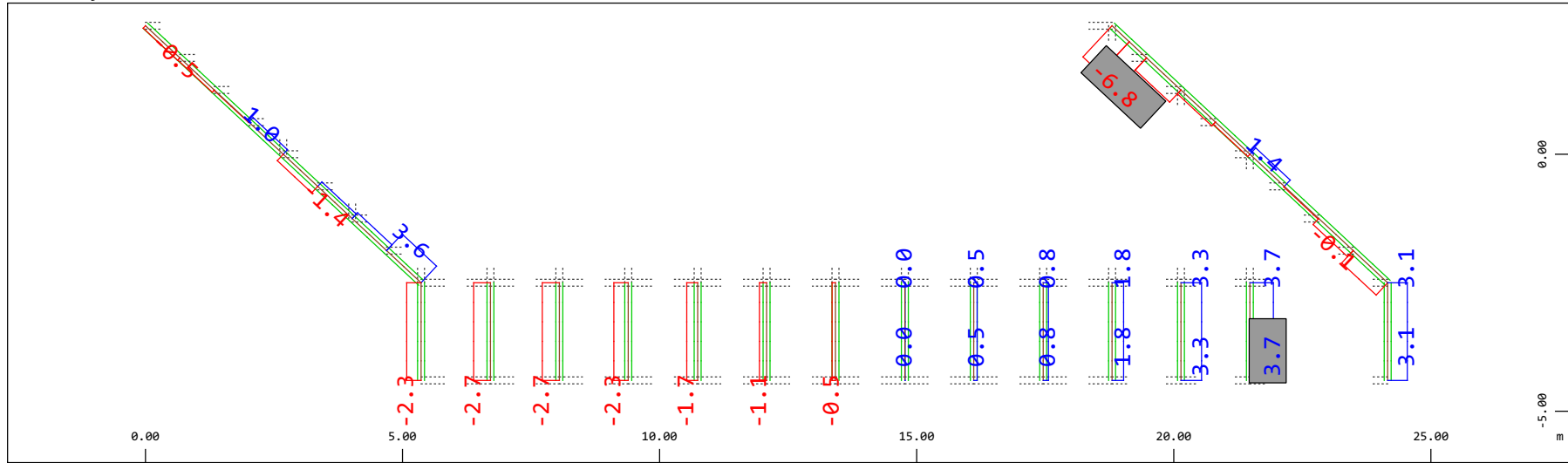
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 98.0 kNm (Min=-38.9) (Max=53.9)

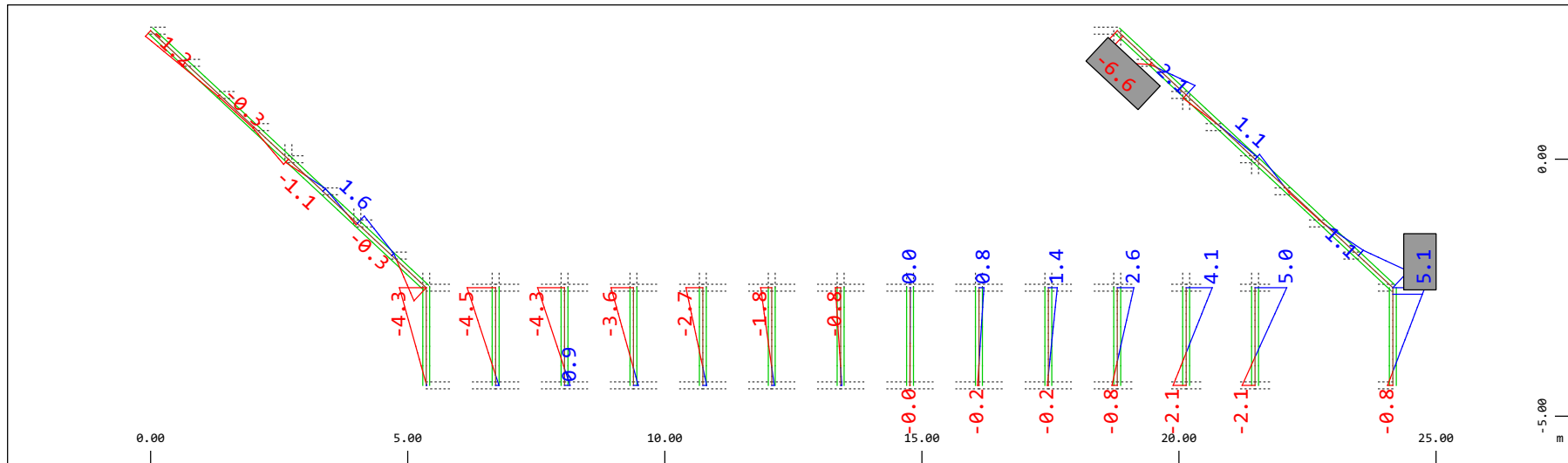
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 9.80 kN (Min=-6.78) (Max=3.73)

M 1 : 120

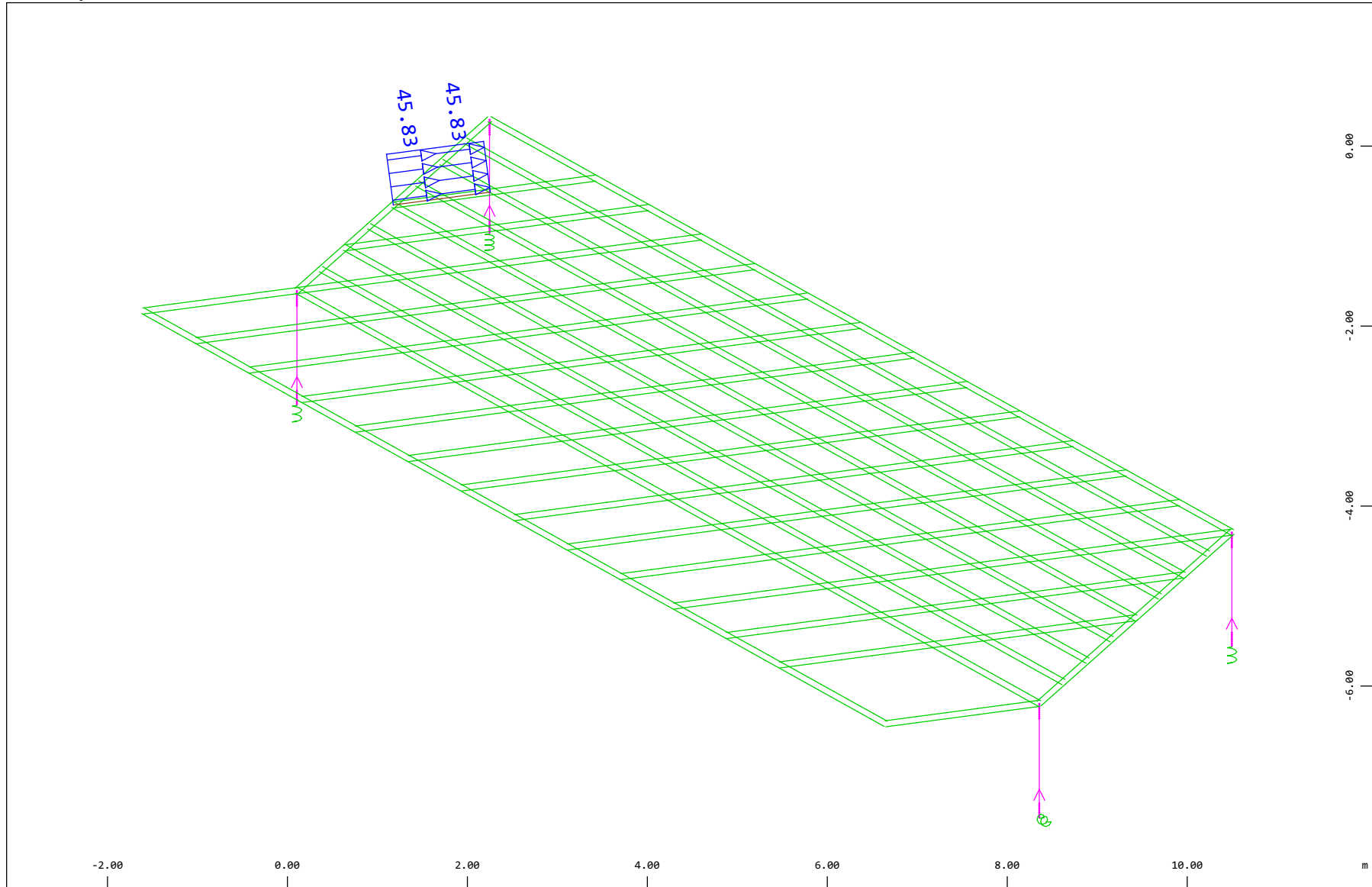


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 203 Qt: Marciapiedi , 1 cm 3D = 9.80 kNm (Min=-6.57) (Max=5.08)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

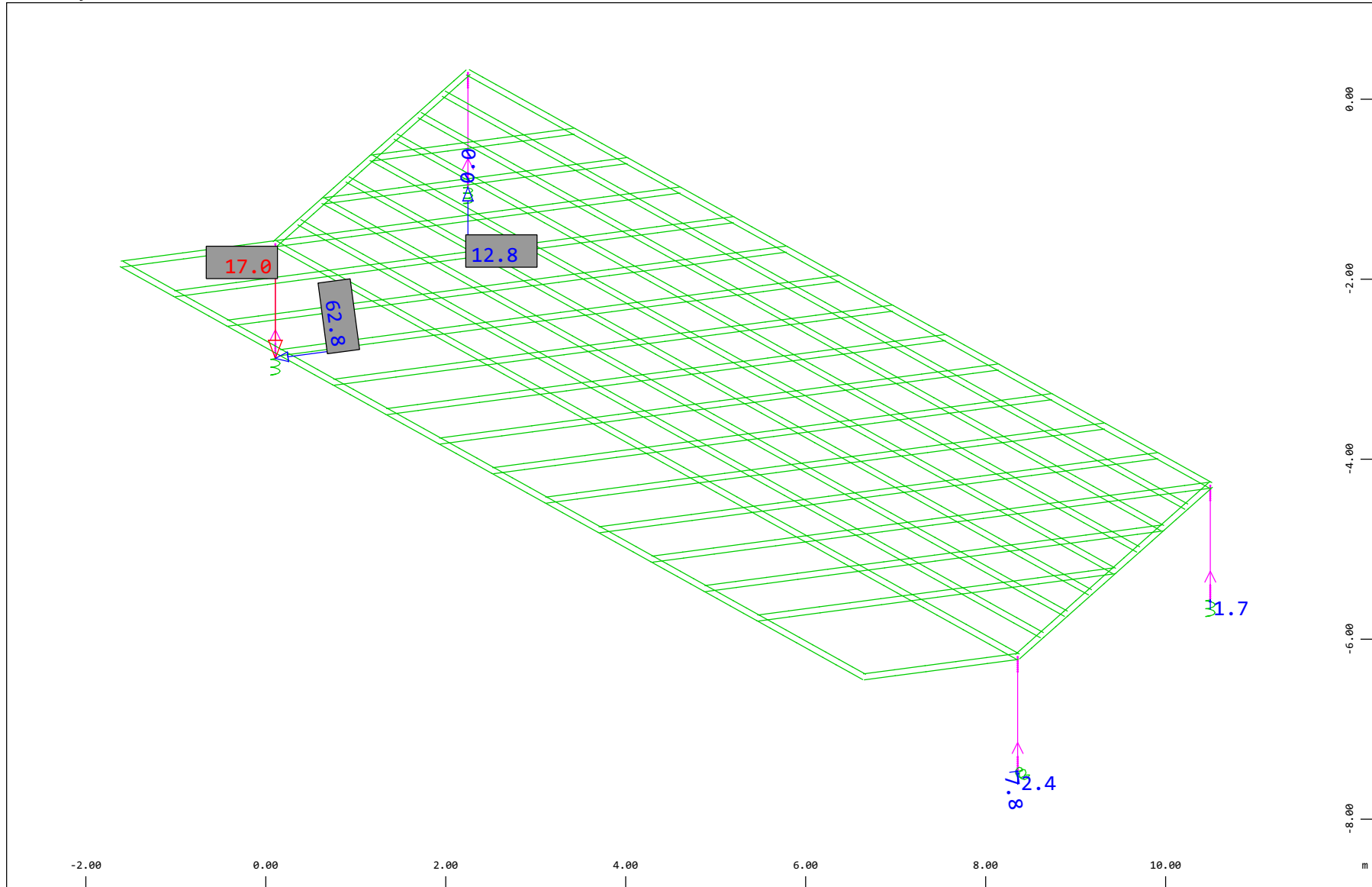
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=48.4 kN/m)
 (Max=45.8)



M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementary loads

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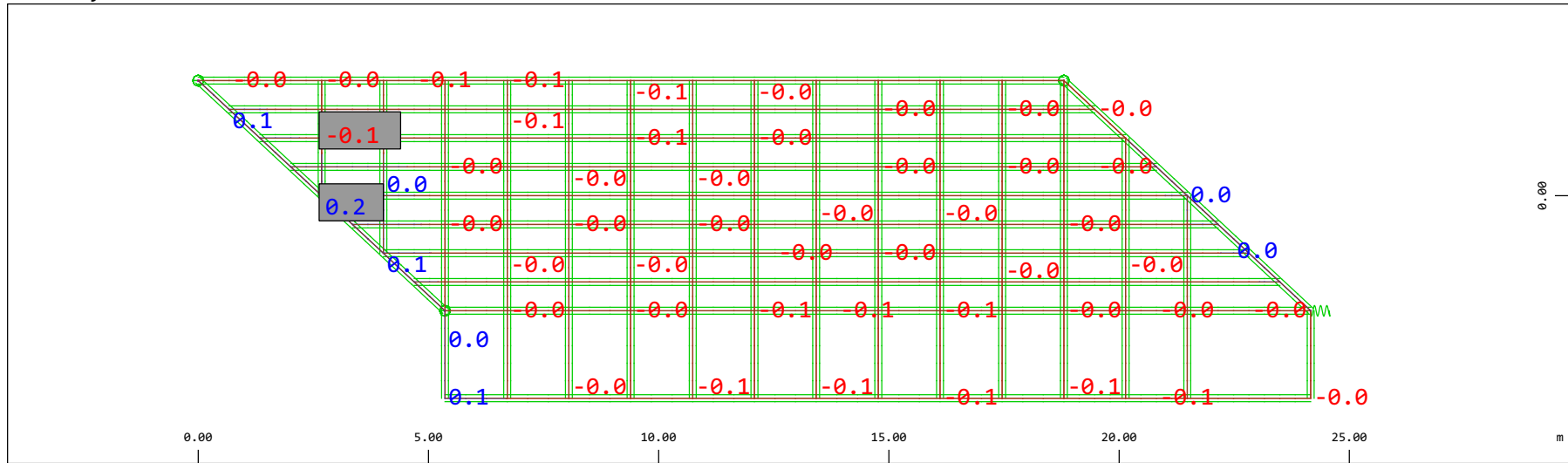
Z
 Y
 X

Sector of system Beam Elements, Spring Elements
 Nodes , Support force in global Z, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 9.69 kN
 0)

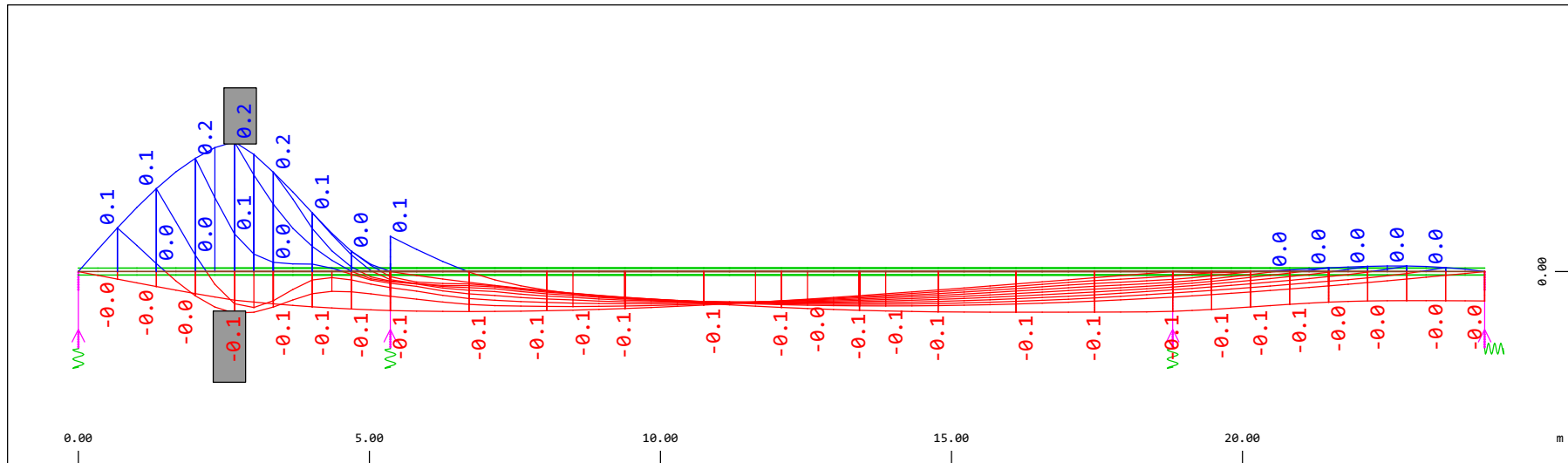
◁ (Min=-17.0) (Max=12.8) (total:

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

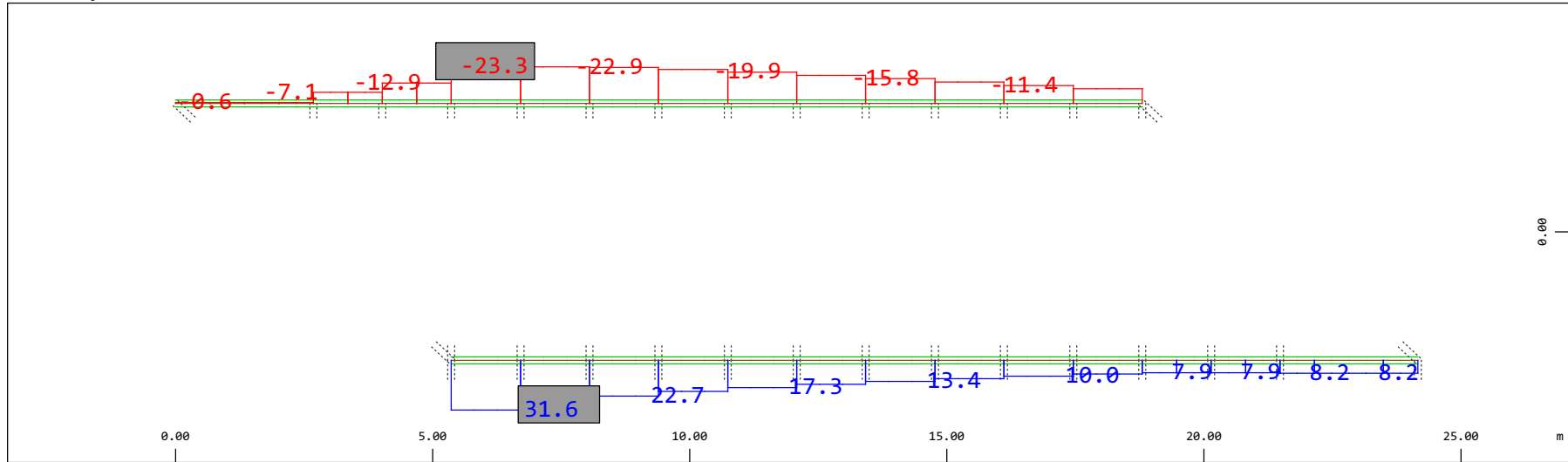


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along (Max=0.204) \odot , Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.0969 mm (Min=-0.0653) M 1 : 134



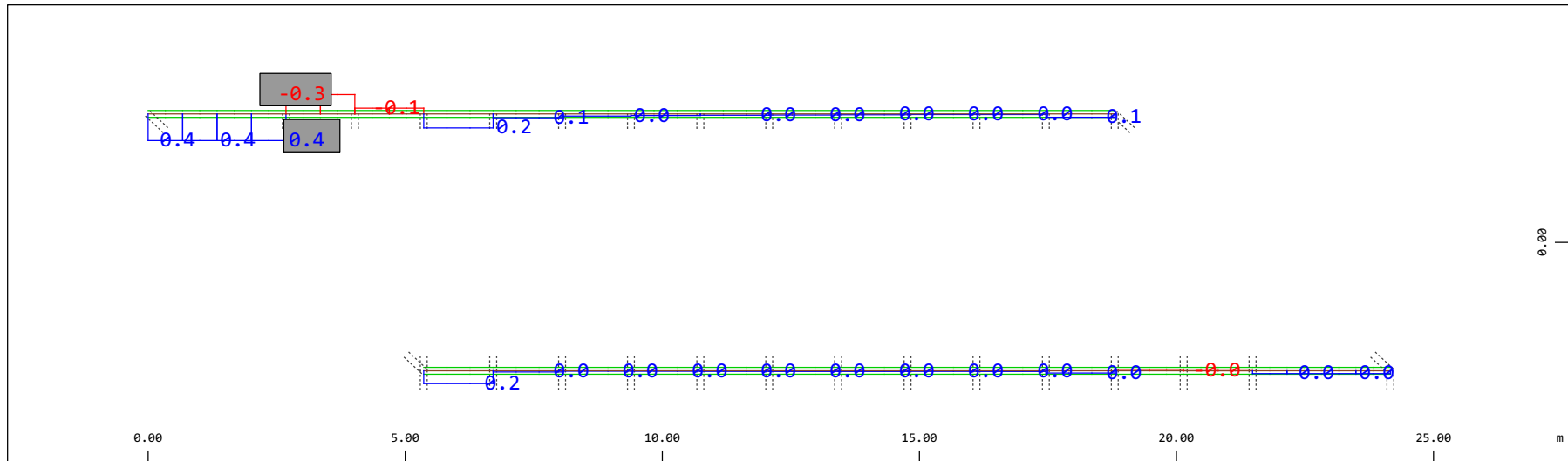
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along (Max=0.204) \updownarrow , Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.0969 mm (Min=-0.0653) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 39.2 kN (Min=-23.3) (Max=31.6)

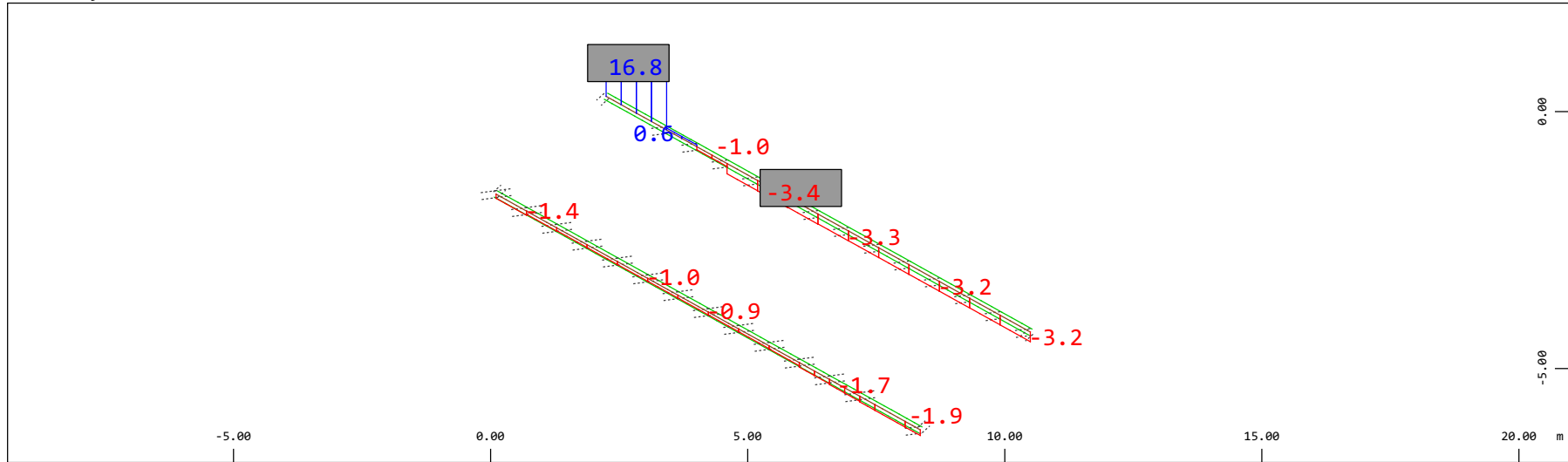
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.980 kNm (Min=-0.309) (Max=0.424)

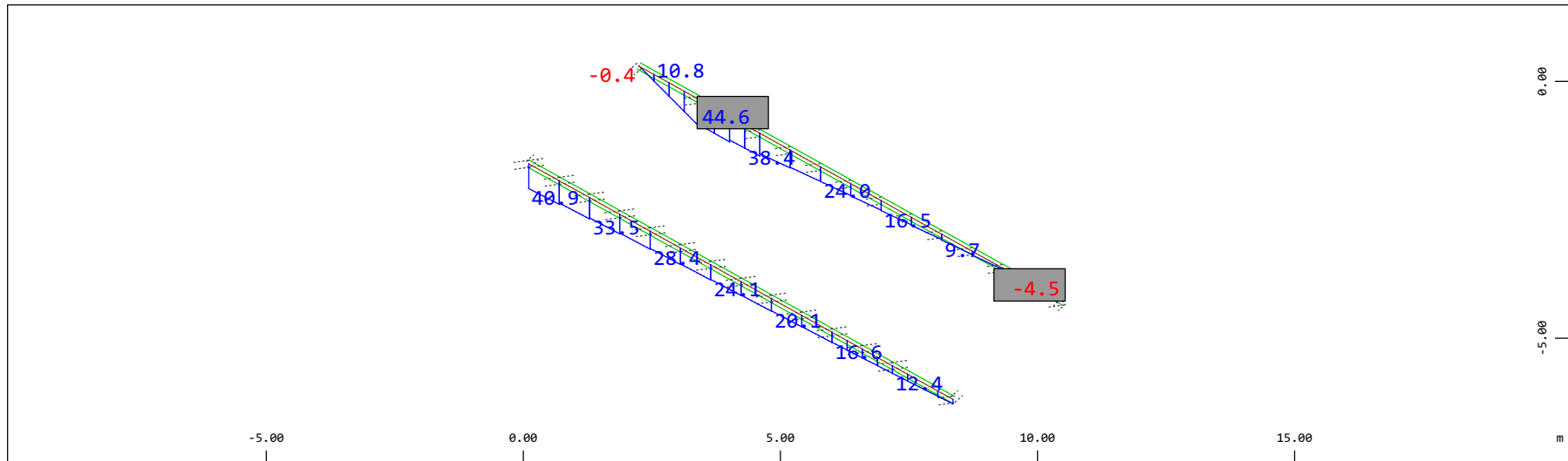
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-3.44) (Max=16.8)

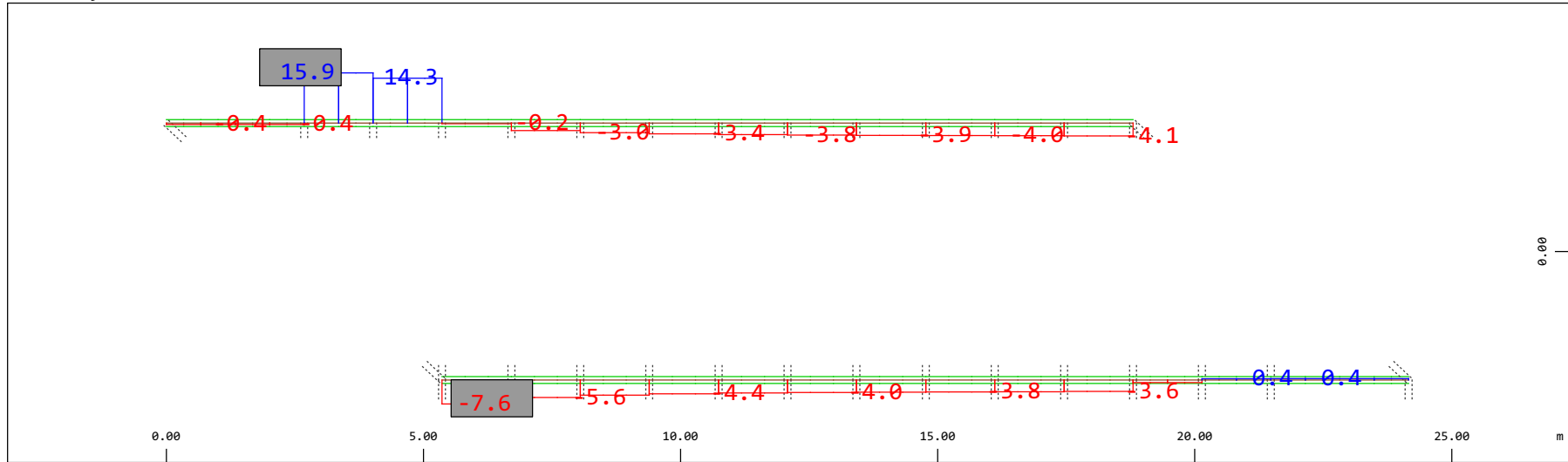
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 98.0 kNm (Min=-4.47) (Max=44.6)

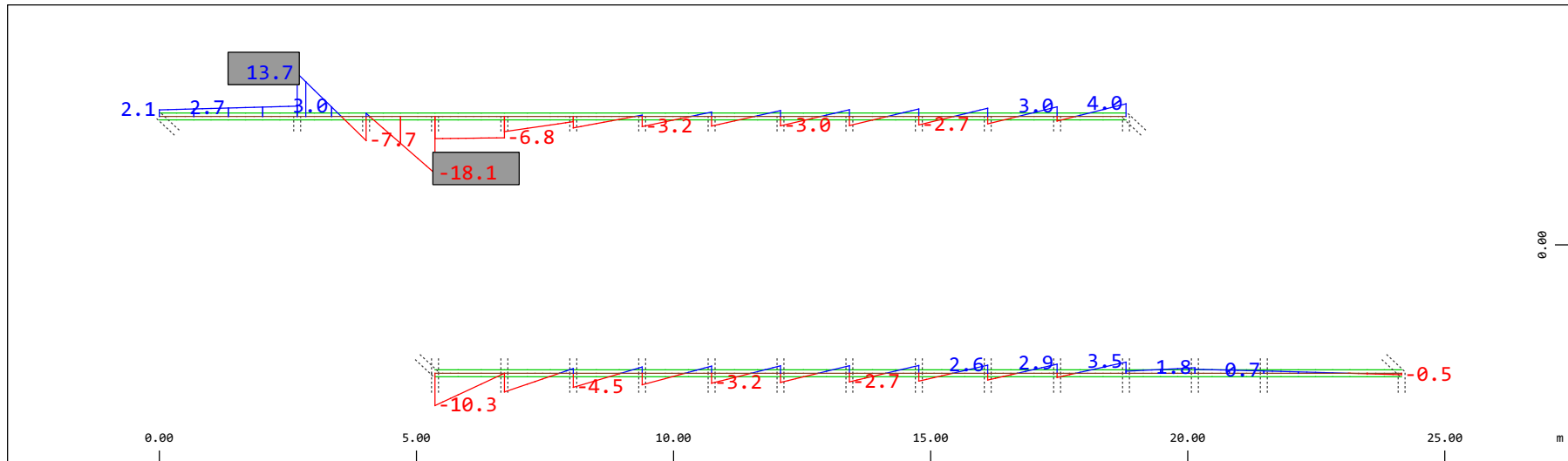
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Shear force Vy, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-7.62) (Max=15.9)

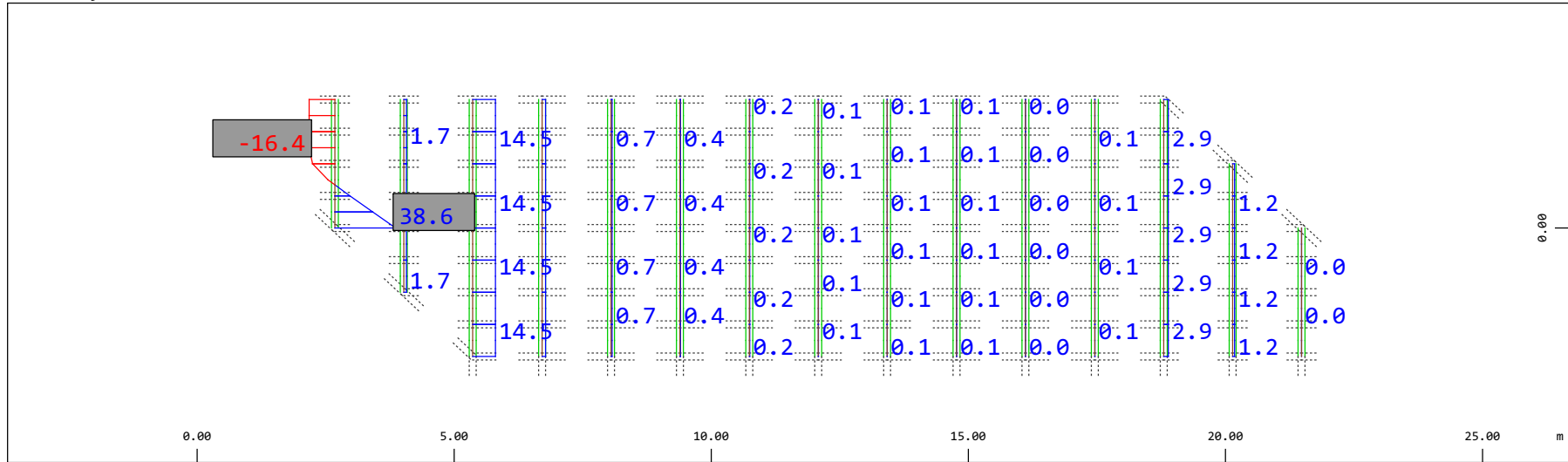
M 1 : 120



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Bending moment Mz, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 19.6 kNm (Min=-18.1) (Max=13.7)

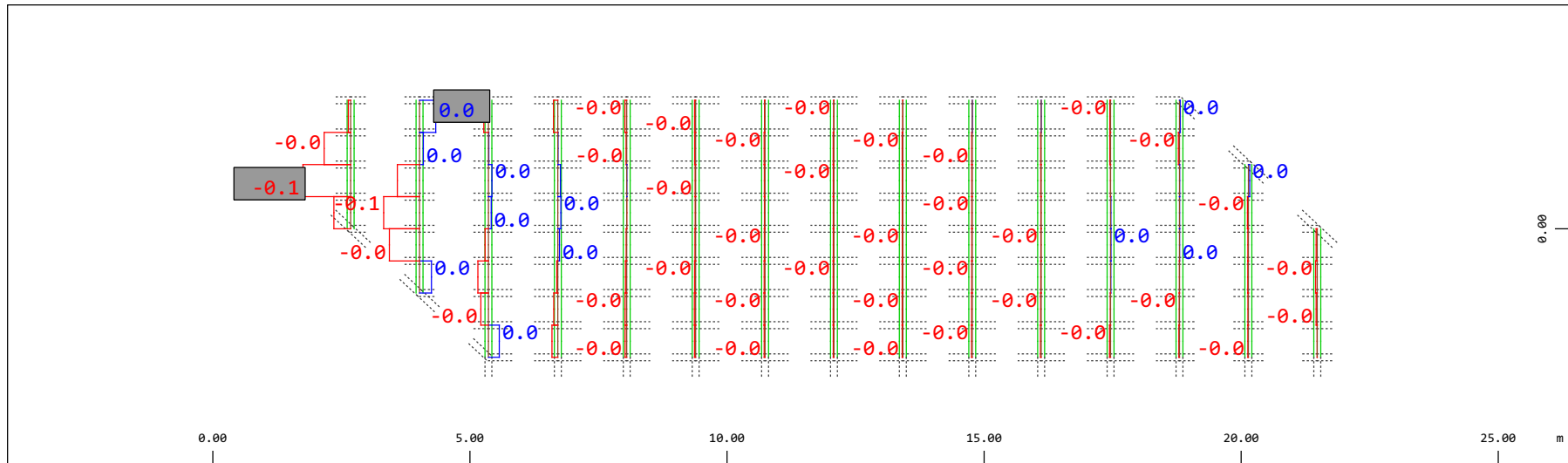
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force Nx, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 39.2 kN (Min=-16.4) (Max=38.6)

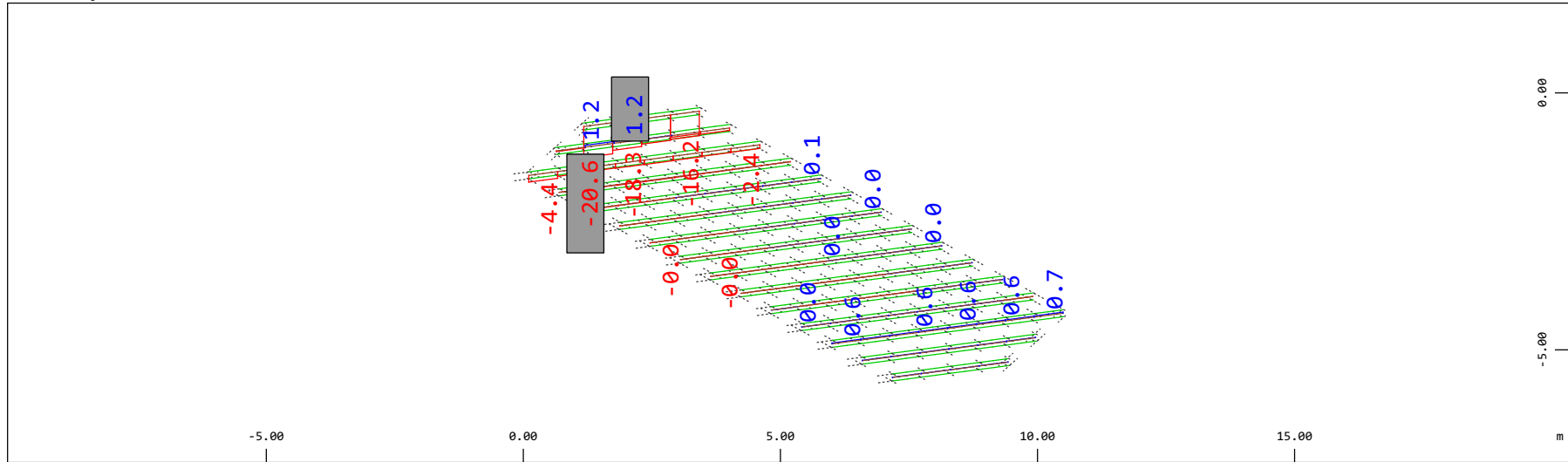
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment Mt, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.0980 kNm (Min=-0.0757) (Max=0.0258)

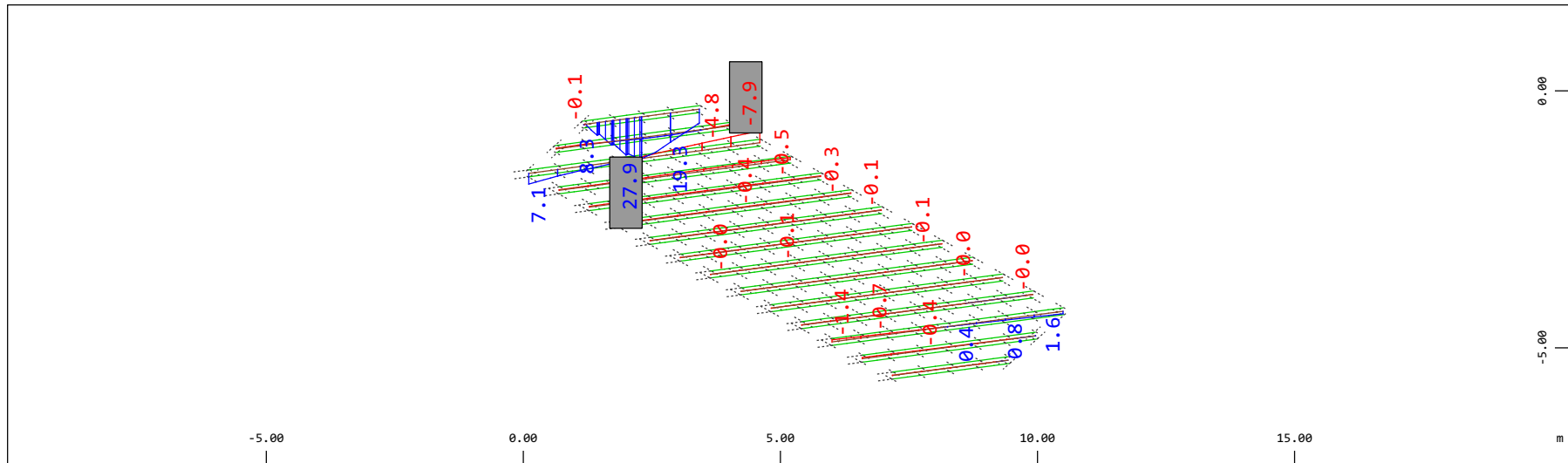
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 39.2 kN (Min=-20.6) (Max=1.17)

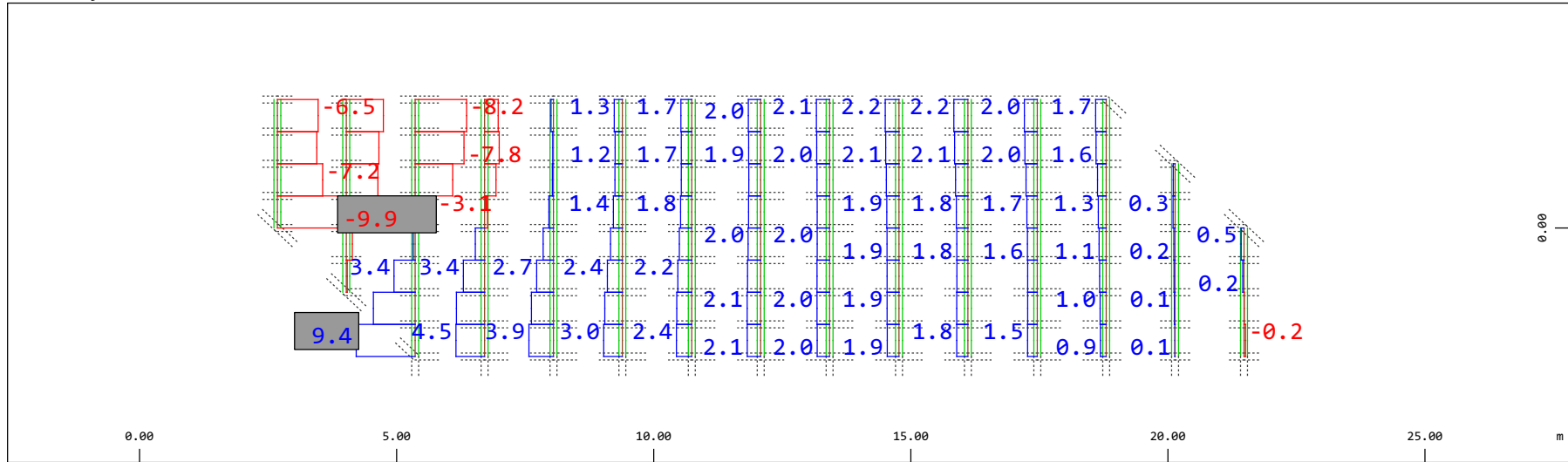
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 39.2 kNm (Min=-7.88) (Max=27.9)

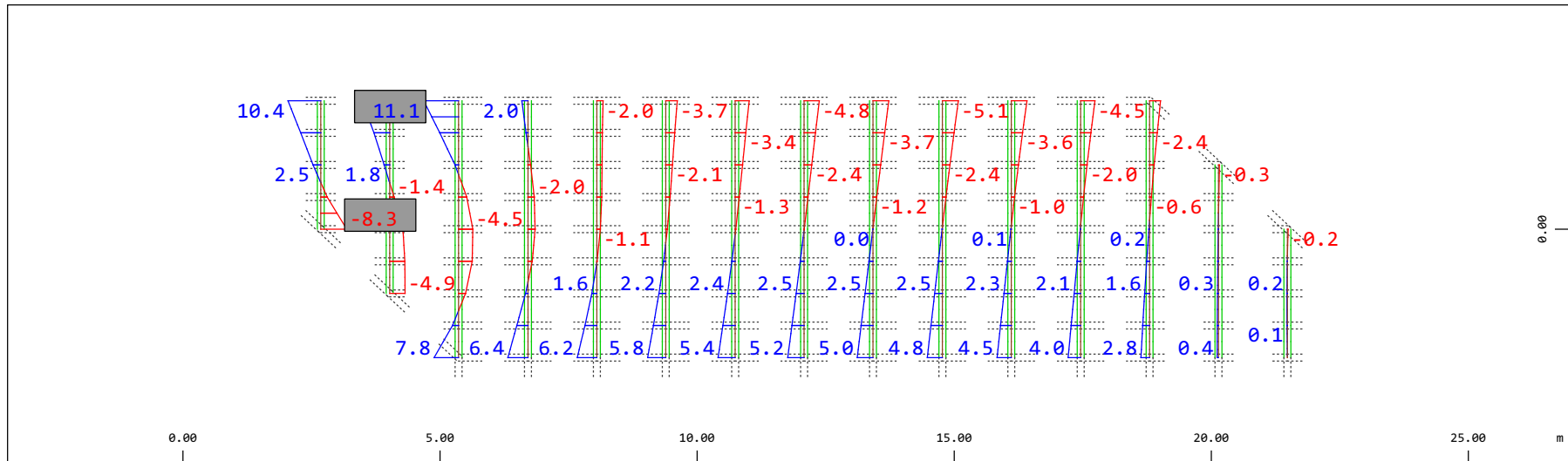
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 9.80 kN (Min=-9.96) (Max=9.36)

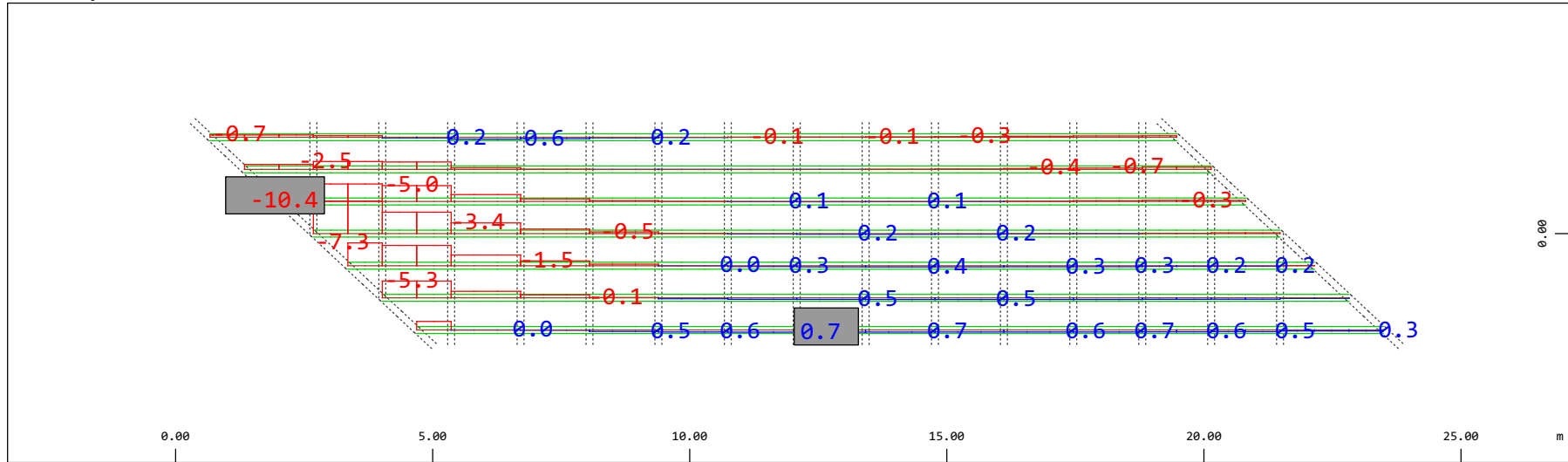
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 19.6 kNm (Min=-8.26) (Max=11.1)

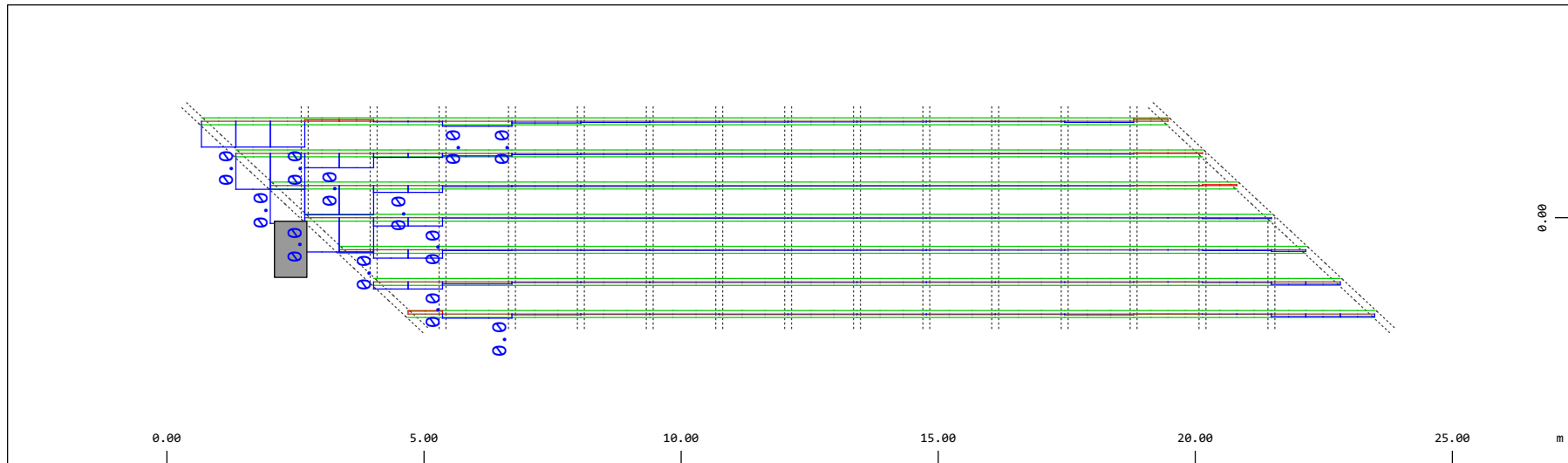
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force N_x , Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-10.4) (Max=0.697)

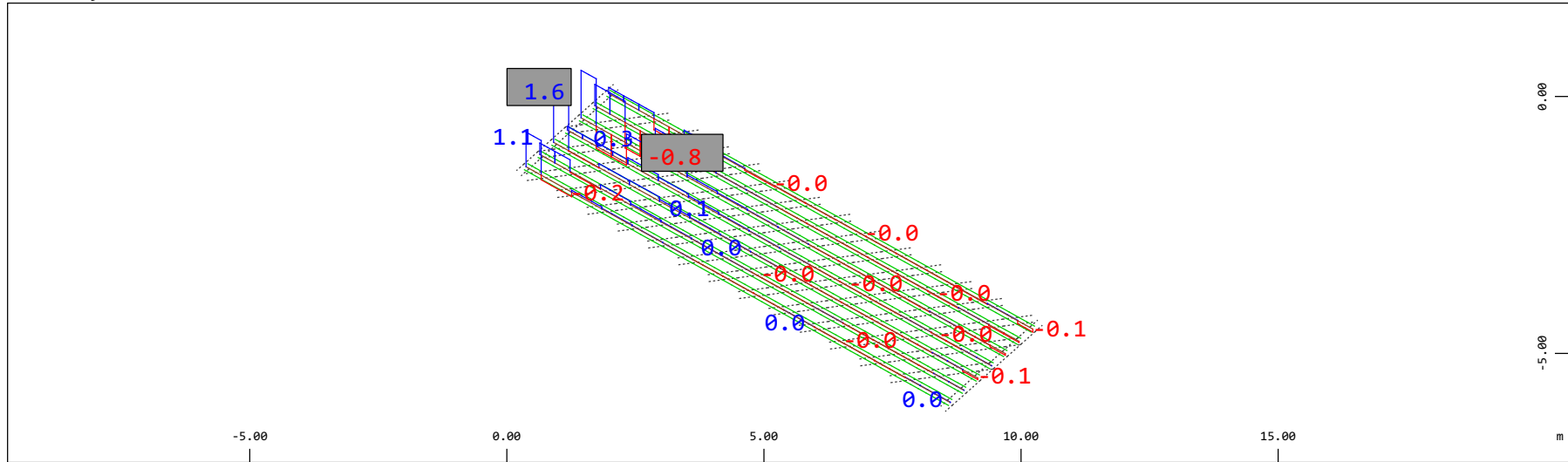
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment M_t , Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.0020 kNm (Min=-9.3201e-05) (Max=0.0012)

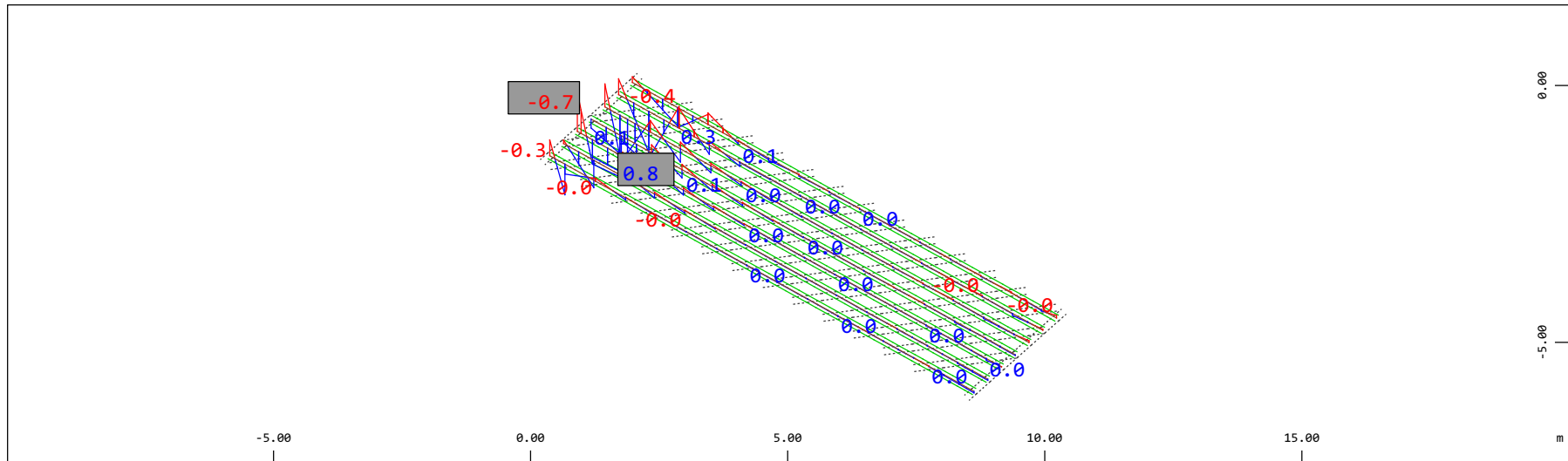
M 1 : 120

Definition of Axis
Results elementay loads



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Shear force Vz, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 1.96 kN (Min=-0.843) (Max=1.58)

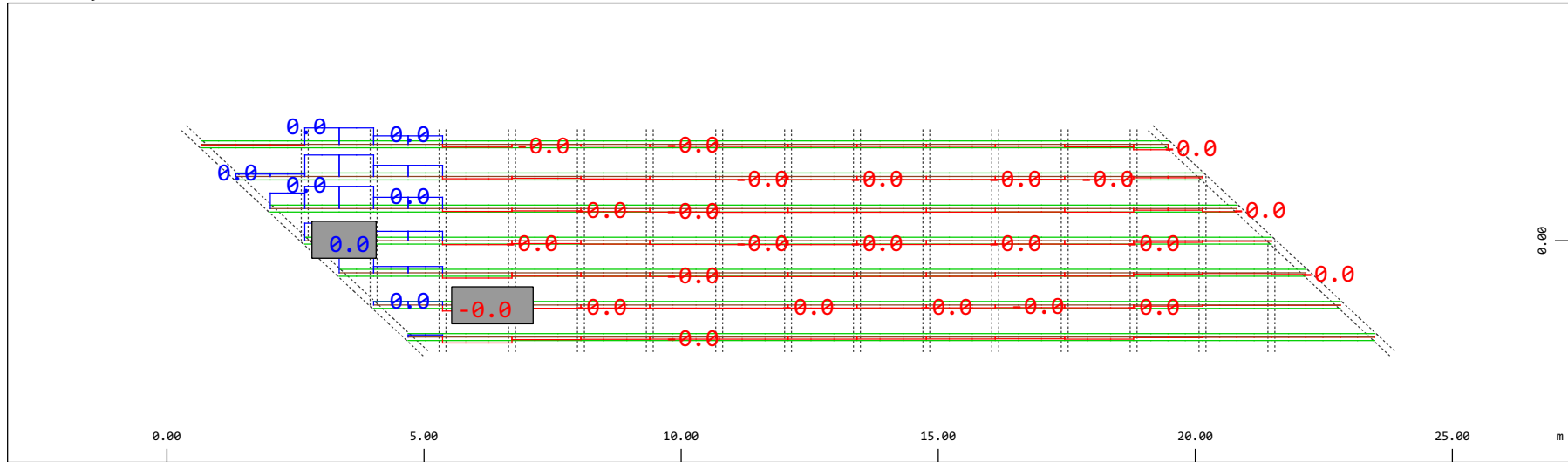
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.980
kNm (Min=-0.651) (Max=0.799)

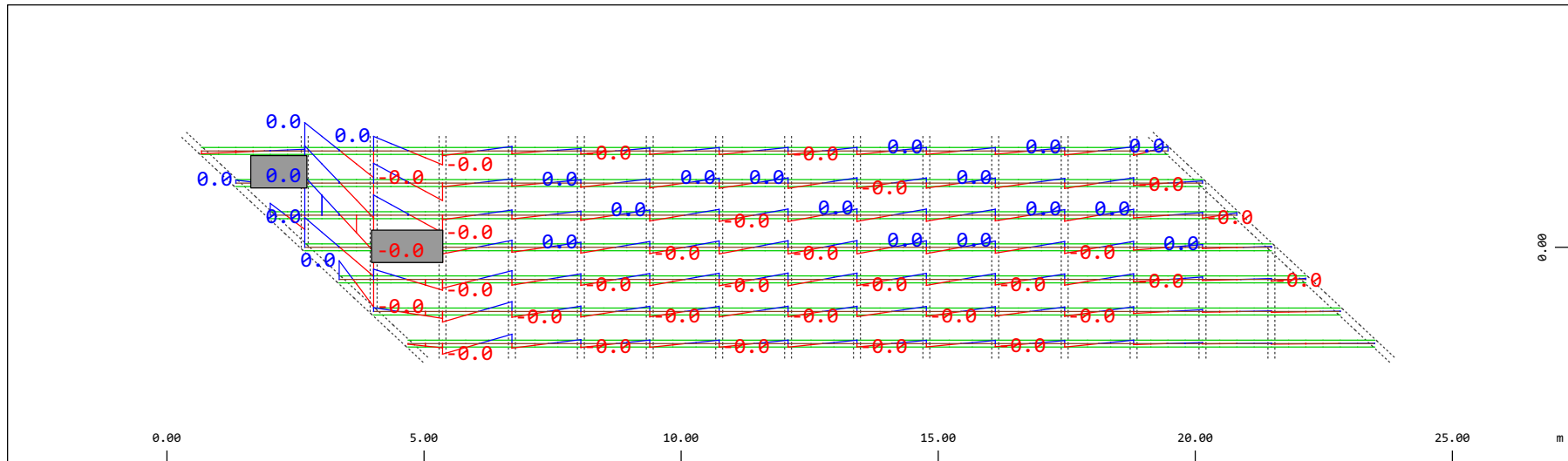
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.0098 kN (Min=-9.5579e-04) (Max=0.0044)

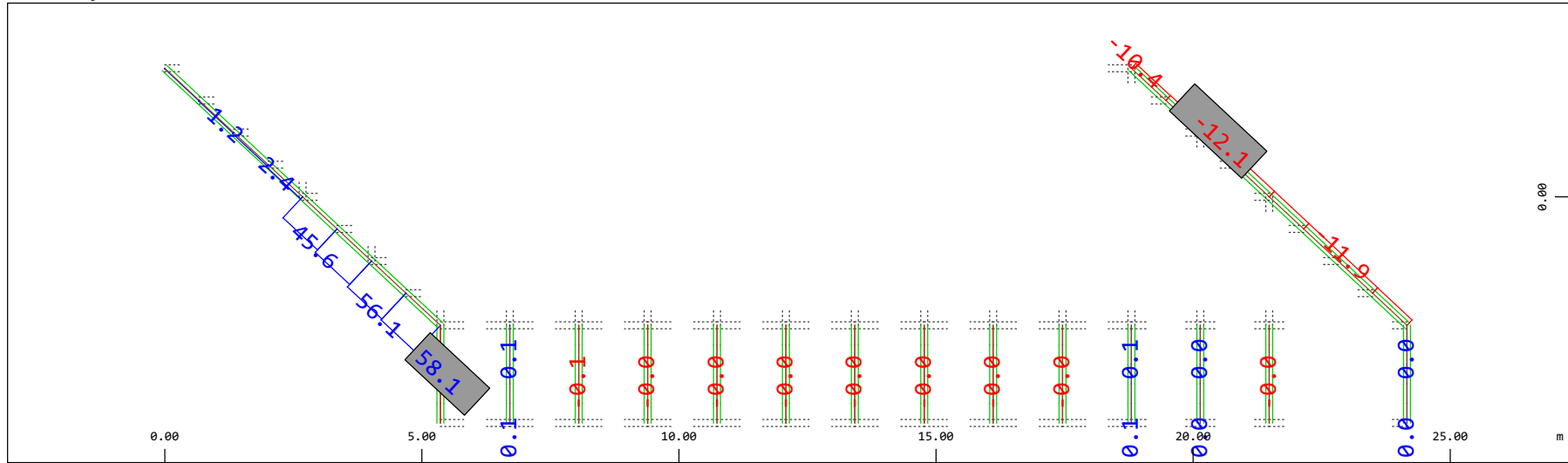
M 1 : 120



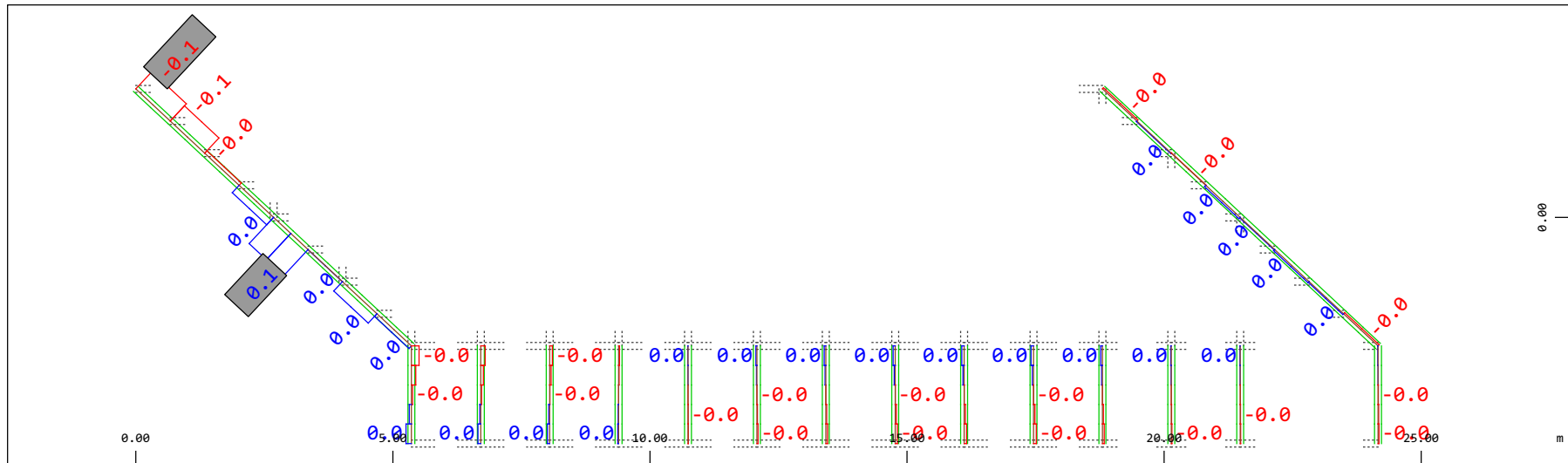
Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.0039 kNm (Min=-0.0023) (Max=0.0024)

M 1 : 120

Definition of Axis
 Results elementay loads

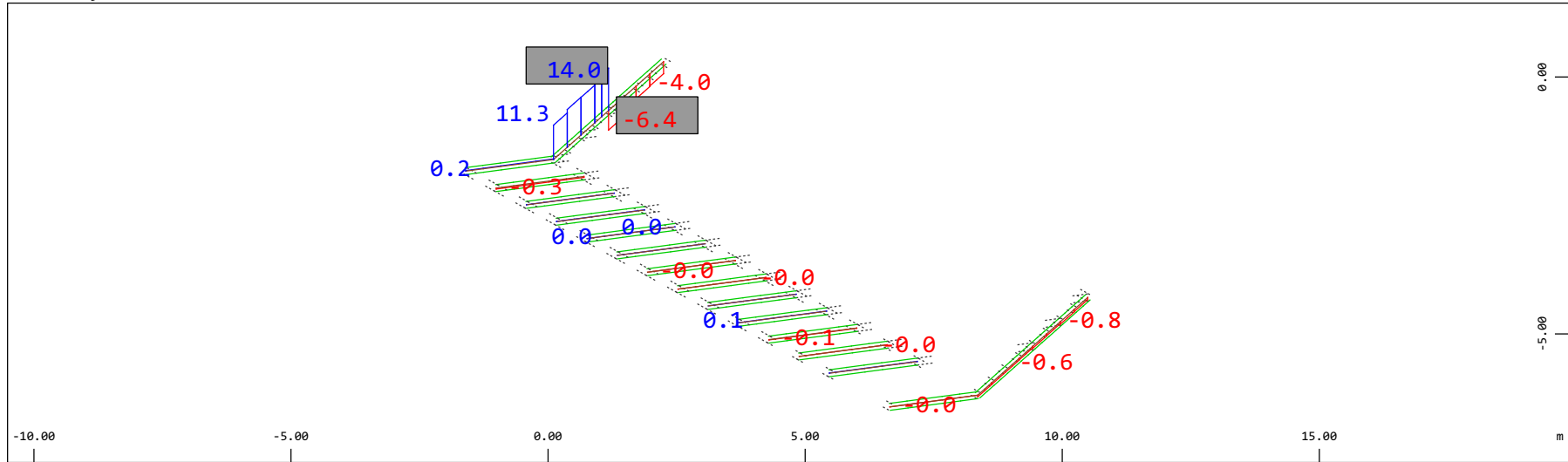


Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 98.0 kN (Min=-12.1) (Max=58.1)



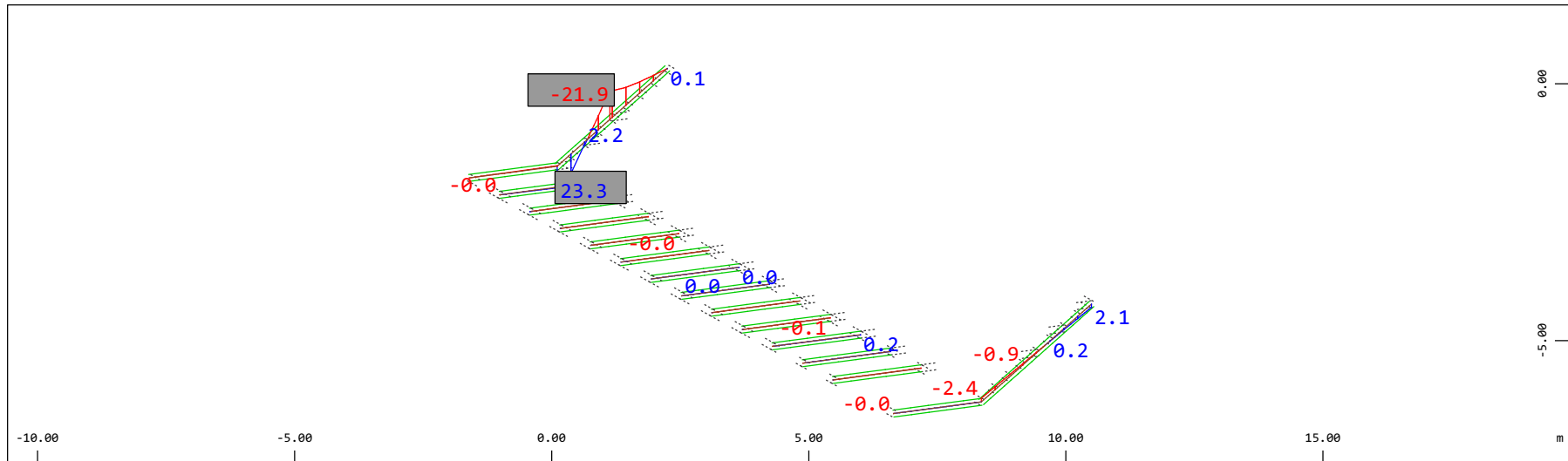
Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 0.196 kNm (Min=-0.0751) (Max=0.114)

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-6.44) (Max=14.0)

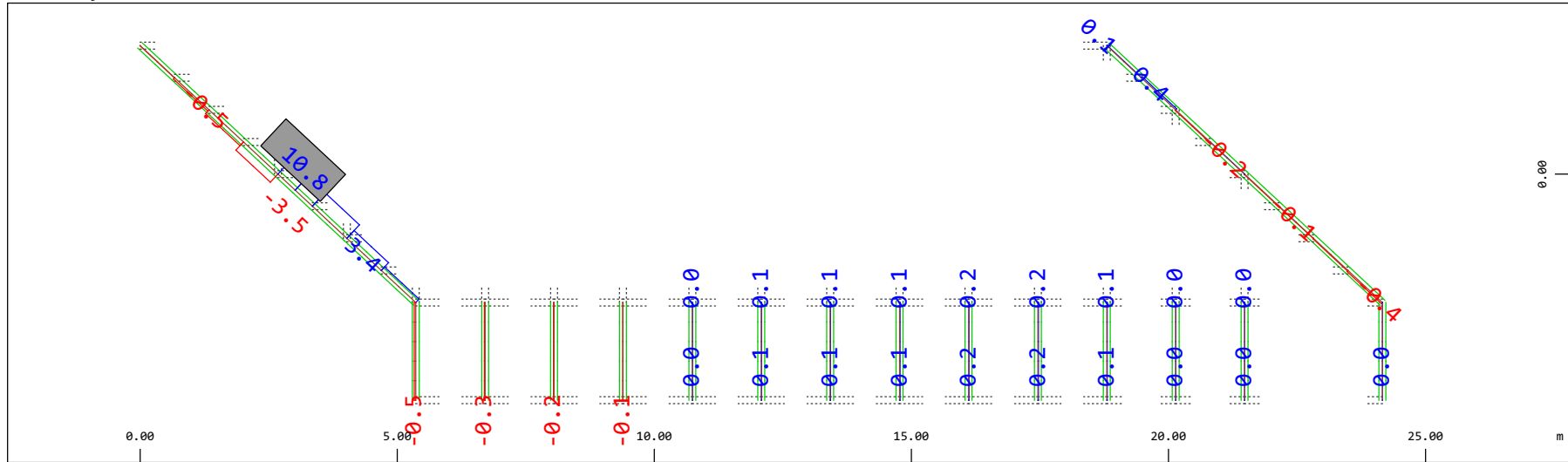
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 39.2 kNm (Min=-21.9) (Max=23.3)

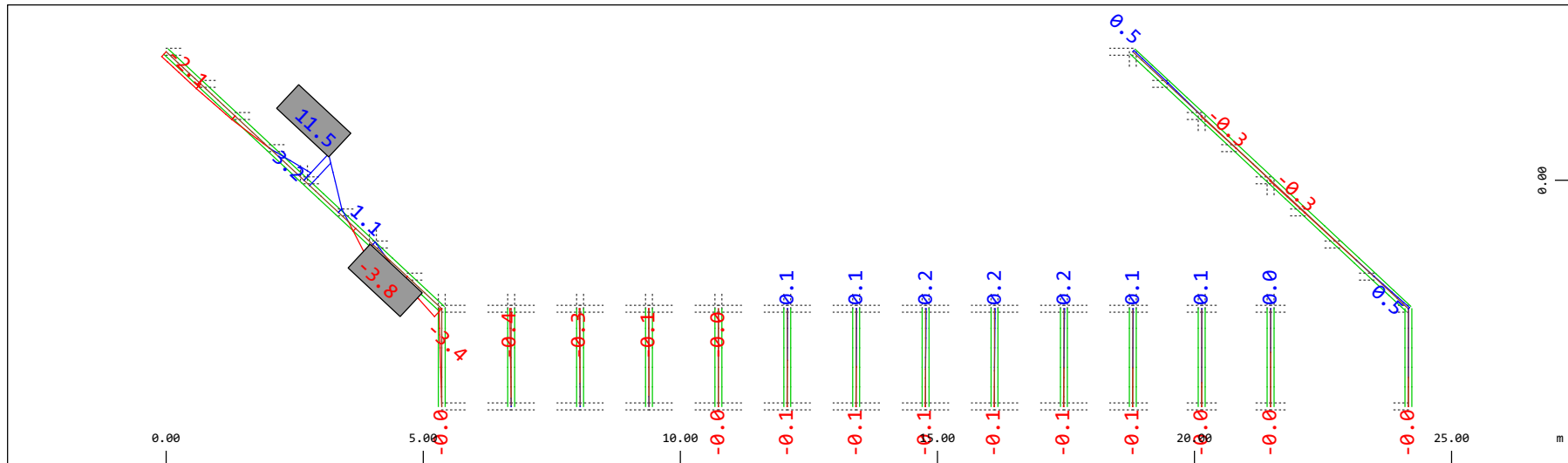
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-3.53) (Max=10.8)

M 1 : 120

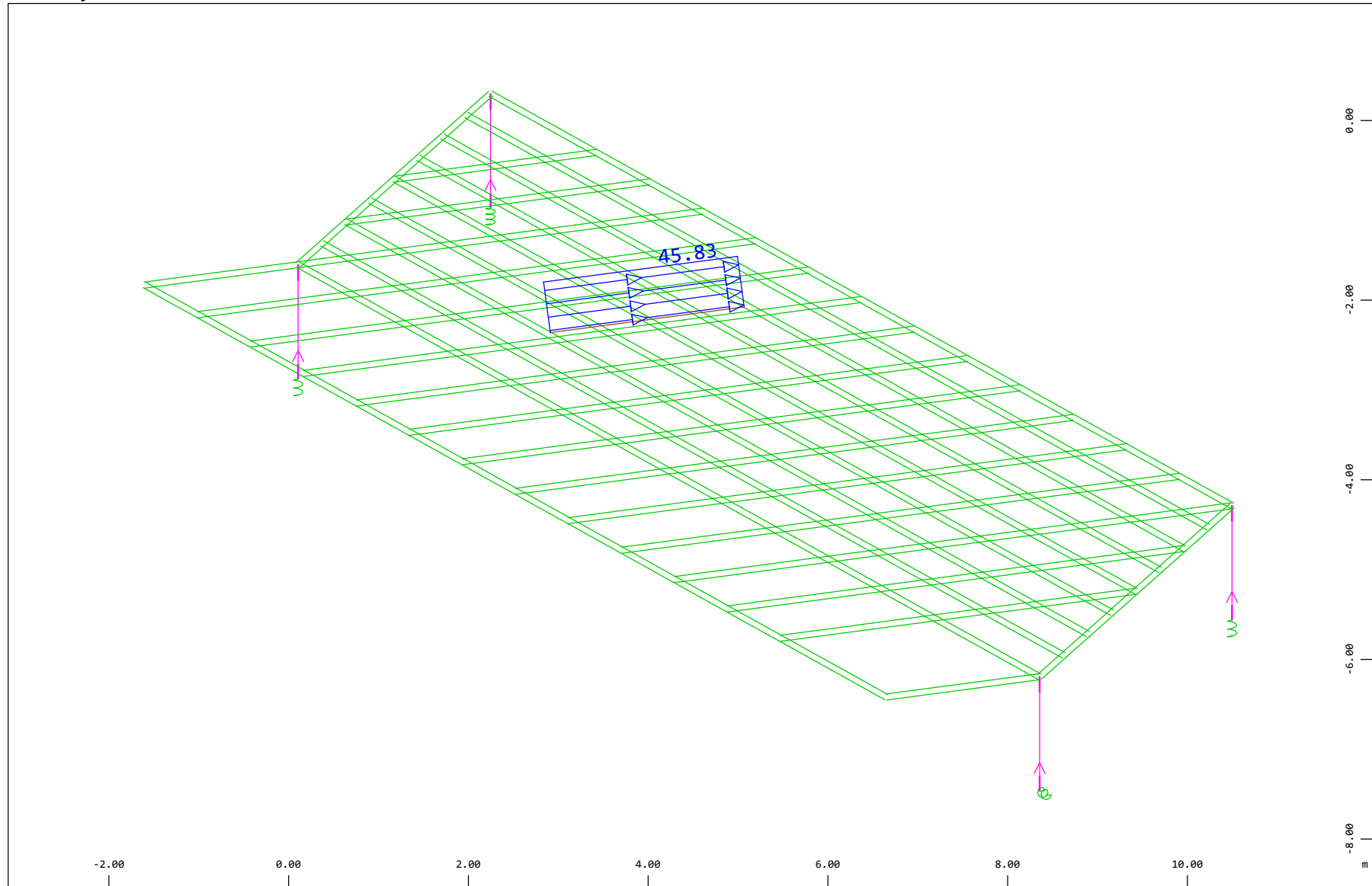


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 300 Qt: Serpeggio-S 3m (DX-->SX) , 1 cm 3D = 19.6 kNm (Min=-3.82) (Max=11.5)

M 1 : 120

Definition of Axis
Results elementay loads

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Z
Y
X

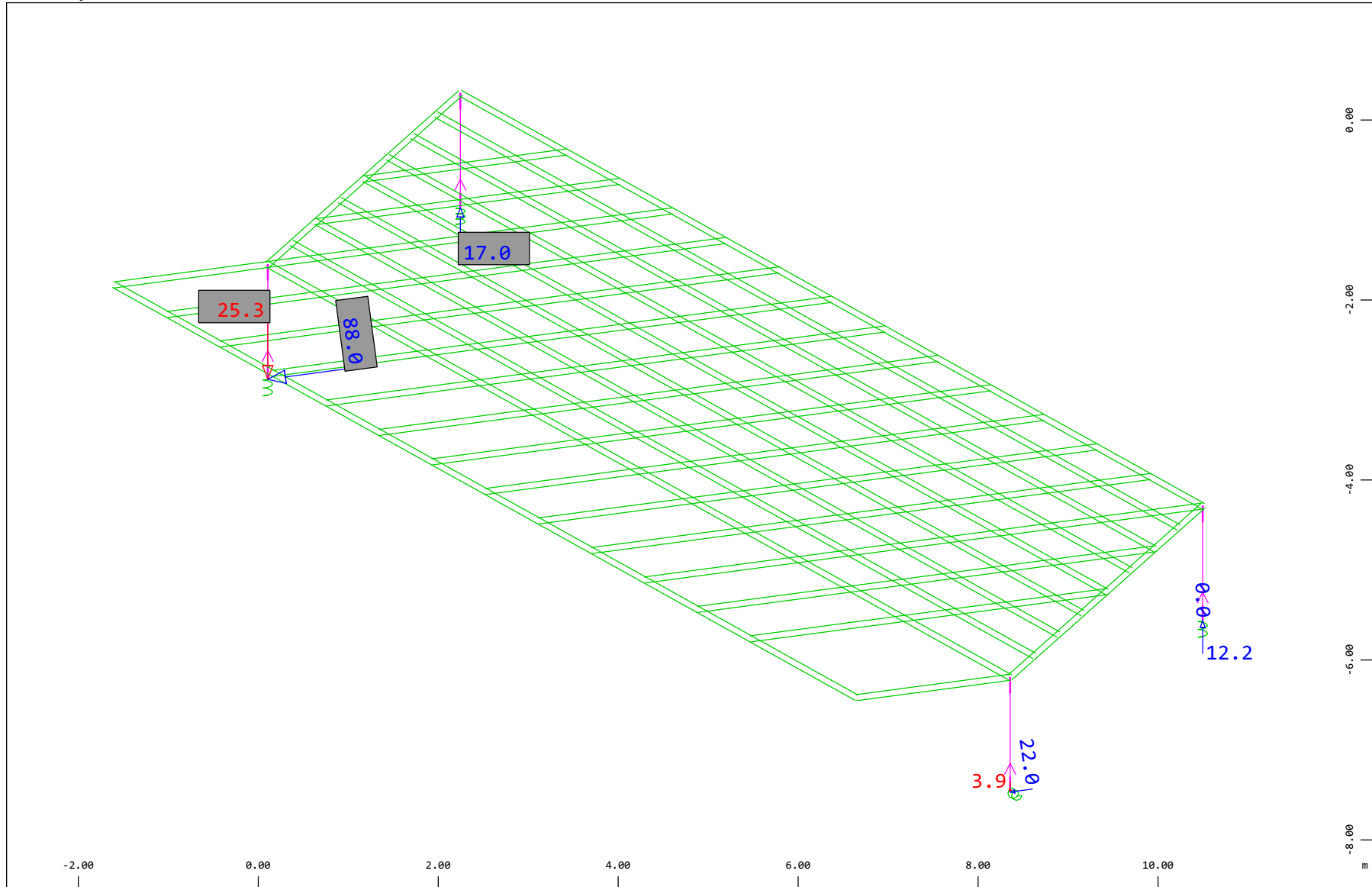
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
All loads, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=48.4 kN/m)
(Max=45.8)



M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads

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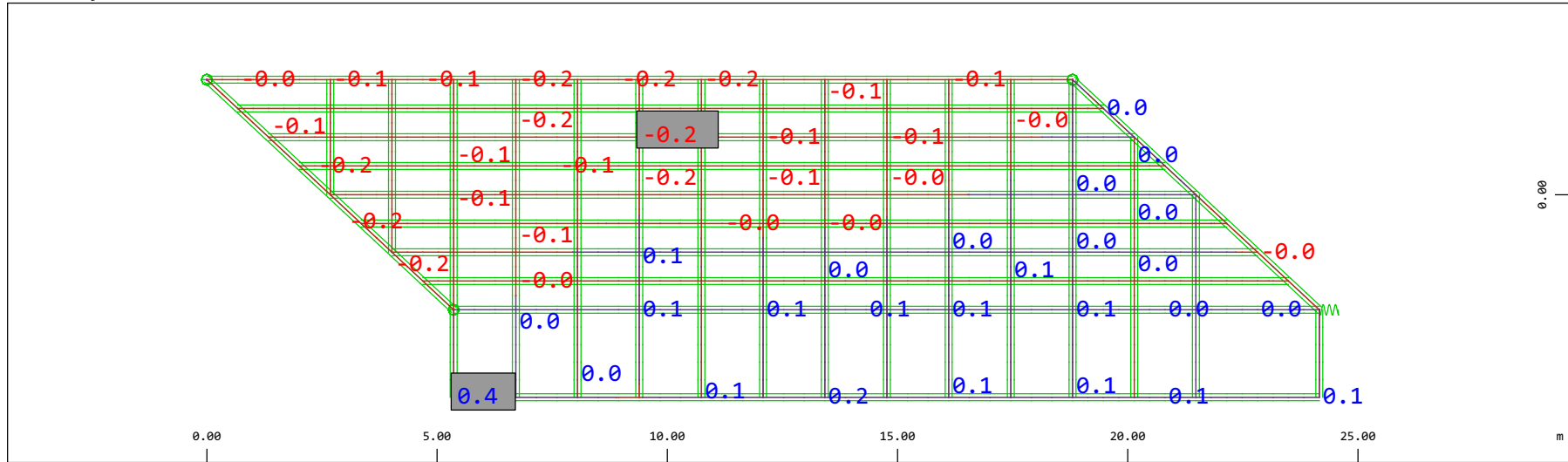
Z
 X Y

Sector of system Beam Elements, Spring Elements
 Nodes , Support force in global Z, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 19.4 kN
 0)

◁ (Min=-25.3) (Max=17.0) (total:

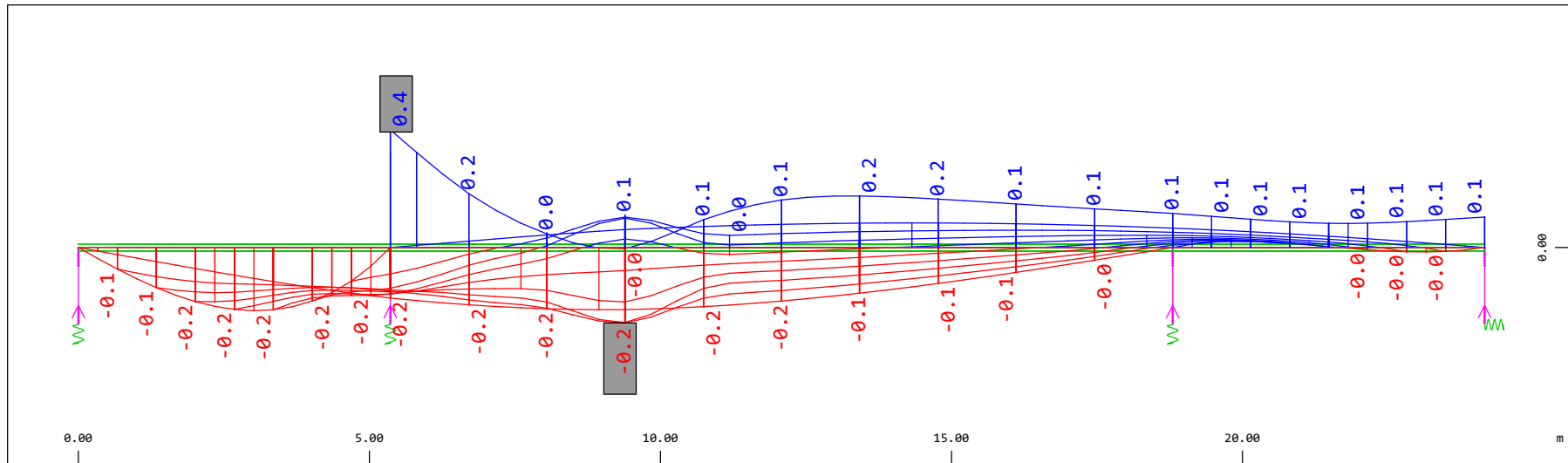
M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=0.370) M 1 : 134

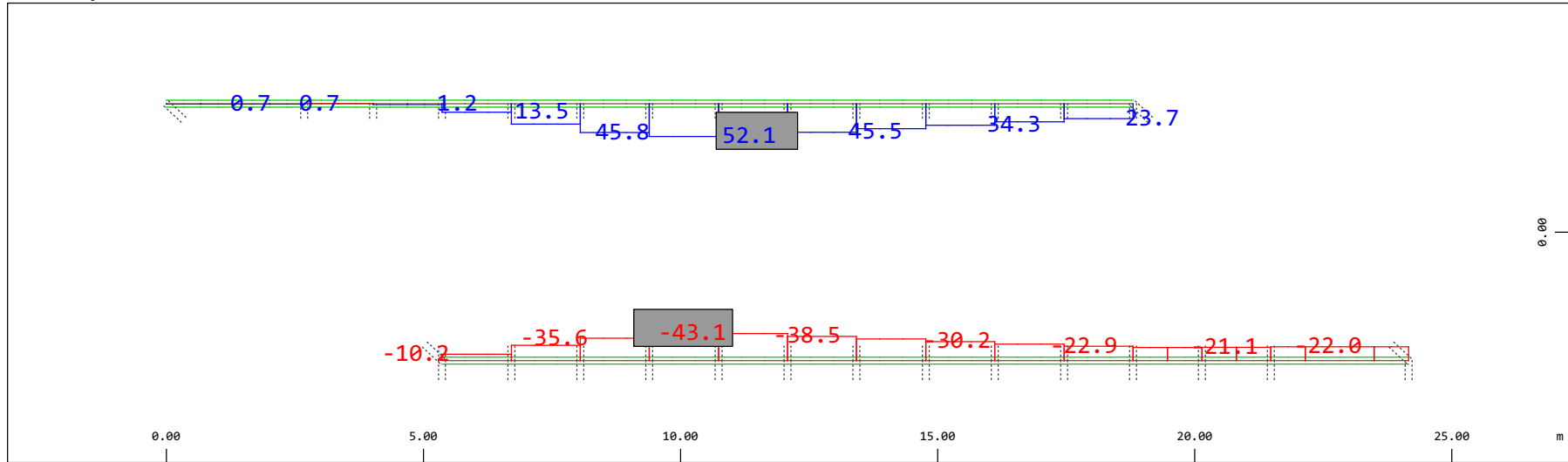
○, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.194 mm (Min=-0.244)



Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=0.370) M 1 : 106

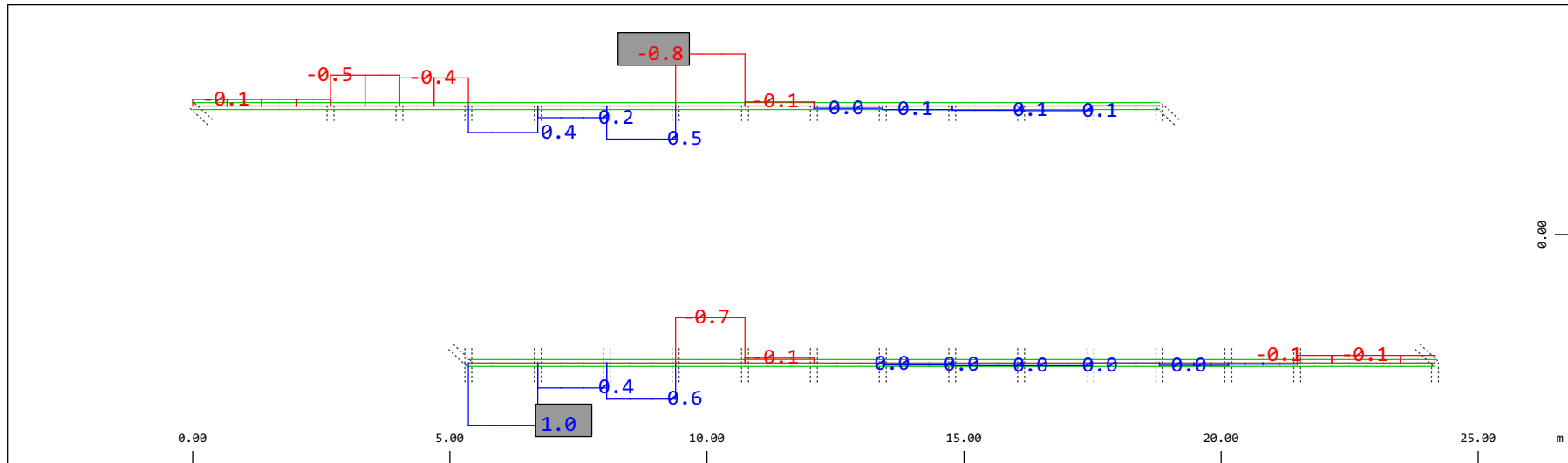
↑, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.194 mm (Min=-0.244)

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 98.0 kN (Min=-43.1) (Max=52.1)

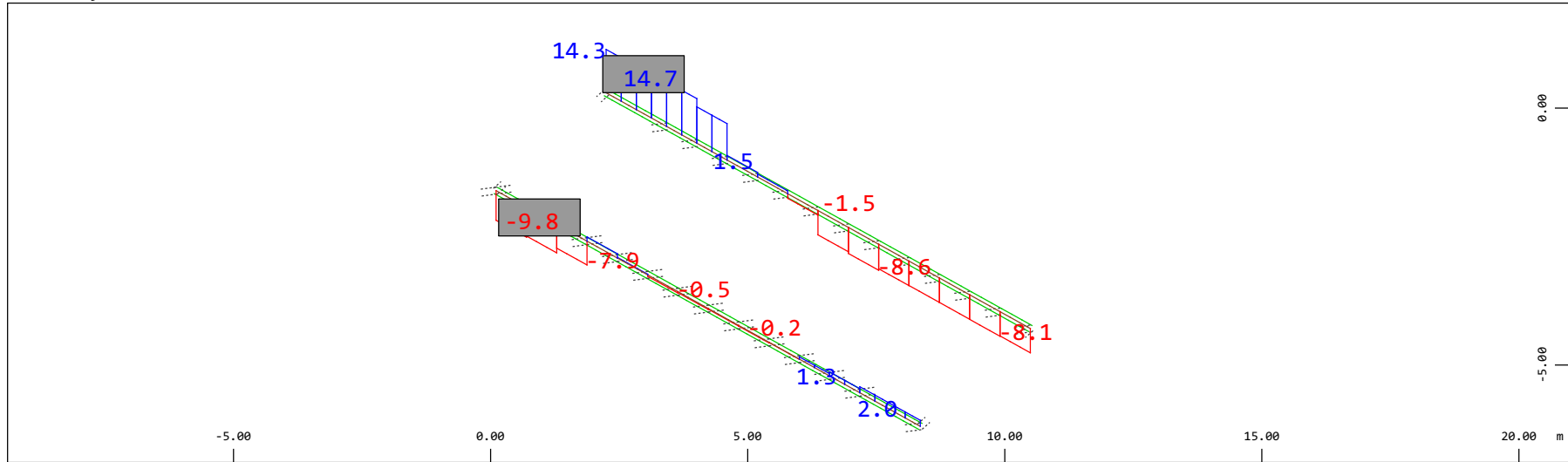
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.980 kNm (Min=-0.826) (Max=0.990)

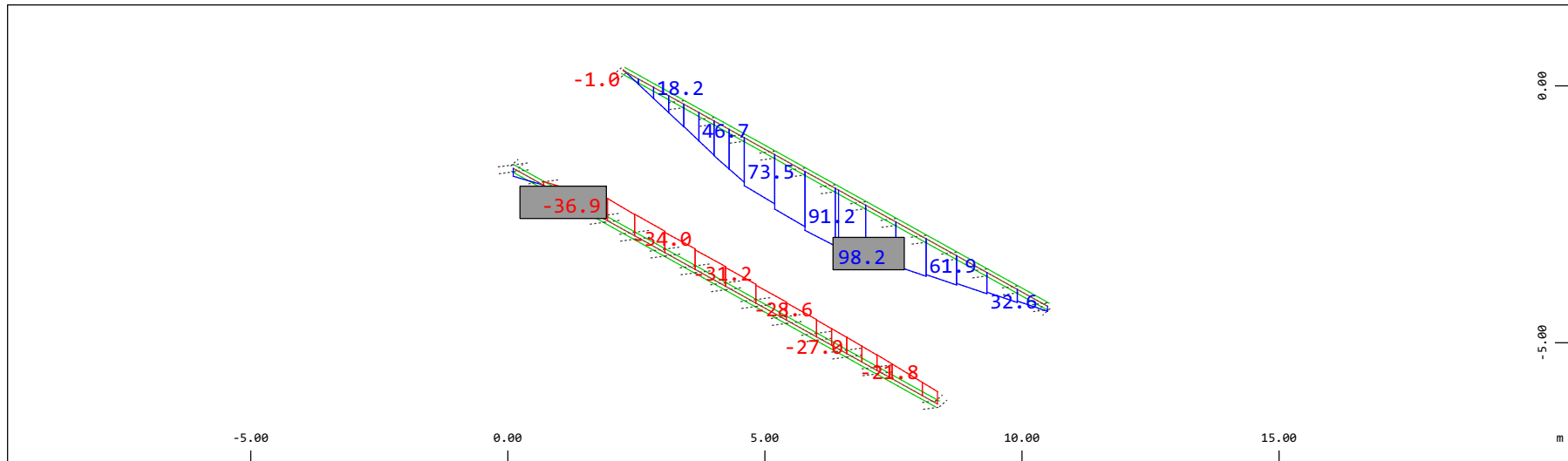
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force V_z , Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-9.80) (Max=14.7)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

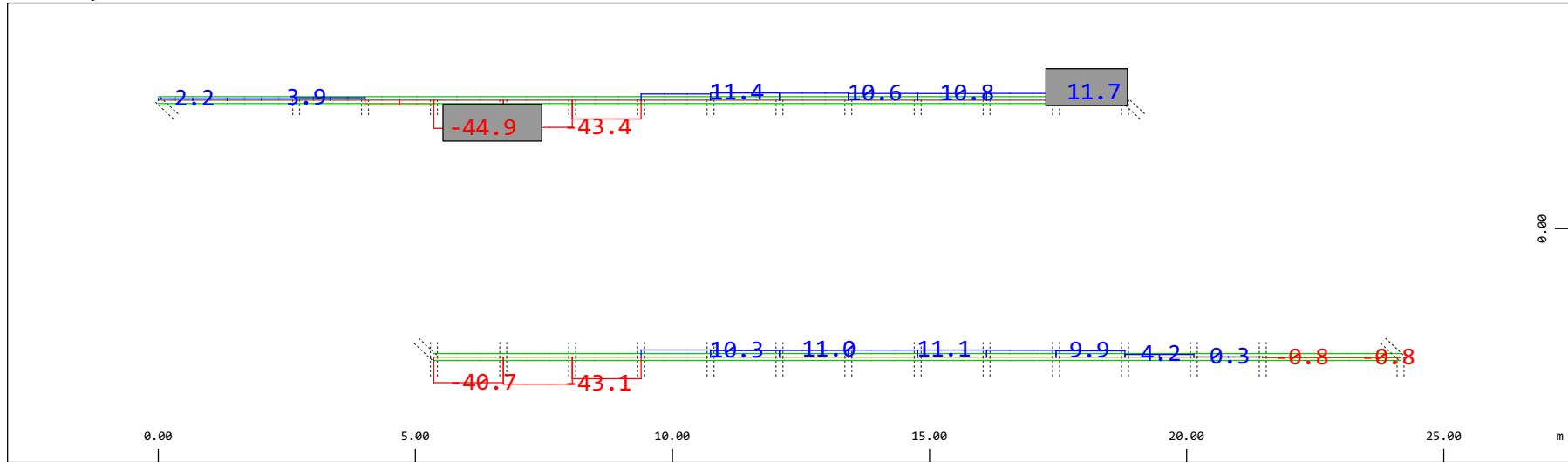


Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment M_y (Maximum values cubic interpolated), Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 98.0 kNm (Min=-36.9) (Max=98.2)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

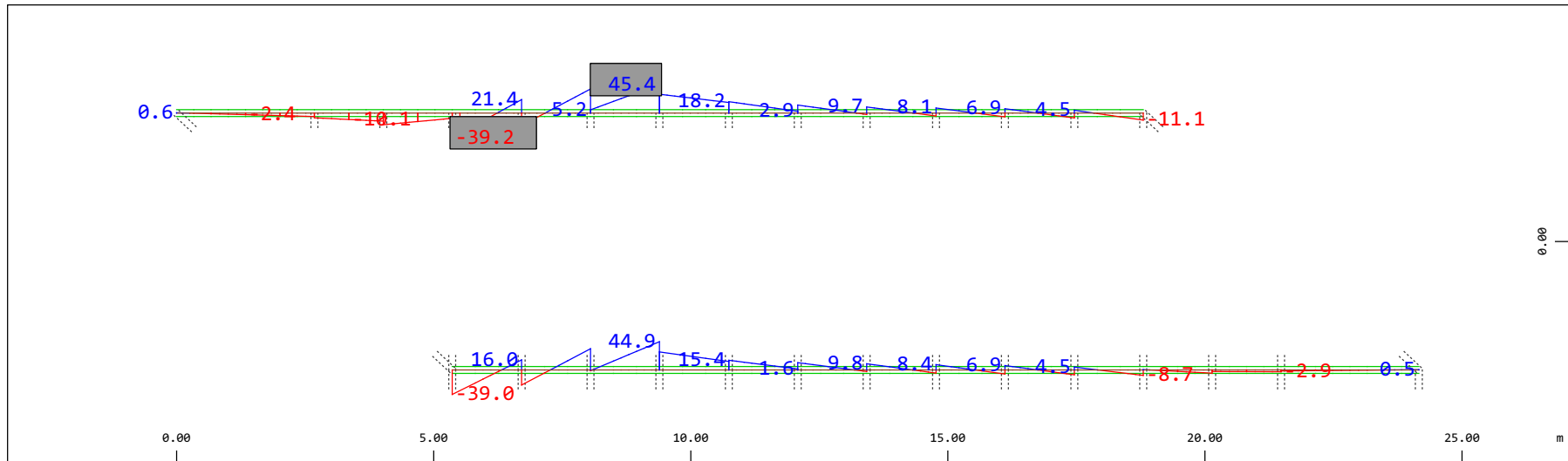
Definition of Axis

Results elementay loads



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Shear force Vy, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 98.0 kN (Min=-44.9) (Max=11.7)

M 1 : 120

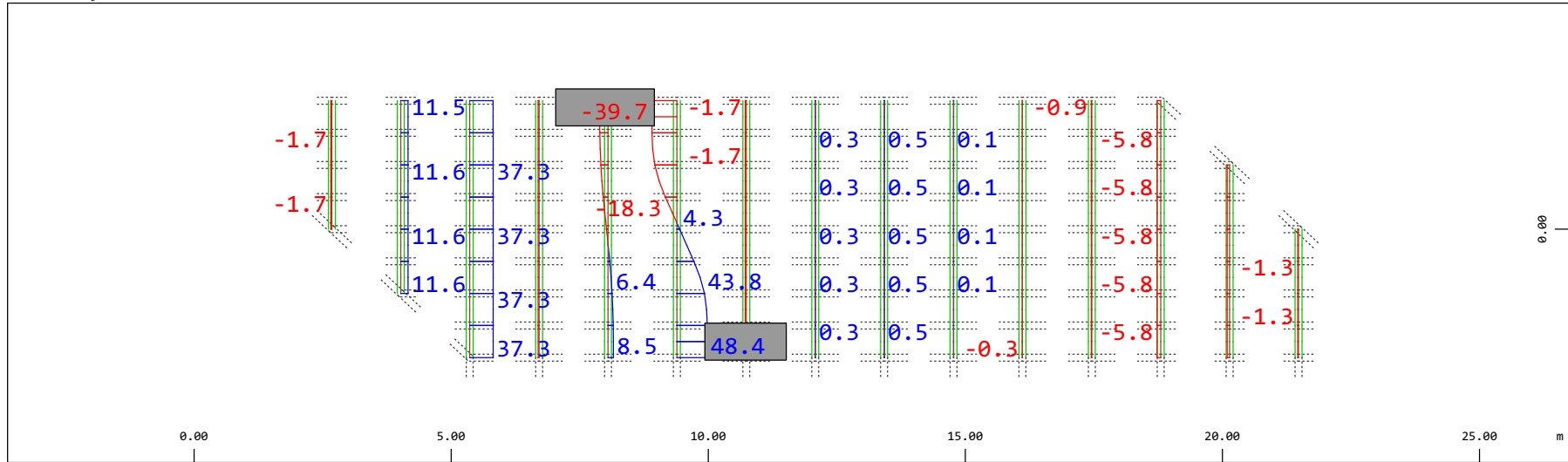


Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Bending moment Mz, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 98.0 kNm (Min=-39.2) (Max=45.4)

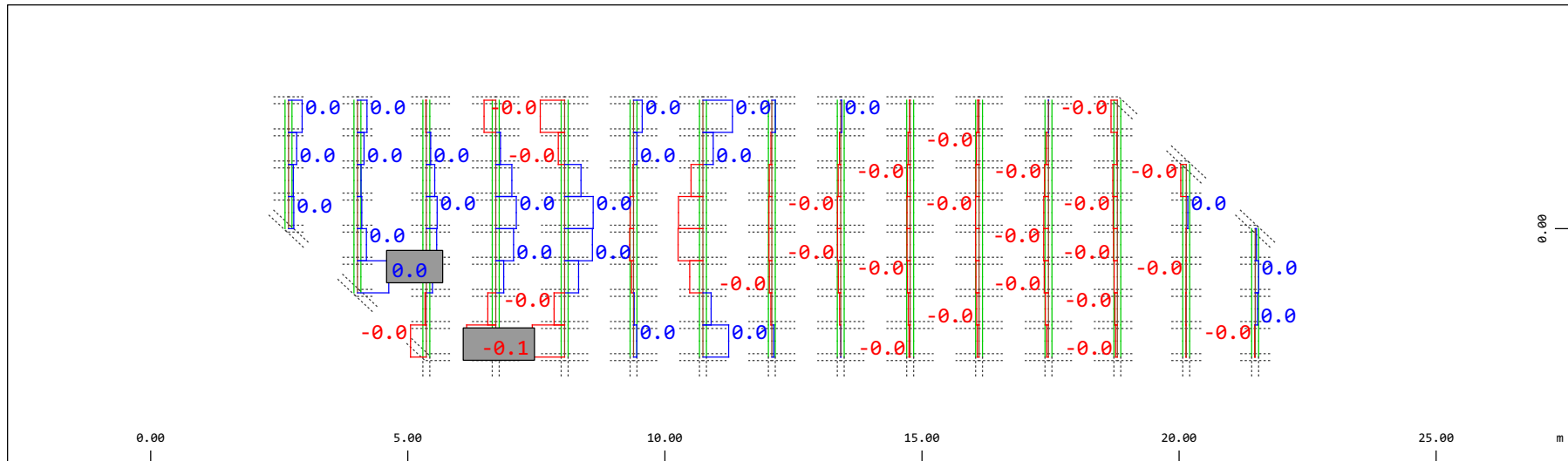
M 1 : 120

Definition of Axis

Results elementay loads



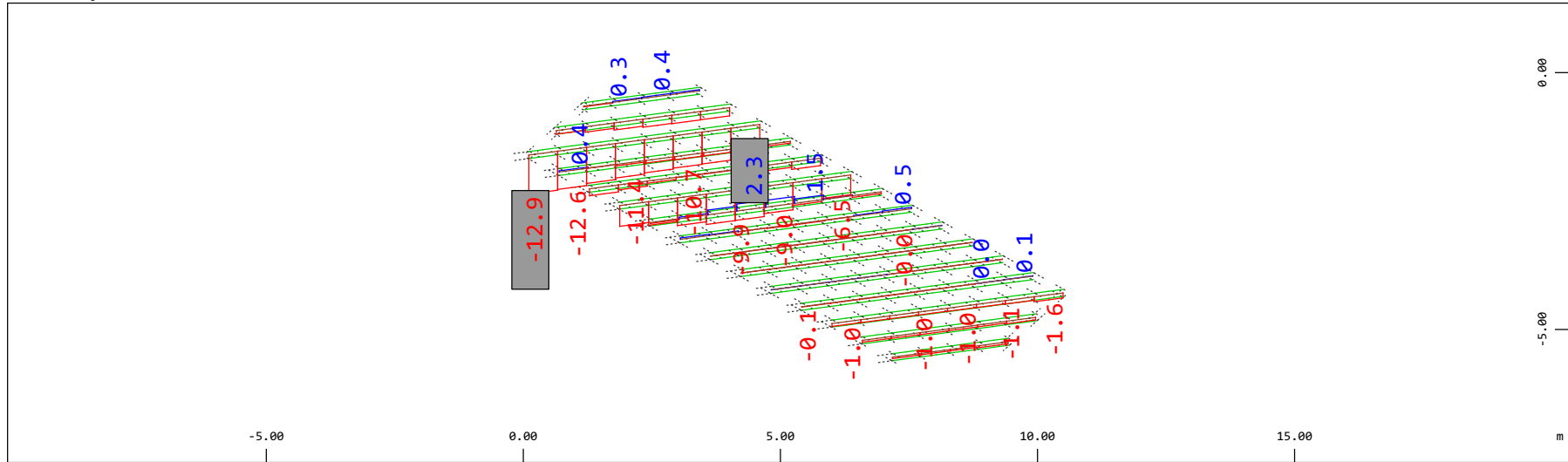
Y Sector of system Beam Elements Group 21 22
 Z-X Beam Elements , Normal force Nx, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 98.0 kN (Min=-39.7) (Max=48.4) M 1 : 120



Y Sector of system Beam Elements Group 21 22
 Z-X Beam Elements , Torsional moment Mt, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.0980 kNm (Min=-0.0514) (Max=0.0497) M 1 : 120

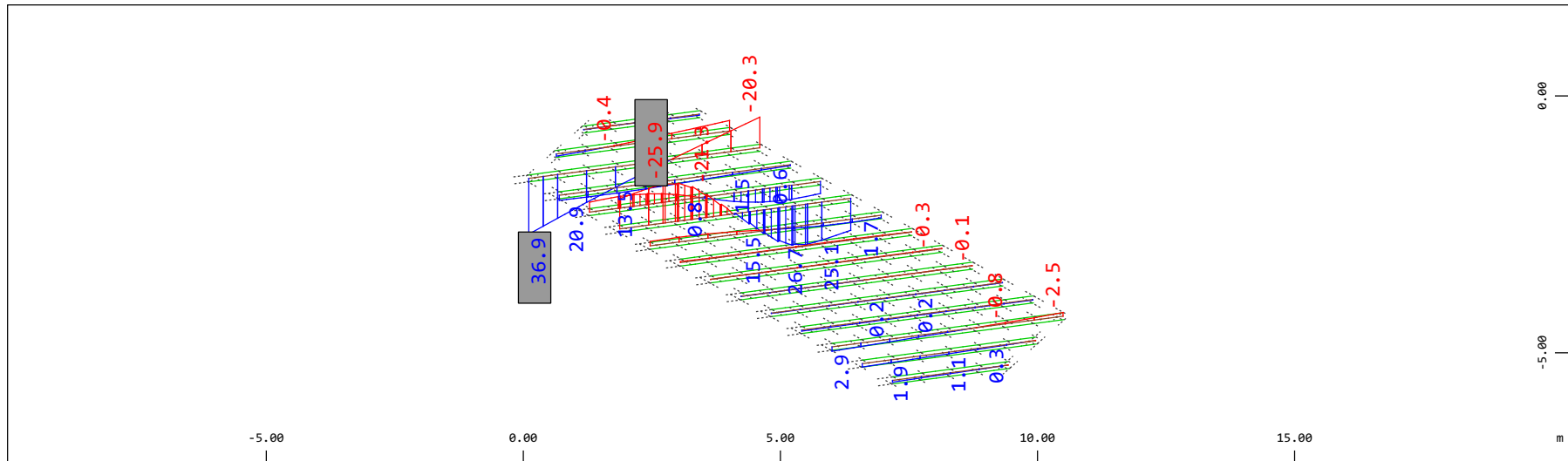
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-12.9) (Max=2.30)

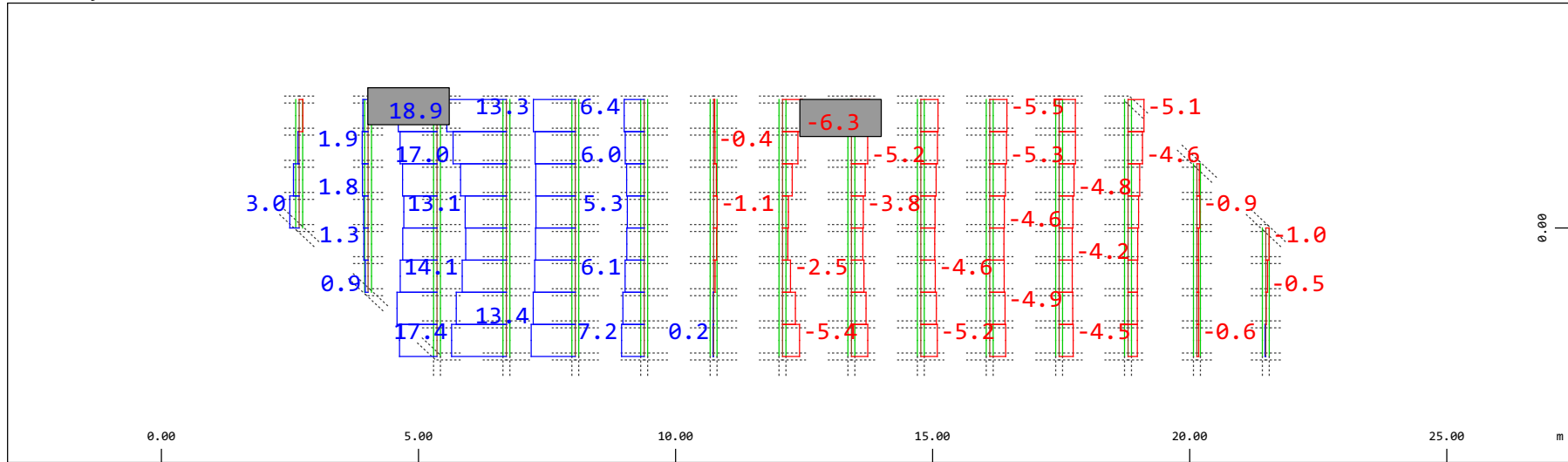
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 39.2
 kNm (Min=-25.9) (Max=36.9)

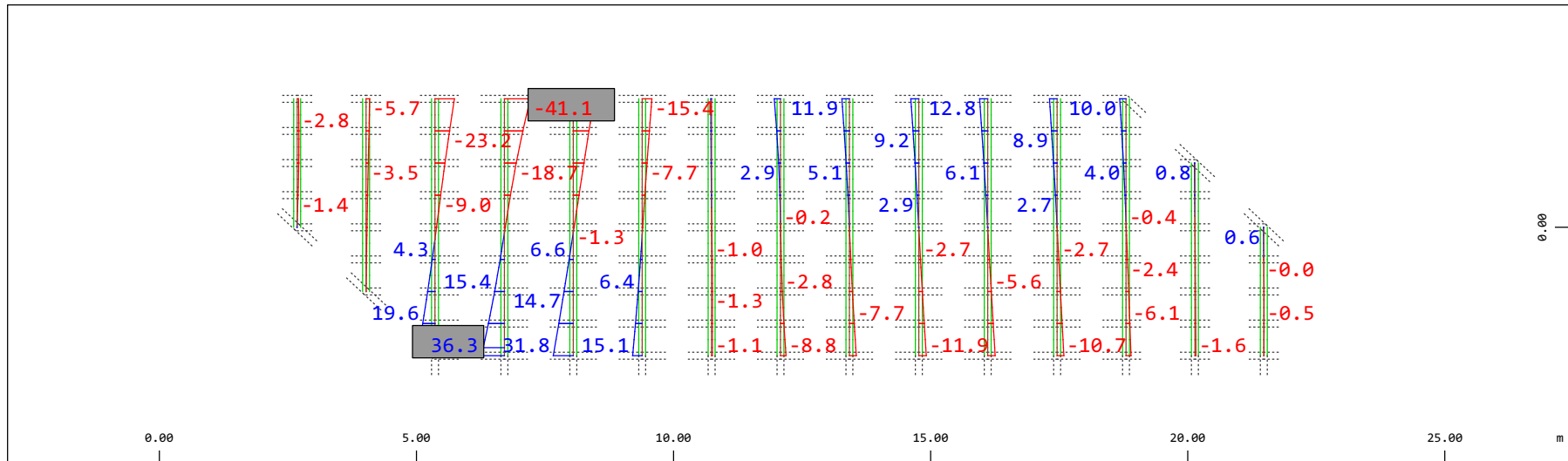
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Y
 X
 Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-6.29) (Max=18.9)

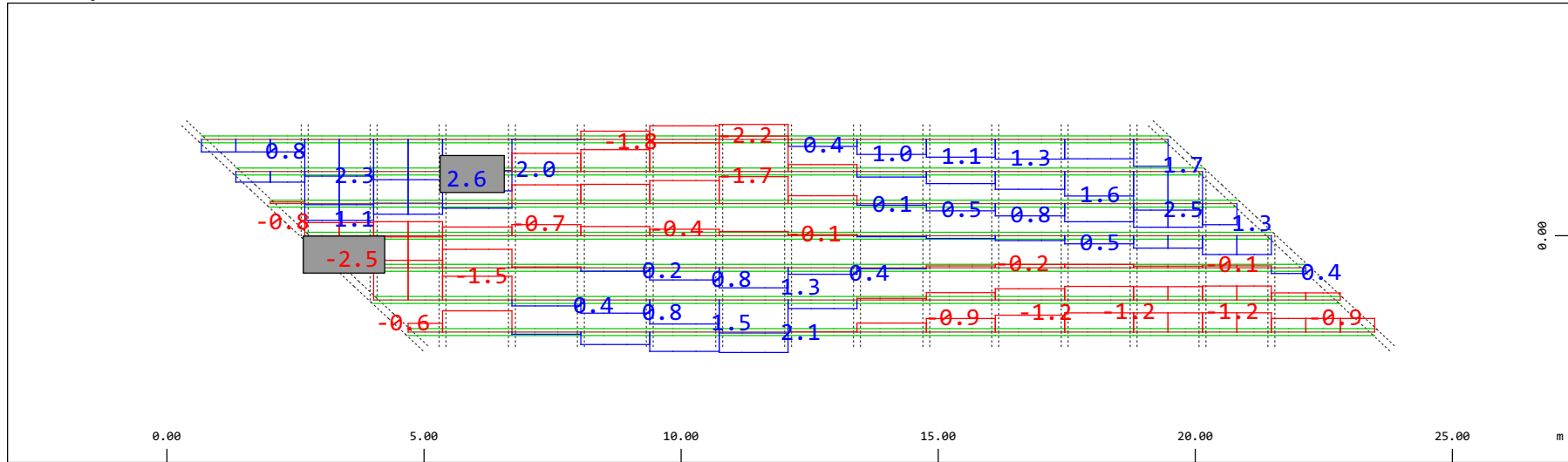
M 1 : 120



Y
 X
 Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 98.0 kNm (Min=-41.1) (Max=36.3)

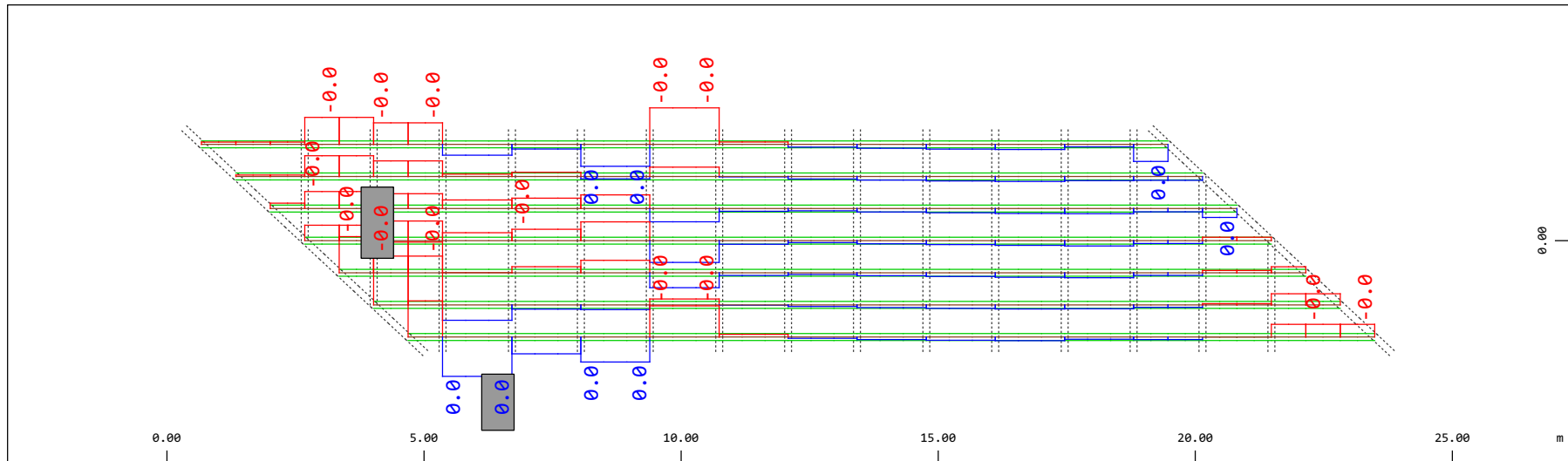
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 3.92 kN (Min=-2.53) (Max=2.56)

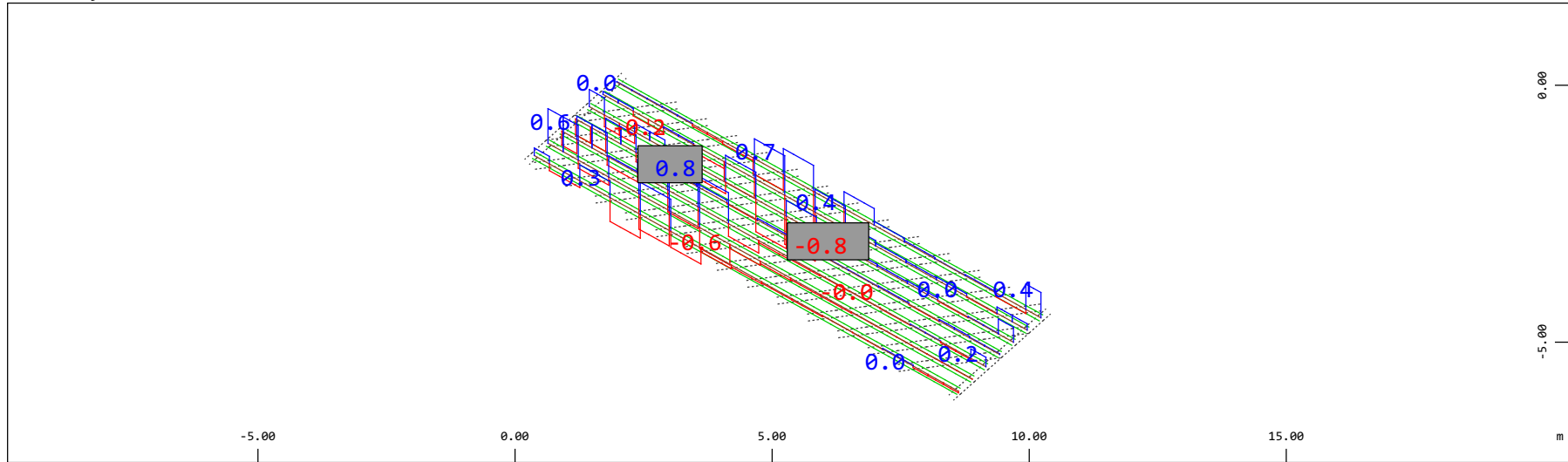
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 9.8047e-04 kNm (Min=-7.7598e-04) (Max=6.2613e-04)

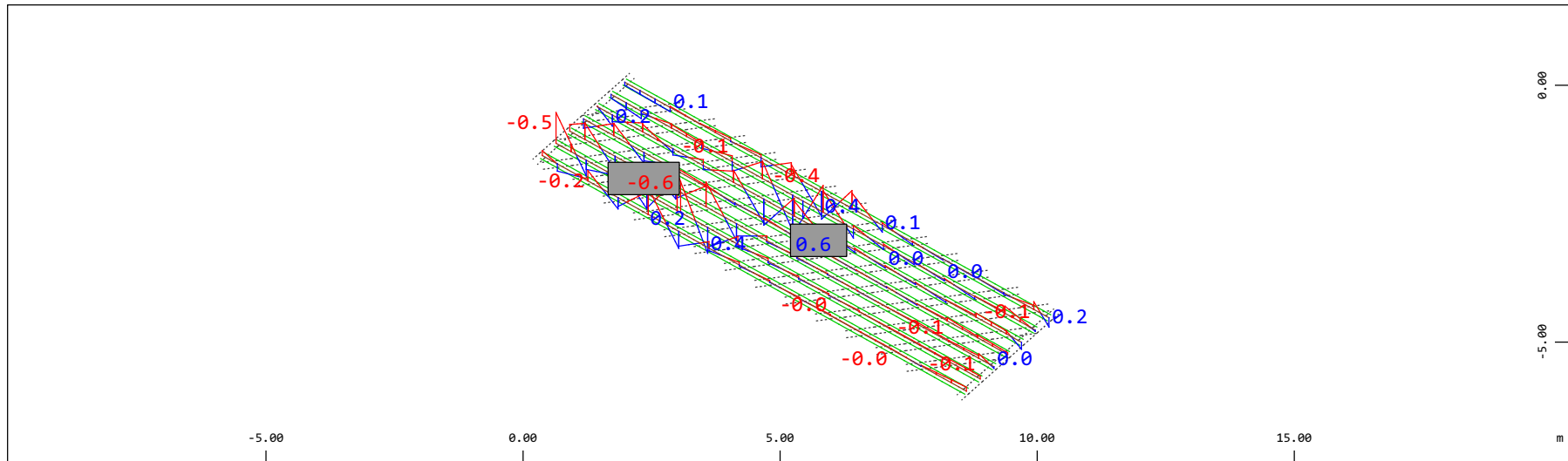
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.980 kN (Min=-0.807) (Max=0.780)

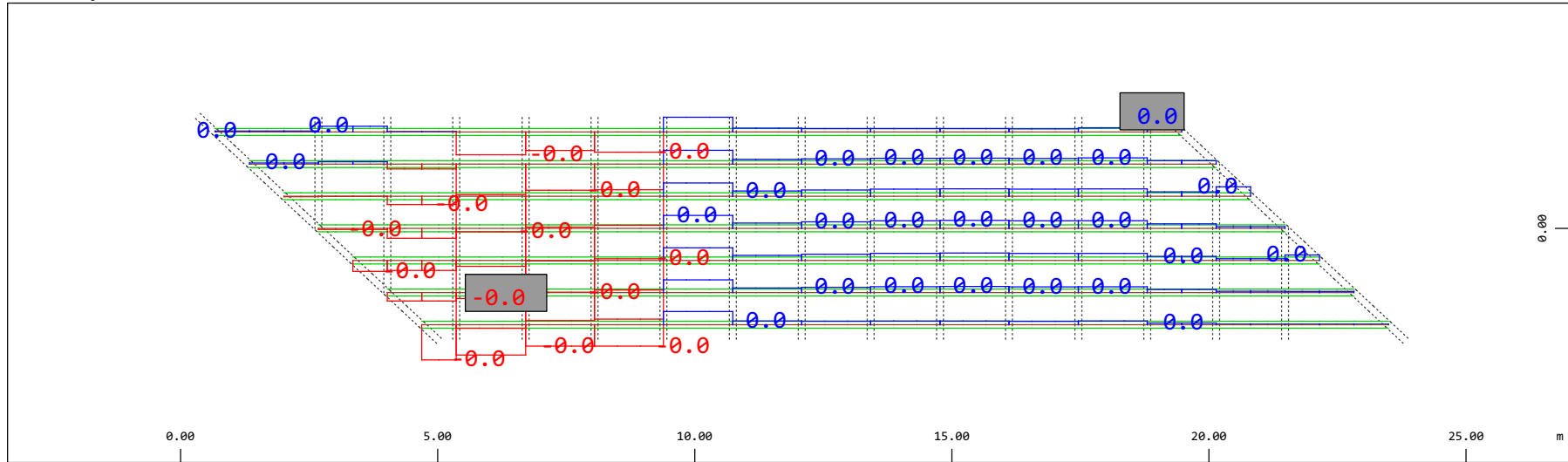
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



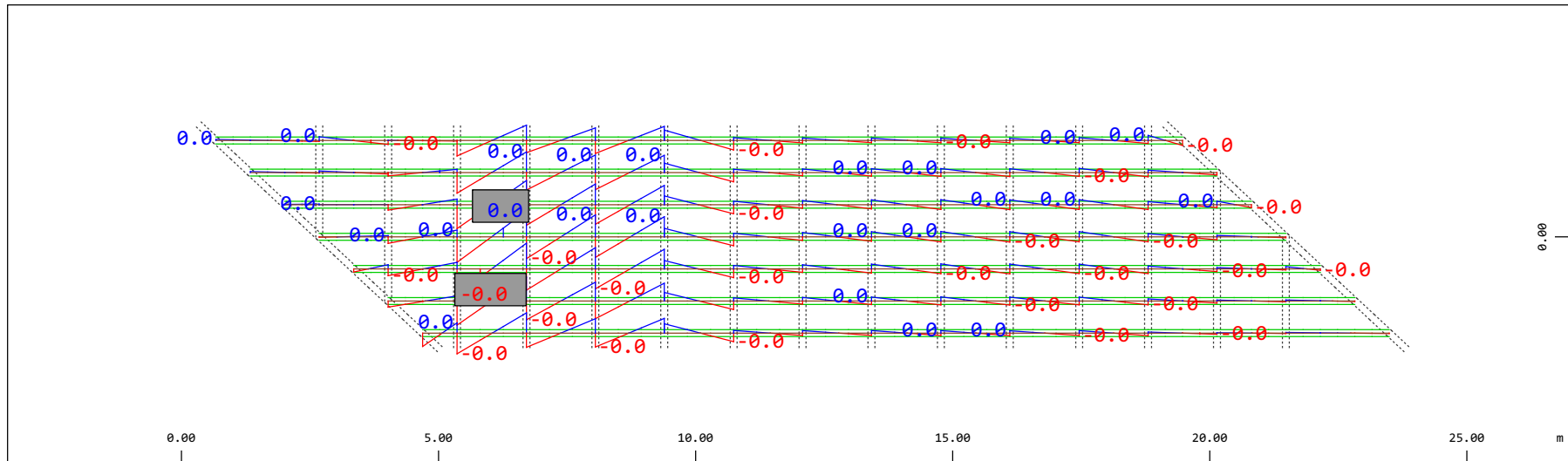
Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.980
 kNm (Min=-0.628) (Max=0.648)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads

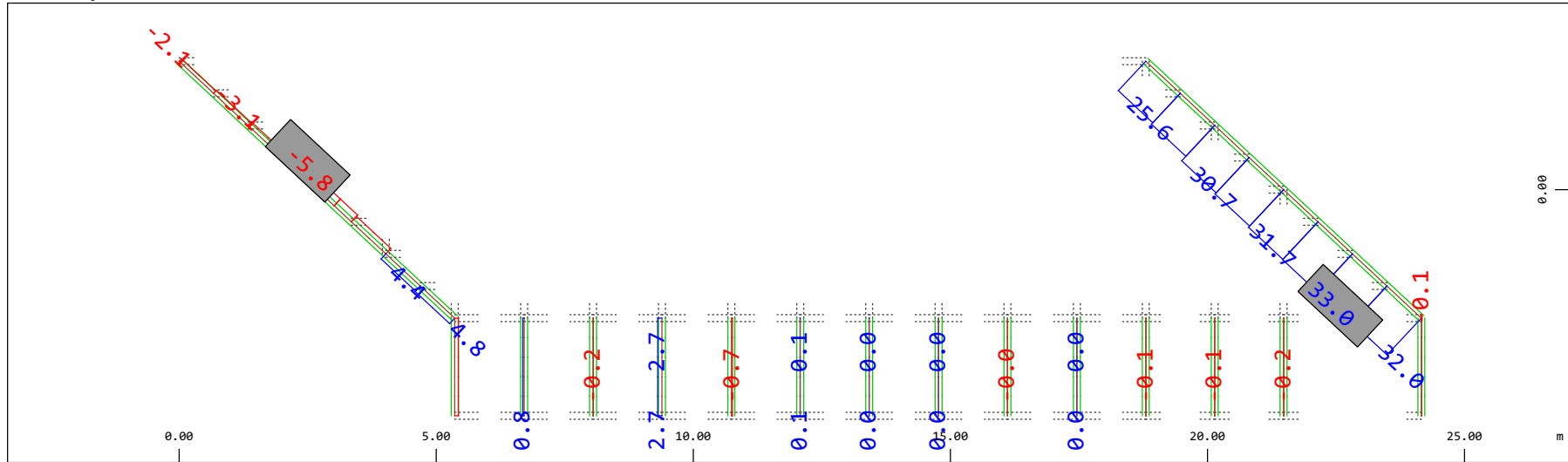


Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.0098 kN (Min=-0.0061) (Max=0.0024) M 1 : 120



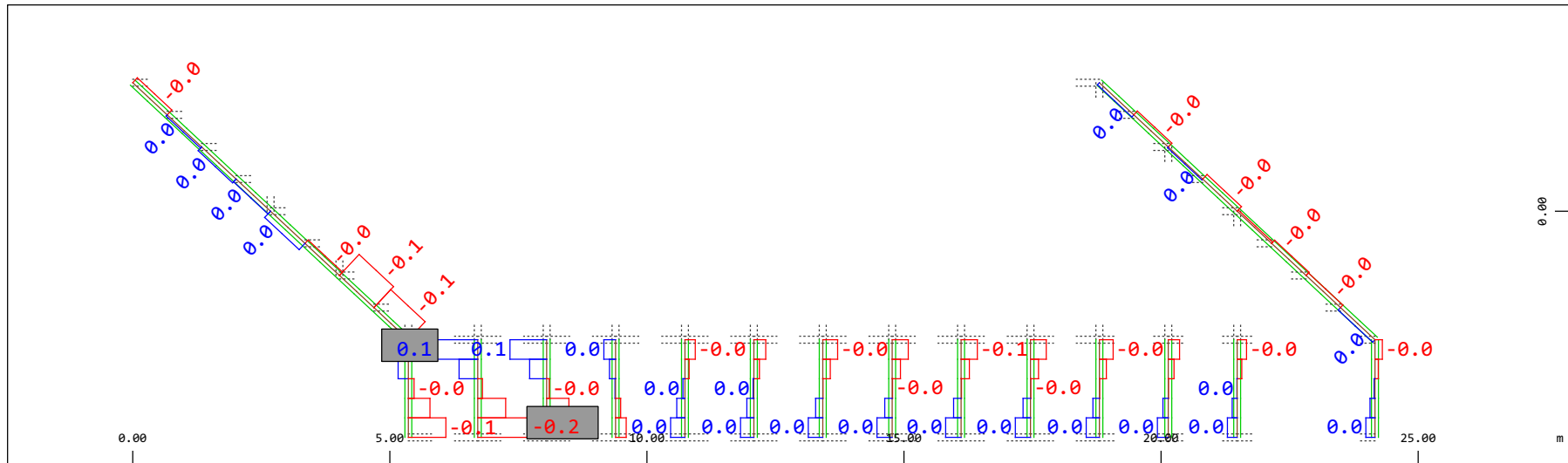
Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.0098 kNm (Min=-0.0041) (Max=0.0041) M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force N_x , Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 39.2 kN (Min=-5.80) (Max=33.0)

M 1 : 120

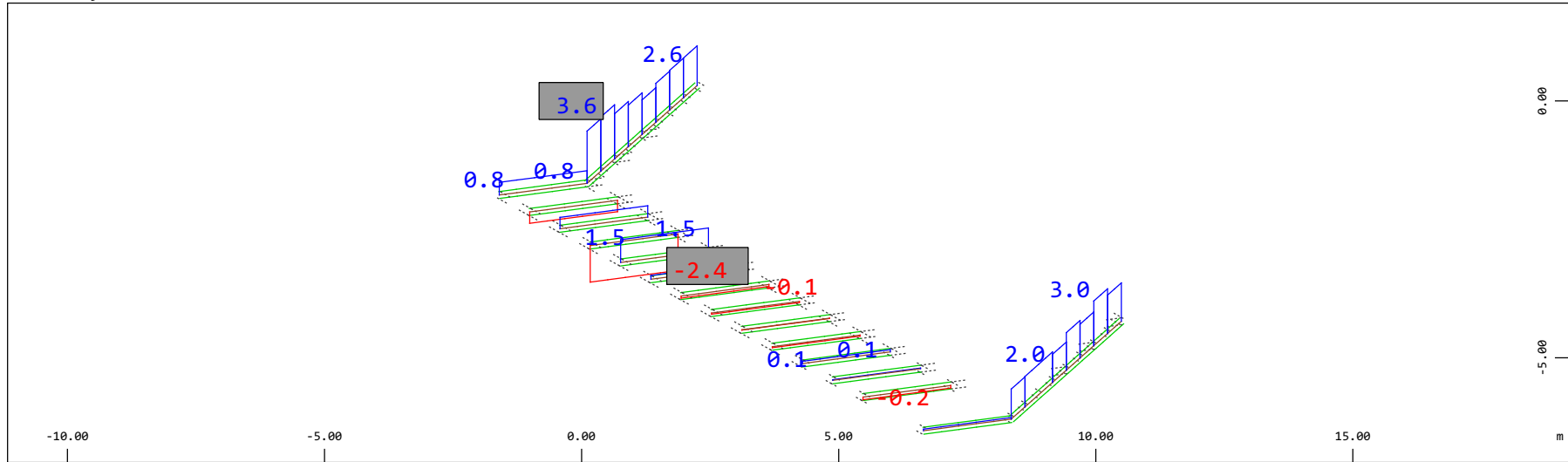


Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment M_t , Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 0.196 kNm (Min=-0.163) (Max=0.134)

M 1 : 120

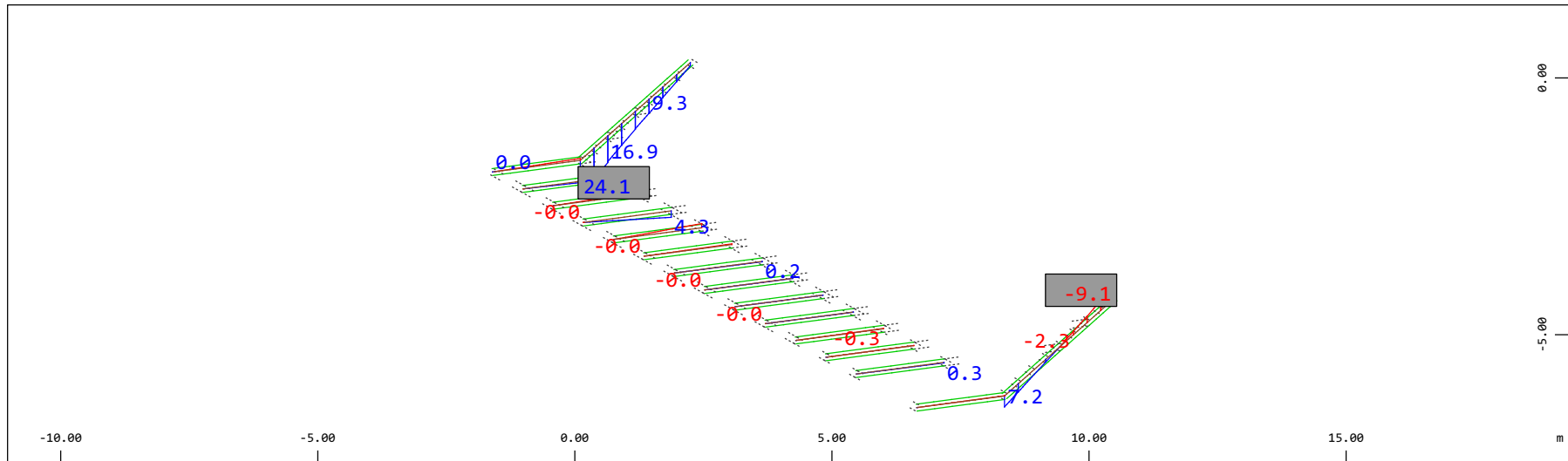
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 3.92 kN (Min=-2.42) (Max=3.58)

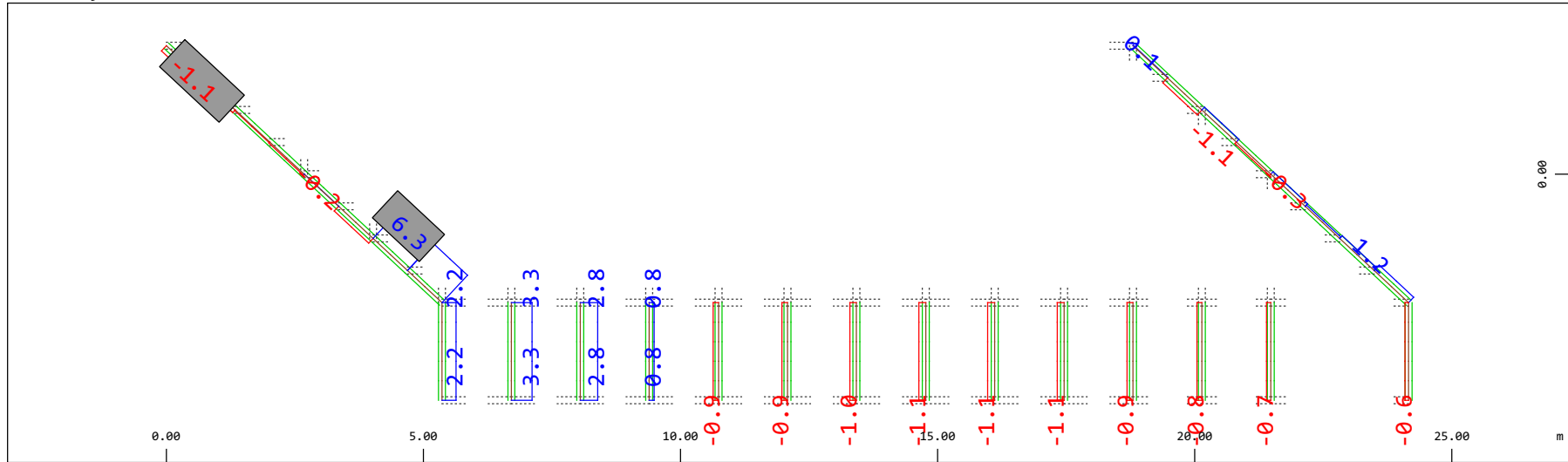
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 39.2 kNm (Min=-9.11) (Max=24.1)

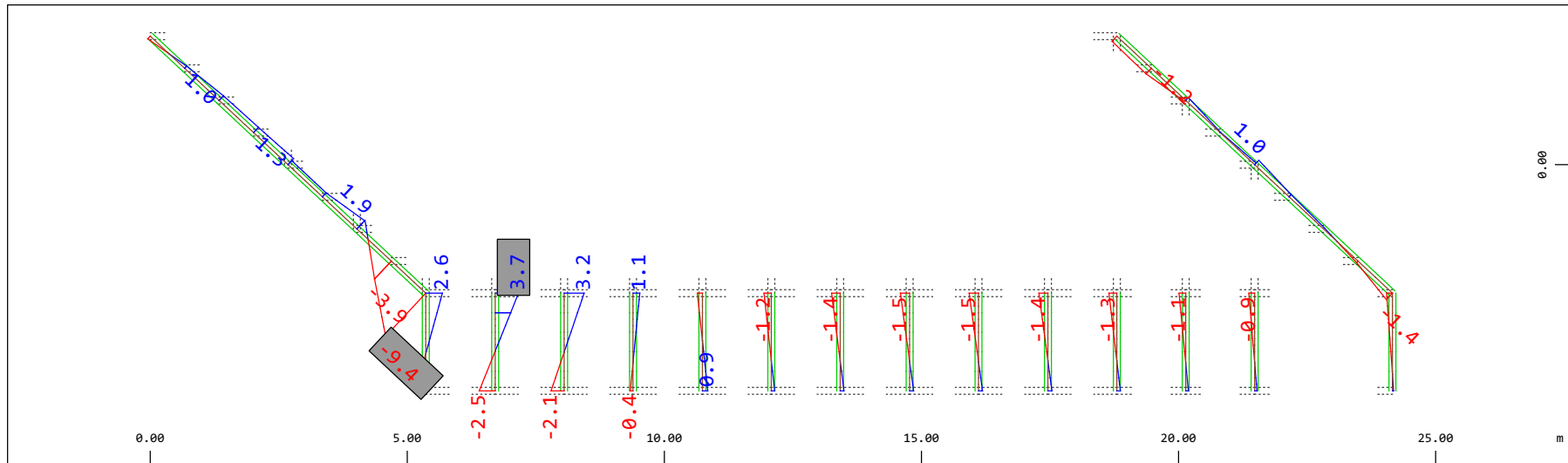
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 9.80 kN (Min=-1.14) (Max=6.32)

M 1 : 120

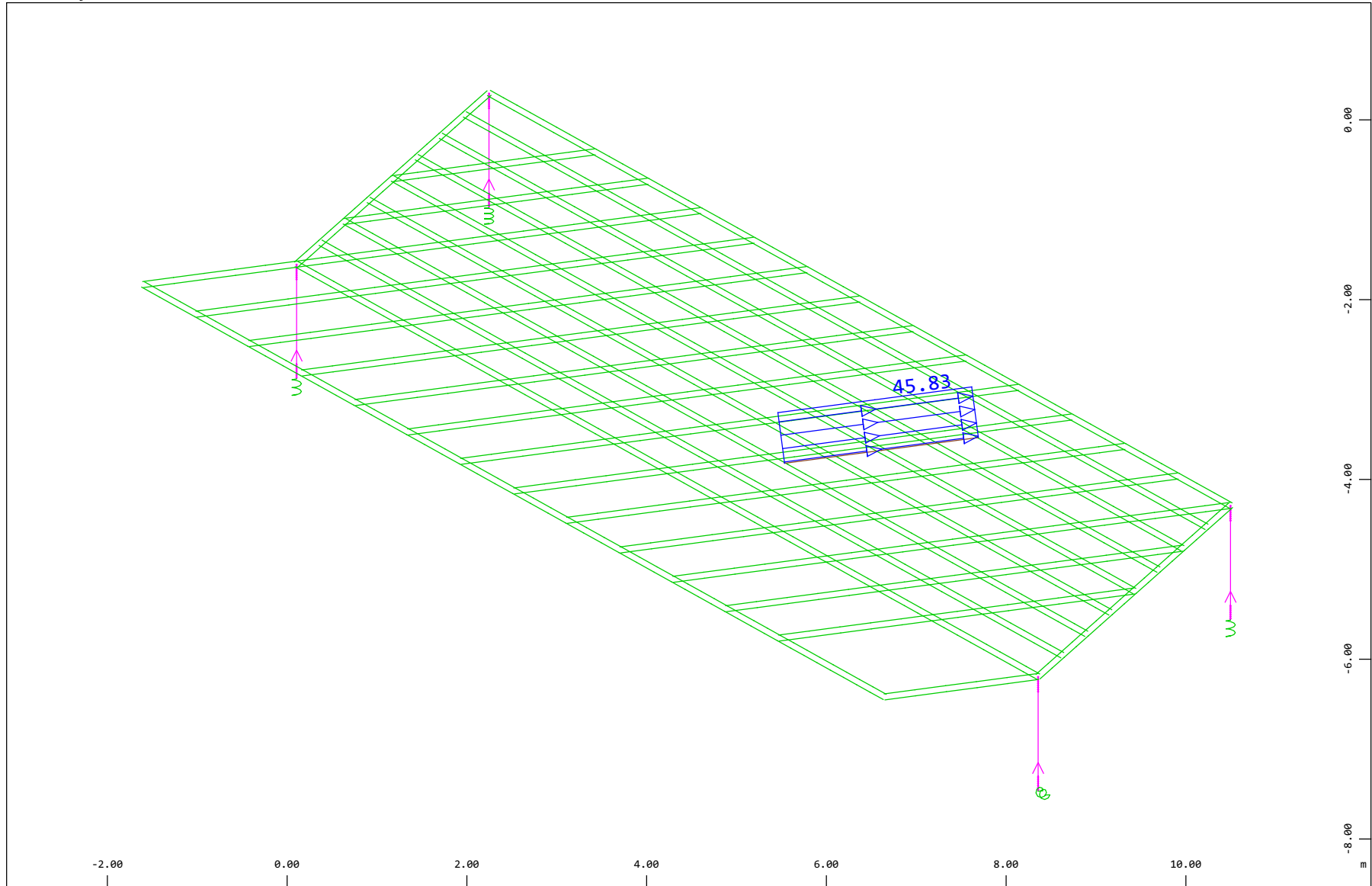


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 307 Qt: Serpeggio-S 9m (DX-->SX) , 1 cm 3D = 9.80 kNm (Min=-9.36) (Max=3.70)

M 1 : 120

Definition of Axis
 Results elementary loads

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Z
 Y
 X

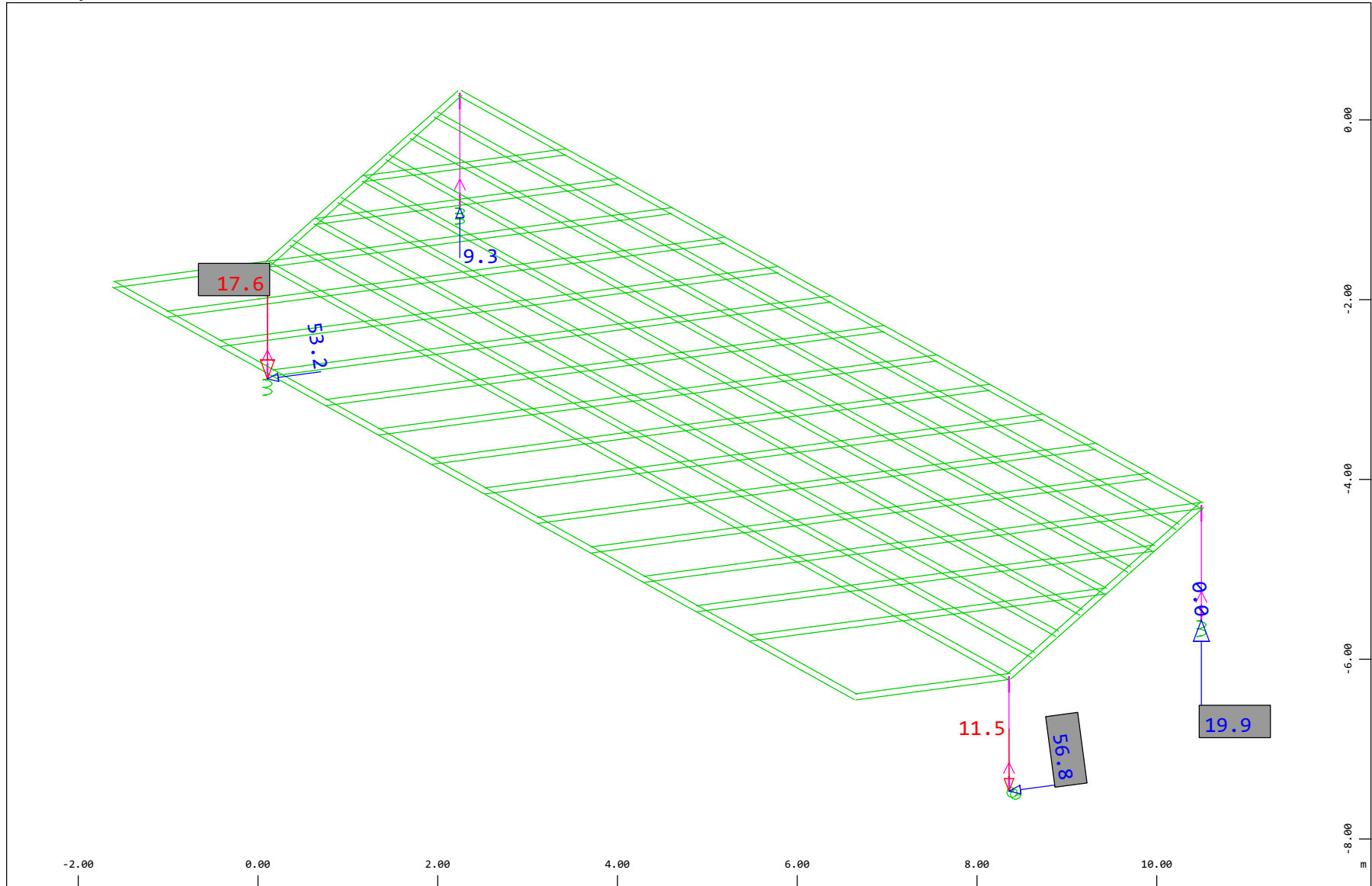
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=48.4 kN/m
 (Max=45.8)



M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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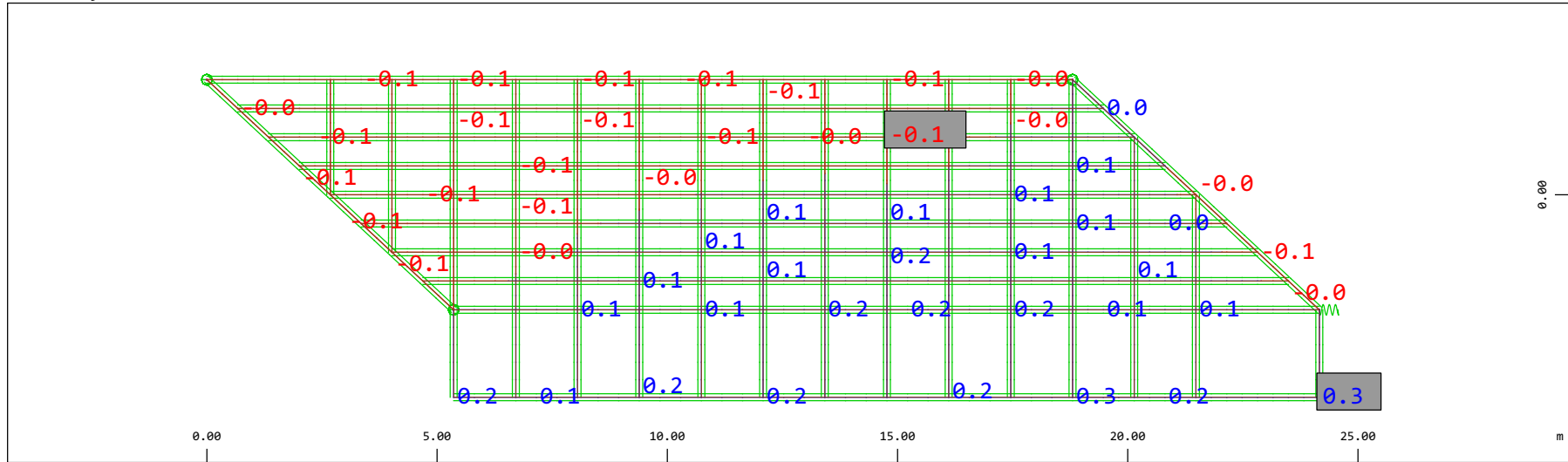
Z
 X Y

Sector of system Beam Elements, Spring Elements
 Nodes , Support force in global Z, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 9.69 kN
 (total: 0)

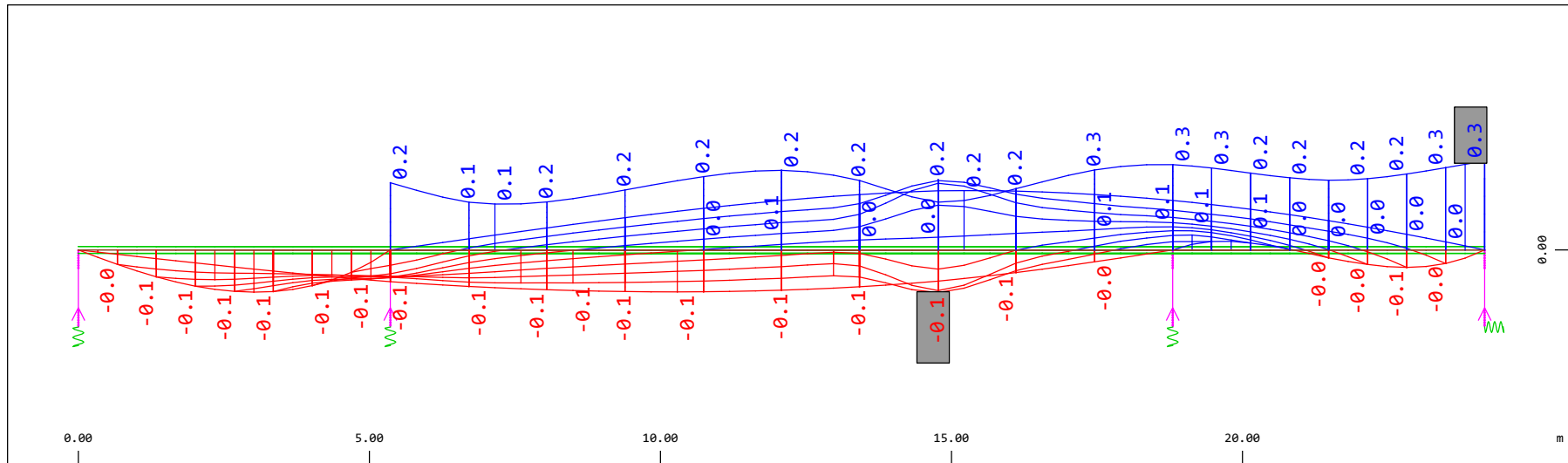
△ (Min=-17.6) (Max=19.9)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

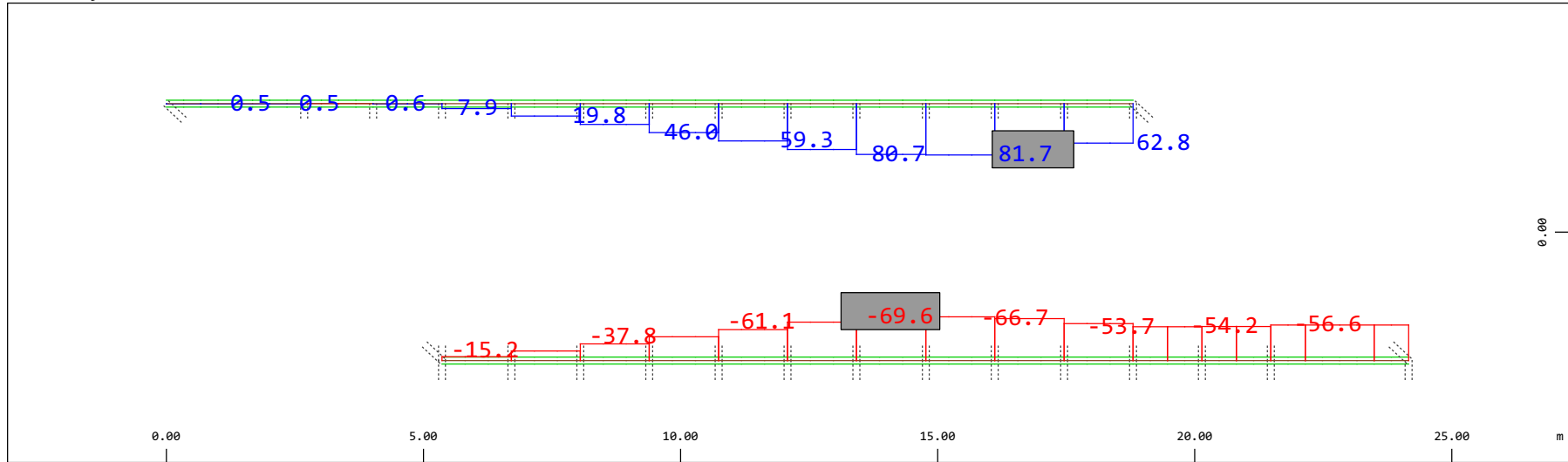


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 0.194 mm (Min=-0.138) (Max=0.279) M 1 : 134



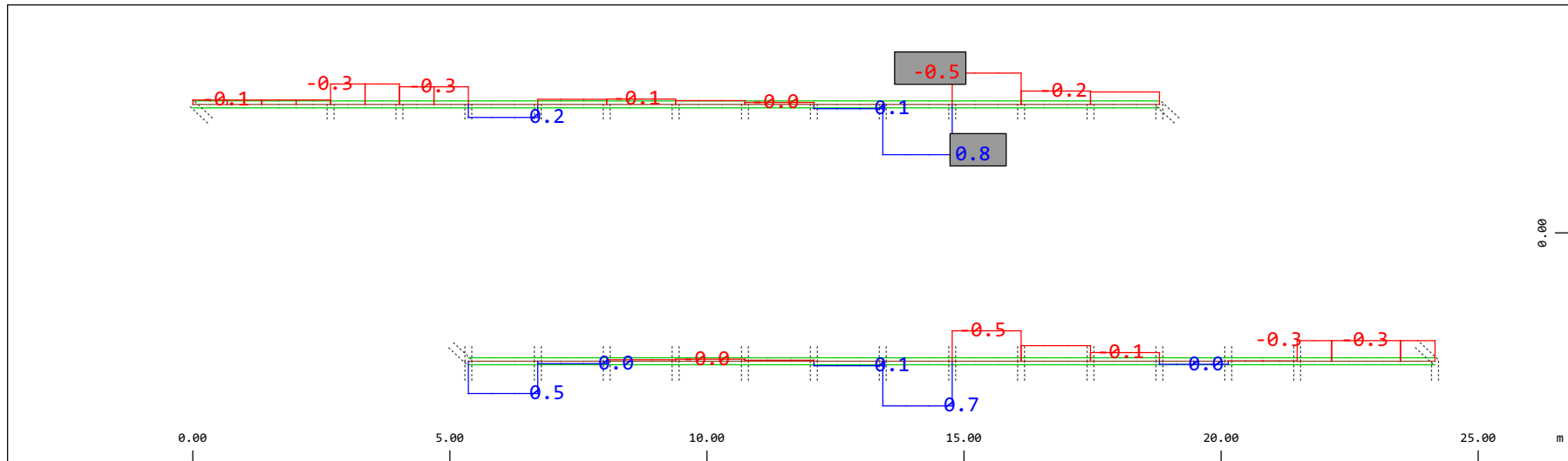
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 0.194 mm (Min=-0.138) (Max=0.279) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 98.0 kN (Min=-69.6) (Max=81.7)

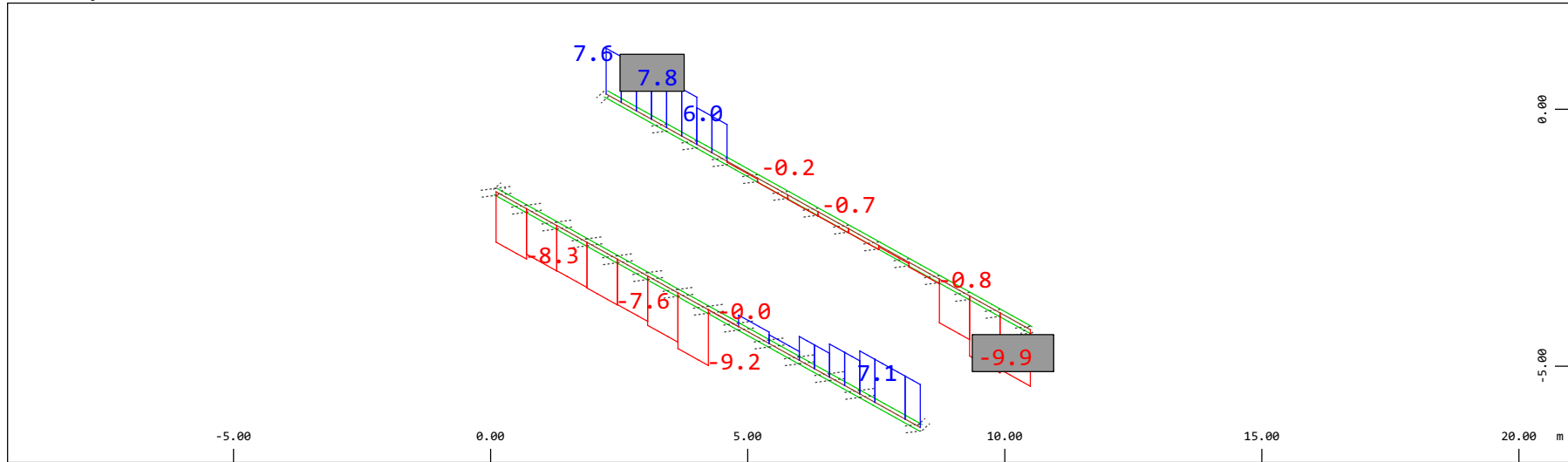
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 0.980 kNm (Min=-0.498) (Max=0.801)

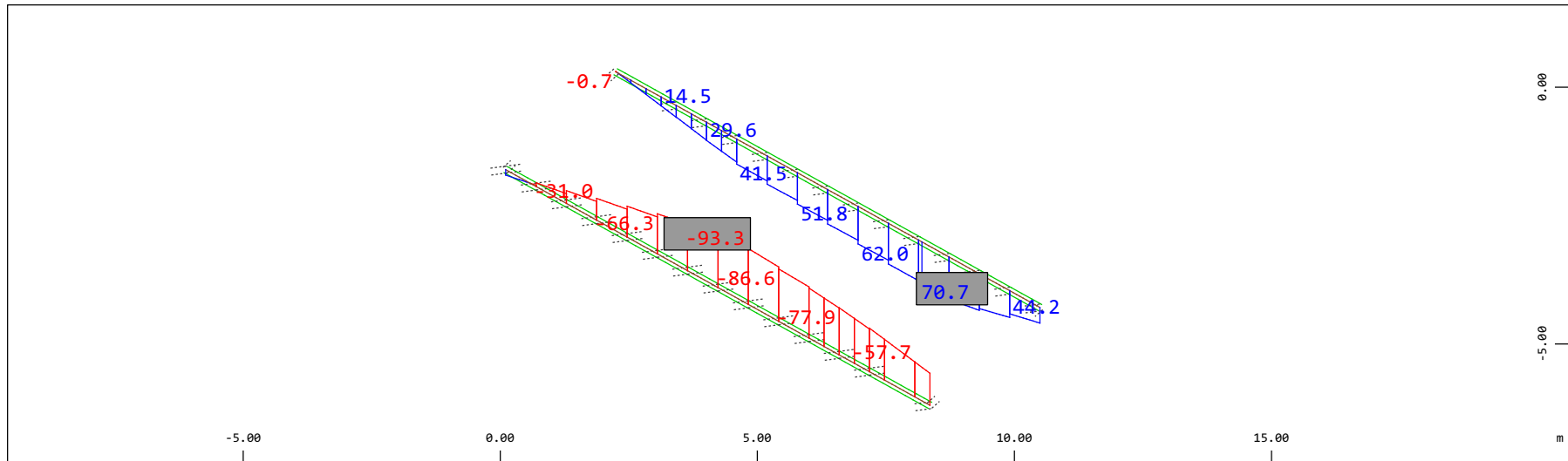
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 9.80 kN (Min=-9.92) (Max=7.80)

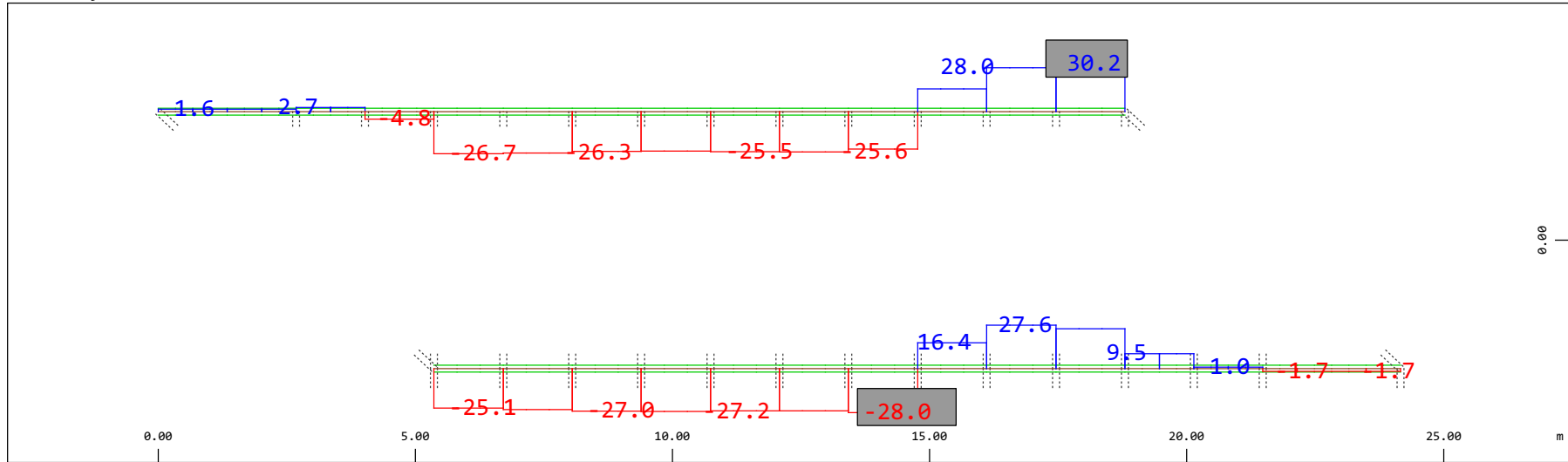
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 98.0 kNm (Min=-93.3) (Max=70.7)

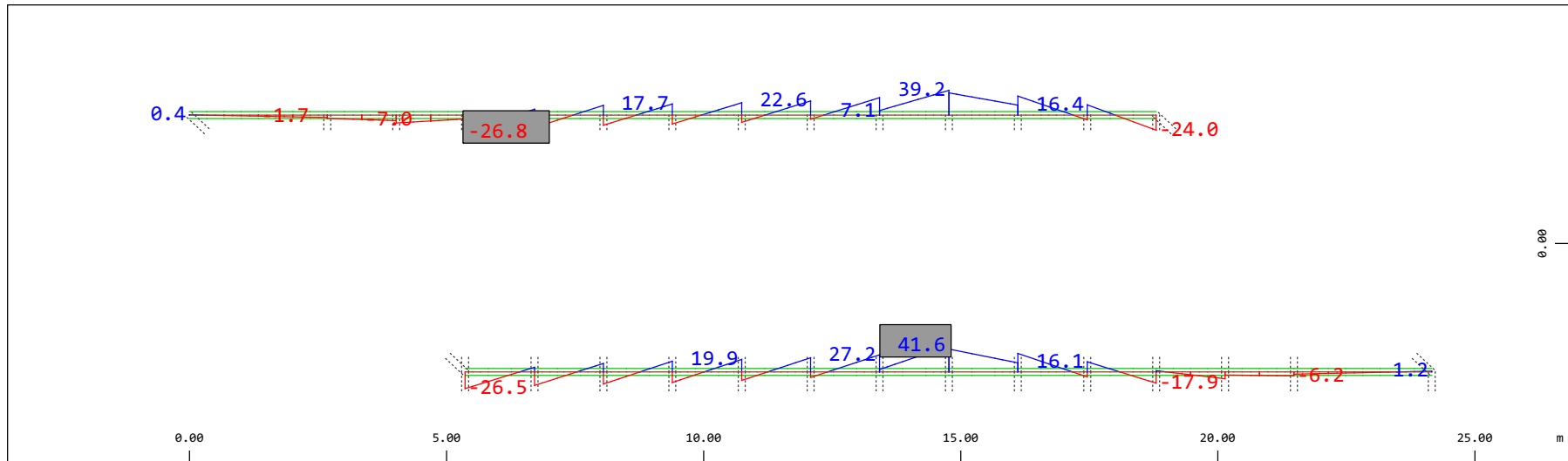
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 39.2 kN (Min=-28.0) (Max=30.2)

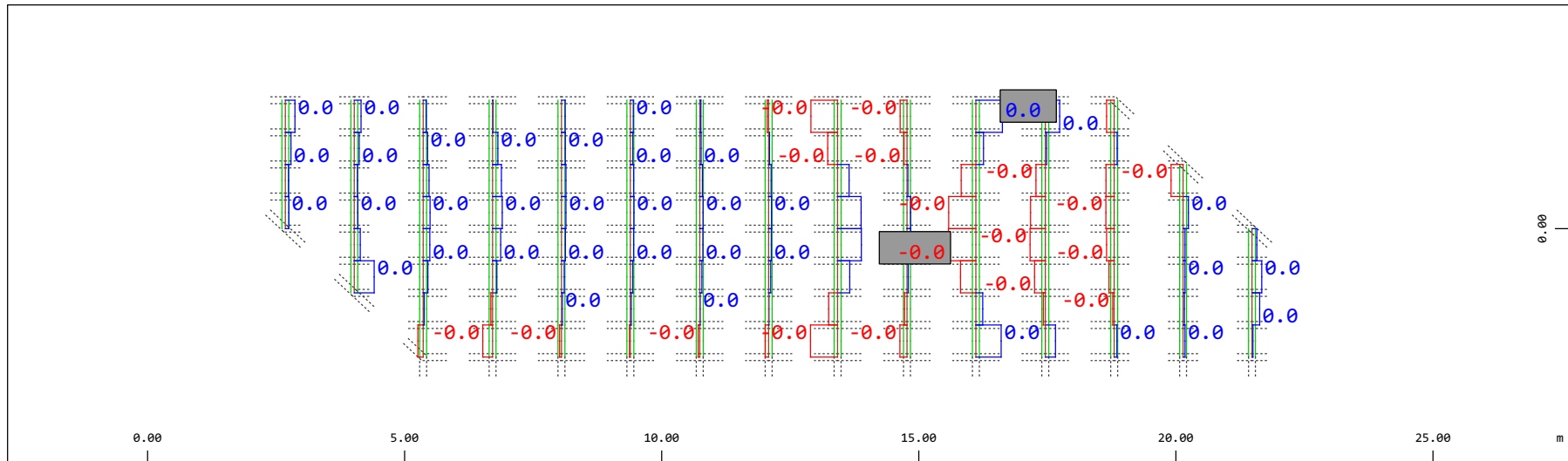
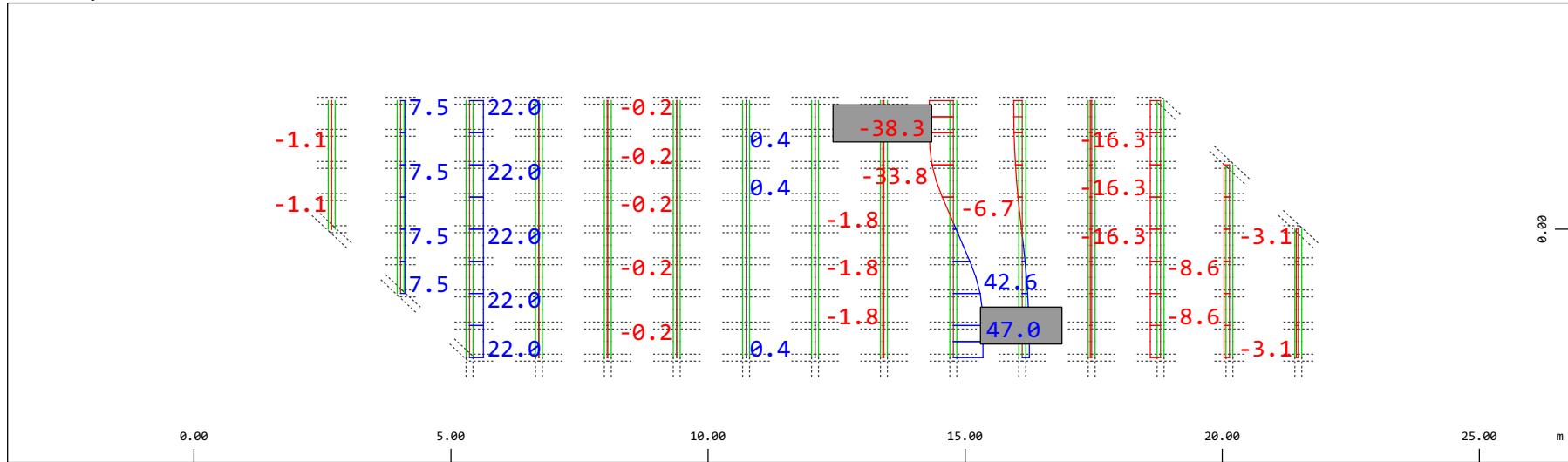
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 98.0 kNm (Min=-26.8) (Max=41.6)

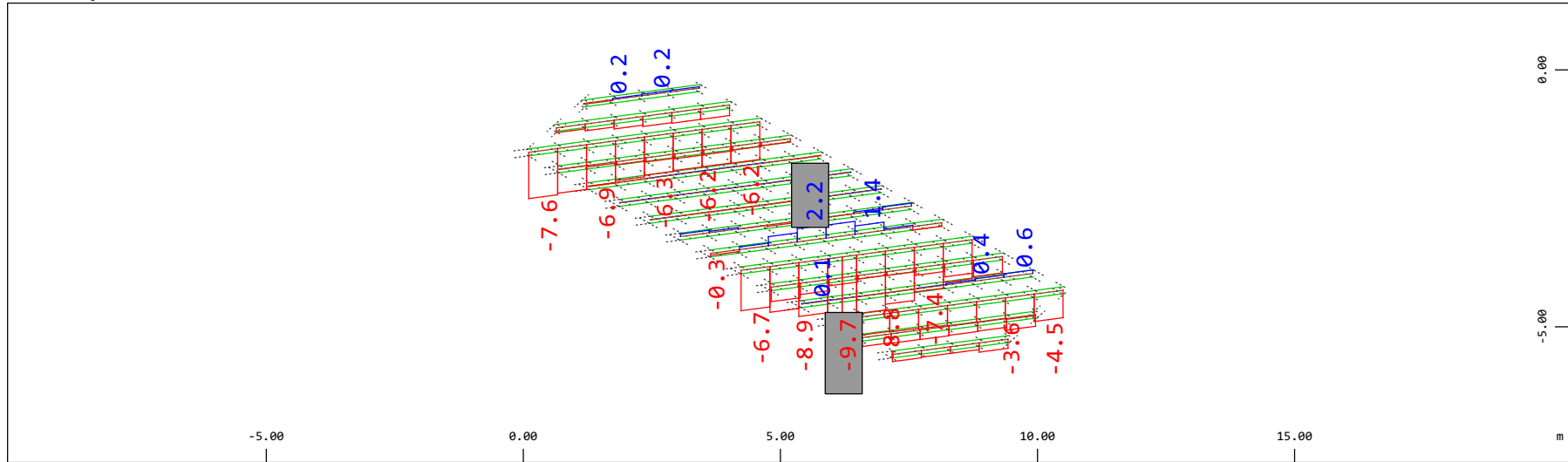
M 1 : 120

Definition of Axis
 Results elementay loads



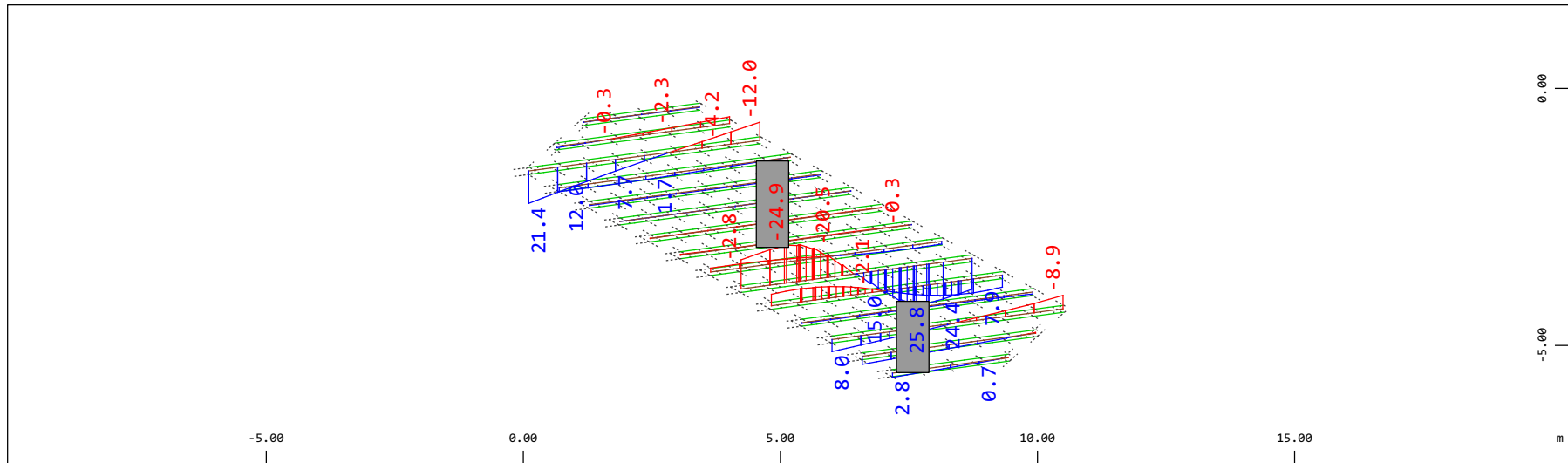
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 9.80 kN (Min=-9.74) (Max=2.18)

M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

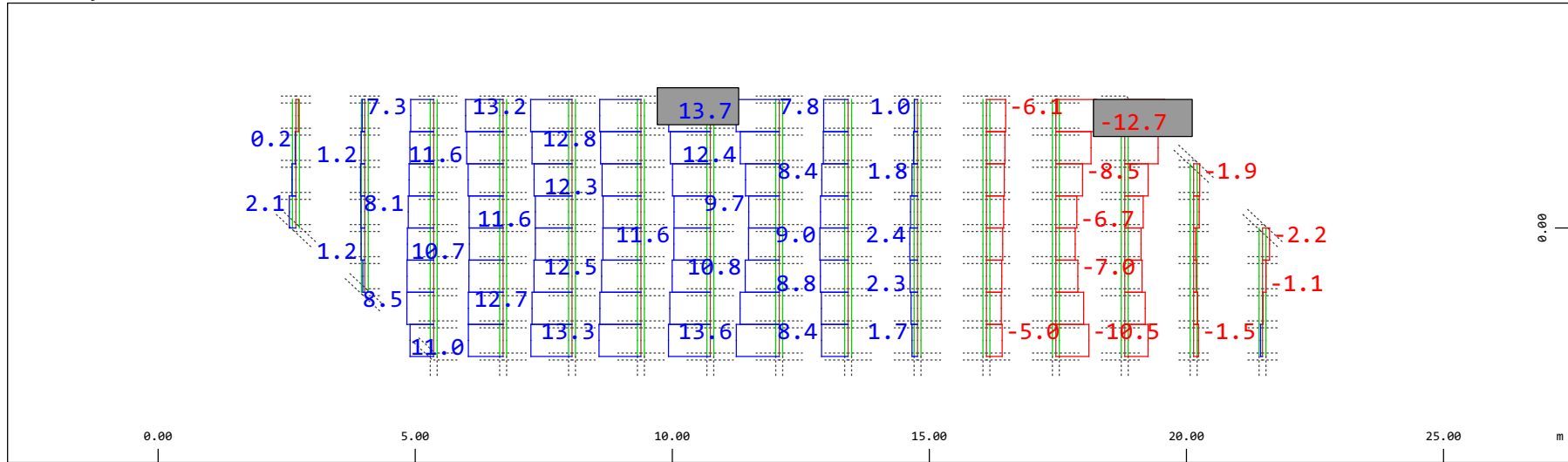


Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 39.2 kNm (Min=-24.9) (Max=25.8)

M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

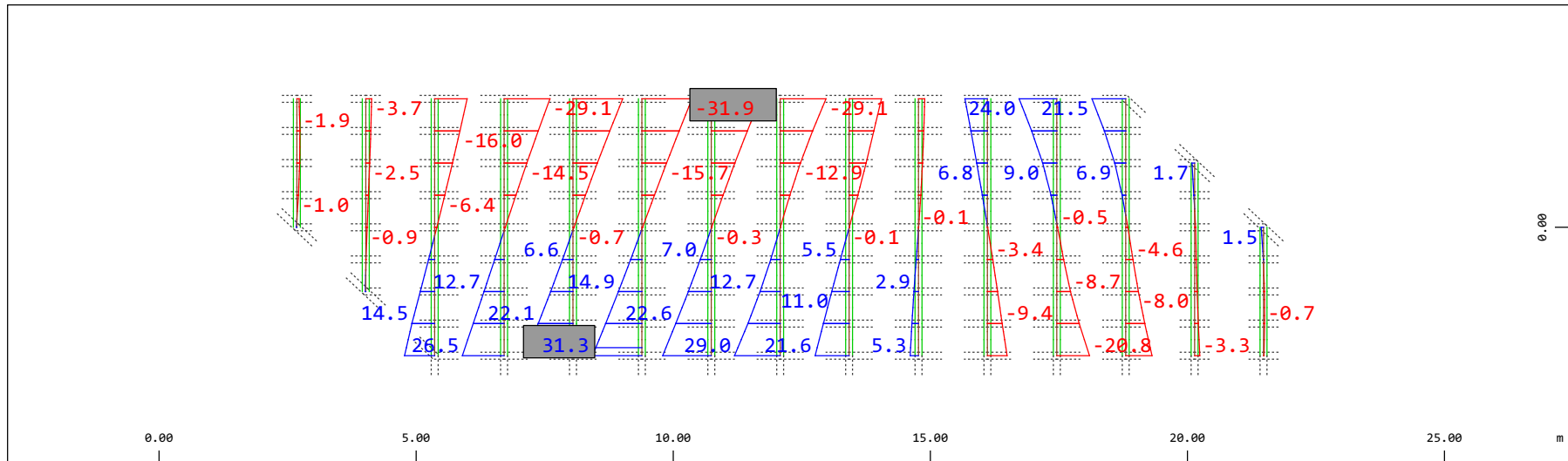
Definition of Axis

Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force V_y , Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-12.7) (Max=13.7)

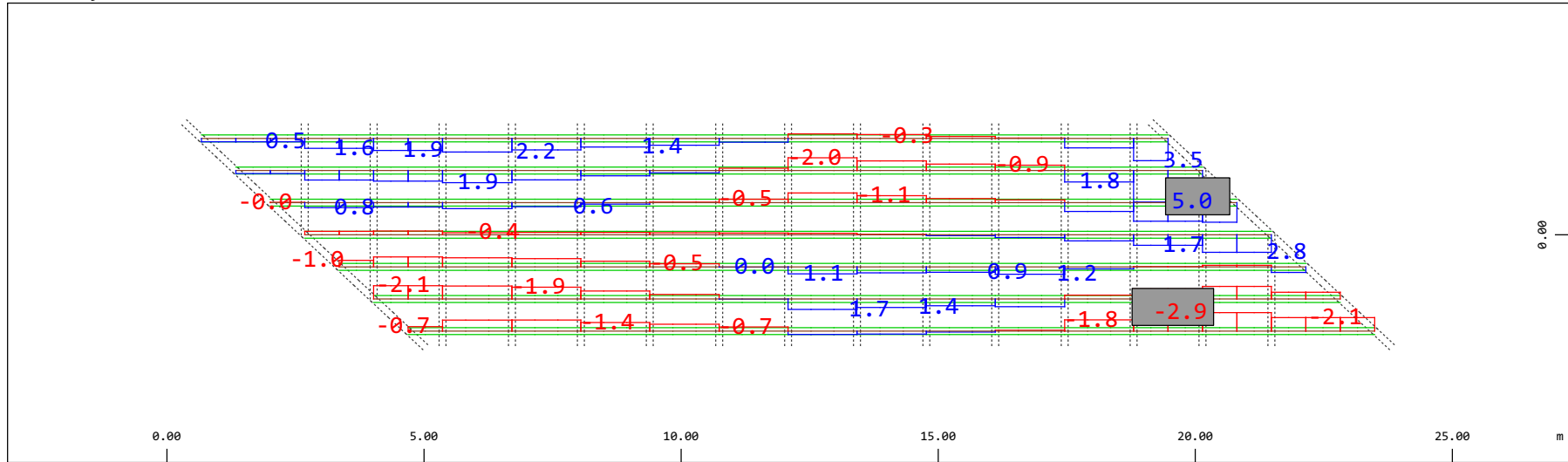
M 1 : 120



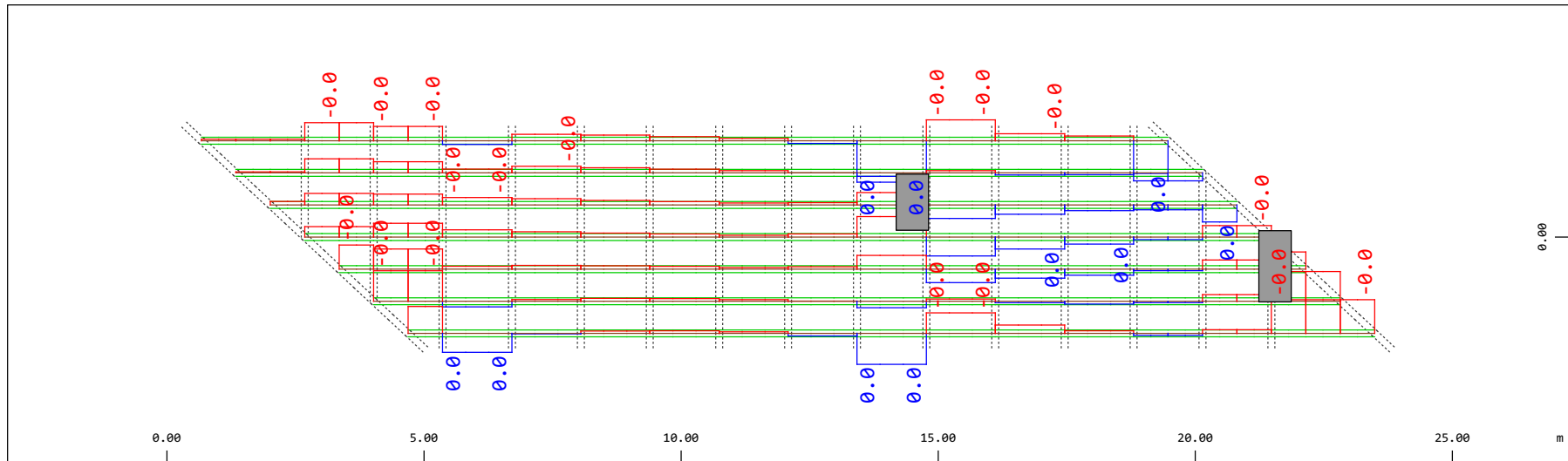
Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment M_z , Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 39.2 kNm (Min=-31.9) (Max=31.3)

M 1 : 120

Definition of Axis
 Results elementay loads



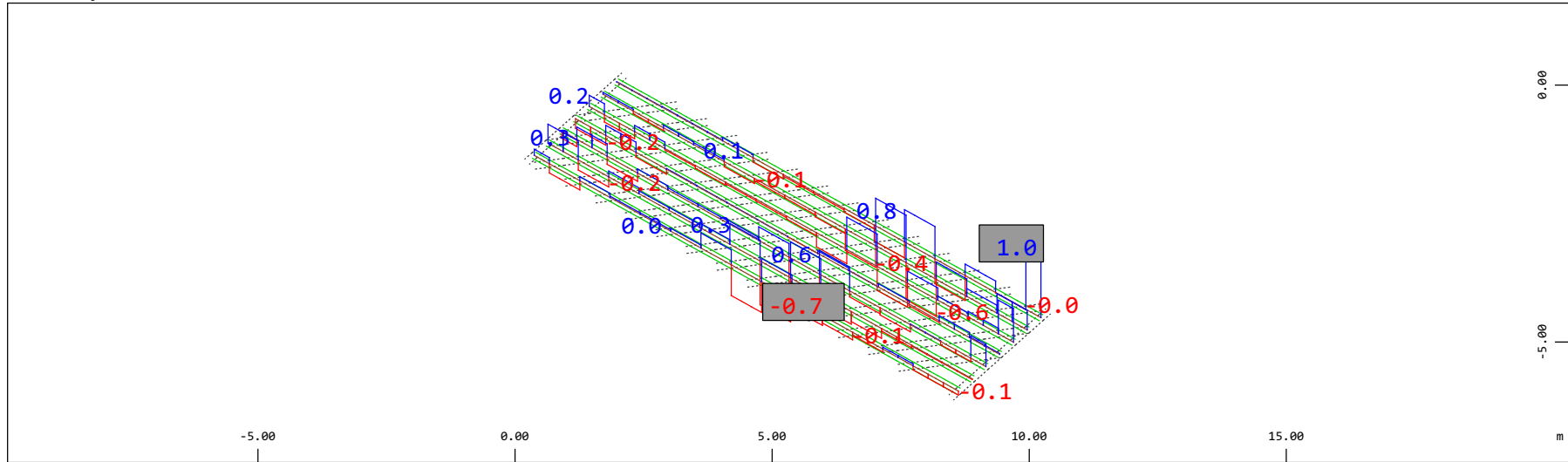
Y Sector of system Beam Elements Group 31...37
 Z-X Beam Elements , Normal force Nx, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 9.80 kN (Min=-2.94) (Max=5.01) M 1 : 120



Y Sector of system Beam Elements Group 31...37
 Z-X Beam Elements , Torsional moment Mt, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 9.8047e-04 kNm (Min=-5.3517e-04) (Max=5.6566e-04) M 1 : 120

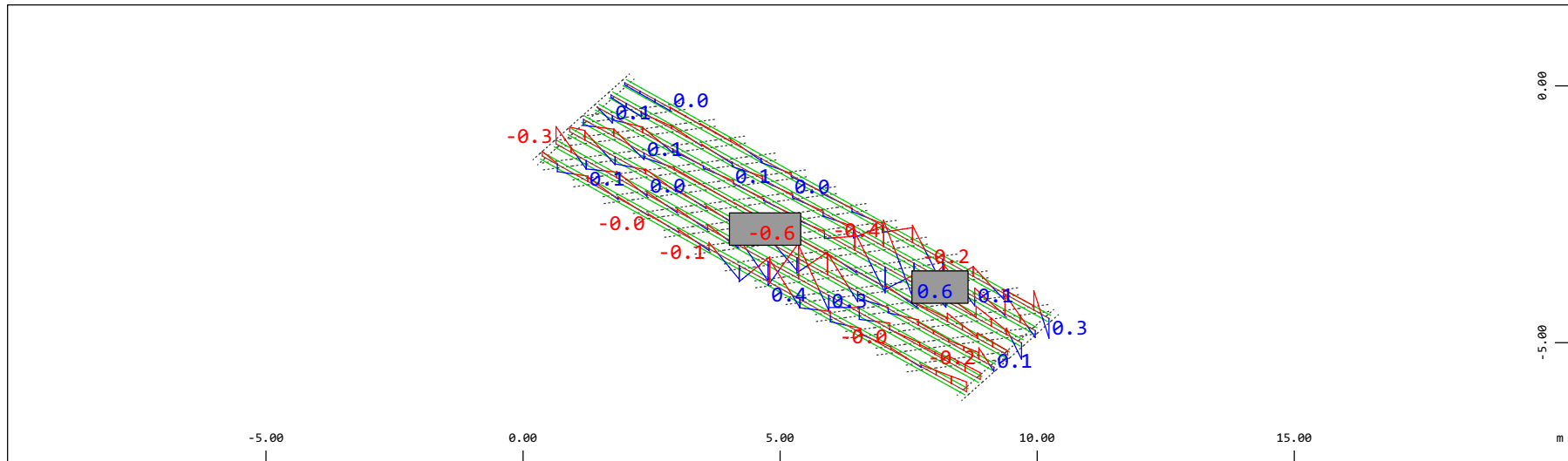
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 0.980 kN (Min=-0.724) (Max=0.962)

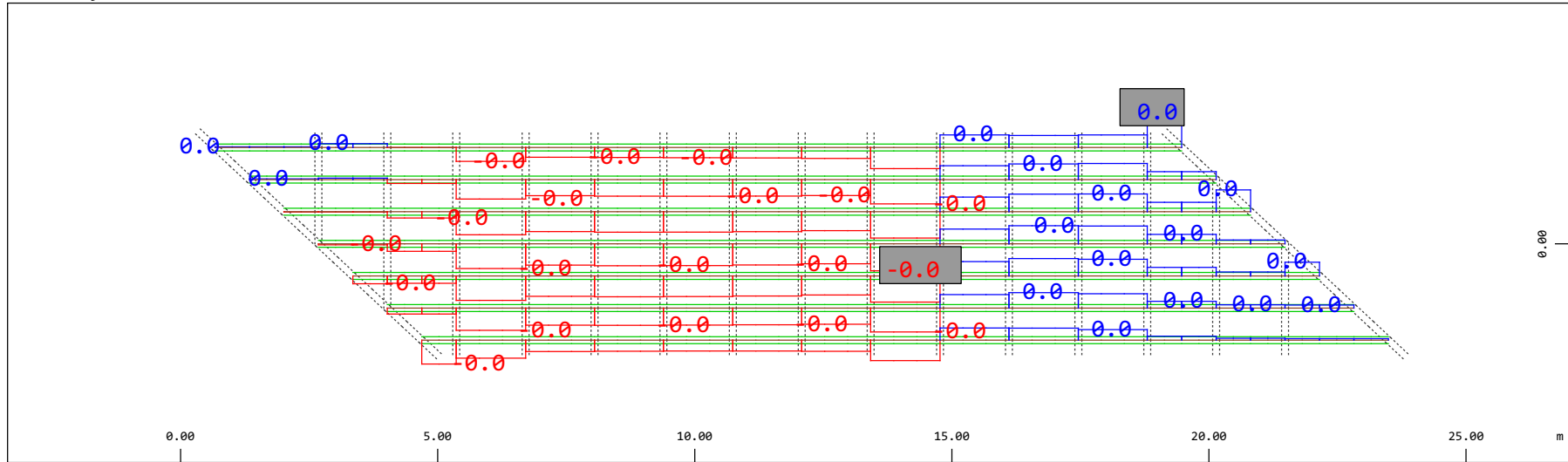
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 0.980 kNm (Min=-0.587) (Max=0.625)

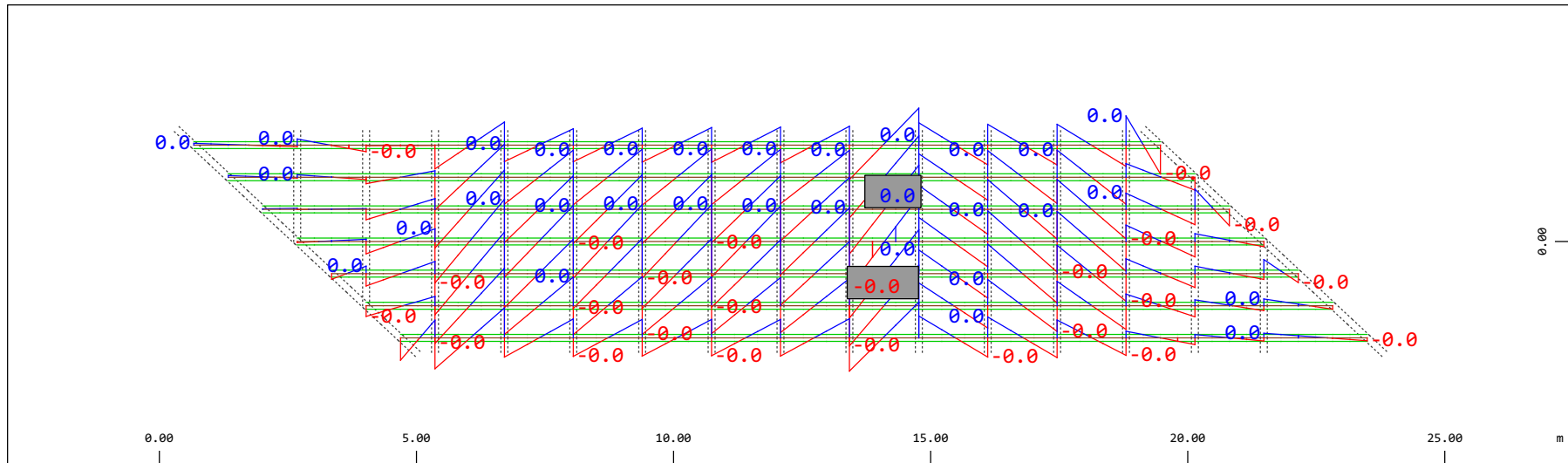
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 0.0098 kN (Min=-0.0043) (Max=0.0055)

