
4. ERANSKINA.- EGITURAK

ANEJO 4.- ESTRUCTURAS

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1.- OBJETO

El objeto del presente anejo es la realización de los cálculos estructurales necesarios para la completa definición de las obras de drenaje transversal (ODT) del presente proyecto.

2.- DATOS DE PARTIDA

Se parte de los datos del “Proyecto de Construcción de la Duplicación de Calzada de la carretera N-638 en Hondarribia. Tramo: Amute – rotonda del Aeropuerto” redactado por la empresa Saitec para la Diputación Foral de Gipuzkoa.

3.- NORMATIVA

Se ha considerado la siguiente documentación para el cálculo justificativo de los diferentes elementos estructurales:

- Código Estructural CE.
- Instrucción sobre las acciones a considerar en el proyecto de puentes de carretera IAP-11.

4.- PROGRAMAS

Se han utilizado los siguientes programas comerciales, suficientemente conocidos y sancionados por la práctica:

- SOFISTIK
 - Cálculo matricial de estructuras de barras y láminas, por el método de elementos finitos. Cálculo tridimensional.

Se han utilizado, asimismo, hojas de cálculo de elaboración propia para el dimensionamiento de las secciones de muro con cimentación superficial y para tareas de pre y post-proceso.

5.- MATERIALES

5.1.- Hormigón

Las clases de hormigón que se consideran para la ejecución de las ODT son las indicadas a continuación:

Clase de exposición:

Corrosión inducida por cloruros de origen marino, expuestos a aerosoles marinos XS1.

Ambiente de una moderada agresividad química XA1 de acuerdo al informe geotécnico del proyecto de desdoblamiento de la N-638, redactado por la empresa Saitec.

Denominación:

HA-30/B/20/XS1+XA1

Características:

Máxima relación agua/cemento: 0,50

Contenido mínimo de cemento: 350 Kg/m³

Resistencia característica: 30 N/mm²

Recubrimiento: 55 mm + 10 mm ejecutado in situ nivel normal de control con CEM II/B-S, B-P

Cemento con protección especial: SR – Cemento resistente a los sulfatos.

Abertura de fisura máxima: 0,2 mm

Las características mecánicas son las siguientes:

- Coeficiente de dilatación térmica: $\alpha = 10 \times 10^{-6} \text{ K}^{-1}$
- Coeficiente de Poisson:
 - $\nu = 0.2$ en deformaciones elásticas.
 - $\nu = 0$ en fisuración.

5.2.- Armaduras pasivas

Todos los elementos serán del tipo B-500SD, siendo las características mecánicas las siguientes:

- Límite elástico: $f_{yk} = 500 \text{ MPa}$.
- Deformación en rotura: $\epsilon_{uk} = 7.5\%$ (clase C).
- Módulo elástico: $E_s = 200000 \text{ MPa}$.
- Densidad: 25 kN/m^3 .

6.- PARÁMETROS GEOTÉCNICOS

Los parámetros geotécnicos se obtienen del proyecto de desdoblamiento de la N-638, redactado por la empresa Saitec.

Empuje de rellenos en el trasdós

Para la estimación del empuje se consideran los siguientes parámetros del relleno de acuerdo a los datos del

- | | |
|--|----------------------|
| • Peso específico aparente: | 20 kN/m ² |
| • Ángulo de rozamiento interno efectivo: | $\phi' = 30^\circ$ |
| • Cohesión efectiva: | $c' = 0$ |
| • Coeficiente de empuje activo: | $k_a = 0.33$ |
| • Coeficiente de empuje al reposo: | $k_0 = 0.50$ |

Tensión admisible y módulo de balasto

Para la cimentación directa en las arenas se estima una carga admisible del terreno de 1.0-1.5 kg/cm2. Para poder cimentar con esta carga admisible es necesario sustituir los 1.5 primeros metros de suelo con material tipo escollera cimentándose sobre ella la estructura.

Se considera un módulo de balasto del terreno de cimentación de 10 000 kN/m³.

7.- ACCIONES CONSIDERADAS

Acciones permanentes

1. Peso propio: Elementos de hormigón armado: $\gamma=25\text{kN/m}^3$.
2. Cargas muertas:
 - 20cm aglomerado: $\gamma=25\text{kN/m}^3$.
 - Altura tierras sobre losa superior del marco: $\gamma=20\text{kN/m}^3$.
3. Empuje de rellenos en el trasdós.
4. Rozamiento negativo: presión vertical uniforme sobre el dintel.

Acciones variables

5. Se considera un valor de sobrecarga sobre la losa superior de 5 kN/m² según la IAP-11 para aceras y carriles bici.
6. Sobrecarga sobre los muros: 5kN/m², aplicada de manera independiente a cada lado de los marcos. En las ODT-4 y 5 se incluye una barandilla, por lo que se tendrá en cuenta una fuerza horizontal de 1.5kN/m a 1.20m de altura de acuerdo a la IAP-11.
7. Vehículo de mantenimiento:
 - Se ha considerado el peor de los siguientes vehículos: Camión de 340kN, Hitachi con cazo o pinza de 250kN y Gondola de 150kN.
 - Se introduce entonces el camión de tres ejes de 80kN+2x130kN con separación entre ejes de 3.90m-1.40m y ancho de 1.80m.

8.- COMBINACIÓN DE ACCIONES

Las combinaciones de acciones se realizarán de acuerdo con las siguientes expresiones:

8.1.- ELS cuasi-permanentes

$$\sum_{j=1} \gamma_{G,j} G_{k,j} + \sum_{m=1} \gamma_{G,m} G_{k,m}^* + \sum_{i=1} \gamma_{Q,i} \psi_{2,i} Q_{k,i}$$

8.2.- ELS frecuentes

$$\sum_{j=1} \gamma_{G,j} G_{k,j} + \sum_{m=1} \gamma_{G,m} G_{k,m}^* + \gamma_{Q,1} \psi_{1,1} Q_{k,1} + \sum_{i=1} \gamma_{Q,i} \psi_{2,i} Q_{k,i}$$

8.3.- ELS característica

$$\sum_{j=1} \gamma_{G,j} G_{k,j} + \sum_{m=1} \gamma_{G,m} G_{k,m}^* + \gamma_{Q,1} Q_{k,1} + \sum_{i=1} \gamma_{Q,i} \psi_{0,i} Q_{k,i}$$

8.4.- Estados Límite Últimos ELU

Las combinaciones de acciones que se tienen en cuenta para las verificaciones ELU son las siguientes:

Situaciones persistentes o transitorias

$$\sum_{j=1} \gamma_{G,j} G_{k,j} + \sum_{m=1} \gamma_{G,m} G_{k,m}^* + \gamma_{Q,1} Q_{k,1} + \sum_{i=1} \gamma_{Q,i} \psi_{0,i} Q_{k,i}$$

- $G_{k,j}$: Valor representativo de cada acción permanente de valor constante
- $G_{k,j}^*$: Valor representativo de cada acción permanente de valor no constante
- $Q_{k,1}$: Valor característico de la acción variable dominante
- $\psi_{0,i} Q_{k,i}$: Valores de combinación de las acciones variables concomitantes con la acción variable dominante

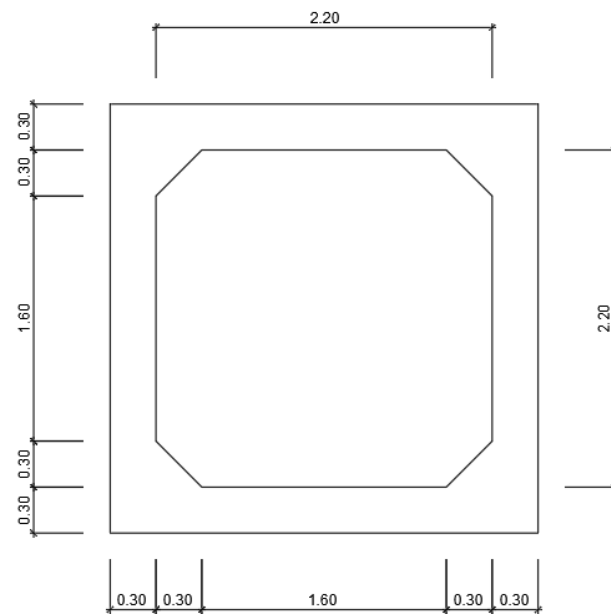
TABLA 6.1-a FACTORES DE SIMULTANEIDAD ψ

ACCIÓN		ψ_0	ψ_1	ψ_2	
Sobrecarga de uso	gr 1, Cargas verticales	Vehículos pesados	0,75	0,75	0
		Sobrecarga uniforme	0,4	0,4	0 / 0,2 ⁽¹⁾
		Carga en aceras	0,4	0,4	0
	gr 2, Fuerzas horizontales	0	0	0	
	gr 3, Peatones	0	0	0	
	gr 4, Aglomeraciones	0	0	0	
	Sobrecarga de uso en pasarelas	0,4	0,4	0	
Viento	F_{wk}	En situación persistente	0,6	0,2	0
		En construcción	0,8	0	0
		En pasarelas	0,3	0,2	0
Acción térmica	T_k	0,6	0,6	0,5	
Nieve	Q_{Sik}	En construcción	0,8	0	0
Acción del agua	W_k	Empuje hidrostático	1,0	1,0	1,0
		Empuje hidrodinámico	1,0	1,0	1,0
Sobrecargas de construcción	Q_c	1,0	0	1,0	

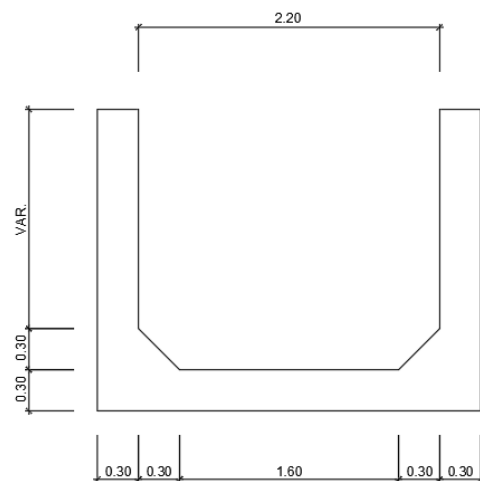
9.- DESCRIPCIÓN DE LAS ESTRUCTURAS

9.1.- ODT 1

La estructura que materializa la ODT 1 es un marco de hormigón armado ejecutado in-situ. La sección interior del marco es de 2.20m x 2.20m. El espesor de los muros y losas es de 30cm, con un chaflán en las esquinas de 30cm. Se ha considerado una altura de tierras de 70cm (20cm firme y 50cm tierras).



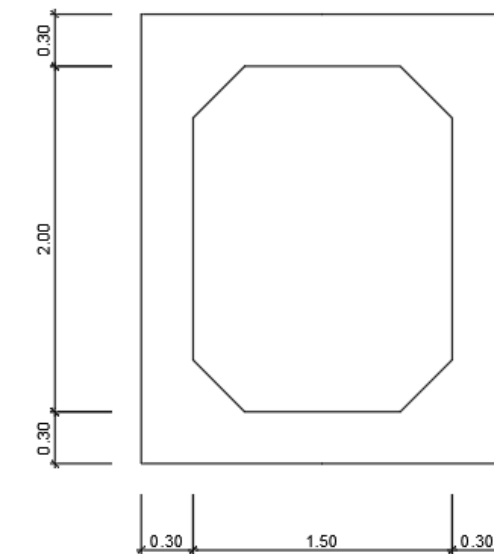
Las aletas de la ODT se formarán con una sección en U de hormigón armado que mantiene la geometría del marco sin la losa superior. La altura de las aletas varía hasta llegar a los 0.75m en 3.00m de longitud.



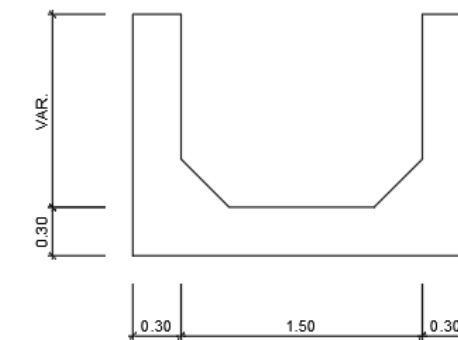
En el trasdós de los muros se dispondrá de una capa de 50cm de material granular para facilitar el drenaje hasta un tubo de desagüe que se ubicará por encima del plano de la solera, para evitar acumulación de agua y el consiguiente incremento del empuje que ocasionaría. El trasdós del muro se impermeabilizará con pintura bituminosa.

9.2.- ODT 2

La ODT 2 es un marco de hormigón armado ejecutado in-situ. La sección interior del marco es de 1.50m x 2.00m. El espesor de los muros y losas es de 30cm, con un chaflán en las esquinas de 30cm. Se ha considerado una altura de tierras de 100cm (20cm firme y 80cm tierras).



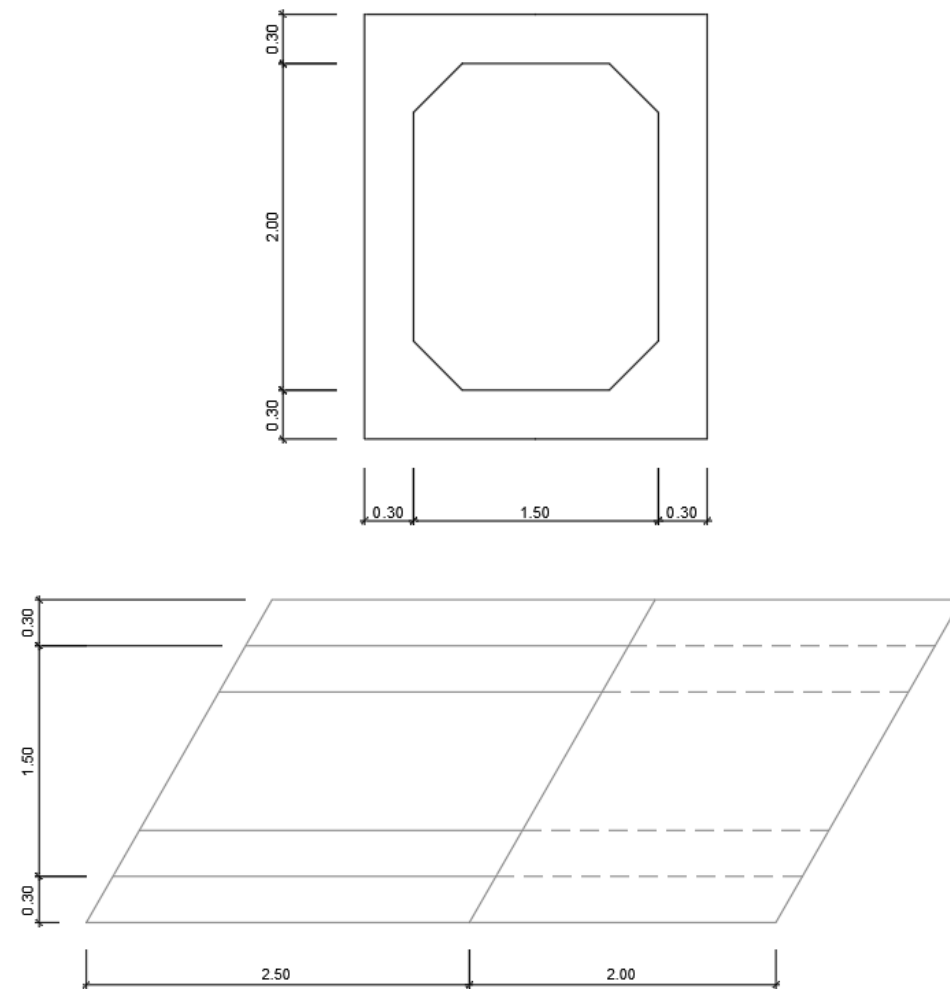
Las aletas de la ODT se formarán con una sección en U de hormigón armado que mantiene la geometría del marco sin la losa superior. La altura de las aletas varía hasta llegar a los 1.00m en 2.50m de longitud.



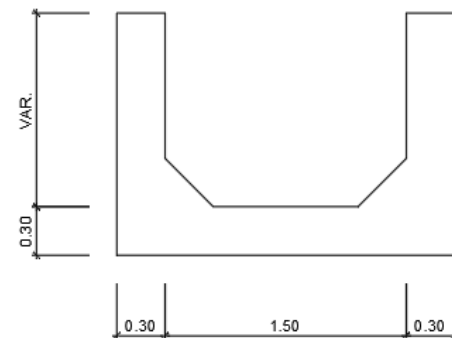
En el trasdós de los muros se dispondrá de una capa de 50cm de material granular para facilitar el drenaje hasta un tubo de desagüe que se ubicará por encima del plano de la solera, para evitar acumulación de agua y el consiguiente incremento del empuje que ocasionaría. El trasdós del muro se impermeabilizará con pintura bituminosa.

9.3.- ODT 3

La ODT 3 es un marco de hormigón armado ejecutado in-situ y esviado en planta. La sección interior del marco es de 1.50m x 2.00m. El espesor de los muros y losas es de 30cm. Se ha considerado una altura de tierras de 50cm (20cm firme y 80cm tierras).



Las aletas de la ODT se formarán con una sección en U de hormigón armado que mantiene la geometría del marco sin la losa superior. La altura de las aletas varía hasta llegar a los 1.10m en 2.50m de longitud.

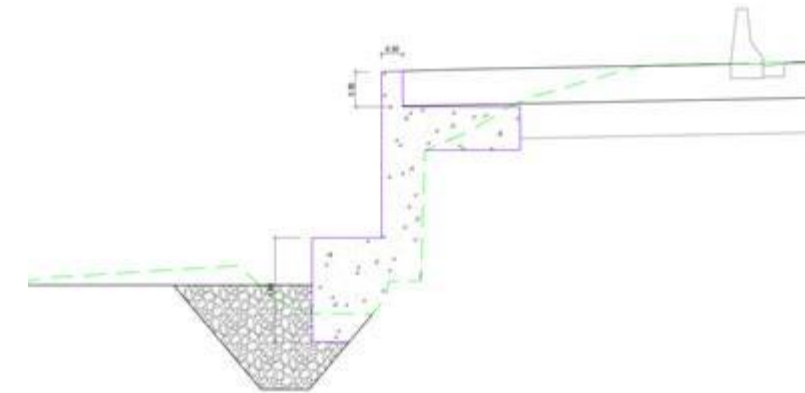


En el trasdós de los muros se dispondrá de una capa de 50cm de material granular para facilitar el drenaje hasta un tubo de desagüe que se ubicará por encima del plano de la solera, para evitar acumulación de agua y el consiguiente incremento del empuje que ocasionaría. El trasdós del muro se impermeabilizará con pintura bituminosa.

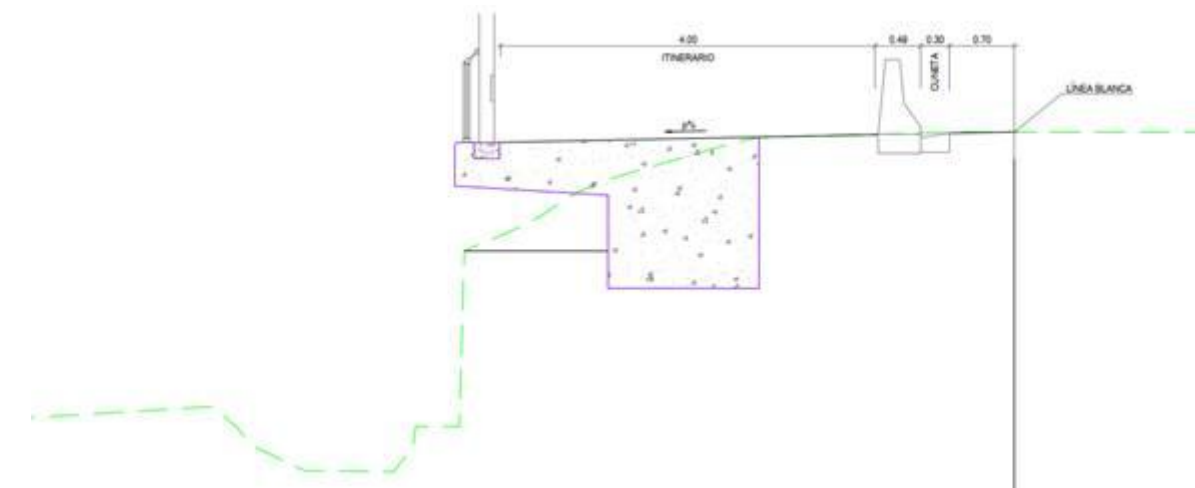
9.4.- ODT 4

En la zona de la ODT-4 existe un murete que contiene el talud existente. Inicialmente se plantean dos alternativas:

1. Ejecutar un forro de hormigón en masa sobre el muro existente que contenga la nueva plataforma. Esta opción implica la ejecución de la cimentación en la zona del cauce.

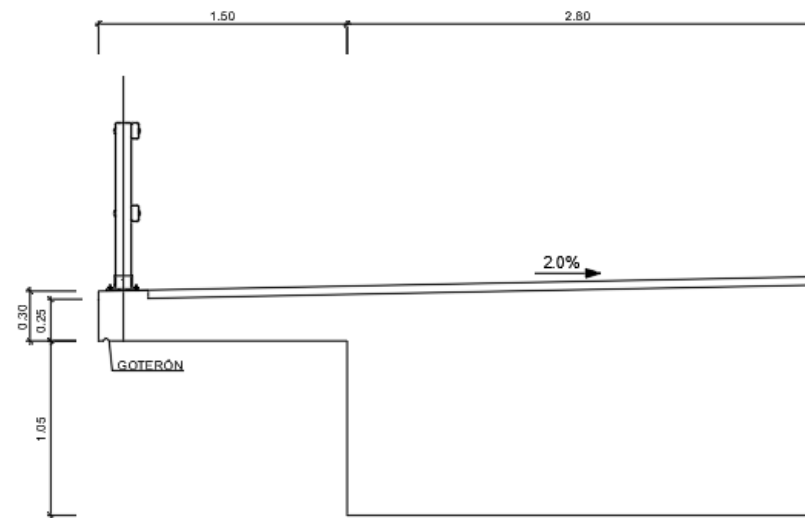


2. Ejecutar una losa en vuelo cimentada en el talud existente lo más alejado posible del muro para evitar cargar el muro actual.