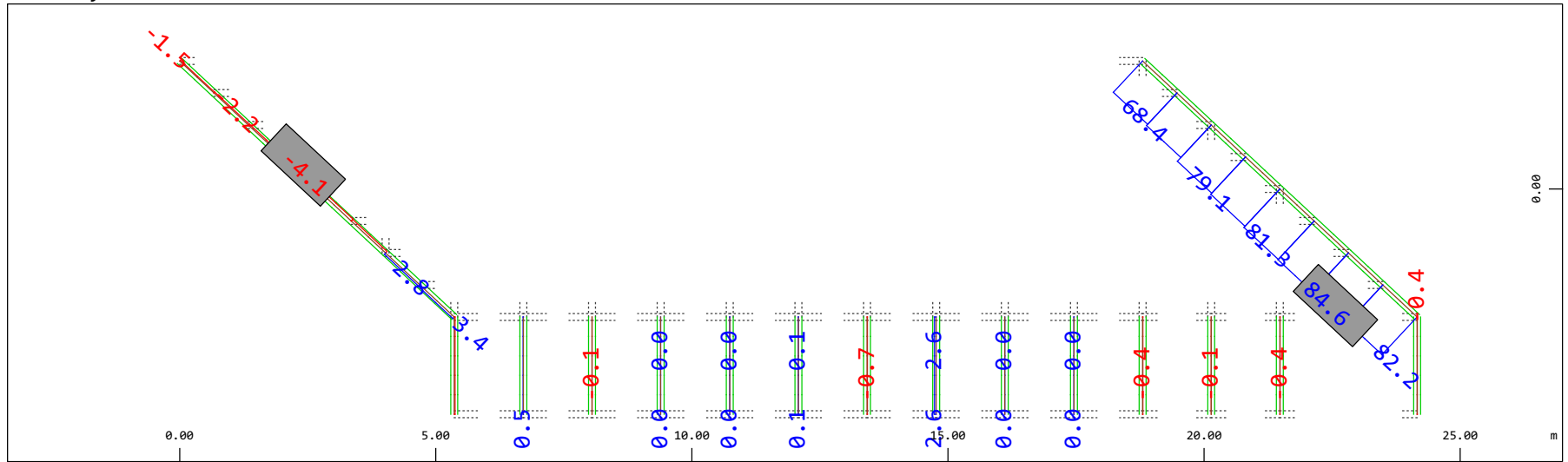
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 0.0039 kNm (Min=-0.0029) (Max=0.0029)

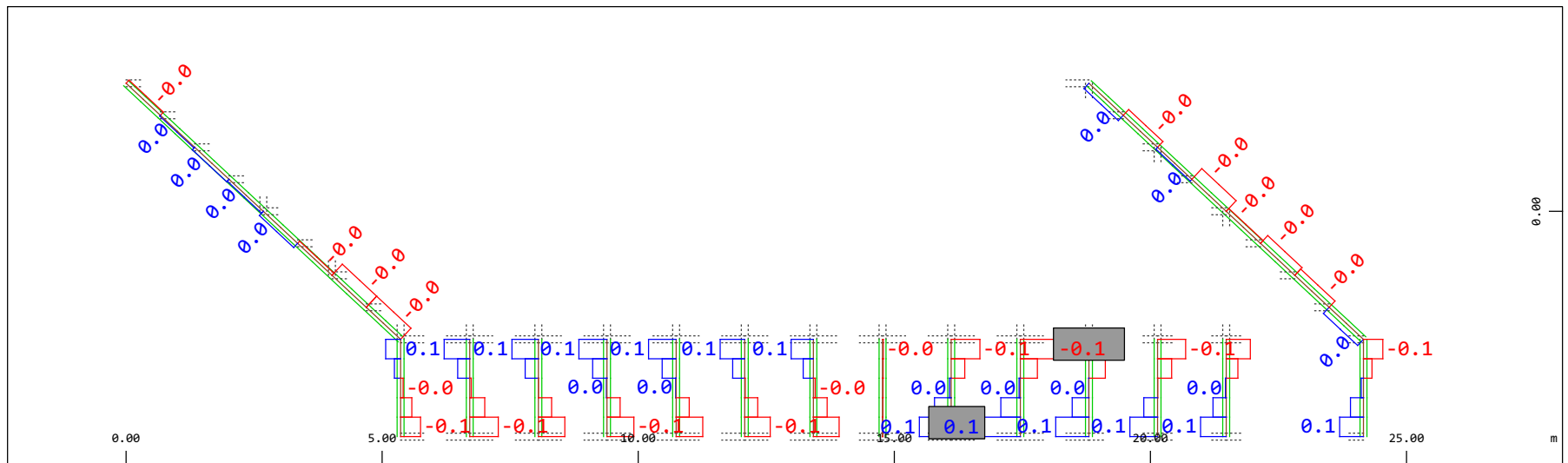
M 1 : 120

Definition of Axis
Results elementary loads



Y Sector of system Beam Elements Group 20 23
Z-X Beam Elements , Normal force Nx, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 98.0 kN (Min=-4.08) (Max=84.6)

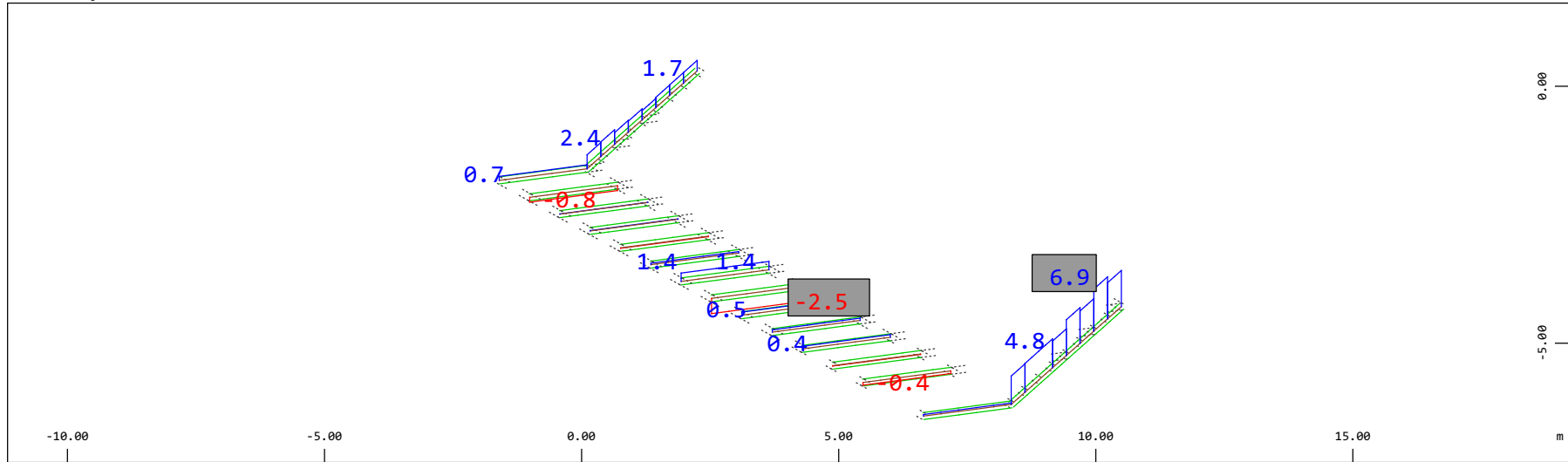
M 1 : 120



Y Sector of system Beam Elements Group 20 23
Z-X Beam Elements , Torsional moment Mt, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 0.196 kNm (Min=-0.113) (Max=0.120)

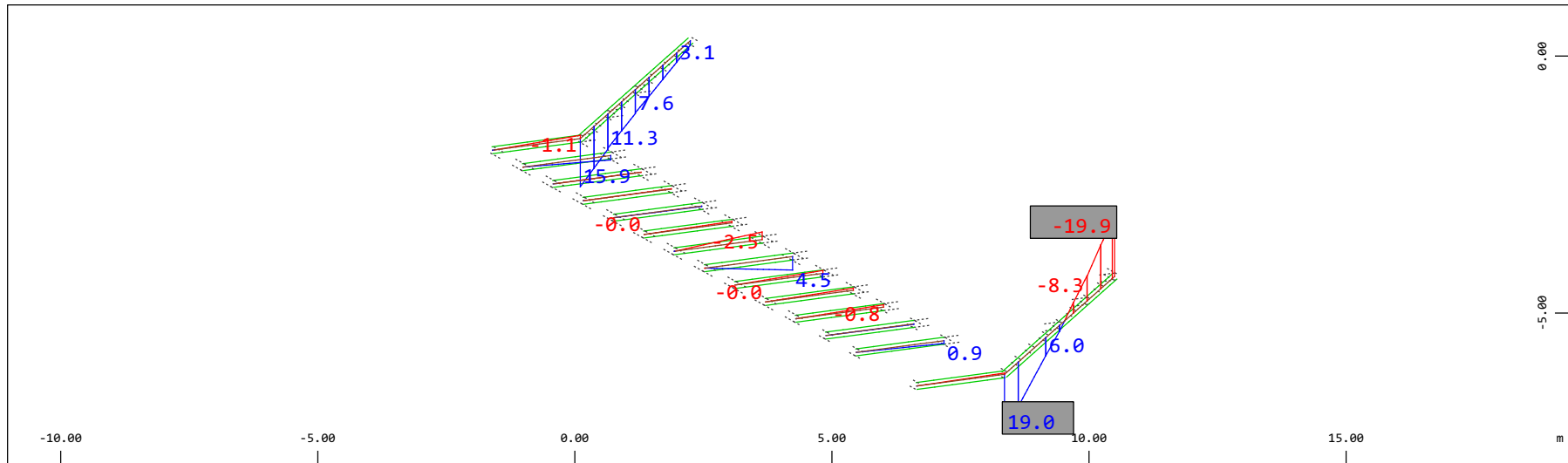
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 9.80 kN (Min=-2.52) (Max=6.93)

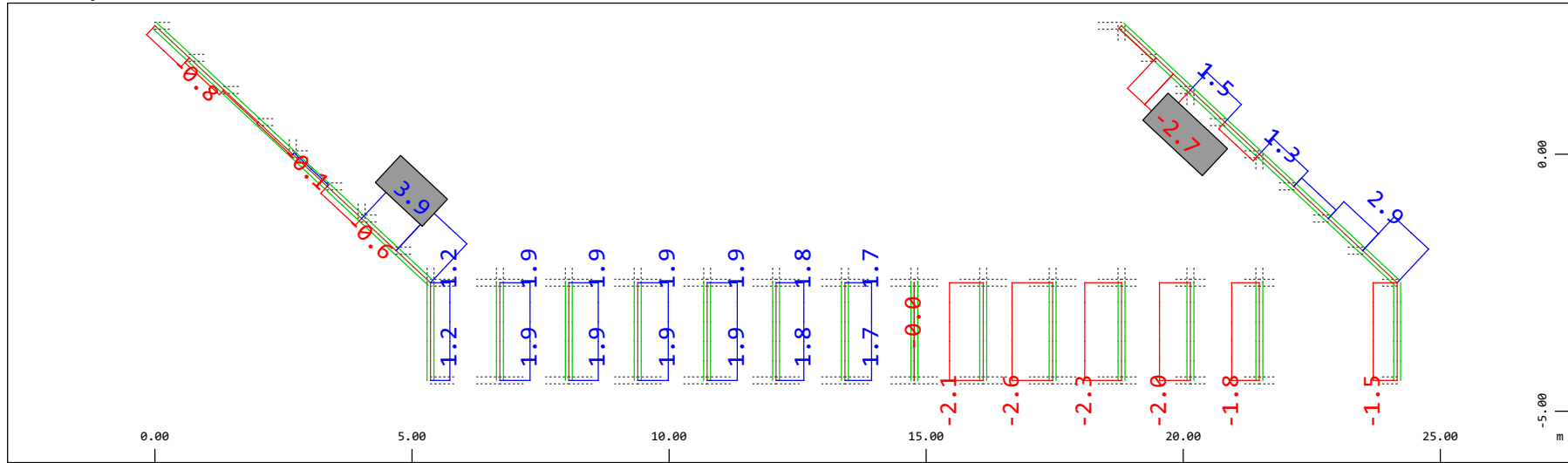
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 19.6
 kNm (Min=-19.9) (Max=19.0)

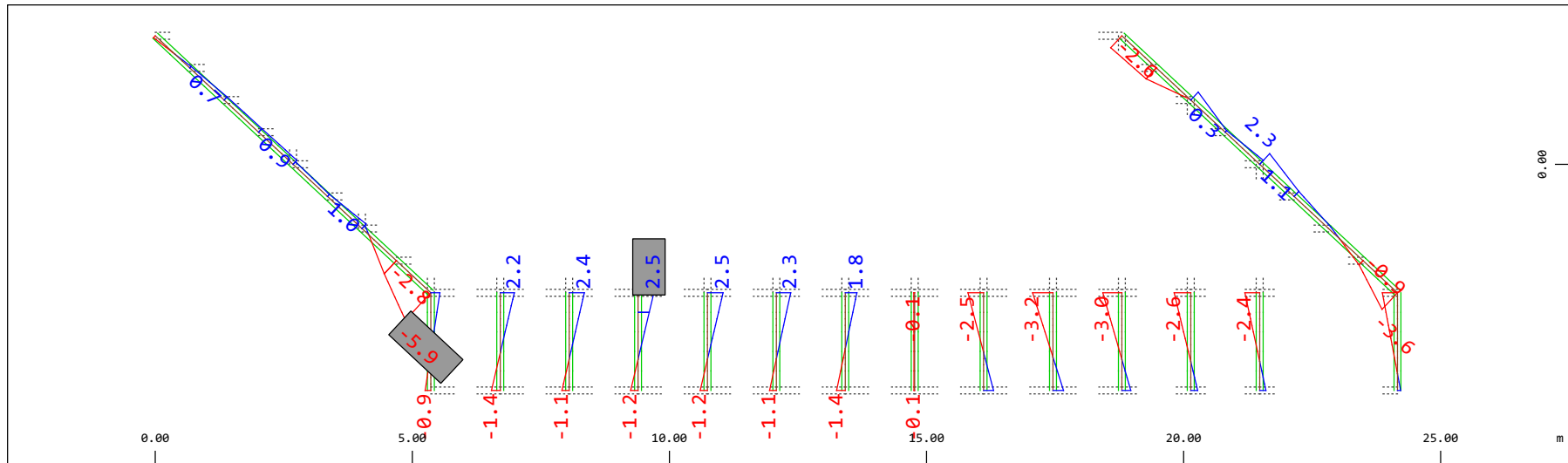
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 3.92 kN (Min=-2.65) (Max=3.87)

M 1 : 120

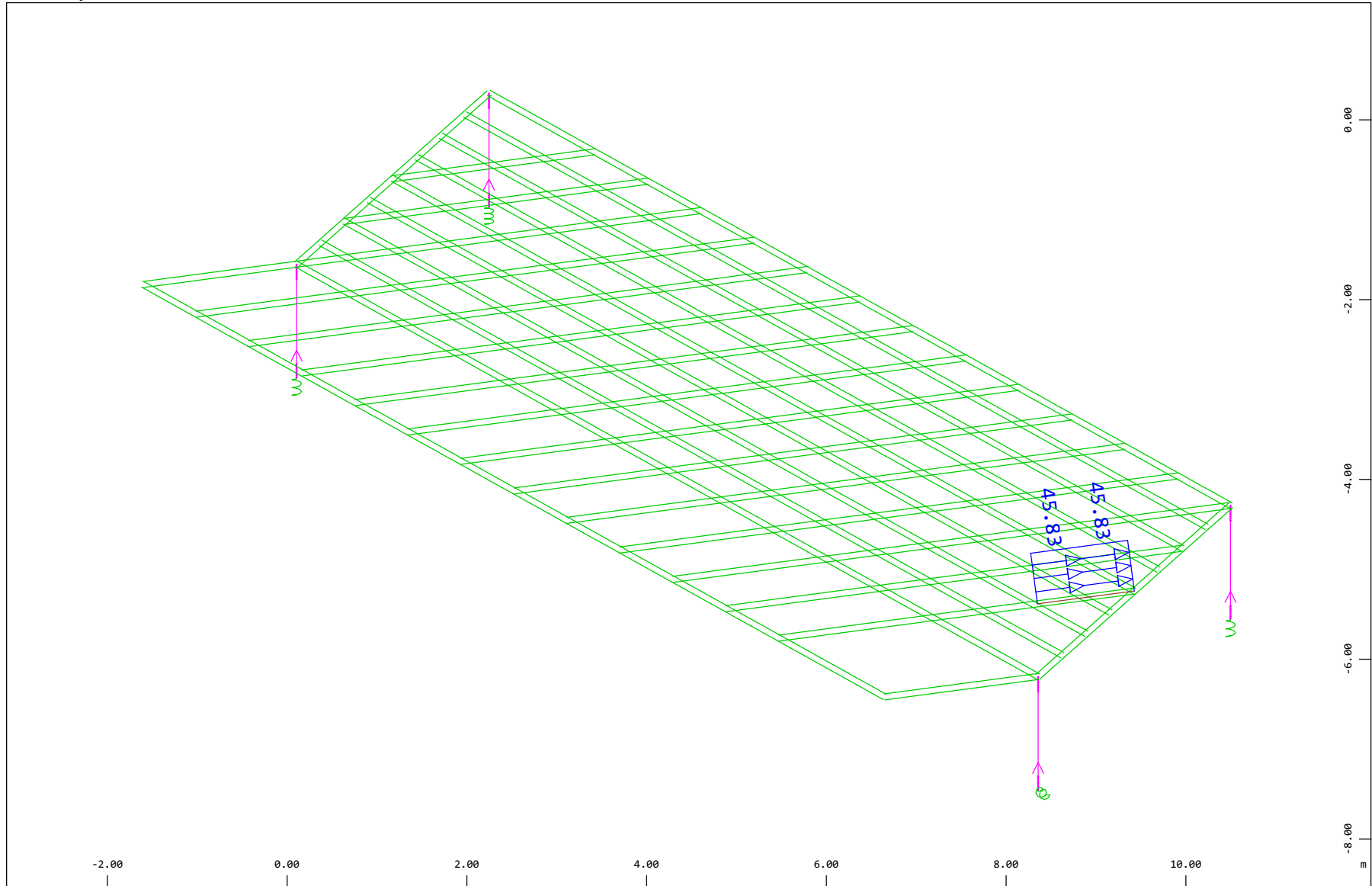


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 314 Qt: Serpeggio-S 15m (DX-->SX) , 1 cm 3D = 9.80 kNm (Min=-5.94) (Max=2.52)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 Y
 X

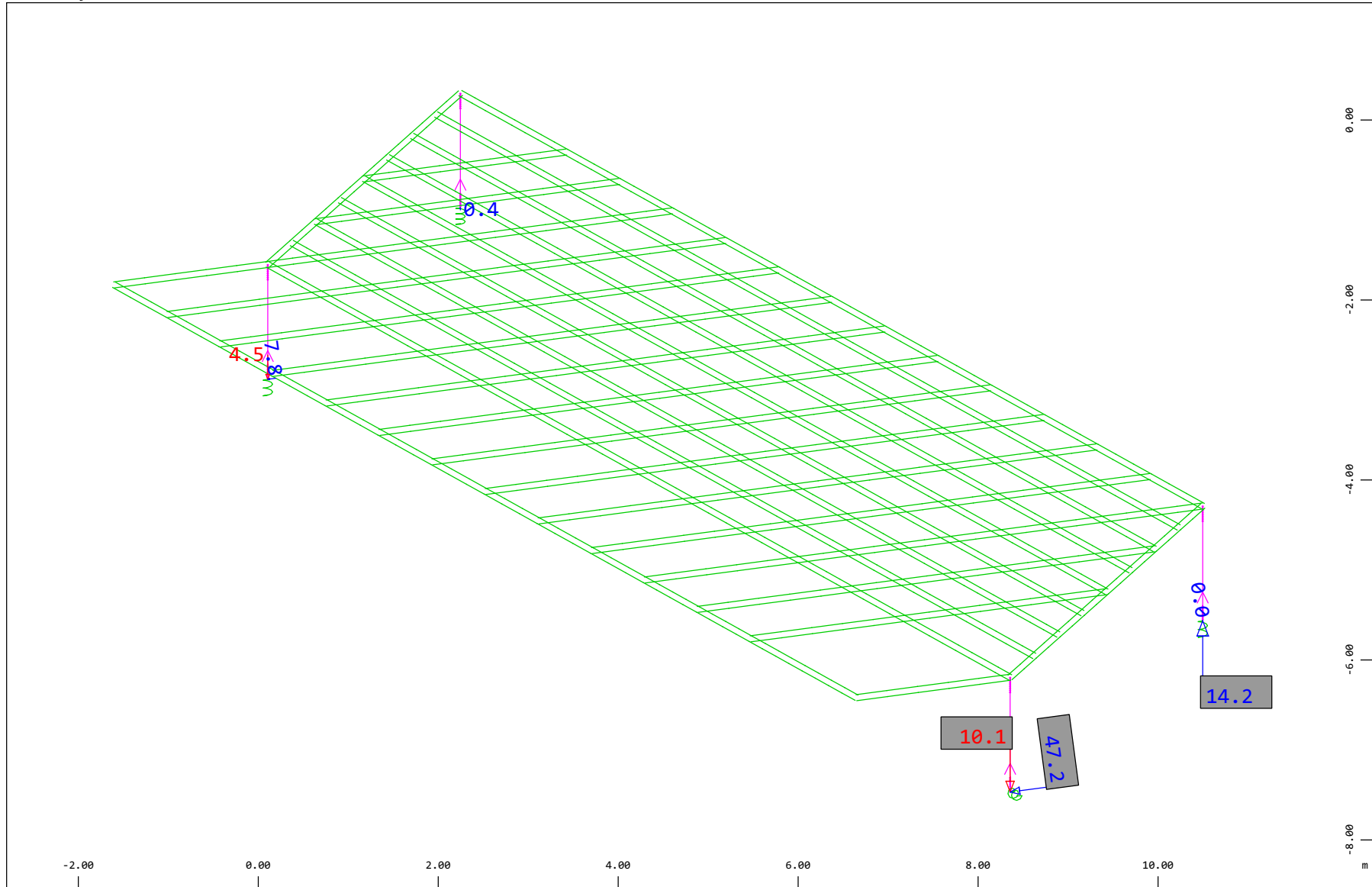
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=48.4 kN/m)
 (Max=45.8)



M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

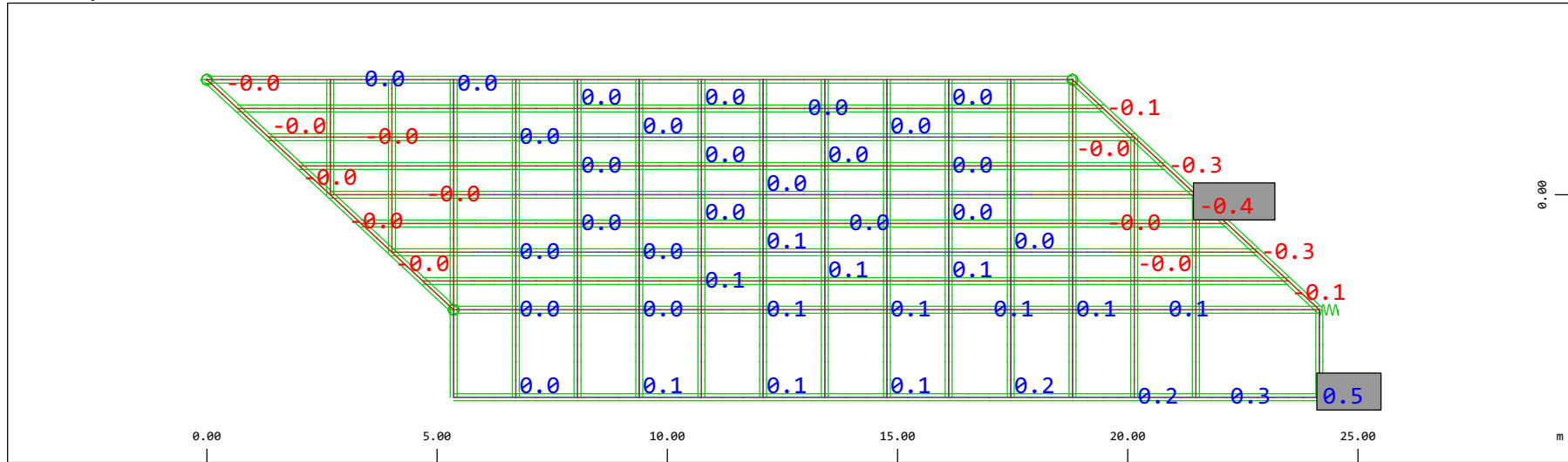
Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 9.69 kN
 (total: -9.5367e-07)

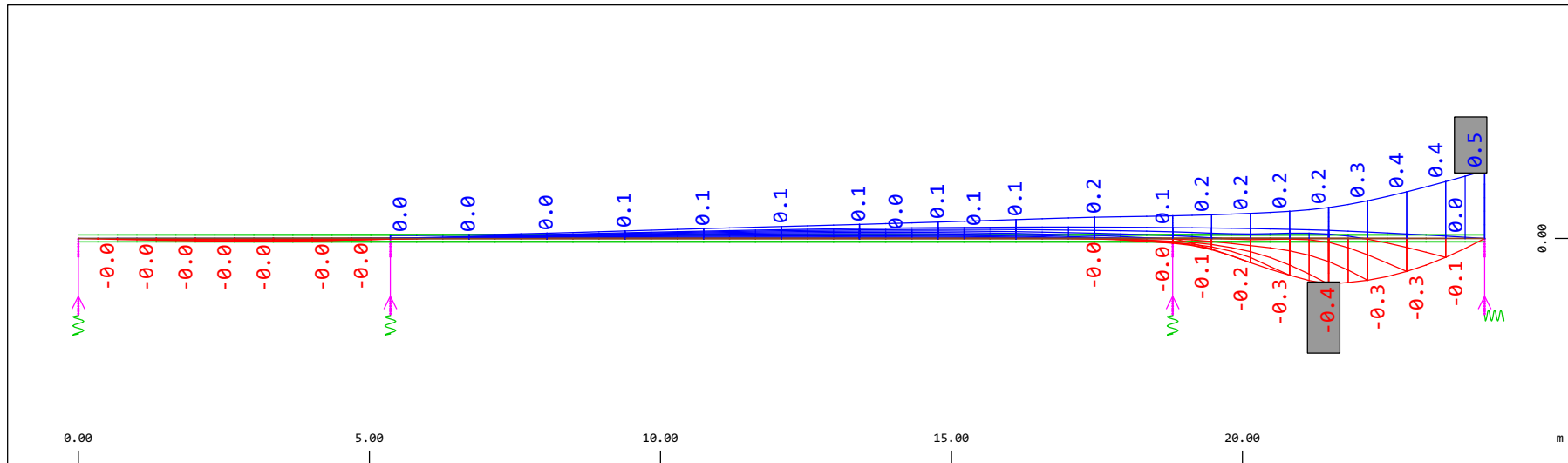
◁ (Min=-10.1) (Max=14.2)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

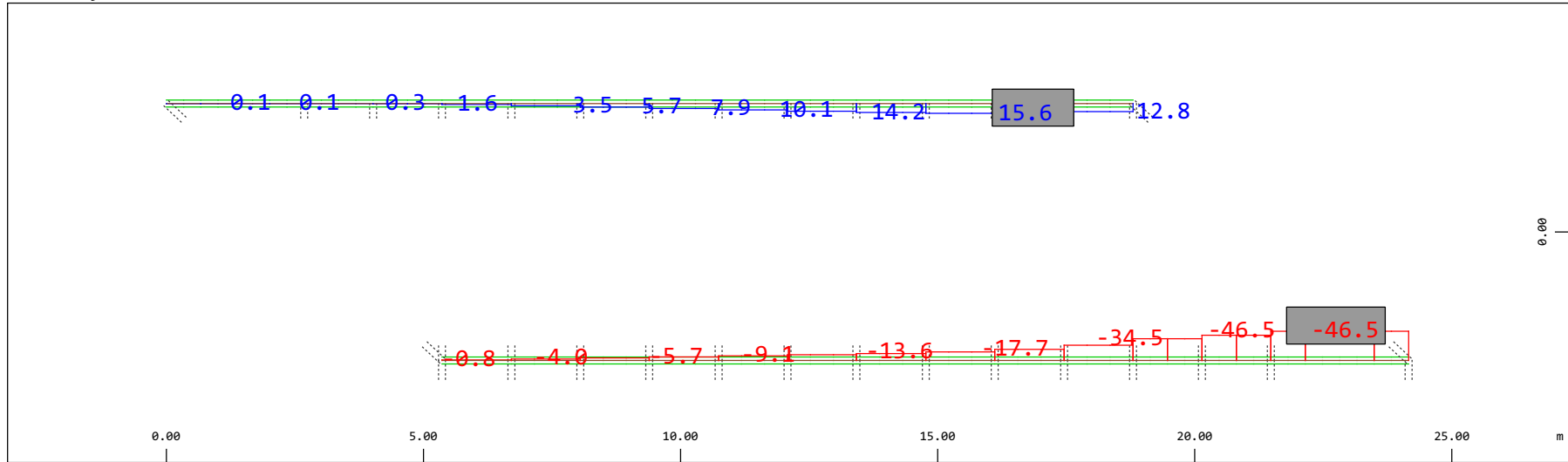


Y Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 0.484 mm (Min=-0.359) (Max=0.531) M 1 : 134



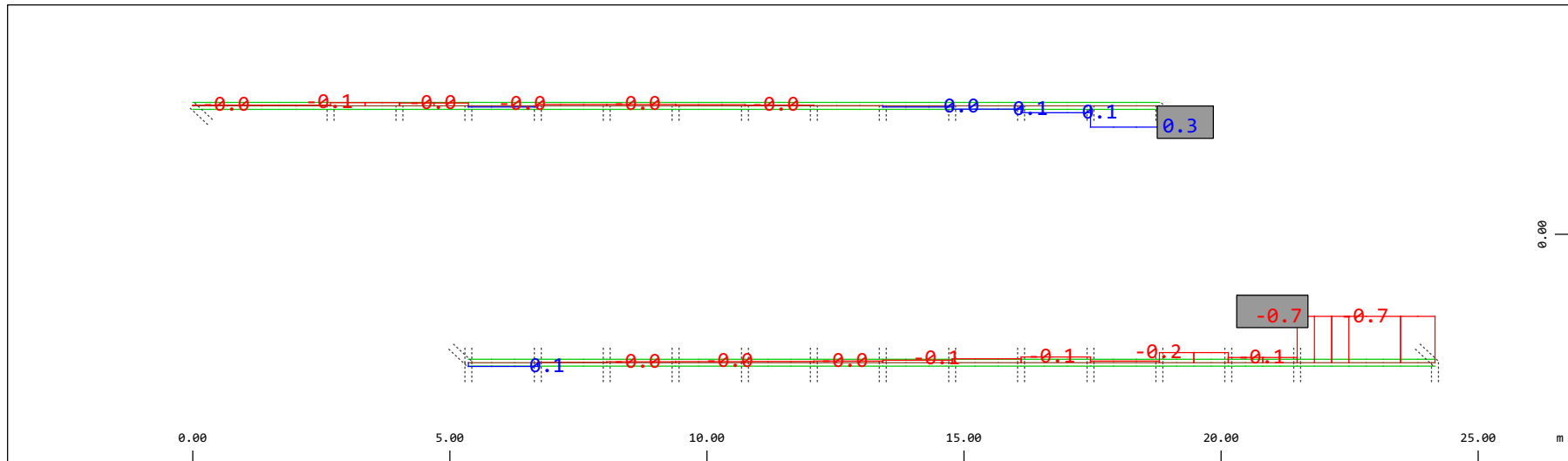
Z Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 0.484 mm (Min=-0.359) (Max=0.531) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 98.0 kN (Min=-46.5) (Max=15.6)

M 1 : 120

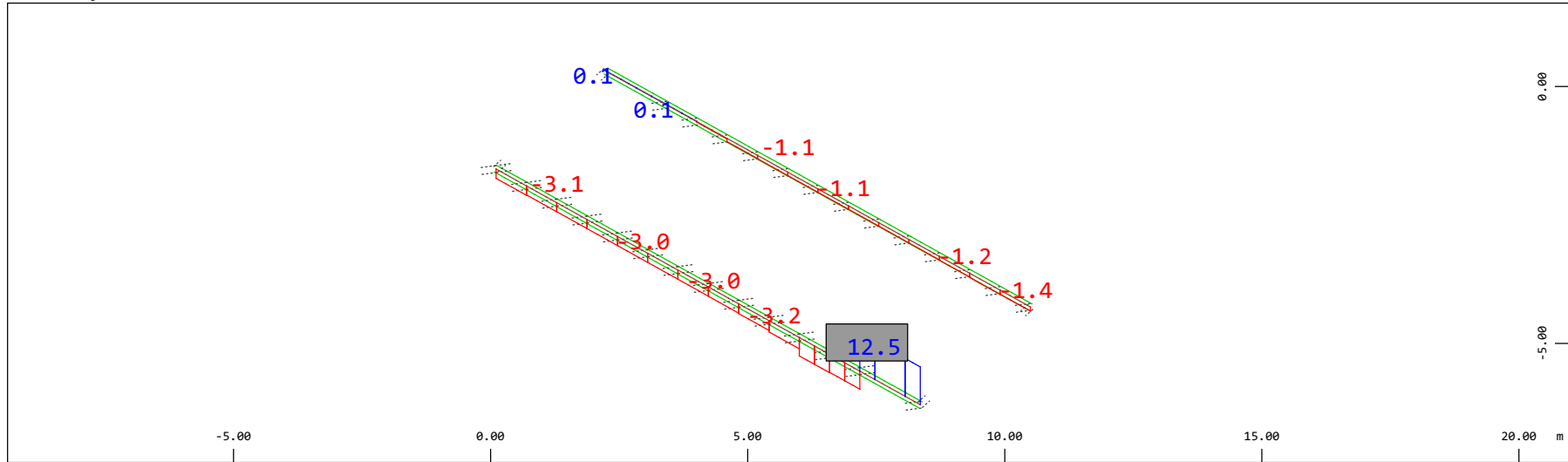


Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 0.980 kNm (Min=-0.737) (Max=0.338)

M 1 : 120

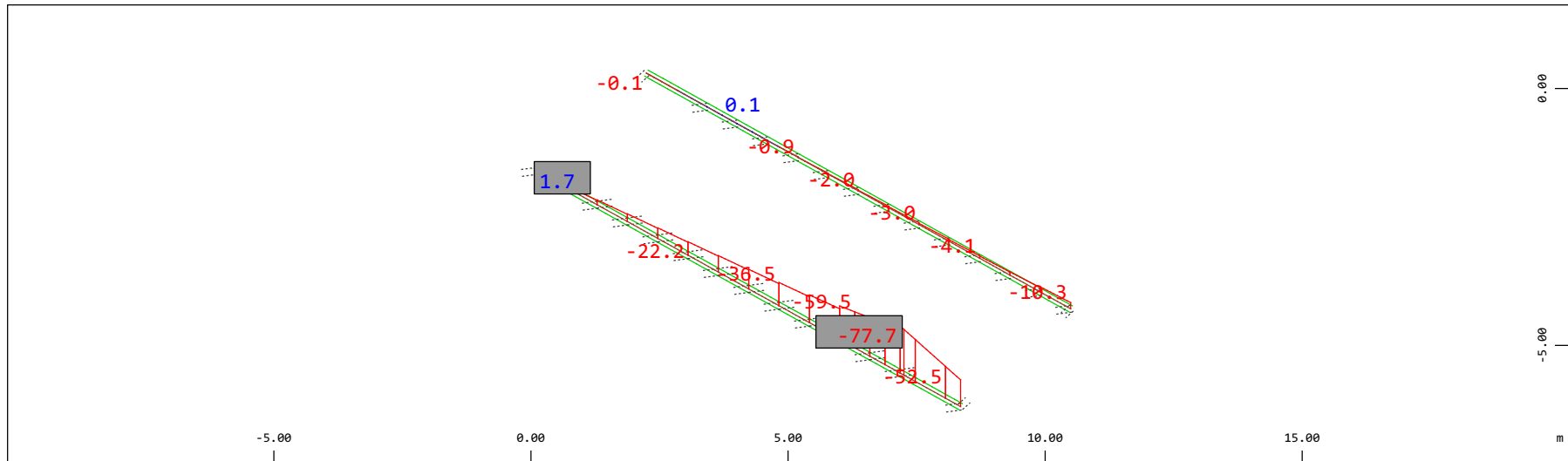
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-6.08) (Max=12.5)

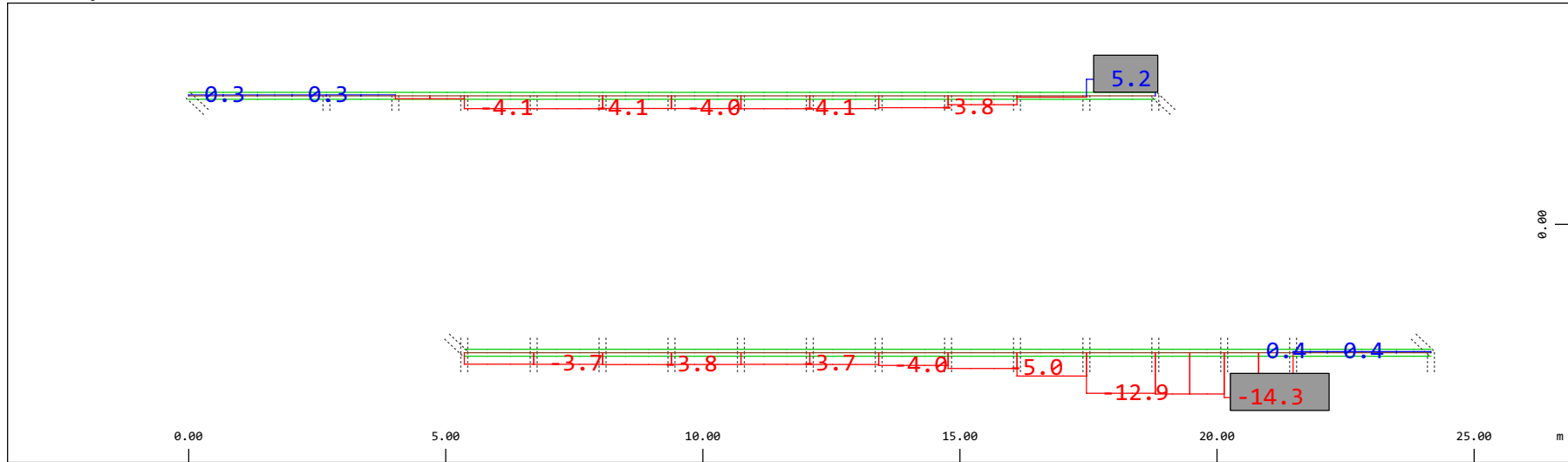
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



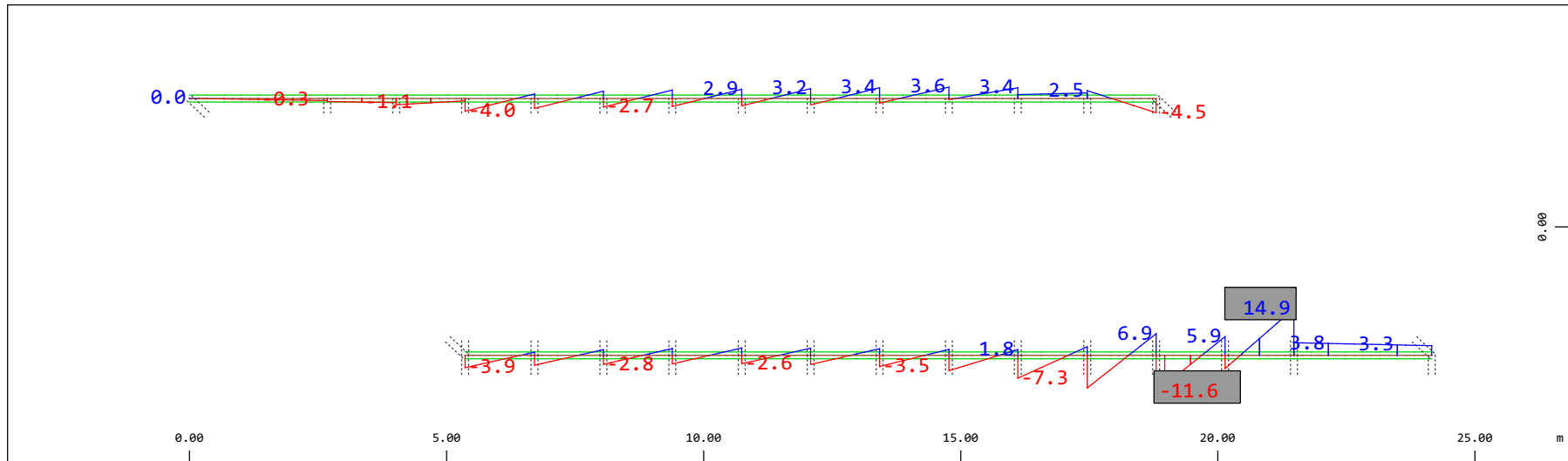
Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 98.0
 kNm (Min=-77.7) (Max=1.66)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

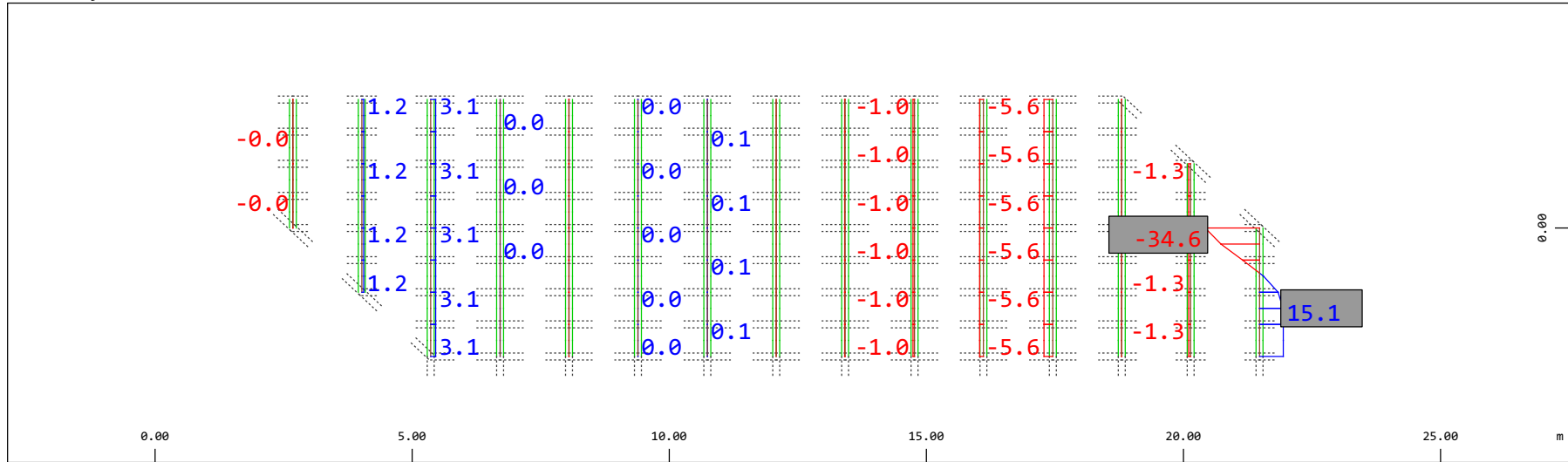


Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-14.3) (Max=5.24) M 1 : 120



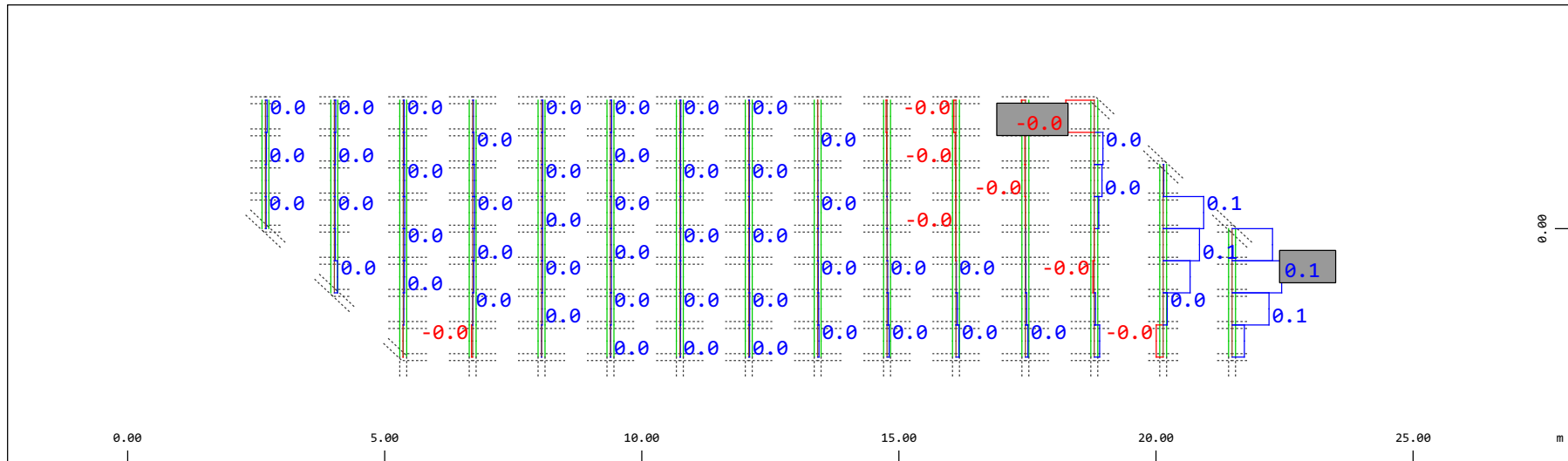
Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kNm (Min=-11.6) (Max=14.9) M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 39.2 kN (Min=-34.6) (Max=15.1)

M 1 : 120

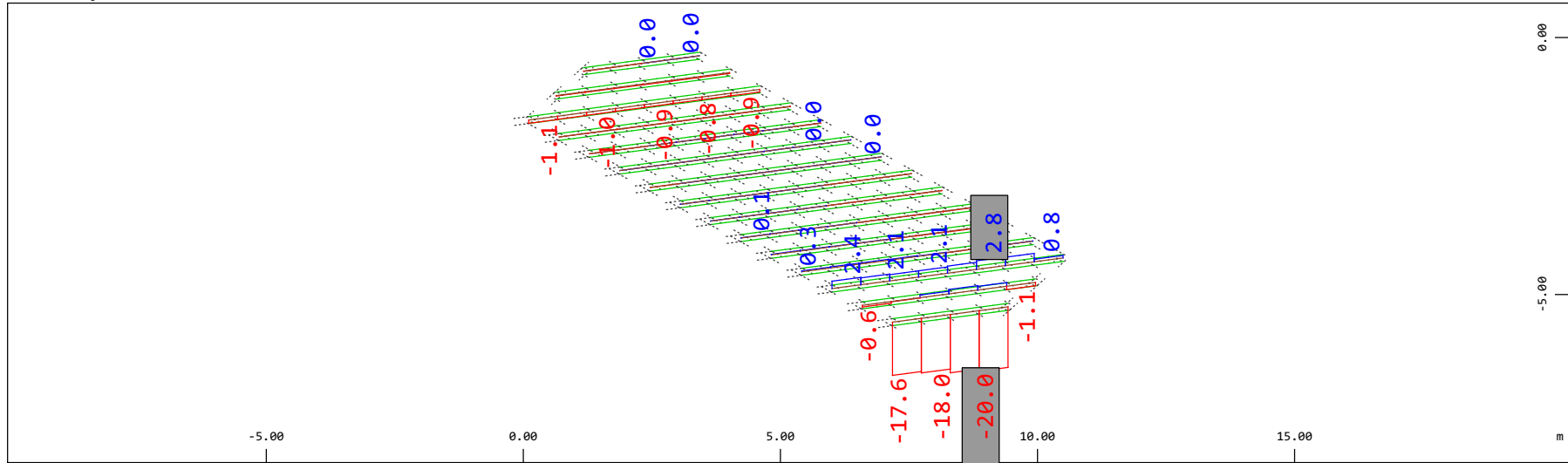


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 0.0980 kNm (Min=-0.0452) (Max=0.0788)

M 1 : 120

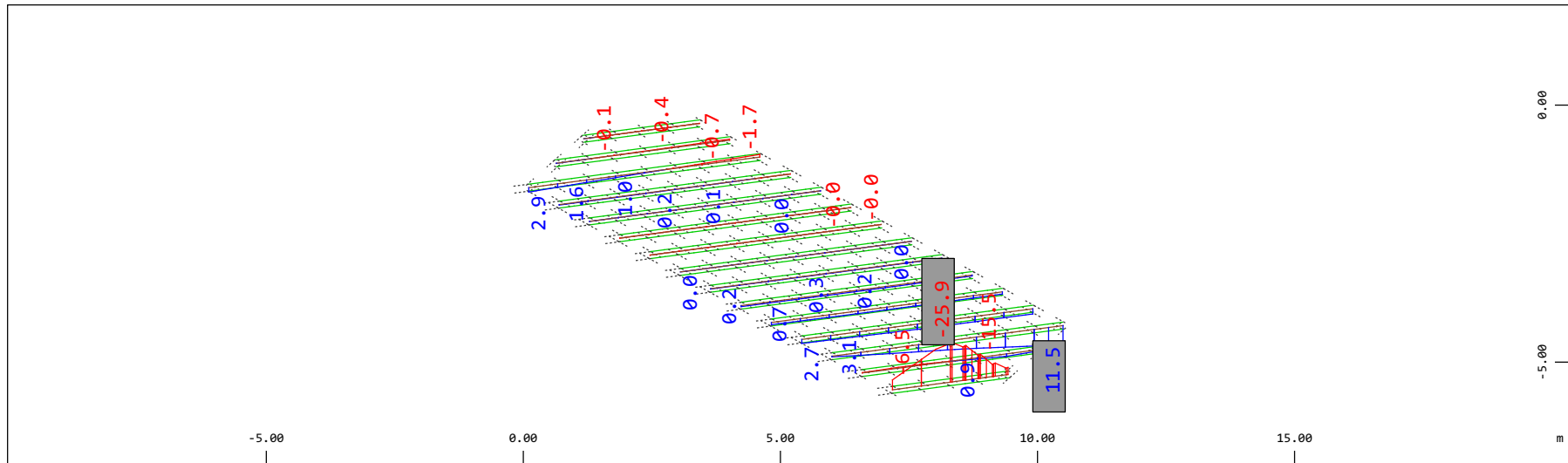
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-20.0) (Max=2.84)

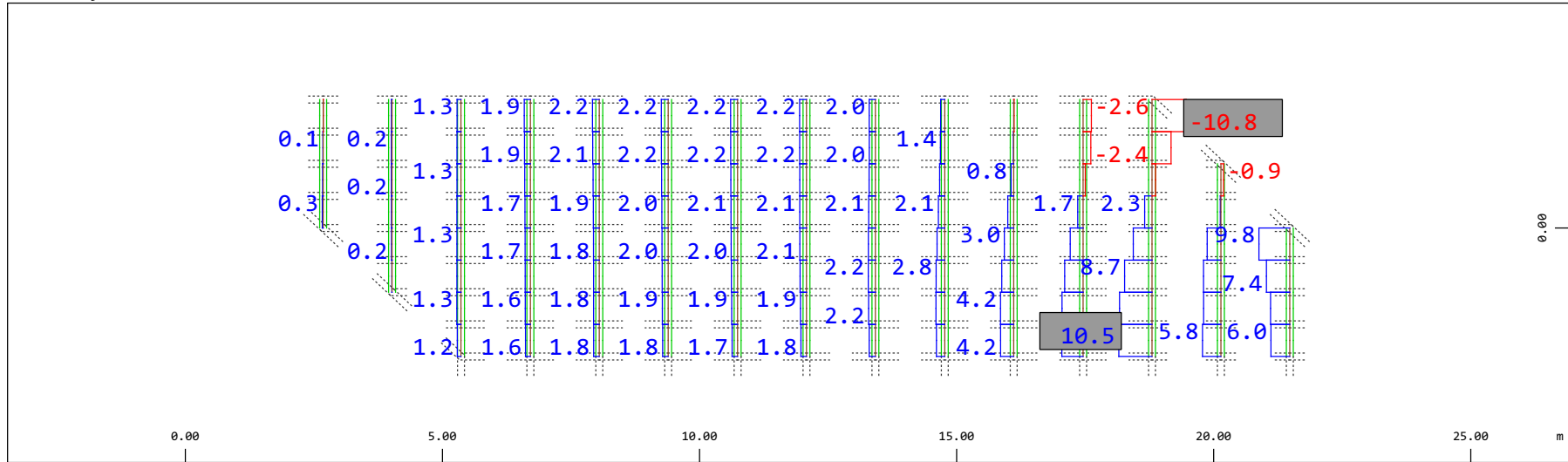
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 39.2 kNm (Min=-25.9) (Max=11.5)

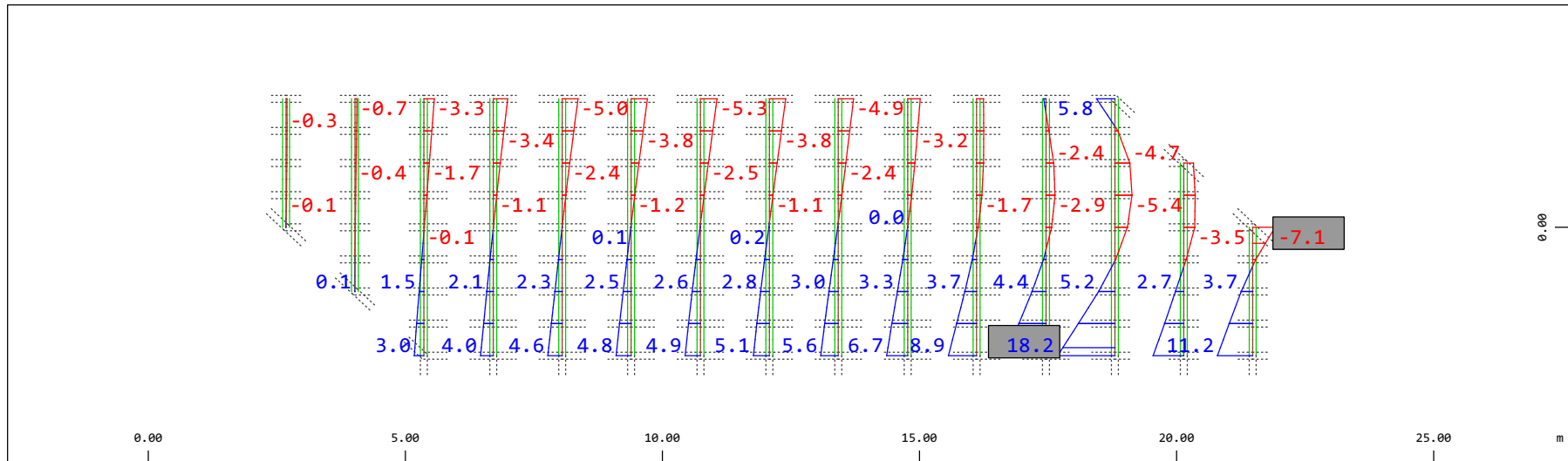
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-10.8) (Max=10.5)

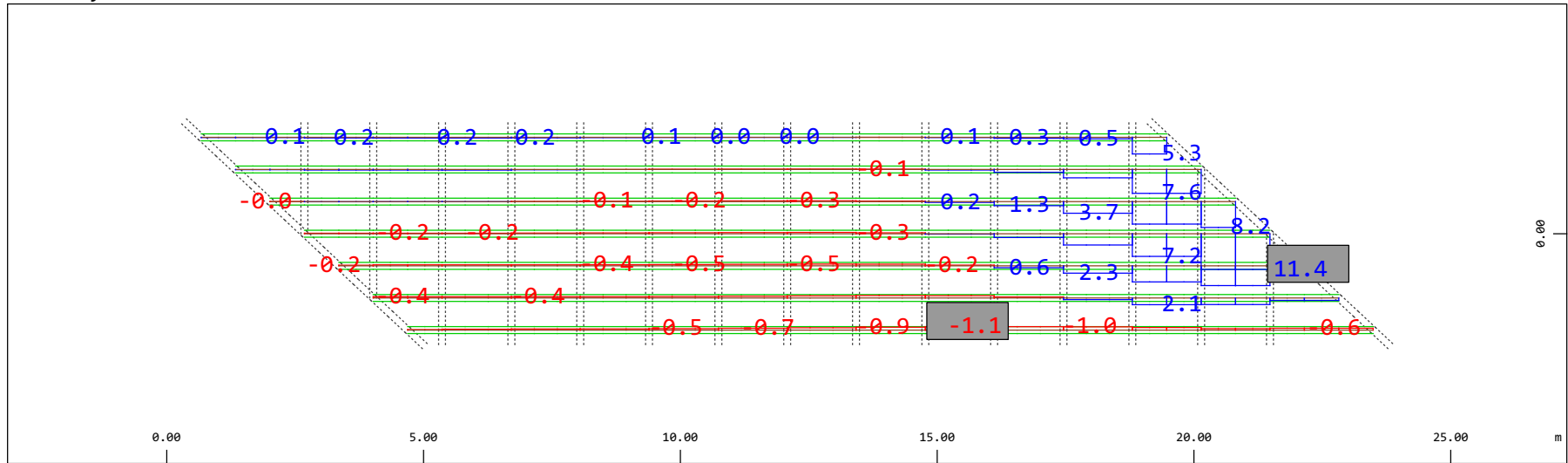
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kNm (Min=-7.12) (Max=18.2)

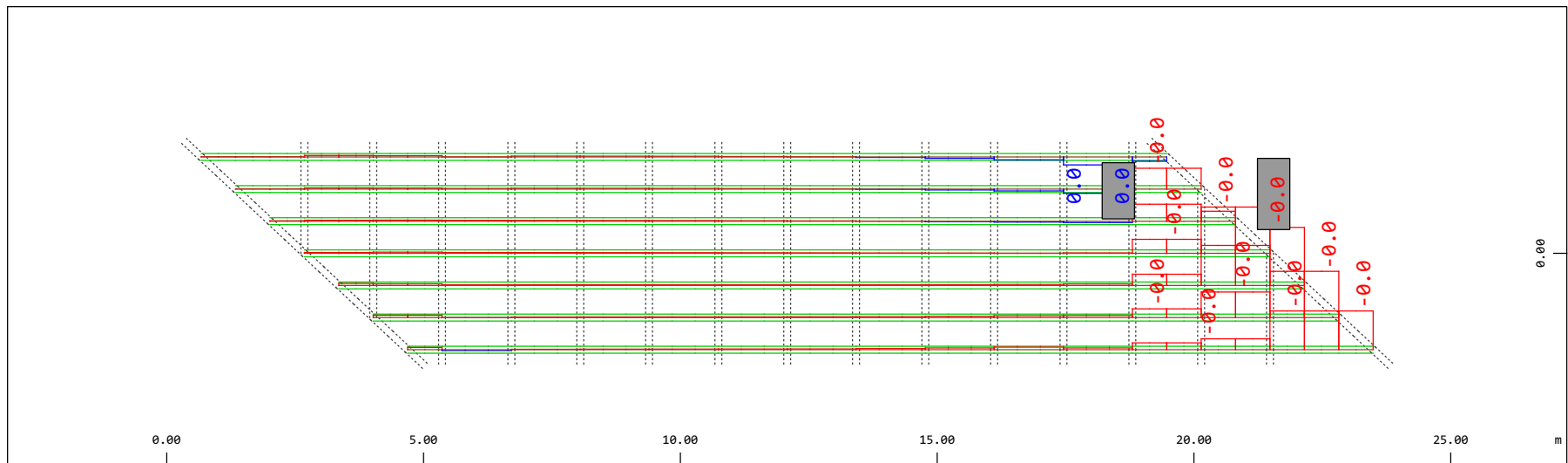
M 1 : 120

Definition of Axis
Results elementay loads



Y
Sector of system Beam Elements Group 31...37
X
Beam Elements , Normal force Nx, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-1.09) (Max=11.4)

M 1 : 120

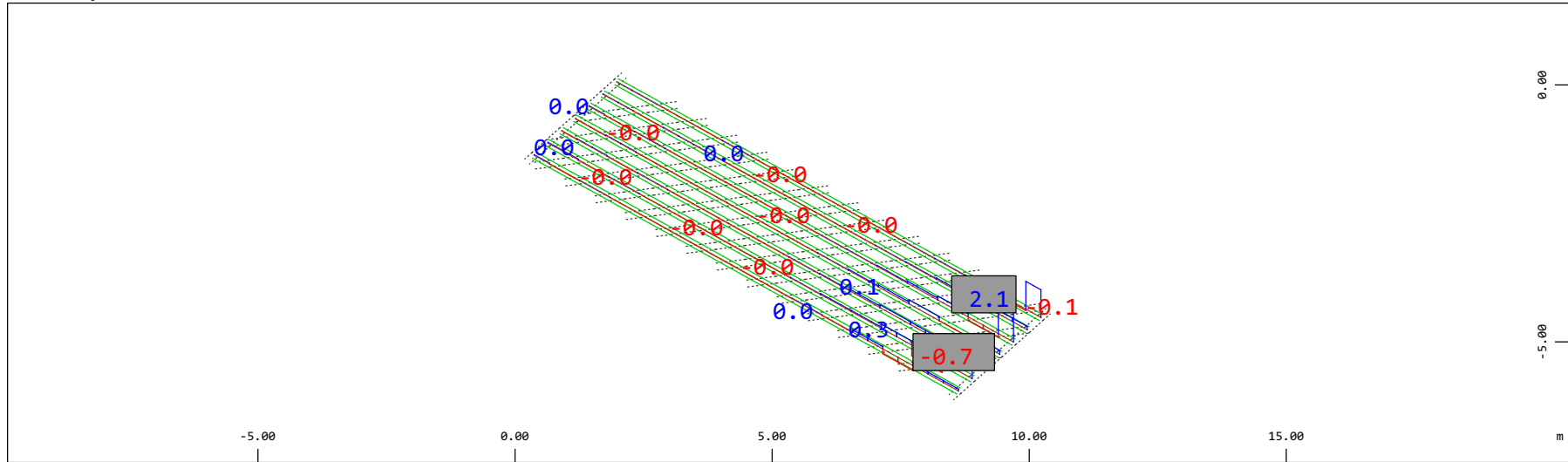


Y
Sector of system Beam Elements Group 31...37
X
Beam Elements , Torsional moment Mt, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 0.0020 kNm (Min=-0.0018) (Max=2.5303e-04)

M 1 : 120

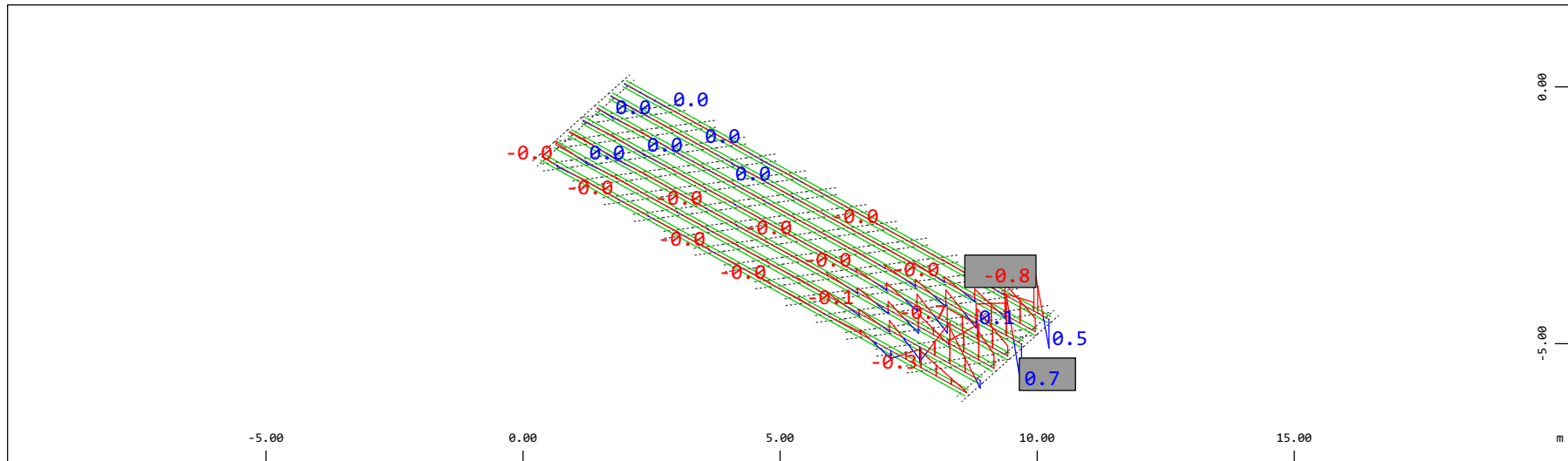
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 3.92 kN (Min=-0.698) (Max=2.09)

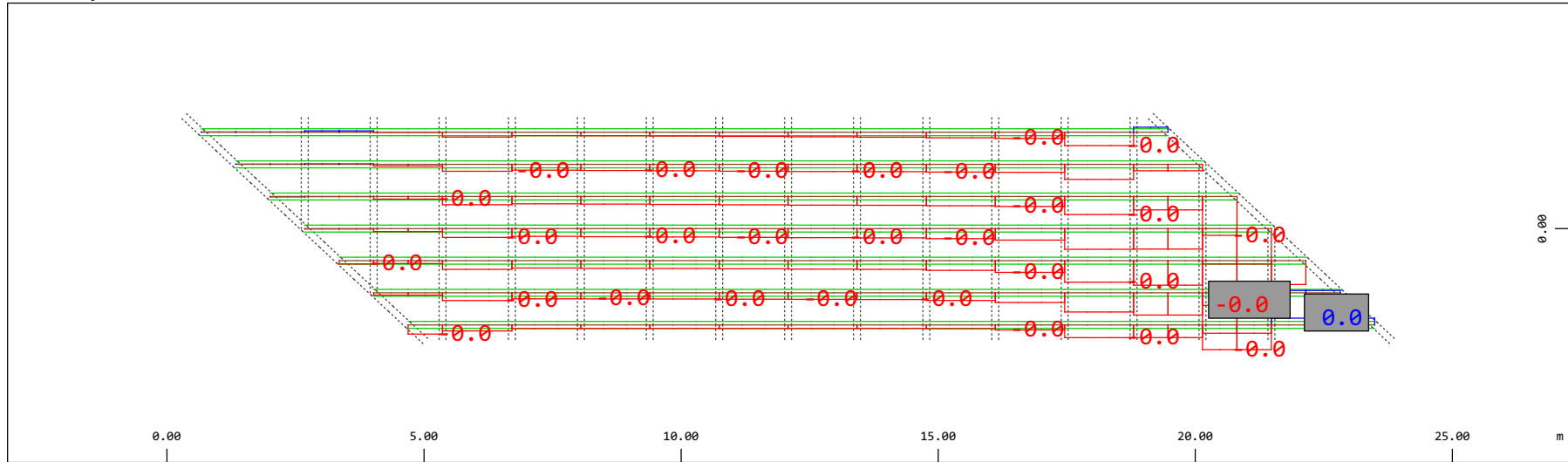
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



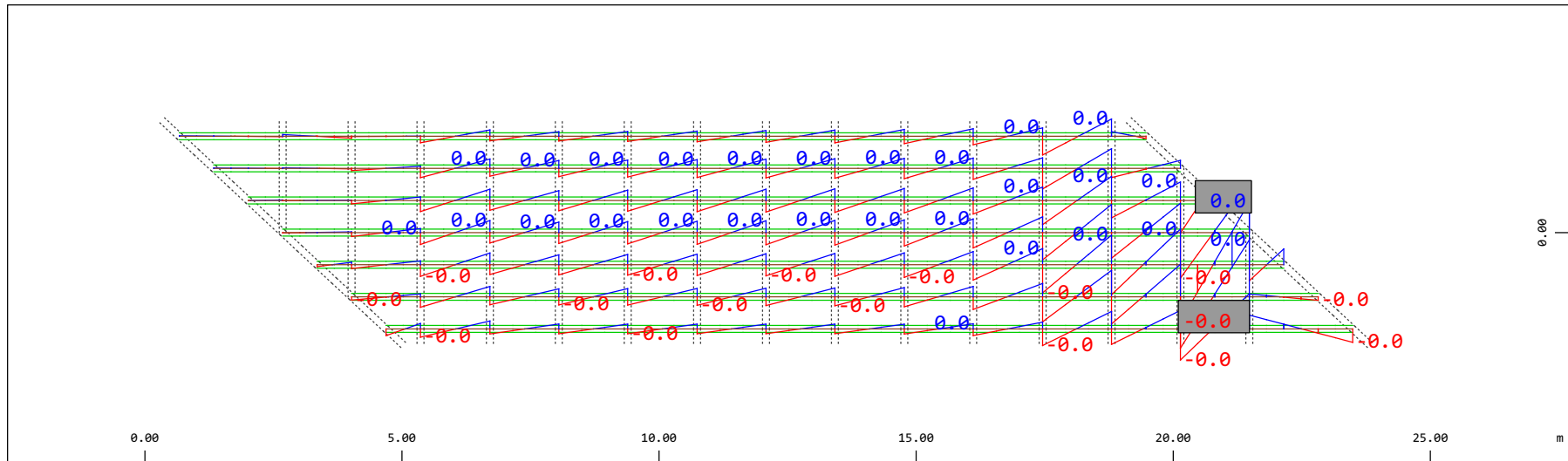
Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 0.980
 kNm (Min=-0.753) (Max=0.735)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads

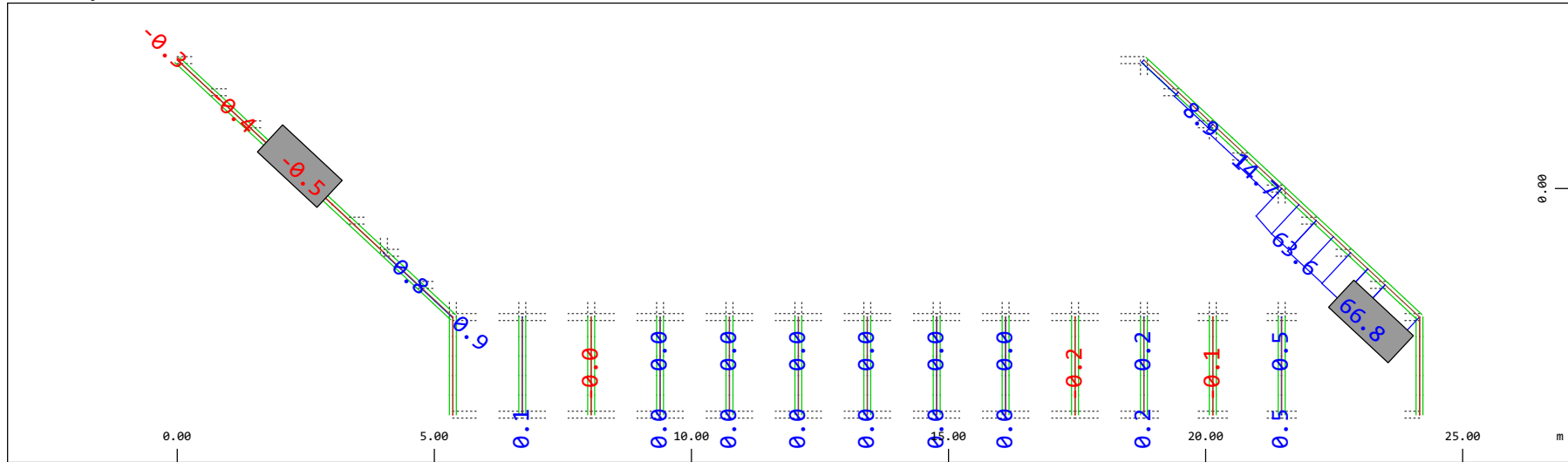


Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Shear force Vy, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 0.0039 kN (Min=-0.0028) (Max= 4.2975e-04) M 1 : 120



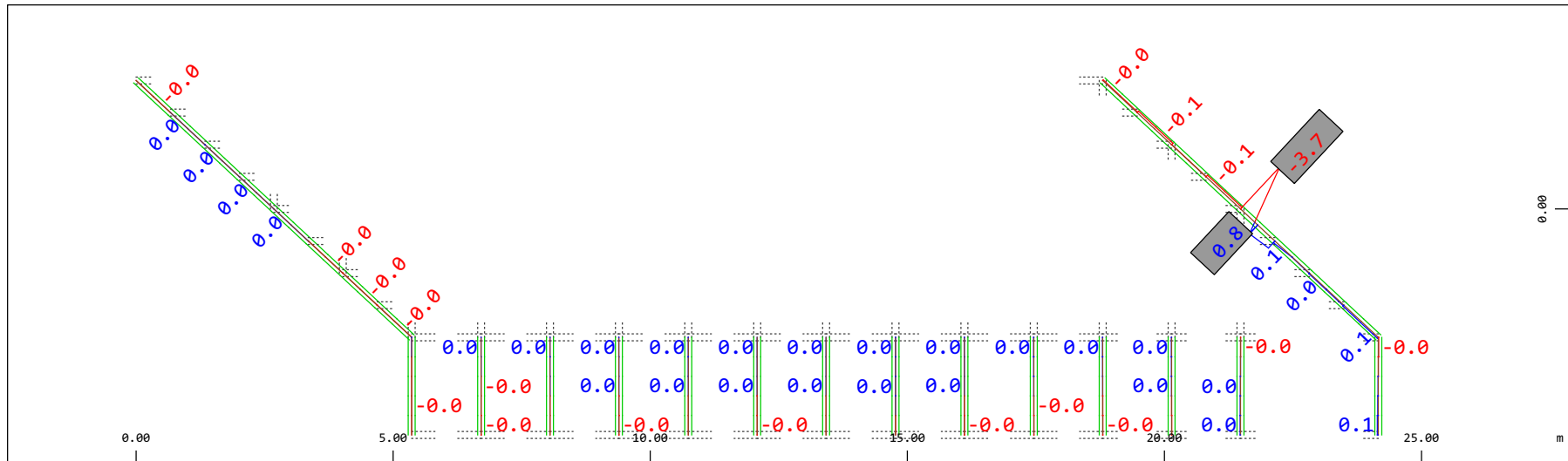
Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Bending moment Mz, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 0.0020 kNm (Min=-0.0018) (Max=0.0020) M 1 : 120

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 20 23
Beam Elements , Normal force Nx, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 98.0 kN (Min=-0.468) (Max=66.8)

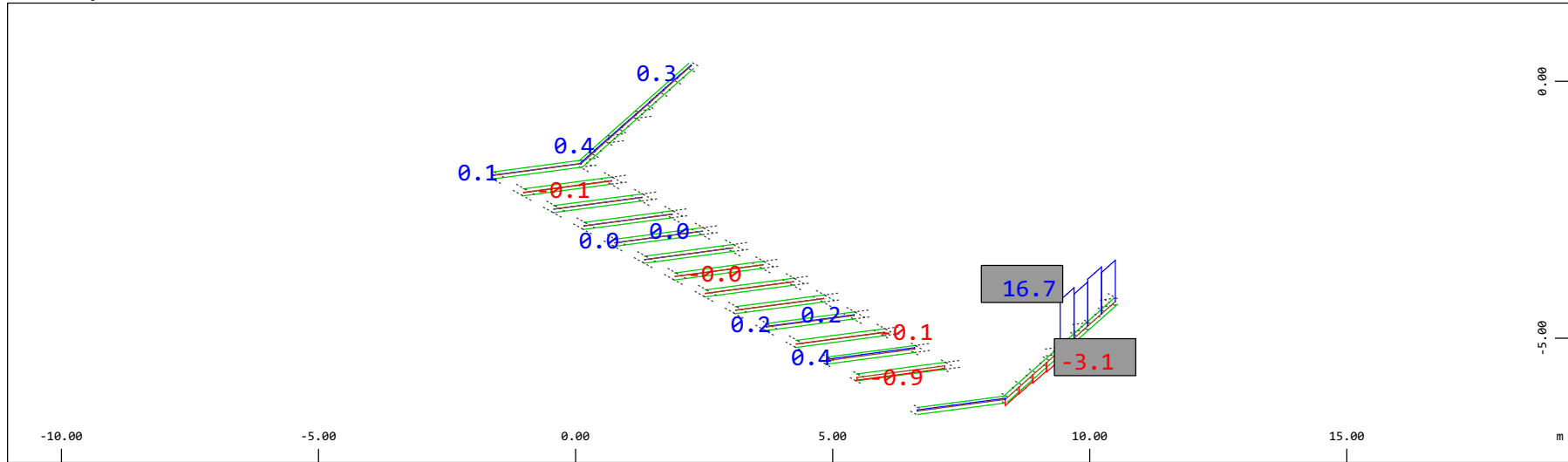
M 1 : 120



Sector of system Beam Elements Group 20 23
Beam Elements , Torsional moment Mt, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 3.92 kNm (Min=-3.66) (Max=0.766)

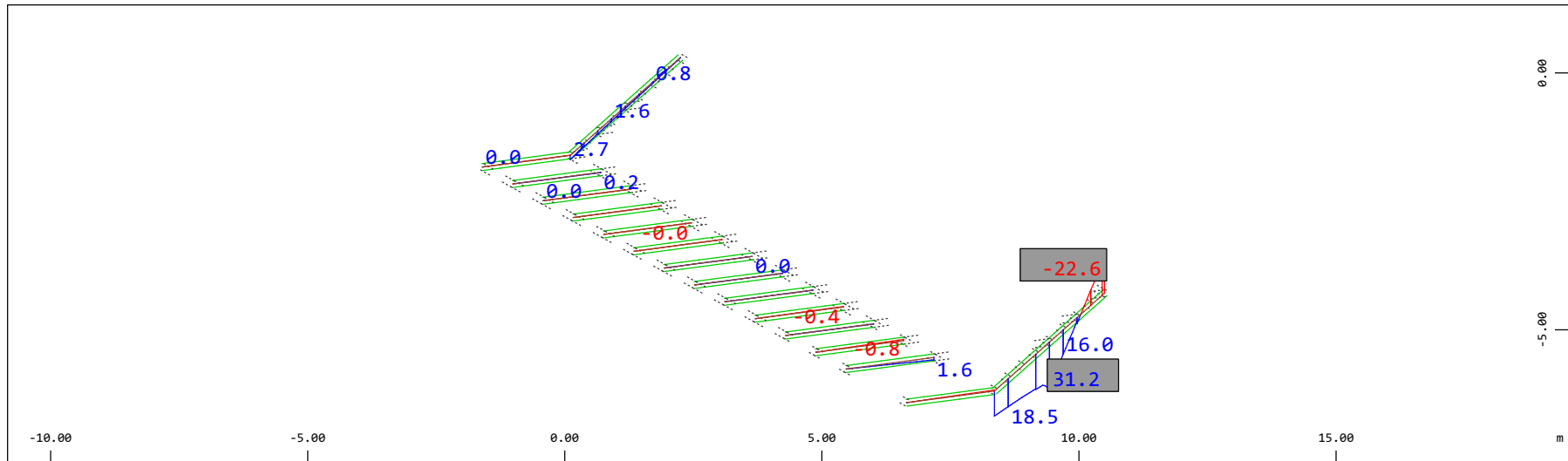
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-3.05) (Max=16.7)

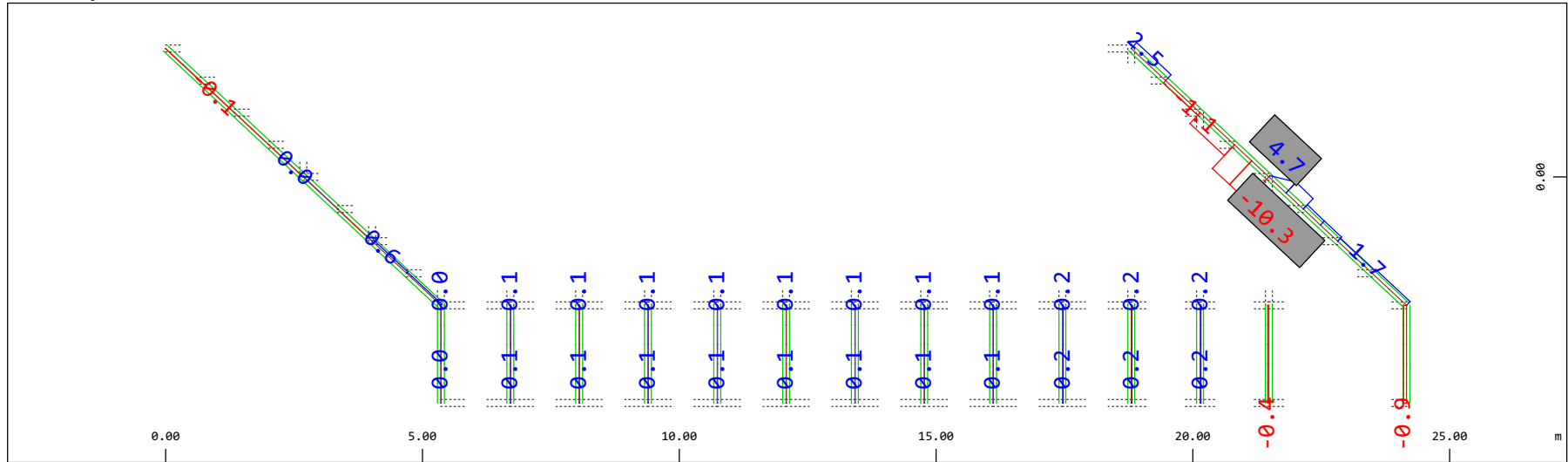
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 39.2 kNm (Min=-22.6) (Max=31.2)

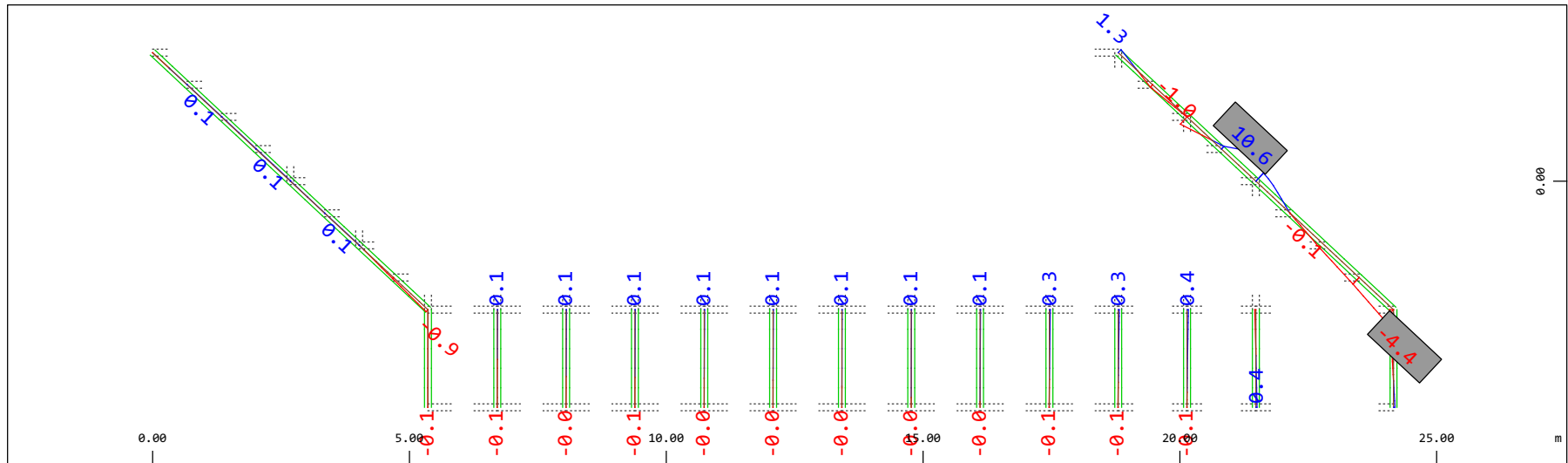
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kN (Min=-10.3) (Max=4.70)

M 1 : 120

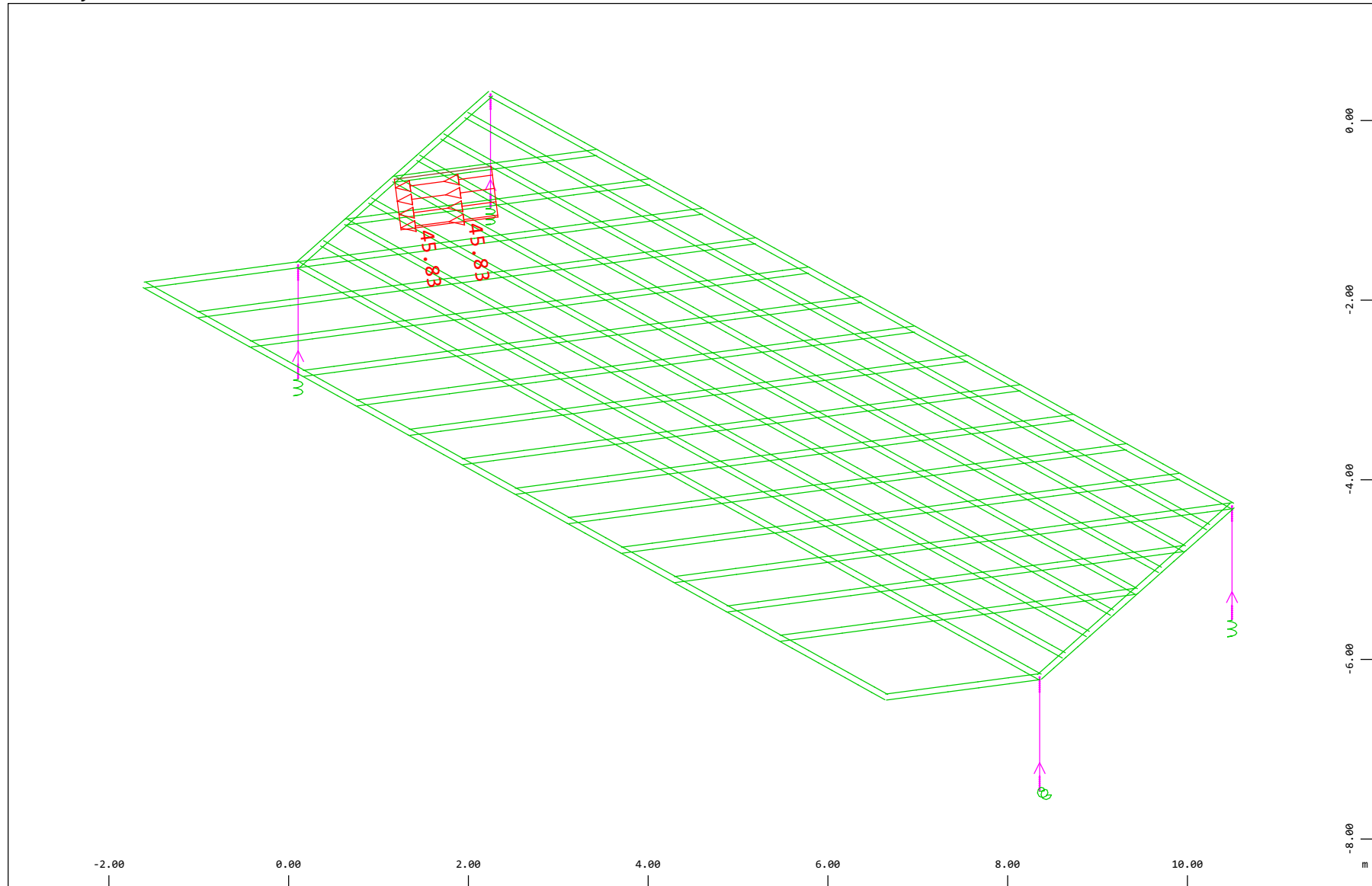


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 321 Qt: Serpeggio-S 21m (DX-->SX) , 1 cm 3D = 19.6 kNm (Min=-4.39) (Max=10.6)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

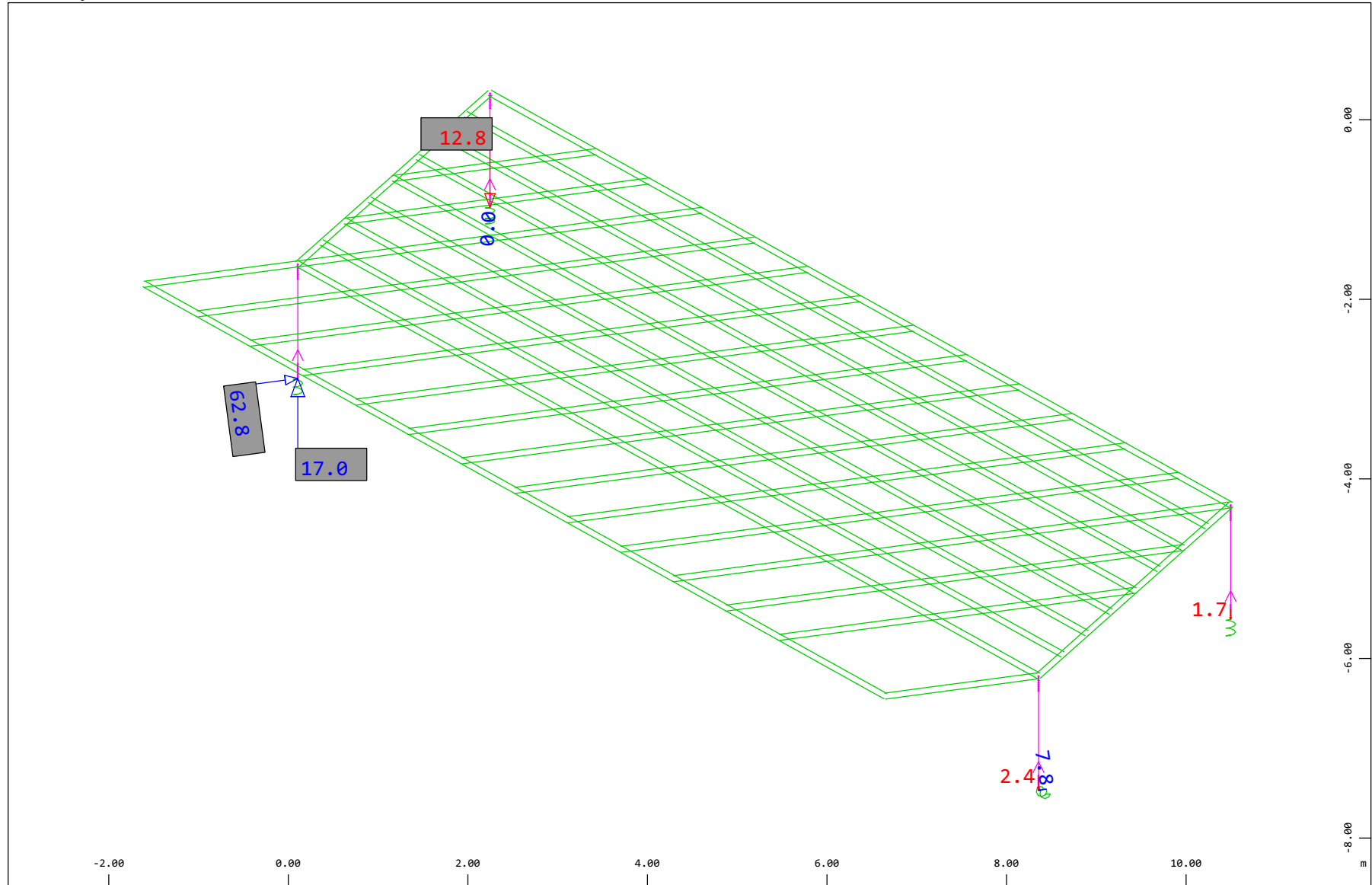
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=48.4 kN/m)
 (Min=-45.8) (Max=-45.8)



M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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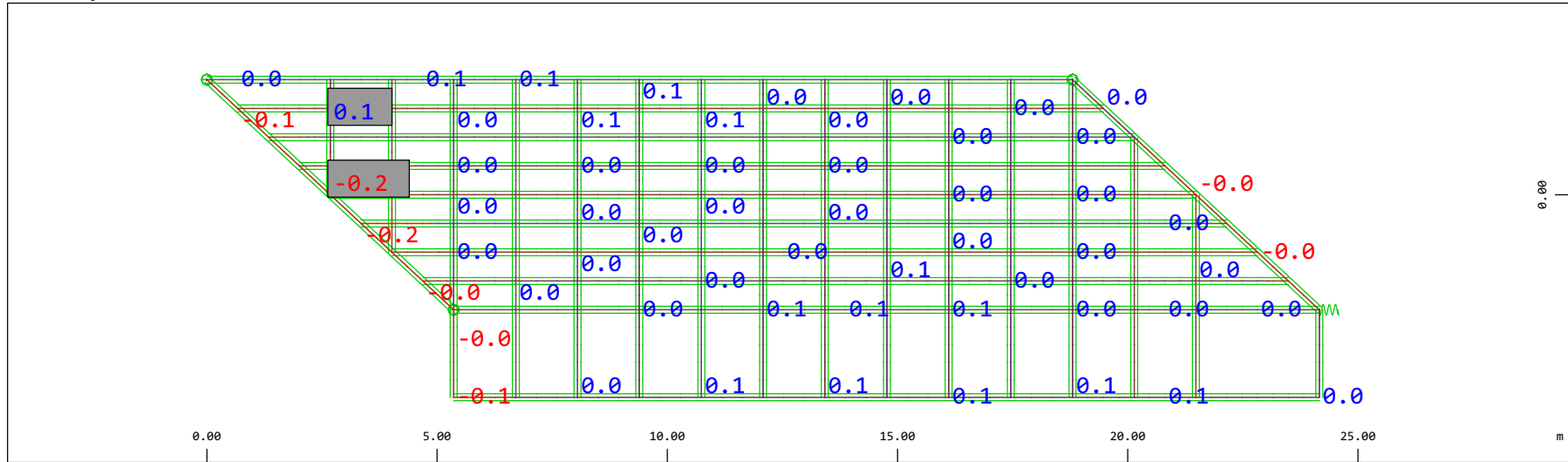
Z
 Y
 X

Sector of system Beam Elements, Spring Elements
 Nodes , Support force in global Z, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 9.69 kN
 0)

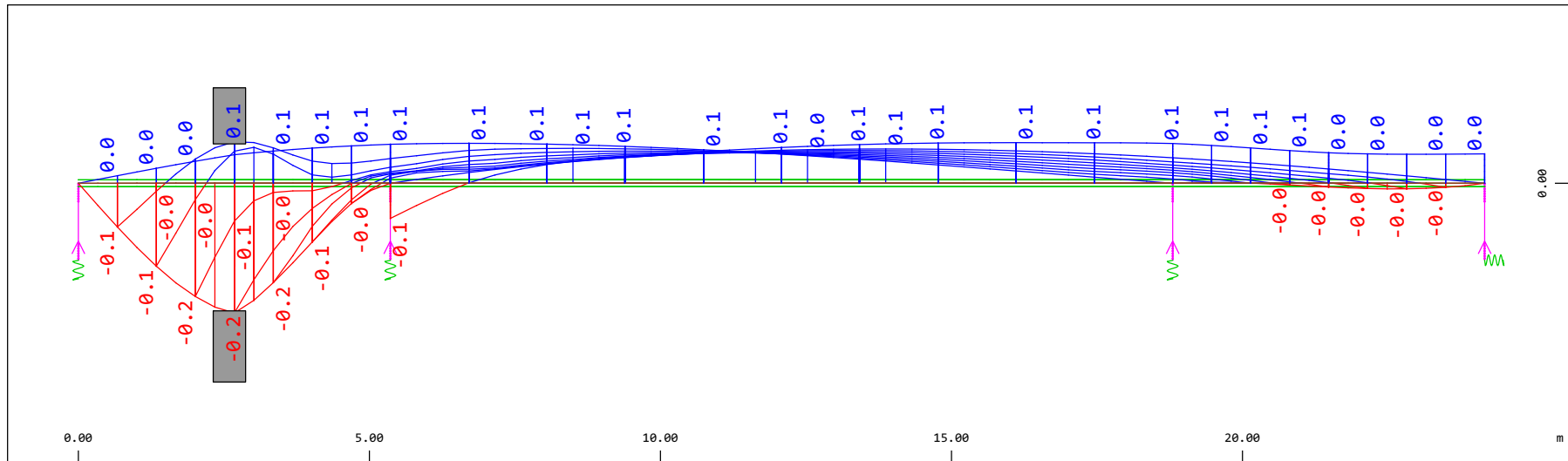
◁ (Min=-12.8) (Max=17.0) (total:

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

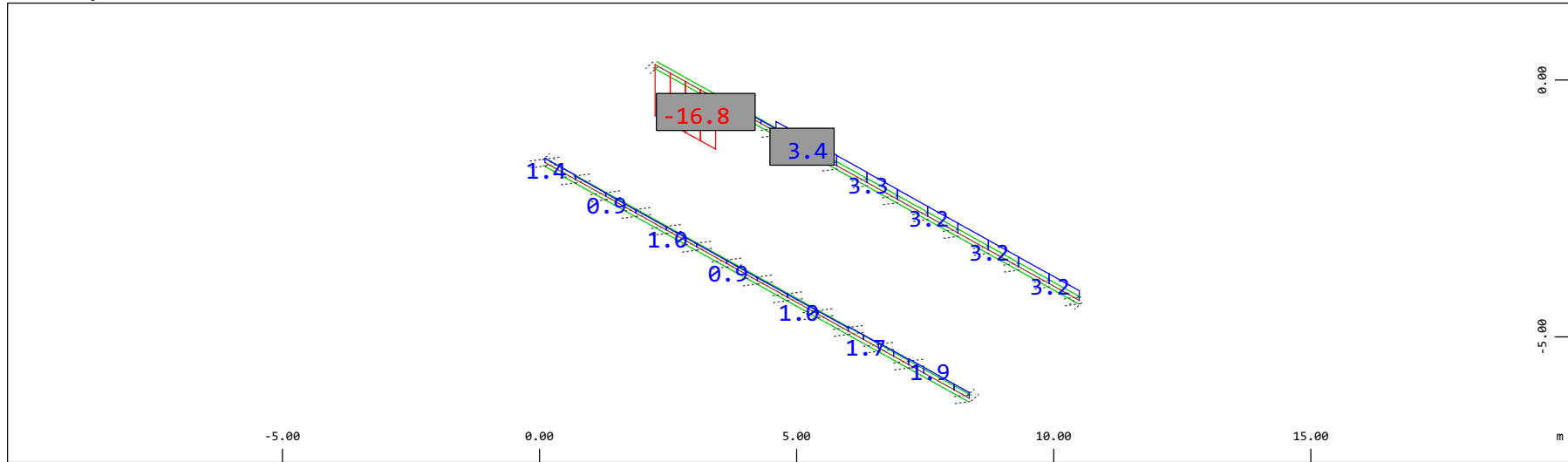


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX), 1 cm 3D = 0.0969 mm (Min=-0.204) (Max=0.0653) M 1 : 134



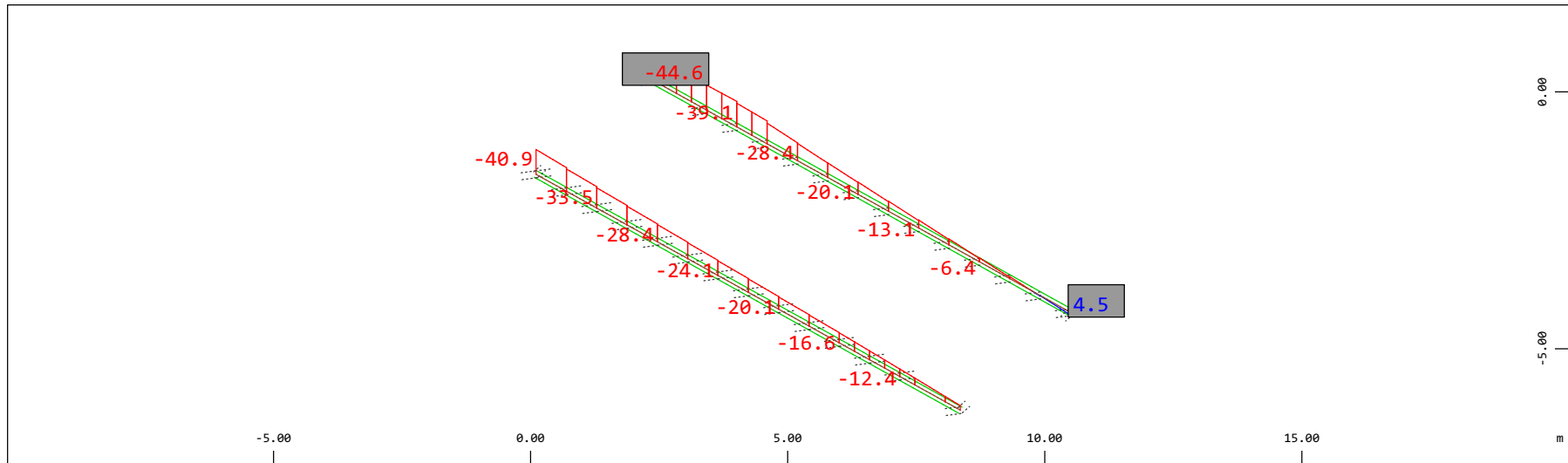
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX), 1 cm 3D = 0.0969 mm (Min=-0.204) (Max=0.0653) M 1 : 106

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force V_z , Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-16.8) (Max=3.44)

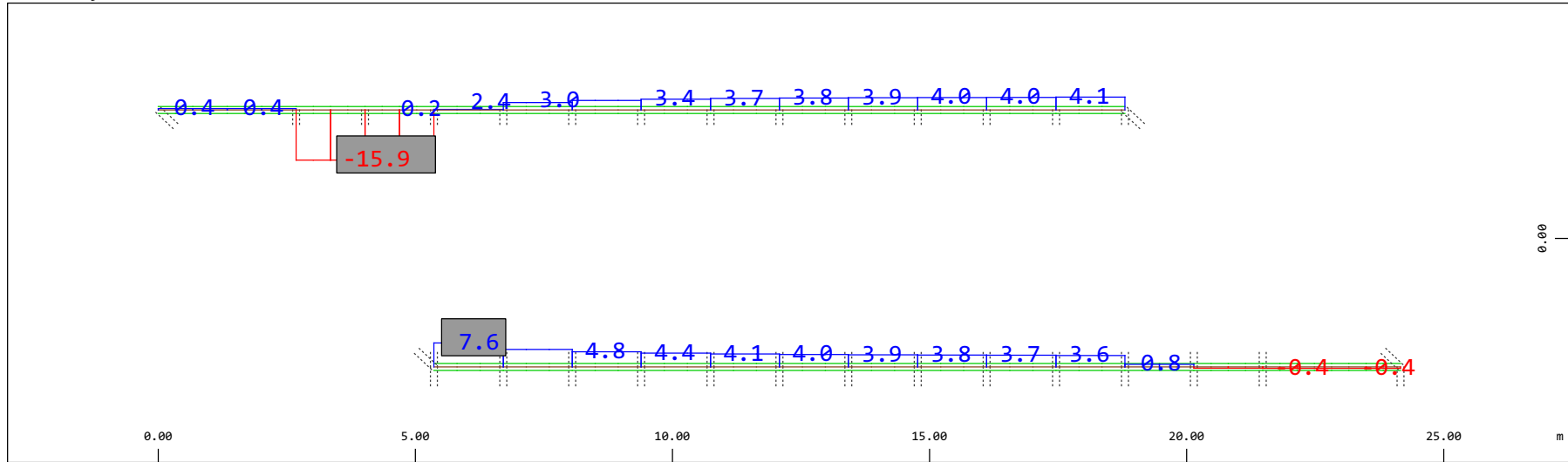
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment M_y (Maximum values cubic interpolated), Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 98.0 kNm (Min=-44.6) (Max=4.47)

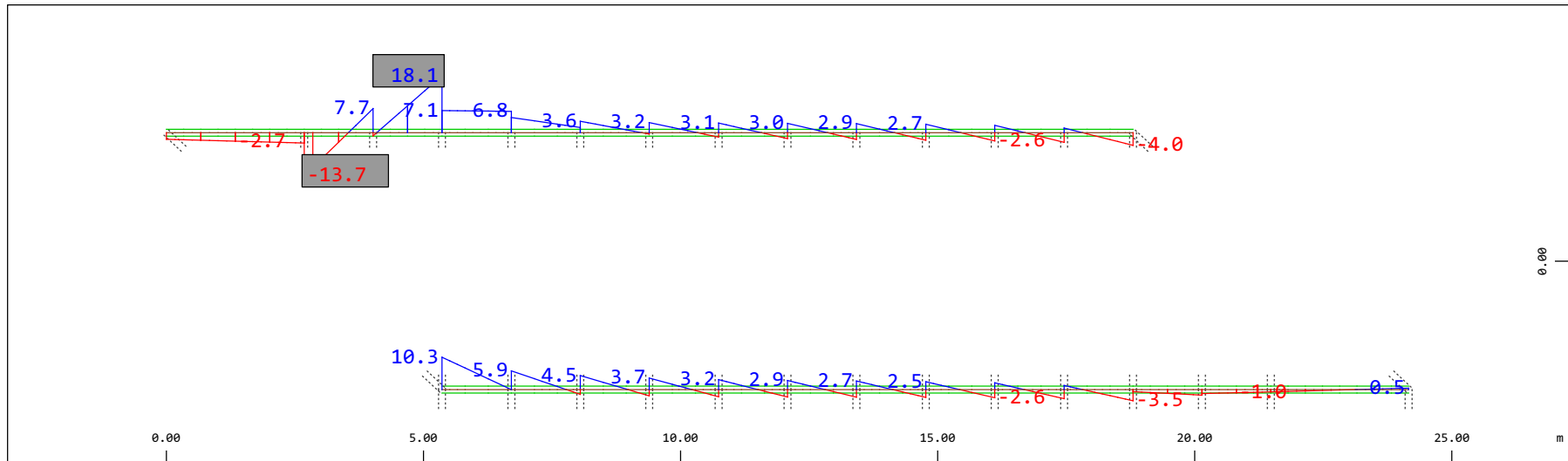
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-15.9) (Max=7.62)

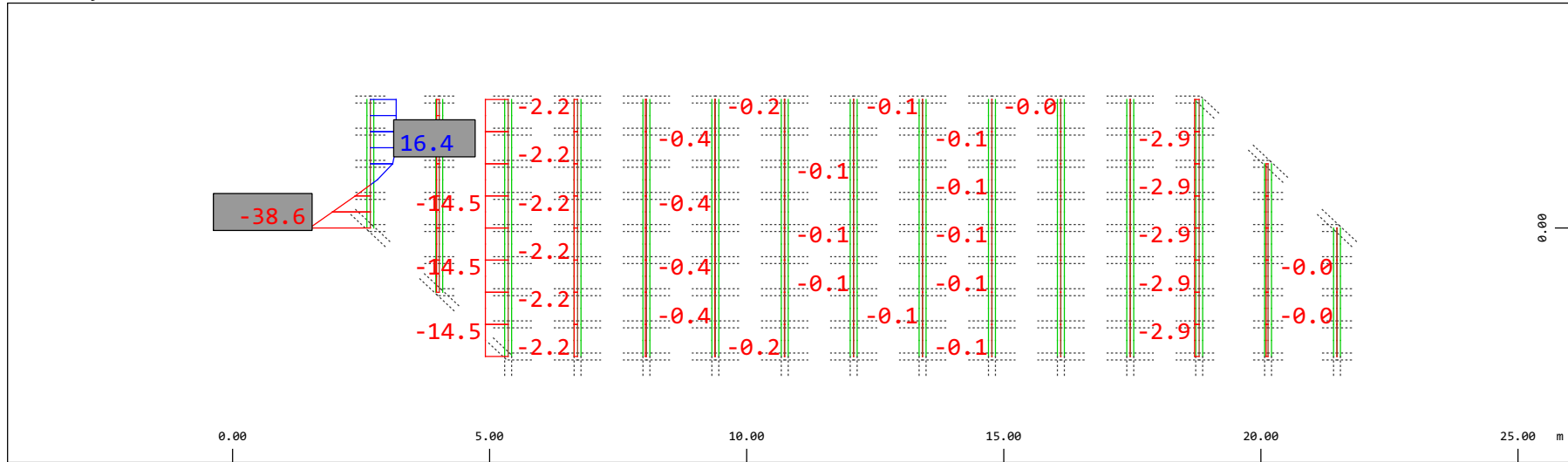
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 19.6 kNm (Min=-13.7) (Max=18.1)

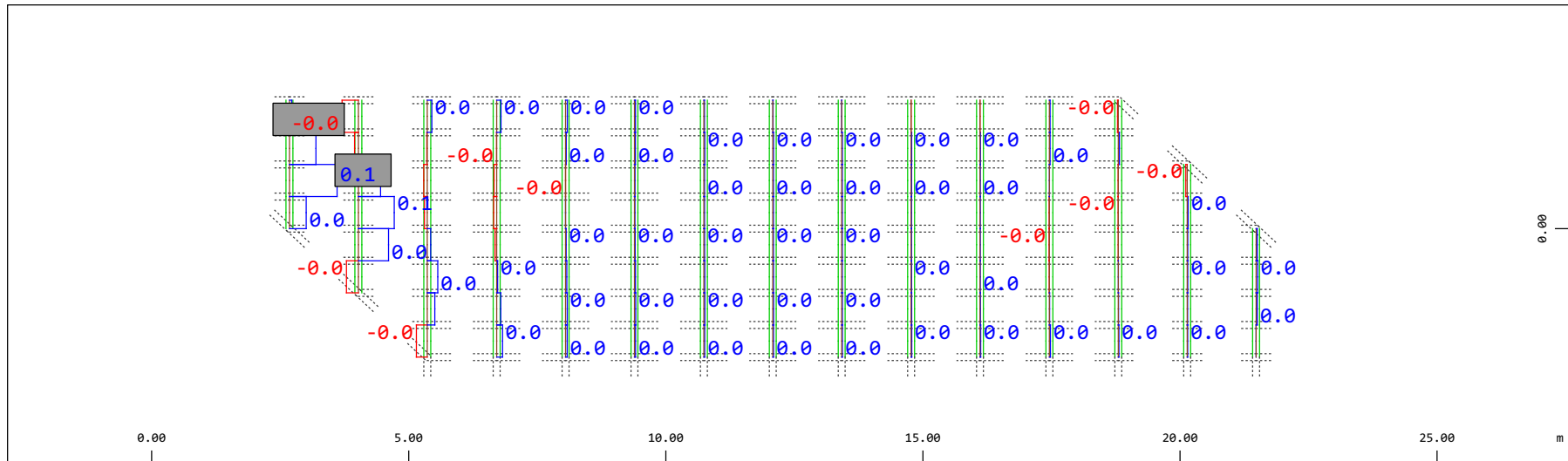
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force N_x , Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 39.2 kN (Min=-38.6) (Max=16.4)

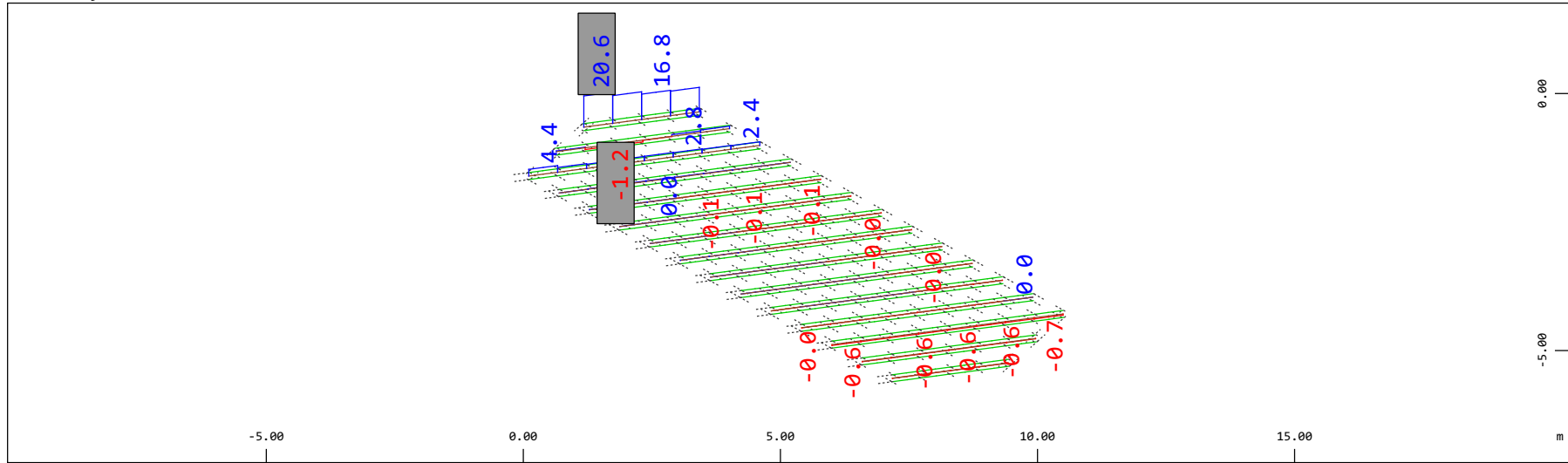
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment M_t , Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 0.0980 kNm (Min=-0.0258) (Max=0.0757)

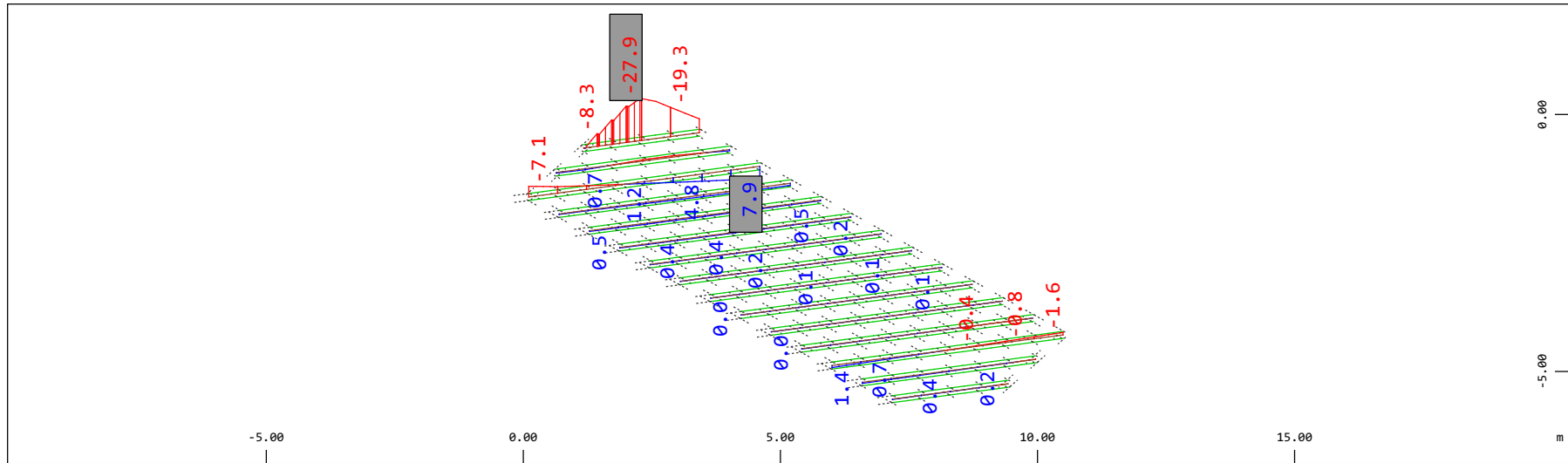
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 39.2 kN (Min=-1.17) (Max=20.6)

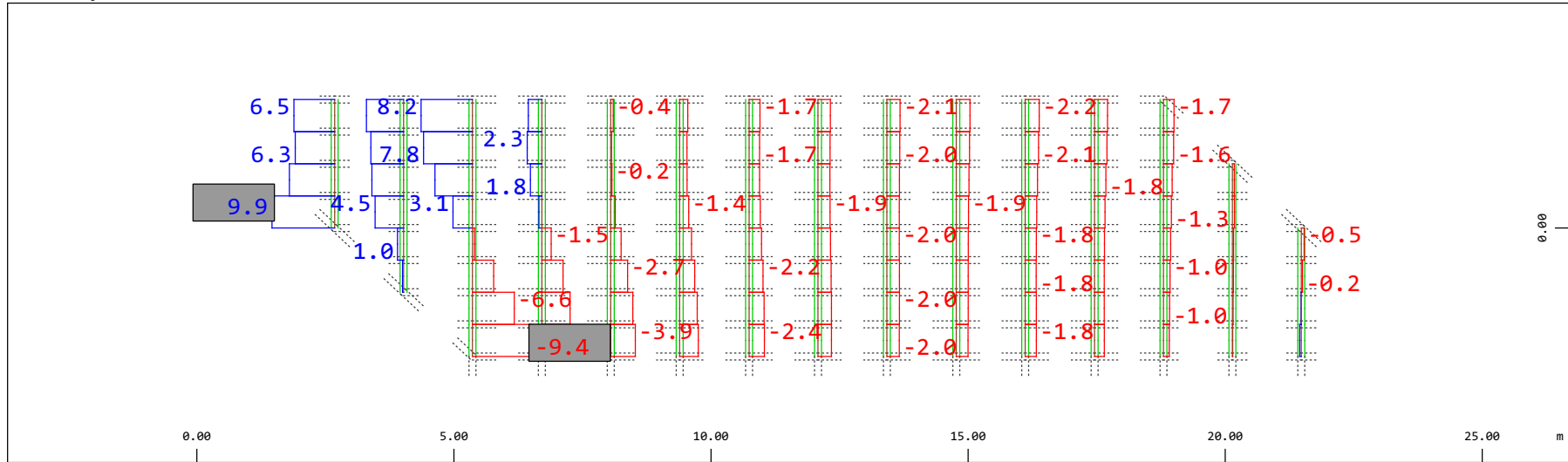
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 39.2
 kNm (Min=-27.9) (Max=7.88)

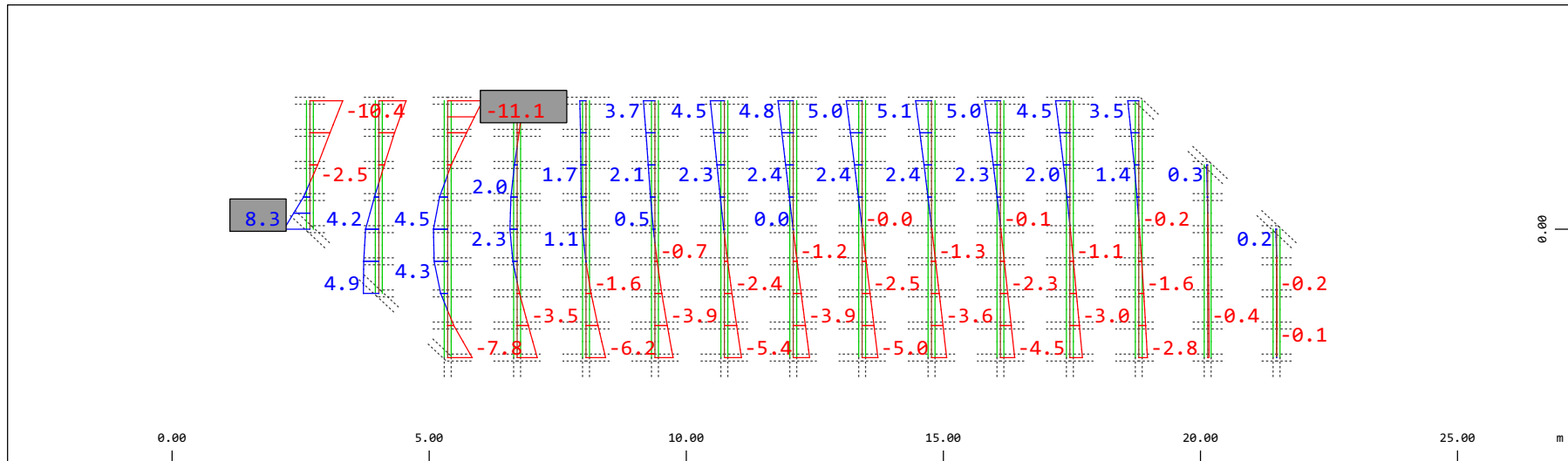
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 9.80 kN (Min=-9.36) (Max=9.96)

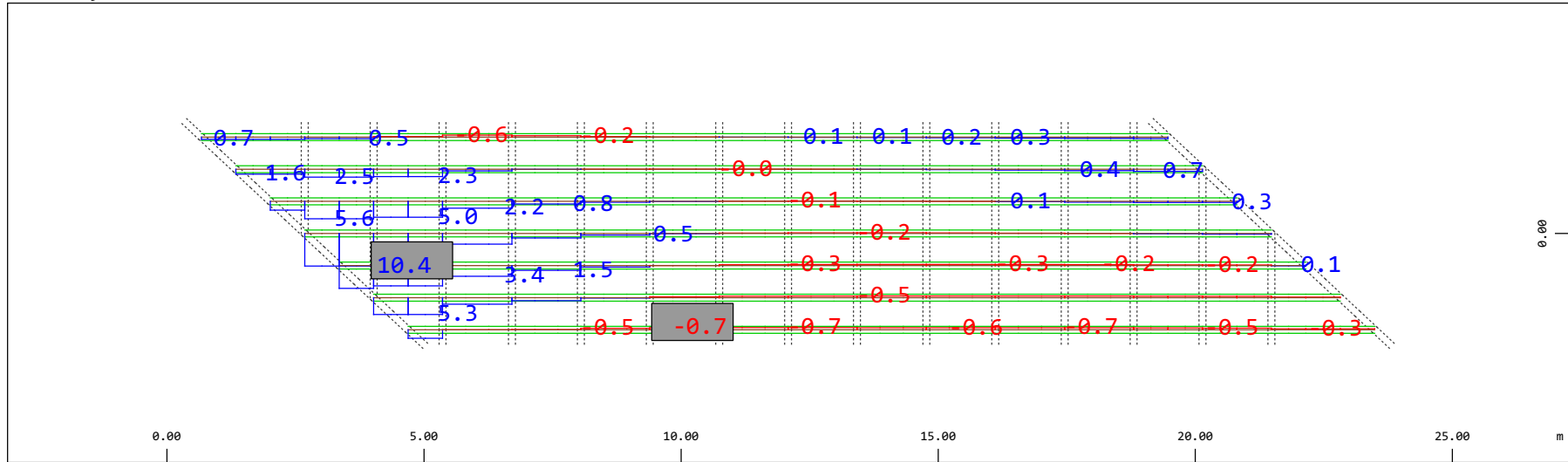
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 19.6 kNm (Min=-11.1) (Max=8.26)

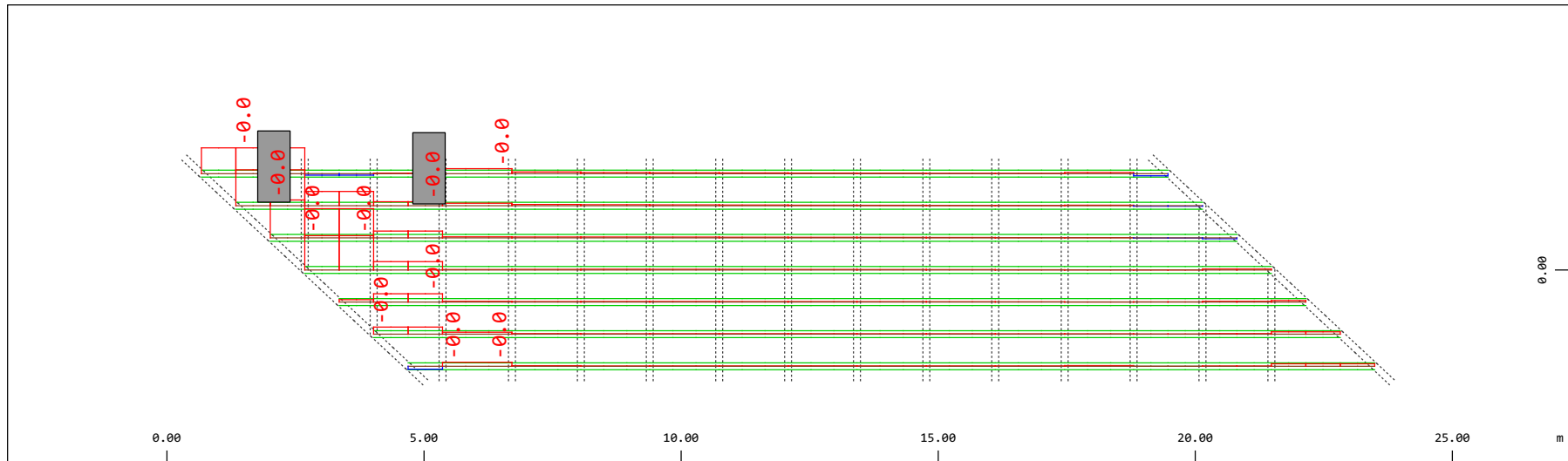
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force N_x , Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-0.697) (Max=10.4)

M 1 : 120

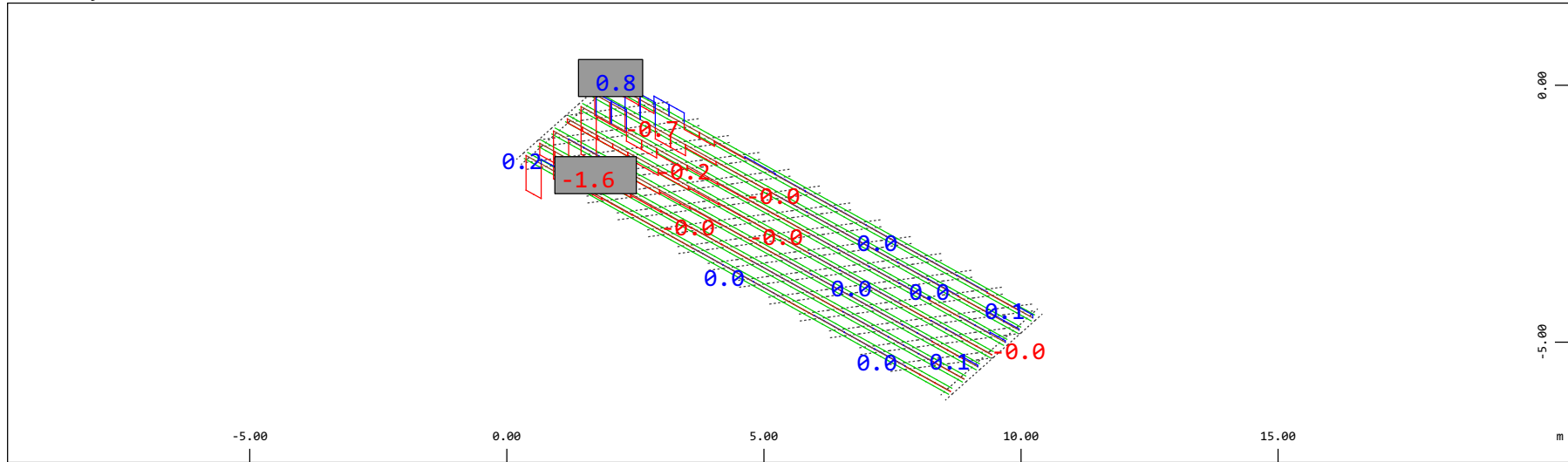


Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment M_t , Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 0.0020 kNm (Min=-0.0012) (Max= 9.3201e-05)

M 1 : 120

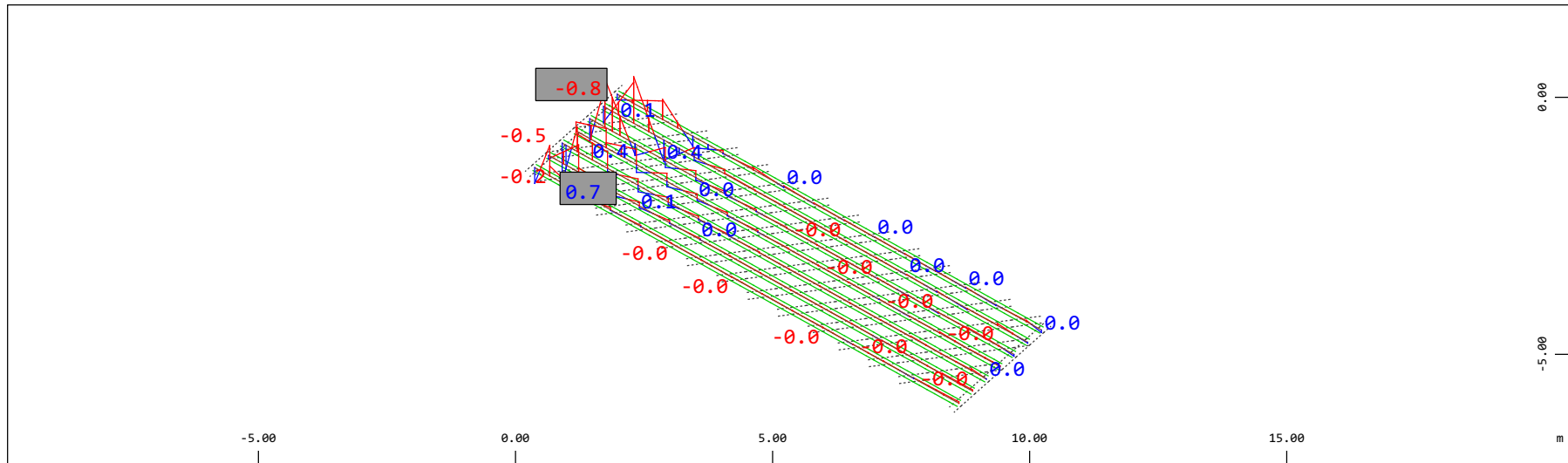
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 1.96 kN (Min=-1.58) (Max=0.843)

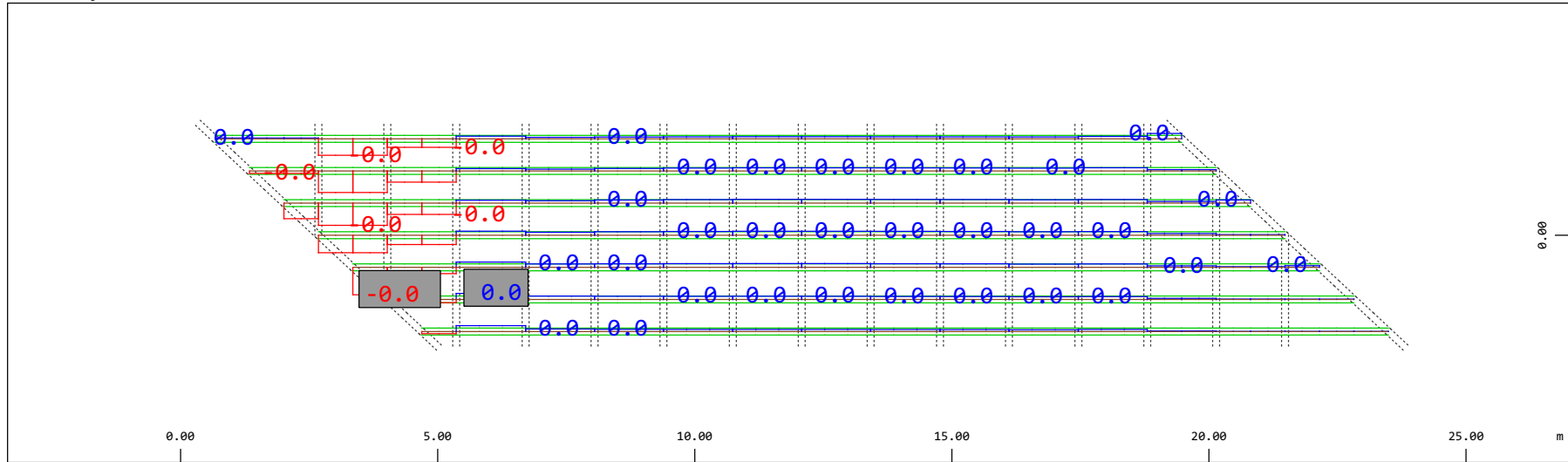
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 0.980
 kNm (Min=-0.799) (Max=0.651)

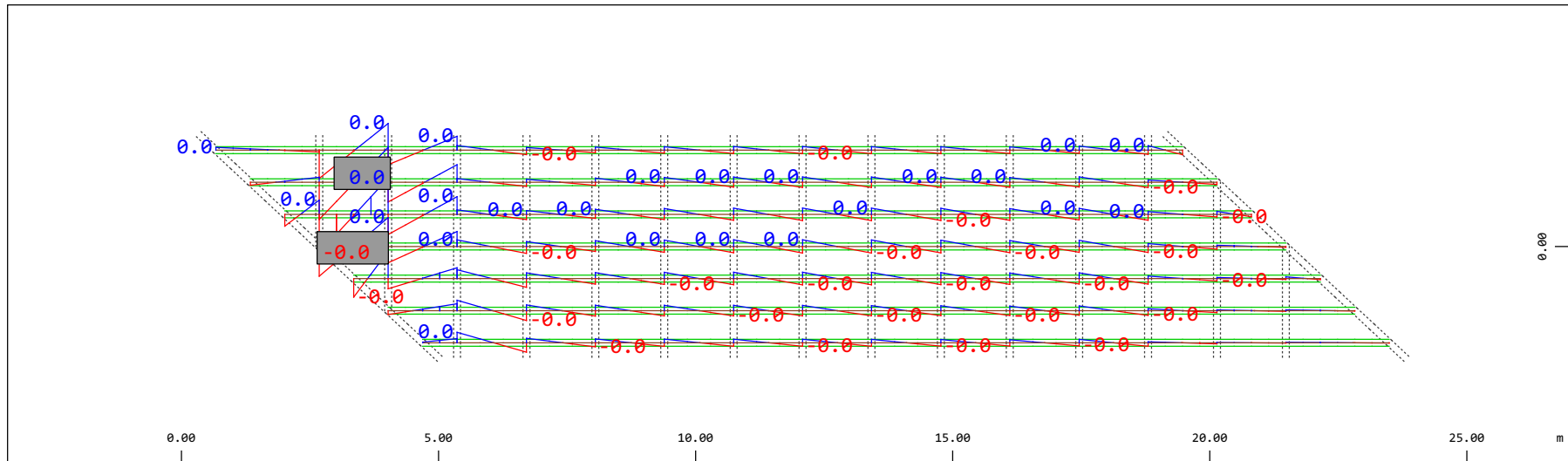
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 0.0098 kN (Min=-0.0044) (Max= 9.5579e-04)

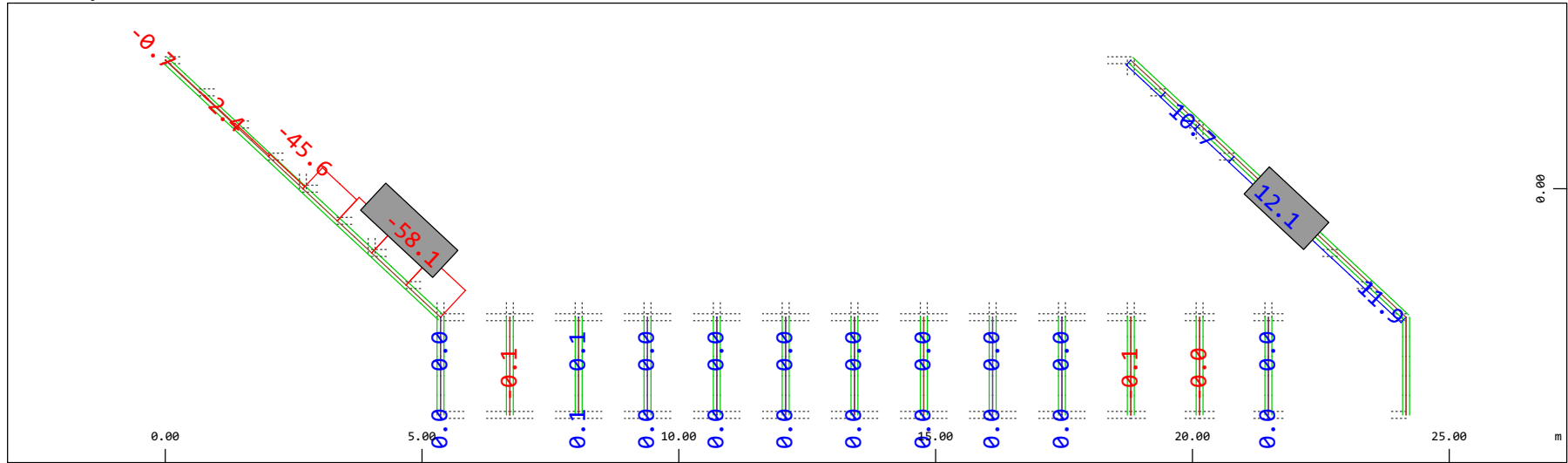
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 0.0039 kNm (Min=-0.0024) (Max=0.0023)

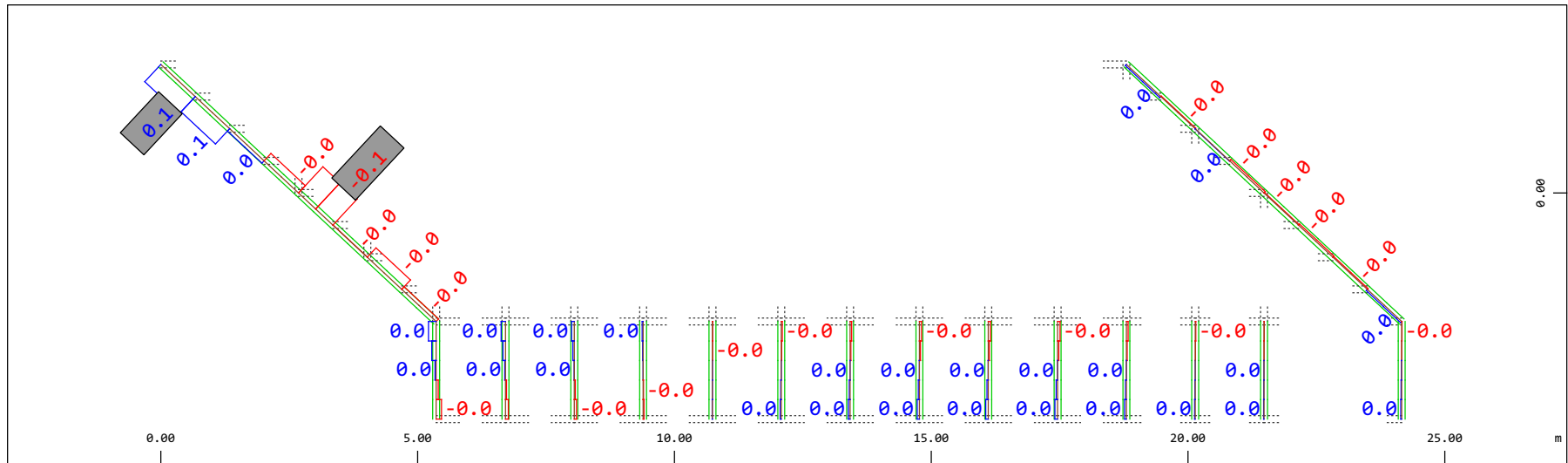
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 20 23
 X Beam Elements , Normal force Nx, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 98.0 kN (Min=-58.1) (Max=12.1)

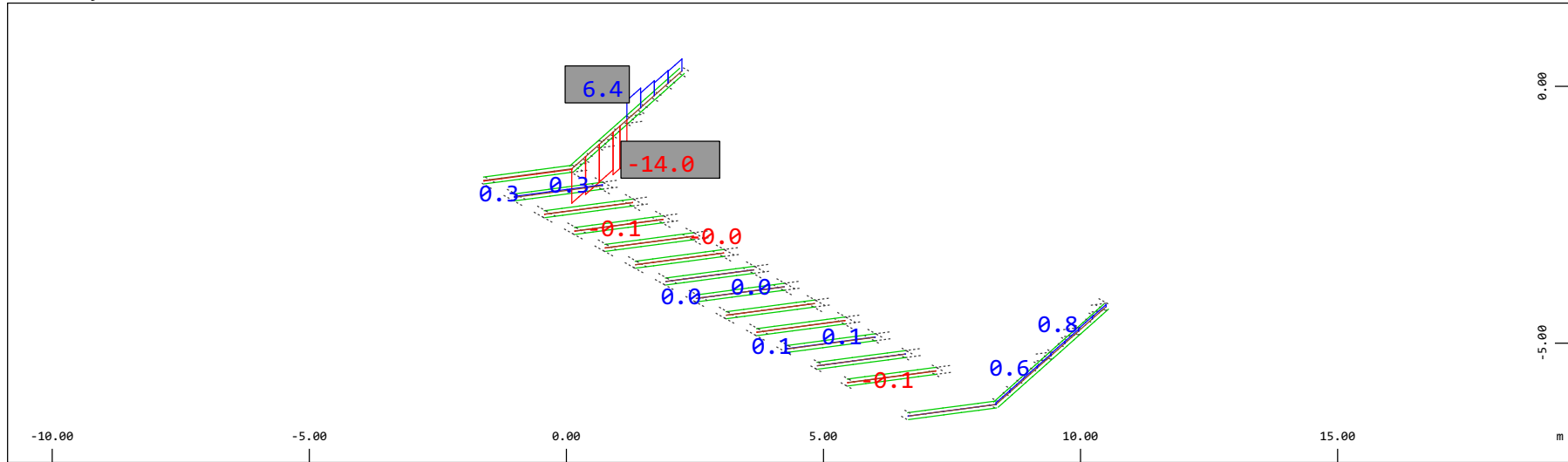
M 1 : 120



Y Sector of system Beam Elements Group 20 23
 X Beam Elements , Torsional moment Mt, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 0.196 kNm (Min=-0.114) (Max=0.0751)

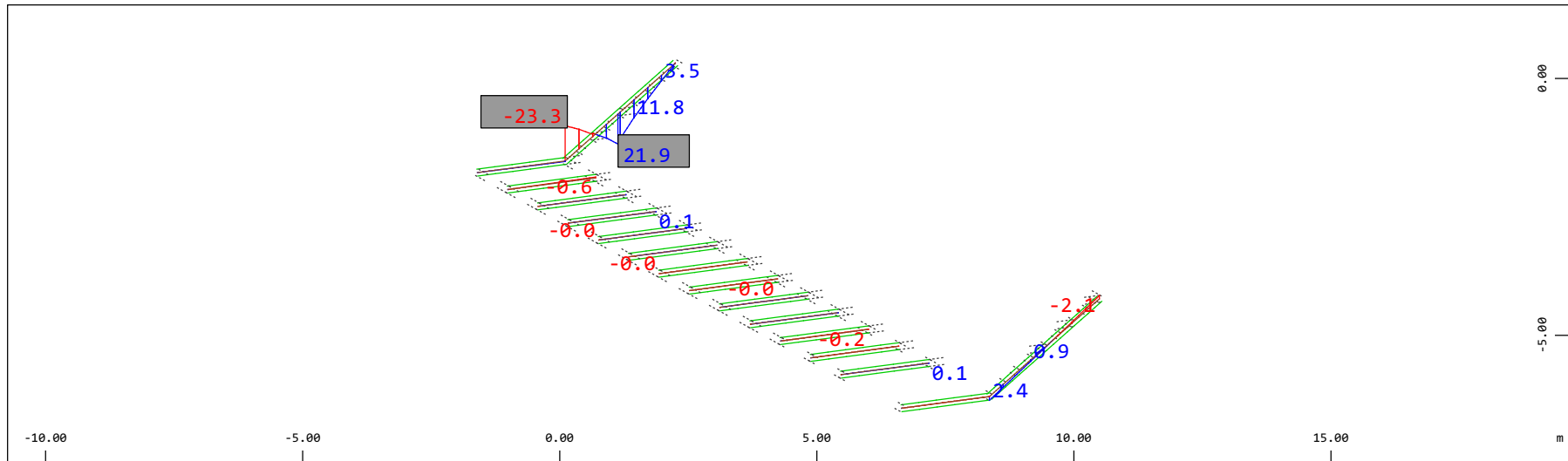
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-14.0) (Max=6.44)

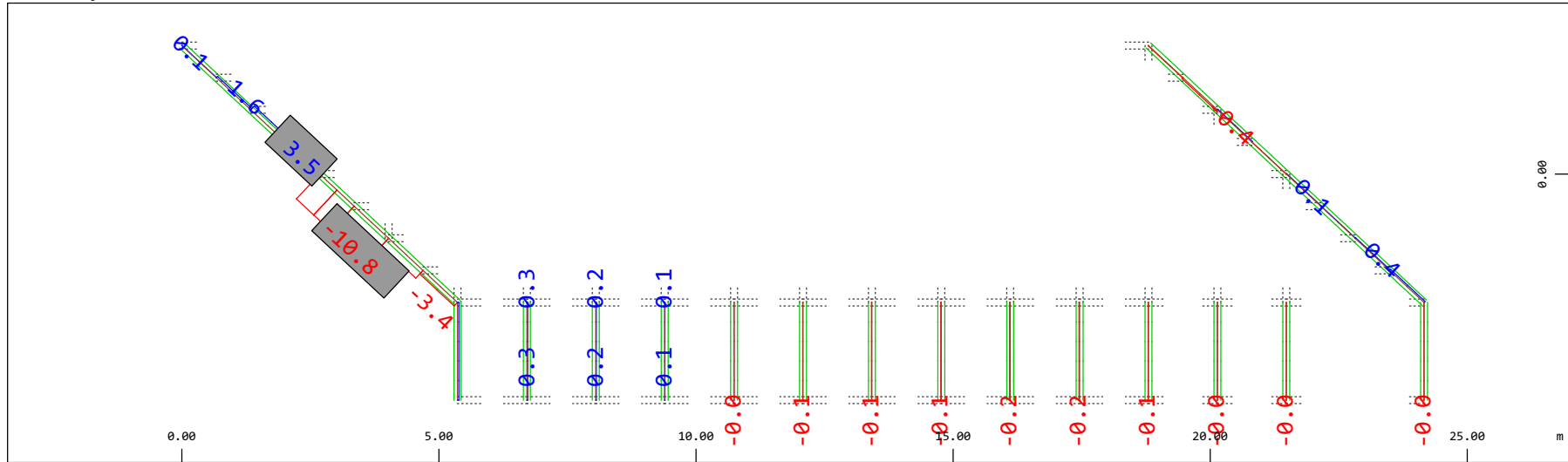
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 39.2
 kNm (Min=-23.3) (Max=21.9)

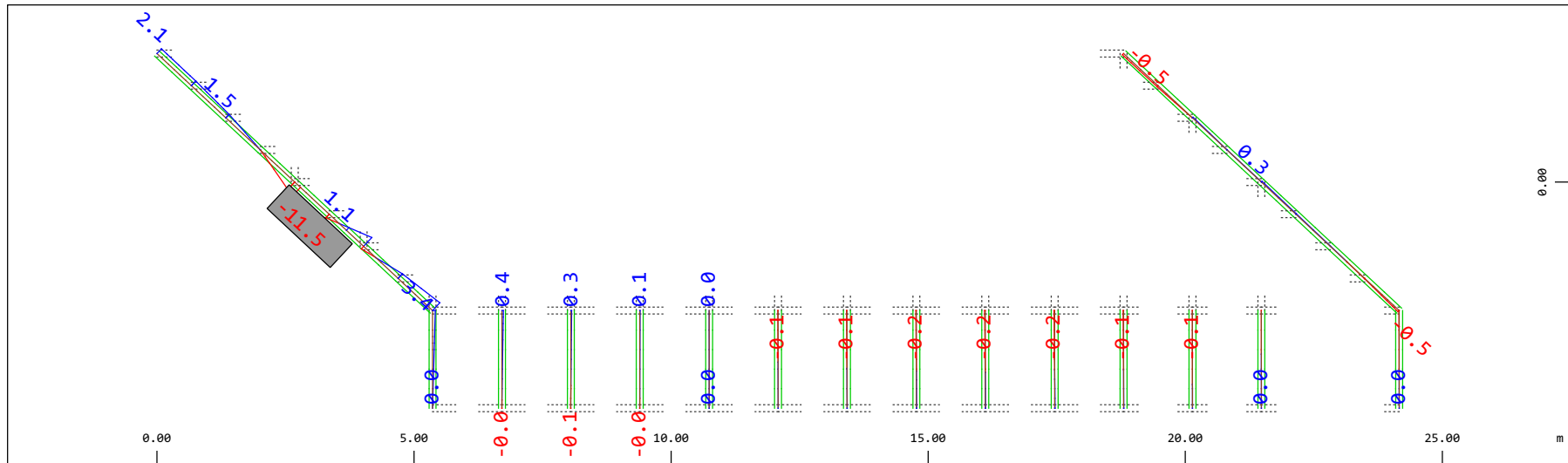
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-10.8) (Max=3.53)

M 1 : 120

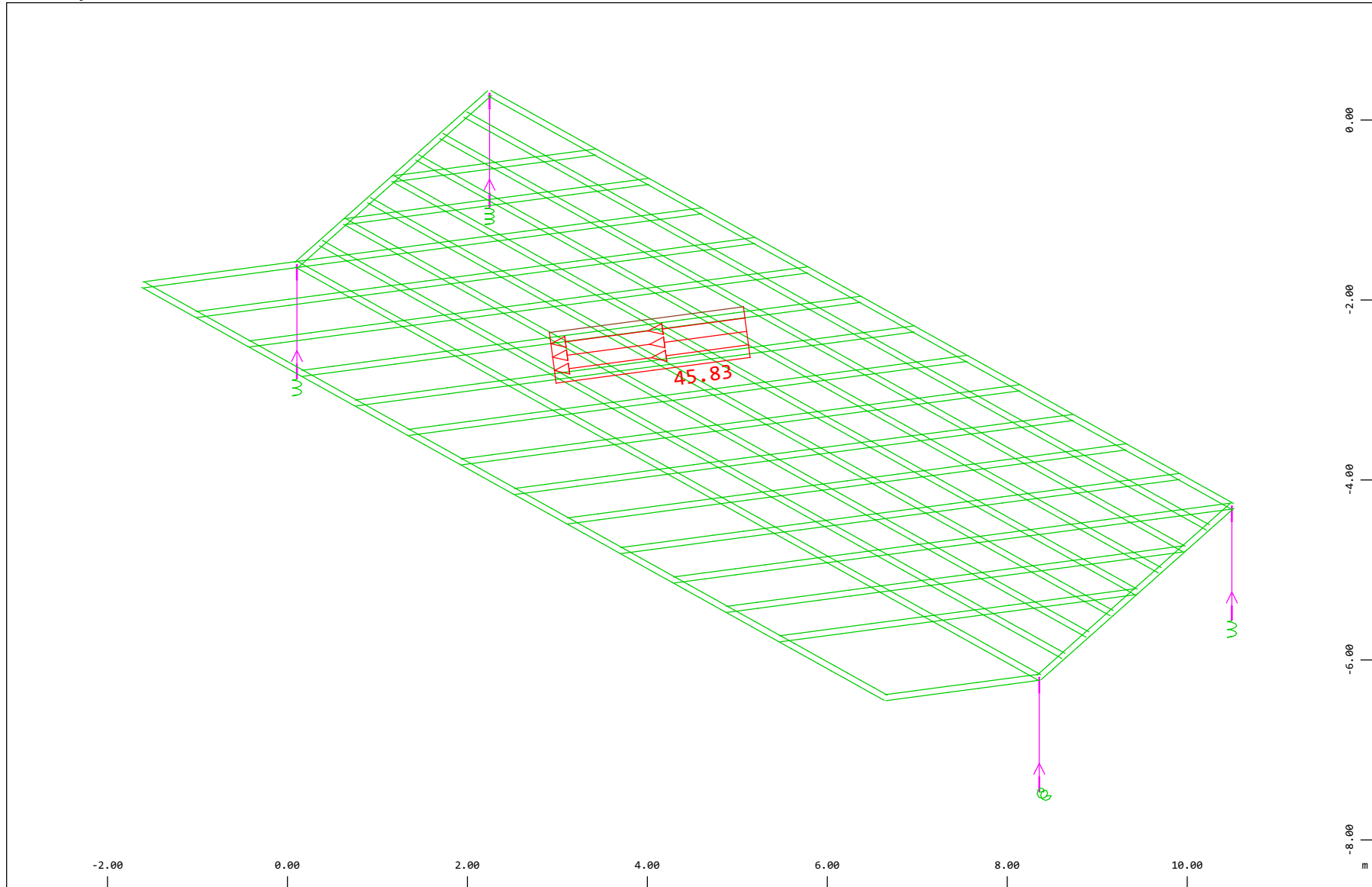


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 400 Qt: Serpeggio-S 3m (SX-->DX) , 1 cm 3D = 19.6 kNm (Min=-11.5) (Max=3.82)

M 1 : 120

Definition of Axis
Results elementay loads

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Z
Y
X

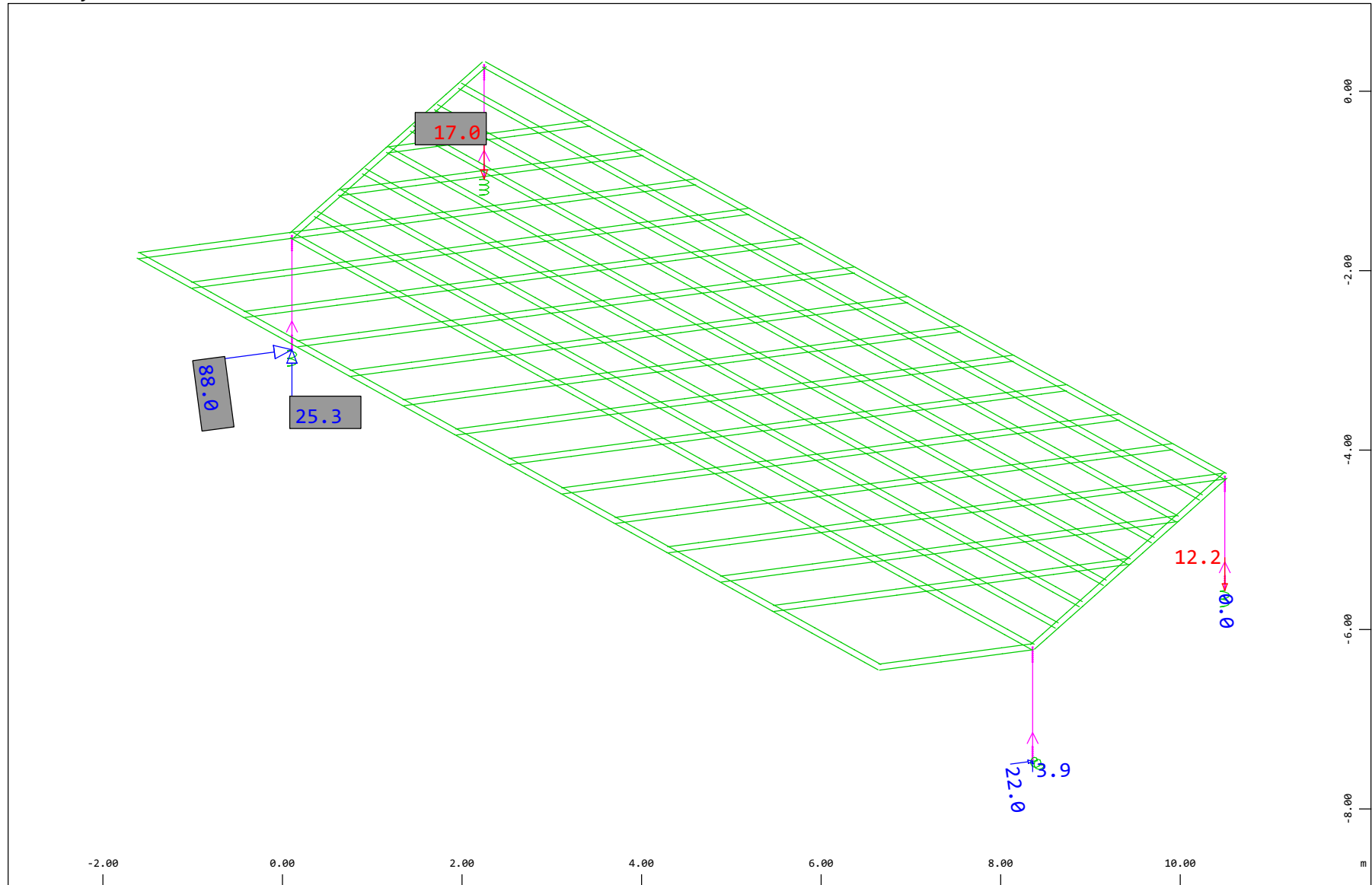
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
All loads, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=48.4 kN/m)
(Min=-45.8) (Max=-45.8)



M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

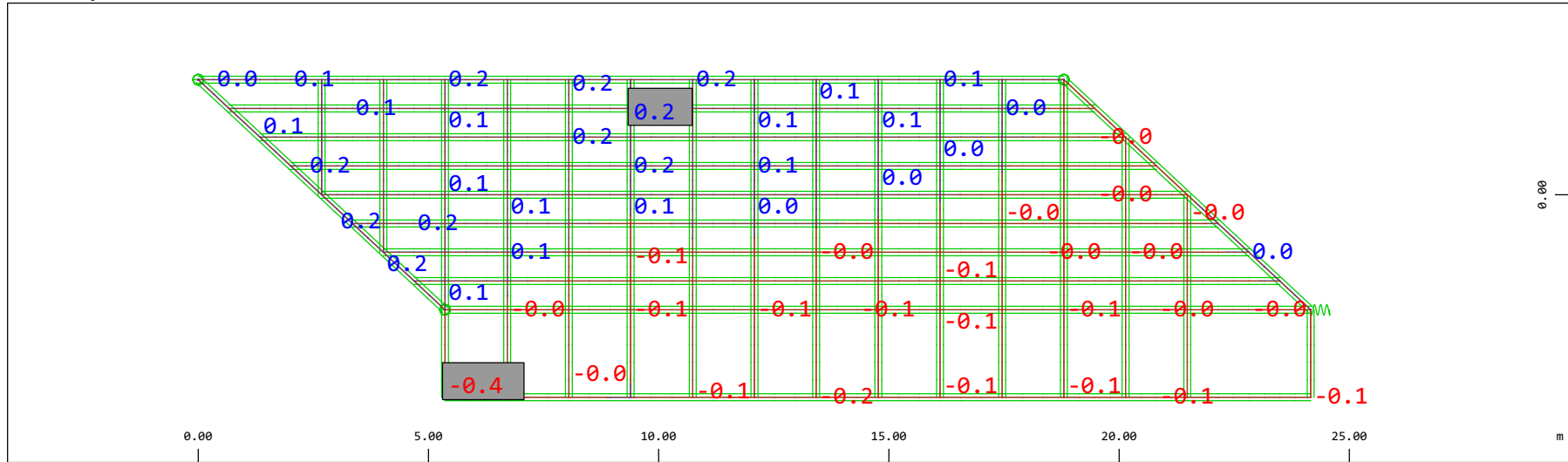
Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 19.4 kN

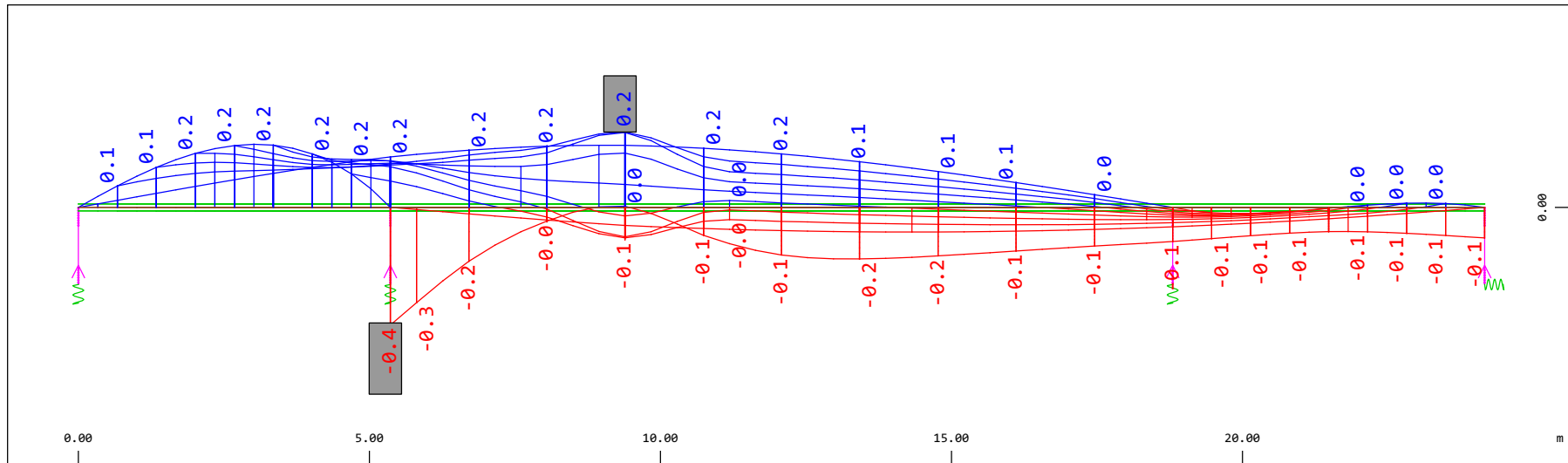
◁ (Min=-17.0) (Max=25.3) (total:

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

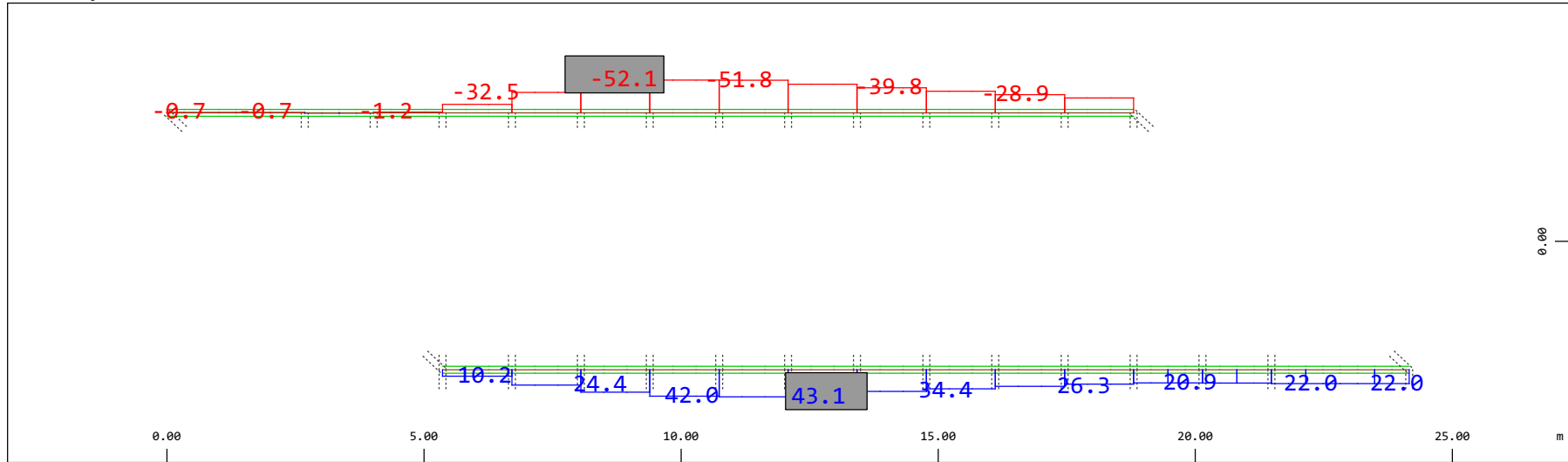


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 0.194 mm (Min=-0.370) (Max=0.244) M 1 : 134



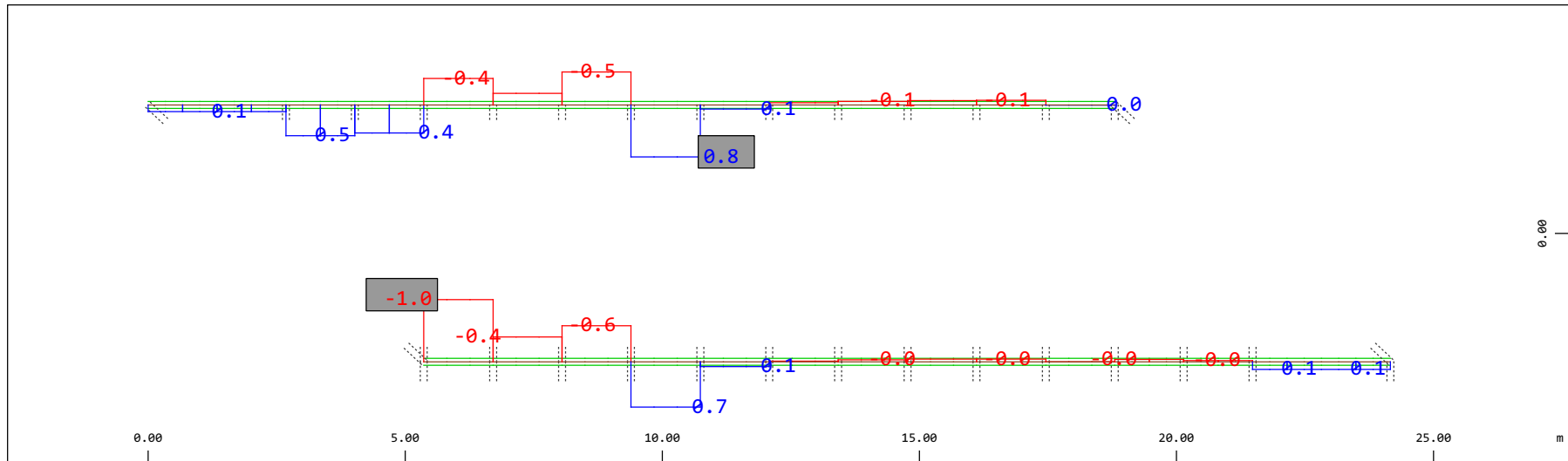
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 0.194 mm (Min=-0.370) (Max=0.244) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 98.0 kN (Min=-52.1) (Max=43.1)

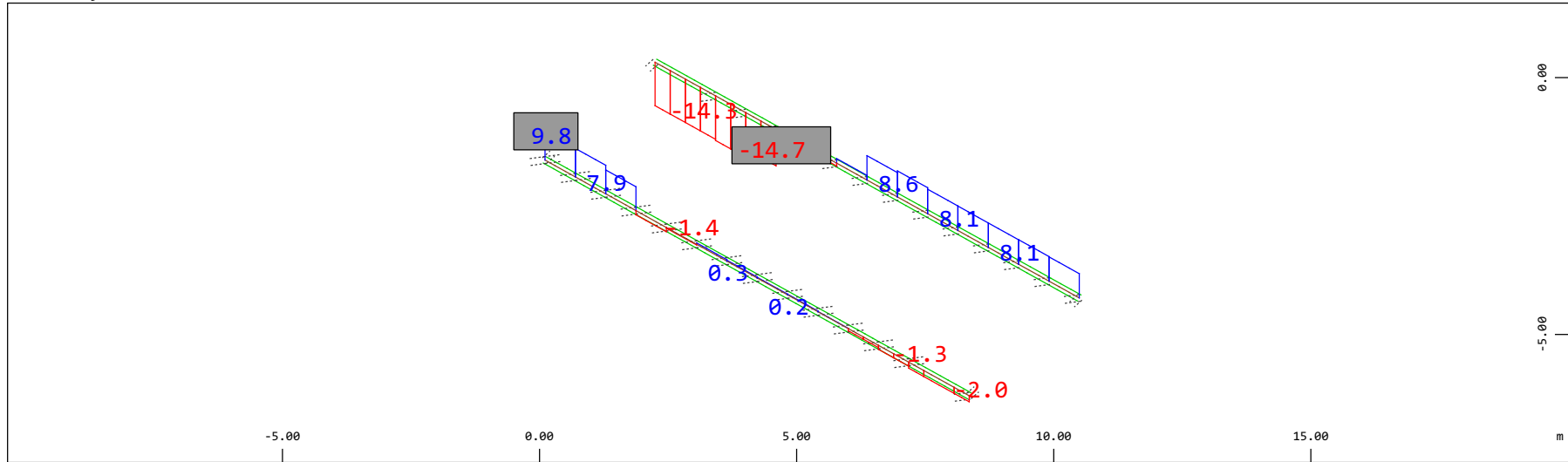
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 0.980 kNm (Min=-0.990) (Max=0.826)

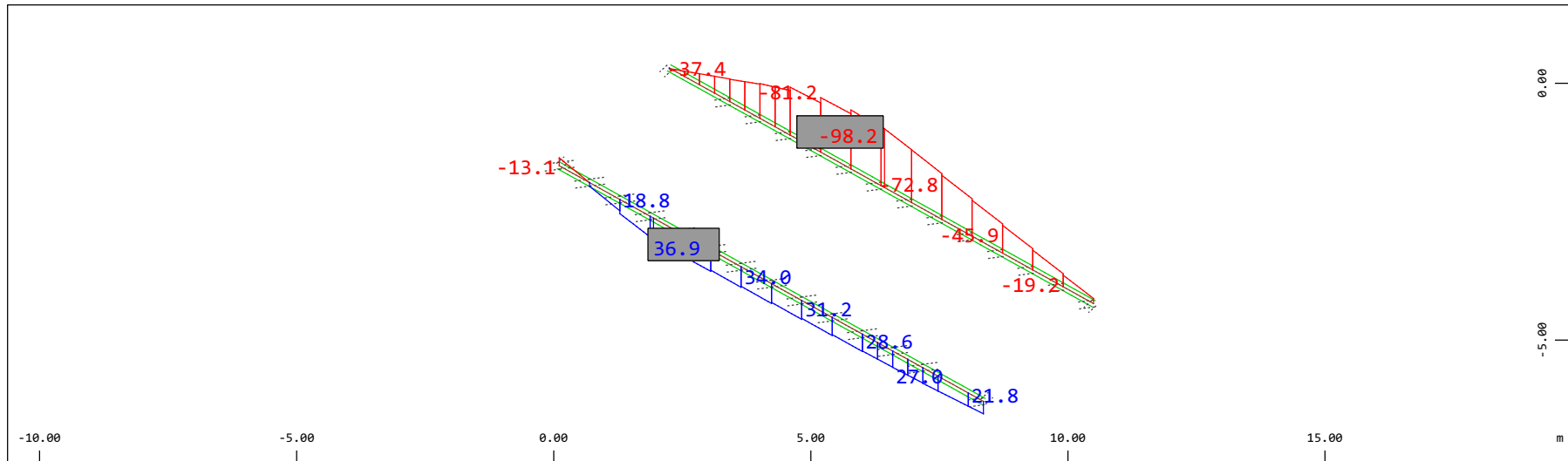
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vz, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-14.7) (Max=9.80)

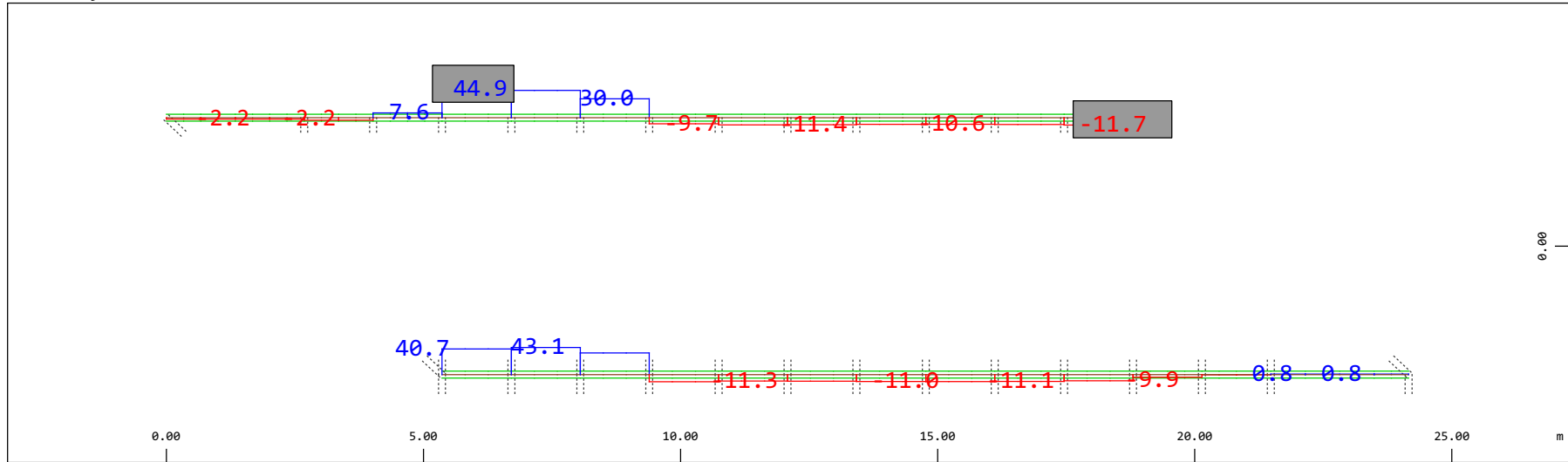
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 98.0 kNm (Min=-98.2) (Max=36.9)

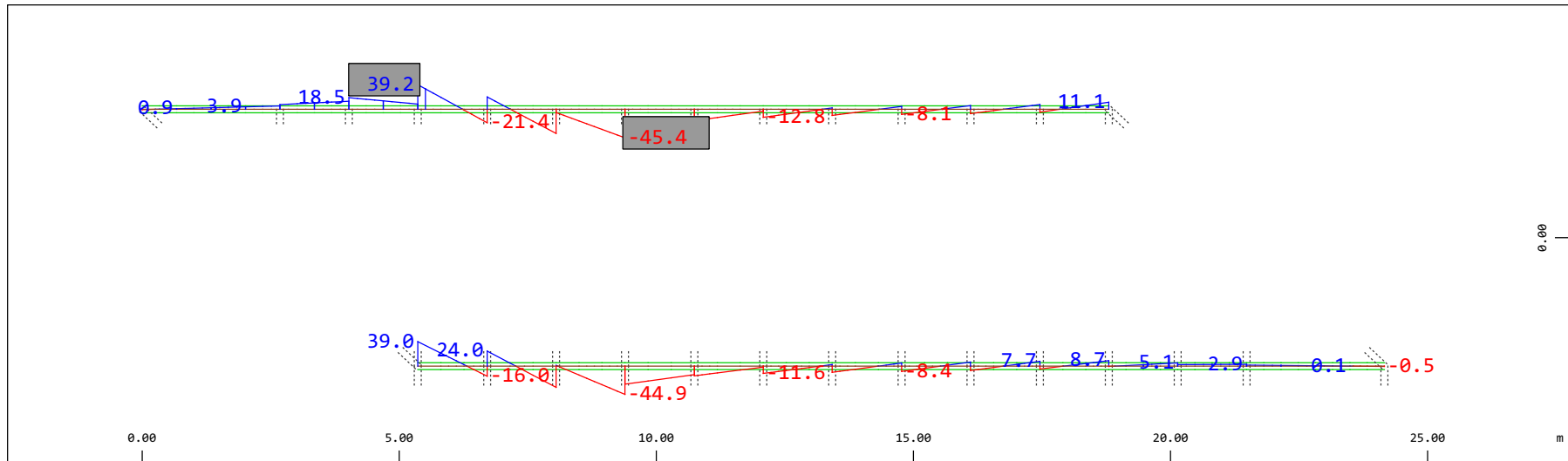
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 10 11
 X Beam Elements , Shear force Vy, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 98.0 kN (Min=-11.7) (Max=44.9)

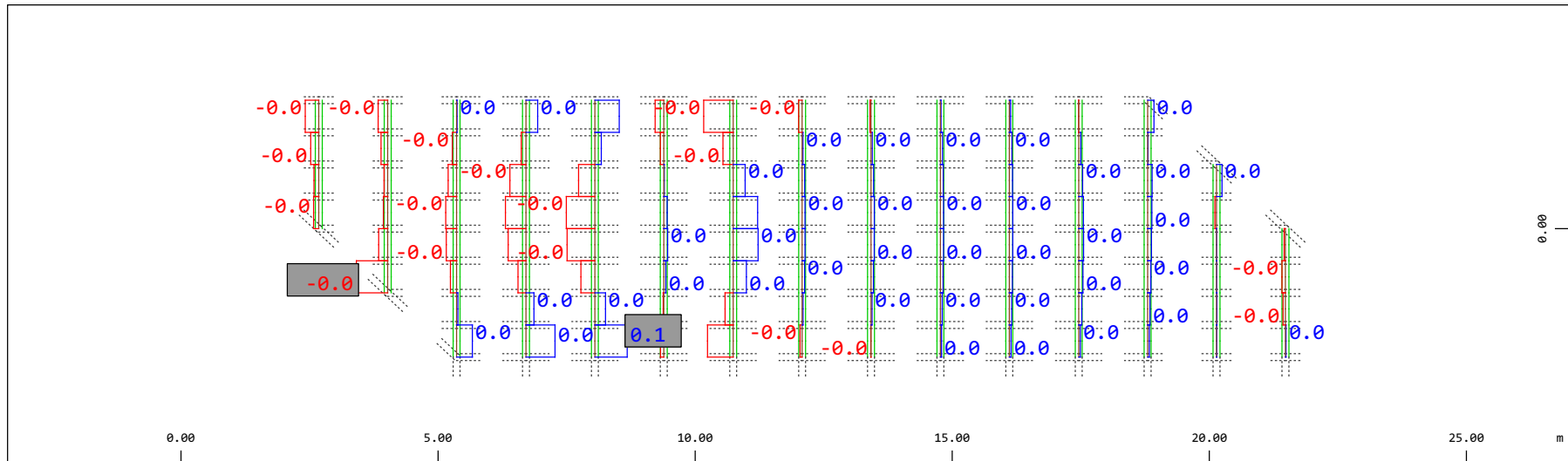
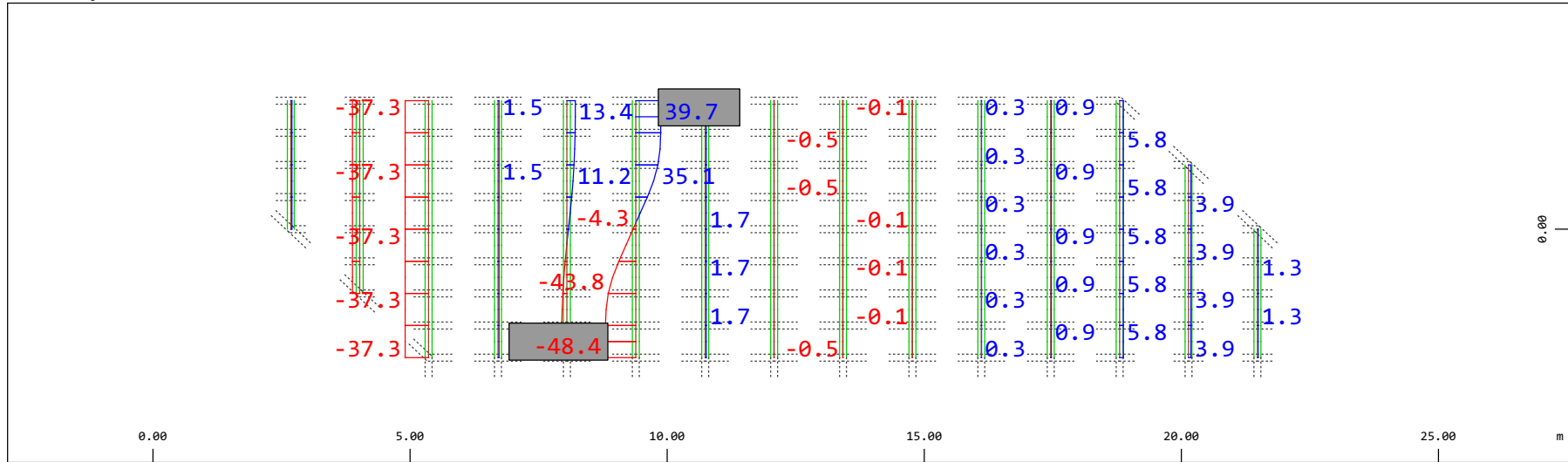
M 1 : 120



Y Sector of system Beam Elements Group 10 11
 X Beam Elements , Bending moment Mz, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 98.0 kNm (Min=-45.4) (Max=39.2)

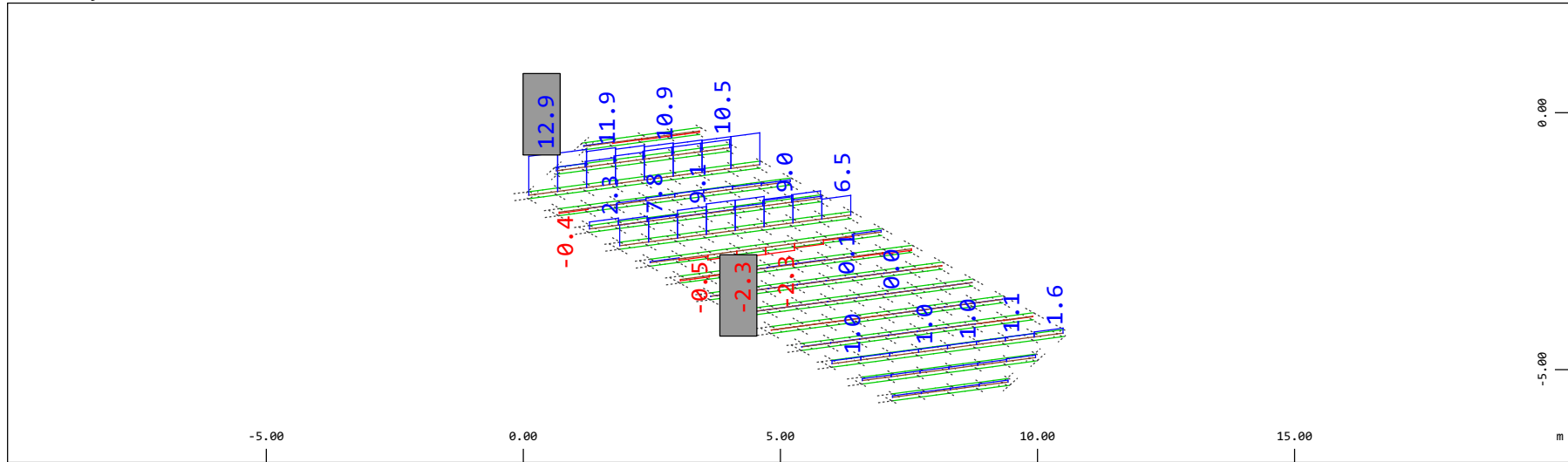
M 1 : 120

Definition of Axis
 Results elementay loads



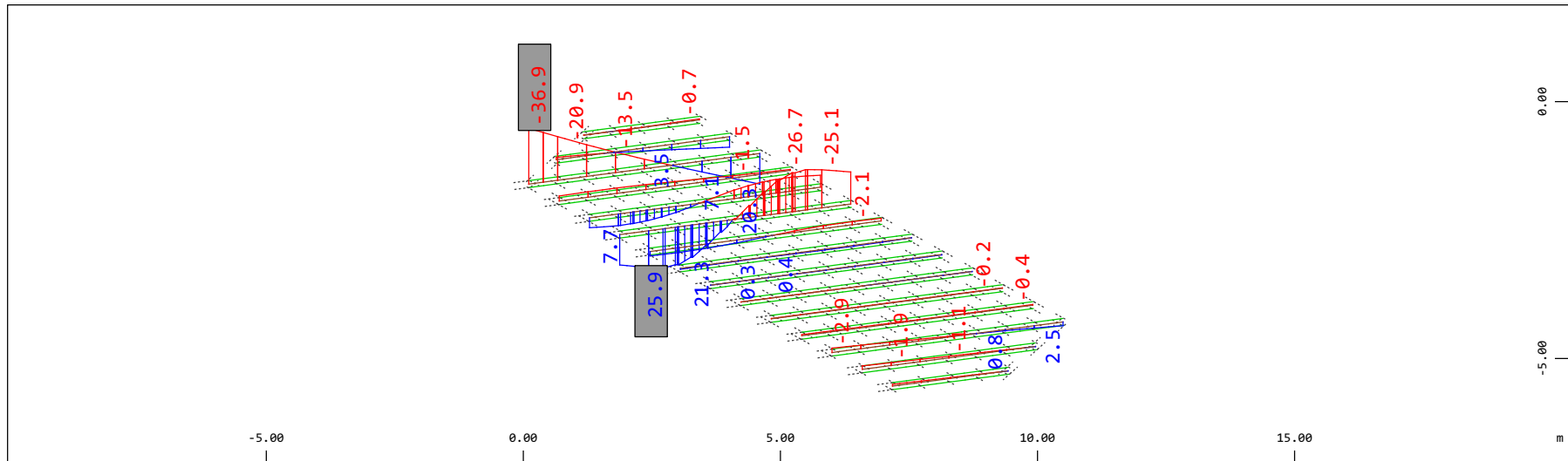
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-2.30) (Max=12.9)

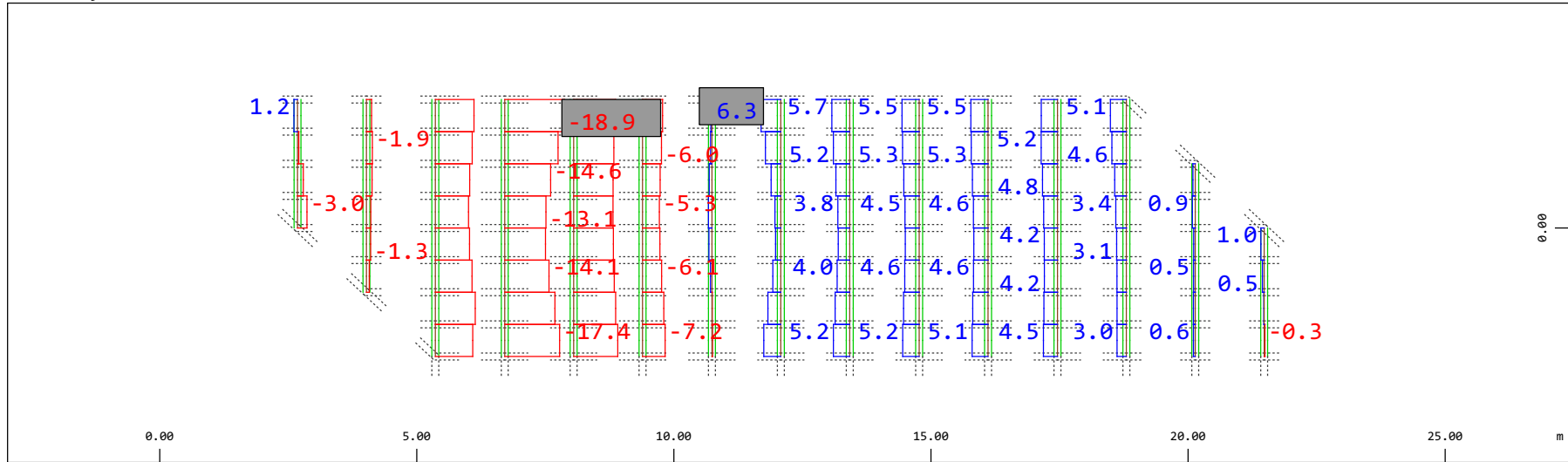
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 39.2
 kNm (Min=-36.9) (Max=25.9)

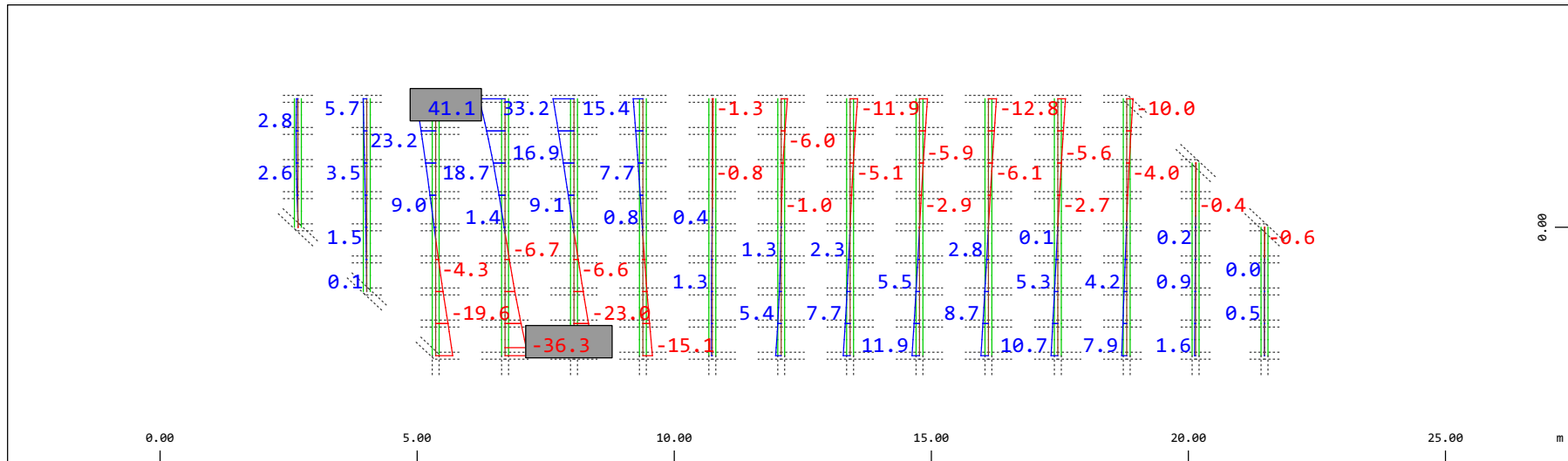
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-18.9) (Max=6.29)

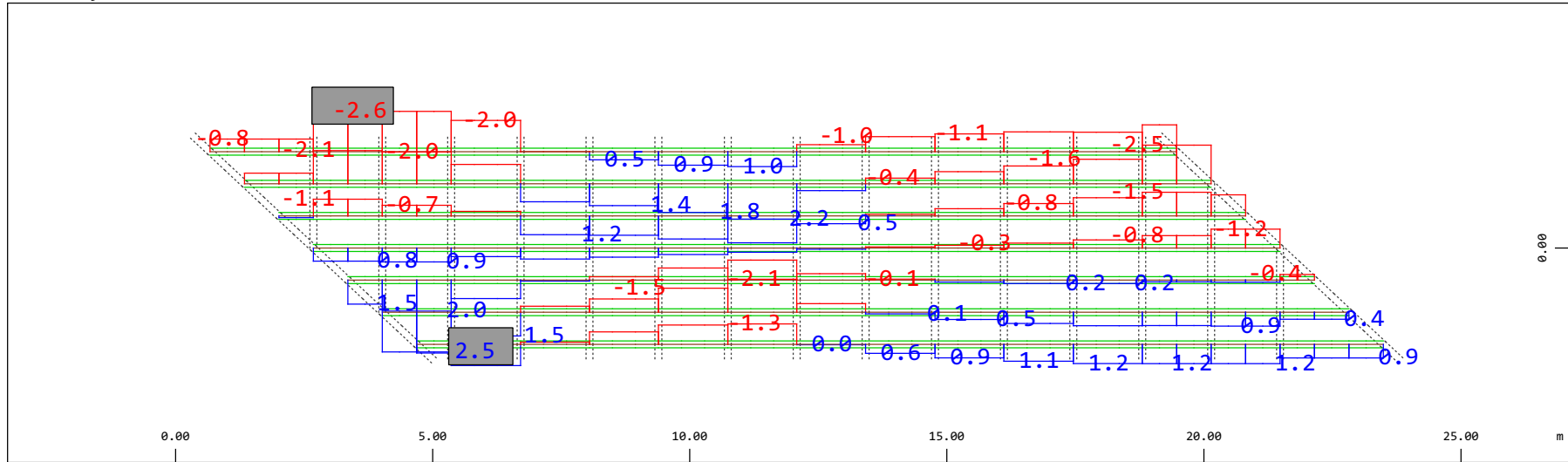
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 98.0 kNm (Min=-36.3) (Max=41.1)

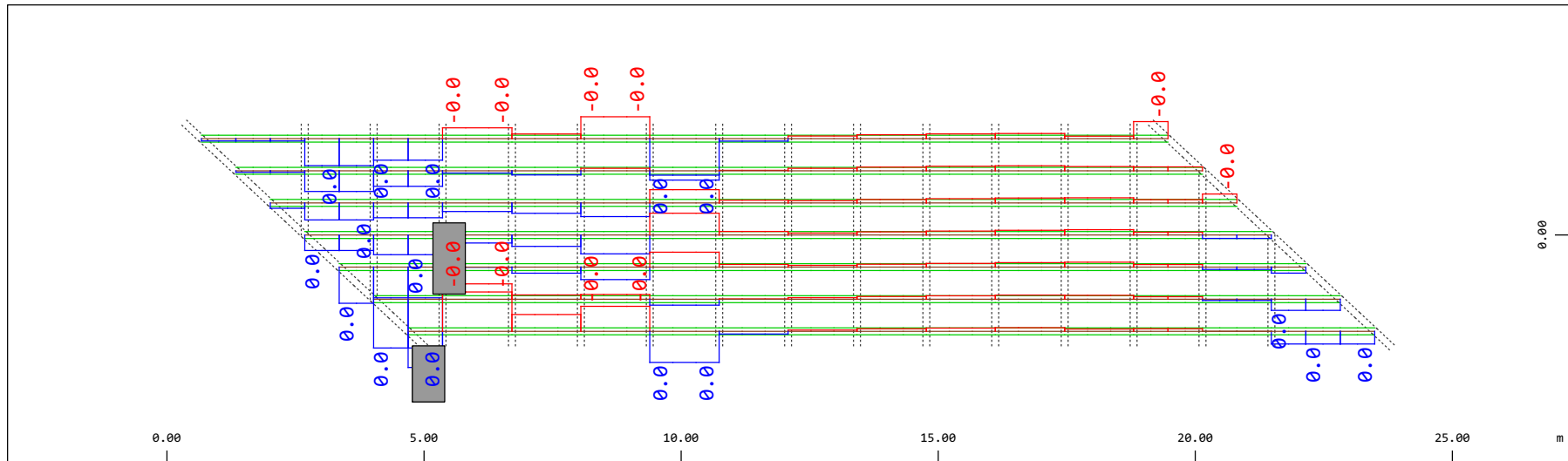
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force Nx, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 3.92 kN (Min=-2.56) (Max=2.53)

M 1 : 120

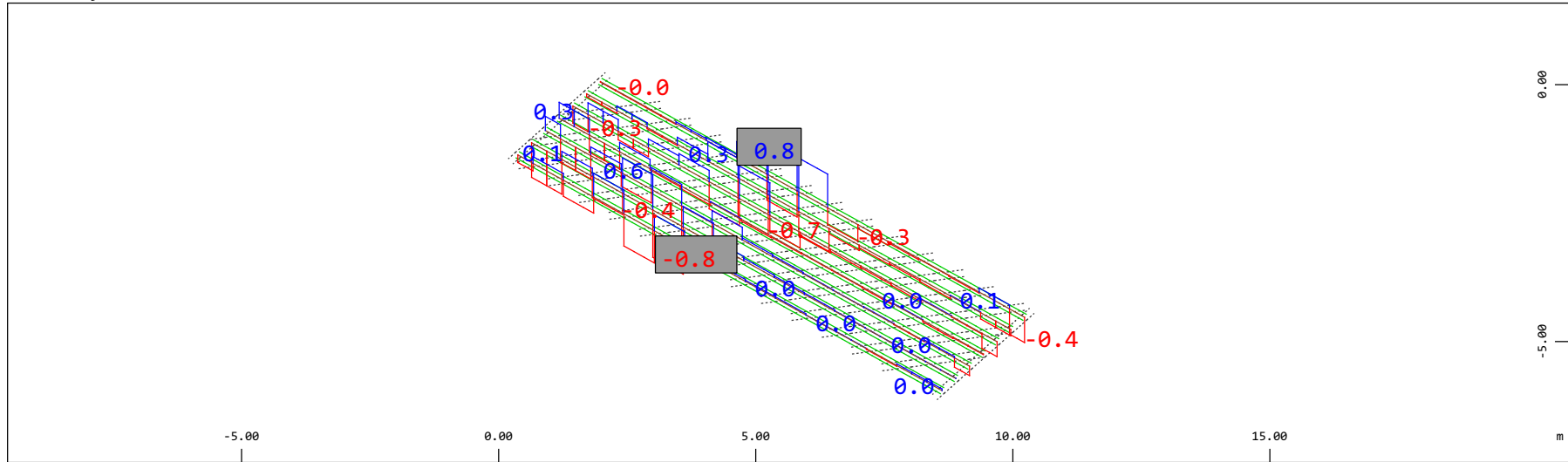


Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment Mt, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 9.8047e-04 kNm (Min=-6.2613e-04) (Max=7.7598e-04)

M 1 : 120

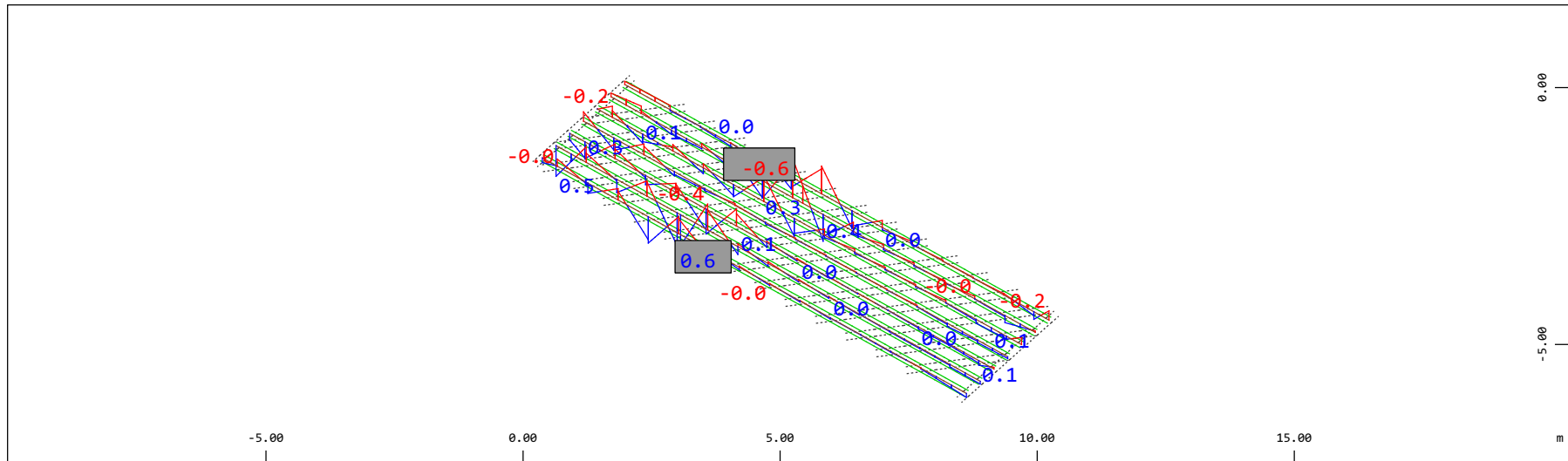
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 0.980 kN (Min=-0.780) (Max=0.807)

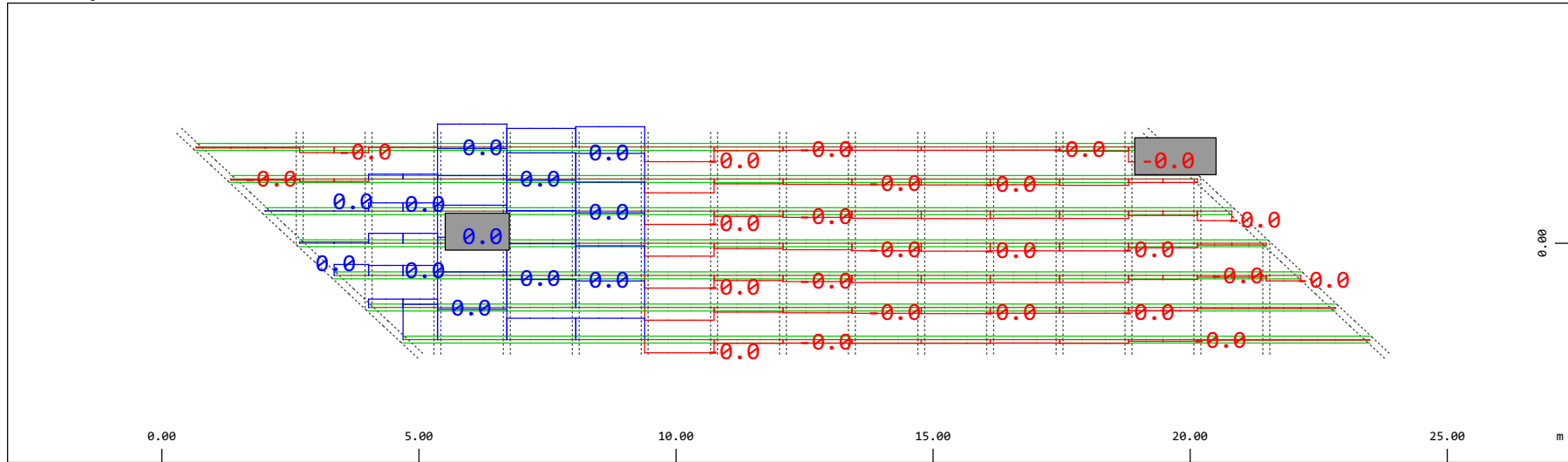
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



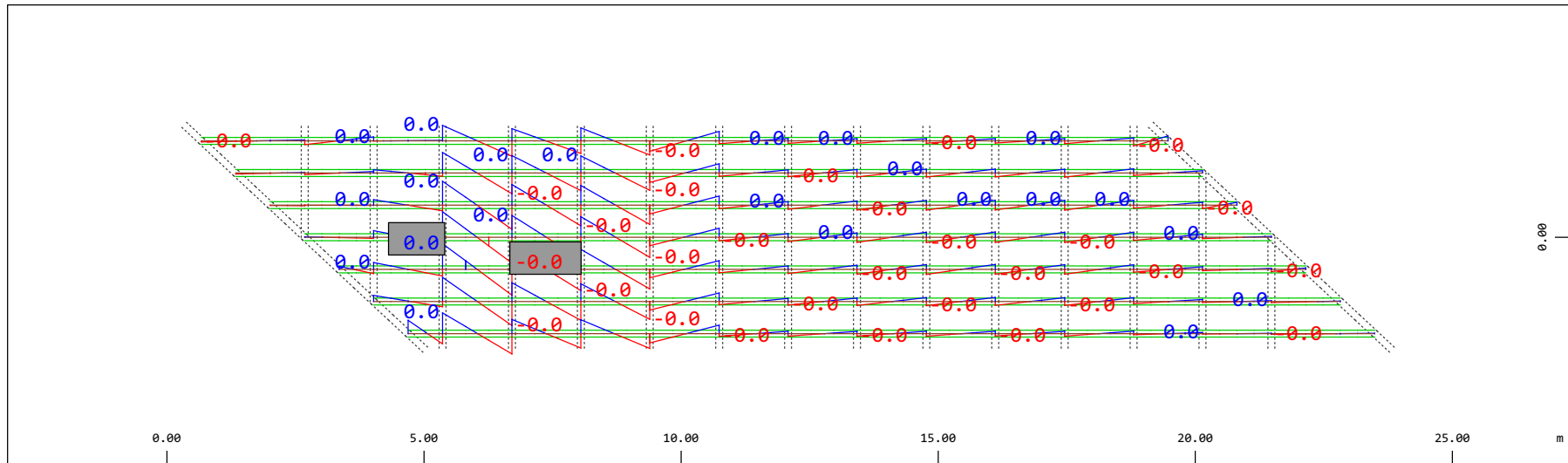
Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 0.980
 kNm (Min=-0.648) (Max=0.628)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



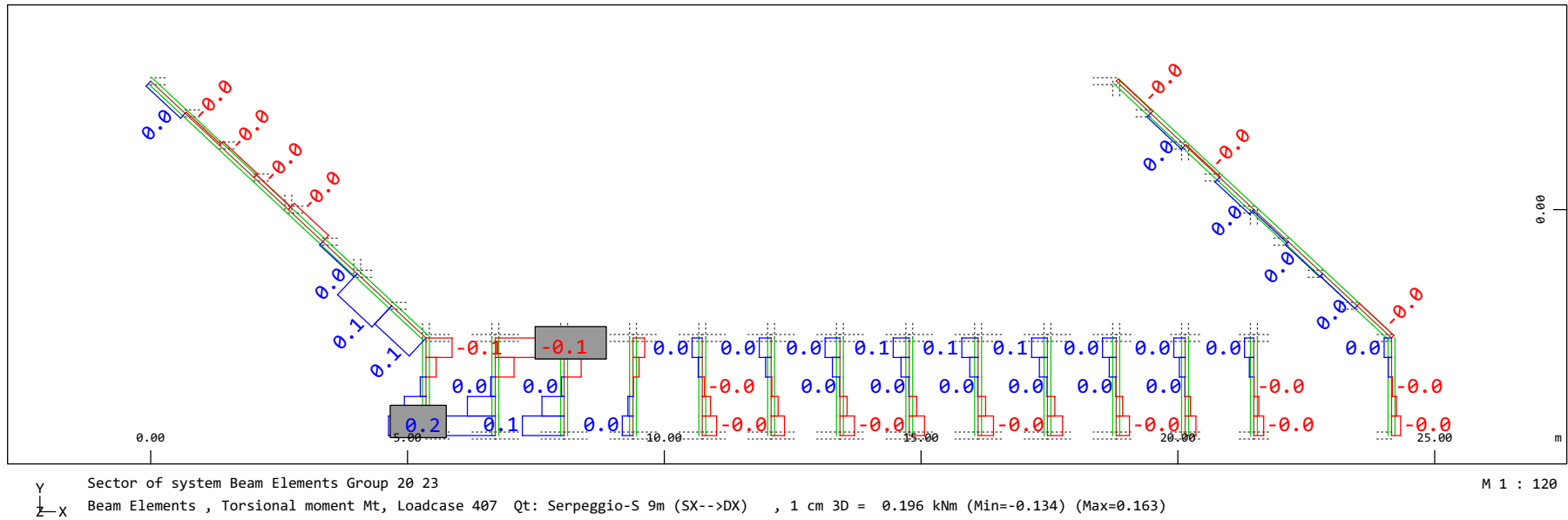
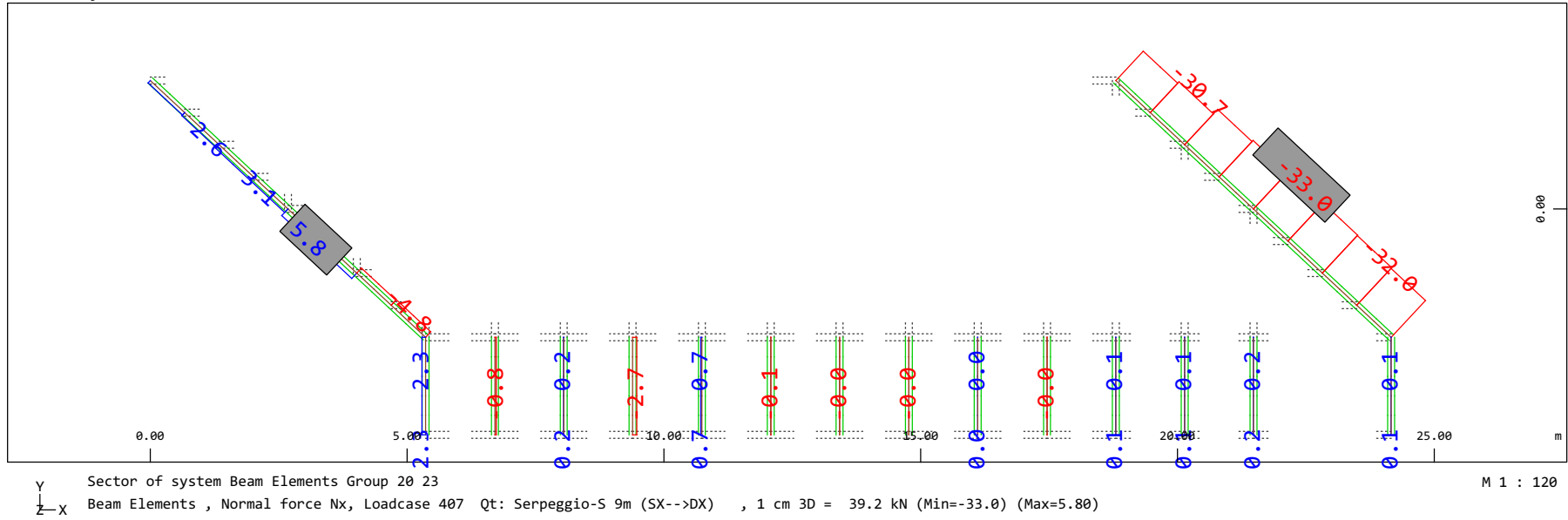
Y Sector of system Beam Elements Group 31...37 M 1 : 120
X Beam Elements , Shear force V_y , Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 0.0098 kN (Min=-0.0024) (Max=0.0061)



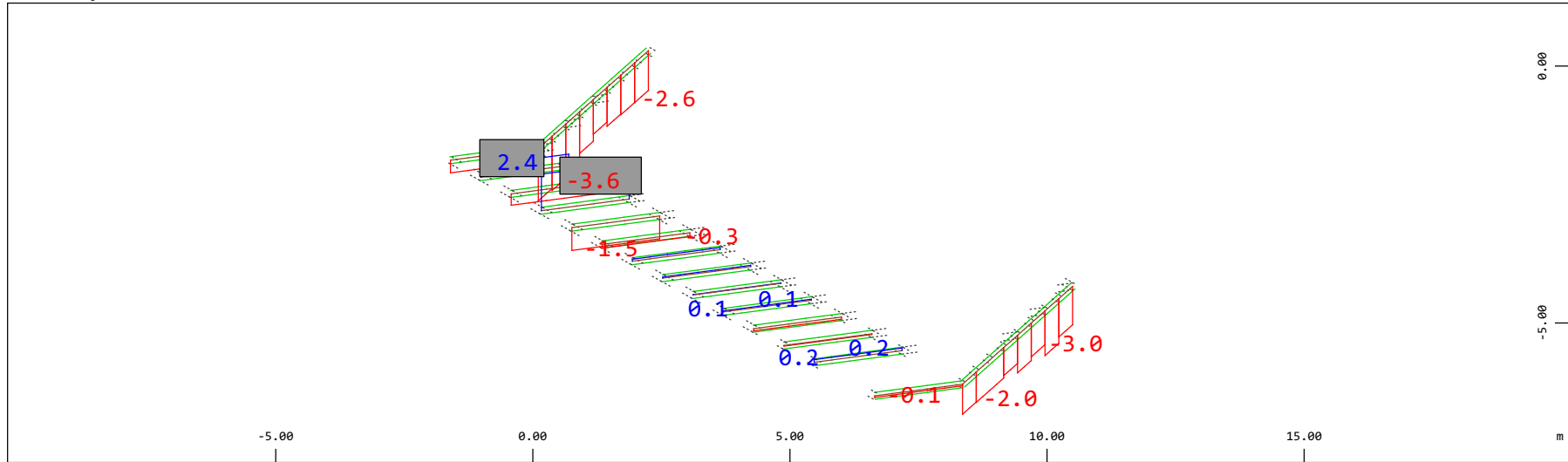
Y Sector of system Beam Elements Group 31...37 M 1 : 120
X Beam Elements , Bending moment M_z , Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 0.0098 kNm (Min=-0.0041) (Max=0.0041)

Definition of Axis
 Results elementay loads

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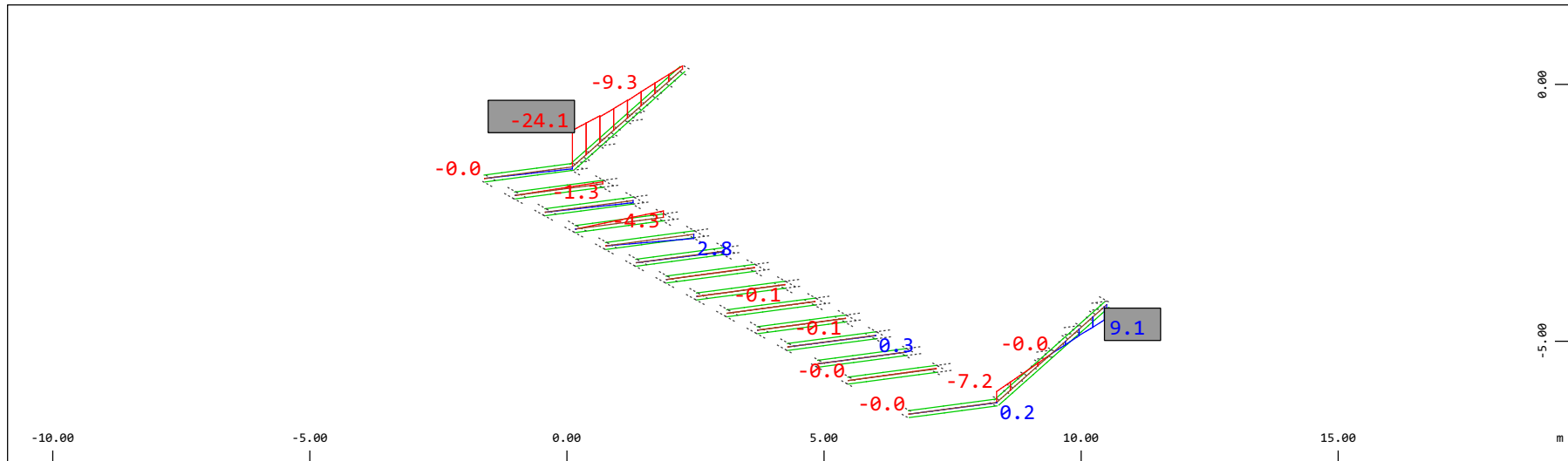


Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 3.92 kN (Min=-3.58) (Max=2.42)

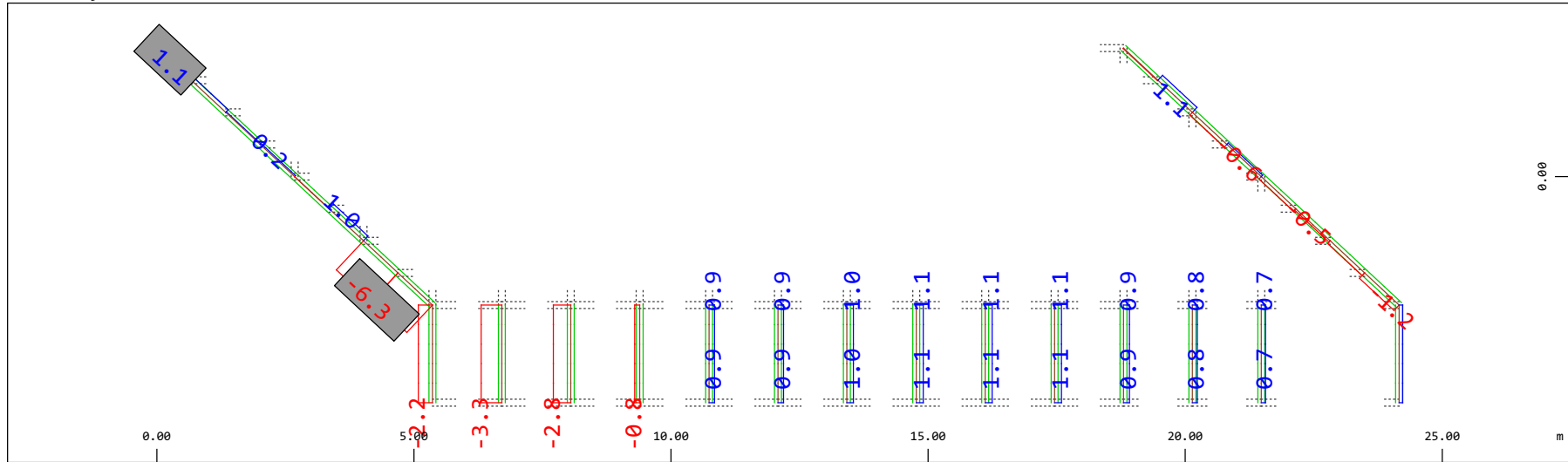
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 39.2 kNm (Min=-24.1) (Max=9.11)

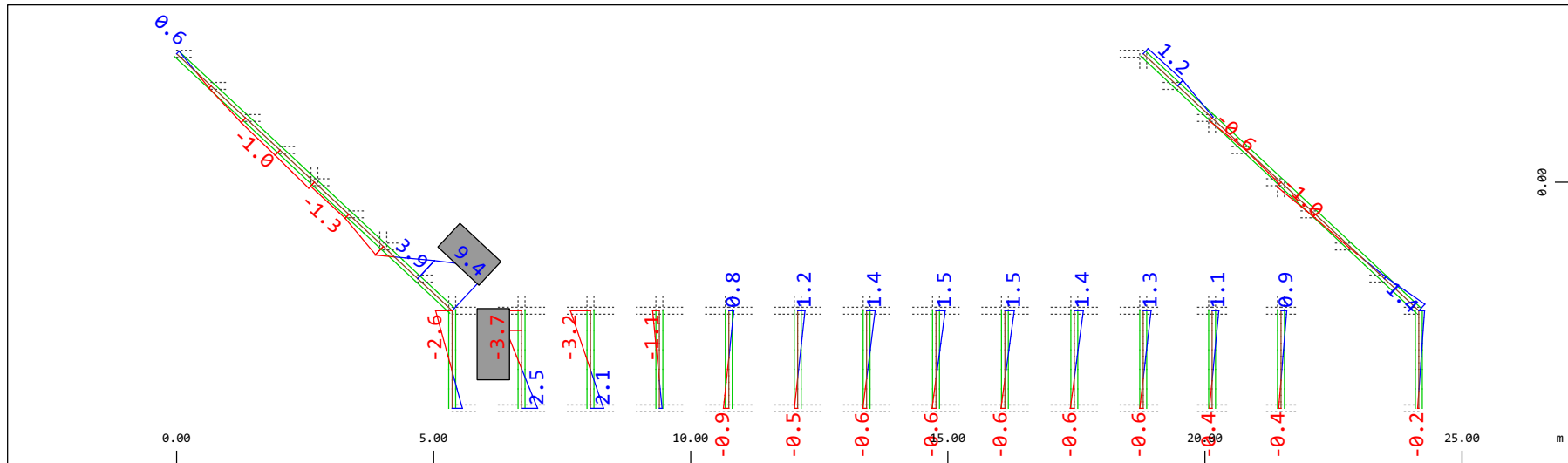
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 9.80 kN (Min=-6.32) (Max=1.14)

M 1 : 120

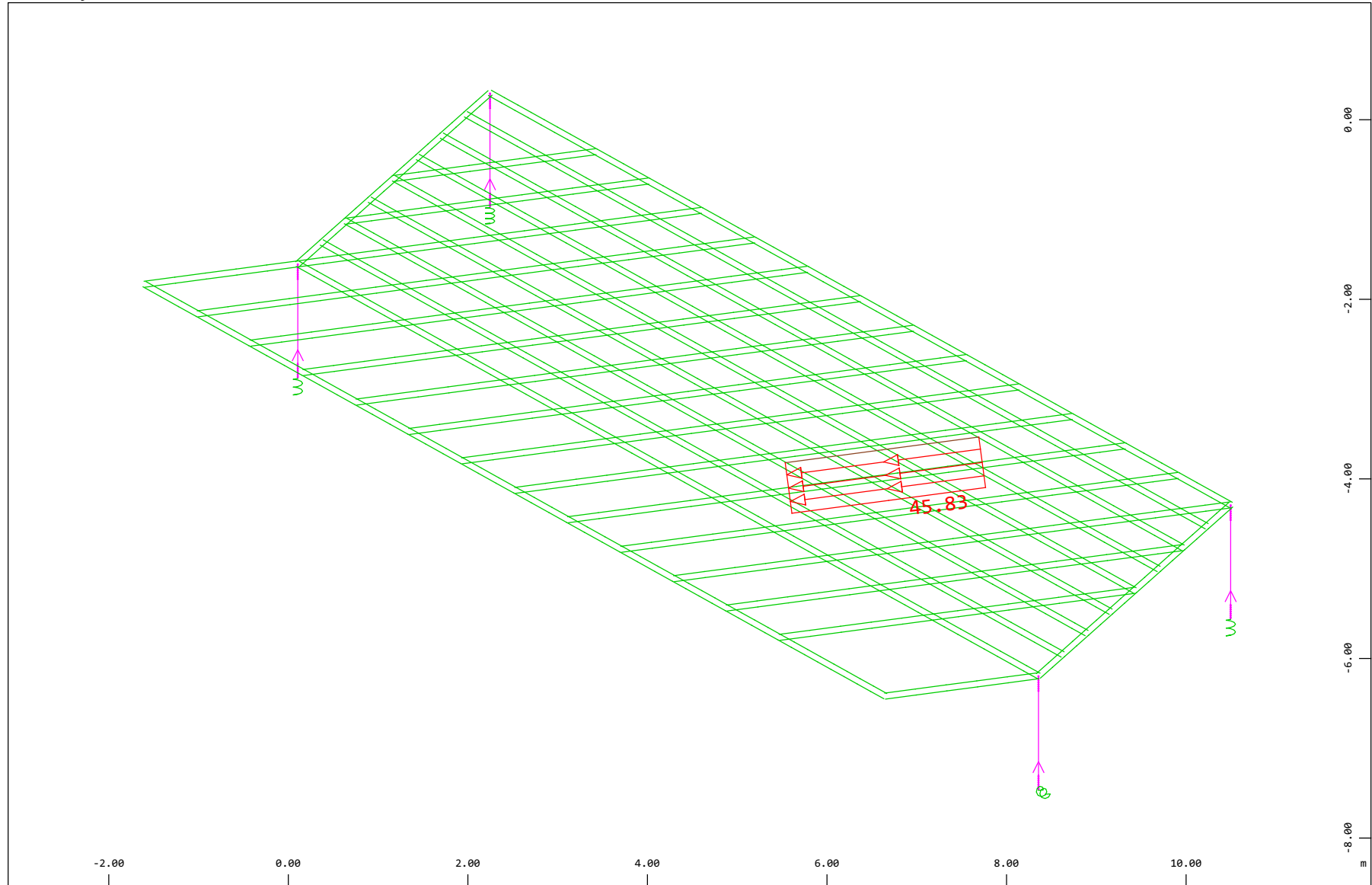


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 407 Qt: Serpeggio-S 9m (SX-->DX) , 1 cm 3D = 9.80 kNm (Min=-3.70) (Max=9.36)

M 1 : 120

Definition of Axis
Results elementay loads

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Z
Y
X

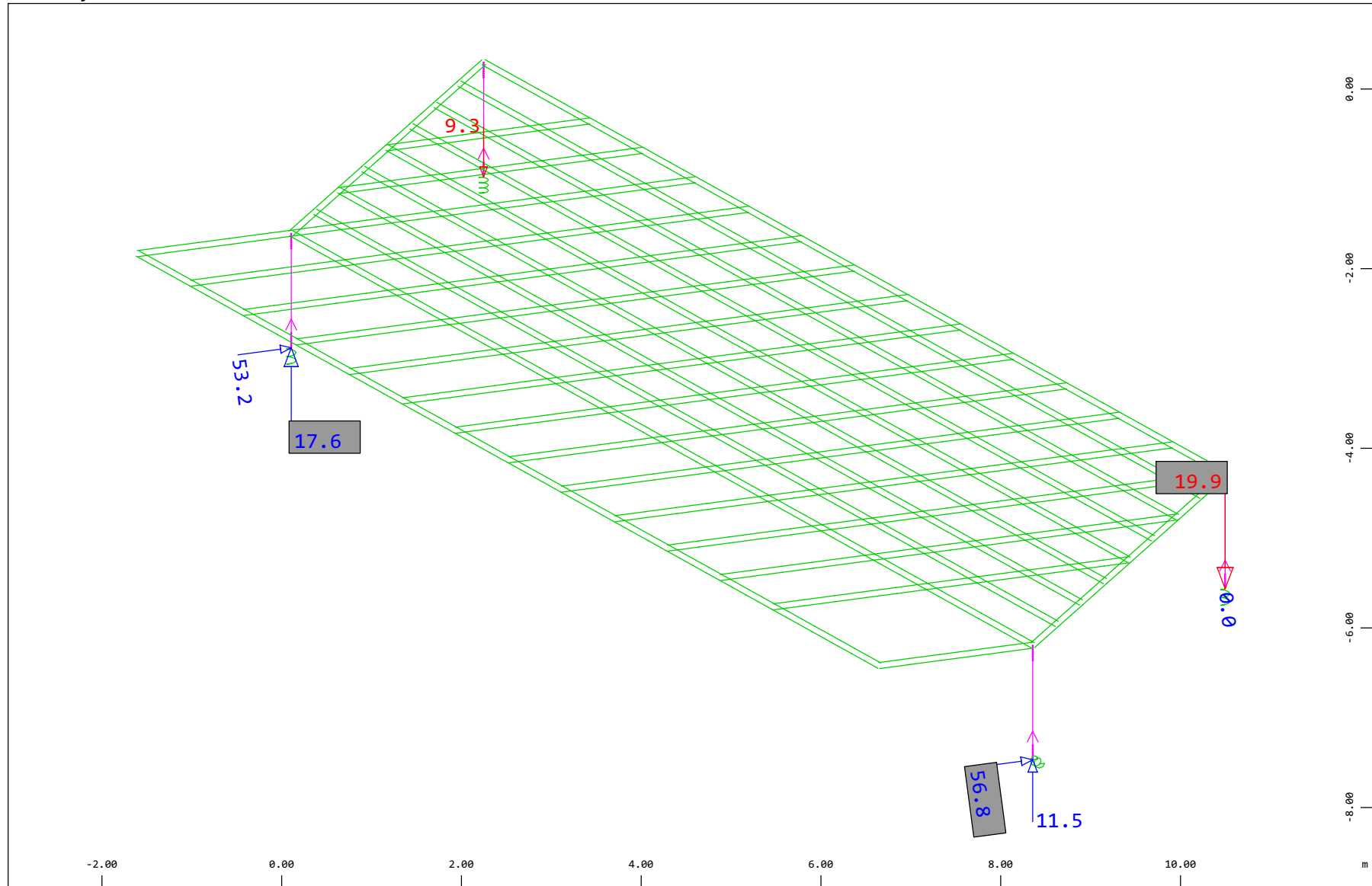
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
All loads, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=48.4 kN/m)
(Min=-45.8) (Max=-45.8)



M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads

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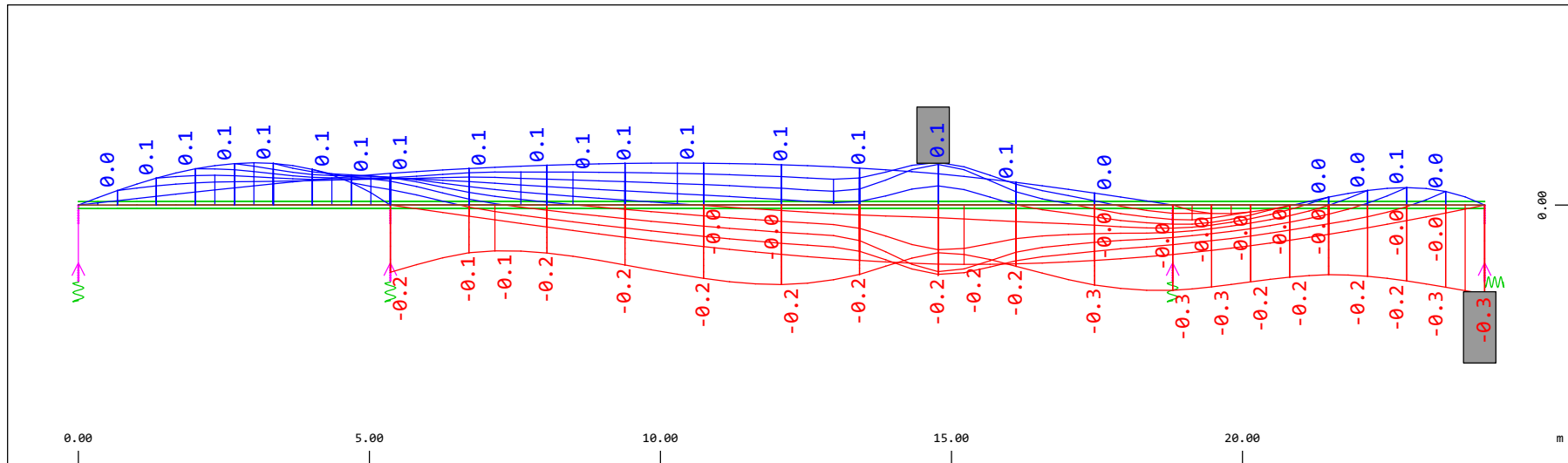
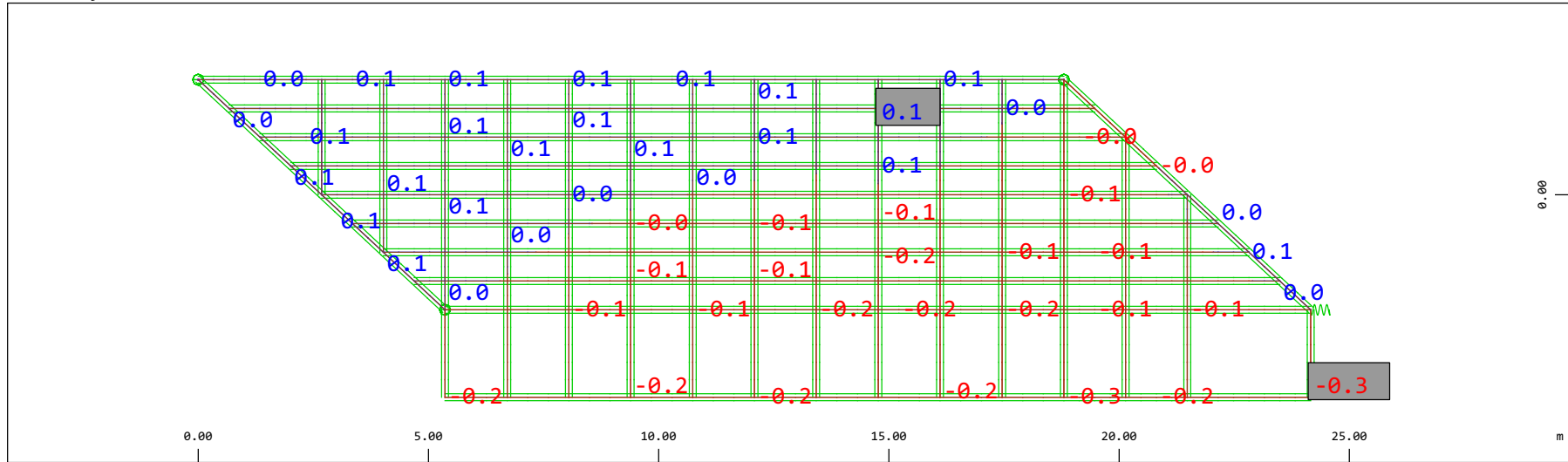
Z
 X Y

Sector of system Beam Elements, Spring Elements
 Nodes , Support force in global Z, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 9.69 kN
 (total: 0)

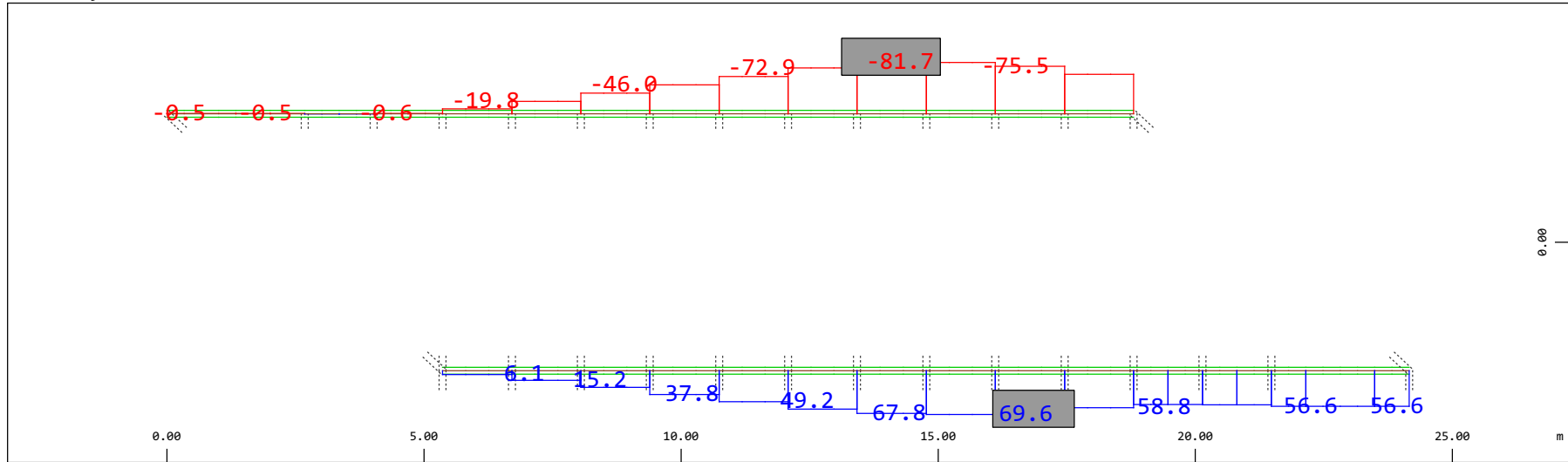
△ (Min=-19.9) (Max=17.6)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

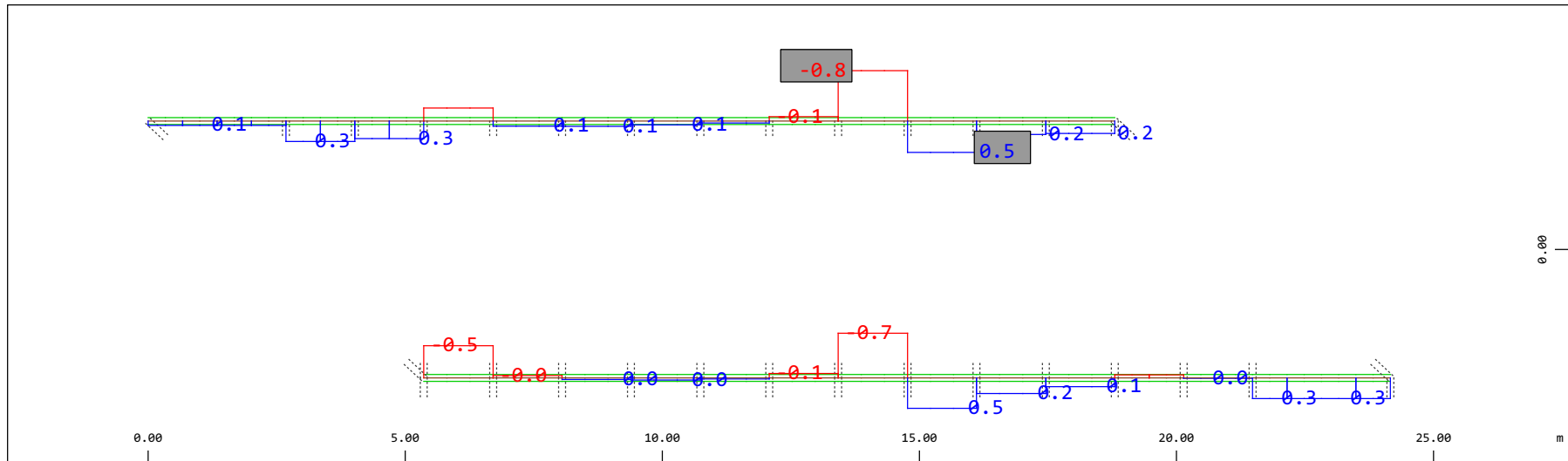


Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 98.0 kN (Min=-81.7) (Max=69.6)

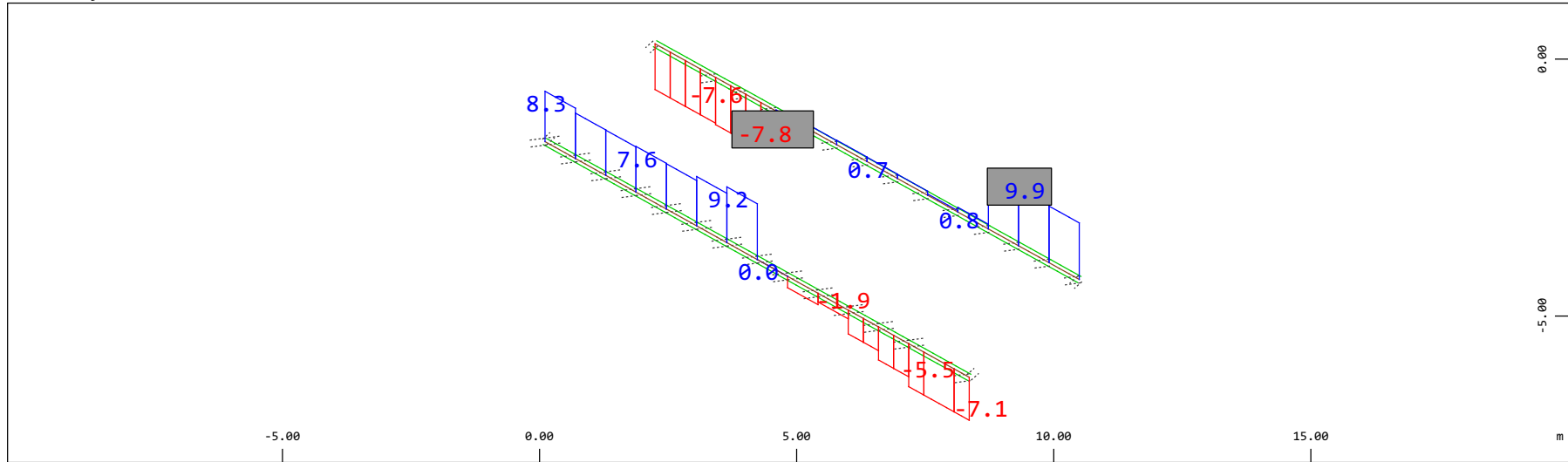
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 0.980 kNm (Min=-0.801) (Max=0.498)

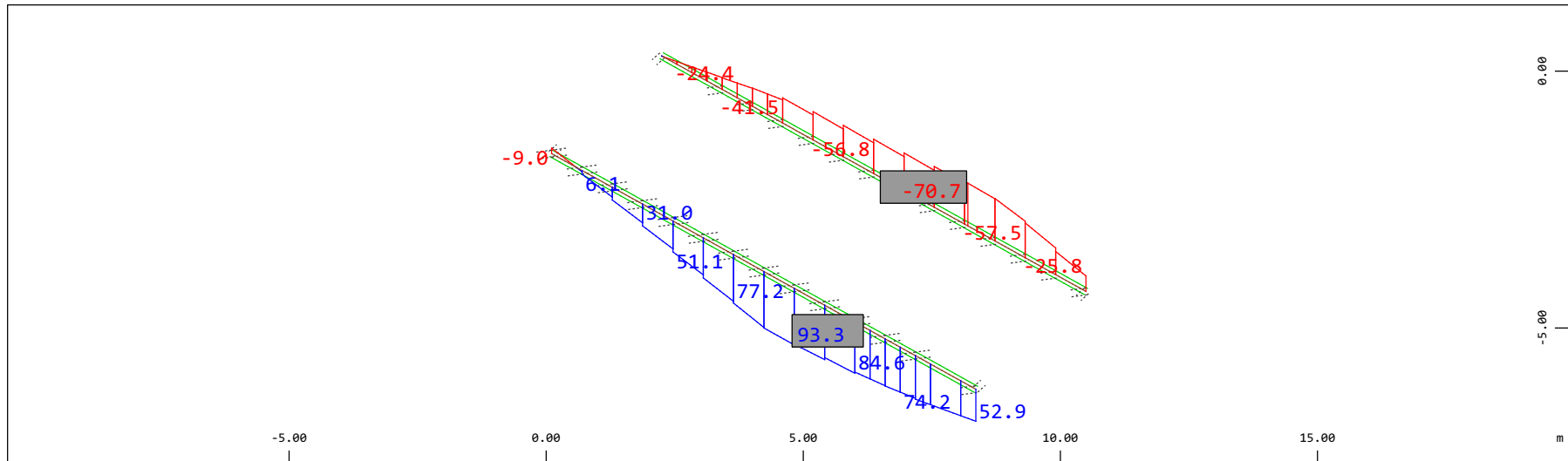
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 9.80 kN (Min=-7.80) (Max=9.92)

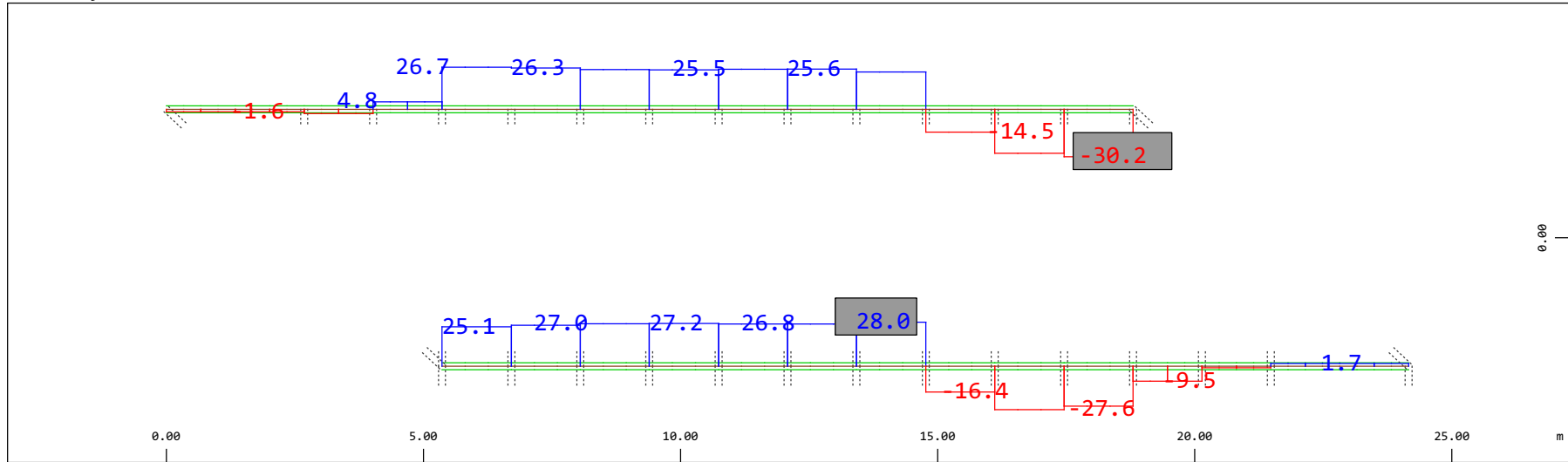
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 98.0 kNm (Min=-70.7) (Max=93.3)

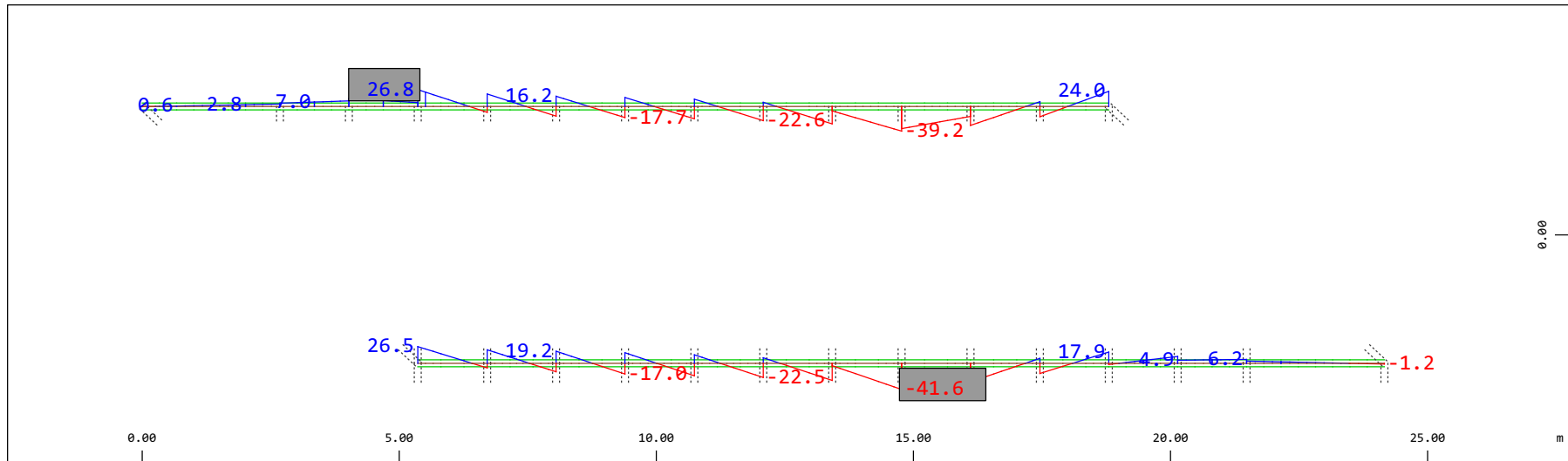
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementary loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 39.2 kN (Min=-30.2) (Max=28.0)

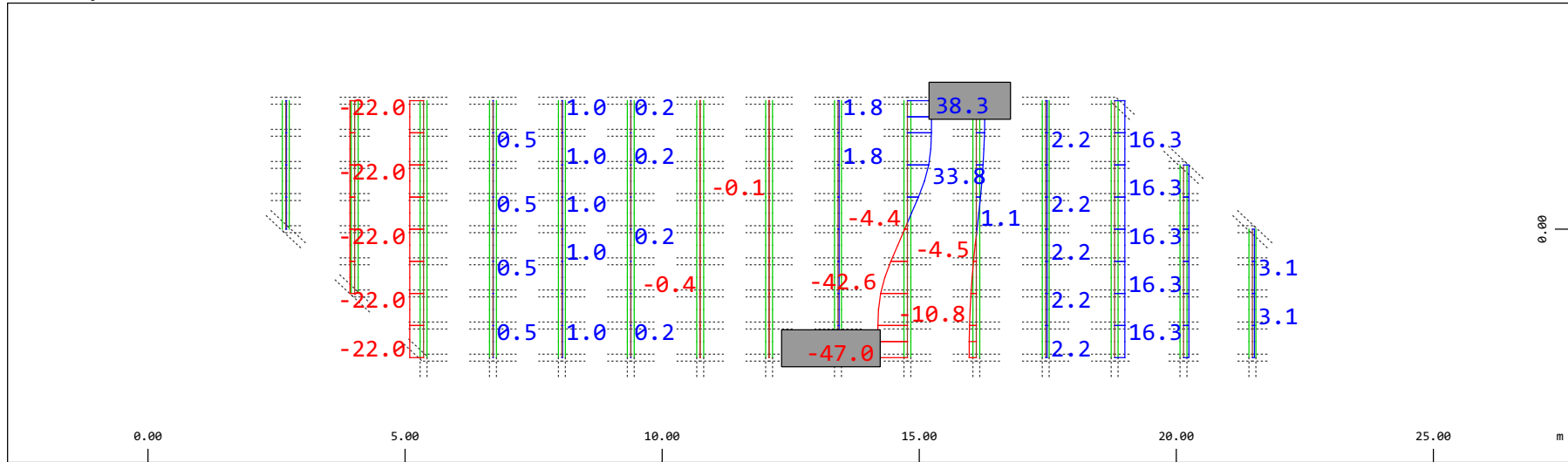
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 98.0 kNm (Min=-41.6) (Max=26.8)

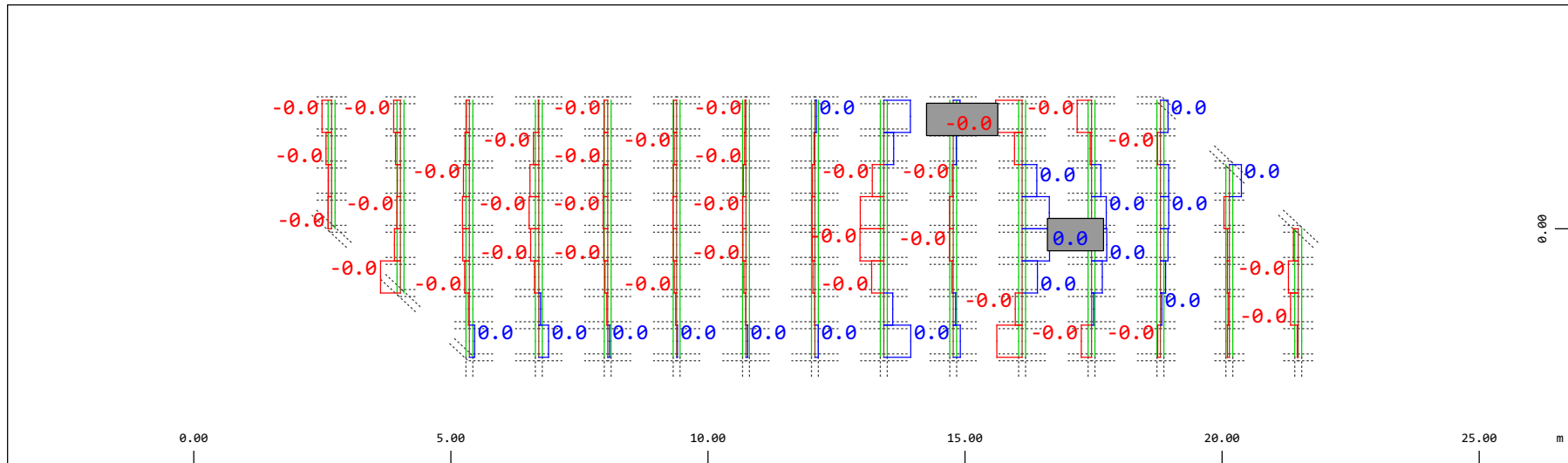
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 98.0 kN (Min=-47.0) (Max=38.3)

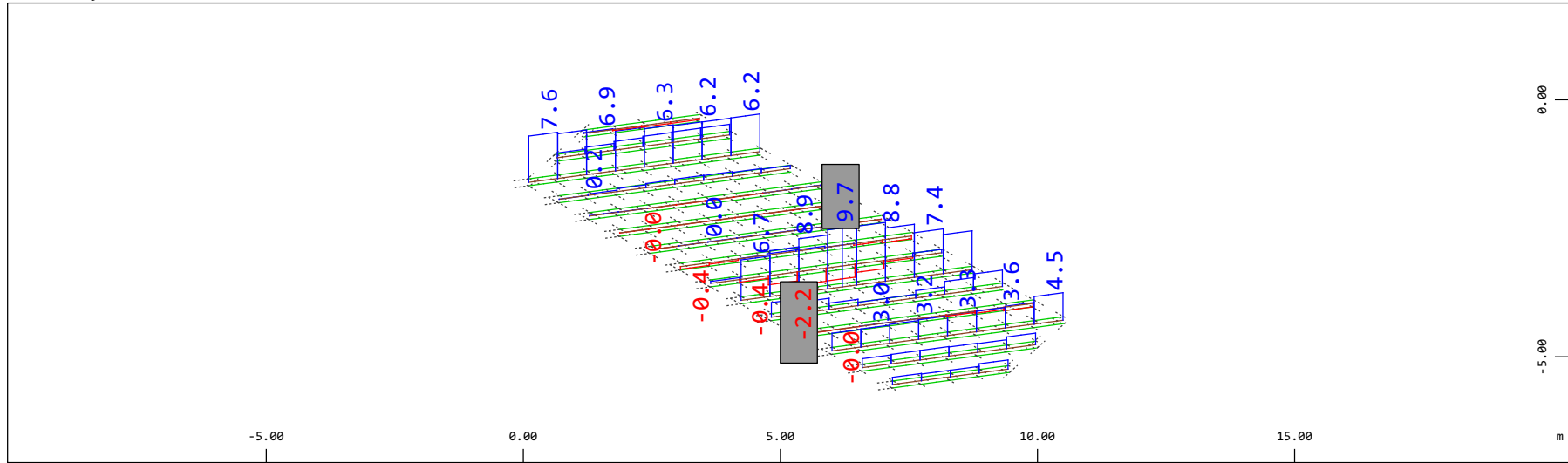
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 0.0980 kNm (Min=-0.0421) (Max=0.0436)

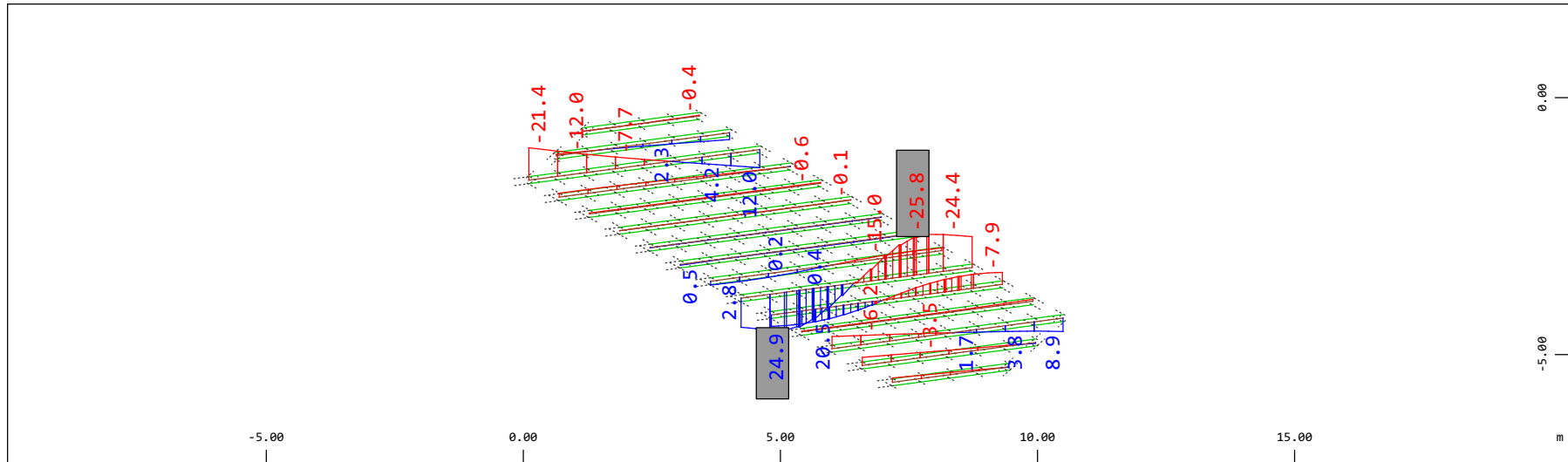
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vz, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 9.80 kN (Min=-2.18) (Max=9.74)

M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

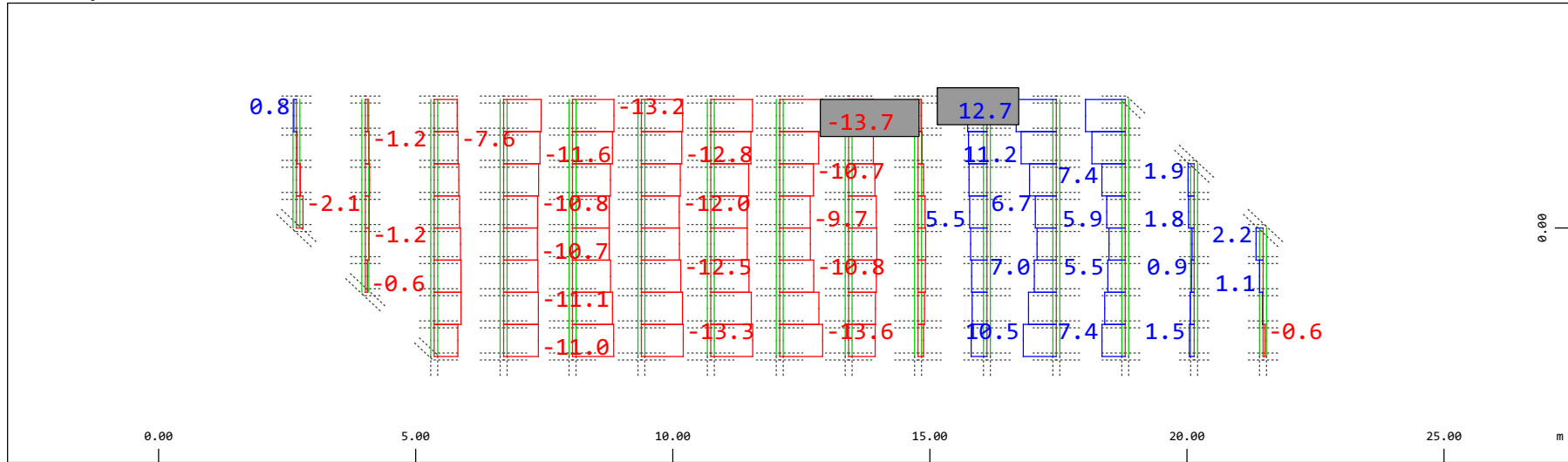


Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 39.2 kNm (Min=-25.8) (Max=24.9)

M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

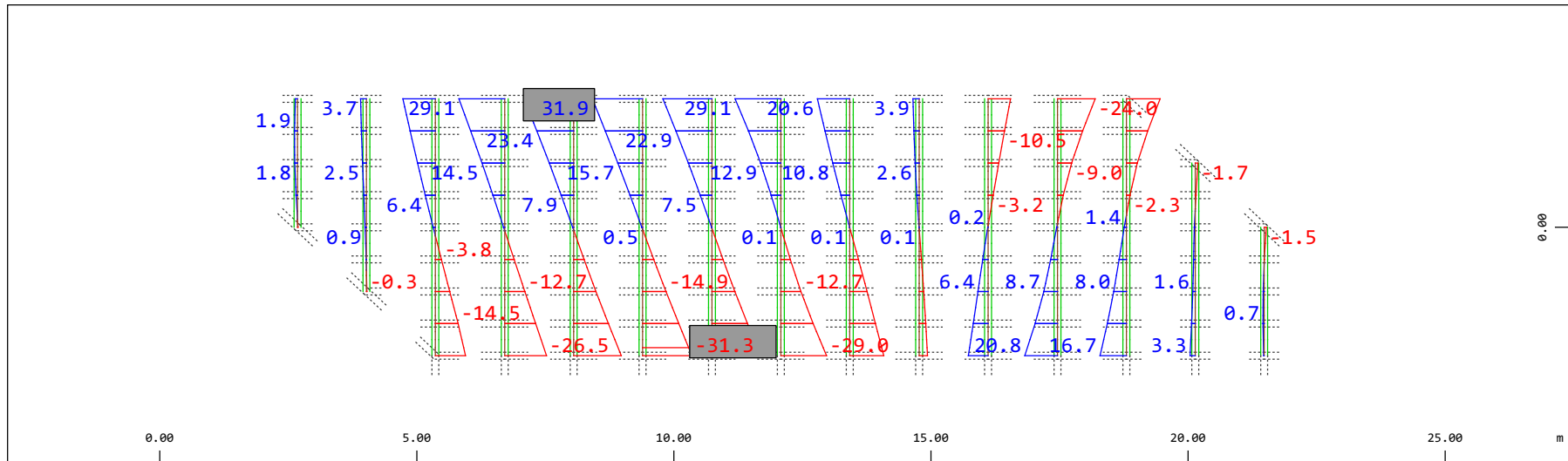
Definition of Axis

Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-13.7) (Max=12.7)

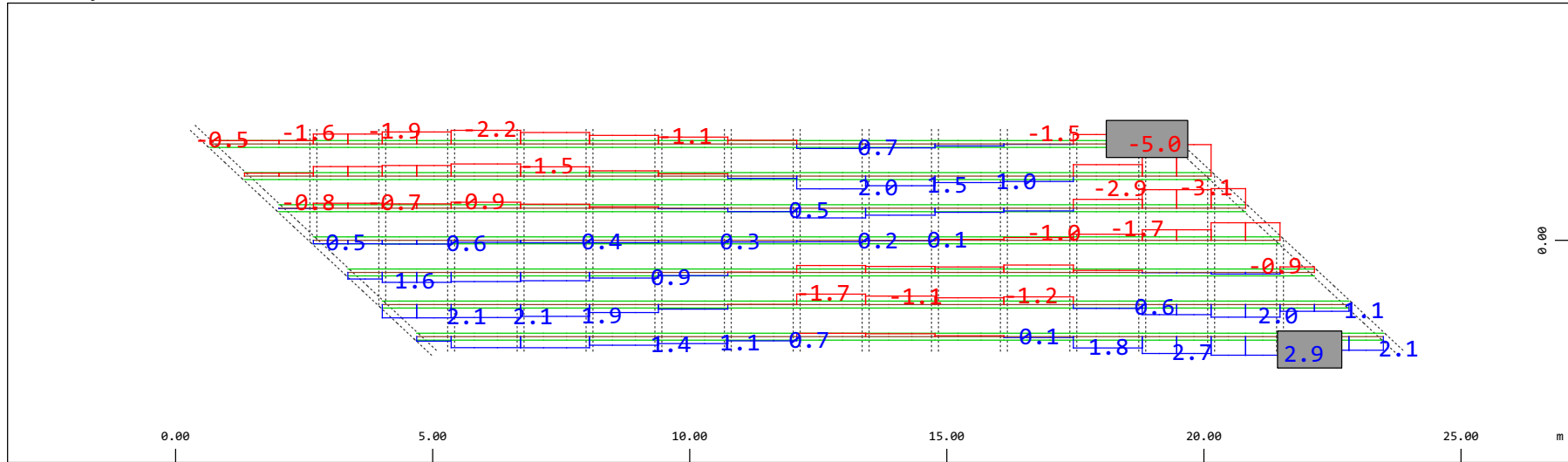
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 39.2 kNm (Min=-31.3) (Max=31.9)

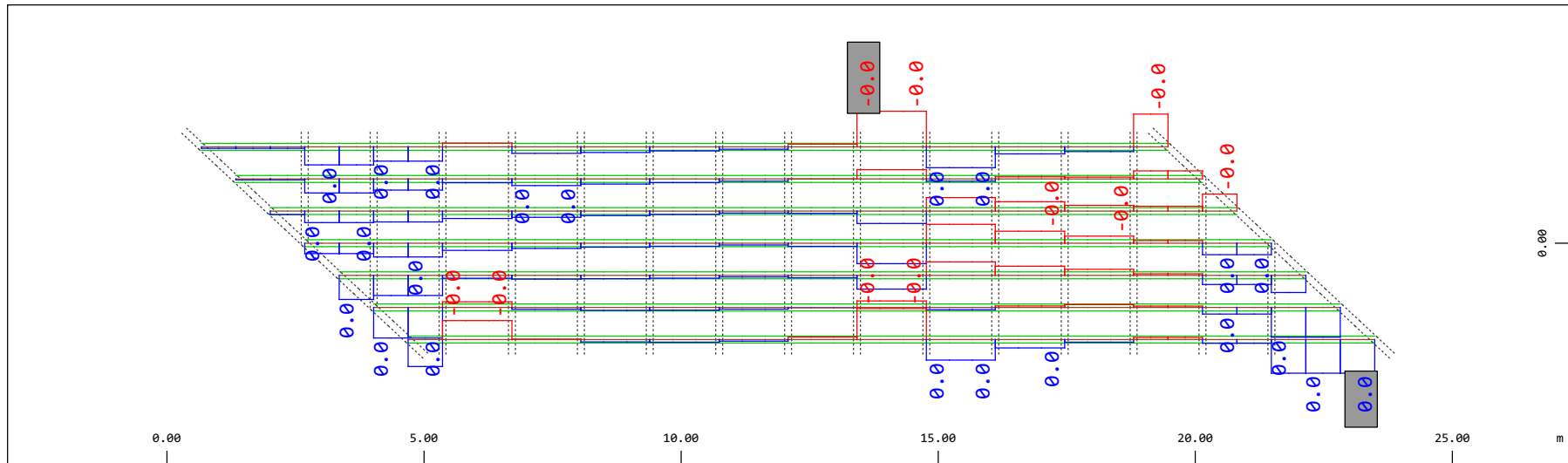
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 9.80 kN (Min=-5.01) (Max=2.94)

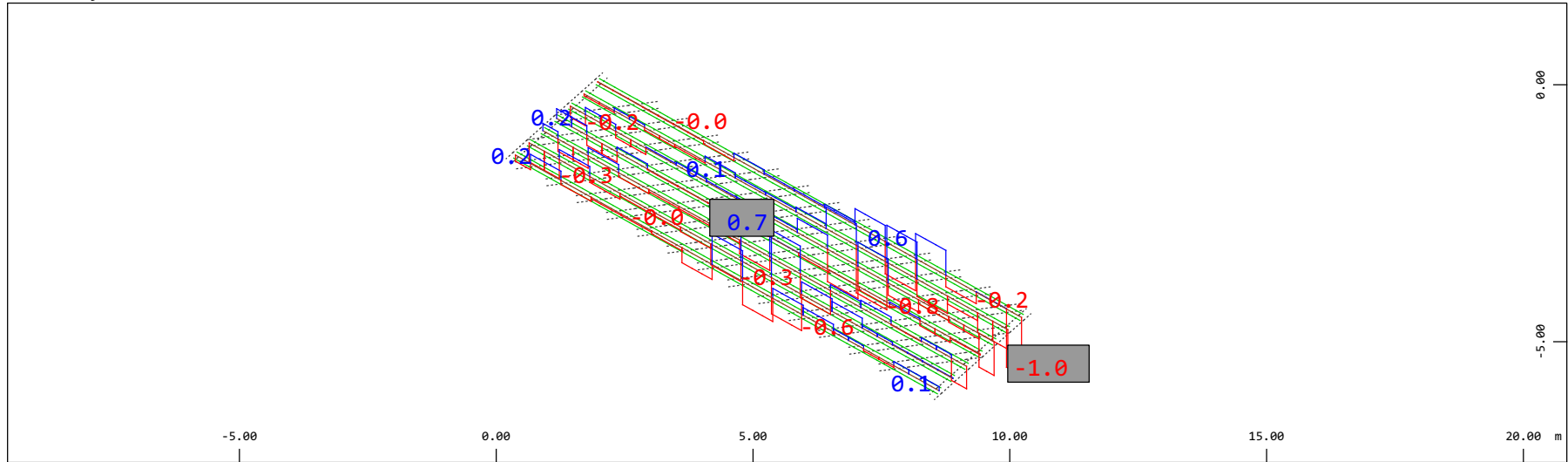
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 9.8047e-04 kNm (Min=-5.6566e-04) (Max=5.3517e-04)

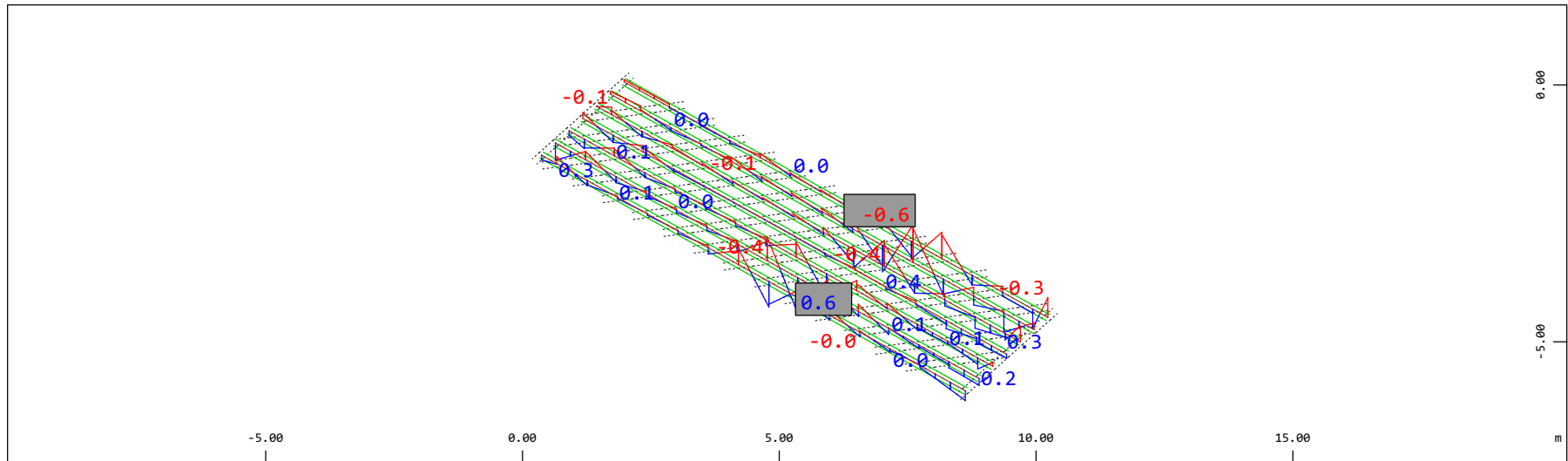
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 0.980 kN (Min=-0.962) (Max=0.724)

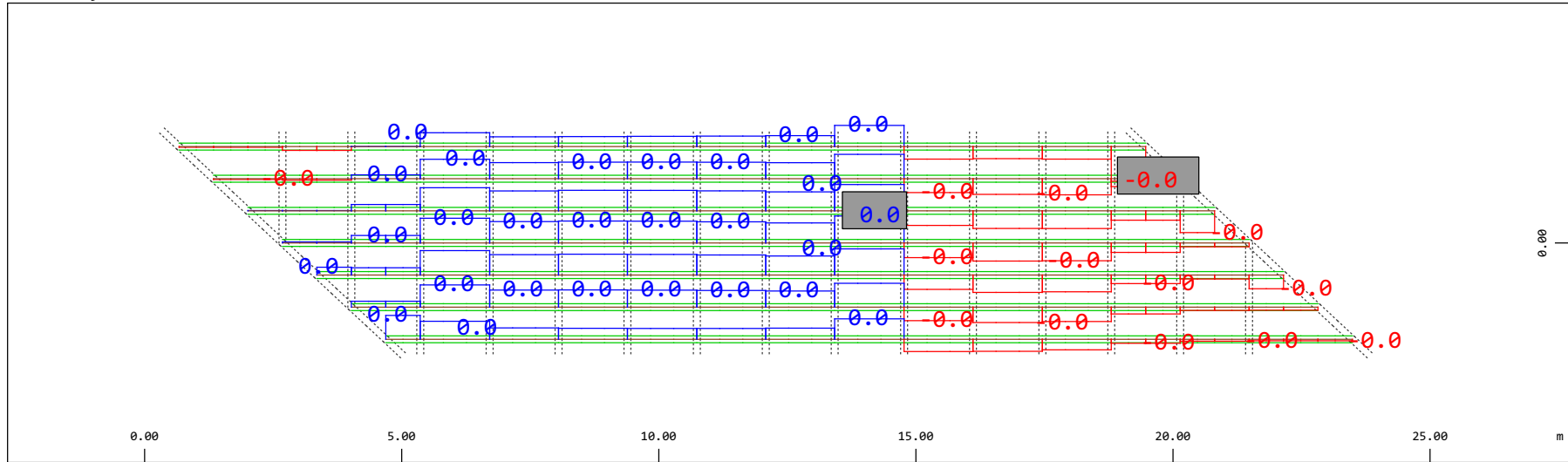
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 0.980
 kNm (Min=-0.625) (Max=0.587)

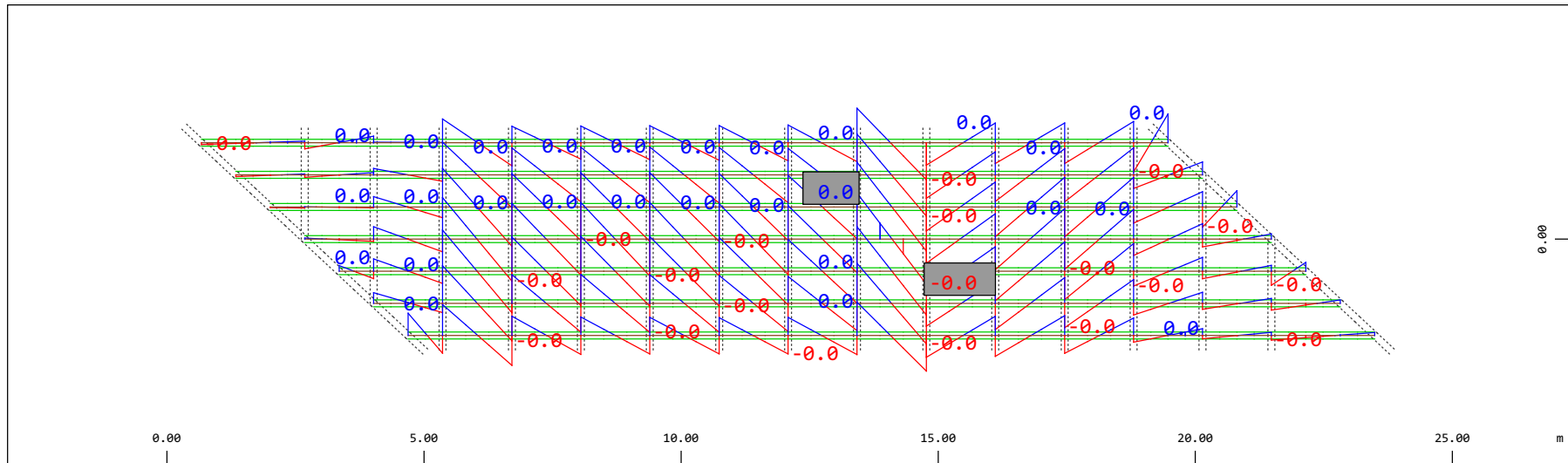
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 0.0098 kN (Min=-0.0055) (Max=0.0043)

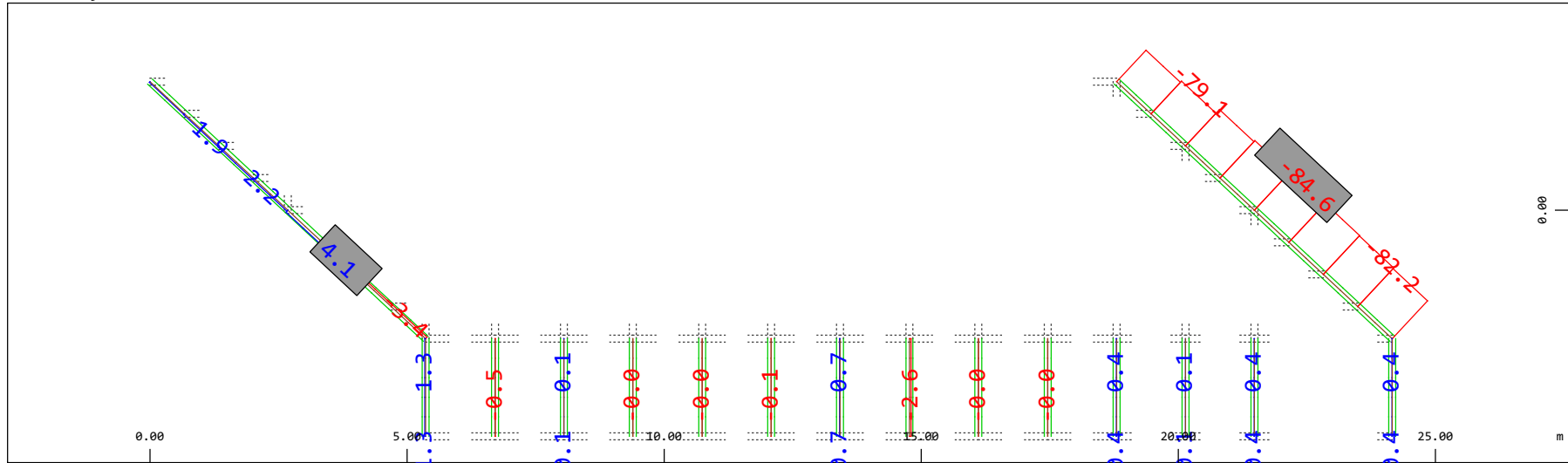
M 1 : 120



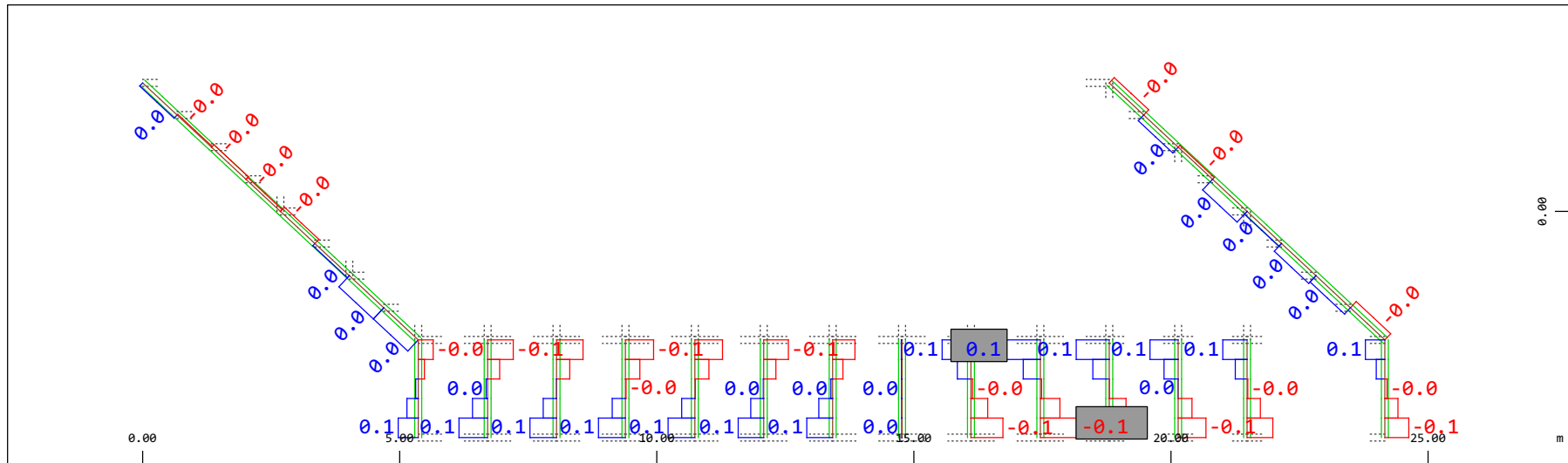
Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 0.0039 kNm (Min=-0.0029) (Max=0.0029)

M 1 : 120

Definition of Axis
Results elementay loads

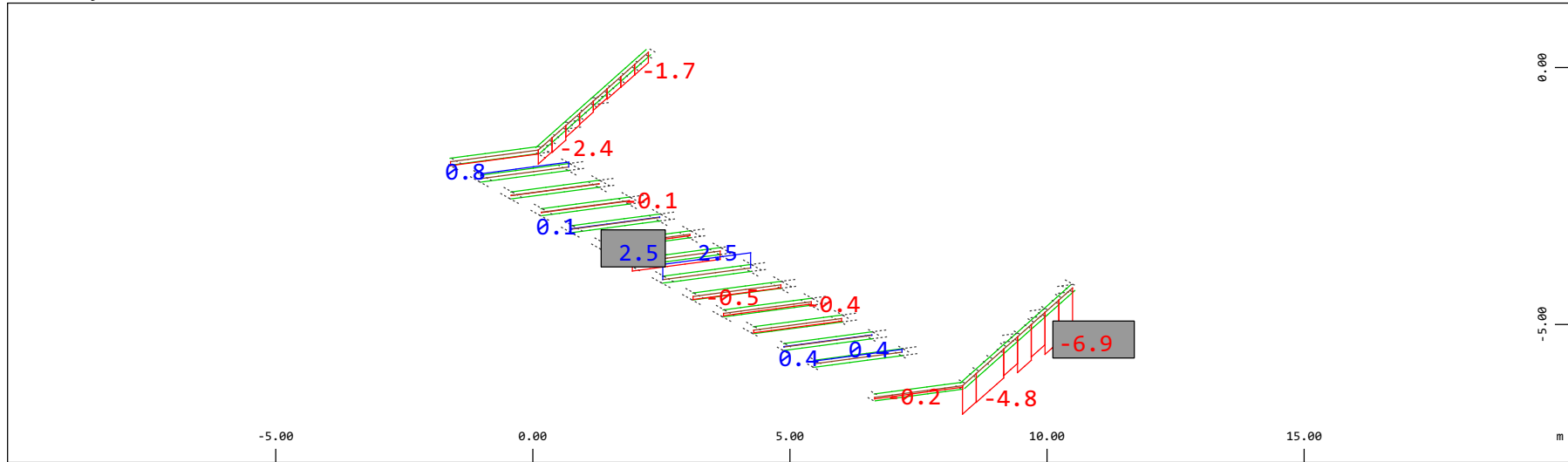


Sector of system Beam Elements Group 20 23
Beam Elements , Normal force Nx, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 98.0 kN (Min=-84.6) (Max=4.08)



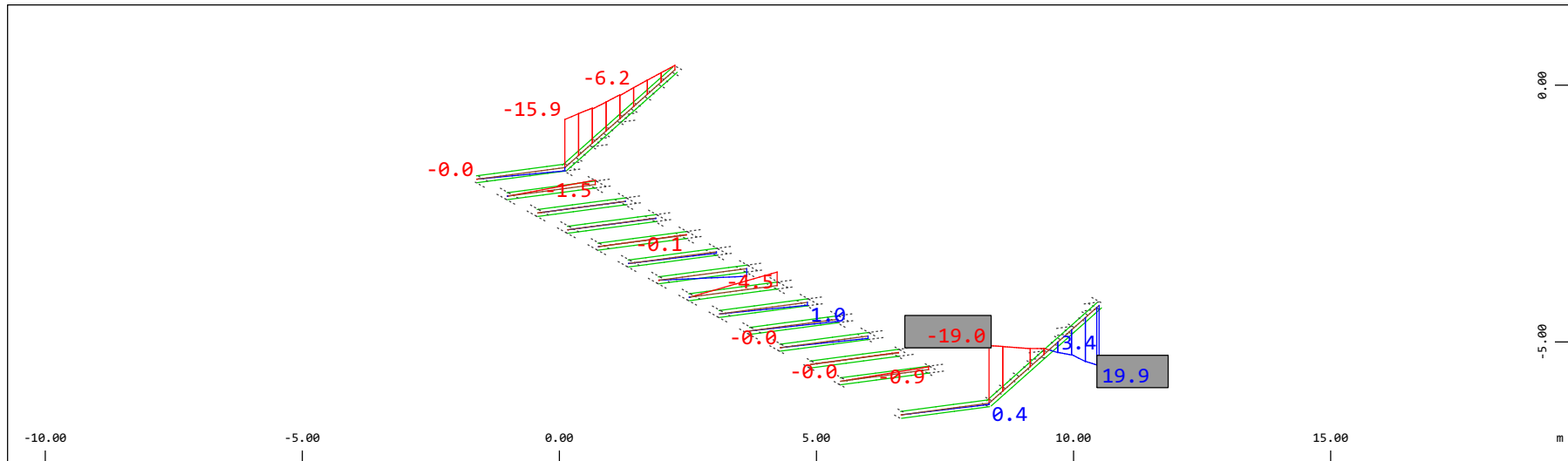
Sector of system Beam Elements Group 20 23
Beam Elements , Torsional moment Mt, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 0.196 kNm (Min=-0.120) (Max=0.113)

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vz, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 9.80 kN (Min=-6.93) (Max=2.52)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

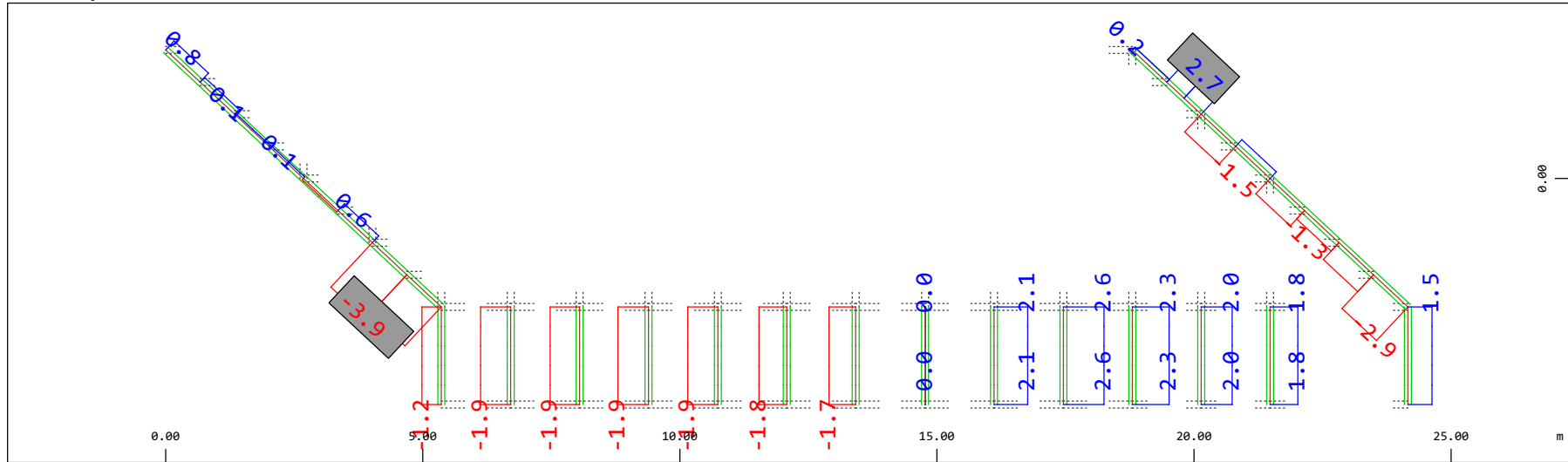


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 19.6
 kNm (Min=-19.0) (Max=19.9)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

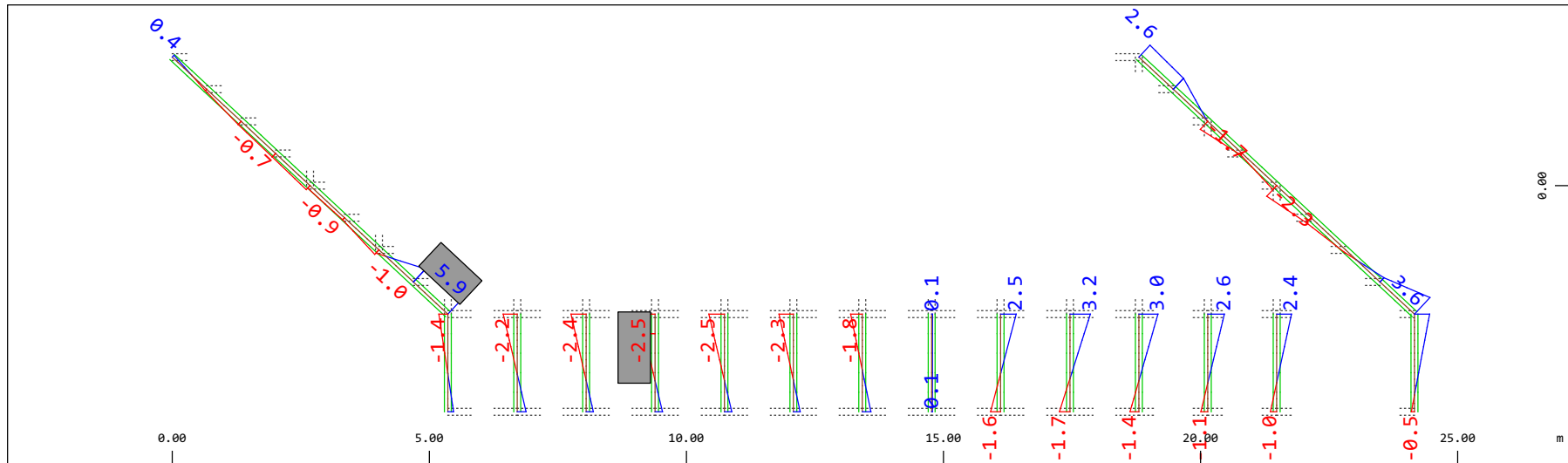
Definition of Axis
 Results elementay loads

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Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 3.92 kN (Min=-3.87) (Max=2.65)

M 1 : 120

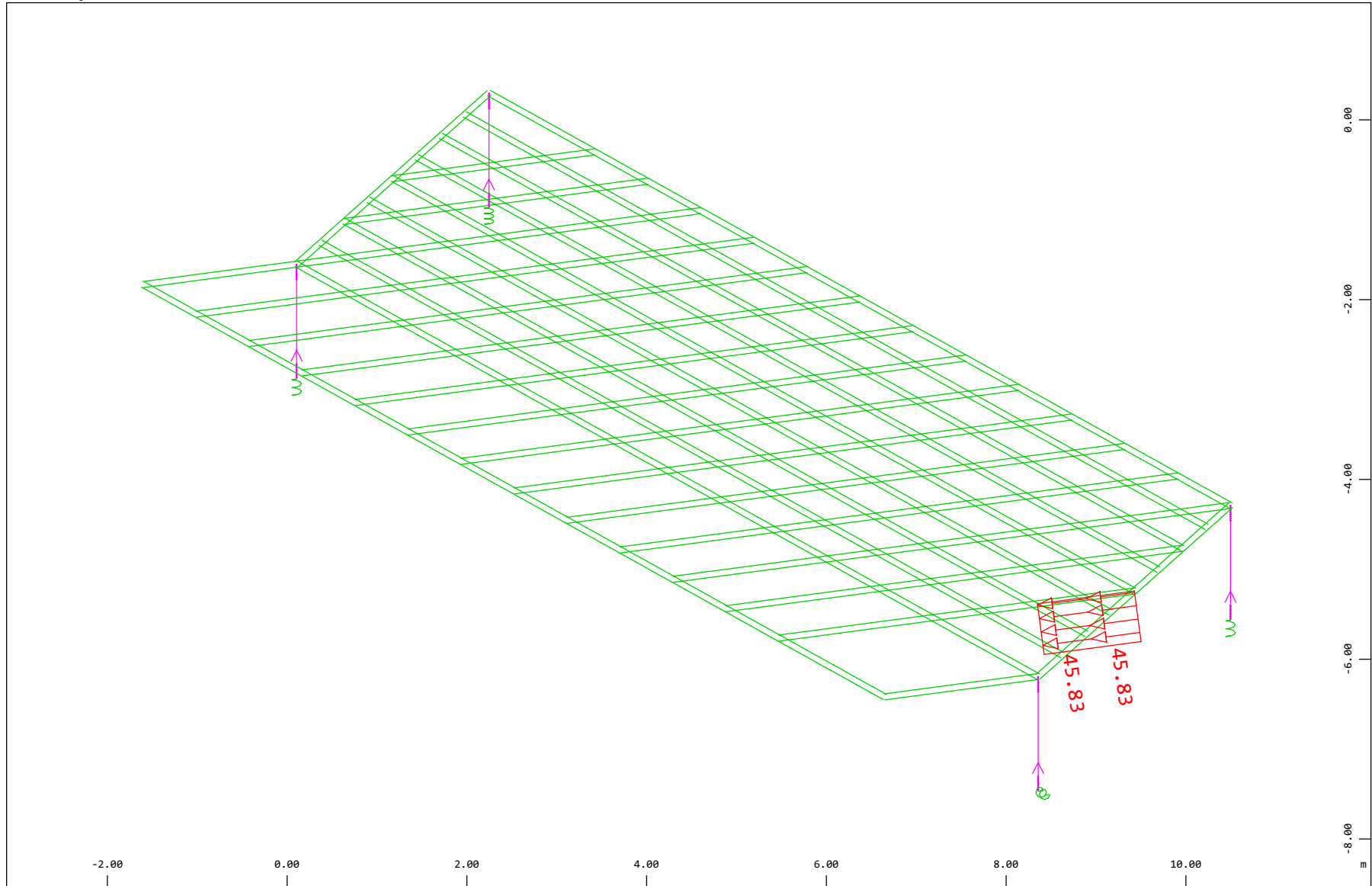


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 414 Qt: Serpeggio-S 15m (SX-->DX) , 1 cm 3D = 9.80 kNm (Min=-2.52) (Max=5.94)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

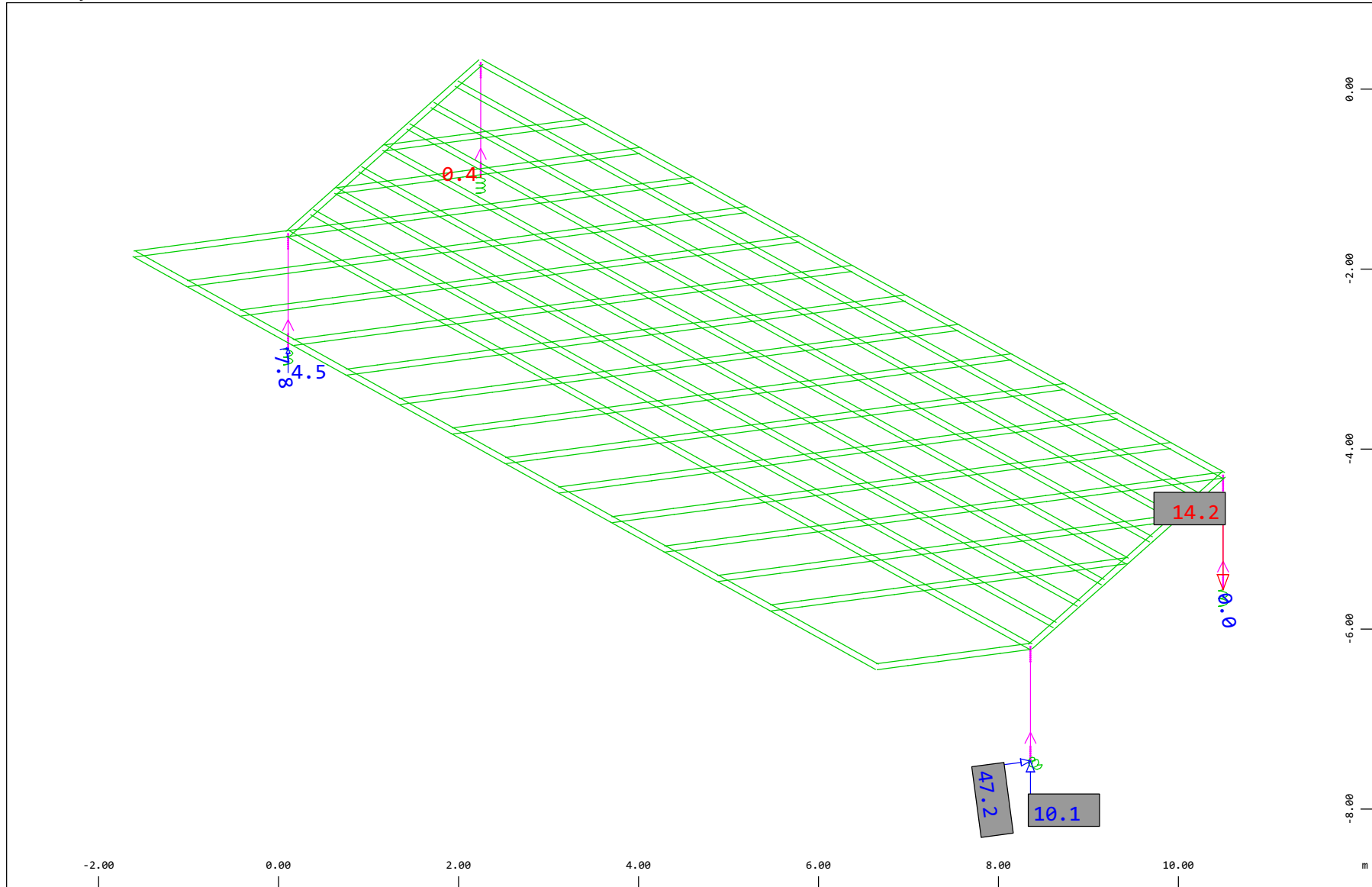
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , (1 cm 3D = unit) Free line load (force) in global Y (Unit=48.4 kN/m)
 (Min=-45.8) (Max=-45.8)



M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

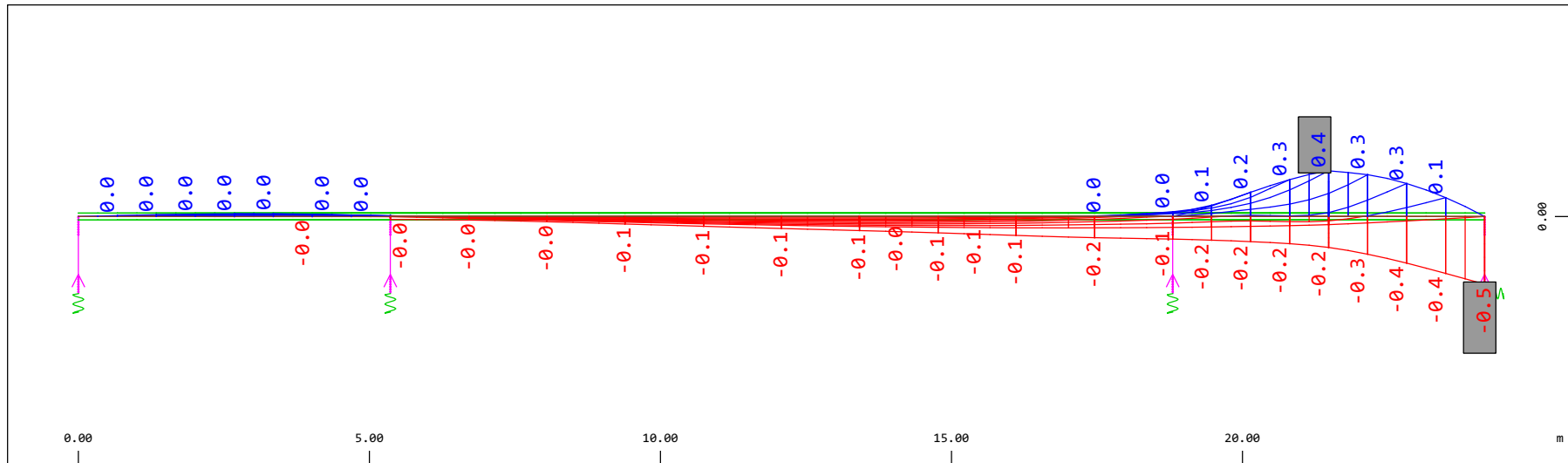
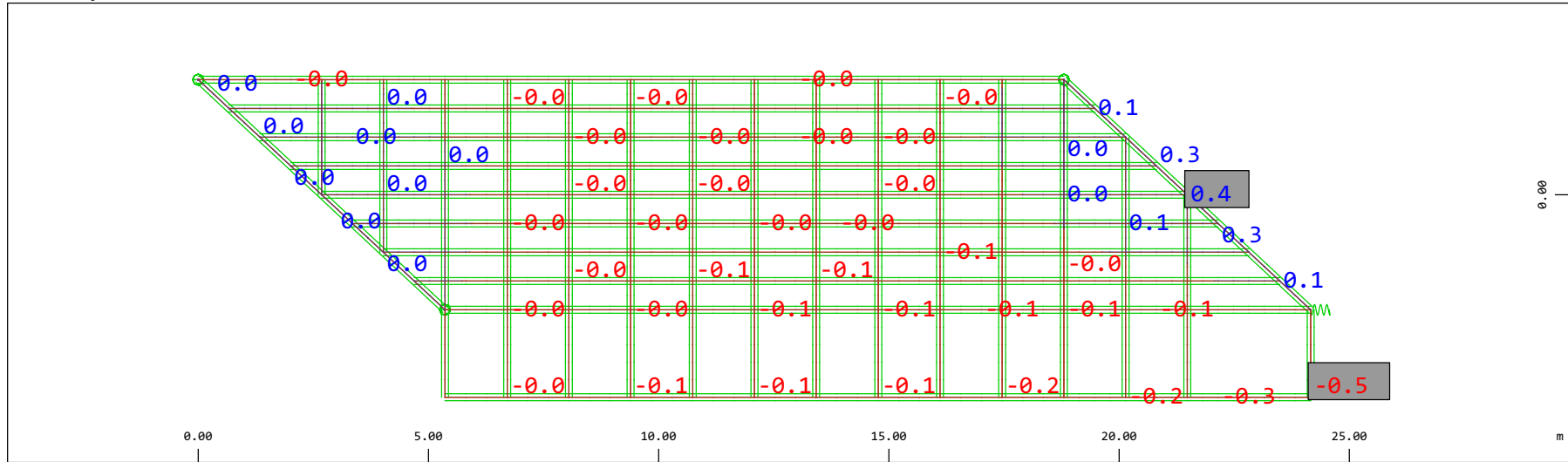
Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 9.69 kN
 (total: 9.5367e-07)

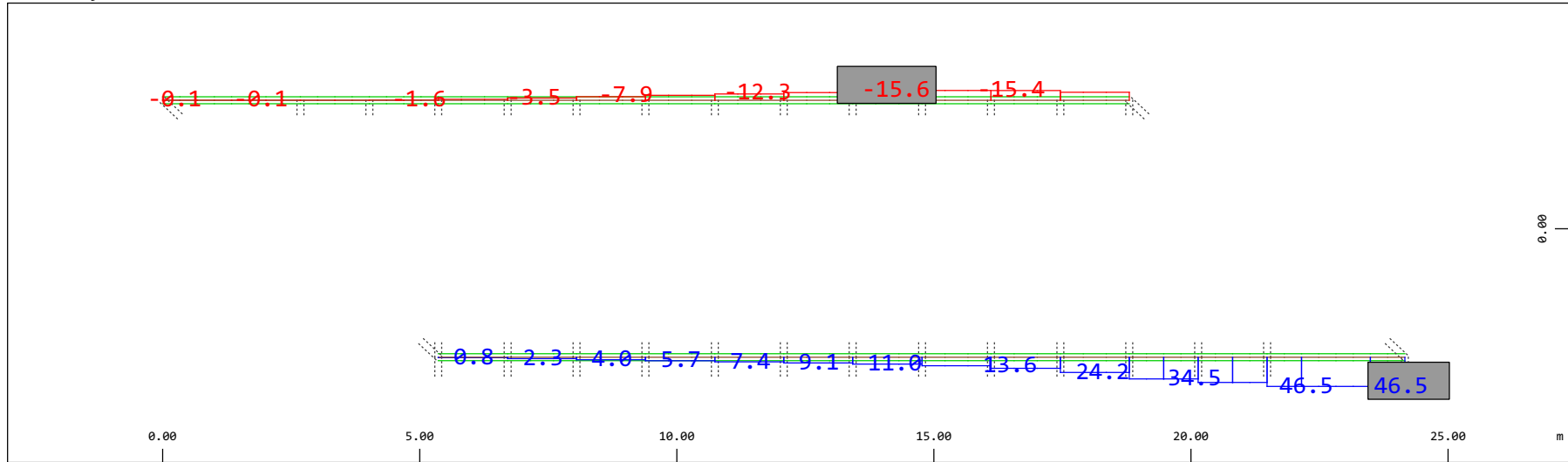
▽ (Min=-14.2) (Max=10.1)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

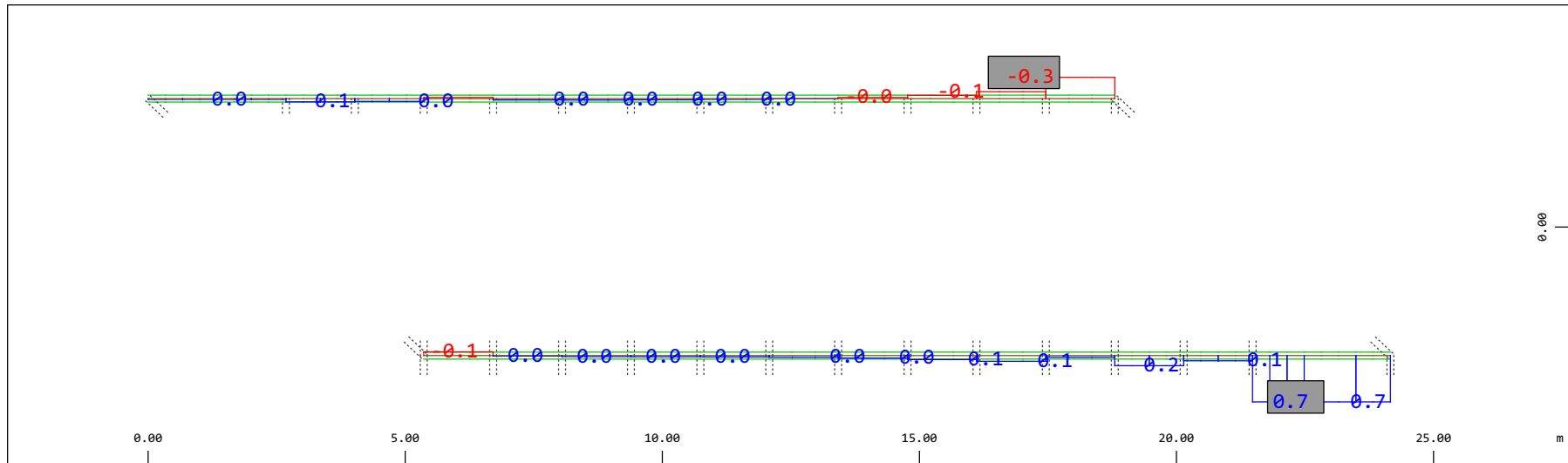


Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 98.0 kN (Min=-15.6) (Max=46.5)

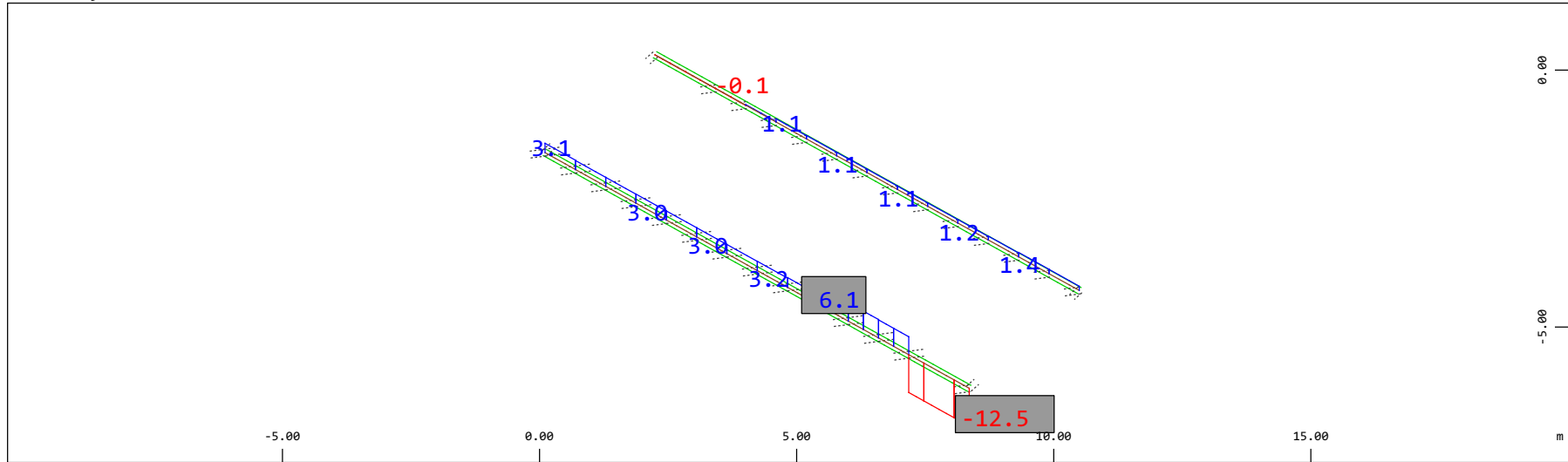
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 0.980 kNm (Min=-0.338) (Max=0.737)

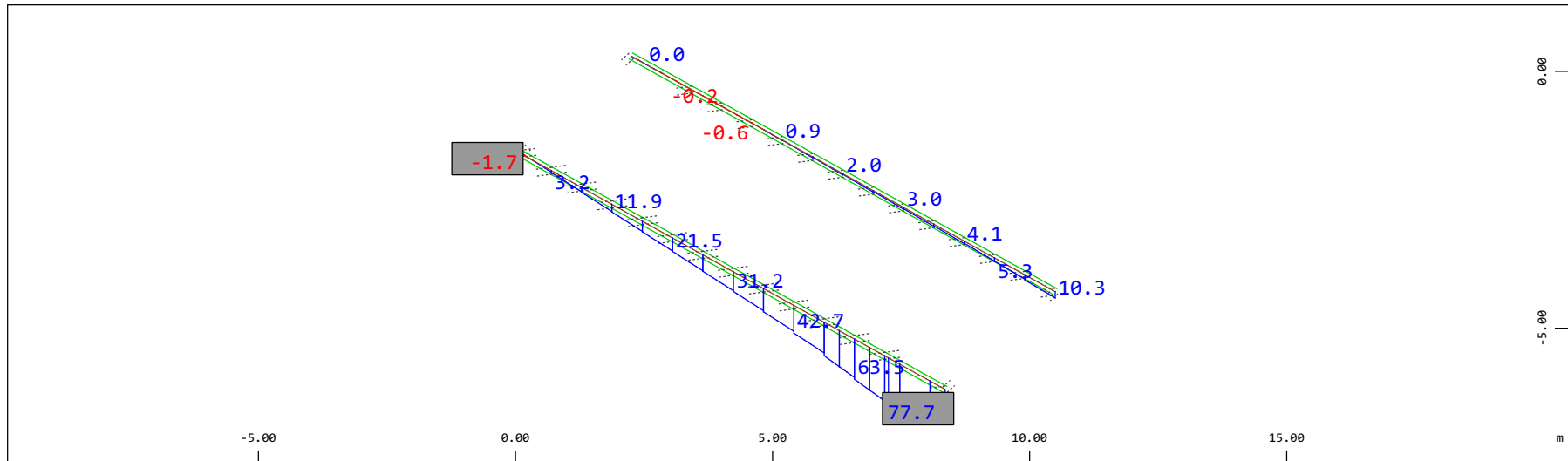
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-12.5) (Max=6.08)

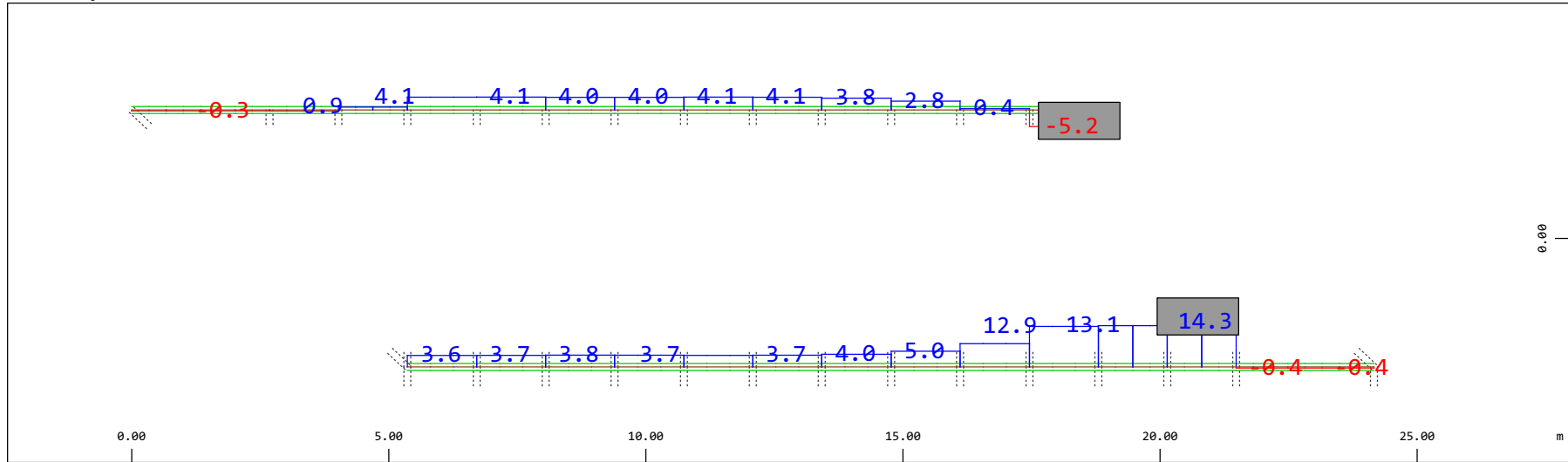
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 98.0
 kNm (Min=-1.66) (Max=77.7)

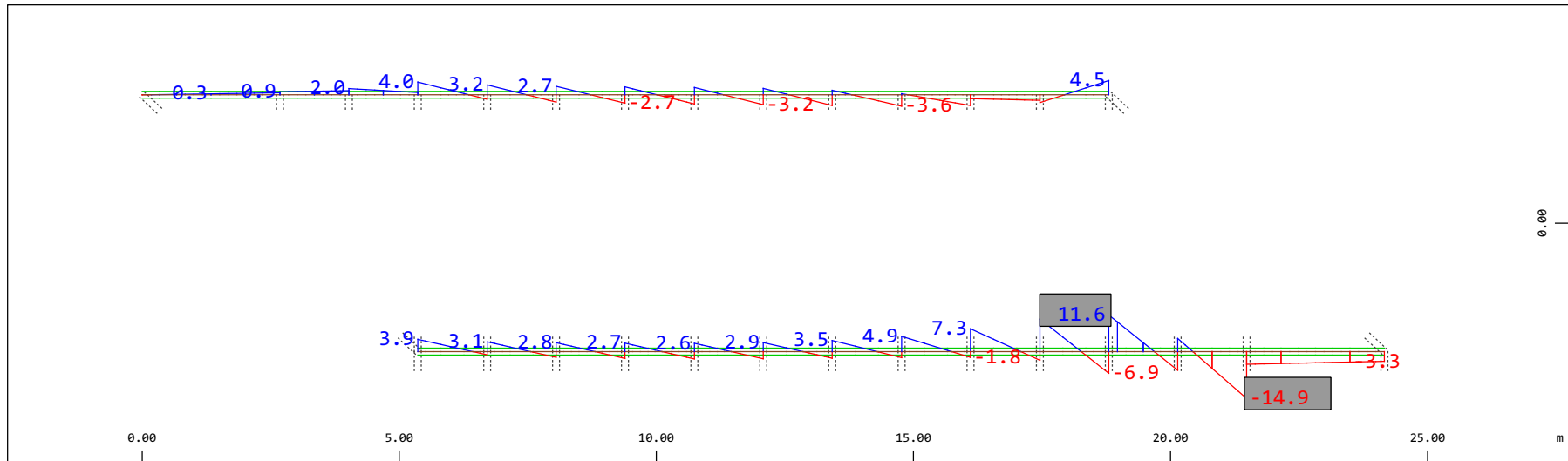
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-5.24) (Max=14.3)

M 1 : 120

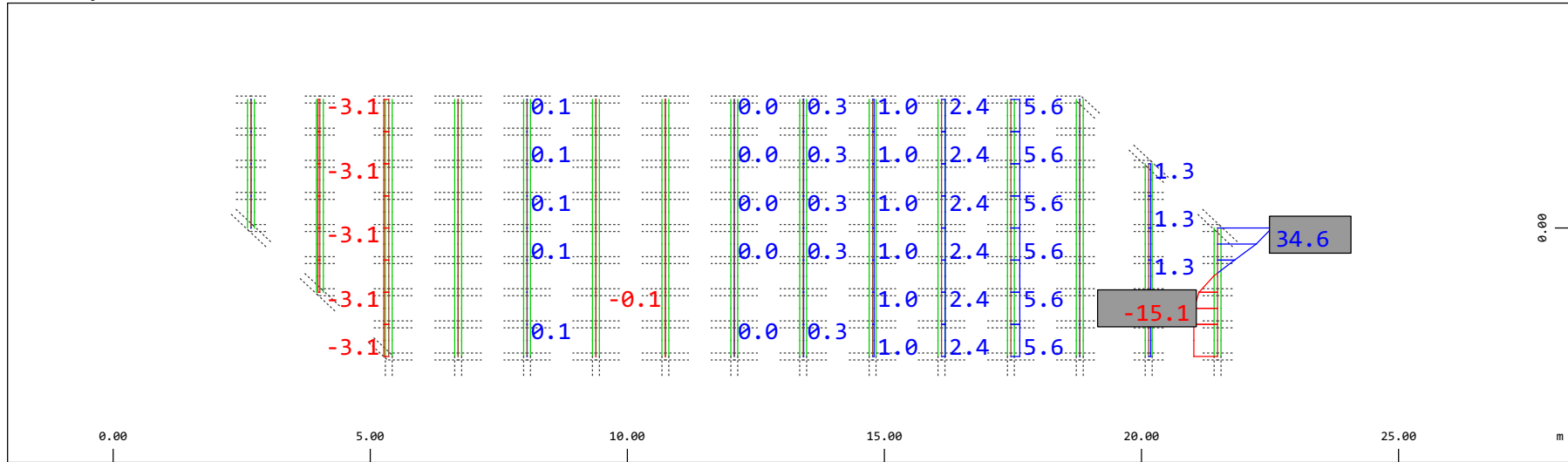


Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kNm (Min=-14.9) (Max=11.6)

M 1 : 120

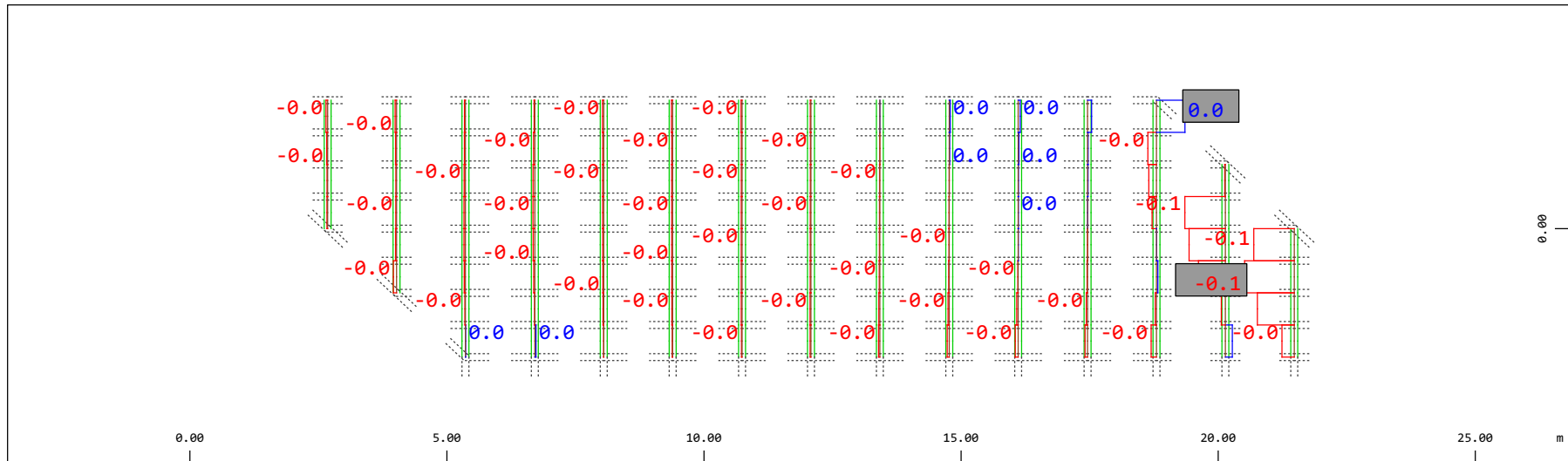
Definition of Axis

Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 39.2 kN (Min=-15.1) (Max=34.6)

M 1 : 120

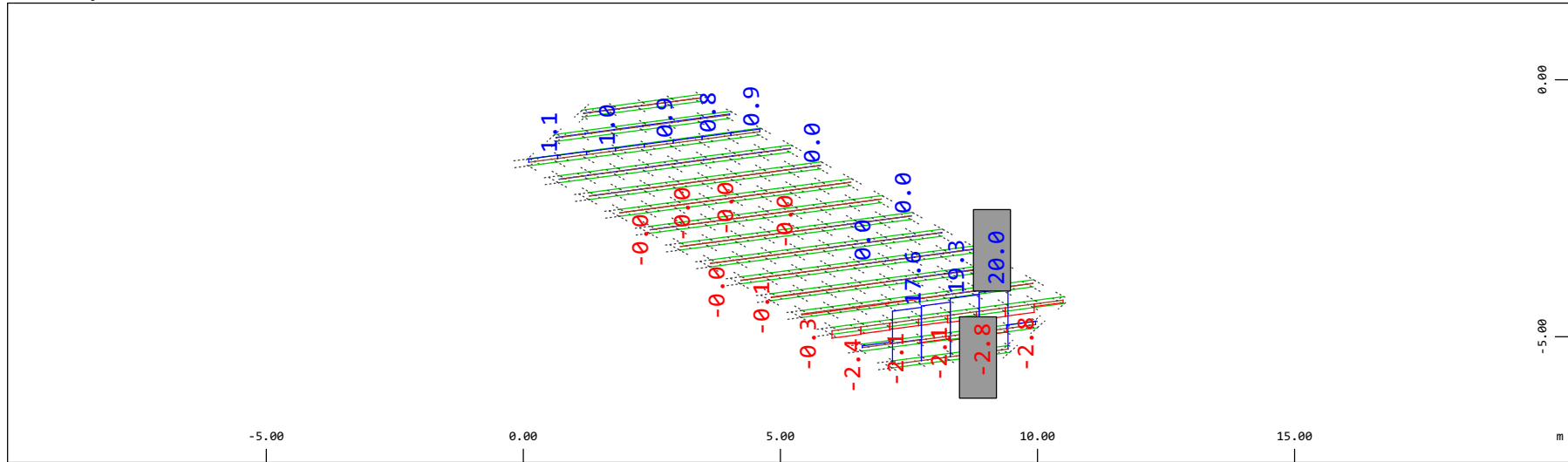


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 0.0980 kNm (Min=-0.0788) (Max=0.0452)

M 1 : 120

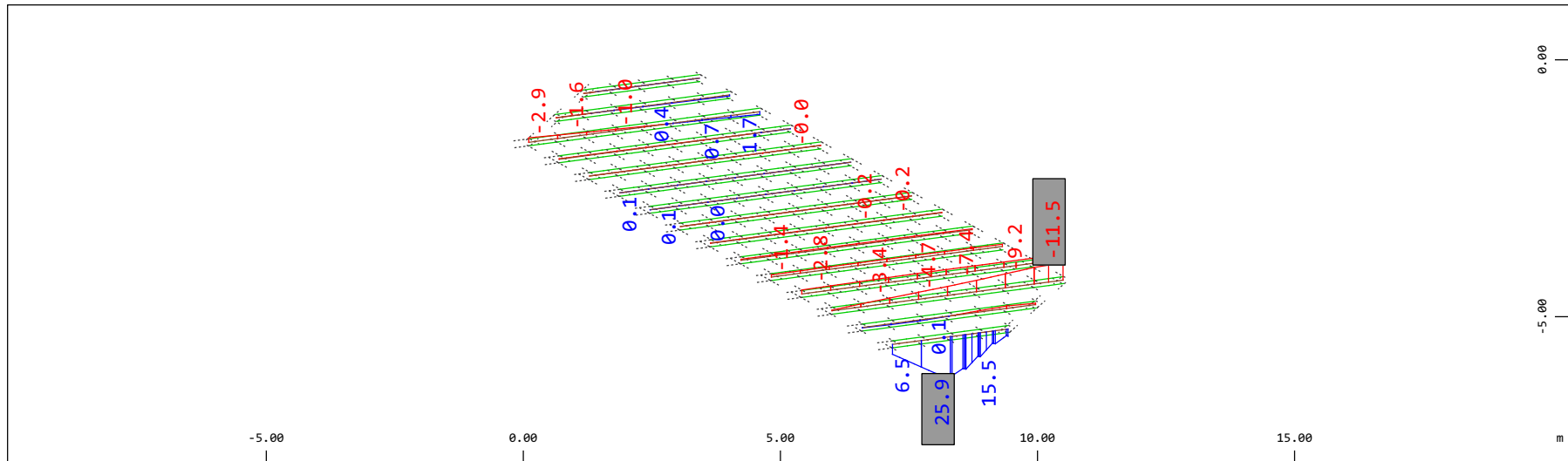
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-2.84) (Max=20.0)

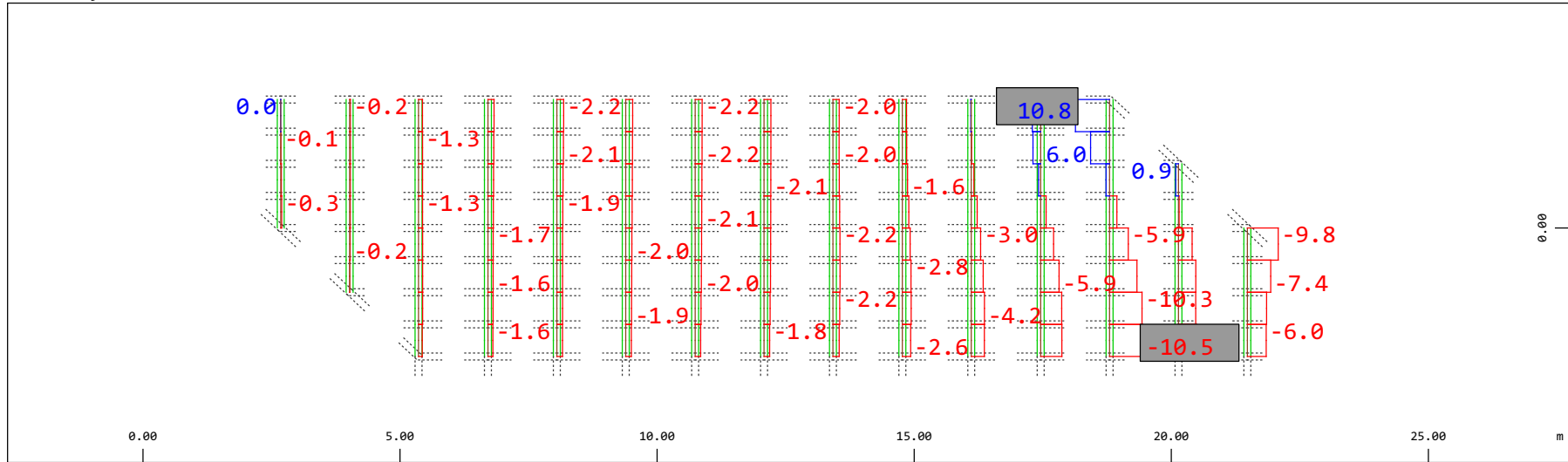
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 39.2 kNm (Min=-11.5) (Max=25.9)

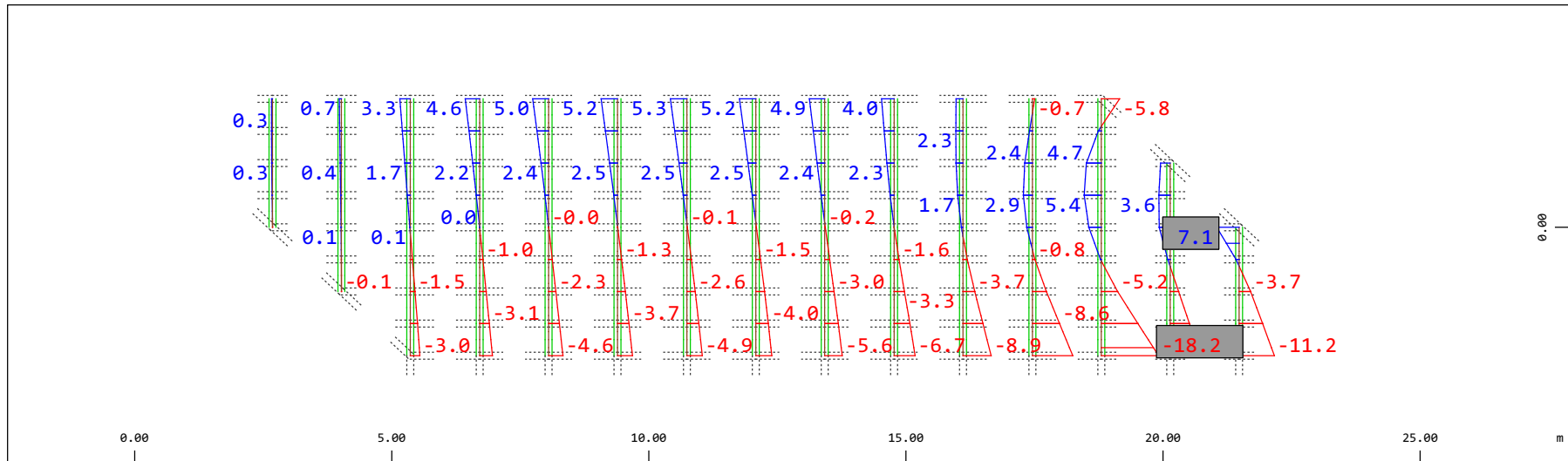
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Y
 X Beam Elements , Shear force Vy, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-10.5) (Max=10.8)

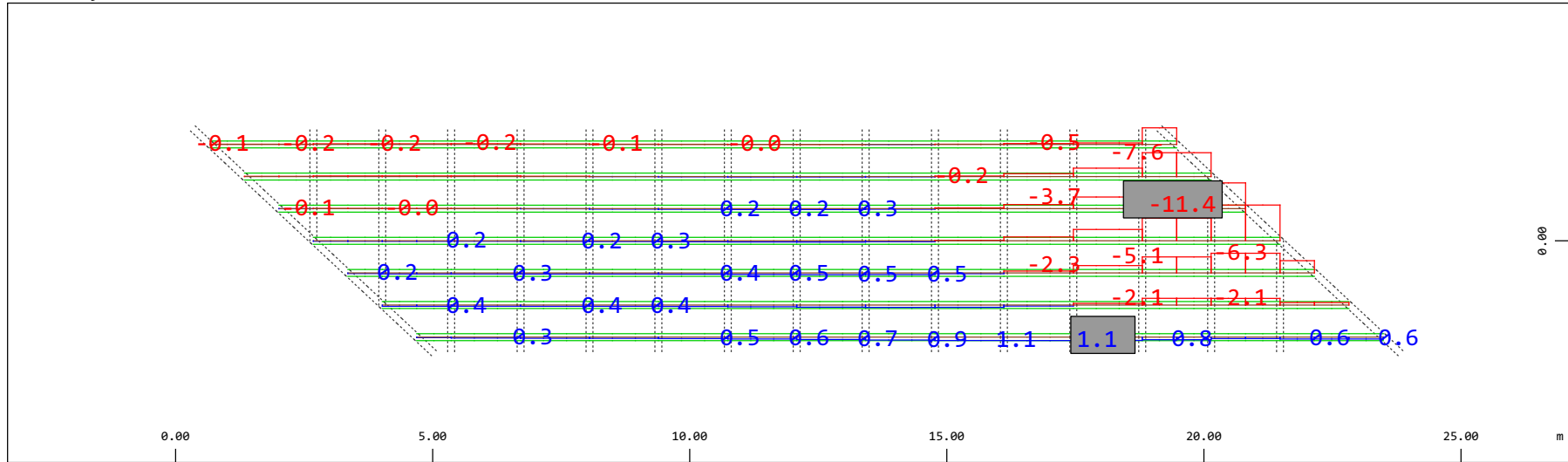
M 1 : 120



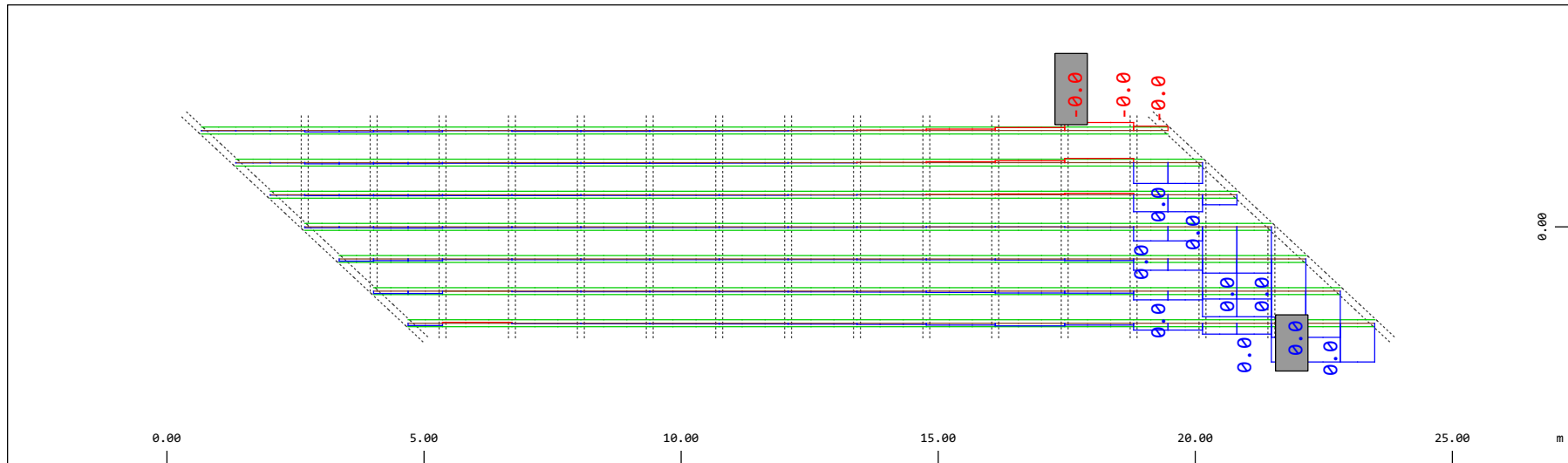
Y
 X Beam Elements , Bending moment Mz, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kNm (Min=-18.2) (Max=7.12)

M 1 : 120

Definition of Axis
 Results elementay loads

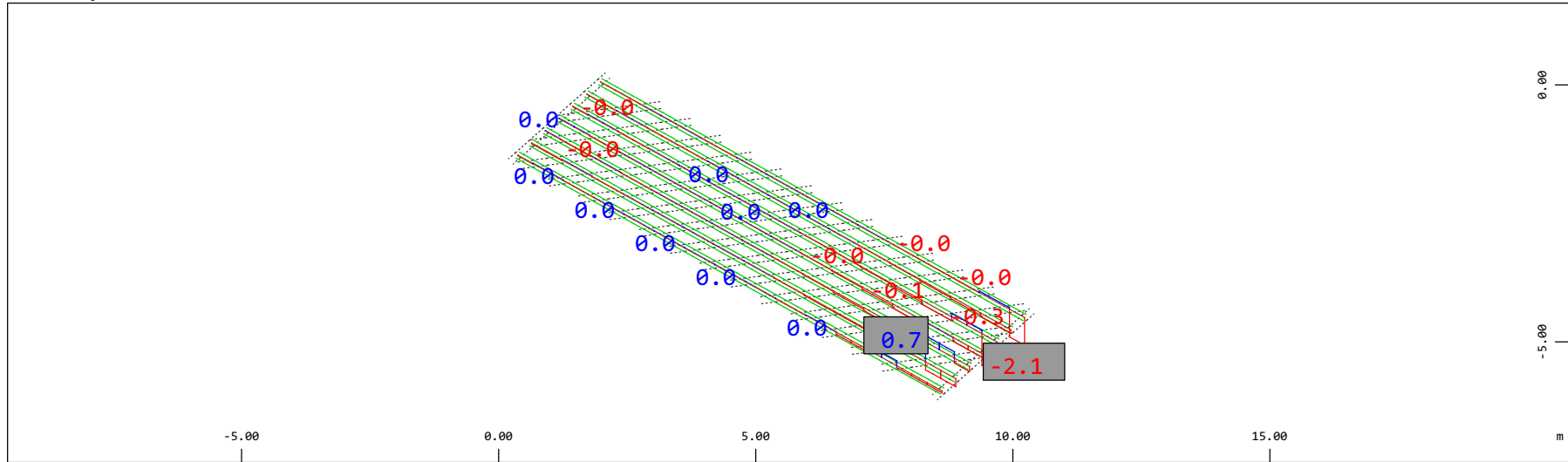


Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force N_x , Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-11.4) (Max=1.09) M 1 : 120



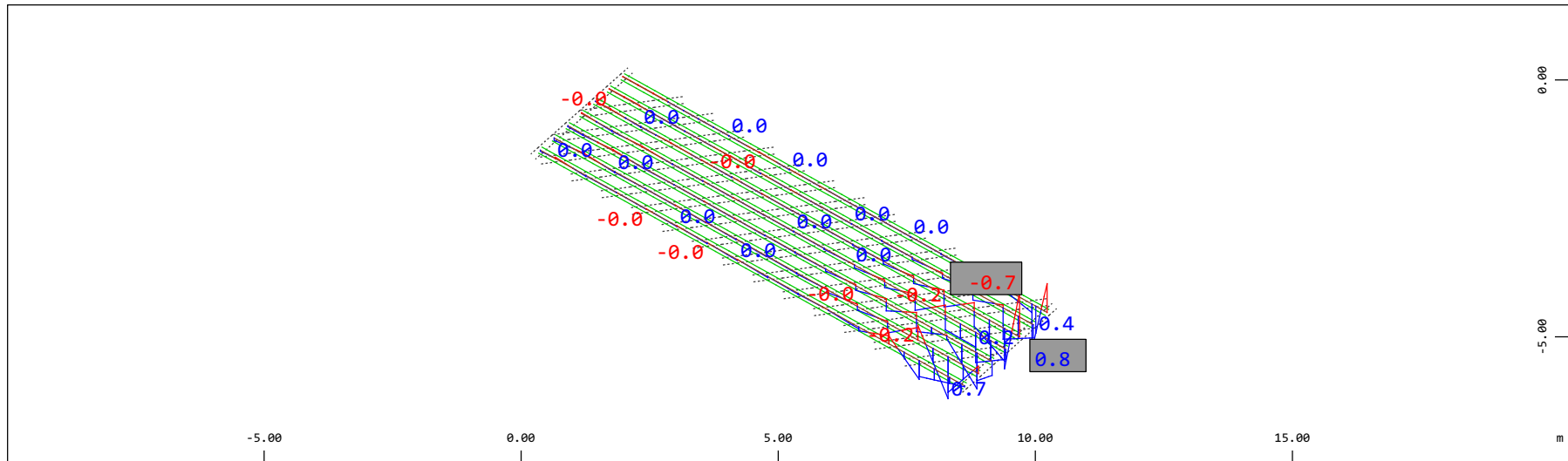
Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment M_t , Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 0.0020 kNm (Min=-2.5303e-04) (Max=0.0018) M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 3.92 kN (Min=-2.09) (Max=0.698)

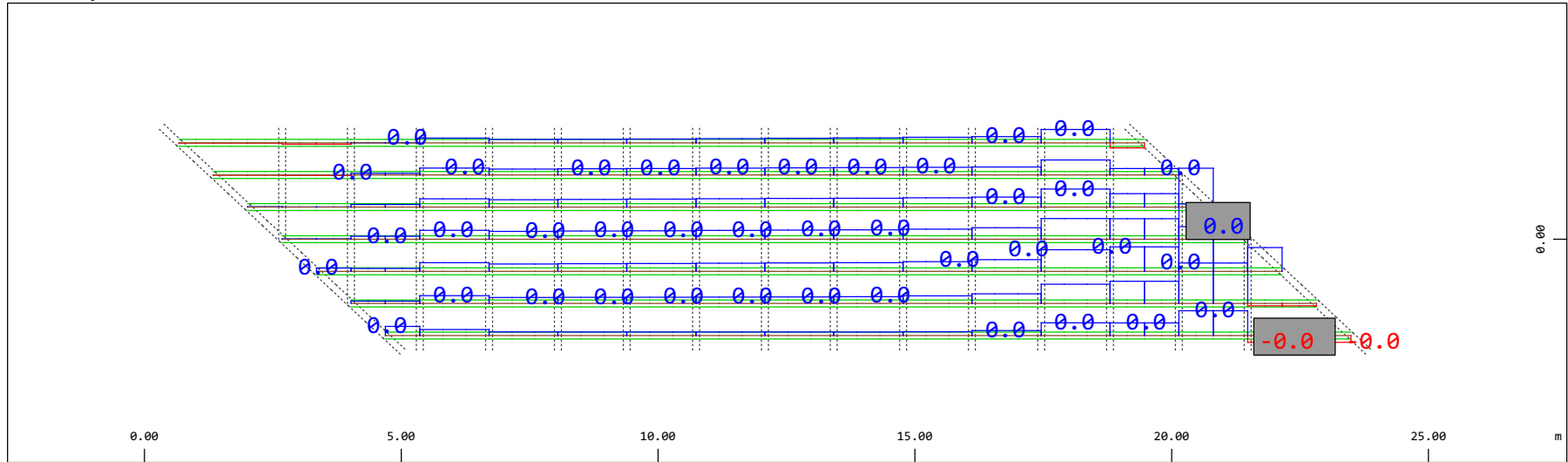
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



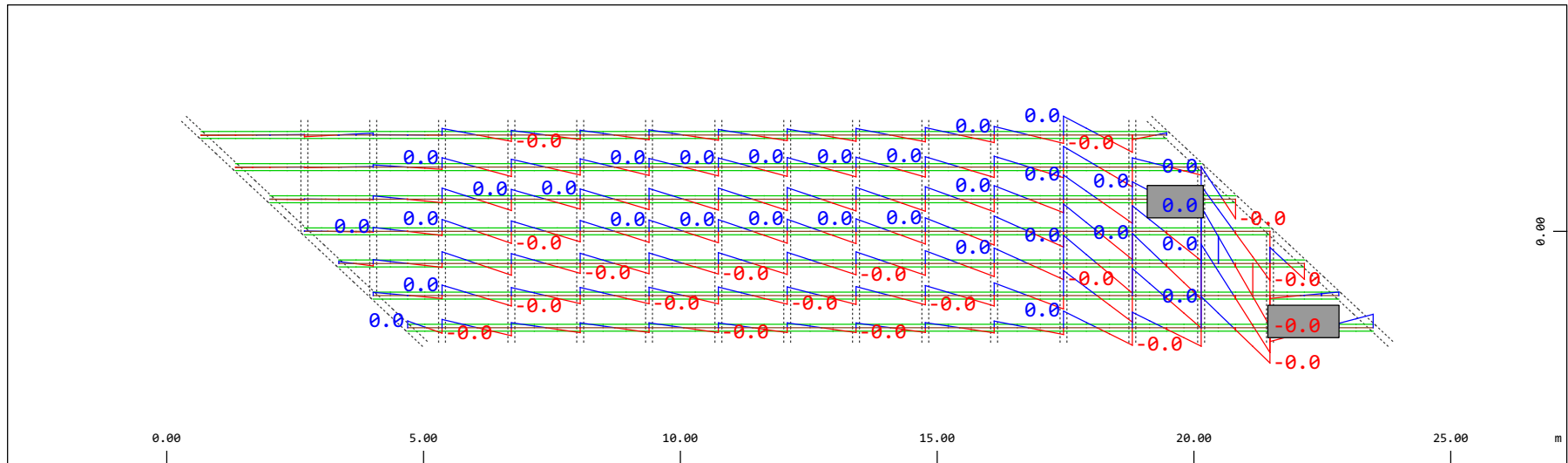
Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 0.980
 kNm (Min=-0.735) (Max=0.753)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads

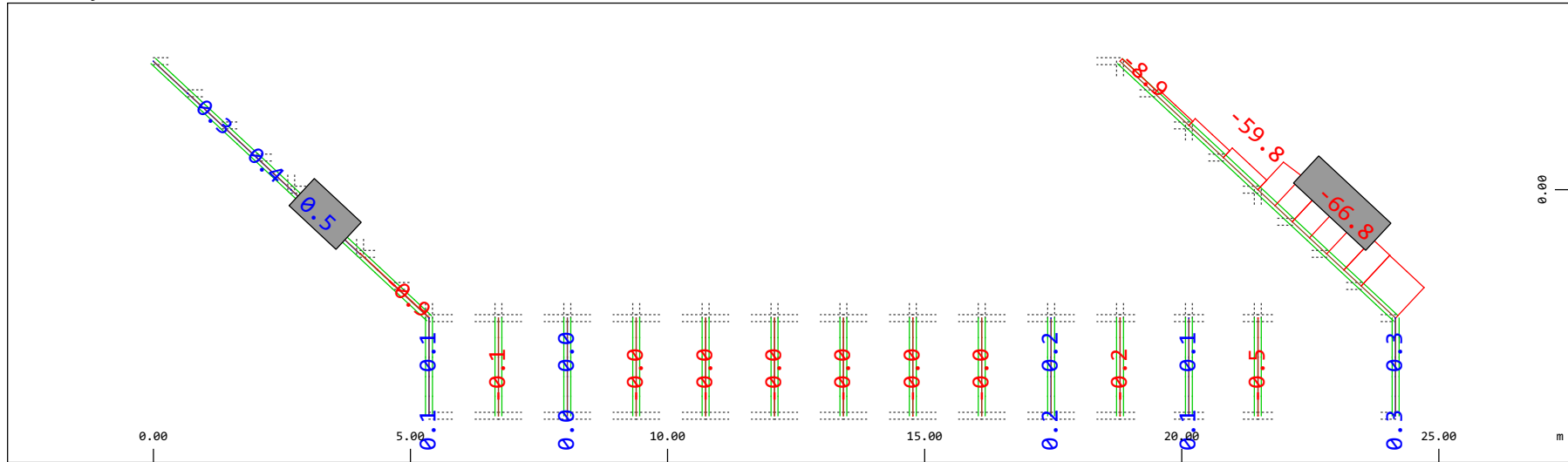


Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Shear force Vy, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 0.0039 kN (Min=-4.2975e-04) (Max=0.0028) M 1 : 120



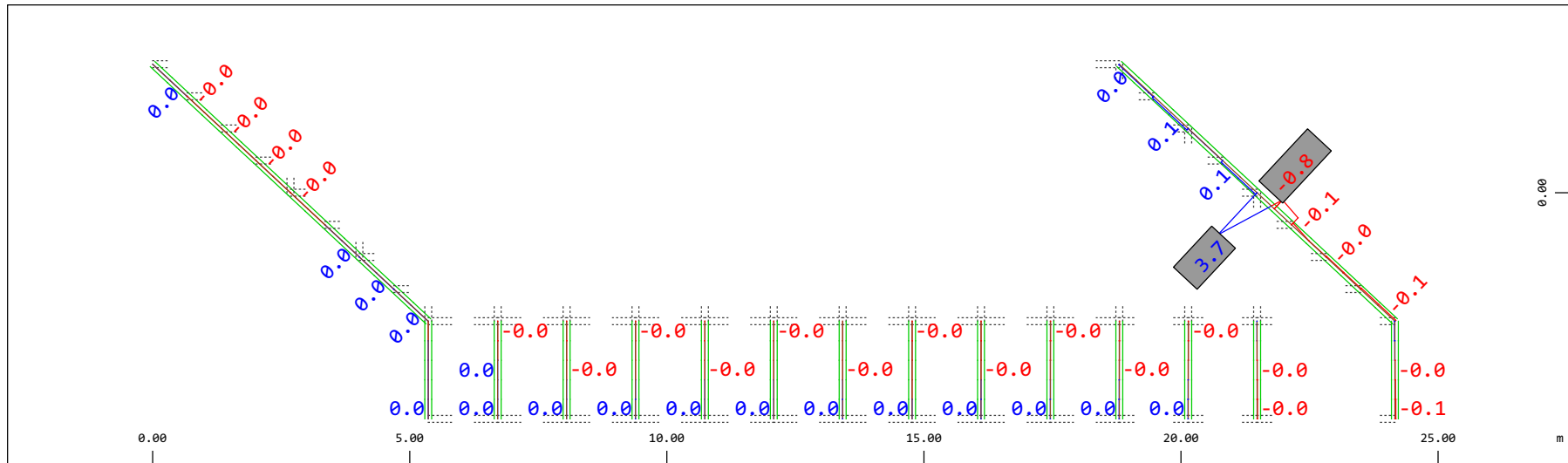
Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Bending moment Mz, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 0.0020 kNm (Min=-0.0020) (Max=0.0018) M 1 : 120

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 20 23
Beam Elements , Normal force Nx, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 98.0 kN (Min=-66.8) (Max=0.468)

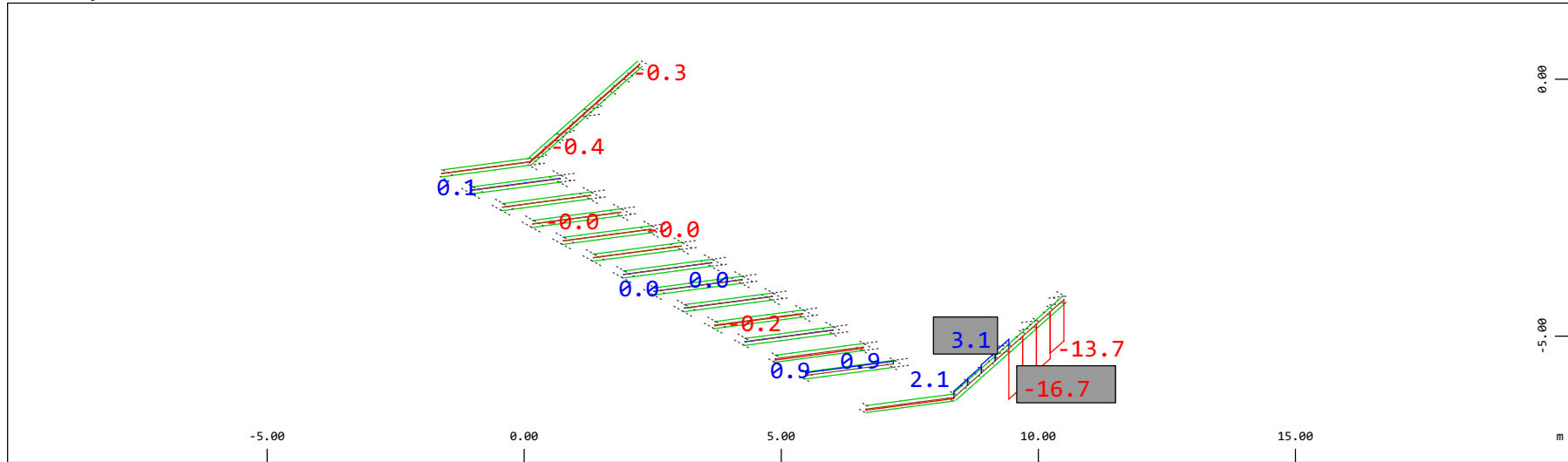
M 1 : 120



Sector of system Beam Elements Group 20 23
Beam Elements , Torsional moment Mt, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 3.92 kNm (Min=-0.766) (Max=3.66)

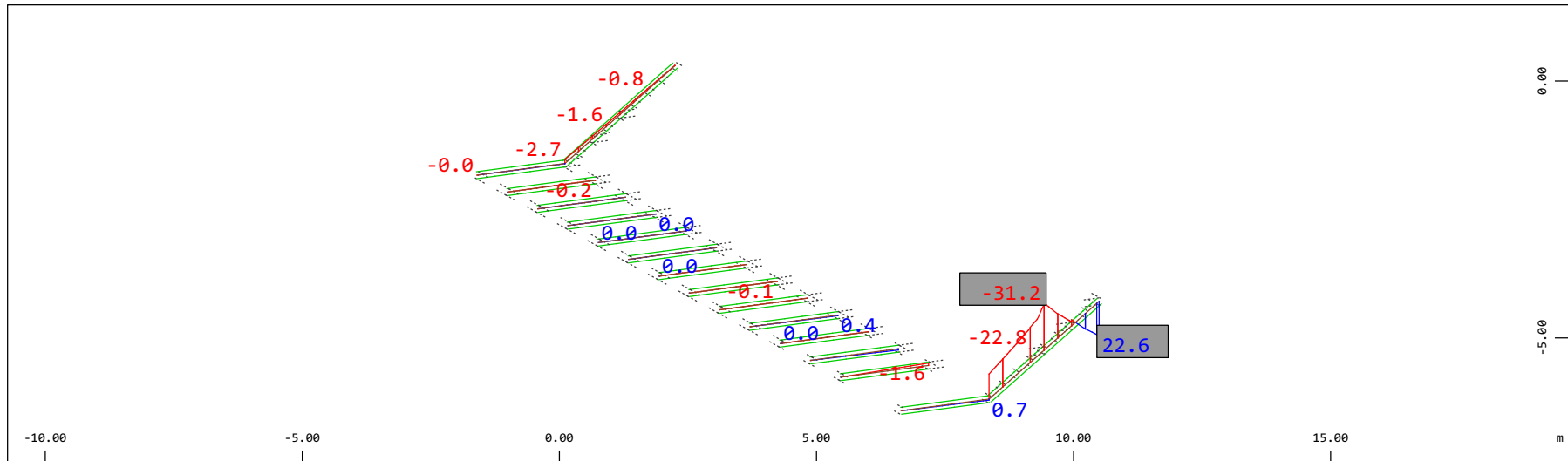
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-16.7) (Max=3.05)

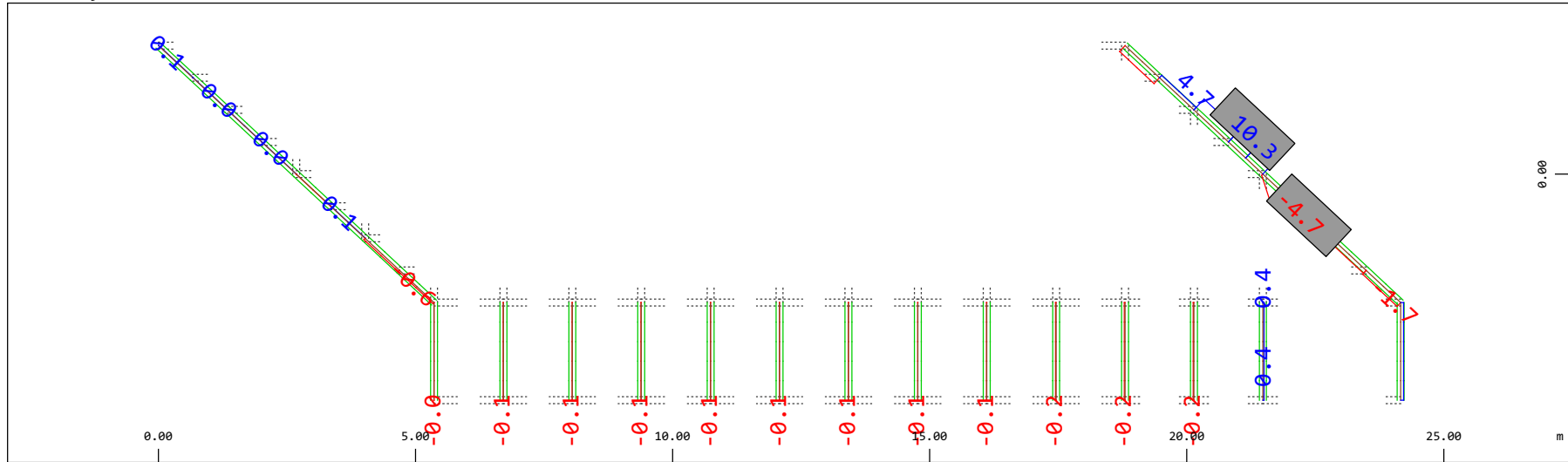
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My (Maximum values cubic interpolated), Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 39.2 kNm (Min=-31.2) (Max=22.6)

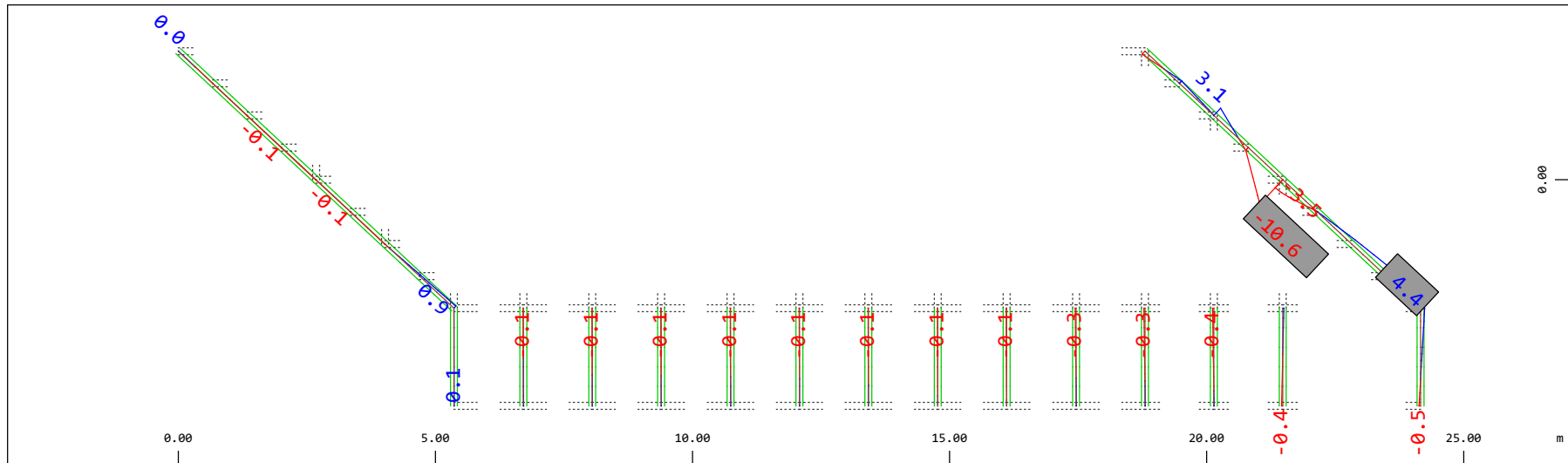
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 20 23
 X Beam Elements , Shear force Vy, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kN (Min=-4.70) (Max=10.3)

M 1 : 120

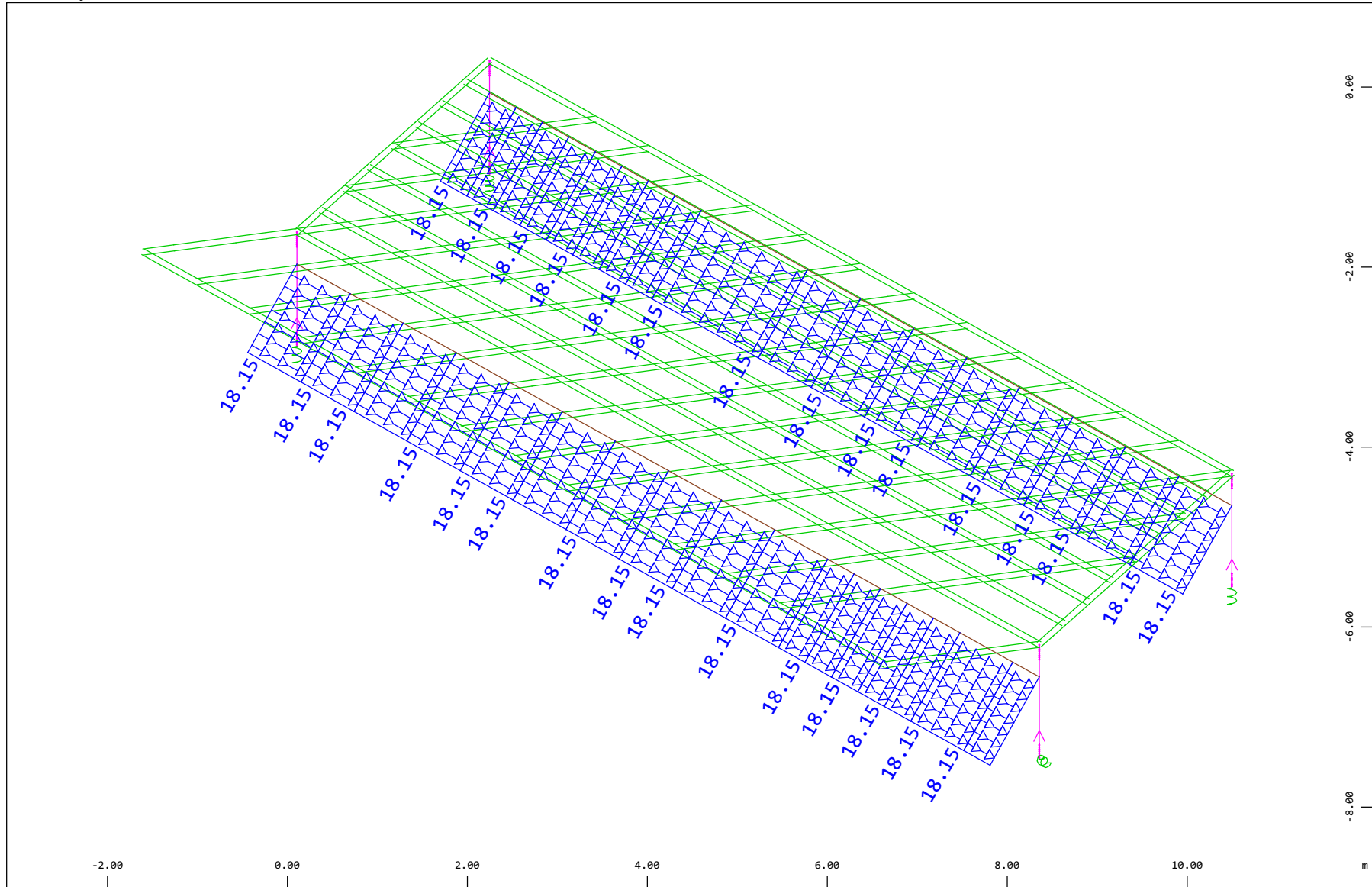


Y Sector of system Beam Elements Group 20 23
 X Beam Elements , Bending moment Mz, Loadcase 421 Qt: Serpeggio-S 21m (SX-->DX) , 1 cm 3D = 19.6 kNm (Min=-10.6) (Max=4.39)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

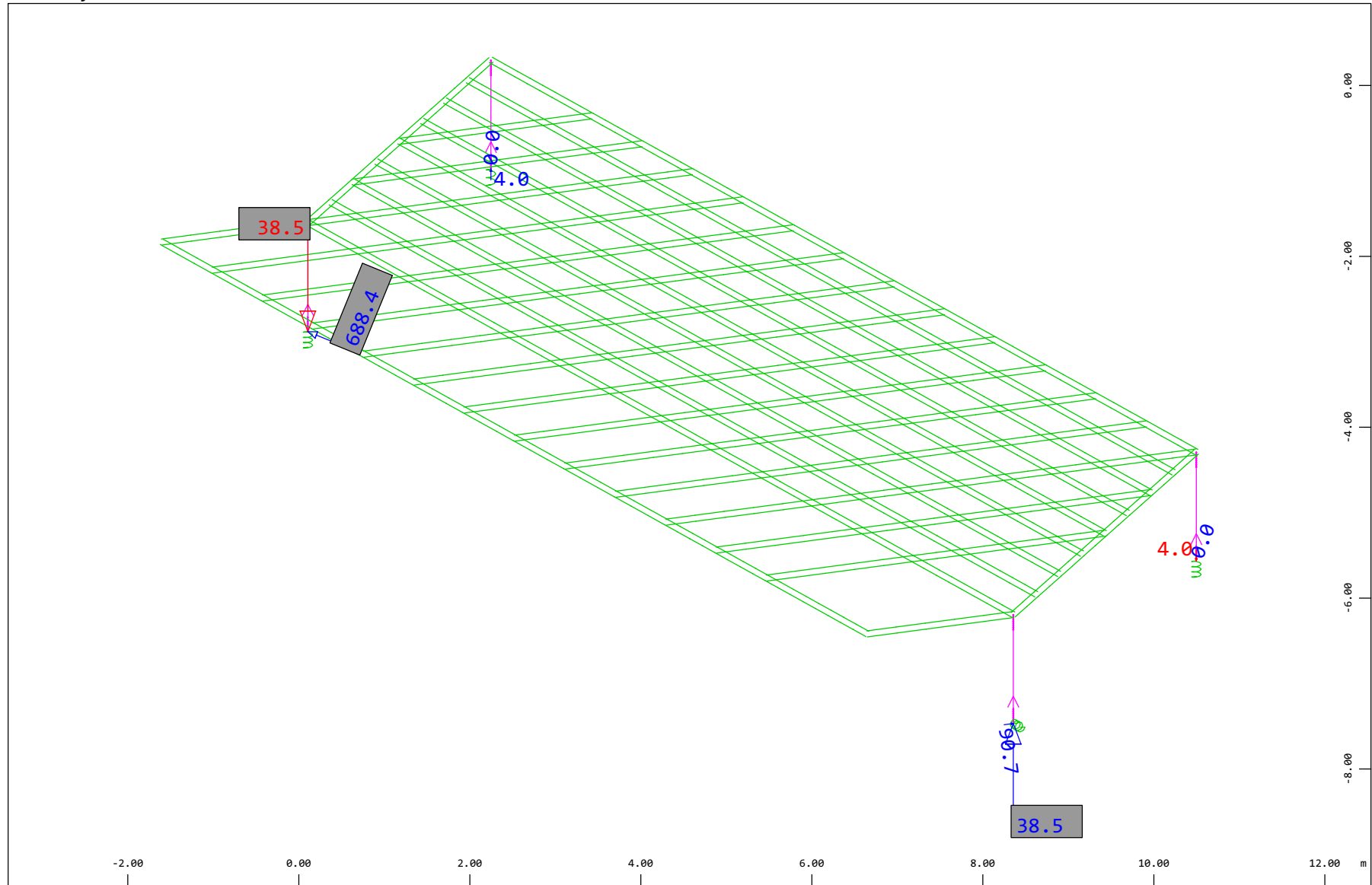
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 500 Qt: Avviamento LM71 (A-->B) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=9.69 kN/m)
 (Max=18.1)



M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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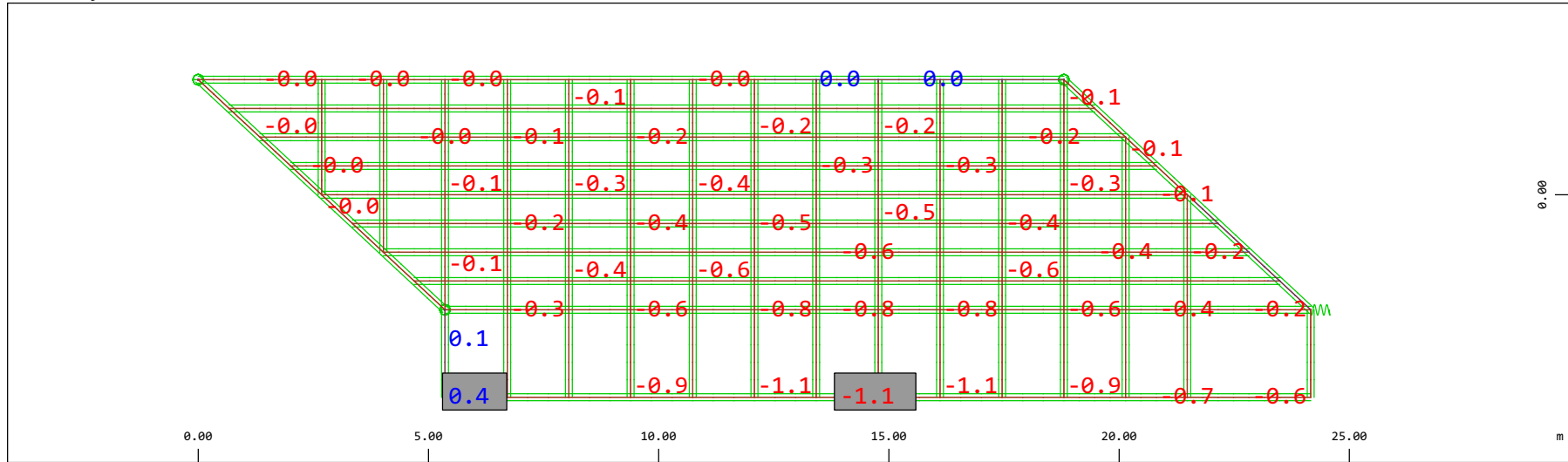


Z Sector of system Beam Elements, Spring Elements
 X Y Nodes , Support force in global Z, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 19.4 kN
 0)

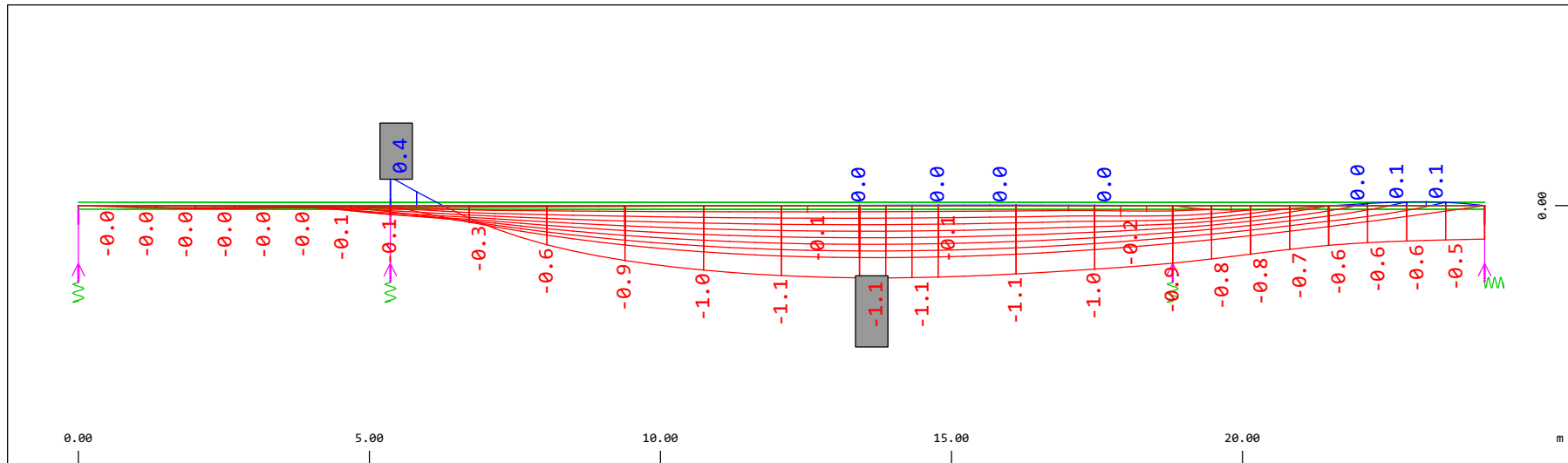
△ (Min=-38.5) (Max=38.5) (total: 0)

M 1 : 63
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

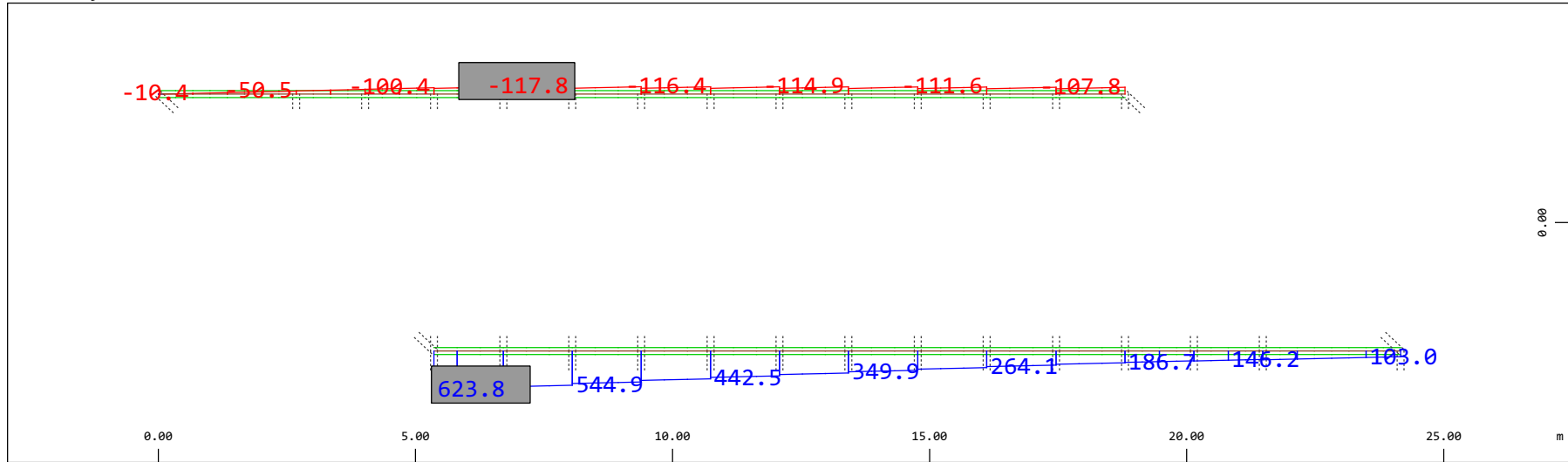


Y
 X Sector of system Beam Elements, Spring Elements M 1 : 134
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 0.969 mm (Min=-1.14) (Max=0.449)



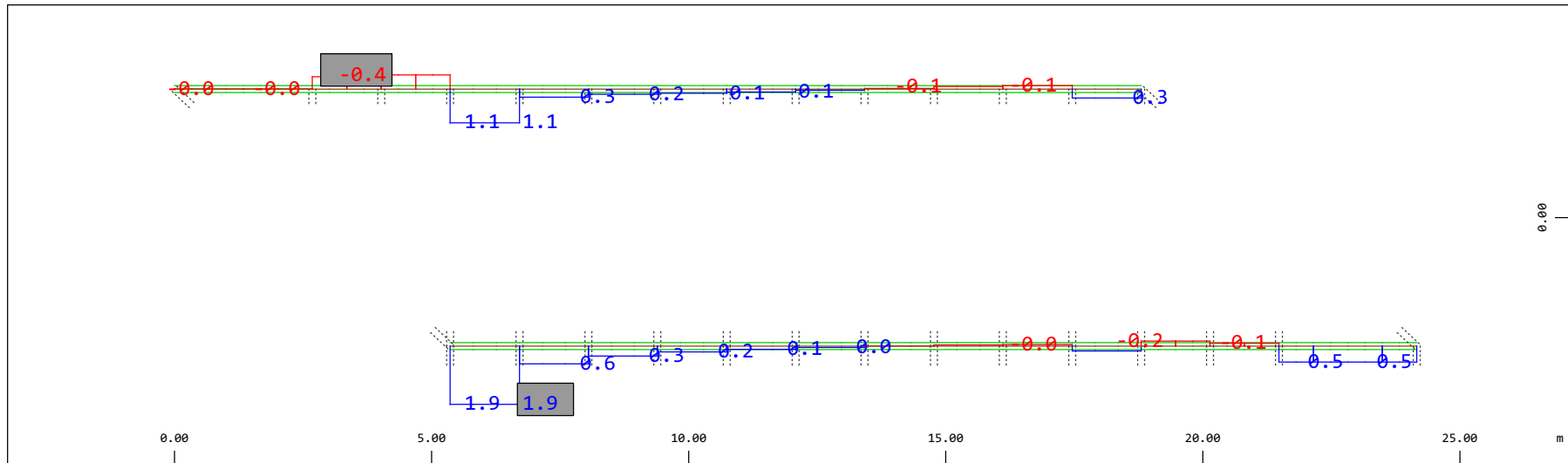
Z
 X Sector of system Beam Elements, Spring Elements M 1 : 106
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 0.969 mm (Min=-1.14) (Max=0.449)

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 980.5 kN (Min=-117.8) (Max=623.8)

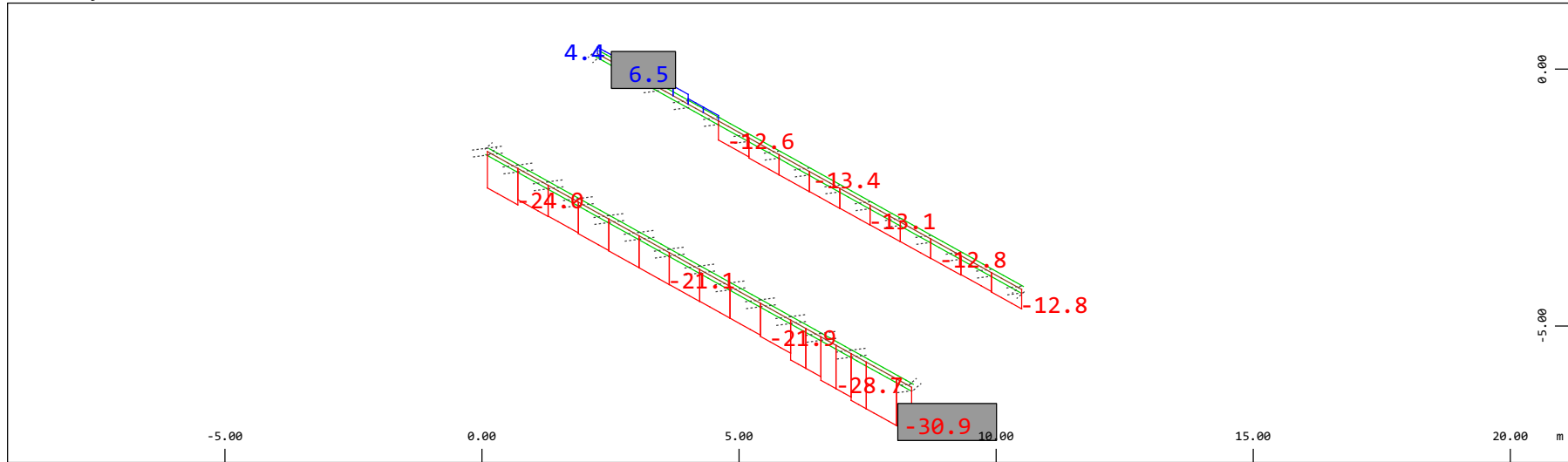
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 1.96 kNm (Min=-0.450) (Max=1.85)

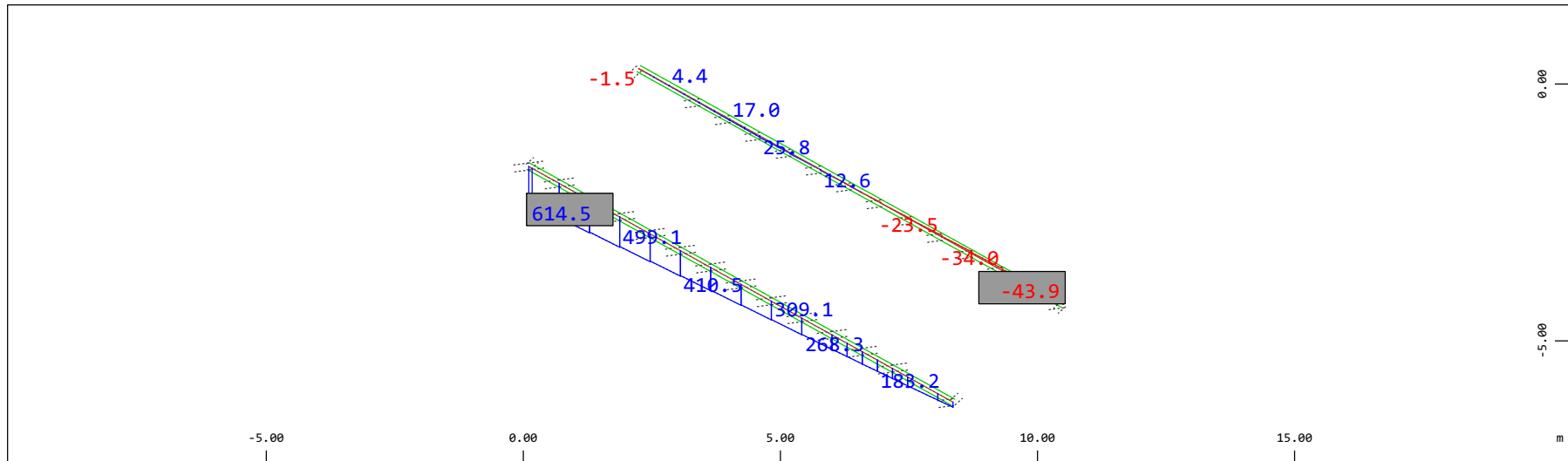
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 39.2 kN (Min=-30.9) (Max=6.47)

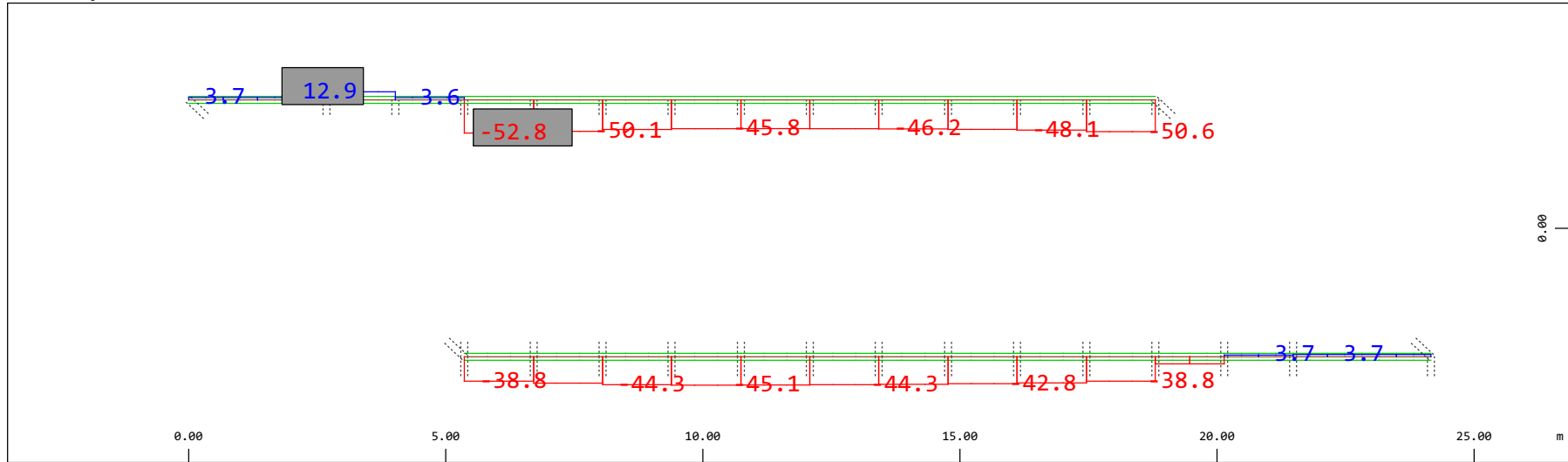
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 980.5 kNm (Min=-43.9) (Max=614.5)

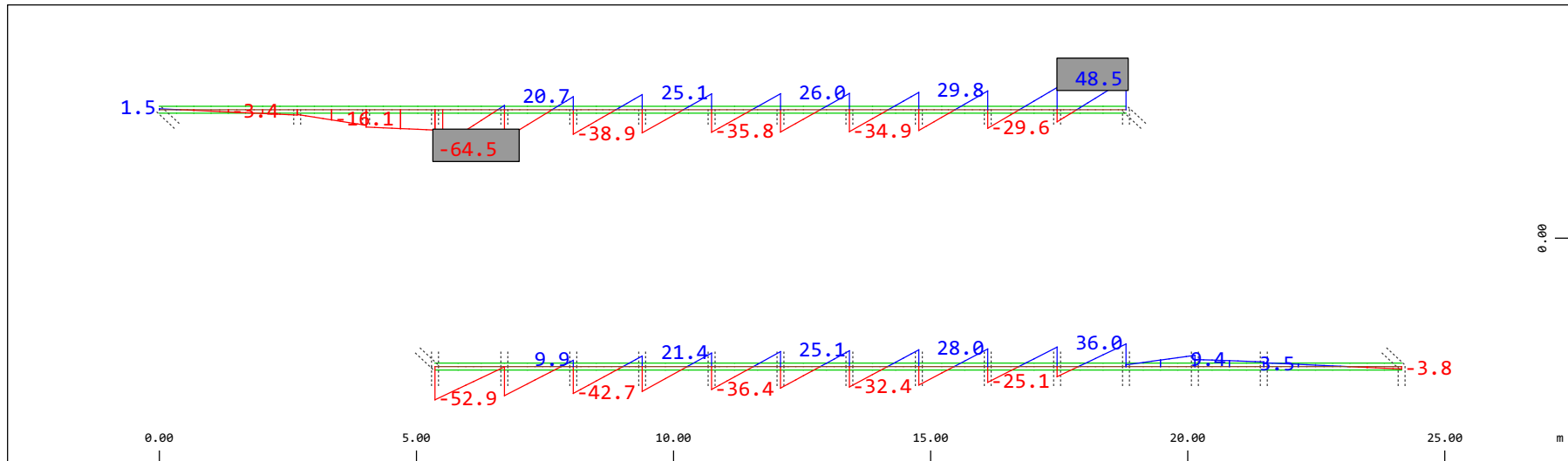
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 98.0 kN (Min=-52.8) (Max=12.9)

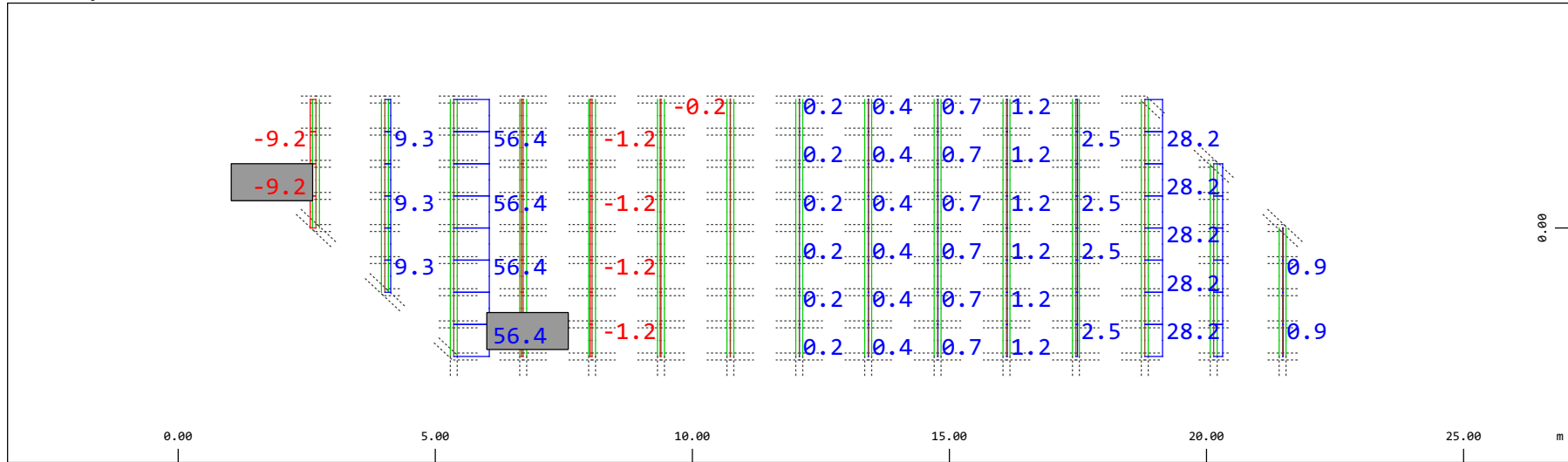
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-64.5) (Max=48.5)

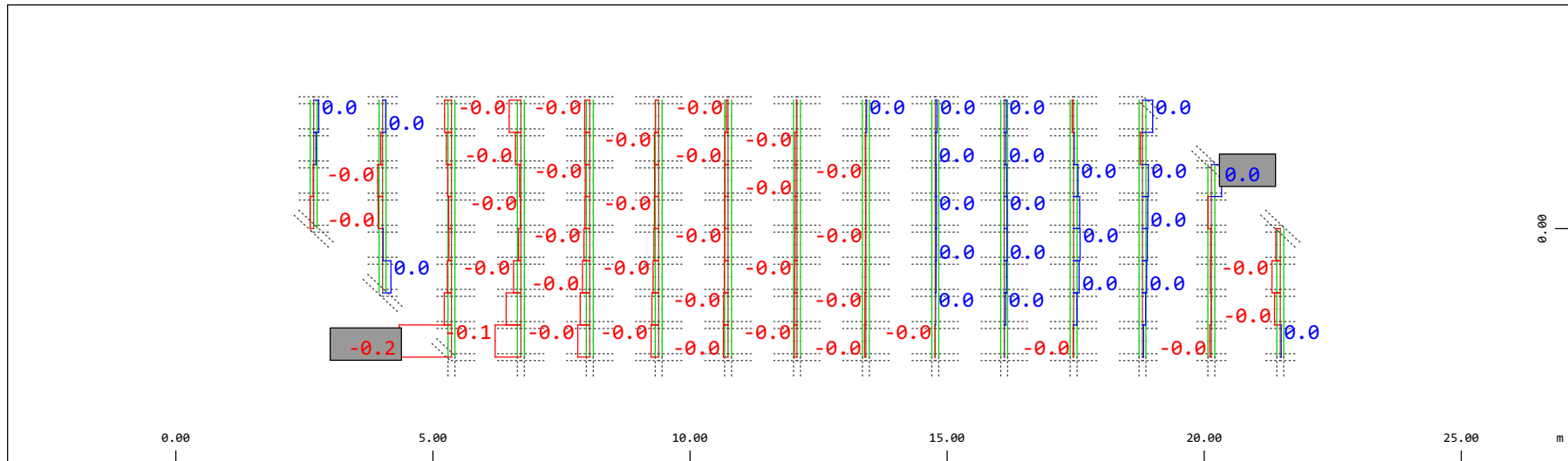
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force Nx, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 98.0 kN (Min=-9.16) (Max=56.4)

M 1 : 120

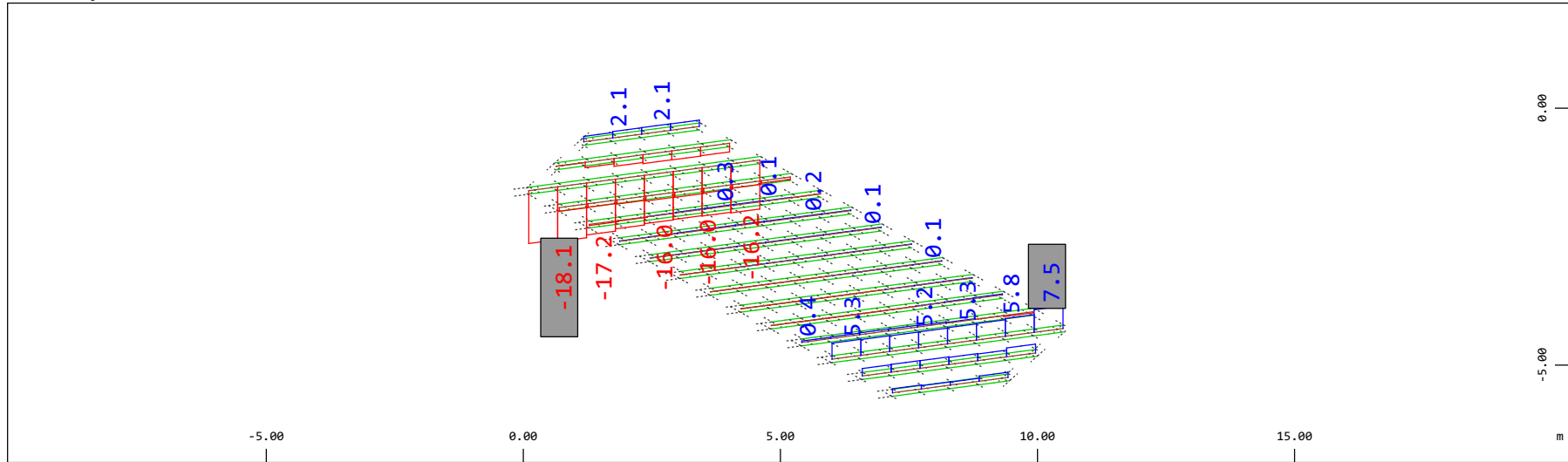


Y Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment Mt, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 0.196 kNm (Min=-0.166) (Max=0.0324)

M 1 : 120

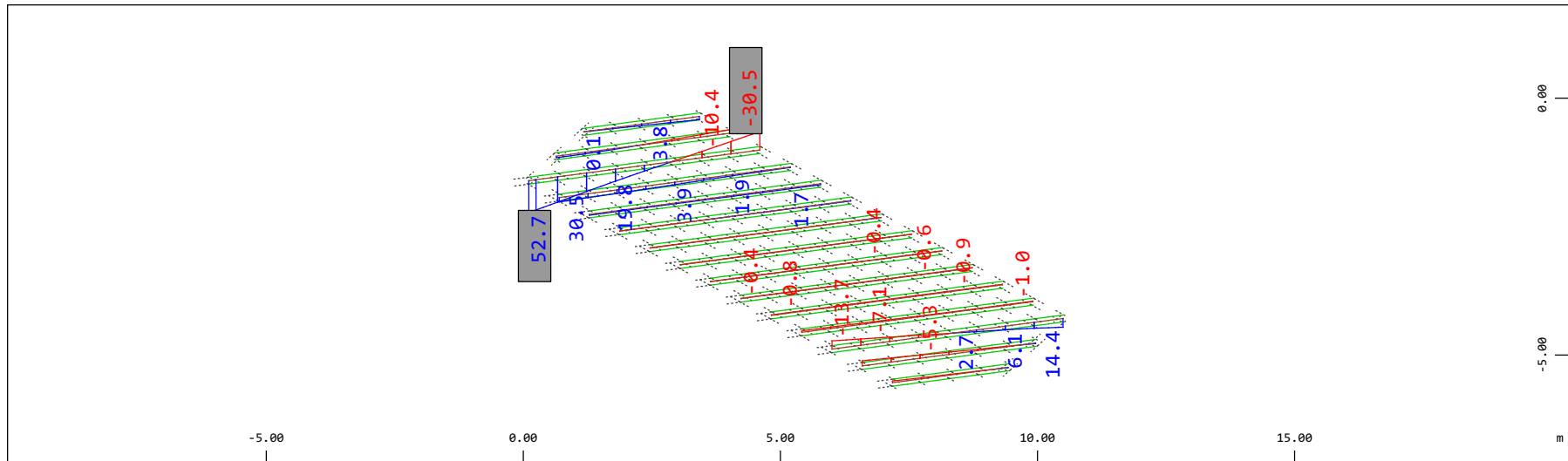
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force V_z , Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 19.6 kN (Min=-18.1) (Max=7.47)

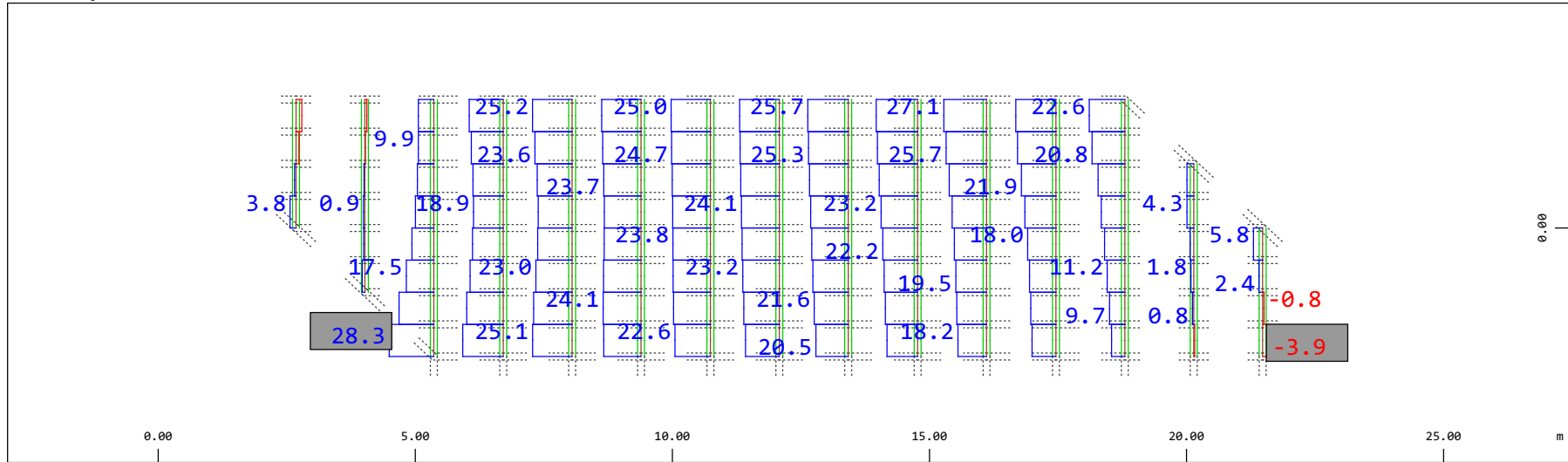
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment M_y , Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-30.5) (Max=52.7)

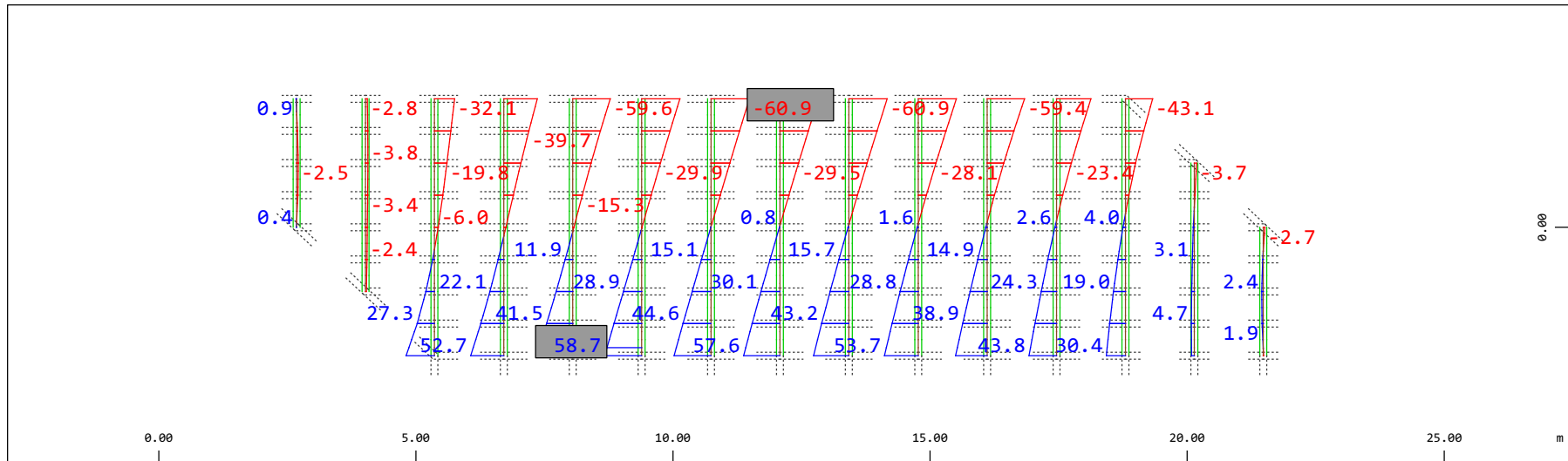
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 39.2 kN (Min=-3.92) (Max=28.3)