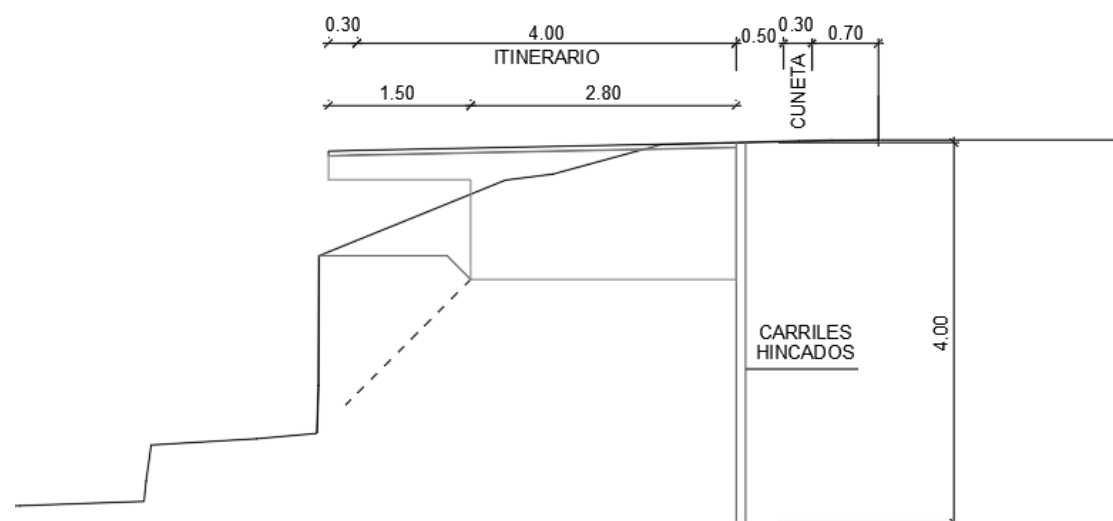


Se selecciona la segunda alternativa por considerarla la más sencilla y la que menor afecciones genera sobre el cauce existente.

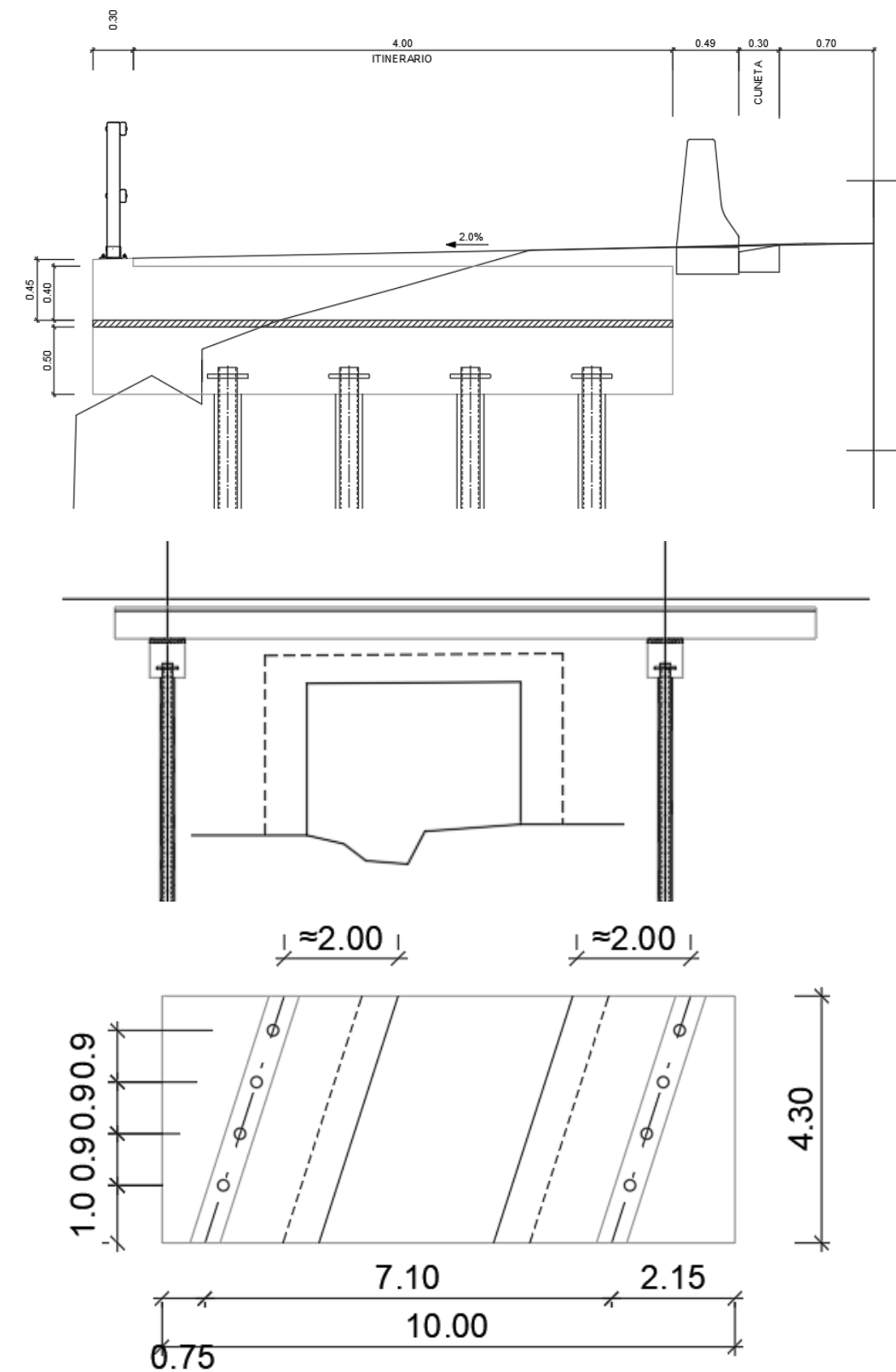
La solución consiste en una sección de hormigón en masa formada por un contrapeso de 2.80m y una losa en vuelo de 1.50m. La altura del contrapeso es de 1.30m y el espesor de la losa es de 0.25m.



Para realizar la excavación sin invadir la calzada existente se plantea el uso de carriles hincados como se muestra en la siguiente imagen:



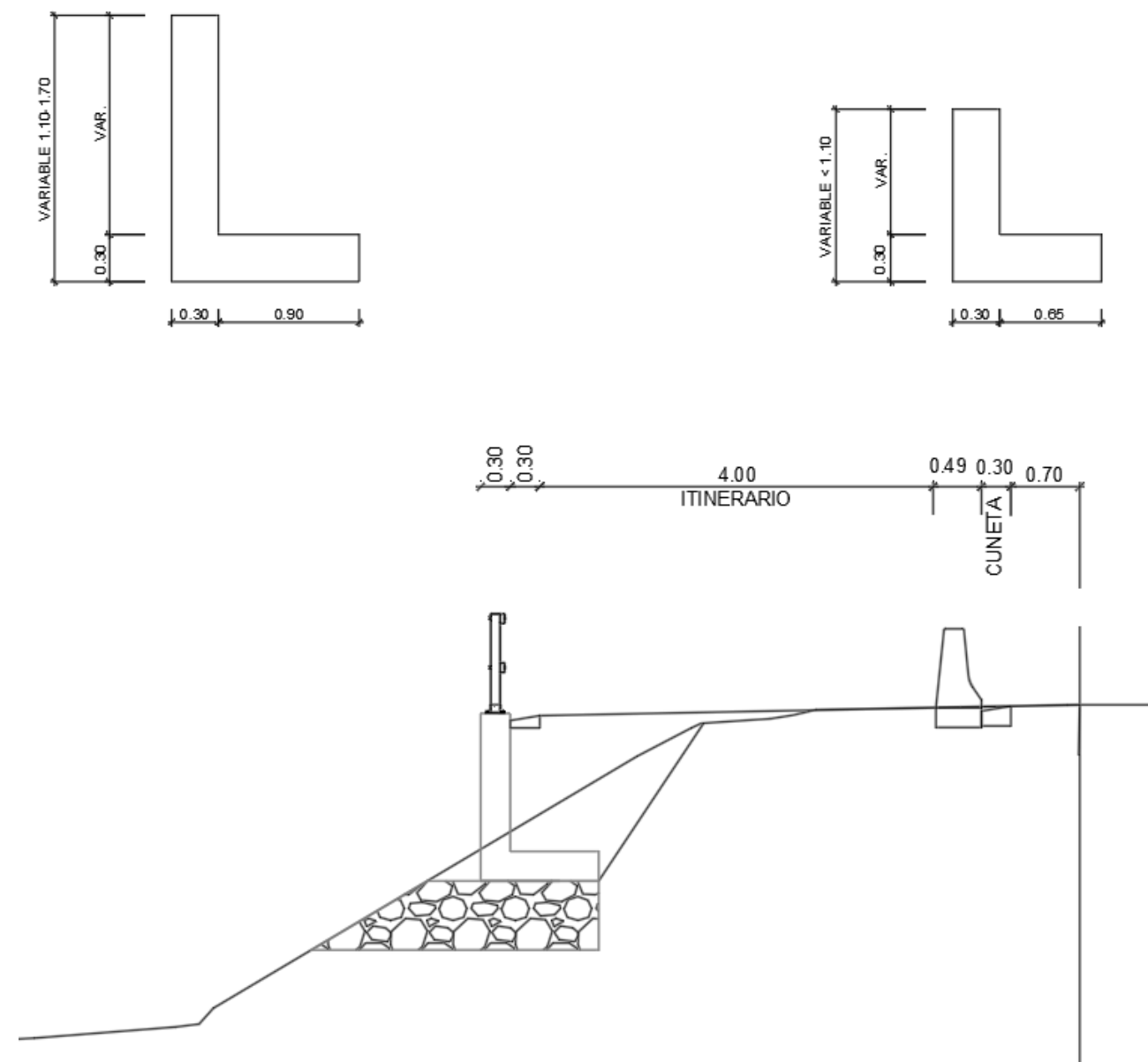
Para pasar sobre la obra de drenaje existente se plantea una estructura que puntea el marco existente. La estructura está formada por dos vigas cargadero con cuatro micropilotes cada una. Sobre las vigas apoya una losa de 40cm de espesor.



La losa se apoyará sobre las vigas sobre una lámina de porexpan. En el informe geotécnico no hay datos para el diseño de cimentaciones profundas. Se ha considerado que los micropilotes se empotran en la "Unidad 2 – Arcillas y limos con indicios de arenas", que se estima se encuentra a una profundidad de unos 15.0m-16.0m. Para esta unidad se ha tomado como valor de resistencia por fuste 200kPa. La validez de estos datos será comprobada en obra.

9.5.- ODT 5

Para contener el talud en la zona de la ODT-5 se diseña un muro de hormigón armado ejecutado in-situ. Se divide el muro en dos secciones tipo, una para alturas de hasta 1.0m y otro para alturas entre 1.0-1.75m.

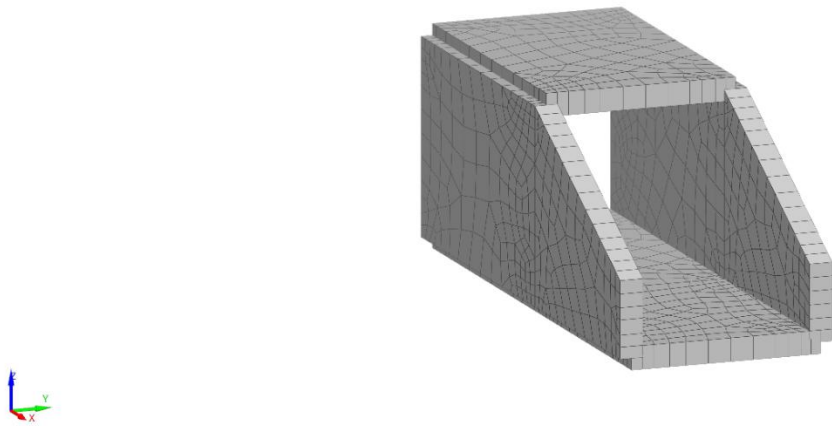


En el trasdós de los muros se dispondrá de una capa de 50cm de material granular para facilitar el drenaje hasta un tubo de desagüe que se ubicará por encima del plano de la solera, para evitar acumulación de agua y el consiguiente incremento del empuje que ocasionaría. El trasdós del muro se impermeabilizará con pintura bituminosa.

10.- RESULTADOS

10.1.- ODT 1

Se realiza un modelo FEM en 3D con elementos tipos placa.



A continuación, se muestra los resultados incluyendo:

- 1. Tablas con el cálculo de la armadura mínima y la resistencia a cortante sin armadura.
- 2. Características del modelo FEM.
- 3. Reacciones en el terreno por caso de carga y en ELS.
- 4. Esfuerzos por caso de carga y ELU.
- 5. Armado.

Cuantías mínimas

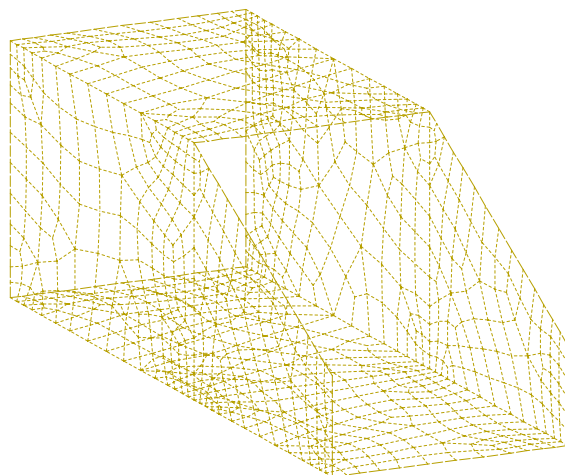
fck =30 Mpa			
Canto (m)	Cuantía (cm2/m)	s=15cm-->Ø	s=20cm-->Ø
0.25	4.2	12	12
0.35	5.8	12	16
0.4	6.7	12	16

Cortante sin armadura

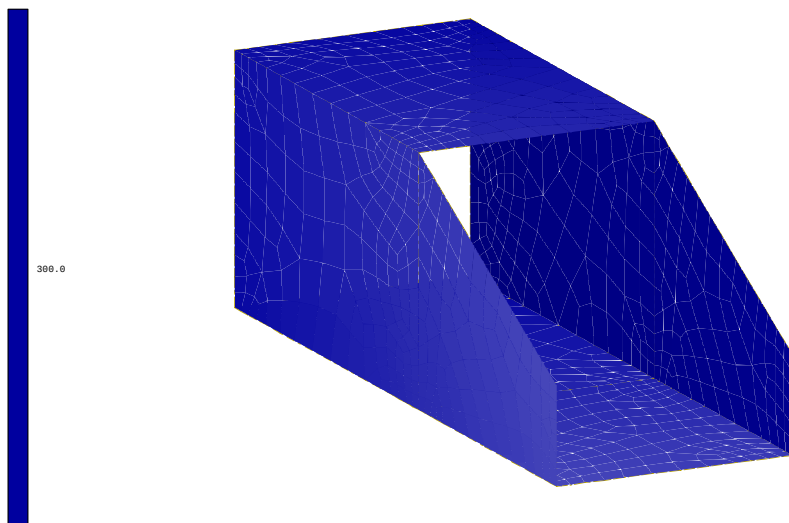
MATERIALES	
fck (Mpa)	30
f _{yk} (Mpa)	500
f _{yd} (Mpa)	435
f _{ct,m} (Mpa)	2.9

DIMENSIONES	
b0 (m)	1
H (m)	0.3
d (m)	0.25

CAPACIDAD SIN ARM	
ε	1.89
k	1.89
Vu2 min (kN) EHE	179
VRd,c min (kN) CE	125

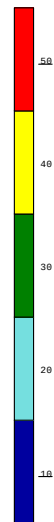


Structure
Z
Y
X



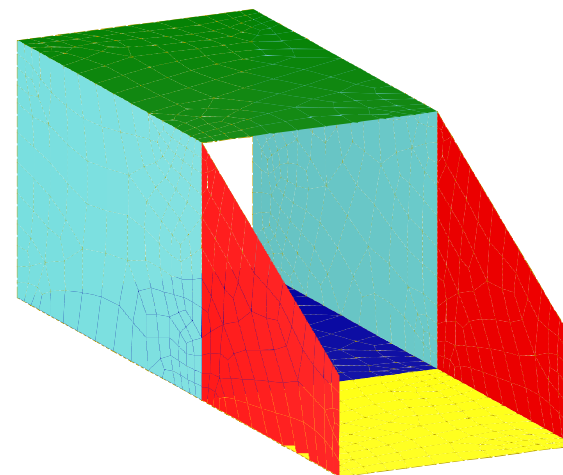
Quadrilateral Elements , Average plate thickness in mm (Max=300)
Z
Y
X

Características del modelo

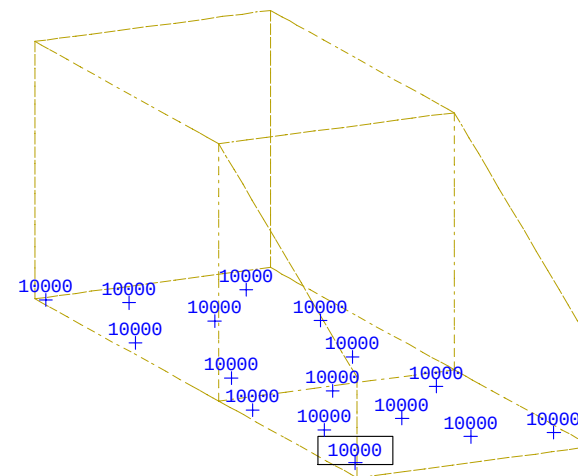


M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X

Quadrilateral Elements , Number of group (Max=50)



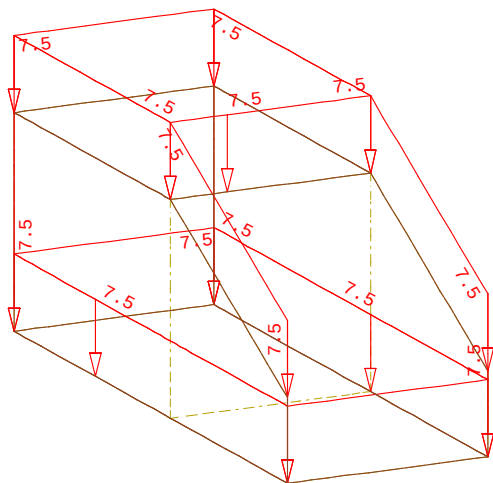
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X

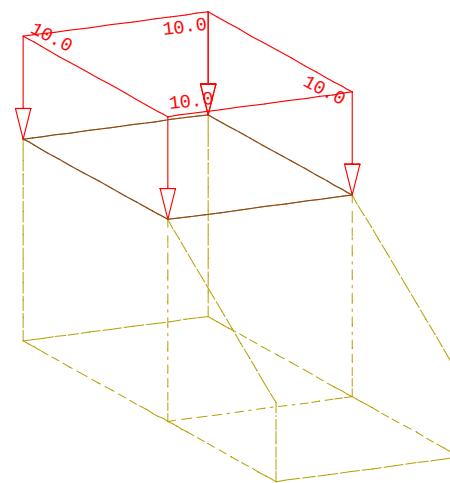
Elastic bedding in Element in kN/m3 (Max=10000)

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



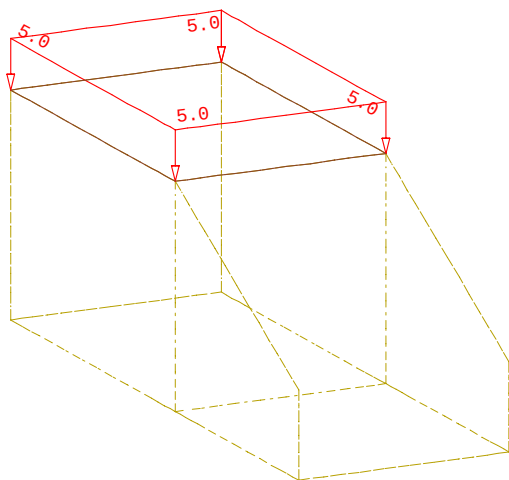
z All loads, Loadcase 1 Peso propio , (1 cm 3D = unit) QUAD-Area dead load in global Z in
Y X Element (Unit=5.0 kN/m2 ∇) (Min=-7.5) (Max=-7.5)

M 1 : 60
X * 0.502
Y * 0.906
Z * 0.962



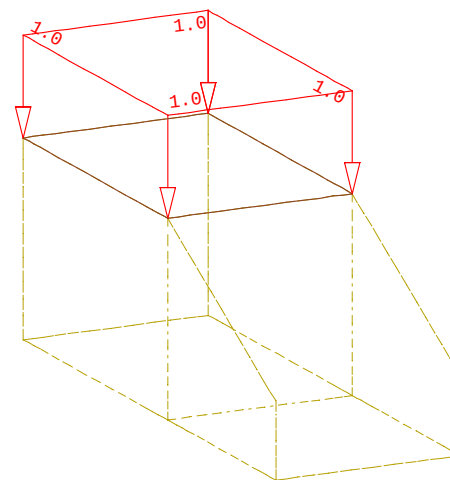
z All loads, Loadcase 2 Peso tierras , (1 cm 3D = unit) Free area load (force) in global Z
Y X (Unit=5.0 kN/m2 ∇) (Min=-10.0) (Max=-10.0)

M 1 : 65
X * 0.502
Y * 0.906
Z * 0.962



z All loads, Loadcase 3 Peso aglomerado , (1 cm 3D = unit) Free area load (force) in global
Y X Z (Unit=5.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)

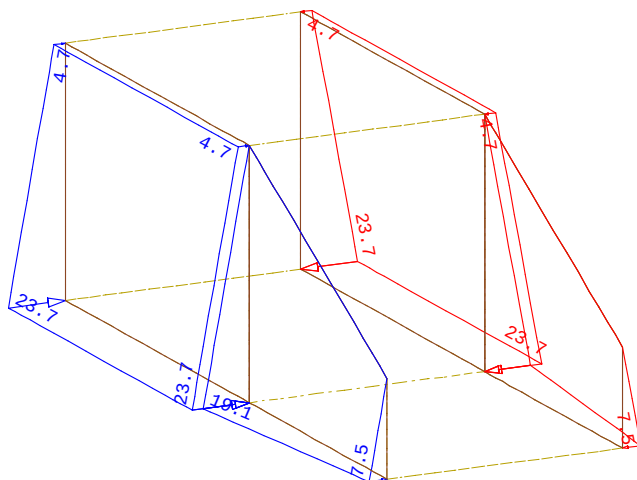
M 1 : 57
X * 0.502
Y * 0.906
Z * 0.962



z All loads, Loadcase 4 Rozamiento negativo , (1 cm 3D = unit) Free area load (force) in
Y X global Z (Unit=0.5 kN/m2 ∇) (Min=-1.0) (Max=-1.0)