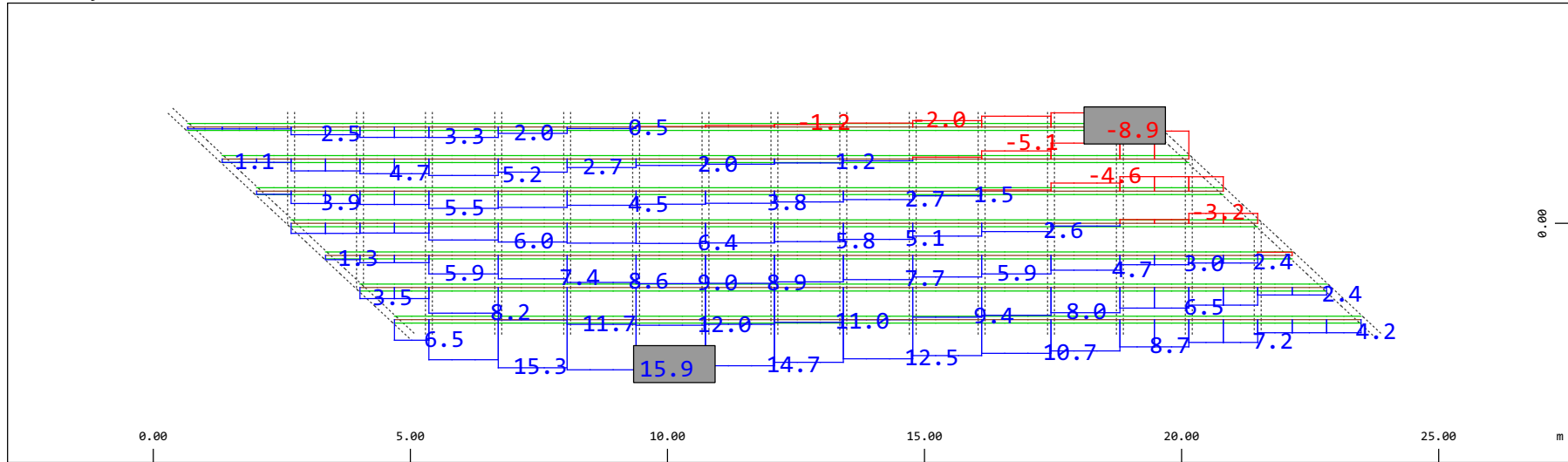
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-60.9) (Max=58.7)

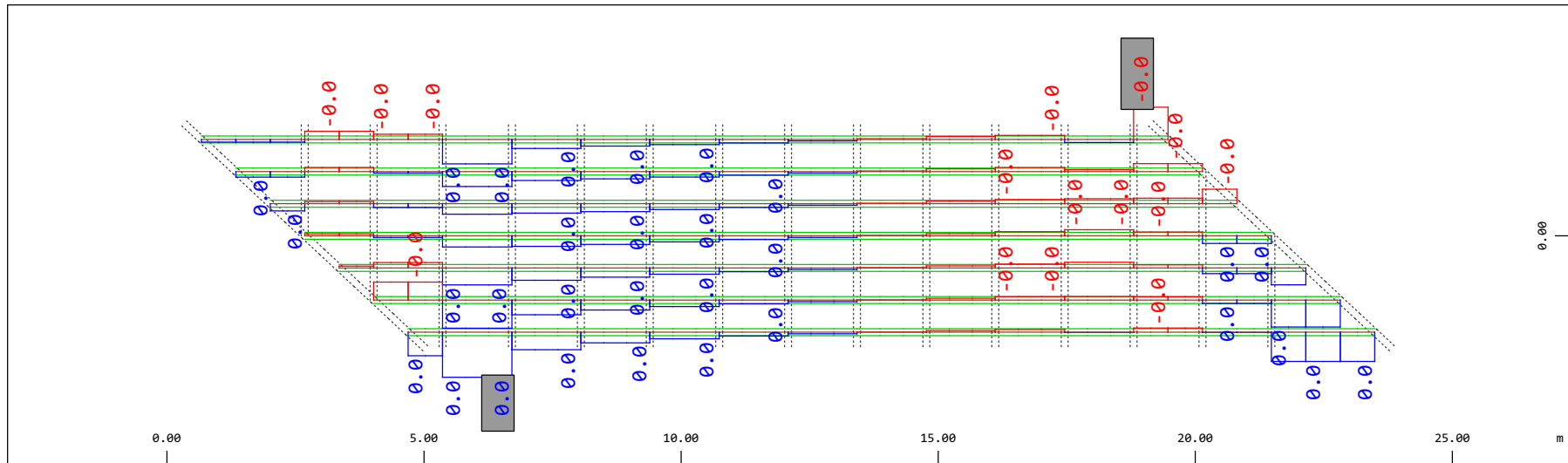
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 19.6 kN (Min=-8.88) (Max=15.9)

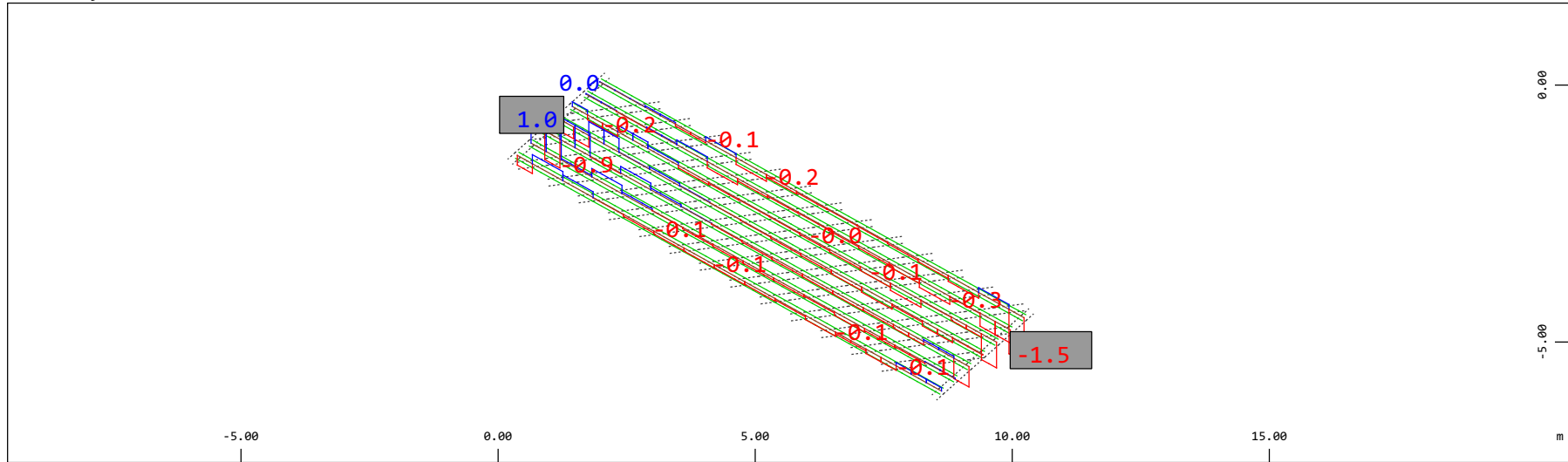
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 0.0020 kNm (Min=-0.0010) (Max=0.0014)

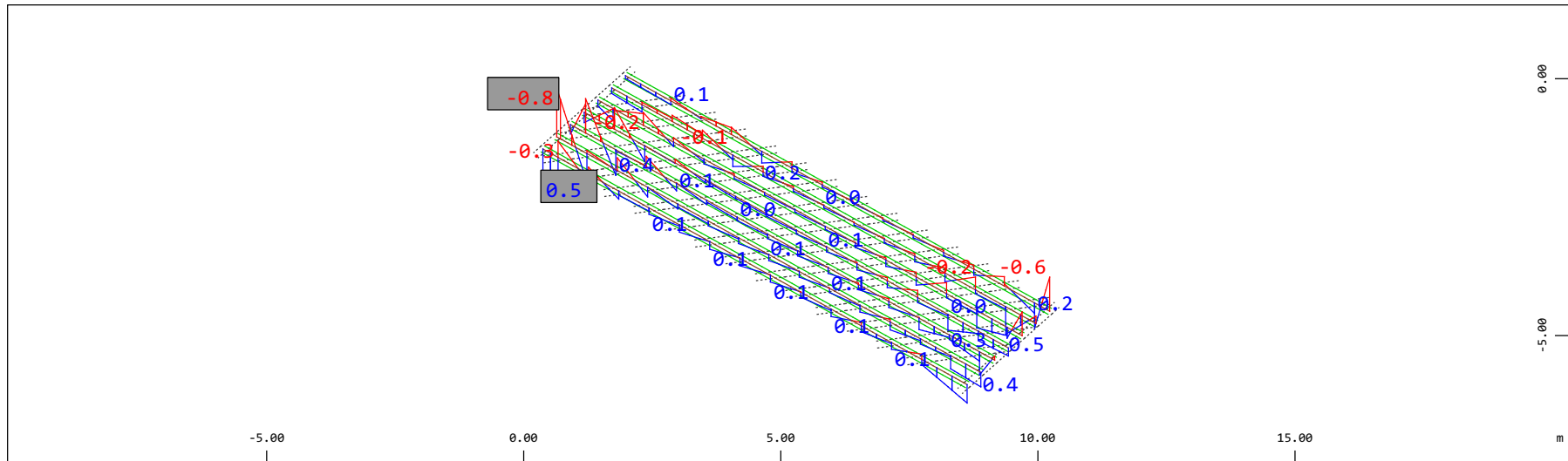
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 1.96 kN (Min=-1.47) (Max=0.960)

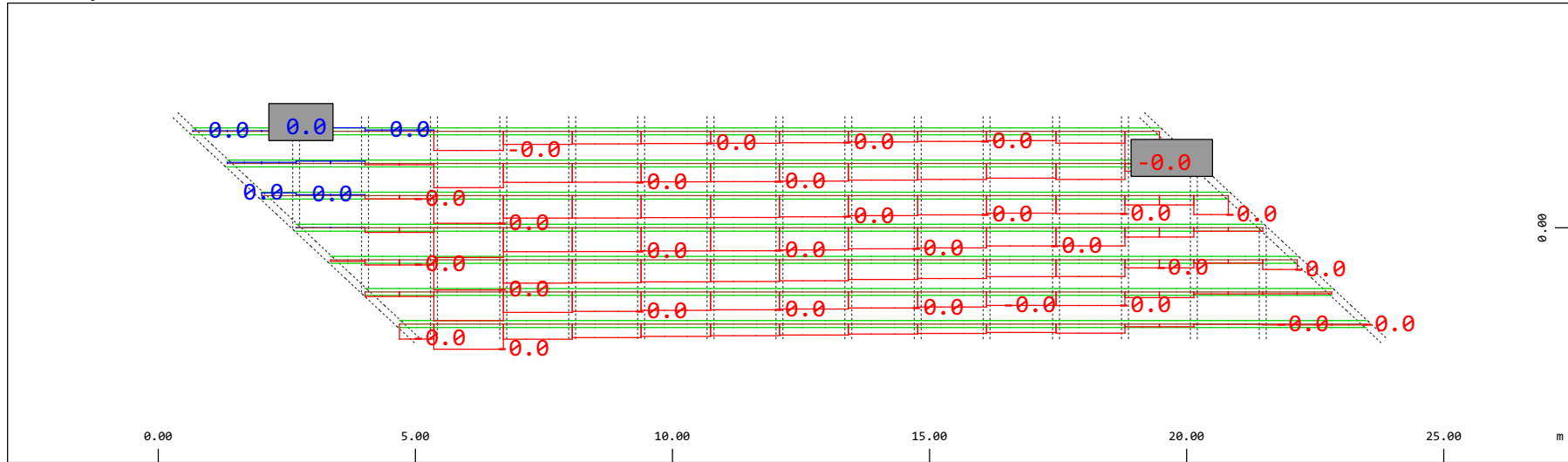
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



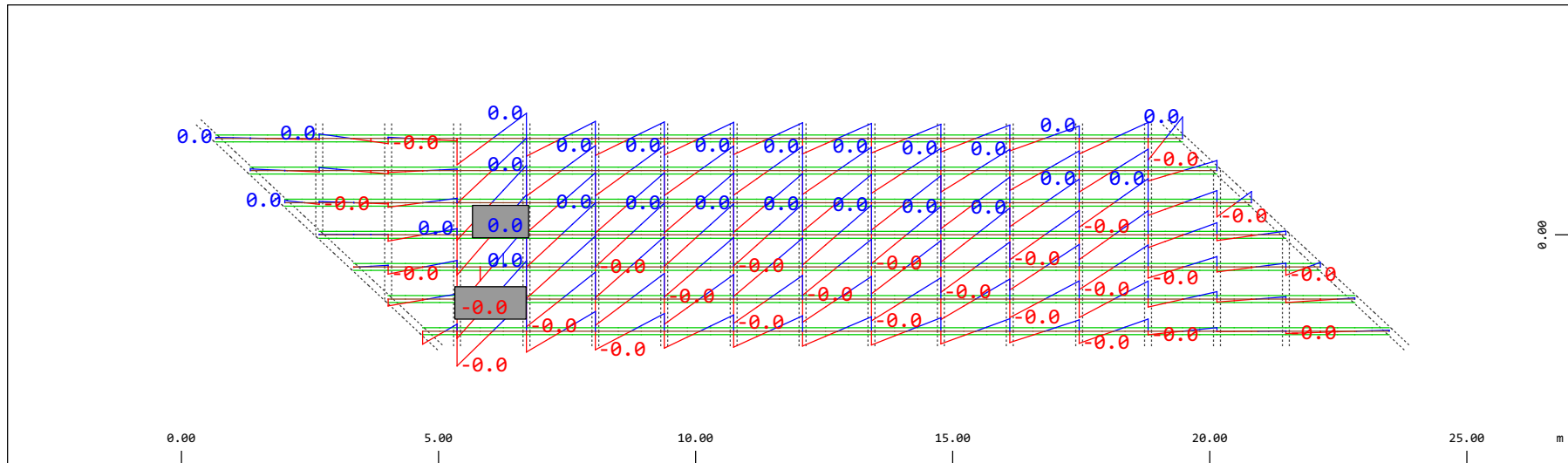
Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 0.980 kNm (Min=-0.809) (Max=0.521)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads

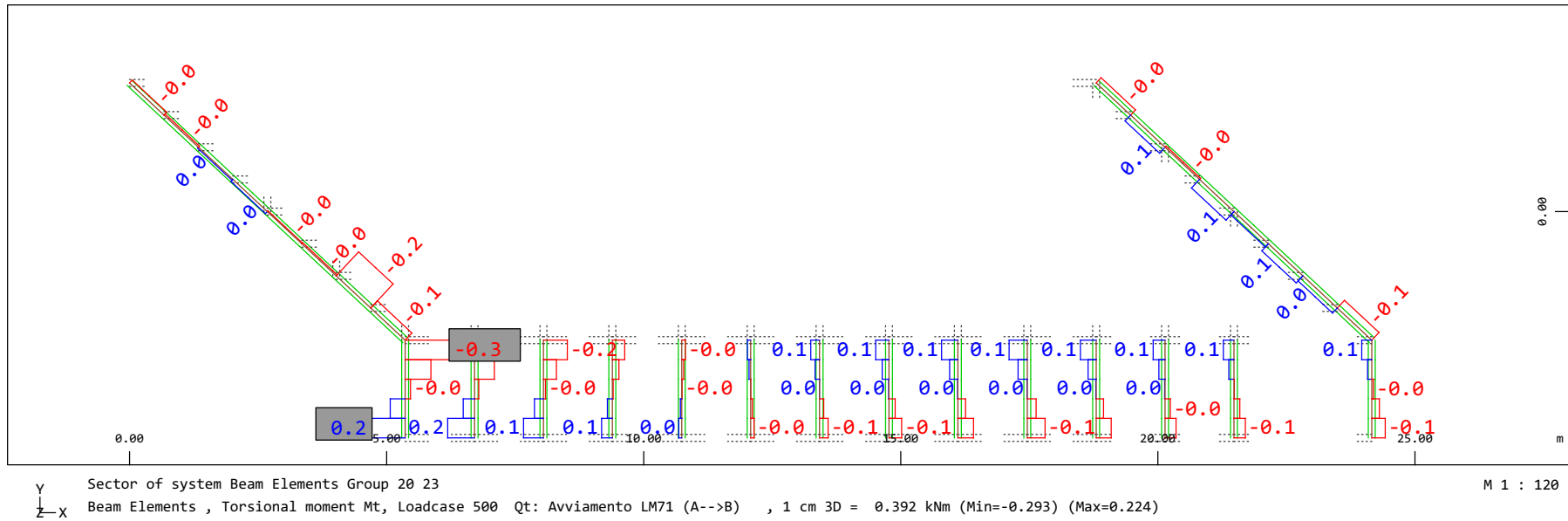
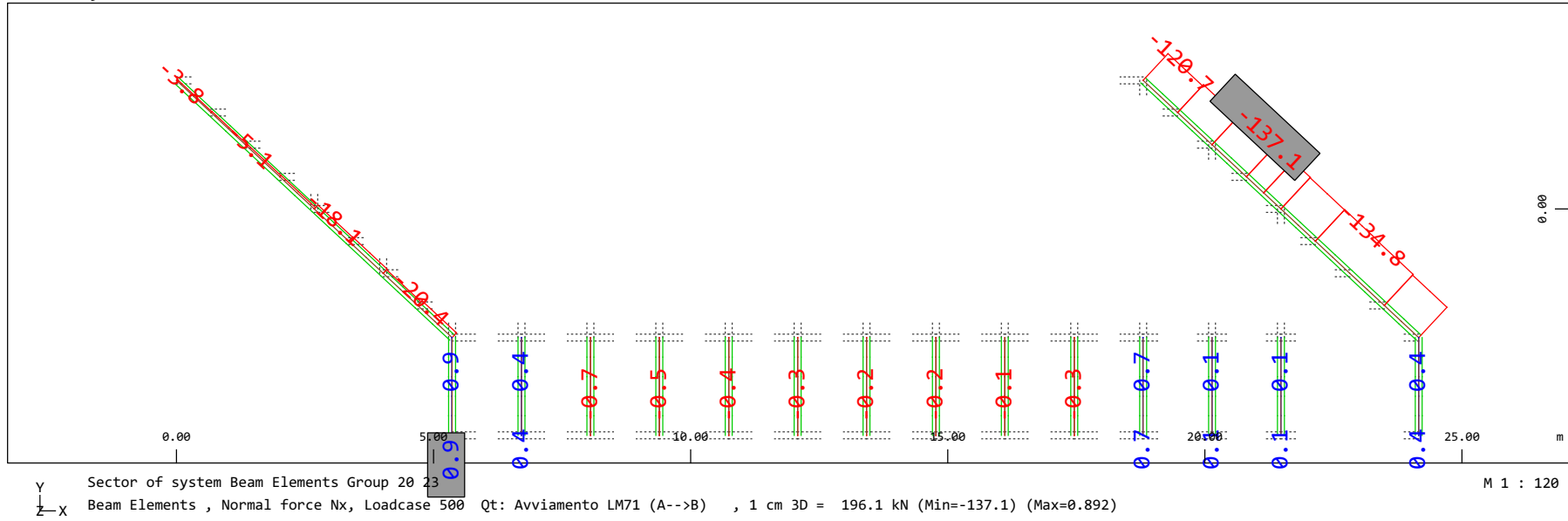


Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Shear force Vy, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 0.0196 kN (Min=-0.0102) (Max=0.0012) M 1 : 120

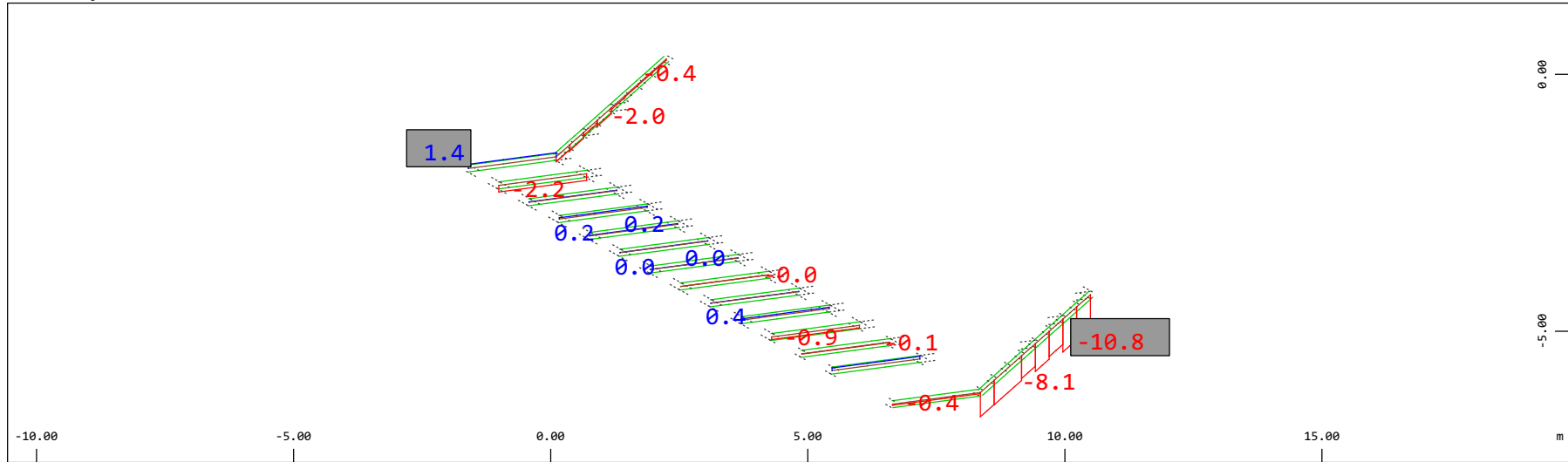


Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Bending moment Mz, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 0.0098 kNm (Min=-0.0065) (Max=0.0064) M 1 : 120

Definition of Axis
 Results elementay loads

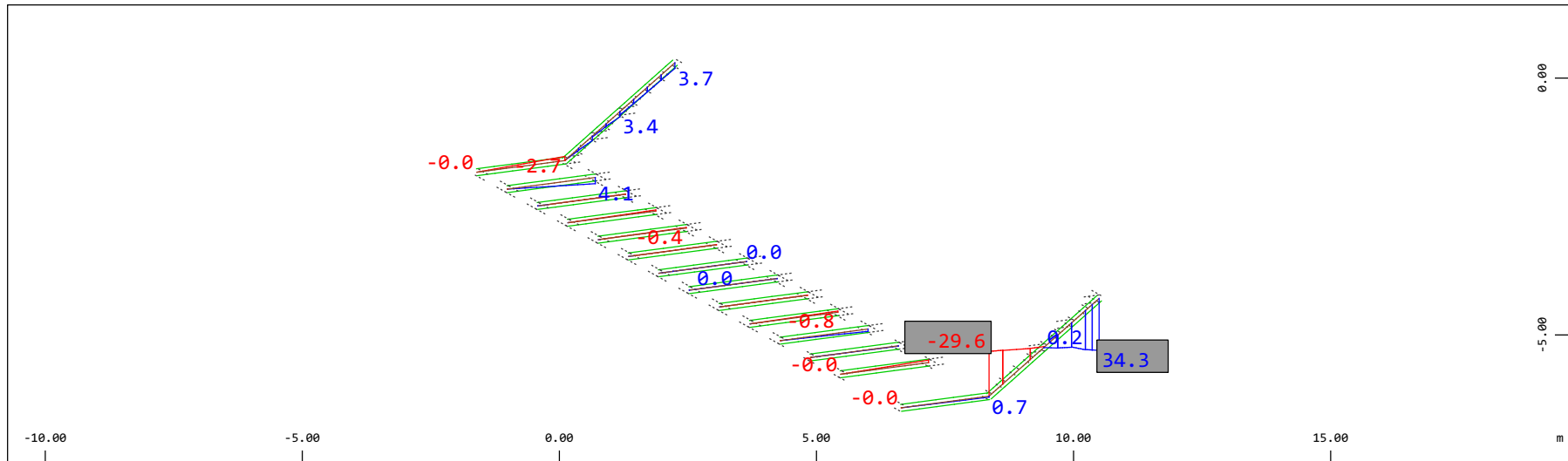


Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 19.6 kN (Min=-10.8) (Max=1.38)

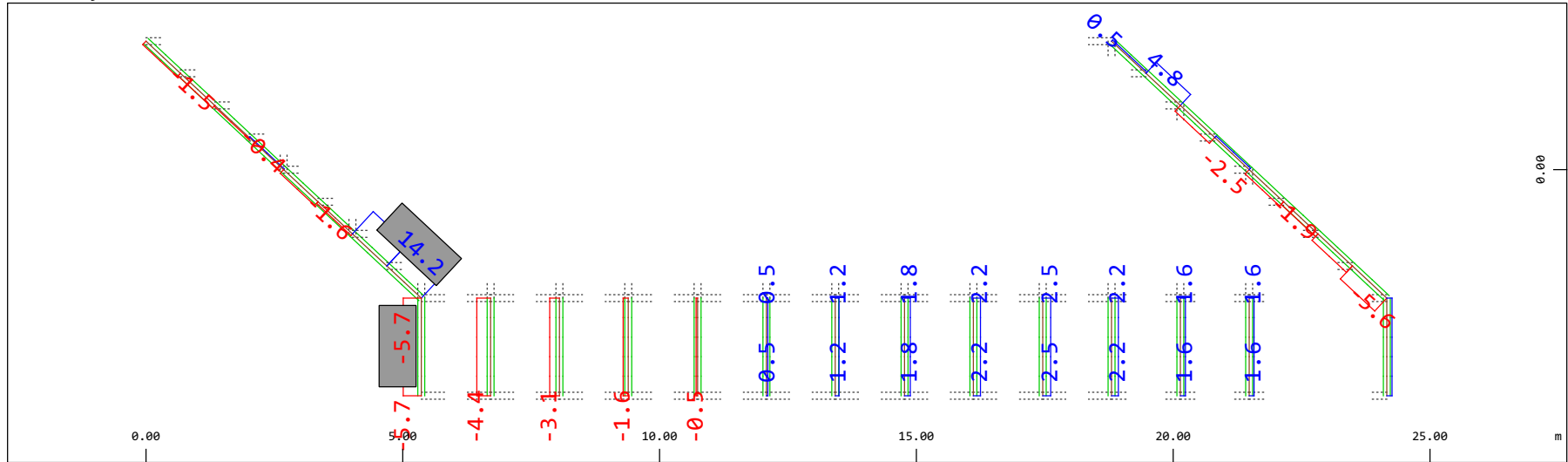
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 39.2 kNm (Min=-29.6) (Max=34.3)

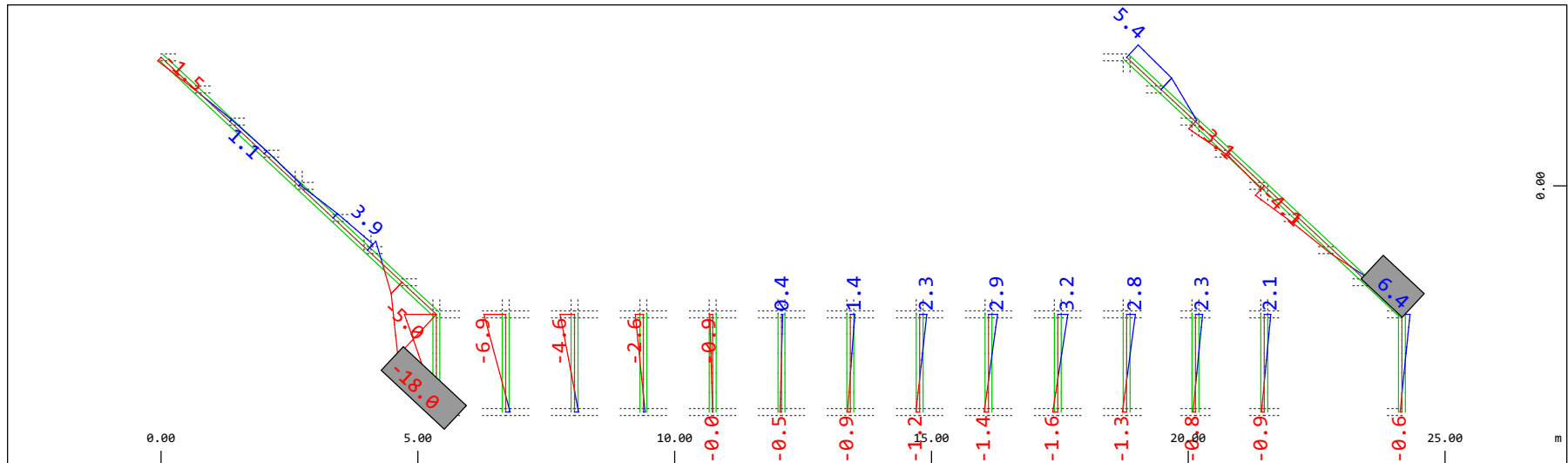
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 19.6 kN (Min=-5.73) (Max=14.2)

M 1 : 120

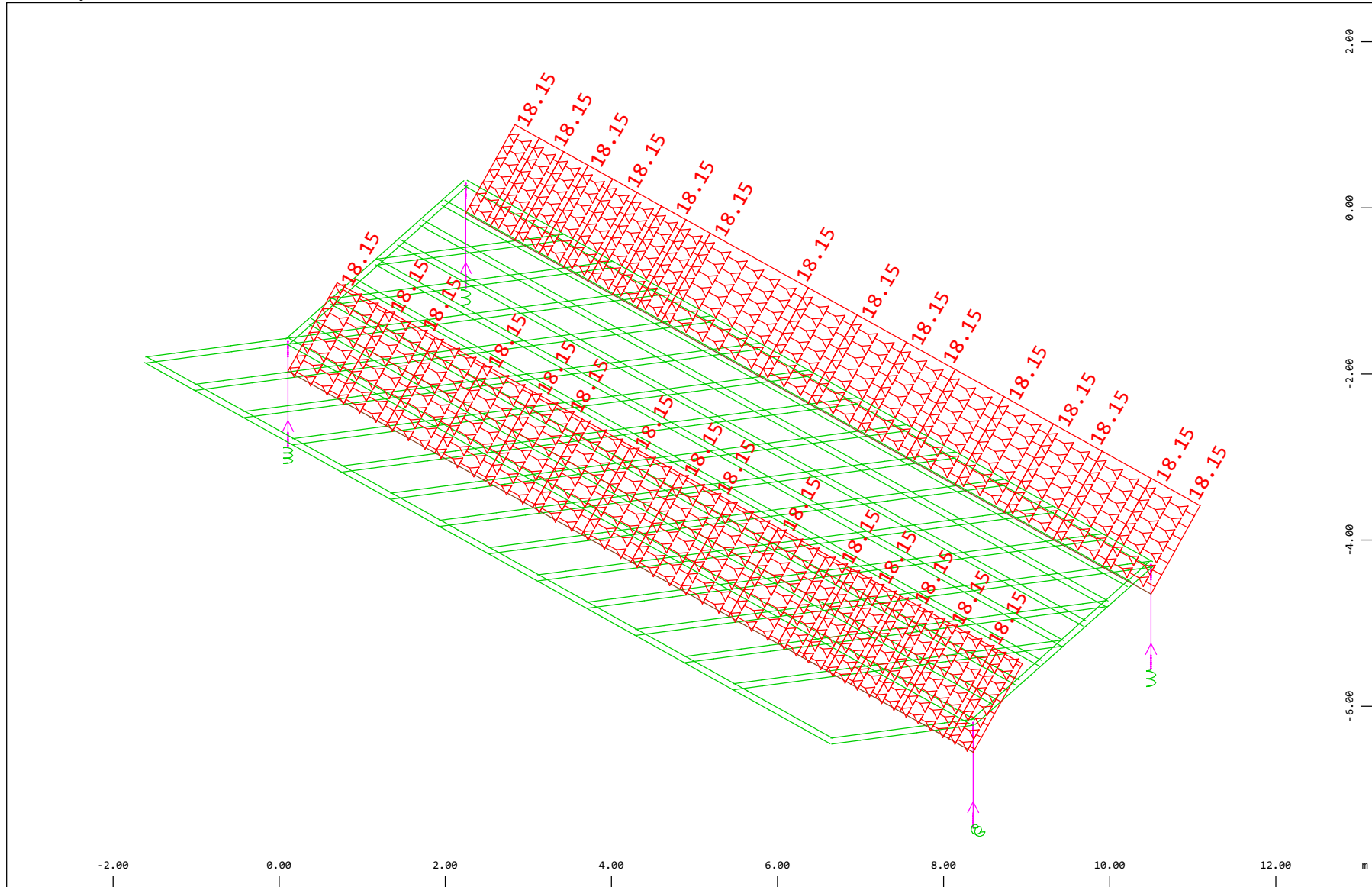


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 500 Qt: Avviamento LM71 (A-->B) , 1 cm 3D = 19.6 kNm (Min=-18.0) (Max=6.37)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

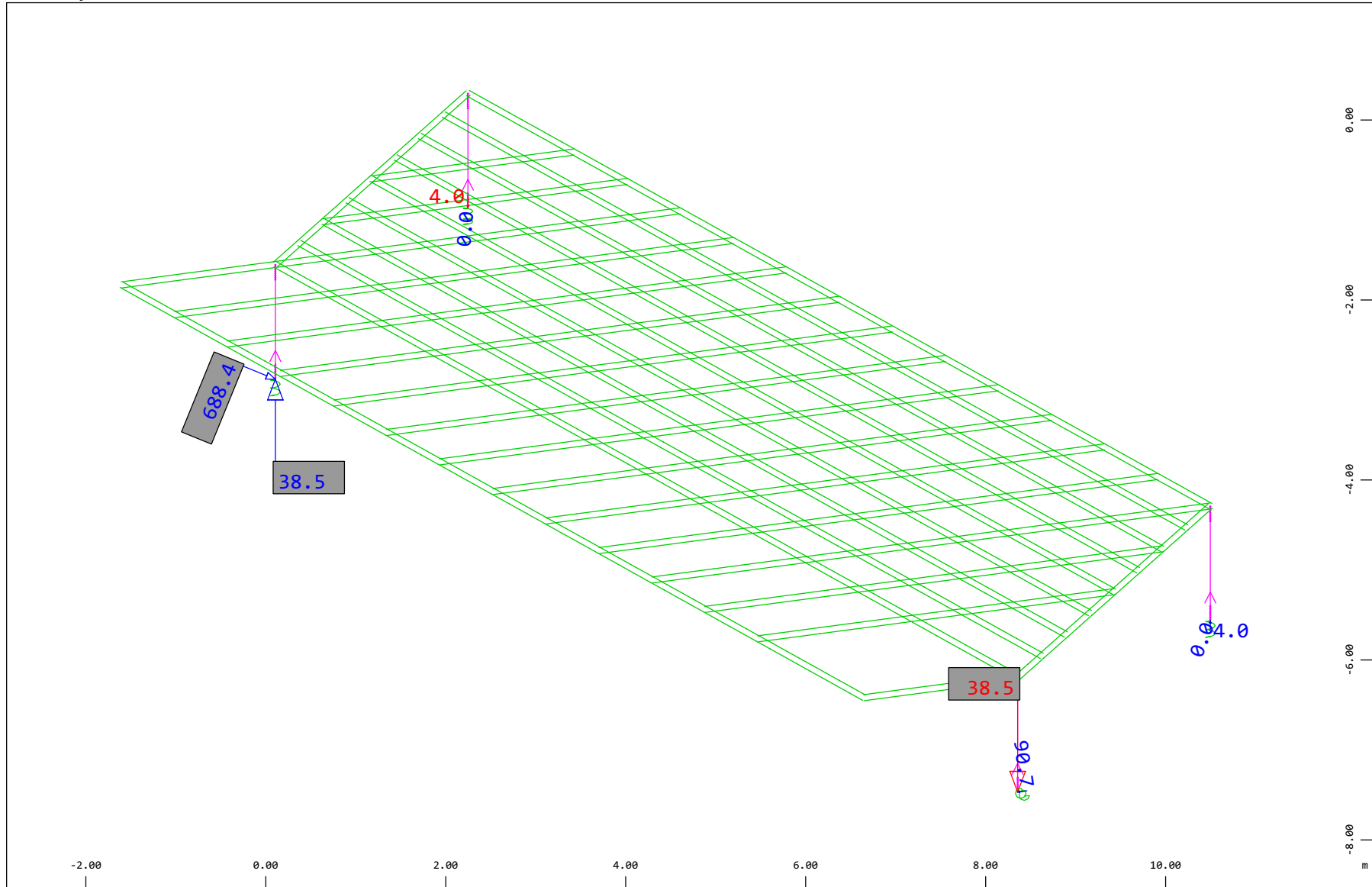
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 501 Qt: Avviamento LM71 (B-->A) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=9.69 kN/m)
 (Min=-18.1) (Max=-18.1)



M 1 : 65
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X
 Y

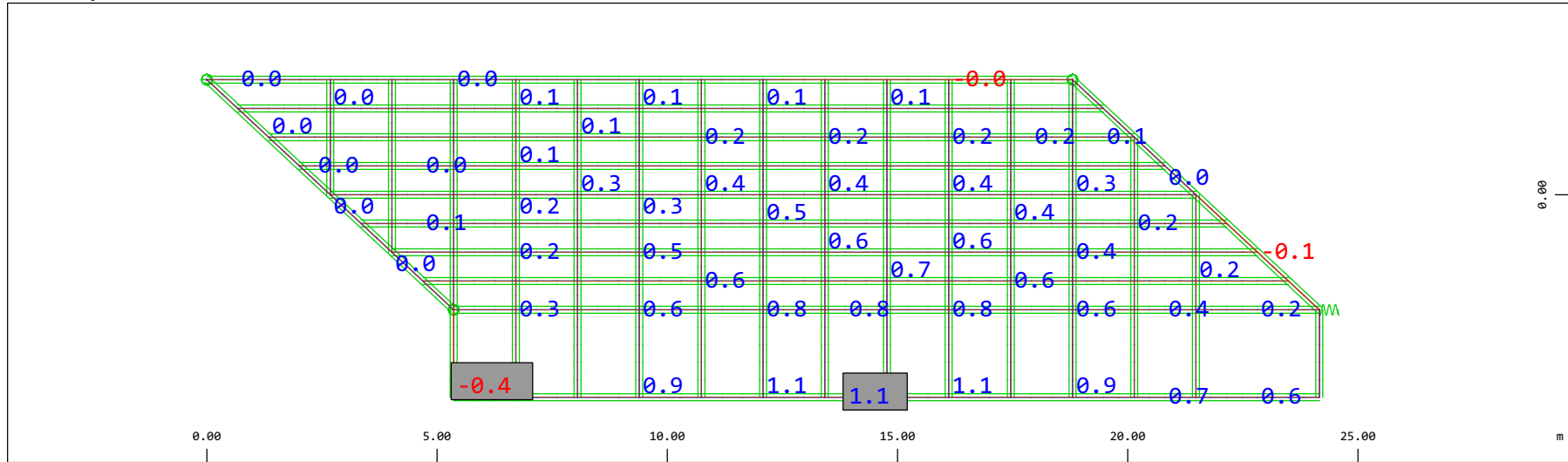
Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 19.4 kN
 0)

◁ (Min=-38.5) (Max=38.5) (total:

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

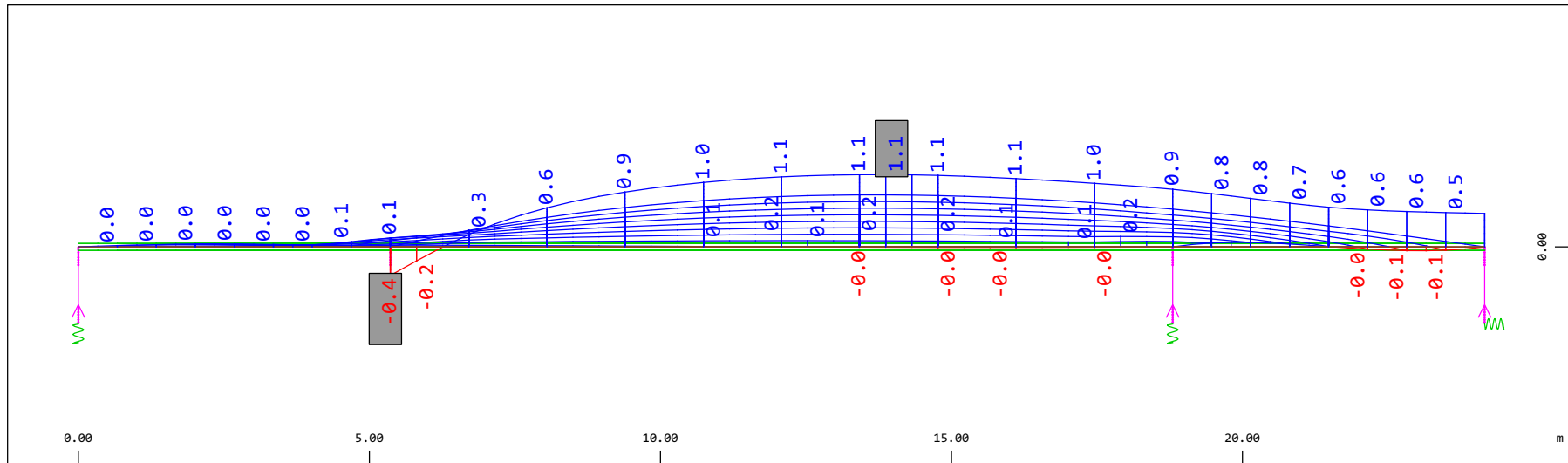
Definition of Axis
 Results elementay loads



Y
 X
 Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=1.14)

○, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 0.969 mm (Min=-0.449)

M 1 : 134

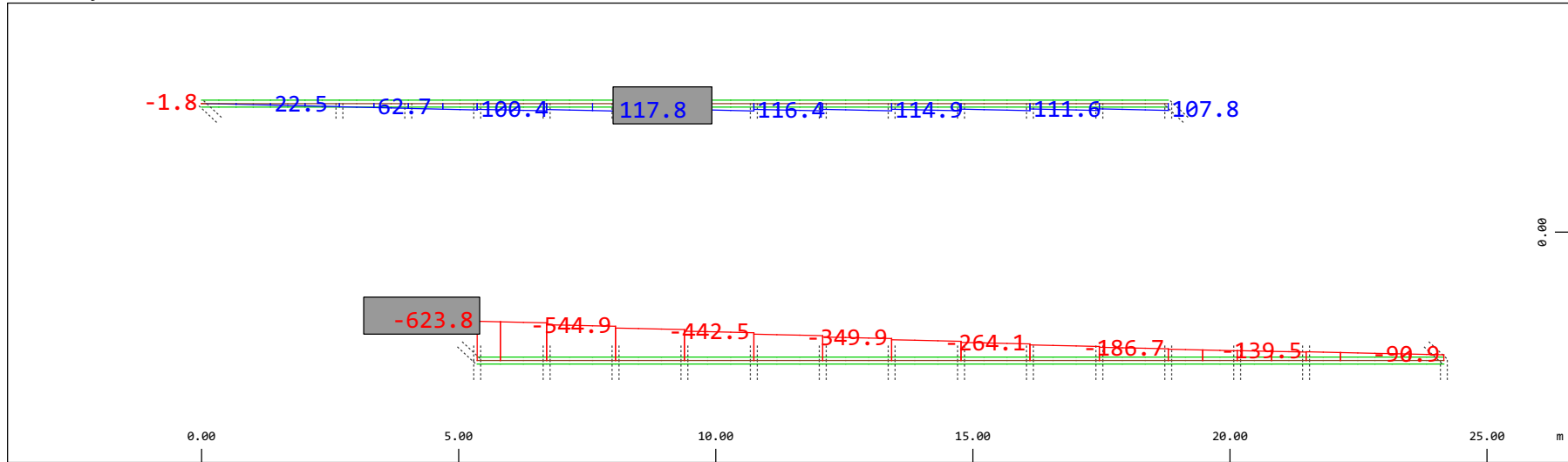


Z
 X
 Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=1.14)

↑, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 0.969 mm (Min=-0.449)

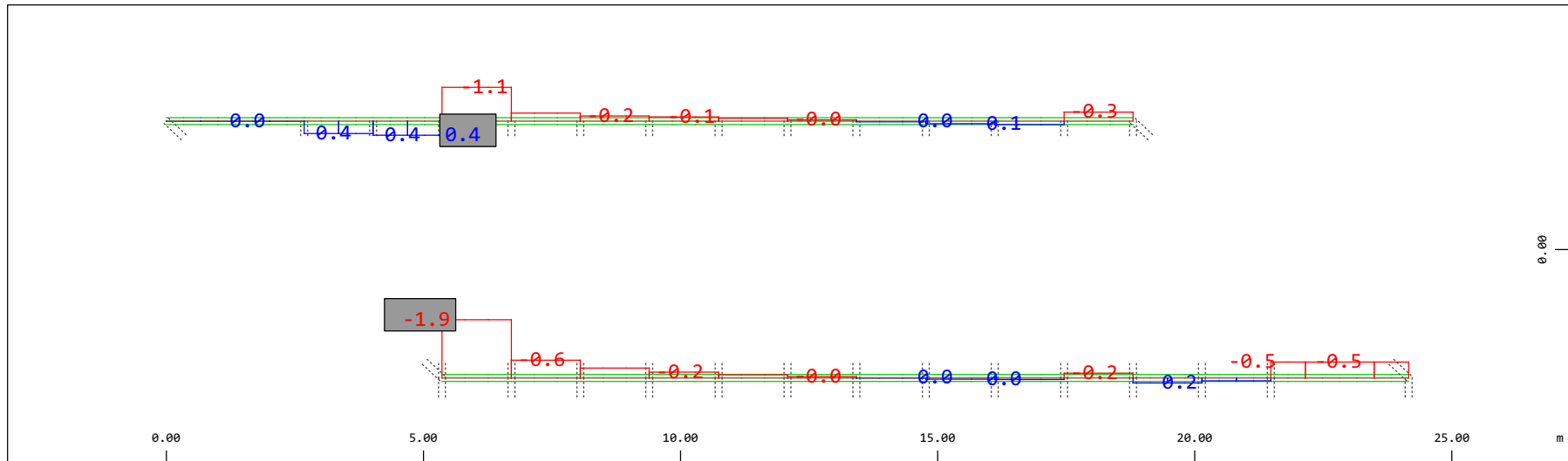
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 980.5 kN (Min=-623.8) (Max=117.8)

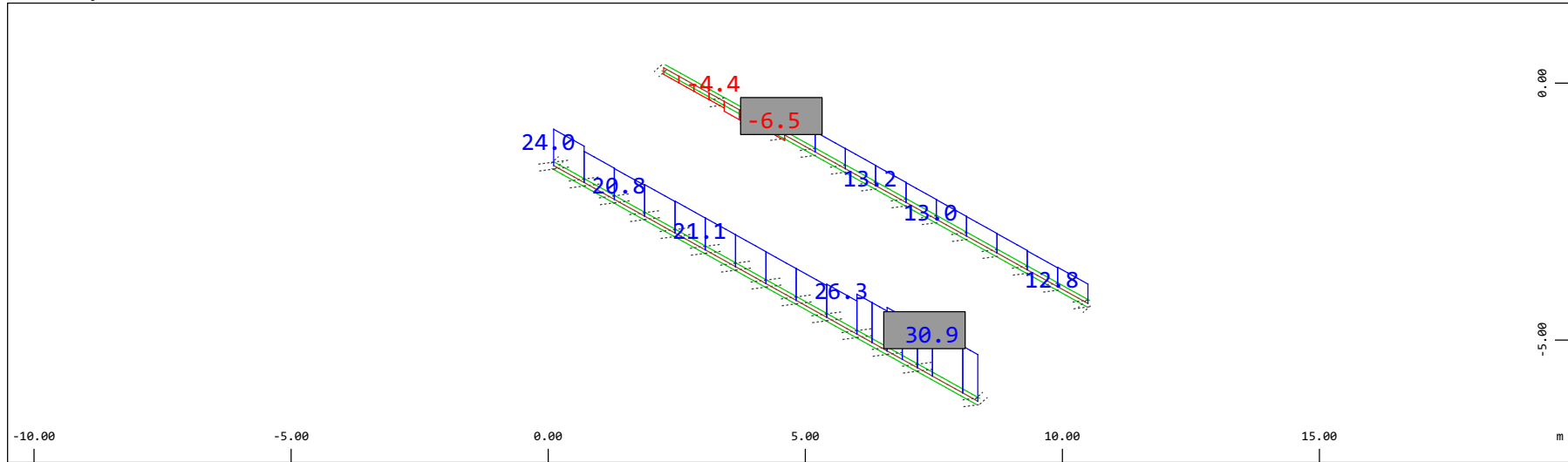
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 1.96 kNm (Min=-1.85) (Max=0.450)

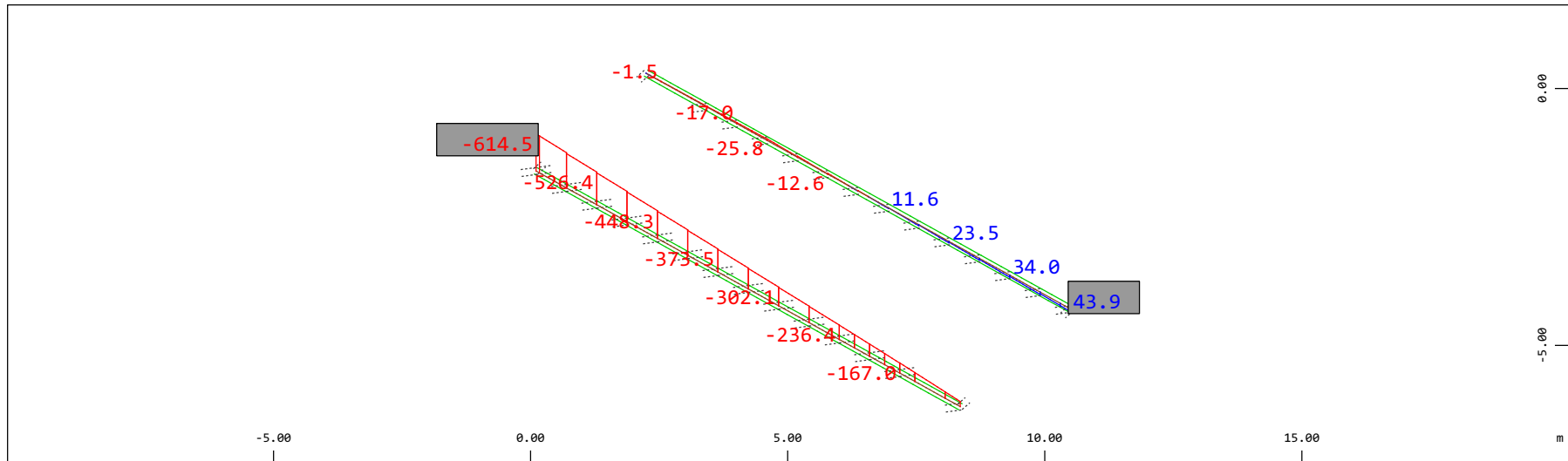
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 39.2 kN (Min=-6.47) (Max=30.9)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

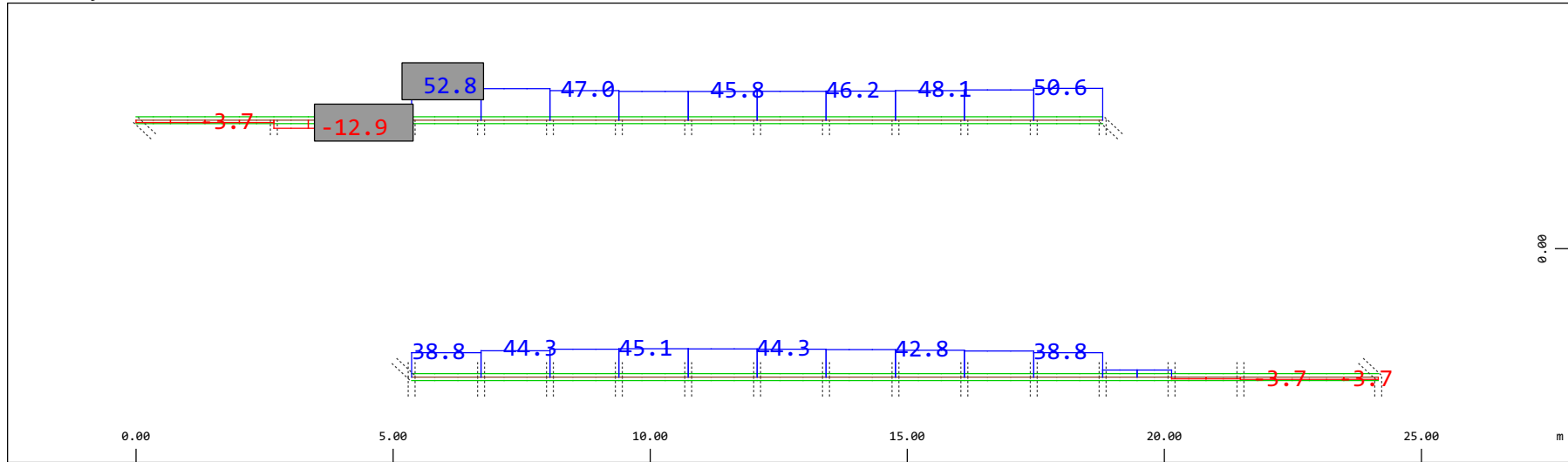


Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 980.5 kNm (Min=-614.5) (Max=43.9)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

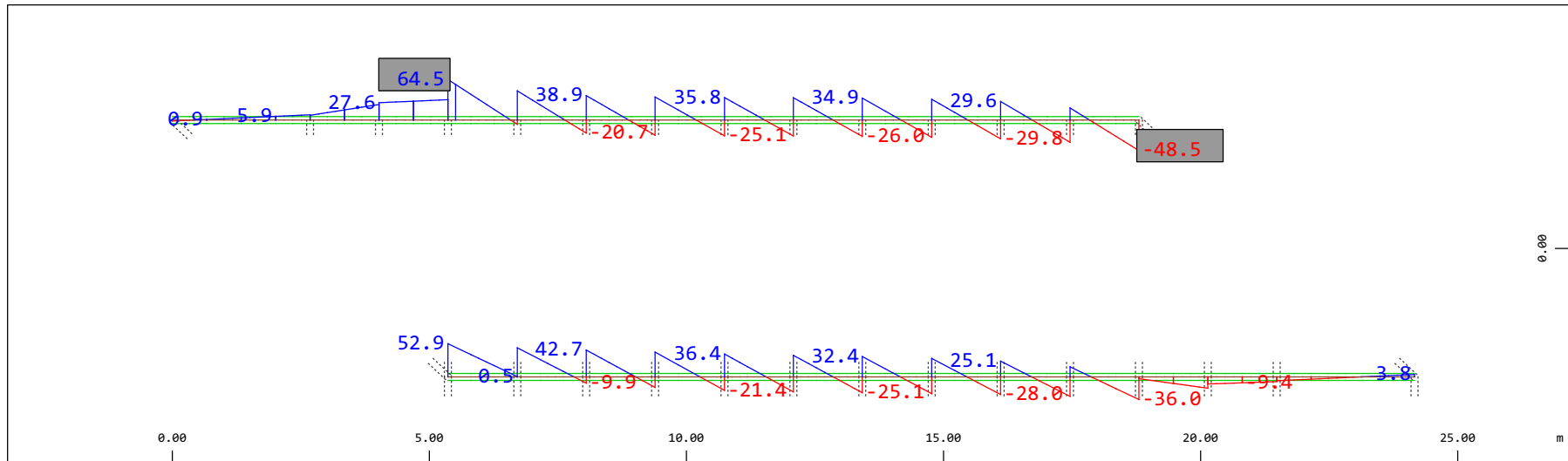
Definition of Axis

Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 98.0 kN (Min=-12.9) (Max=52.8)

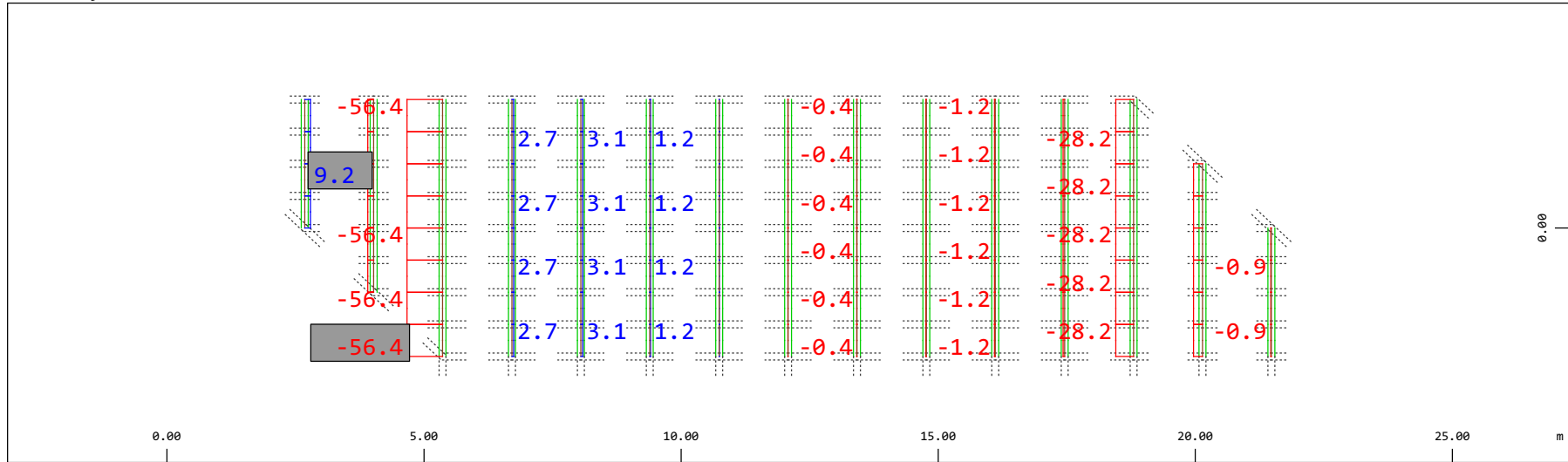
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-48.5) (Max=64.5)

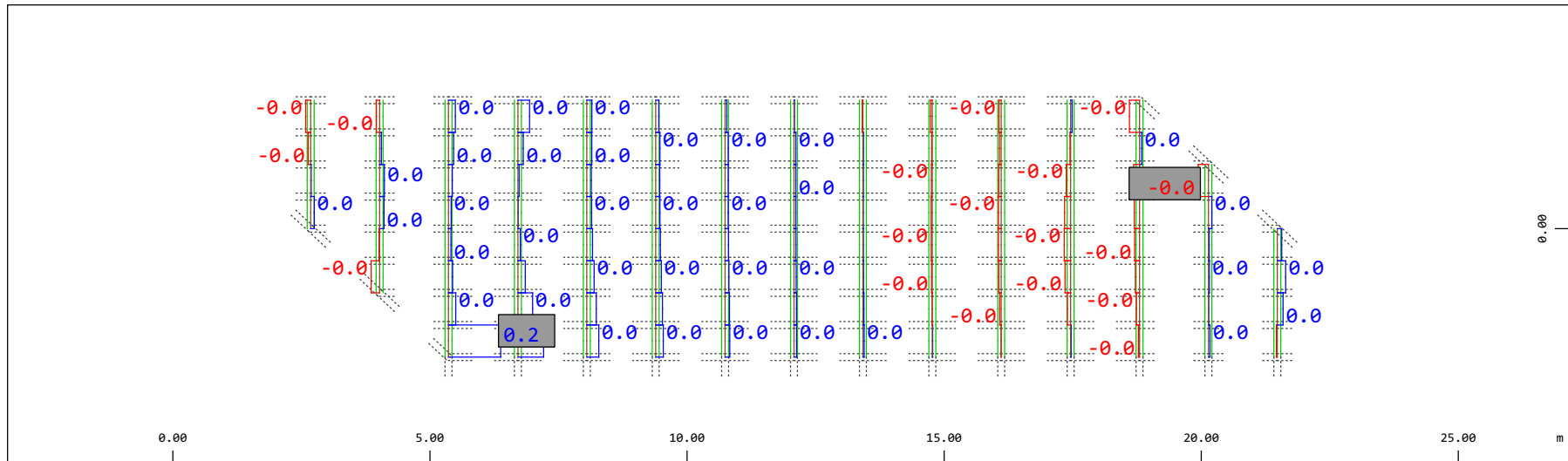
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force Nx, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 98.0 kN (Min=-56.4) (Max=9.16)

M 1 : 120

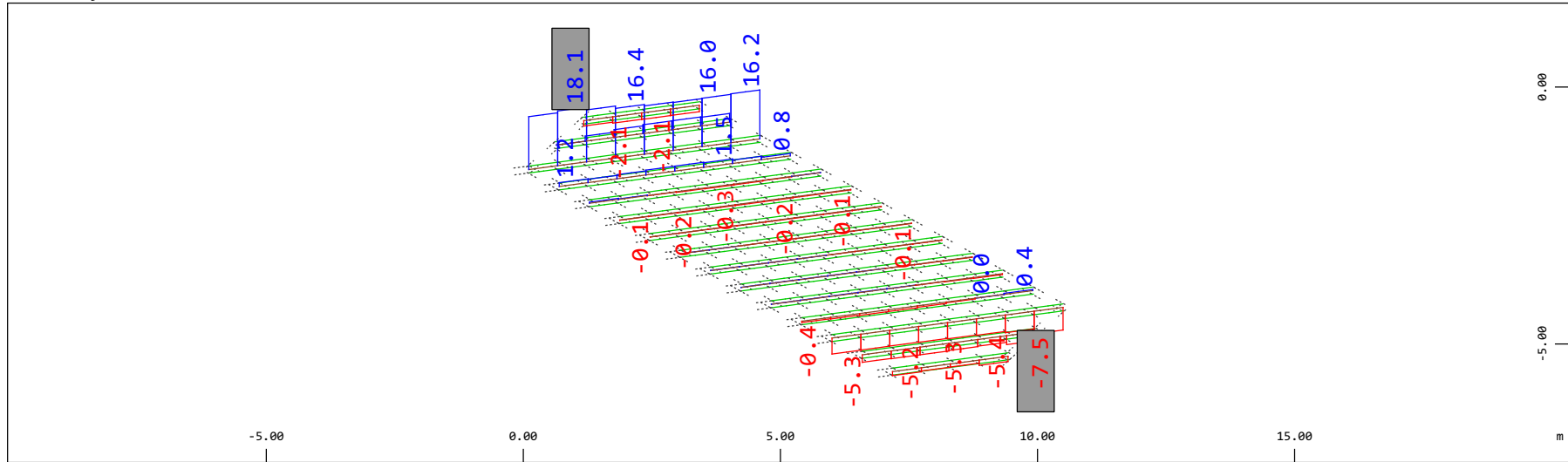


Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment Mt, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 0.196 kNm (Min=-0.0324) (Max=0.166)

M 1 : 120

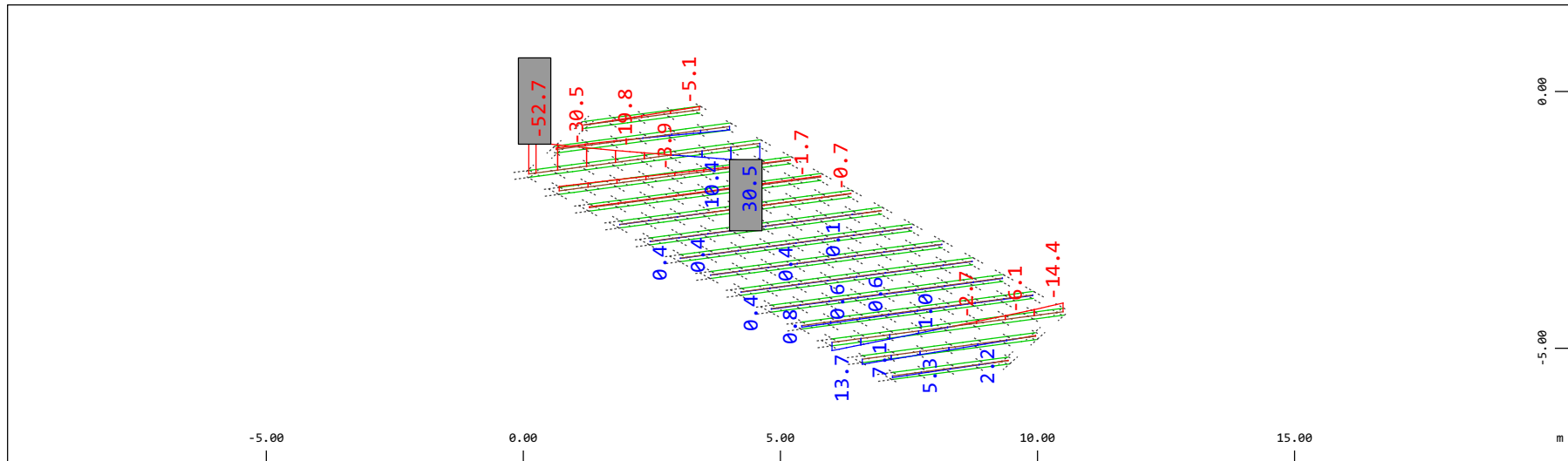
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 19.6 kN (Min=-7.47) (Max=18.1)

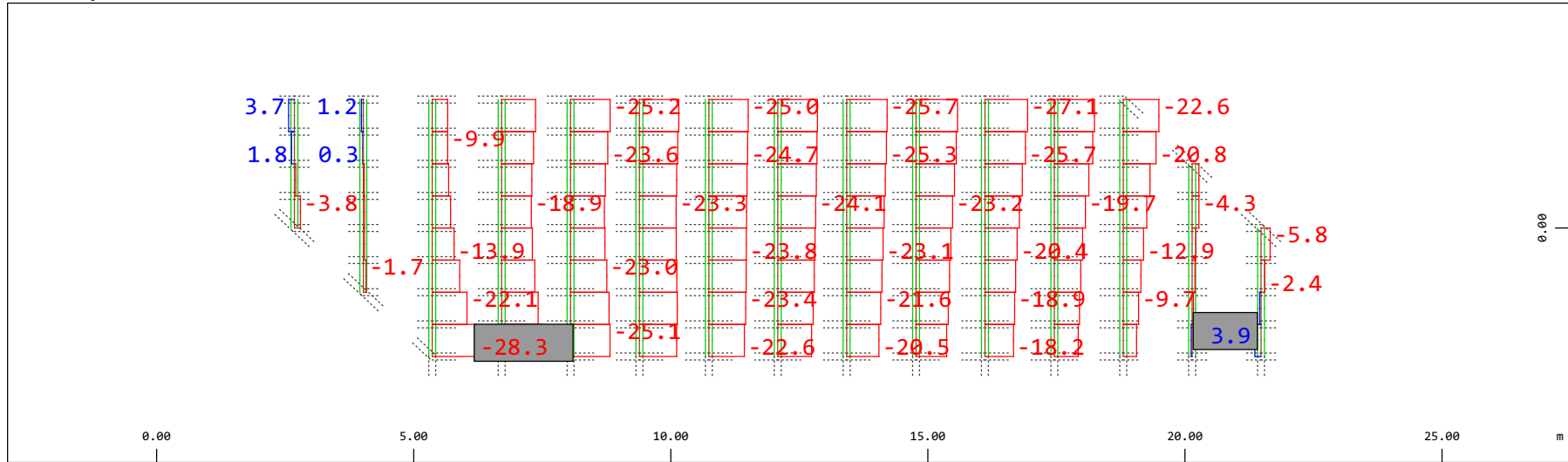
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-52.7) (Max=30.5)

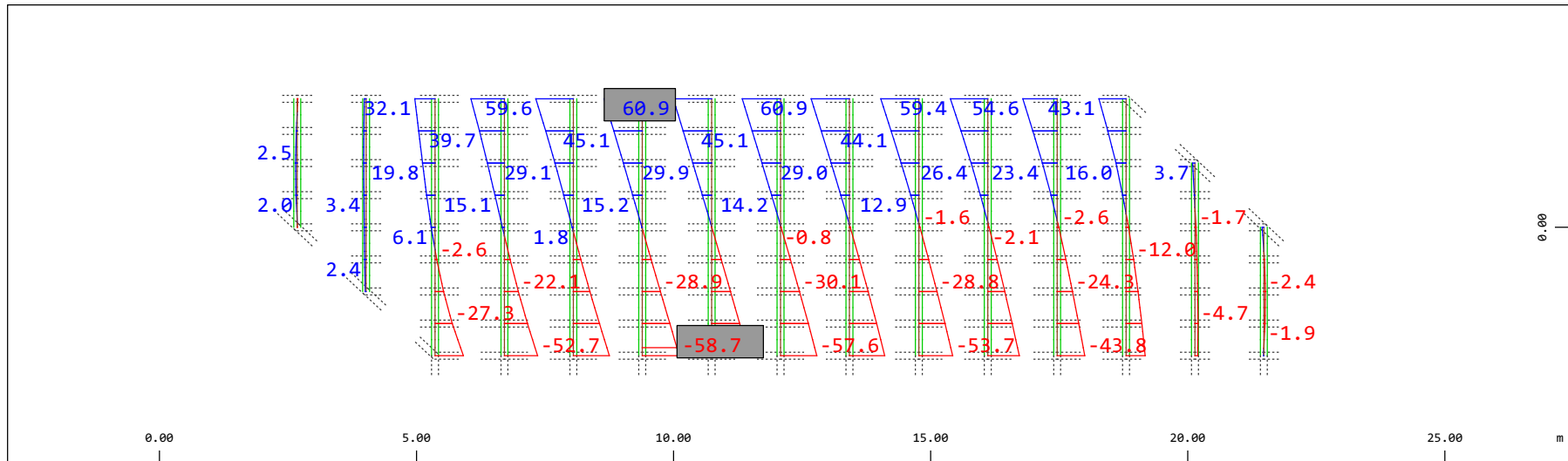
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 39.2 kN (Min=-28.3) (Max=3.92)

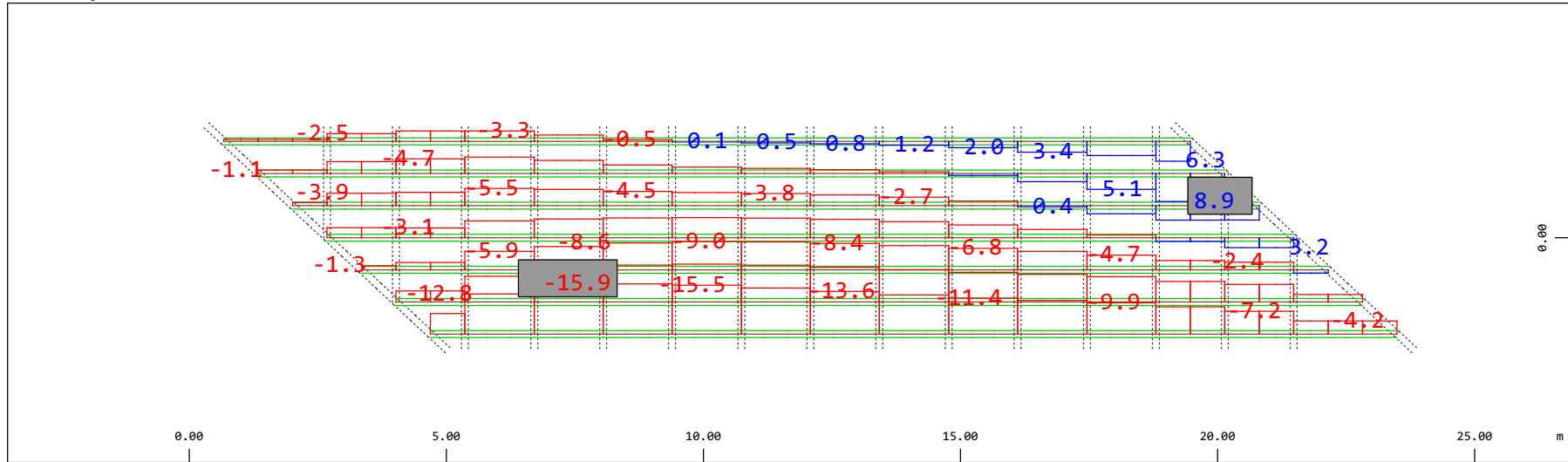
M 1 : 120



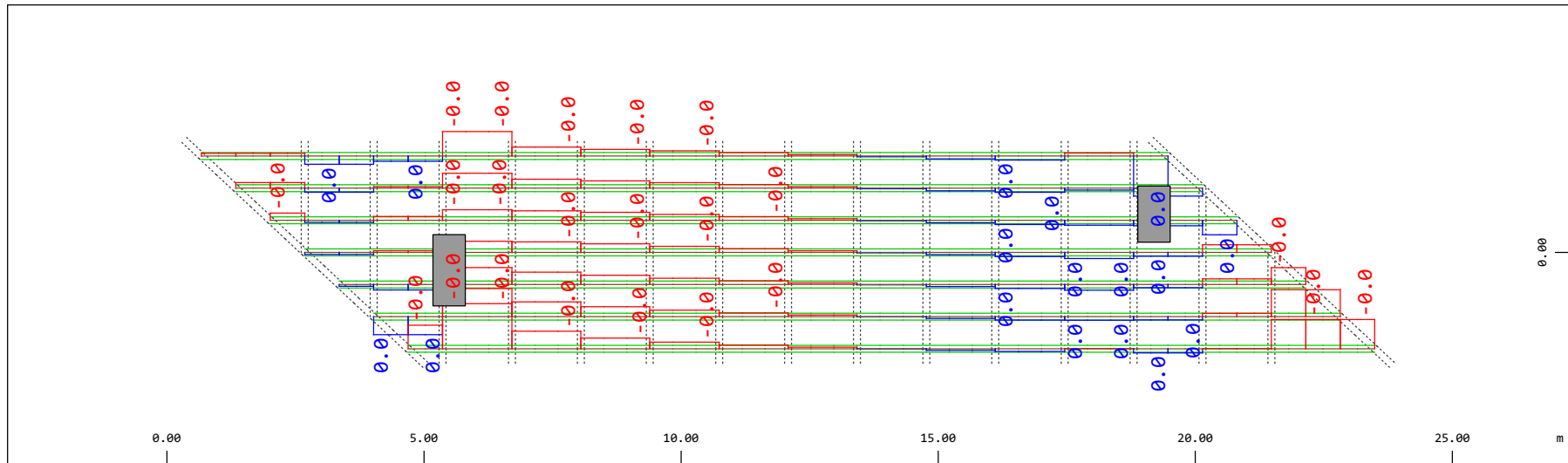
Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-58.7) (Max=60.9)

M 1 : 120

Definition of Axis
 Results elementay loads



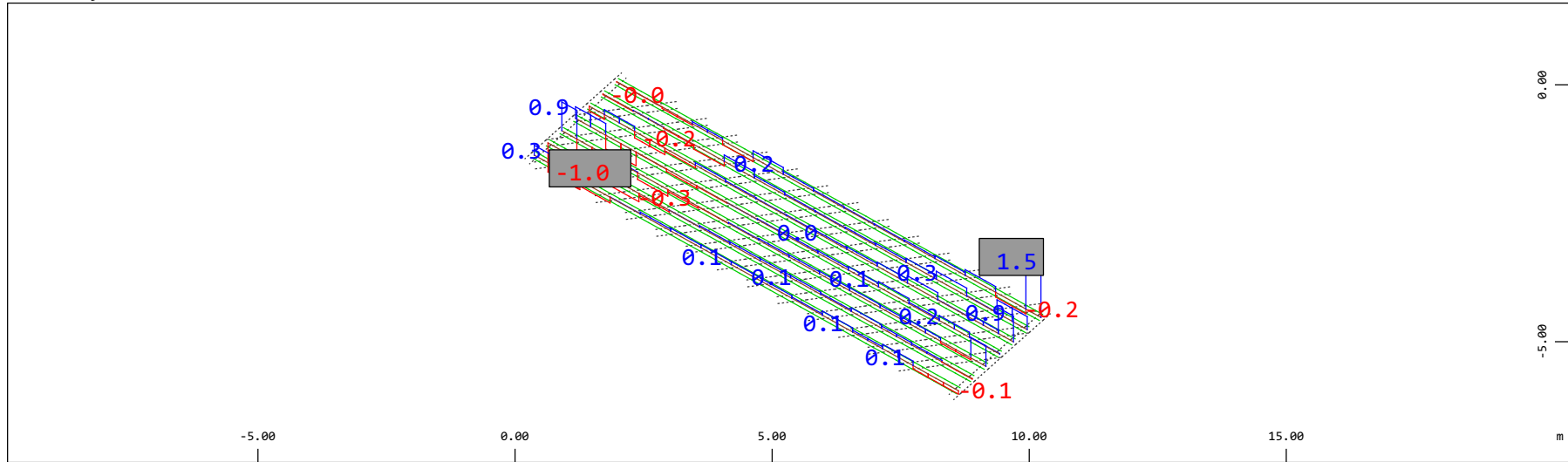
Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force Nx, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 19.6 kN (Min=-15.9) (Max=8.88)



Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment Mt, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 0.0020 kNm (Min=-0.0014) (Max=0.0010)

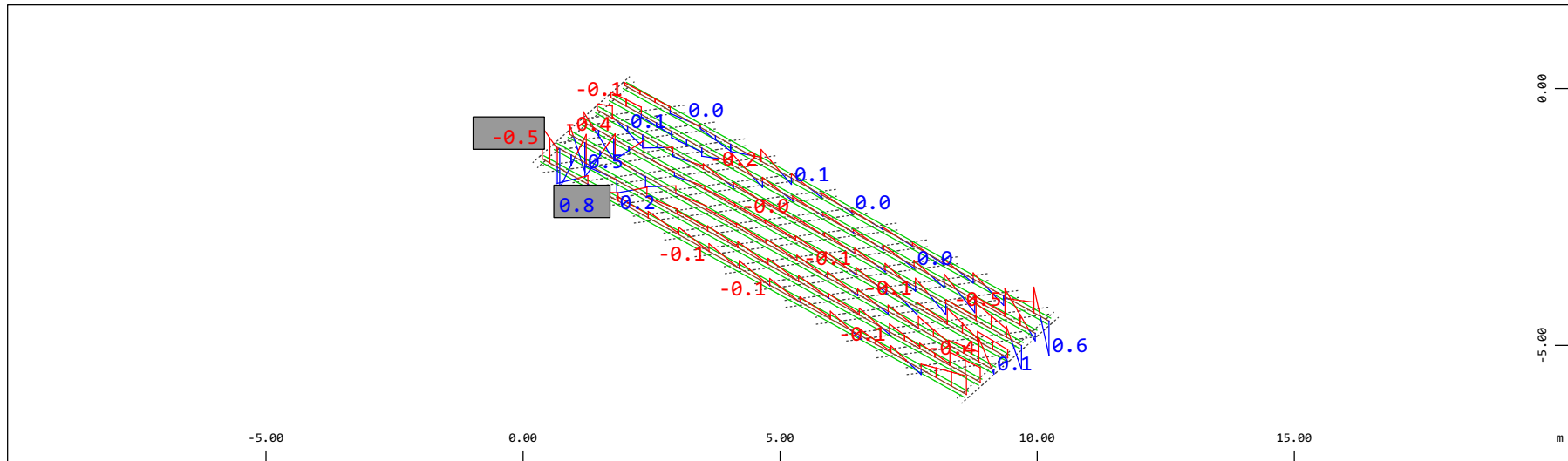
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Shear force Vz, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 1.96 kN (Min=-0.960) (Max=1.47)

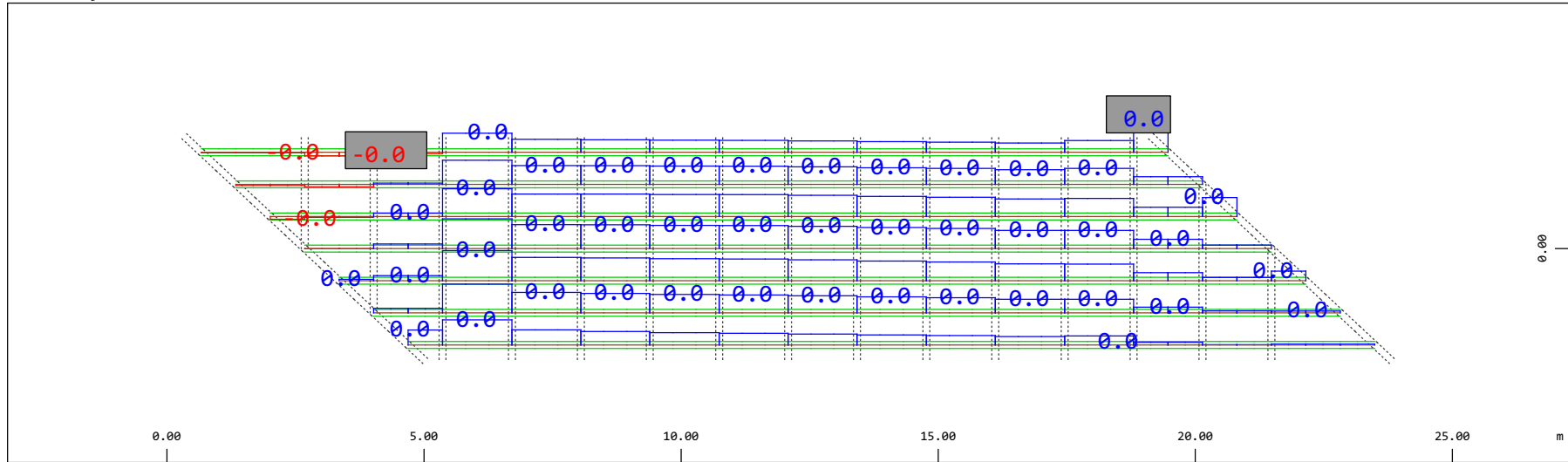
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Bending moment My, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 0.980 kNm (Min=-0.521) (Max=0.809)

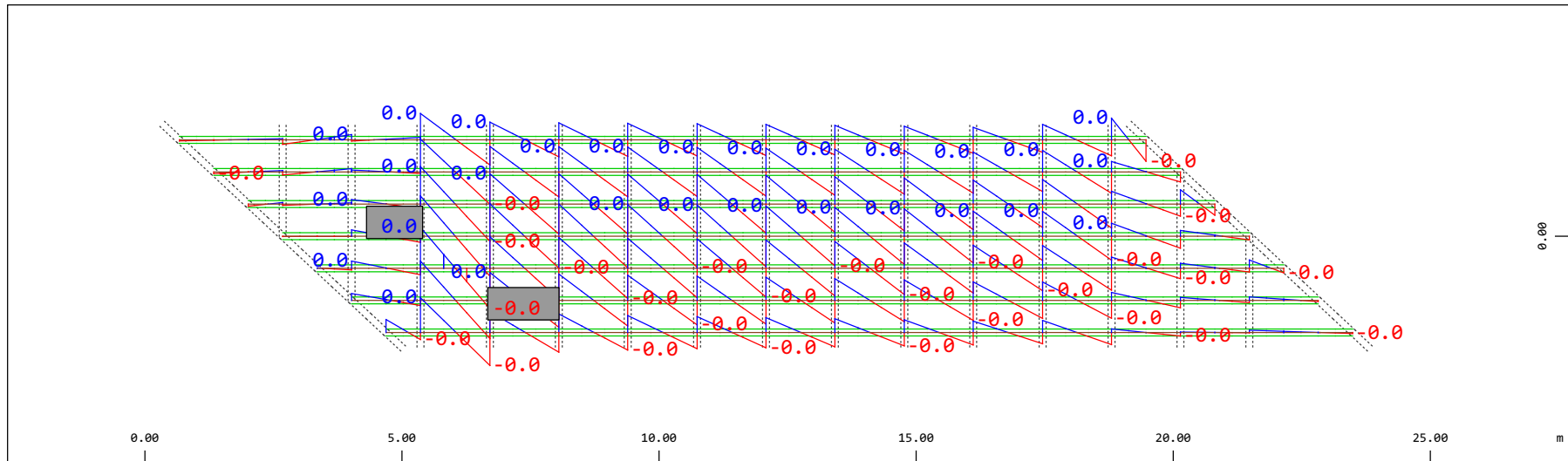
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Shear force Vy, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 0.0196 kN (Min=-0.0012) (Max=0.0102)

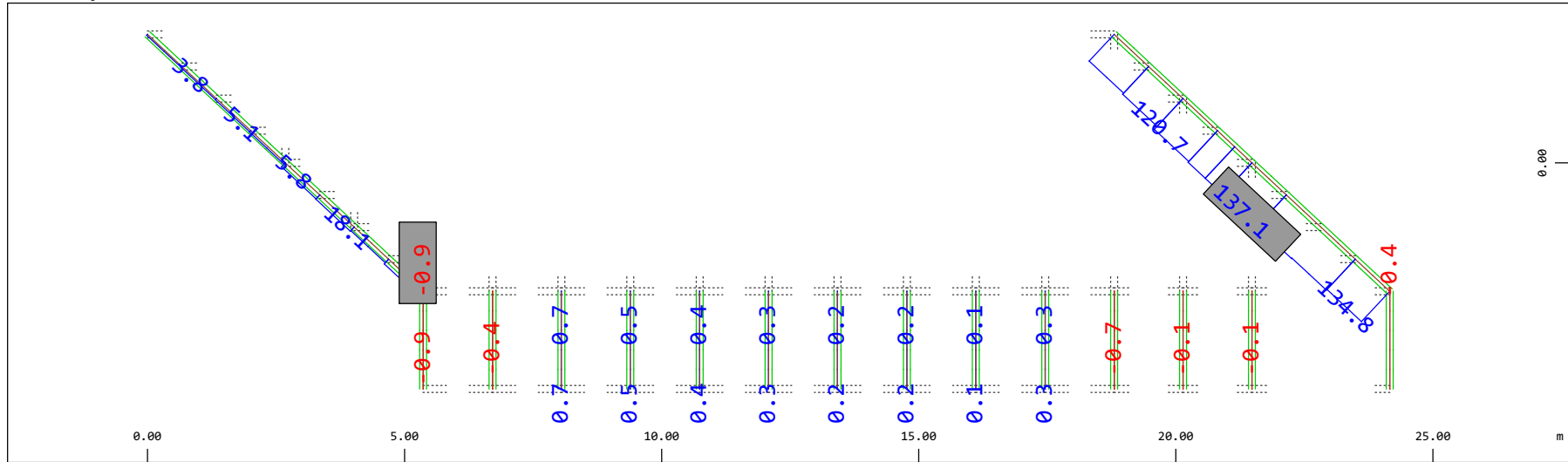
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Bending moment Mz, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 0.0098 kNm (Min=-0.0064) (Max=0.0065)

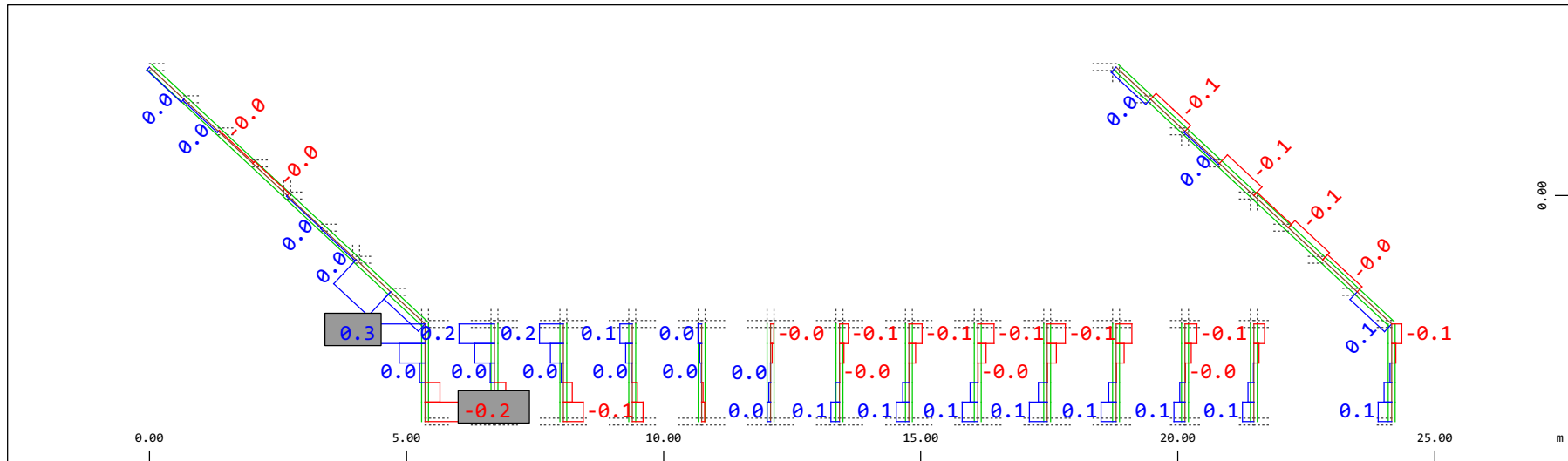
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 20 23
 Z-X Beam Elements , Normal force Nx, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 196.1 kN (Min=-0.892) (Max=137.1)

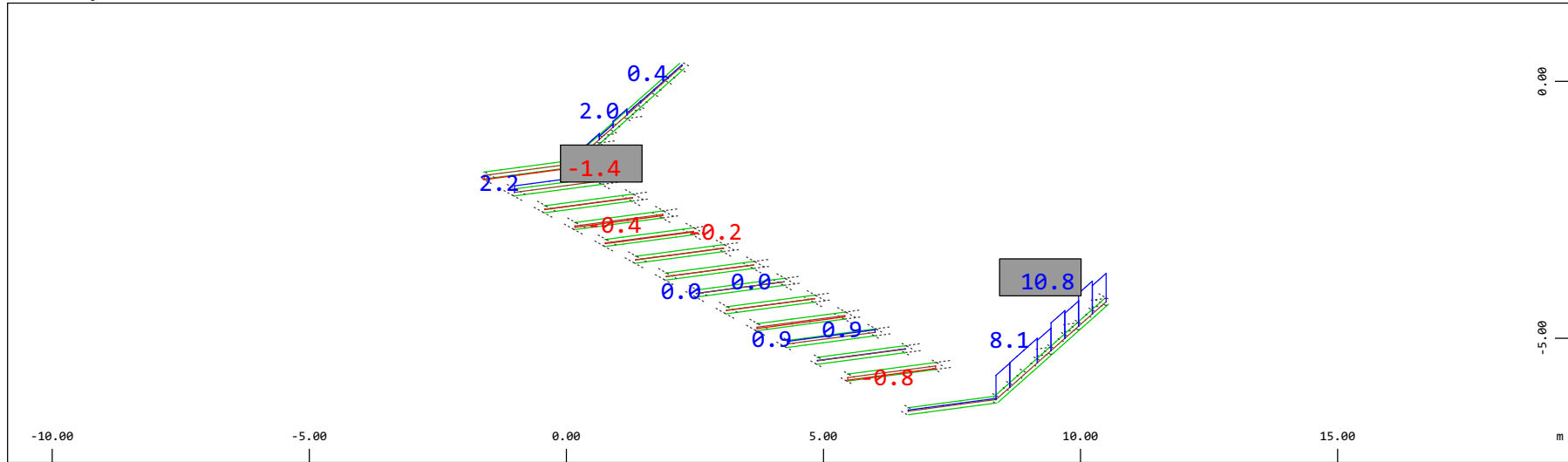
M 1 : 120



Y Sector of system Beam Elements Group 20 23
 Z-X Beam Elements , Torsional moment Mt, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 0.392 kNm (Min=-0.224) (Max=0.293)

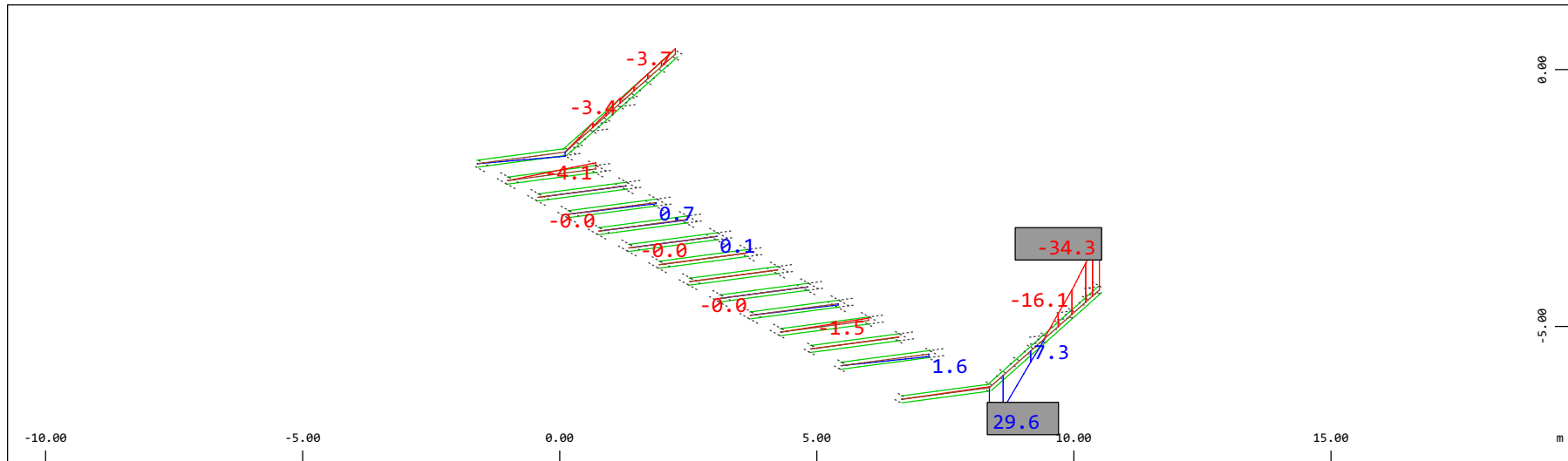
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 19.6 kN (Min=-1.38) (Max=10.8)

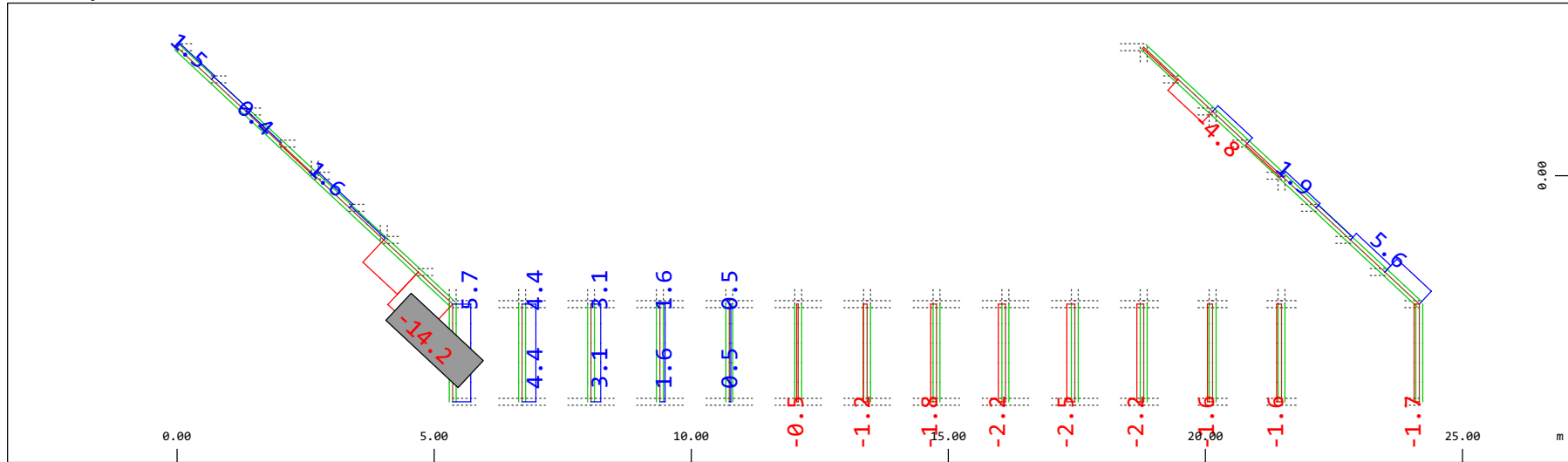
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 39.2 kNm (Min=-34.3) (Max=29.6)

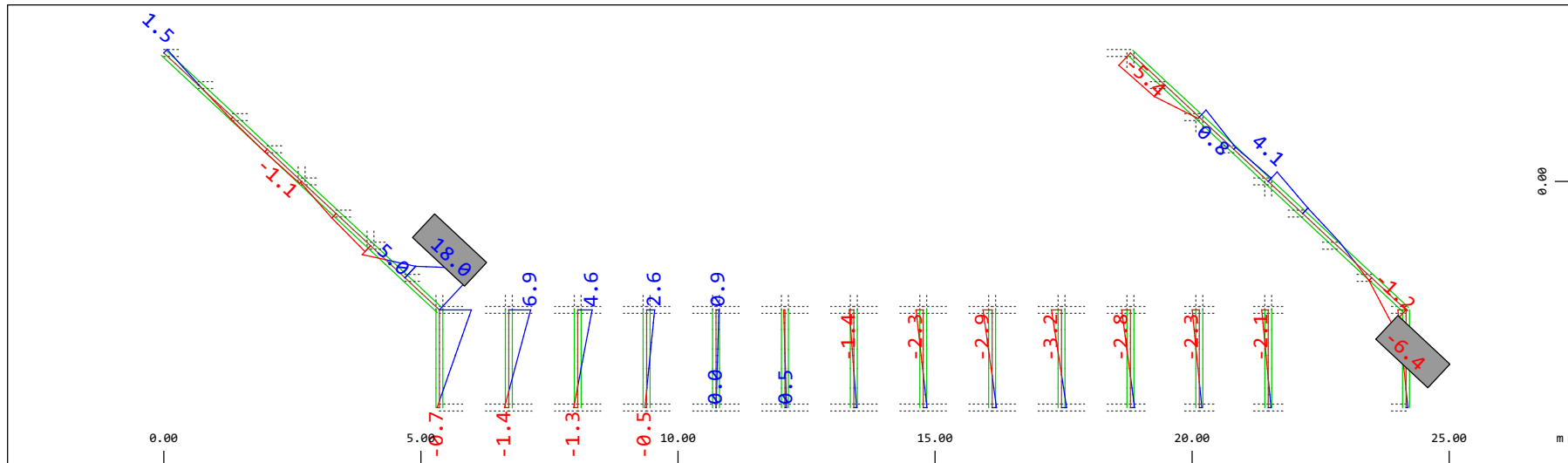
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 19.6 kN (Min=-14.2) (Max=5.73)

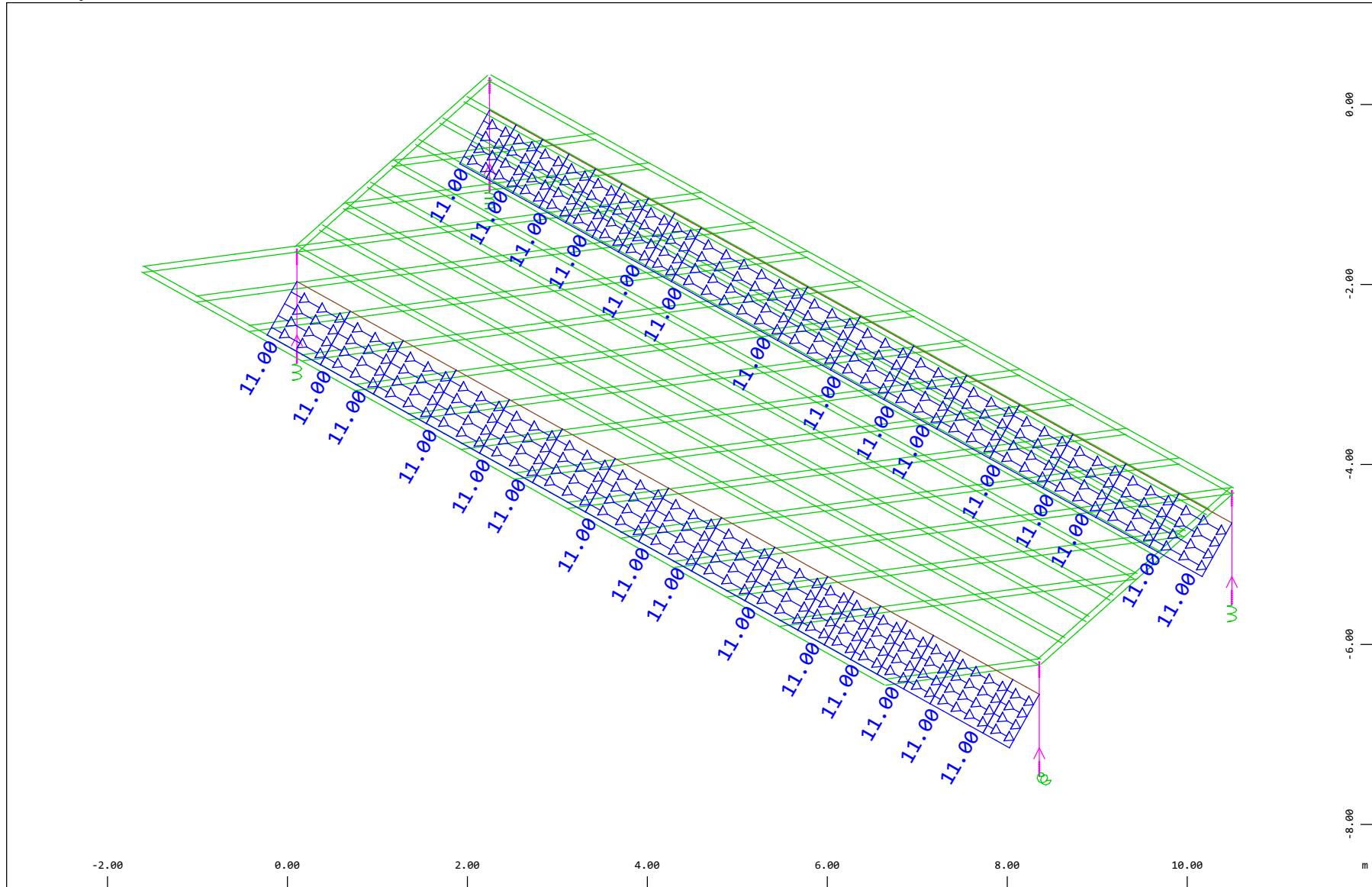
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 501 Qt: Avviamento LM71 (B-->A) , 1 cm 3D = 19.6 kNm (Min=-6.37) (Max=18.0)

M 1 : 120

Definition of Axis
 Results elementay loads



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Z
 X Y

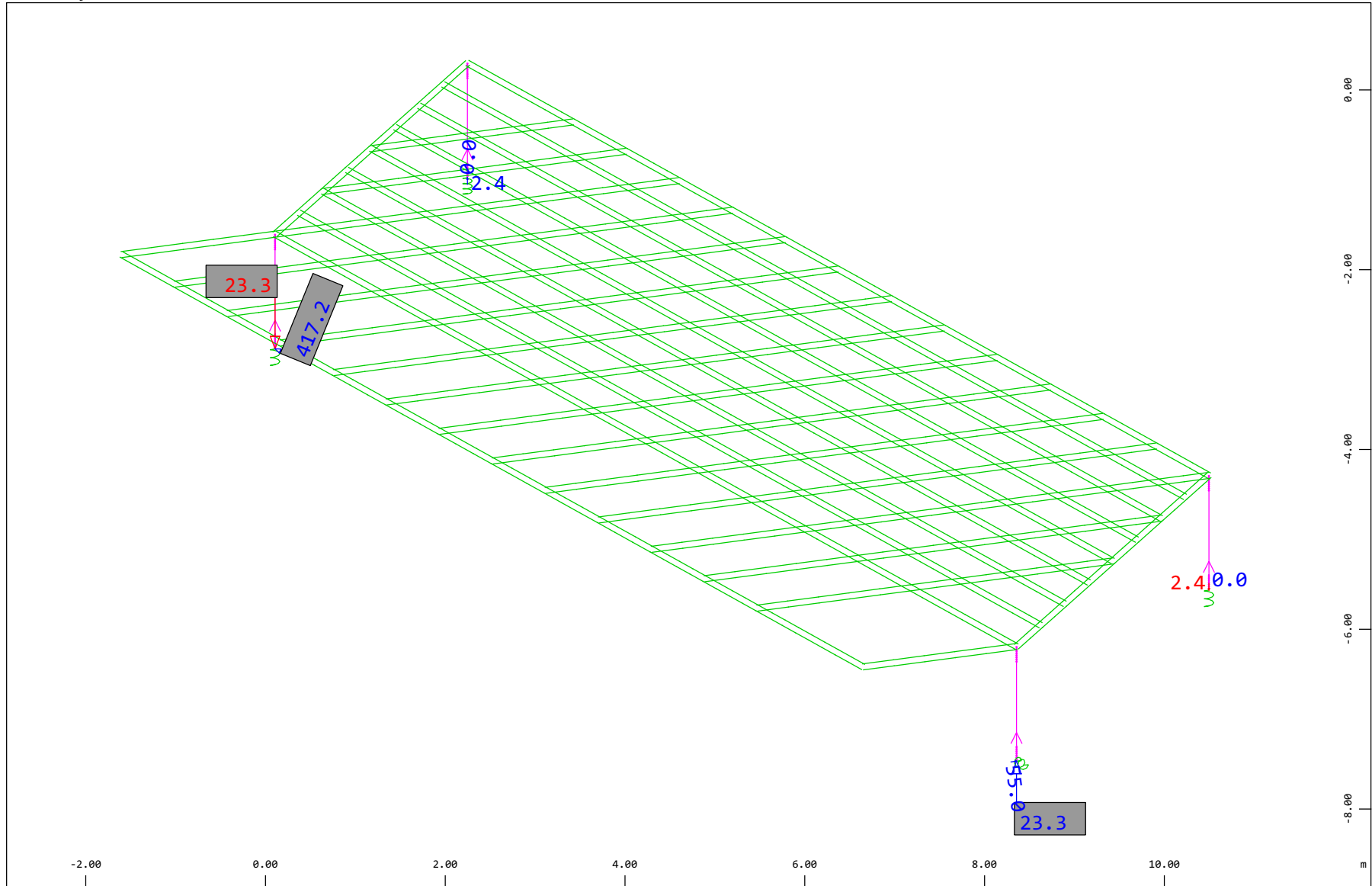
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 502 Qt: Frenatura LM71 (A-->B) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=9.69 kN/m
 (Max=11.0)



M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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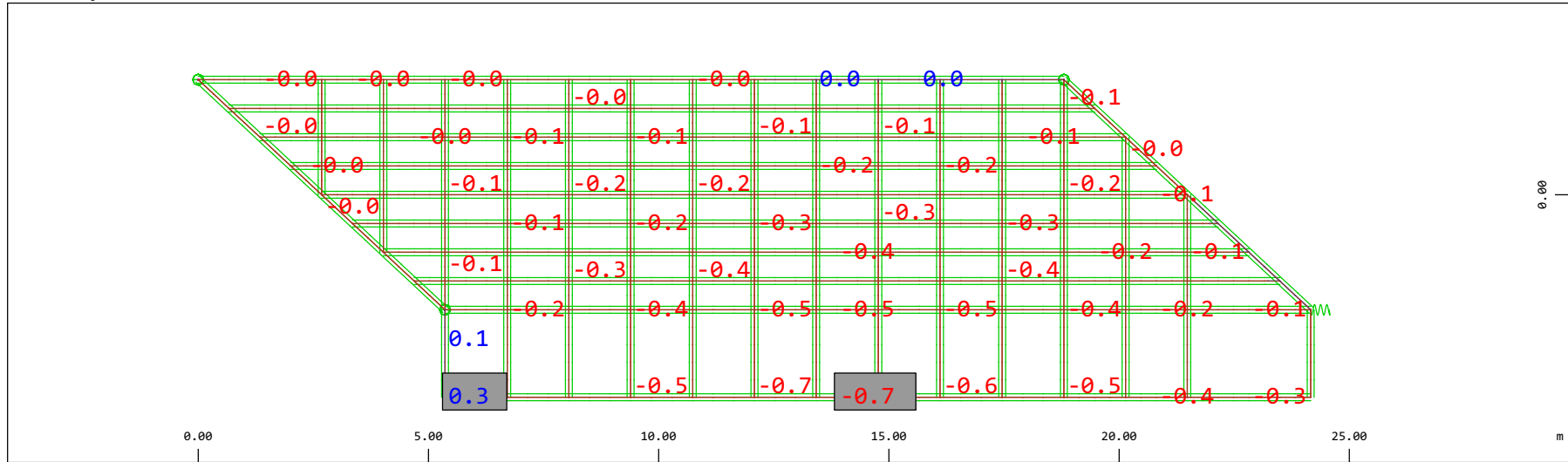
Z
 X Y

Sector of system Beam Elements, Spring Elements
 Nodes , Support force in global Z, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 19.4 kN
 1.9073e-06)

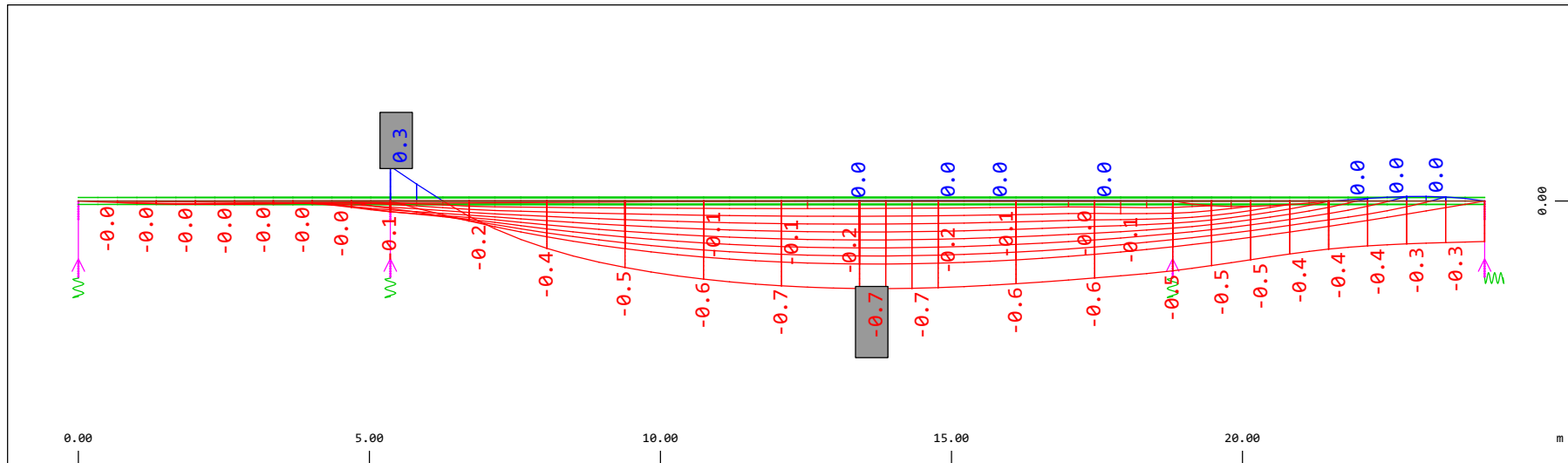
◁ (Min=-23.3) (Max=23.3) (total:

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

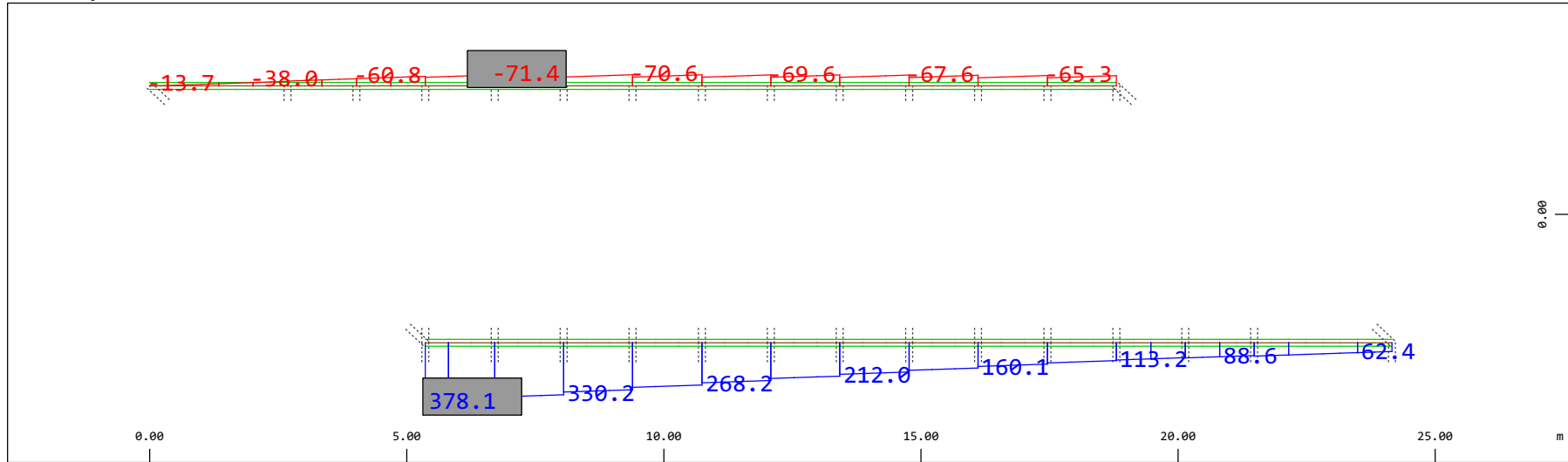


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 0.484 mm (Min=-0.688) (Max=0.272) M 1 : 134



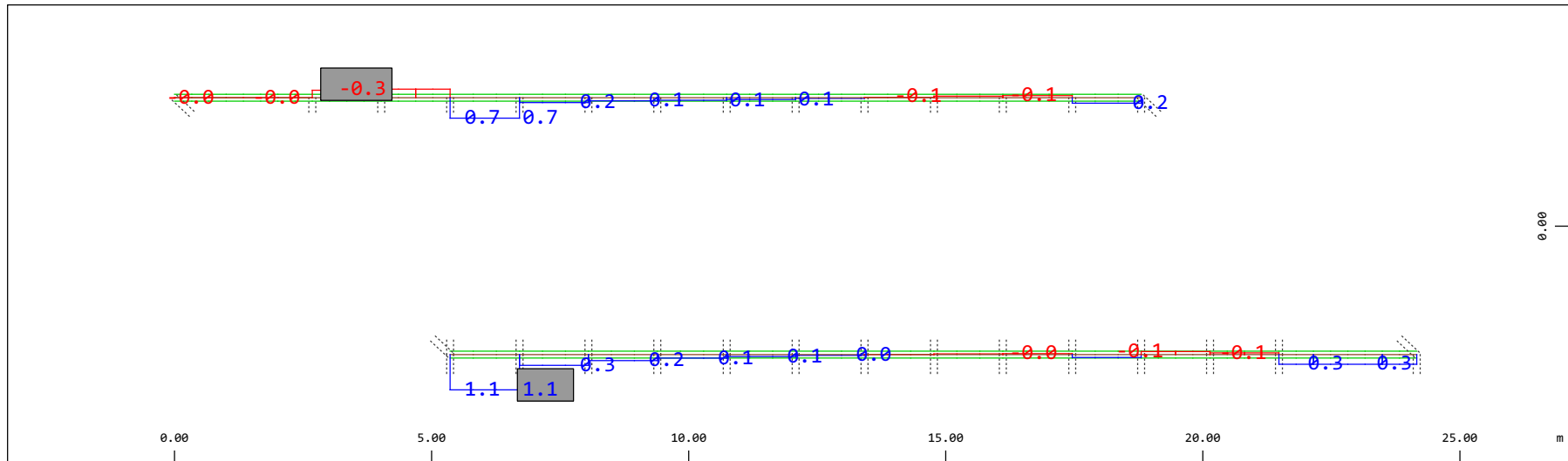
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 0.484 mm (Min=-0.688) (Max=0.272) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 392.2 kN (Min=-71.4) (Max=378.1)

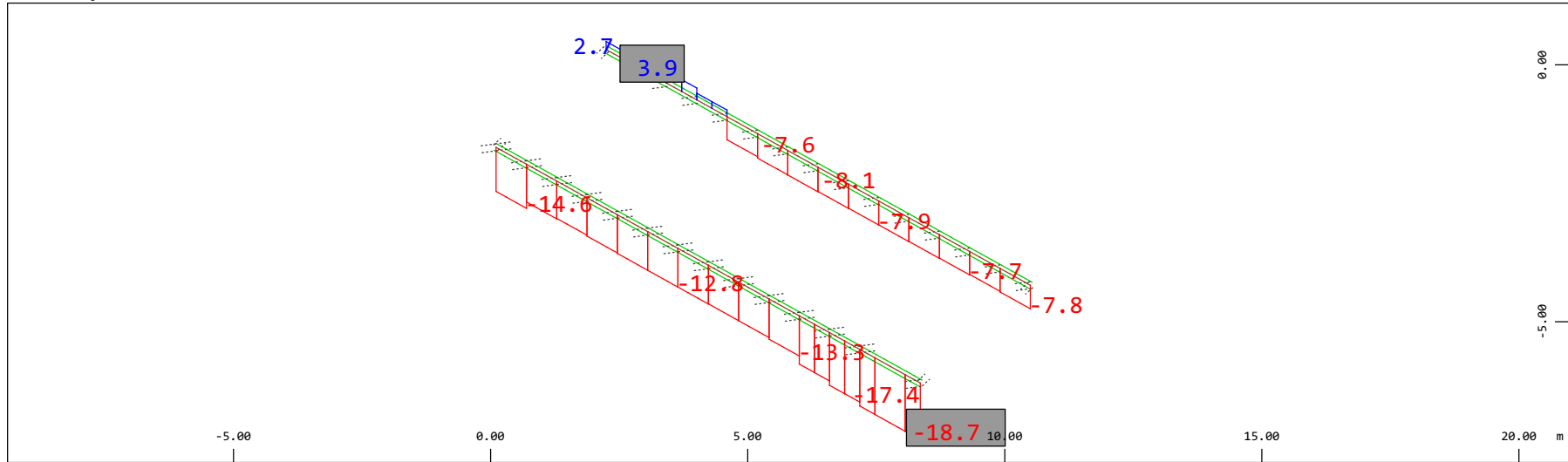
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 1.96 kNm (Min=-0.273) (Max=1.12)

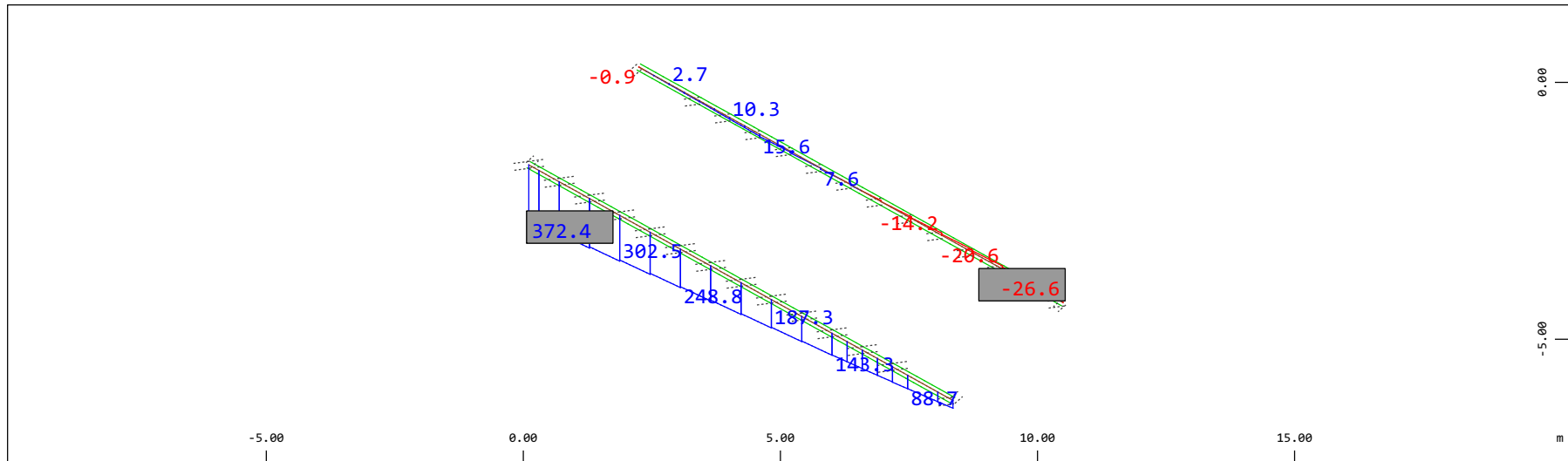
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vz, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 19.6 kN (Min=-18.7) (Max=3.92)

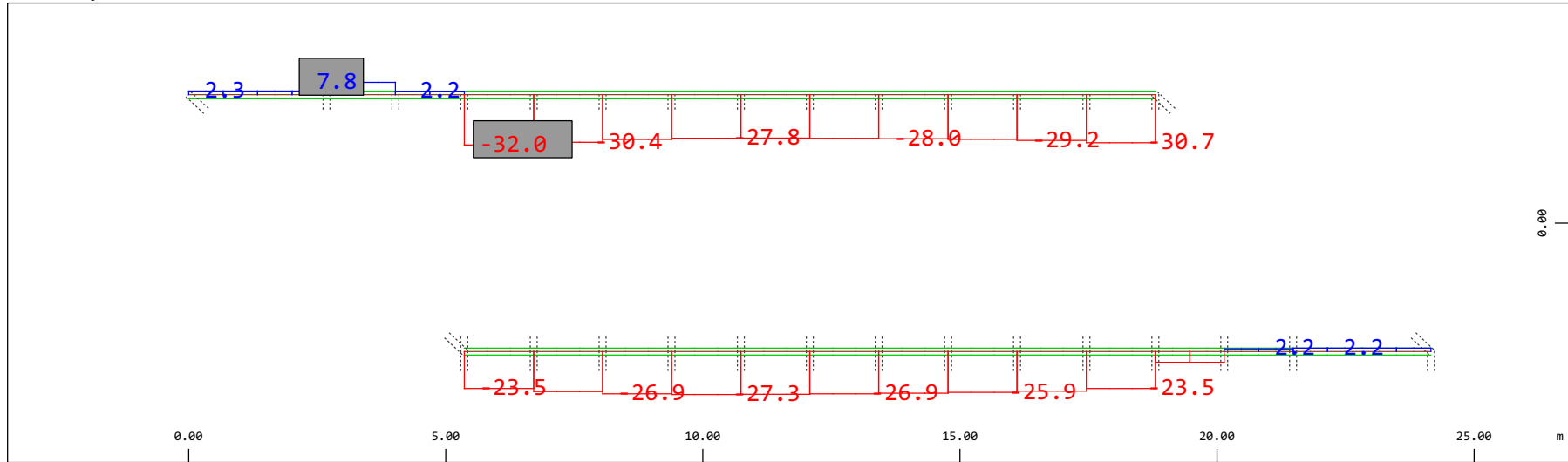
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment My, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 392.2 kNm (Min=-26.6) (Max=372.4)

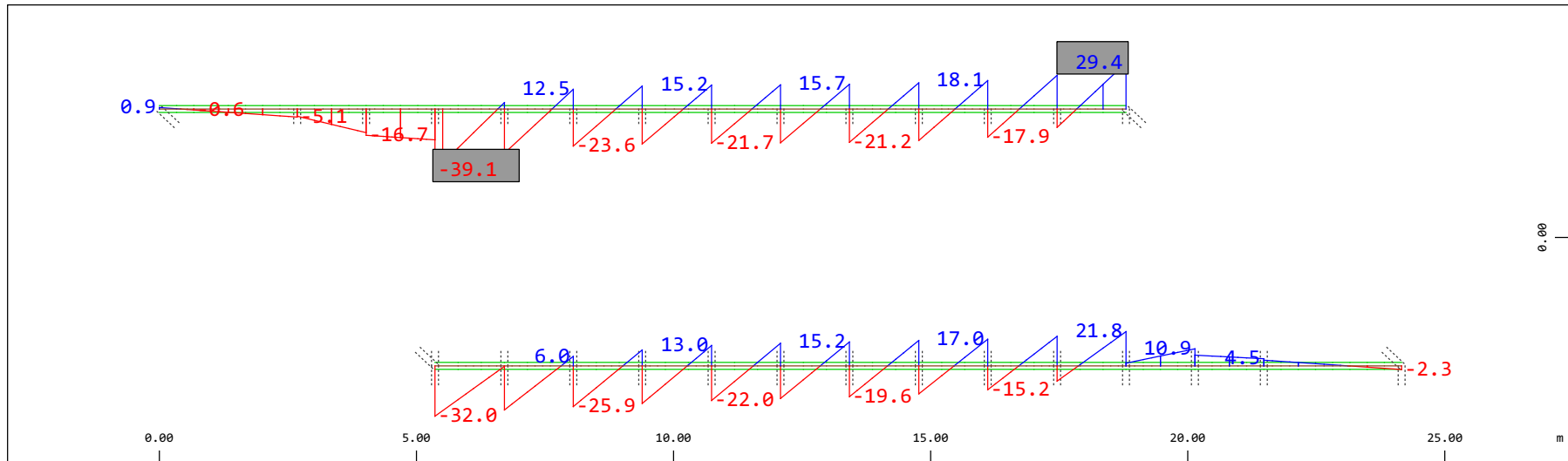
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 39.2 kN (Min=-32.0) (Max=7.80)

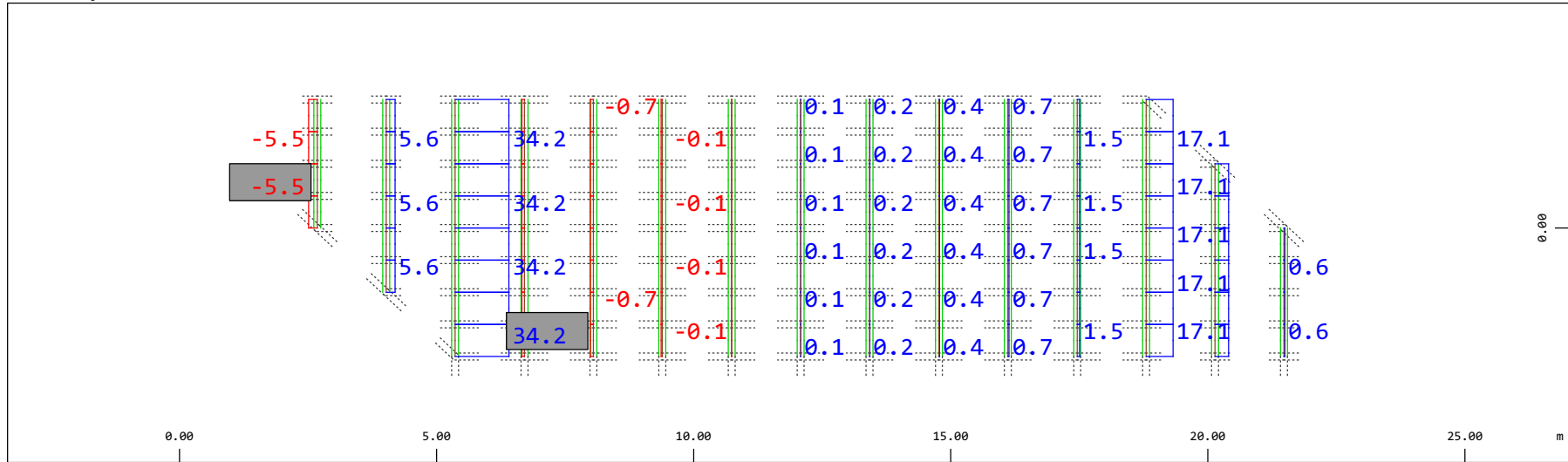
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 39.2 kNm (Min=-39.1) (Max=29.4)

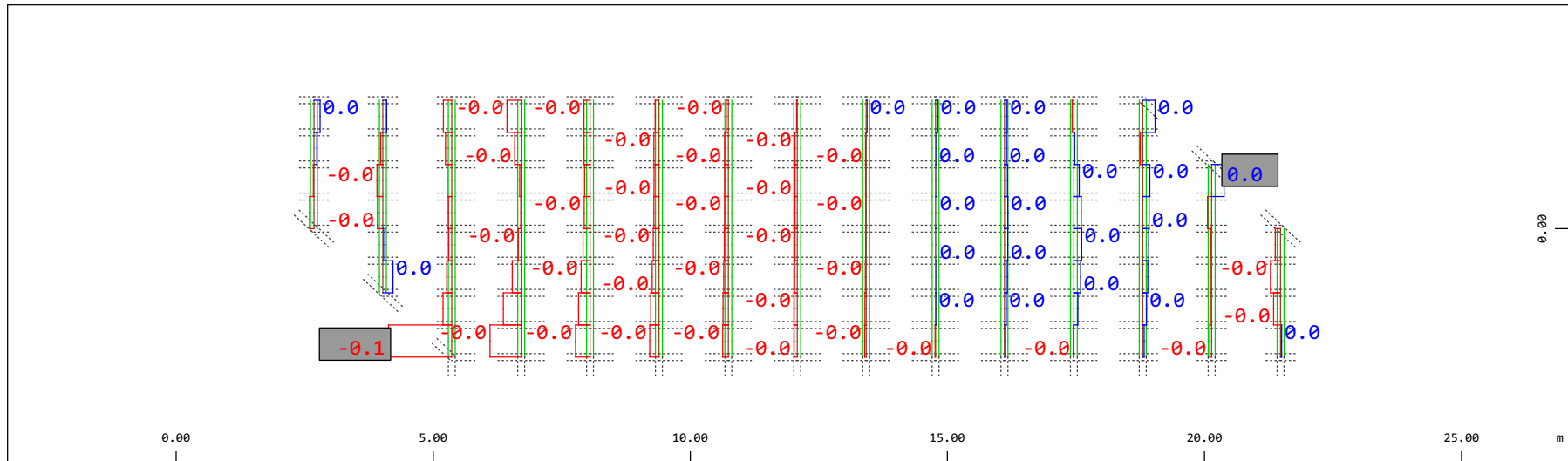
M 1 : 120

Definition of Axis
 Results elementay loads



Y
 Z-X Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force N_x , Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 39.2 kN (Min=-5.55) (Max=34.2)

M 1 : 120

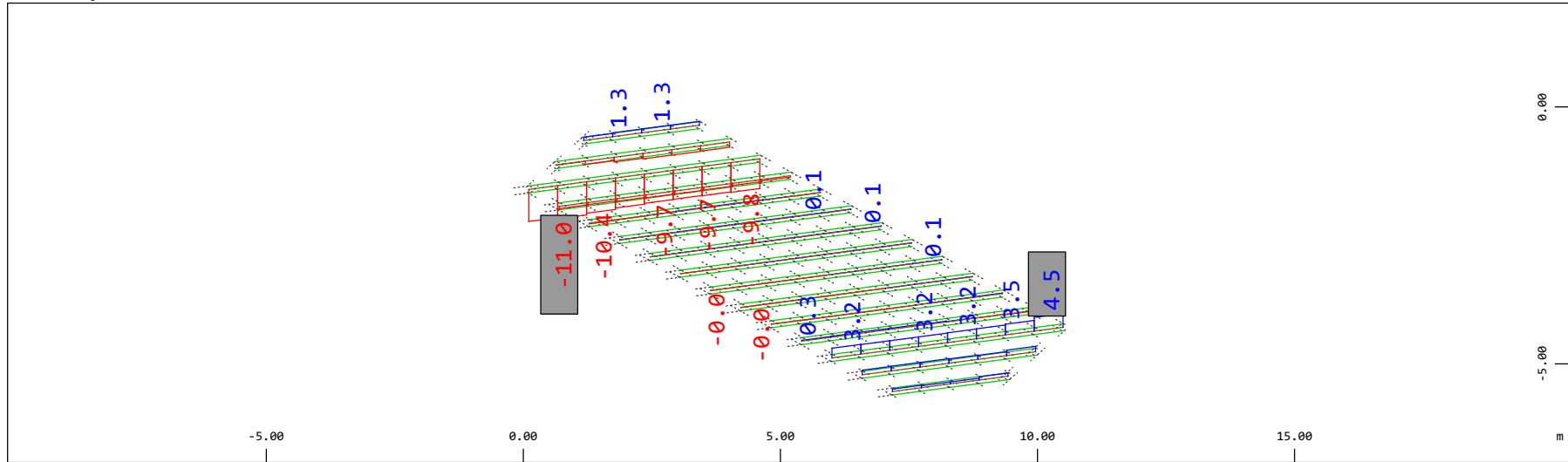


Y
 Z-X Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment M_t , Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 0.0980 kNm (Min=-0.101) (Max=0.0196)

M 1 : 120

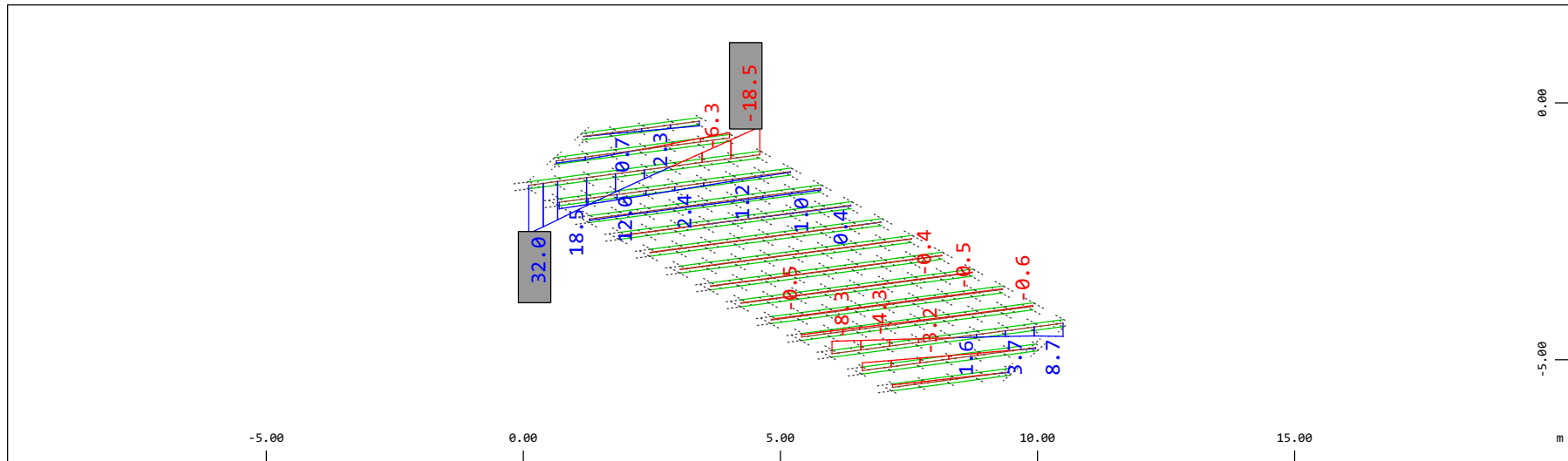
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 19.6 kN (Min=-11.0) (Max=4.53)

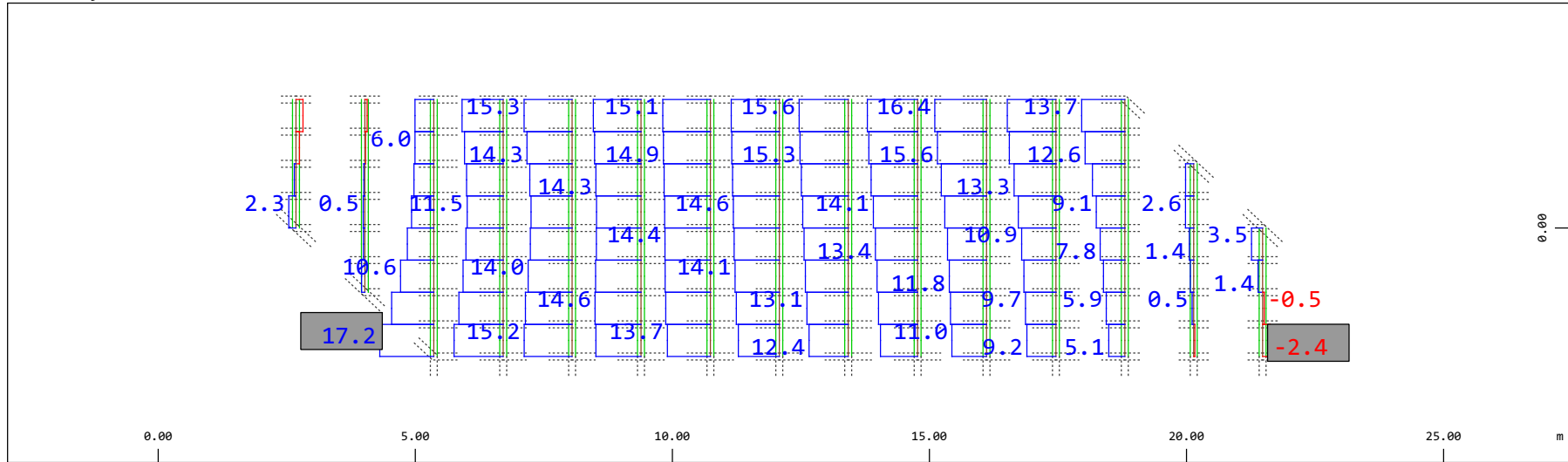
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 39.2 kNm (Min=-18.5) (Max=32.0)

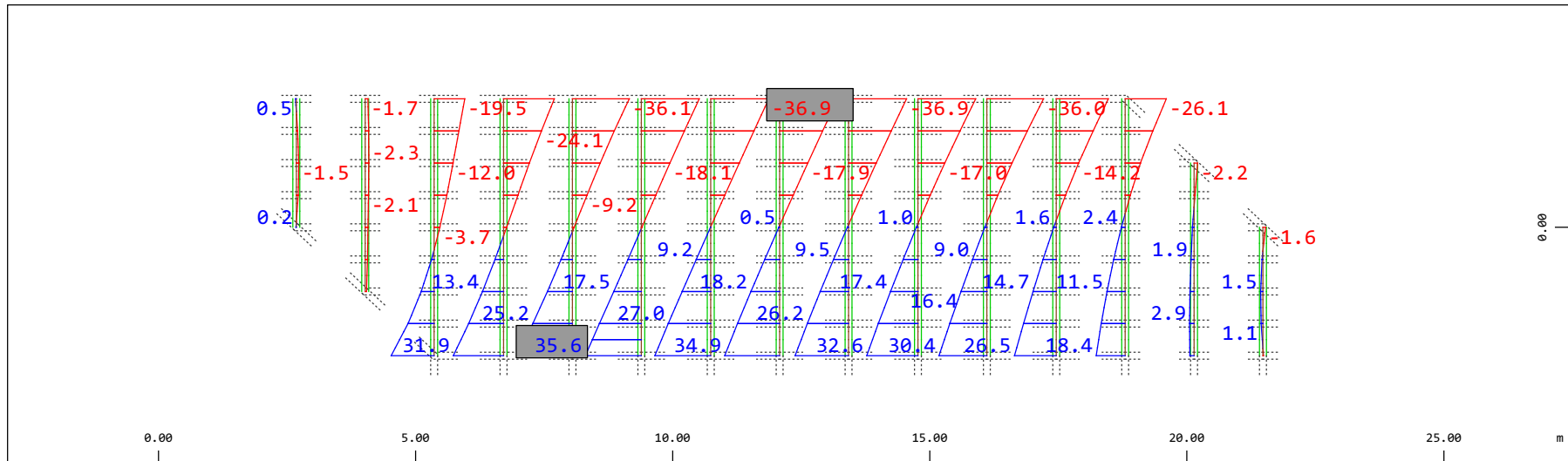
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 19.6 kN (Min=-2.38) (Max=17.2)

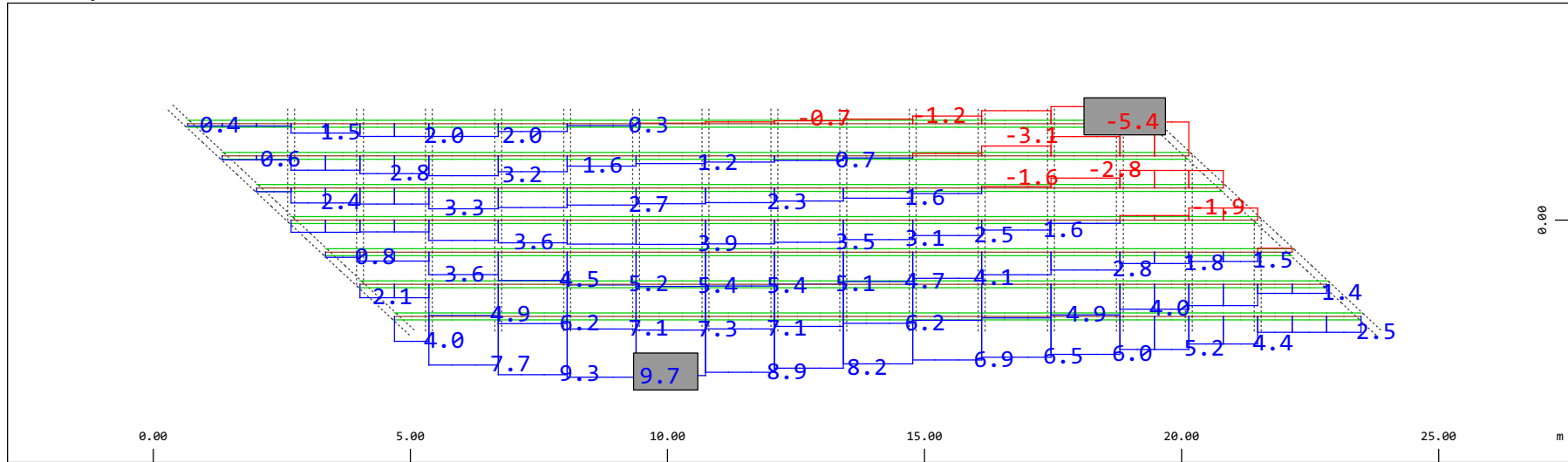
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 39.2 kNm (Min=-36.9) (Max=35.6)

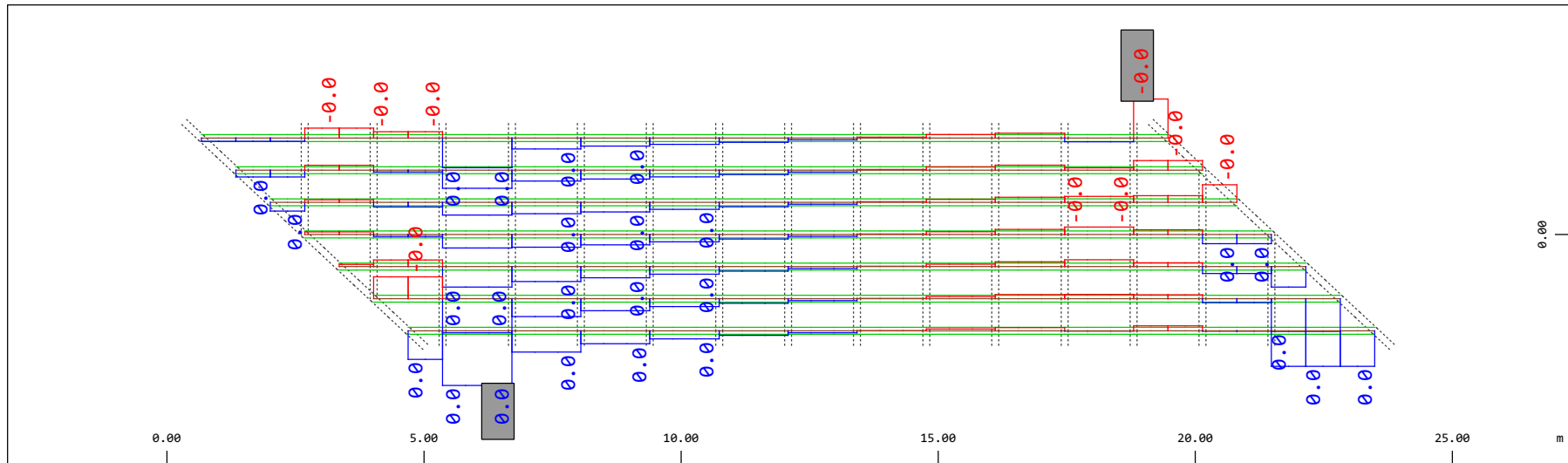
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force Nx, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 9.80 kN (Min=-5.38) (Max=9.66)

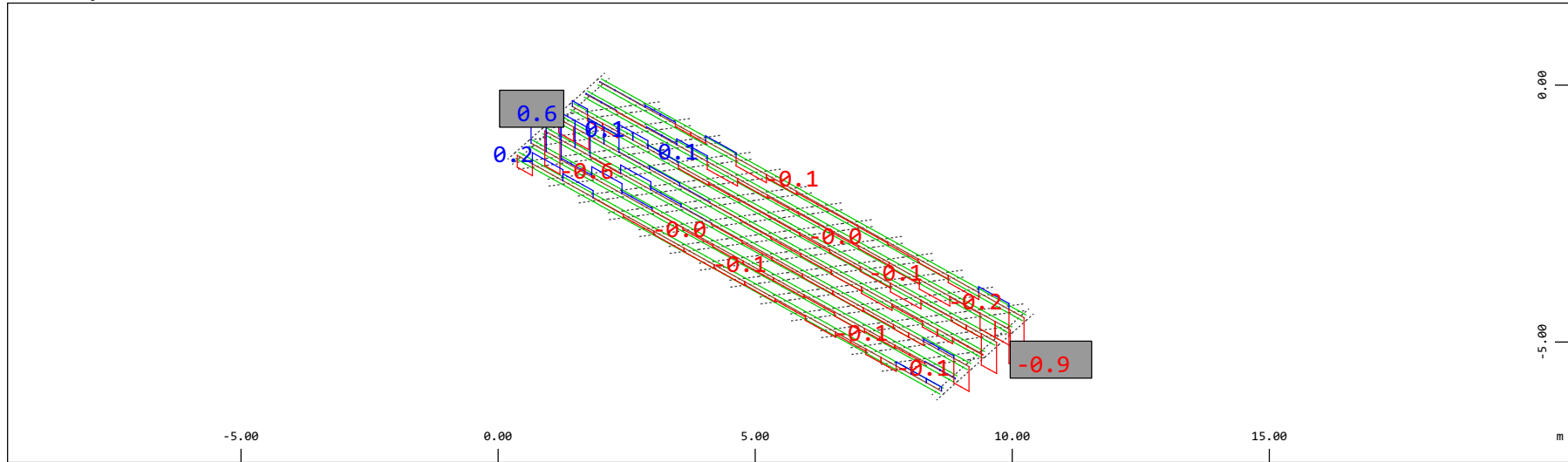
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment Mt, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 9.8047e-04 kNm (Min=-6.2026e-04) (Max=8.6799e-04)

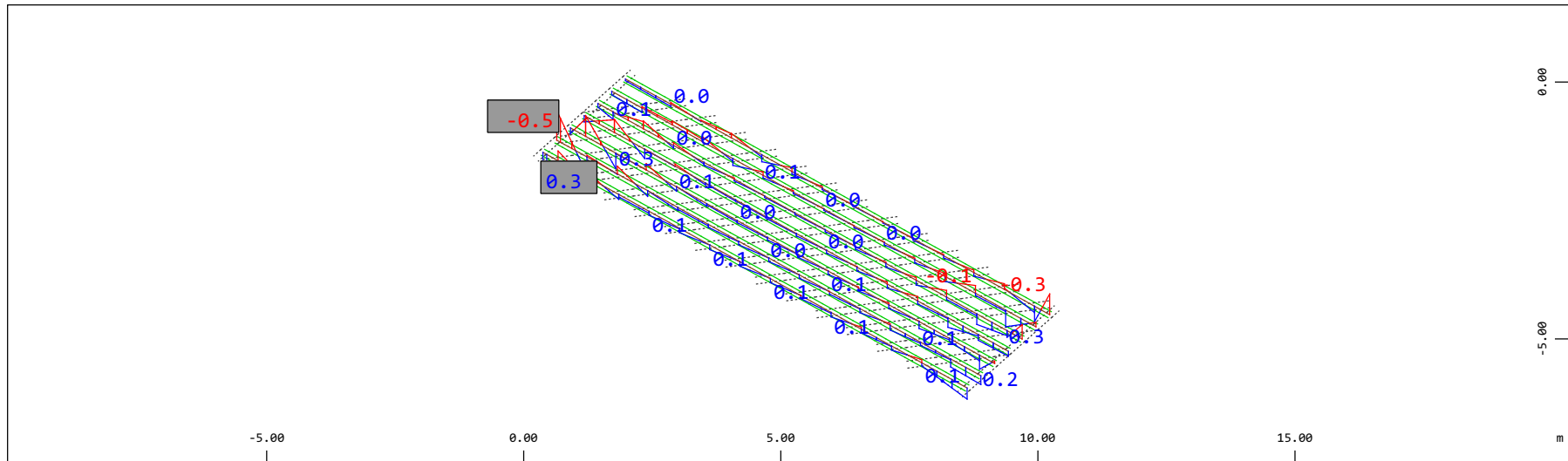
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 0.980 kN (Min=-0.891) (Max=0.582)

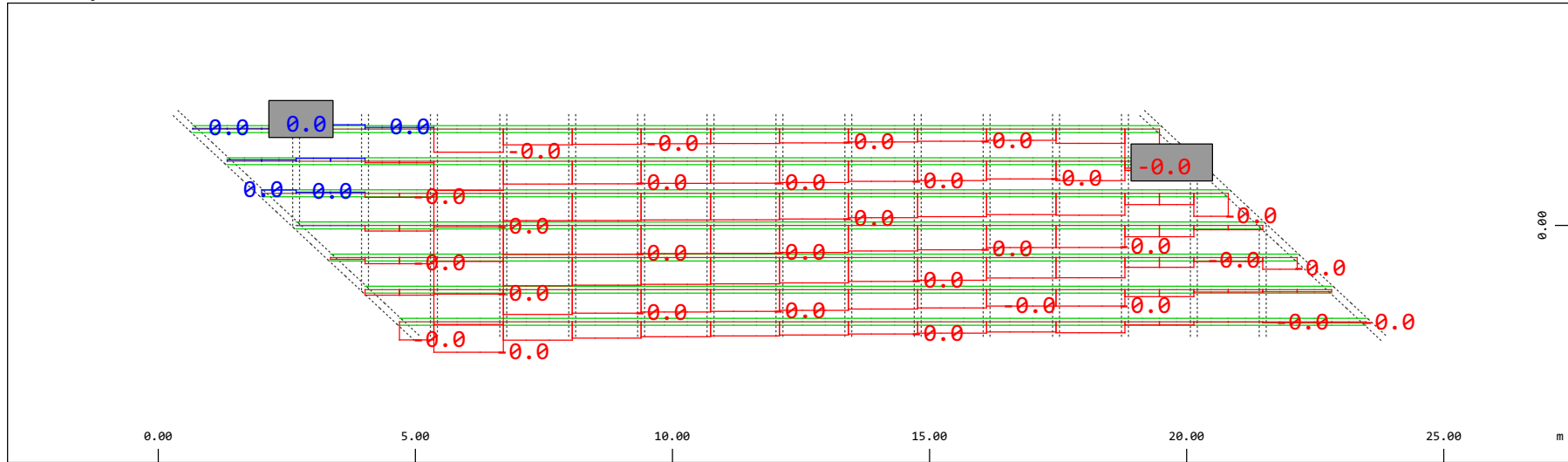
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 0.980 kNm (Min=-0.490) (Max=0.316)

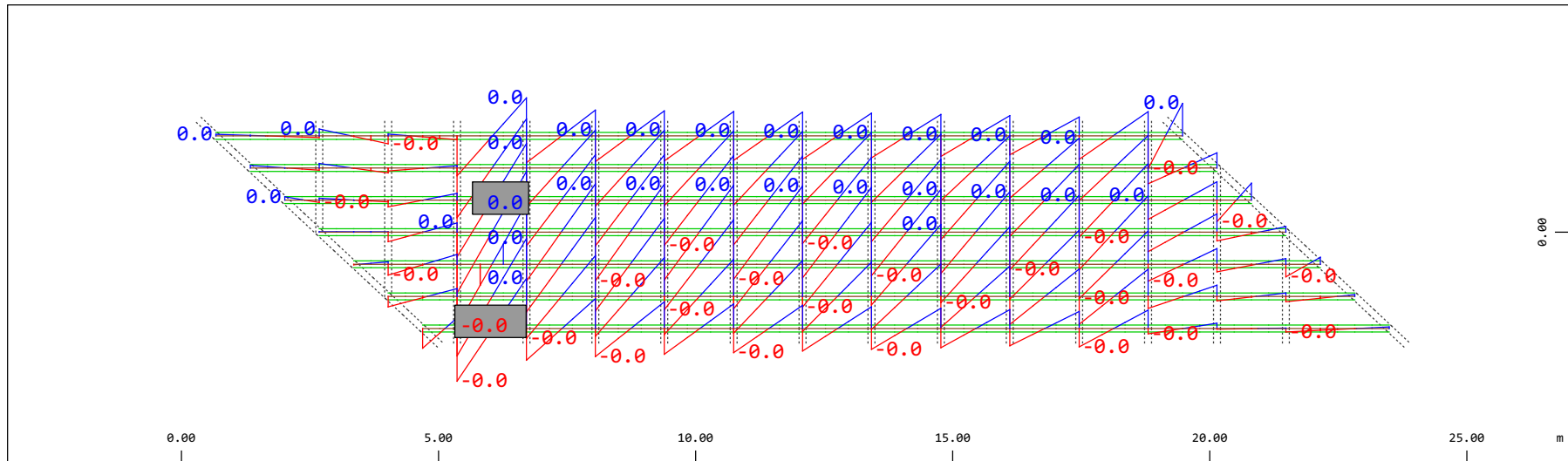
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 0.0098 kN (Min=-0.0062) (Max= 7.0068e-04)

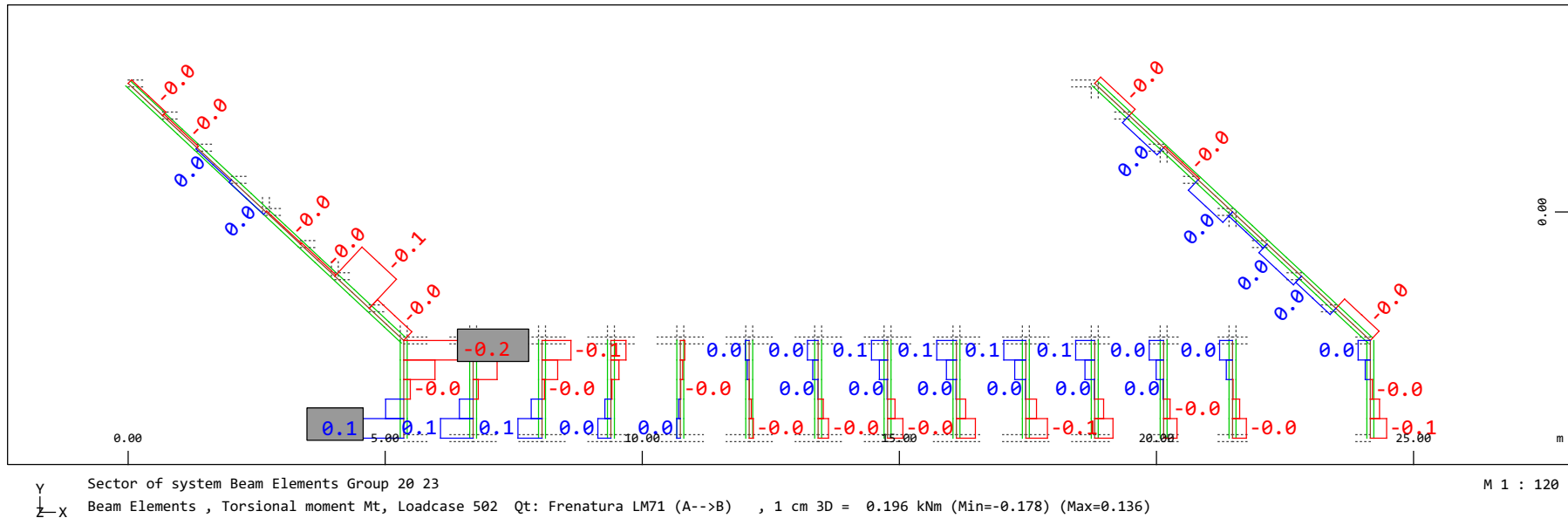
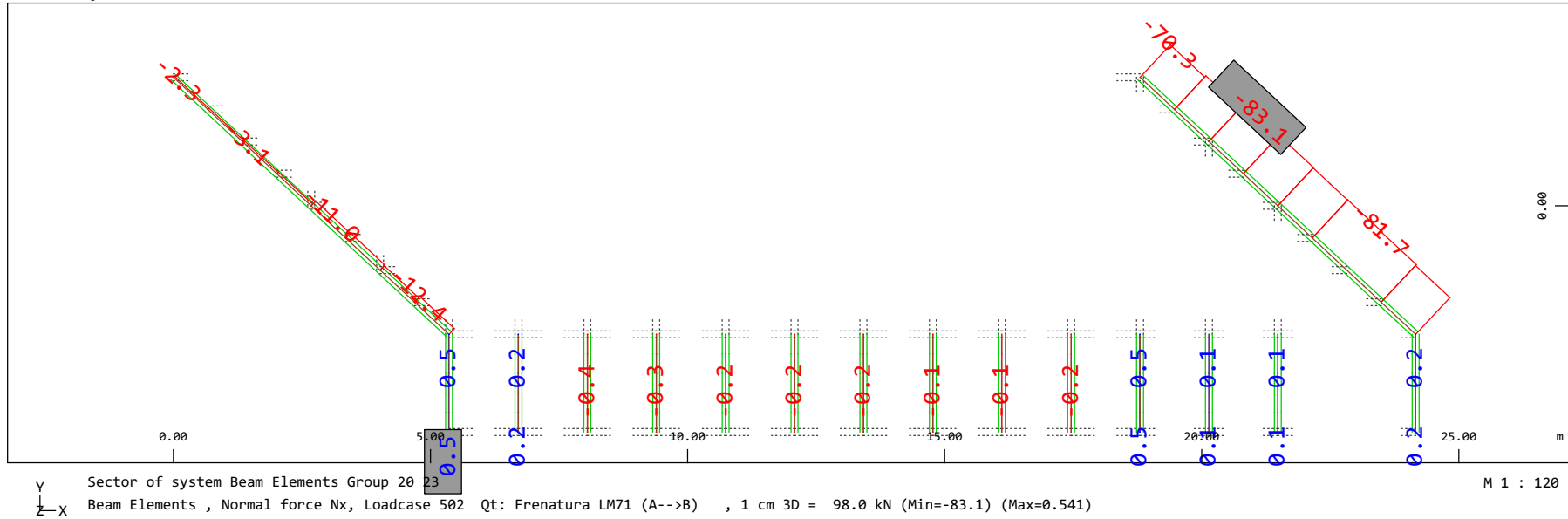
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 0.0039 kNm (Min=-0.0039) (Max=0.0039)

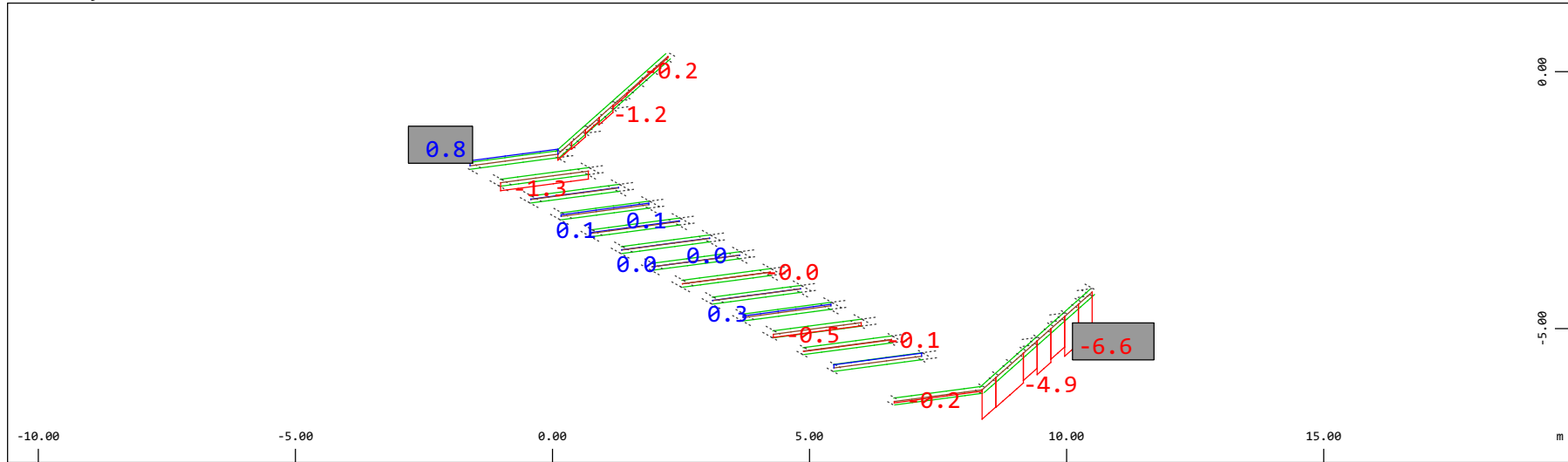
M 1 : 120

Definition of Axis
 Results elementay loads



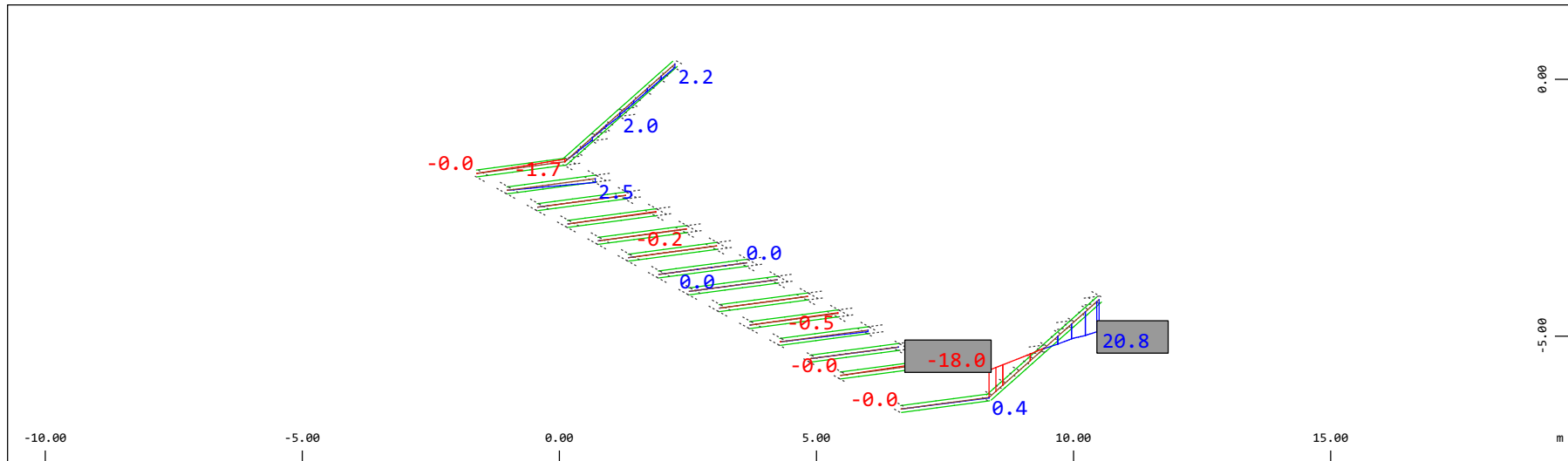
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 9.80 kN (Min=-6.57) (Max=0.835)

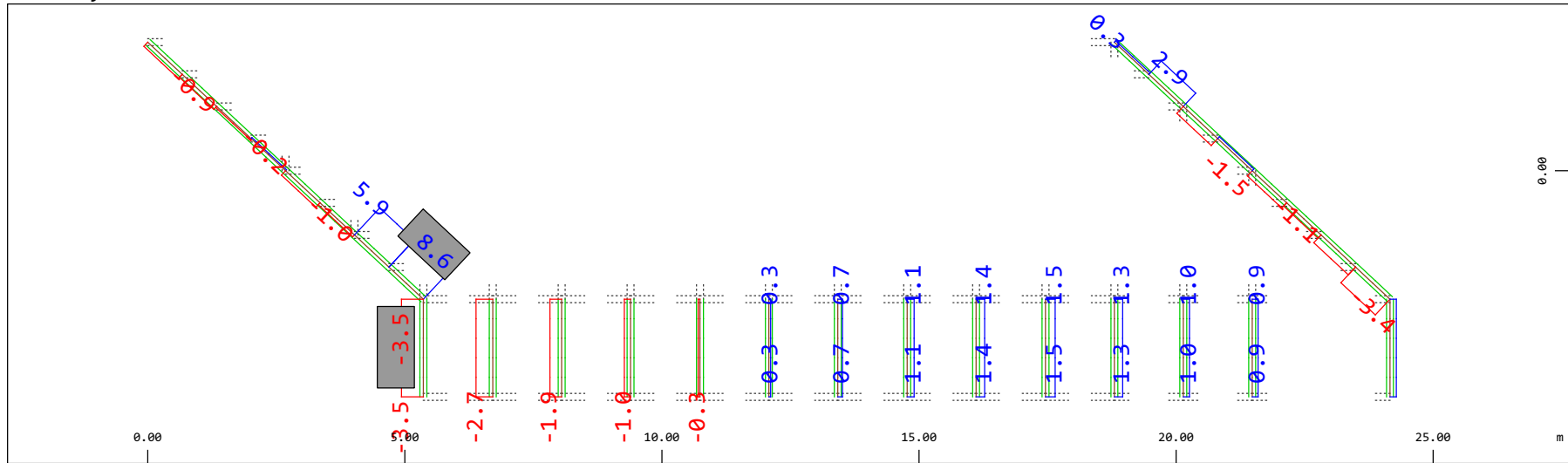
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 39.2 kNm (Min=-18.0) (Max=20.8)

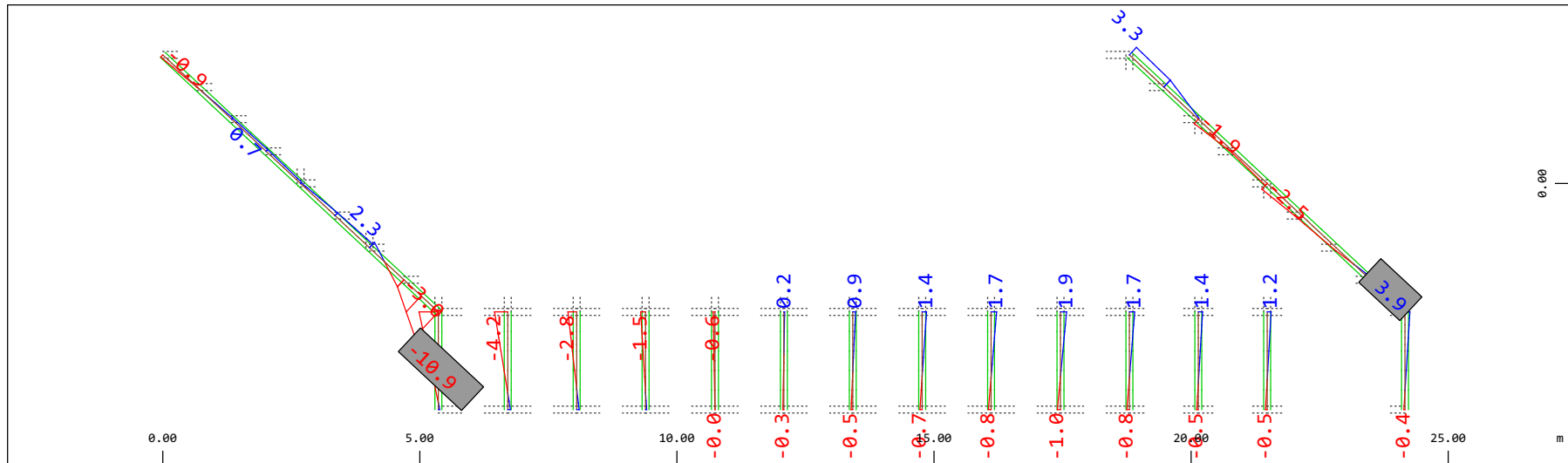
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 9.80 kN (Min=-3.47) (Max=8.58)

M 1 : 120

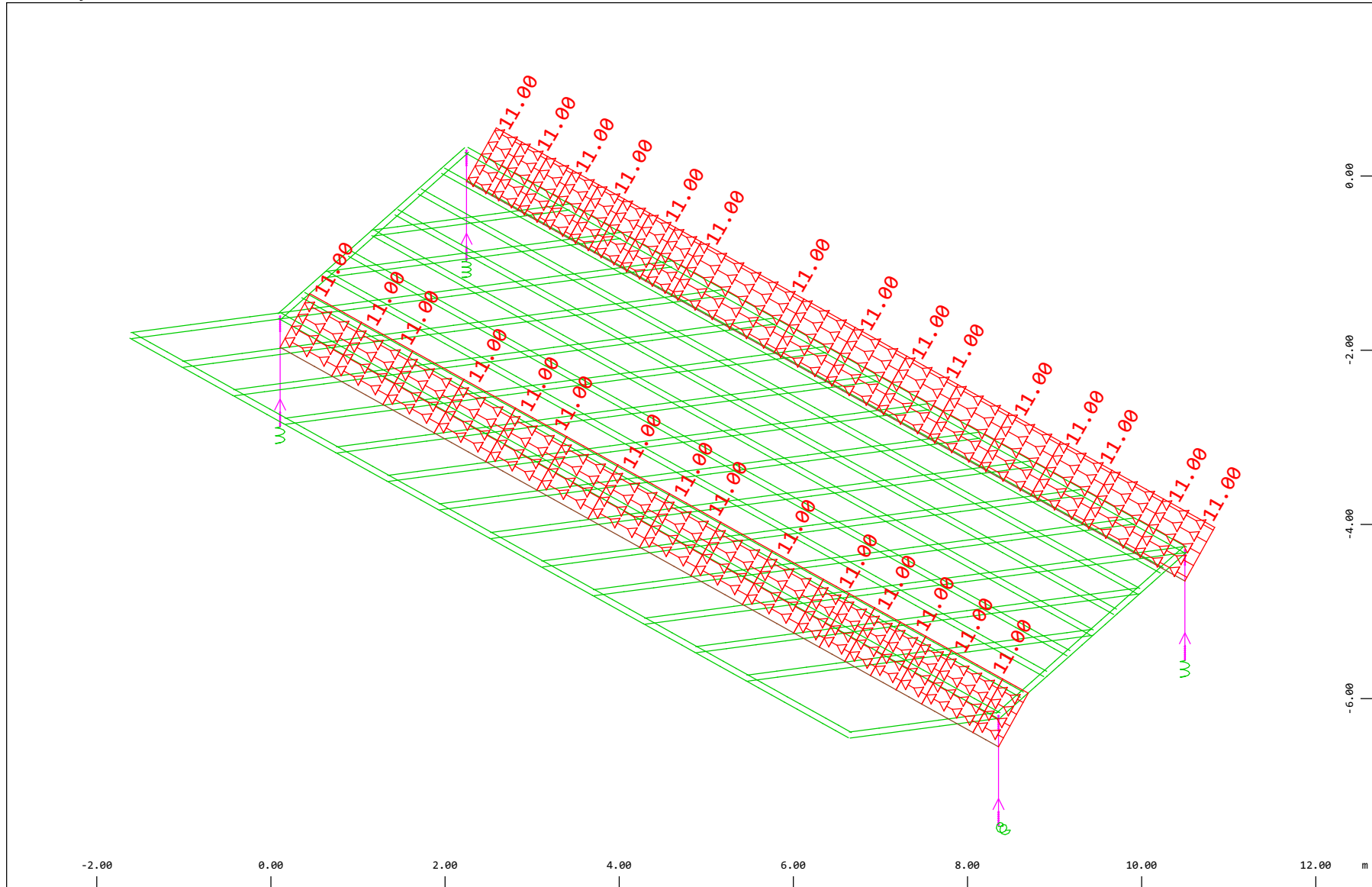


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 502 Qt: Frenatura LM71 (A-->B) , 1 cm 3D = 19.6 kNm (Min=-10.9) (Max=3.86)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

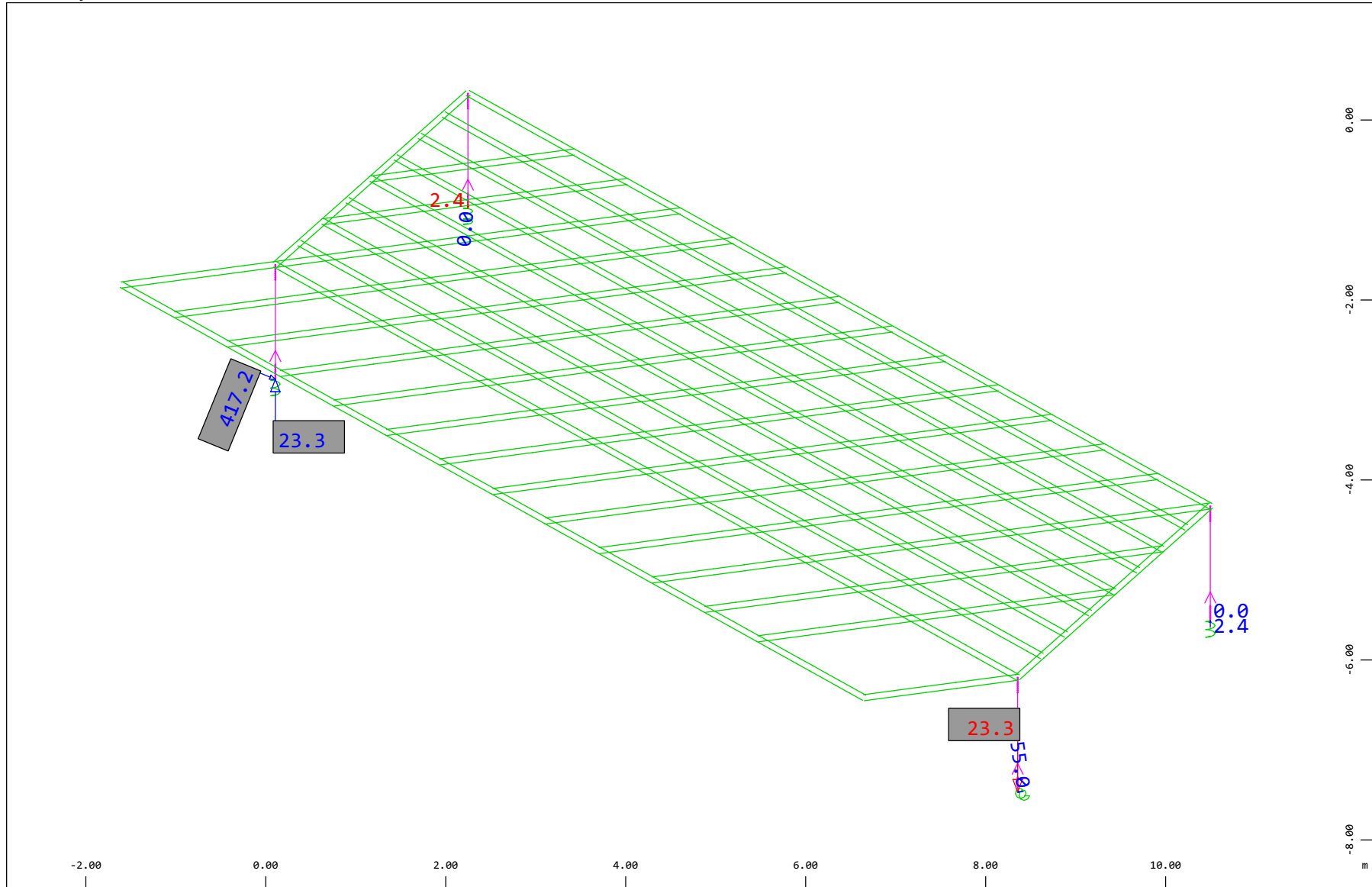
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 503 Qt: Frenatura LM71 (B-->A) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=9.69 kN/m
 (Min=-11.0) (Max=-11.0)



M 1 : 62
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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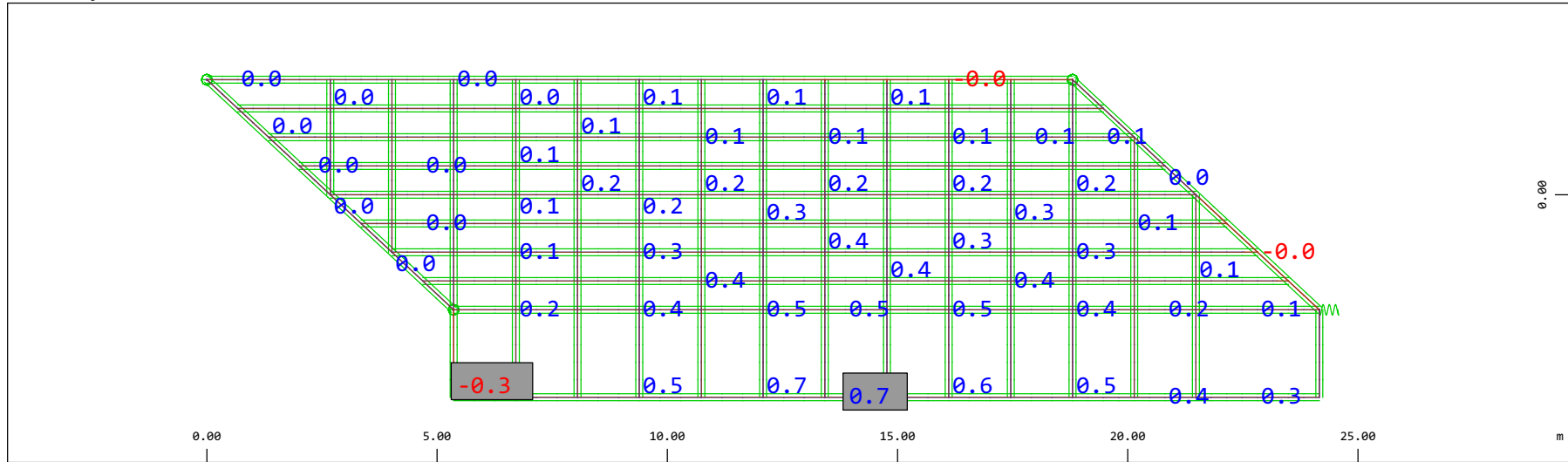
Z
 X Y

Sector of system Beam Elements, Spring Elements
 Nodes , Support force in global Z, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 19.4 kN
 -1.9073e-06)

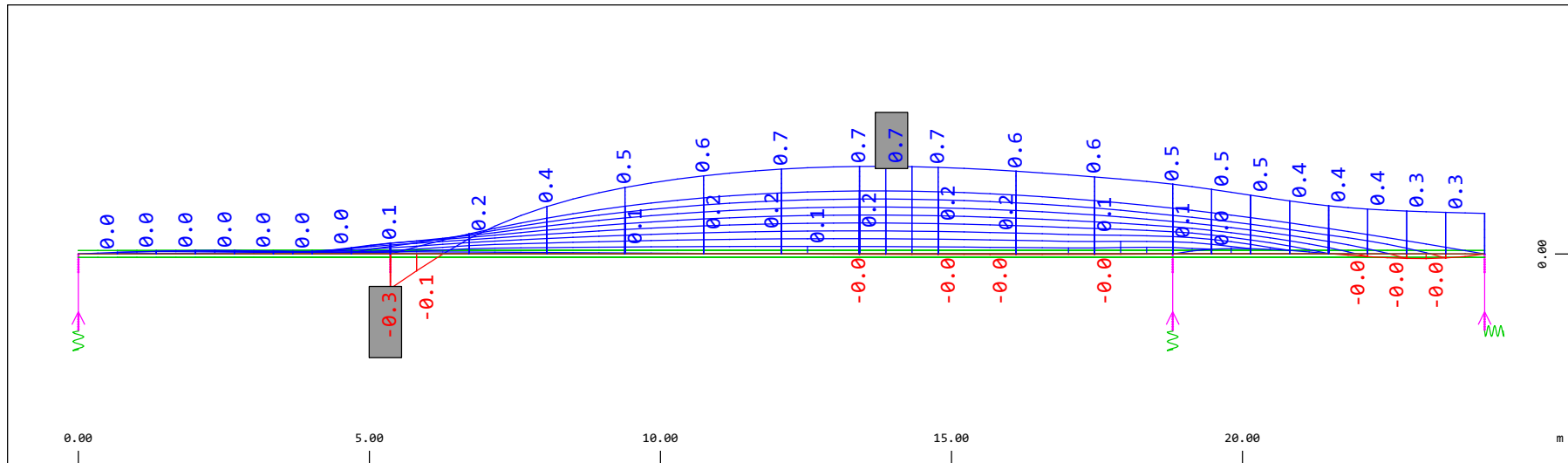
◁ (Min=-23.3) (Max=23.3) (total:

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

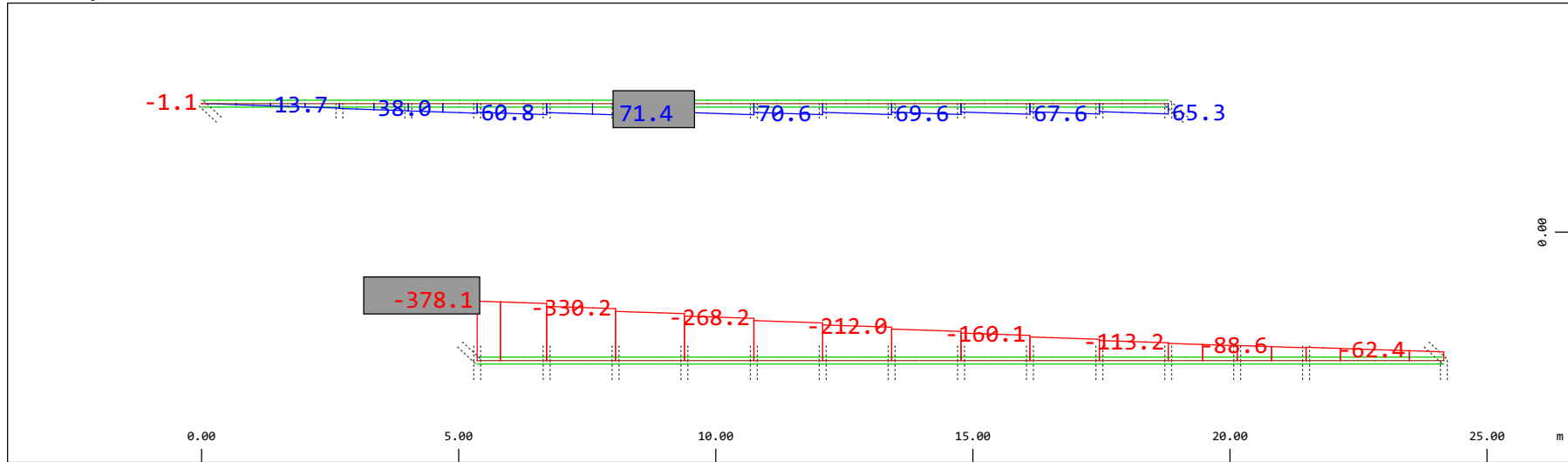


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 0.484 mm (Min=-0.272) (Max=0.688) M 1 : 134



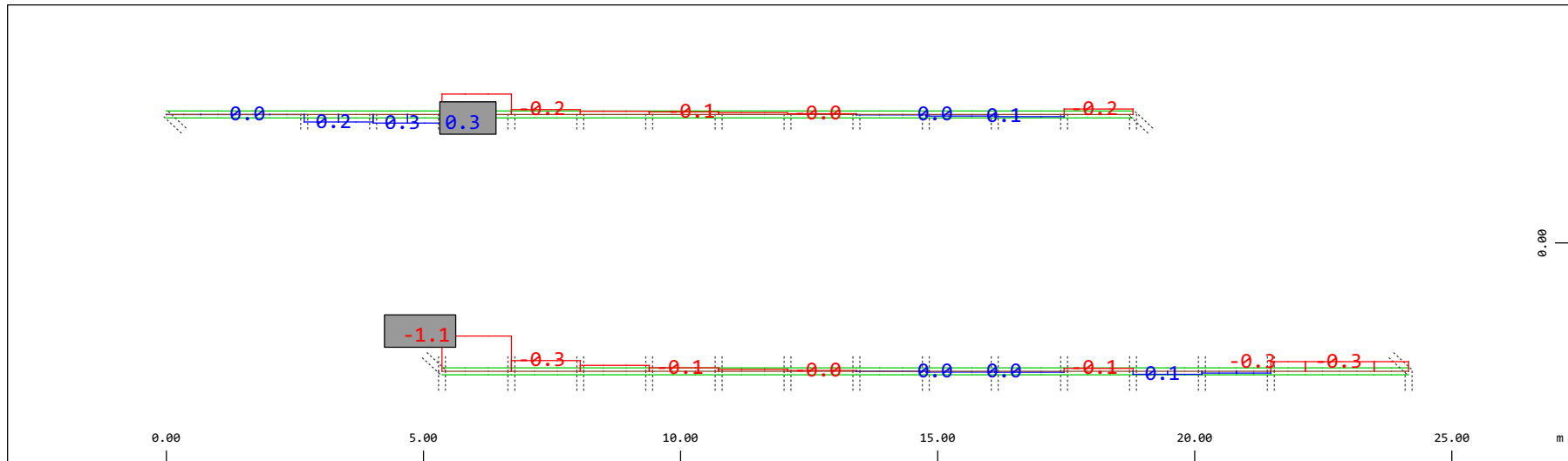
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 0.484 mm (Min=-0.272) (Max=0.688) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 392.2 kN (Min=-378.1) (Max=71.4)

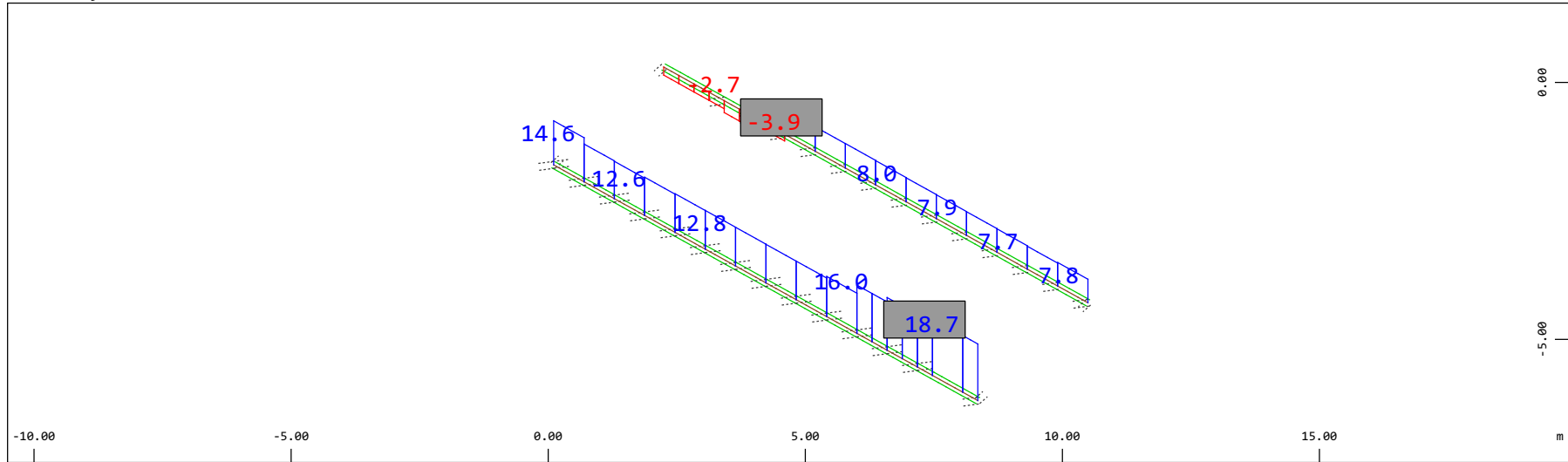
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 1.96 kNm (Min=-1.12) (Max=0.273)

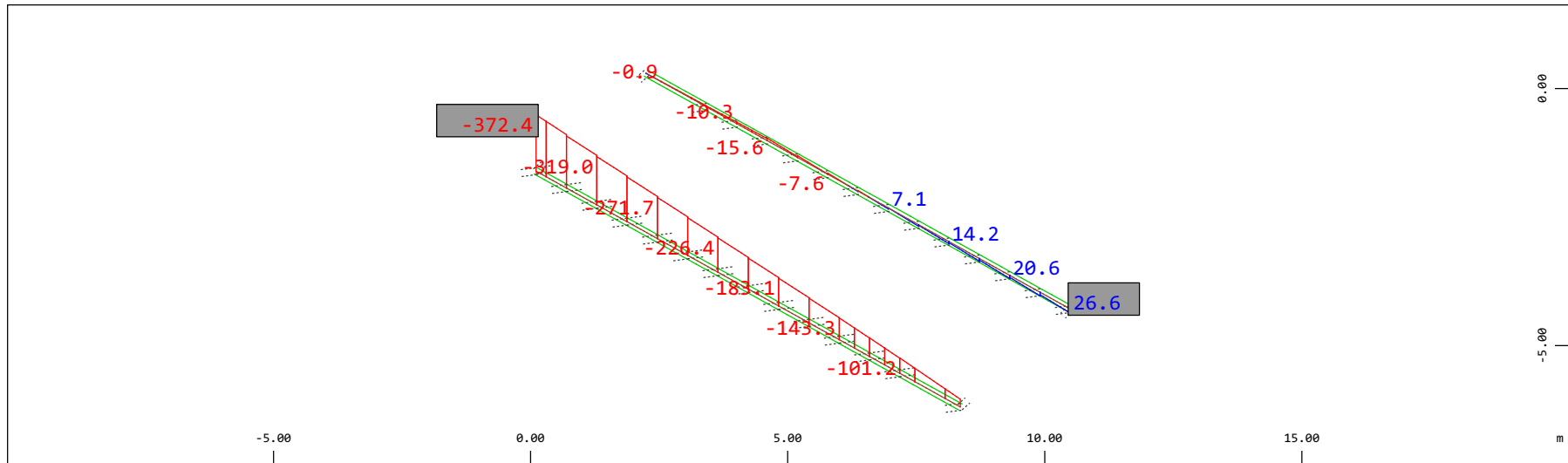
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vz, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 19.6 kN (Min=-3.92) (Max=18.7)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

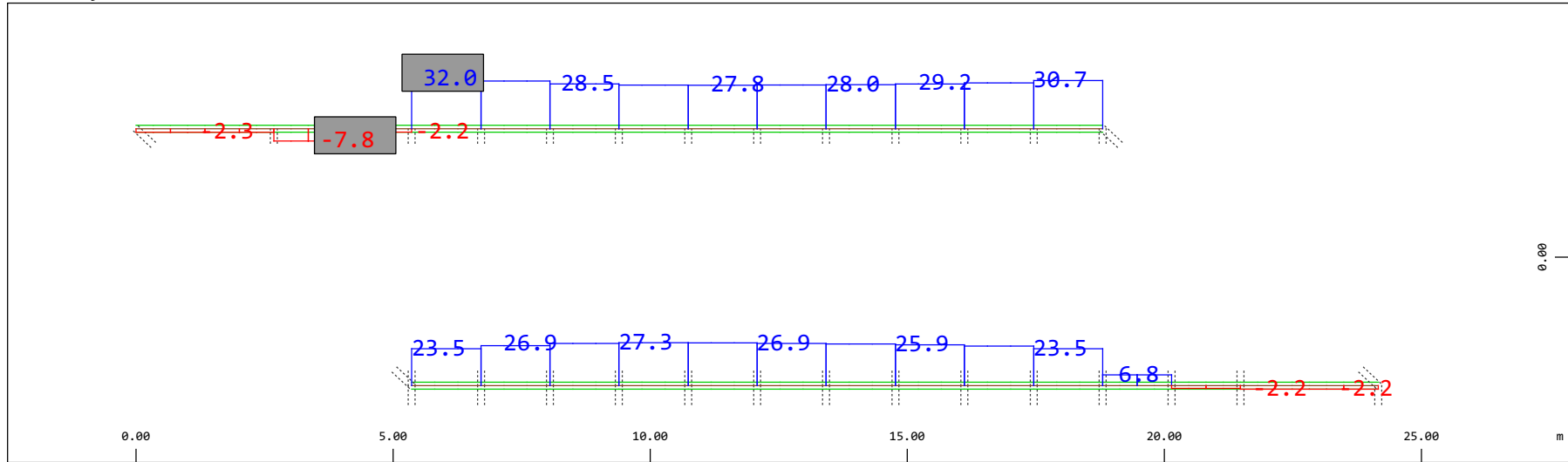


Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment My, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 392.2 kNm (Min=-372.4) (Max=26.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

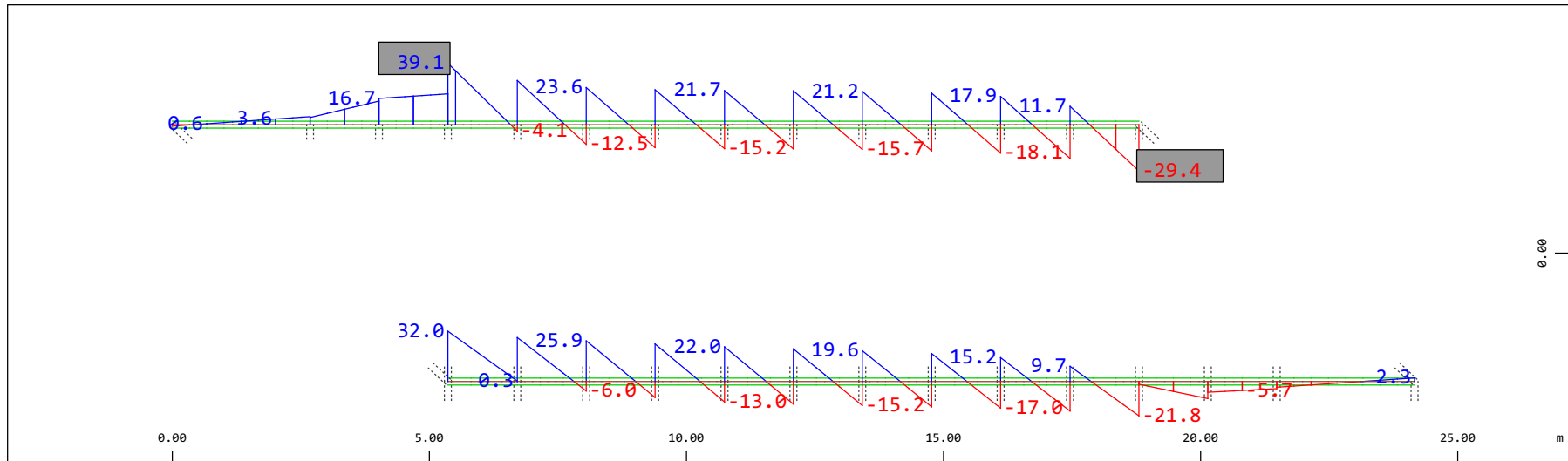
Definition of Axis

Results elementay loads



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Shear force Vy, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 39.2 kN (Min=-7.80) (Max=32.0)

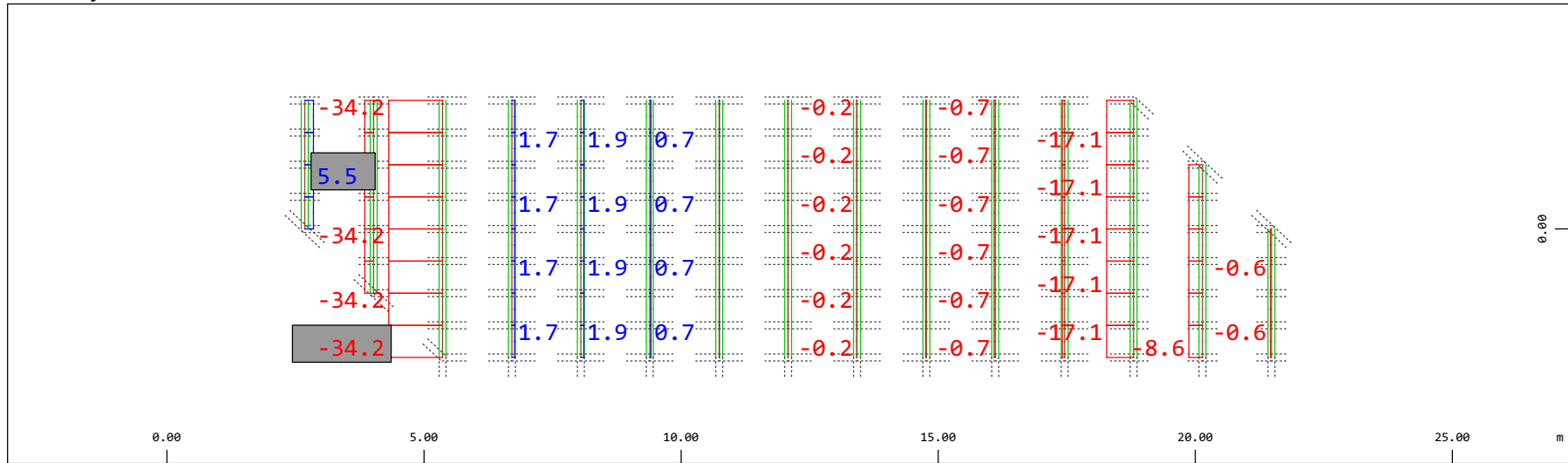
M 1 : 120



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Bending moment Mz, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 39.2 kNm (Min=-29.4) (Max=39.1)

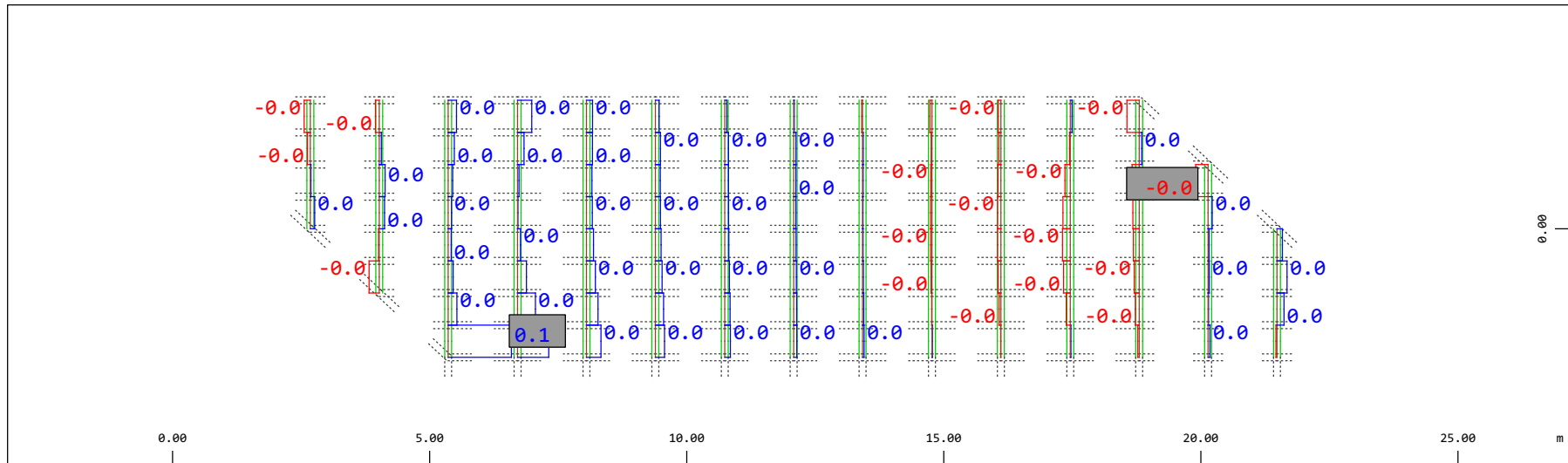
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 39.2 kN (Min=-34.2) (Max=5.55)

M 1 : 120

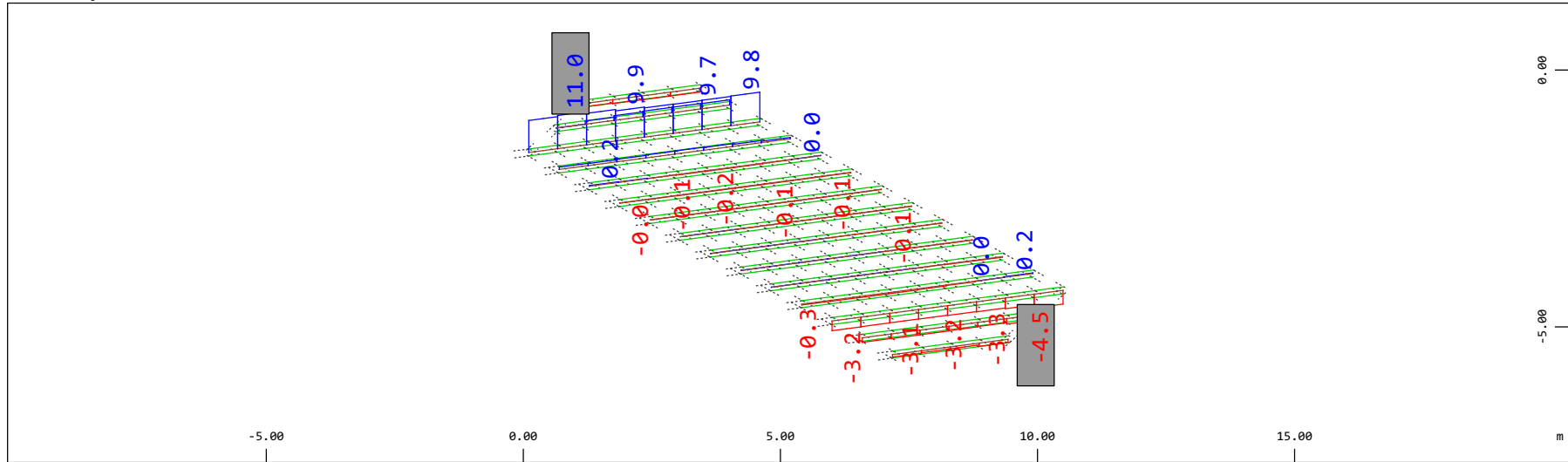


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 0.0980 kNm (Min=-0.0196) (Max=0.101)

M 1 : 120

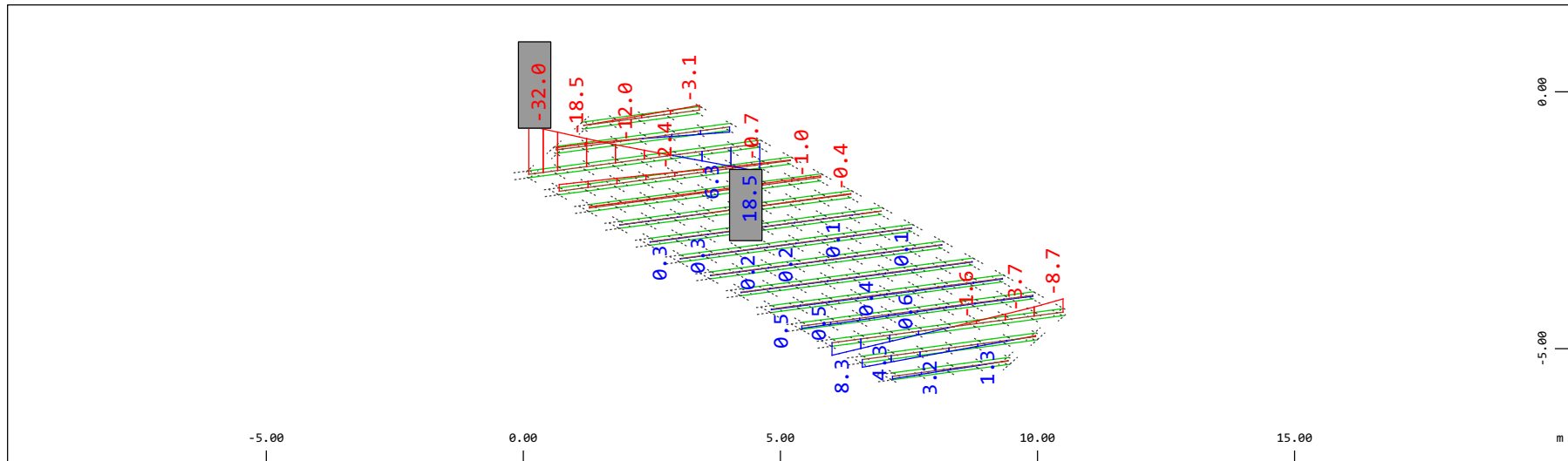
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 19.6 kN (Min=-4.53) (Max=11.0)

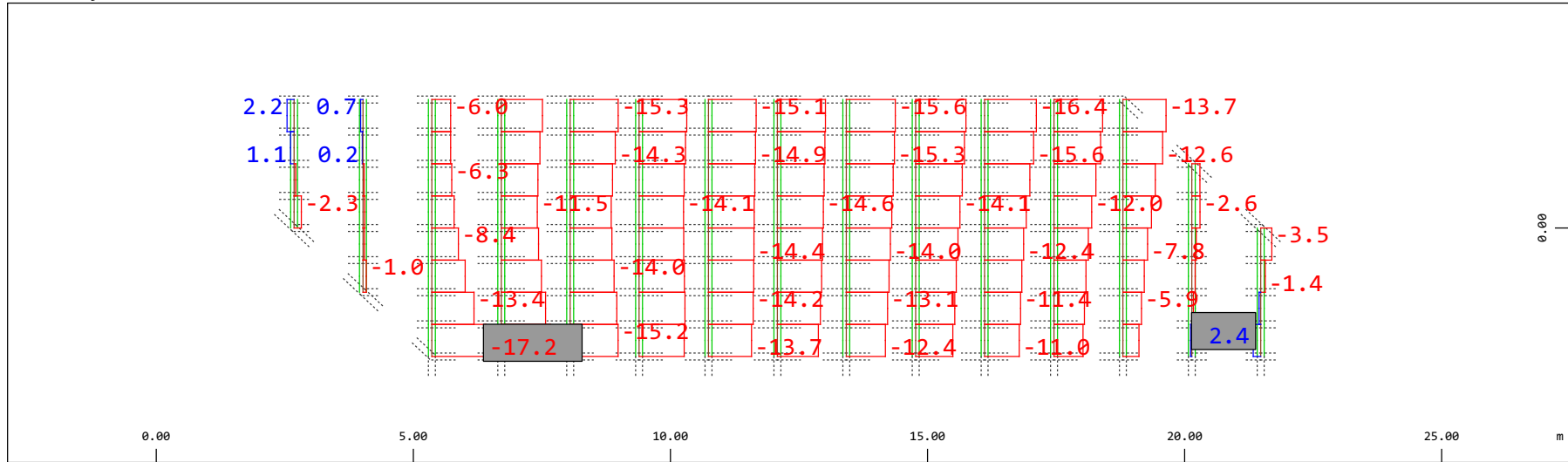
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 39.2 kNm (Min=-32.0) (Max=18.5)

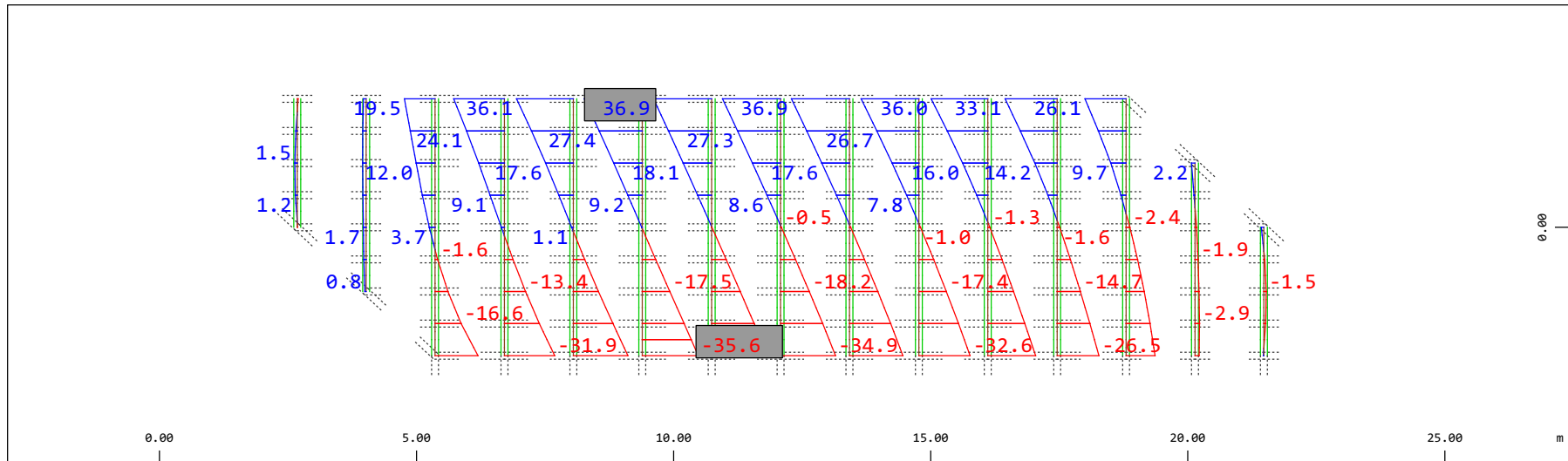
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force V_y , Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 19.6 kN (Min=-17.2) (Max=2.38)

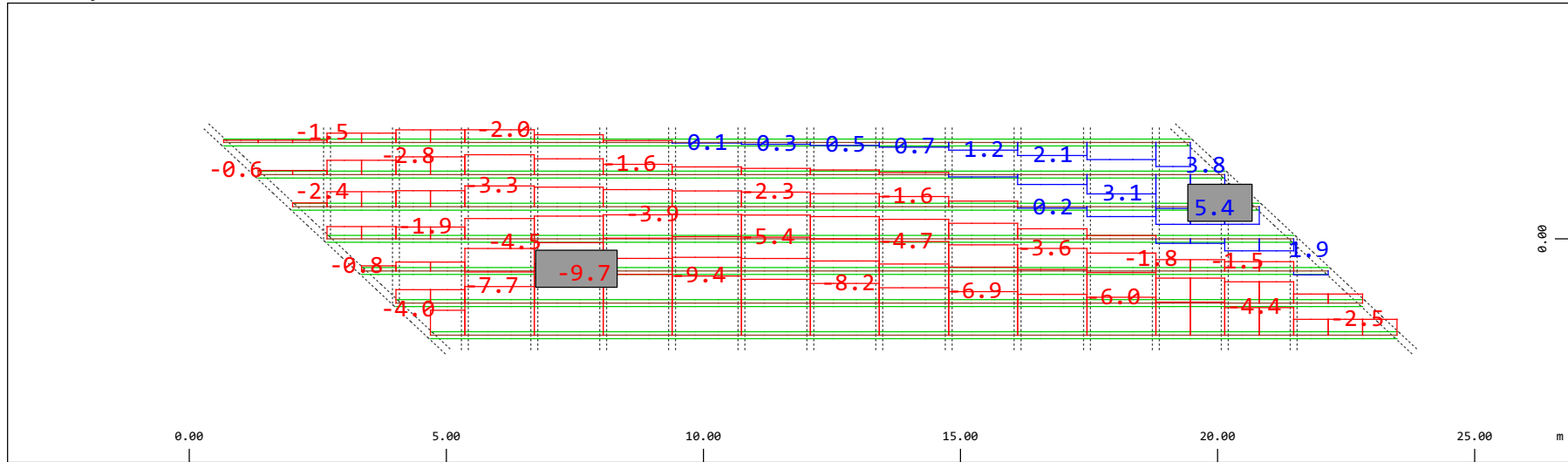
M 1 : 120



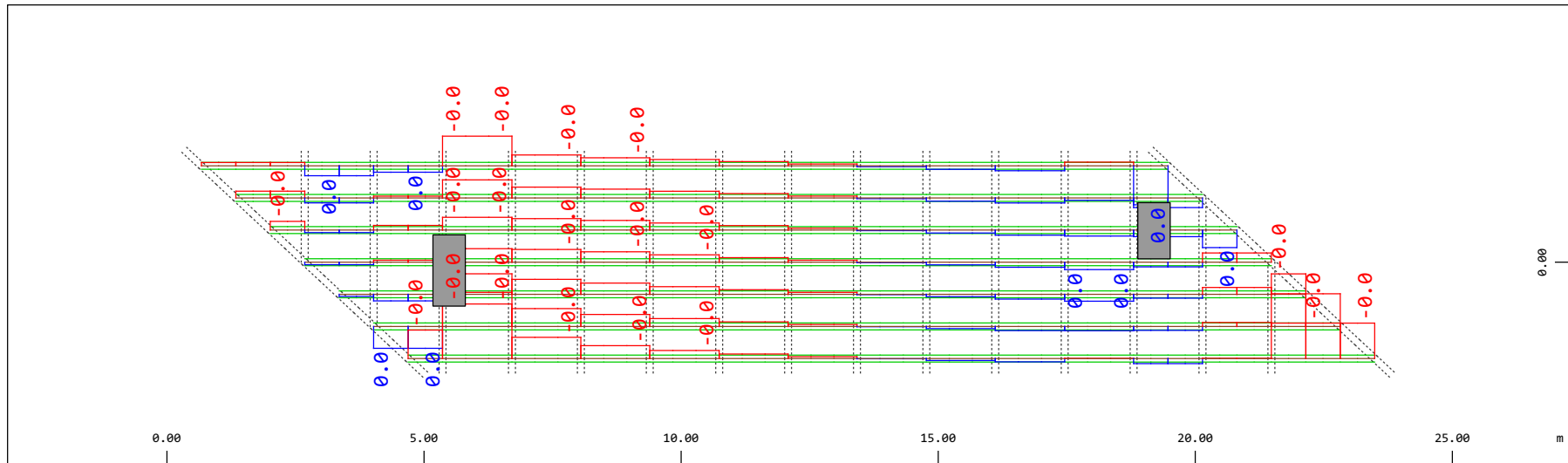
Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment M_z , Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 39.2 kNm (Min=-35.6) (Max=36.9)

M 1 : 120

Definition of Axis
 Results elementay loads

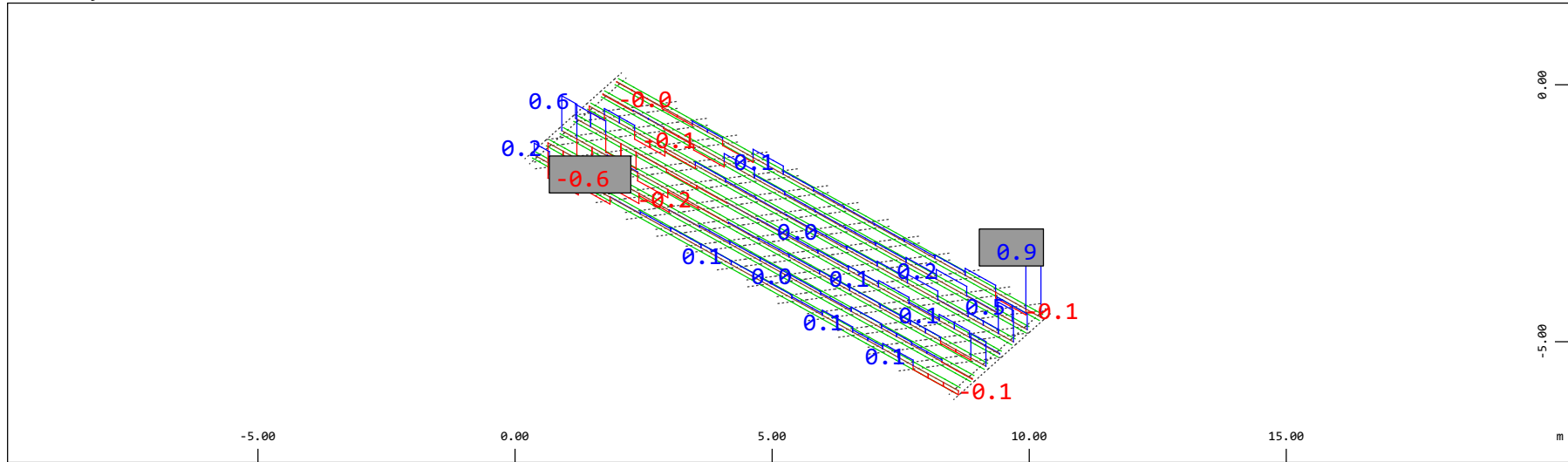


Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 9.80 kN (Min=-9.66) (Max=5.38) M 1 : 120



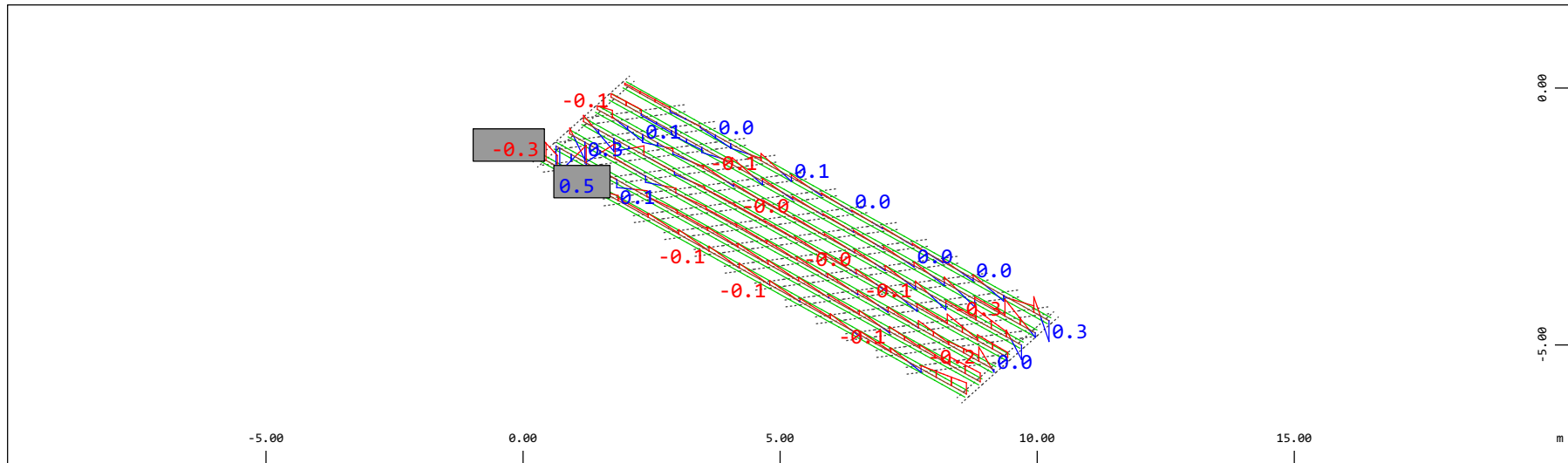
Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 9.8047e-04 kNm (Min=-8.6799e-04) (Max=6.2026e-04) M 1 : 120

Definition of Axis
Results elementay loads



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Shear force Vz, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 0.980 kN (Min=-0.582) (Max=0.891)

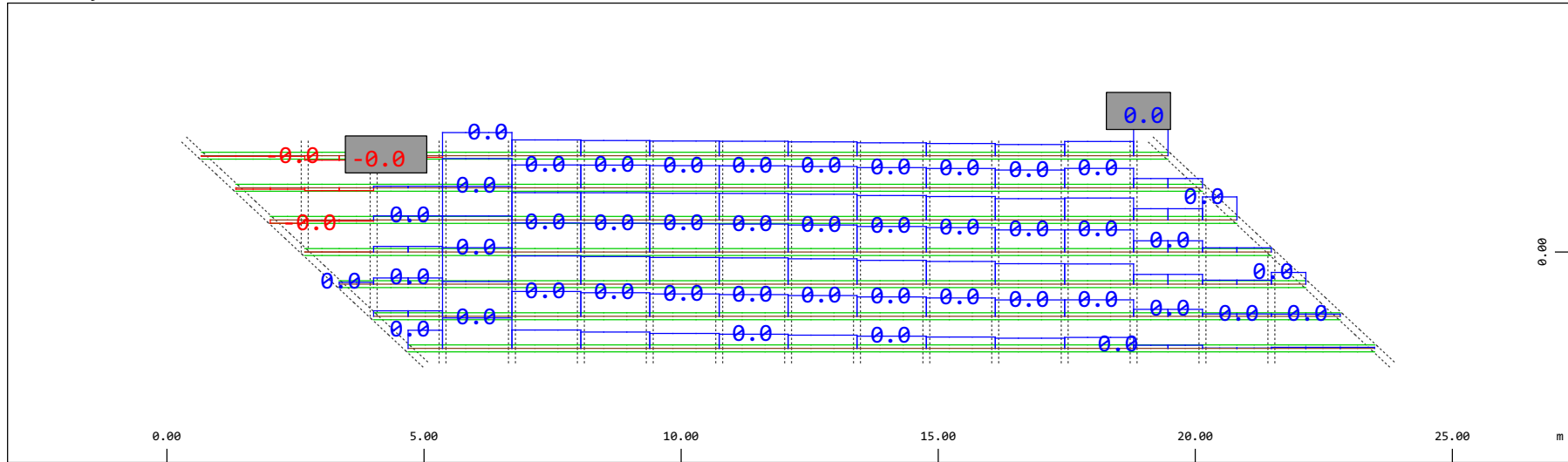
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Bending moment My, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 0.980 kNm (Min=-0.316) (Max=0.490)

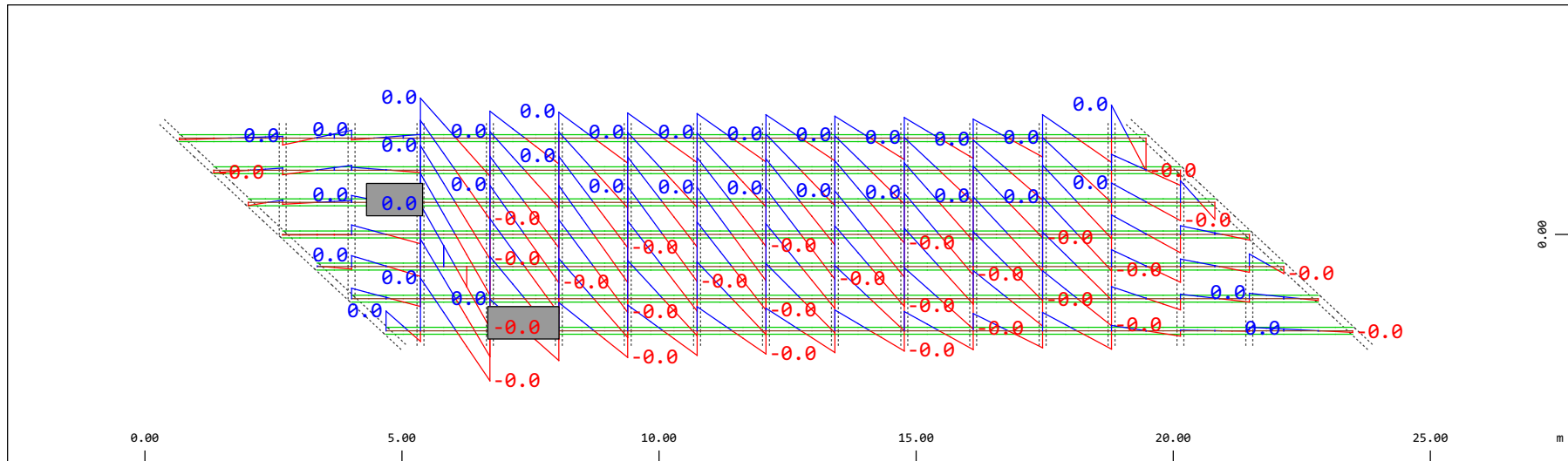
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Shear force Vy, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 0.0098 kN (Min=-7.0068e-04) (Max=0.0062)

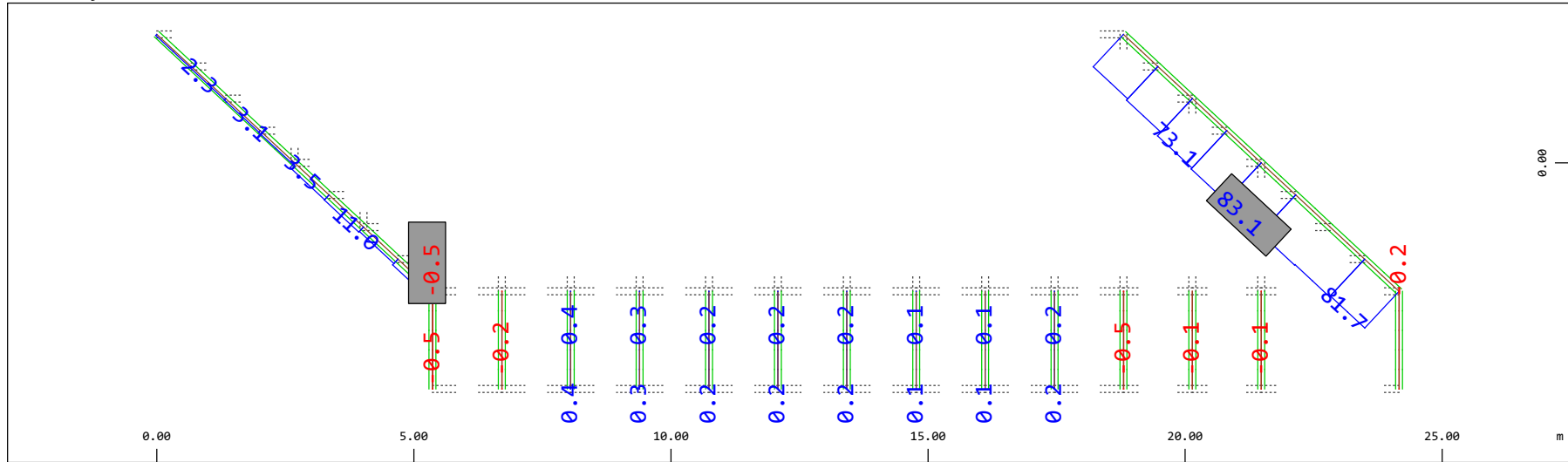
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Bending moment Mz, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 0.0039 kNm (Min=-0.0039) (Max=0.0039)

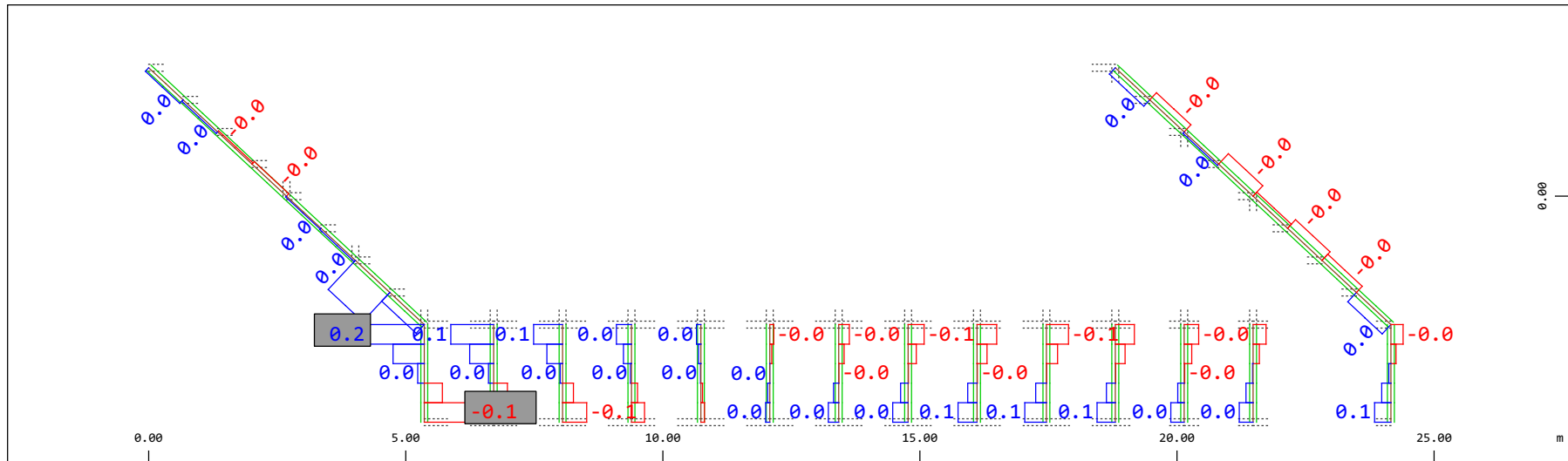
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force N_x , Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 98.0 kN (Min=-0.541) (Max=83.1)

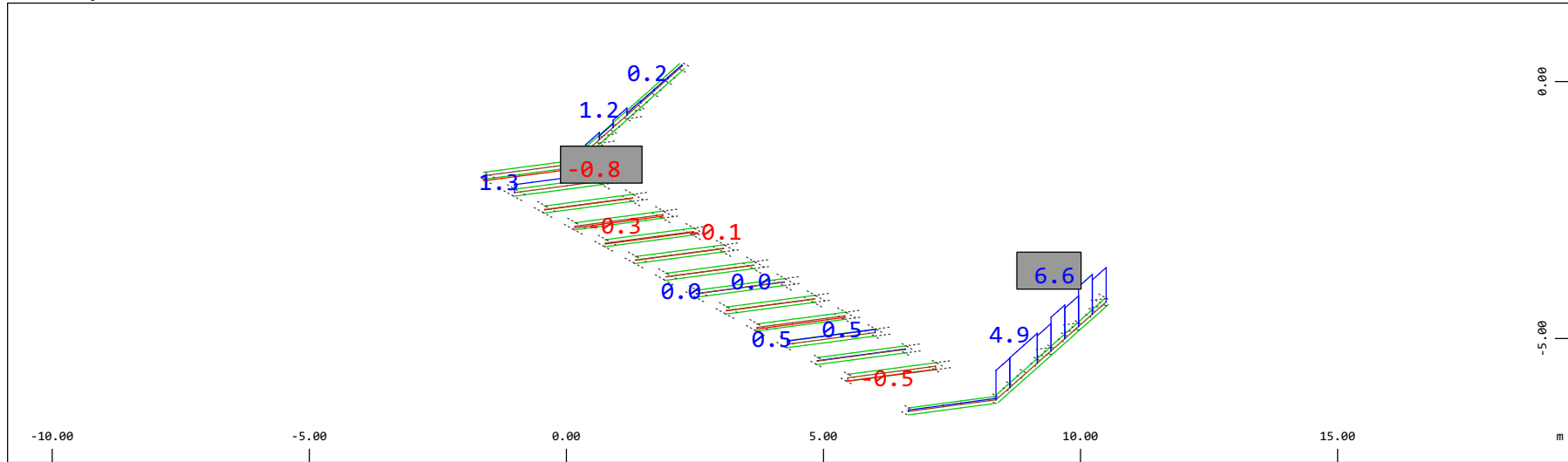
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment M_t , Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 0.196 kNm (Min=-0.136) (Max=0.178)

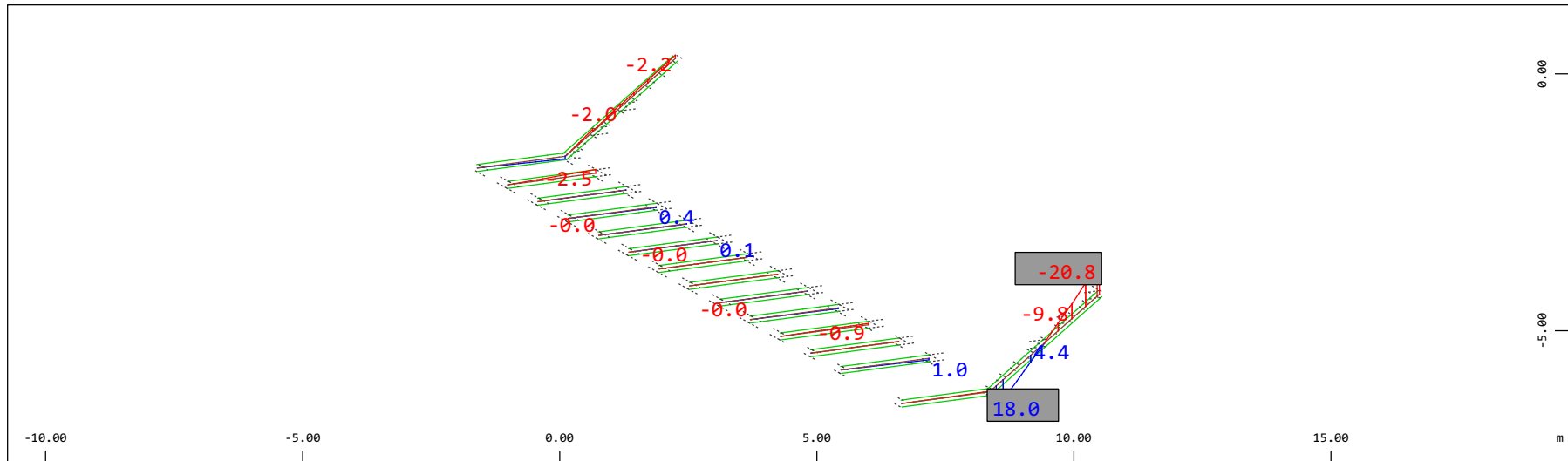
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 9.80 kN (Min=-0.835) (Max=6.57)

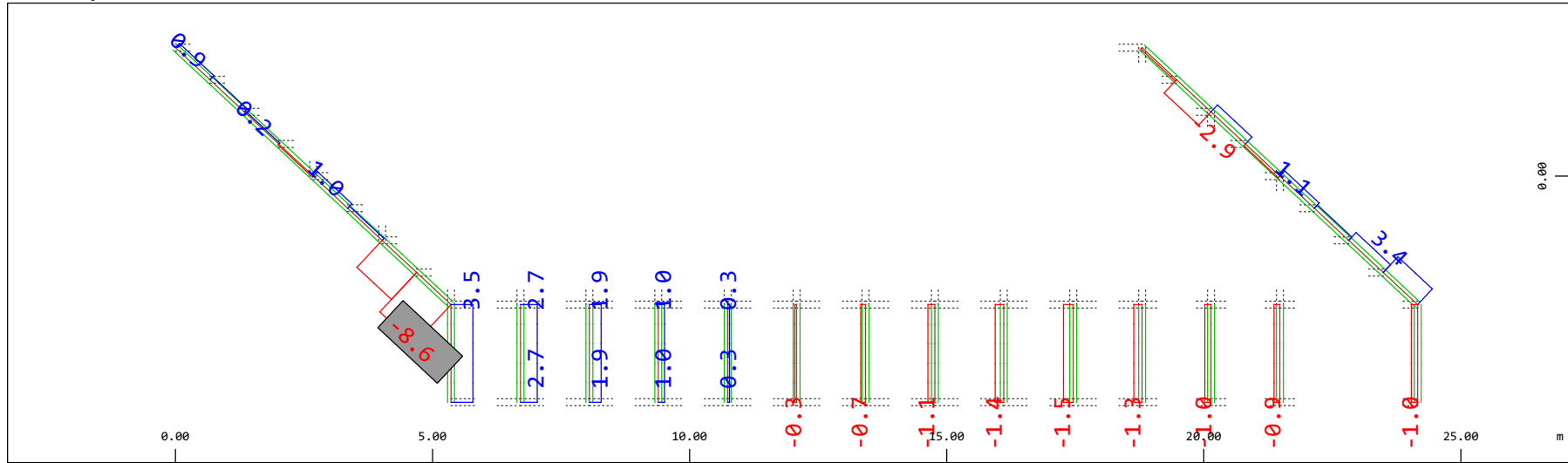
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 39.2 kNm (Min=-20.8) (Max=18.0)

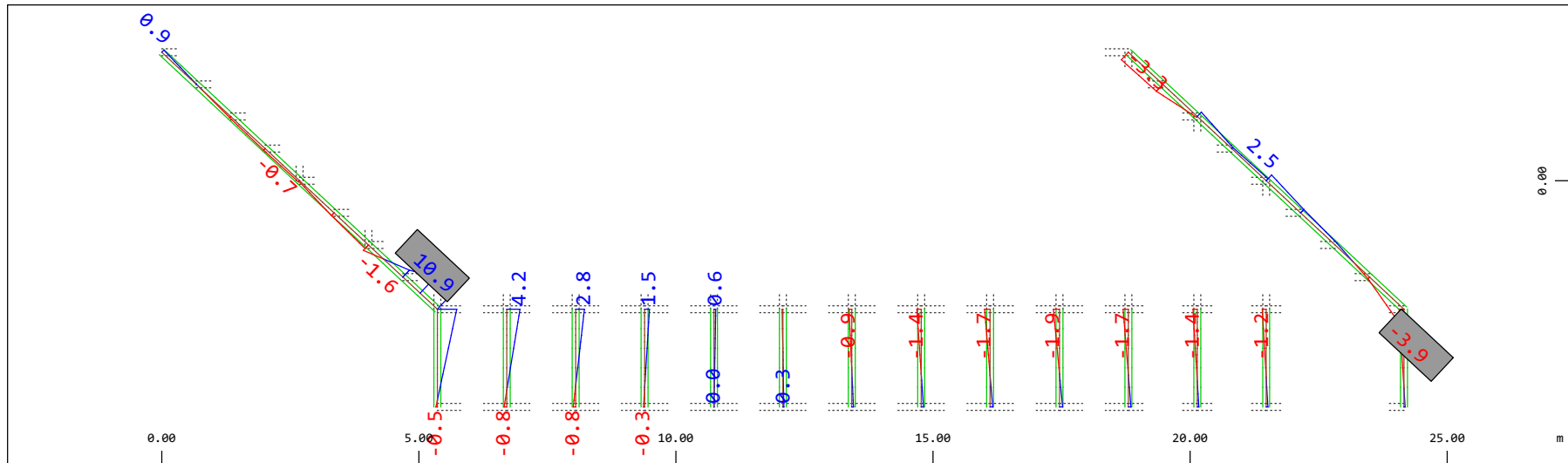
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 9.80 kN (Min=-8.58) (Max=3.47)

M 1 : 120

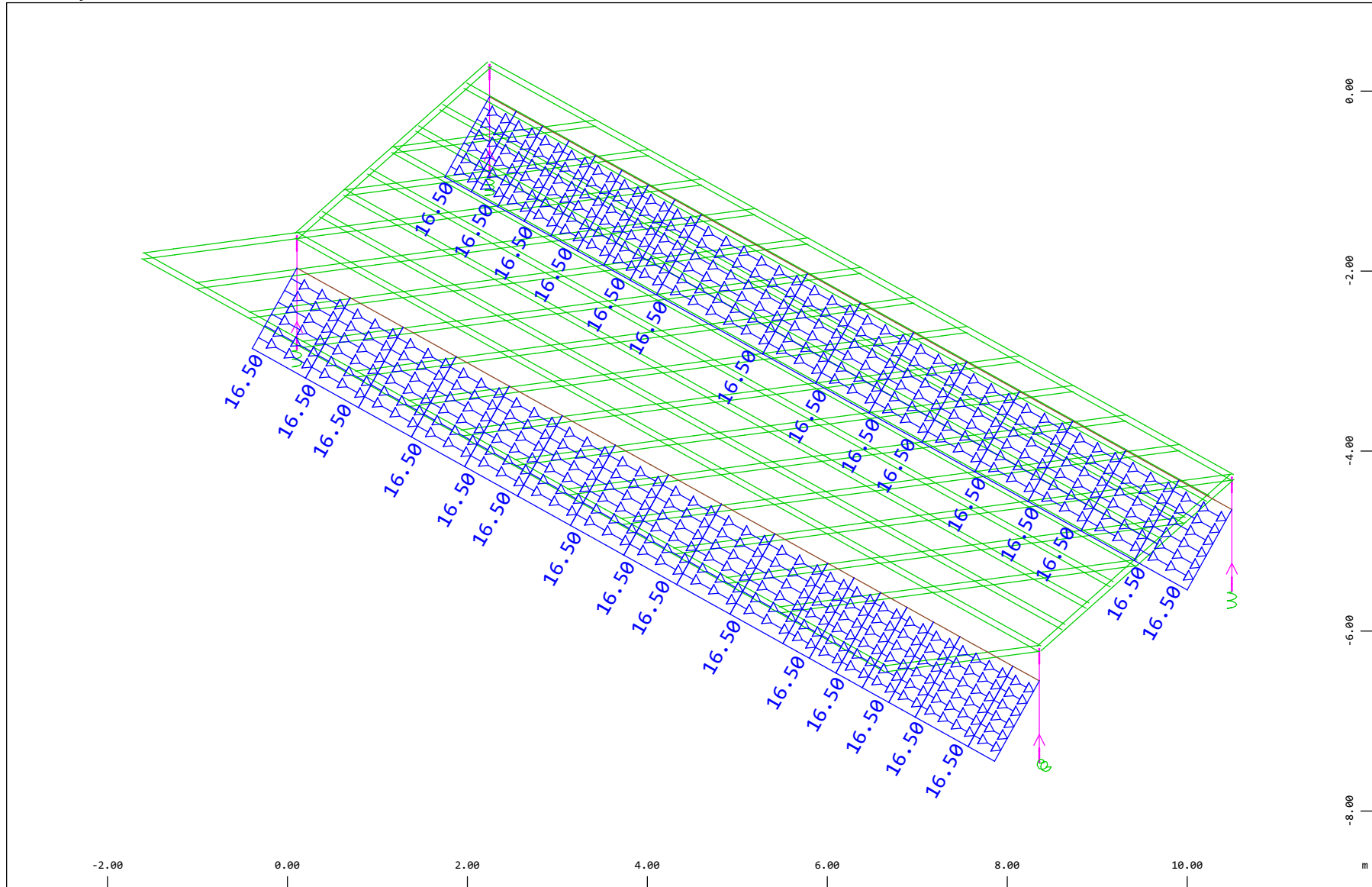


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 503 Qt: Frenatura LM71 (B-->A) , 1 cm 3D = 19.6 kNm (Min=-3.86) (Max=10.9)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

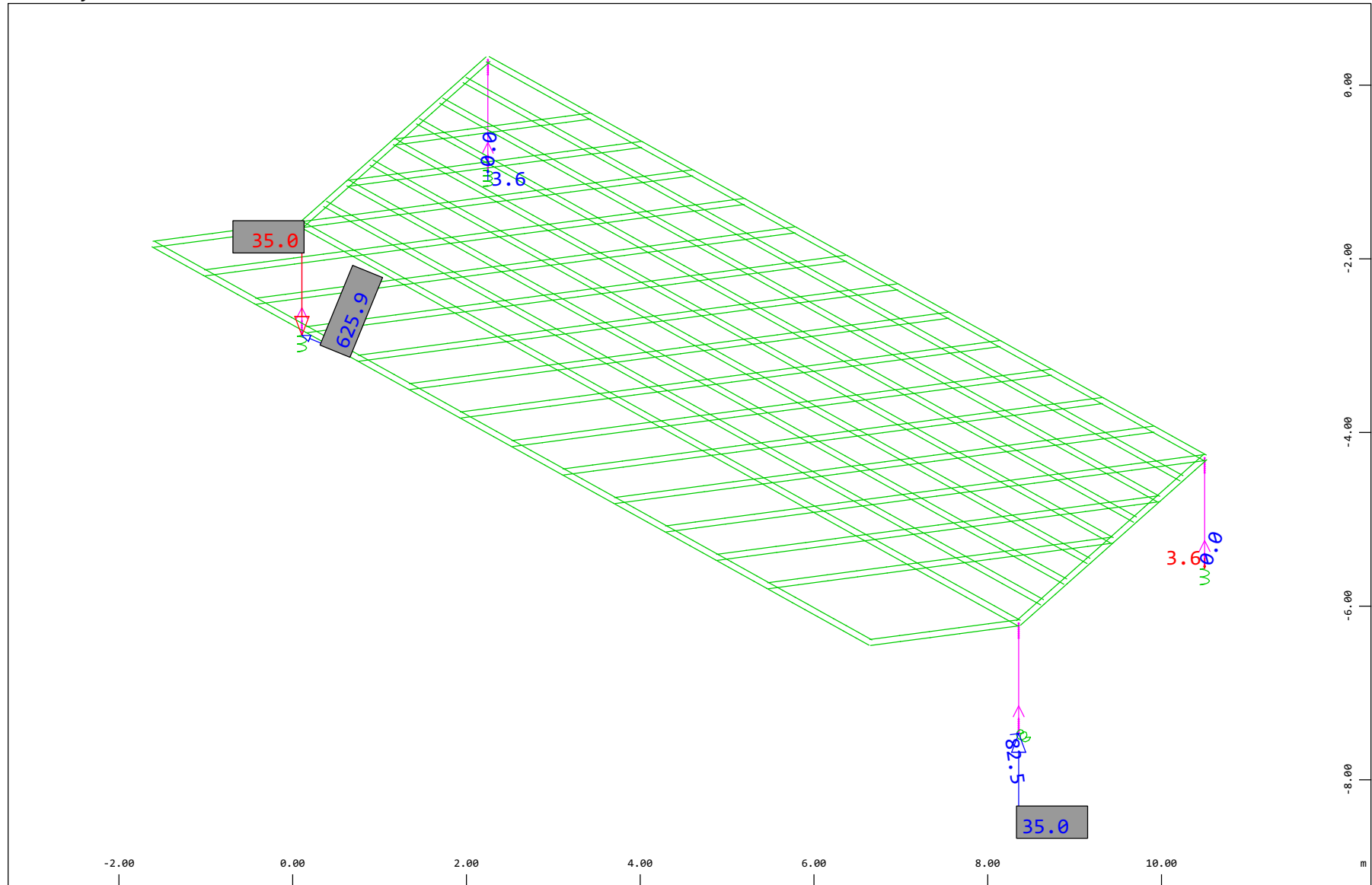
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=9.69 kN/m)
 (Max=16.5)



M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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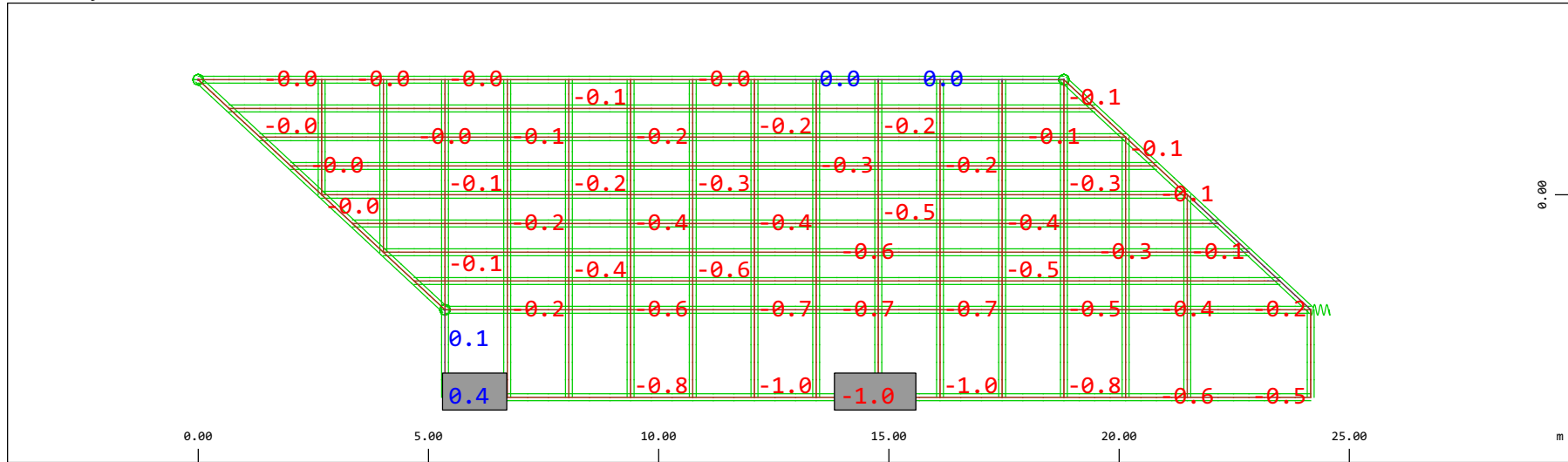


Z Sector of system Beam Elements, Spring Elements
 X Y Nodes , Support force in global Z, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 19.4 kN
 0)

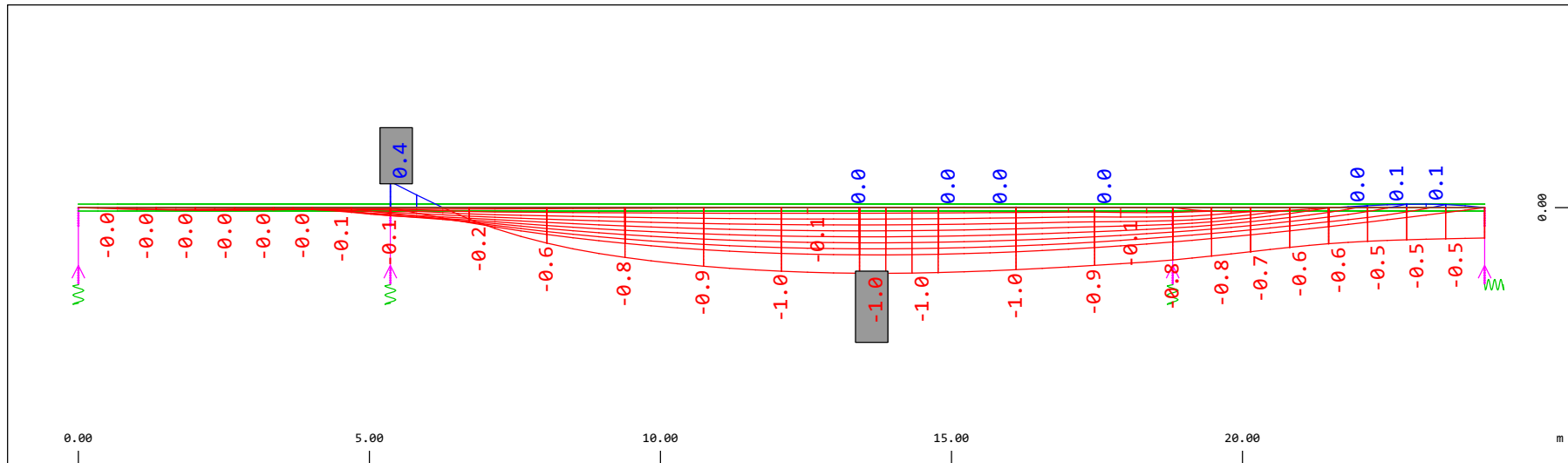
◁ (Min=-35.0) (Max=35.0) (total:

M 1 : 62
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

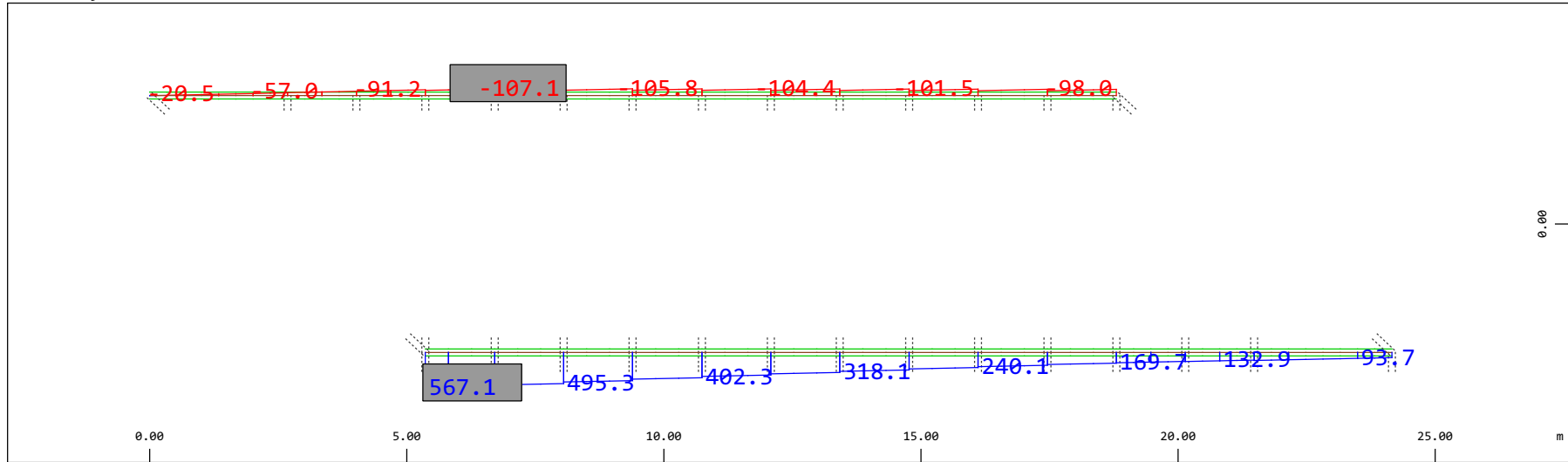


Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 0.969 mm (Min=-1.03) (Max=0.408) M 1 : 134



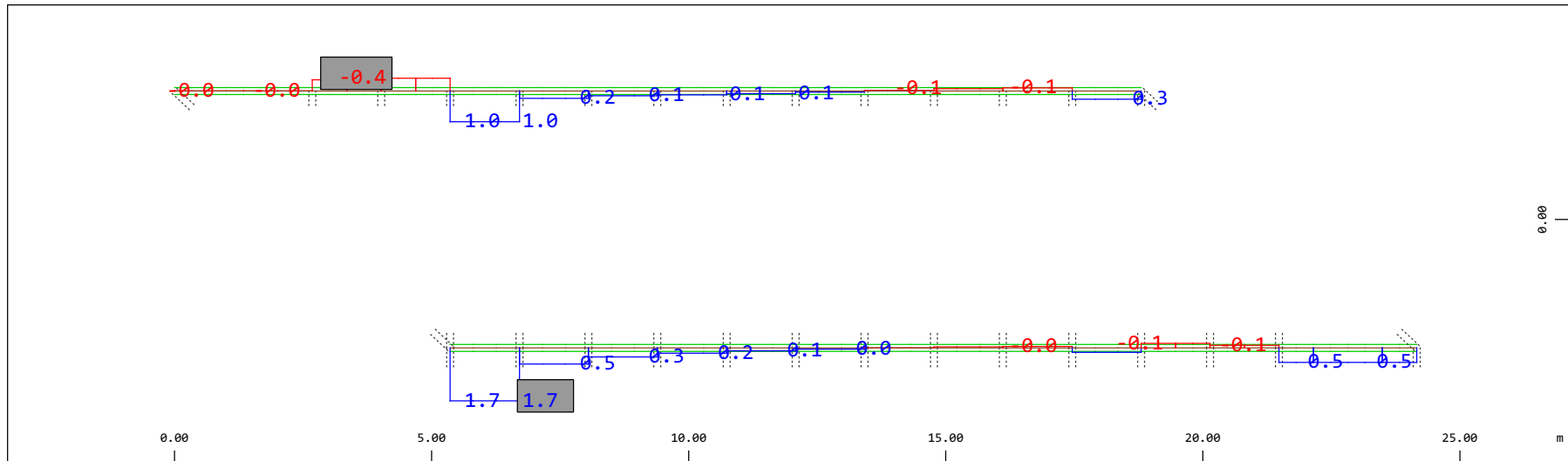
Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 0.969 mm (Min=-1.03) (Max=0.408) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force N_x , Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 980.5 kN (Min=-107.1) (Max=567.1)

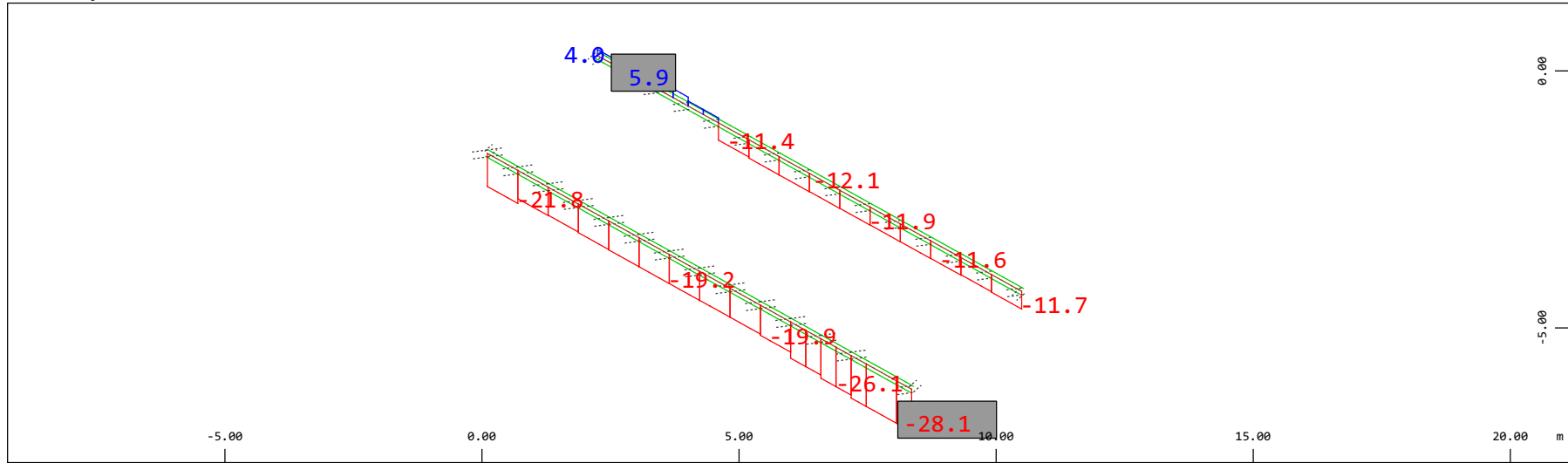
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment M_t , Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 1.96 kNm (Min=-0.409) (Max=1.68)

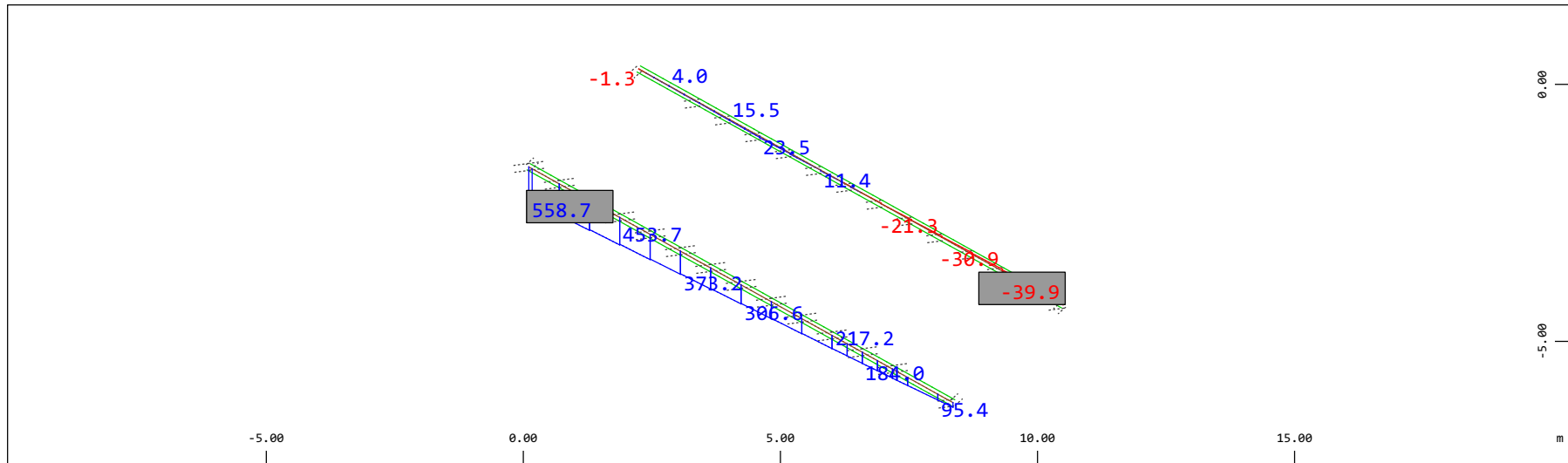
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vz, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 39.2 kN (Min=-28.1) (Max=5.89)

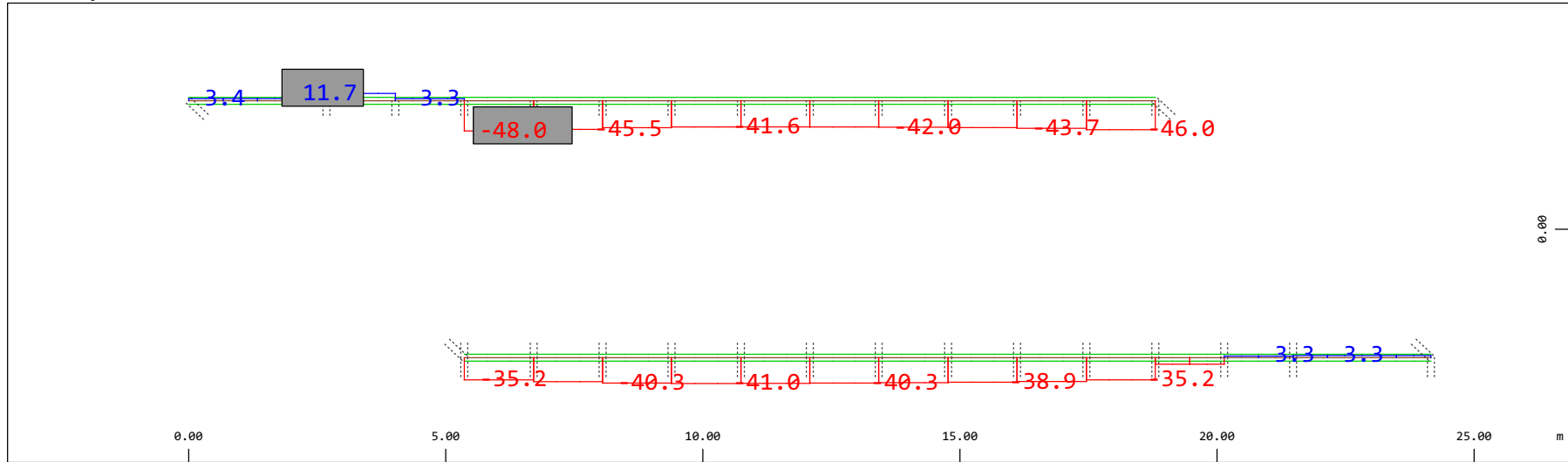
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



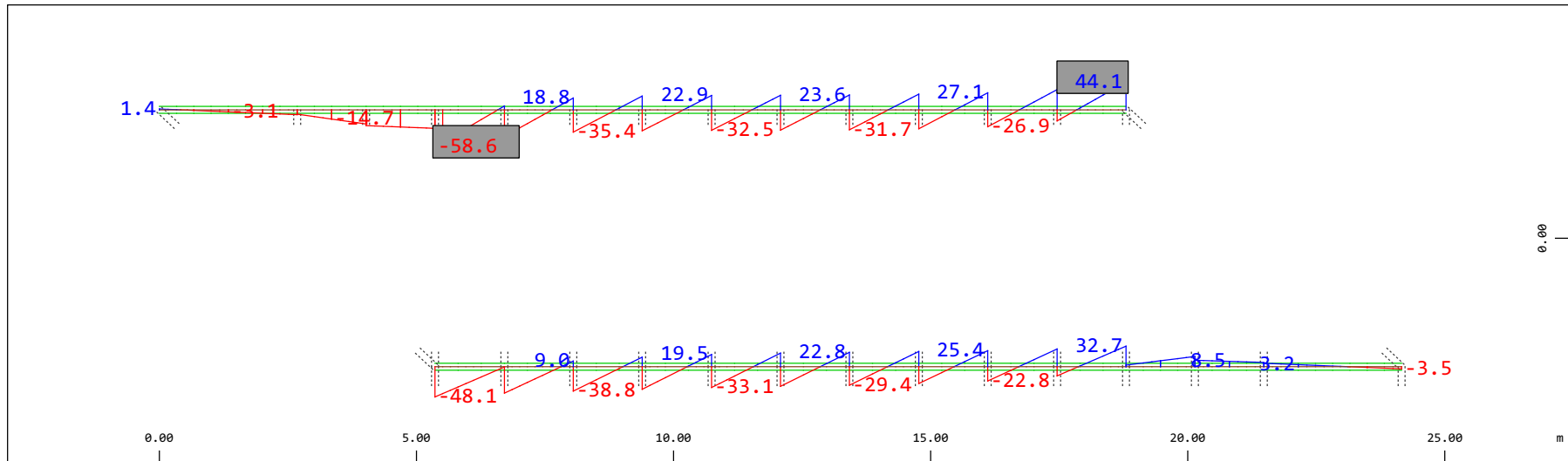
Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment My, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 980.5 kNm (Min=-39.9) (Max=558.7)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

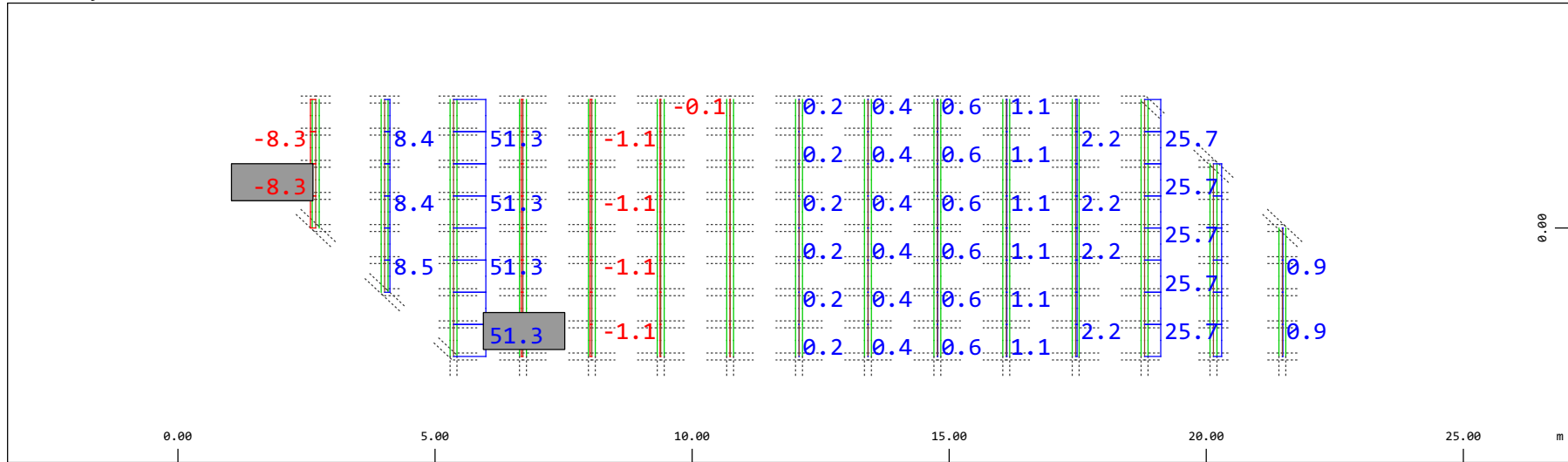


Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 98.0 kN (Min=-48.0) (Max=11.7)



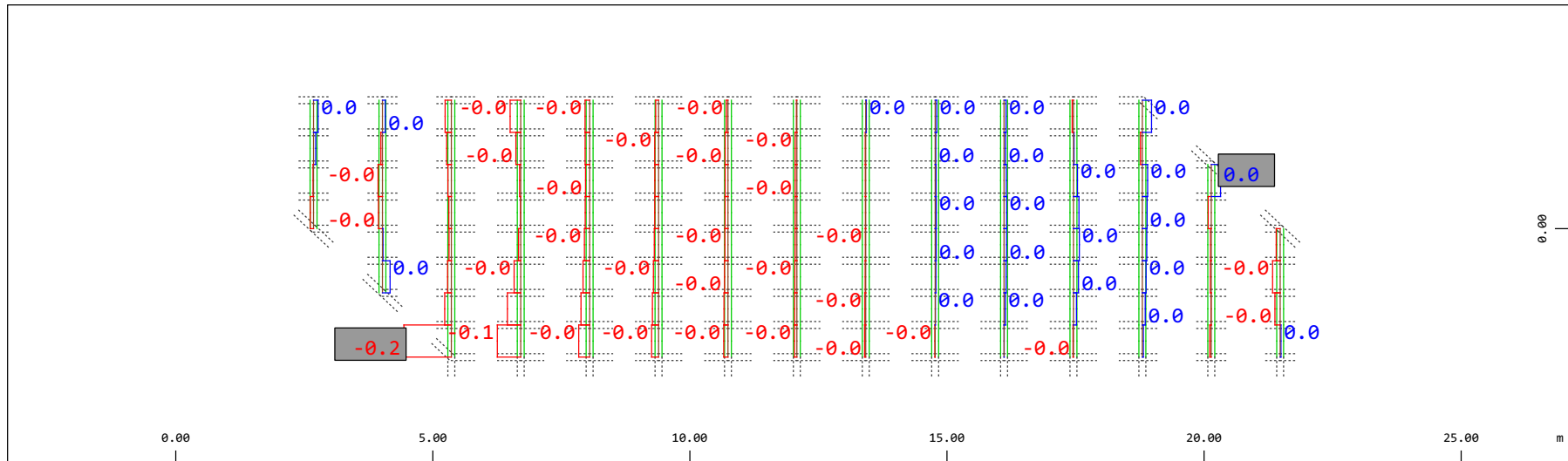
Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-58.6) (Max=44.1)

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 98.0 kN (Min=-8.32) (Max=51.3)

M 1 : 120

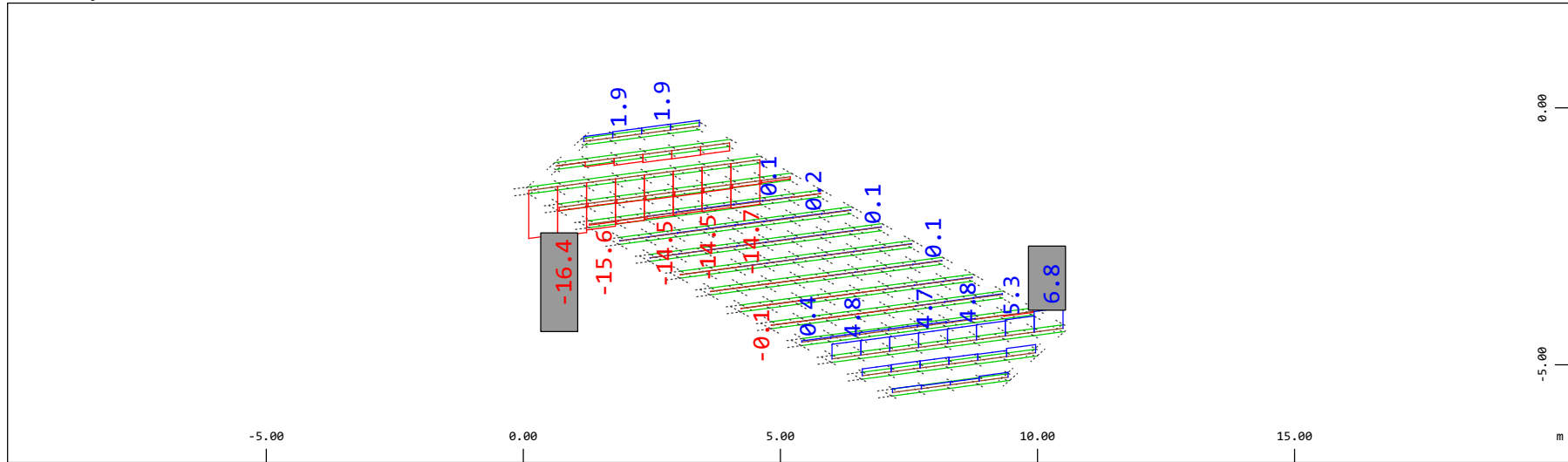


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 0.196 kNm (Min=-0.151) (Max=0.0294)

M 1 : 120

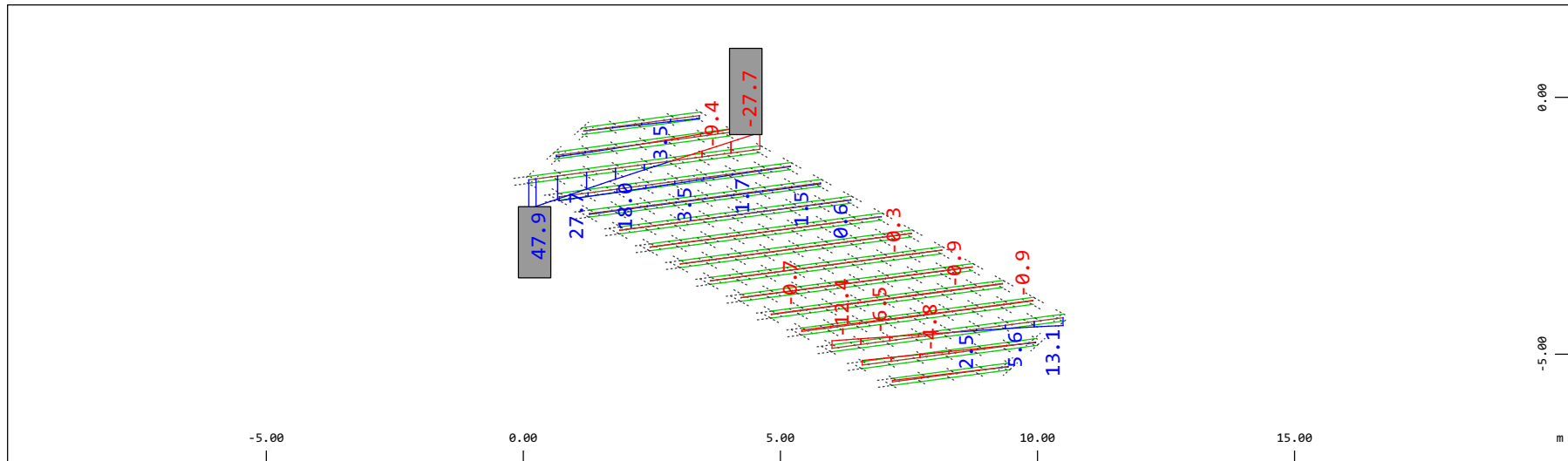
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 19.6 kN (Min=-16.4) (Max=6.79)

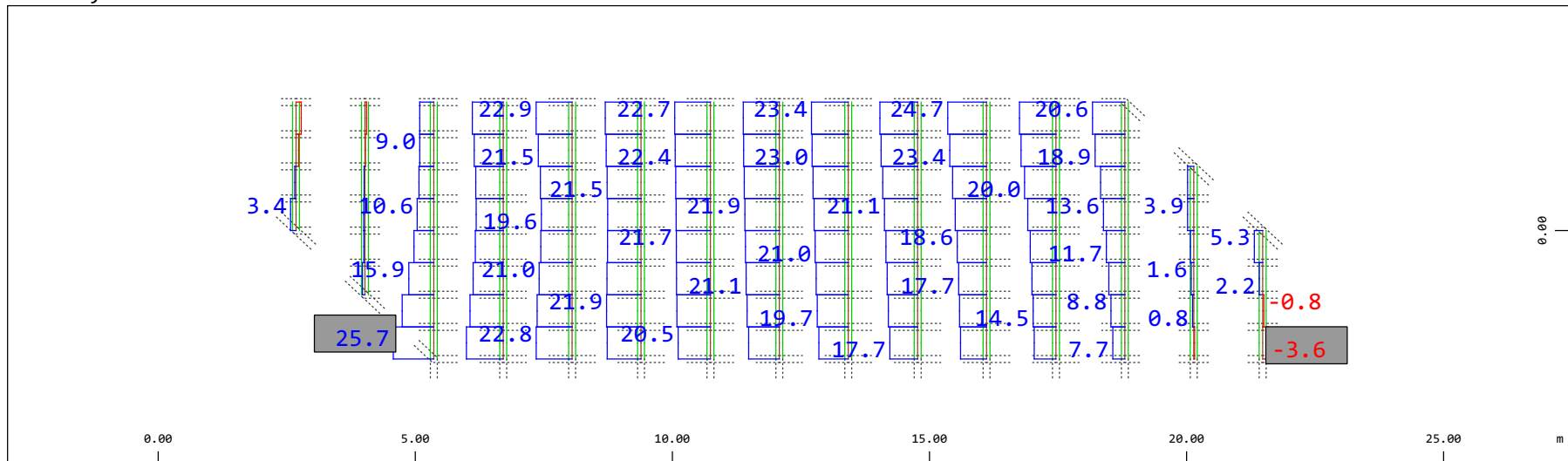
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-27.7) (Max=47.9)

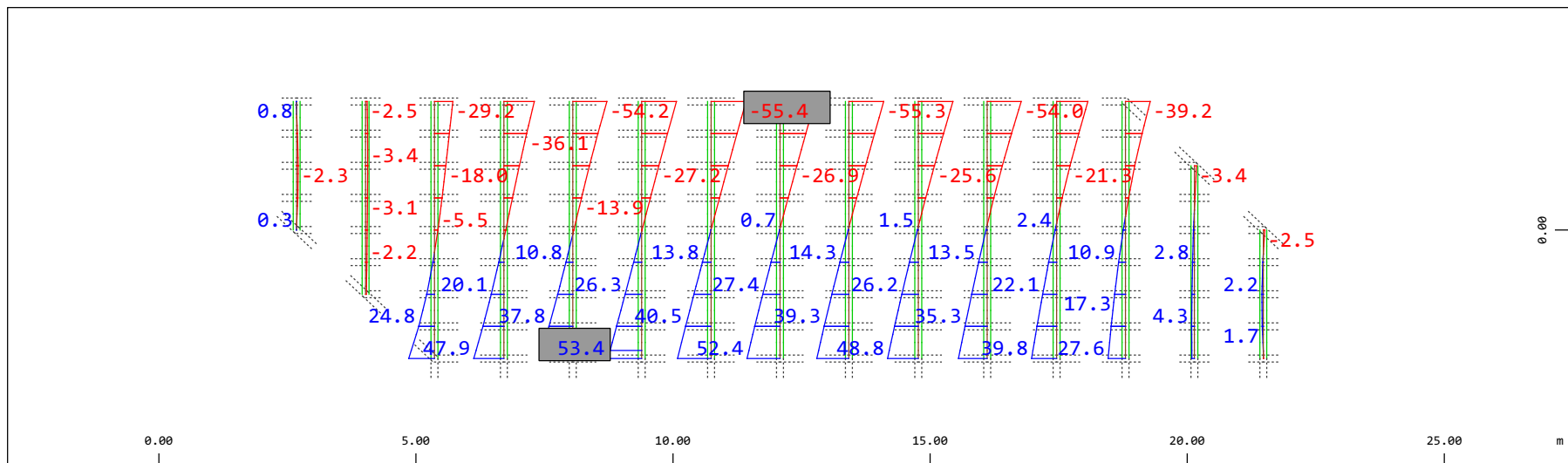
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 39.2 kN (Min=-3.56) (Max=25.7)

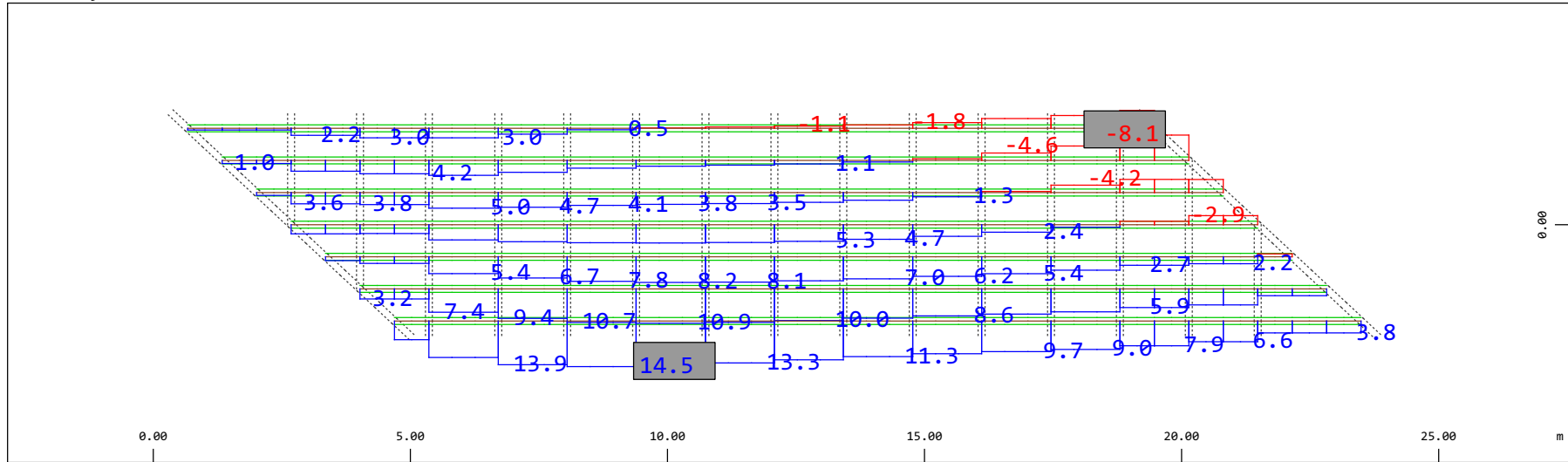
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-55.4) (Max=53.4)

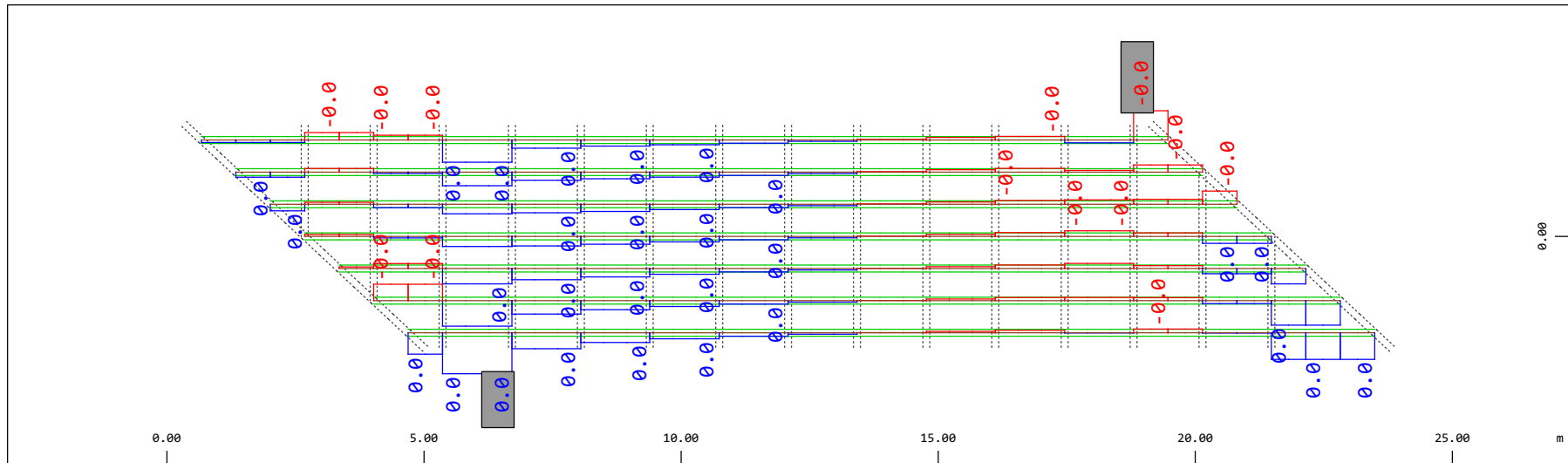
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 19.6 kN (Min=-8.07) (Max=14.5)

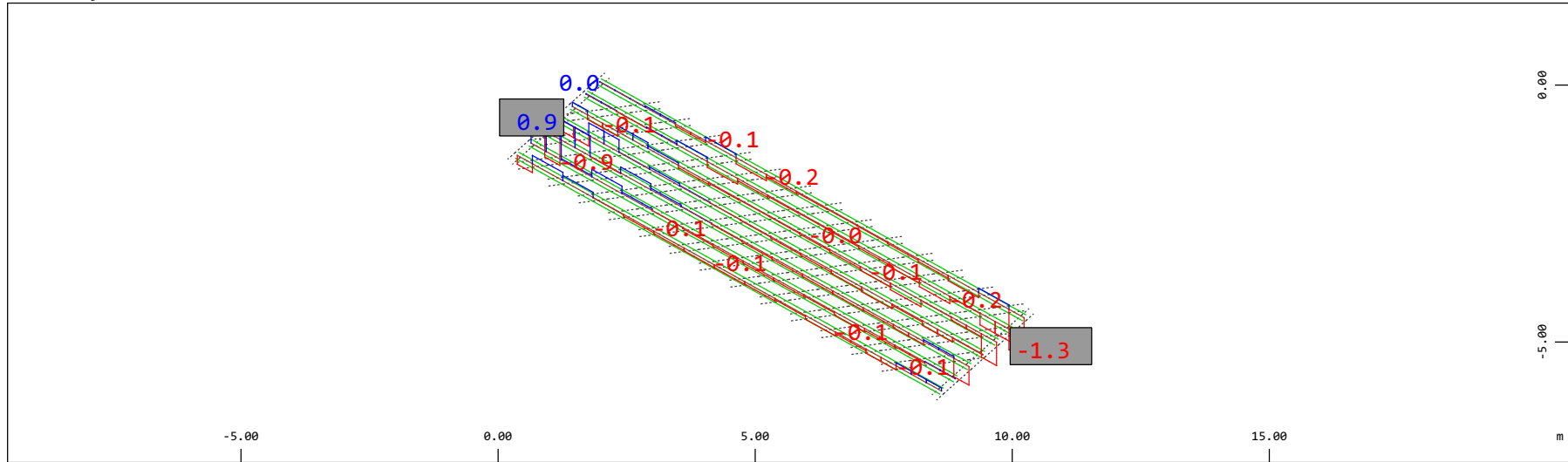
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 0.0020 kNm (Min=-9.3039e-04) (Max=0.0013)

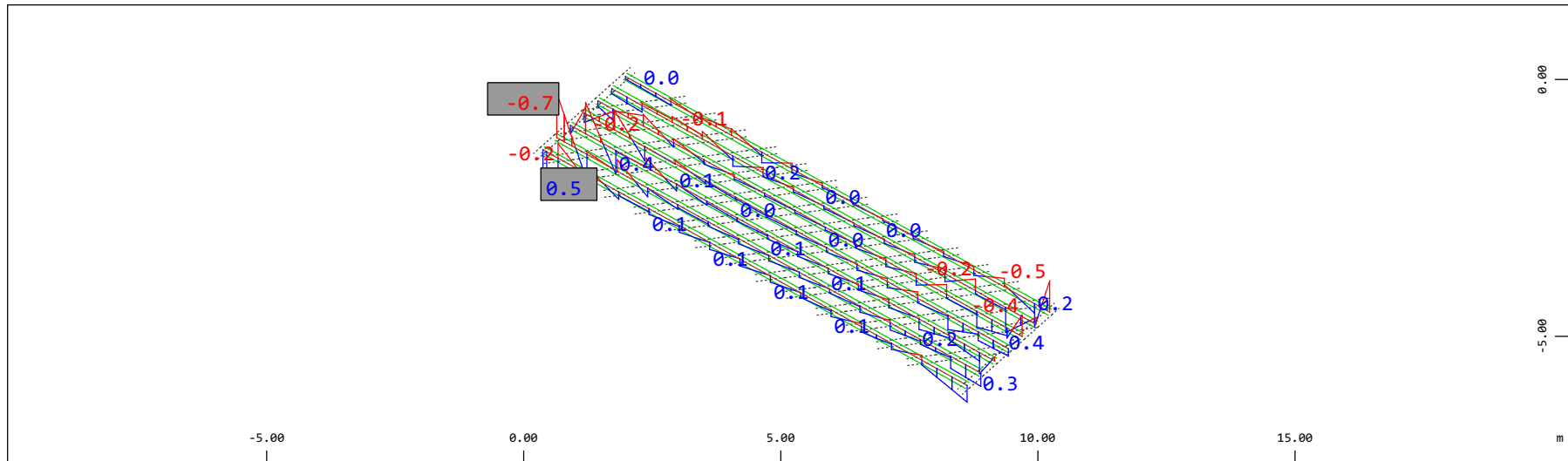
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force V_z , Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 1.96 kN (Min=-1.34) (Max=0.873)

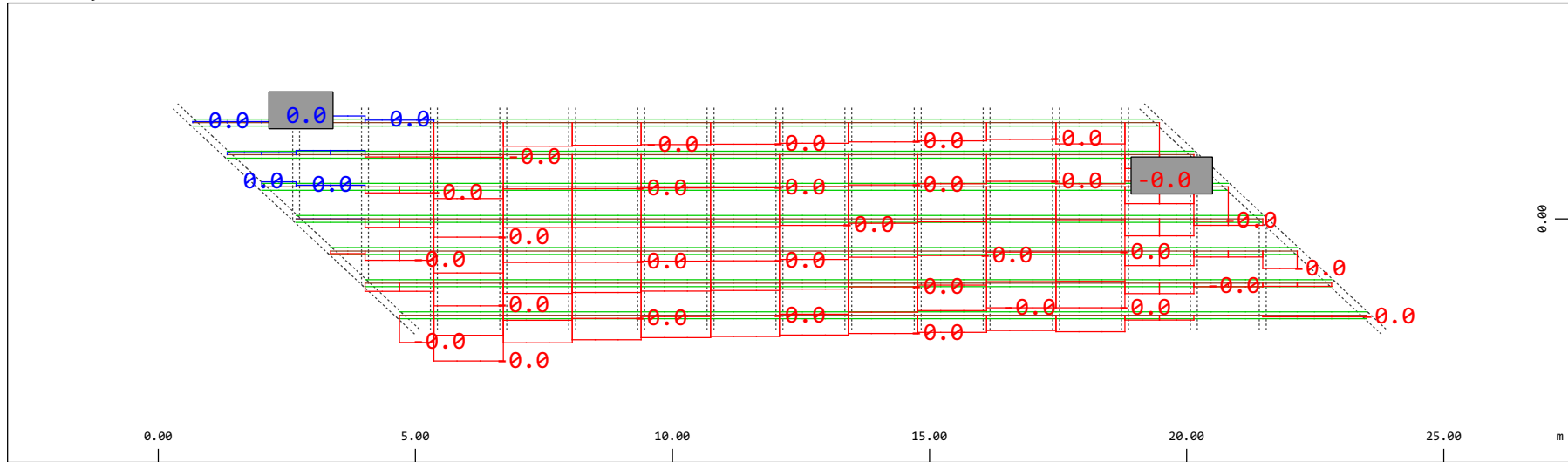
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment M_y , Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 0.980 kNm (Min=-0.736) (Max=0.474)

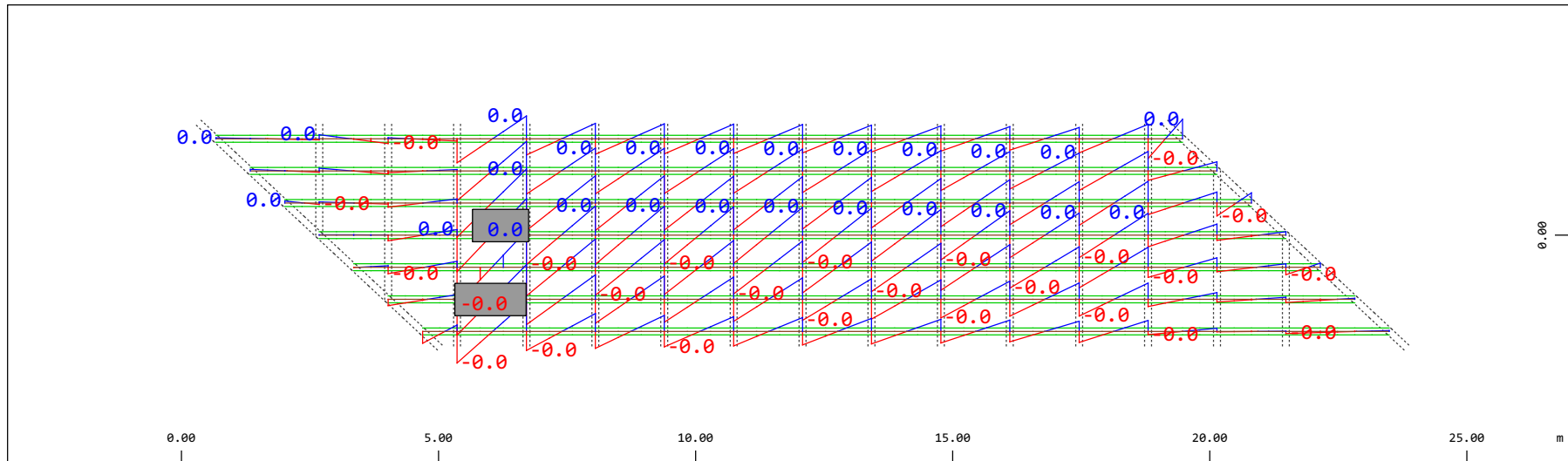
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Shear force Vy, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 0.0098 kN (Min=-0.0093) (Max=0.0011)

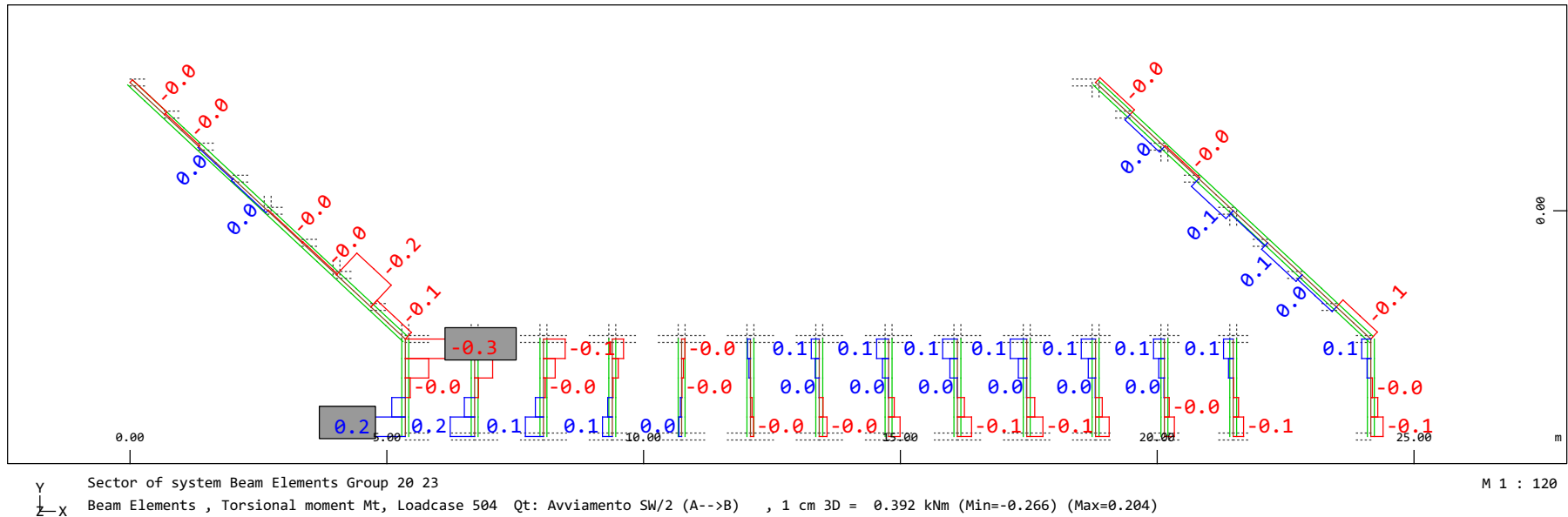
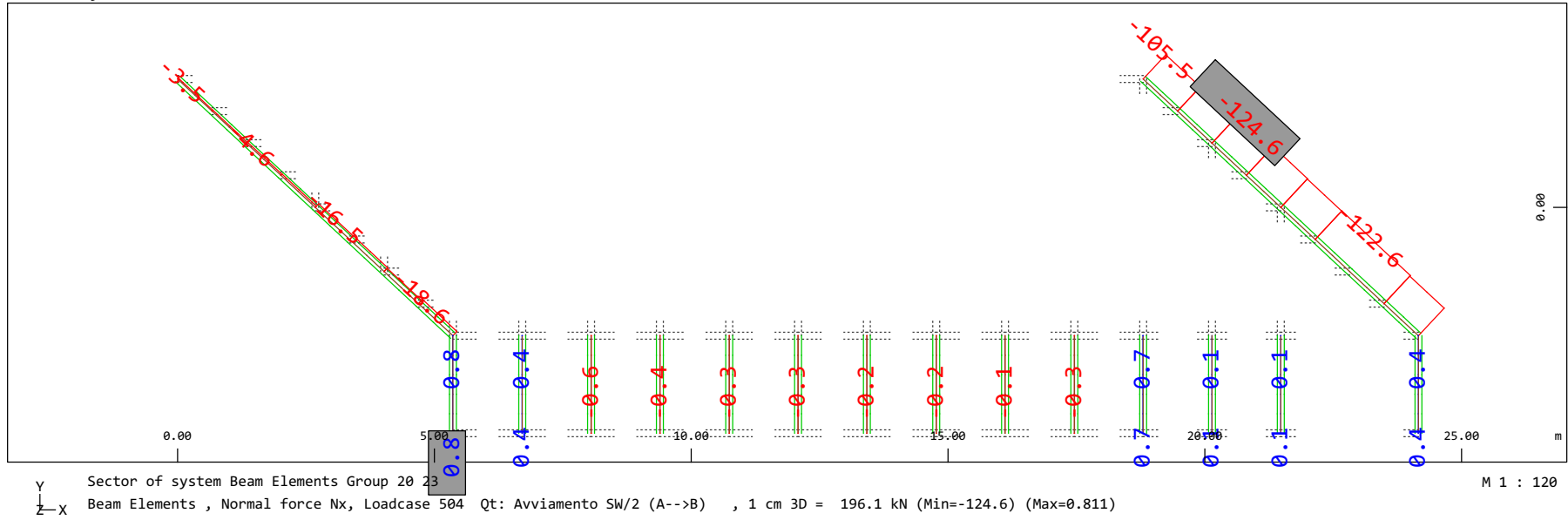
M 1 : 120



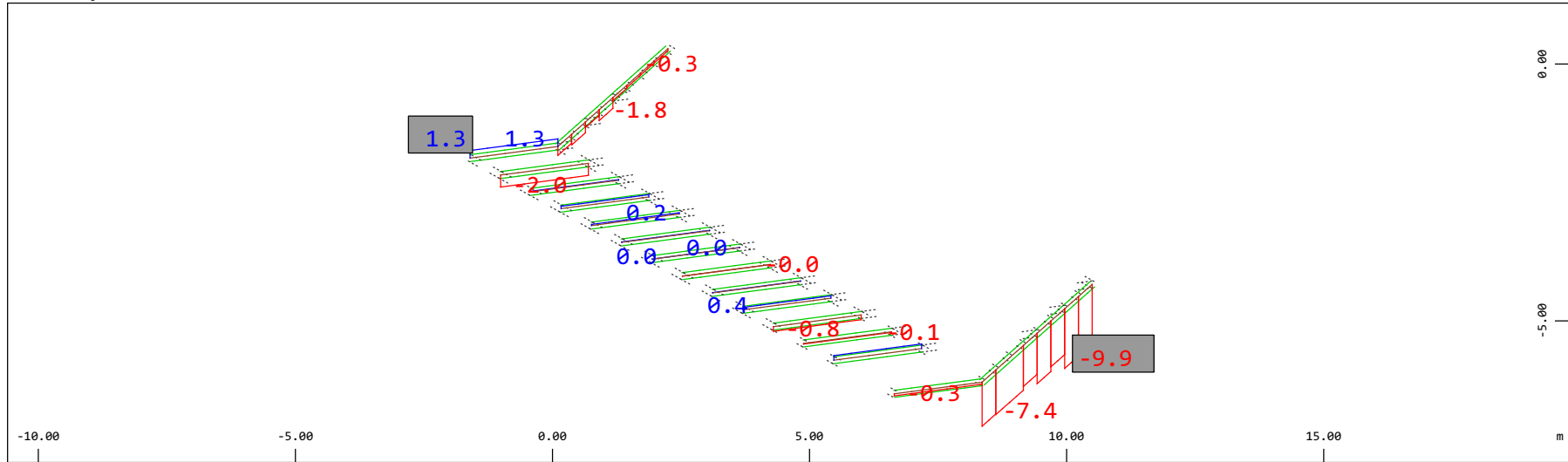
Sector of system Beam Elements Group 31...37
 Beam Elements , Bending moment Mz, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 0.0098 kNm (Min=-0.0059) (Max=0.0058)

M 1 : 120

Definition of Axis
 Results elementay loads

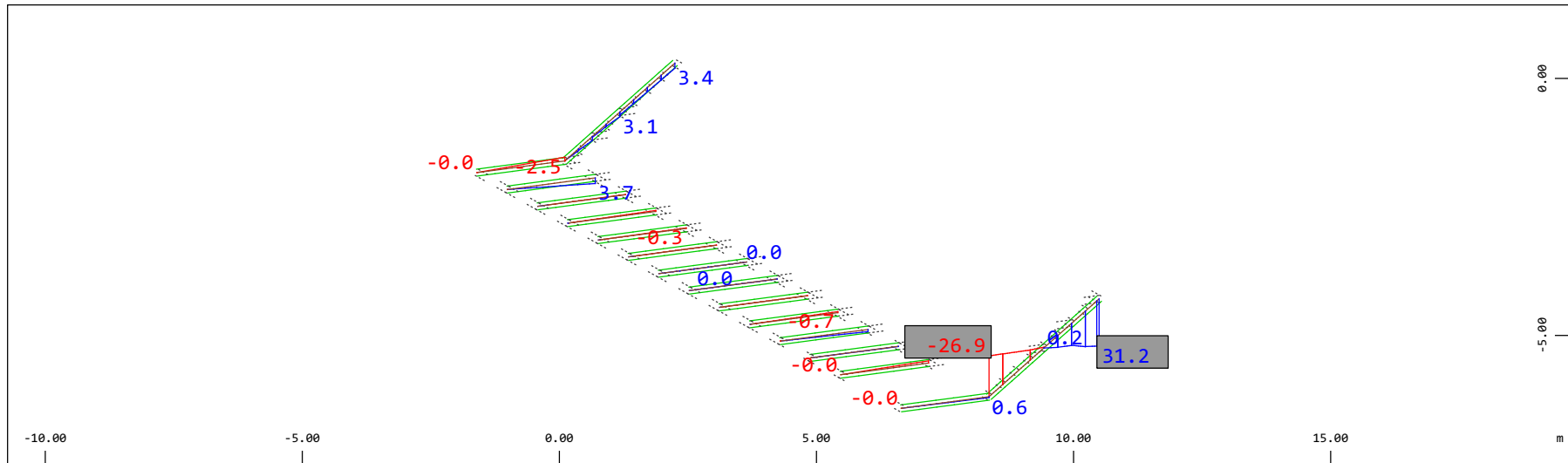


Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 9.80 kN (Min=-9.85) (Max=1.25)

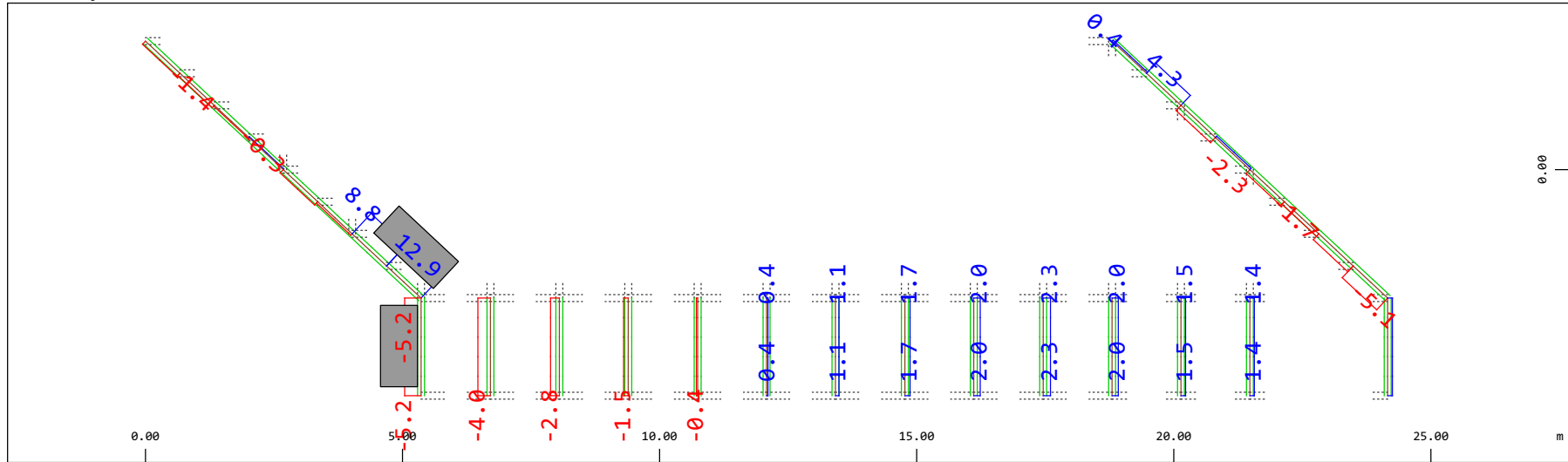
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 39.2 kNm (Min=-26.9) (Max=31.2)

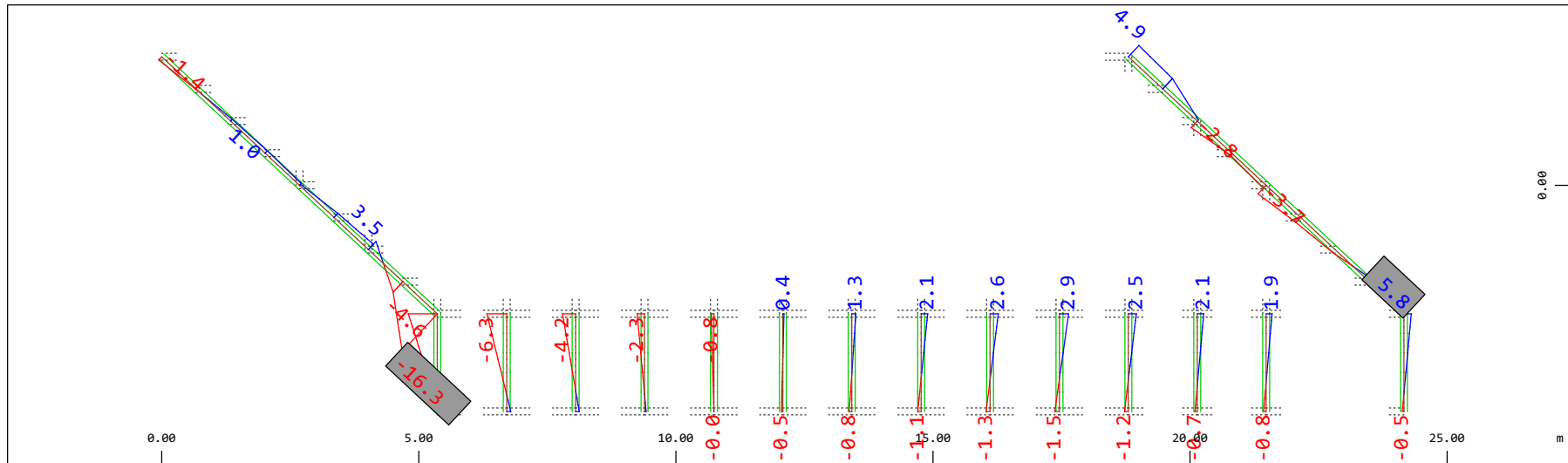
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 19.6 kN (Min=-5.21) (Max=12.9)

M 1 : 120

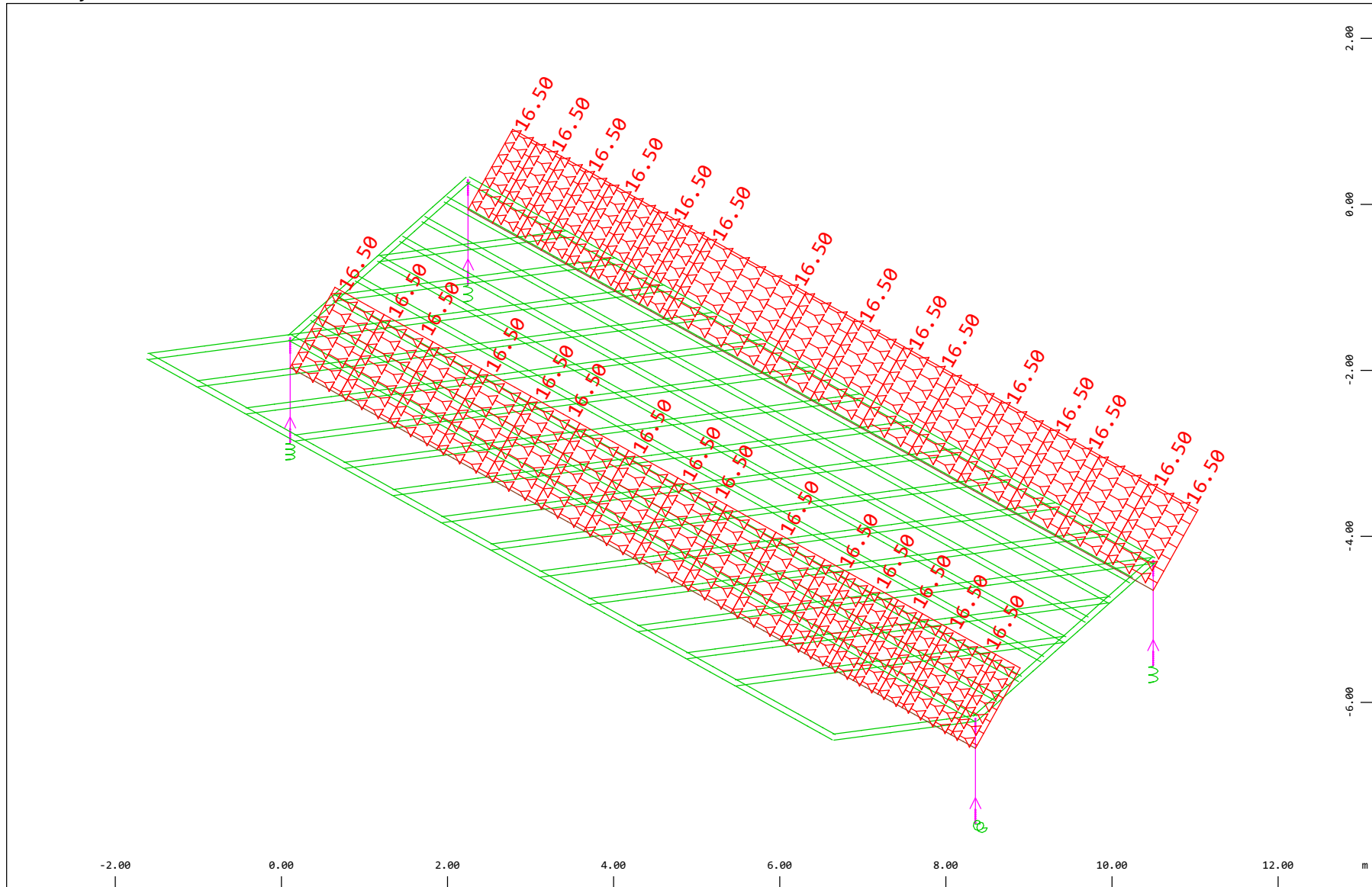


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 504 Qt: Avviamento SW/2 (A-->B) , 1 cm 3D = 19.6 kNm (Min=-16.3) (Max=5.79)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 Y
 X

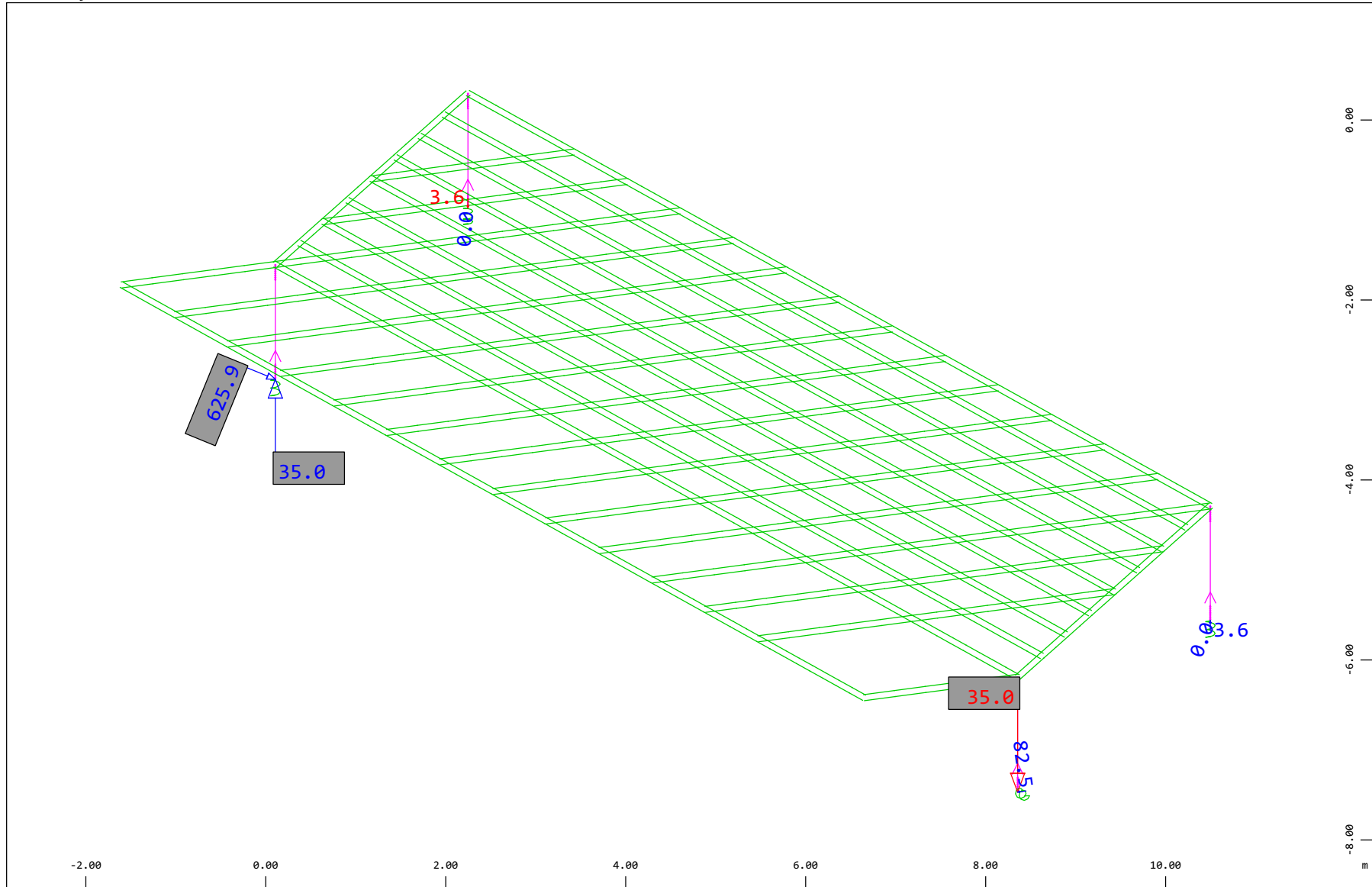
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=9.69 kN/m)
 (Min=-16.5) (Max=-16.5)



M 1 : 65
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X
 Y

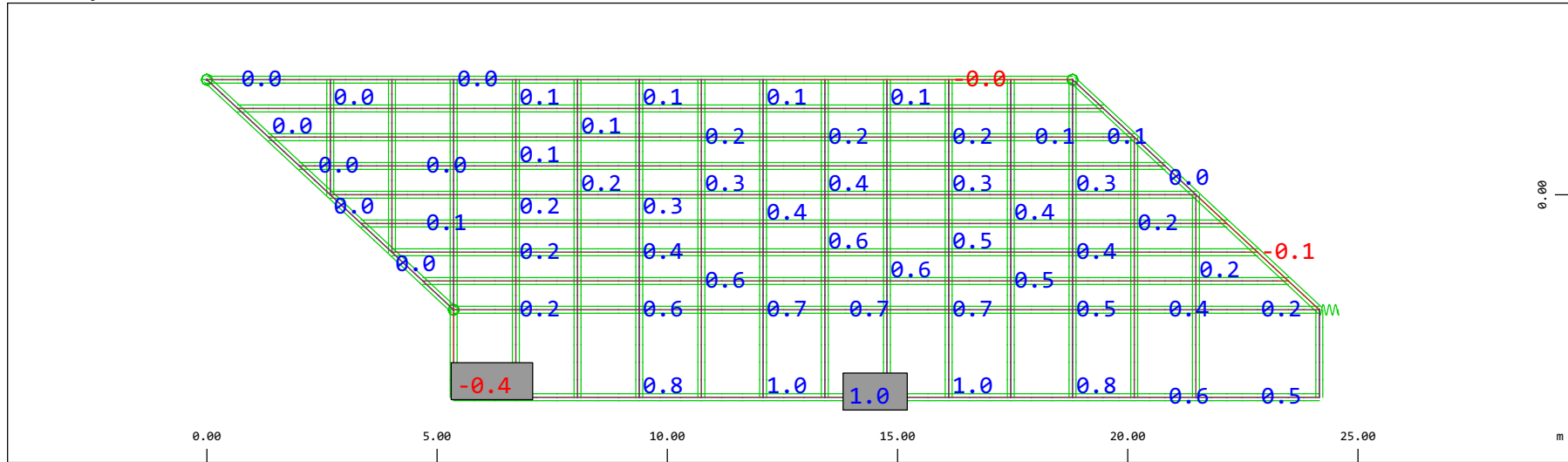
Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 19.4 kN
 0)

◁ (Min=-35.0) (Max=35.0) (total:

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

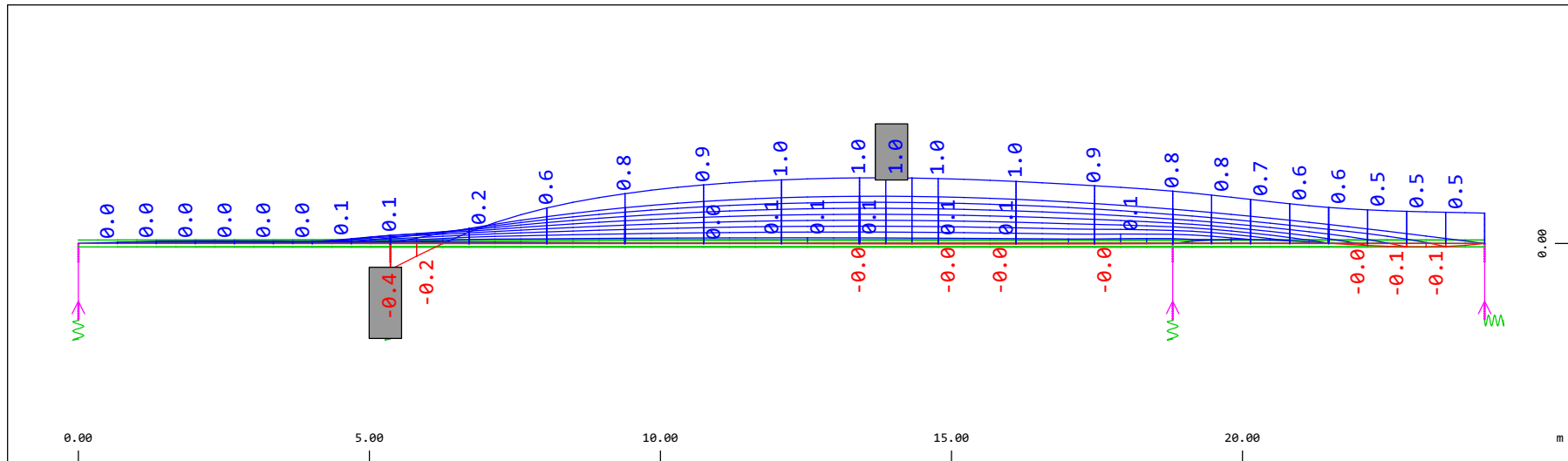
Definition of Axis
 Results elementay loads



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=1.03)

○, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 0.969 mm (Min=-0.408)

M 1 : 134

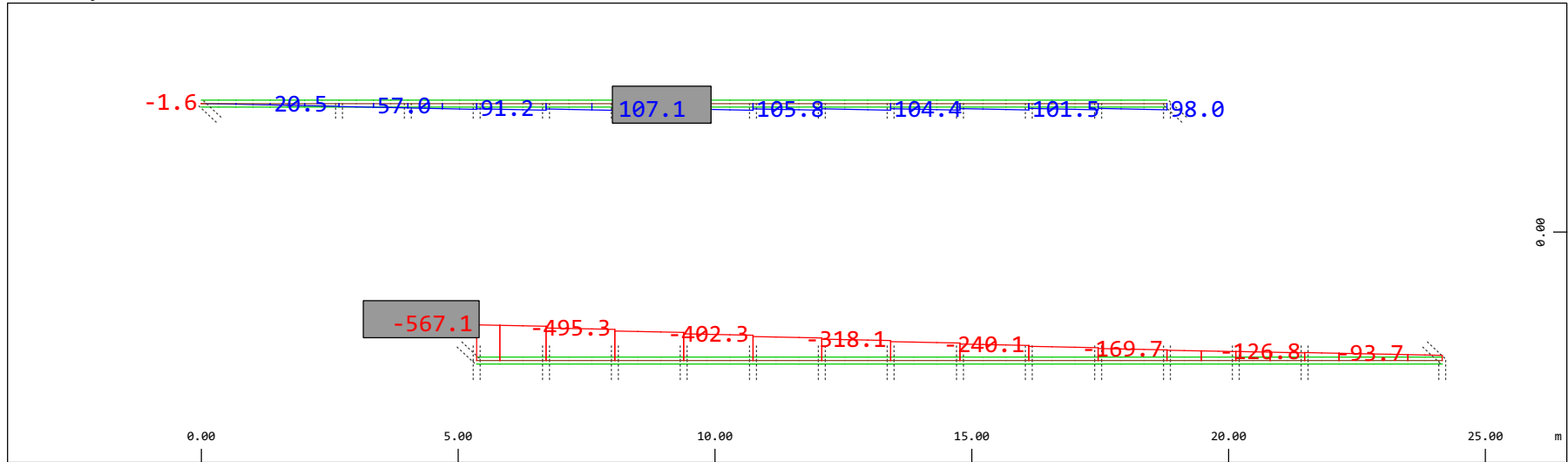


Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=1.03)

↑, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 0.969 mm (Min=-0.408)

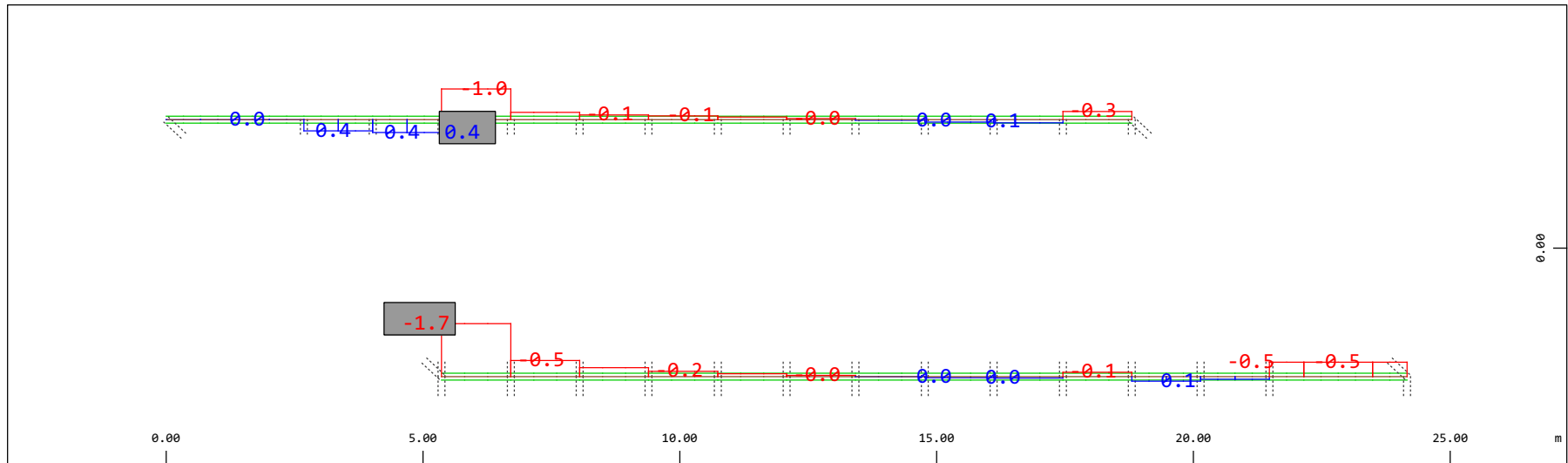
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 980.5 kN (Min=-567.1) (Max=107.1)

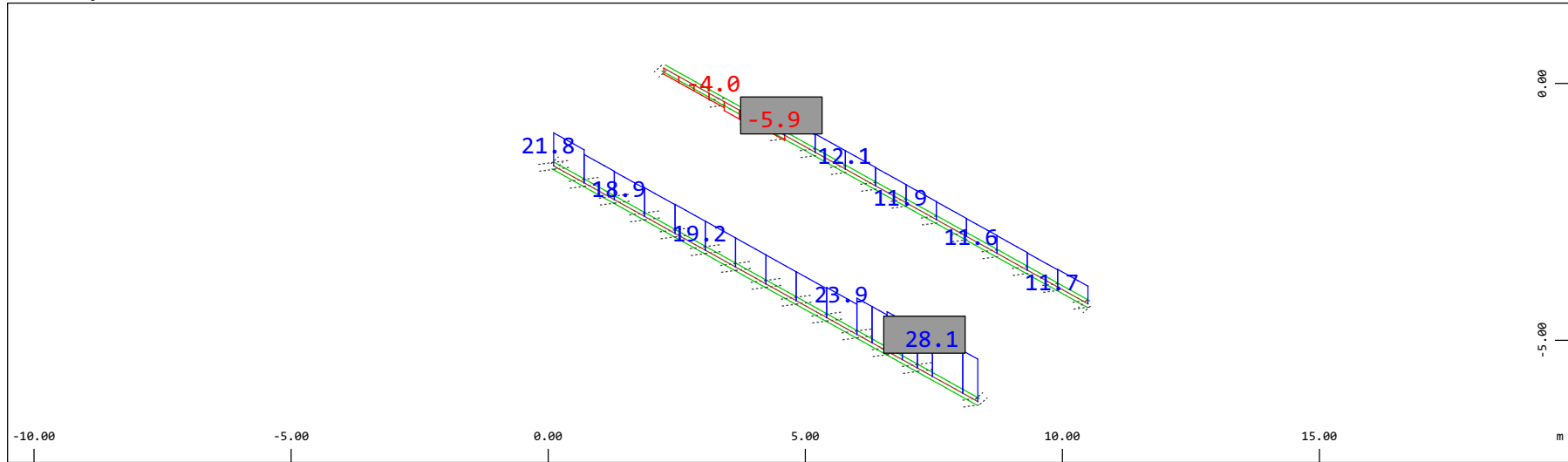
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 1.96 kNm (Min=-1.68) (Max=0.409)

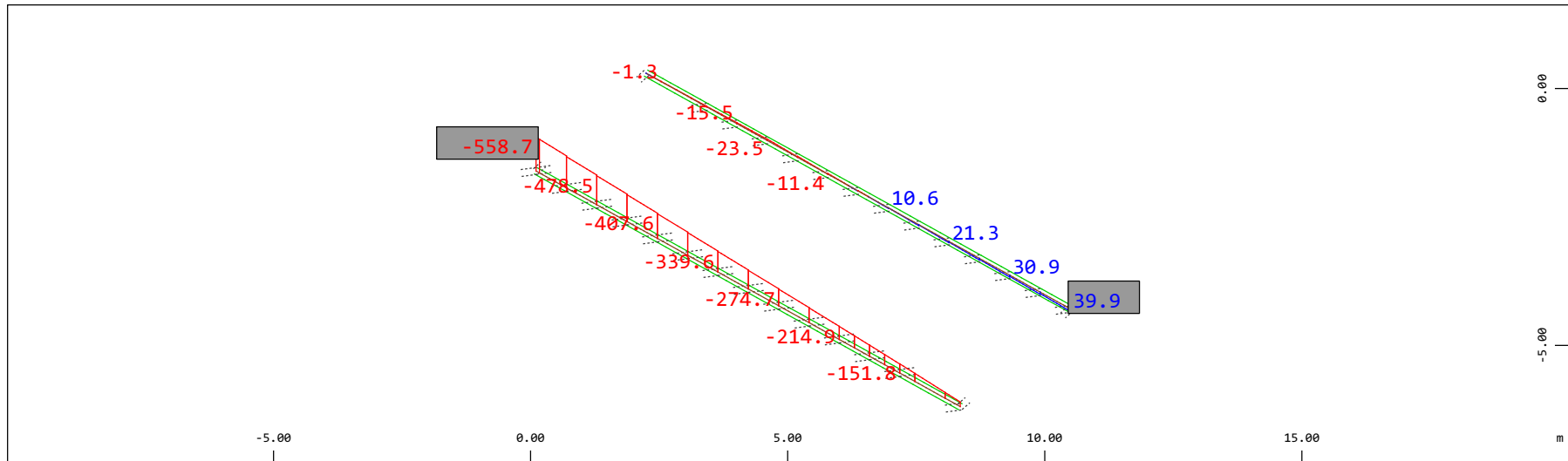
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vz, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 39.2 kN (Min=-5.89) (Max=28.1)

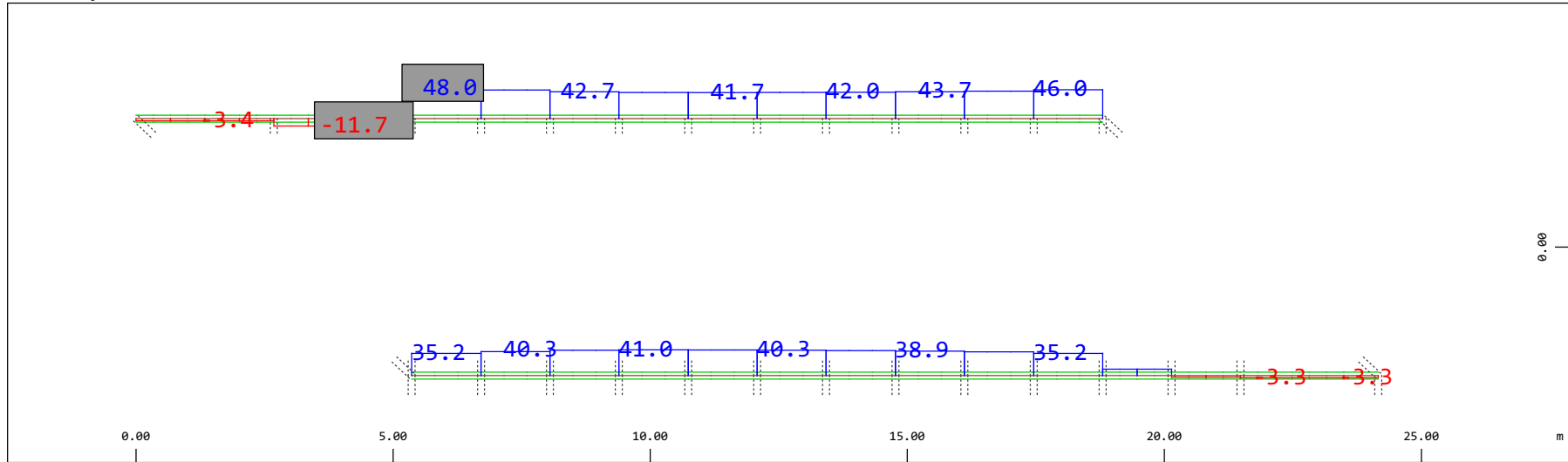
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment My, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 980.5 kNm (Min=-558.7) (Max=39.9)

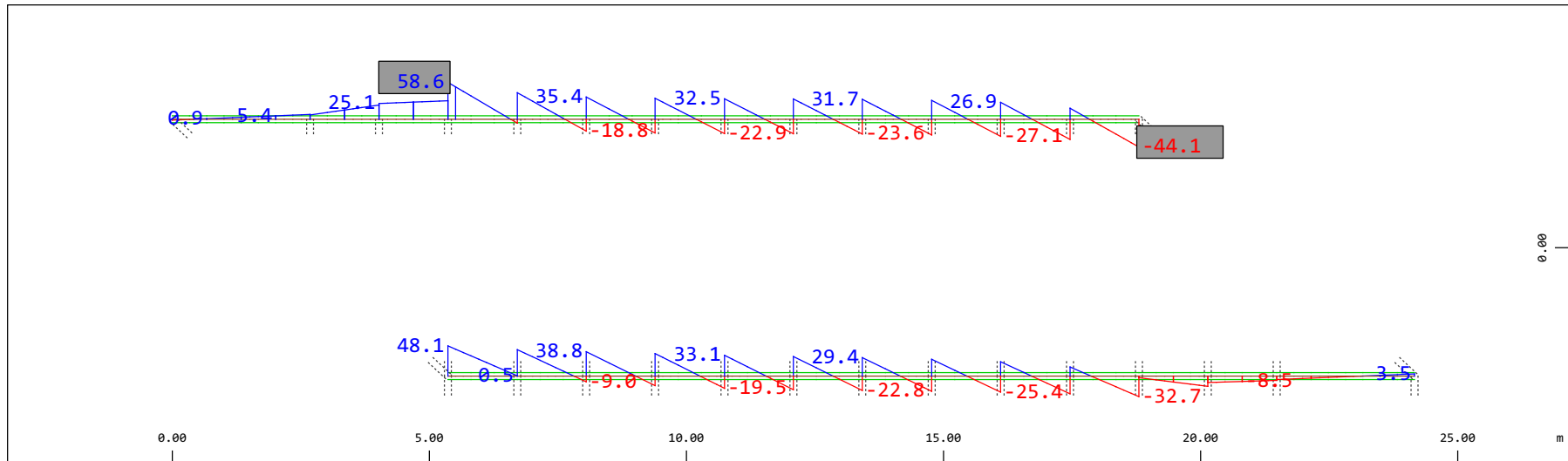
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 98.0 kN (Min=-11.7) (Max=48.0)

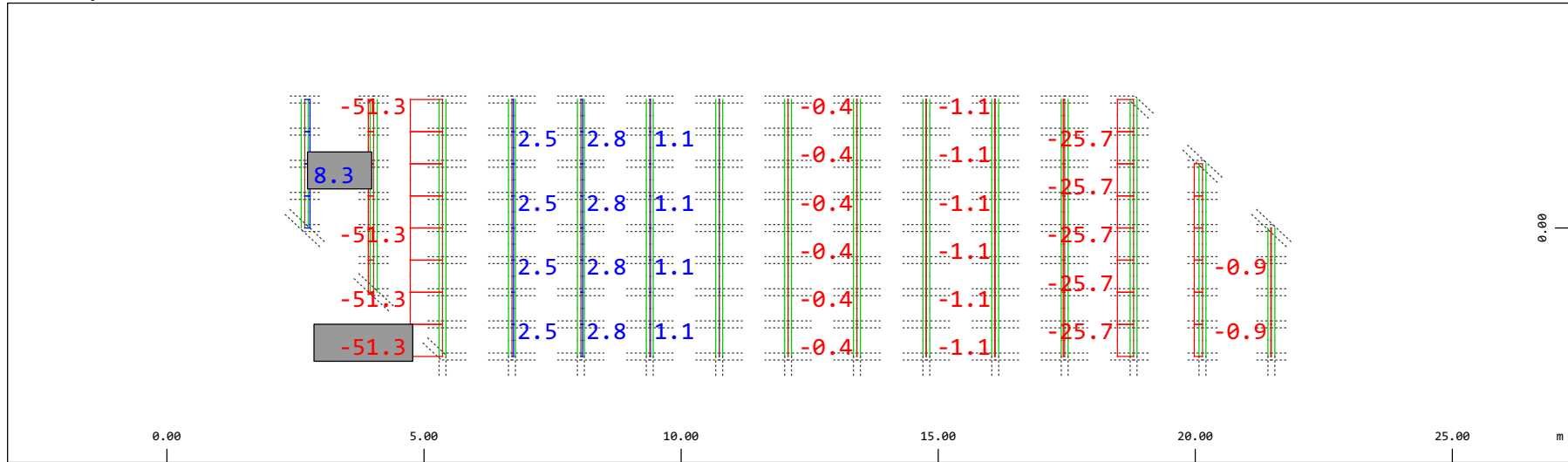
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-44.1) (Max=58.6)

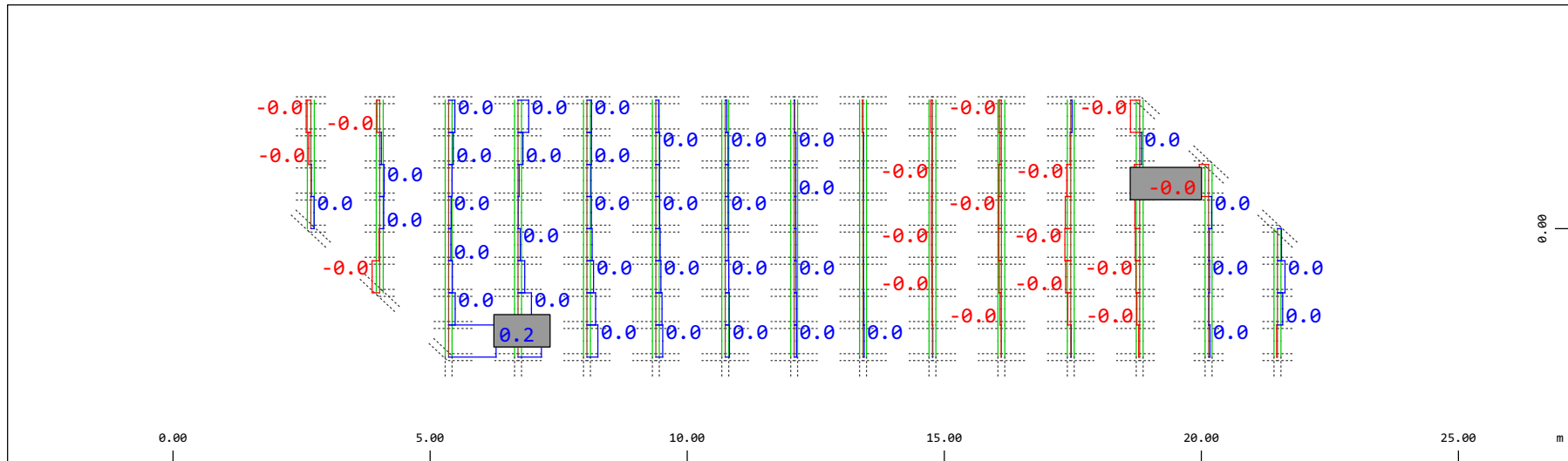
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 98.0 kN (Min=-51.3) (Max=8.32)

M 1 : 120

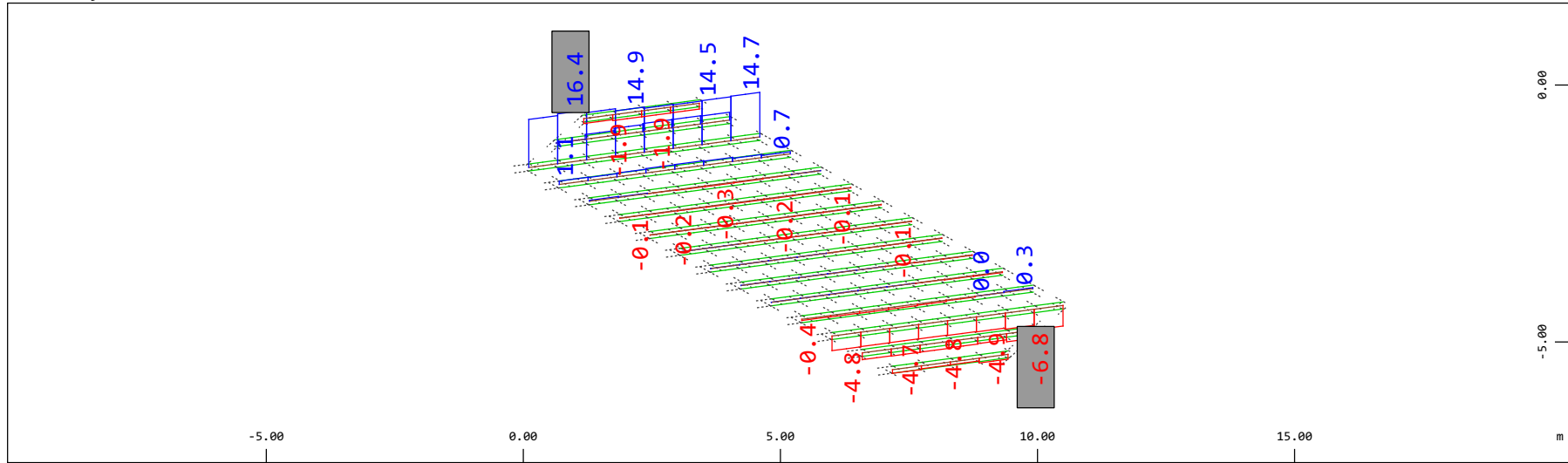


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 0.196 kNm (Min=-0.0294) (Max=0.151)

M 1 : 120

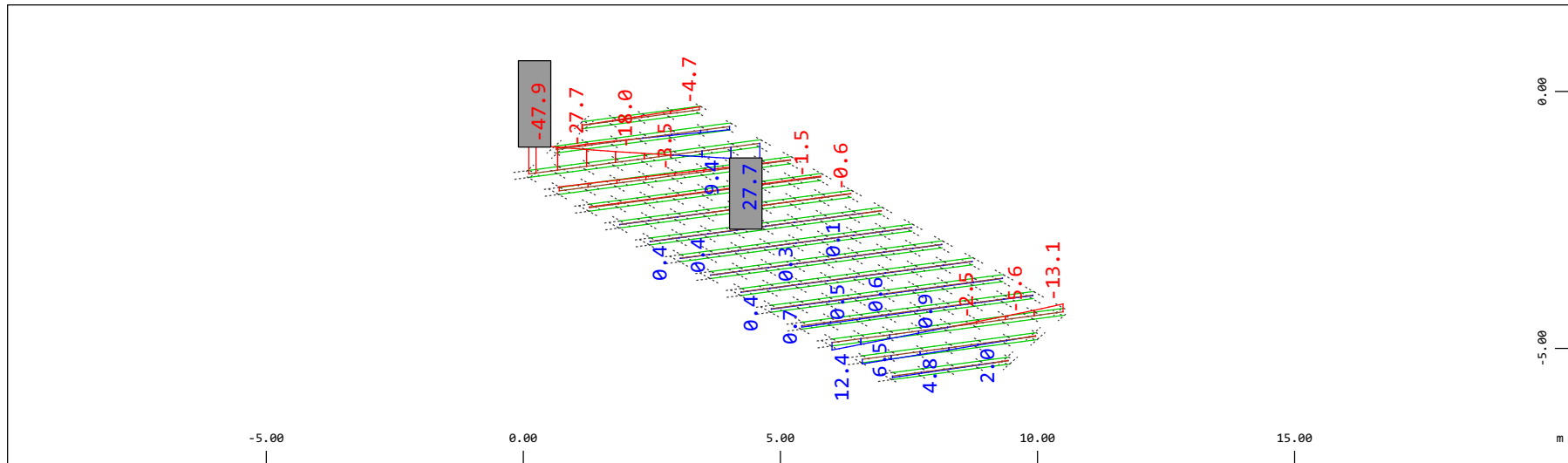
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 19.6 kN (Min=-6.79) (Max=16.4)

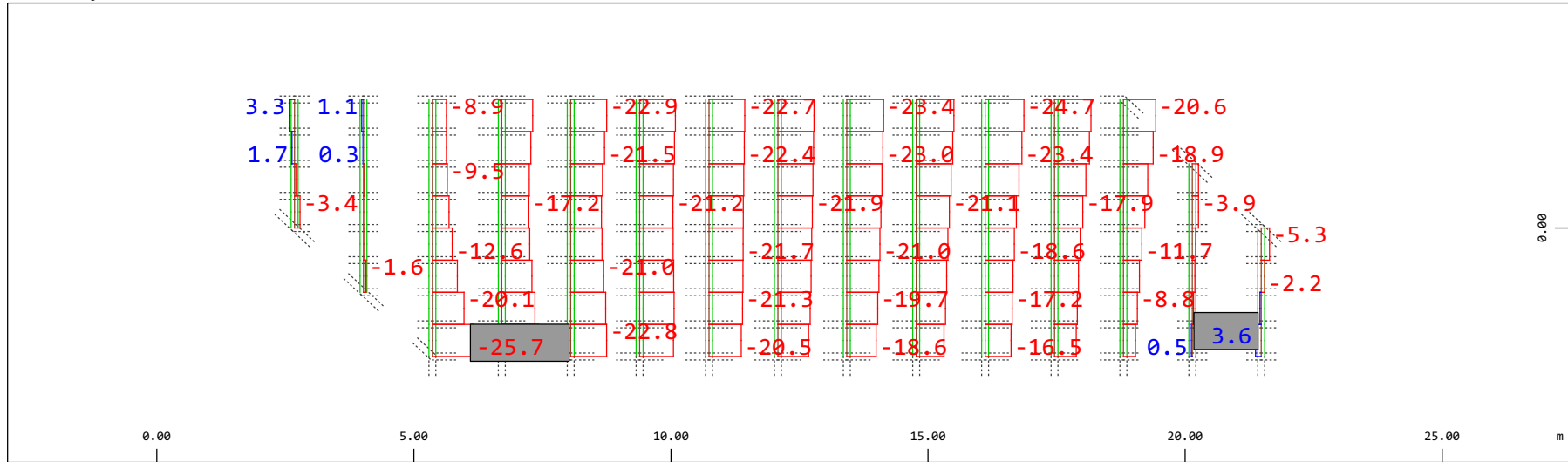
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-47.9) (Max=27.7)

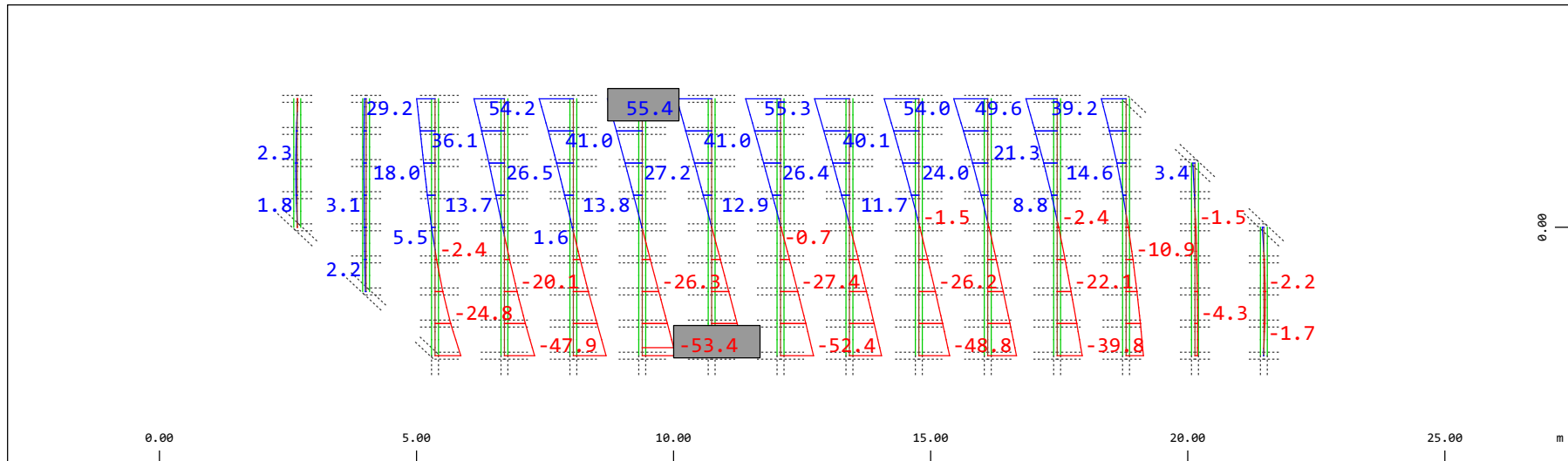
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 39.2 kN (Min=-25.7) (Max=3.56)

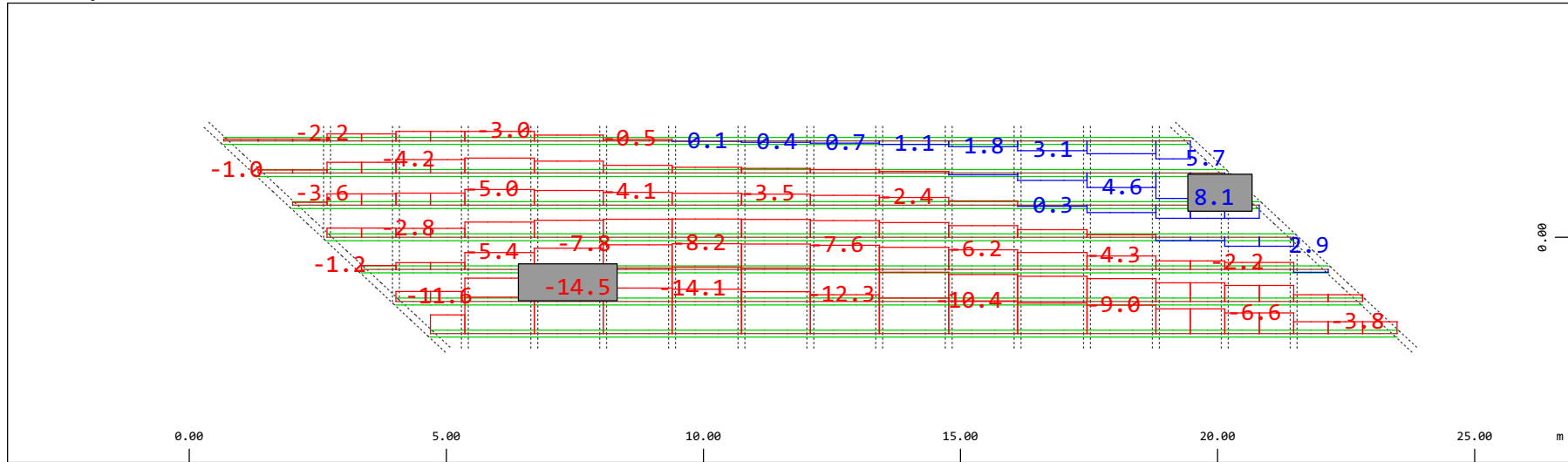
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-53.4) (Max=55.4)

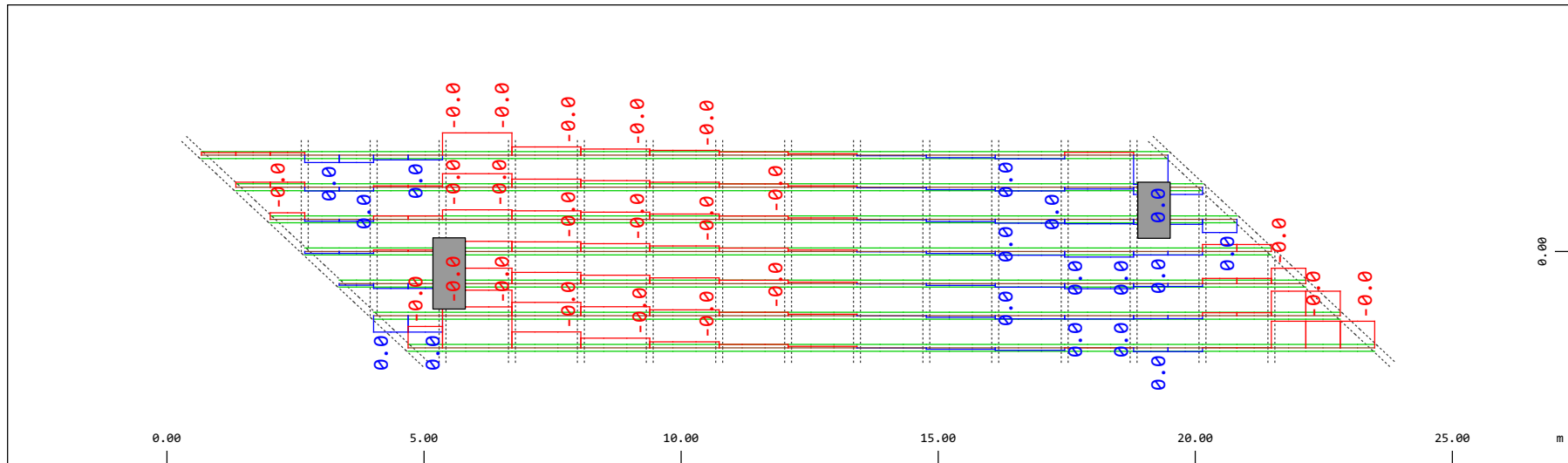
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 19.6 kN (Min=-14.5) (Max=8.07)

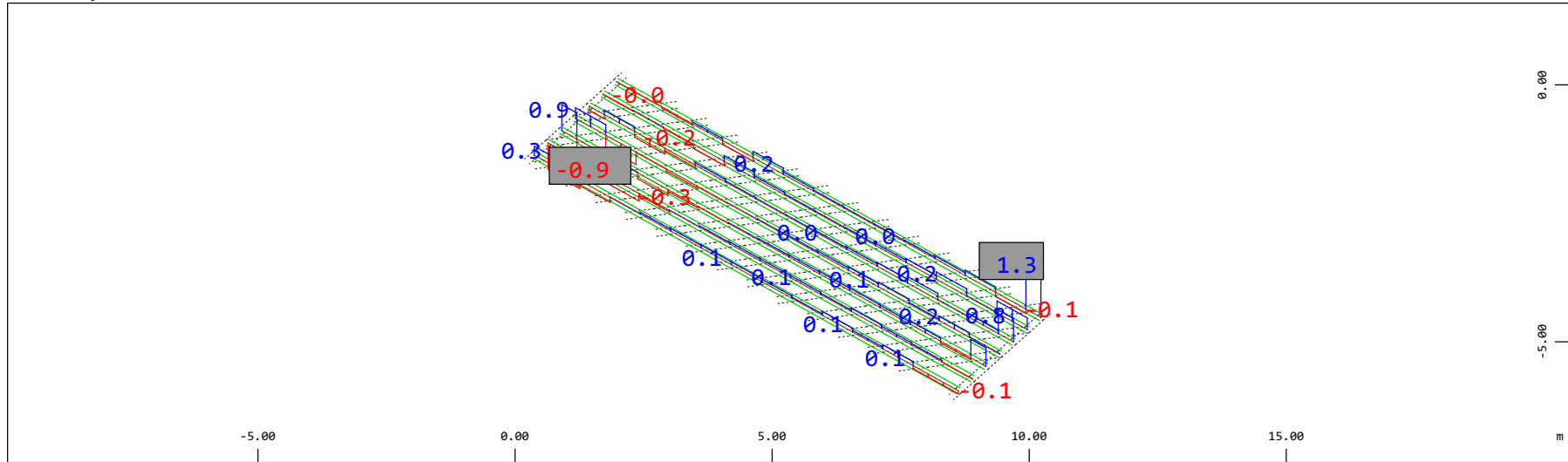
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 0.0020 kNm (Min=-0.0013) (Max= 9.3039e-04)

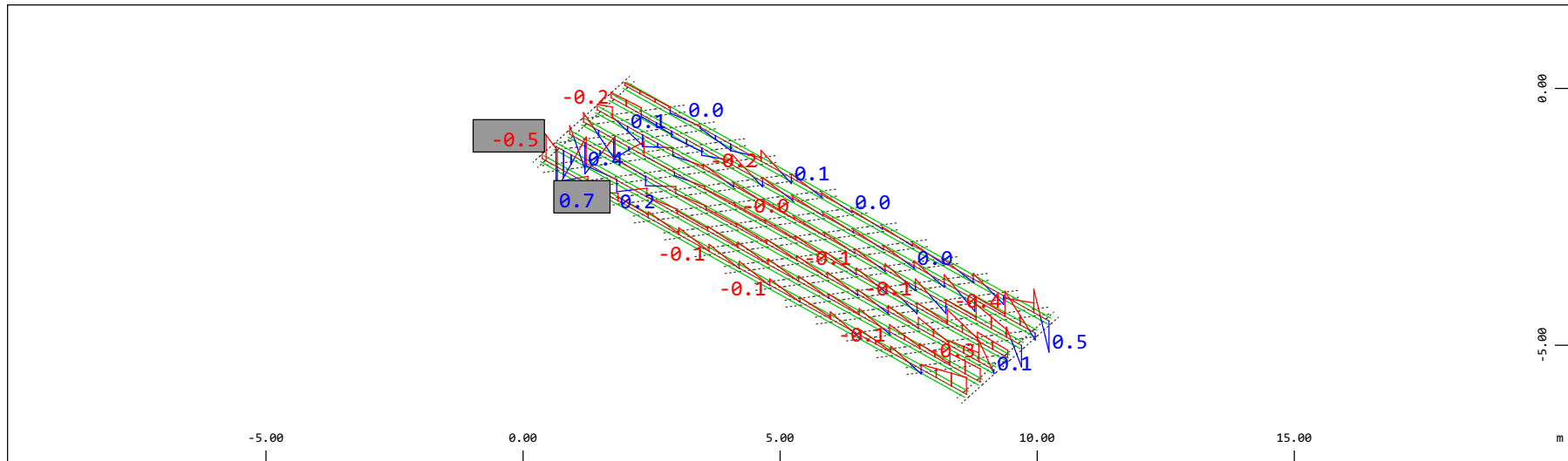
M 1 : 120

Definition of Axis
Results elementay loads



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Shear force Vz, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 1.96 kN (Min=-0.873) (Max=1.34)

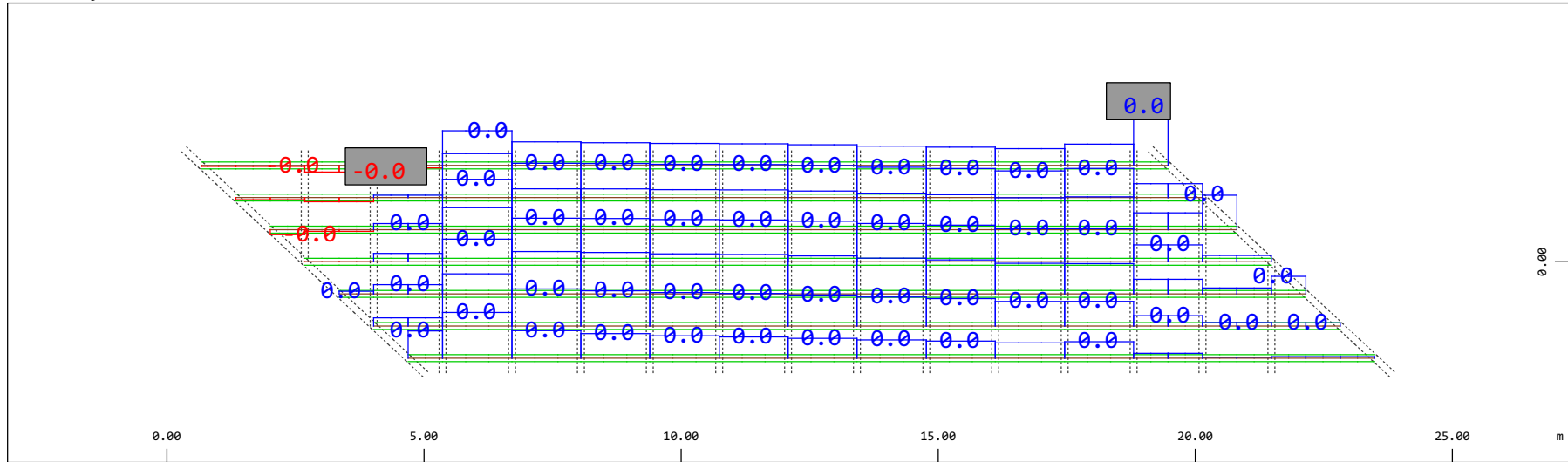
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Bending moment My, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 0.980 kNm (Min=-0.474) (Max=0.736)

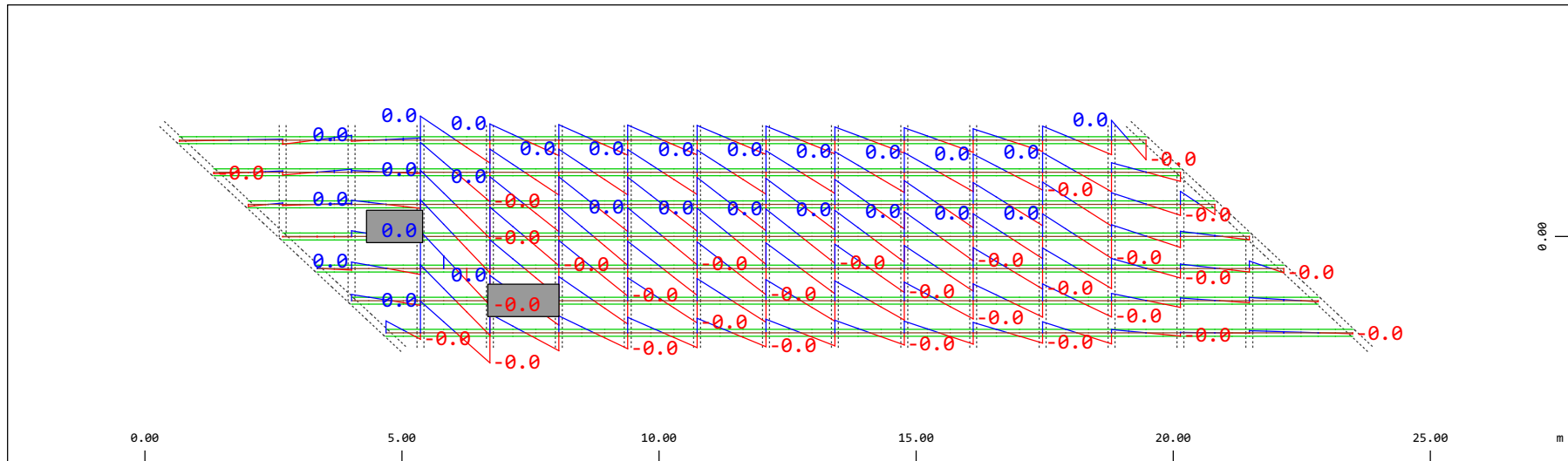
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 31...37
 Beam Elements , Shear force V_y , Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 0.0098 kN (Min=-0.0011) (Max=0.0093)

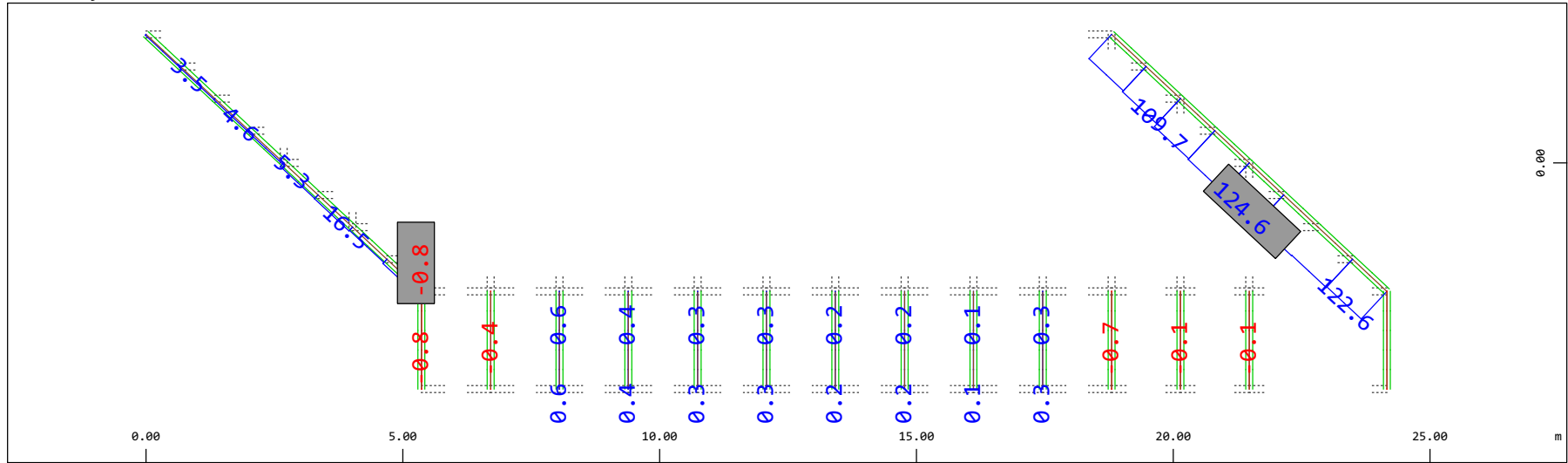
M 1 : 120



Sector of system Beam Elements Group 31...37
 Beam Elements , Bending moment M_z , Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 0.0098 kNm (Min=-0.0058) (Max=0.0059)

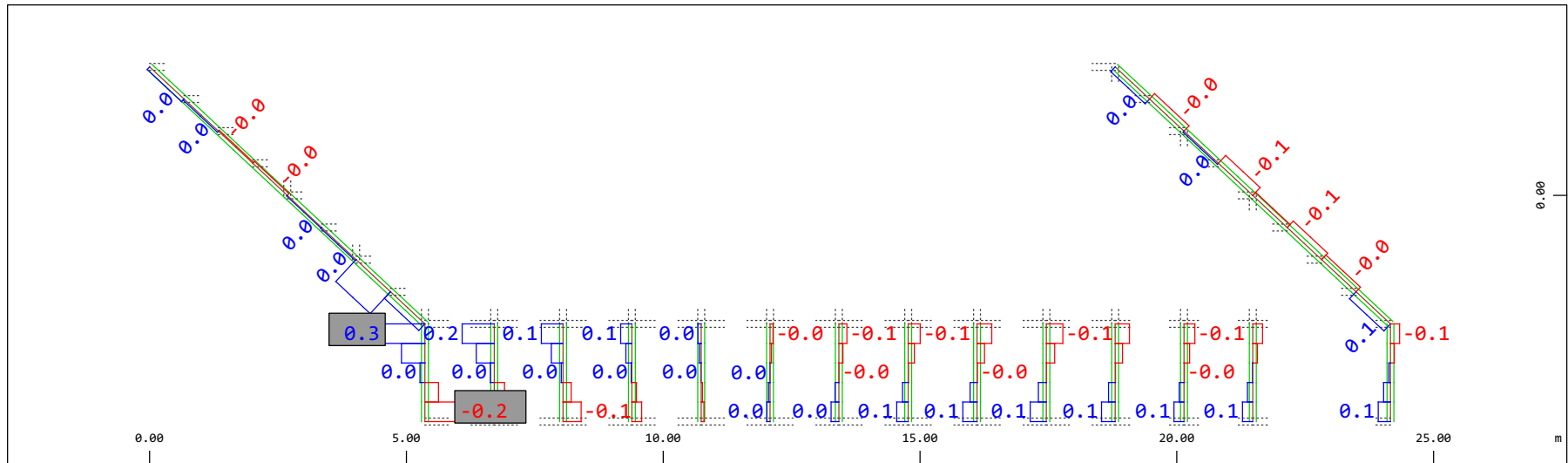
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 196.1 kN (Min=-0.811) (Max=124.6)

M 1 : 120

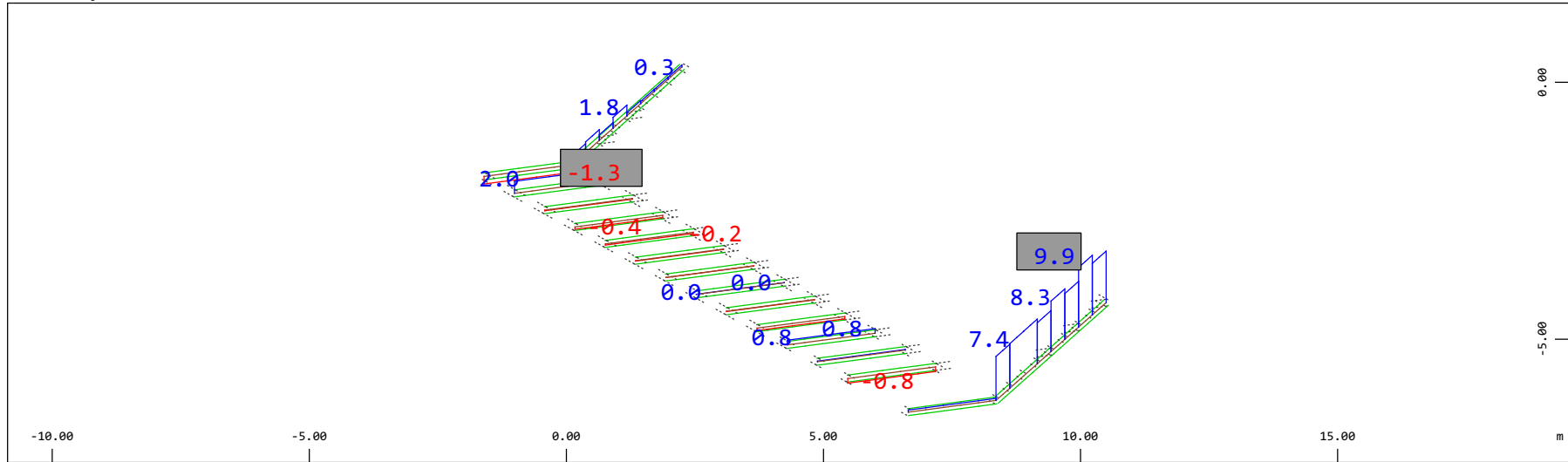


Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 0.392 kNm (Min=-0.204) (Max=0.266)

M 1 : 120

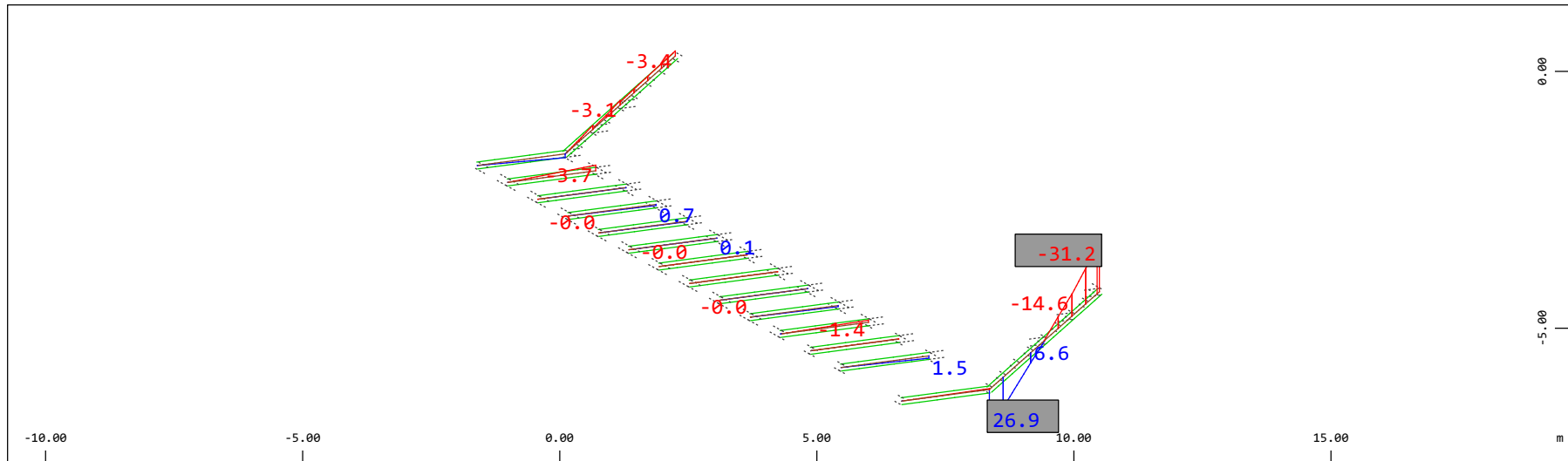
Definition of Axis

Results elementary loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 9.80 kN (Min=-1.25) (Max=9.85)

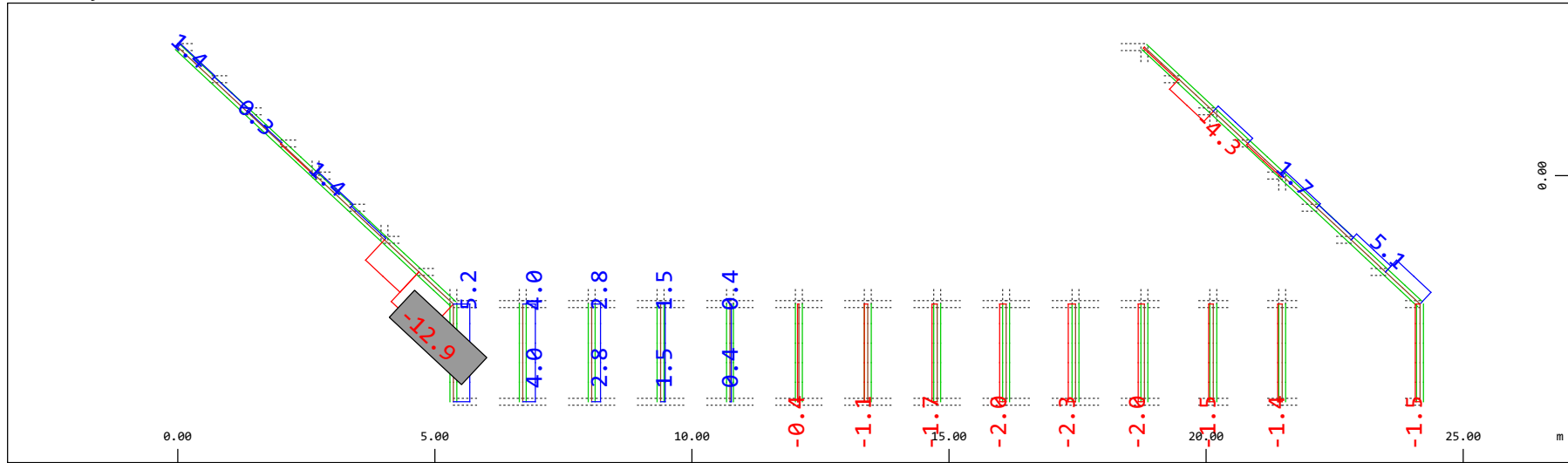
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 39.2 kNm (Min=-31.2) (Max=26.9)

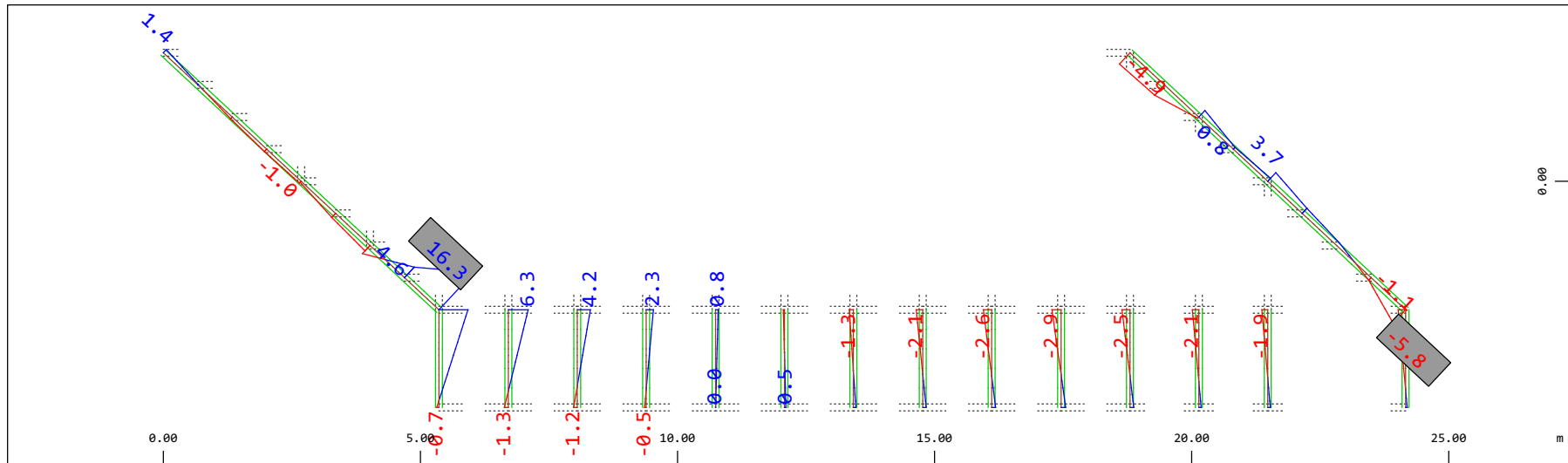
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 19.6 kN (Min=-12.9) (Max=5.21)

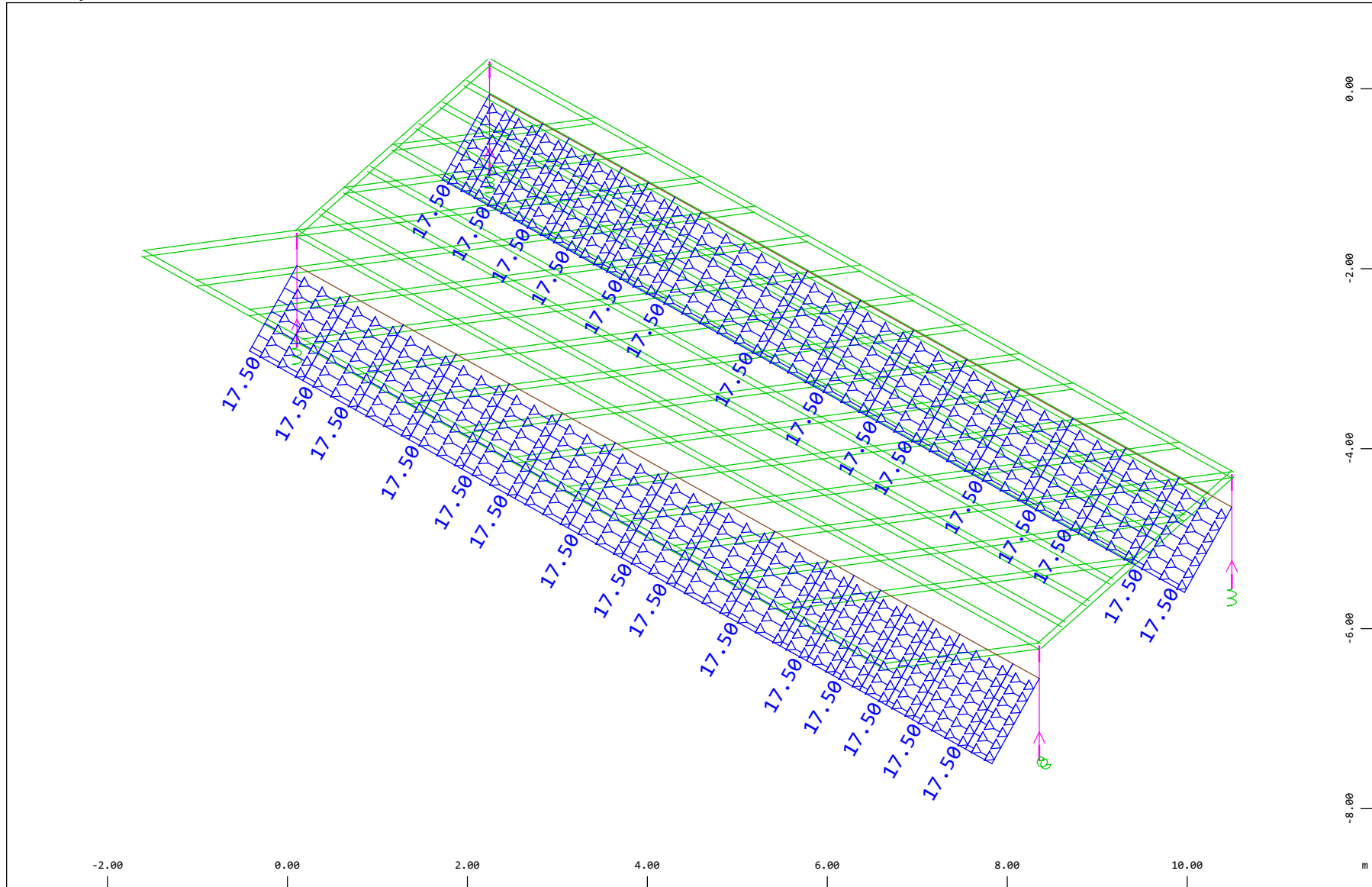
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 505 Qt: Avviamento SW/2 (B-->A) , 1 cm 3D = 19.6 kNm (Min=-5.79) (Max=16.3)

M 1 : 120

Definition of Axis
Results elementay loads



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Z
X Y

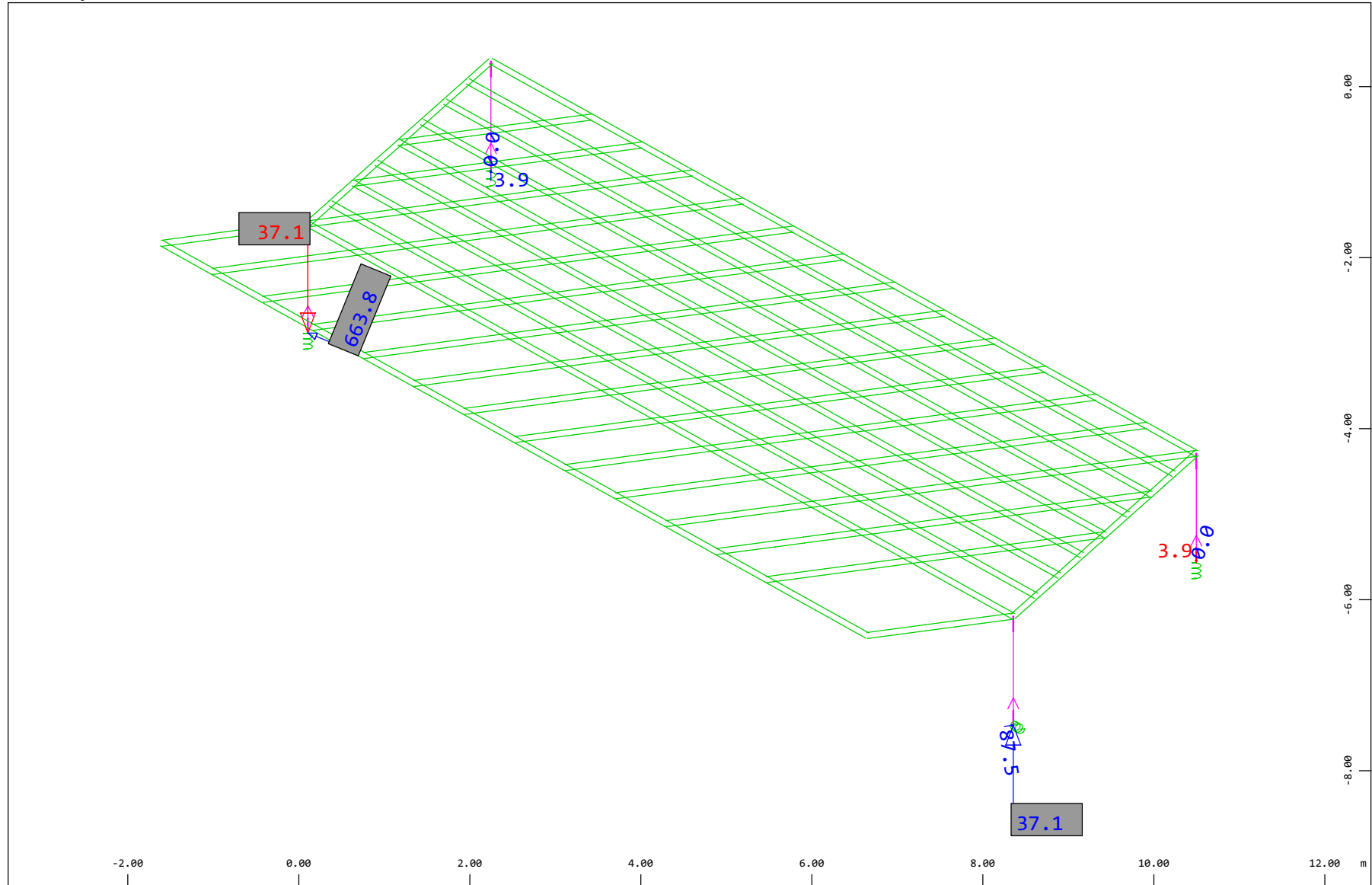
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
All loads, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=9.69 kN/m
(Max=17.5)



M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 19.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 484.4 kN

△ (Min=-37.1) (Max=37.1) (total: 0)

△ (Max=663.8)

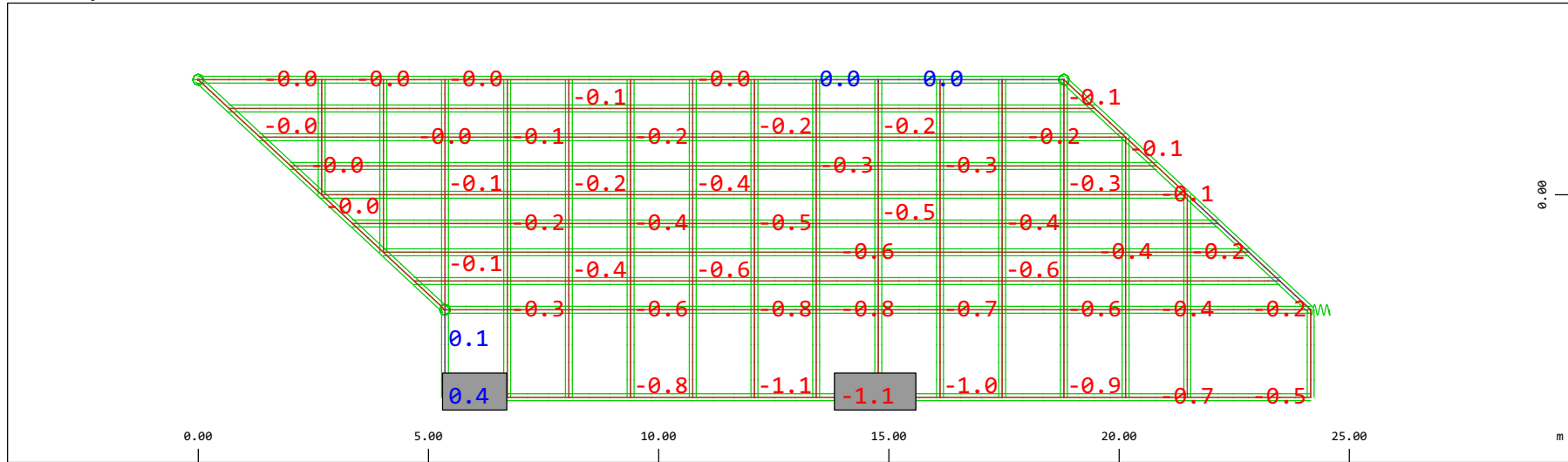
M 1 : 63

X * 0.502

Y * 0.906

Z * 0.962

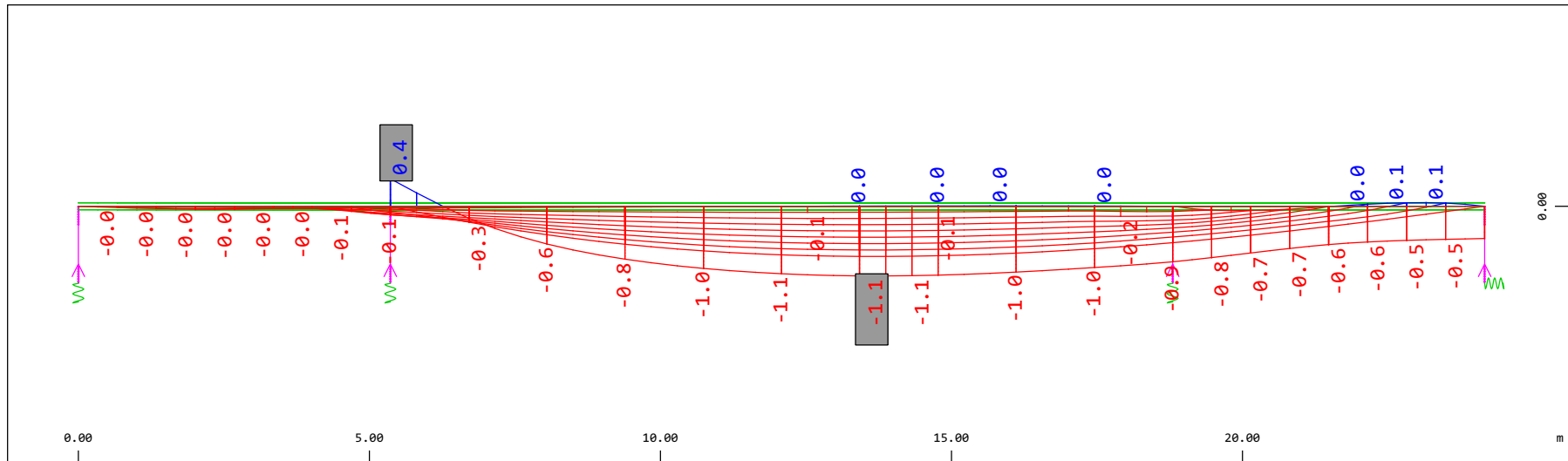
Definition of Axis
 Results elementay loads



Y
 X
 Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=0.433)

○, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 0.969 mm (Min=-1.09)

M 1 : 134

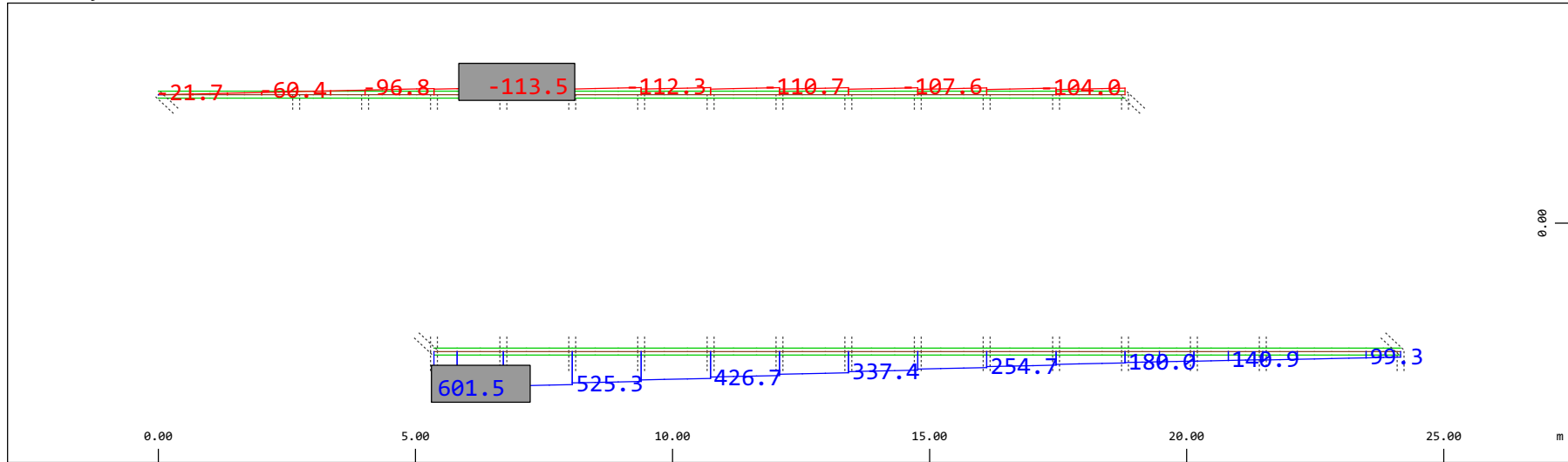


Z
 X
 Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=0.433)

⬆, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 0.969 mm (Min=-1.09)

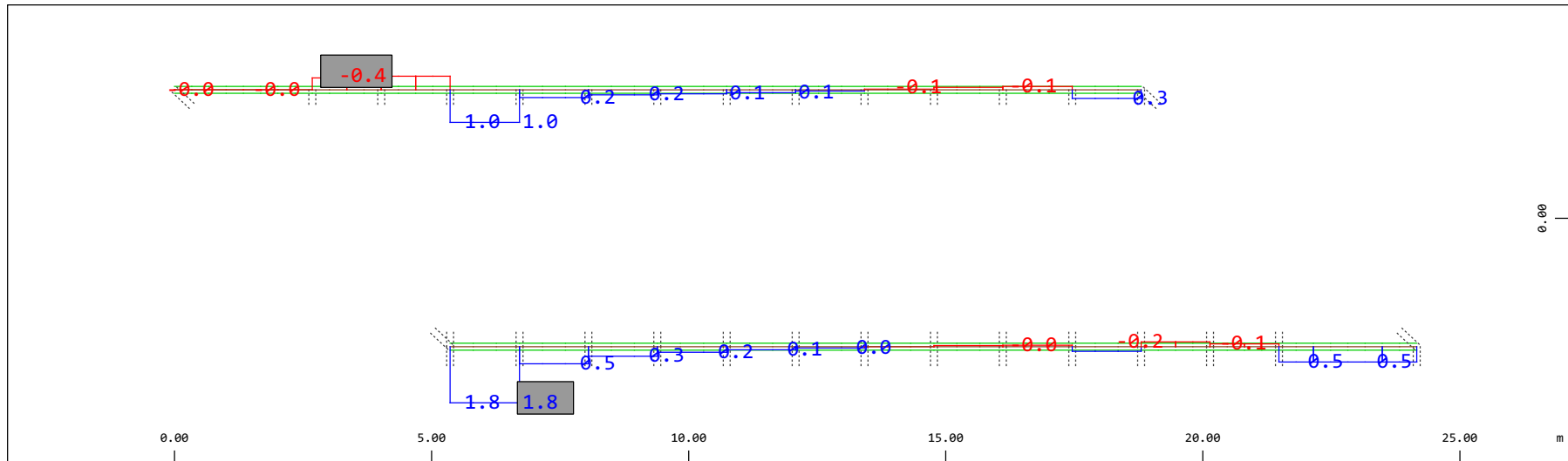
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 980.5 kN (Min=-113.5) (Max=601.5)

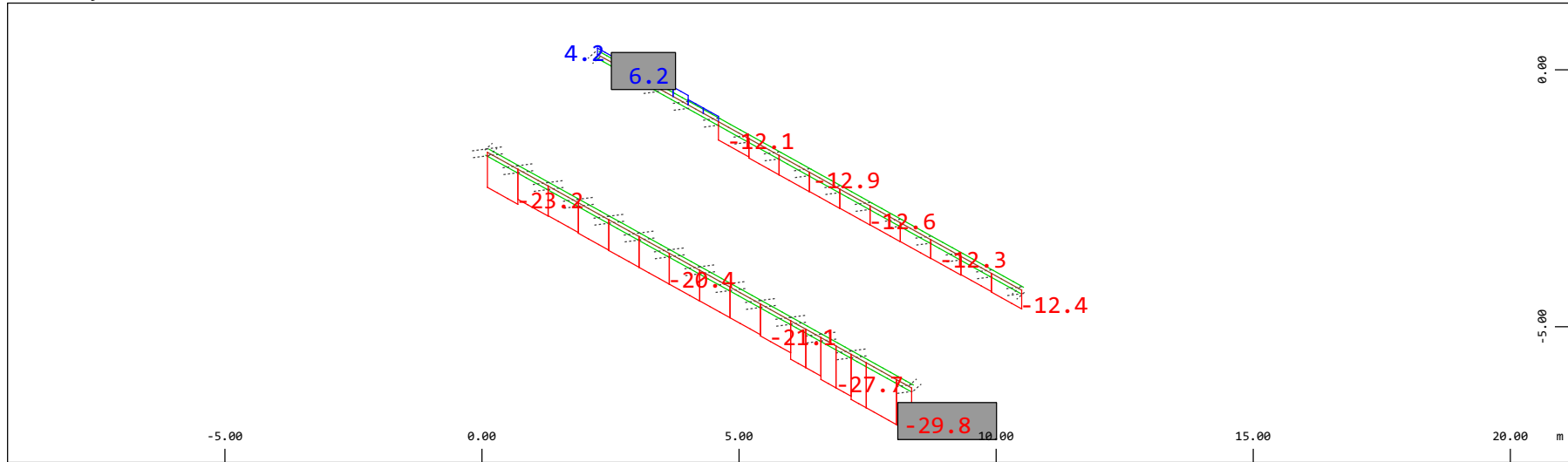
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 1.96 kNm (Min=-0.434) (Max=1.79)

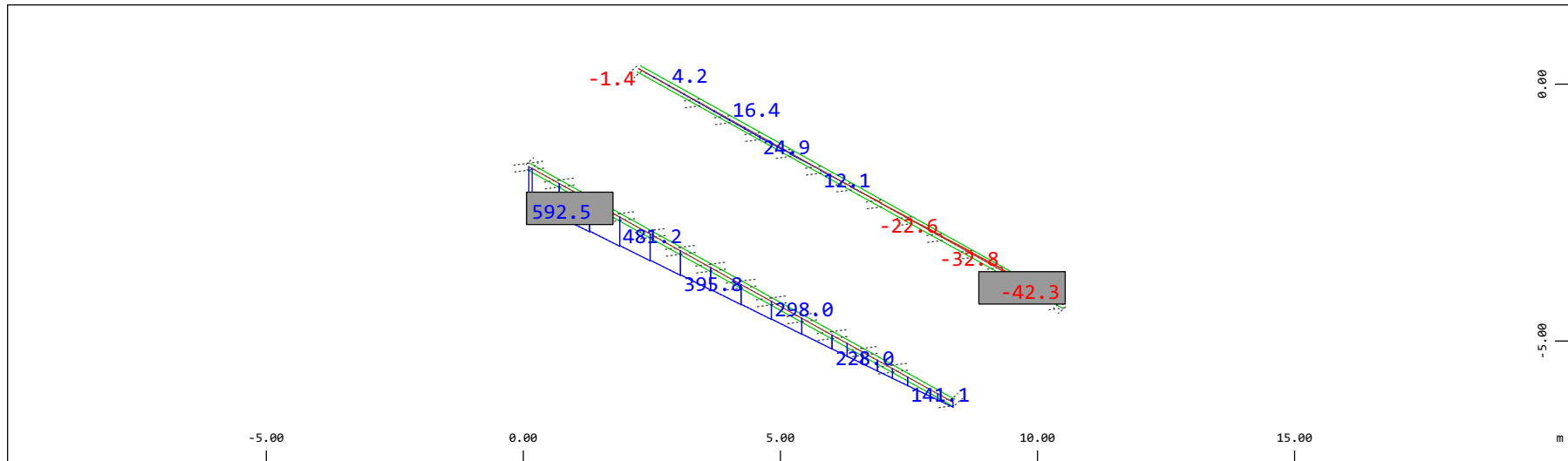
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 39.2 kN (Min=-29.8) (Max=6.24)