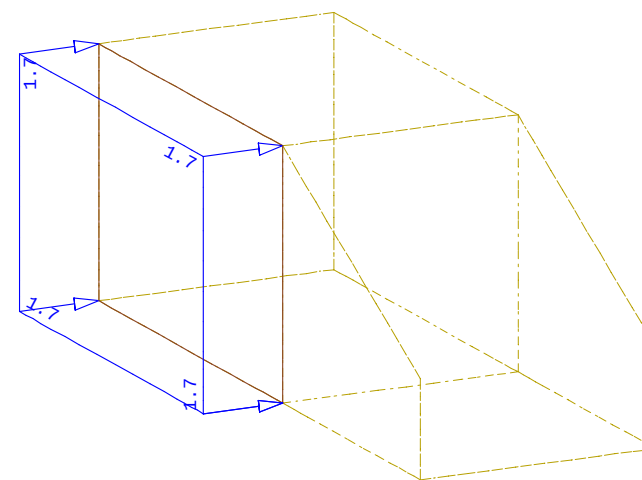
M 1 : 65
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo



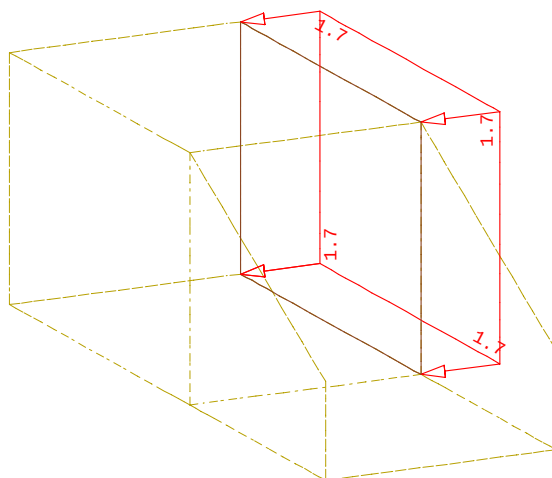
z All loads, Loadcase 5 Empuje tierras , (1 cm 3D = unit) Free area load (force) in global
Y (Unit=20.0 kN/m2 ∇) (Min=-23.8) (Max=23.8)

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



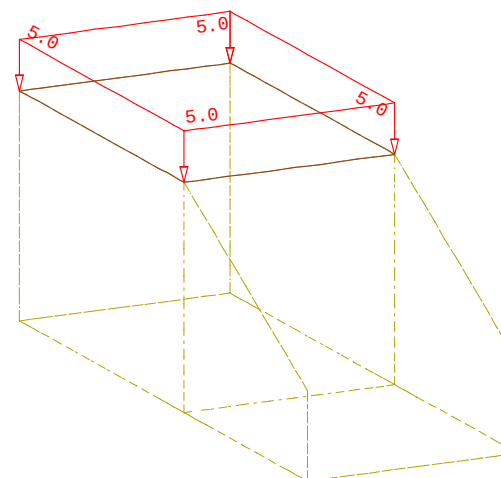
z All loads, Loadcase 6 Sobrecarga uso terraplenes 1 , (1 cm 3D = unit) Free area load
(force) in global Y (Unit=1.0 kN/m2 ∇) (Max=1.6)

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



z All loads, Loadcase 7 Sobrecarga uso terraplenes 2 , (1 cm 3D = unit) Free area load
(force) in global Y (Unit=1.0 kN/m2 ∇) (Min=-1.6) (Max=-1.6)

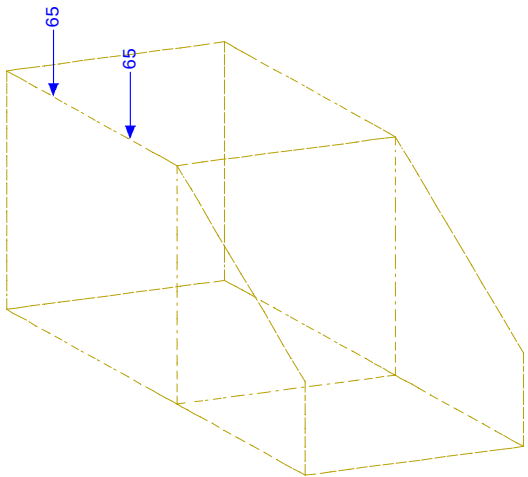
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



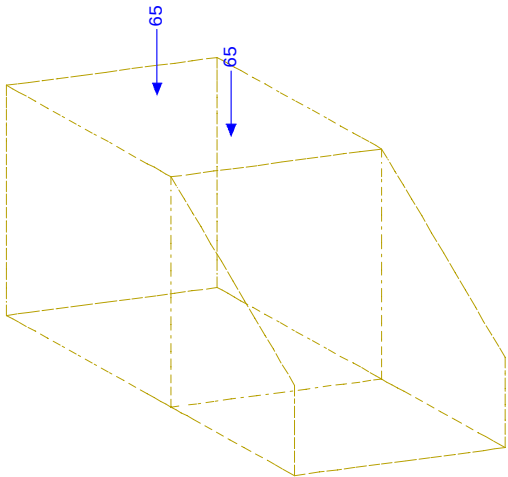
z All loads, Loadcase 8 Sobrecarga uniforme , (1 cm 3D = unit) Free area load (force) in
global Z (Unit=5.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)

M 1 : 57
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo

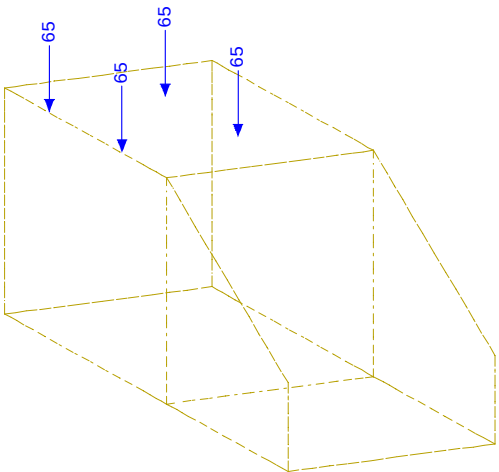


z All loads, Loadcase 9 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

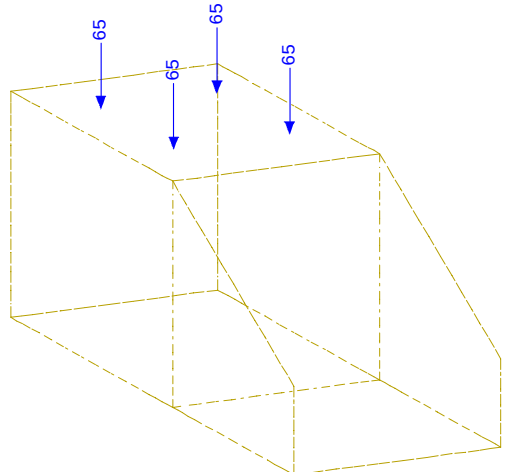


M 1 : 55
x * 0.502
y * 0.906
z * 0.962
z All loads, Loadcase 10 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 57
x * 0.502
y * 0.906
z * 0.962



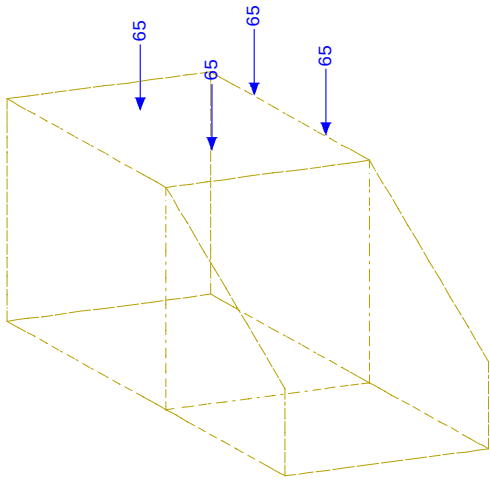
z All loads, Loadcase 11 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)



M 1 : 58
x * 0.502
y * 0.906
z * 0.962
z All loads, Loadcase 12 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

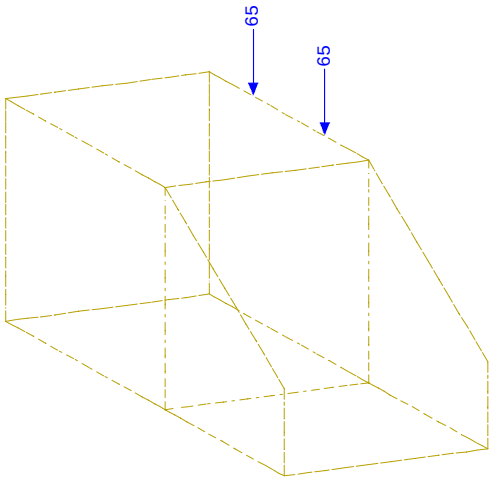
M 1 : 58
x * 0.502
y * 0.906
z * 0.962

Características del modelo



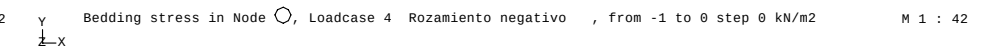
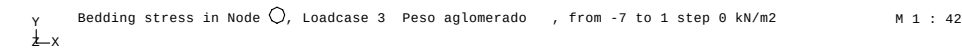
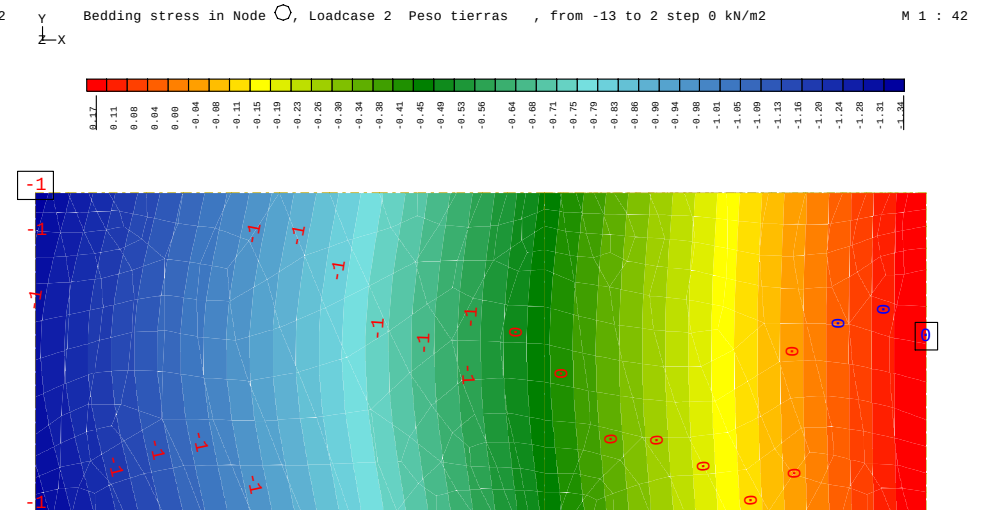
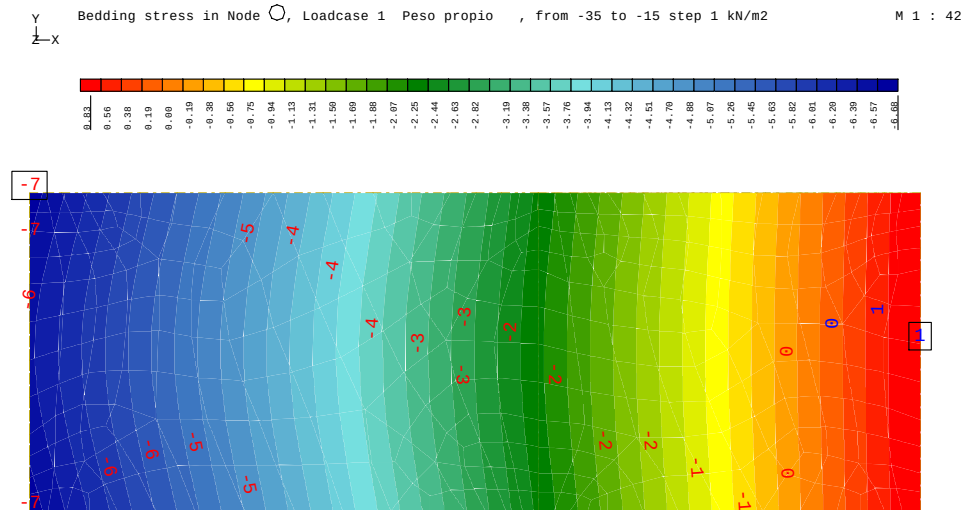
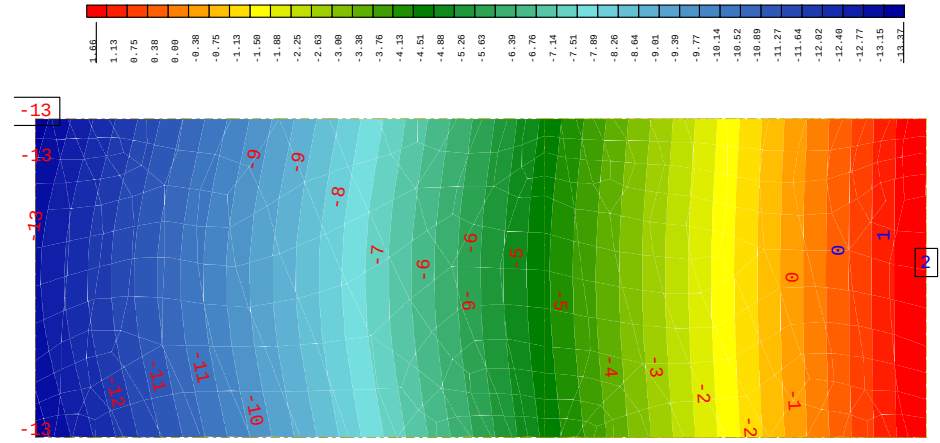
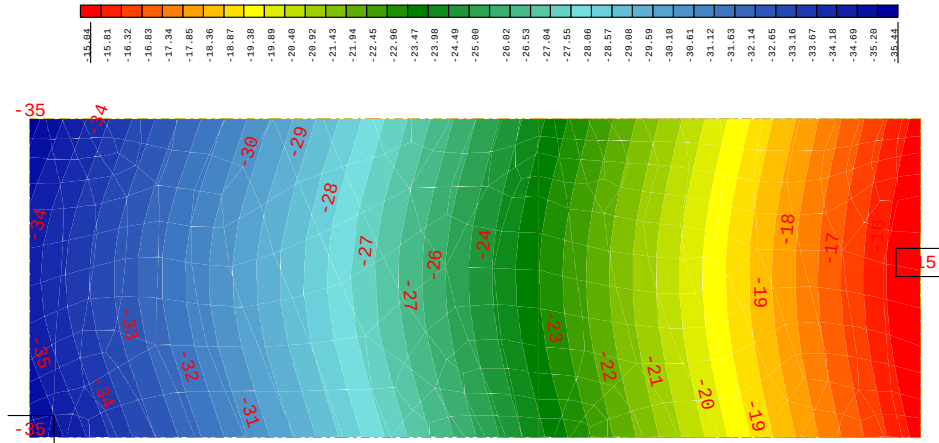
z All loads, Loadcase 13 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 59
x * 0.502
y * 0.906
z * 0.962

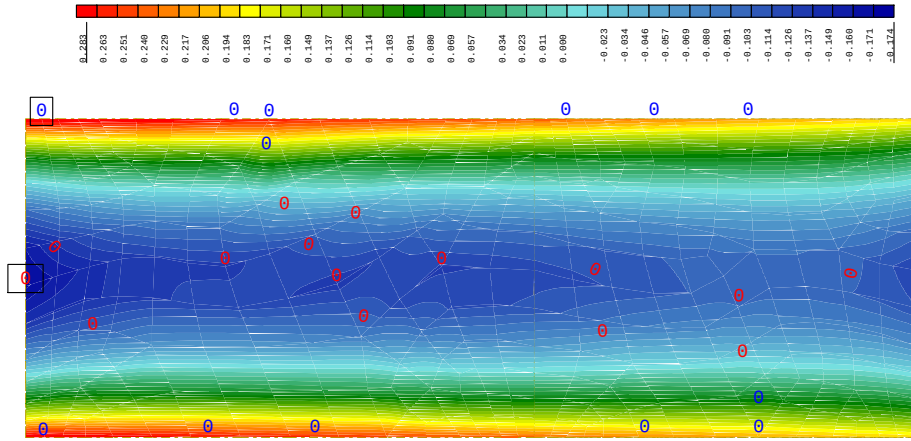


z All loads, Loadcase 14 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 59
x * 0.502
y * 0.906
z * 0.962

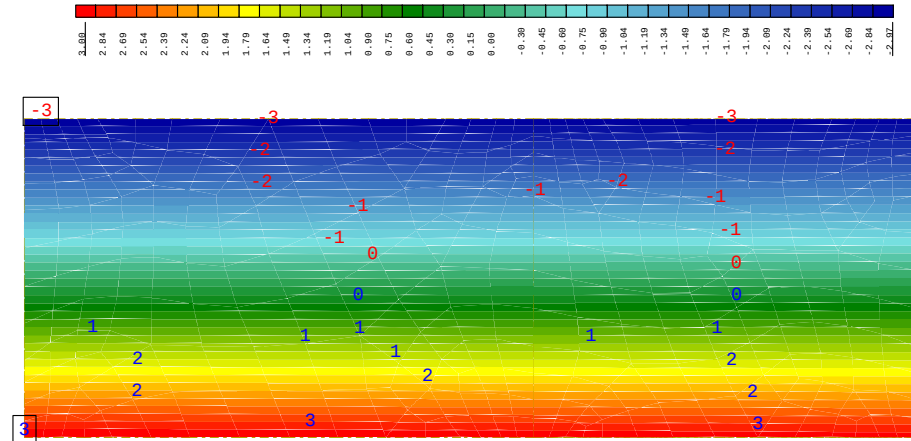


Reacciones terreno LC y ELS



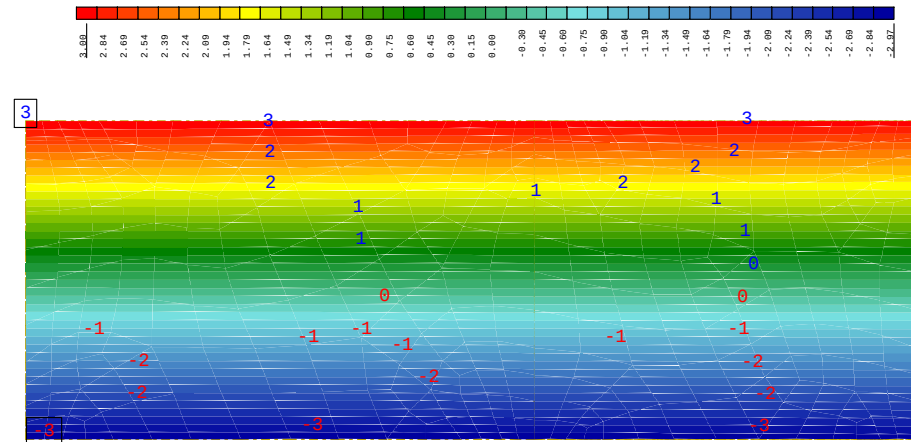
Bedding stress in Node $\bigcirc$, Loadcase 5 Empuje tierras , from 0 to 0 step 0 kN/m2

M 1 : 42



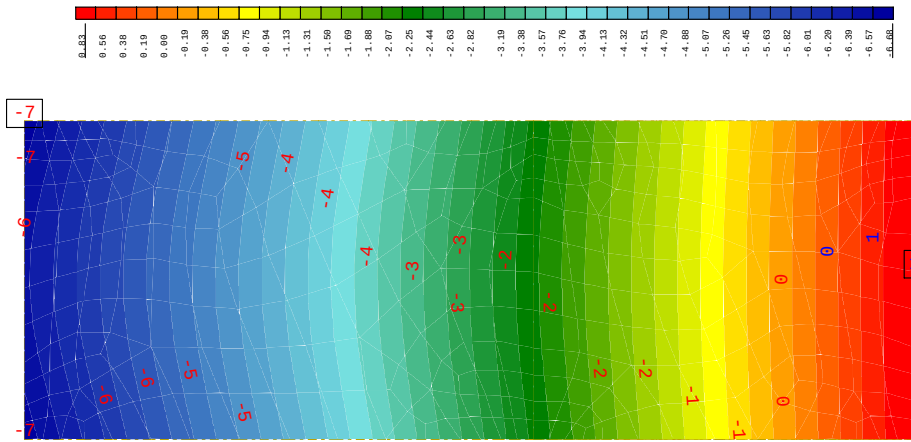
Bedding stress in Node $\bigcirc$, Loadcase 6 Sobrecarga uso terraplenes 1 , from -3 to 3 step 0 kN/m2

M 1 : 42



Bedding stress in Node $\bigcirc$, Loadcase 7 Sobrecarga uso terraplenes 2 , from -3 to 3 step 0 kN/m2

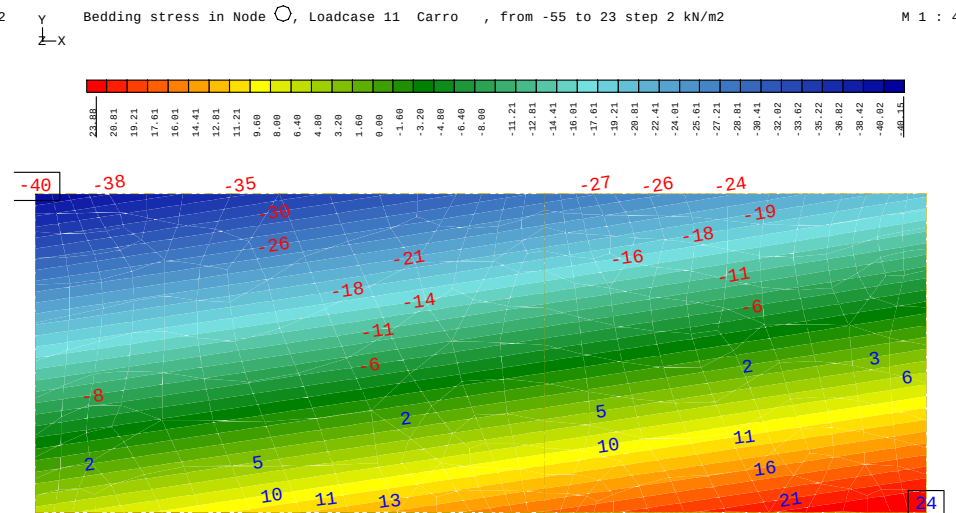
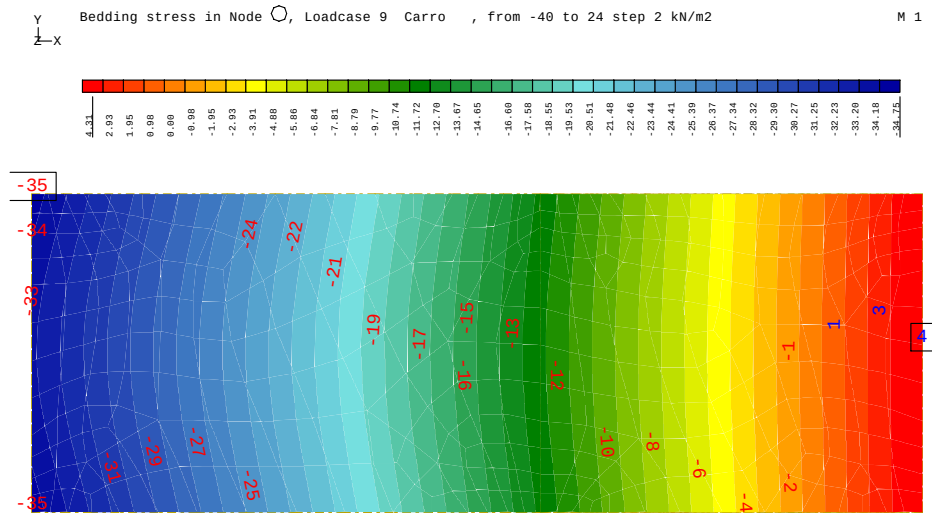
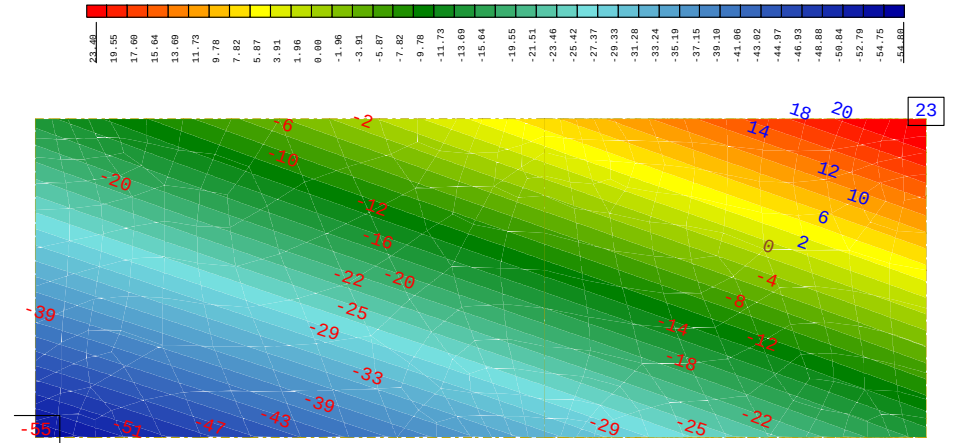
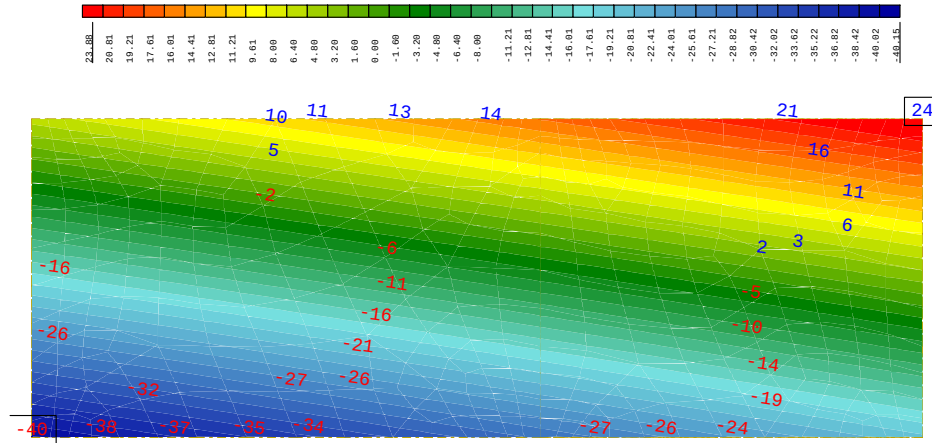
M 1 : 42



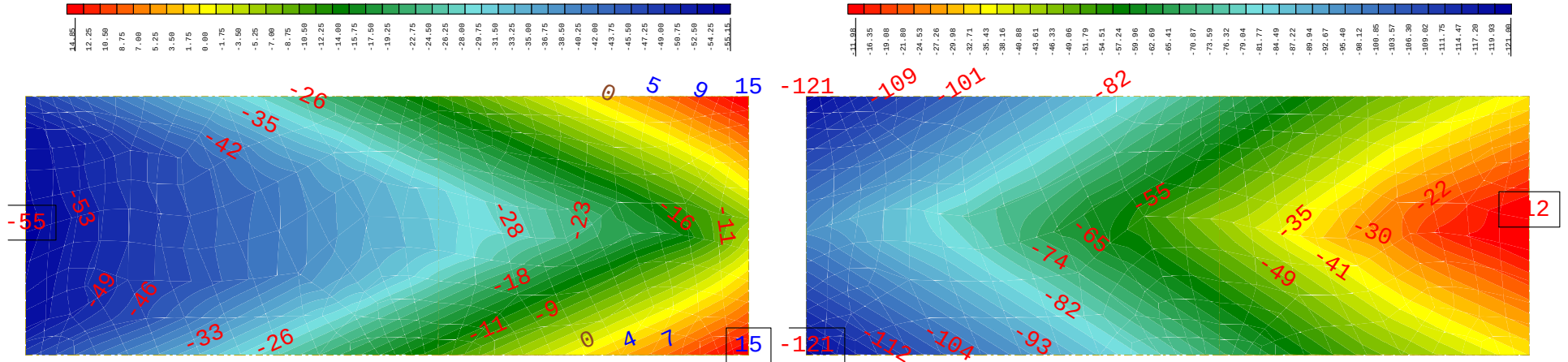
Bedding stress in Node $\bigcirc$, Loadcase 8 Sobrecarga uniforme , from -7 to 1 step 0 kN/m2

M 1 : 42

Reacciones terreno LC y ELS

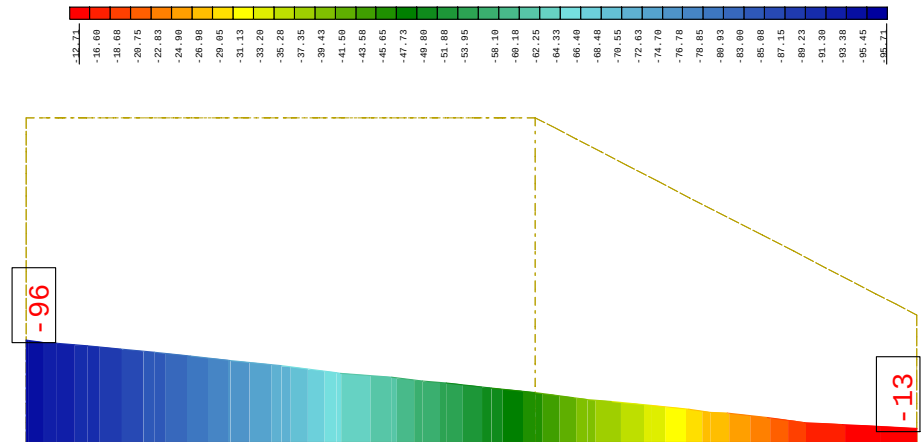
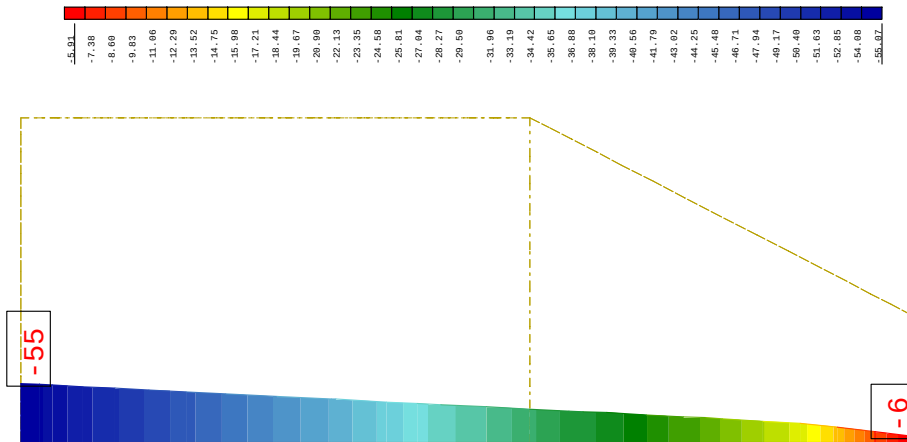


Reacciones terreno LC y ELS



Y Bedding stress in Node ○, Loadcase 1117 MAXR-P QUAD Bedding Stresses , from -55 to 15 M 1 : 42
Z-X step 2 kN/m2

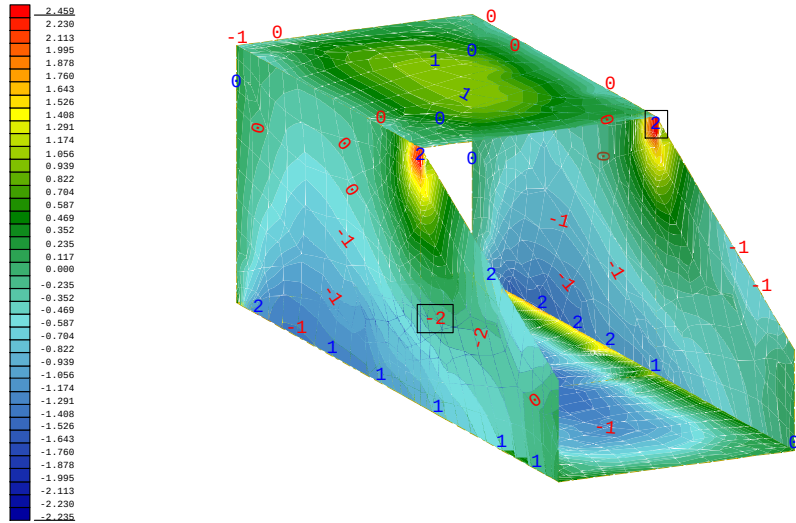
Y Bedding stress in Node ○, Loadcase 1118 MINR-P QUAD Bedding Stresses , from -121 to -12 M 1 : 42
Z-X step 3 kN/m2



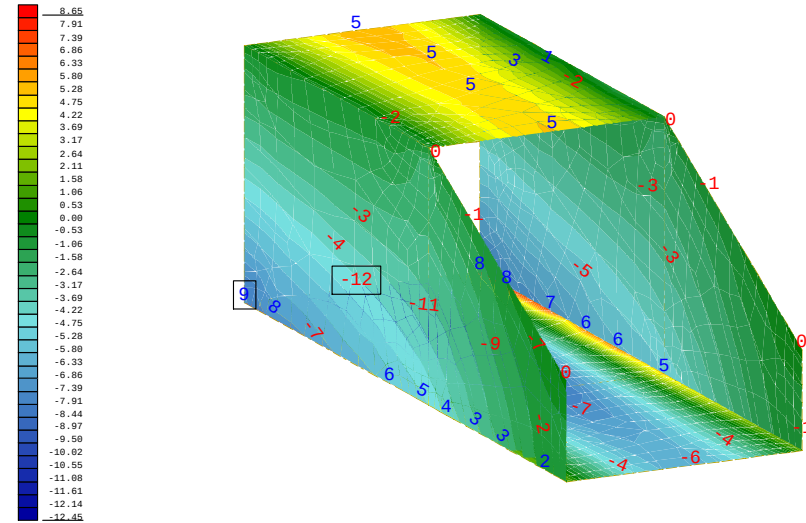
Z Bedding stress in Node ↓, Loadcase 1117 MAXR-P QUAD Bedding Stresses , 1 cm 3D = 50.000 M 1 : 42
Y-X kN/m2 (Min=-55) (Max=-6)

Z Bedding stress in Node ↓, Loadcase 1118 MINR-P QUAD Bedding Stresses , 1 cm 3D = 50.000 M 1 : 42
Y-X kN/m2 (Min=-96) (Max=-13)

Reacciones terreno LC y ELS

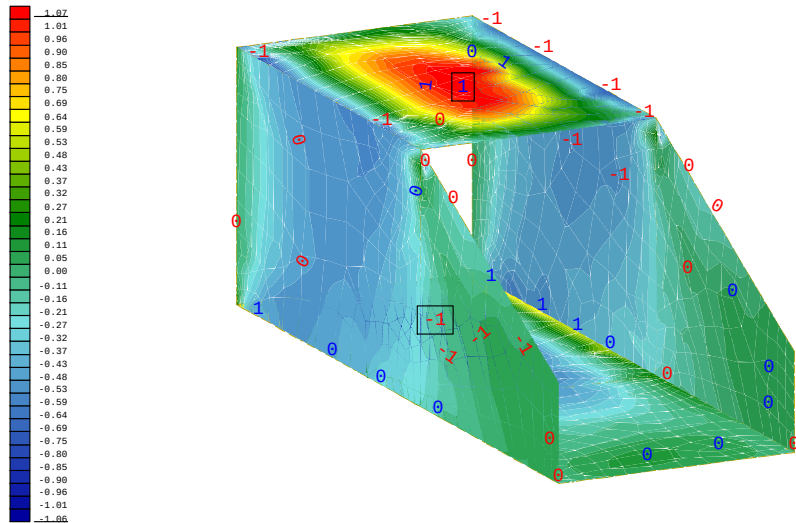


Bending moment m-xx in local x in Node , Loadcase 1 Peso propio , from -2 to 2 step 0
kNm/m

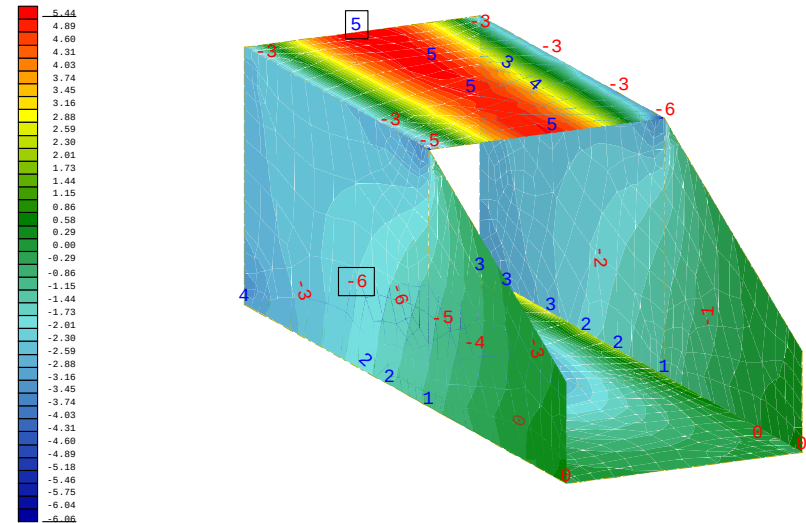


Bending moment m-yy in local y in Node, Loadcase 1 Peso propio , from -12 to 9 step 1
kNm/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



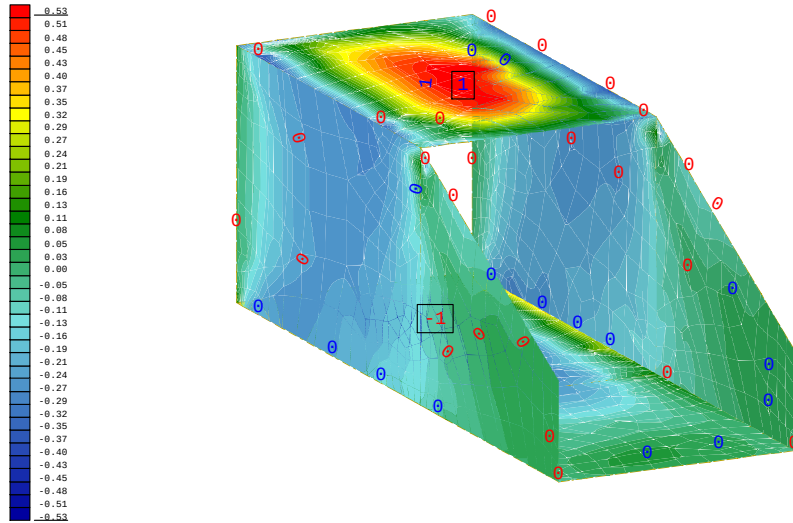
Bending moment m-xx in local x in Node , Loadcase 2 Peso tierras , from -1 to 1 step 0
kNm/m



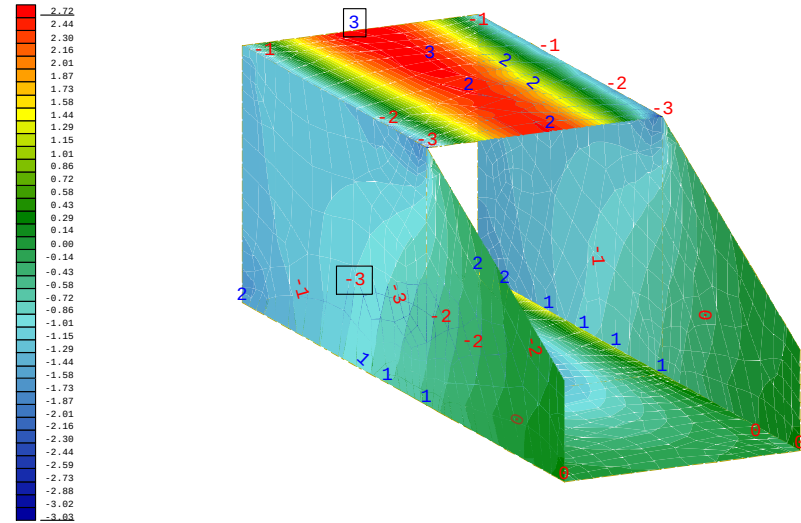
Bending moment m-yy in local y in Node, Loadcase 2 Peso tierras , from -6 to 5 step 0
kNm/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

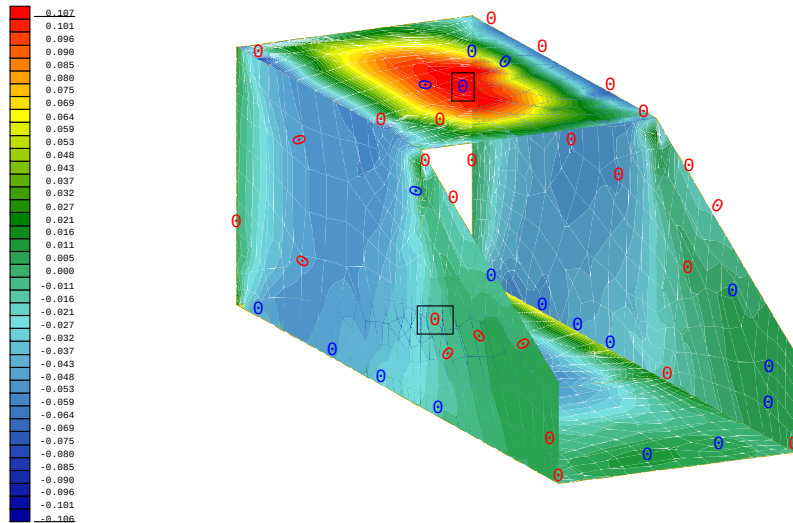


Bending moment m-xx in local x in Node $\rightarrow$, Loadcase 3 Peso aglomerado , from -1 to 1 step 0 kNm/m

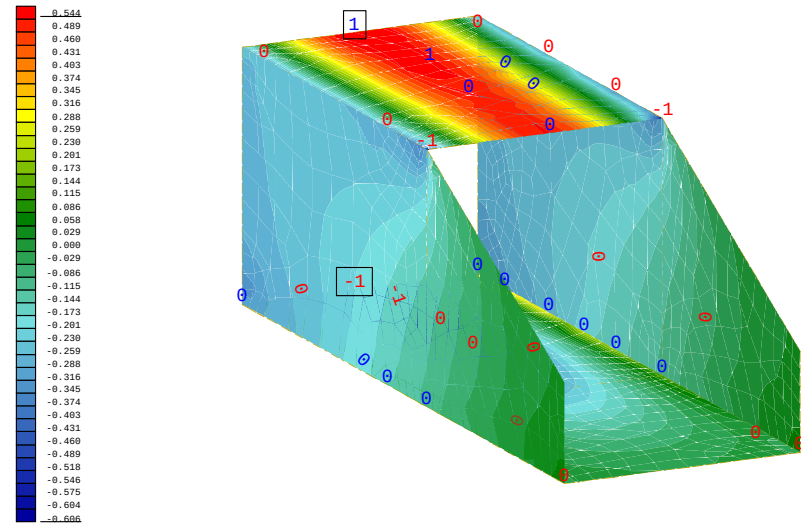


Bending moment m-yy in local y in Node, Loadcase 3 Peso aglomerado , from -3 to 3 step 0 kNm/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



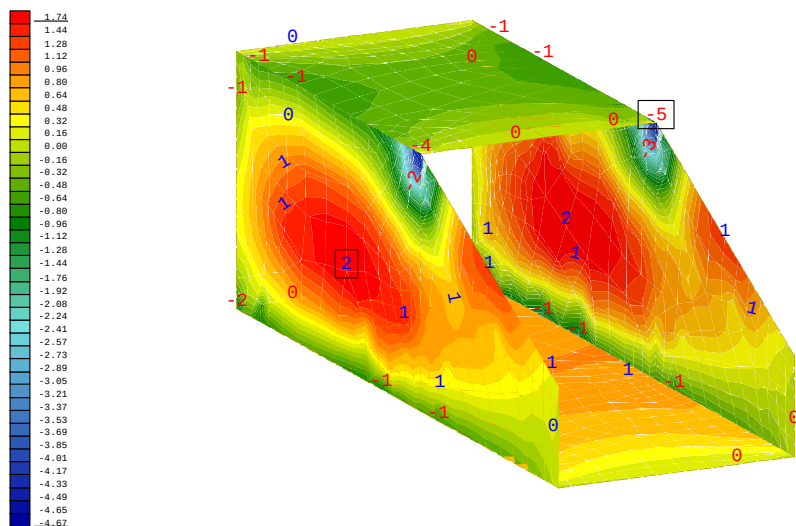
Bending moment m-xx in local x in Node $\rightarrow$, Loadcase 4 Rozamiento negativo , from 0 to 0 step 0 kNm/m



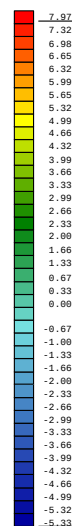
Bending moment m-yy in local y in Node, Loadcase 4 Rozamiento negativo , from -1 to 1 step 0 kNm/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