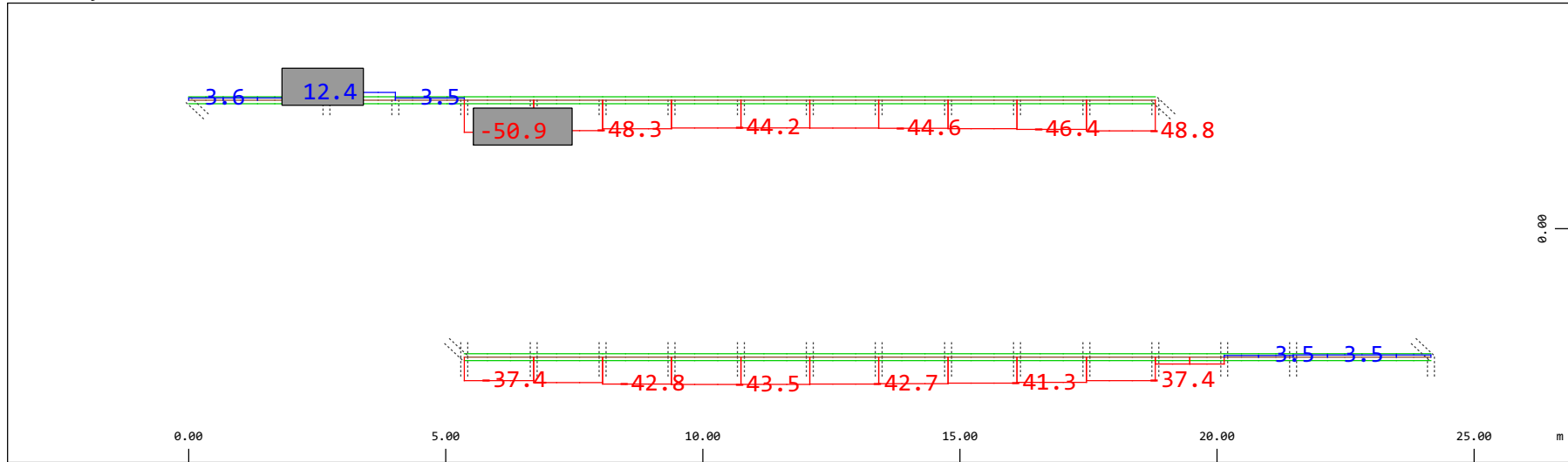
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 980.5 kNm (Min=-42.3) (Max=592.5)

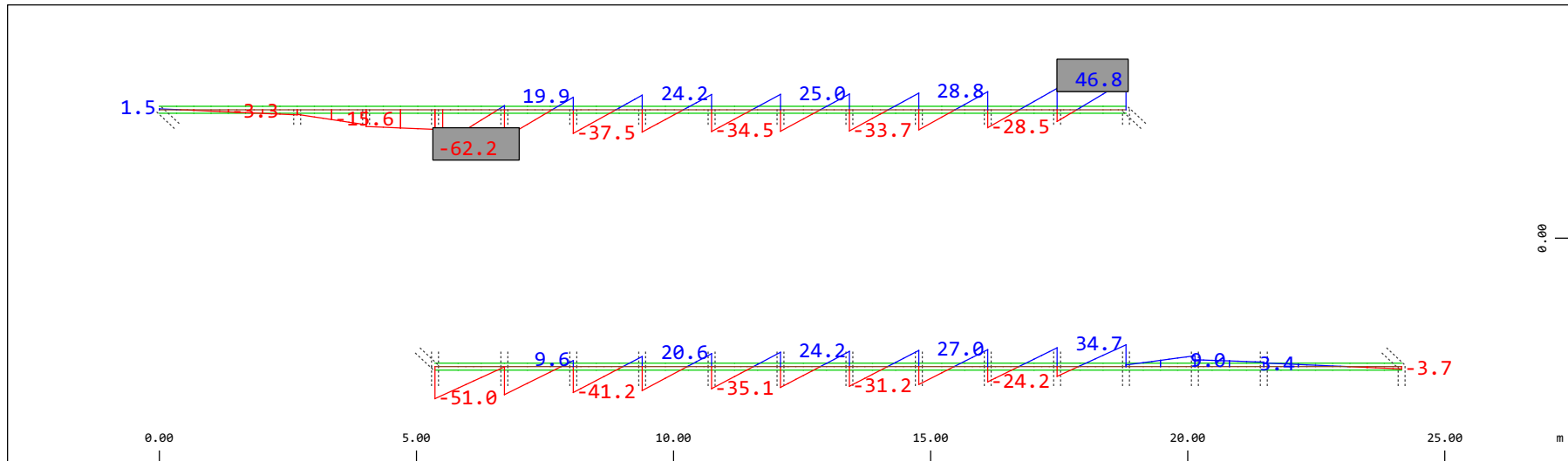
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 98.0 kN (Min=-50.9) (Max=12.4)

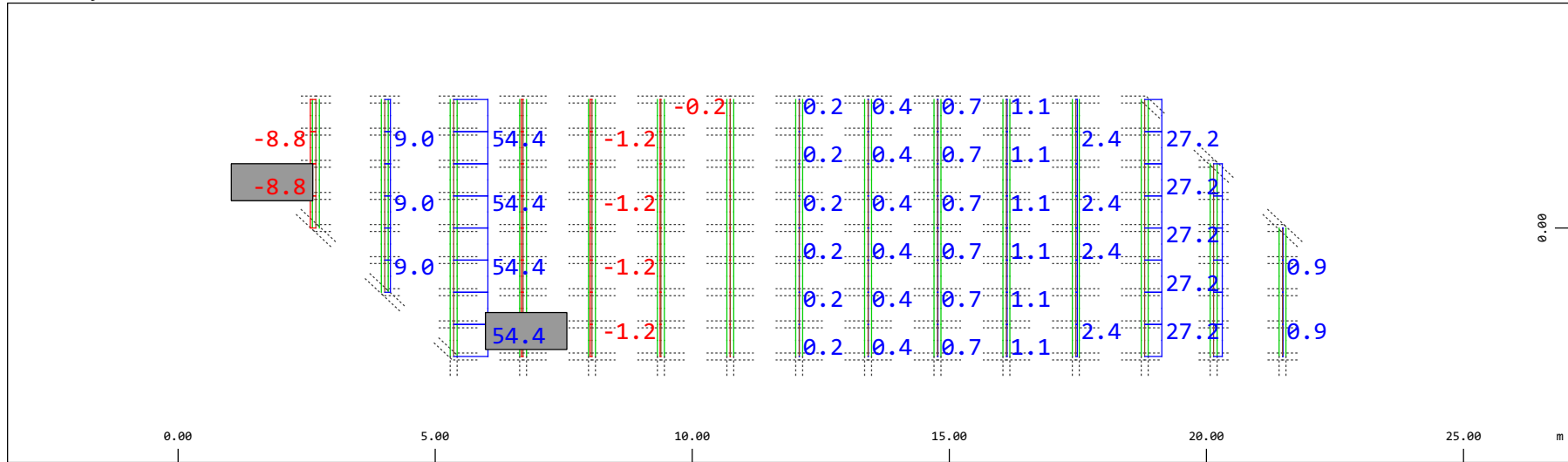
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-62.2) (Max=46.8)

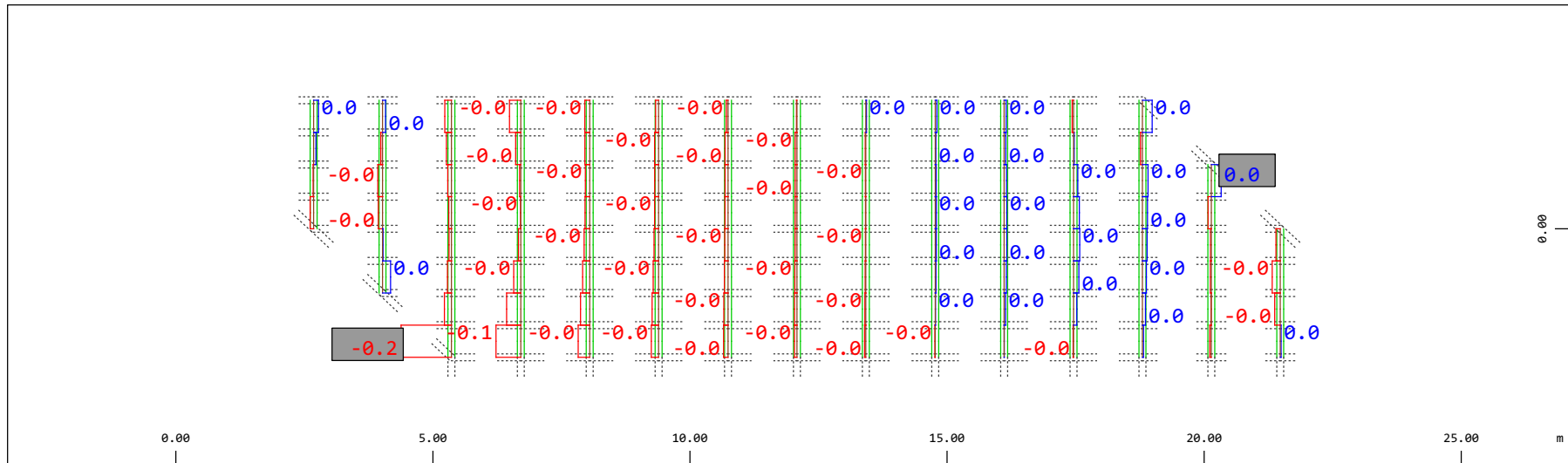
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force Nx, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 98.0 kN (Min=-8.83) (Max=54.4)

M 1 : 120

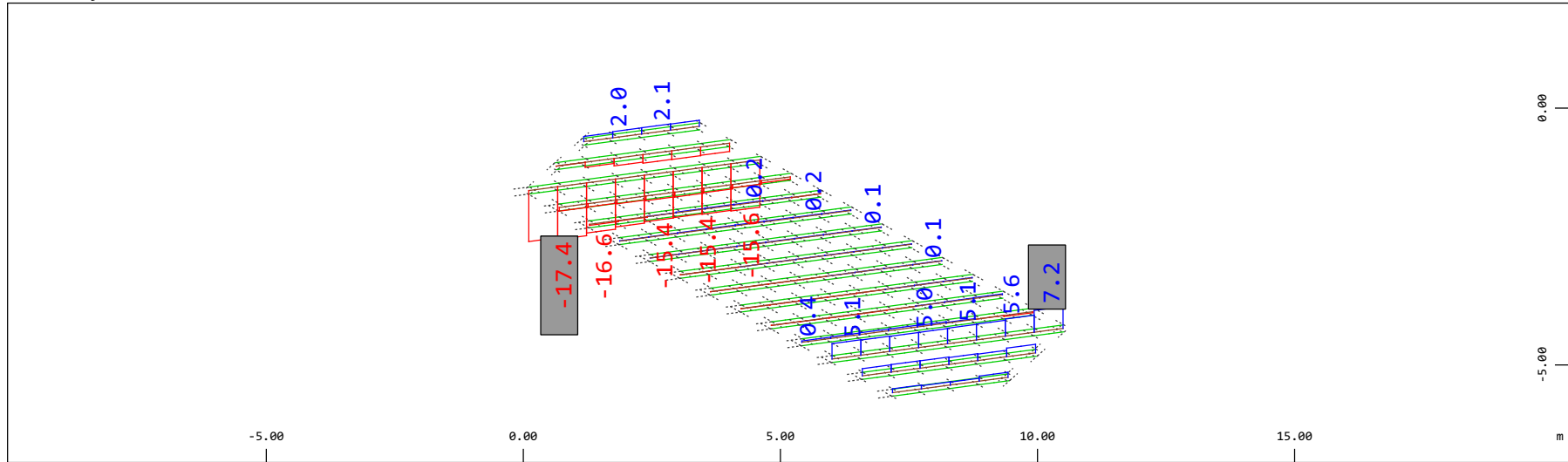


Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment Mt, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 0.196 kNm (Min=-0.160) (Max=0.0312)

M 1 : 120

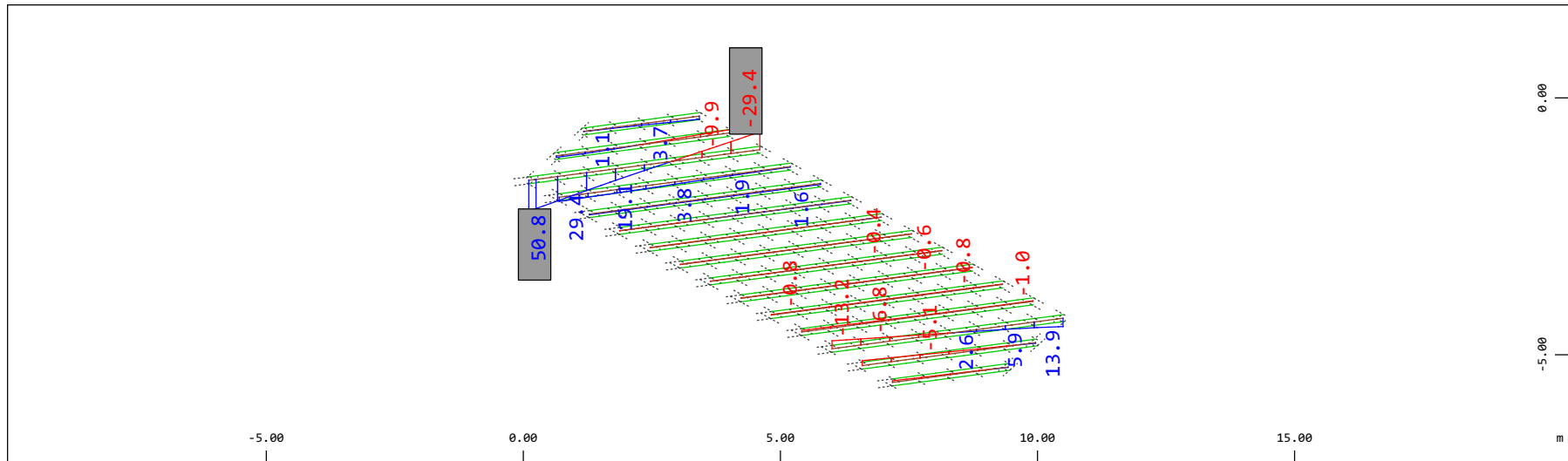
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force V_z , Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 19.6 kN (Min=-17.4) (Max=7.20)

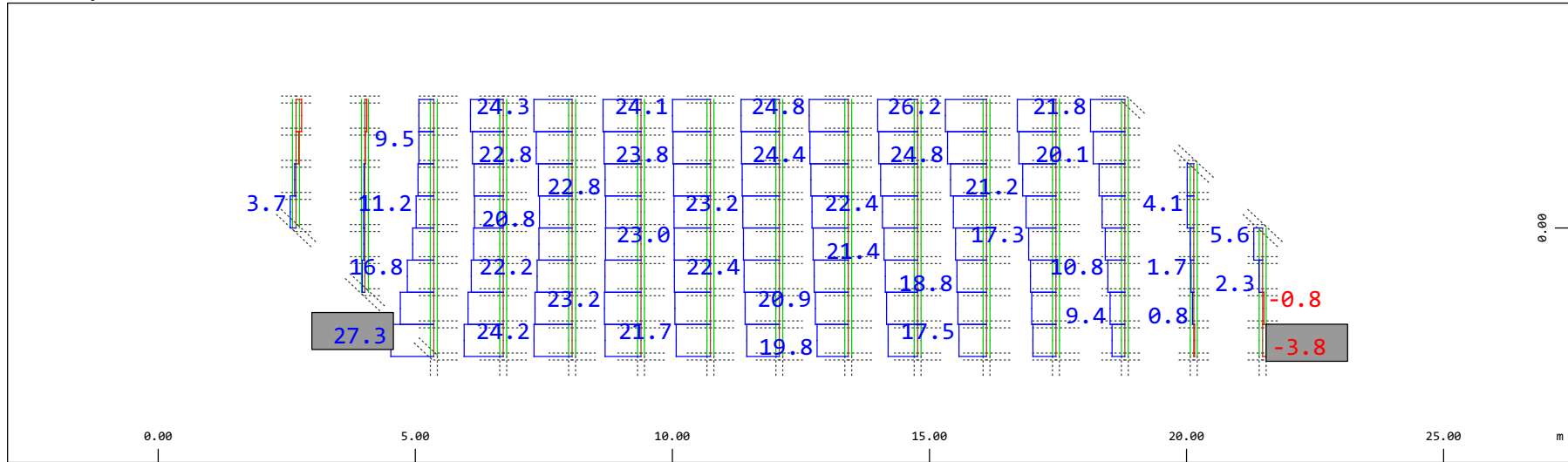
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment M_y , Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-29.4) (Max=50.8)

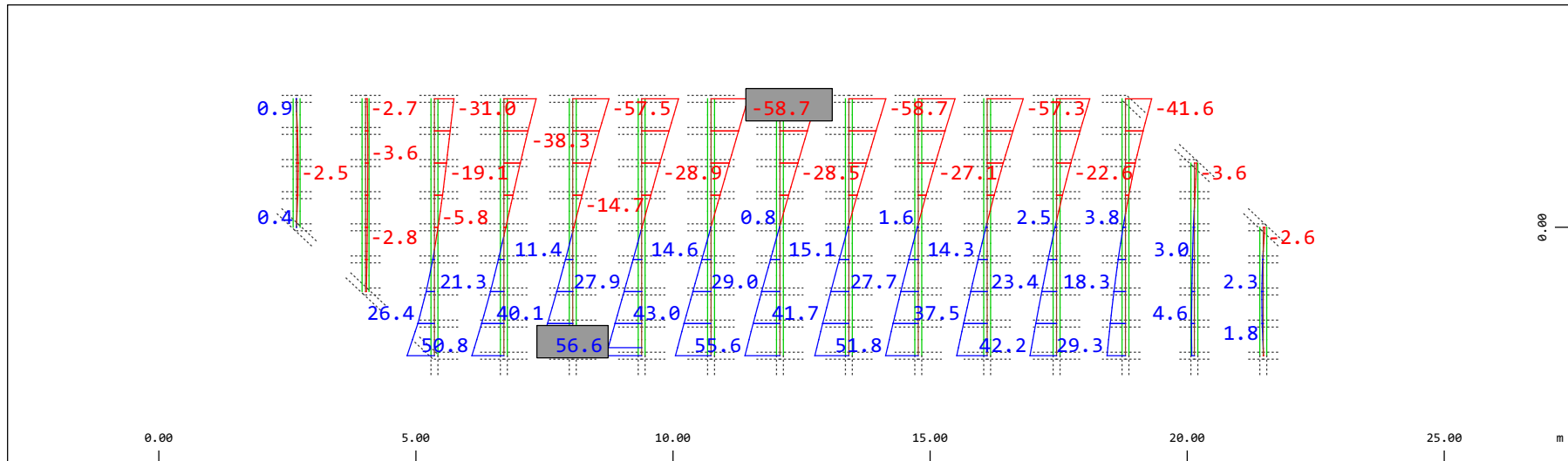
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 39.2 kN (Min=-3.78) (Max=27.3)

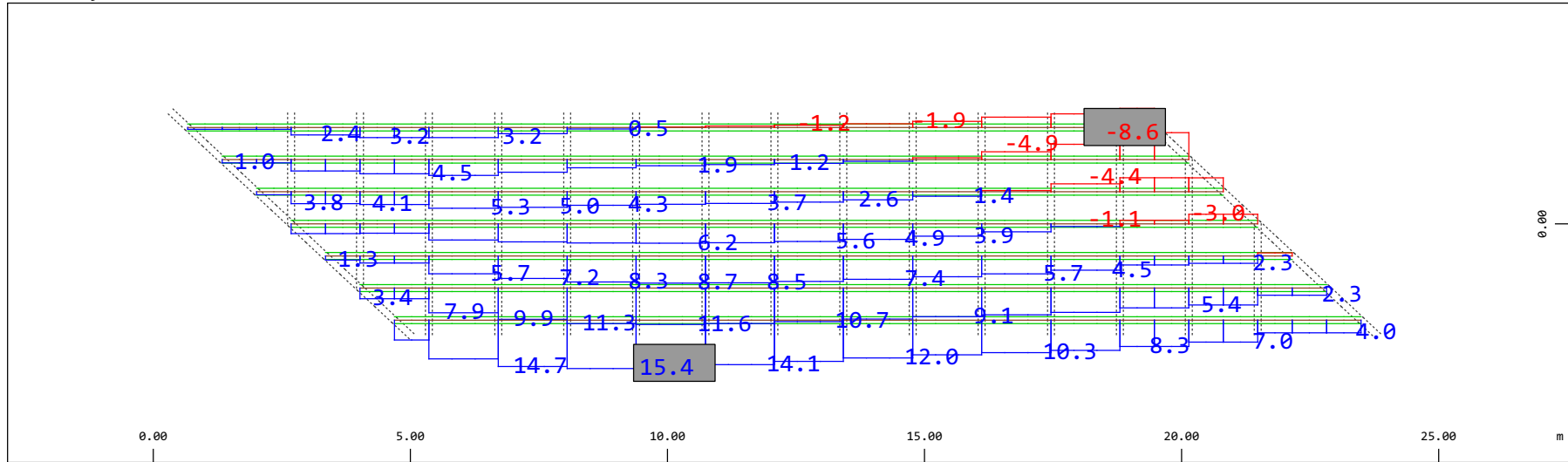
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 98.0 kNm (Min=-58.7) (Max=56.6)

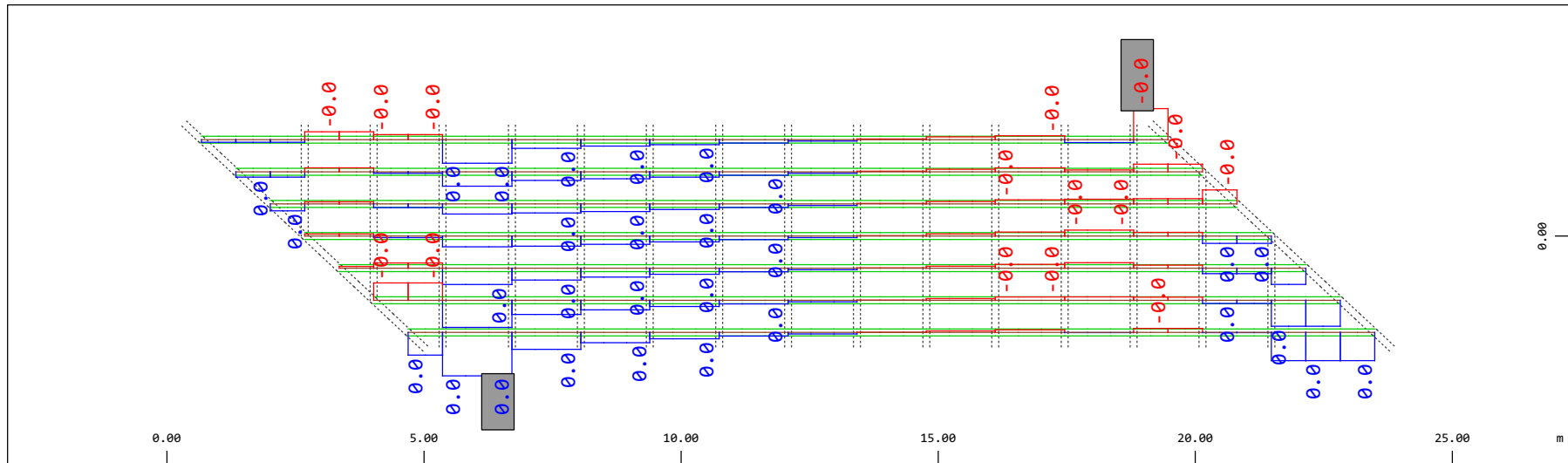
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 19.6 kN (Min=-8.56) (Max=15.4)

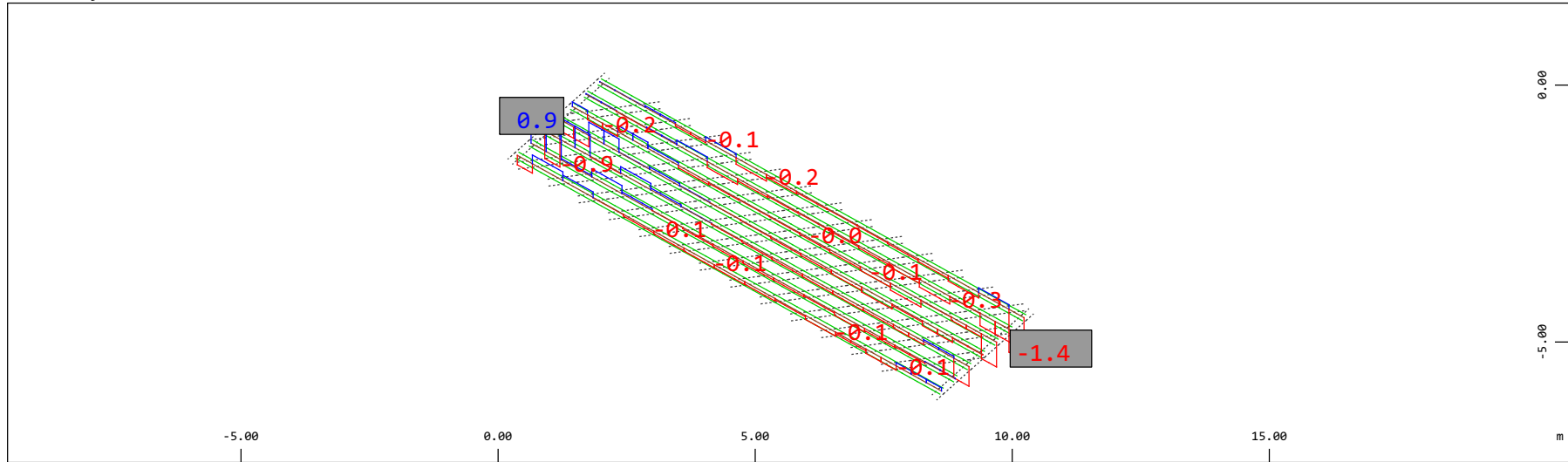
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 0.0020 kNm (Min=-9.8678e-04) (Max=0.0014)

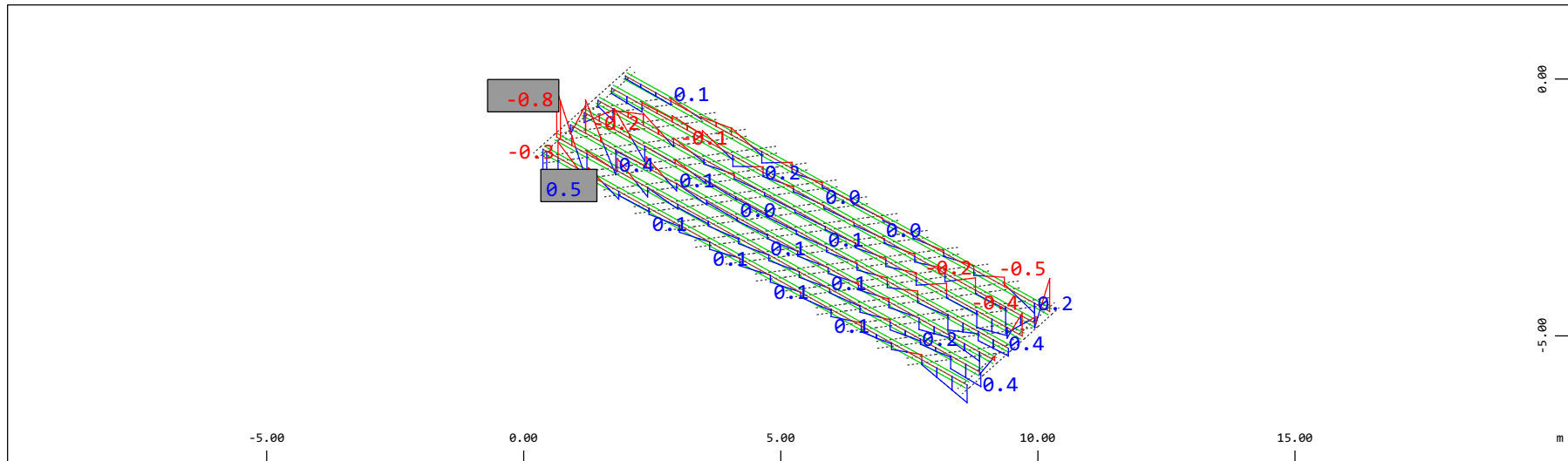
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 1.96 kN (Min=-1.42) (Max=0.926)

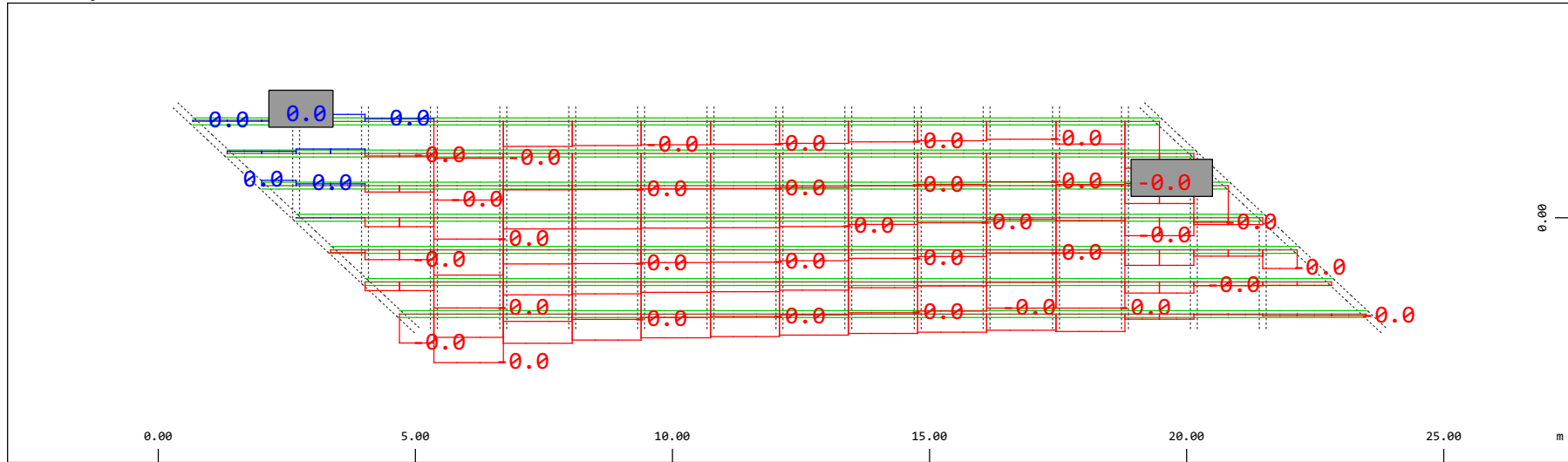
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 0.980 kNm (Min=-0.780) (Max=0.502)

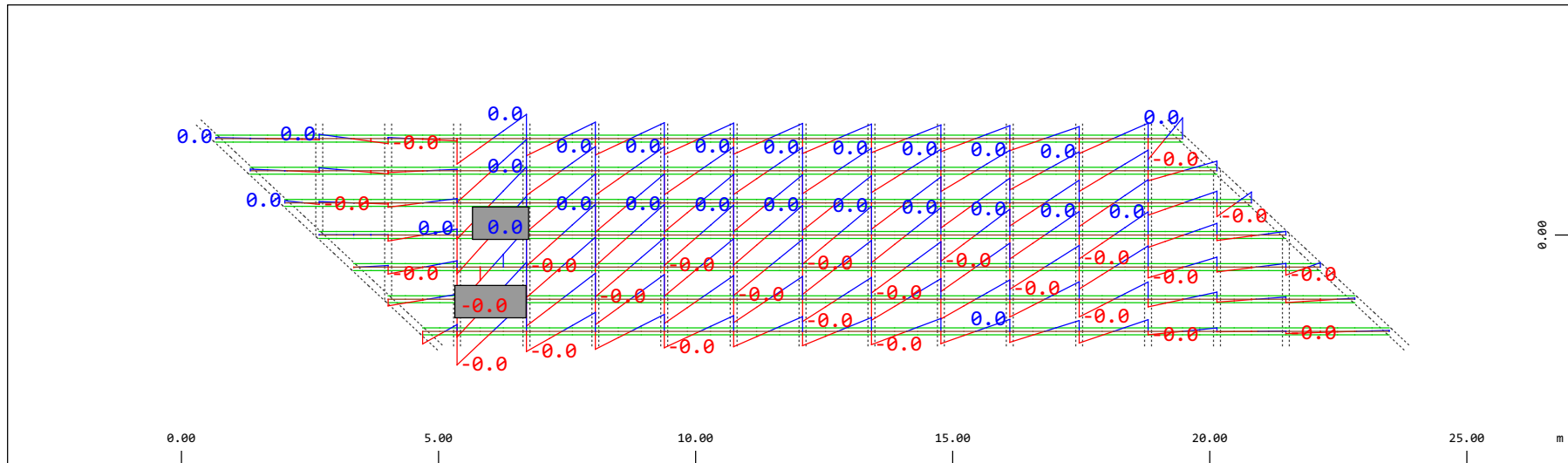
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 0.0098 kN (Min=-0.0099) (Max=0.0011)

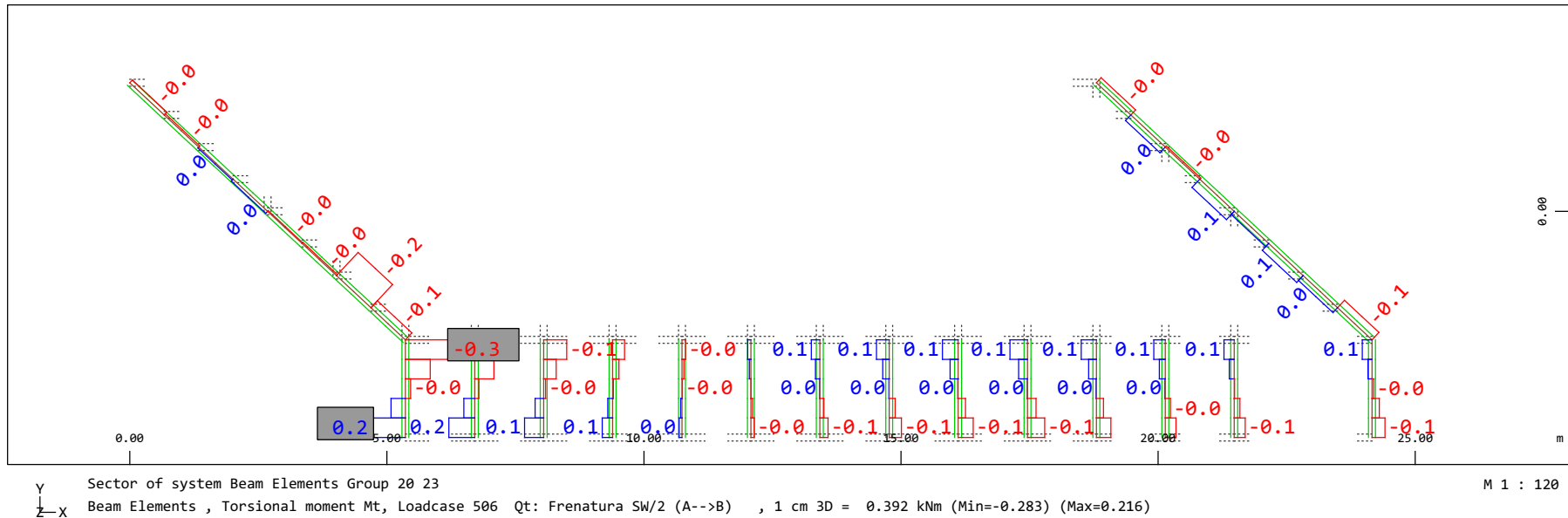
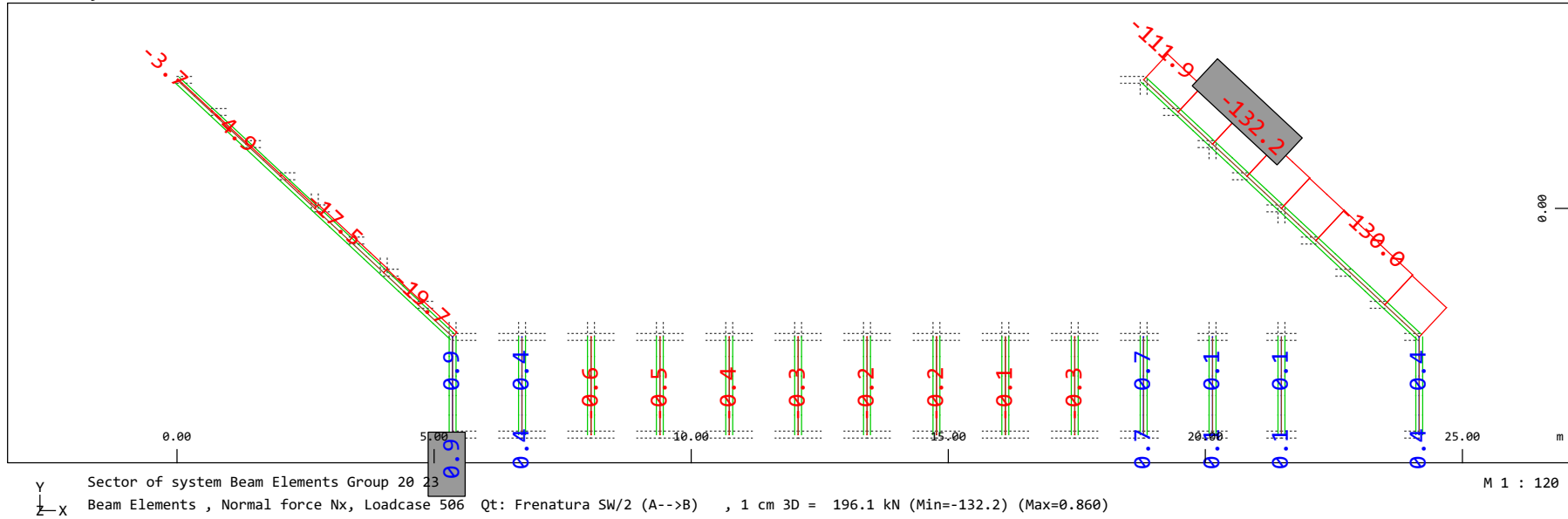
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 0.0098 kNm (Min=-0.0063) (Max=0.0062)

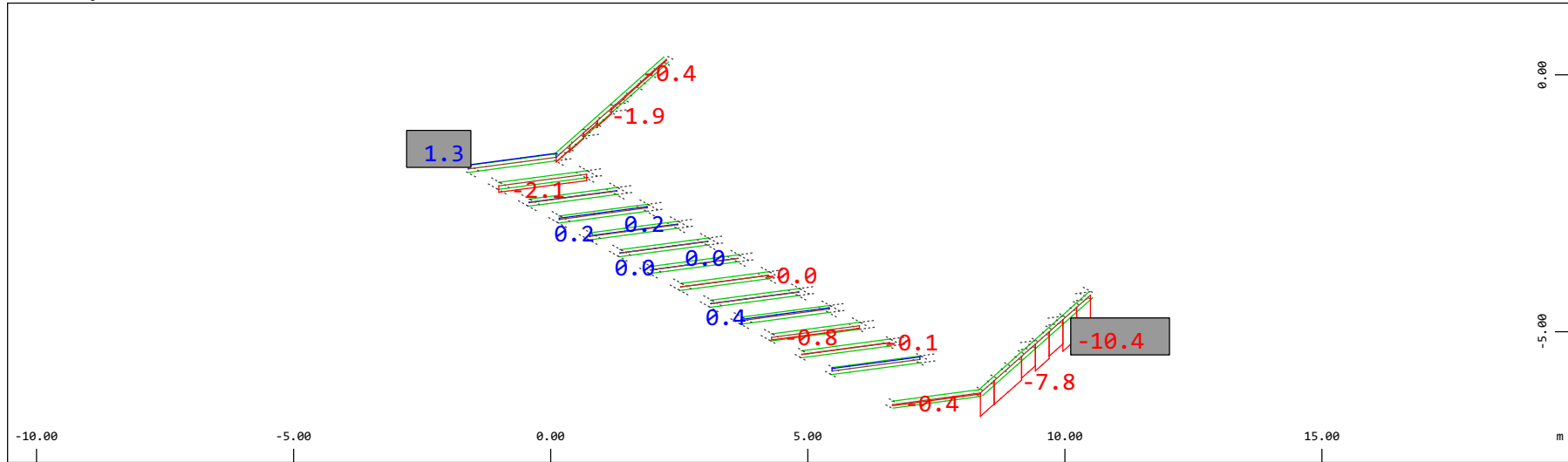
M 1 : 120

Definition of Axis
 Results elementay loads



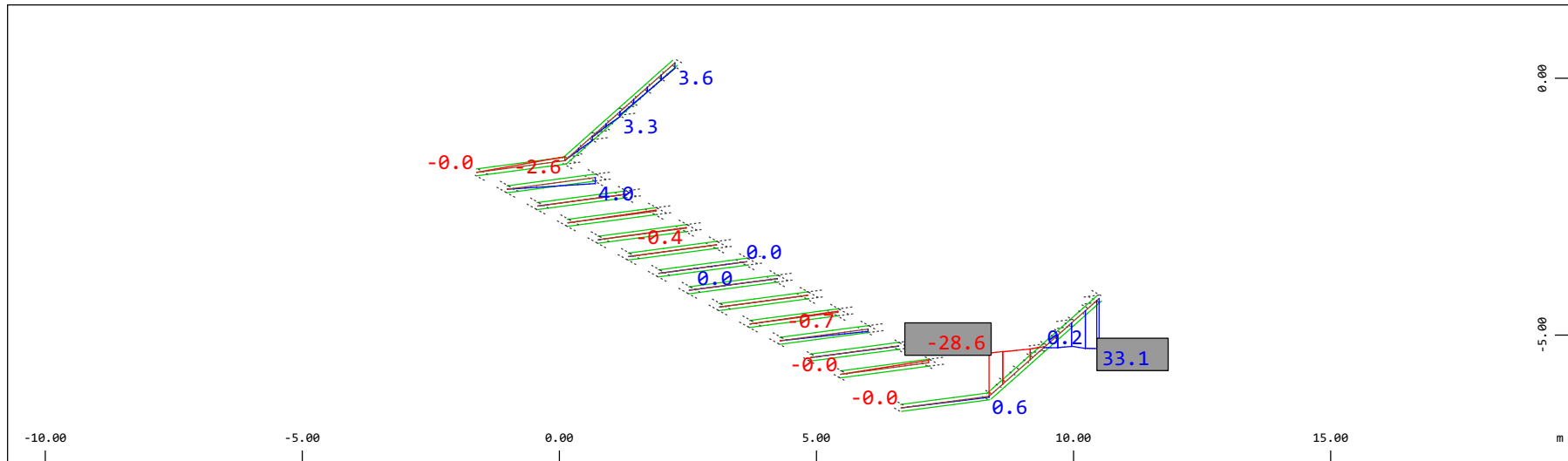
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 19.6 kN (Min=-10.4) (Max=1.33)

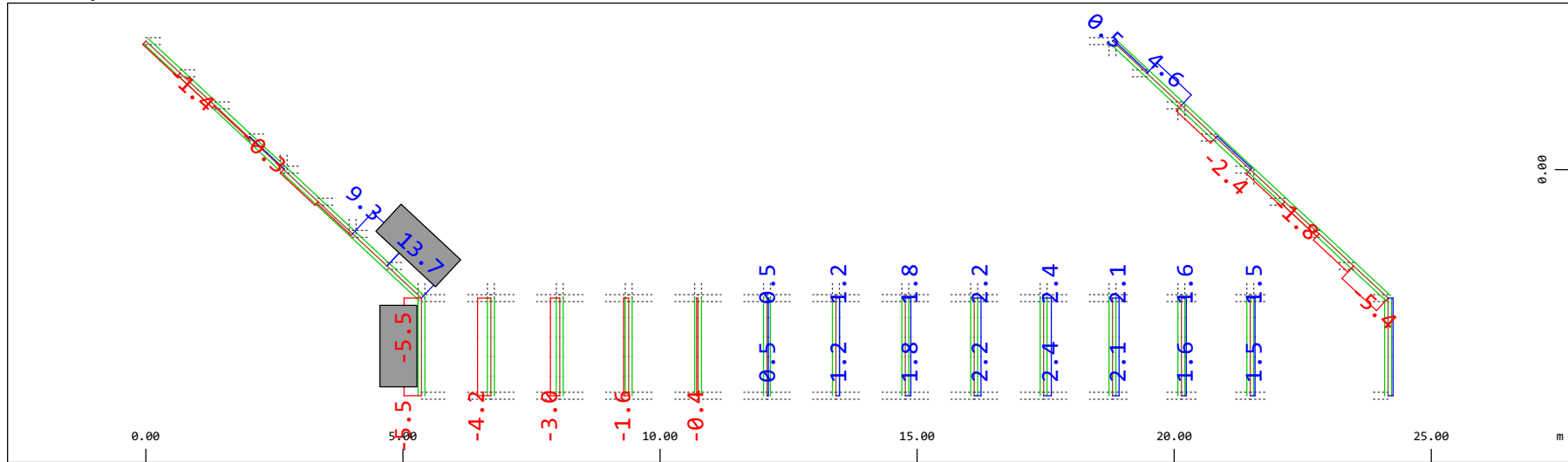
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 39.2 kNm (Min=-28.6) (Max=33.1)

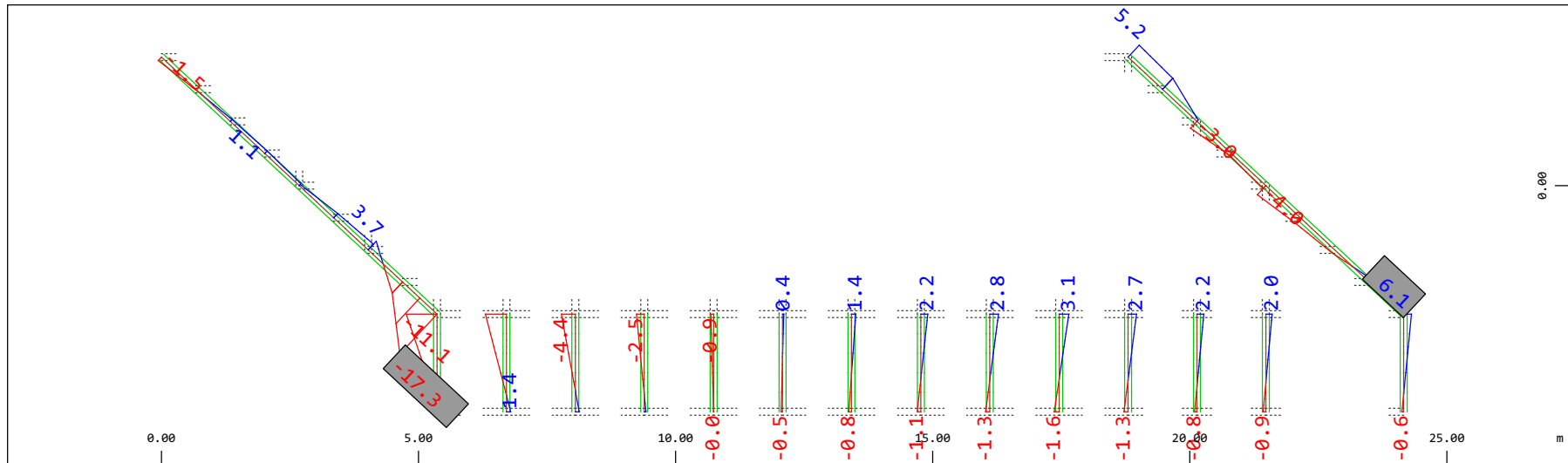
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 19.6 kN (Min=-5.53) (Max=13.7)

M 1 : 120

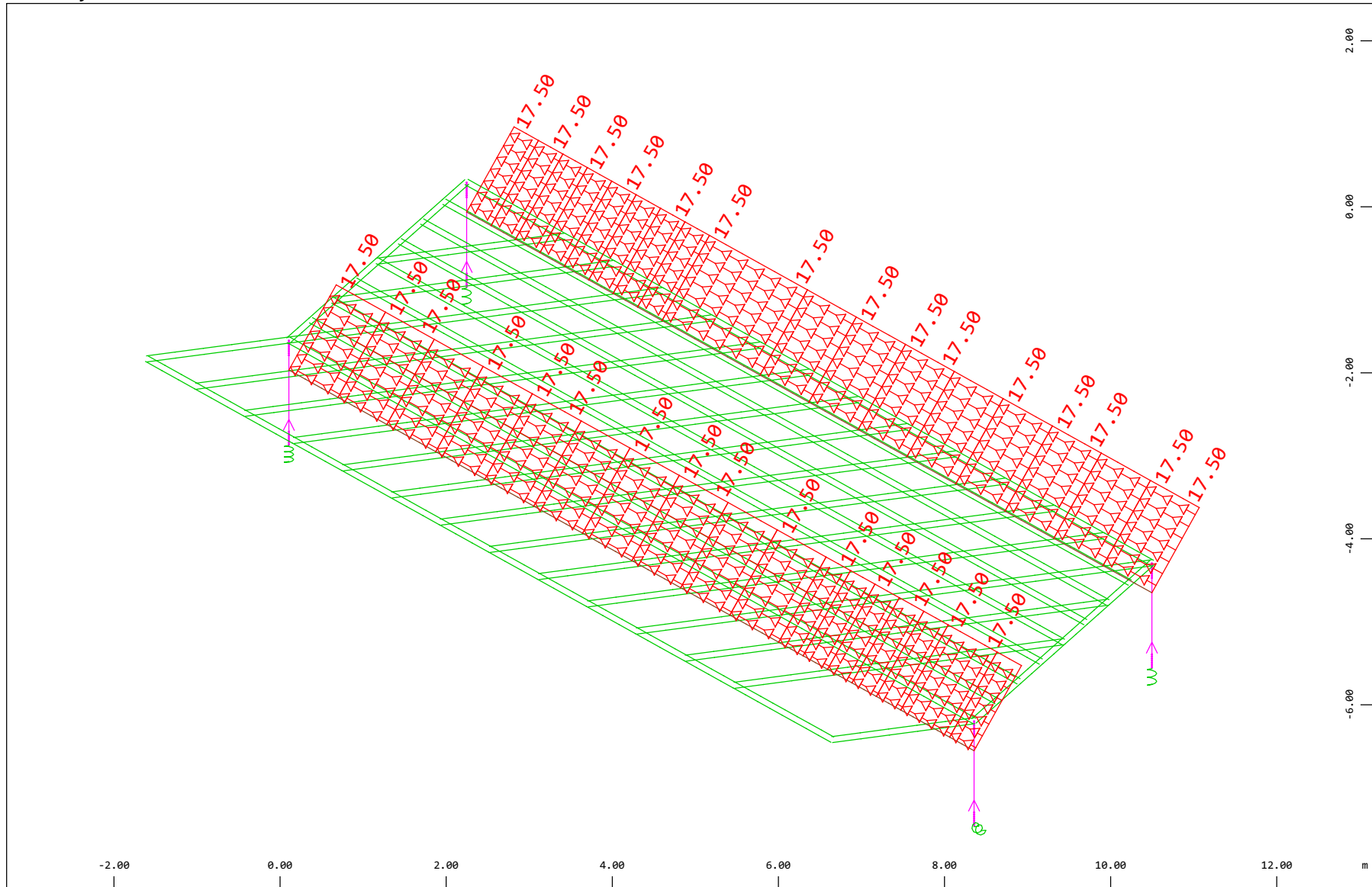


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 506 Qt: Frenatura SW/2 (A-->B) , 1 cm 3D = 19.6 kNm (Min=-17.3) (Max=6.14)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

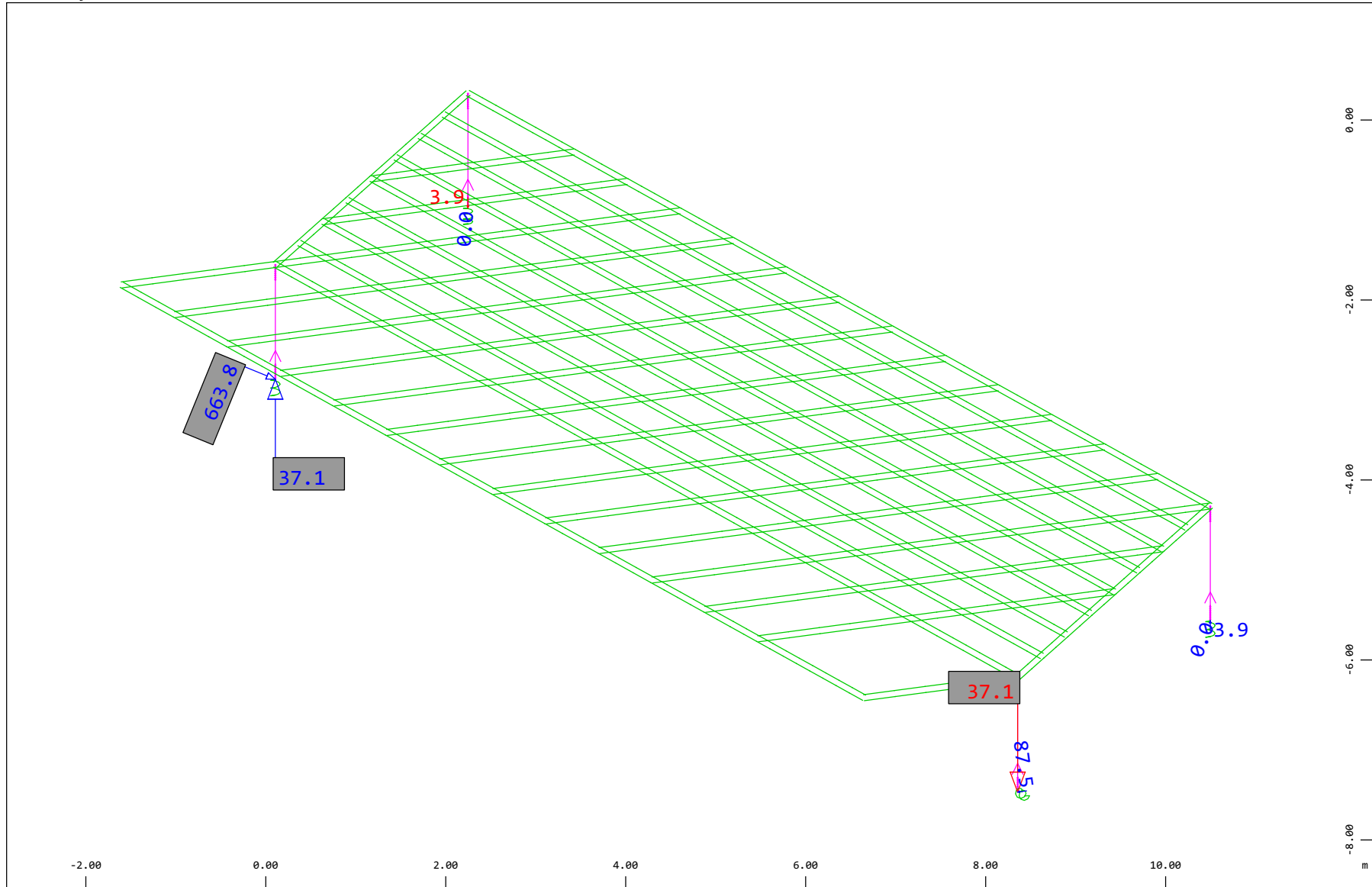
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , (1 cm 3D = unit) Beam line load (force) in global X (Unit=9.69 kN/m
 (Min=-17.5) (Max=-17.5)



M 1 : 65
 X * 0.502
 Y * 0.906
 Z * 0.962

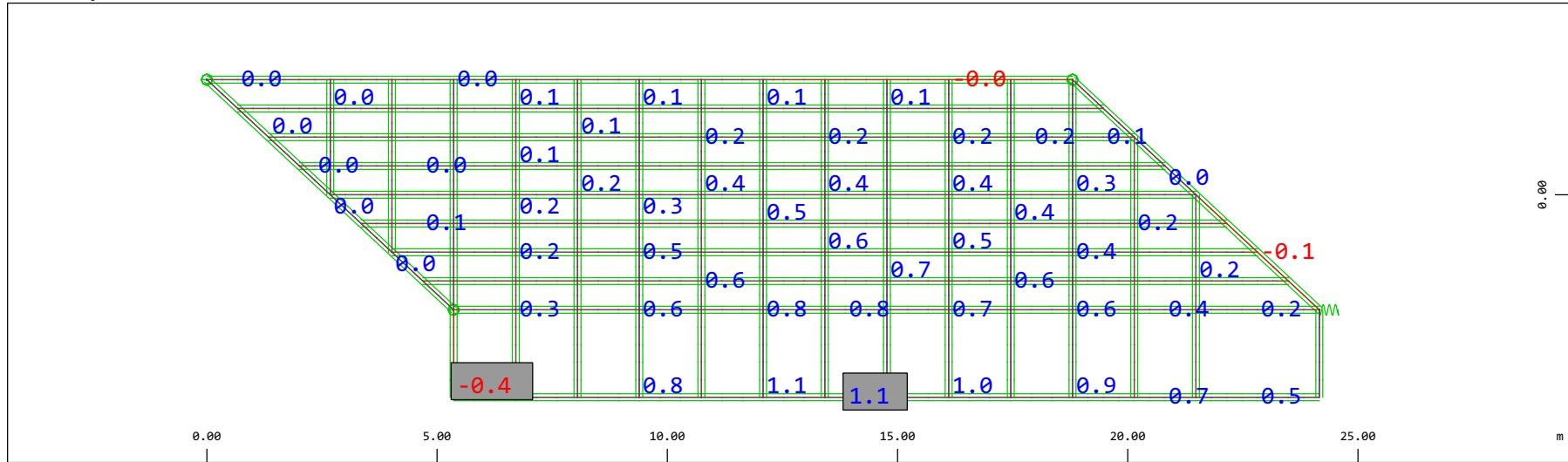
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements, Spring Elements
 X Y Nodes , Support force in global Z, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 19.4 kN
 Nodes , Support force vector in the global XY plane, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 484.4 kN
 (Min=-37.1) (Max=37.1) (total: 0)
 (Max=663.8)
 M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

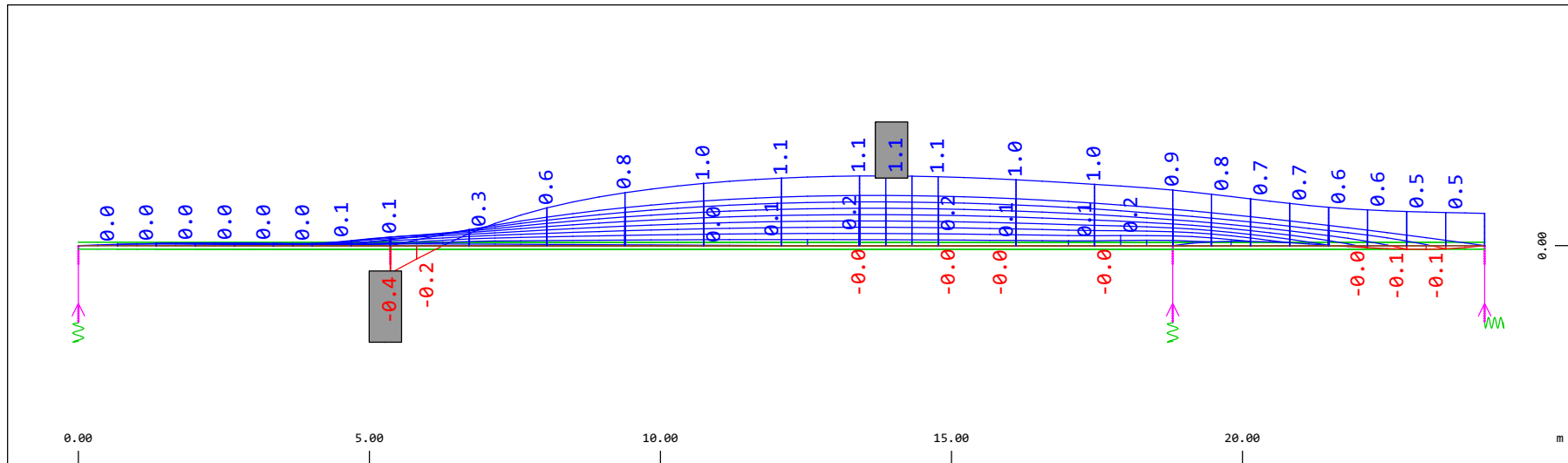
Definition of Axis
 Results elementay loads



Y
 X
 Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=1.09)

○, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 0.969 mm (Min=-0.433)

M 1 : 134

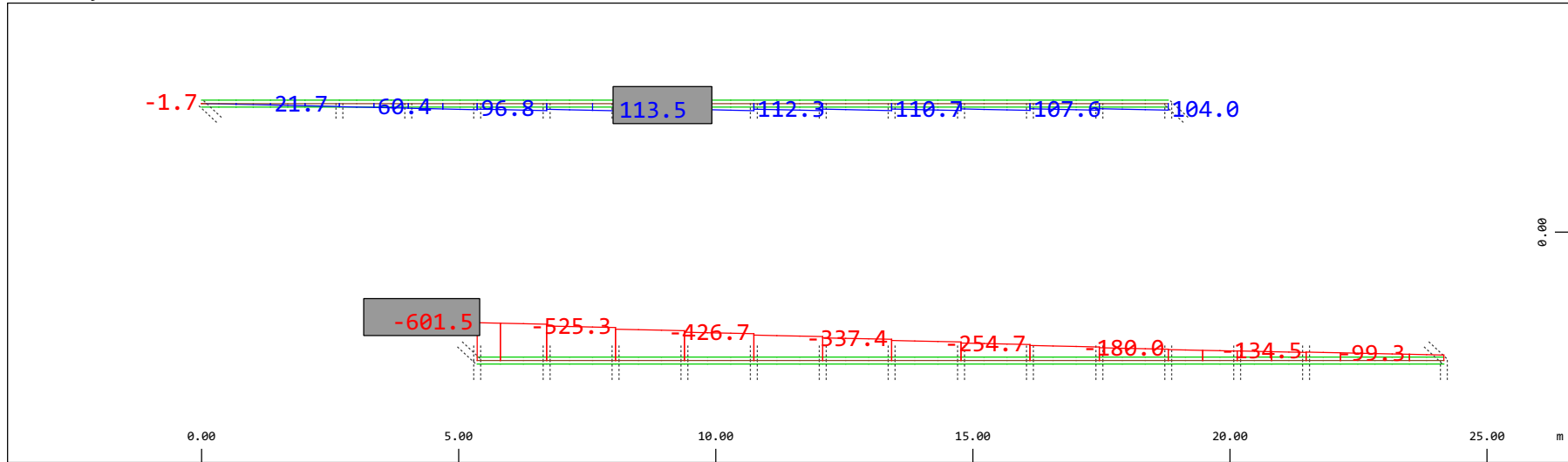


Z
 X
 Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along
 (Max=1.09)

↑, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 0.969 mm (Min=-0.433)

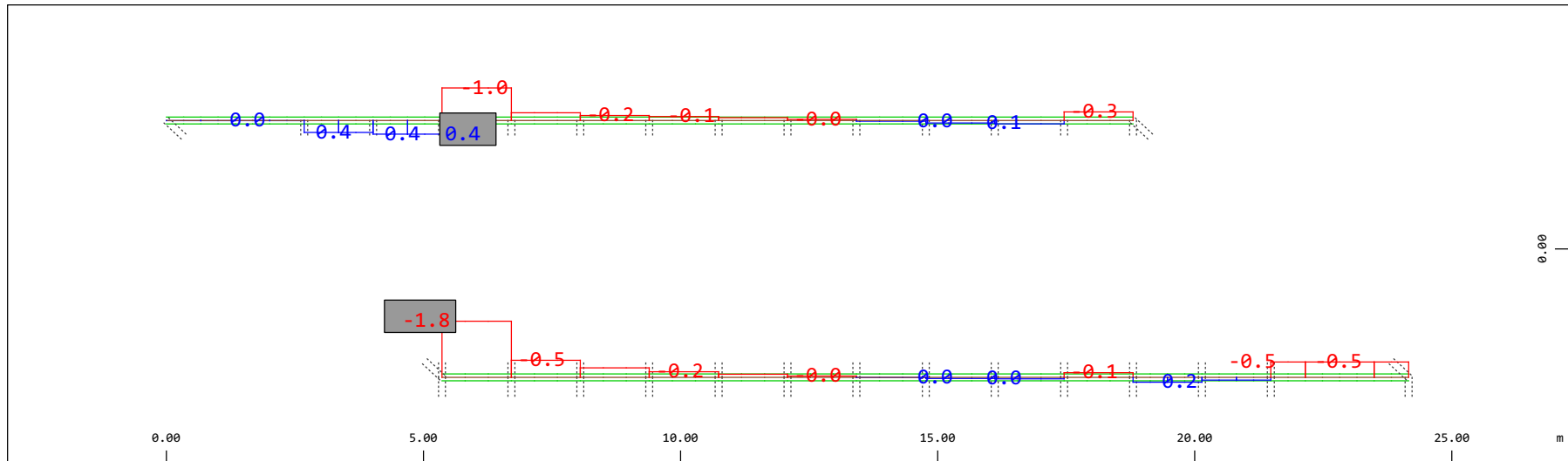
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 980.5 kN (Min=-601.5) (Max=113.5)

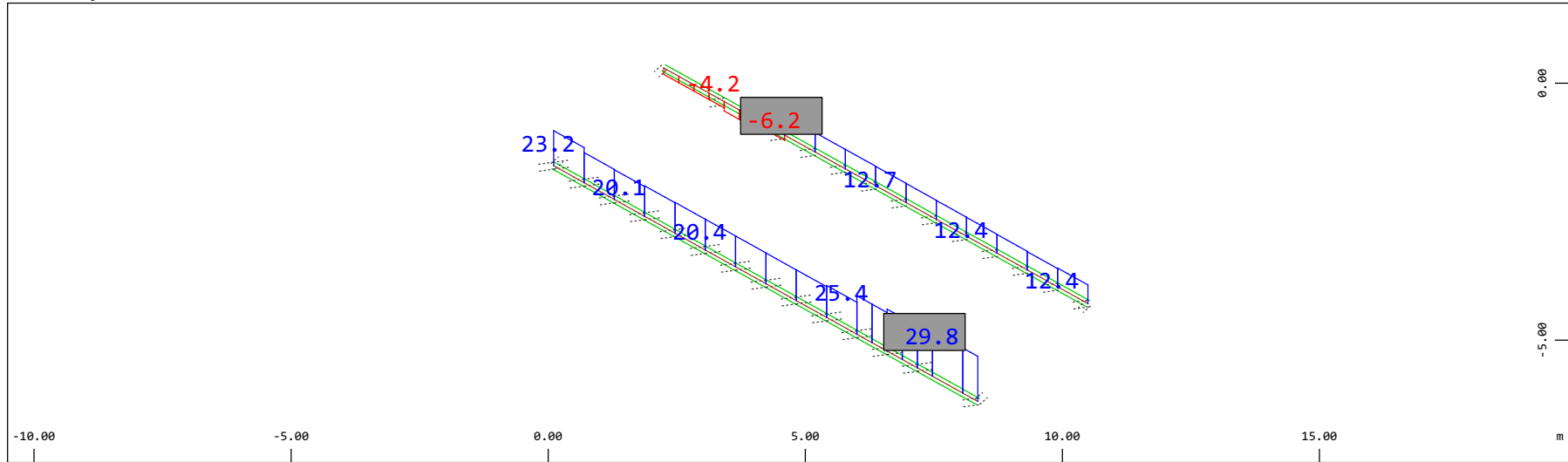
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 1.96 kNm (Min=-1.79) (Max=0.434)

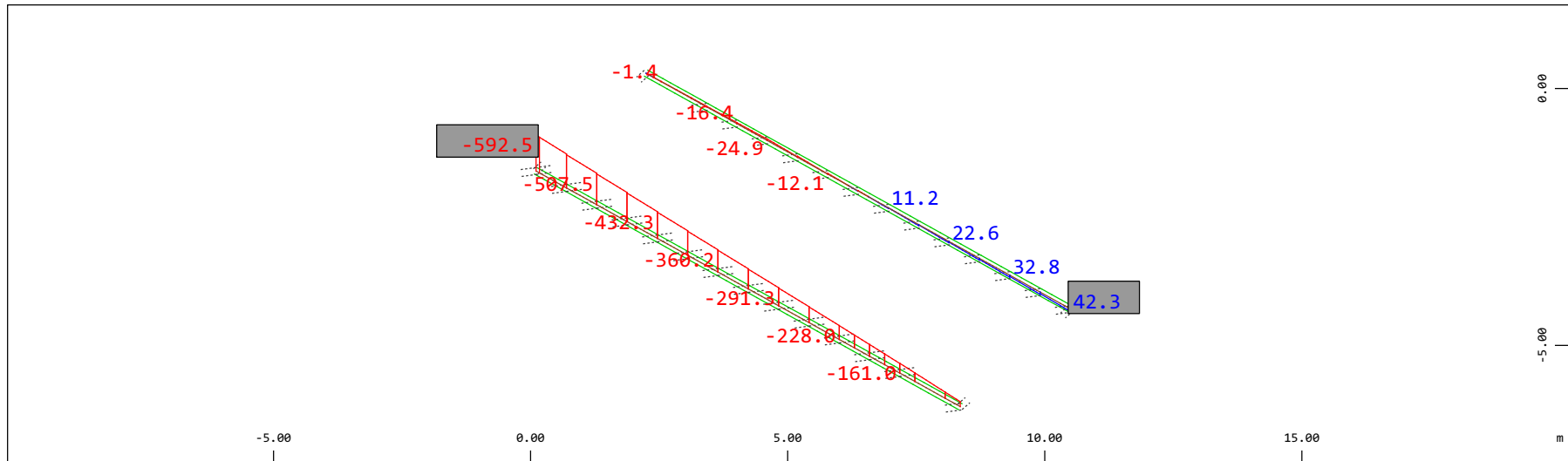
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vz, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 39.2 kN (Min=-6.24) (Max=29.8)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

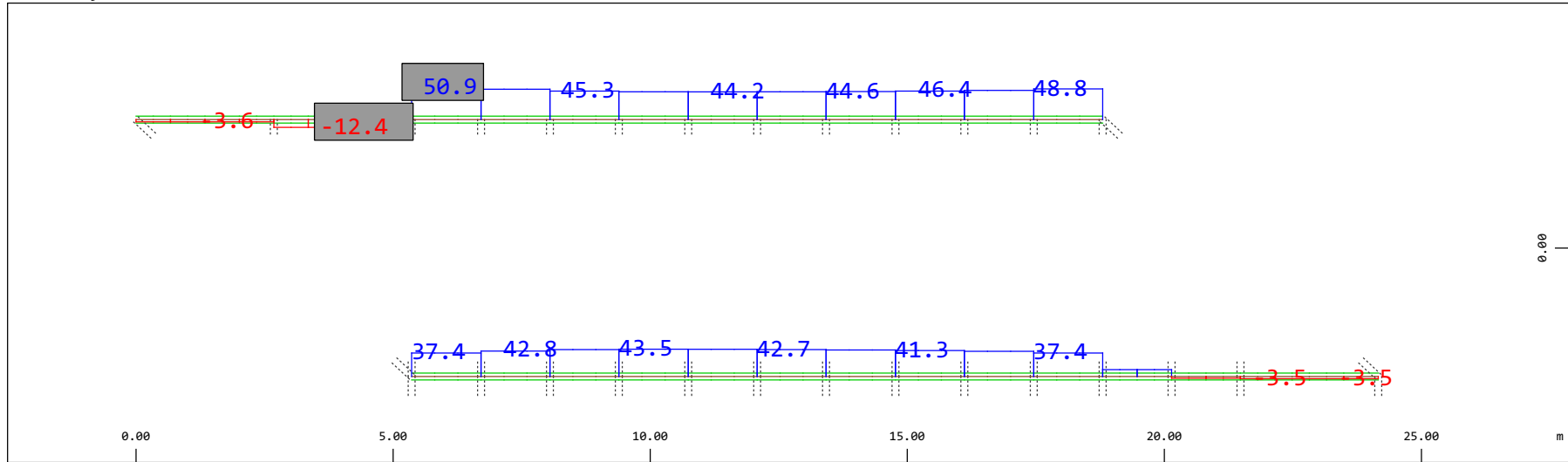


Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment My, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 980.5 kNm (Min=-592.5) (Max=42.3)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

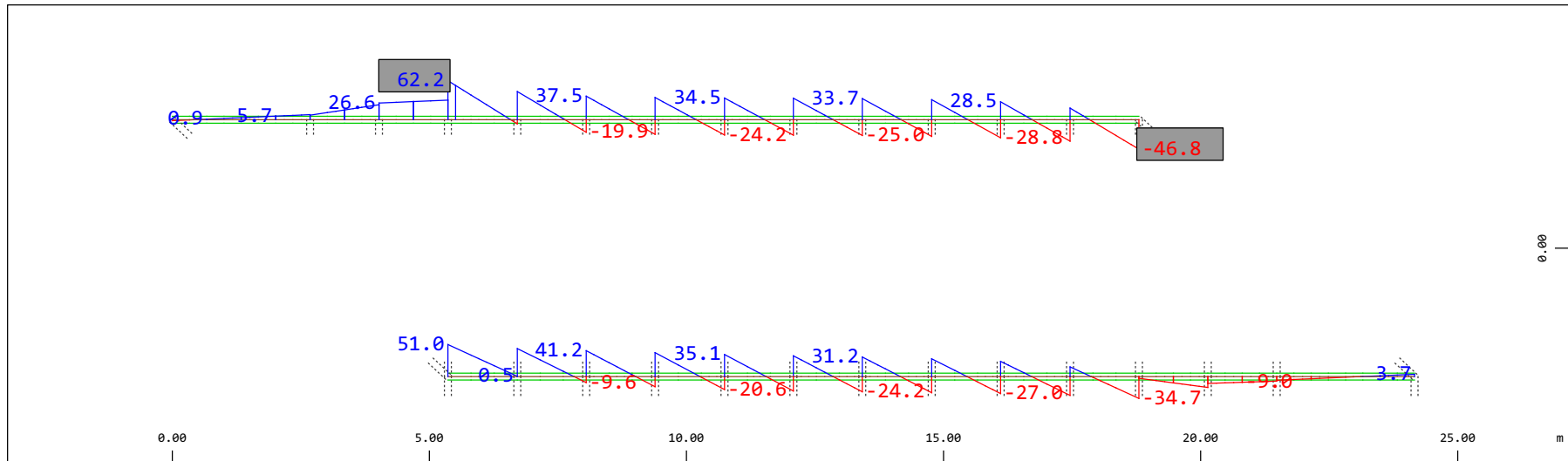
Definition of Axis

Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 98.0 kN (Min=-12.4) (Max=50.9)

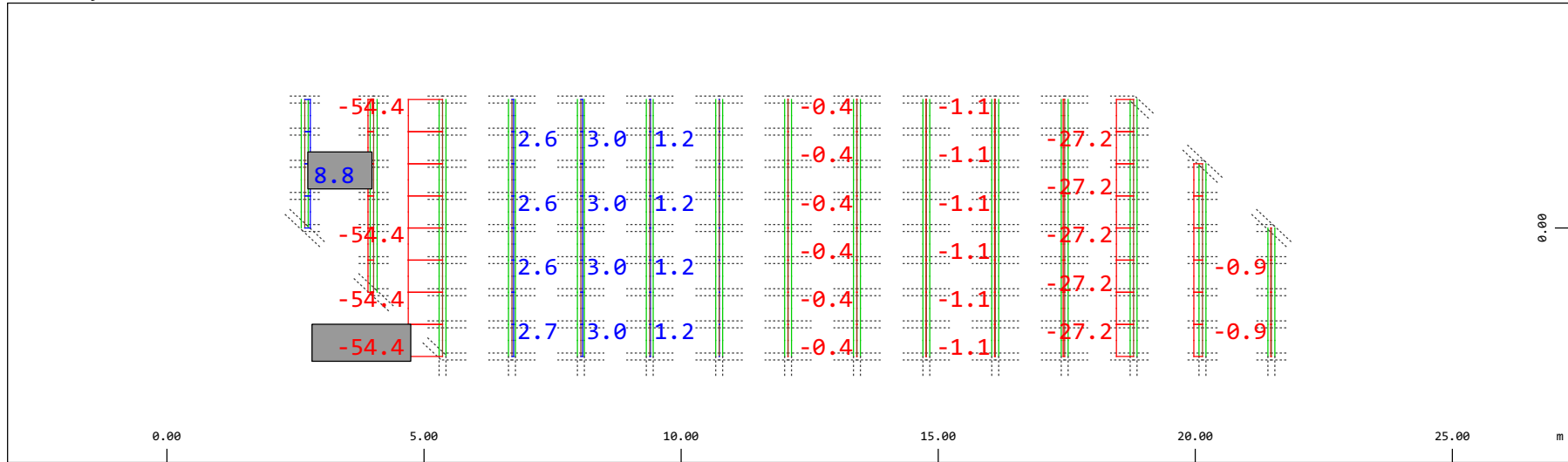
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-46.8) (Max=62.2)

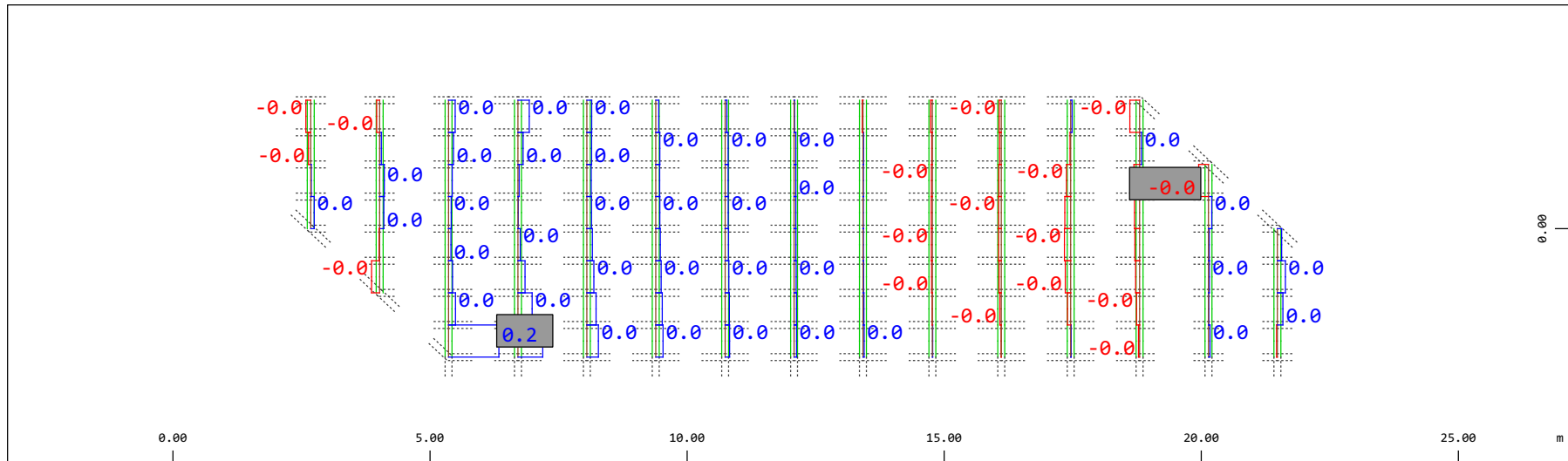
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force N_x , Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 98.0 kN (Min=-54.4) (Max=8.83)

M 1 : 120

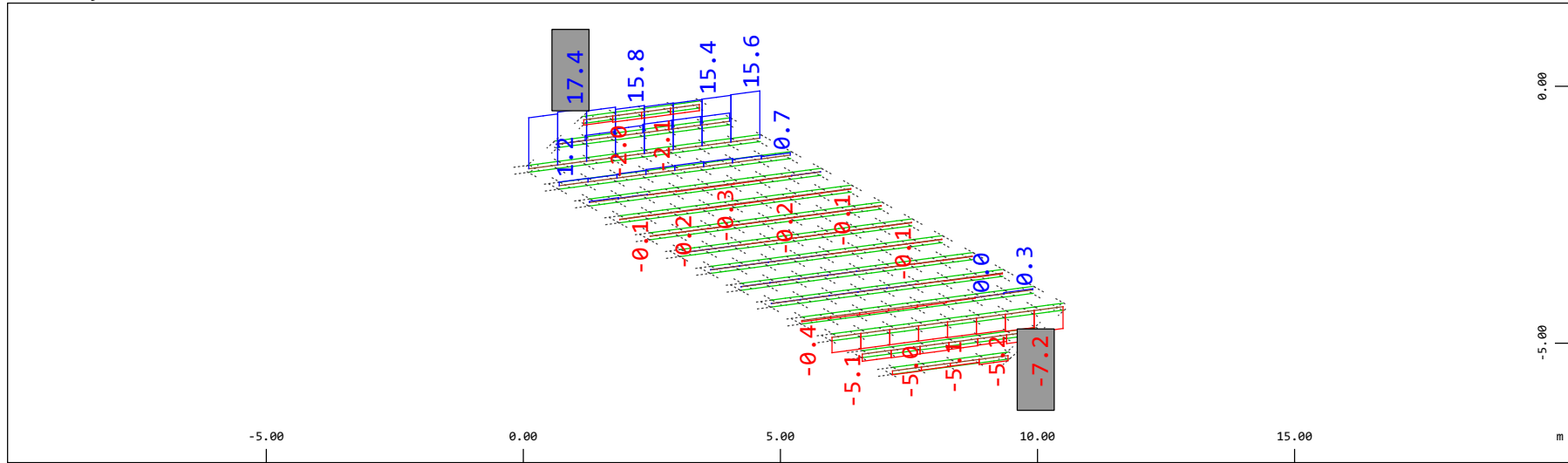


Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment M_t , Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 0.196 kNm (Min=-0.0312) (Max=0.160)

M 1 : 120

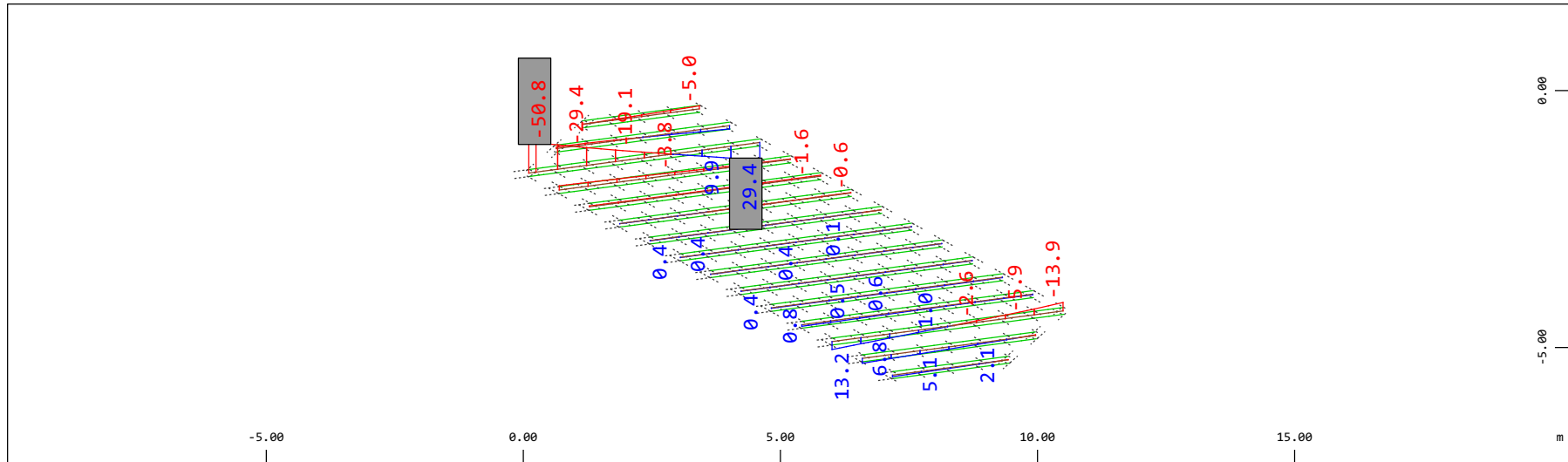
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 19.6 kN (Min=-7.20) (Max=17.4)

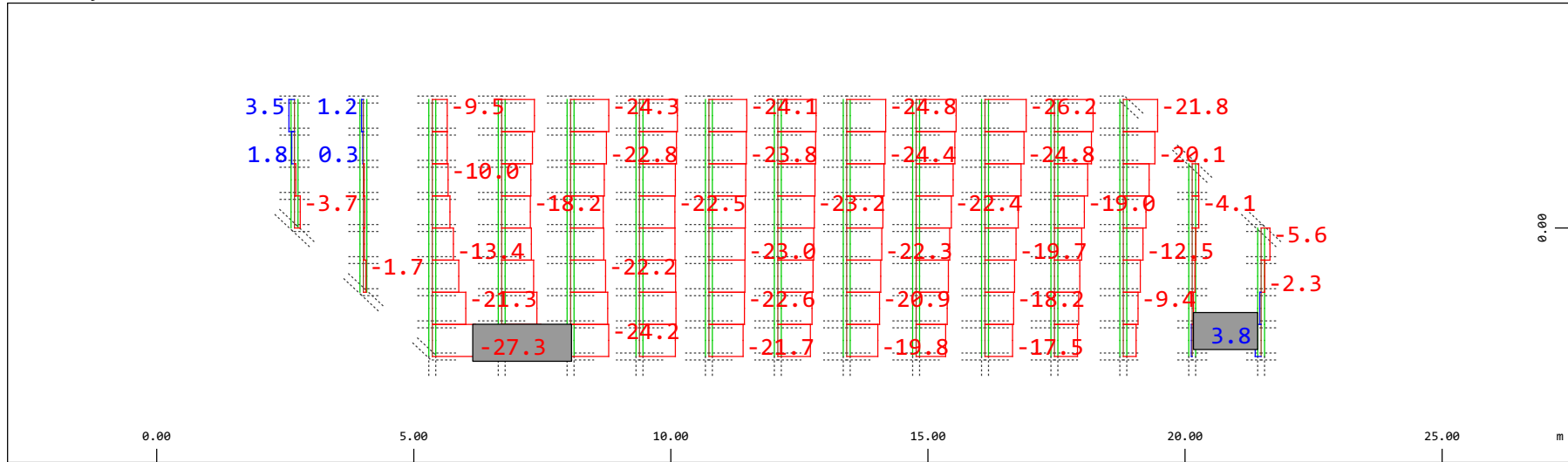
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-50.8) (Max=29.4)

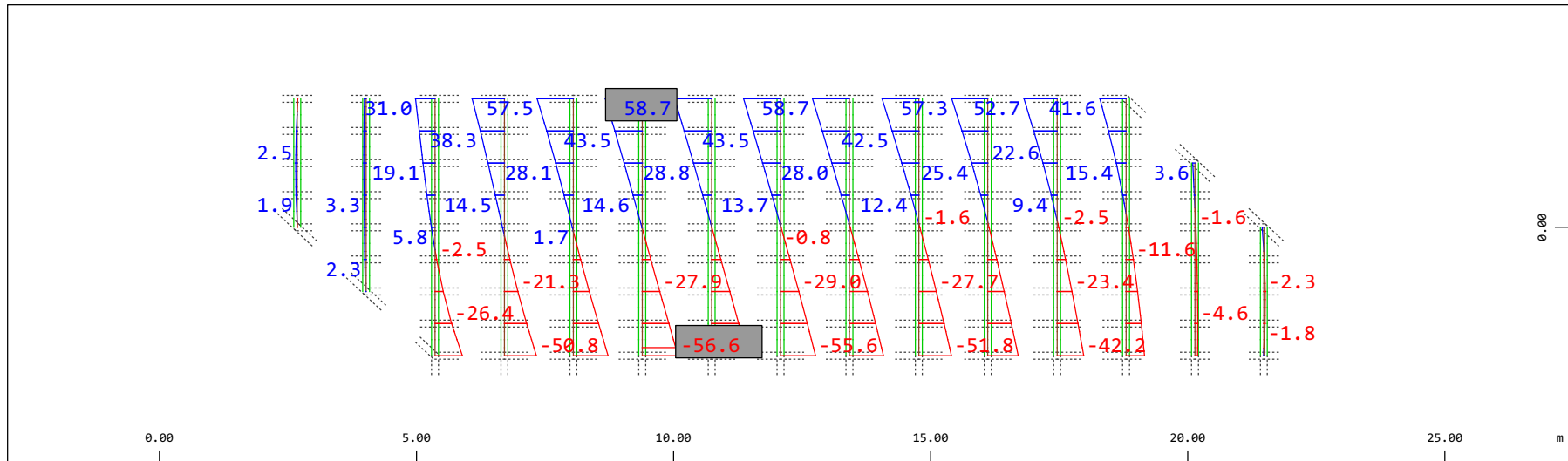
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 39.2 kN (Min=-27.3) (Max=3.78)

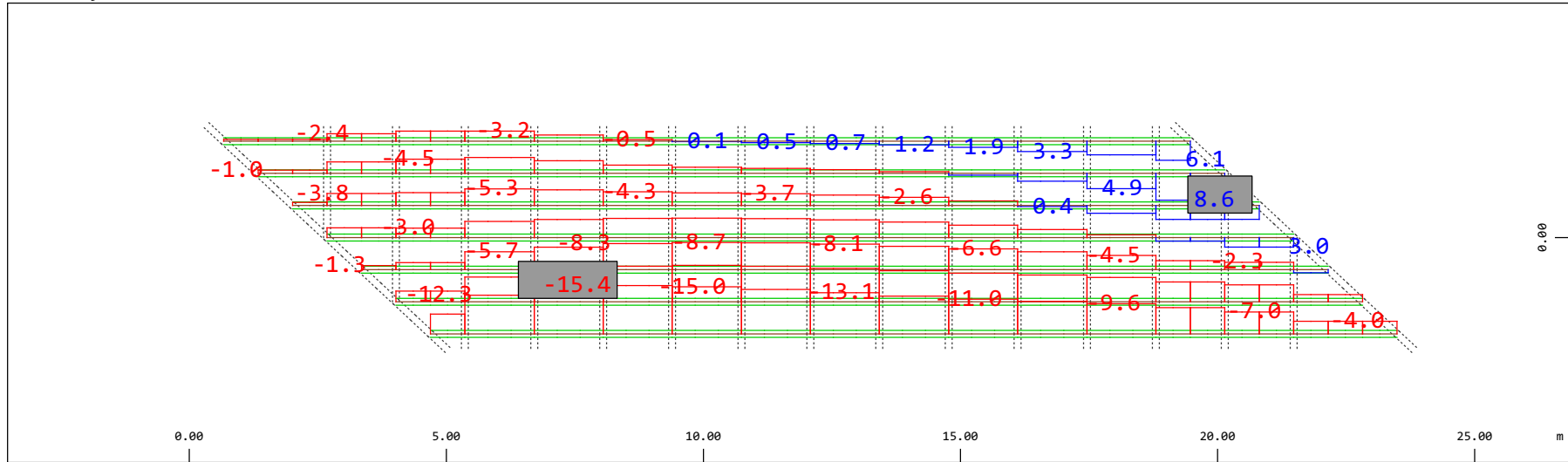
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 98.0 kNm (Min=-56.6) (Max=58.7)

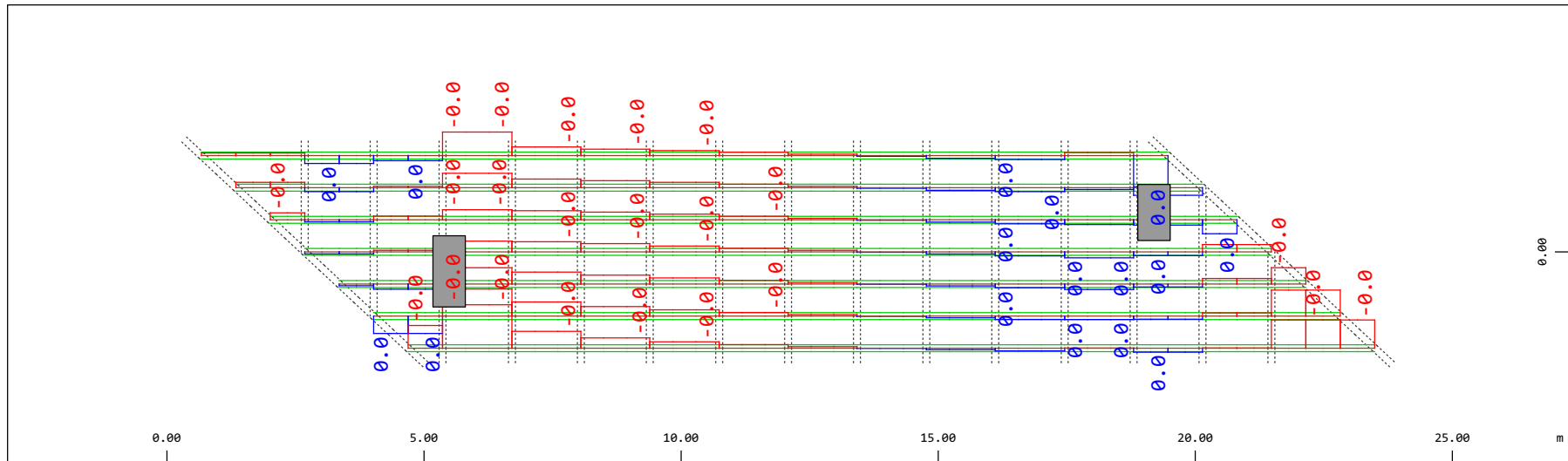
M 1 : 120

Definition of Axis
 Results elementay loads



Y
 X
 Sector of system Beam Elements Group 31...37
 Beam Elements , Normal force Nx, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 19.6 kN (Min=-15.4) (Max=8.56)

M 1 : 120

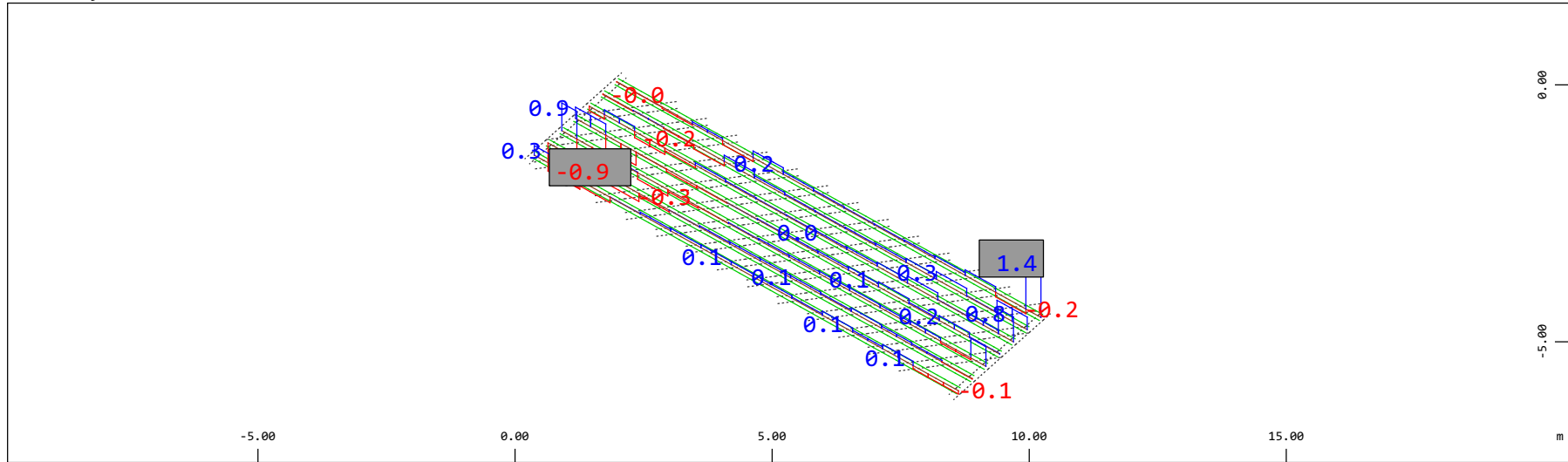


Y
 X
 Sector of system Beam Elements Group 31...37
 Beam Elements , Torsional moment Mt, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 0.0020 kNm (Min=-0.0014) (Max= 9.8678e-04)

M 1 : 120

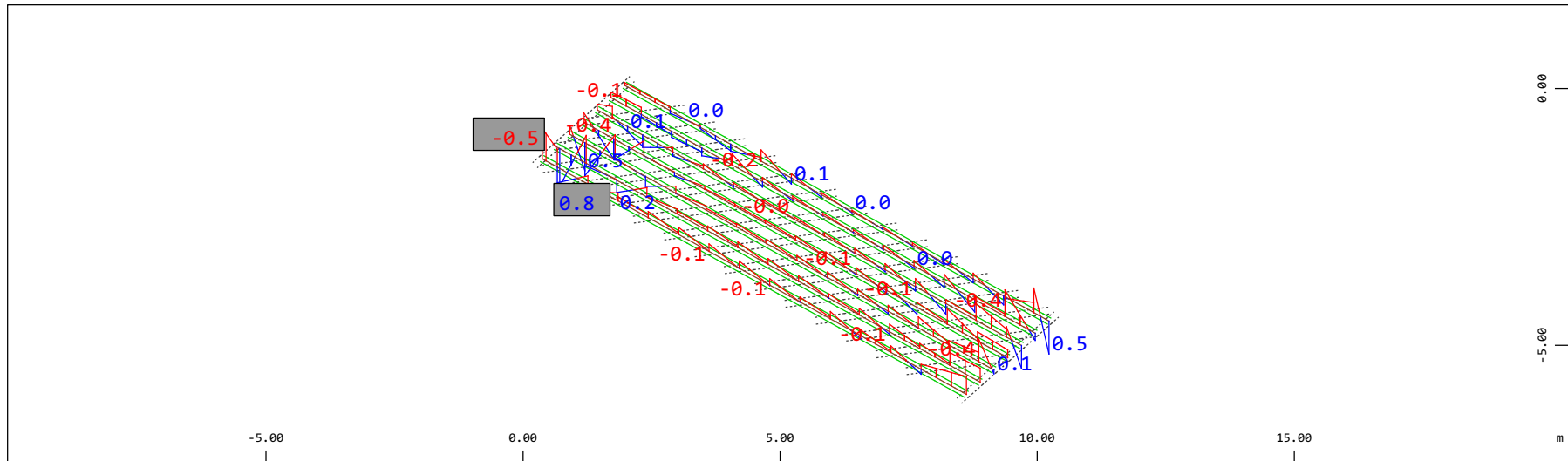
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 1.96 kN (Min=-0.926) (Max=1.42)

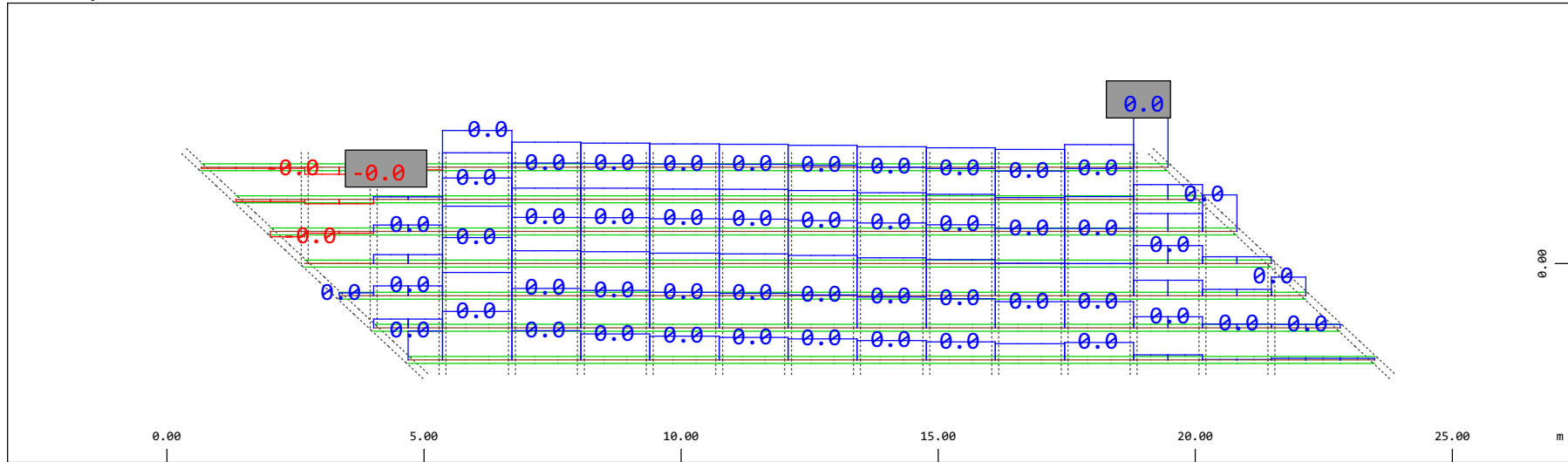
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 0.980 kNm (Min=-0.502) (Max=0.780)

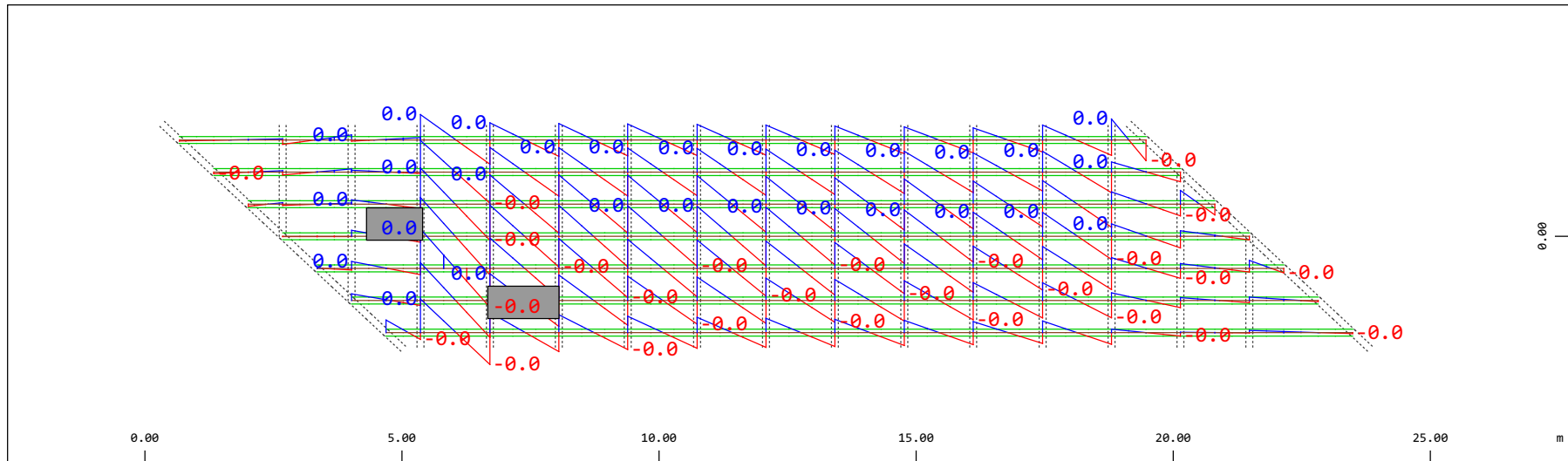
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force V_y , Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 0.0098 kN (Min=-0.0011) (Max=0.0099)

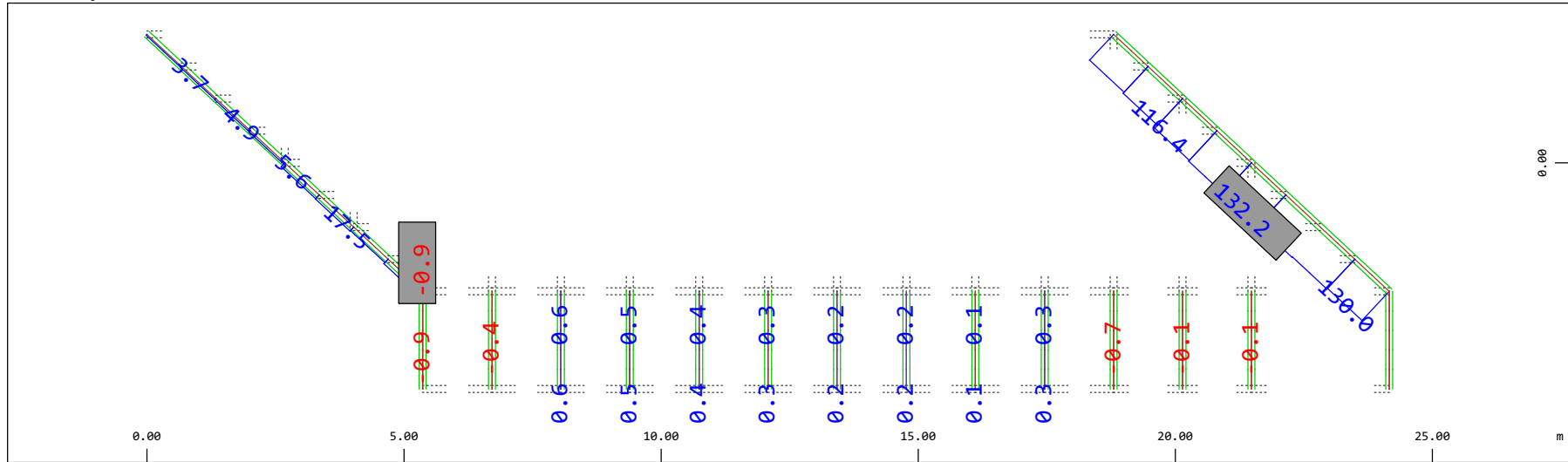
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment M_z , Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 0.0098 kNm (Min=-0.0062) (Max=0.0063)

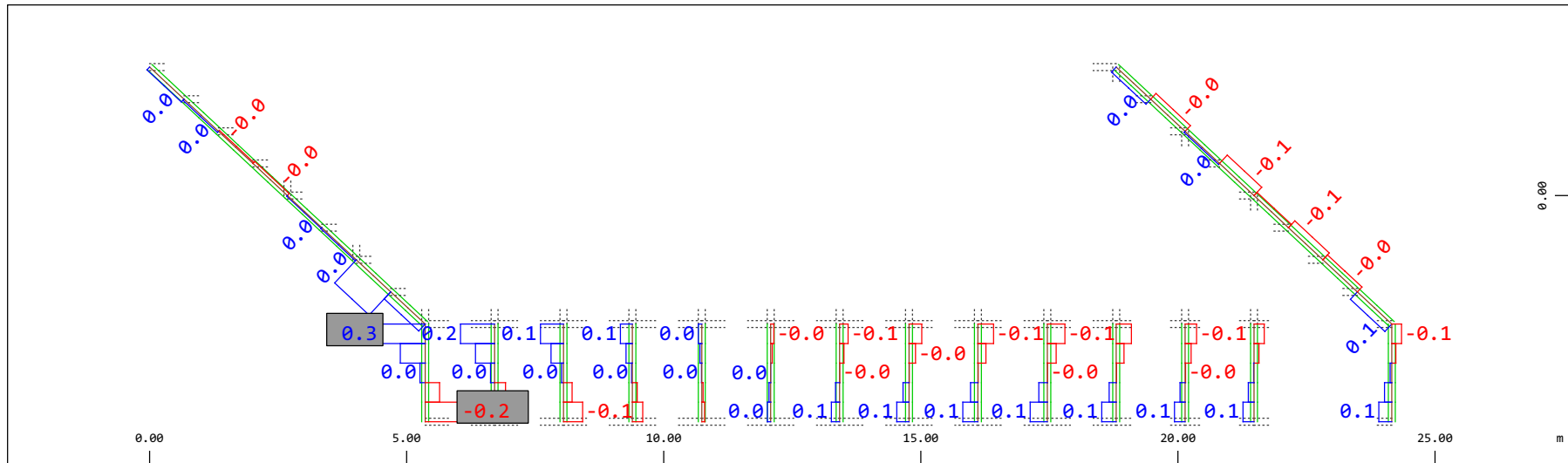
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 196.1 kN (Min=-0.860) (Max=132.2)

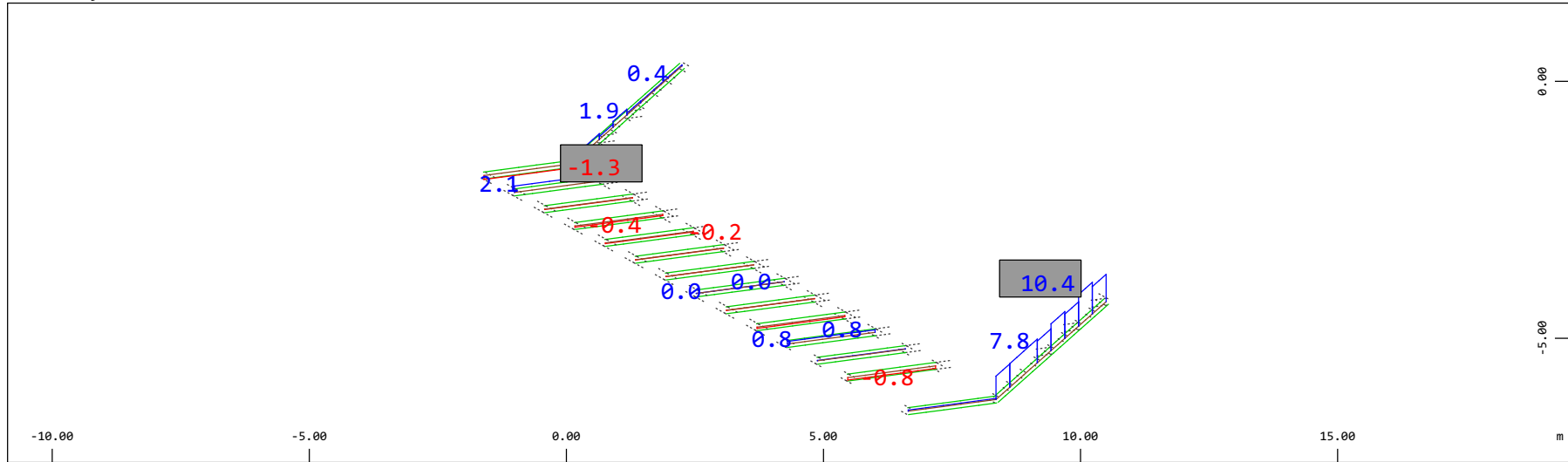
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 0.392 kNm (Min=-0.216) (Max=0.283)

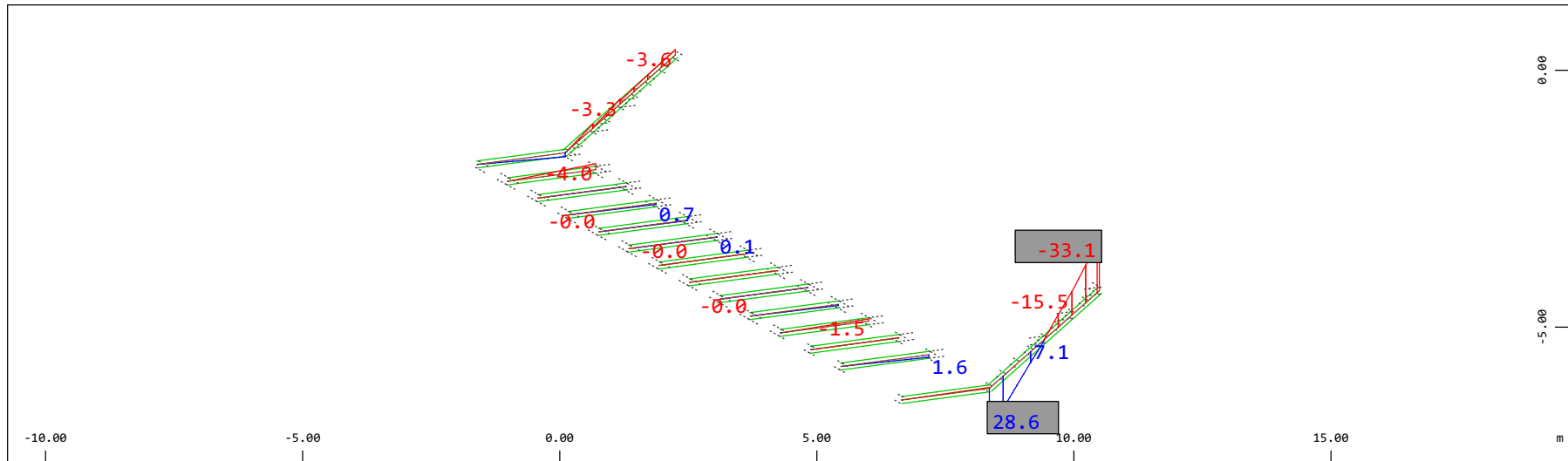
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 19.6 kN (Min=-1.33) (Max=10.4)

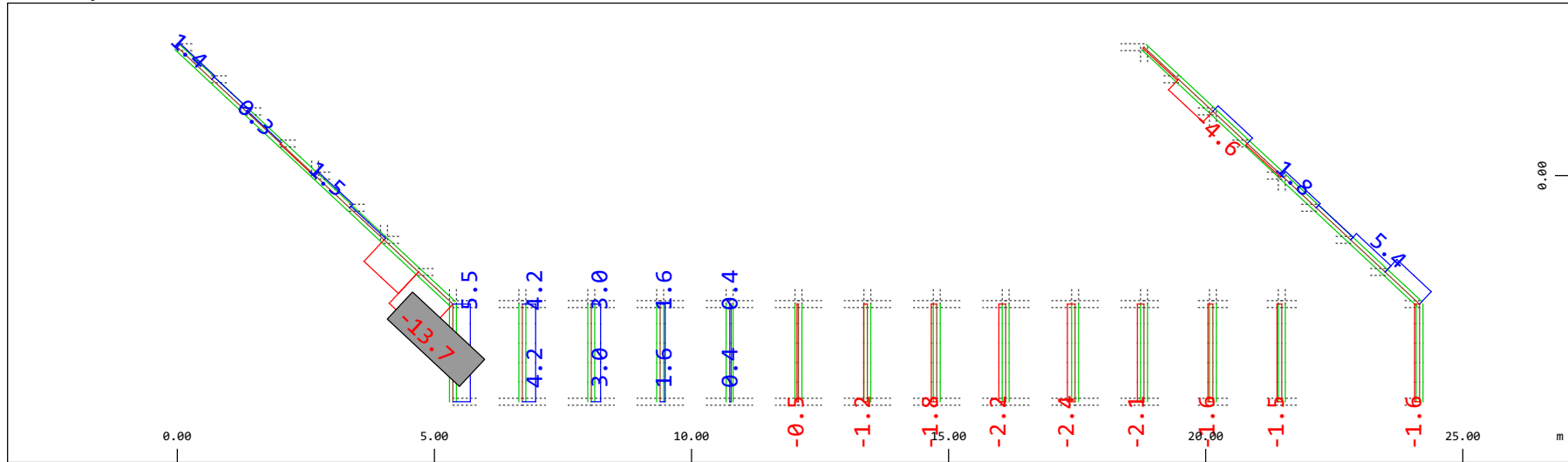
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 39.2 kNm (Min=-33.1) (Max=28.6)

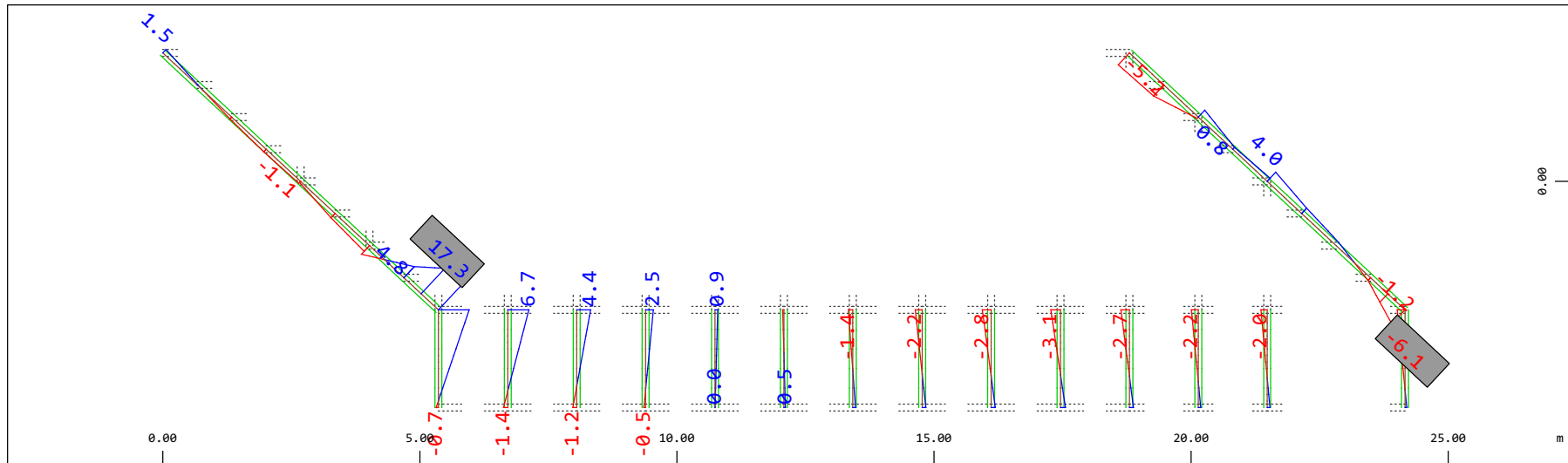
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 19.6 kN (Min=-13.7) (Max=5.53)

M 1 : 120

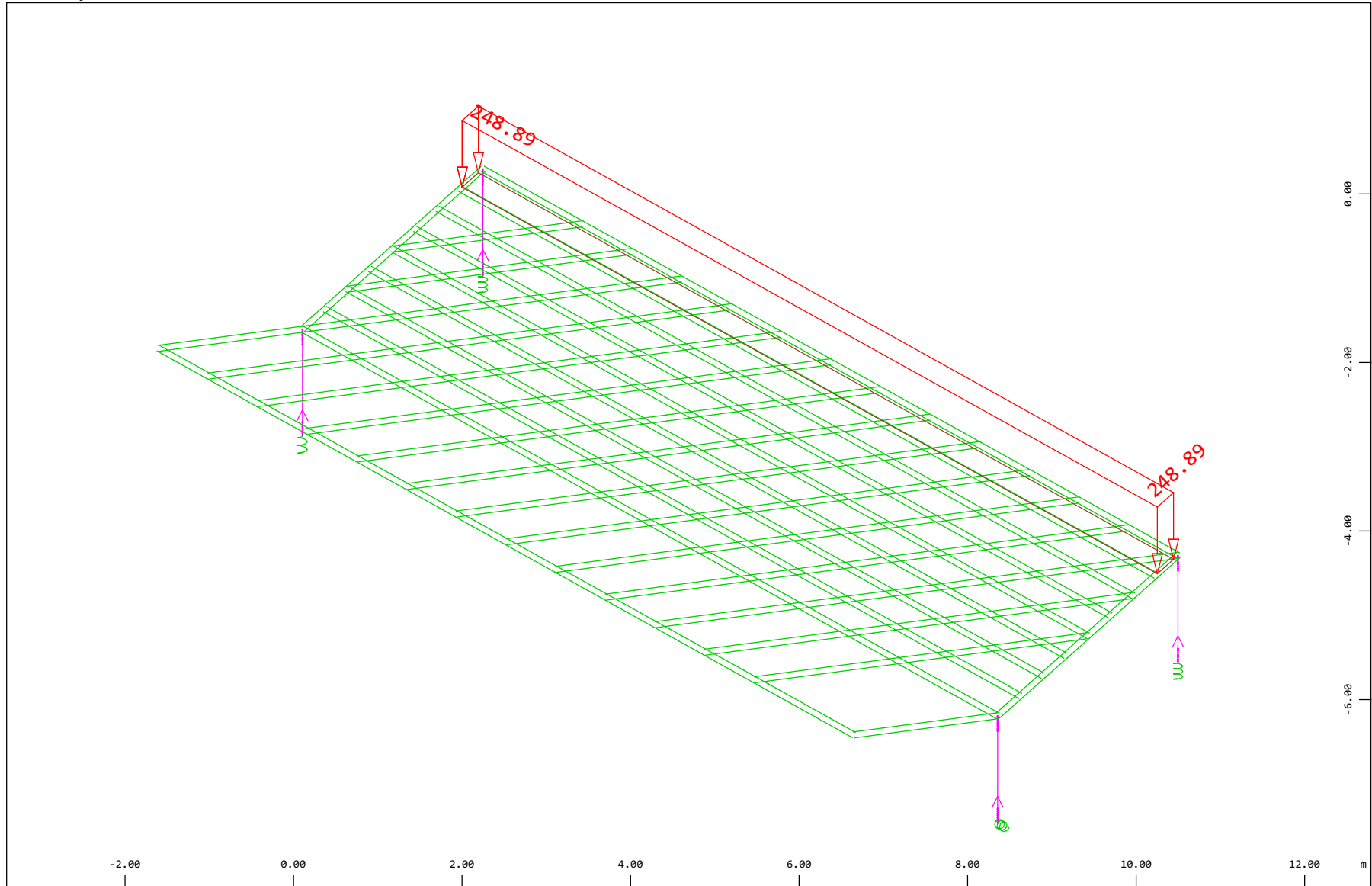


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 507 Qt: Frenatura SW/2 (B-->A) , 1 cm 3D = 19.6 kNm (Min=-6.14) (Max=17.3)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

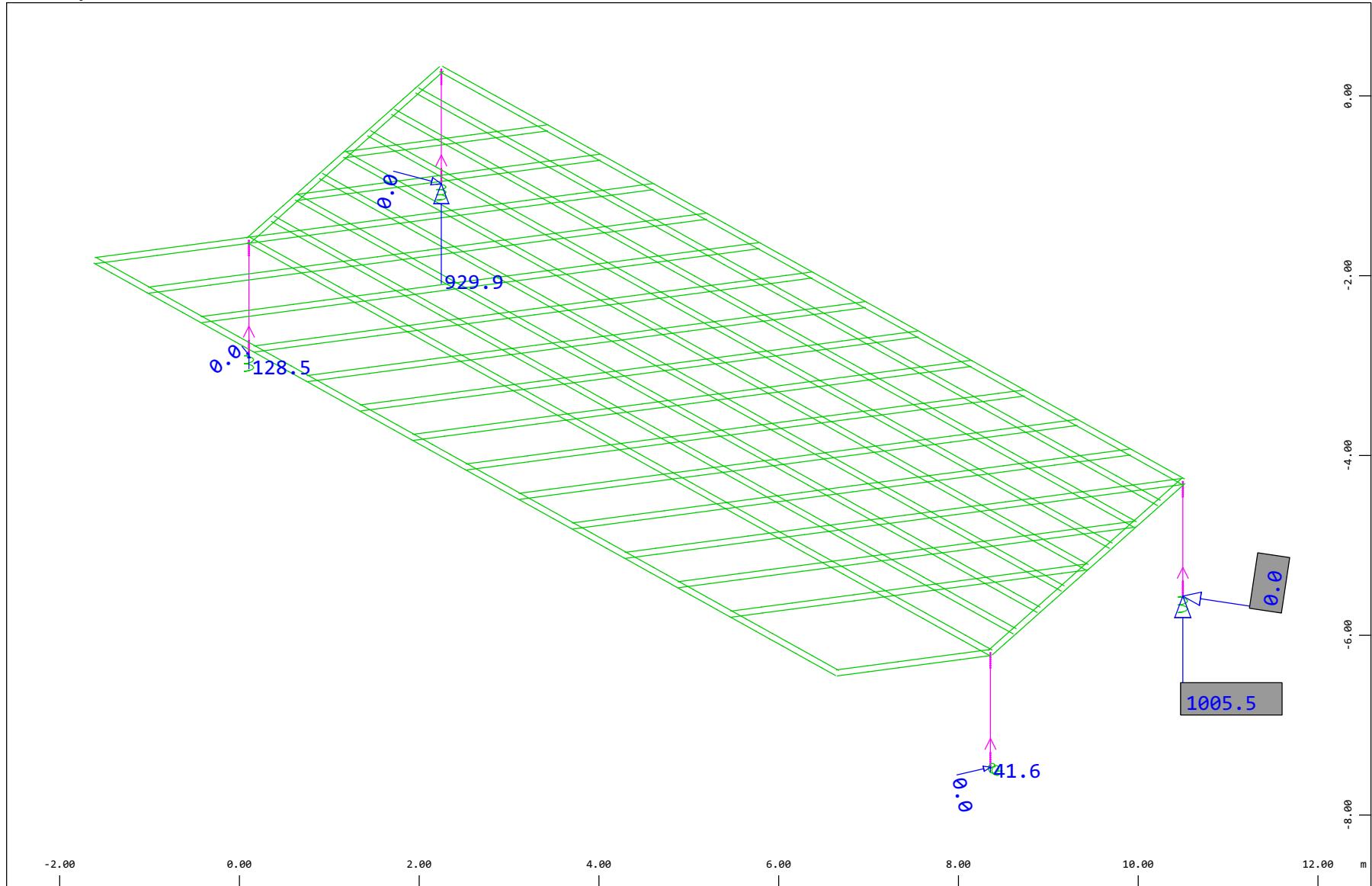
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 210 Qt: deragliament-caso2+ , (1 cm 3D = unit) Free area load (force) in global Z (Unit=193.8 kN/m2)
 (Min=-248.9) (Max=-248.9)



M 1 : 64
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 484.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 9.6875e-04 kN

△ (Max=1005.) (total: 2105.)

△

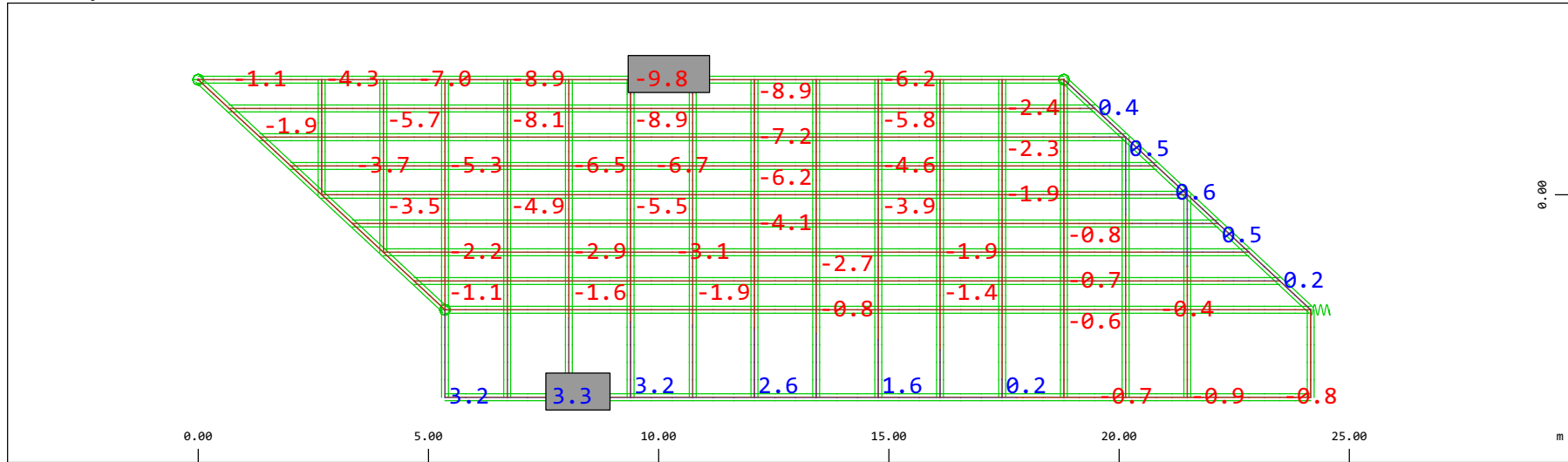
M 1 : 60

X * 0.502

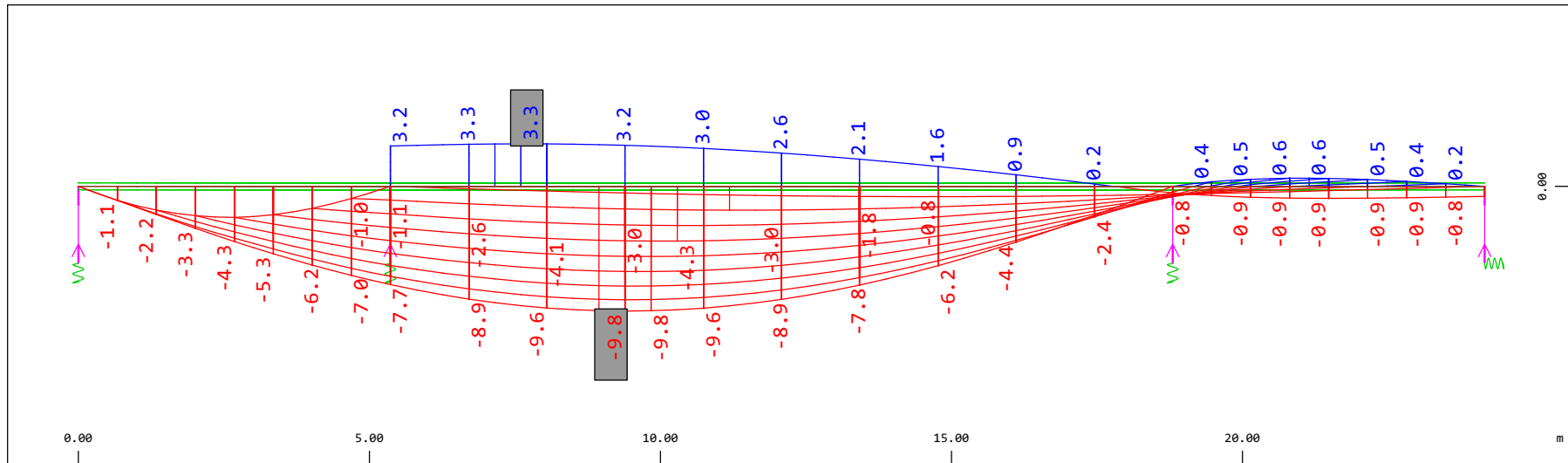
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

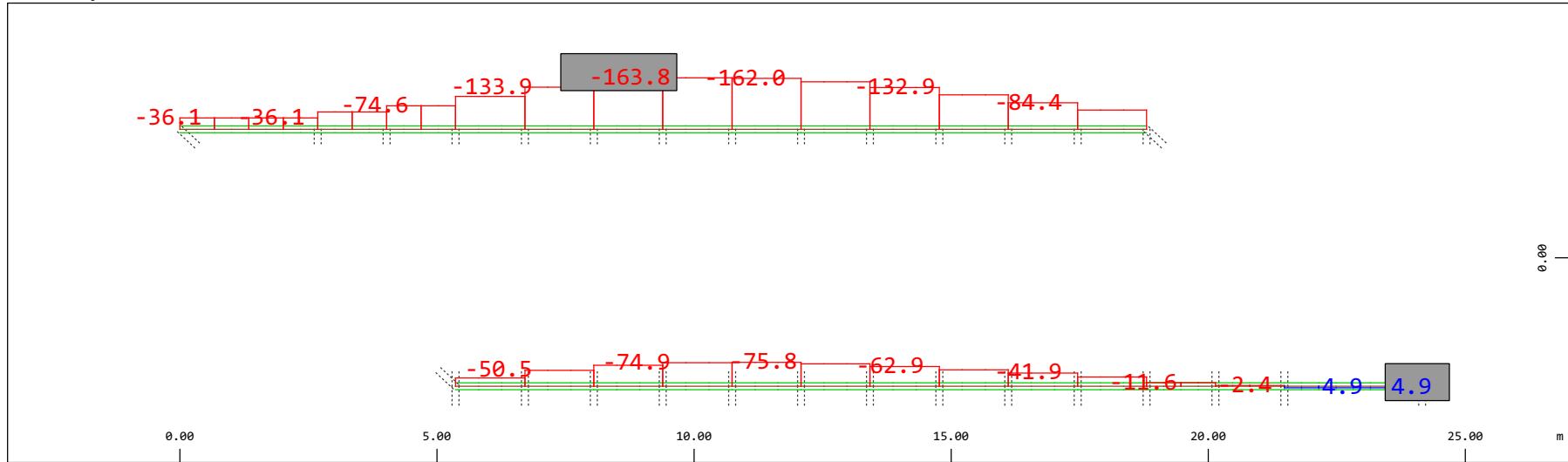


Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along (Max=3.33) \circ , Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 4.84 mm (Min=-9.80) M 1 : 134



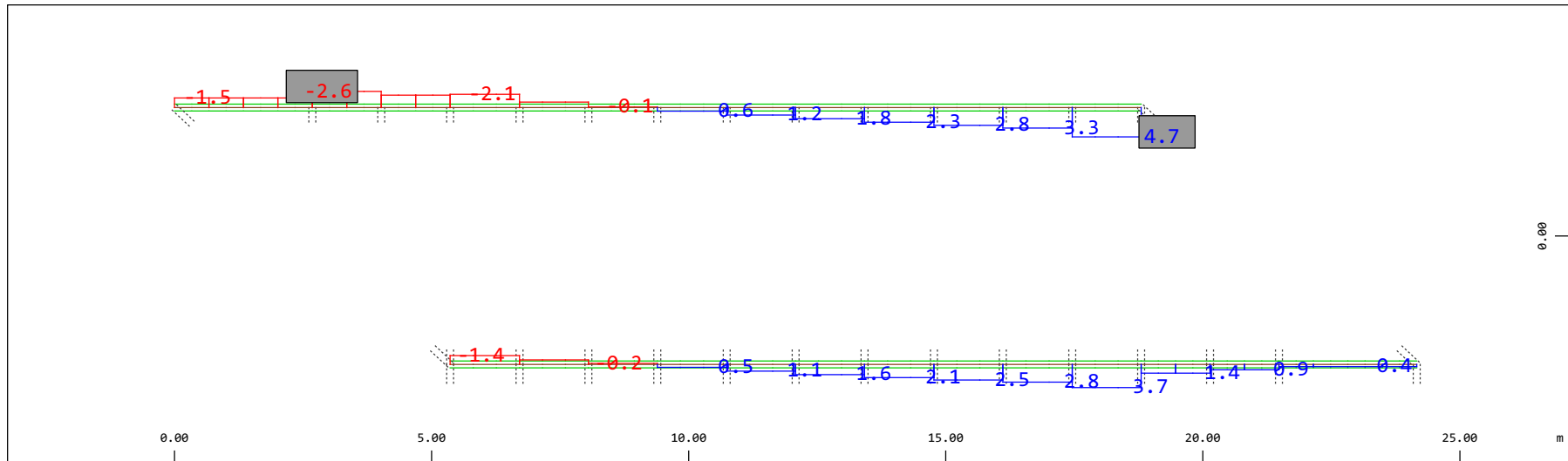
Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along (Max=3.33) \updownarrow , Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 4.84 mm (Min=-9.80) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 196.1 kN (Min=-163.8) (Max=4.88)

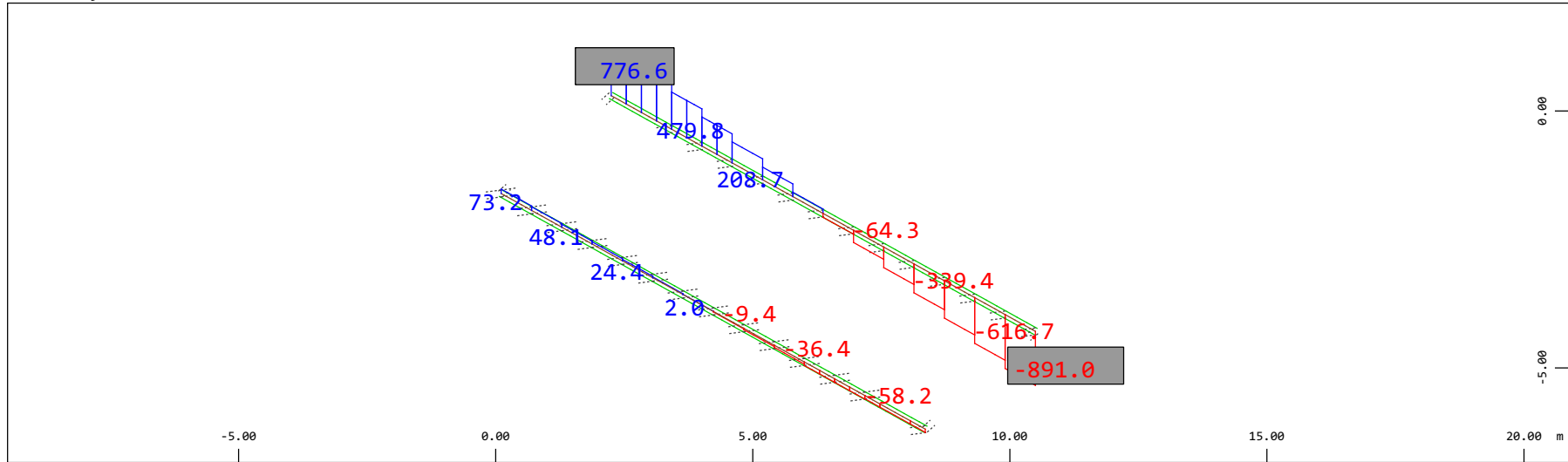
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 9.80 kNm (Min=-2.57) (Max=4.67)

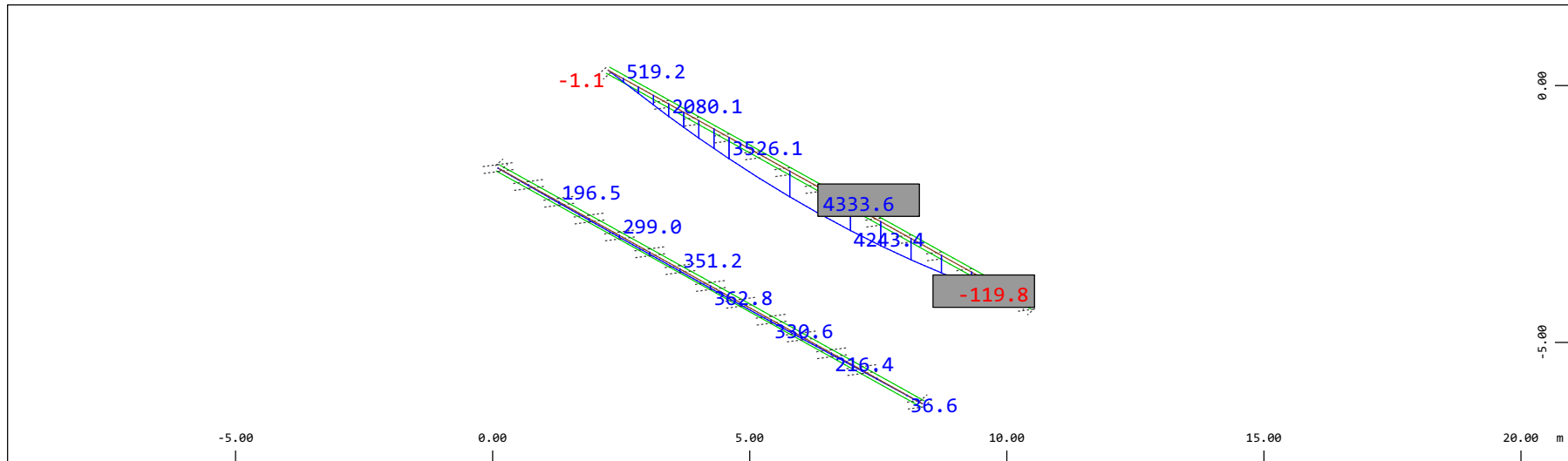
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 210 Qt: deragliamento-caso2+ , 1 cm 3D = 980.5 kN (Min=-891.0) (Max=776.6)

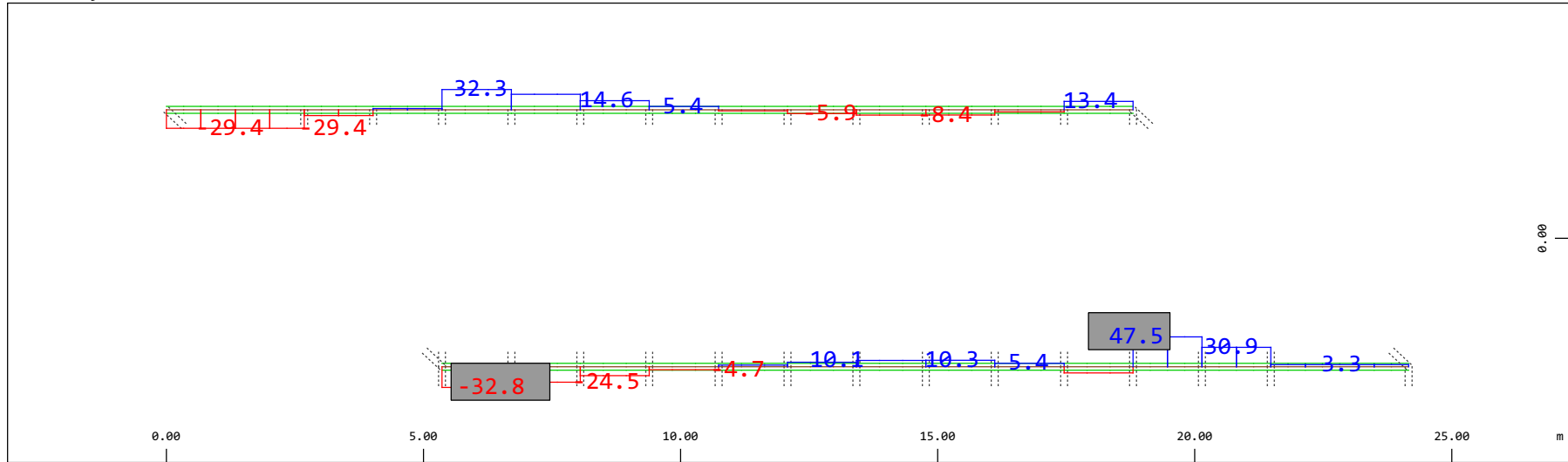
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 210 Qt: deragliamento-caso2+ , 1 cm 3D = 9805. kNm (Min=-119.8) (Max=4334.)

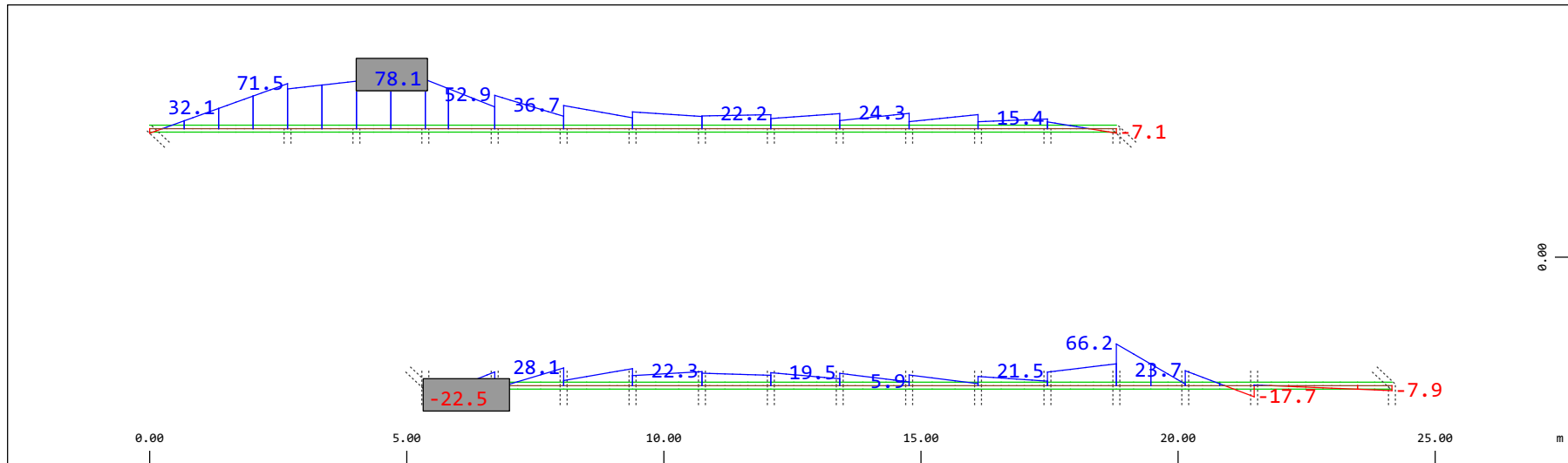
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 98.0 kN (Min=-32.8) (Max=47.5)

M 1 : 120

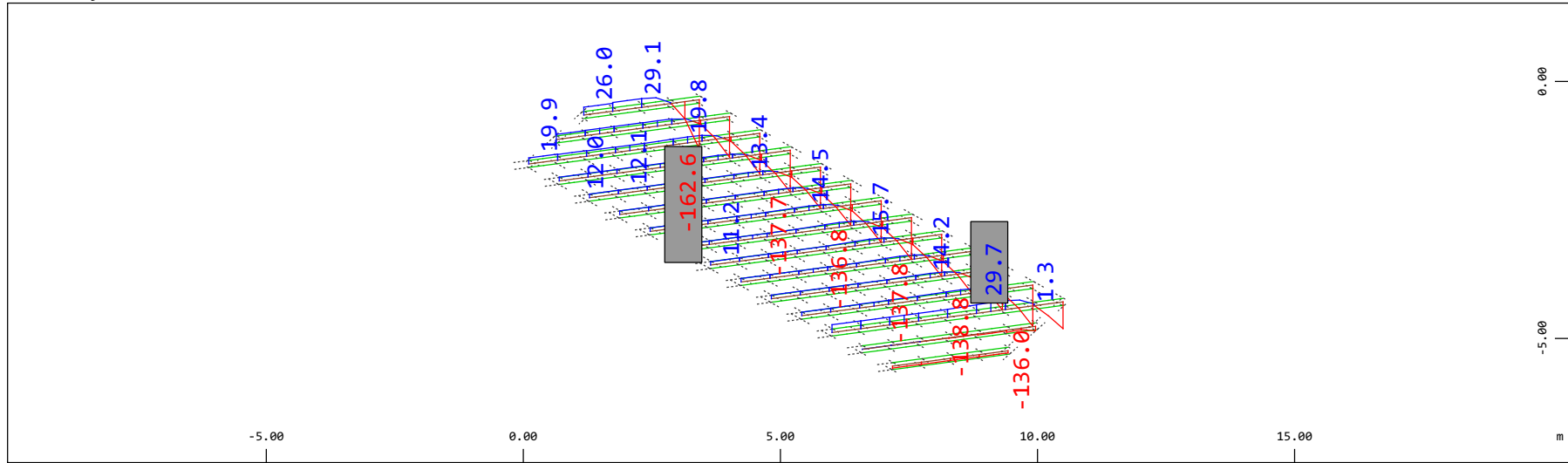


Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 98.0 kNm (Min=-22.5) (Max=78.1)

M 1 : 120

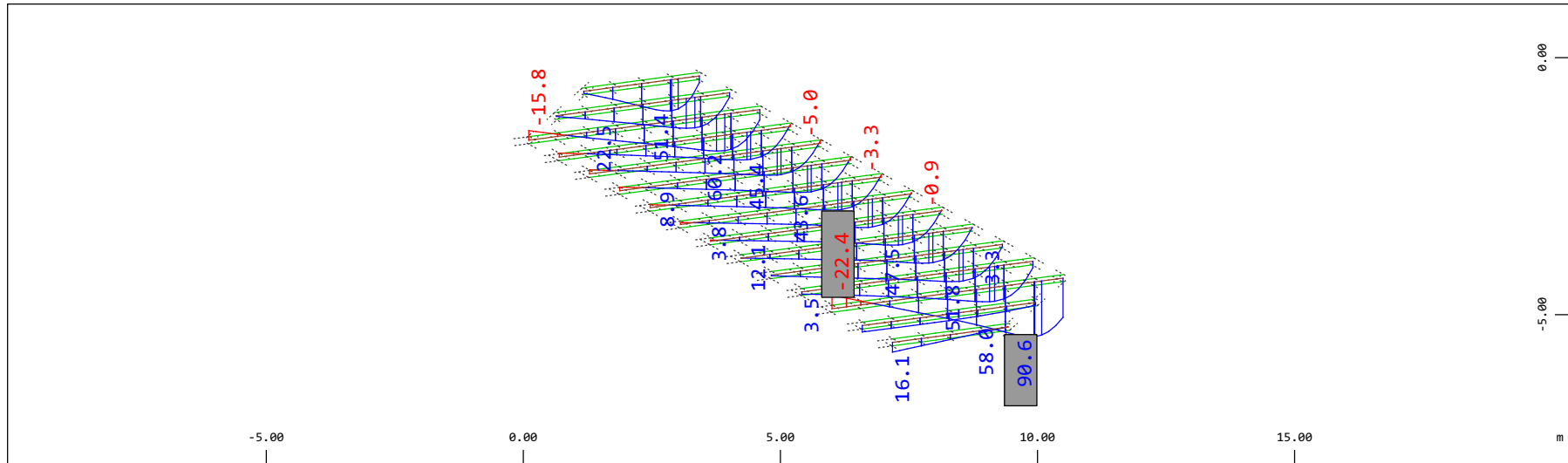
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 196.1 kN (Min=-162.6) (Max=29.7)

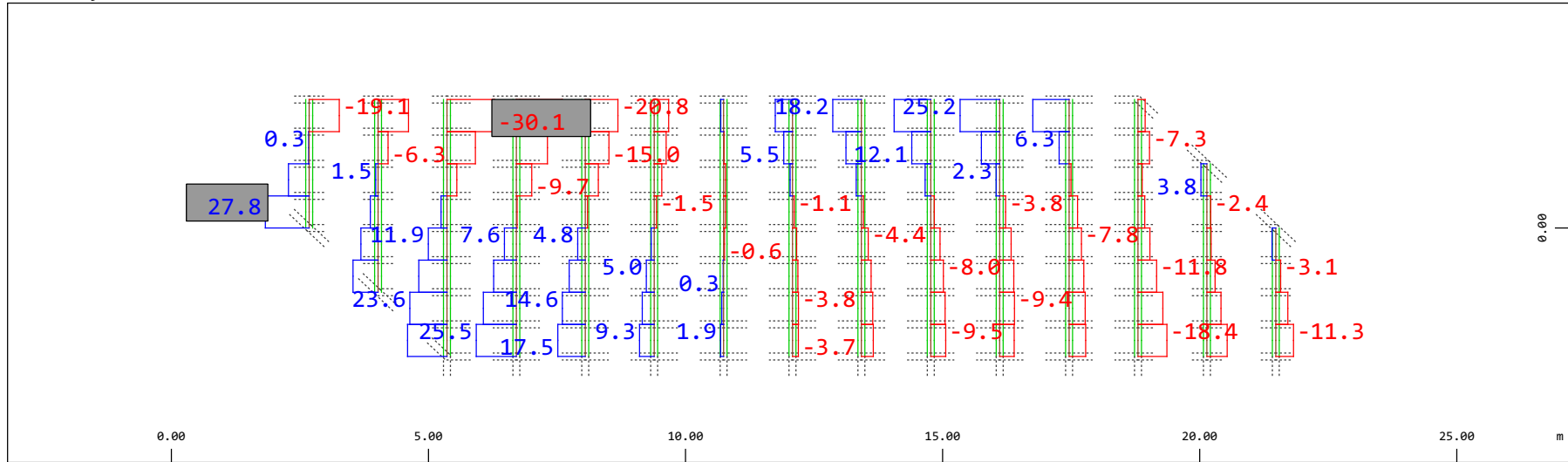
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 98.0 kNm (Min=-22.4) (Max=90.6)

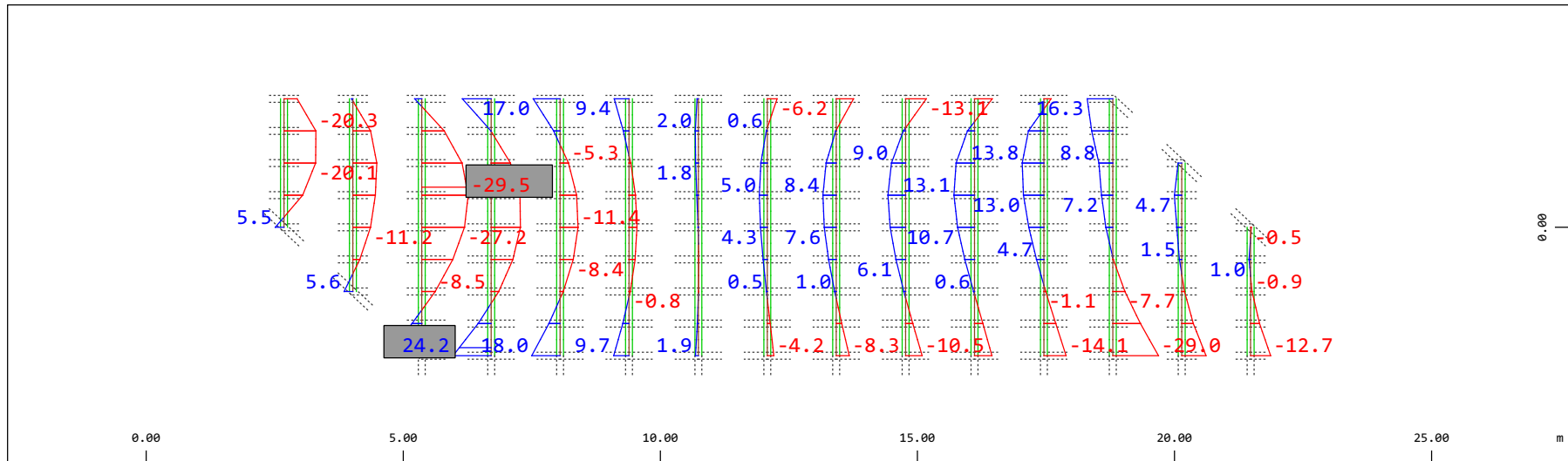
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Shear force Vy, Loadcase 210 Qt: deragliamento-caso2+ , 1 cm 3D = 39.2 kN (Min=-30.1) (Max=27.8)

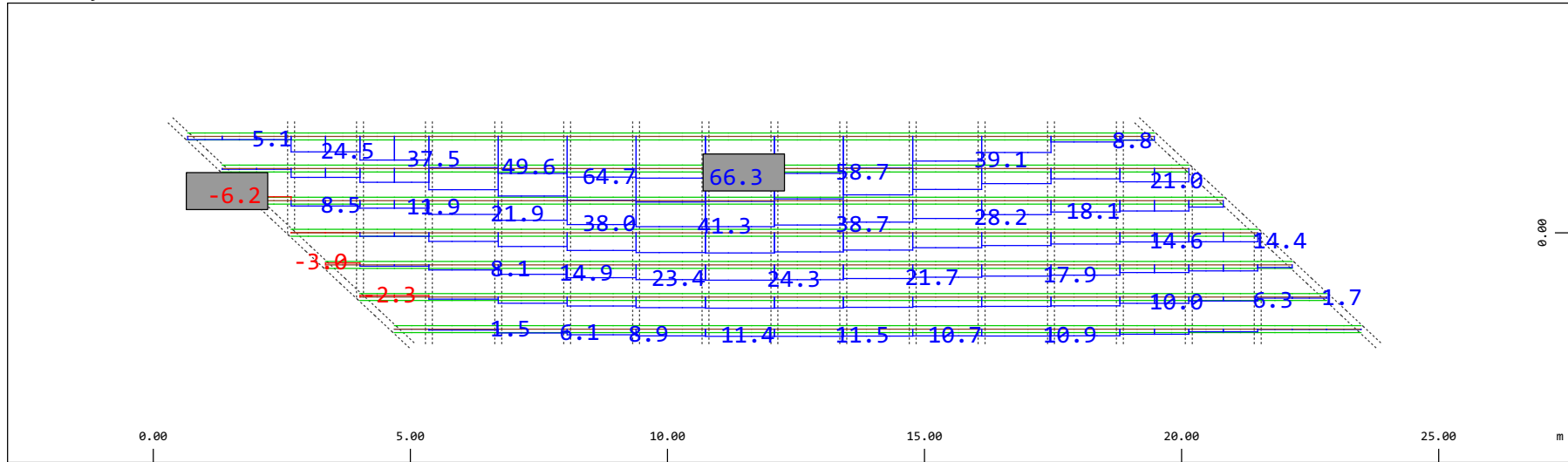
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Bending moment Mz, Loadcase 210 Qt: deragliamento-caso2+ , 1 cm 3D = 39.2 kNm (Min=-29.5) (Max=24.2)

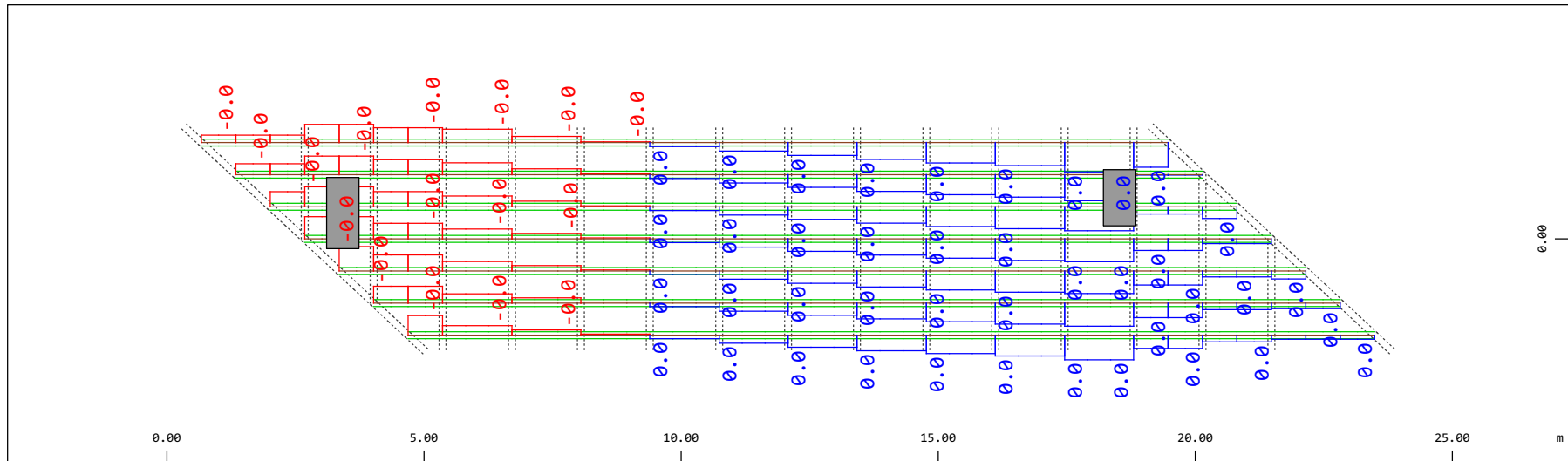
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 Z-X Beam Elements , Normal force Nx, Loadcase 210 Qt: deragliamento-caso2+ , 1 cm 3D = 98.0 kN (Min=-6.22) (Max=66.3)

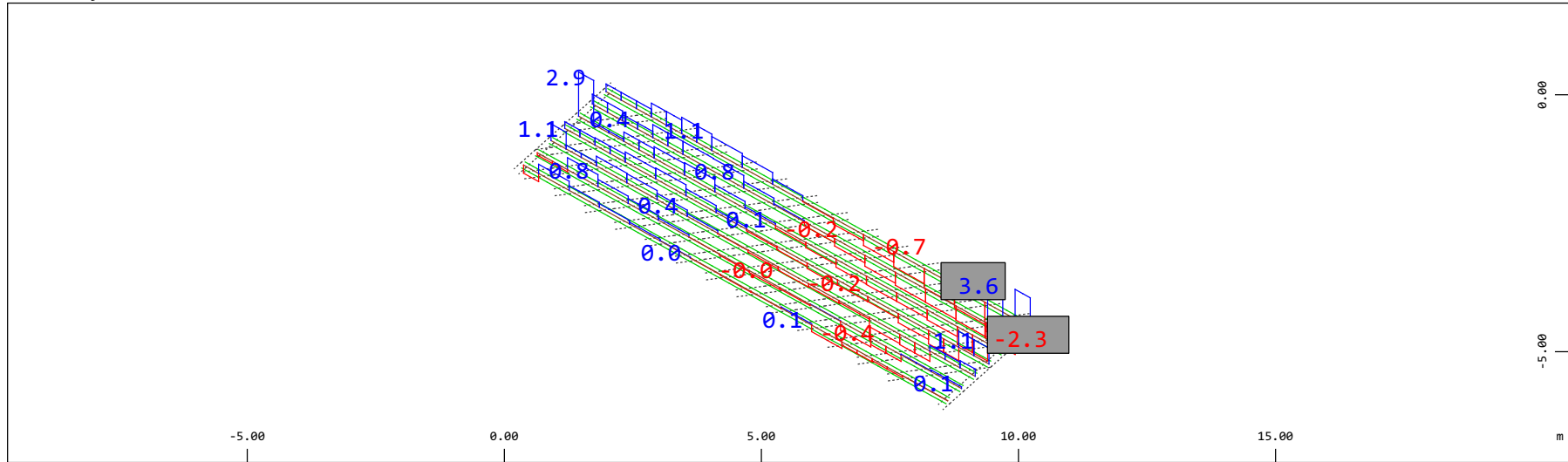
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 Z-X Beam Elements , Torsional moment Mt, Loadcase 210 Qt: deragliamento-caso2+ , 1 cm 3D = 0.0098 kNm (Min=-0.0039) (Max=0.0047)

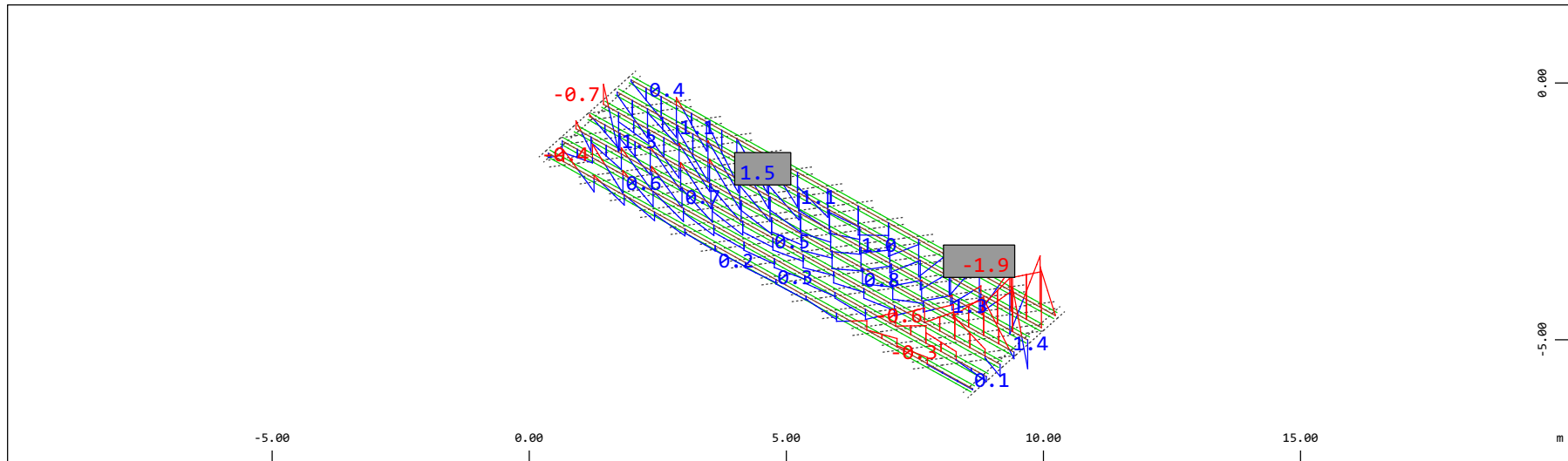
M 1 : 120

Definition of Axis
Results elementay loads



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Shear force Vz, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 3.92 kN (Min=-2.34) (Max=3.61)

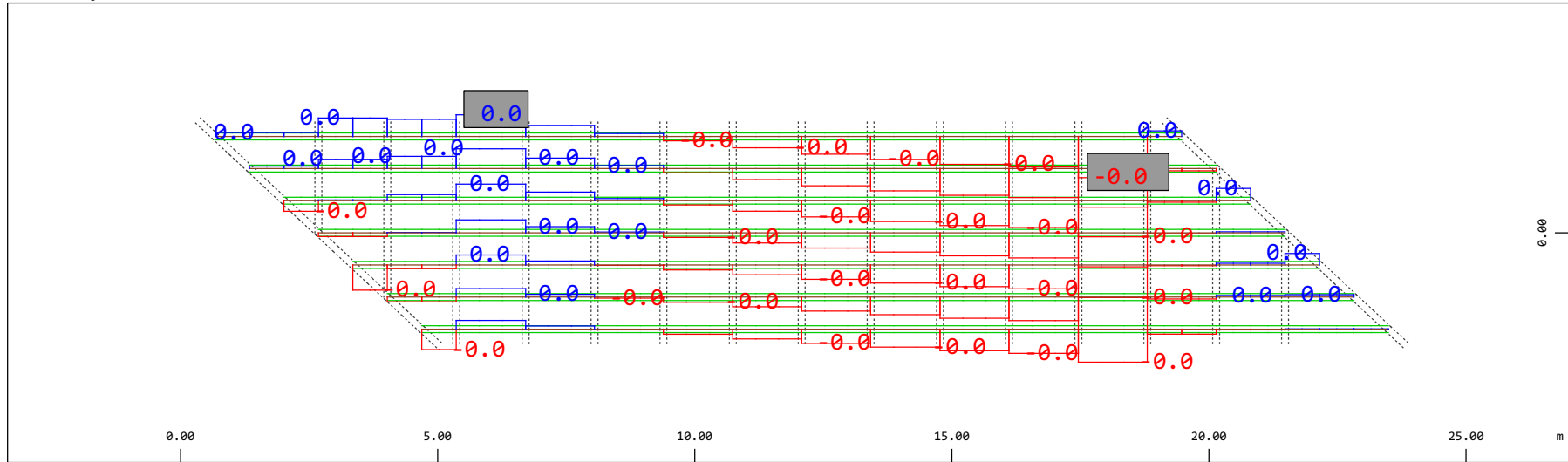
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Z Sector of system Beam Elements Group 31...37
X Y Beam Elements , Bending moment My, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 1.96 kNm (Min=-1.86) (Max=1.46)

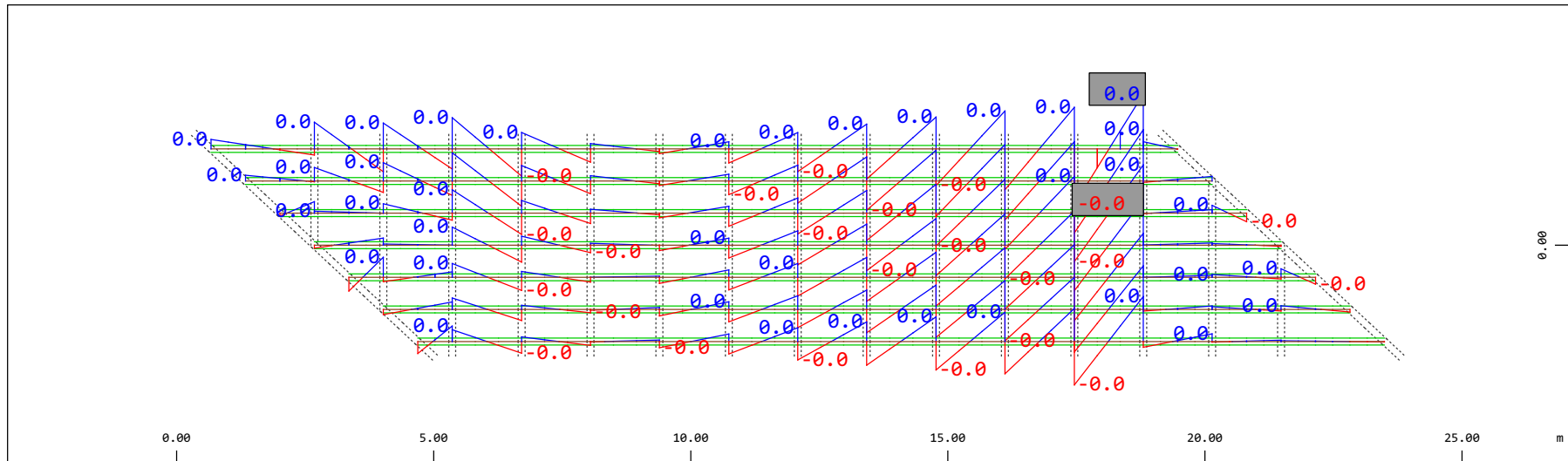
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
Results elementay loads



Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Shear force Vy, Loadcase 210 Qt: deragliamento-caso2+ , 1 cm 3D = 0.0196 kN (Min=-0.0131) (Max=0.0069)

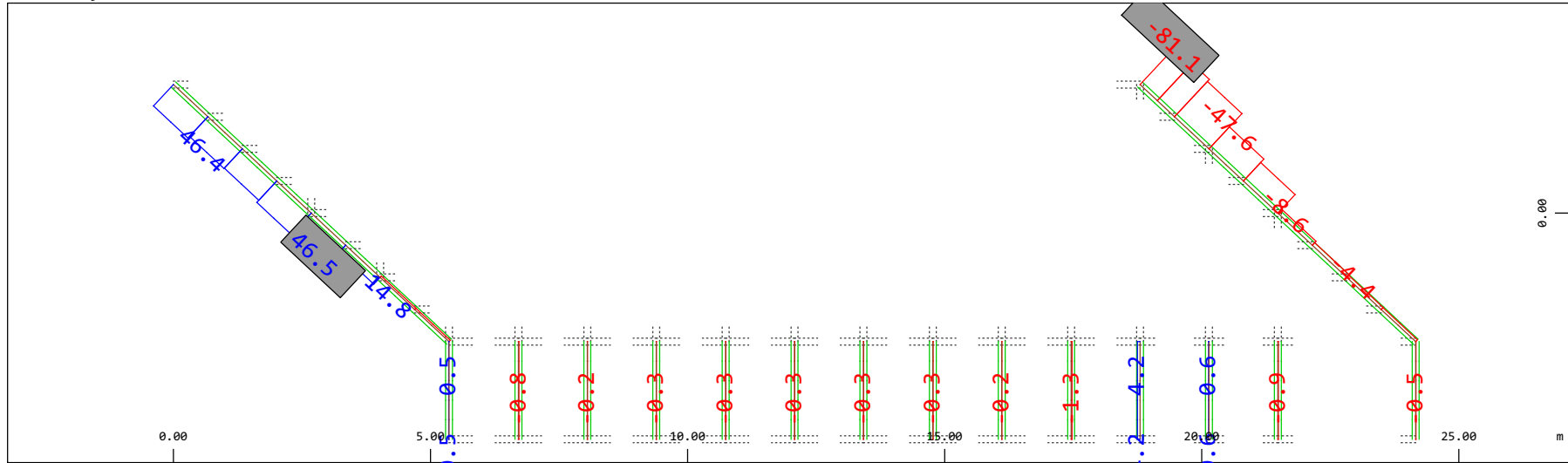
M 1 : 120



Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Bending moment Mz, Loadcase 210 Qt: deragliamento-caso2+ , 1 cm 3D = 0.0098 kNm (Min=-0.0088) (Max=0.0087)

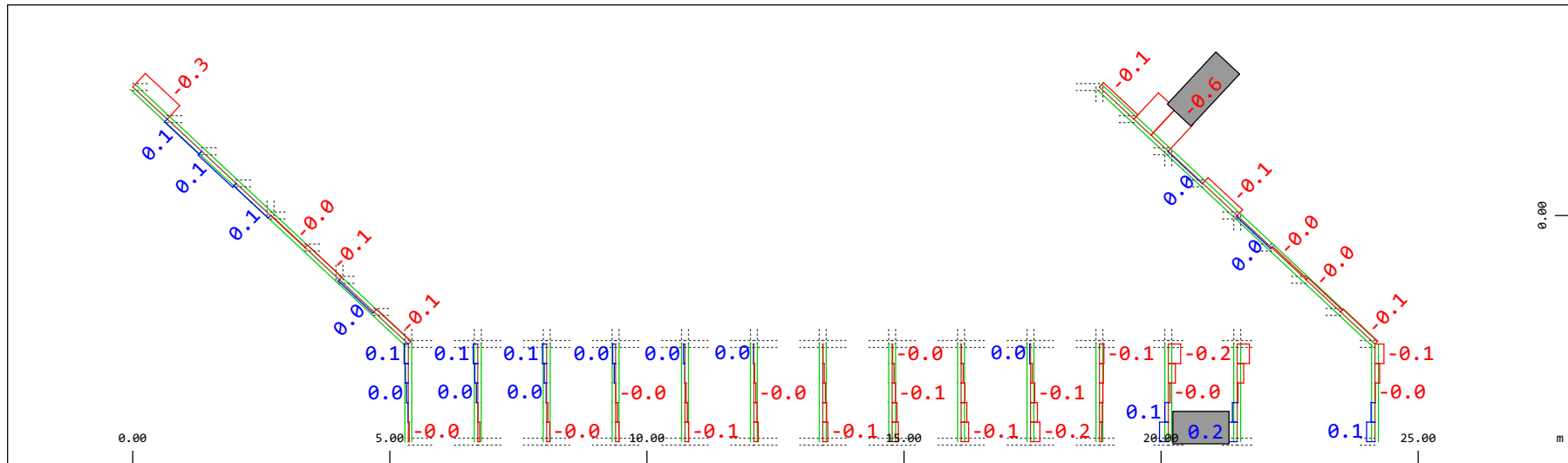
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 98.0 kN (Min=-81.1) (Max=46.5)

M 1 : 120

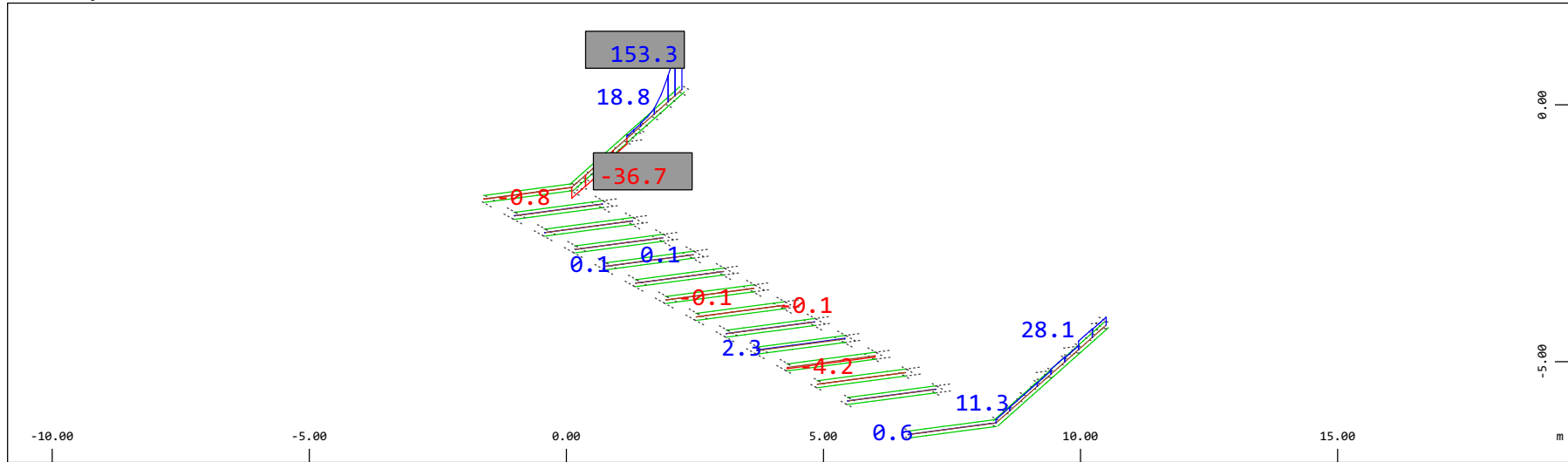


Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 0.980 kNm (Min=-0.572) (Max=0.165)

M 1 : 120

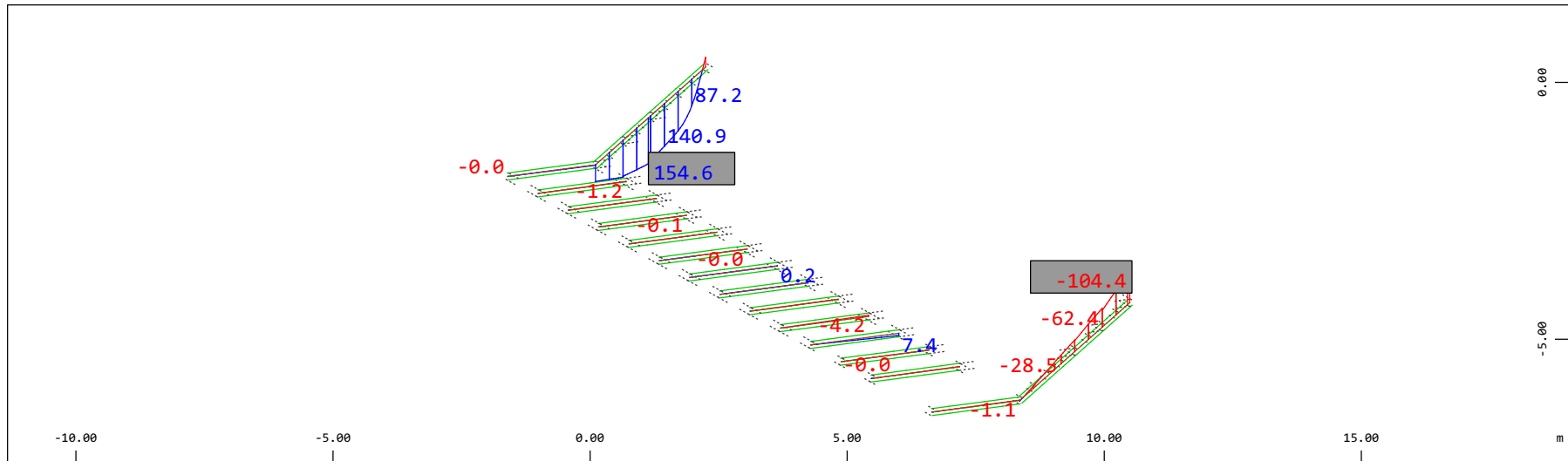
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 196.1 kN (Min=-36.7) (Max=153.3)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

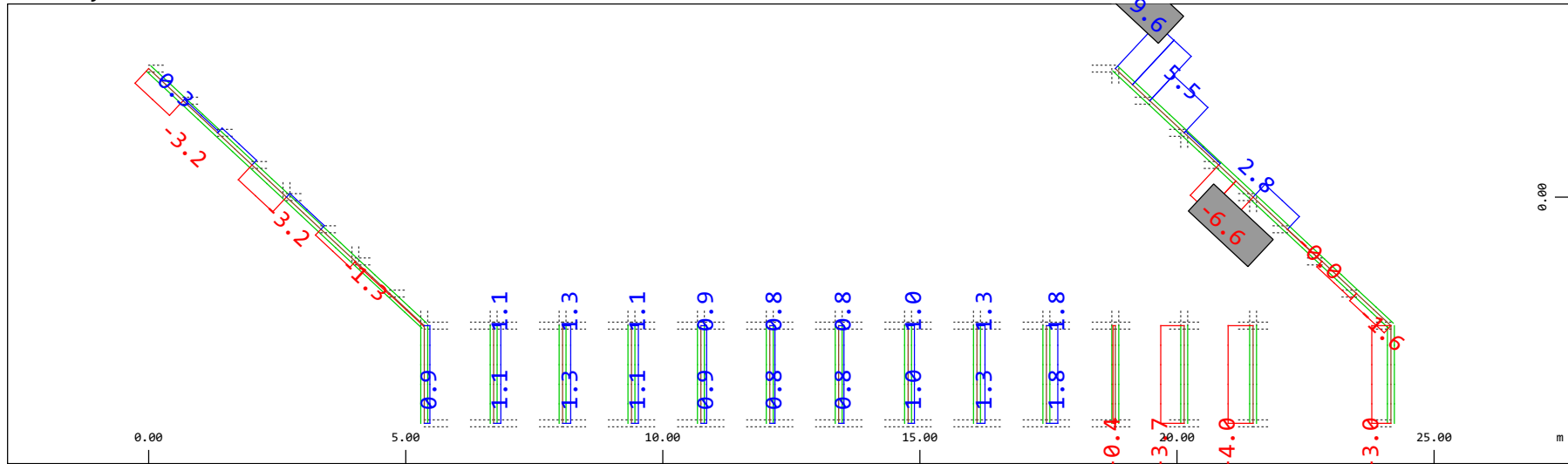


Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 196.1 kNm (Min=-104.4) (Max=154.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

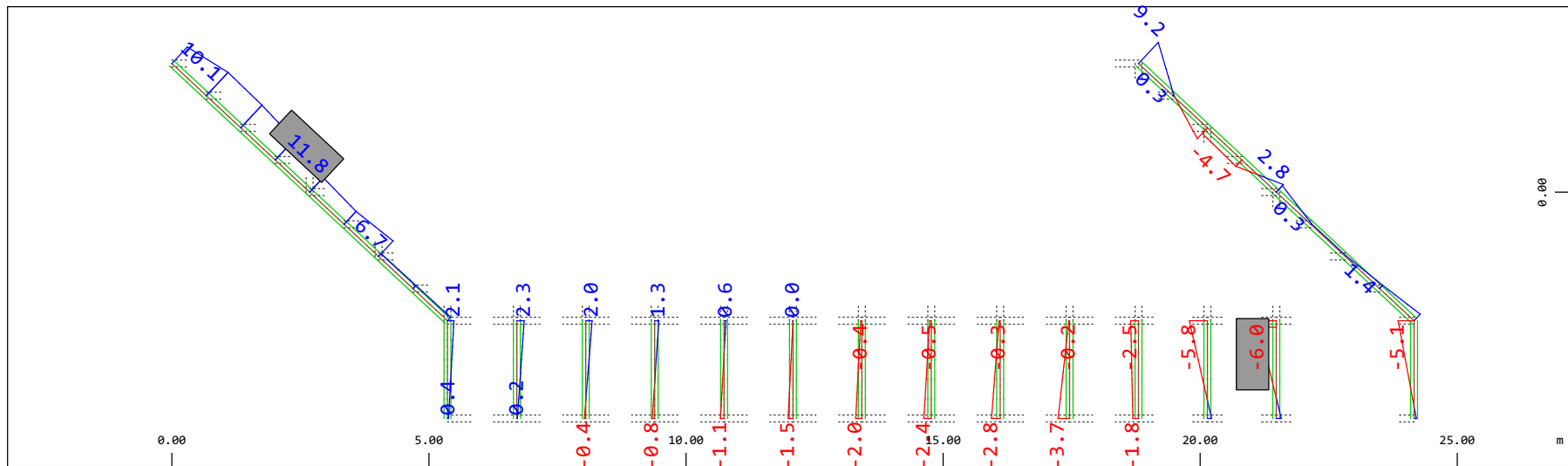
Definition of Axis
 Results elementay loads

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Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 9.80 kN (Min=-6.59) (Max=9.65)

M 1 : 120

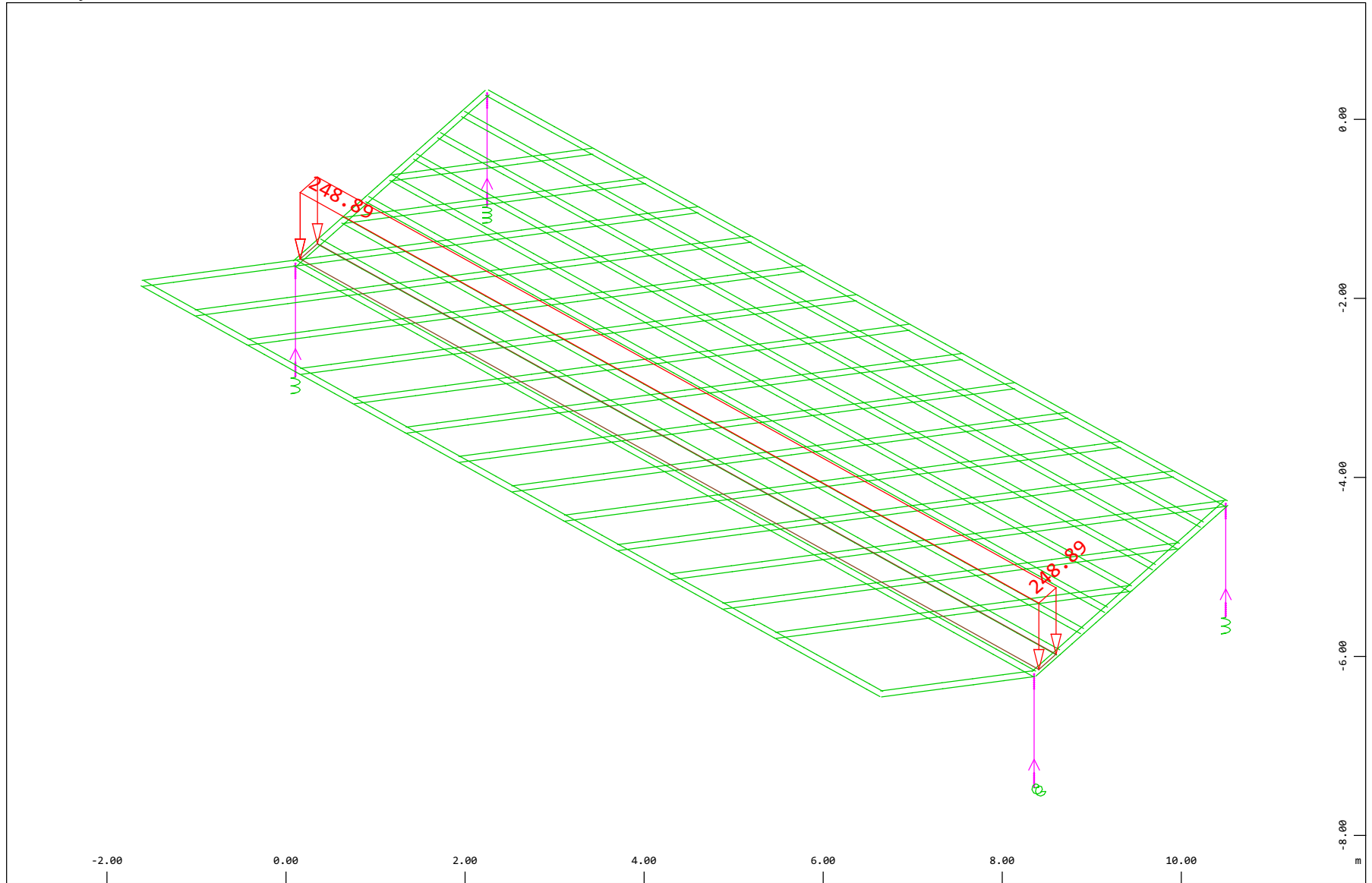


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 210 Qt: deragliament-caso2+ , 1 cm 3D = 19.6 kNm (Min=-5.96) (Max=11.8)

M 1 : 120

Definition of Axis
Results elementay loads

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Z
Y
X

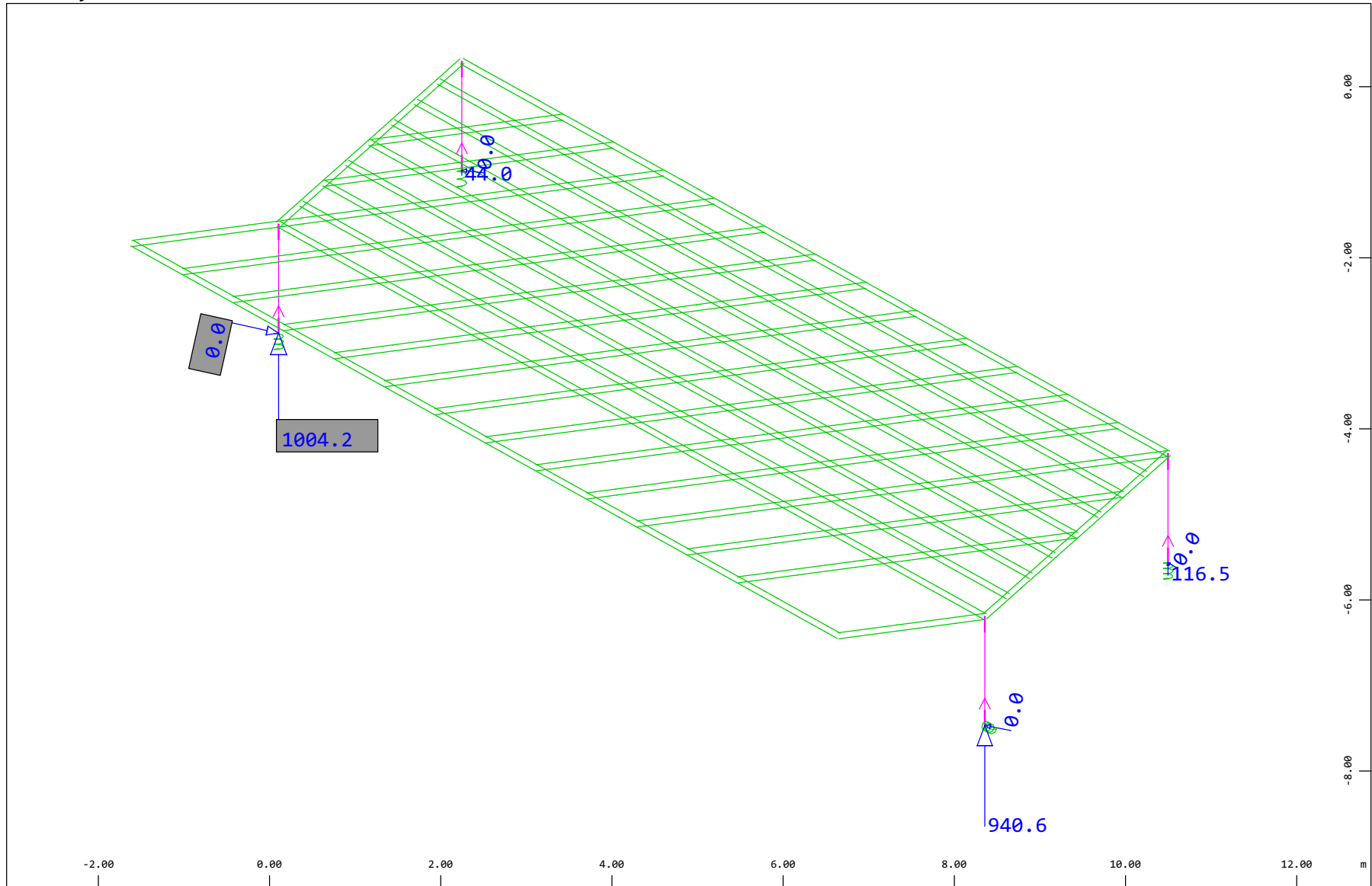
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
All loads, Loadcase 211 Qt: deragliament-caso2- , (1 cm 3D = unit) Free area load (force) in global Z (Unit=193.8 kN/m2)
(Min=-248.9) (Max=-248.9)



M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 484.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 0.0048 kN

▴ (Max=1004.) (total: 2105.)