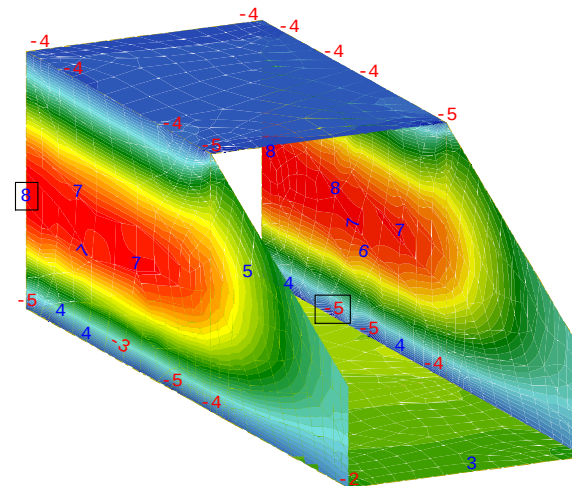
Esfuerzos LC y ELU



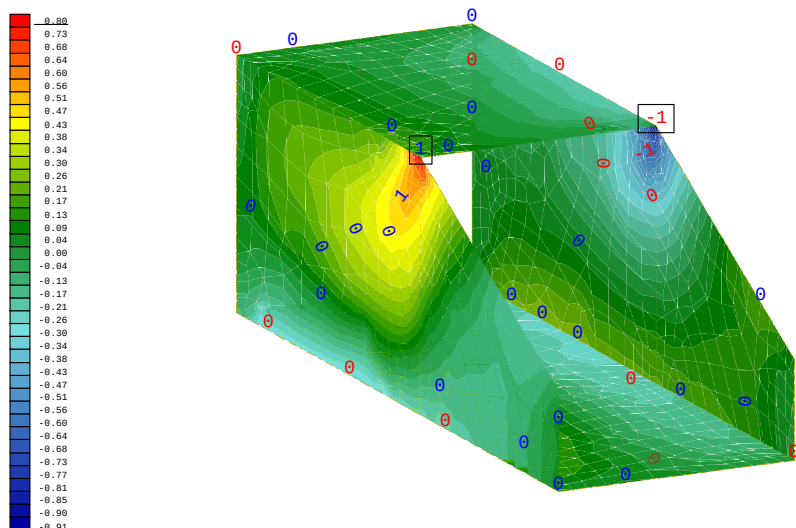
Bending moment m-xx in local x in Node , Loadcase 5 Empuje tierras , from -5 to 2 step 0
kNm/m



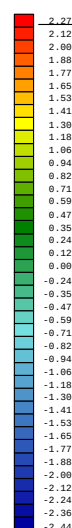
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Bending moment m-yy in local y in Node, Loadcase 5 Empuje tierras , from -5 to 8 step 0
kNm/m



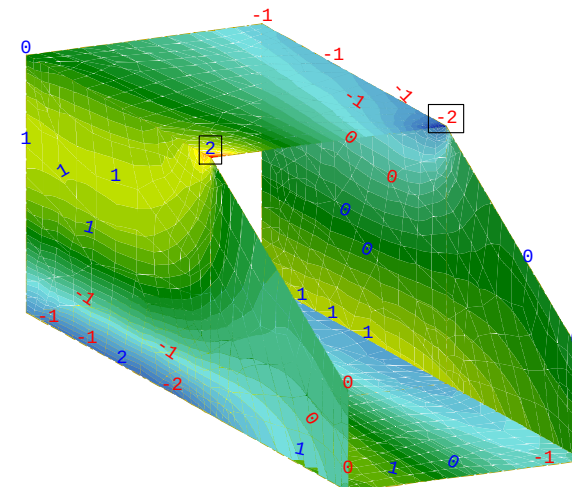
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



Bending moment m-xx in local x in Node , Loadcase 6 Sobrecarga uso terraplenes 1 , from -1 to 1 step 0 kNm/m

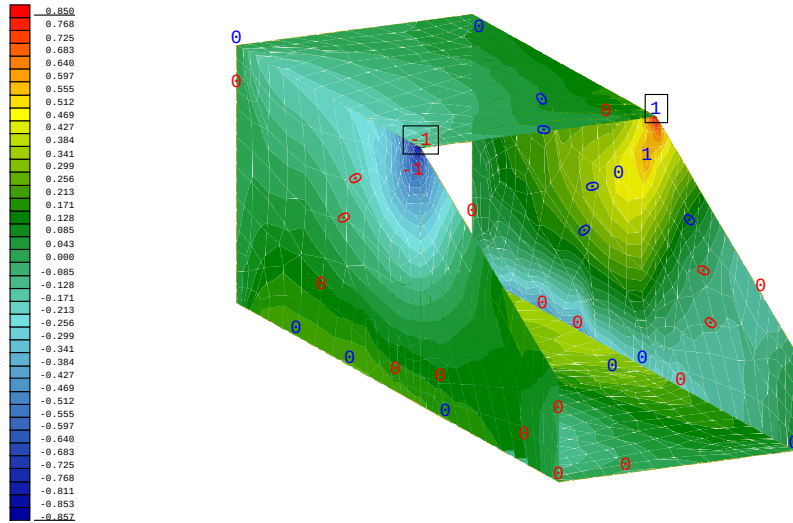


M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Bending moment m-yy in local y in Node, Loadcase 6 Sobrecarga uso terraplenes 1 , from -2 to 2 step 0 kNm/m

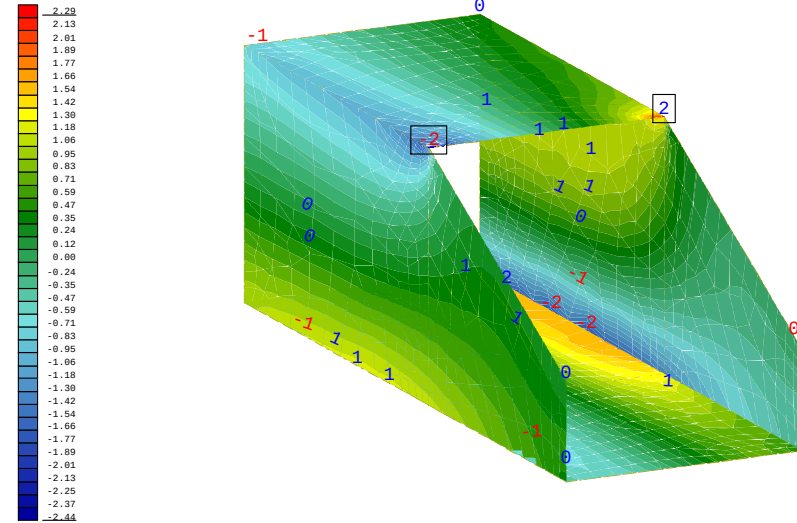


M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

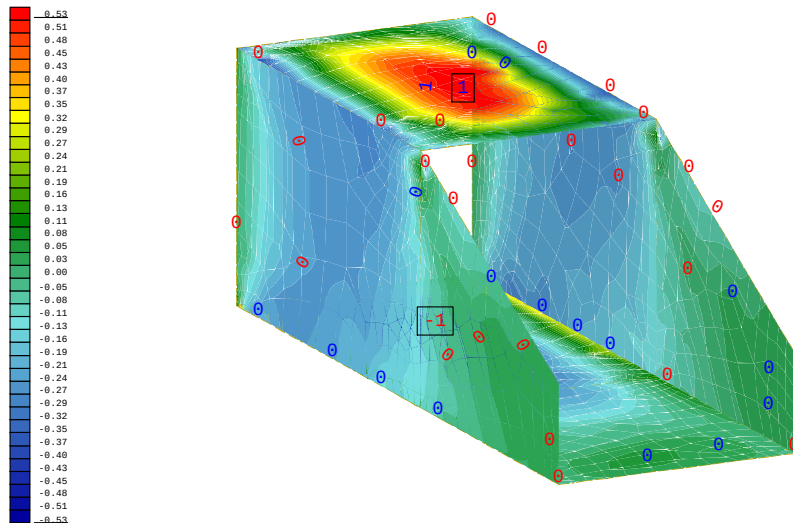


Bending moment m-xx in local x in Node , Loadcase 7 Sobrecarga uso terraplenes 2 , from -1 to 1 step 0 kNm/m

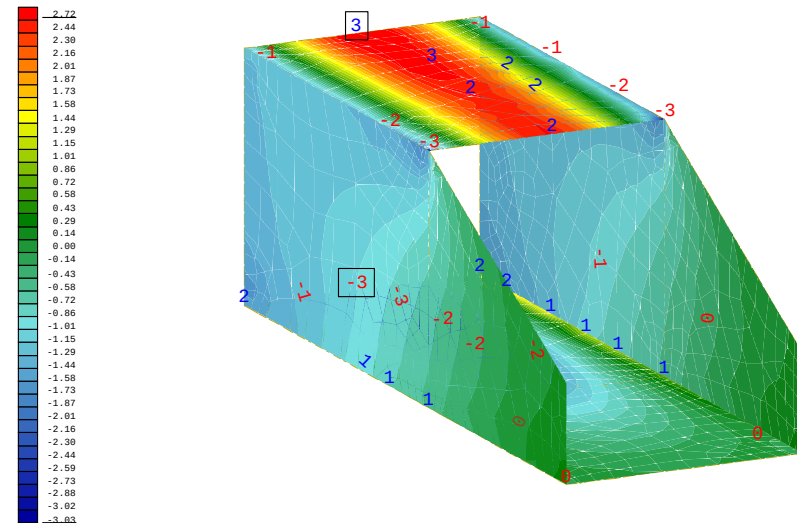


Bending moment m-yy in local y in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -2 to 2 step 0 kNm/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



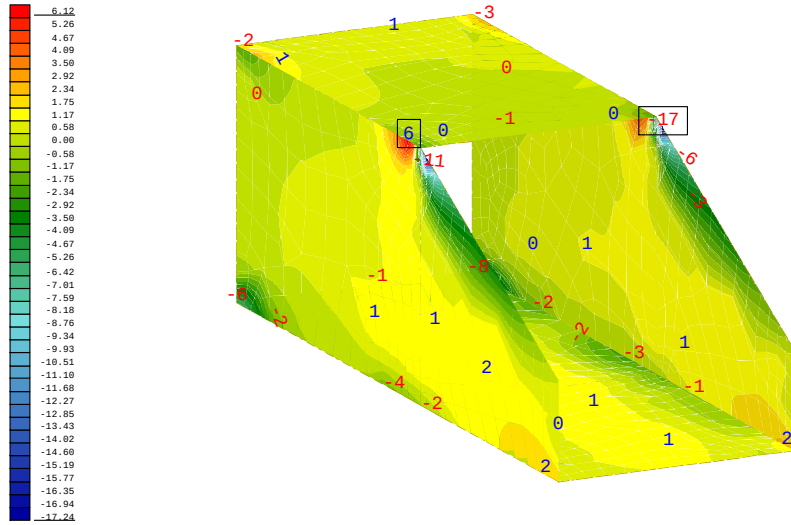
Bending moment m-xx in local x in Node , Loadcase 8 Sobrecarga uniforme , from -1 to 1 step 0 kNm/m



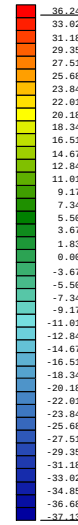
Bending moment m-yy in local y in Node, Loadcase 8 Sobrecarga uniforme , from -3 to 3 step 0 kNm/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

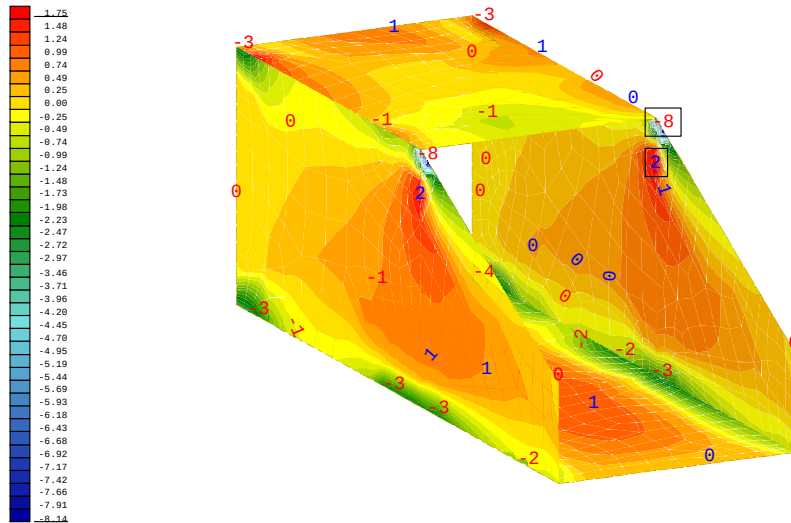


Shear force v-x in local x in Node, Loadcase 1 Peso propio, from -17 to 6 step 1 kN/m

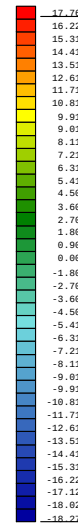


Shear force v-y in local y in Node, Loadcase 1 Peso propio, from -37 to 36 step 2 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



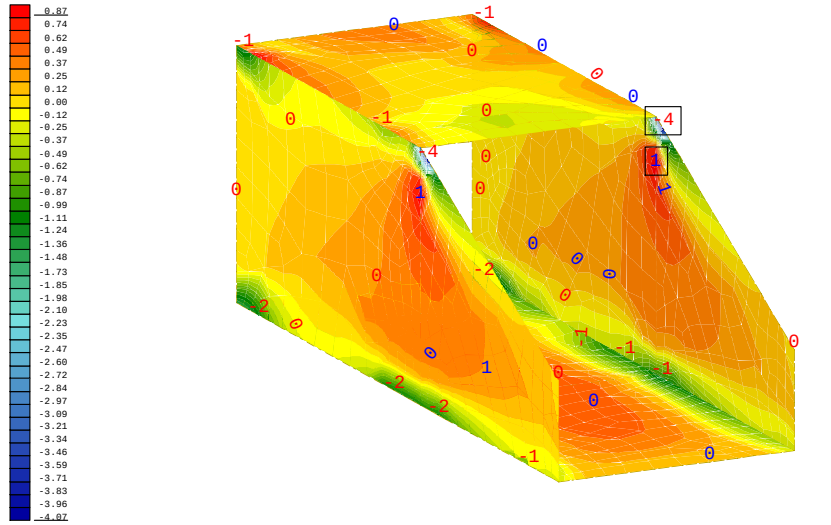
Shear force v-x in local x in Node, Loadcase 2 Peso tierras, from -8 to 2 step 0 kN/m



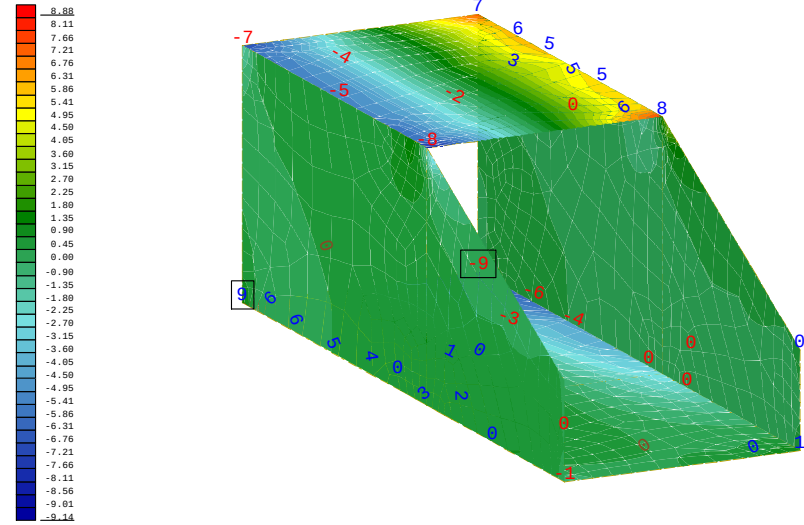
Shear force v-y in local y in Node, Loadcase 2 Peso tierras, from -18 to 18 step 1 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

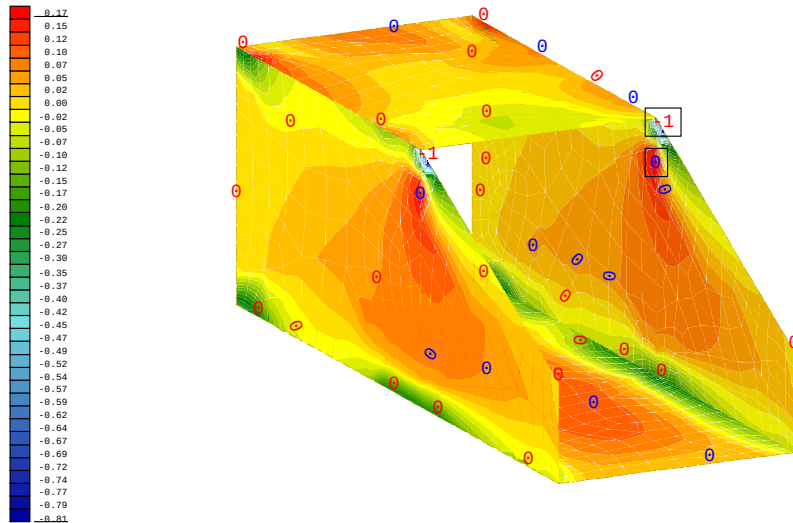


Shear force v-x in local x in Node $\rightarrow$, Loadcase 3 Peso aglomerado , from -4 to 1 step 0 kN/m

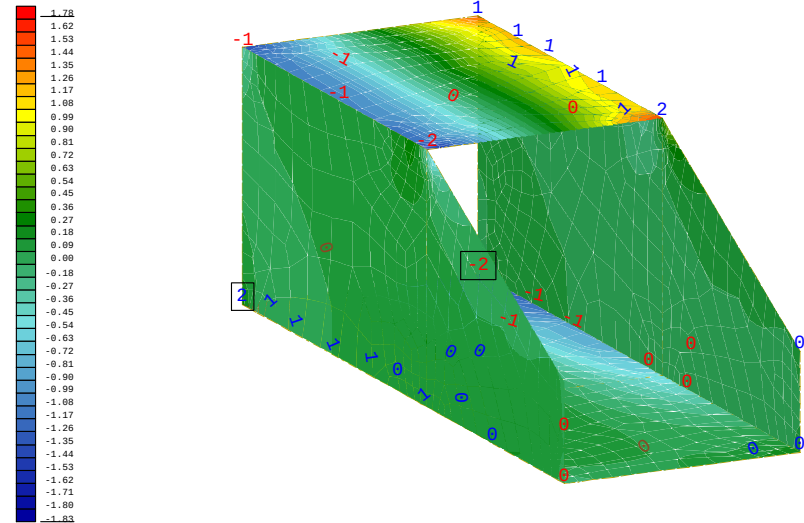


Shear force v-y in local y in Node, Loadcase 3 Peso aglomerado , from -9 to 9 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



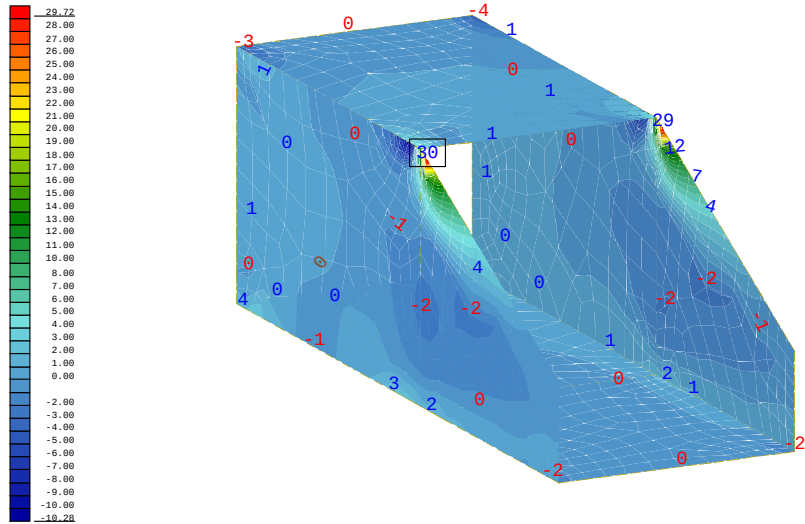
Shear force v-x in local x in Node $\rightarrow$, Loadcase 4 Rozamiento negativo , from -1 to 0 step 0 kN/m



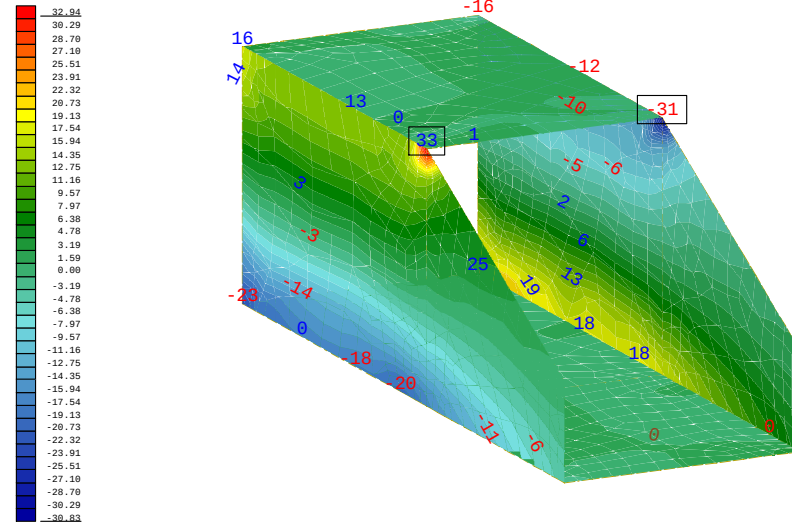
Shear force v-y in local y in Node, Loadcase 4 Rozamiento negativo , from -2 to 2 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

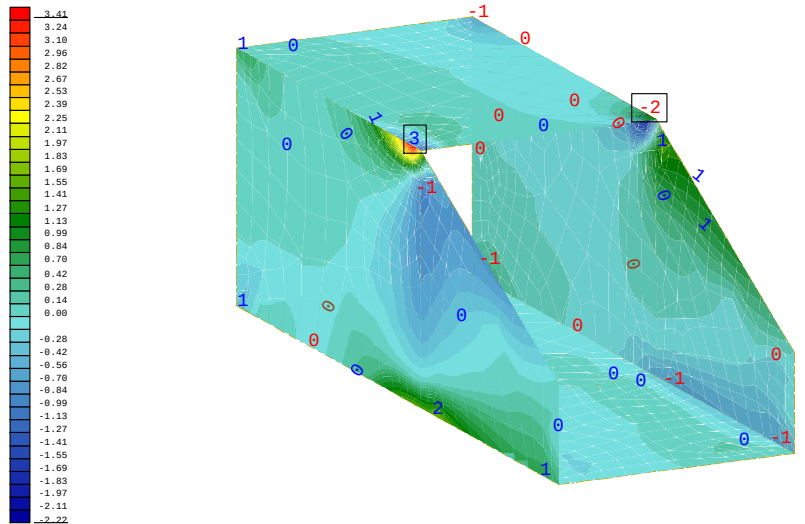


Shear force v-x in local x in Node 51, Loadcase 5 Empuje tierras, from -10 to 30 step 1 kN/m

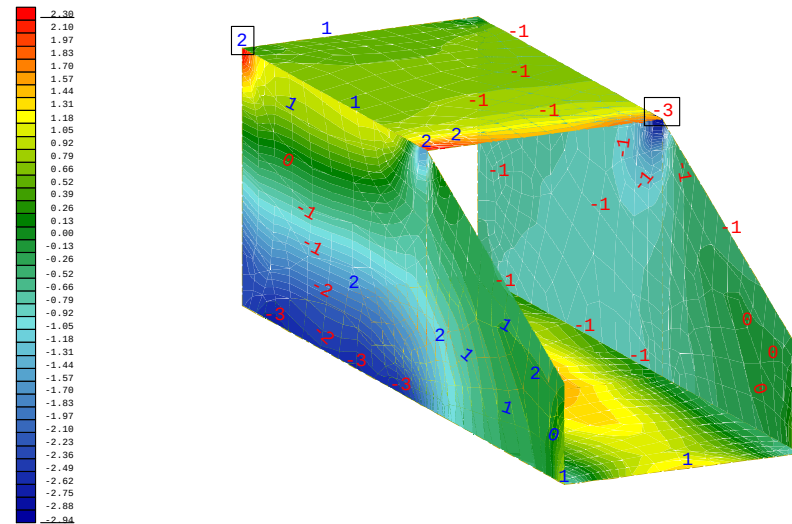


Shear force v-y in local y in Node, Loadcase 5 Empuje tierras, from -31 to 33 step 2 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



Shear force v-x in local x in Node 51, Loadcase 6 Sobrecarga uso terraplenes 1, from -2 to 3 step 0 kN/m



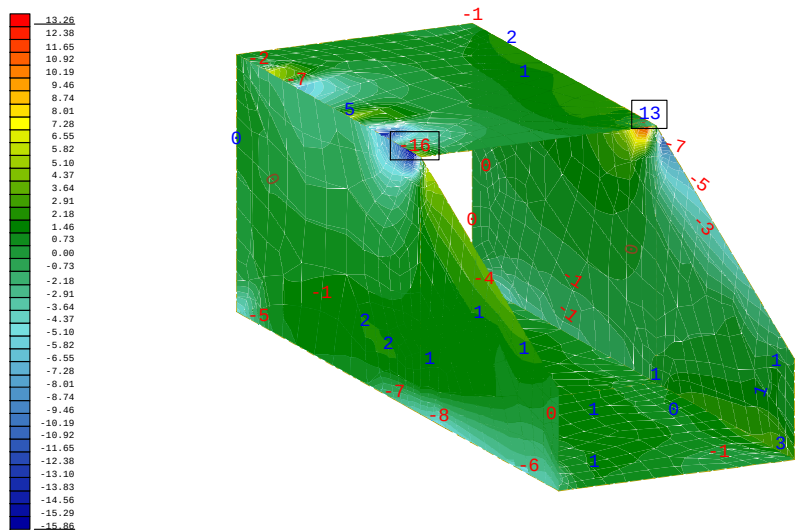
Shear force v-y in local y in Node, Loadcase 6 Sobrecarga uso terraplenes 1, from -3 to 2 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

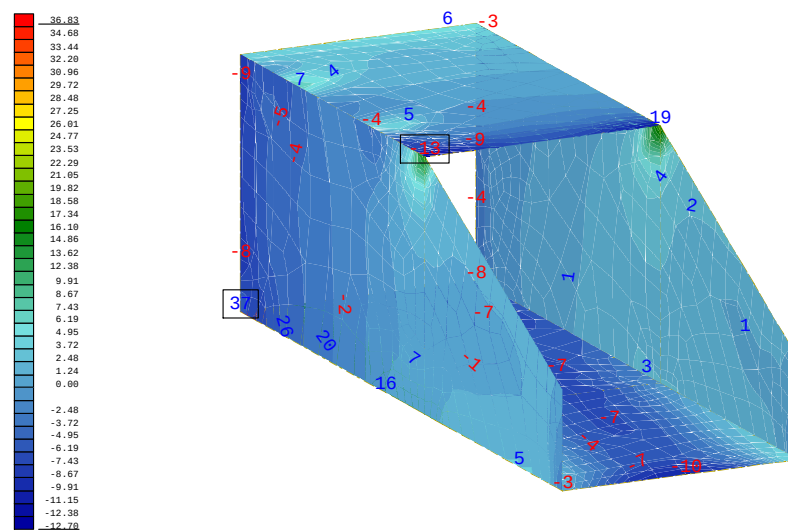
Esfuerzos LC y ELU

A 3D surface plot of a function. The color bar on the left indicates the function value, ranging from -4.82 (dark blue) to 0.87 (dark red). The surface is yellow/orange with red peaks and blue valleys. A red box highlights a peak on the right, and a blue box highlights a valley on the left.

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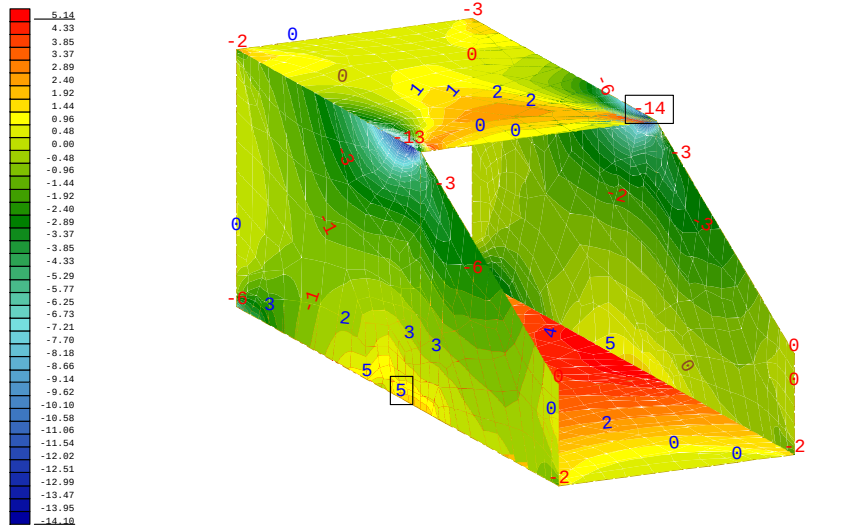


Shear force v-x in local x in Node 13, Loadcase 9 Carro, from -16 to 13 step 1 kN/m

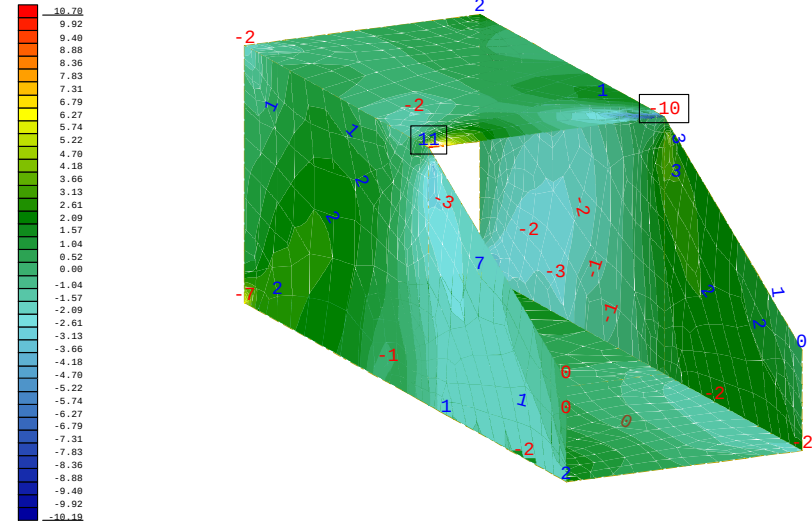


Shear force v-y in local y in Node 37, Loadcase 9 Carro, from -13 to 37 step 1 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

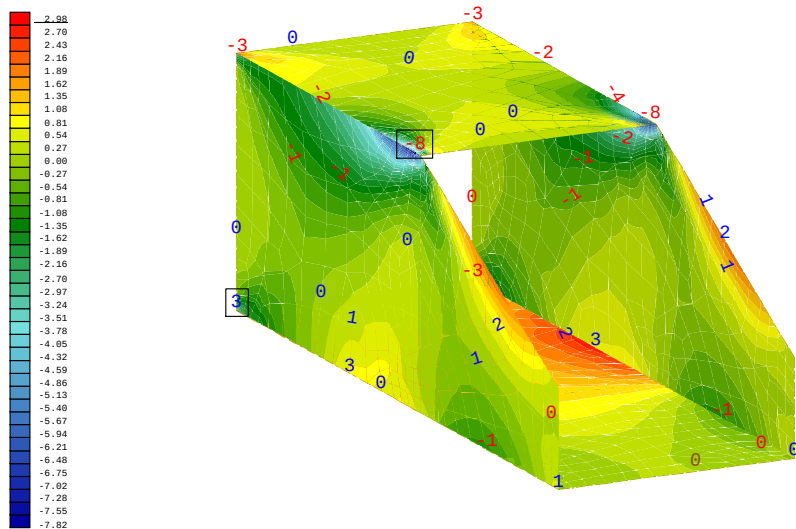


Membrane force n-xx in local x in Node, Loadcase 1 Peso propio, from -14 to 5 step 0 kN/m

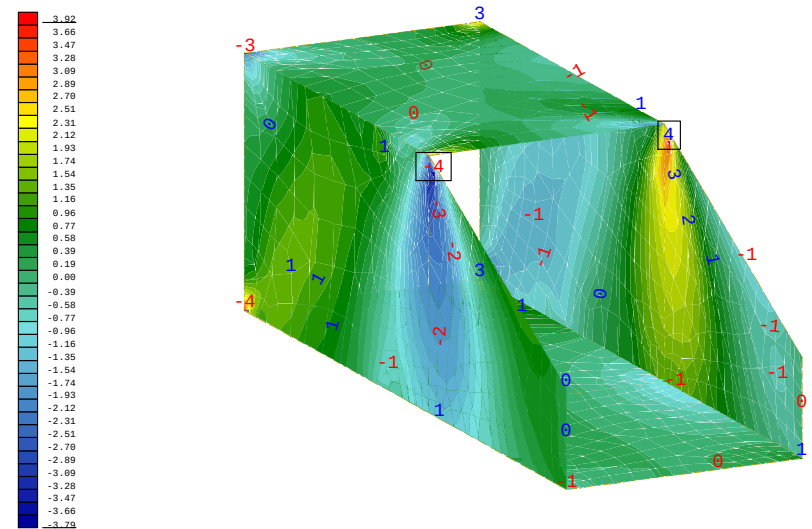


Membrane shear force n-xy in local xy in Node, Loadcase 1 Peso propio, from -10 to 11 step 1 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



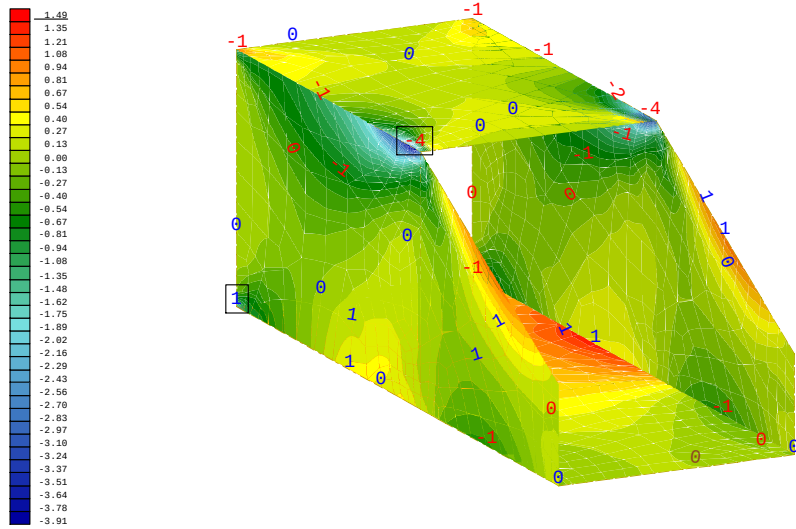
Membrane force n-xx in local x in Node, Loadcase 2 Peso tierras, from -8 to 3 step 0 kN/m



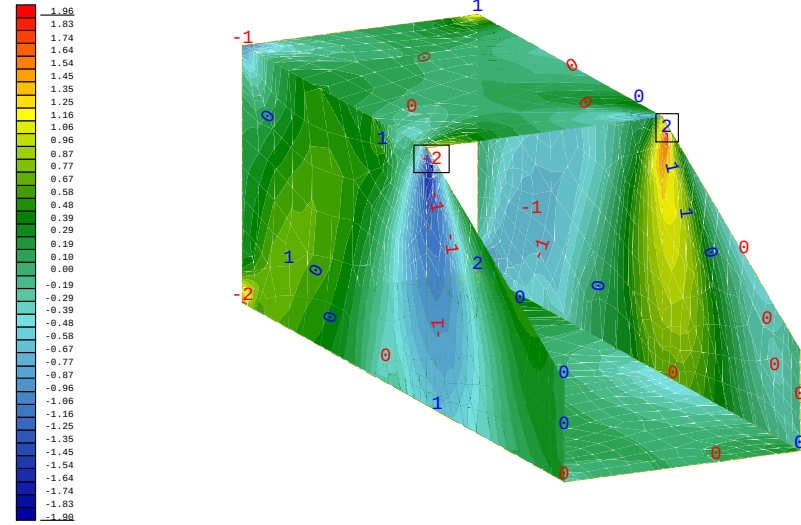
Membrane shear force n-xy in local xy in Node, Loadcase 2 Peso tierras, from -4 to 4 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

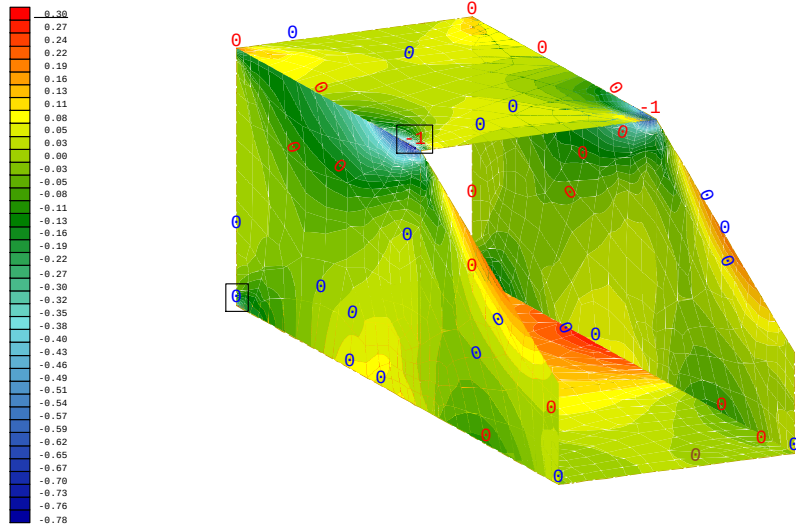


Membrane force n-xx in local x in Node, Loadcase 3 Peso aglomerado, from -4 to 1 step 0 kN/m

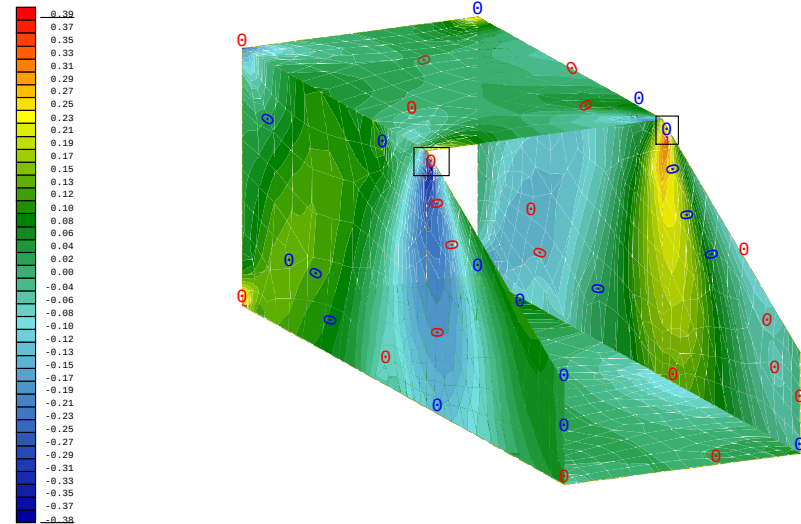


Membrane shear force n-xy in local xy in Node, Loadcase 3 Peso aglomerado, from -2 to 2 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



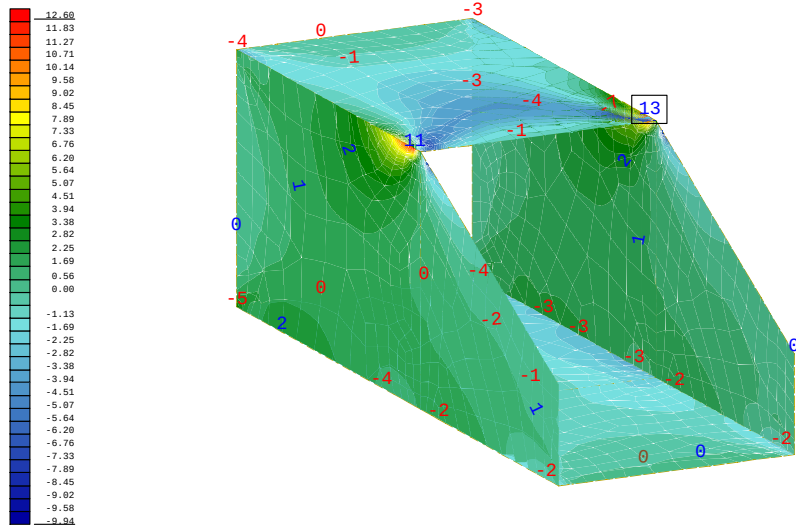
Membrane force n-xx in local x in Node, Loadcase 4 Rozamiento negativo, from -1 to 0 step 0 kN/m



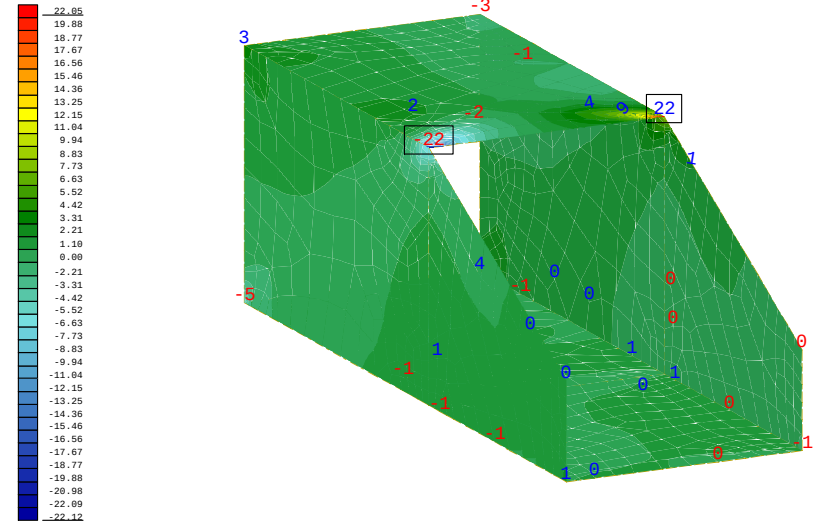
Membrane shear force n-xy in local xy in Node, Loadcase 4 Rozamiento negativo, from 0 to 0 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

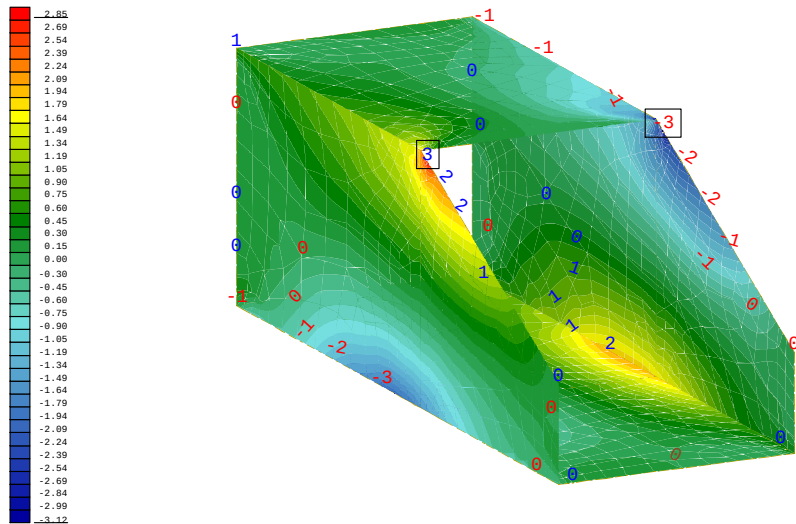


Membrane force n-xx in local x in Node $\rightarrow$, Loadcase 5 Empuje tierras, from -10 to 13 step 1 kN/m

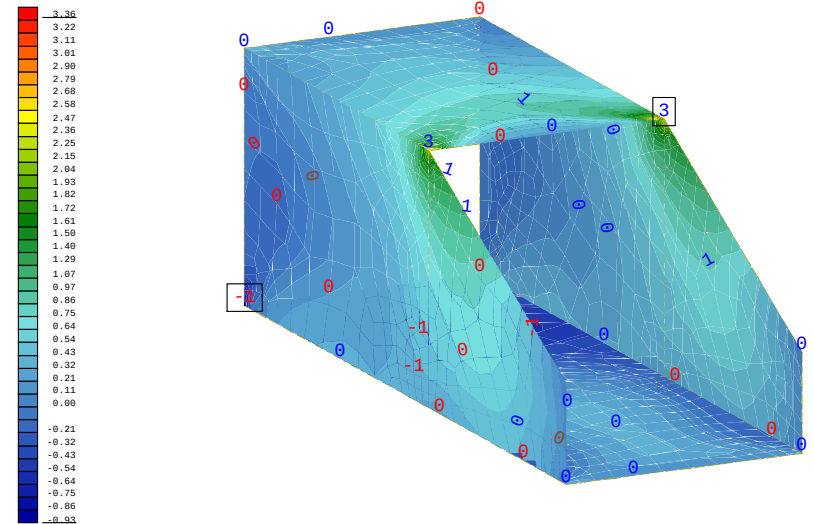


Membrane shear force n-xy in local xy in Node, Loadcase 5 Empuje tierras, from -22 to 22 step 1 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