▴ (Max=0.0067)

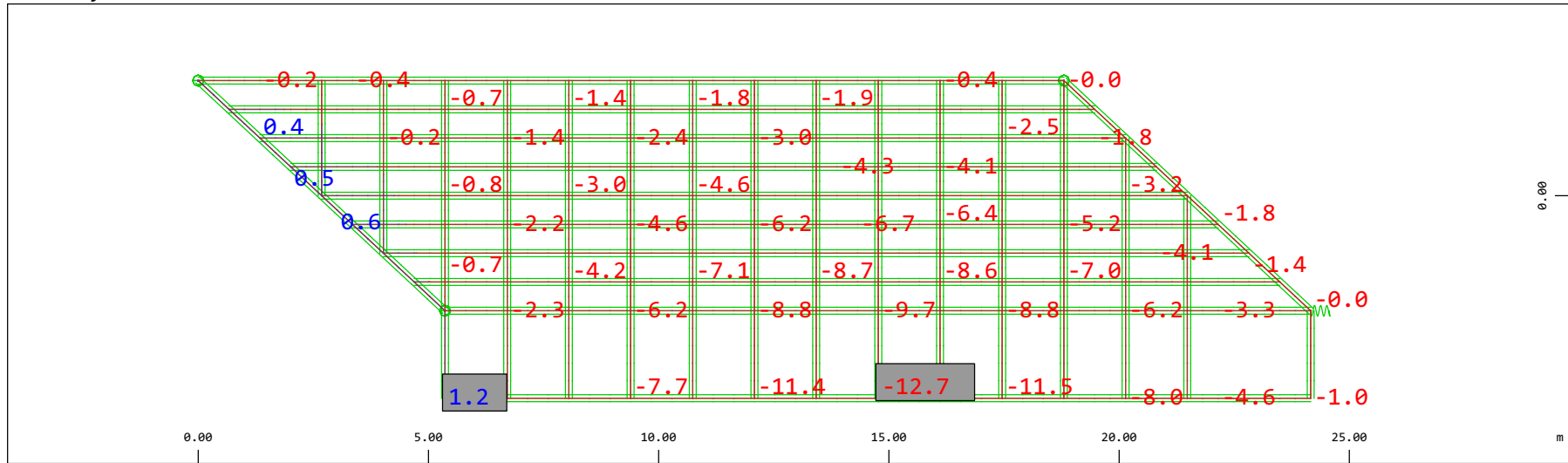
M 1 : 63

X * 0.502

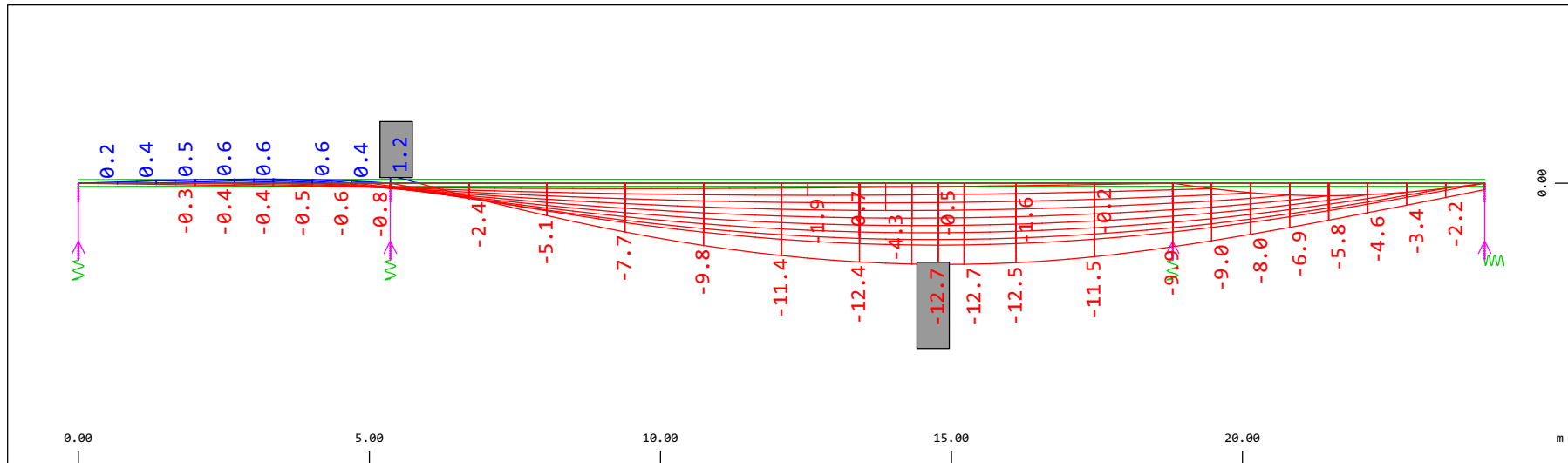
Y * 0.906

Z * 0.962

Definition of Axis
 Results elementay loads

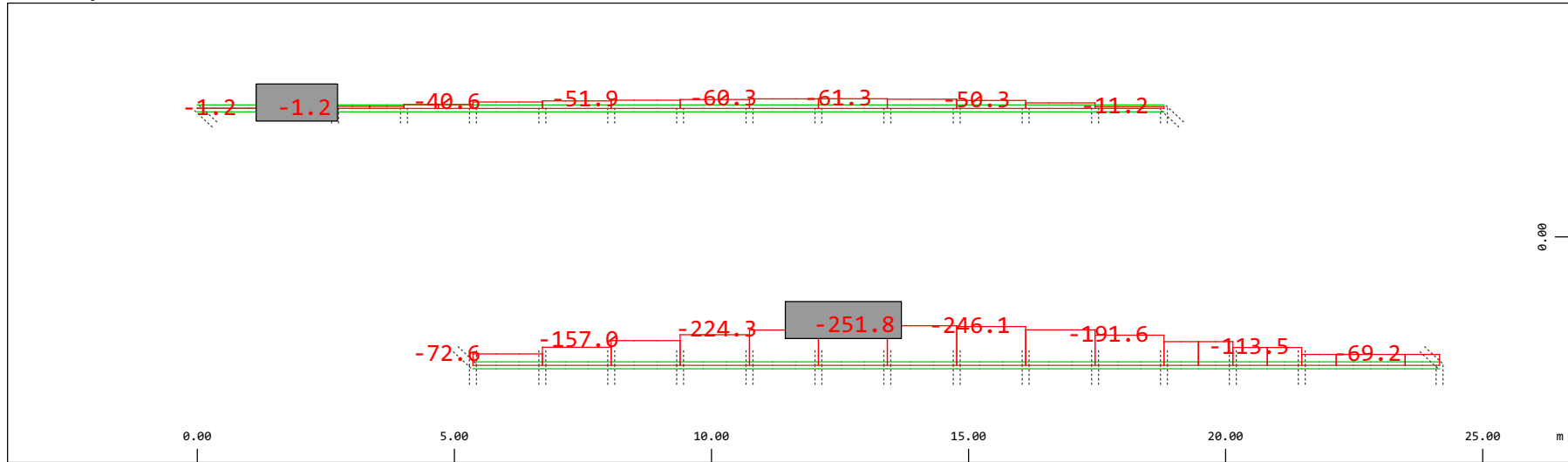


Y Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \curvearrowright , Loadcase 211 Qt: deragliamento-caso2- , 1 cm 3D = 9.69 mm (Min=-12.7) (Max=1.22) M 1 : 134



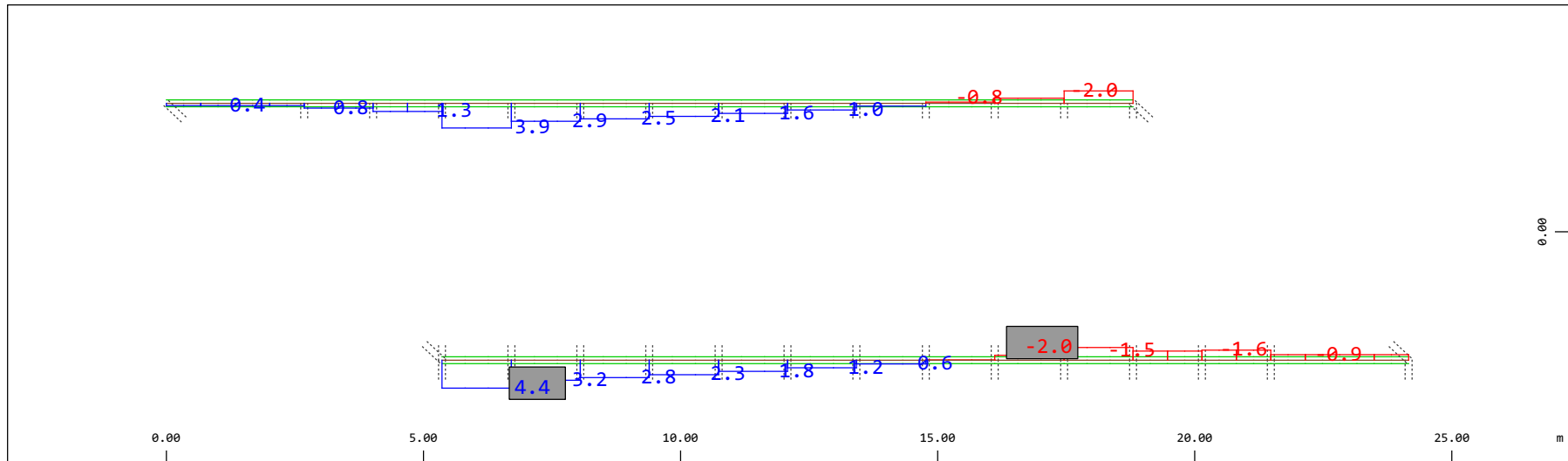
Z Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 211 Qt: deragliamento-caso2- , 1 cm 3D = 9.69 mm (Min=-12.7) (Max=1.22) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 392.2 kN (Min=-251.8) (Max=-1.17)

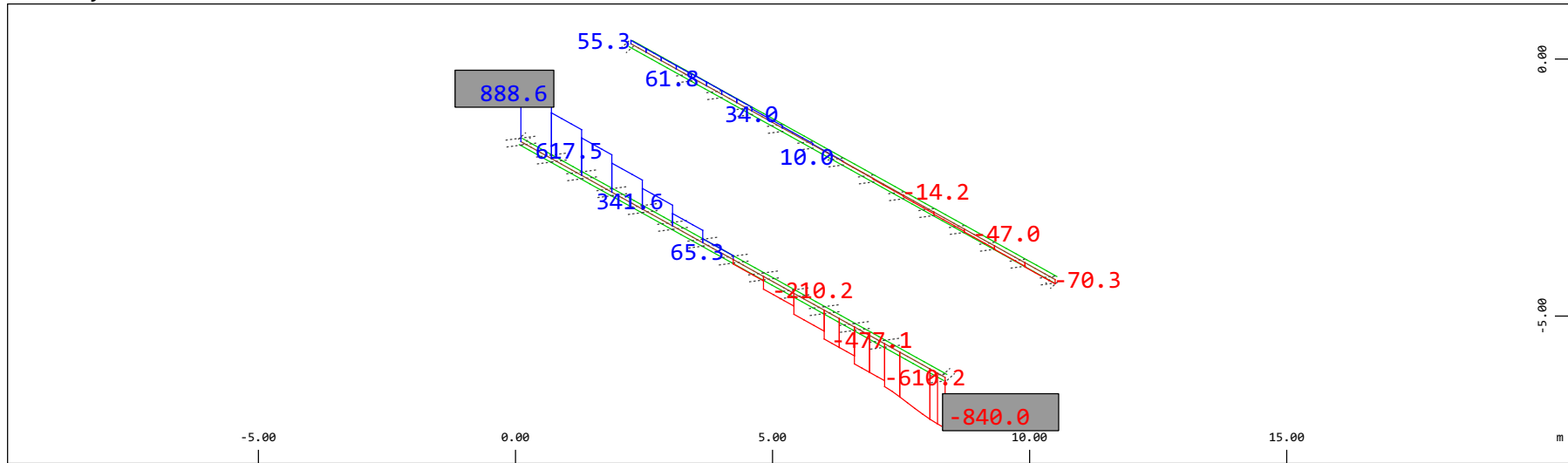
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 9.80 kNm (Min=-2.02) (Max=4.44)

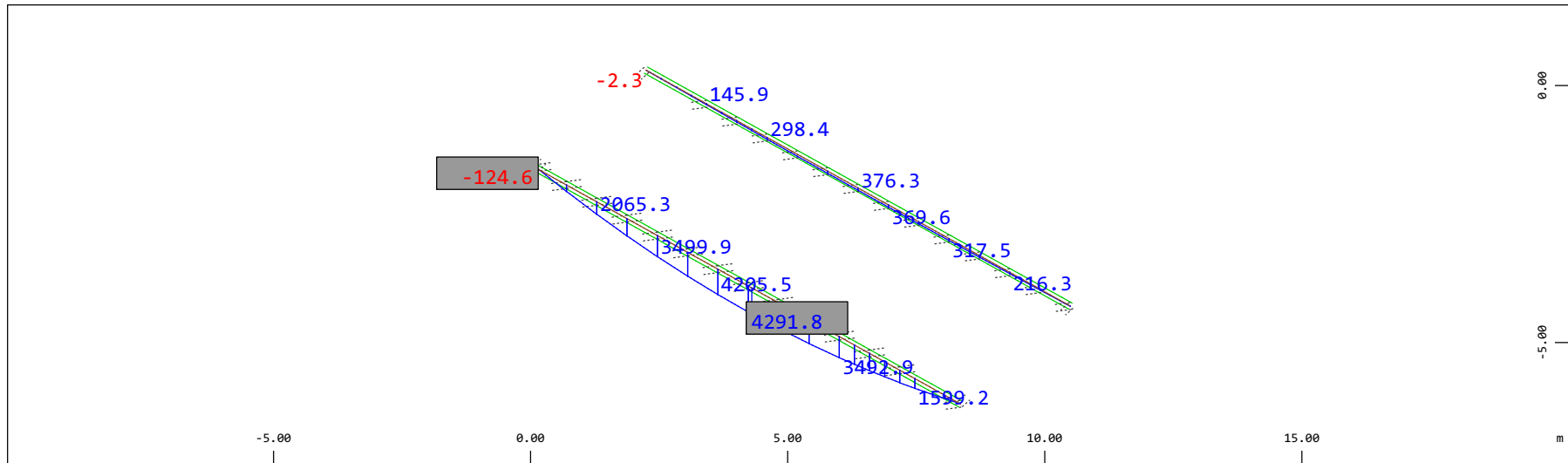
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 980.5 kN (Min=-840.0) (Max=888.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

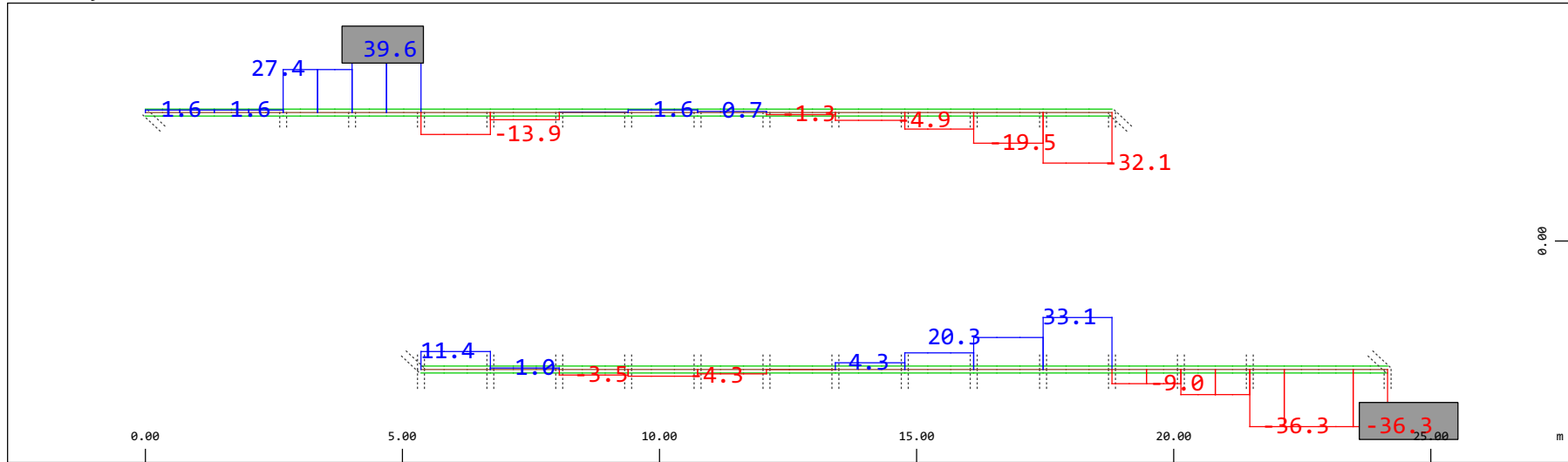


Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 9805. kNm (Min=-124.6) (Max=4292.)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

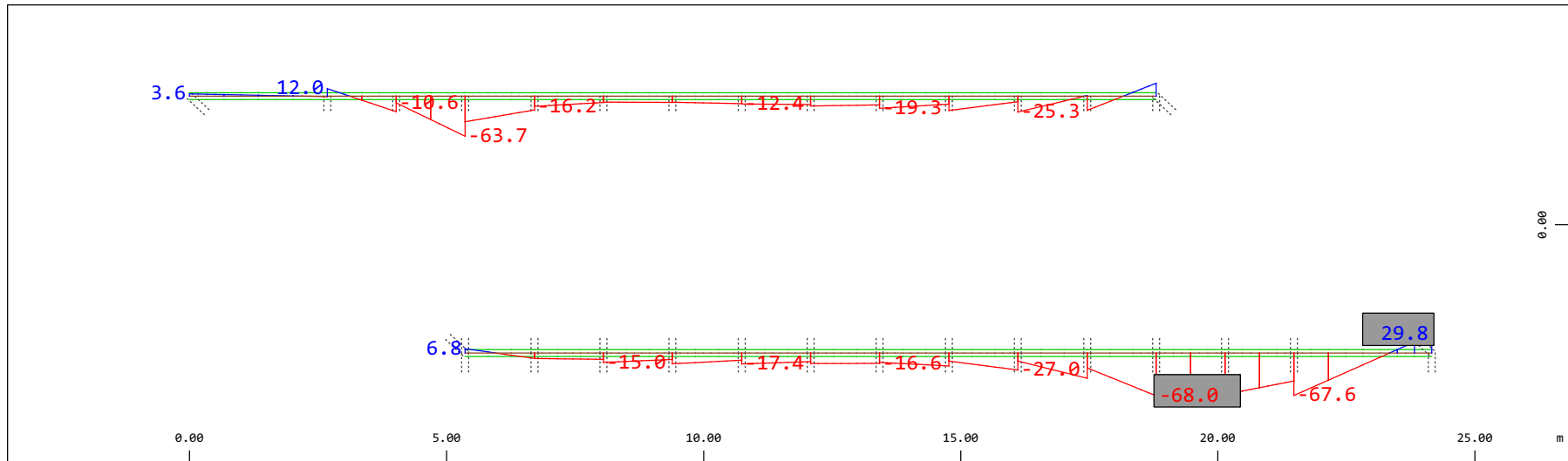
Definition of Axis

Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 39.2 kN (Min=-36.3) (Max=39.6)

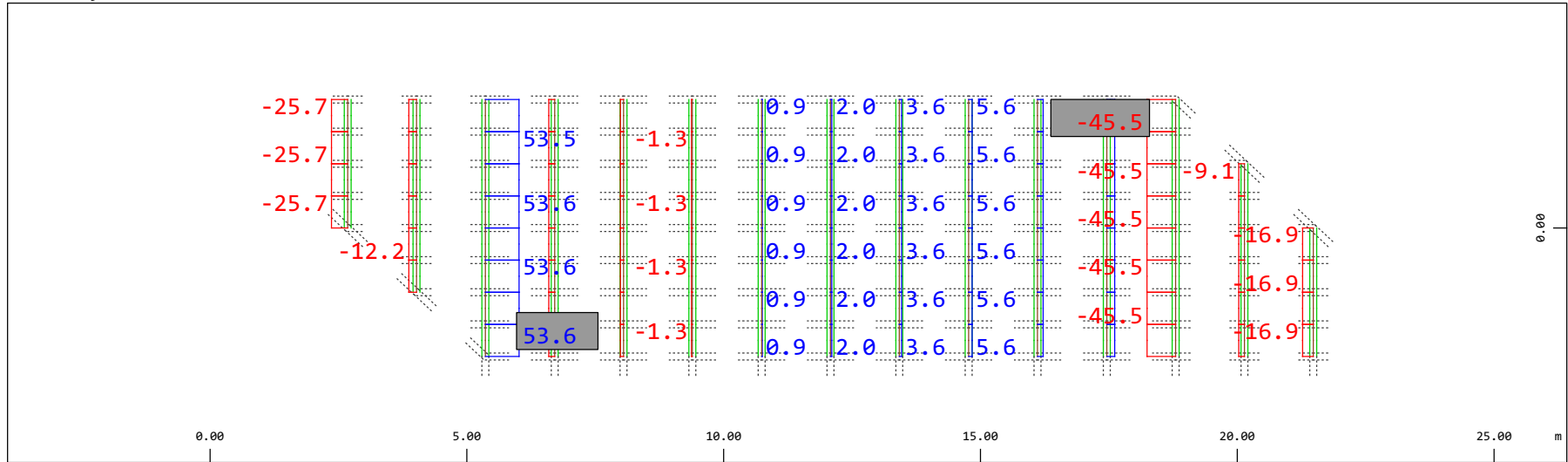
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 98.0 kNm (Min=-68.0) (Max=29.8)

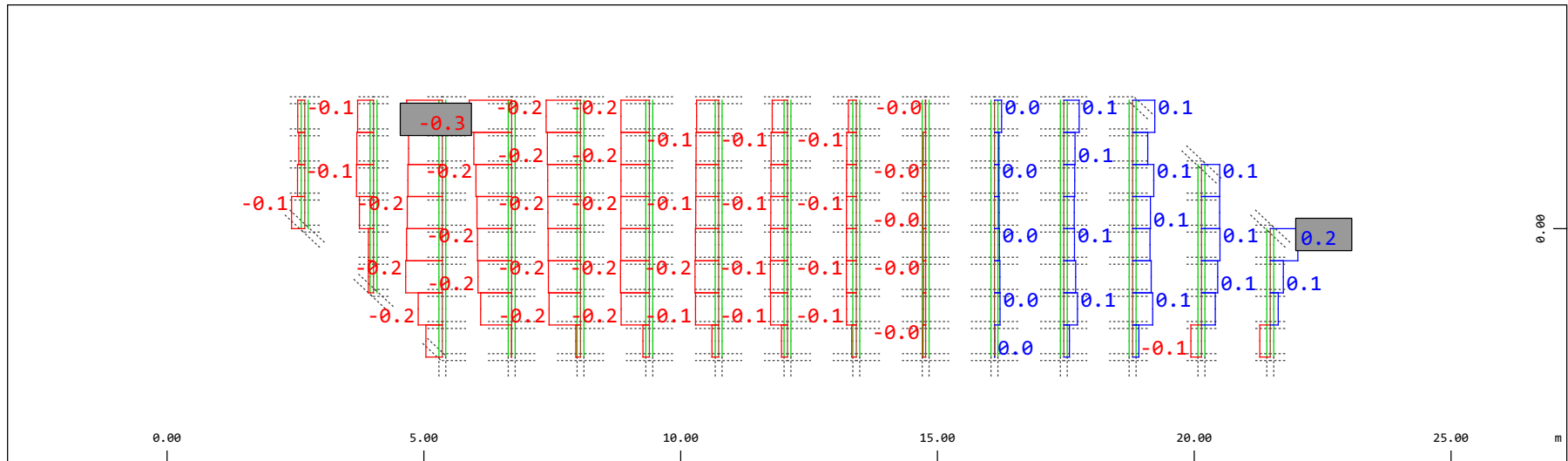
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 98.0 kN (Min=-45.5) (Max=53.6)

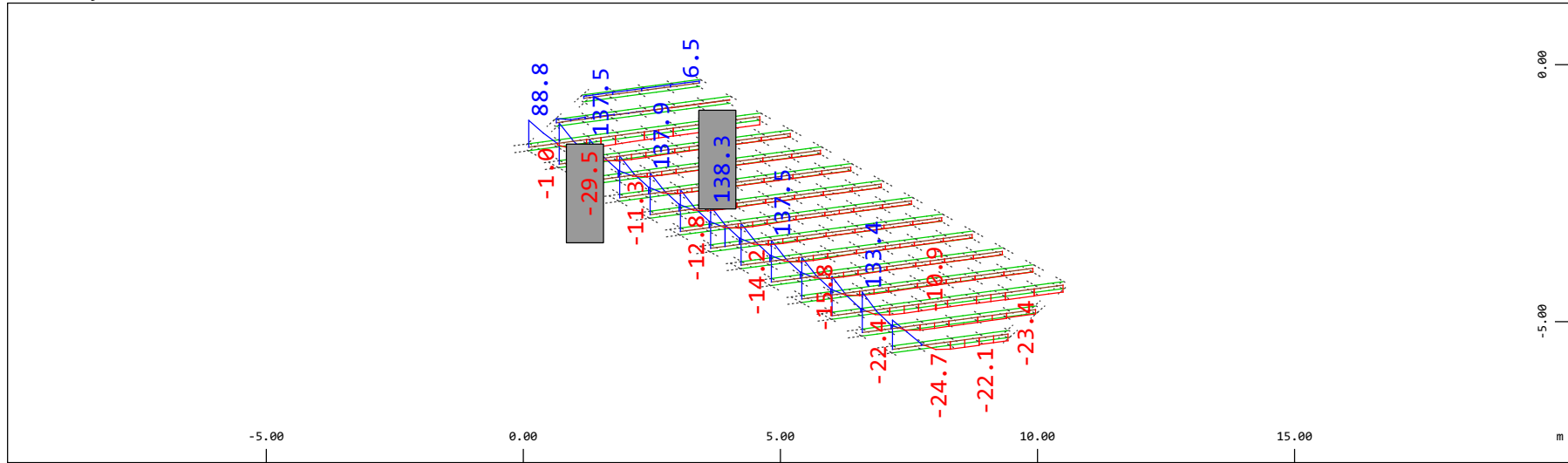
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 0.392 kNm (Min=-0.270) (Max=0.176)

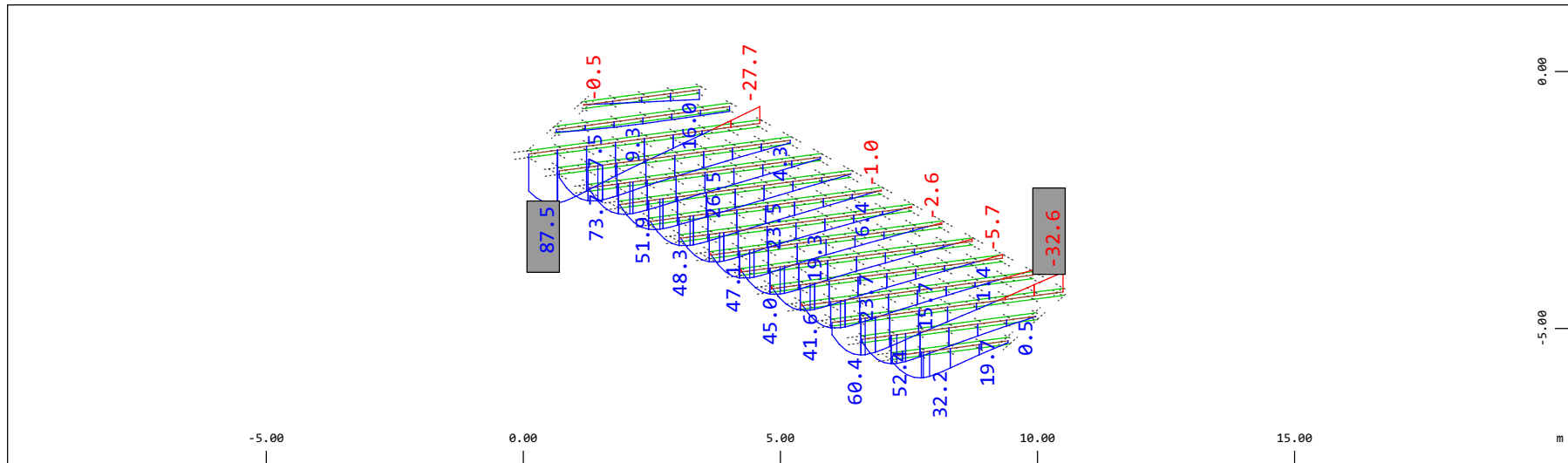
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 196.1 kN (Min=-29.5) (Max=138.3)

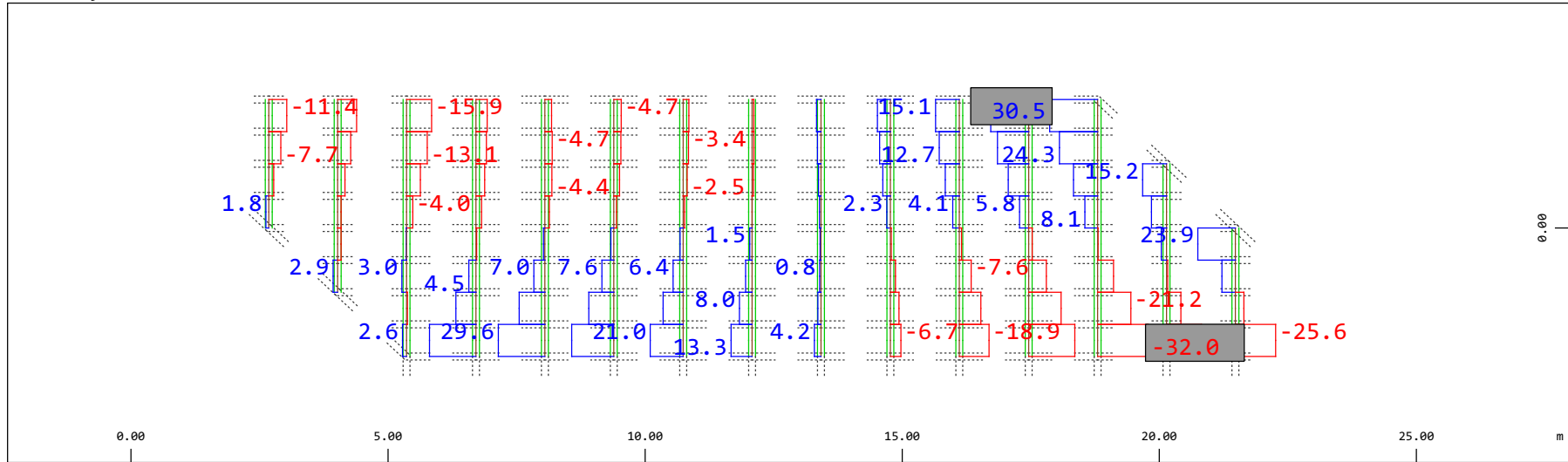
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 98.0 kNm (Min=-32.6) (Max=87.5)

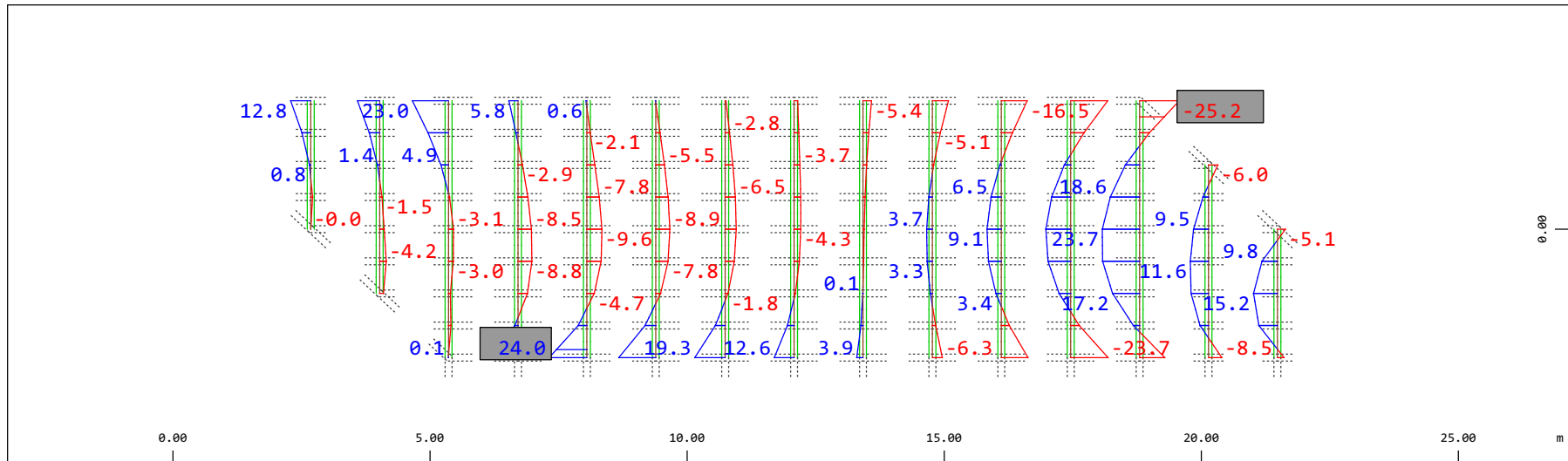
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 39.2 kN (Min=-32.0) (Max=30.5)

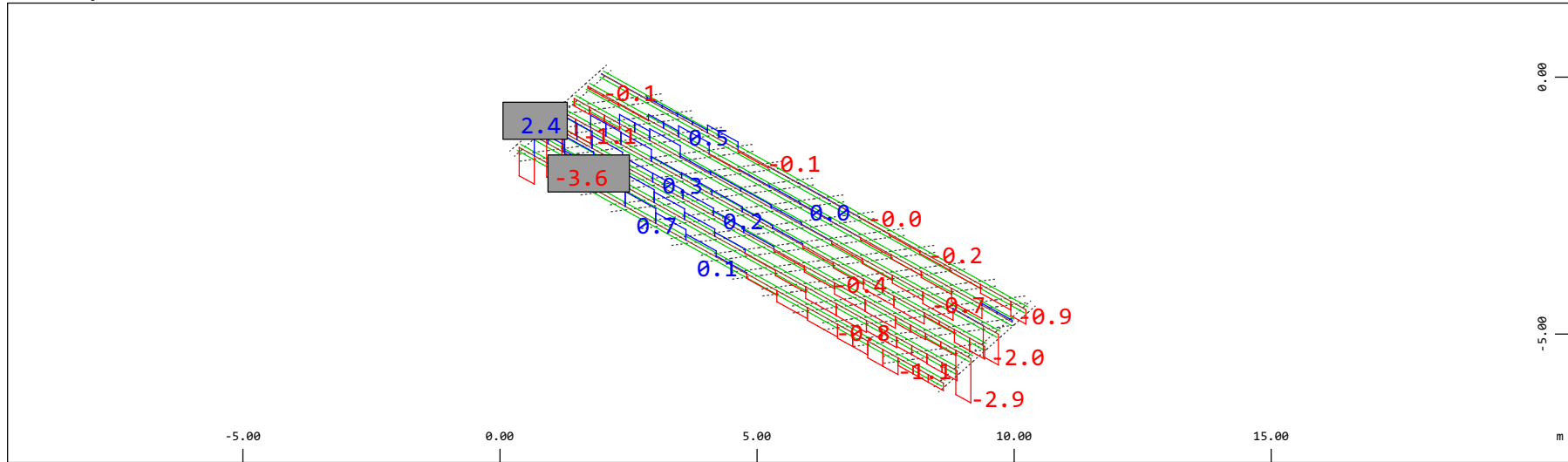
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 39.2 kNm (Min=-25.2) (Max=24.0)

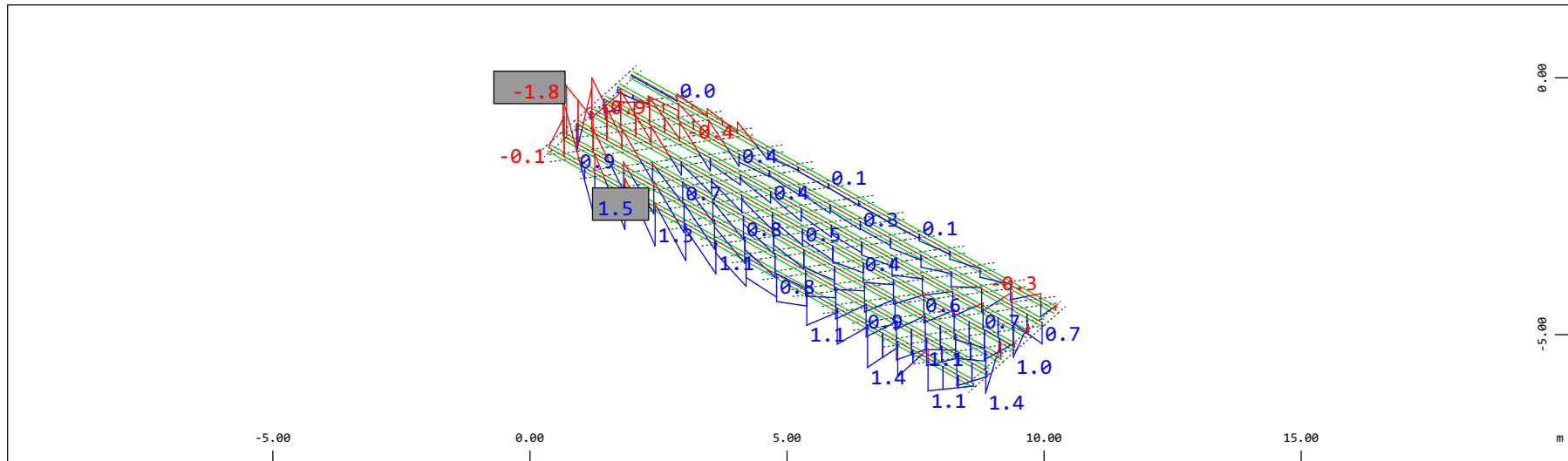
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 3.92 kN (Min=-3.57) (Max=2.38)

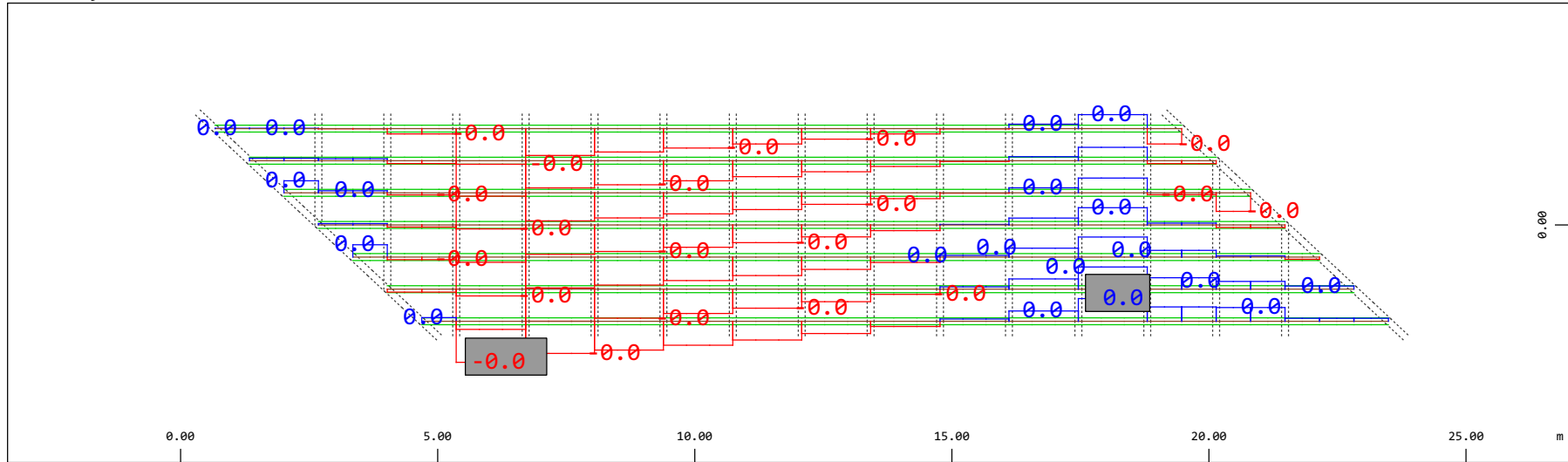
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 1.96 kNm (Min=-1.79) (Max=1.48)

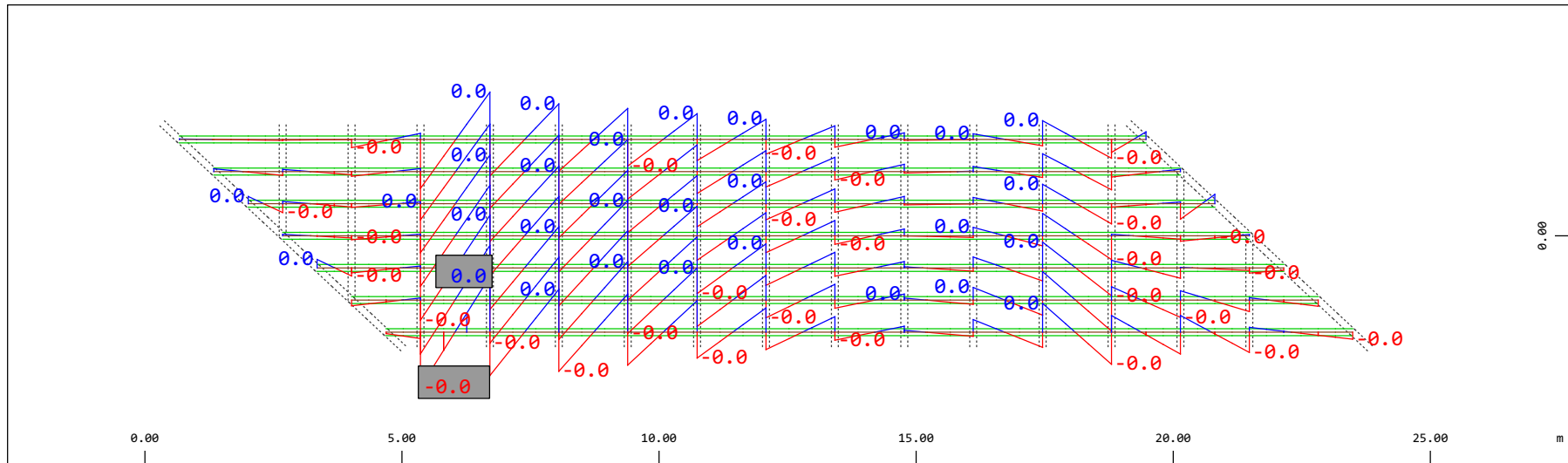
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 211 Qt: deragliamento-caso2- , 1 cm 3D = 0.0196 kN (Min=-0.0130) (Max=0.0072)

M 1 : 120

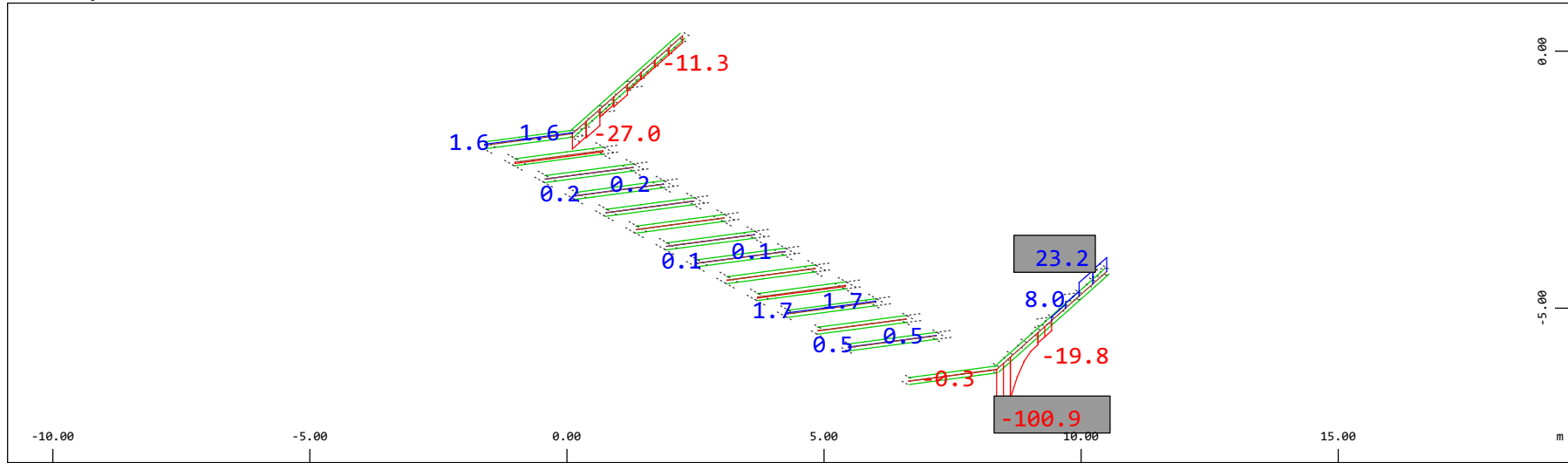


Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 211 Qt: deragliamento-caso2- , 1 cm 3D = 0.0098 kNm (Min=-0.0087) (Max=0.0089)

M 1 : 120

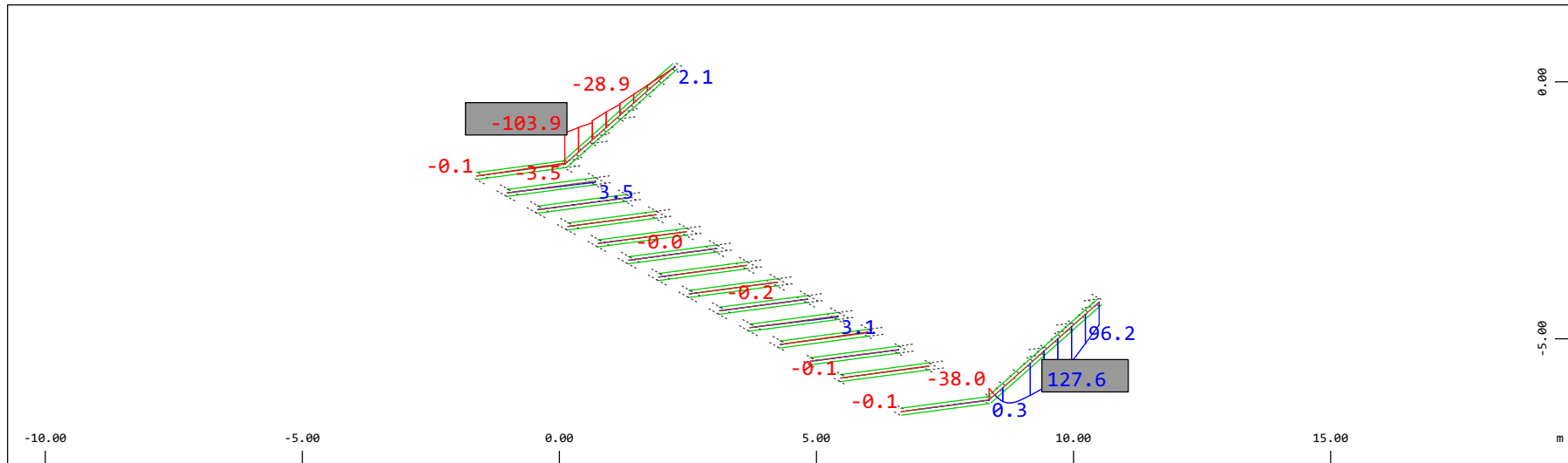
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 98.0 kN (Min=-100.9) (Max=23.2)

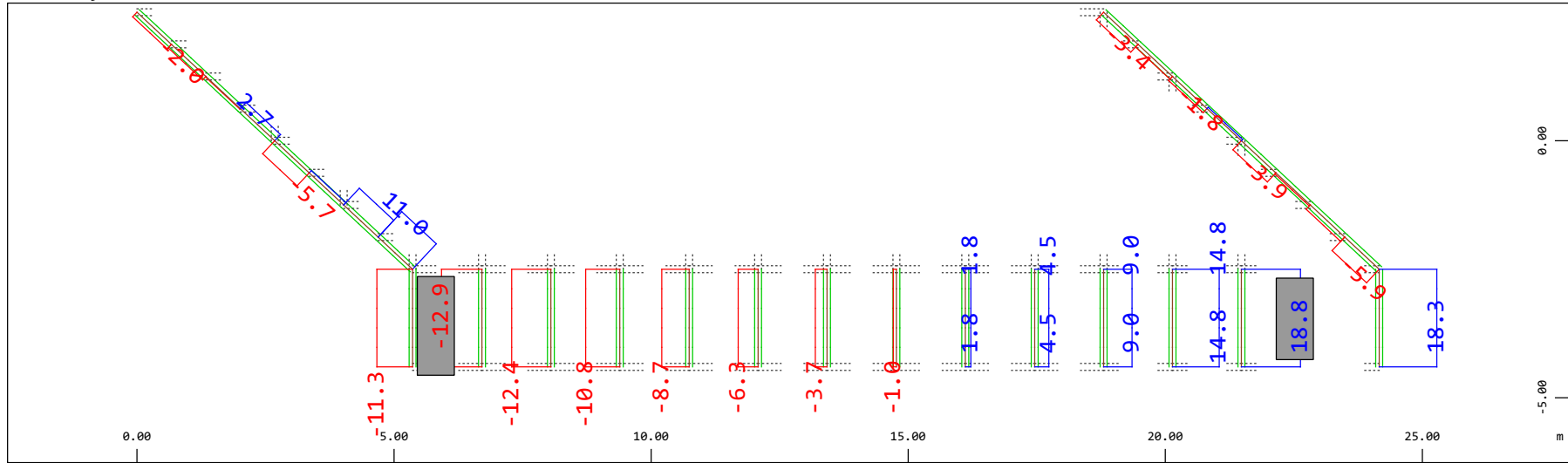
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 196.1 kNm (Min=-103.9) (Max=127.6)

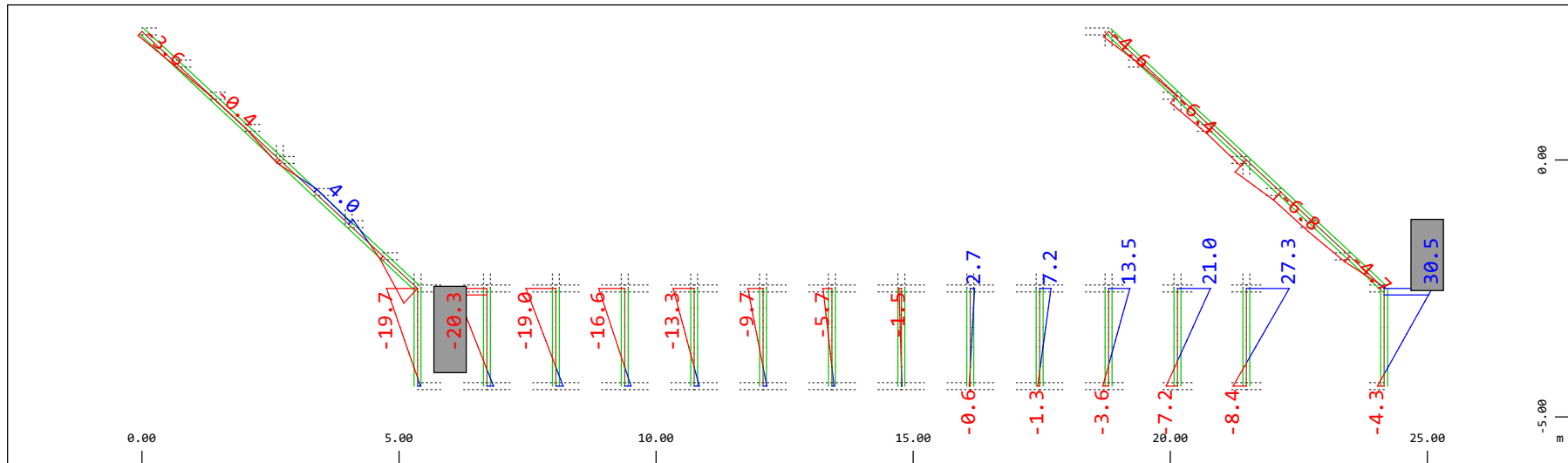
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 19.6 kN (Min=-12.9) (Max=18.8)

M 1 : 120

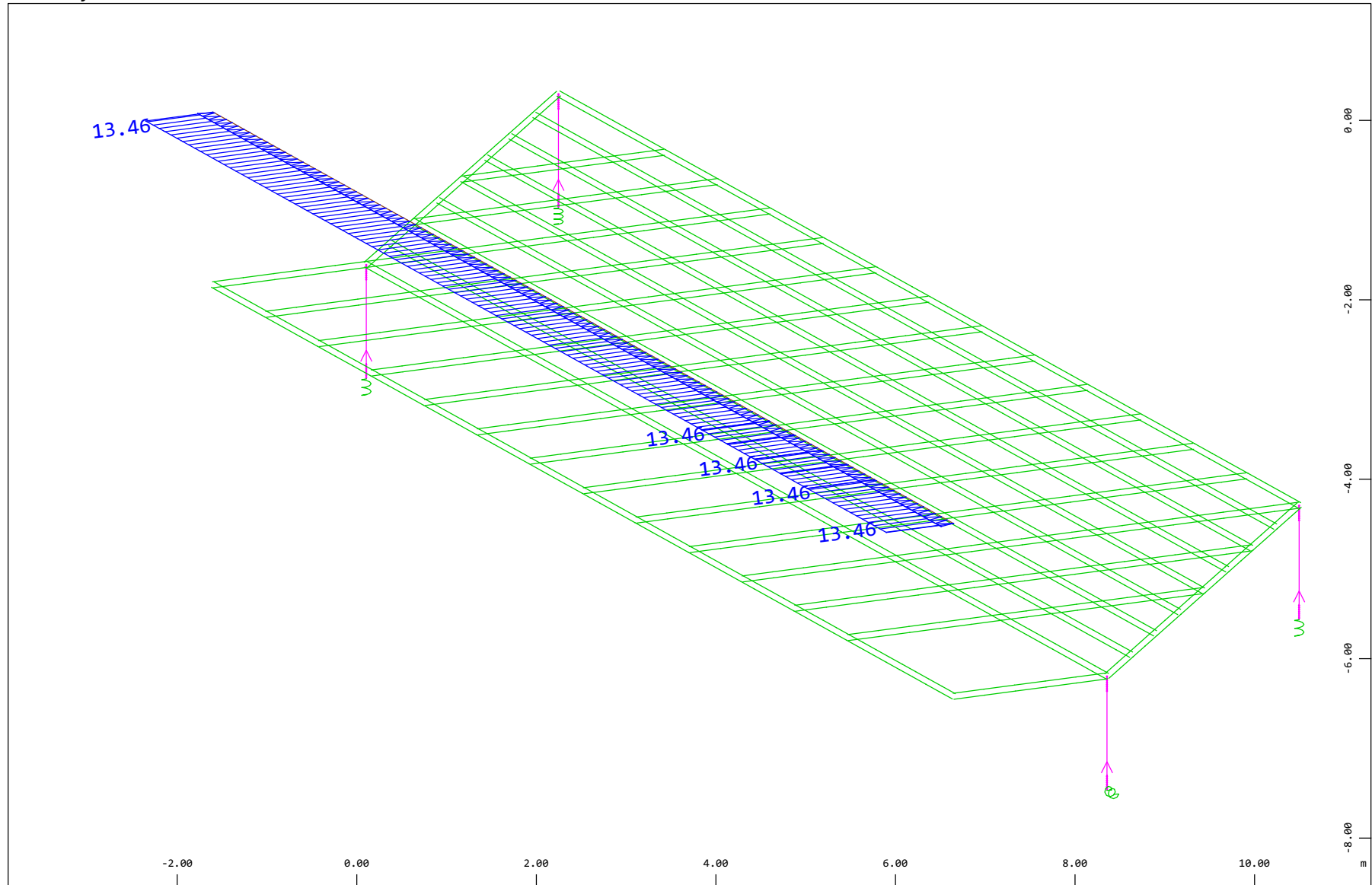


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 211 Qt: deragliament-caso2- , 1 cm 3D = 39.2 kNm (Min=-20.3) (Max=30.5)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 Y
 X

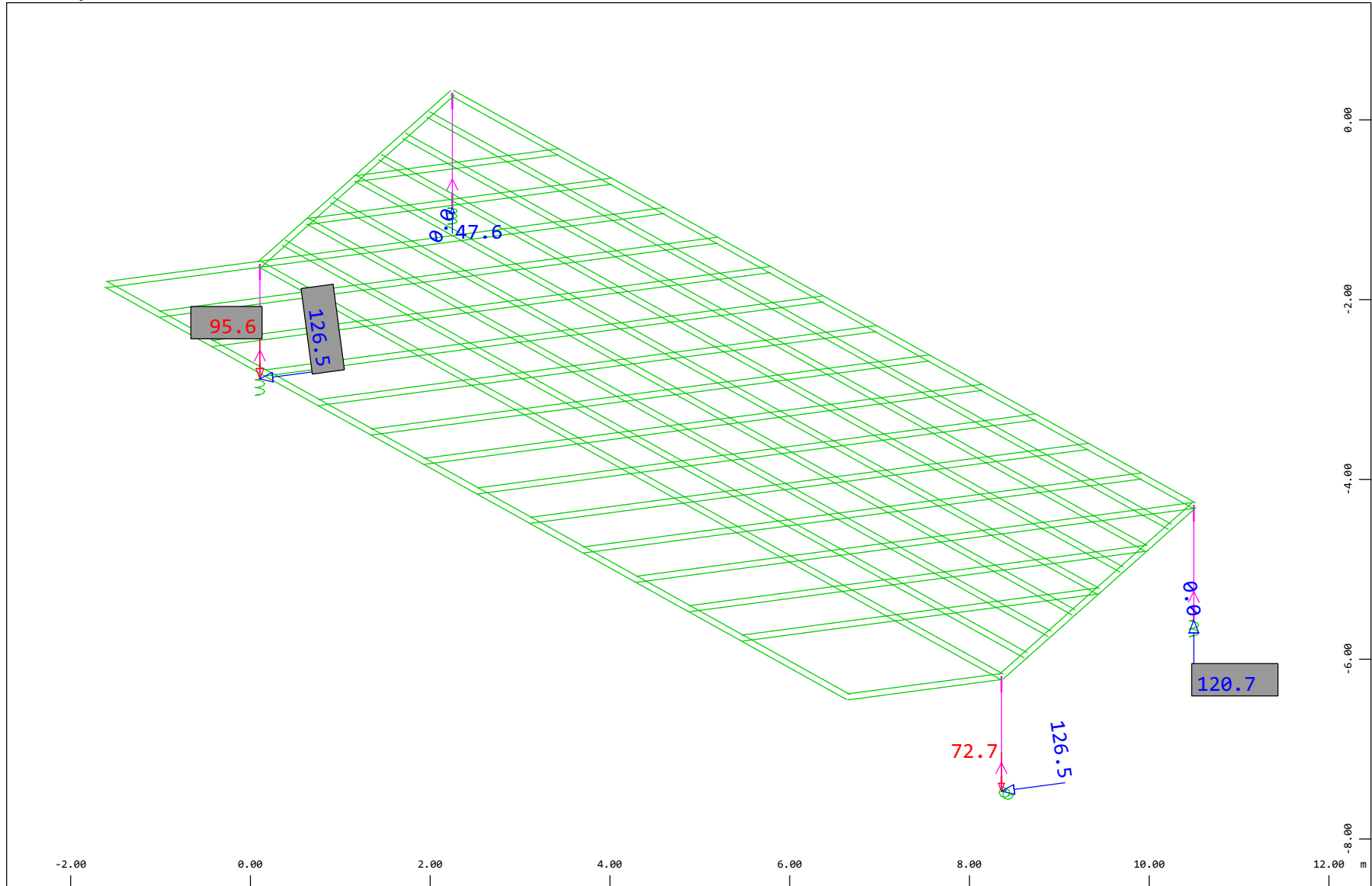
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 600 W: Fwy+ , (1 cm 3D = unit) Beam line load (force) in global Y (Unit=9.69 kN/m)

➤ (Max=13.5)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 Y
 X

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 600 W: Fwy+ , 1 cm 3D = 96.9 kN

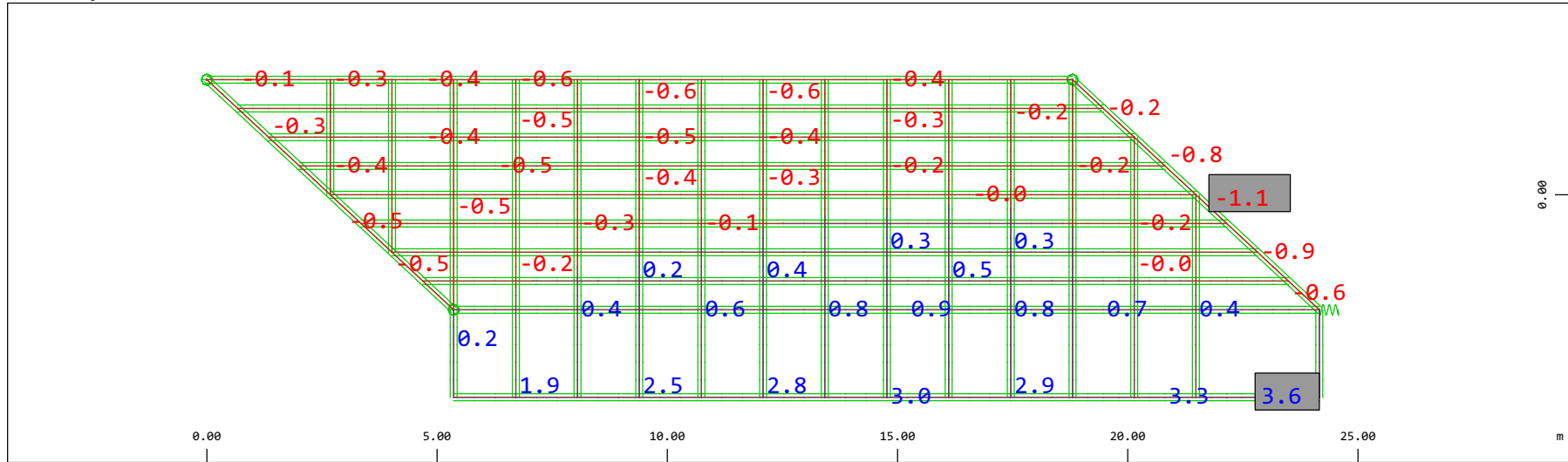
Nodes , Support force vector in the global XY plane, Loadcase 600 W: Fwy+ , 1 cm 3D = 96.9 kN

▬ (Min=-95.6) (Max=120.7) (total: -1.5259e-05)

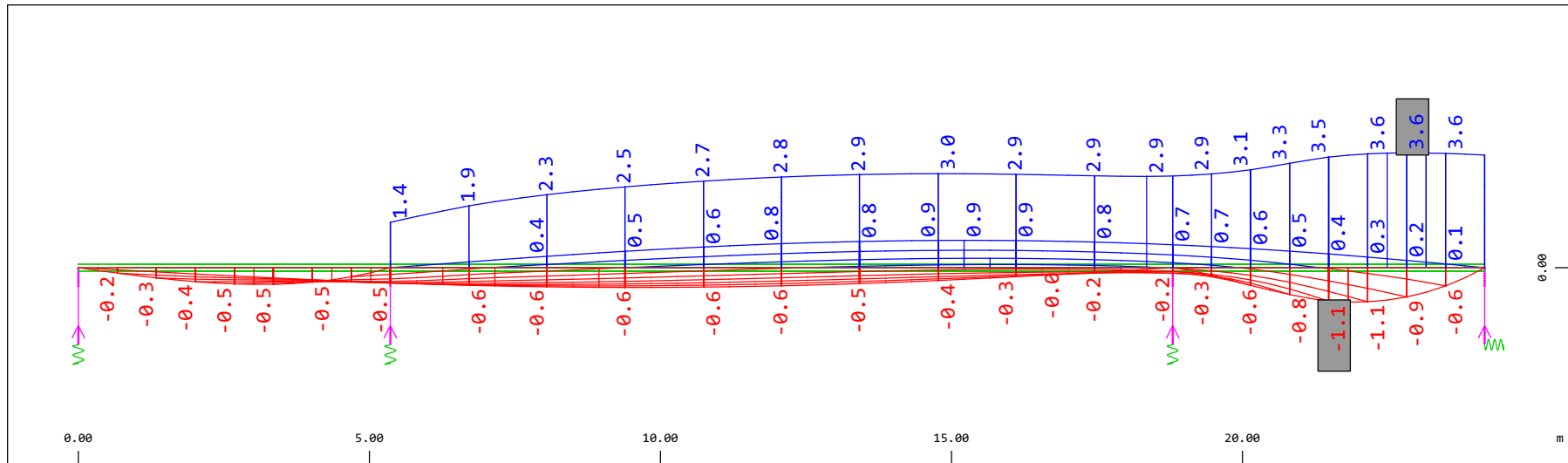
▬ (Max=126.5)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

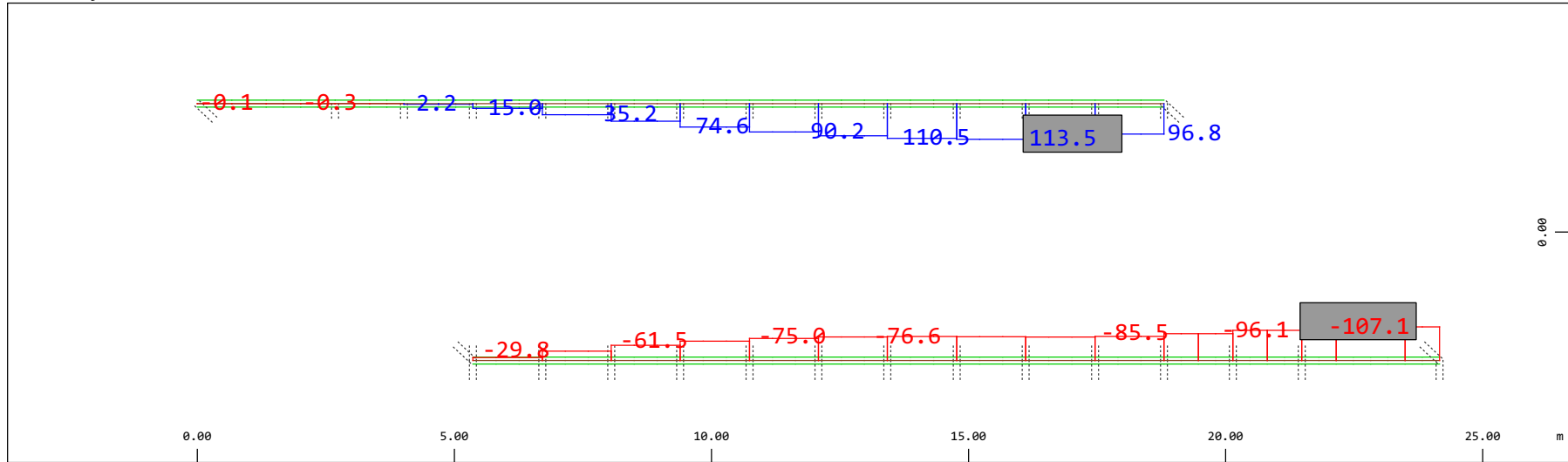


Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \circ , Loadcase 600 W: Fwy+ , 1 cm 3D = 1.94 mm (Min=-1.08) (Max=3.61) M 1 : 134



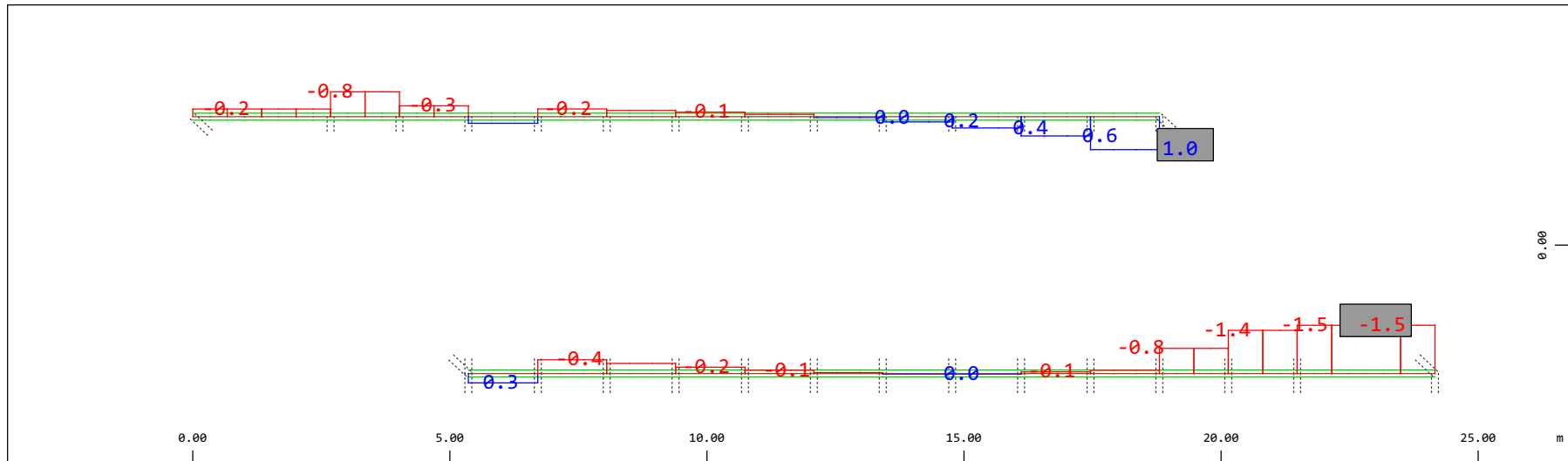
Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 600 W: Fwy+ , 1 cm 3D = 1.94 mm (Min=-1.08) (Max=3.61) M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 600 W: Fwy+ , 1 cm 3D = 196.1 kN (Min=-107.1) (Max=113.5)

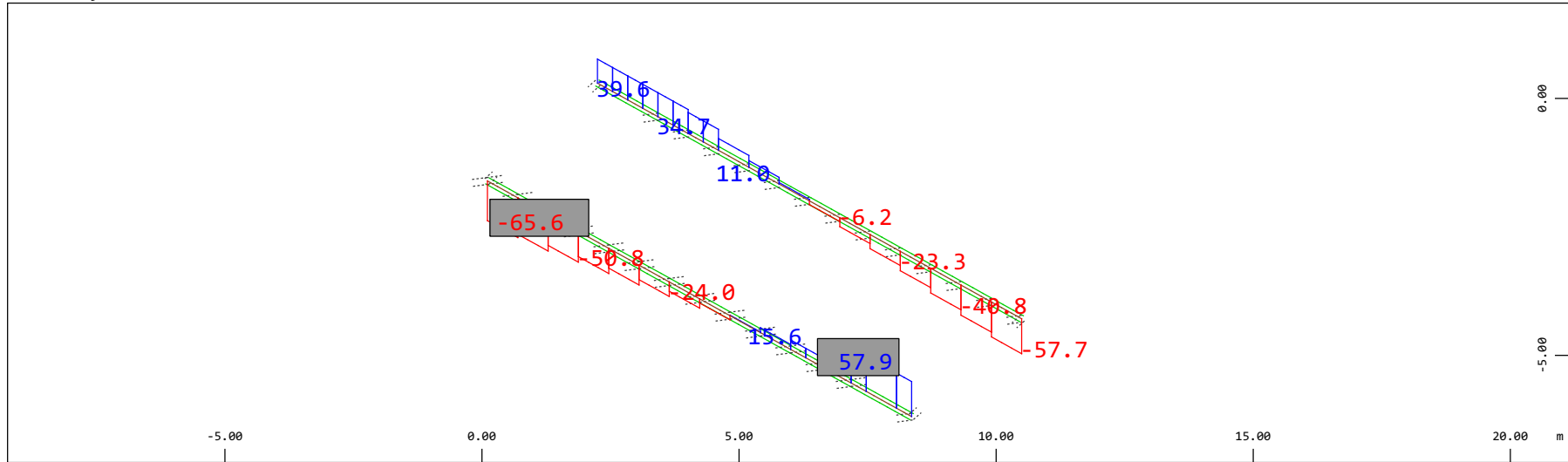
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 600 W: Fwy+ , 1 cm 3D = 1.96 kNm (Min=-1.53) (Max=1.05)

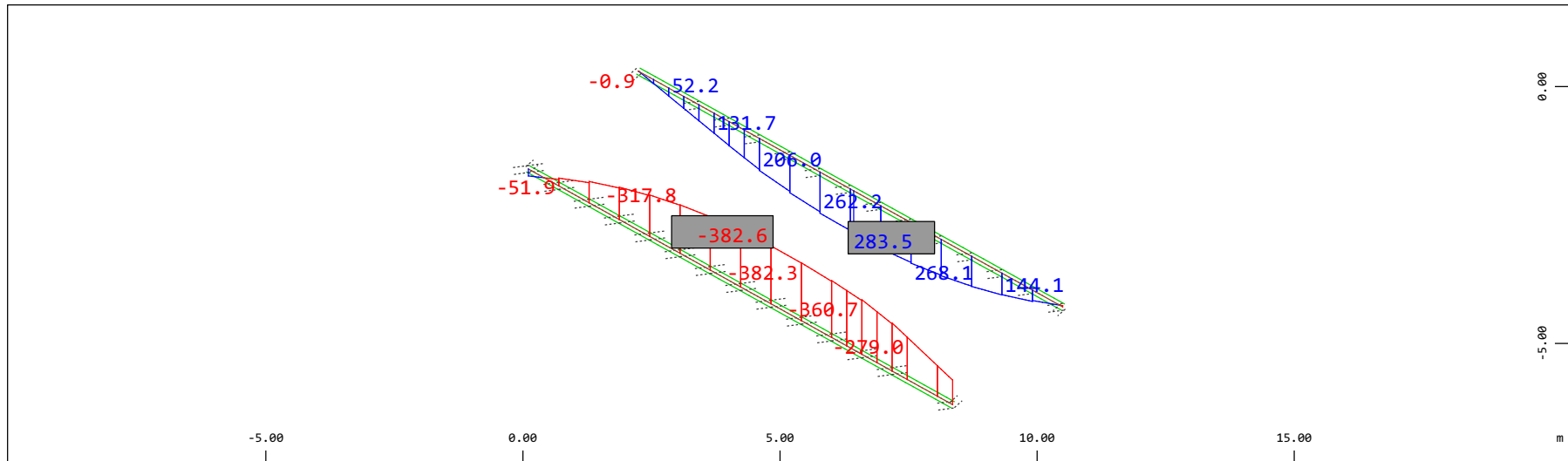
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force V_z , Loadcase 600 W: Fwy+ , 1 cm 3D = 98.0 kN (Min=-65.6) (Max=57.9)

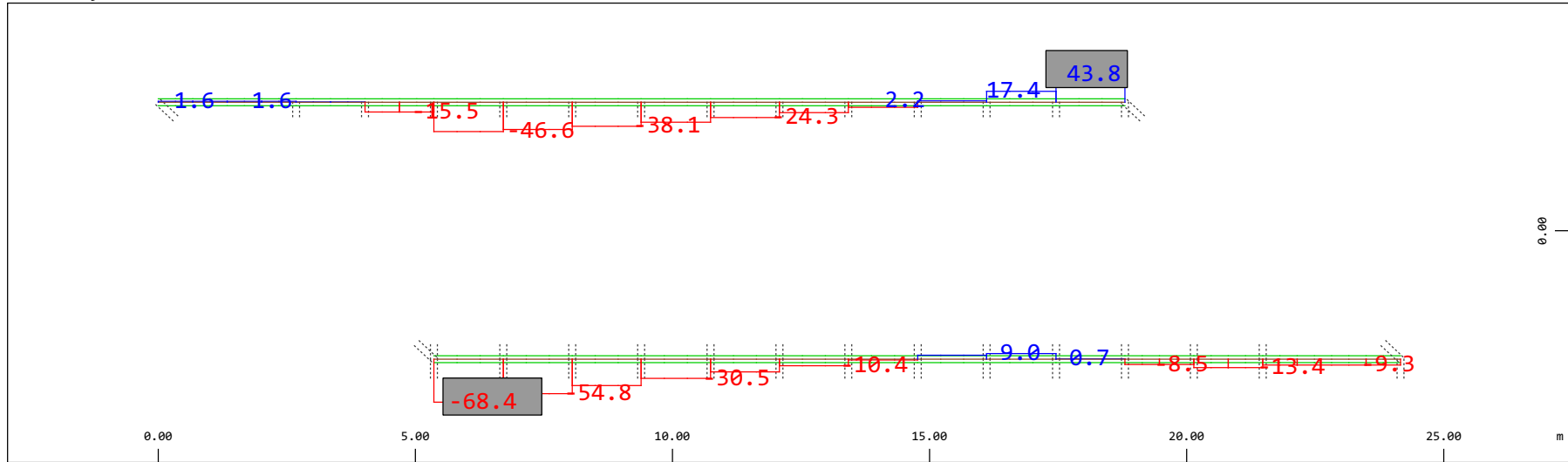
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment M_y , Loadcase 600 W: Fwy+ , 1 cm 3D = 392.2 kNm (Min=-382.6) (Max=283.5)

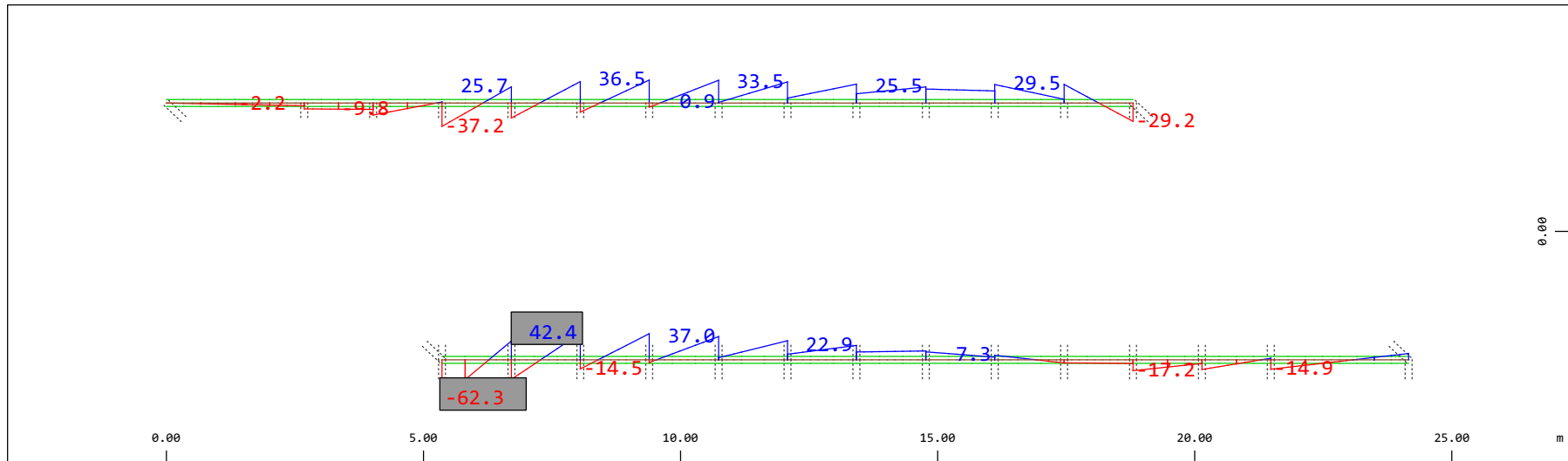
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 600 W: Fwy+ , 1 cm 3D = 98.0 kN (Min=-68.4) (Max=43.8)

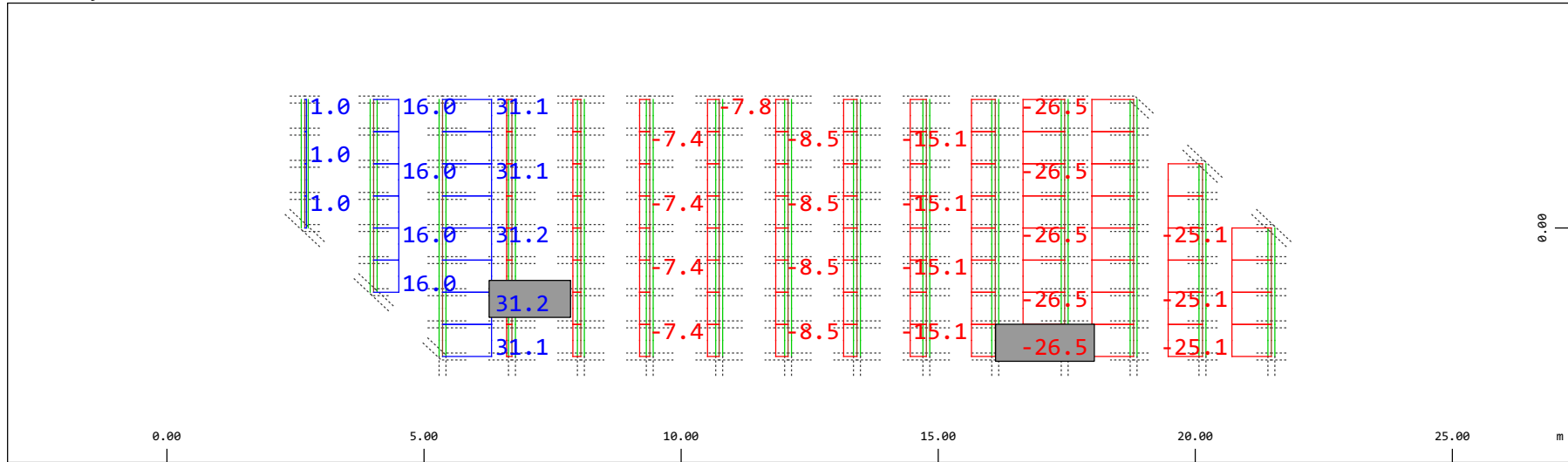
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz (Maximum values cubic interpolated), Loadcase 600 W: Fwy+ , 1 cm 3D = 98.0 kNm (Min=-62.3) (Max=42.4)

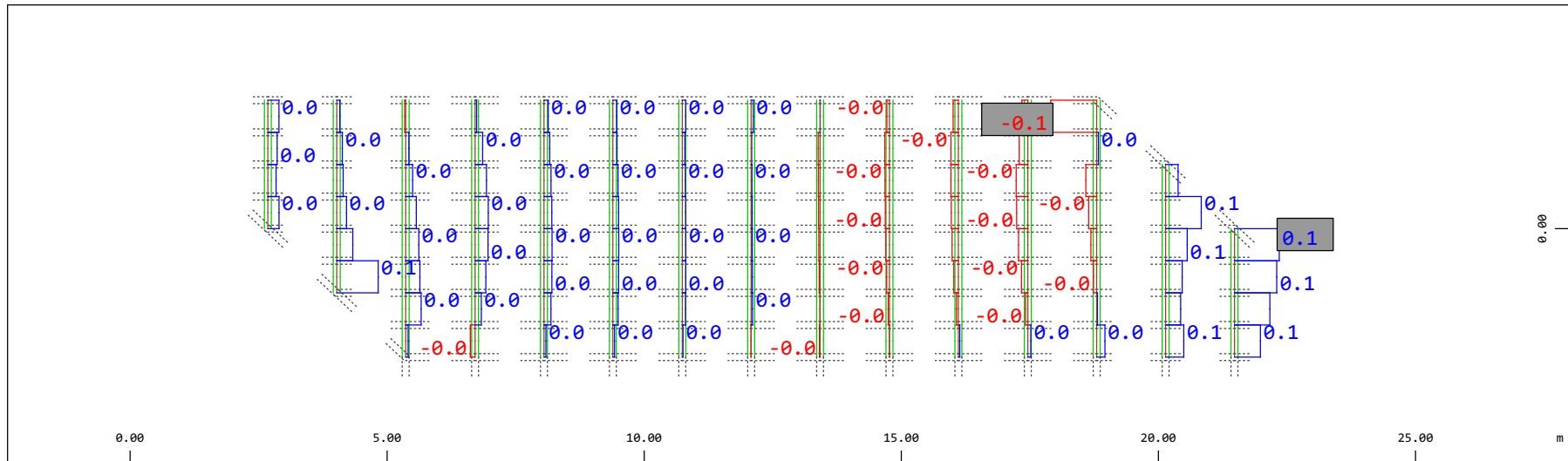
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force N_x , Loadcase 600 W: Fwy+ , 1 cm 3D = 39.2 kN (Min=-26.5) (Max=31.2)

M 1 : 120

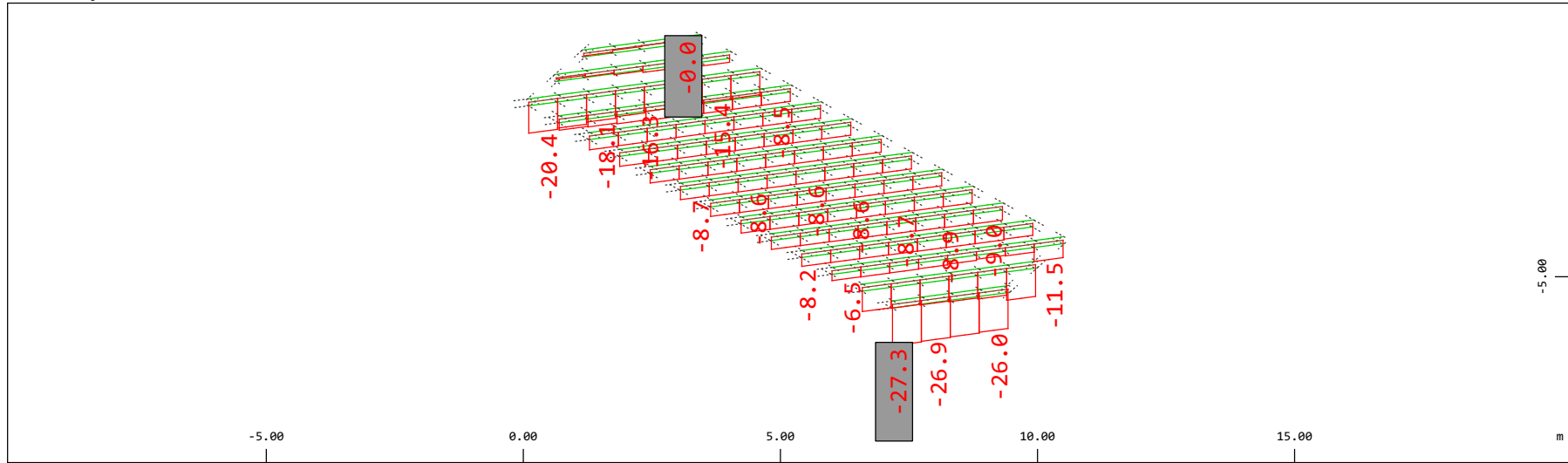


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment M_t , Loadcase 600 W: Fwy+ , 1 cm 3D = 0.196 kNm (Min=-0.146) (Max=0.142)

M 1 : 120

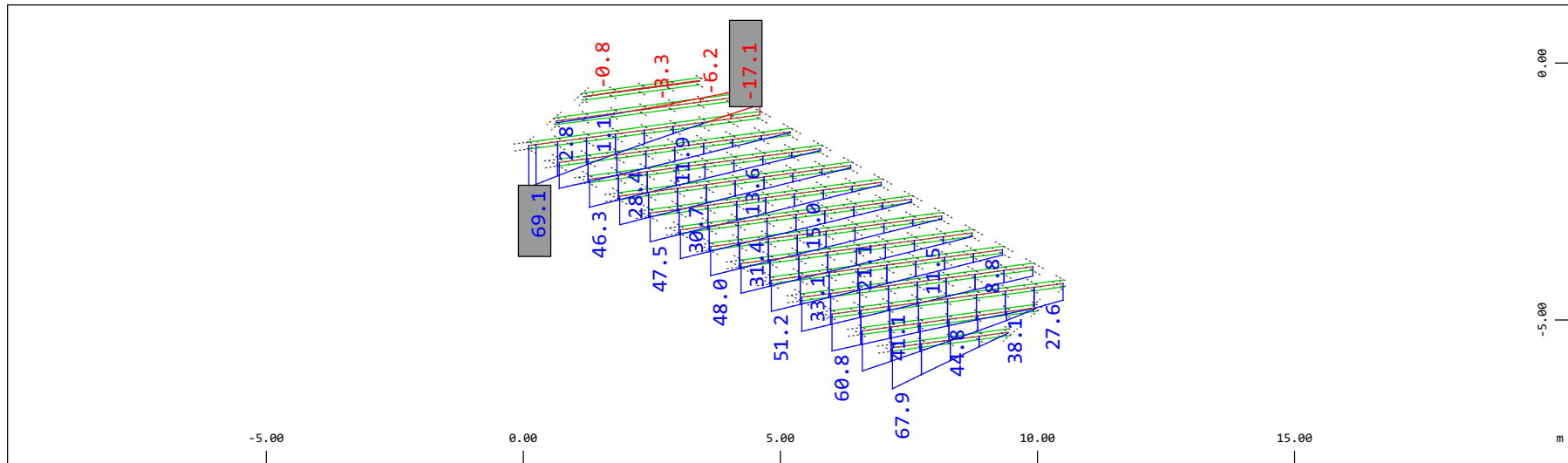
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 600 W: Fwy+ , 1 cm 3D = 39.2 kN (Min=-27.3) (Max=-0.0115)

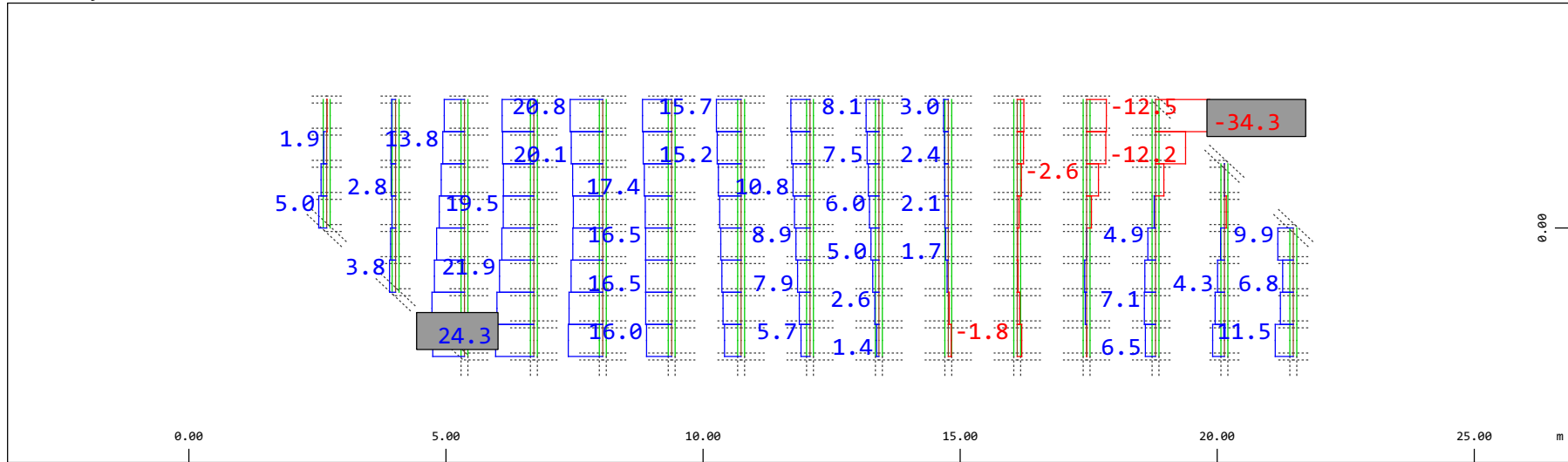
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 600 W: Fwy+ , 1 cm 3D = 98.0 kNm (Min=-17.1) (Max=69.1)

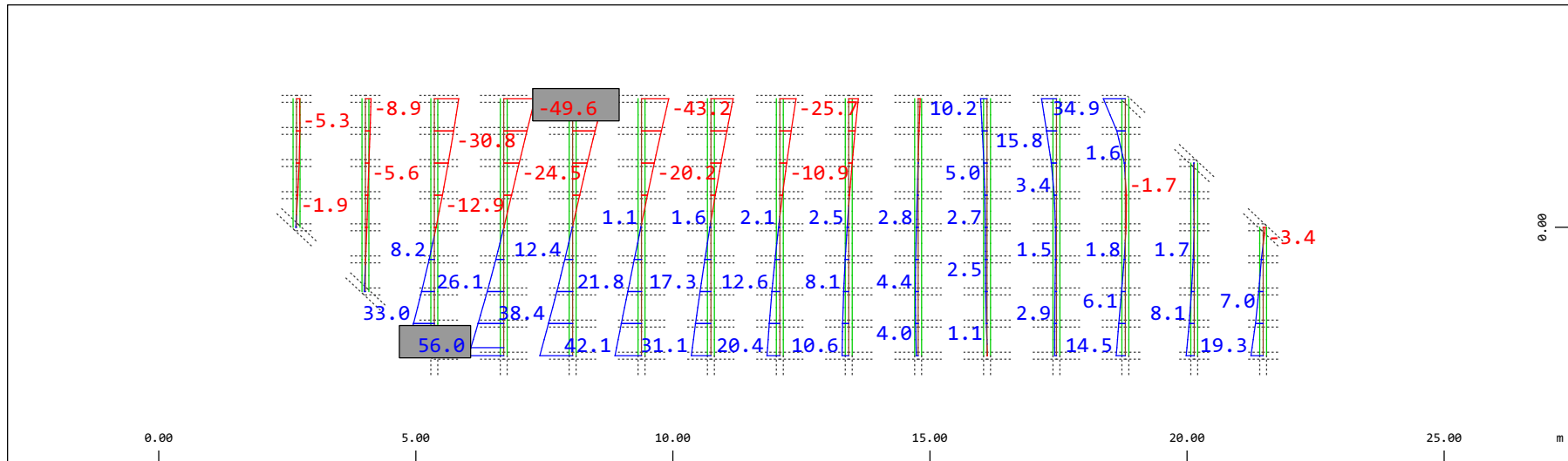
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 600 W: Fwy+ , 1 cm 3D = 39.2 kN (Min=-34.3) (Max=24.3)

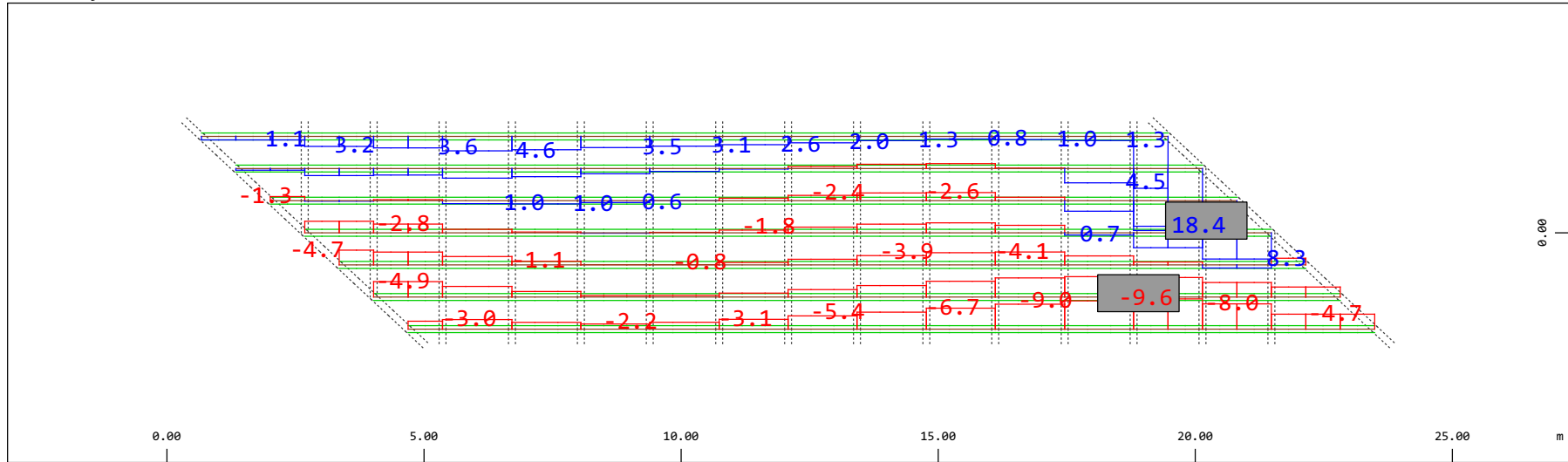
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz (Maximum values cubic interpolated), Loadcase 600 W: Fwy+ , 1 cm 3D = 98.0 kNm (Min=-49.6) (Max=56.0)

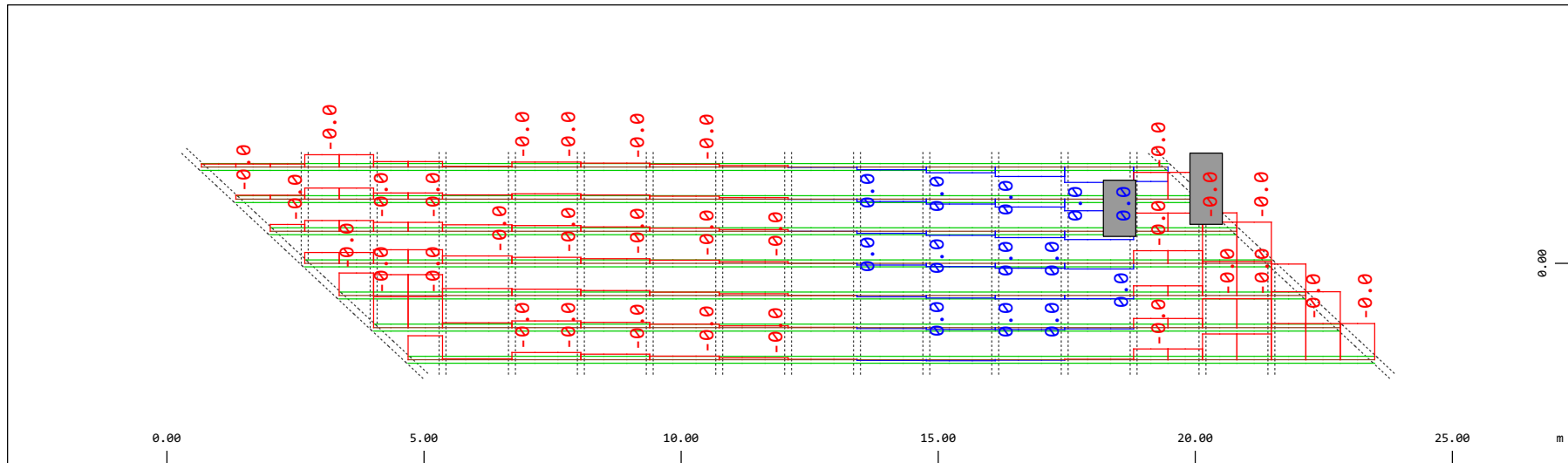
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force N_x , Loadcase 600 W: Fwy+ , 1 cm 3D = 19.6 kN (Min=-9.62) (Max=18.4)

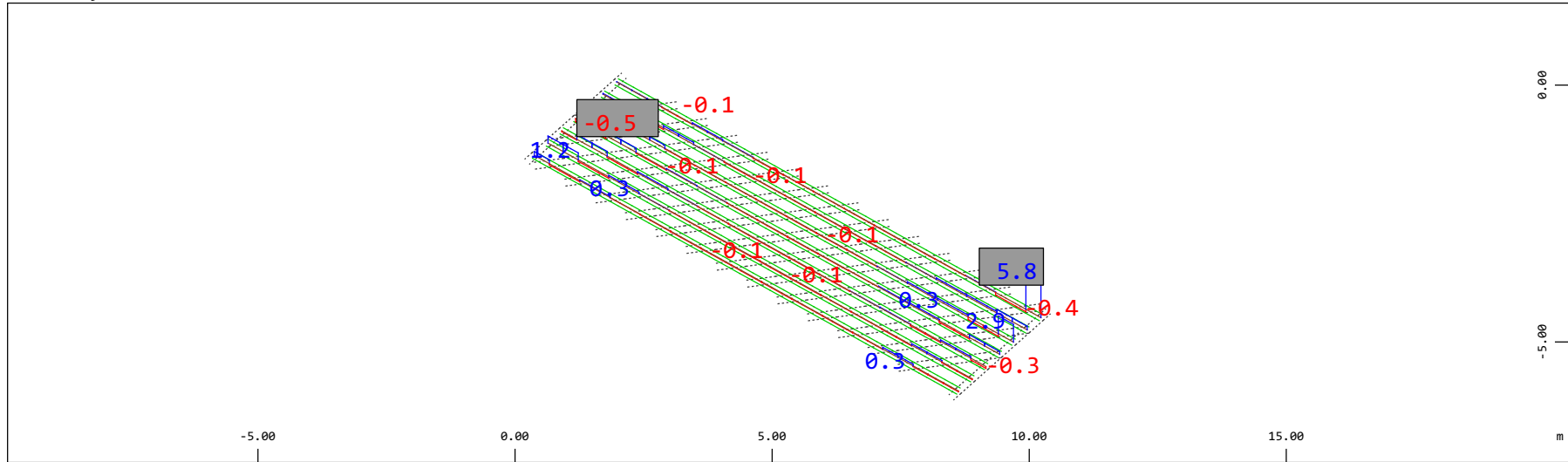
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment M_t , Loadcase 600 W: Fwy+ , 1 cm 3D = 0.0039 kNm (Min=-0.0026) (Max= 9.8197e-04)

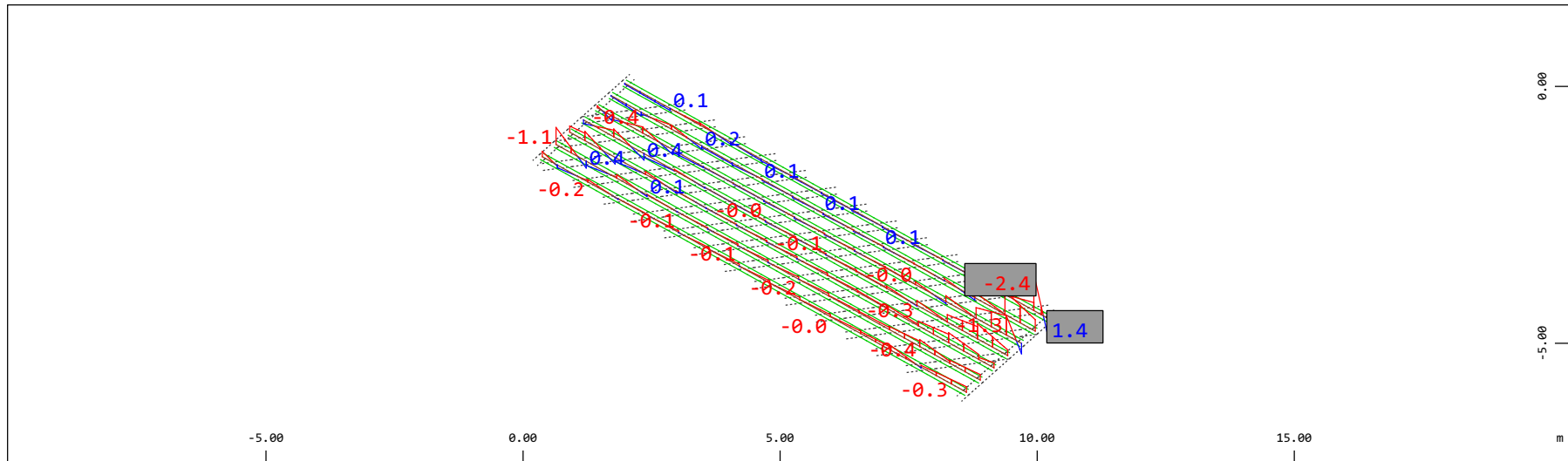
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 600 W: Fwy+ , 1 cm 3D = 9.80 kN (Min=-0.502) (Max=5.78)

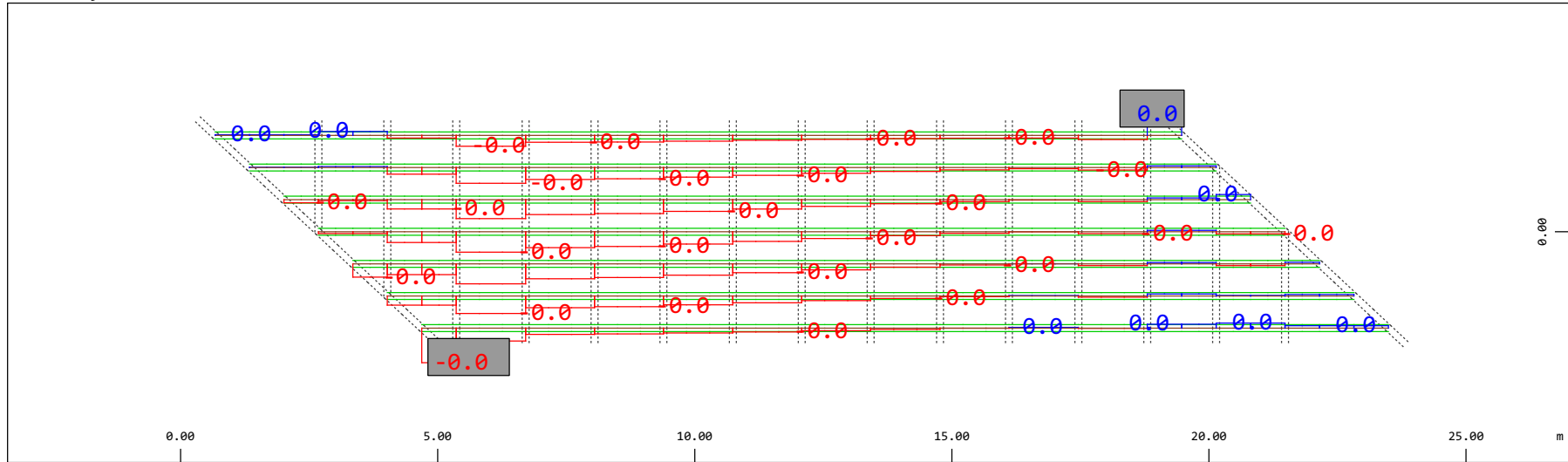
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 600 W: Fwy+ , 1 cm 3D = 3.92 kNm (Min=-2.42) (Max=1.45)

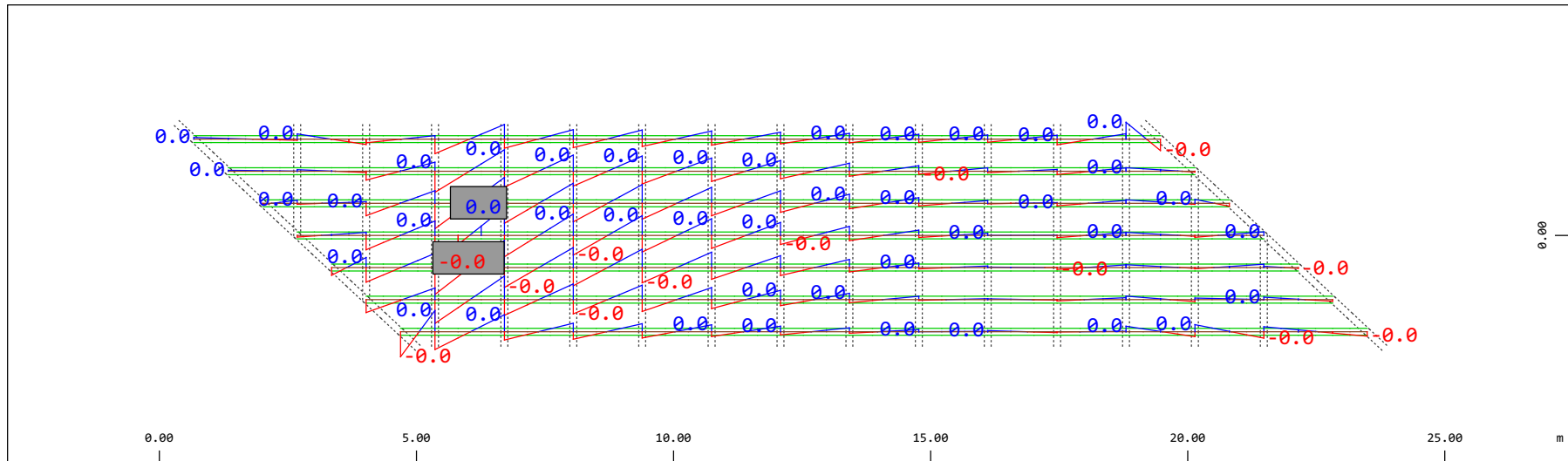
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Shear force Vy, Loadcase 600 W: Fwy+ , 1 cm 3D = 0.0196 kN (Min=-0.0110) (Max=0.0067)

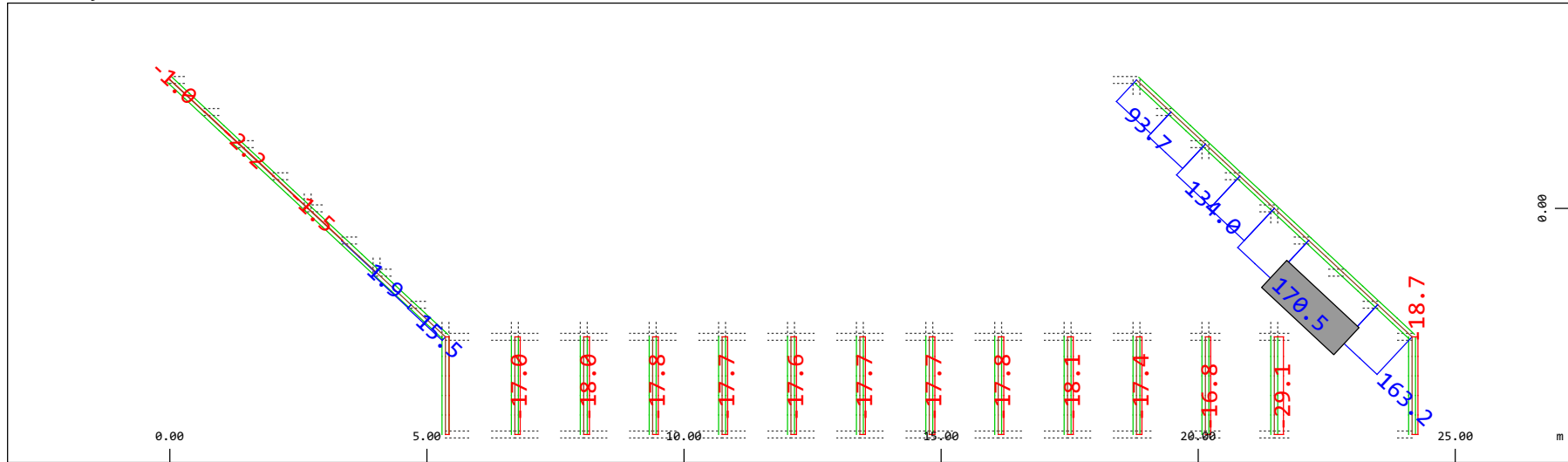
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Bending moment Mz (Maximum values cubic interpolated), Loadcase 600 W: Fwy+ , 1 cm 3D = 0.0098 kNm (Min=-0.0044) (Max=0.0044)

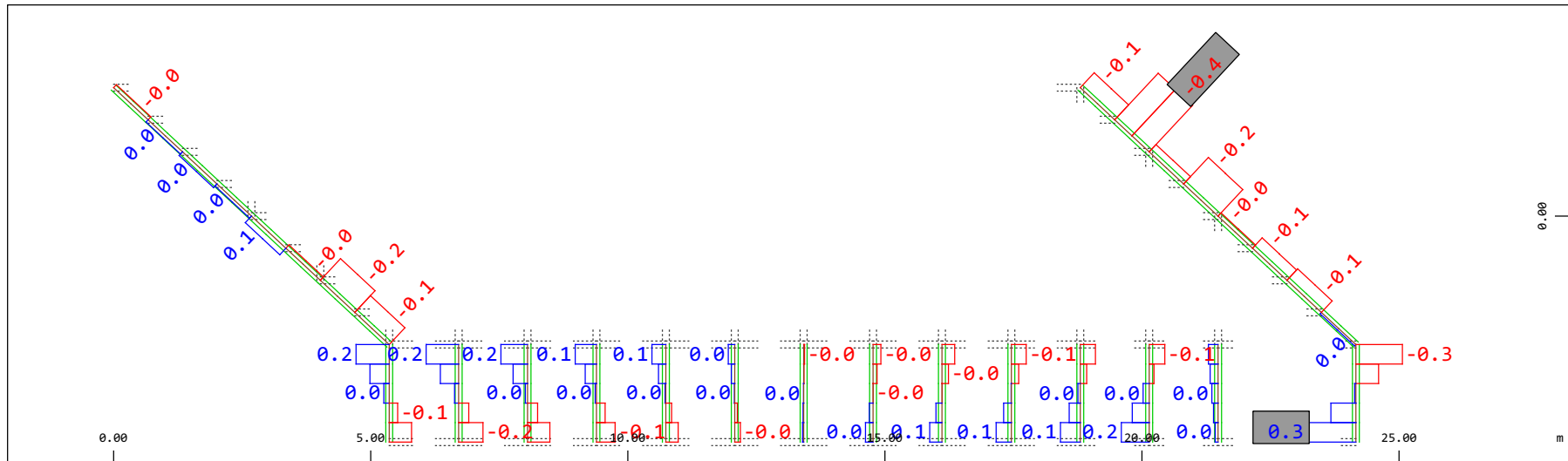
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 600 W: Fwy+ , 1 cm 3D = 196.1 kN (Min=-29.1) (Max=170.5)

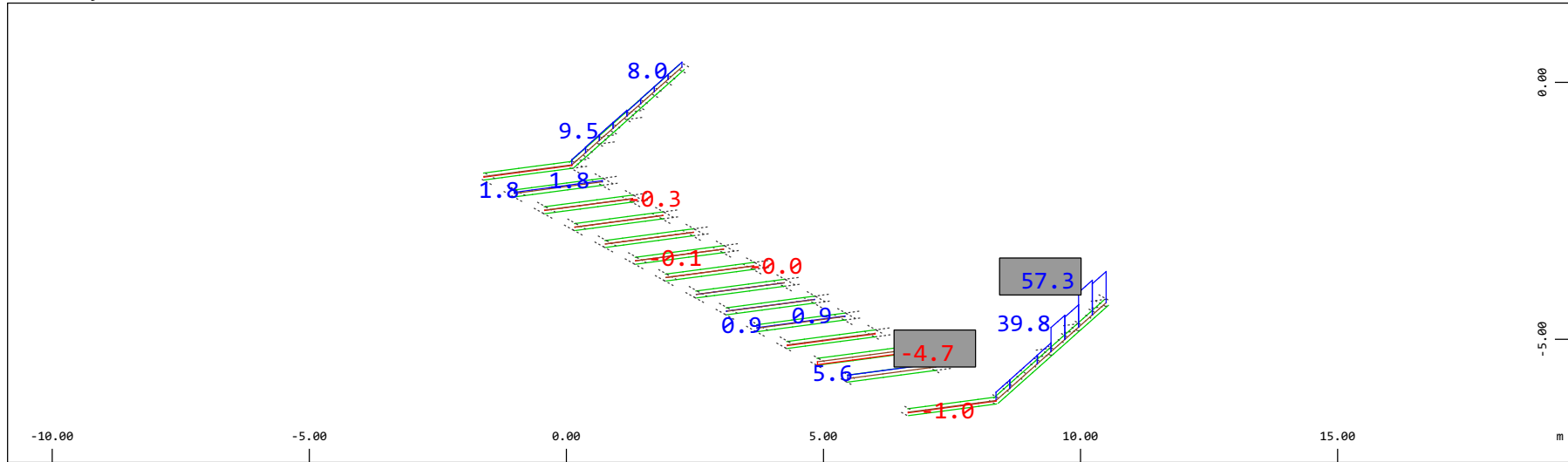
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 600 W: Fwy+ , 1 cm 3D = 0.392 kNm (Min=-0.405) (Max=0.310)

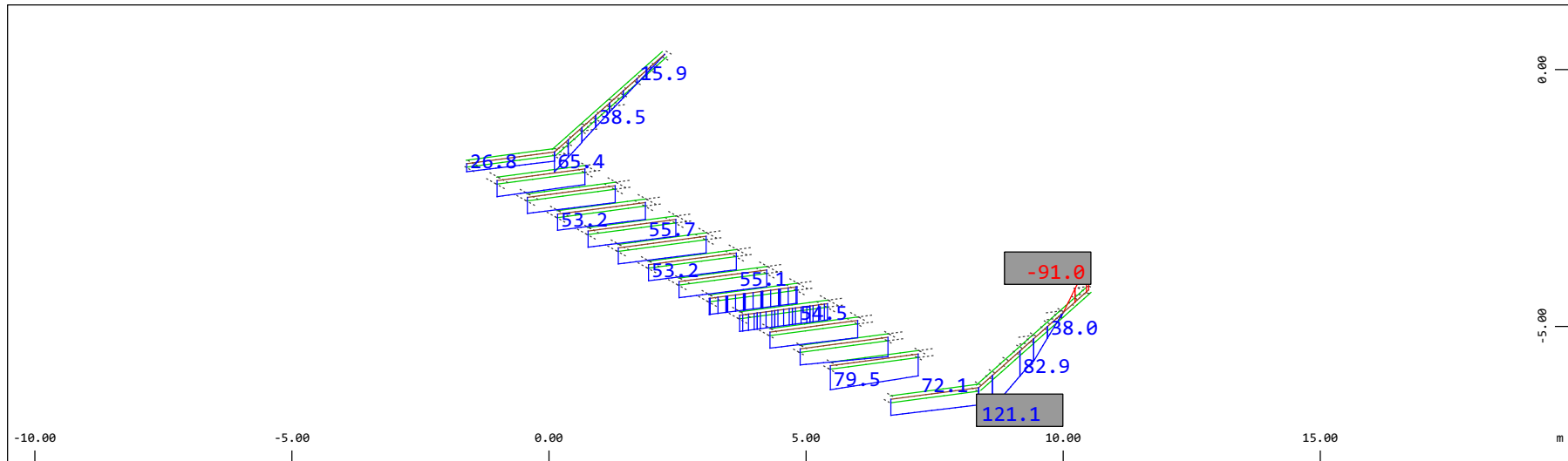
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 600 W: Fwy+ , 1 cm 3D = 98.0 kN (Min=-4.75) (Max=57.3)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

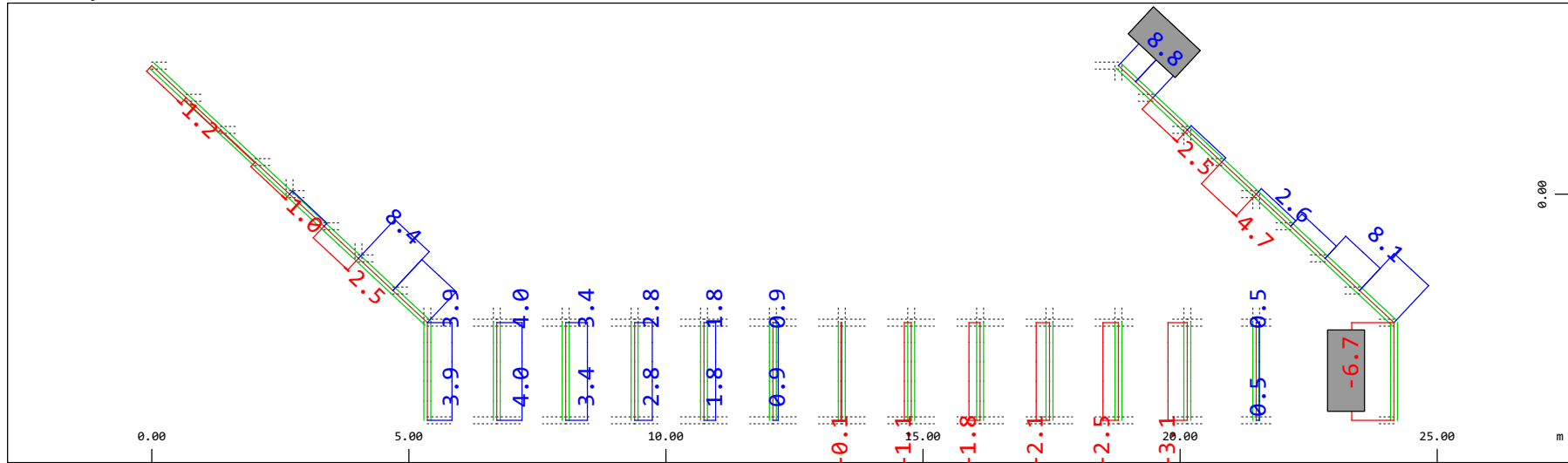


Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 600 W: Fwy+ , 1 cm 3D = 196.1 kNm (Min=-91.0) (Max=121.1)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

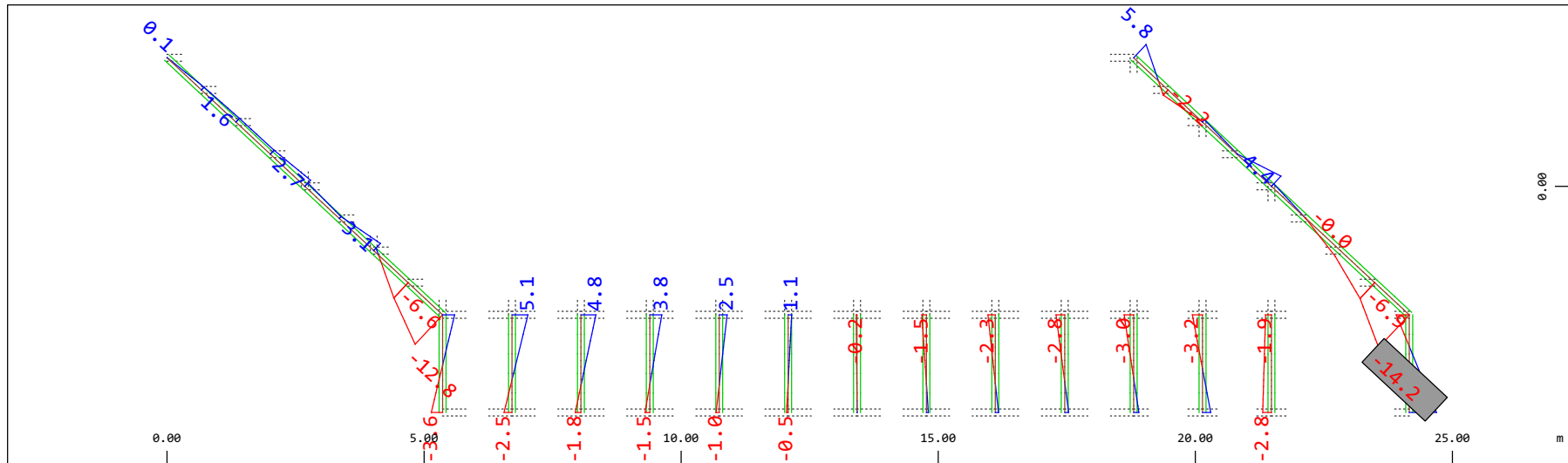
Definition of Axis
 Results elementay loads

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Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force V_y , Loadcase 600 W: Fwy+ , 1 cm 3D = 9.80 kN (Min=-6.72) (Max=8.75)

M 1 : 120

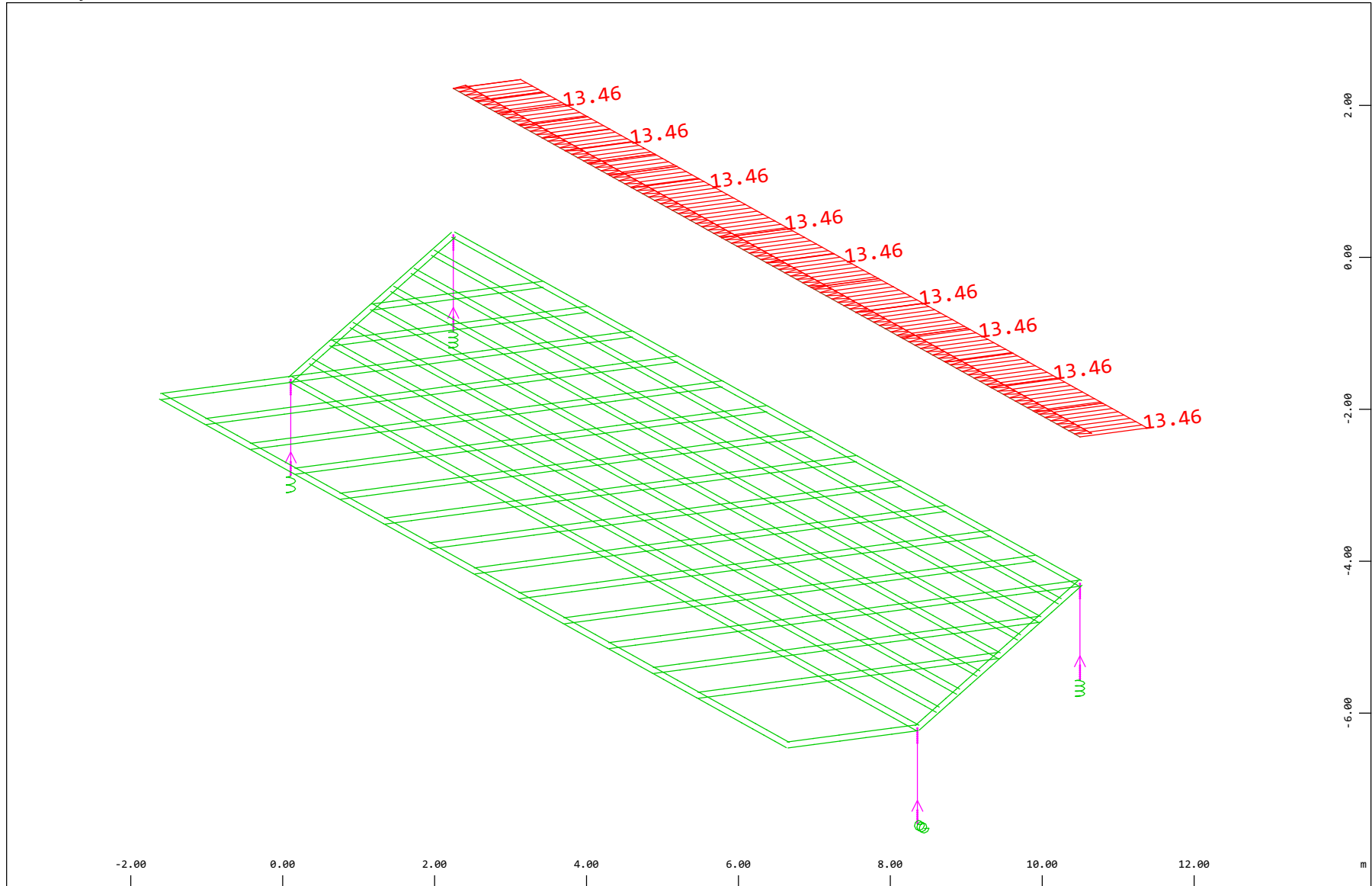


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment M_z (Maximum values cubic interpolated), Loadcase 600 W: Fwy+ , 1 cm 3D = 19.6 kNm (Min=-14.2) (Max=8.64)

M 1 : 120

Definition of Axis
 Results elementay loads

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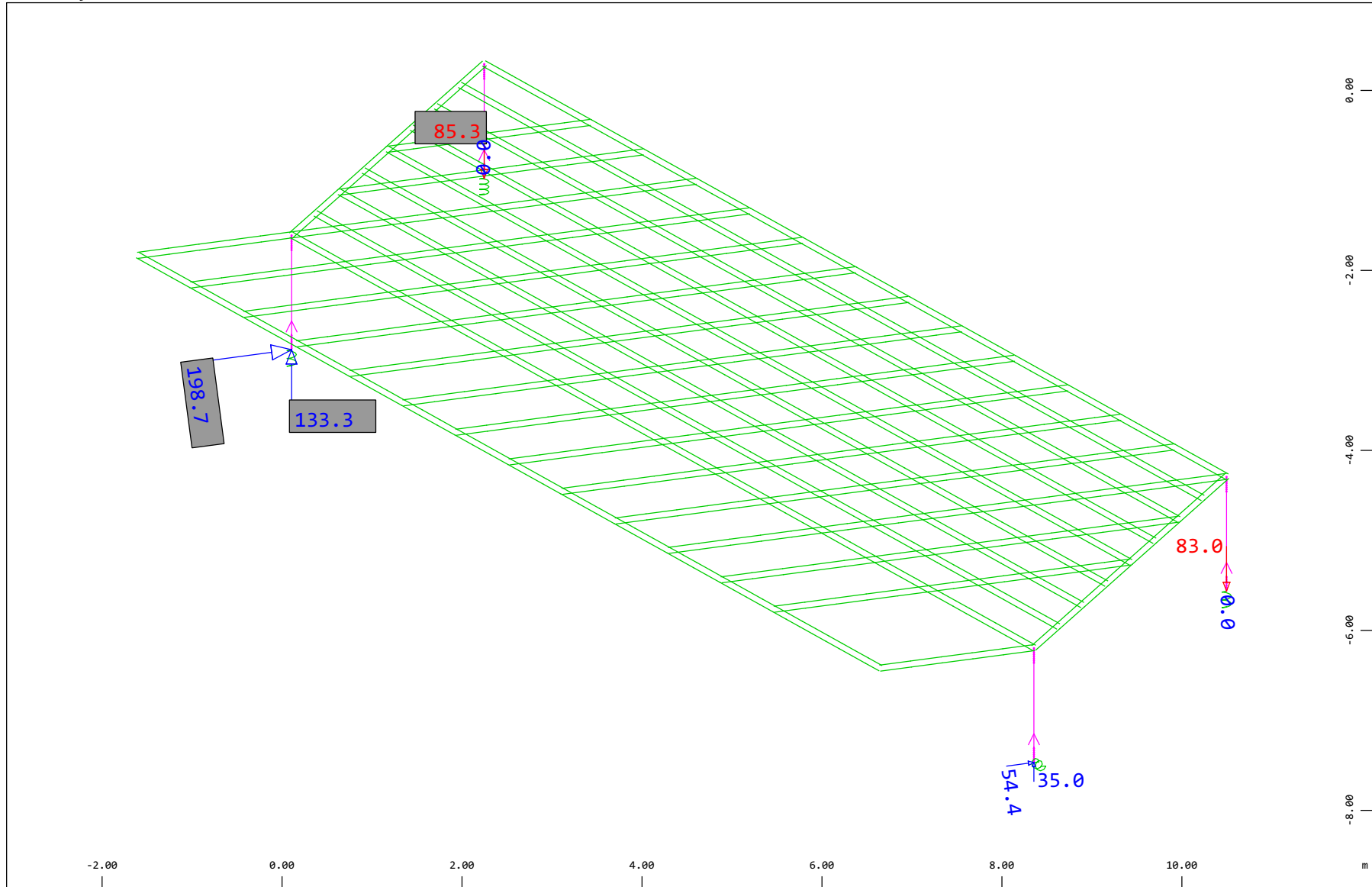
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 601 W: Fwy- , (1 cm 3D = unit) Beam line load (force) in global Y (Unit=9.69 kN/m)

⏏ (Min=-13.5) (Max=-13.5)

M 1 : 71
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 601 W: Fwy- , 1 cm 3D = 96.9 kN

Nodes , Support force vector in the global XY plane, Loadcase 601 W: Fwy- , 1 cm 3D = 96.9 kN

◁ (Min=-85.3) (Max=133.3) (total: 0)

▷ (Max=198.7)

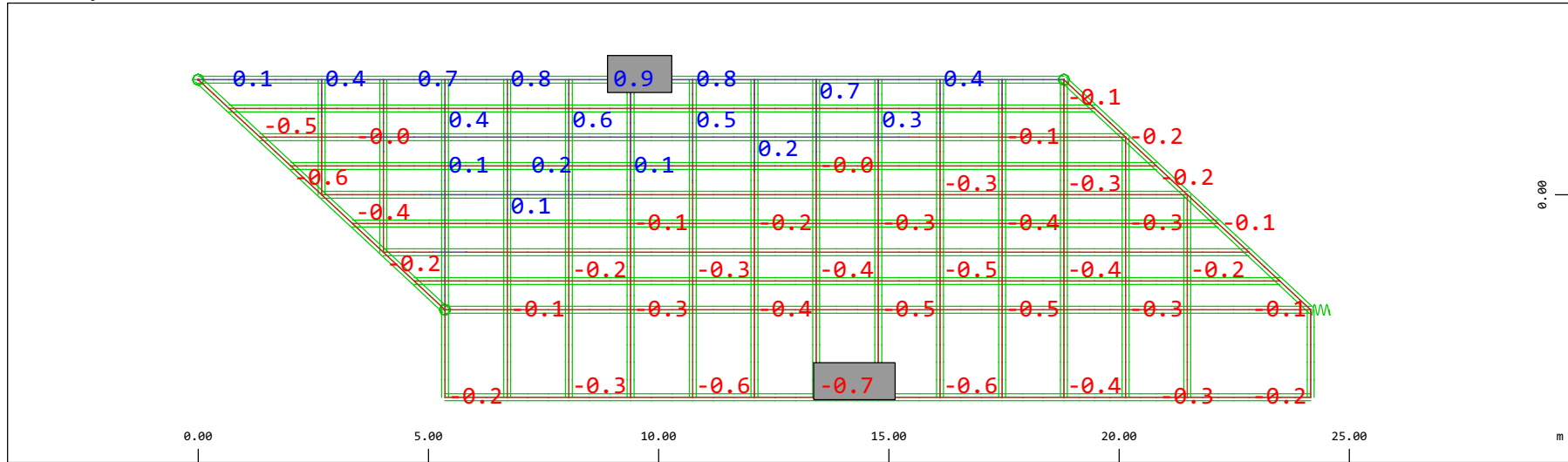
M 1 : 60

X * 0.502

Y * 0.906

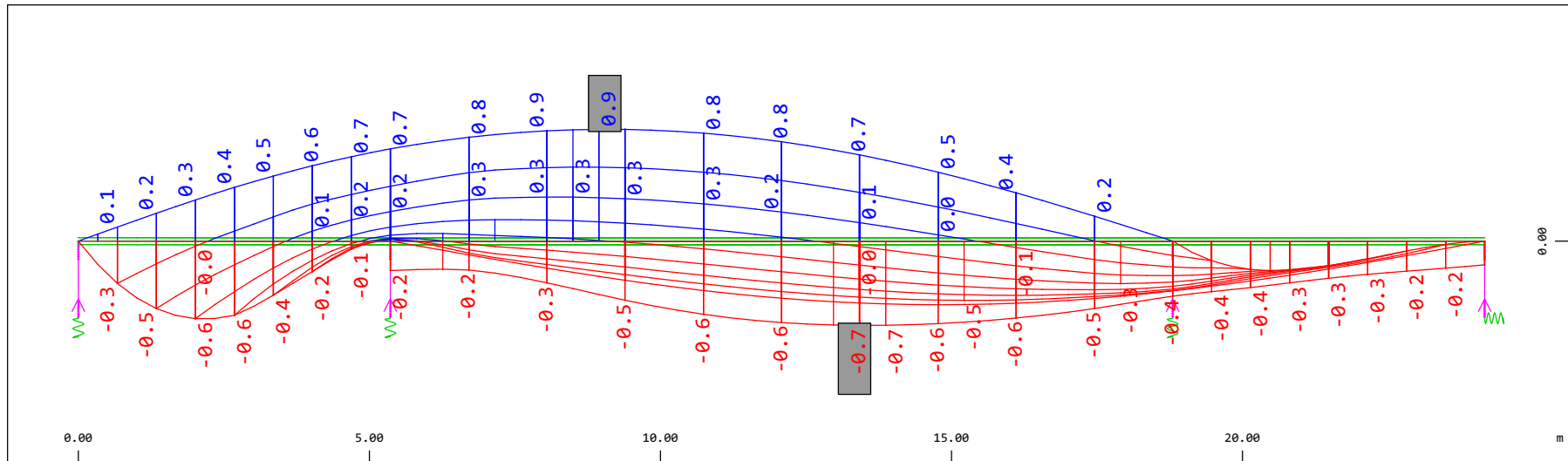
Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 601 W: Fwy- , 1 cm 3D = 0.484 mm (Min=-0.662) (Max=0.878)

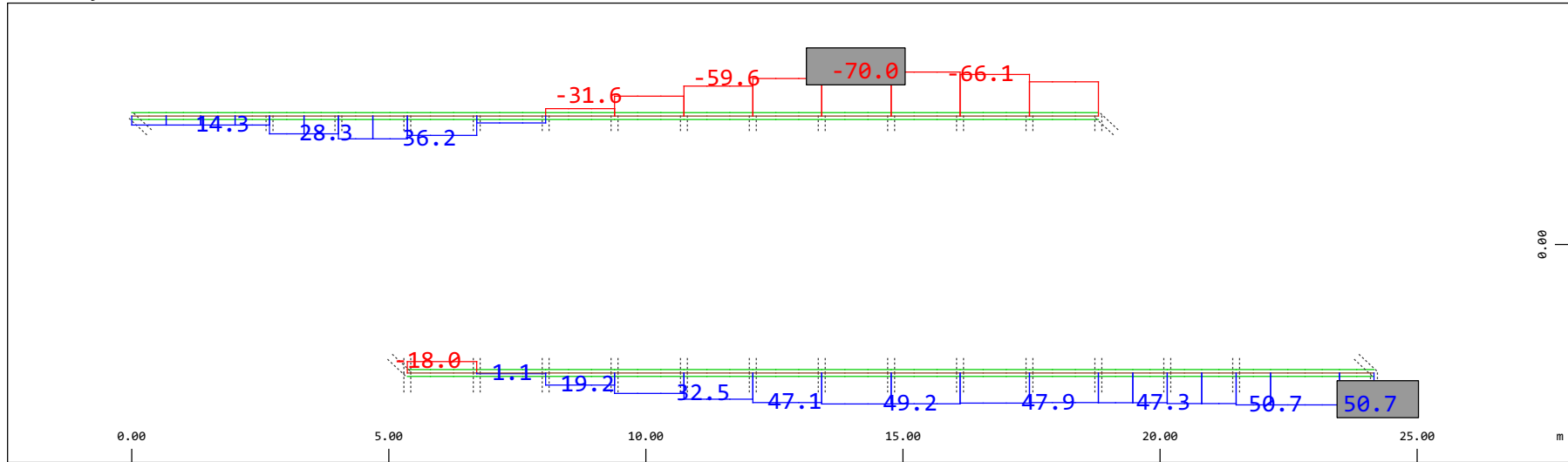
M 1 : 134



Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 601 W: Fwy- , 1 cm 3D = 0.484 mm (Min=-0.662) (Max=0.878)

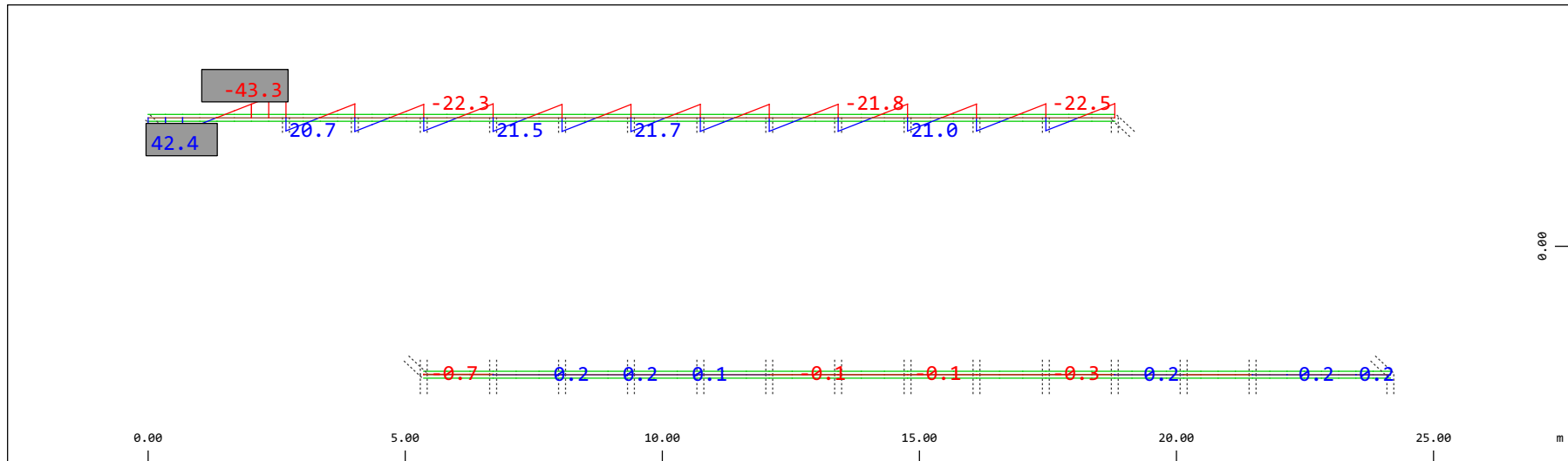
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kN (Min=-70.0) (Max=50.7)

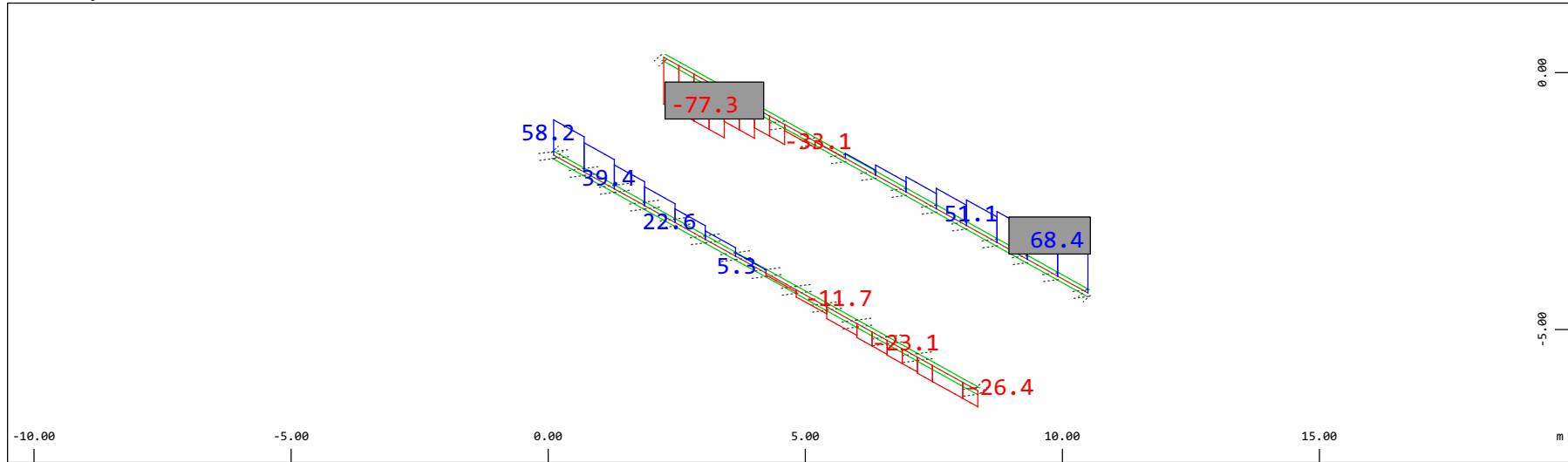
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kNm (Min=-43.3) (Max=42.4)

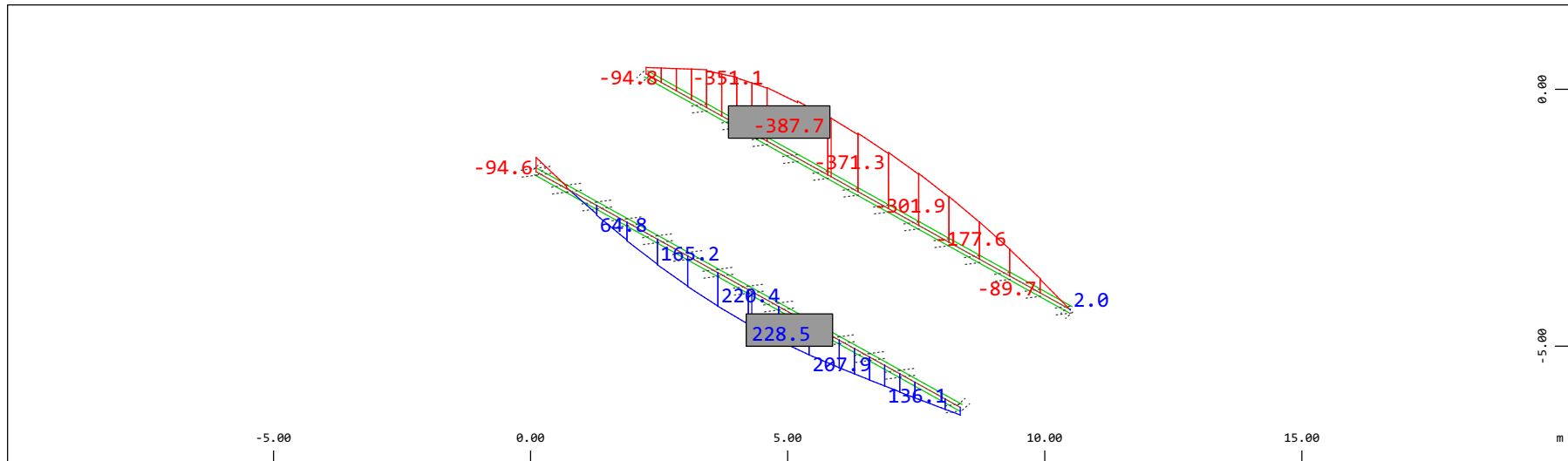
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kN (Min=-77.3) (Max=68.4)

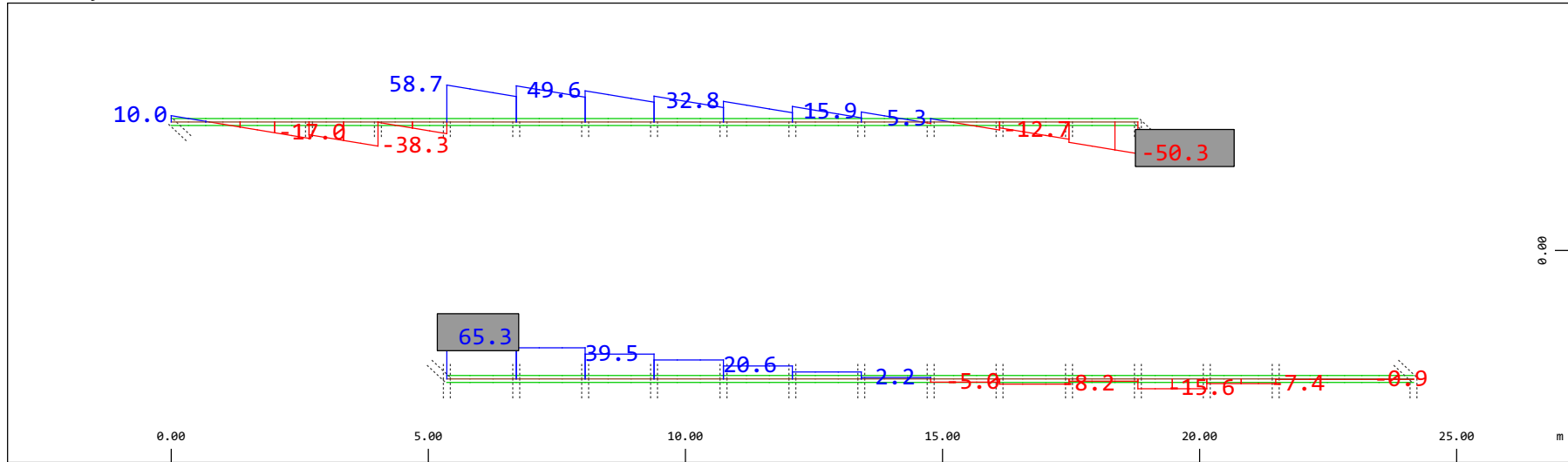
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 601 W: Fwy- , 1 cm 3D = 392.2 kNm (Min=-387.7) (Max=228.5)

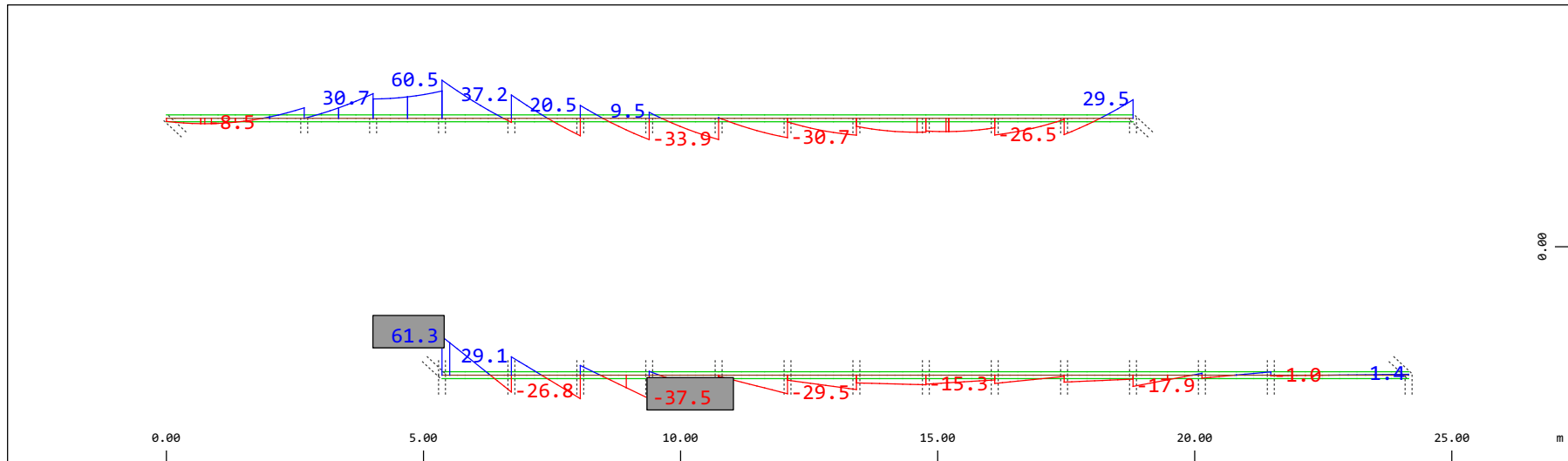
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kN (Min=-50.3) (Max=65.3)

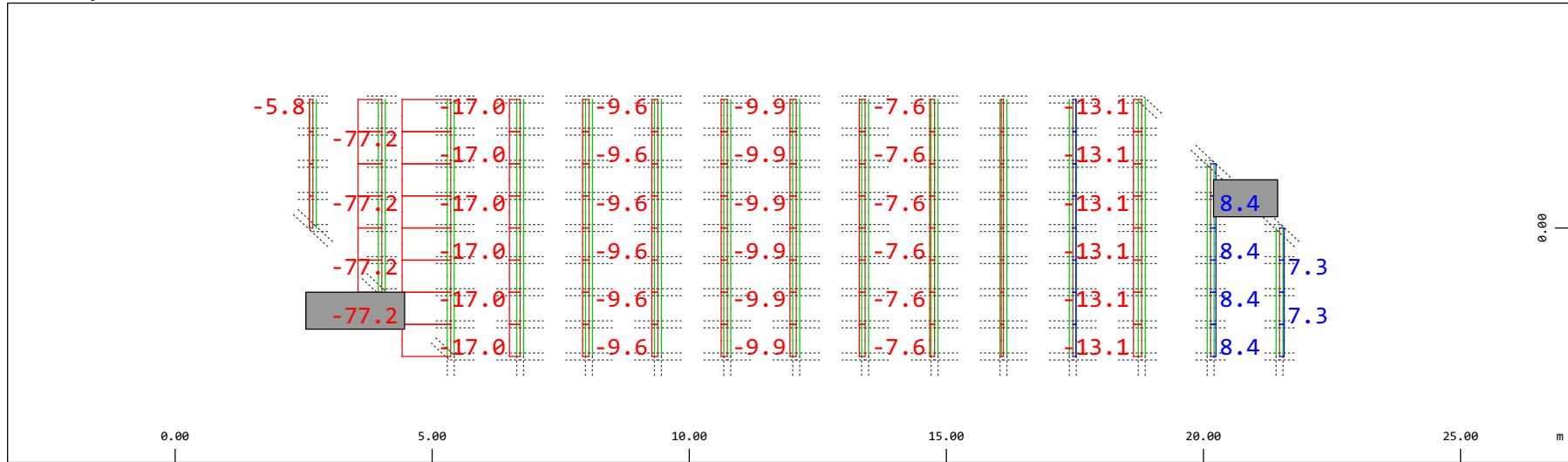
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kNm (Min=-37.5) (Max=61.3)

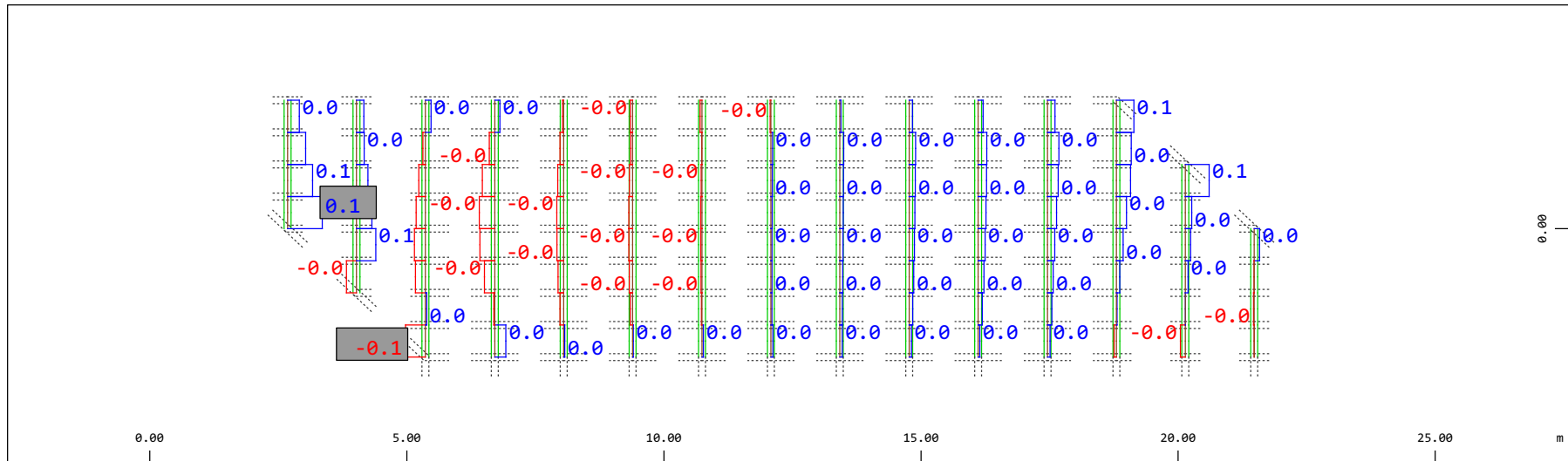
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 Z-X Beam Elements , Normal force N_x , Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kN (Min=-77.2) (Max=8.44)

M 1 : 120

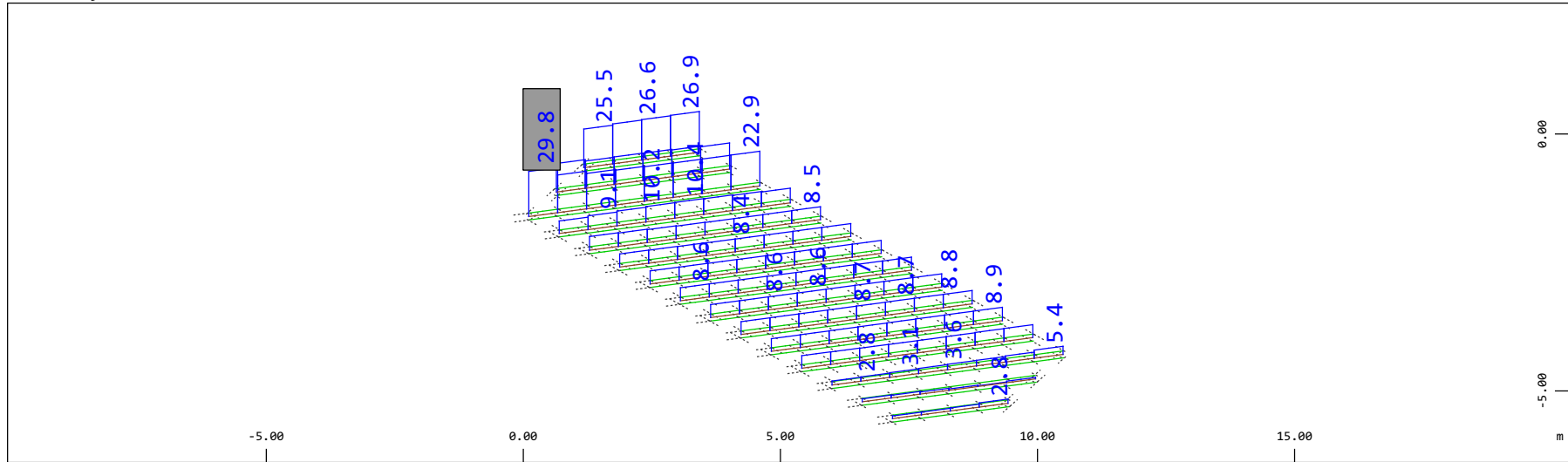


Y Sector of system Beam Elements Group 21 22
 Z-X Beam Elements , Torsional moment M_t , Loadcase 601 W: Fwy- , 1 cm 3D = 0.196 kNm (Min=-0.0630) (Max=0.110)

M 1 : 120

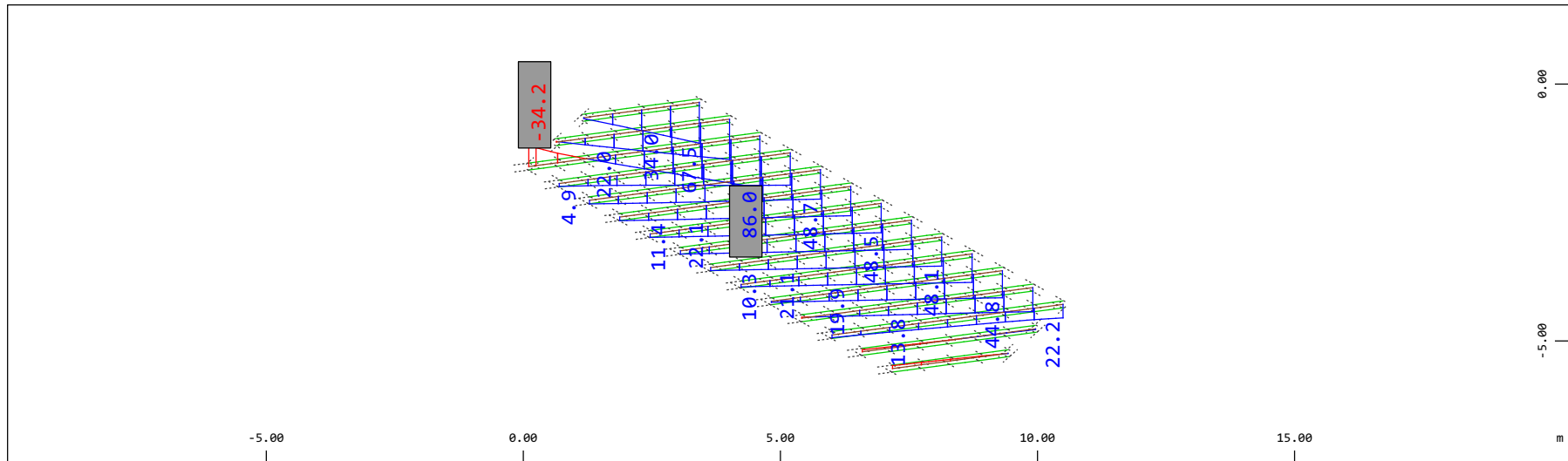
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 601 W: Fwy- , 1 cm 3D = 39.2 kN (Max=29.8)

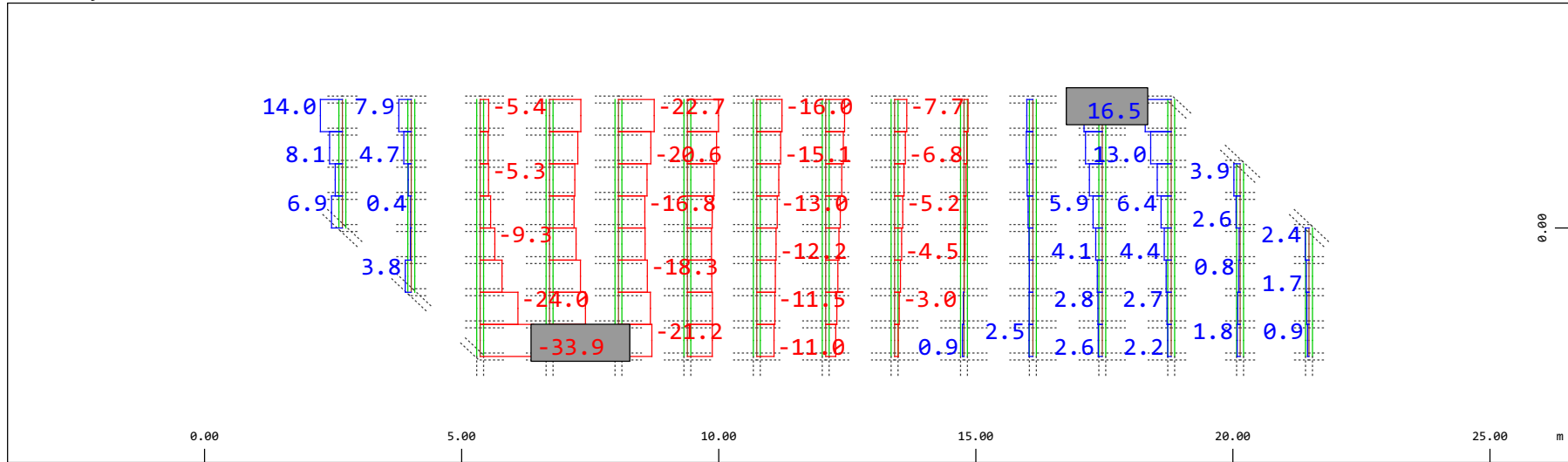
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kNm (Min=-34.2) (Max=86.0)

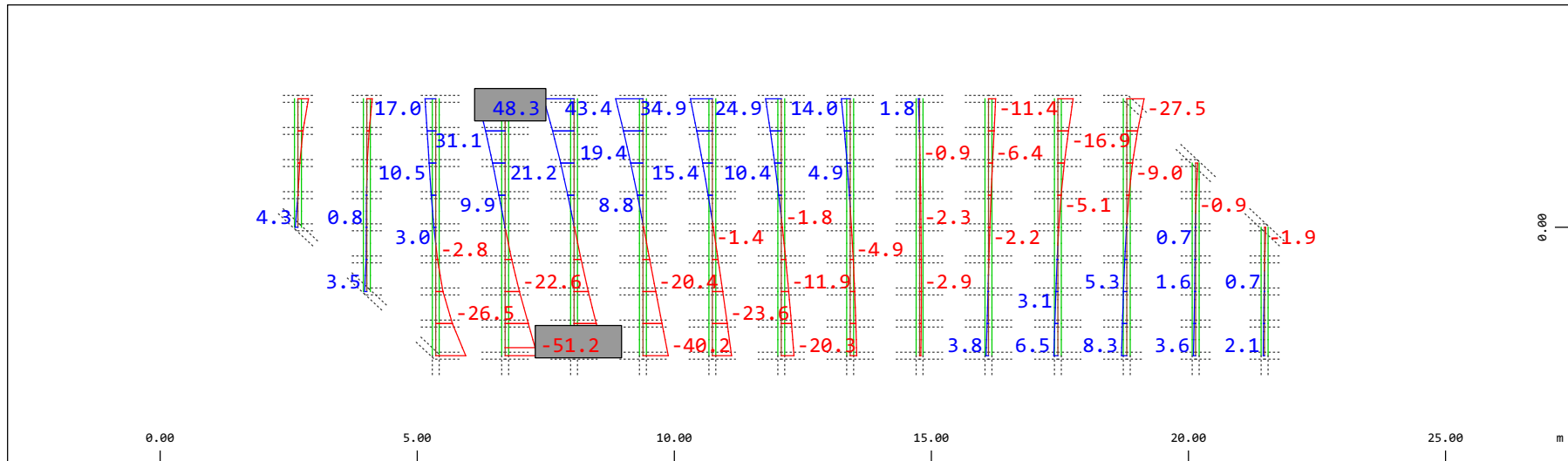
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 601 W: Fwy- , 1 cm 3D = 39.2 kN (Min=-33.9) (Max=16.5)

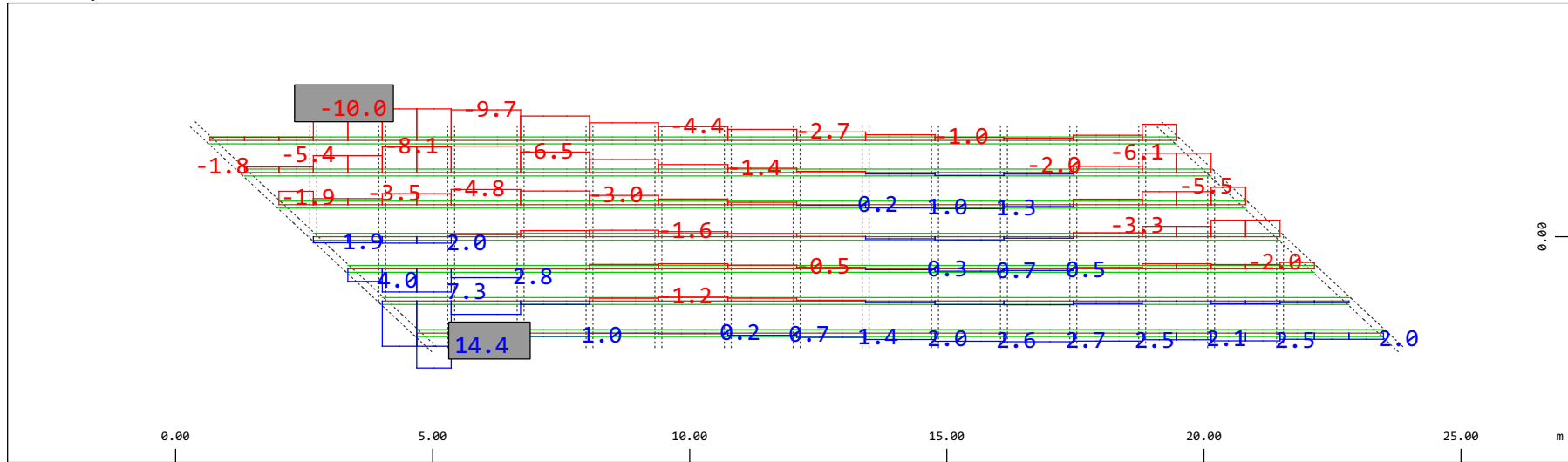
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kNm (Min=-51.2) (Max=48.3)

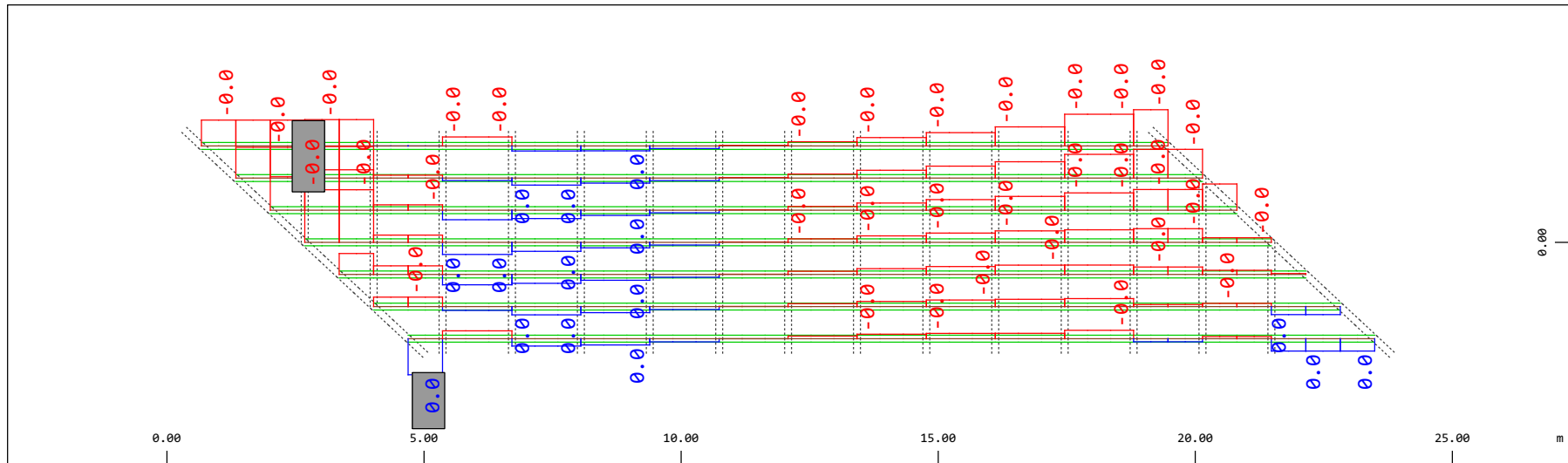
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force Nx, Loadcase 601 W: Fwy- , 1 cm 3D = 19.6 kN (Min=-10.0) (Max=14.4)

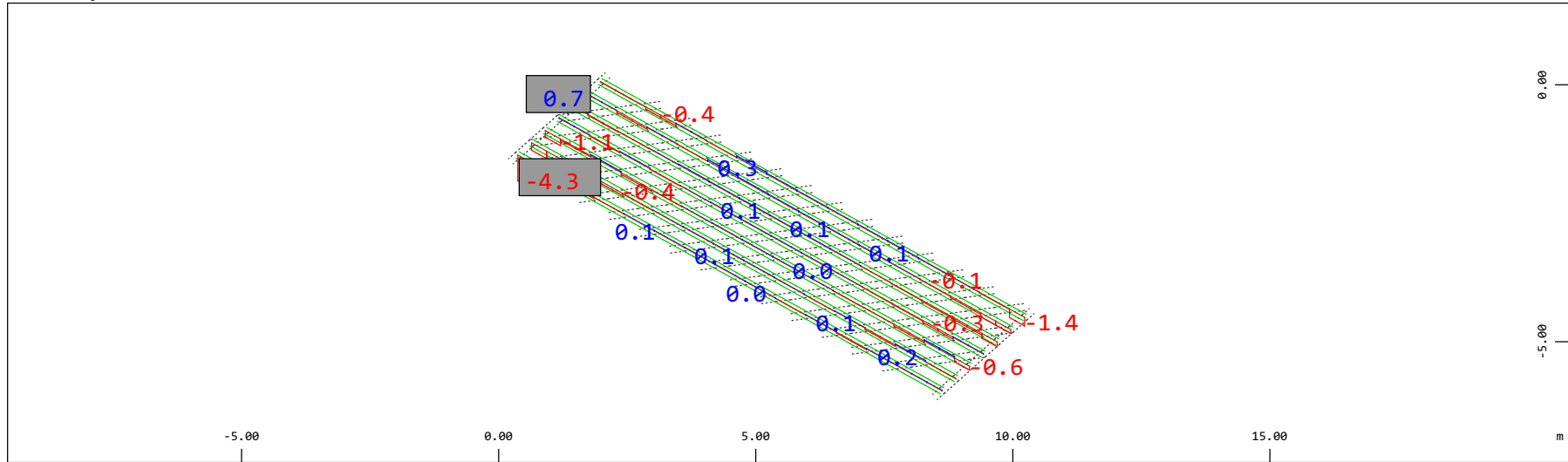
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment Mt, Loadcase 601 W: Fwy- , 1 cm 3D = 0.0020 kNm (Min=-0.0017) (Max=0.0011)

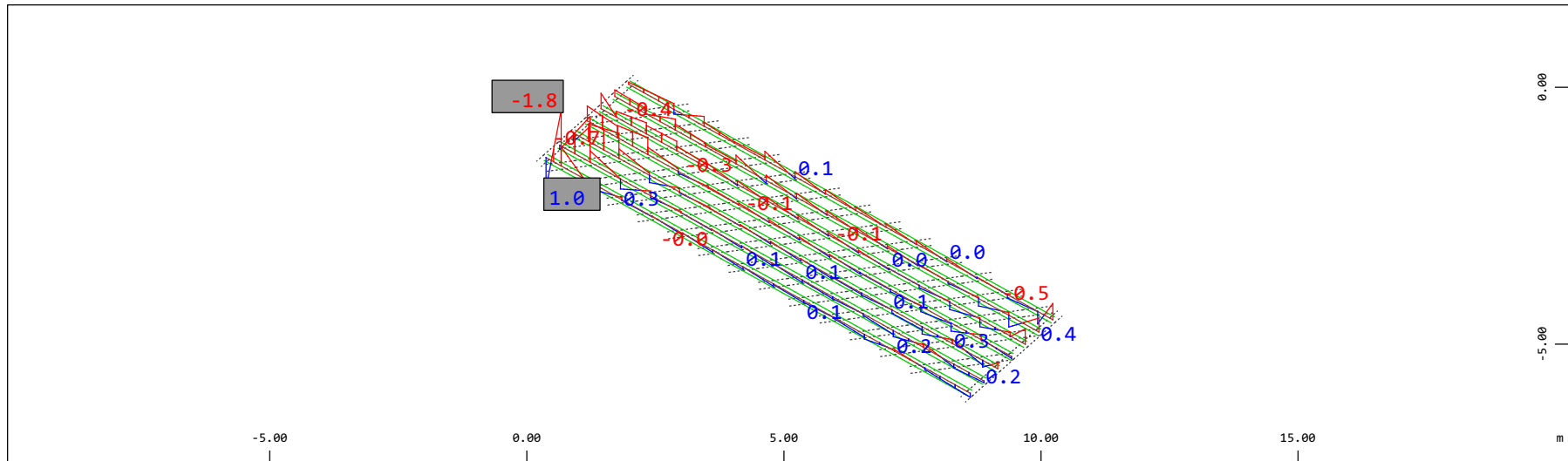
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 601 W: Fwy- , 1 cm 3D = 9.80 kN (Min=-4.26) (Max=0.734)

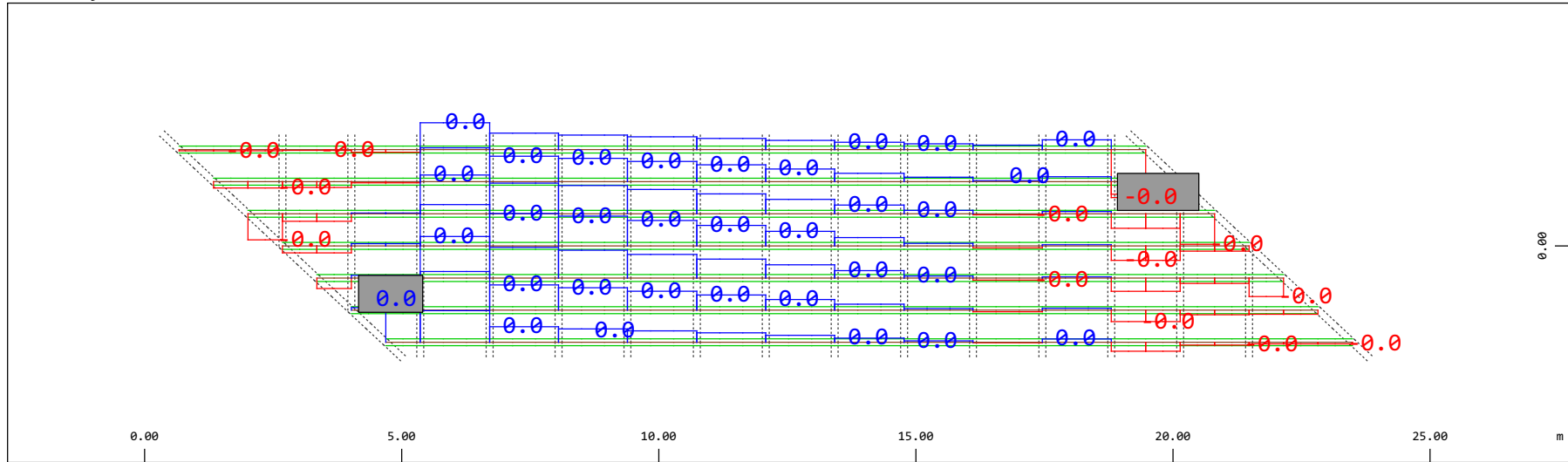
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 601 W: Fwy- , 1 cm 3D = 1.96 kNm (Min=-1.83) (Max=1.02)

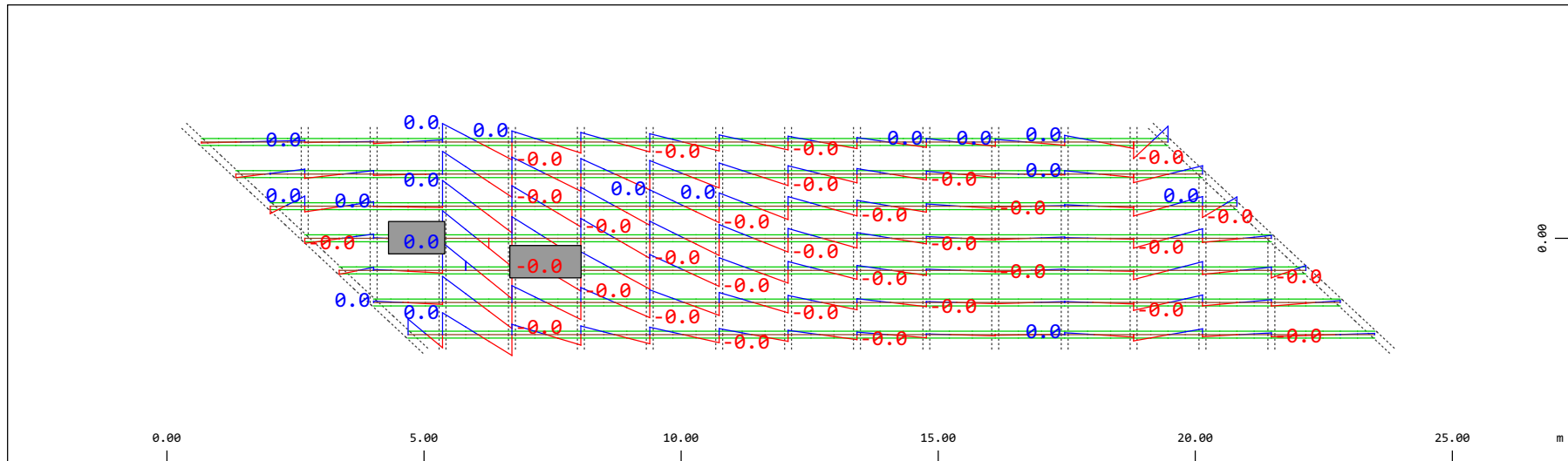
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Shear force Vy, Loadcase 601 W: Fwy- , 1 cm 3D = 0.0098 kN (Min=-0.0076) (Max=0.0068)

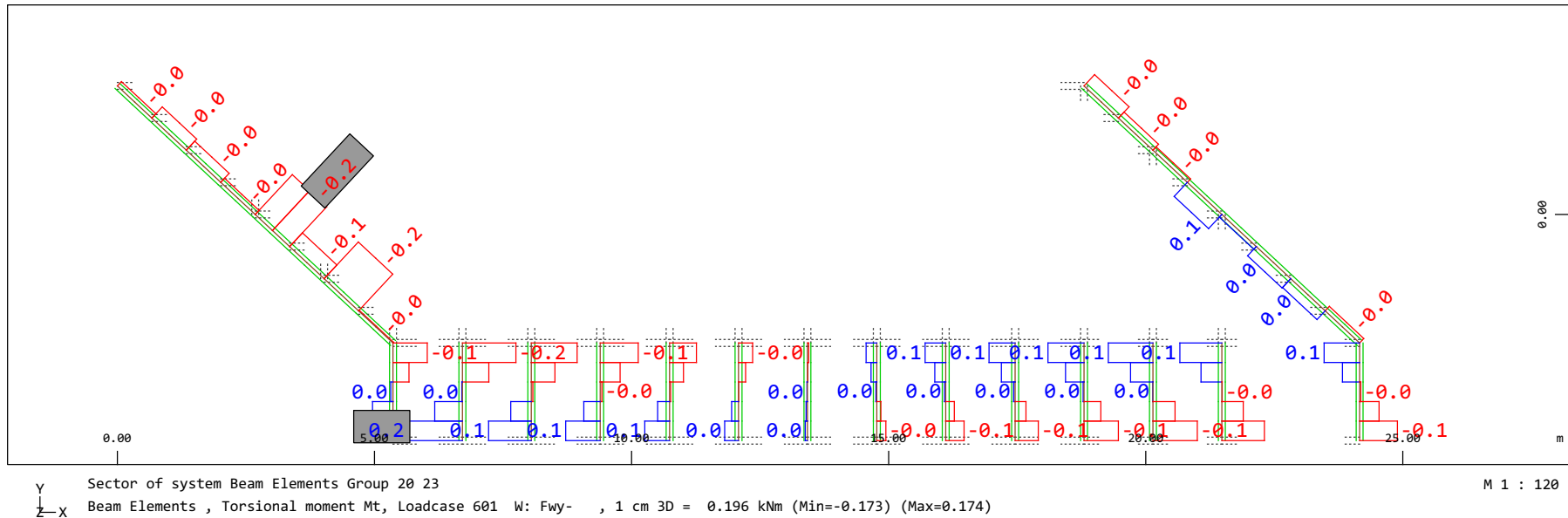
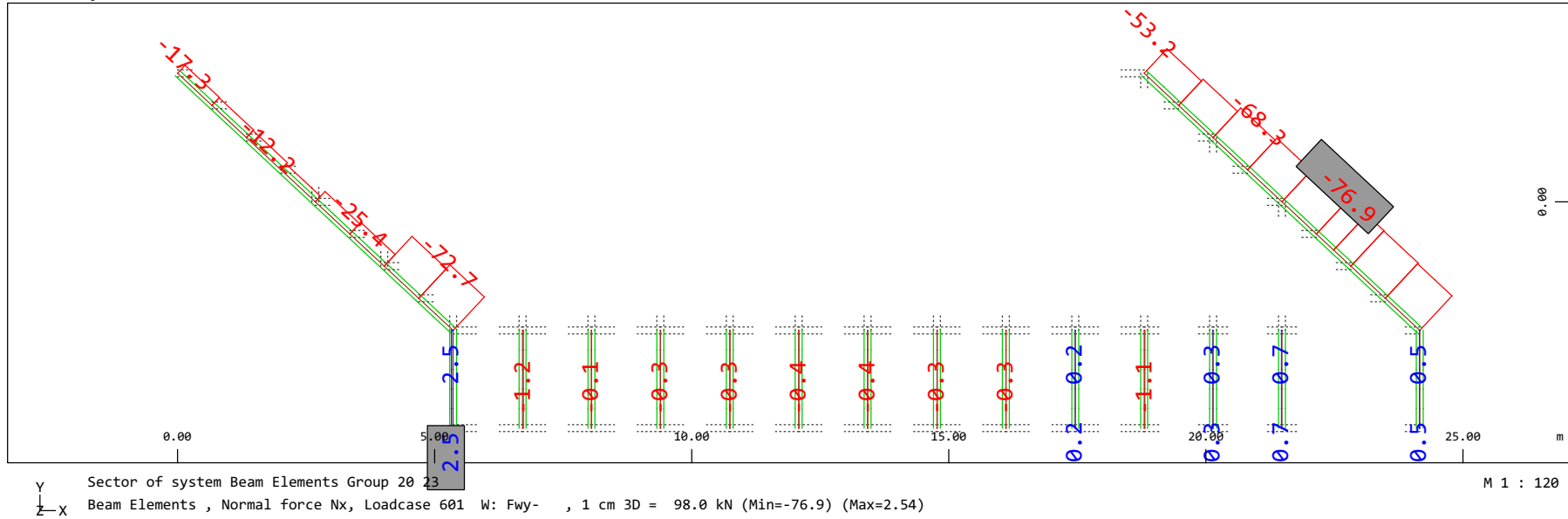
M 1 : 120



Y Sector of system Beam Elements Group 31...37
Z-X Beam Elements , Bending moment Mz, Loadcase 601 W: Fwy- , 1 cm 3D = 0.0098 kNm (Min=-0.0045) (Max=0.0044)

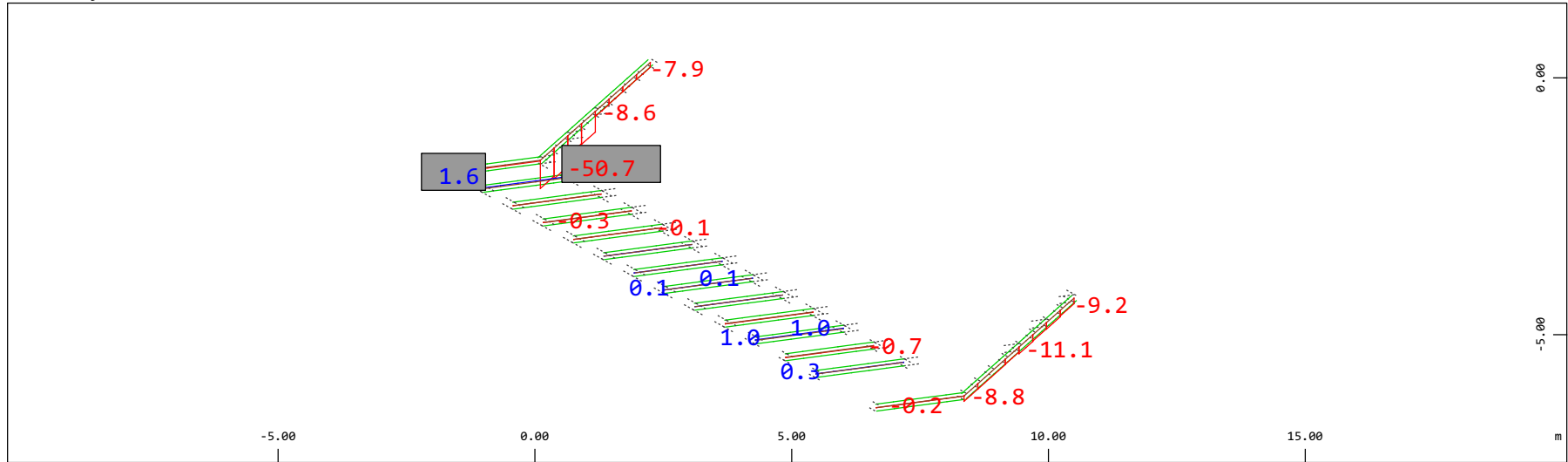
M 1 : 120

Definition of Axis
 Results elementay loads



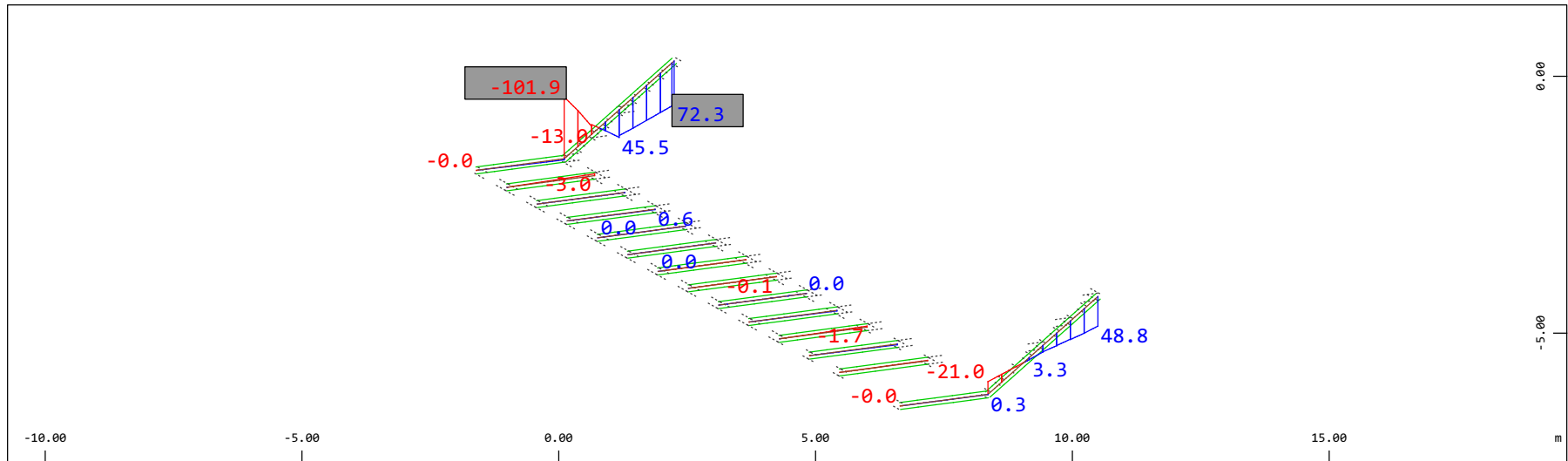
Definition of Axis

Results elementay loads



Z Sector of system Beam Elements Group 20 23
X Y Beam Elements , Shear force Vz, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kN (Min=-50.7) (Max=1.65)

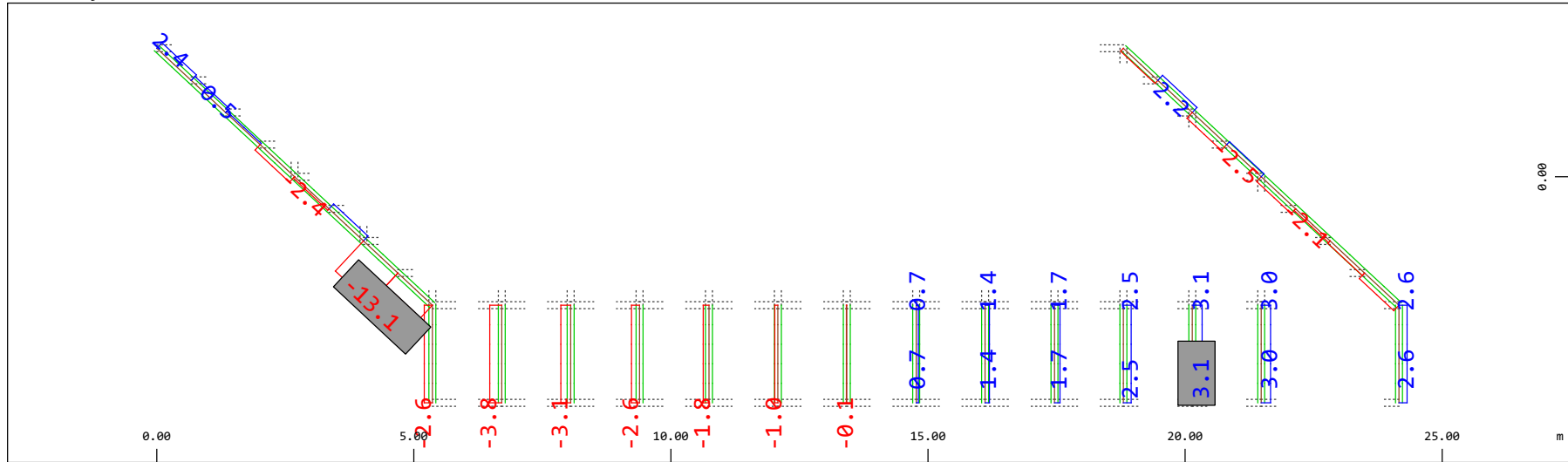
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



Z Sector of system Beam Elements Group 20 23
X Y Beam Elements , Bending moment My, Loadcase 601 W: Fwy- , 1 cm 3D = 98.0 kNm (Min=-101.9) (Max=72.3)

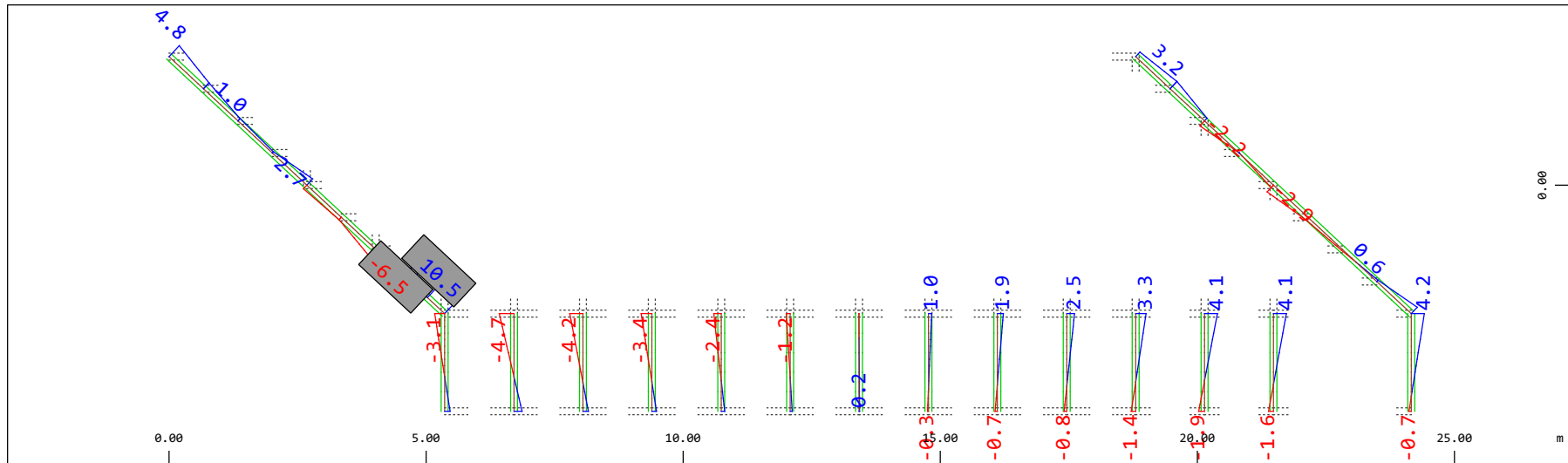
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 601 W: Fwy- , 1 cm 3D = 19.6 kN (Min=-13.1) (Max=3.13)

M 1 : 120

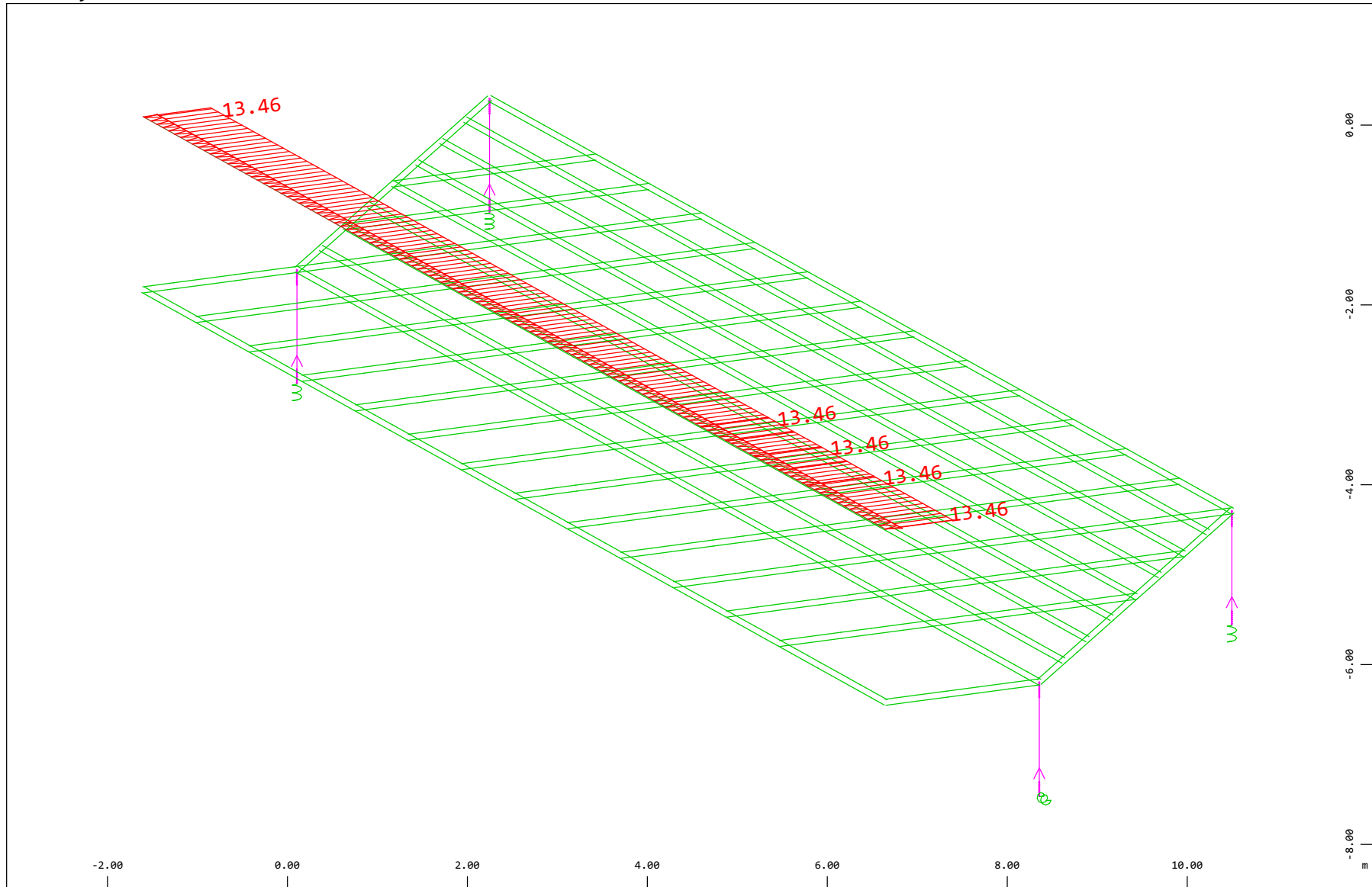


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 601 W: Fwy- , 1 cm 3D = 19.6 kNm (Min=-6.52) (Max=10.5)

M 1 : 120

Definition of Axis
Results elementary loads

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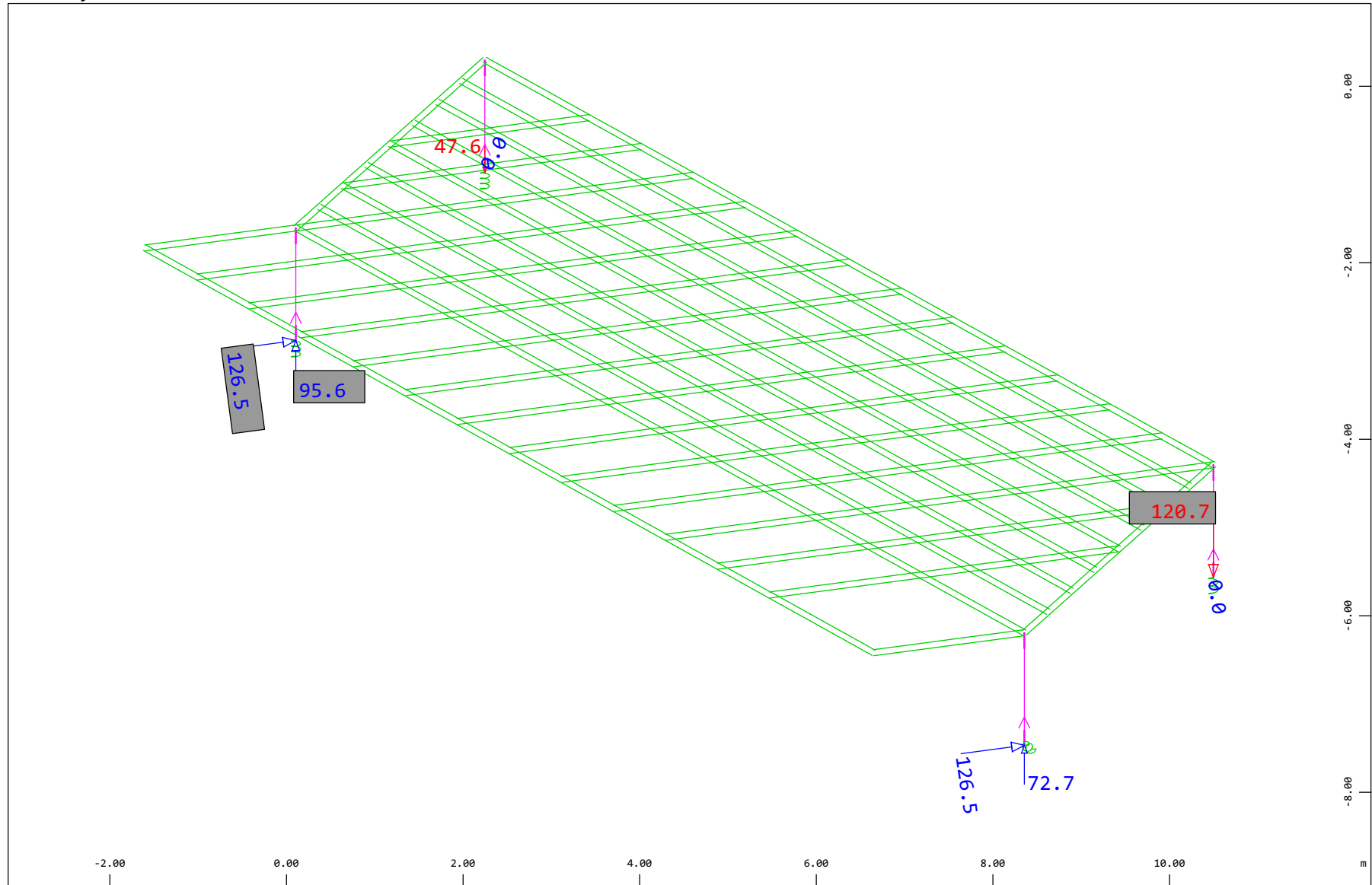
Z Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
X Y All loads, Loadcase 602 W: Fwy- , (1 cm 3D = unit) Beam line load (force) in global Y (Unit=9.69 kN/m)

→ (Min=-13.5) (Max=-13.5)

M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 602 W: Fwy- , 1 cm 3D = 96.9 kN

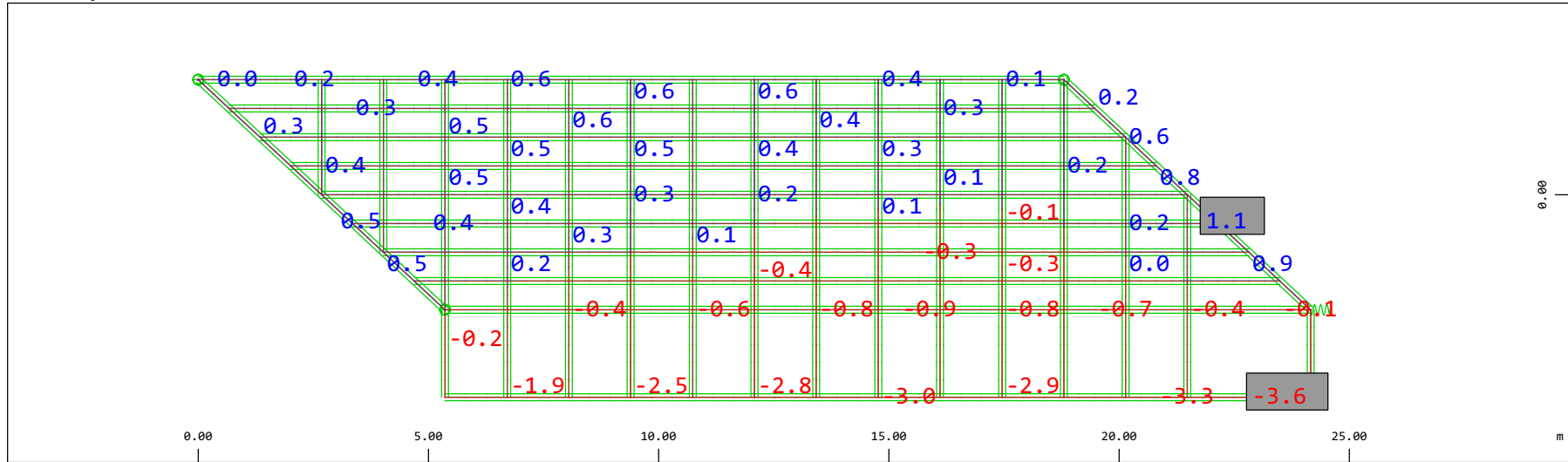
Nodes , Support force vector in the global XY plane, Loadcase 602 W: Fwy- , 1 cm 3D = 96.9 kN

▬ (Min=-120.7) (Max=95.6) (total: 1.5259e-05)

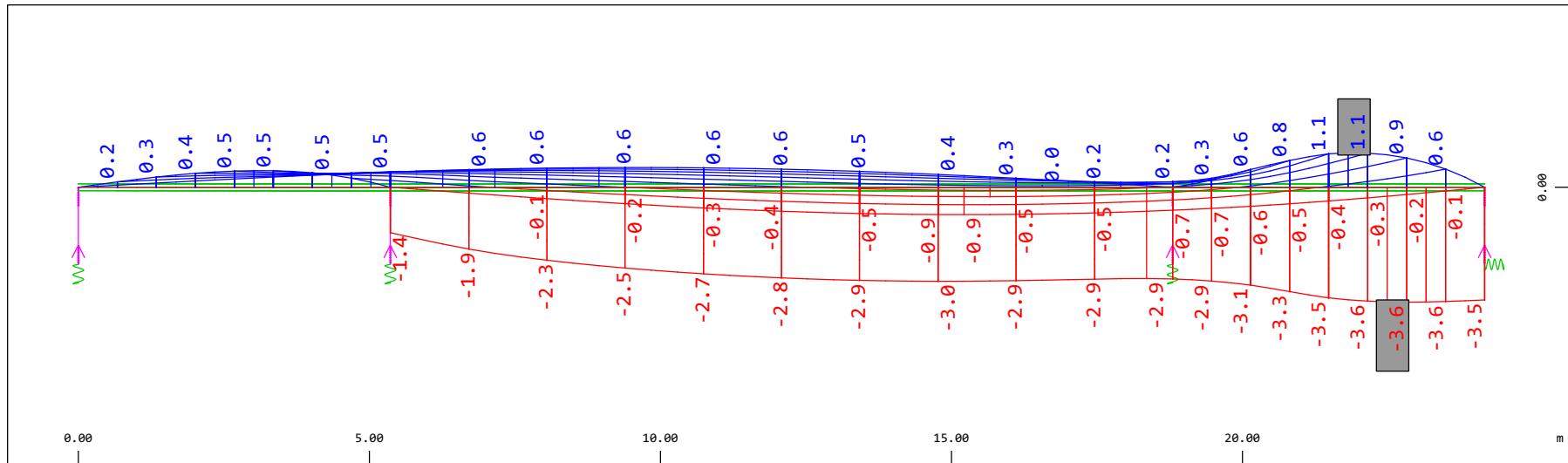
▬ (Max=126.5)

M 1 : 61
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

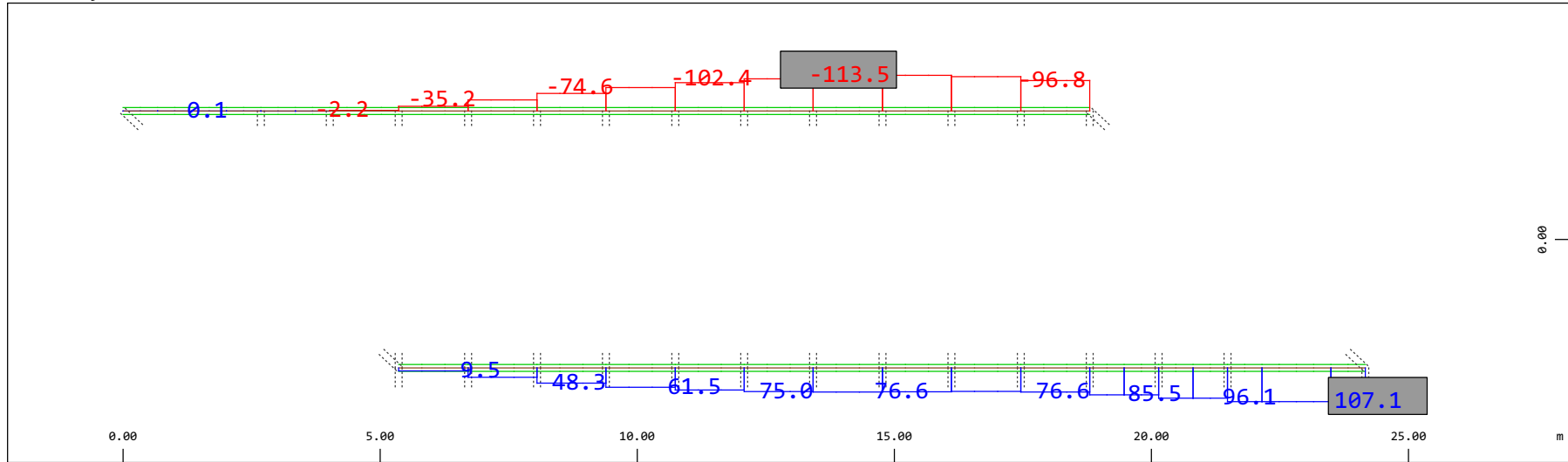


Y Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along ○, Loadcase 602 W: Fwy- , 1 cm 3D = 1.94 mm (Min=-3.61) (Max=1.08) M 1 : 134