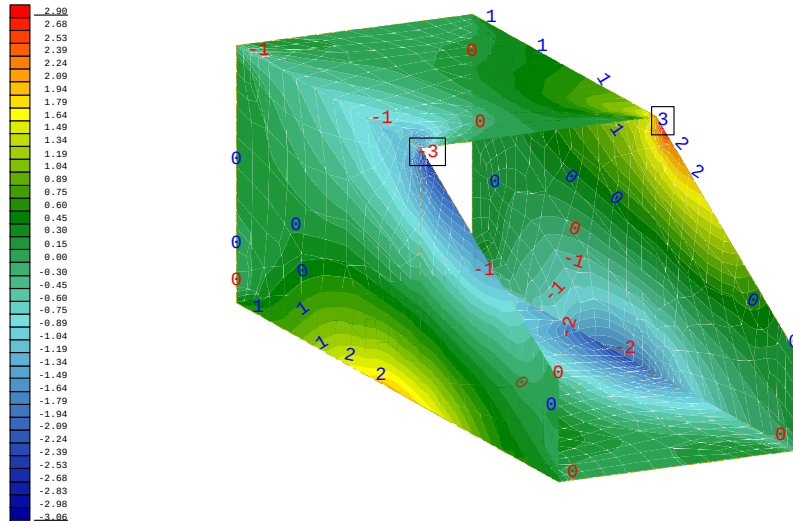
Membrane force n-xx in local x in Node $\rightarrow$, Loadcase 6 Sobrecarga uso terraplenes 1, from -3 to 3 step 0 kN/m



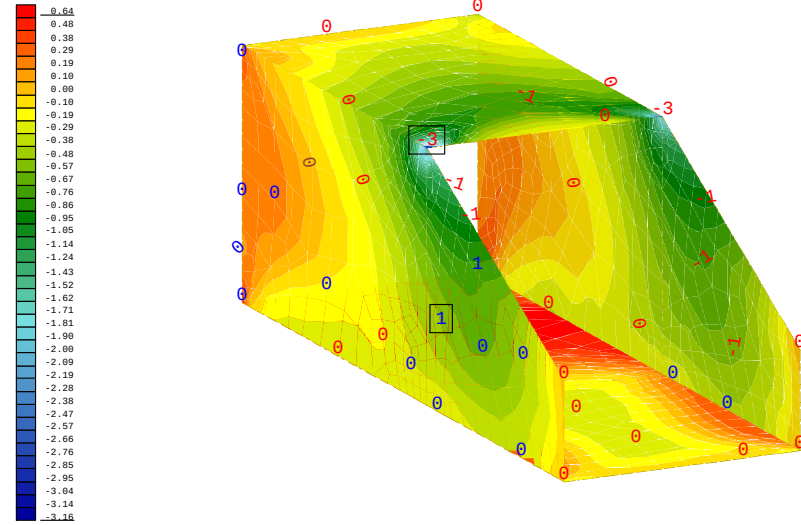
Membrane shear force n-xy in local xy in Node, Loadcase 6 Sobrecarga uso terraplenes 1, from -1 to 3 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

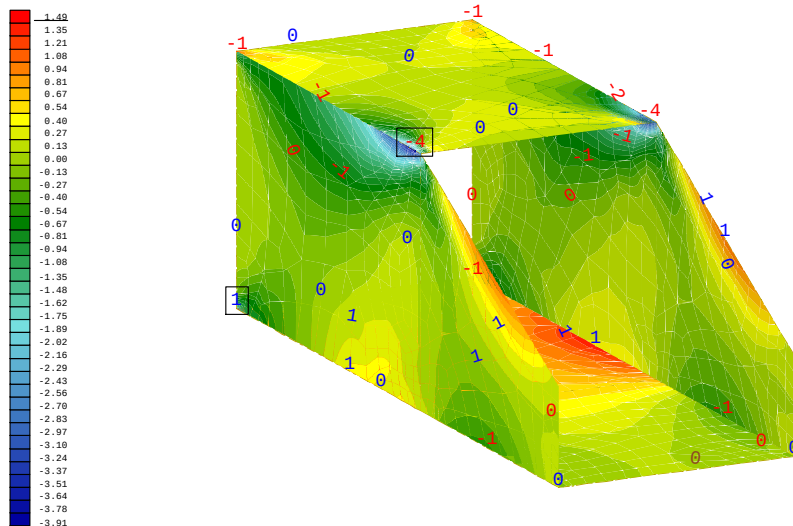


Membrane force n-xx in local x in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -3 to 3 step 0 kN/m

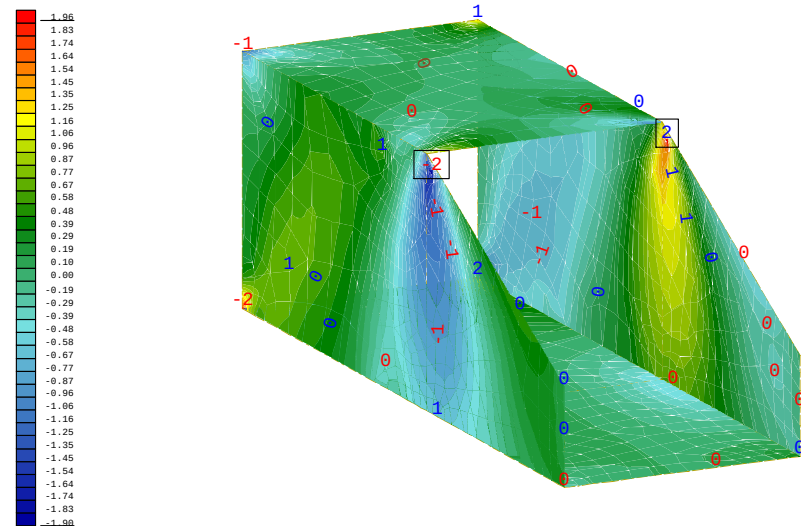


Membrane shear force n-xy in local xy in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -3 to 1 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



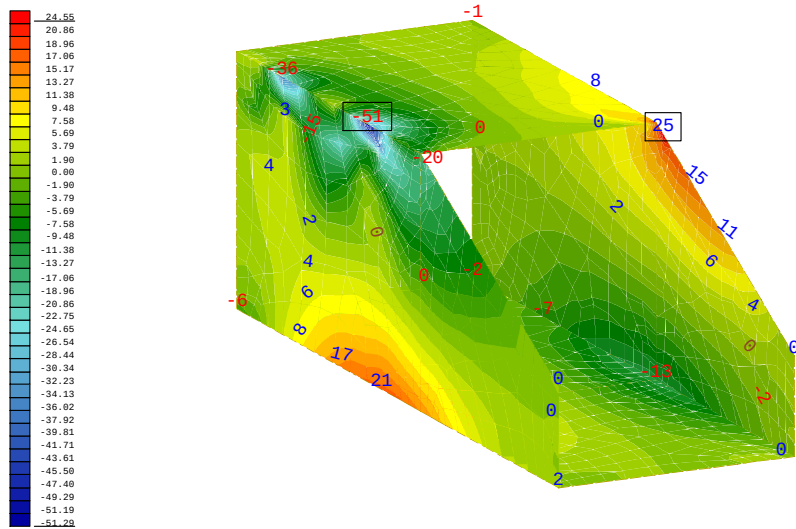
Membrane force n-xx in local x in Node, Loadcase 8 Sobrecarga uniforme , from -4 to 1 step 0 kN/m



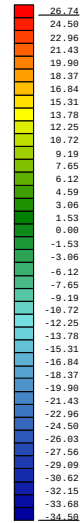
Membrane shear force n-xy in local xy in Node, Loadcase 8 Sobrecarga uniforme , from -2 to 2 step 0 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

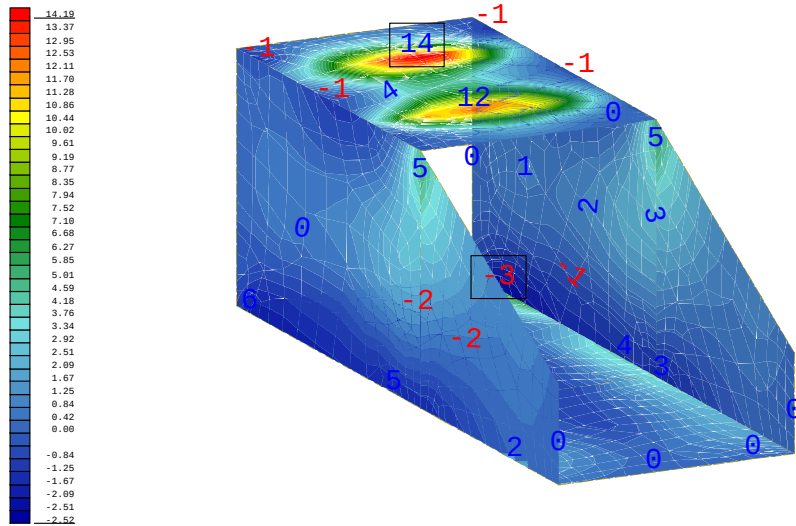


Membrane force n-xx in local x in Node, Loadcase 9 Carro, from -51 to 25 step 2 kN/m

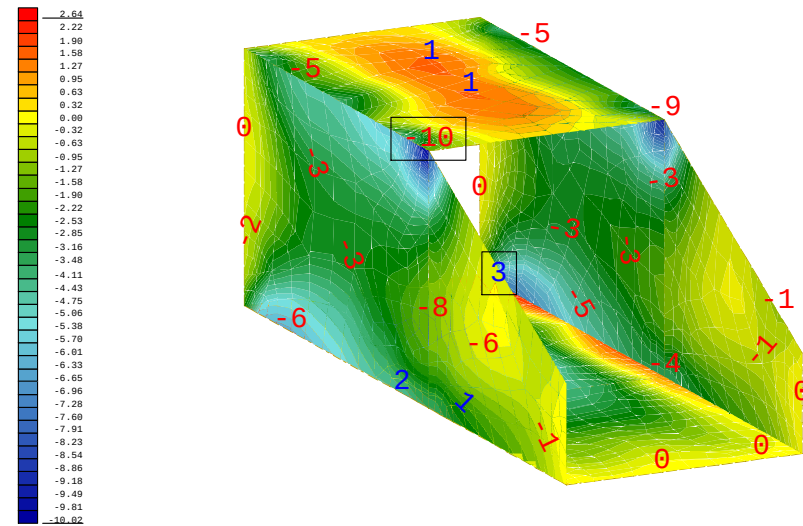


Membrane shear force n-xy in local xy in Node, Loadcase 9 Carro, from -34 to 27 step 2 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

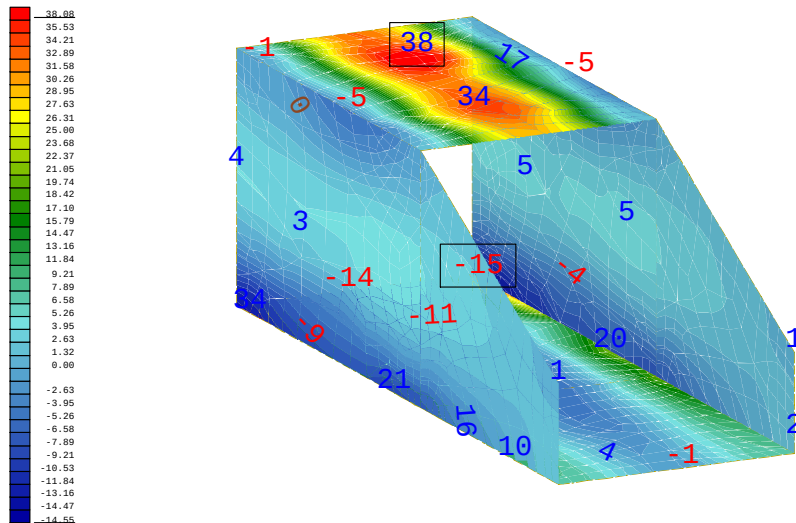


Z Bending moment m-xx in local x from middle of element, Loadcase 2101 MAX-MXX QUAD Forces
X Y in Quadrilat, from -3 to 14 step 0 kNm/m

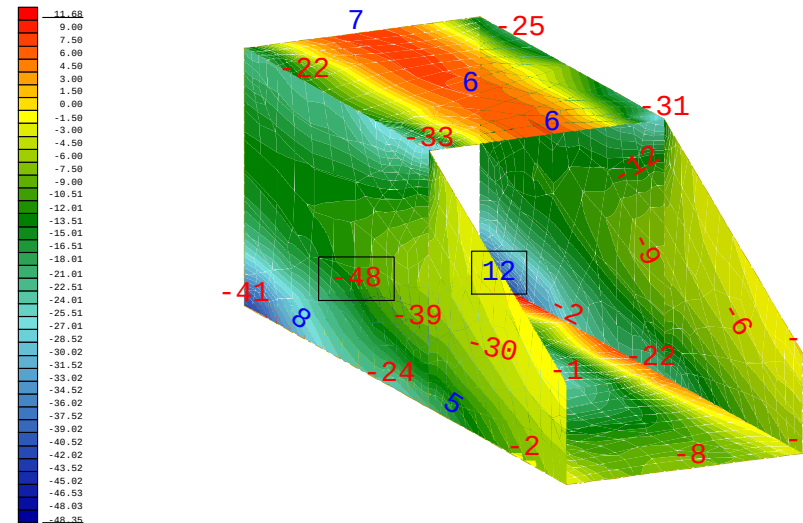


M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z Bending moment m-xx in local x from middle of element, Loadcase 2102 MIN-MXX QUAD Forces
X Y in Quadrilat, from -10 to 3 step 0 kNm/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



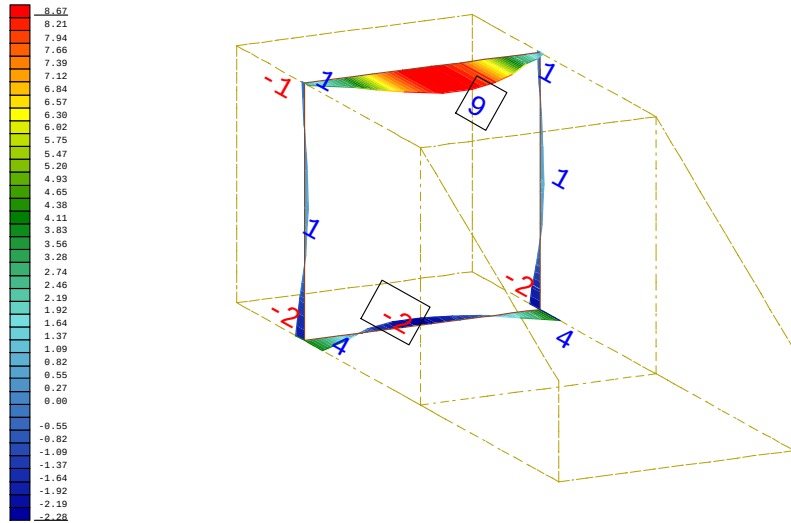
Z Bending moment m-yy in local y from middle of element, Loadcase 2103 MAX-MYY QUAD Forces in
X Y Quadrilat, from -15 to 38 step 1 kNm/m



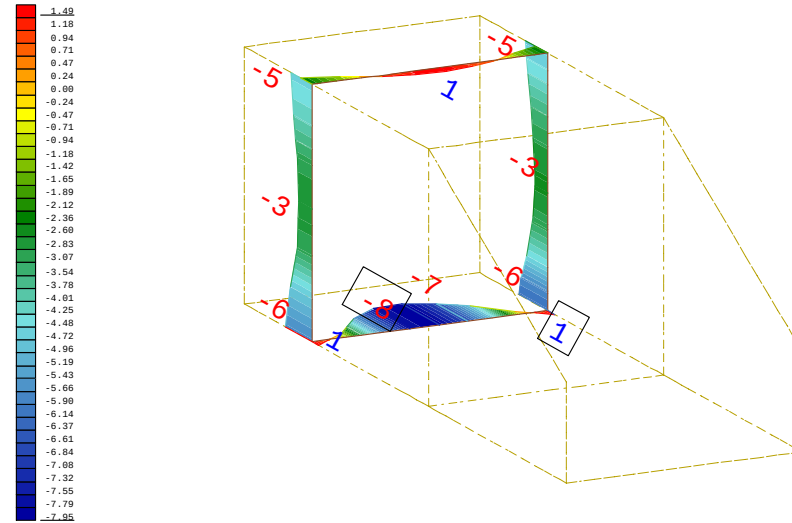
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z Bending moment m-yy in local y from middle of element, Loadcase 2104 MIN-MYY QUAD Forces in
X Y Quadrilat, from -48 to 12 step 2 kNm/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

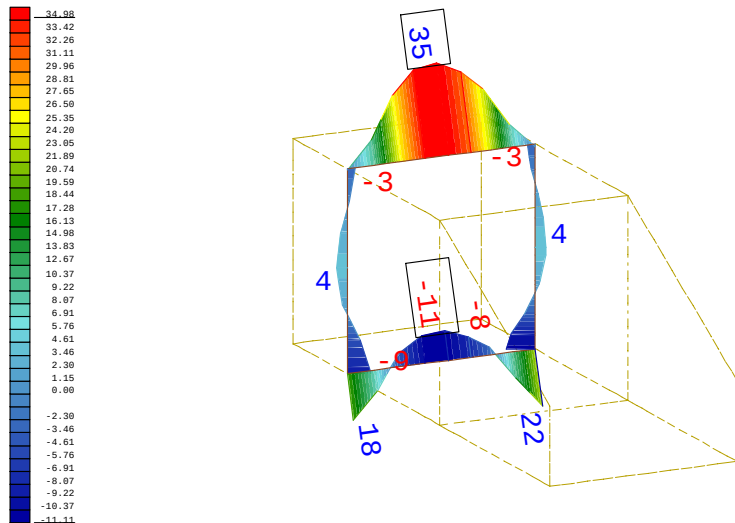
Esfuerzos LC y ELU



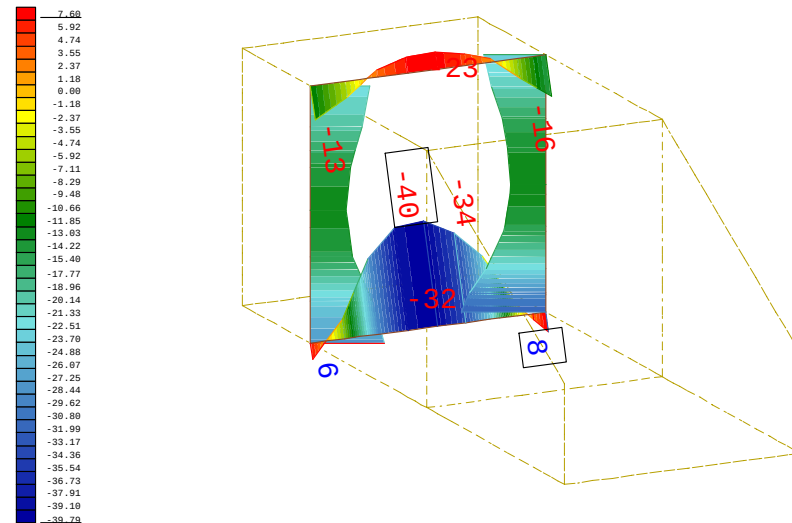
Z Bending moment m-xx in local x from middle of element ↗, Loadcase 2101 MAX-MXX QUAD Forces
X Y in Quadrilat , 1 cm 3D = 5.0000 kNm/m (Min=-2) (Max=9)



Z Bending moment m-xx in local x from middle of element ↗, Loadcase 2102 MIN-MXX QUAD Forces
X Y in Quadrilat , 1 cm 3D = 5.0000 kNm/m (Min=-8) (Max=1)
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



Z Bending moment m-yy in local y from middle of element, Loadcase 2103 MAX-MYY QUAD Forces in
X Y Quadrilat , 1 cm 3D = 20.000 kNm/m (Min=-11) (Max=35)



Z Bending moment m-yy in local y from middle of element, Loadcase 2104 MIN-MYY QUAD Forces in
X Y Quadrilat , 1 cm 3D = 20.000 kNm/m (Min=-40) (Max=8)
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

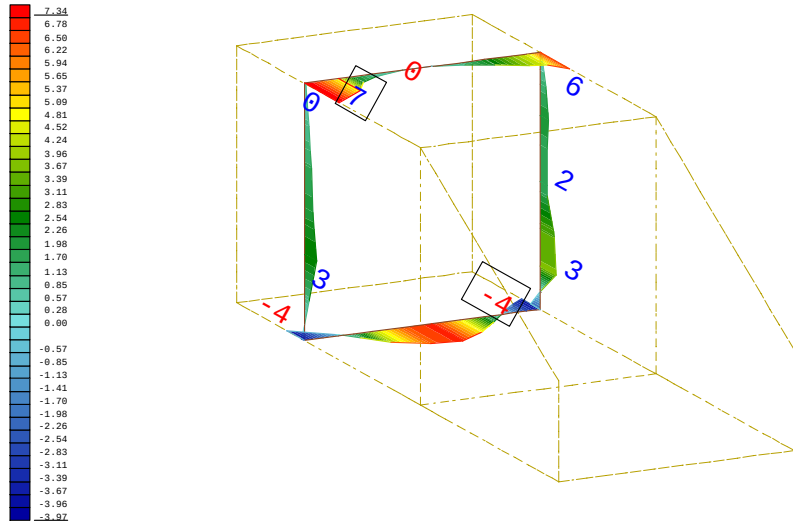
Esfuerzos LC y ELU

3.28
1.55
0.80
-1.55
-3.09
-4.64
-6.19
-7.73
-9.28
-10.83
-12.37
-13.92
-15.47
-17.01
-18.56
-20.11
-21.65
-23.20
-24.75
-26.29
-27.83
-29.39
-30.93
-32.48
-34.03
-35.58
-37.12
-38.67
-40.22
-41.76
-43.31
-44.86
-46.40
-47.95
-49.50
-51.04
-52.59
-54.14
-55.68
-57.23
-58.67

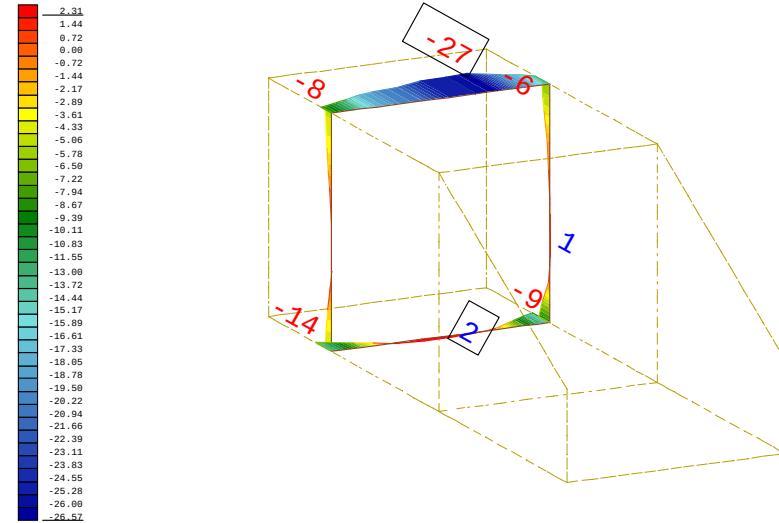
-15
-5
-34
59
-12
-8
1
1
-36
-15
-24
-16
-28
-6
-26
0
1
2
3
-1
2

A 3D surface plot showing a function over a rectangular domain. The surface is colored according to a scale from -179.12 (dark blue) to 47.09 (dark red). The surface has a complex shape with a deep valley and a high ridge. The color bar on the left indicates the function values. The surface is labeled with various values, including -108, -53, -86, -60, -18, -6, -3, -90, -47, -18, -10, -39, -24, -41, -70, -76, -82, -88, -94, -100, -105, -111, -117, -123, -129, -135, -141, -147, -153, -158, -164, -170, -176, and -179.12. A box highlights the value 56 on the left edge, and another box highlights the value -179 on the right edge.