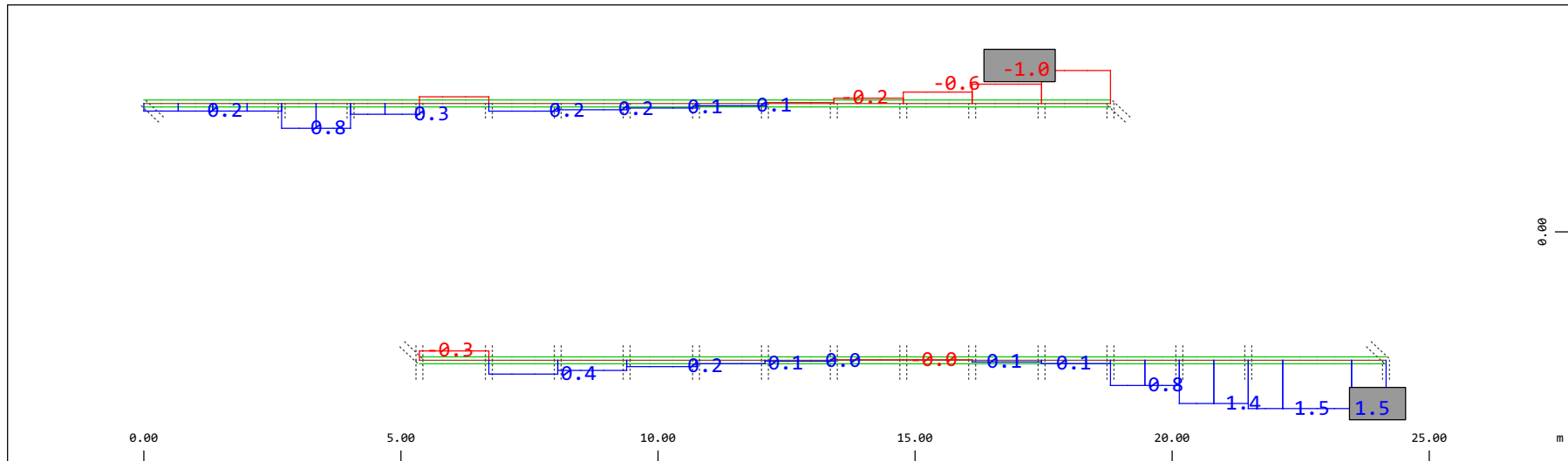
Z Sector of system Beam Elements, Spring Elements
 X Nodal displacement in global Z, Node sequence along ⇕, Loadcase 602 W: Fwy- , 1 cm 3D = 1.94 mm (Min=-3.61) (Max=1.08) M 1 : 106

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Normal force Nx, Loadcase 602 W: Fwy- , 1 cm 3D = 196.1 kN (Min=-113.5) (Max=107.1)

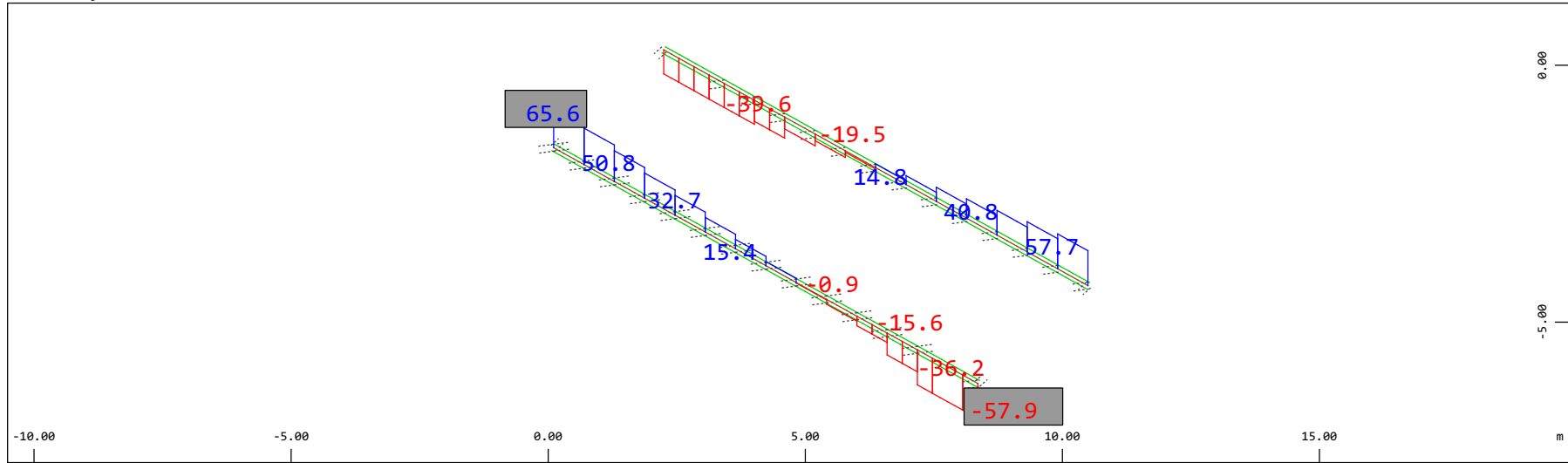
M 1 : 120



Y Sector of system Beam Elements Group 10 11
 Z-X Beam Elements , Torsional moment Mt, Loadcase 602 W: Fwy- , 1 cm 3D = 1.96 kNm (Min=-1.05) (Max=1.53)

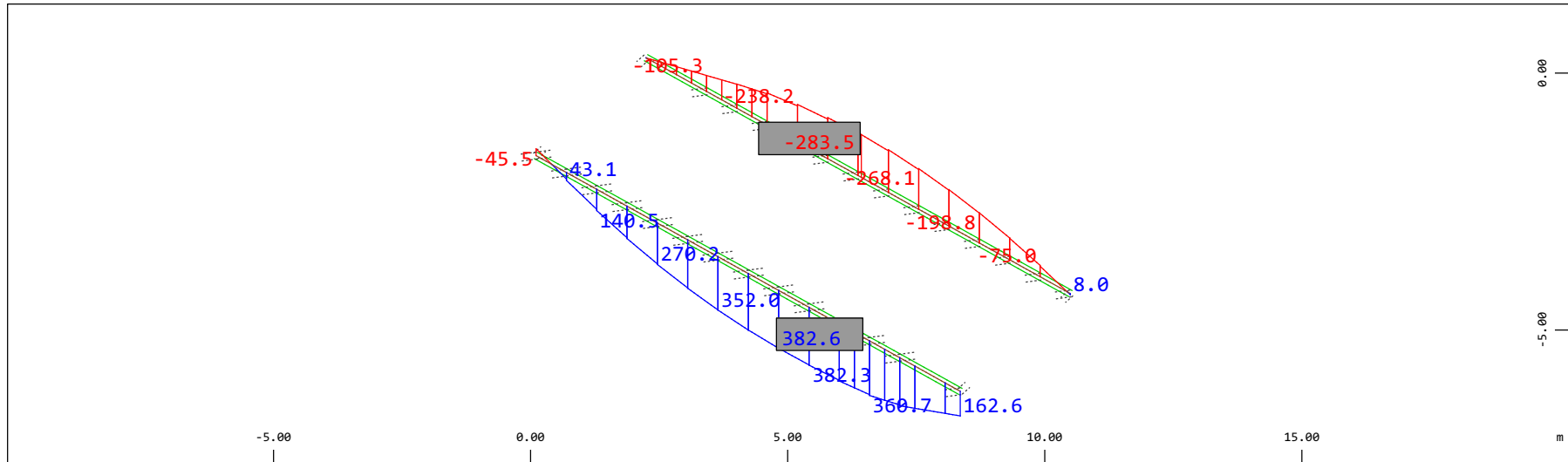
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force V_z , Loadcase 602 W: Fwy- , 1 cm 3D = 98.0 kN (Min=-57.9) (Max=65.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

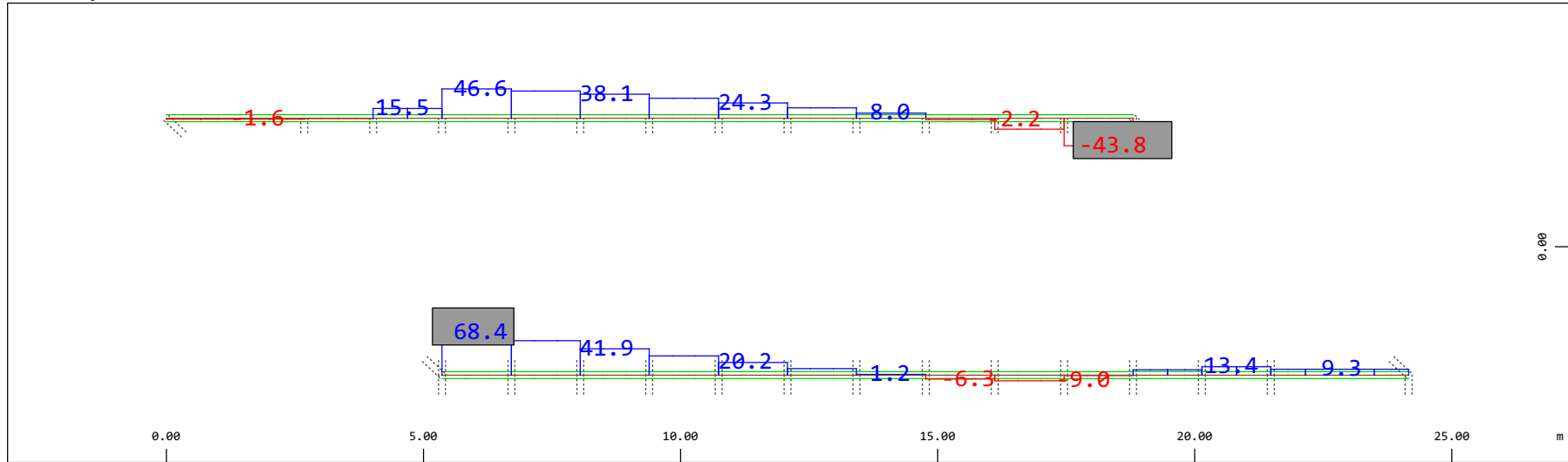


Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment M_y , Loadcase 602 W: Fwy- , 1 cm 3D = 392.2 kNm (Min=-283.5) (Max=382.6)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

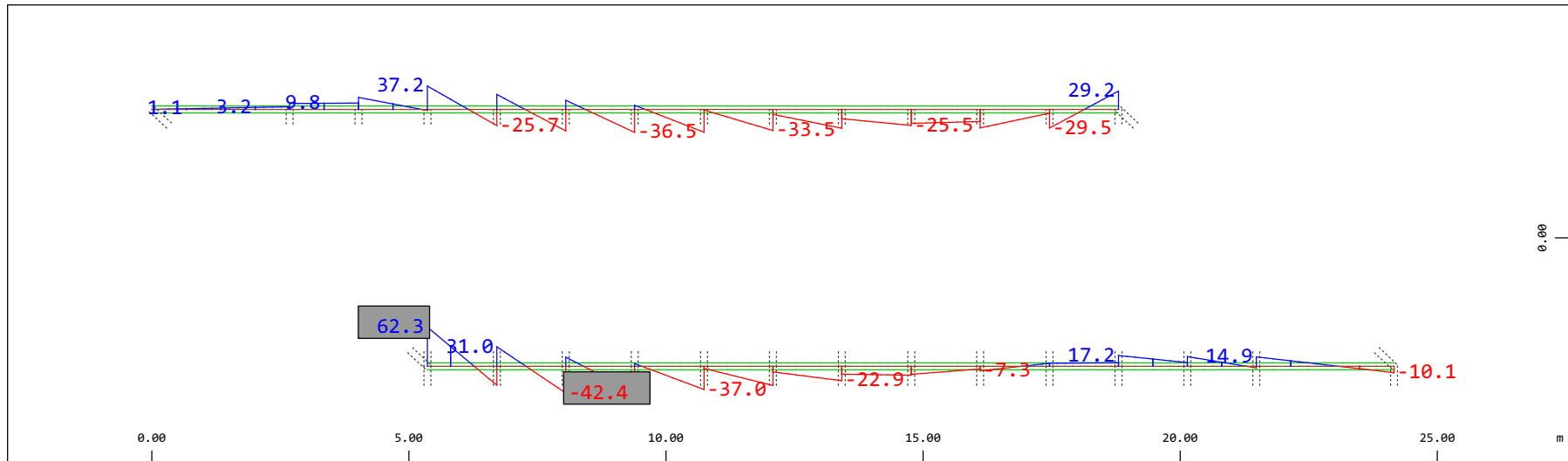
Definition of Axis

Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 602 W: Fwy- , 1 cm 3D = 98.0 kN (Min=-43.8) (Max=68.4)

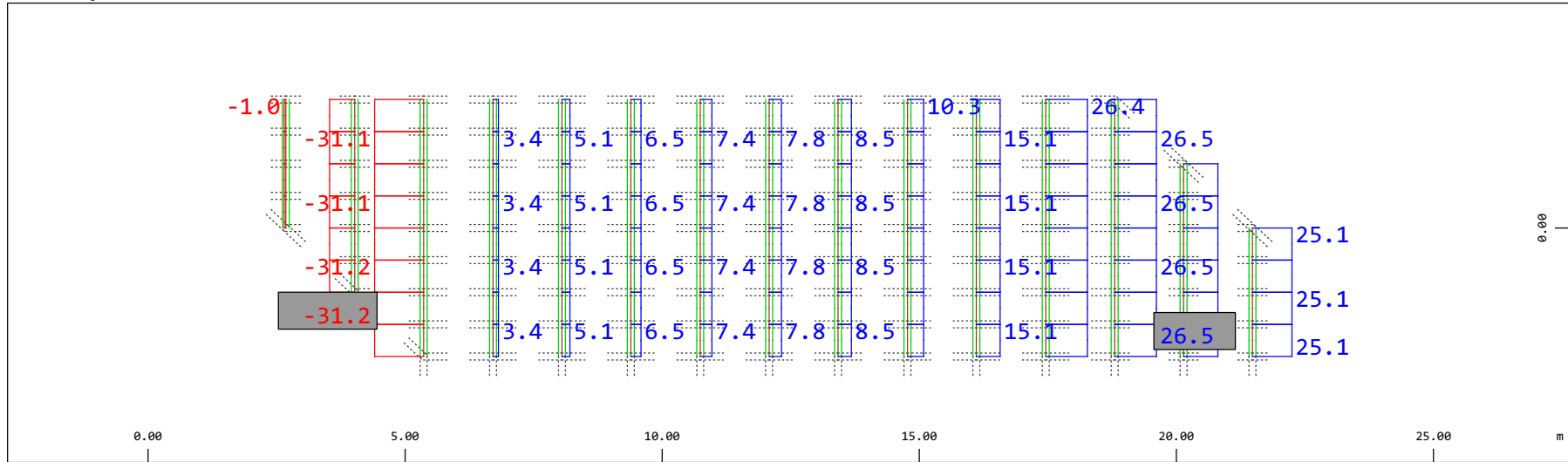
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz (Maximum values cubic interpolated), Loadcase 602 W: Fwy- , 1 cm 3D = 98.0 kNm (Min=-42.4) (Max=62.3)

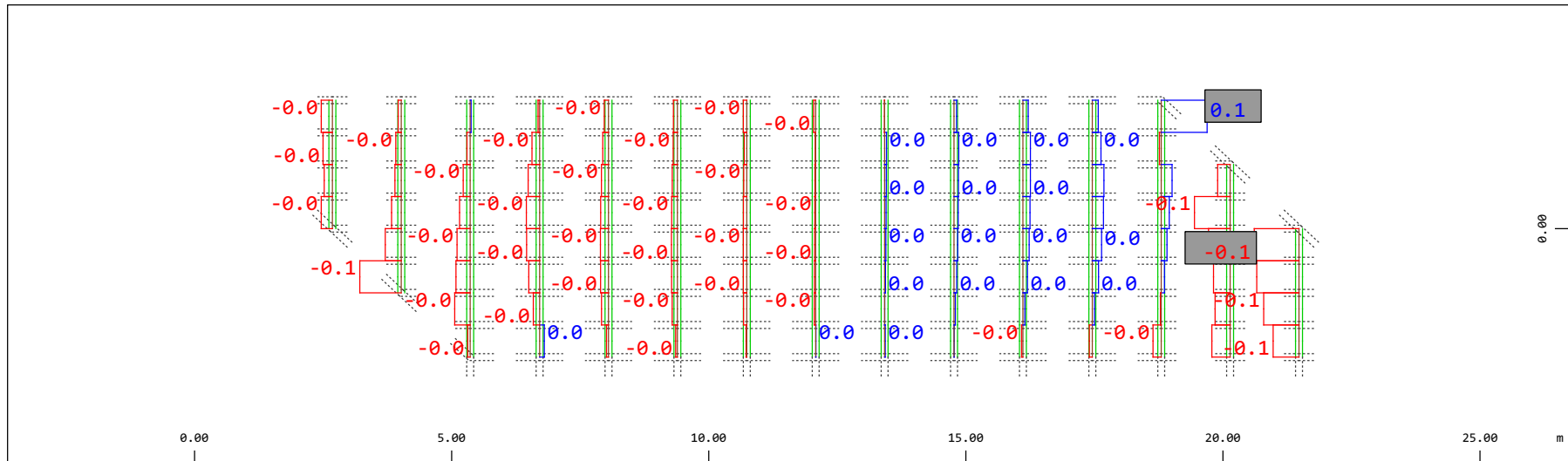
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Normal force Nx, Loadcase 602 W: Fwy- , 1 cm 3D = 39.2 kN (Min=-31.2) (Max=26.5)

M 1 : 120

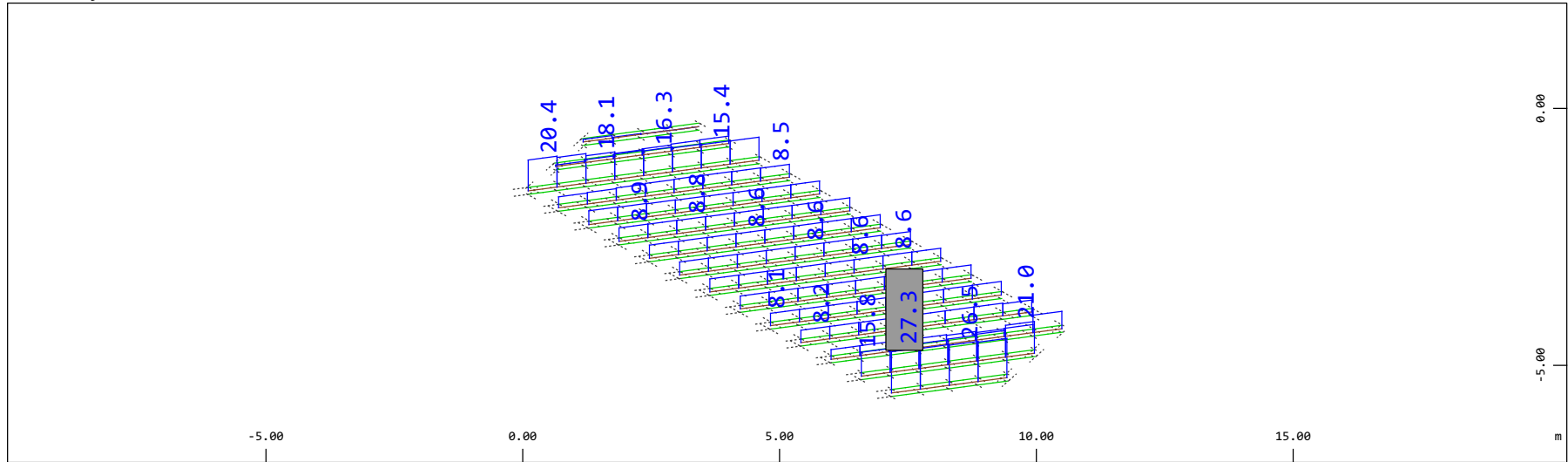


Sector of system Beam Elements Group 21 22
 Beam Elements , Torsional moment Mt, Loadcase 602 W: Fwy- , 1 cm 3D = 0.196 kNm (Min=-0.142) (Max=0.146)

M 1 : 120

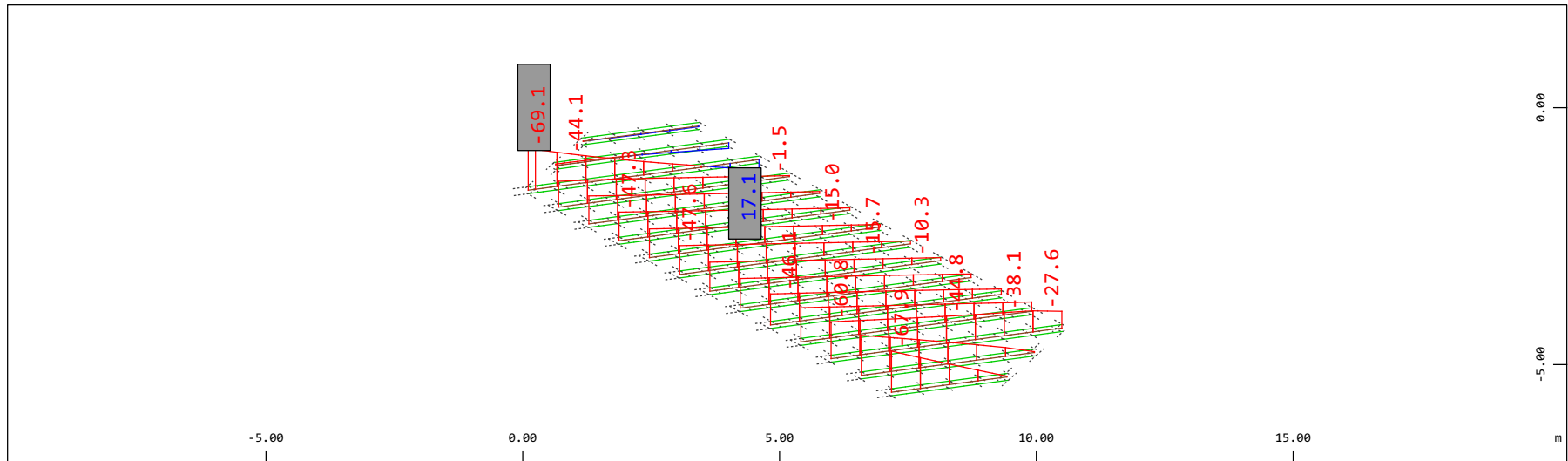
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 602 W: Fwy- , 1 cm 3D = 39.2 kN (Max=27.3)

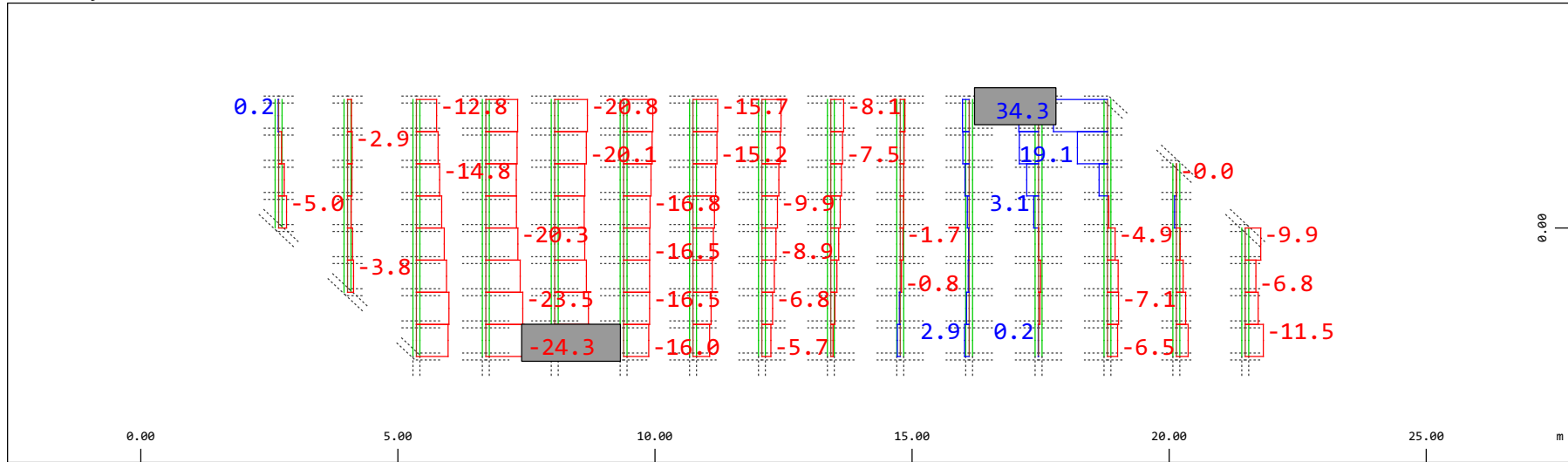
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 602 W: Fwy- , 1 cm 3D = 98.0 kNm (Min=-69.1) (Max=17.1)

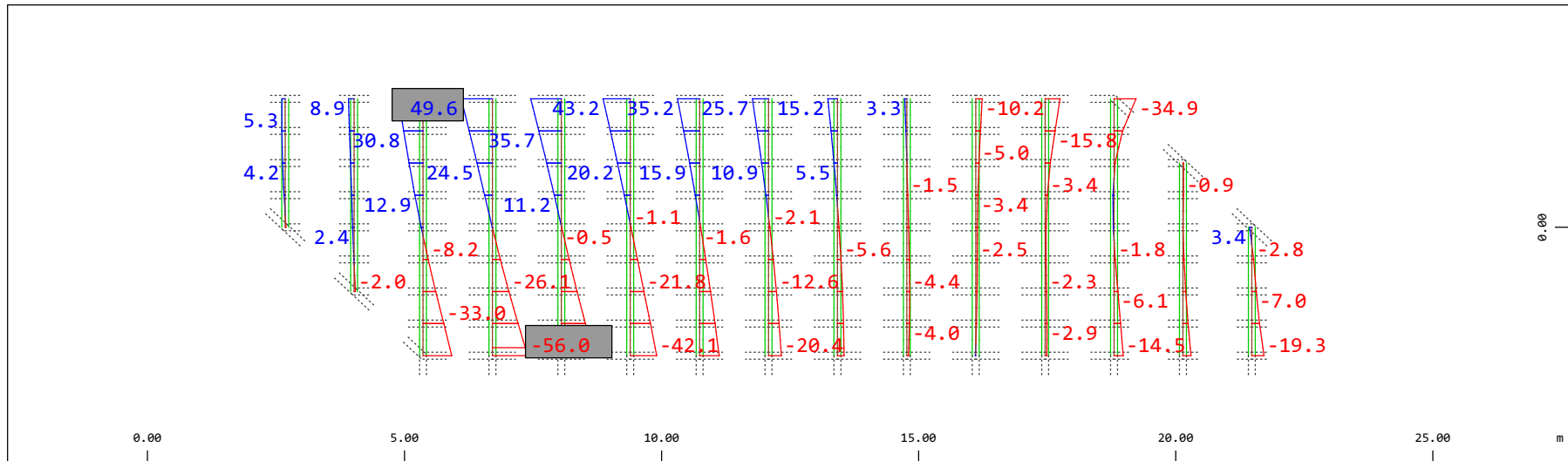
M 1 : 120
 X * 0.502
 Y * 0.986
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 602 W: Fwy- , 1 cm 3D = 39.2 kN (Min=-24.3) (Max=34.3)

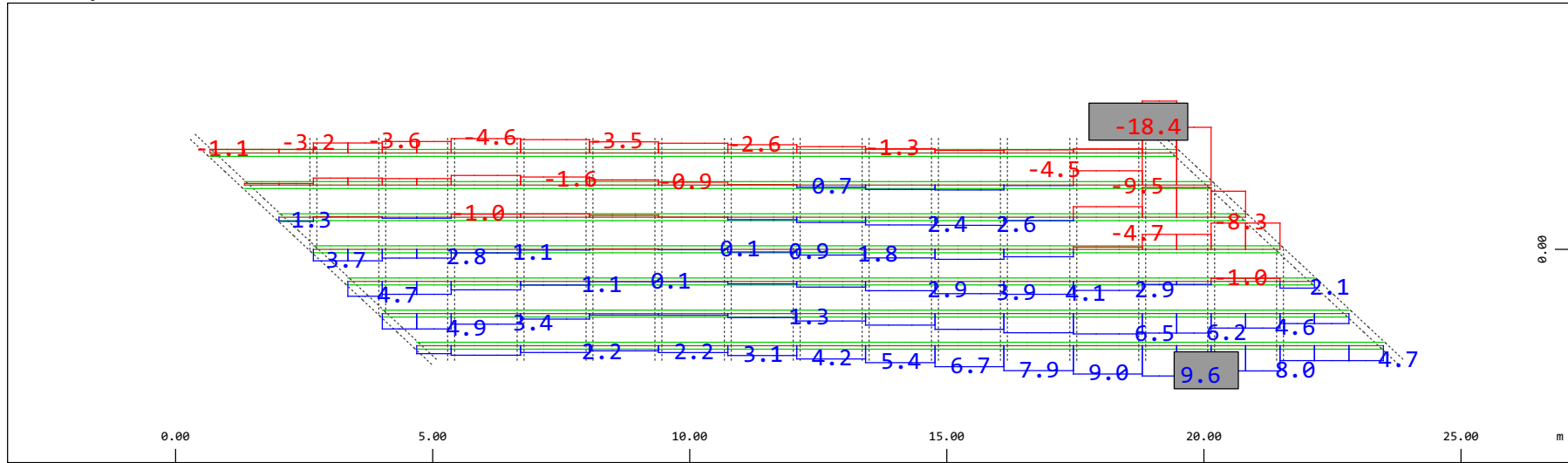
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz (Maximum values cubic interpolated), Loadcase 602 W: Fwy- , 1 cm 3D = 98.0 kNm (Min=-56.0) (Max=49.6)

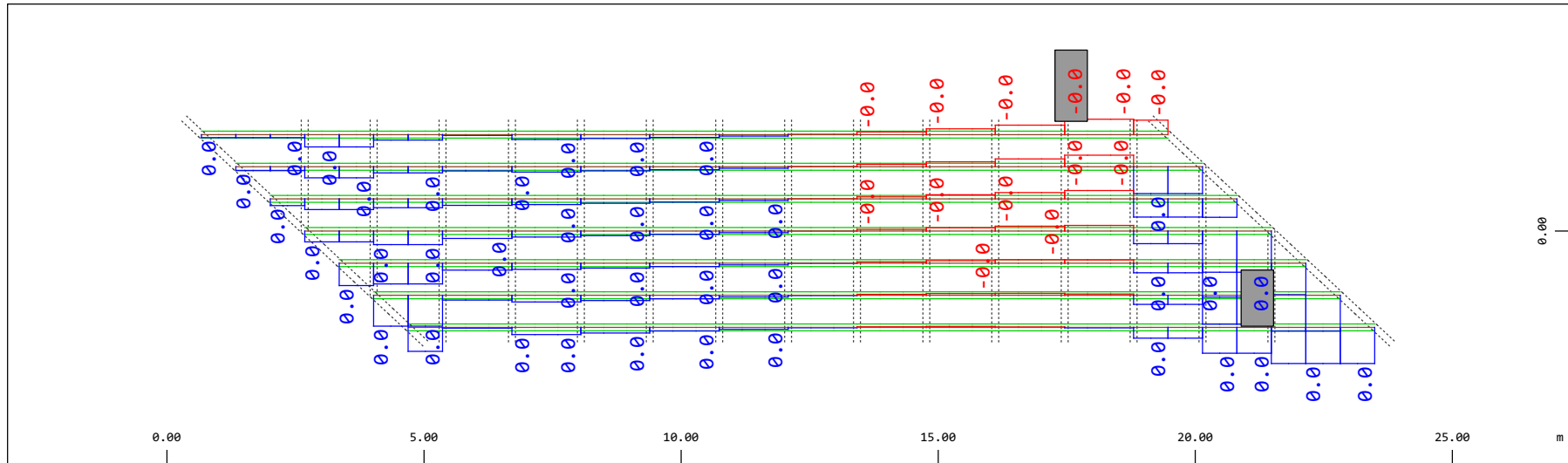
M 1 : 120

Definition of Axis
Results elementay loads



Y Sector of system Beam Elements Group 31...37
X Beam Elements , Normal force Nx, Loadcase 602 W: Fwy- , 1 cm 3D = 19.6 kN (Min=-18.4) (Max=9.62)

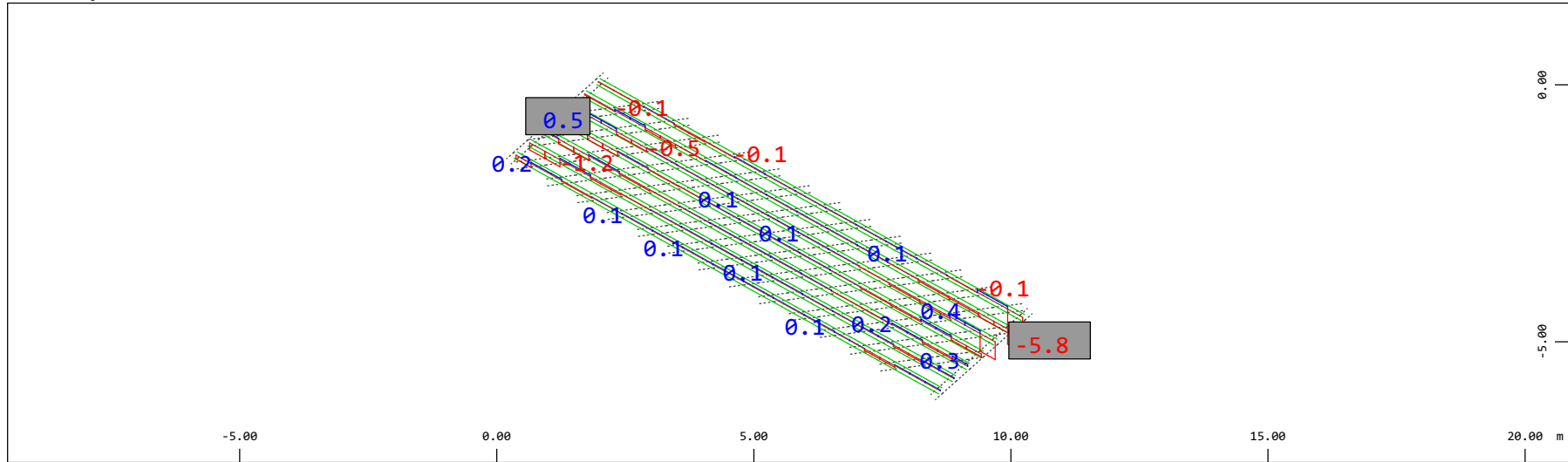
M 1 : 120



Y Sector of system Beam Elements Group 31...37
X Beam Elements , Torsional moment Mt, Loadcase 602 W: Fwy- , 1 cm 3D = 0.0039 kNm (Min=-9.8197e-04) (Max=0.0026)

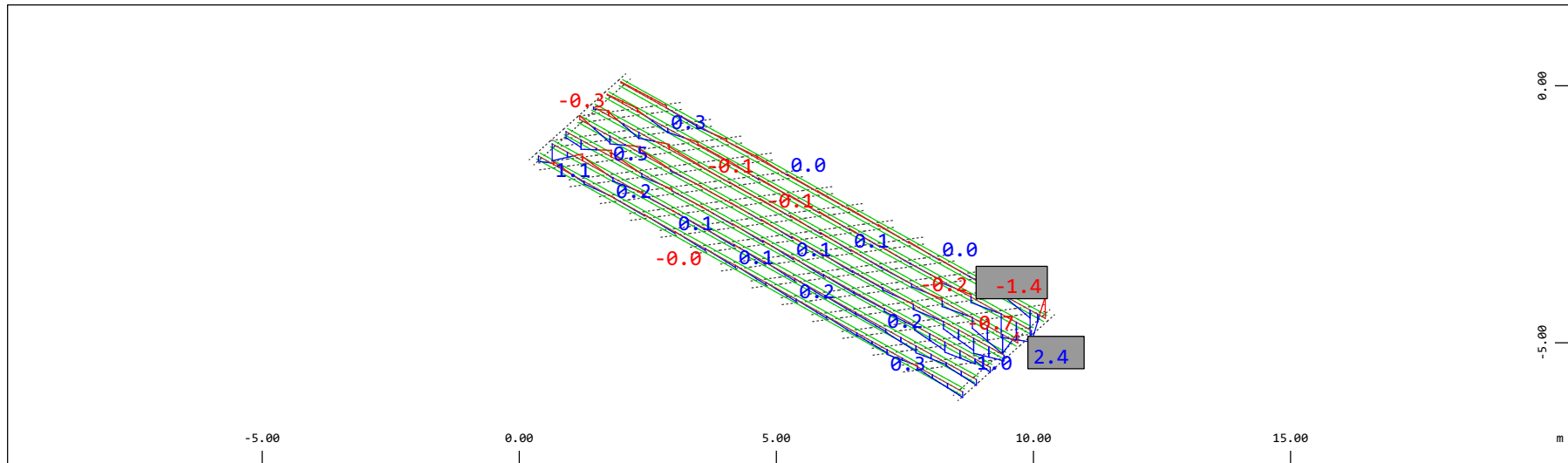
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 602 W: Fwy- , 1 cm 3D = 9.80 kN (Min=-5.78) (Max=0.502)

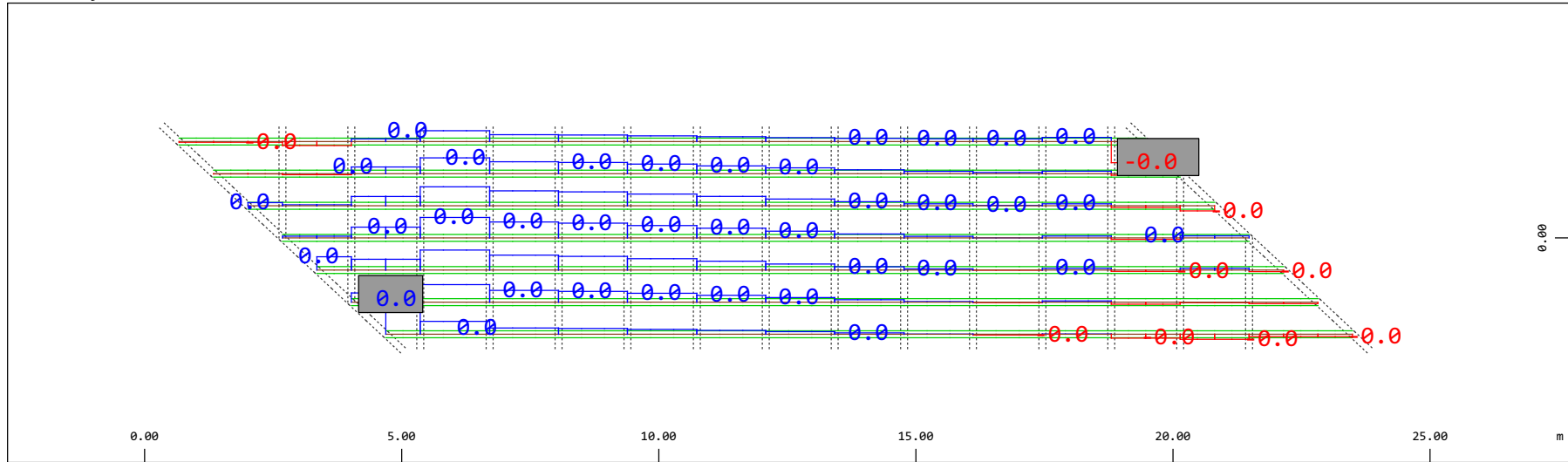
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 602 W: Fwy- , 1 cm 3D = 3.92 kNm (Min=-1.45) (Max=2.42)

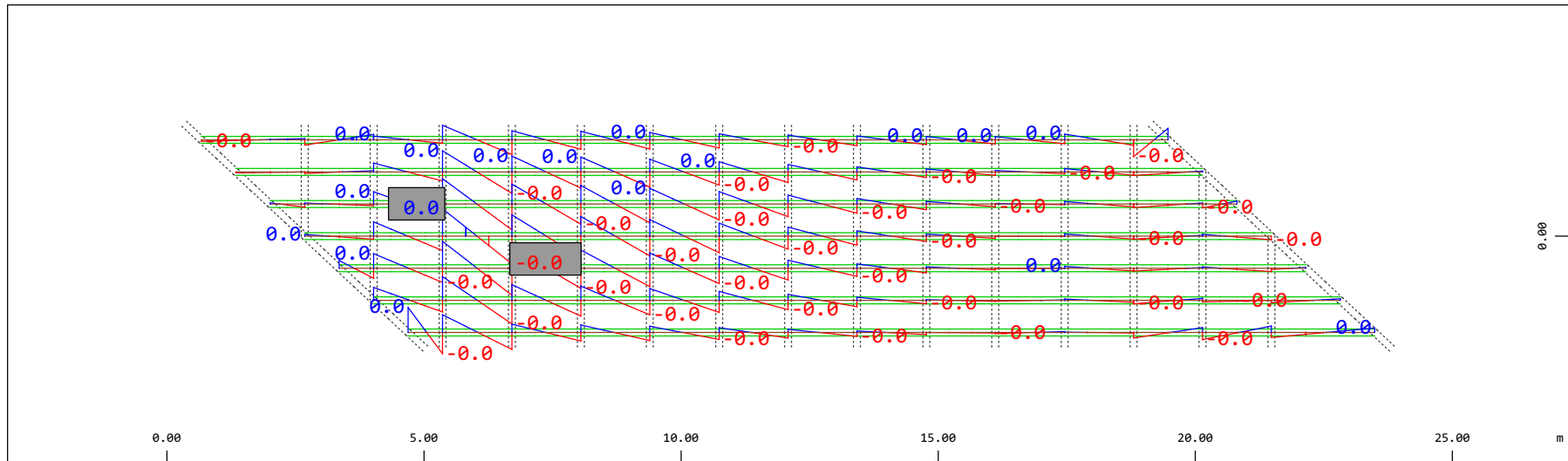
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Shear force Vy, Loadcase 602 W: Fwy- , 1 cm 3D = 0.0196 kN (Min=-0.0067) (Max=0.0110)

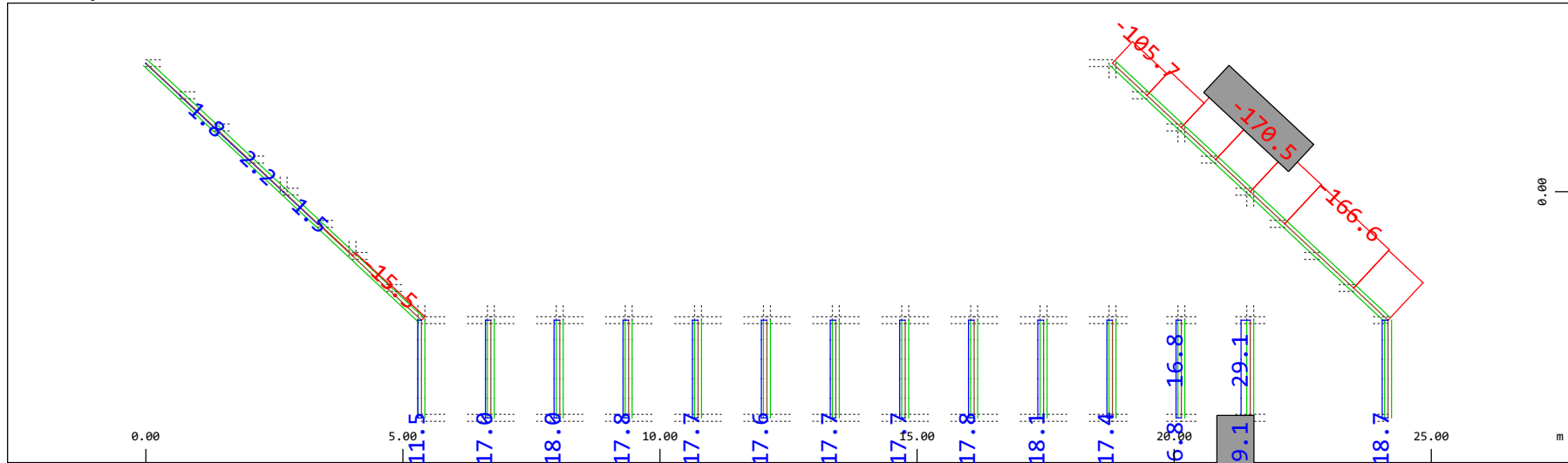
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Bending moment Mz (Maximum values cubic interpolated), Loadcase 602 W: Fwy- , 1 cm 3D = 0.0098 kNm (Min=-0.0044) (Max=0.0044)

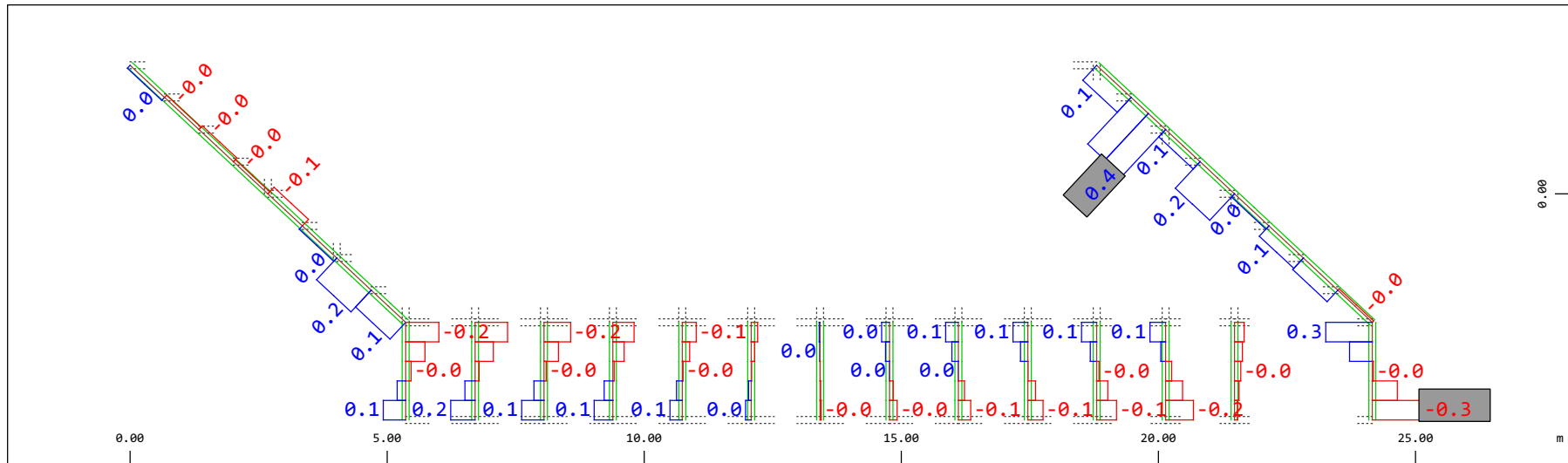
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 602 W: Fwy- , 1 cm 3D = 196.1 kN (Min=-170.5) (Max=29.1)

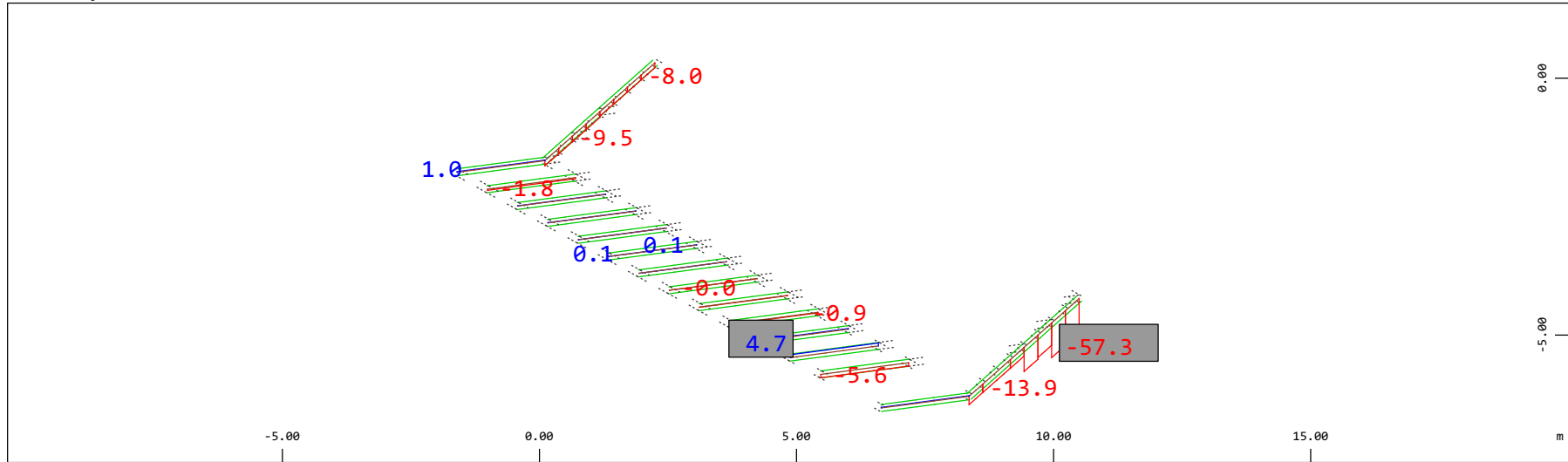
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 602 W: Fwy- , 1 cm 3D = 0.392 kNm (Min=-0.310) (Max=0.405)

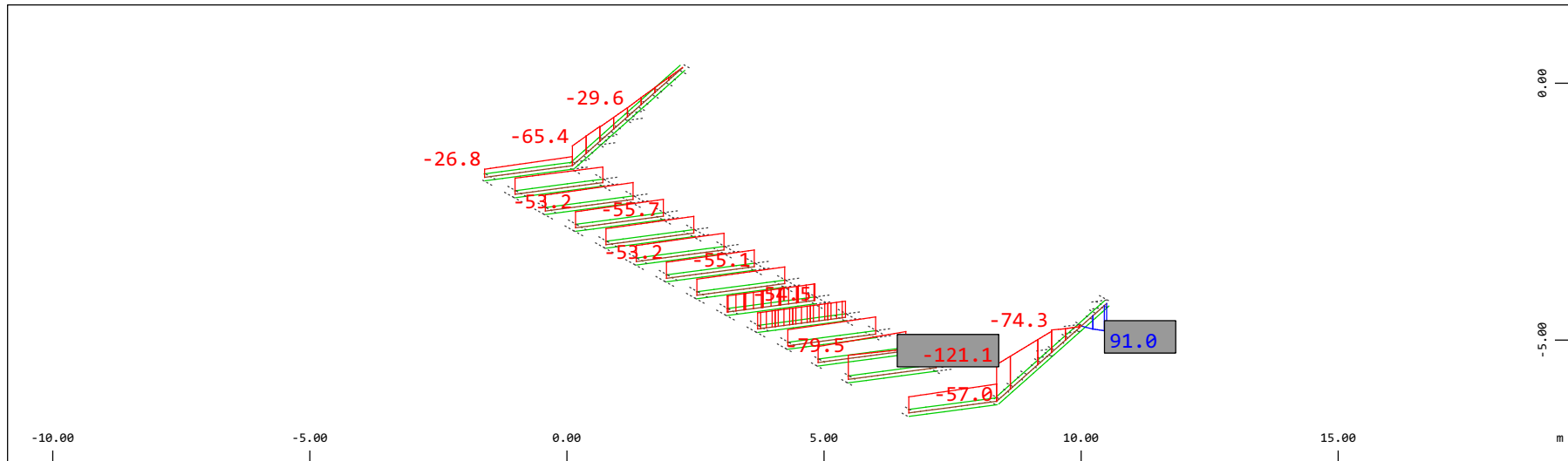
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 602 W: Fwy- , 1 cm 3D = 98.0 kN (Min=-57.3) (Max=4.75)

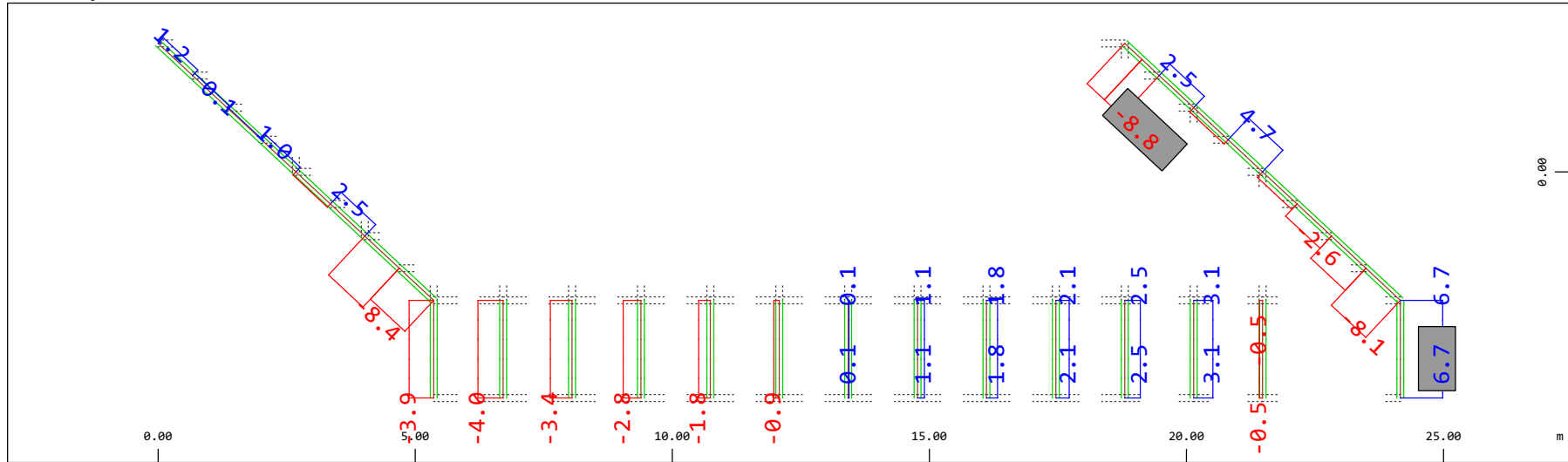
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 602 W: Fwy- , 1 cm 3D = 196.1 kNm (Min=-121.1) (Max=91.0)

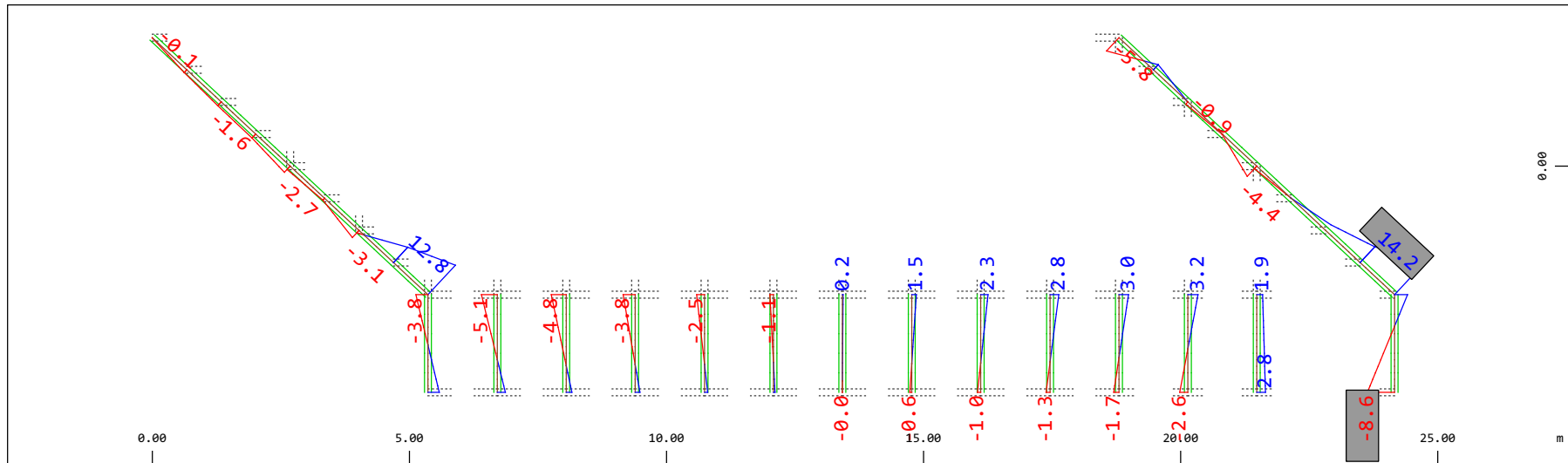
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 602 W: Fwy- , 1 cm 3D = 9.80 kN (Min=-8.75) (Max=6.72)

M 1 : 120

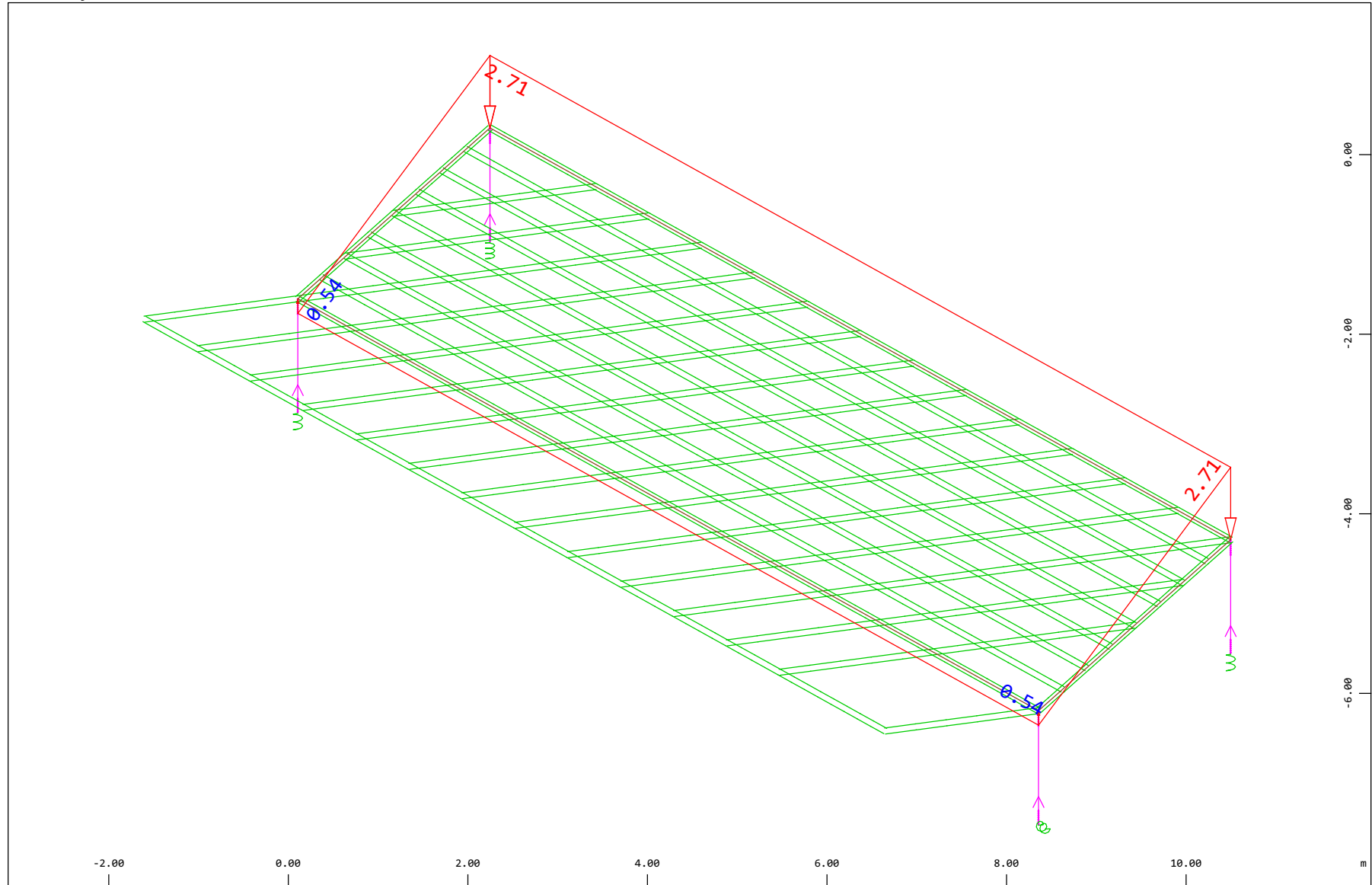


Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz (Maximum values cubic interpolated), Loadcase 602 W: Fwy- , 1 cm 3D = 19.6 kNm (Min=-8.64) (Max=14.2)

M 1 : 120

Definition of Axis
 Results elementay loads

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Z
 X Y

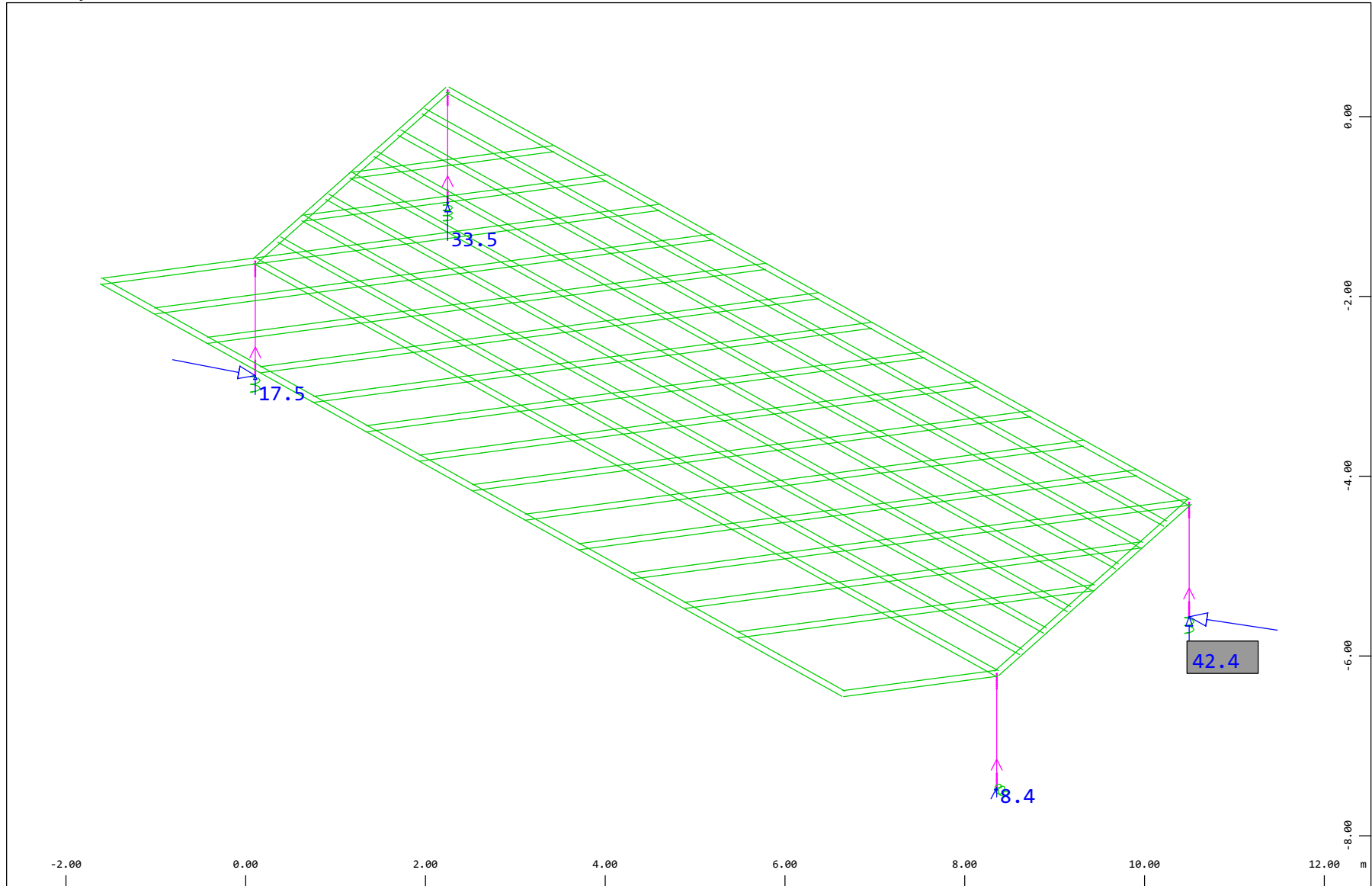
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
 All loads, Loadcase 603 W: Fwz (ecc+) , (1 cm 3D = unit) Free area load (force) in global Z (Unit=1.94 kN/m2)
 (Max=0.541)

(Min=-2.71)

M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads

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Z
 X Y

Sector of system Beam Elements, Spring Elements

Nodes , Support force in global Z, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 48.4 kN

Nodes , Support force vector in the global XY plane, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 4.8438e-05 kN

▬ (Max=42.4) (total: 101.8)

▬ (Max= 9.0720e-05)

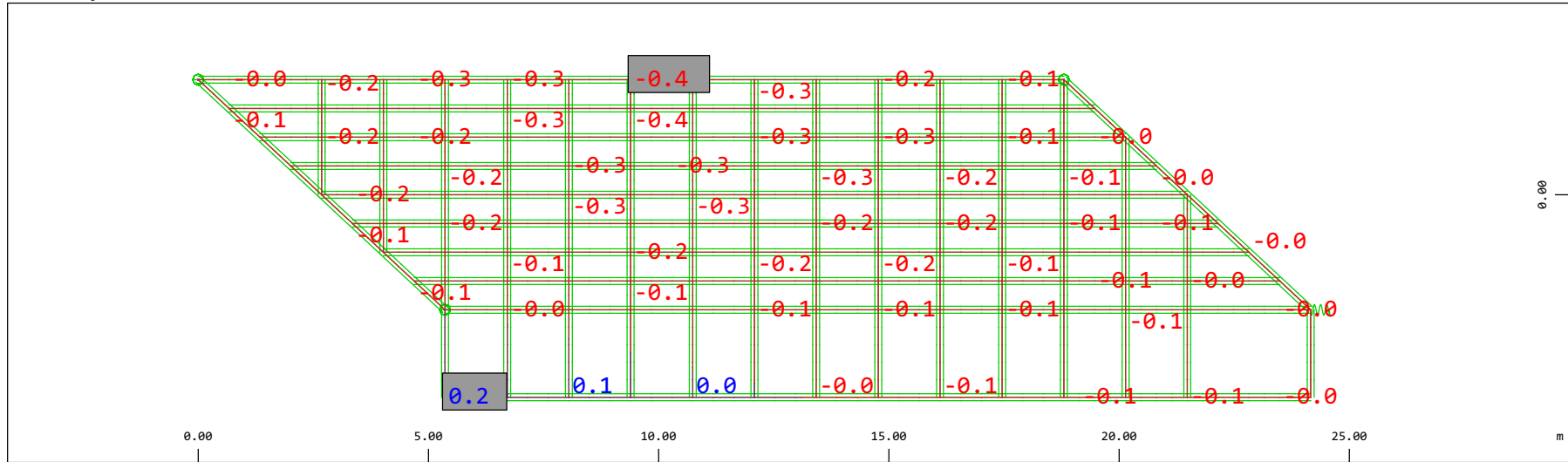
M 1 : 60

X * 0.502

Y * 0.906

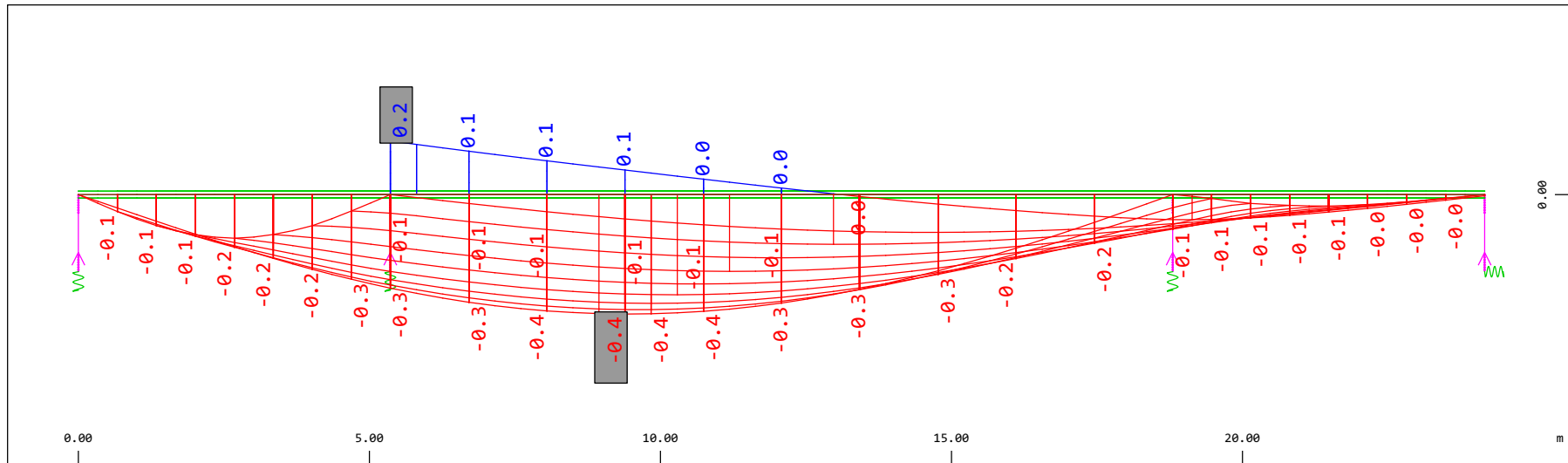
Z * 0.962

Definition of Axis
 Results elementay loads



Y
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.194 mm (Min=-0.375) (Max=0.169)

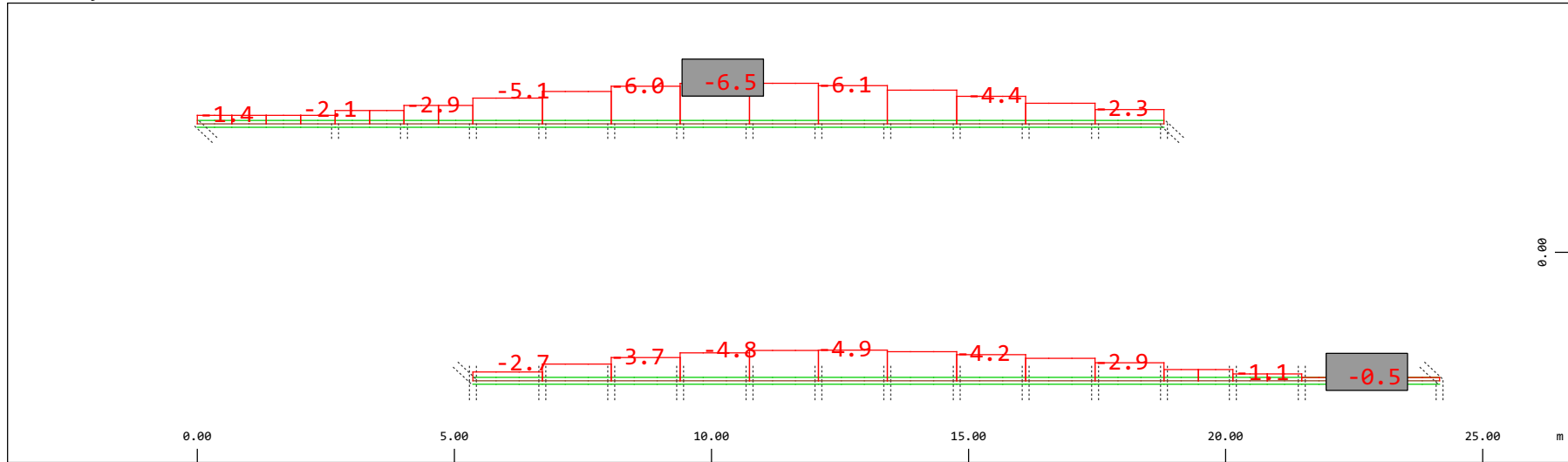
M 1 : 134



Z
 X Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.194 mm (Min=-0.375) (Max=0.169)

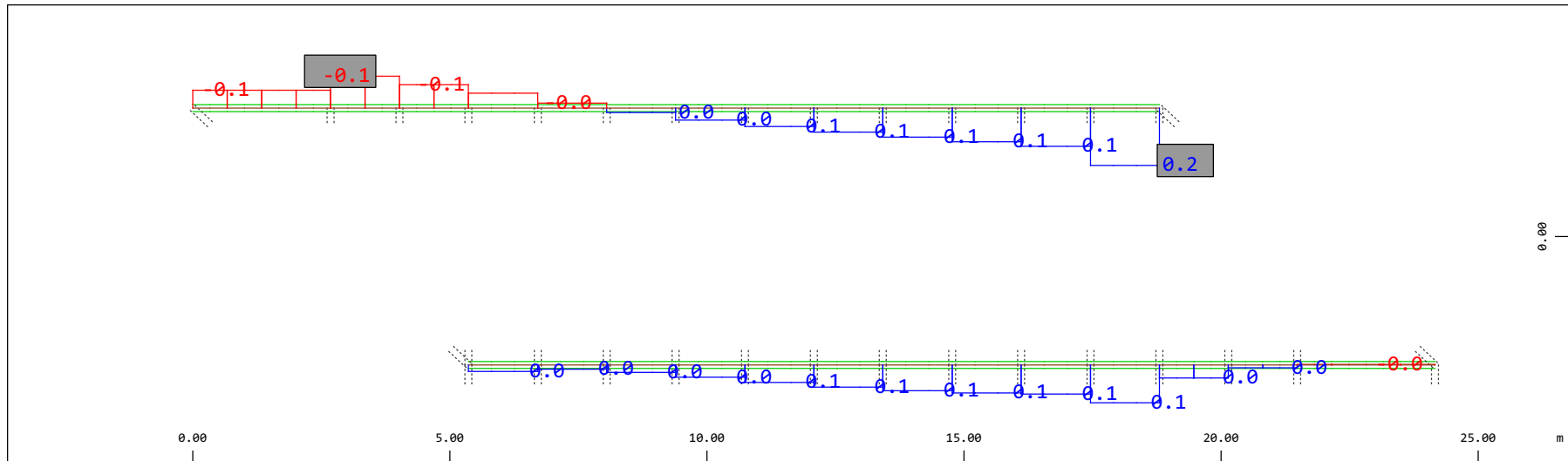
M 1 : 106

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Normal force Nx, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 9.80 kN (Min=-6.46) (Max=-0.517)

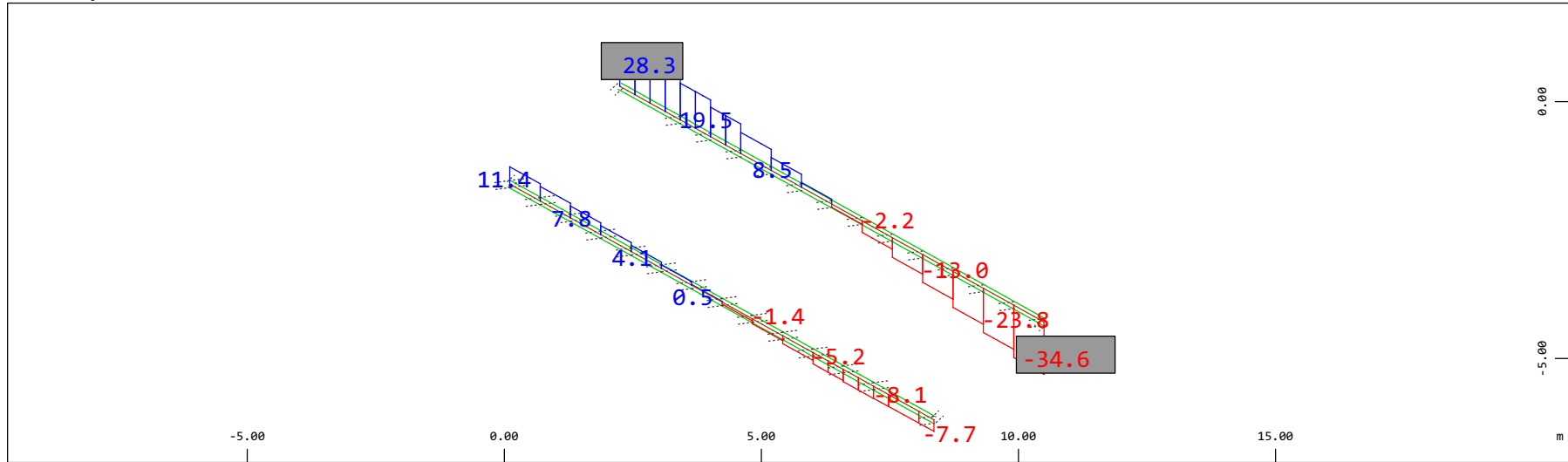
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Torsional moment Mt, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.196 kNm (Min=-0.101) (Max=0.182)

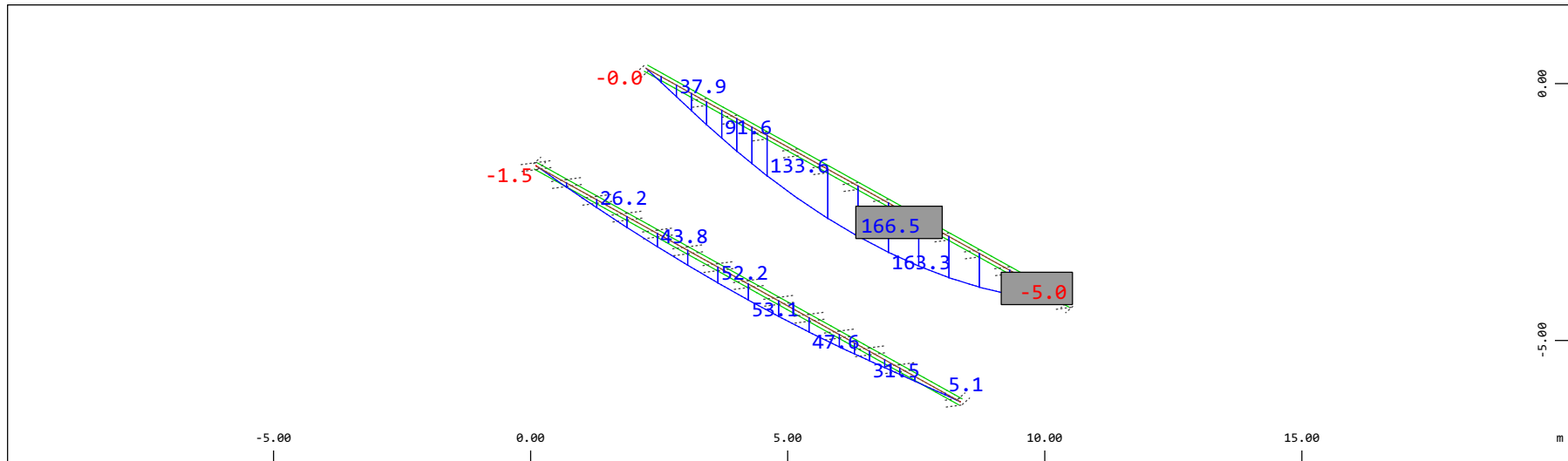
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 39.2 kN (Min=-34.6) (Max=28.3)

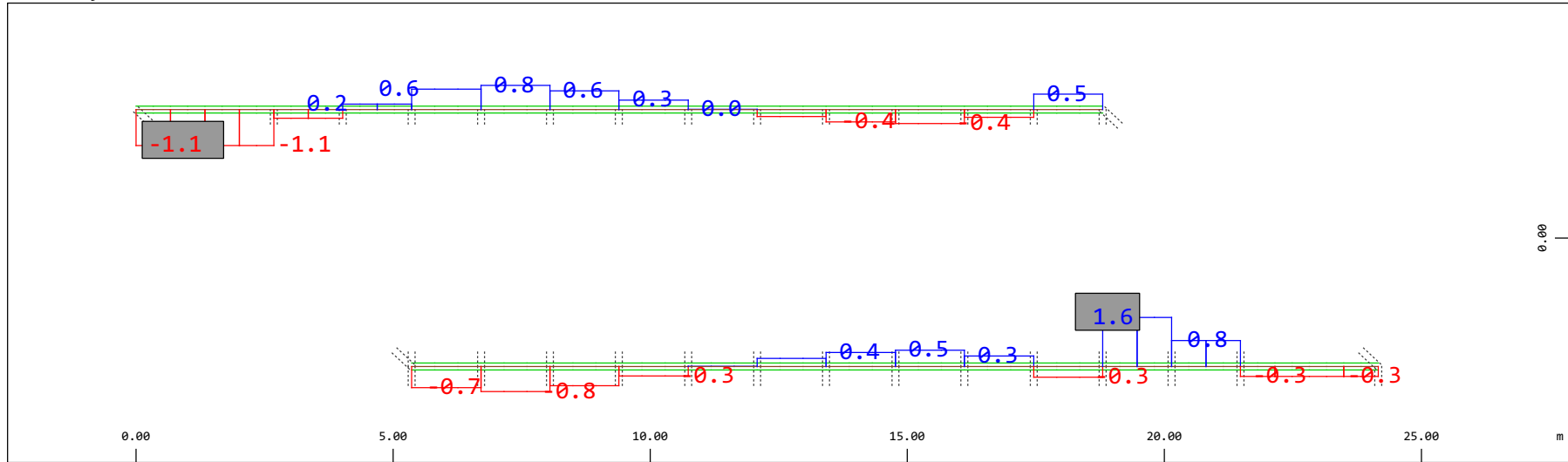
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 196.1 kNm (Min=-4.99) (Max=166.5)

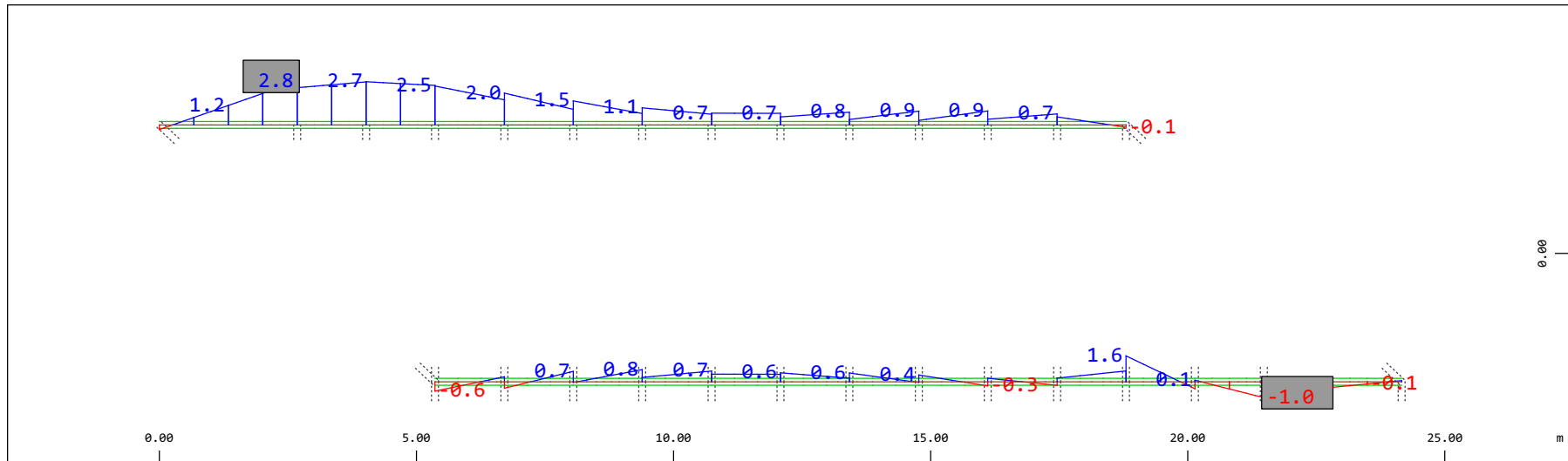
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 1.96 kN (Min=-1.14) (Max=1.56)

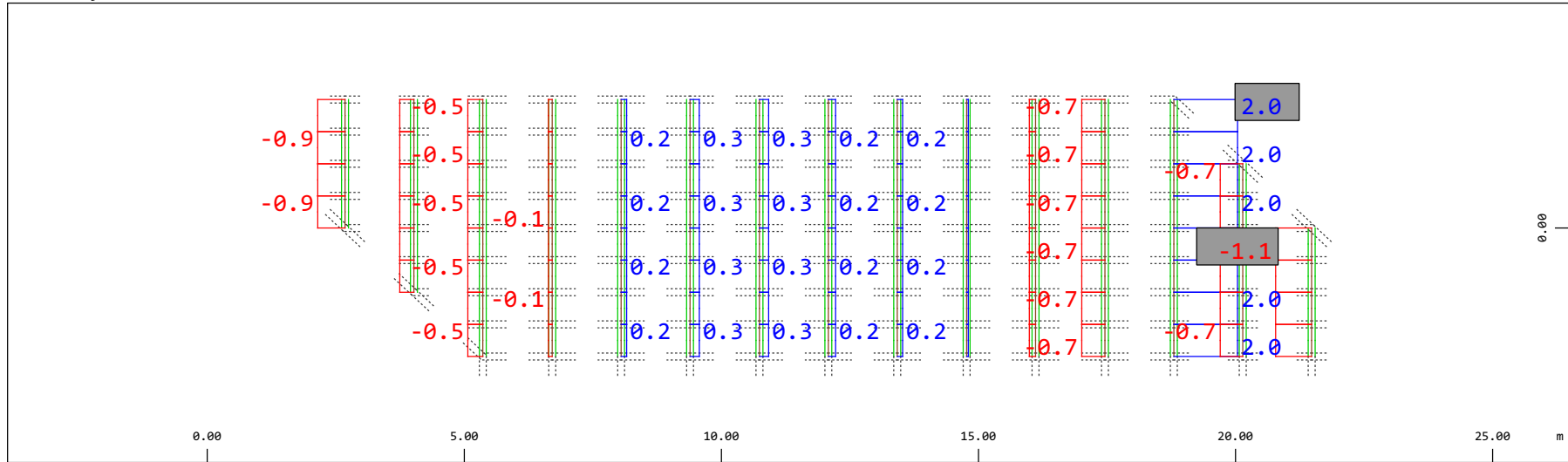
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 3.92 kNm (Min=-1.01) (Max=2.77)

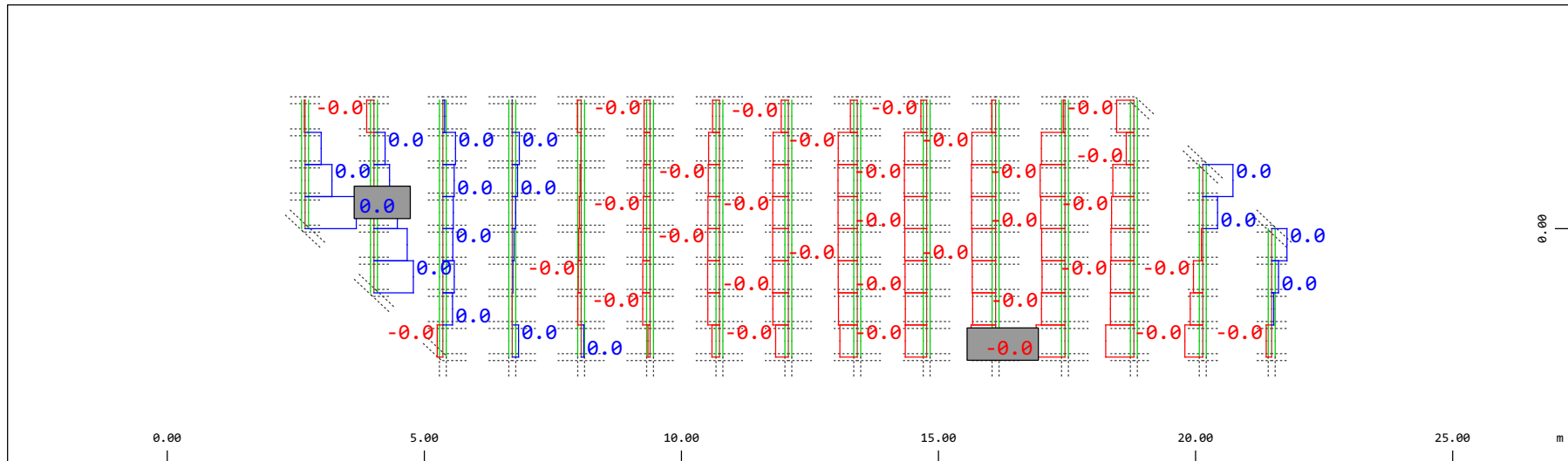
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 1.96 kN (Min=-1.14) (Max=2.02)

M 1 : 120

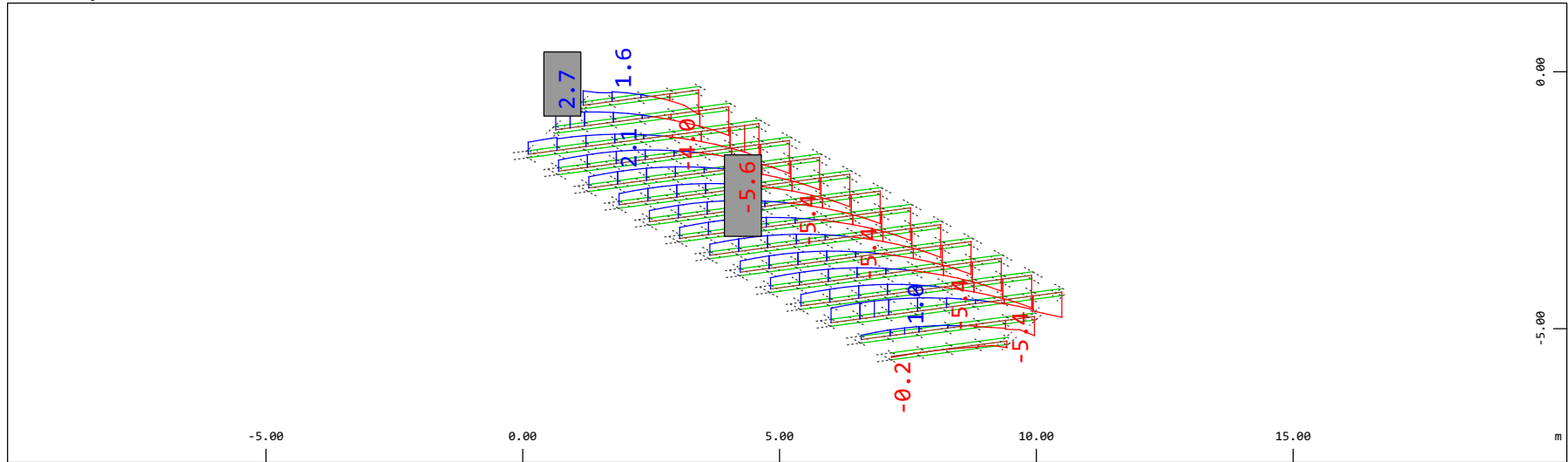


Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.0196 kNm (Min=-0.0092) (Max=0.0163)

M 1 : 120

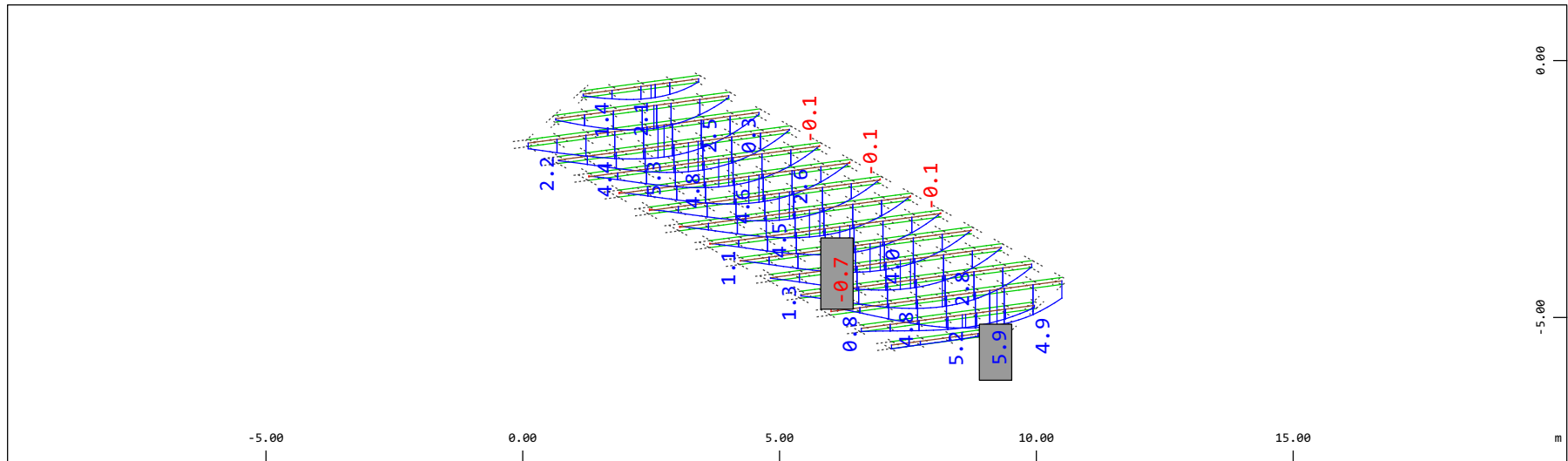
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 9.80 kN (Min=-5.58) (Max=2.67)

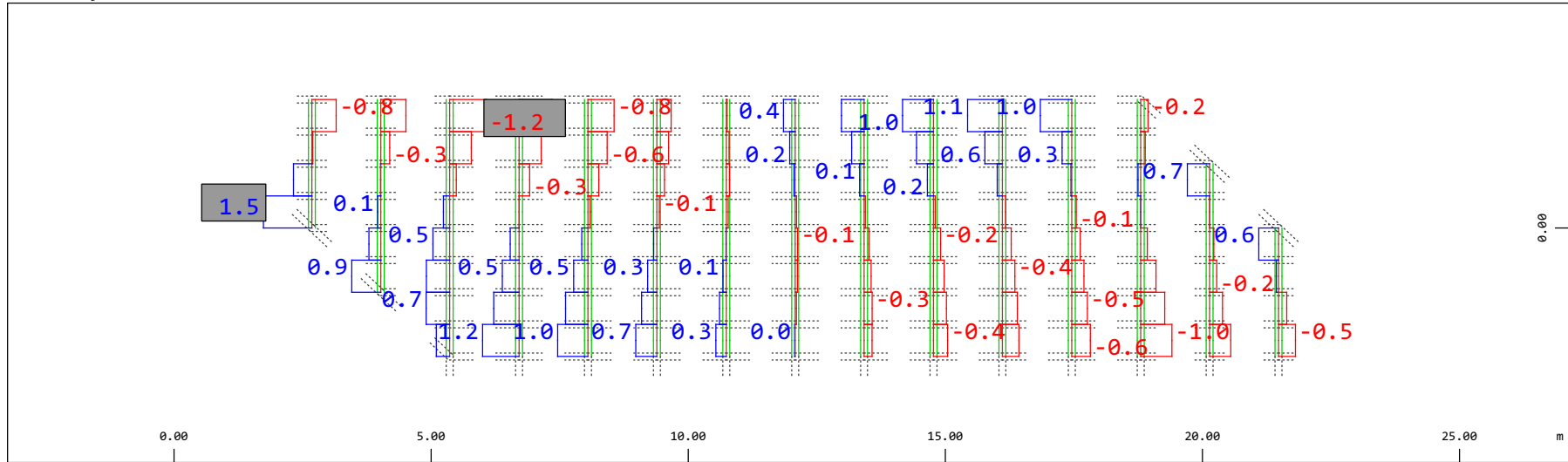
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 9.80 kNm (Min=-0.745) (Max=5.93)

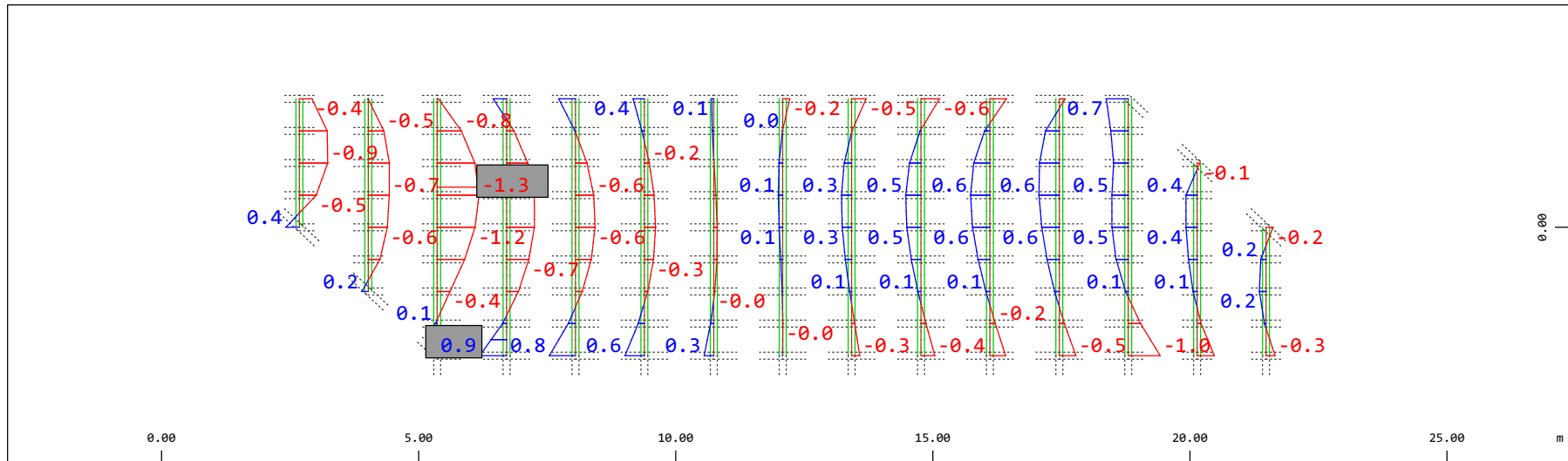
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 1.96 kN (Min=-1.17) (Max=1.54)

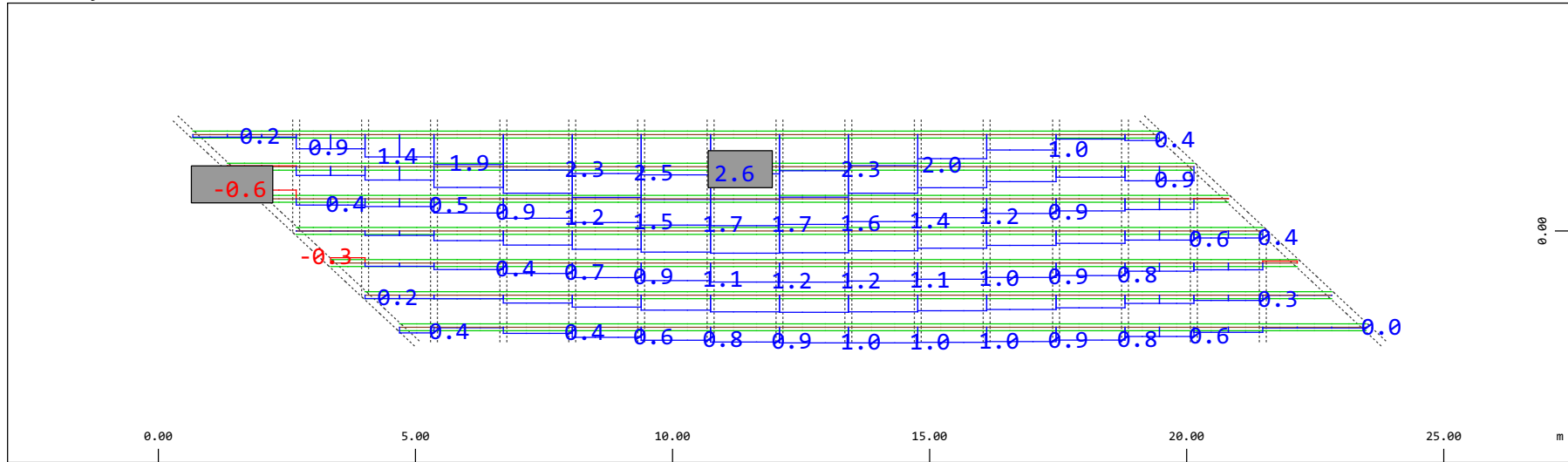
M 1 : 120



Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 1.96 kNm (Min=-1.33) (Max=0.854)

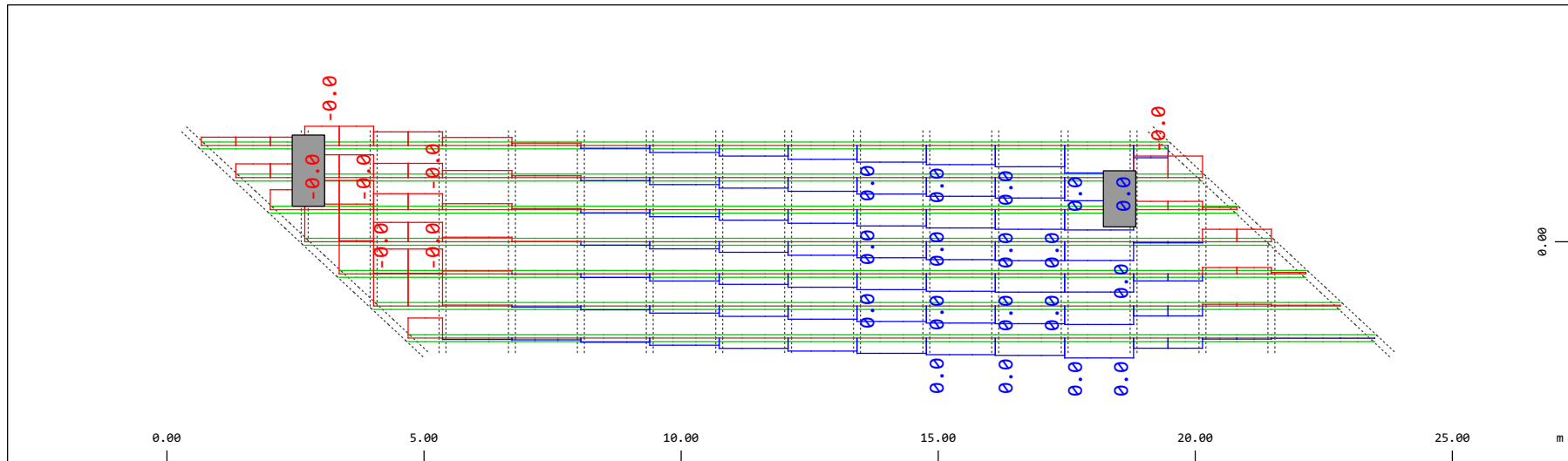
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Normal force N_x , Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 3.92 kN (Min=-0.557) (Max=2.56)

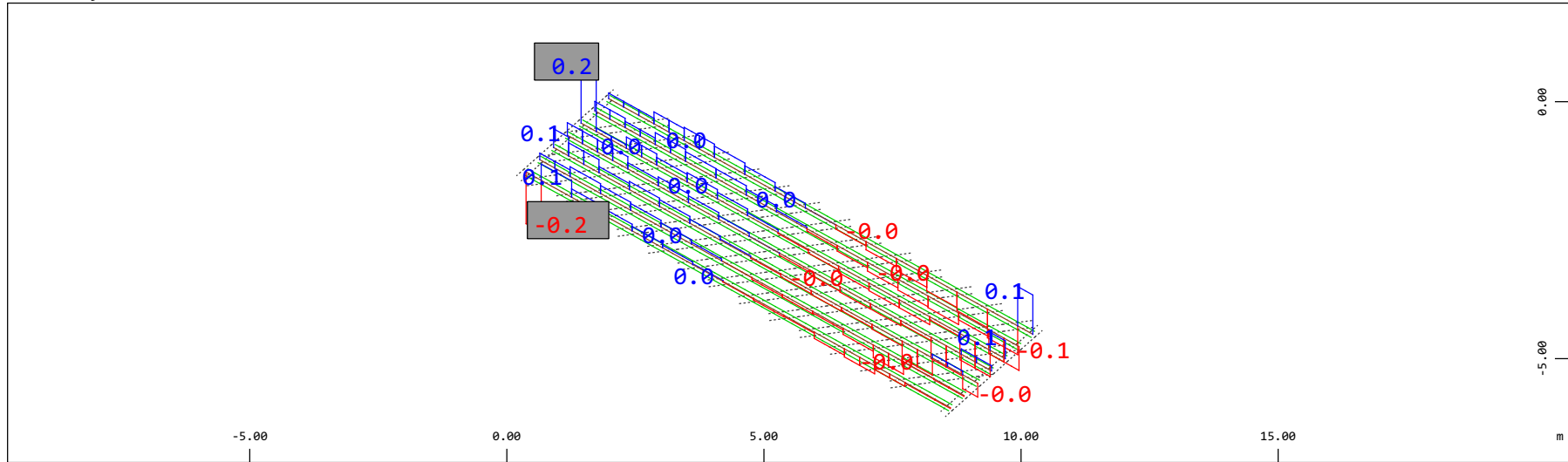
M 1 : 120



Y Sector of system Beam Elements Group 31...37
 X Beam Elements , Torsional moment M_t , Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 3.9219e-04 kNm (Min=-2.3963e-04) (Max= 1.7500e-04)

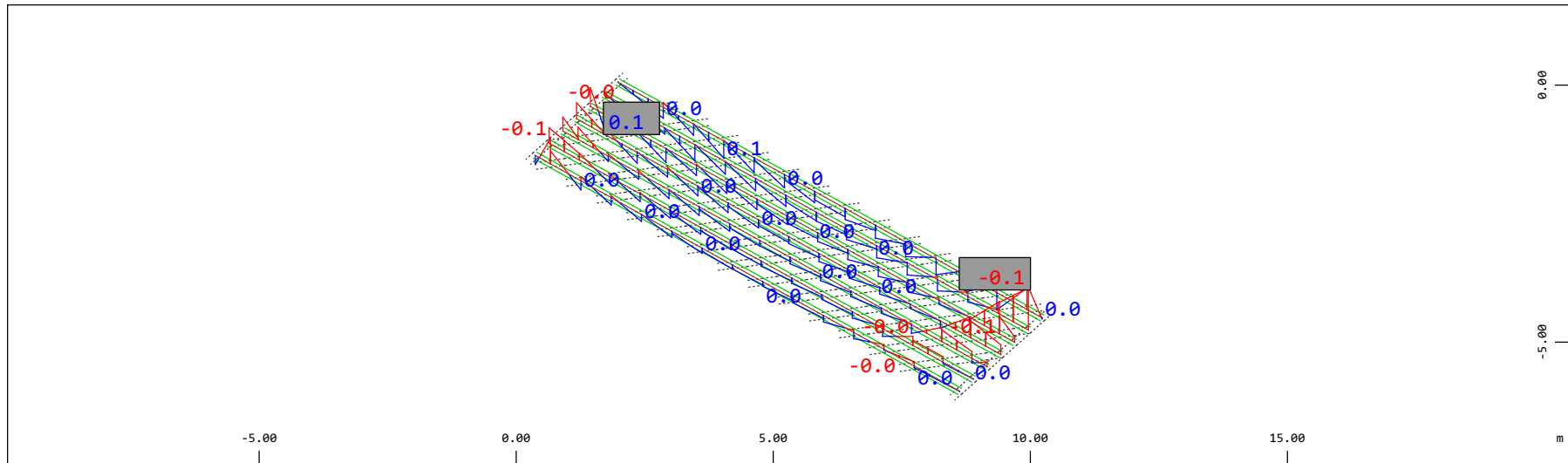
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.196 kN (Min=-0.171) (Max=0.178)

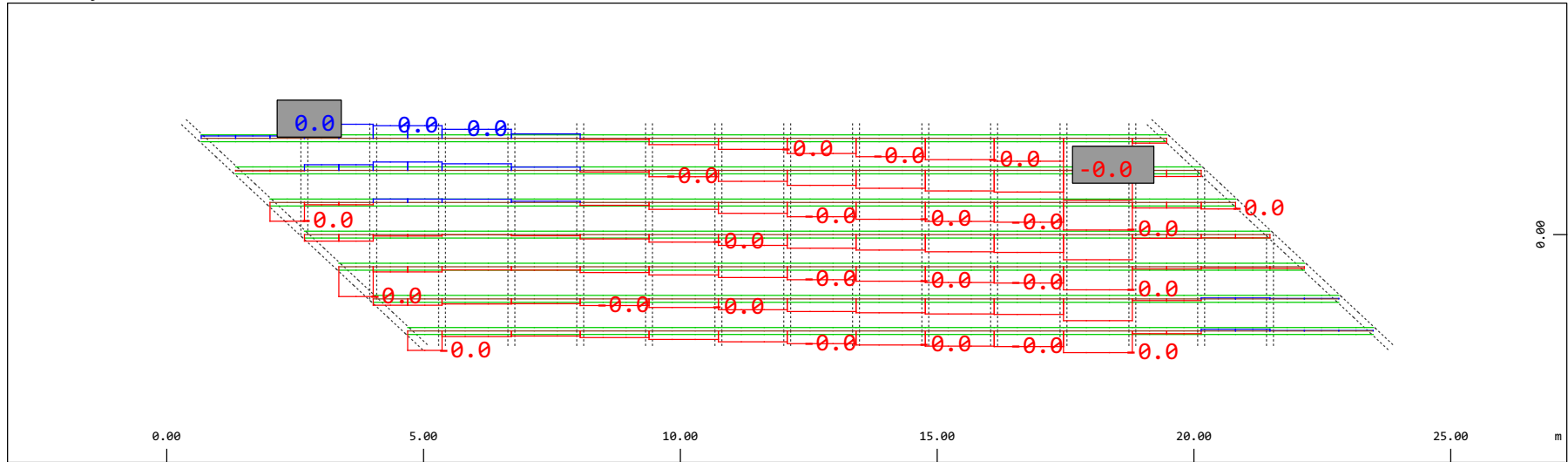
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.196 kNm (Min=-0.140) (Max=0.0575)

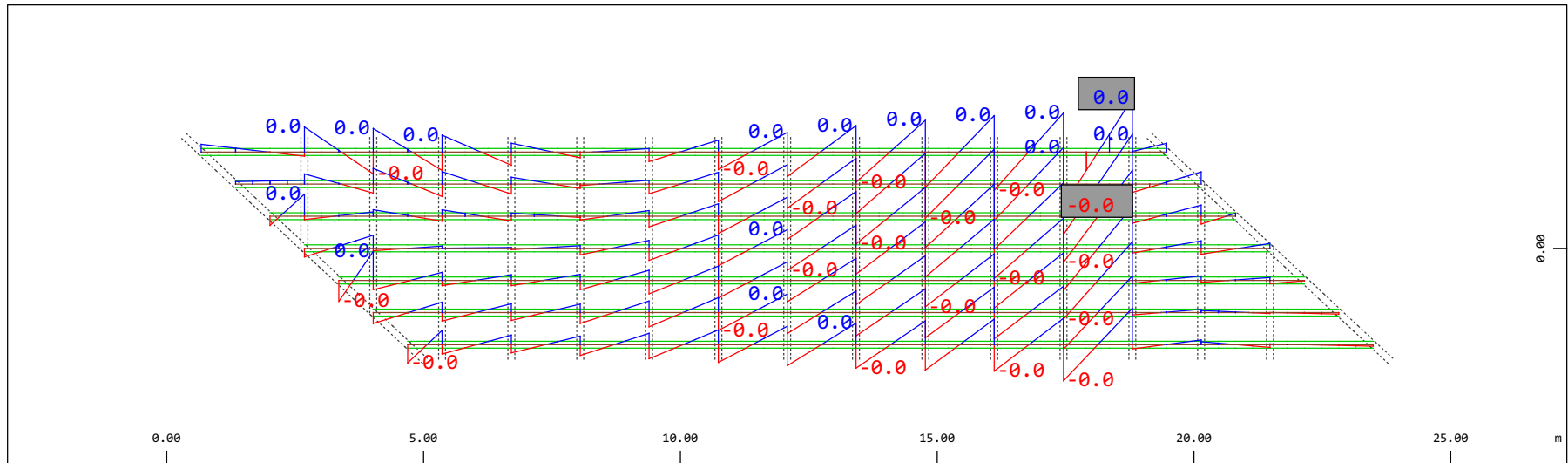
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 9.8047e-04 kN (Min=-5.1066e-04) (Max= 2.2260e-04)

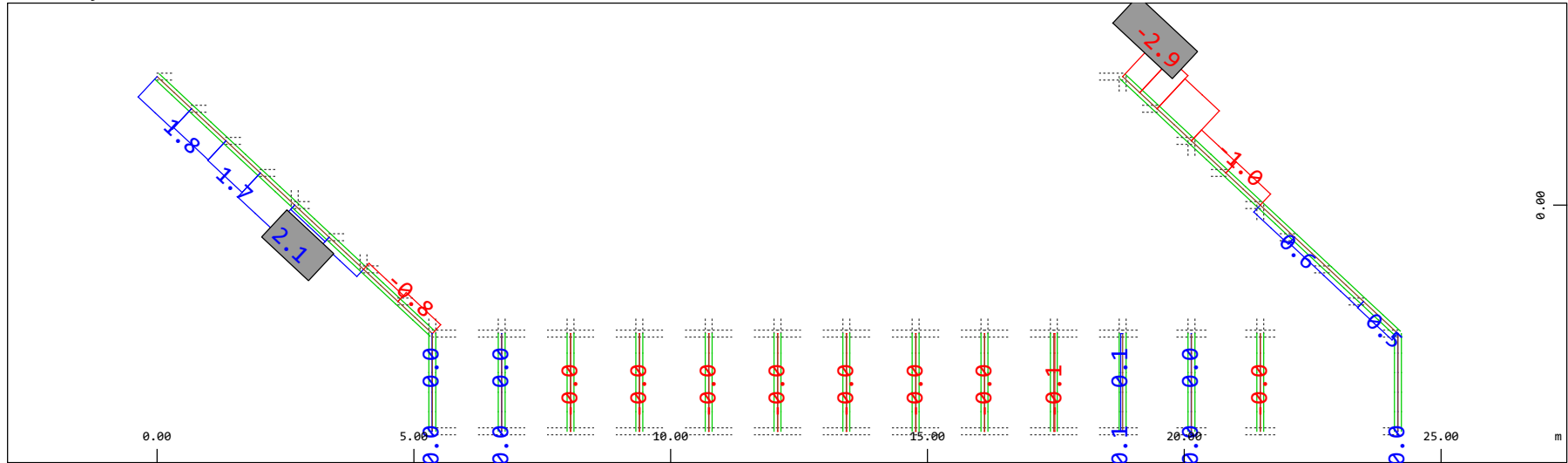
M 1 : 120



Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 3.9219e-04 kNm (Min=-3.4384e-04) (Max= 3.4045e-04)

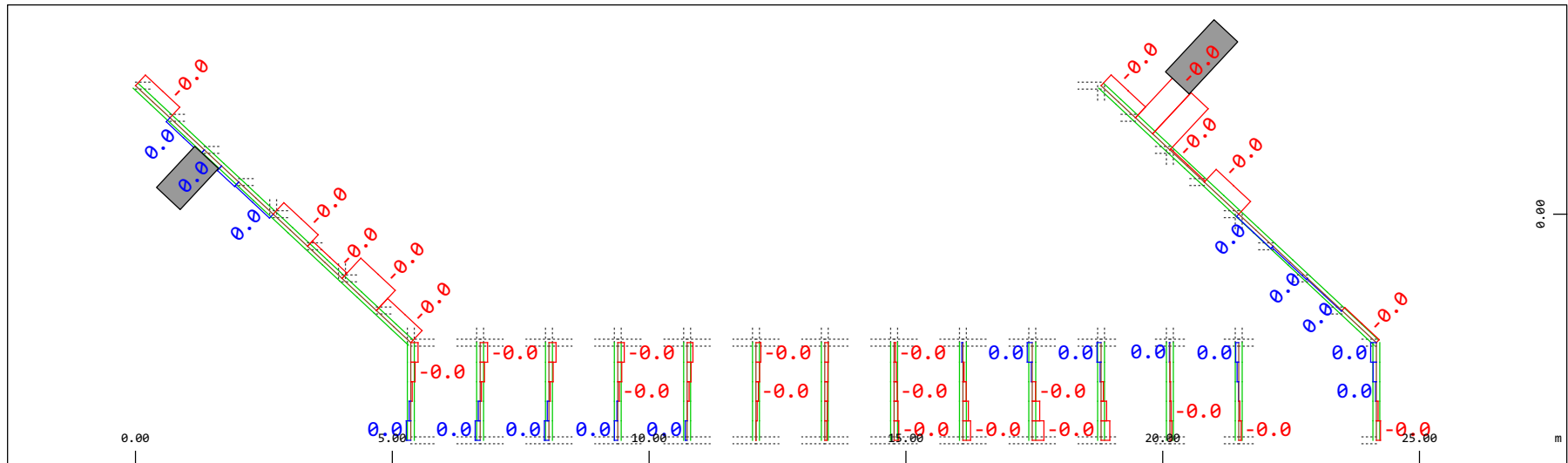
M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 3.92 kN (Min=-2.88) (Max=2.10)

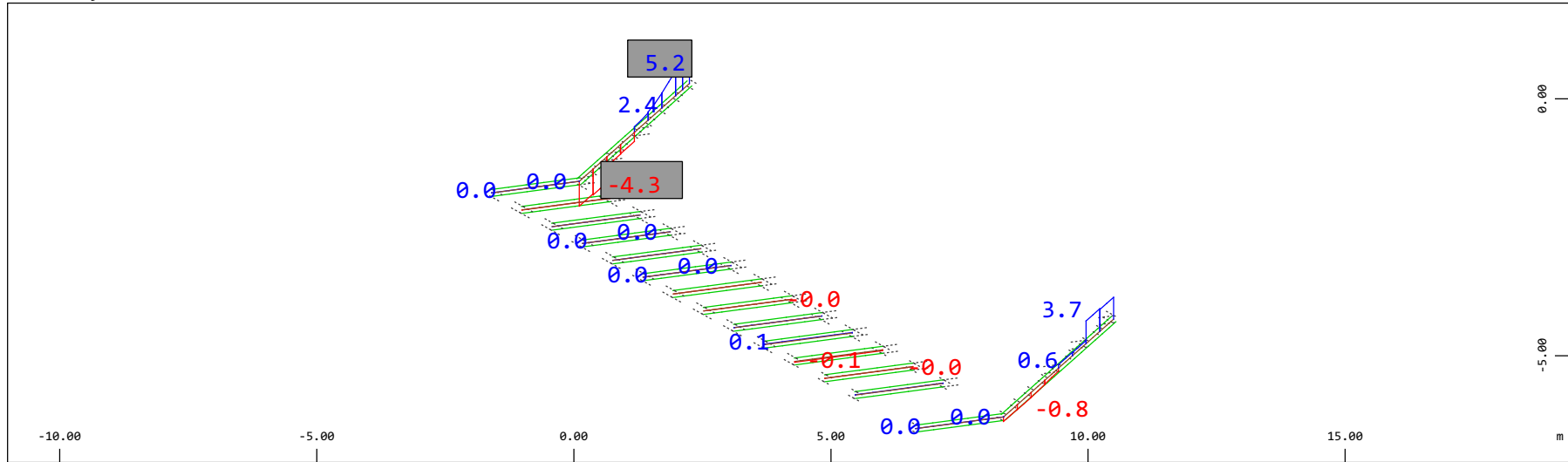
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.0392 kNm (Min=-0.0358) (Max=0.0039)

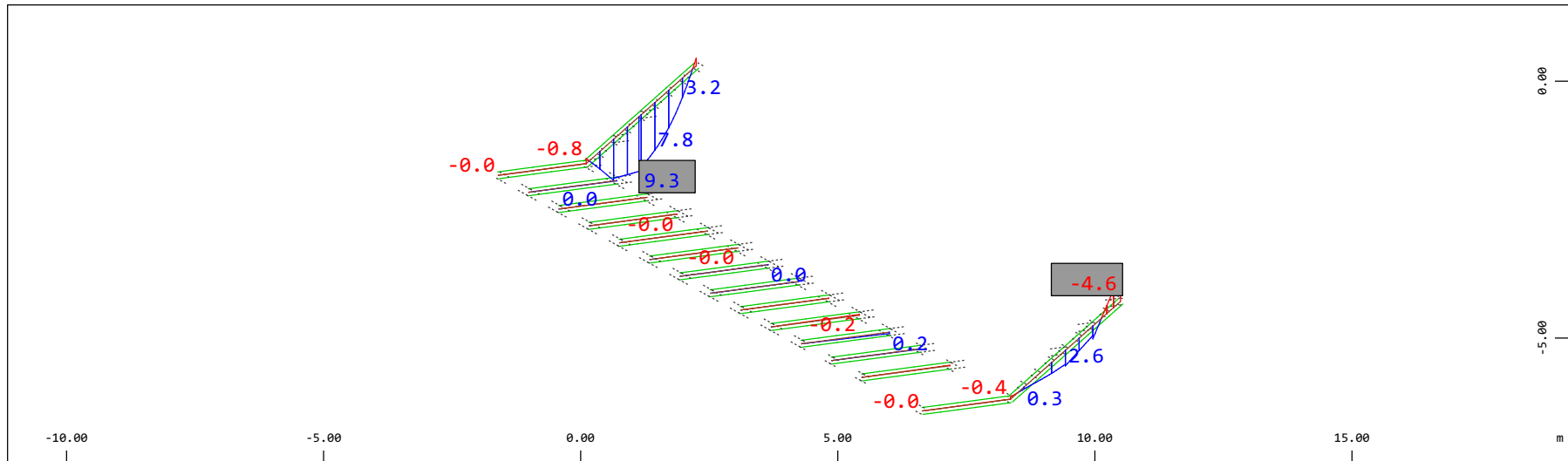
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 9.80 kN (Min=-4.26) (Max=5.22)

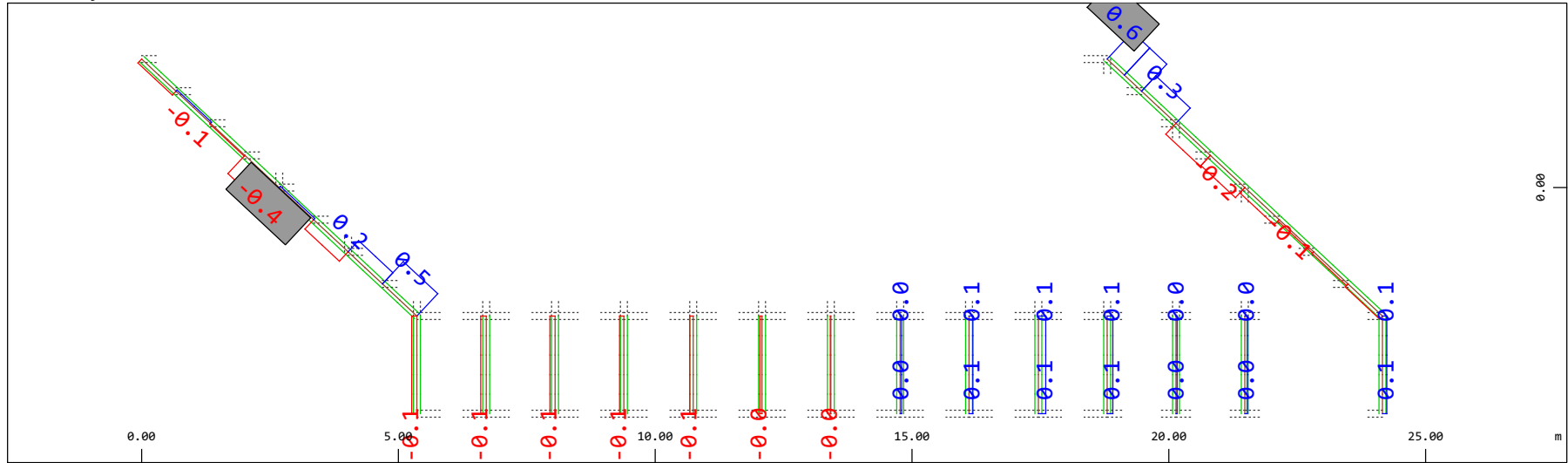
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 9.80 kNm (Min=-4.59) (Max=9.25)

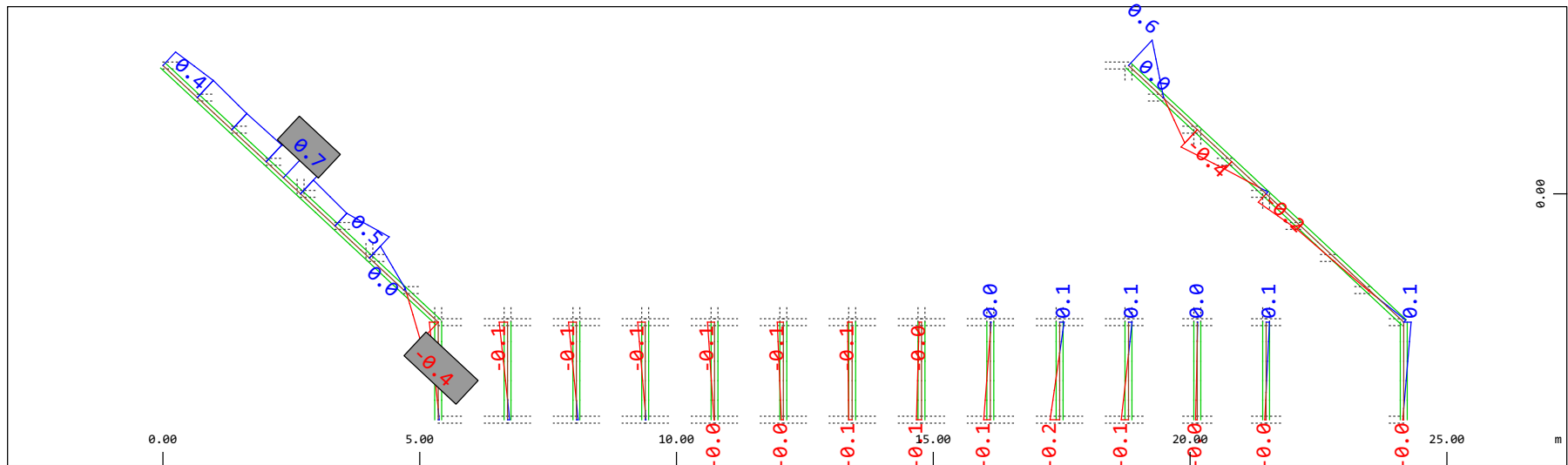
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 20 23
 X Beam Elements , Shear force Vy, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.980 kN (Min=-0.395) (Max=0.588)

M 1 : 120

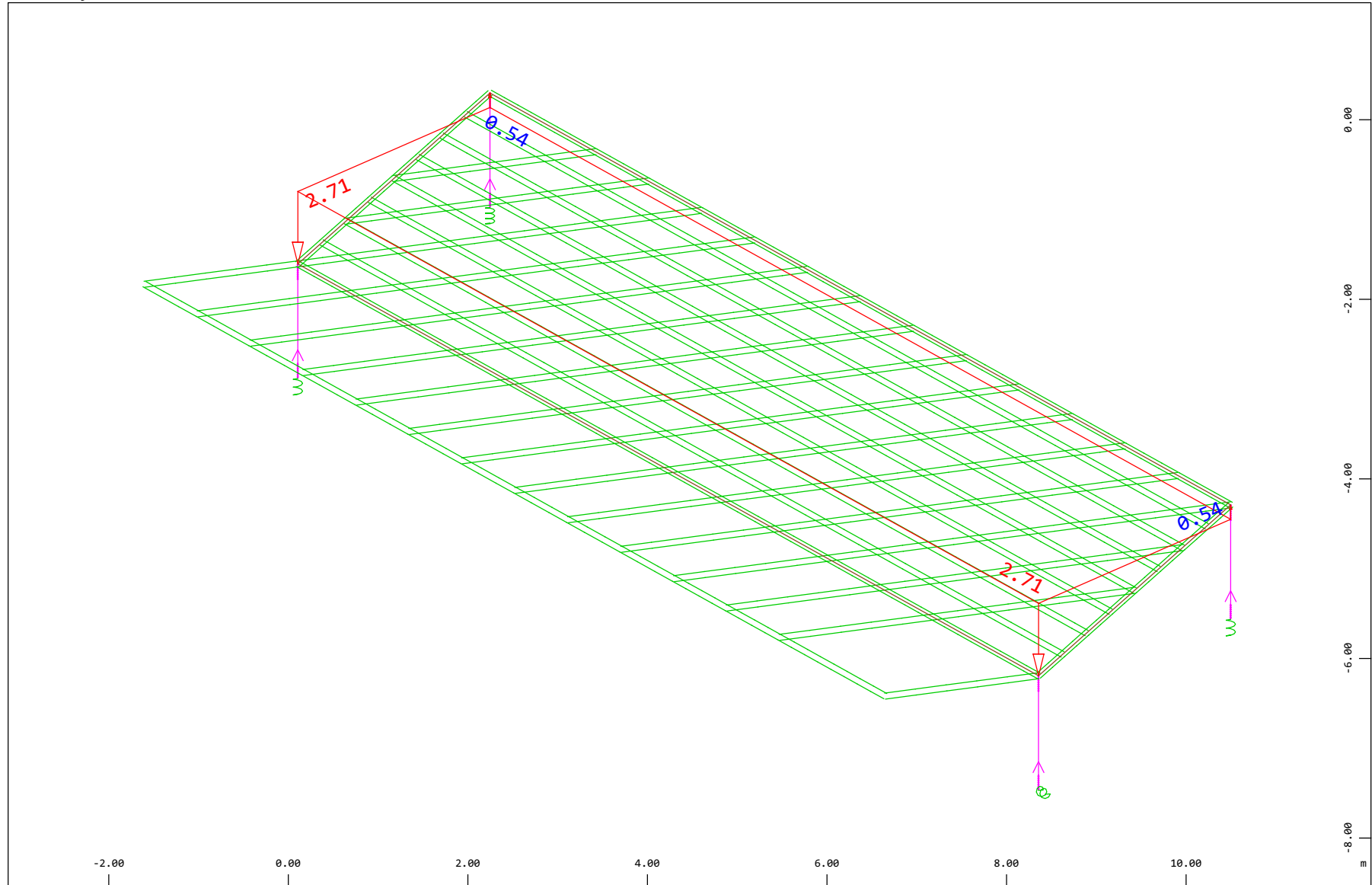


Y Sector of system Beam Elements Group 20 23
 X Beam Elements , Bending moment Mz, Loadcase 603 W: Fwz (ecc+) , 1 cm 3D = 0.980 kNm (Min=-0.411) (Max=0.726)

M 1 : 120

Definition of Axis
Results elementay loads

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Z
X Y

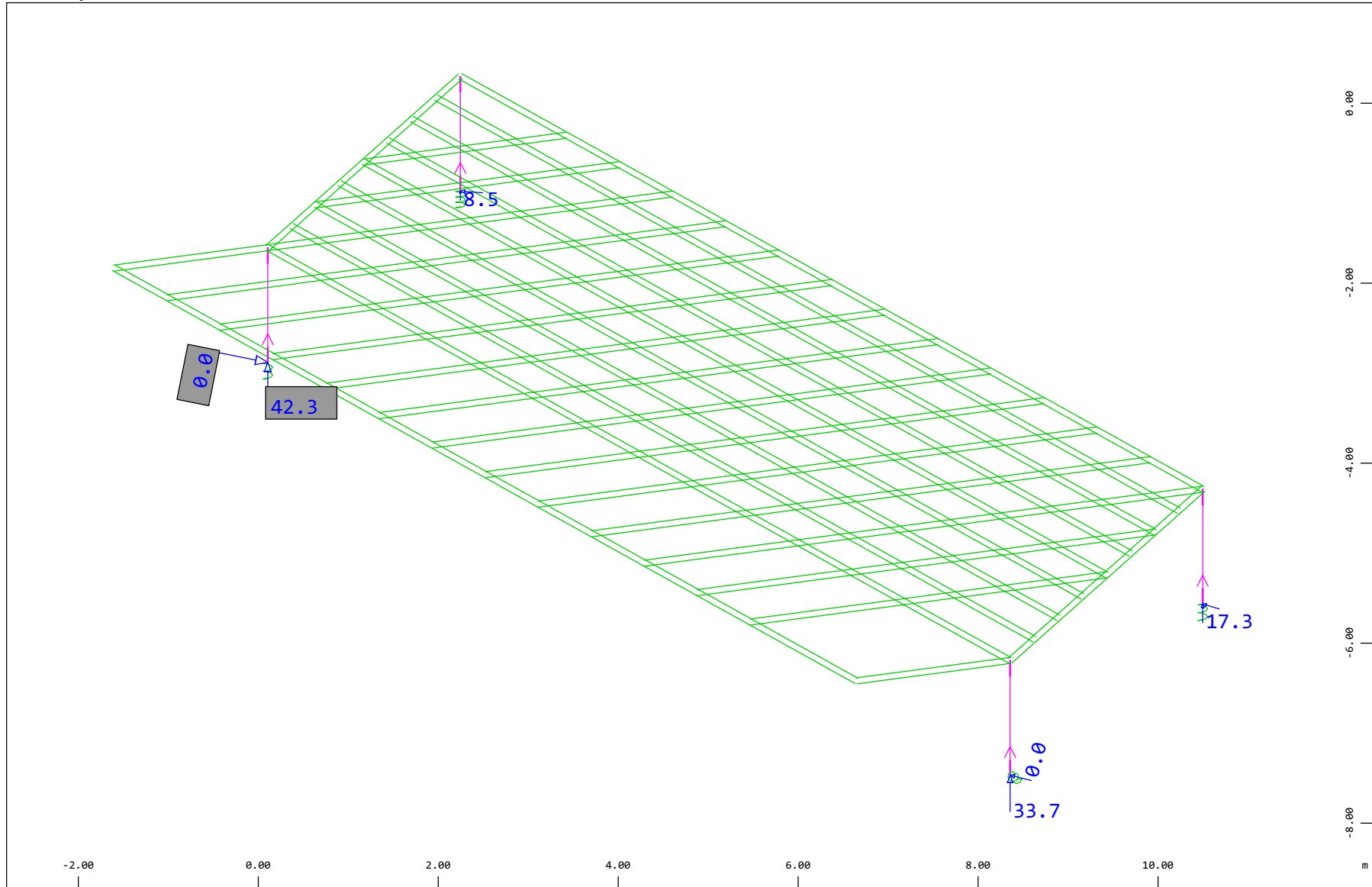
Sector of system Beam Elements, Spring Elements, Structural Lines Group 10 11 20...23 31...37 40
All loads, Loadcase 604 W: Fwz (ecc-) , (1 cm 3D = unit) Free area load (force) in global Z (Unit=1.94 kN/m2)
(Max=0.541)

⊲ (Min=-2.71)

M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962

Definition of Axis
 Results elementay loads

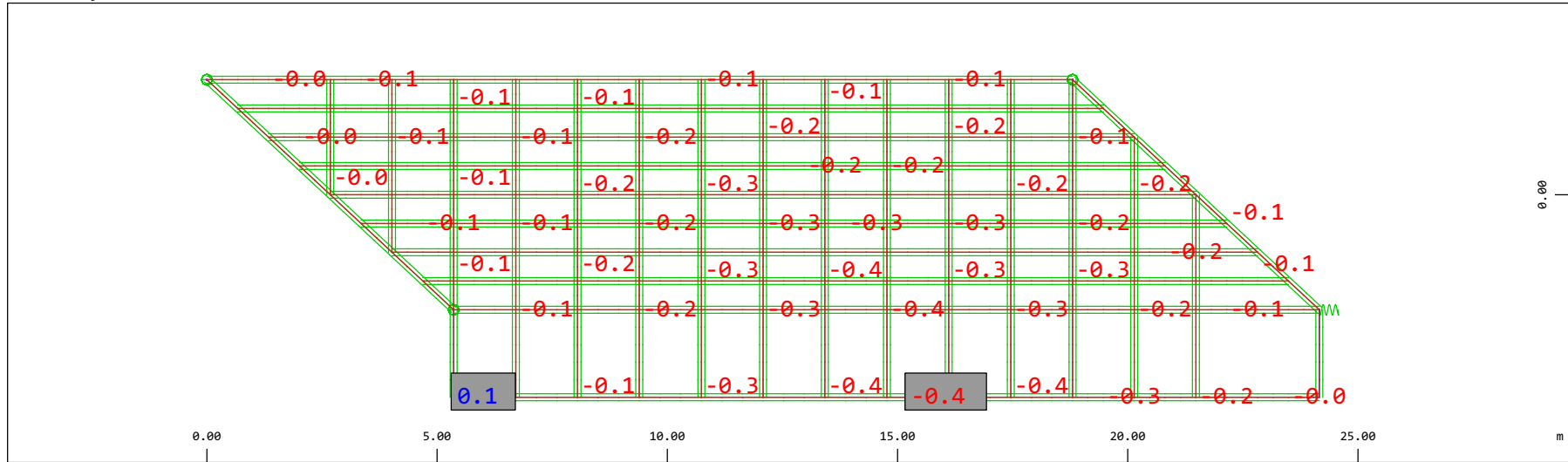
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Sector of system Beam Elements, Spring Elements
 Nodes , Support force in global Z, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 48.4 kN
 Nodes , Support force vector in the global XY plane, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 1.9375e-04 kN

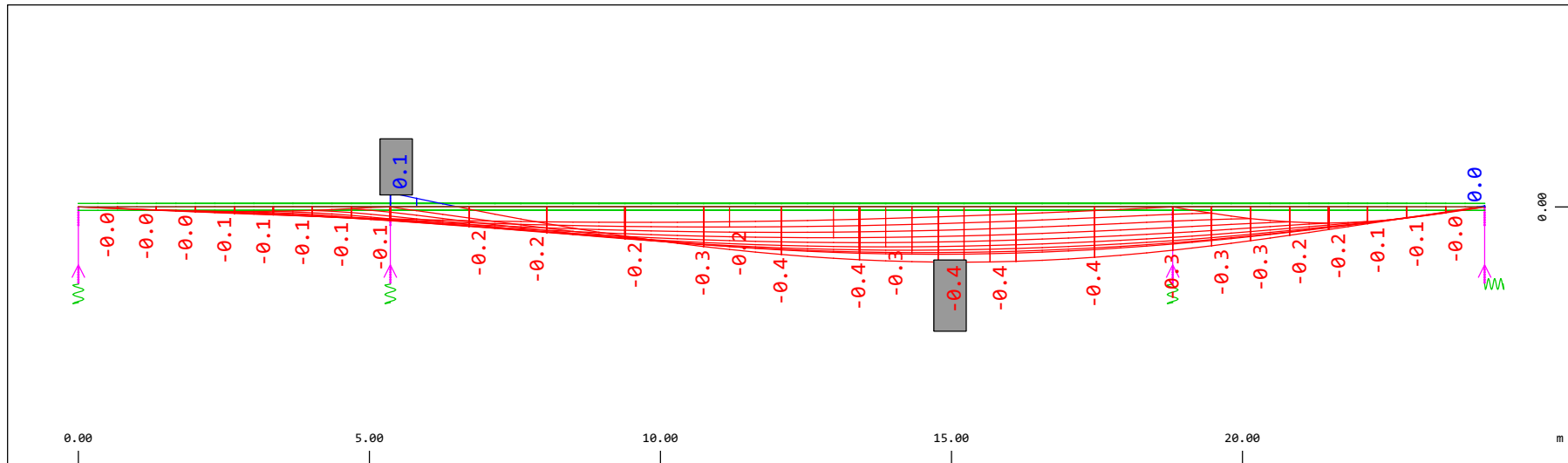
M 1 : 60
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \odot , Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 0.484 mm (Min=-0.434) (Max=0.111)

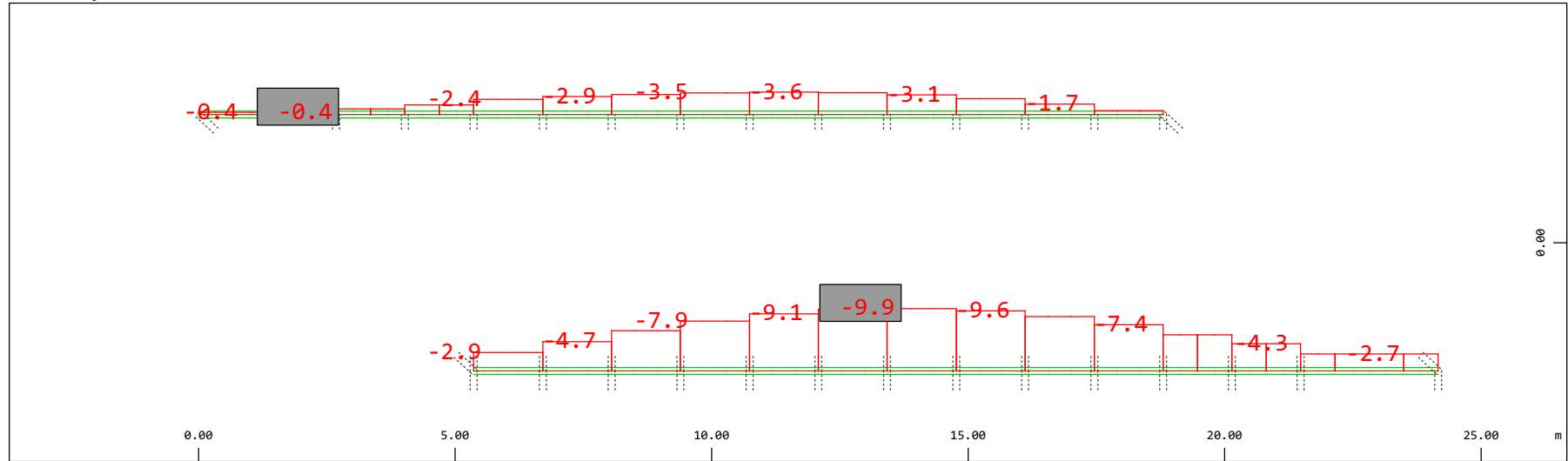
M 1 : 134



Z Sector of system Beam Elements, Spring Elements
 Nodal displacement in global Z, Node sequence along \updownarrow , Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 0.484 mm (Min=-0.434) (Max=0.111)

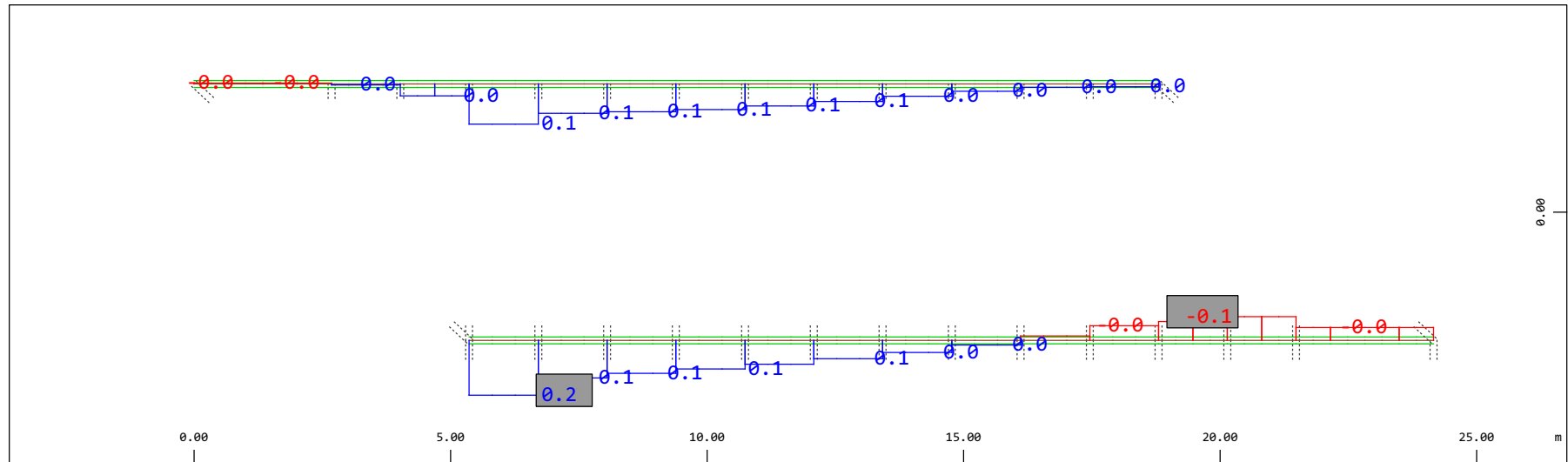
M 1 : 106

Definition of Axis
Results elementay loads



Sector of system Beam Elements Group 10 11
Beam Elements , Normal force Nx, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 9.80 kN (Min=-9.94) (Max=-0.358)

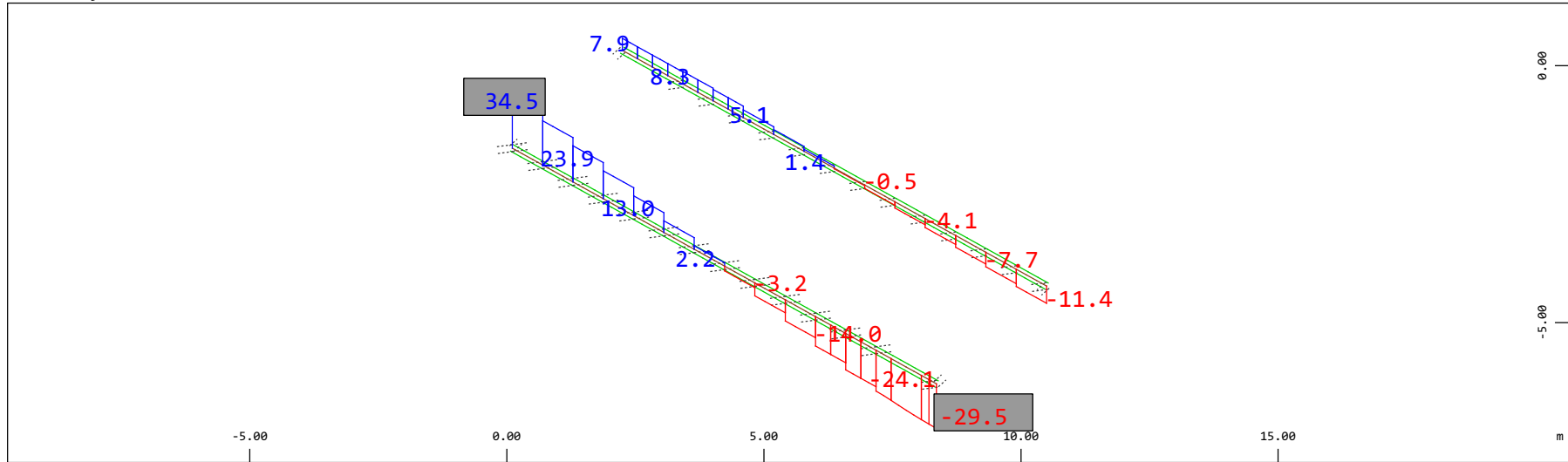
M 1 : 120



Sector of system Beam Elements Group 10 11
Beam Elements , Torsional moment Mt, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 0.196 kNm (Min=-0.0757) (Max=0.175)

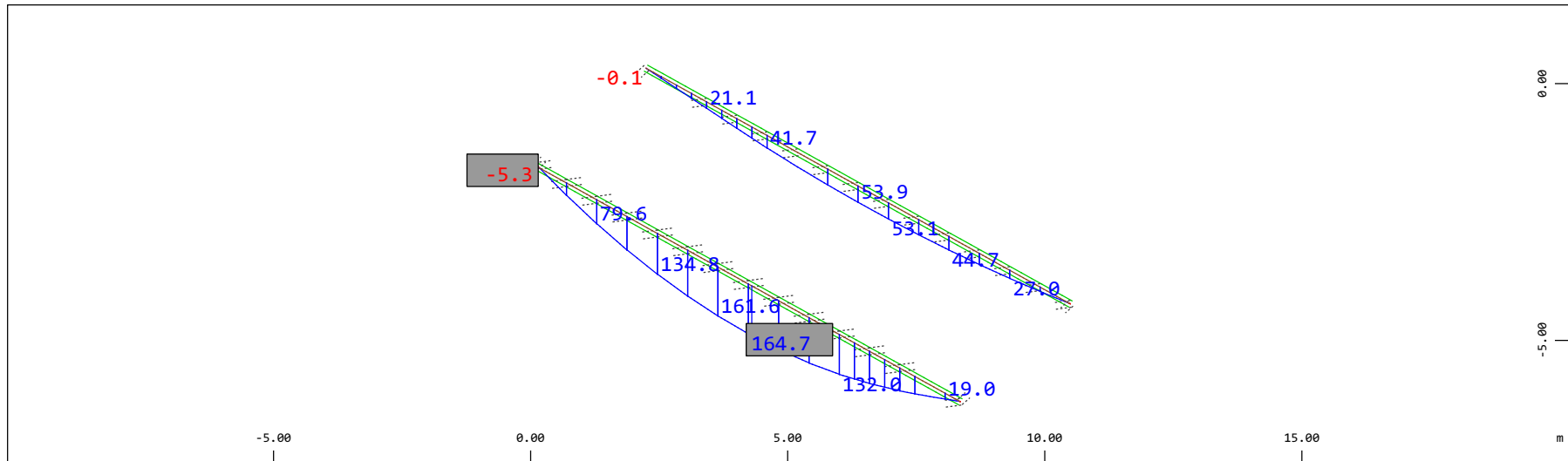
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Shear force Vz, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 39.2 kN (Min=-29.5) (Max=34.5)

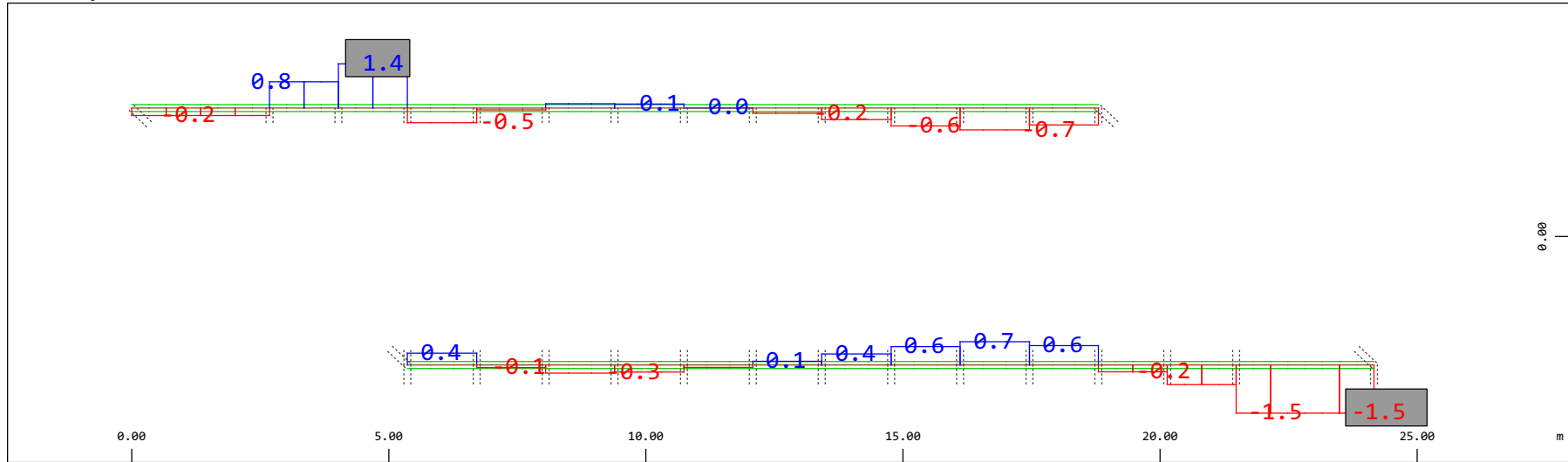
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 10 11
 X Y Beam Elements , Bending moment My, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 196.1 kNm (Min=-5.30) (Max=164.7)

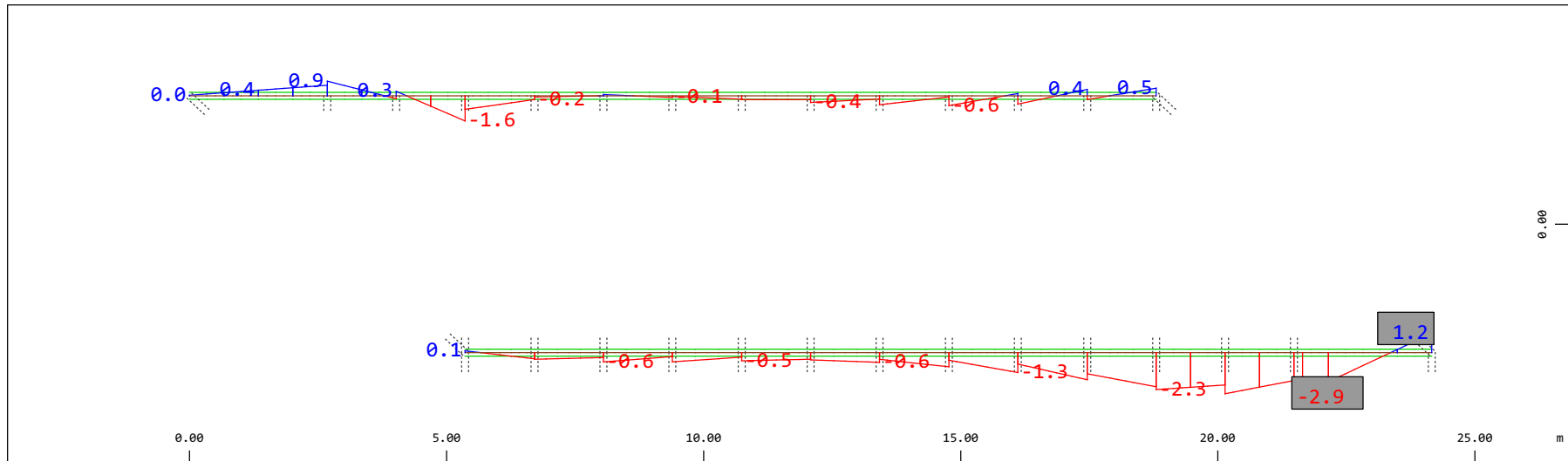
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementary loads



Sector of system Beam Elements Group 10 11
 Beam Elements , Shear force Vy, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 1.96 kN (Min=-1.53) (Max=1.41)

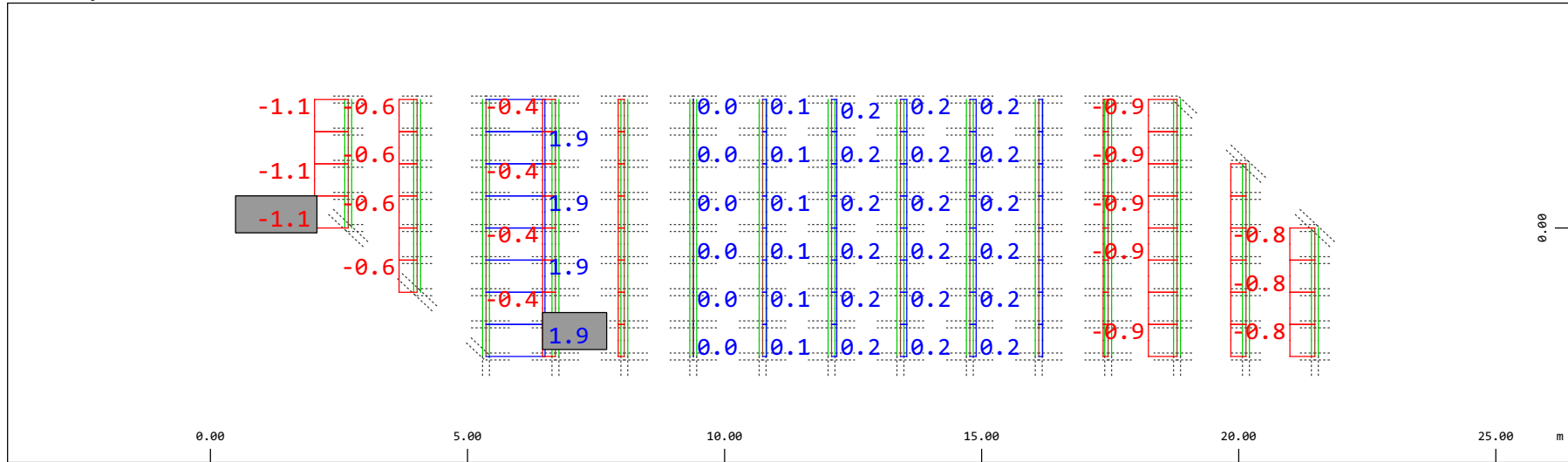
M 1 : 120



Sector of system Beam Elements Group 10 11
 Beam Elements , Bending moment Mz, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 3.92 kNm (Min=-2.88) (Max=1.23)

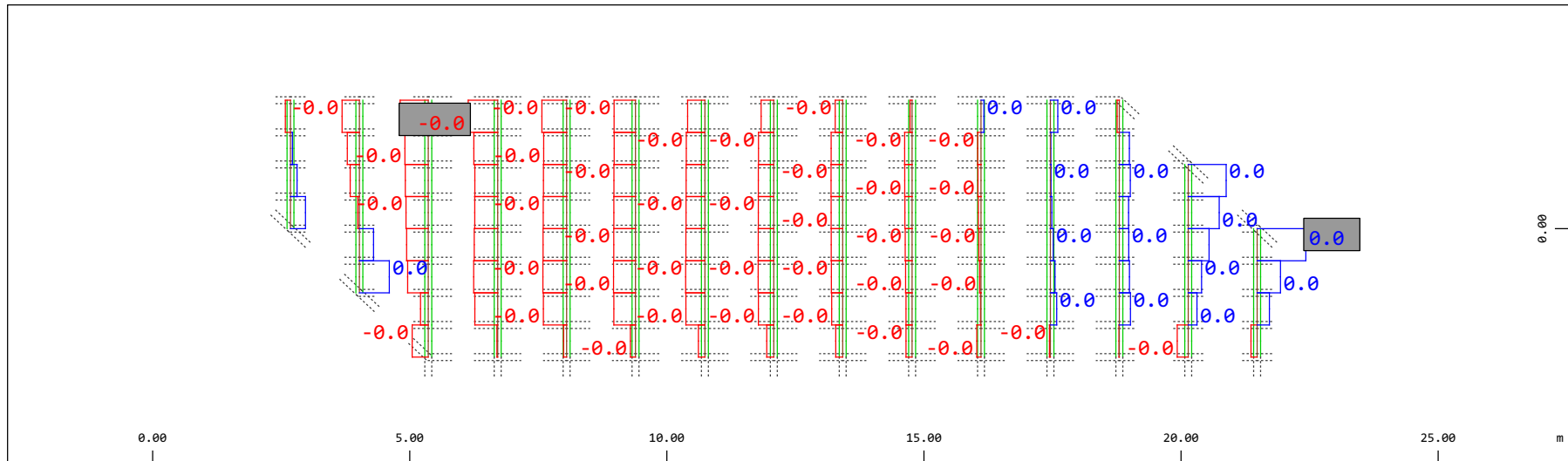
M 1 : 120

Definition of Axis
 Results elementay loads



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Normal force Nx, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 1.96 kN (Min=-1.07) (Max=1.87)

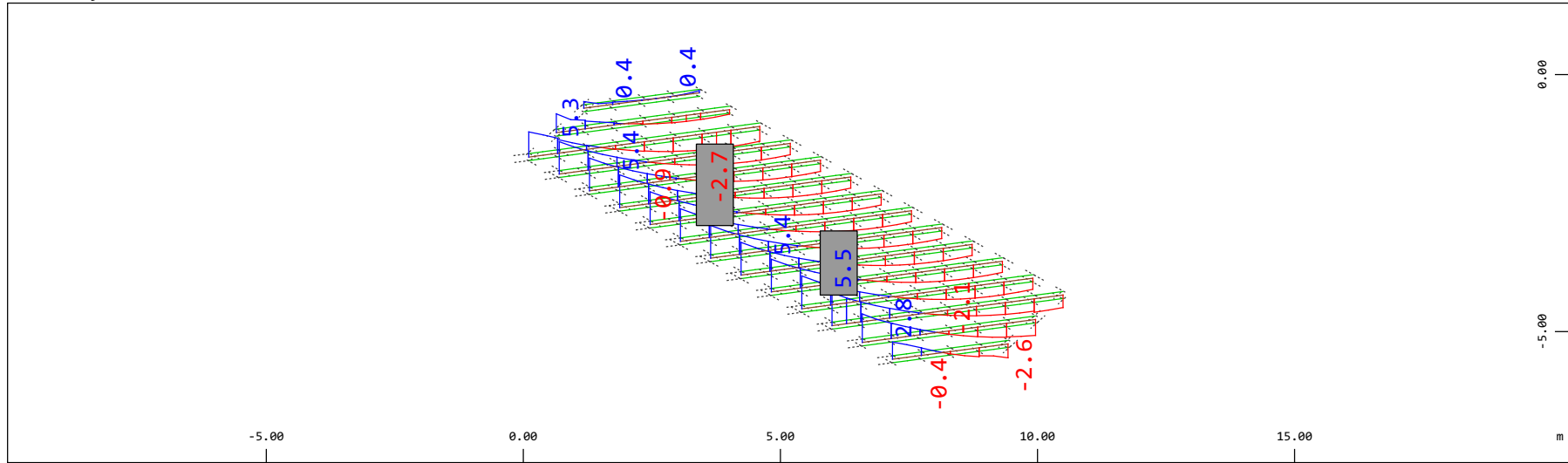
M 1 : 120



Y Sector of system Beam Elements Group 21 22
 X Beam Elements , Torsional moment Mt, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 0.0196 kNm (Min=-0.0094) (Max=0.0155)

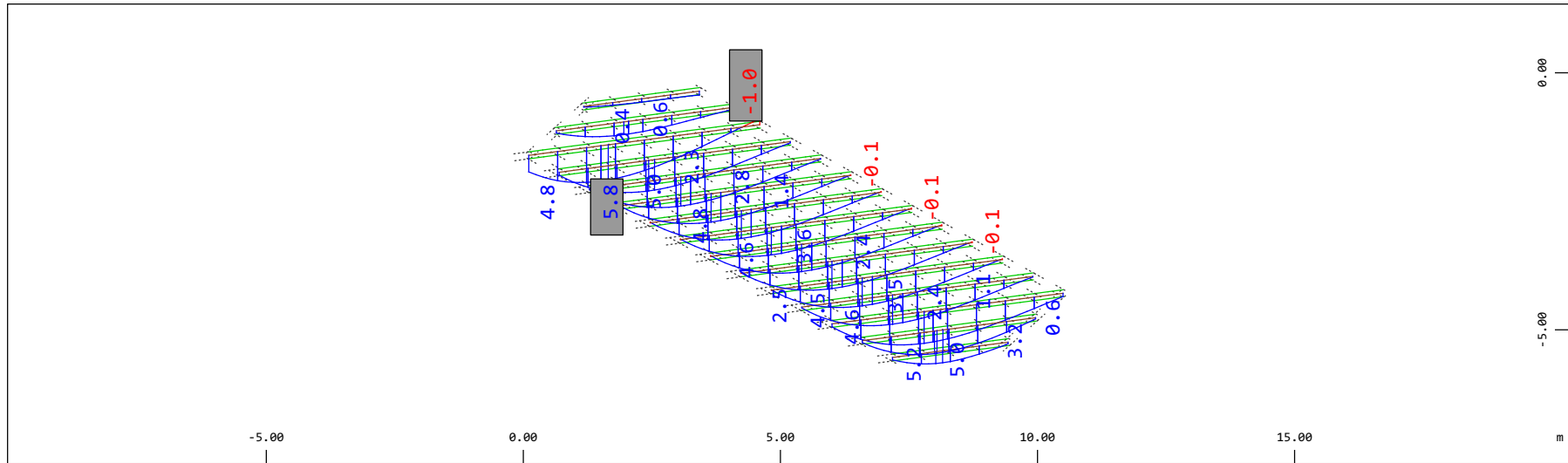
M 1 : 120

Definition of Axis
 Results elementay loads



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Shear force Vz, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 9.80 kN (Min=-2.69) (Max=5.45)

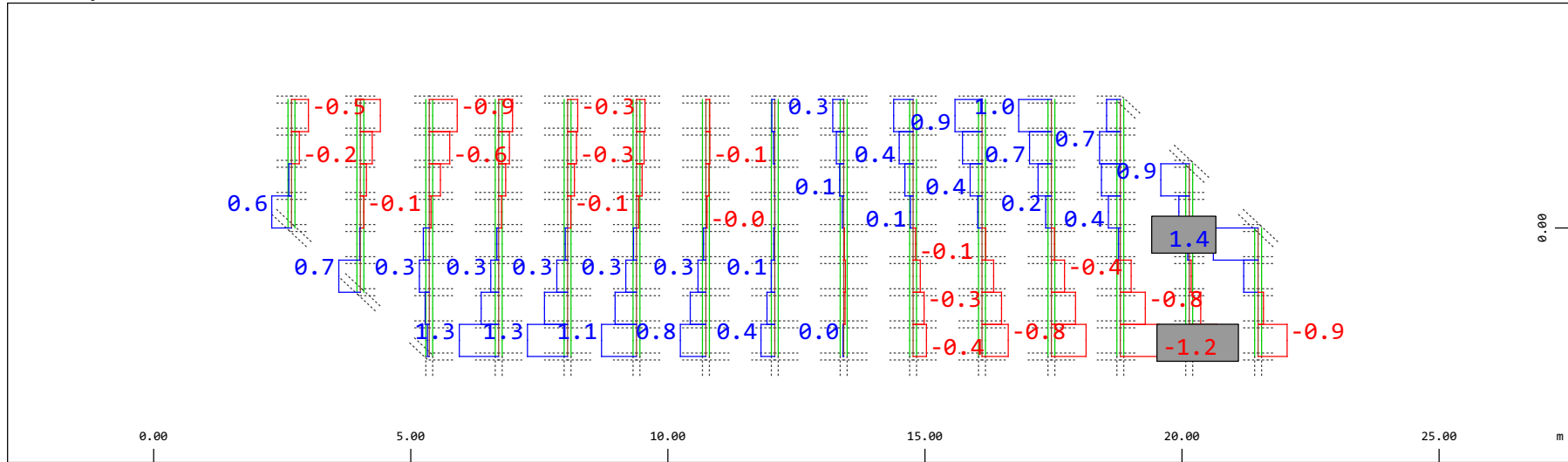
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 21 22
 X Y Beam Elements , Bending moment My, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 9.80 kNm (Min=-0.971) (Max=5.83)

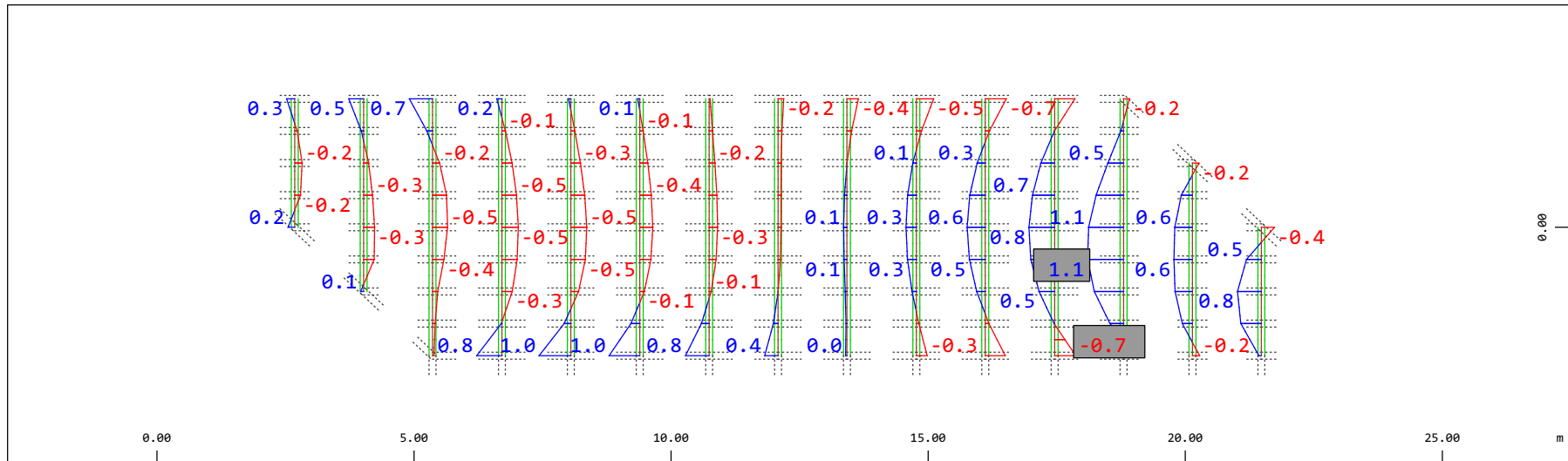
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 21 22
 Beam Elements , Shear force Vy, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 1.96 kN (Min=-1.24) (Max=1.42)

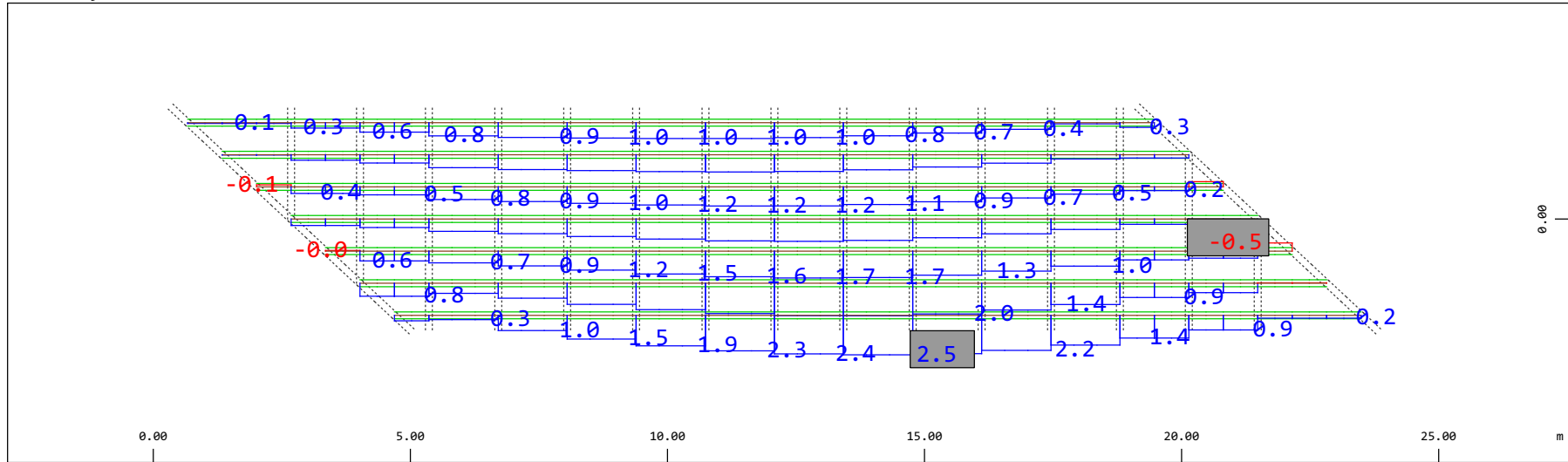
M 1 : 120



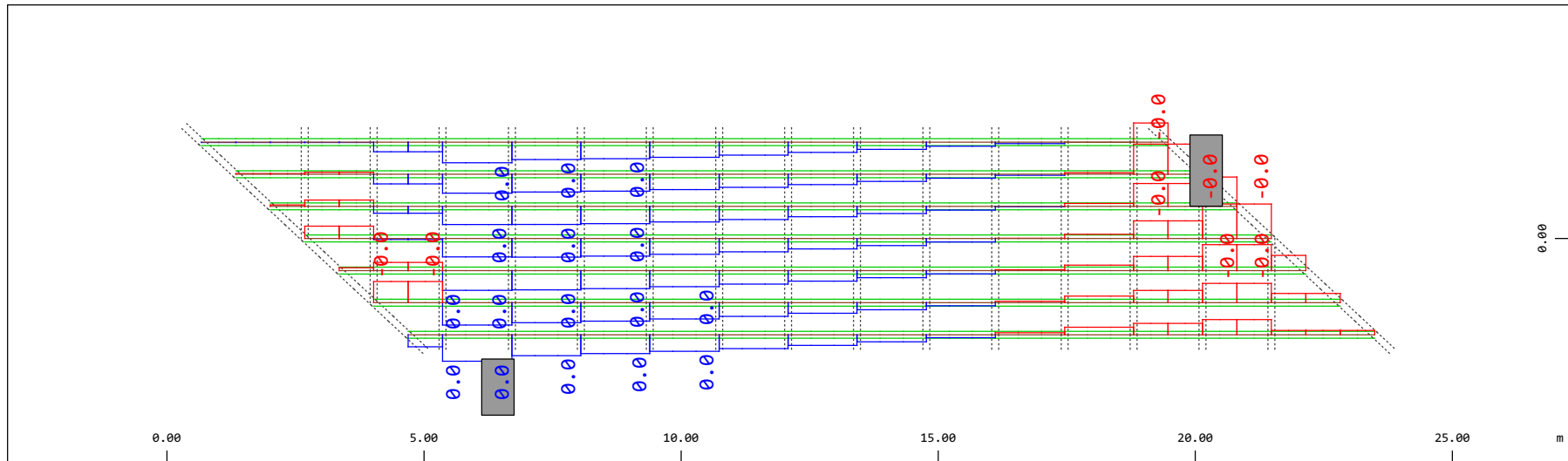
Sector of system Beam Elements Group 21 22
 Beam Elements , Bending moment Mz, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 1.96 kNm (Min=-0.670) (Max=1.14)

M 1 : 120

Definition of Axis
 Results elementay loads



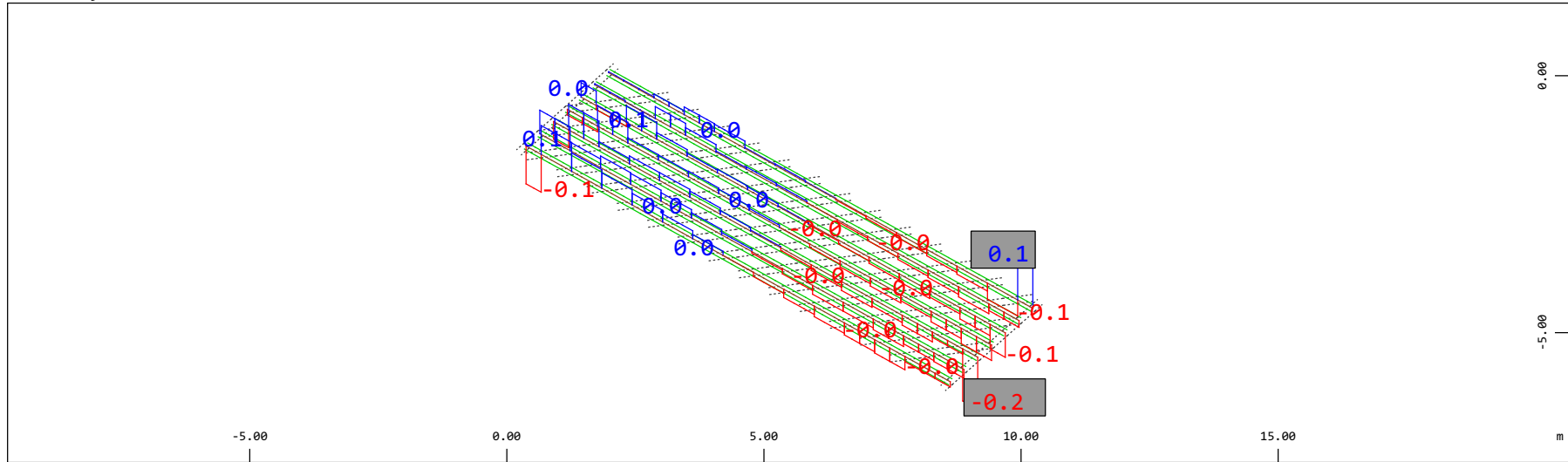
Y Sector of system Beam Elements Group 31...37
 Z-X Beam Elements , Normal force Nx, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 3.92 kN (Min=-0.517) (Max=2.51) M 1 : 120



Y Sector of system Beam Elements Group 31...37
 Z-X Beam Elements , Torsional moment Mt, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 3.9219e-04 kNm (Min=-2.1901e-04) (Max= 1.6821e-04) M 1 : 120

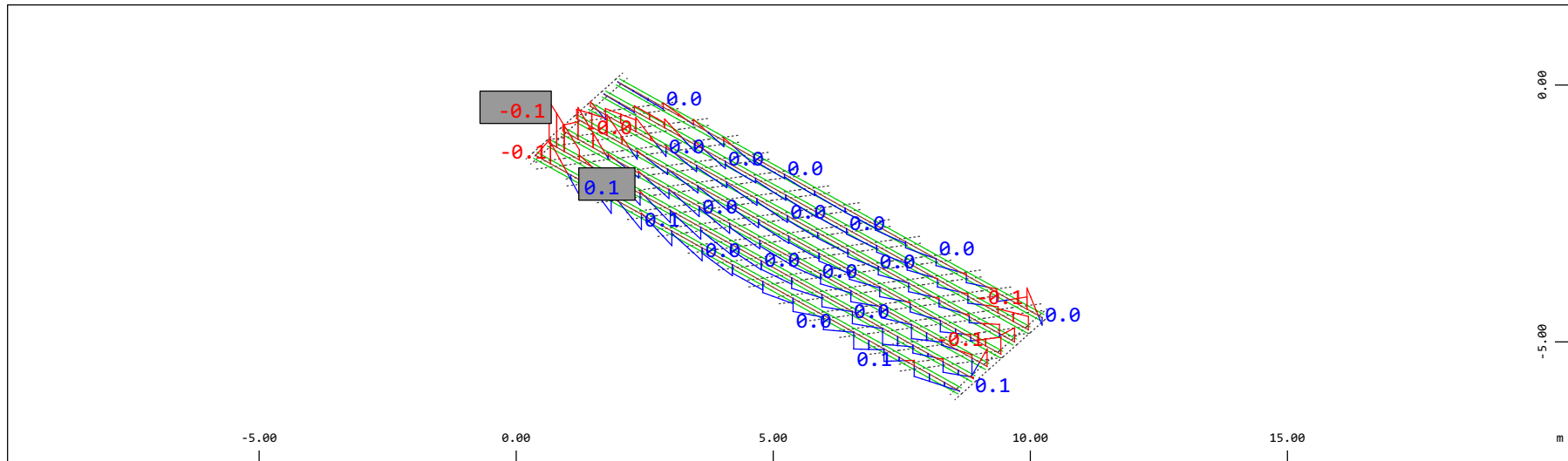
Definition of Axis
 Results elementay loads

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Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Shear force Vz, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 0.196 kN (Min=-0.172) (Max=0.141)

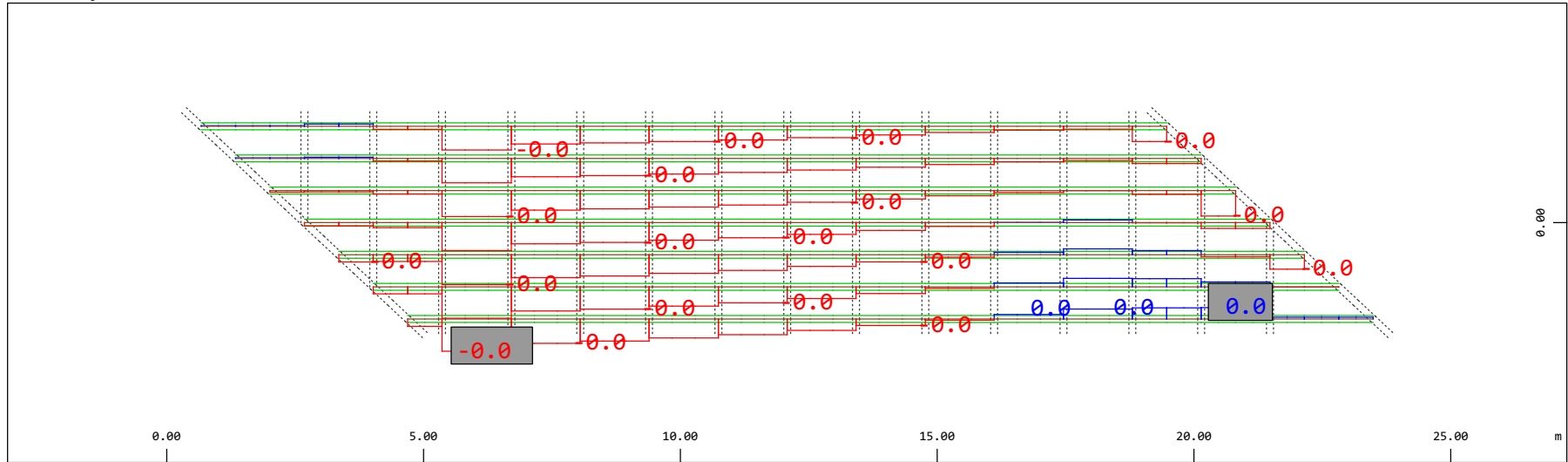
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



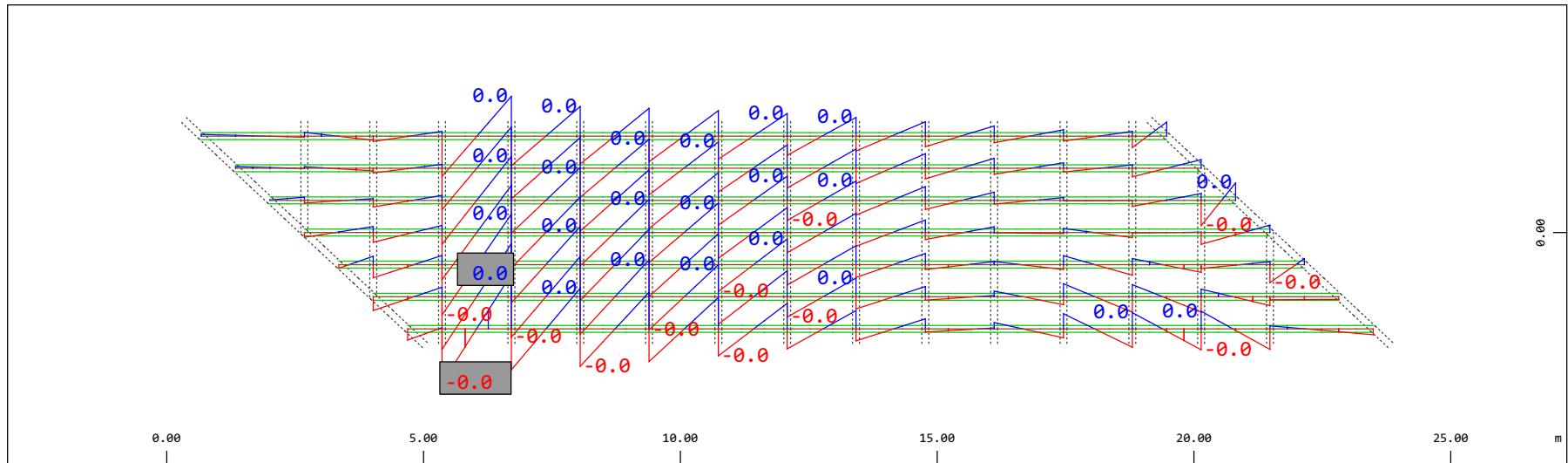
Z Sector of system Beam Elements Group 31...37
 X Y Beam Elements , Bending moment My, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 0.196 kNm (Min=-0.138) (Max=0.0578)

M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
Results elementay loads

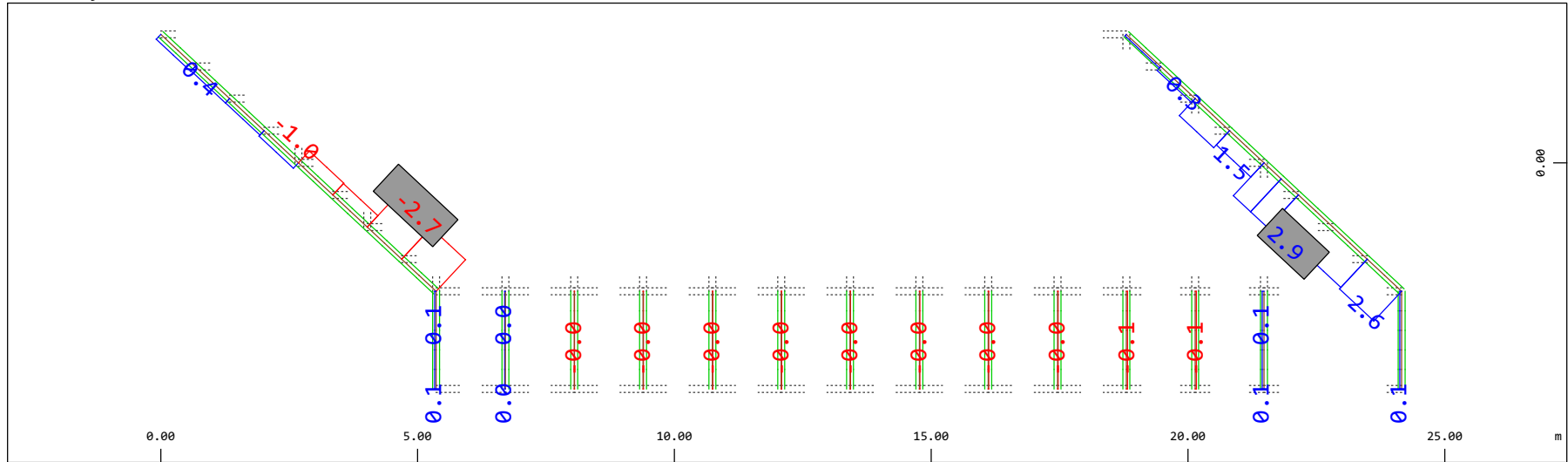


Sector of system Beam Elements Group 31...37
Beam Elements , Shear force Vy, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 9.8047e-04 kN (Min=-5.1231e-04) (Max= 1.8116e-04) M 1 : 120



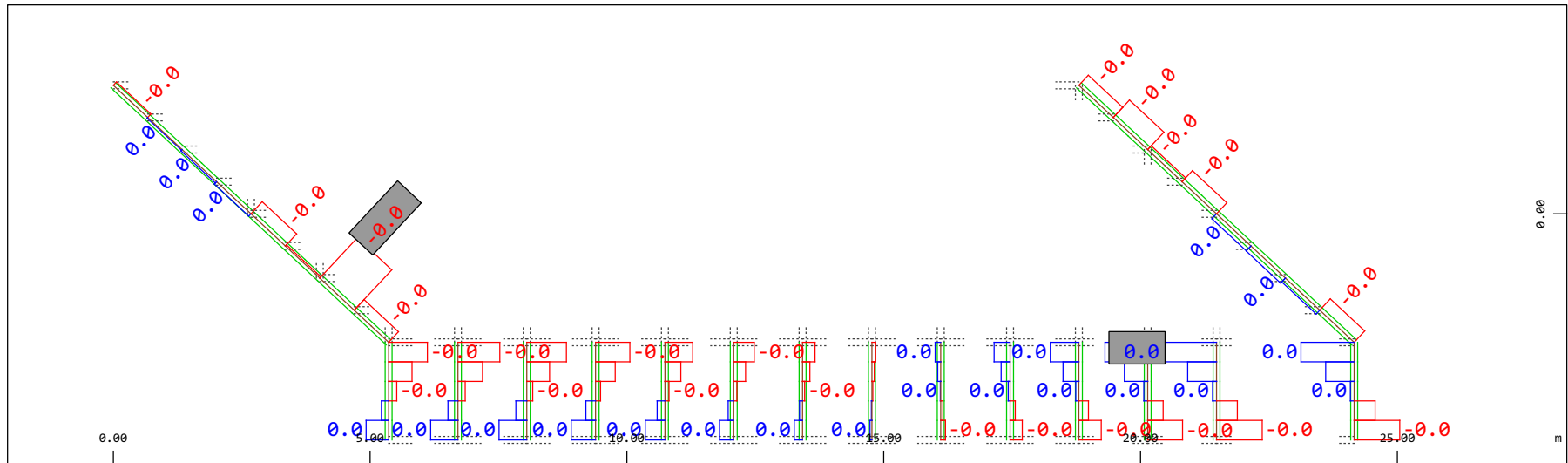
Sector of system Beam Elements Group 31...37
Beam Elements , Bending moment Mz, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 3.9219e-04 kNm (Min=-3.4395e-04) (Max= 3.4767e-04) M 1 : 120

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Normal force Nx, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 3.92 kN (Min=-2.74) (Max=2.86)

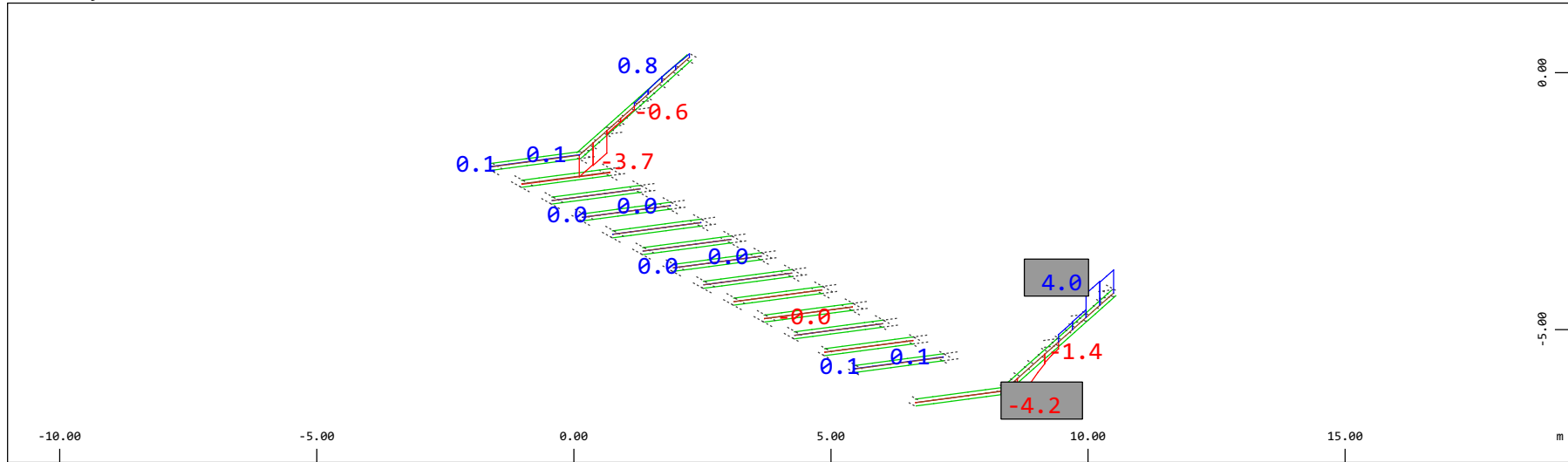
M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Torsional moment Mt, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 0.0392 kNm (Min=-0.0351) (Max=0.0341)

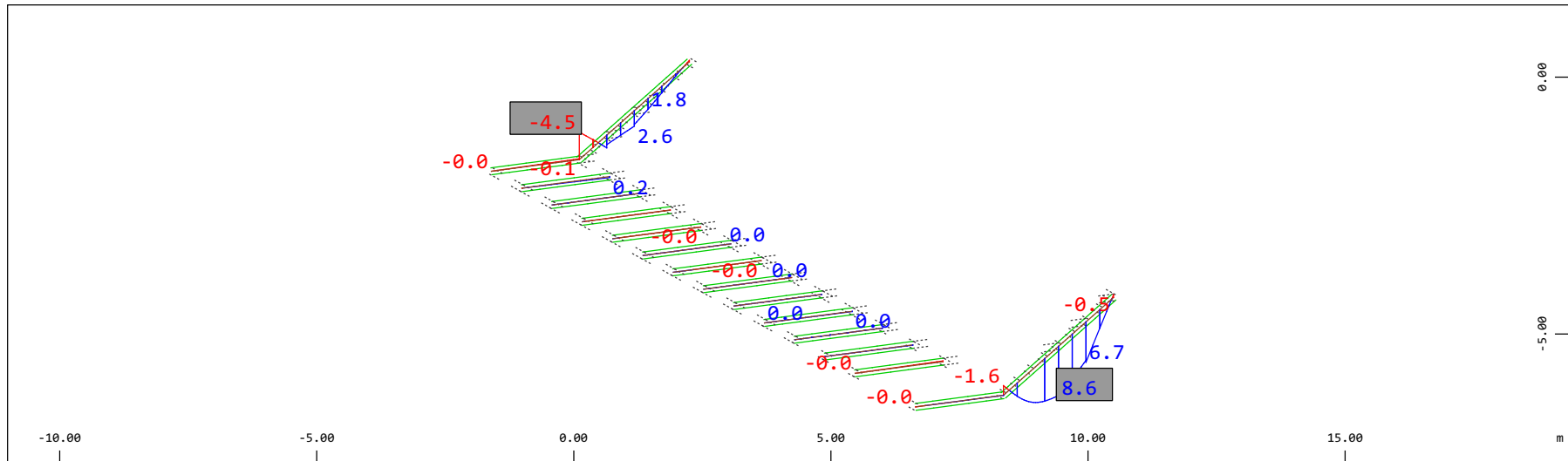
M 1 : 120

Definition of Axis
 Results elementary loads



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Shear force Vz, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 9.80 kN (Min=-4.25) (Max=3.95)

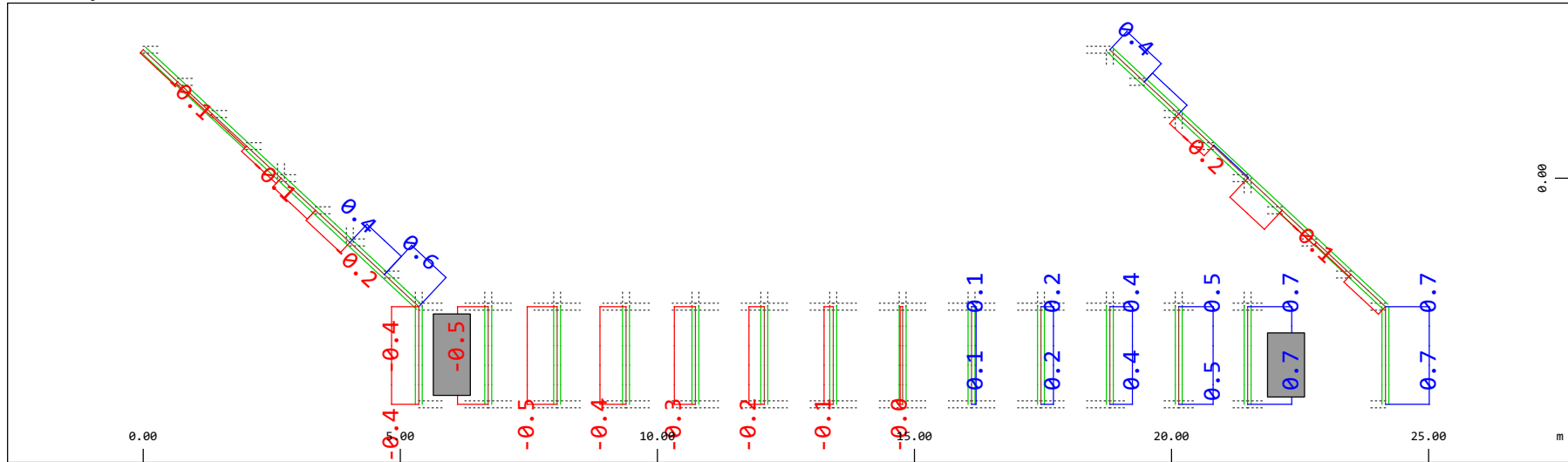
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962



Z Sector of system Beam Elements Group 20 23
 X Y Beam Elements , Bending moment My, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 9.80 kNm (Min=-4.54) (Max=8.61)

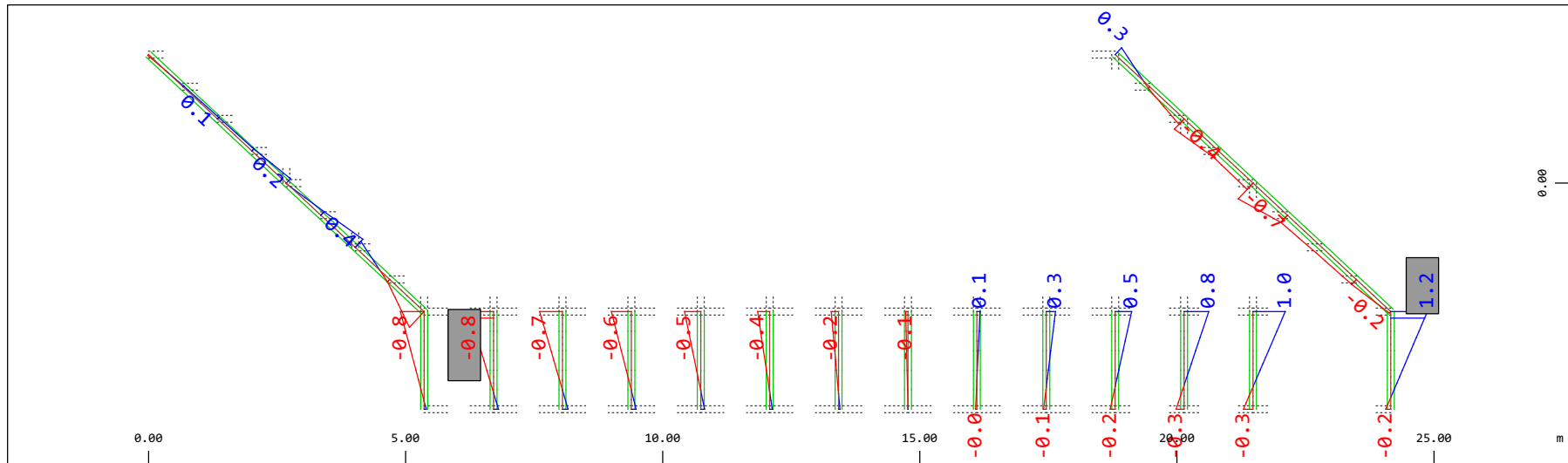
M 1 : 120
 X * 0.502
 Y * 0.906
 Z * 0.962

Definition of Axis
 Results elementay loads



Sector of system Beam Elements Group 20 23
 Beam Elements , Shear force Vy, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 0.980 kN (Min=-0.488) (Max=0.700)

M 1 : 120



Sector of system Beam Elements Group 20 23
 Beam Elements , Bending moment Mz, Loadcase 604 W: Fwz (ecc-) , 1 cm 3D = 1.96 kNm (Min=-0.771) (Max=1.16)

M 1 : 120