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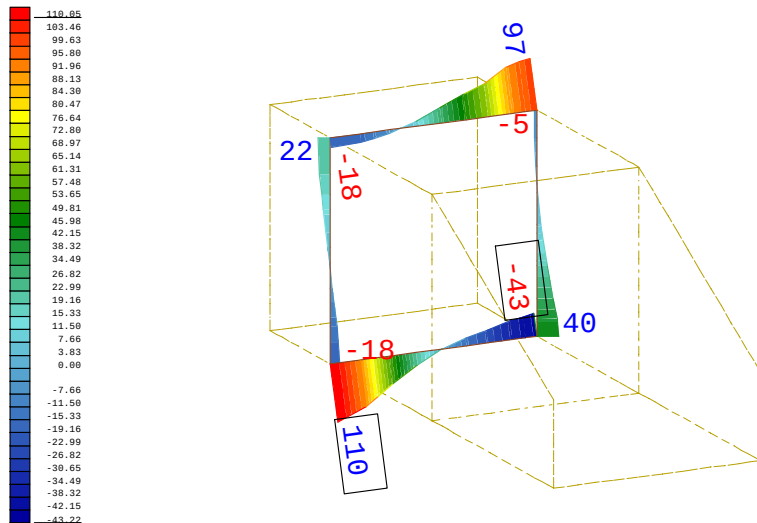


Z Shear force v-x in local x from middle of element, Loadcase 2107 MAX-VX QUAD Forces in
X Y Quadrate , 1 cm 3D = 5.0000 kN/m (Min=-4) (Max=7)

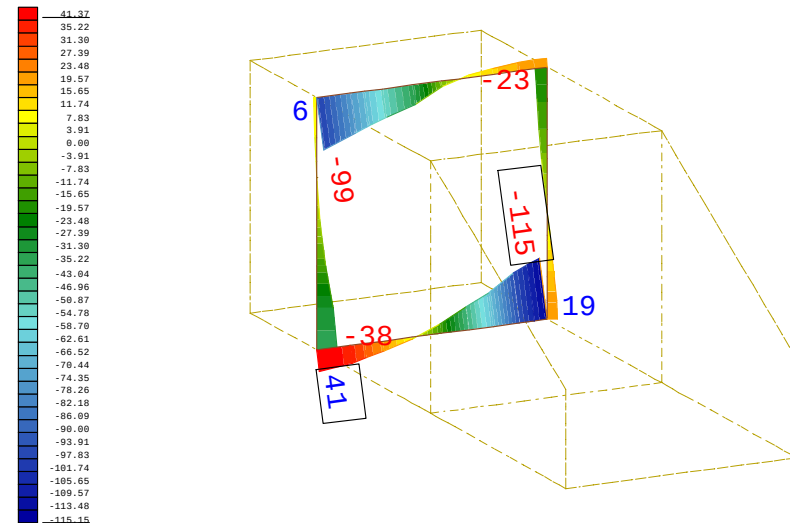


M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z Shear force v-x in local x from middle of element, Loadcase 2108 MIN-VX QUAD Forces in
X Y Quadrate , 1 cm 3D = 20.000 kN/m (Min=-27) (Max=2)

M 1 : 55
X * 0.502
Y * 0.906
Z * 0.962



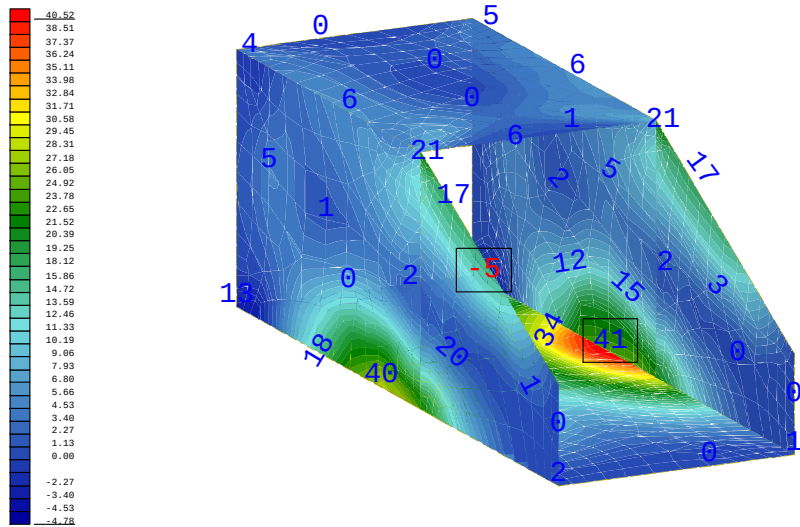
Z Shear force v-y in local y from middle of element, Loadcase 2109 MAX-VY QUAD Forces in
X Y Quadrate , 1 cm 3D = 100.00 kN/m (Min=-43) (Max=110)



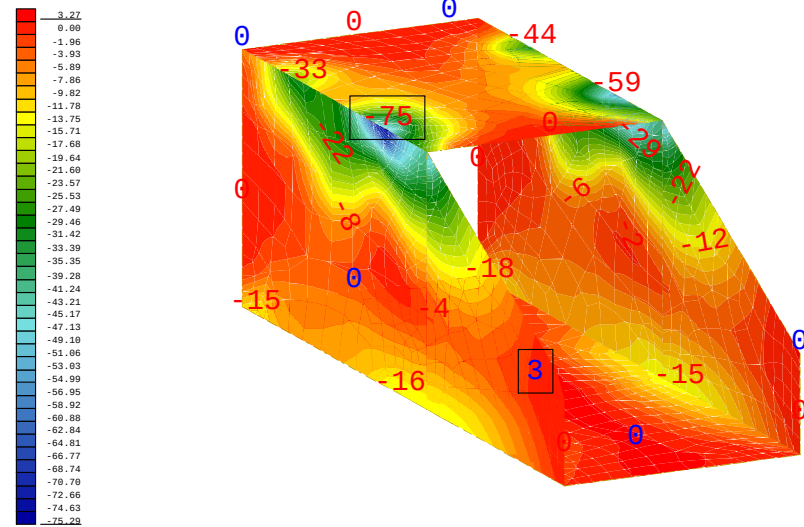
M 1 : 58
X * 0.502
Y * 0.906
Z * 0.962
Z Shear force v-y in local y from middle of element, Loadcase 2110 MIN-VY QUAD Forces in
X Y Quadrate , 1 cm 3D = 100.00 kN/m (Min=-115) (Max=41)

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

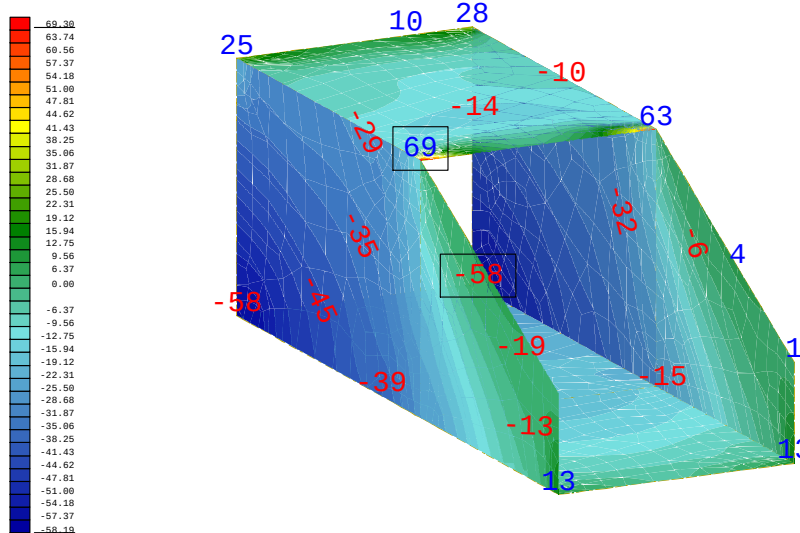


Z
Y
X Membrane force n-xx in local x from middle of element, Loadcase 2111 MAX-NXX QUAD Forces in Quadrilat, from -5 to 41 step 1 kN/m

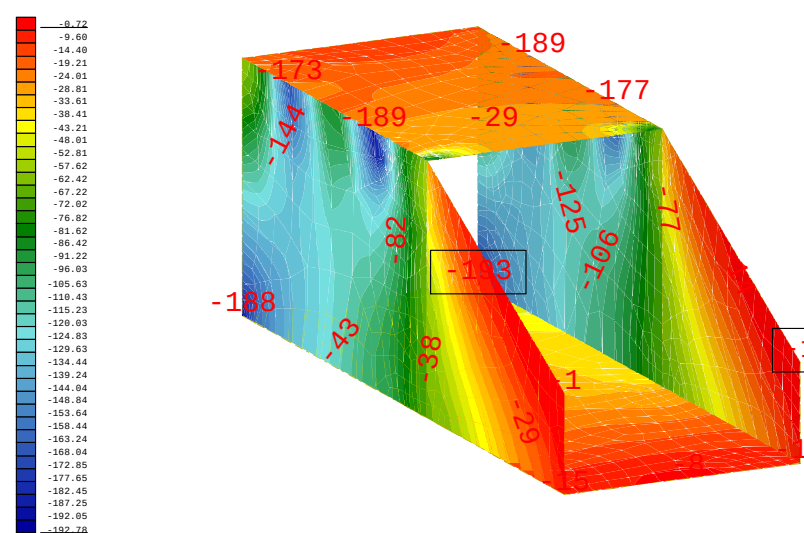


M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X Membrane force n-xx in local x from middle of element, Loadcase 2112 MIN-NXX QUAD Forces in Quadrilat, from -75 to 3 step 2 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



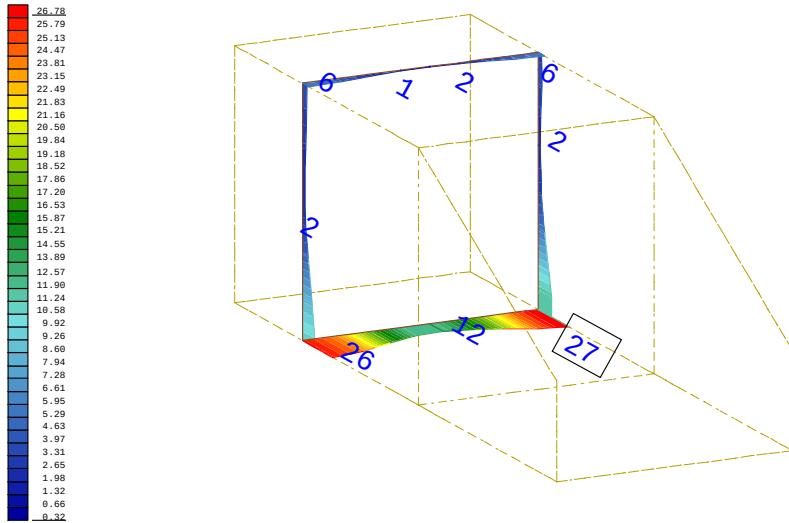
Z
Y
X Membrane force n-yy in local y from middle of element, Loadcase 2113 MAX-NYY QUAD Forces in Quadrilat, from -58 to 69 step 3 kN/m



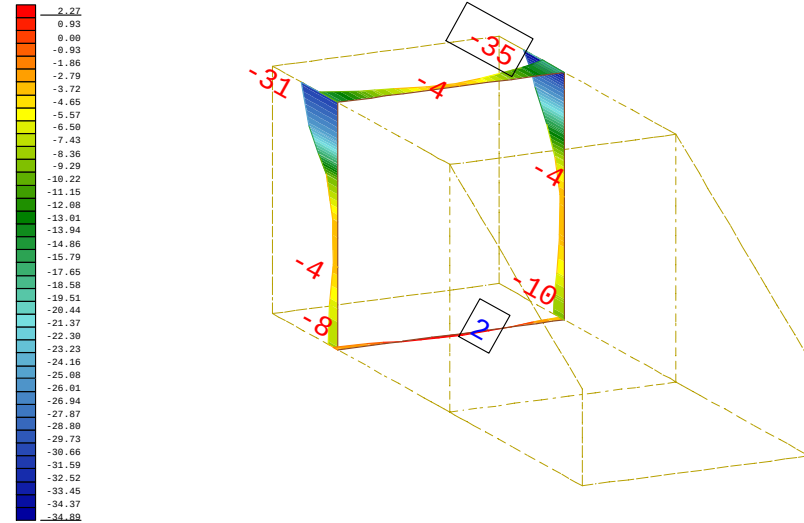
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X Membrane force n-yy in local y from middle of element, Loadcase 2114 MIN-NYY QUAD Forces in Quadrilat, from -193 to -1 step 5 kN/m

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

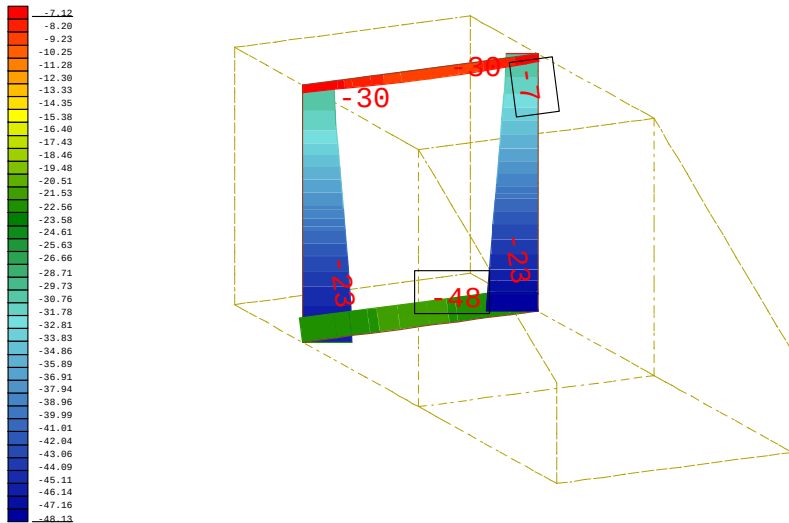
Esfuerzos LC y ELU



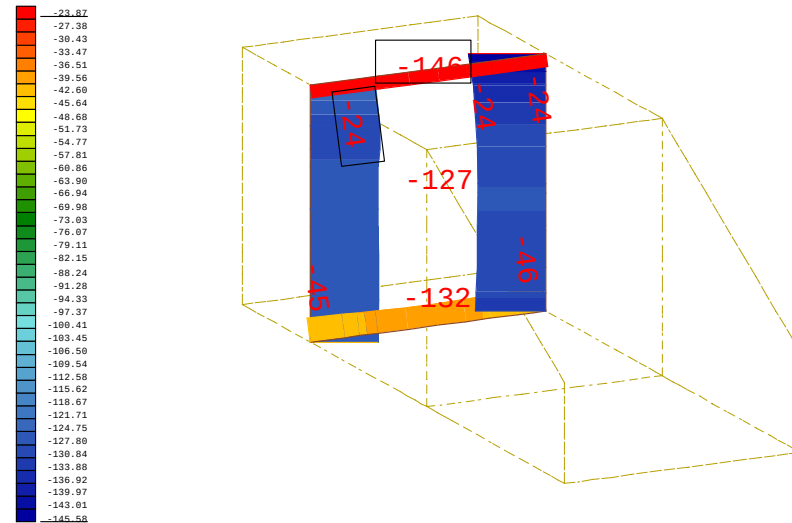
Z
Y X Membrane force n-xx in local x from middle of element ↗, Loadcase 2111 MAX-NXX QUAD Forces in Quadrilat , 1 cm 3D = 20.000 kN/m (Max=27)



M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
Y X Membrane force n-xx in local x from middle of element ↗, Loadcase 2112 MIN-NXX QUAD Forces in Quadrilat , 1 cm 3D = 20.000 kN/m (Min=-35) (Max=2)



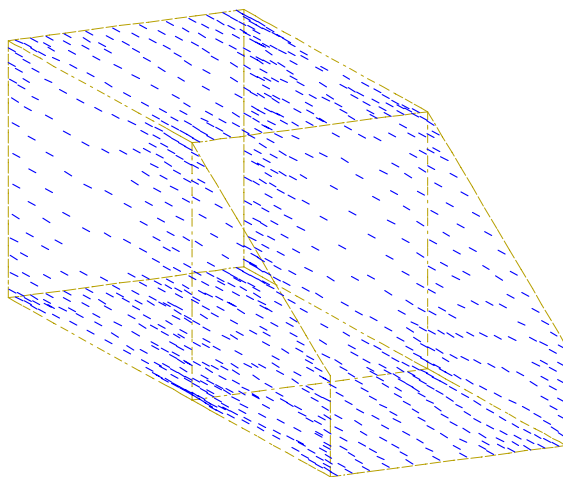
Z
Y X Membrane force n-yy in local y from middle of element, Loadcase 2113 MAX-NYY QUAD Forces in Quadrilat , 1 cm 3D = 50.000 kN/m (Min=-48) (Max=-7)



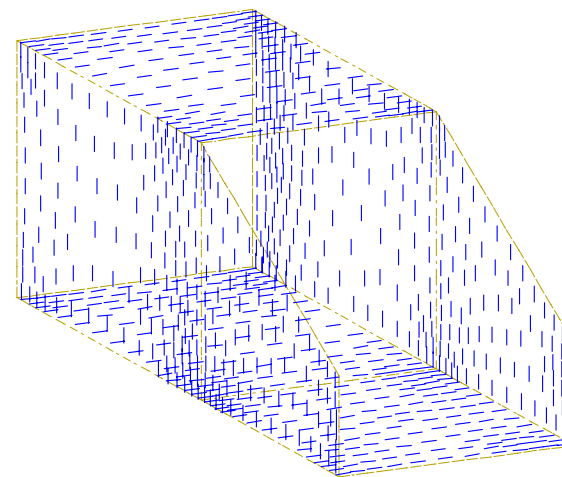
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
Y X Membrane force n-yy in local y from middle of element, Loadcase 2114 MIN-NYY QUAD Forces in Quadrilat , 1 cm 3D = 100.00 kN/m (Min=-146) (Max=-24)

M 1 : 53
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

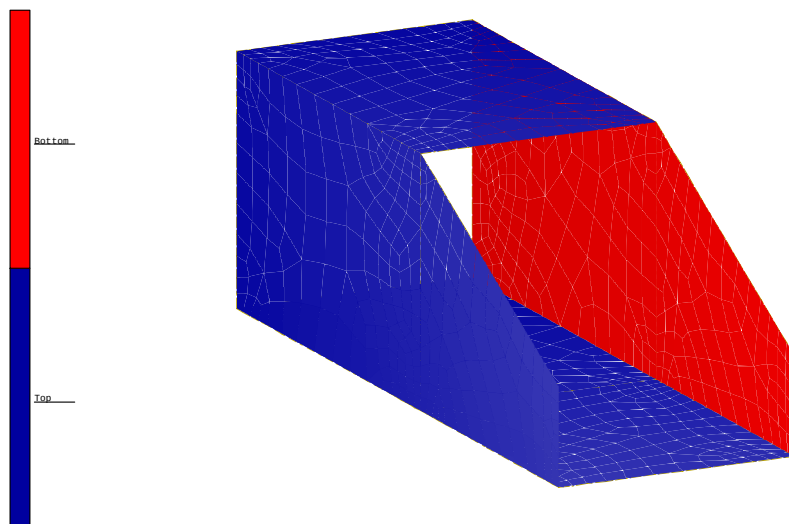


Z
└─Y
X Quadrilateral Elements , Direction of prescribed upper Principal reinforcements (1st layer) (———)



M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
└─Y
X Quadrilateral Elements , Direction of prescribed upper Cross reinforcements (2nd layer) (———)

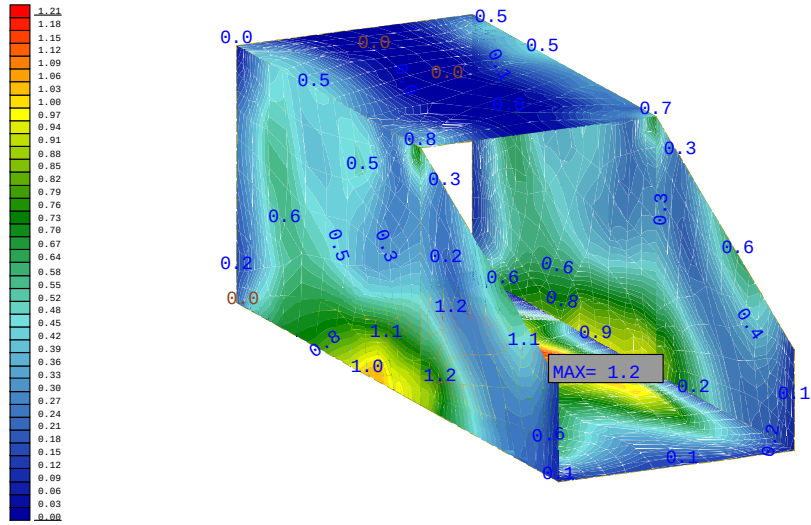
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



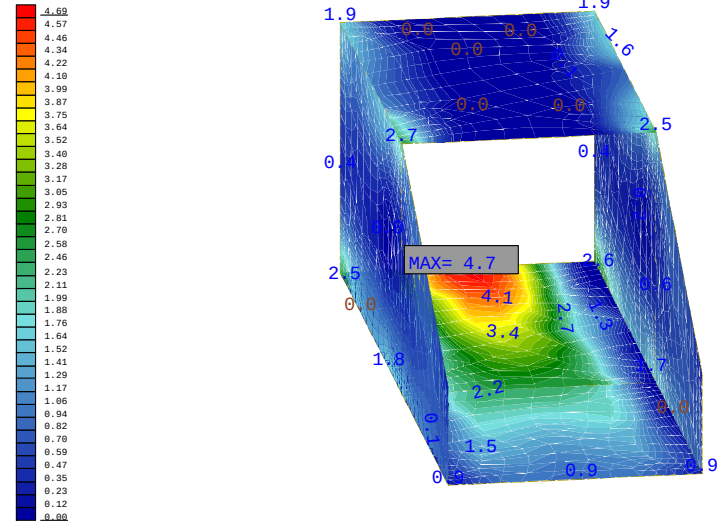
Z
└─Y
X Visible QUAD surface top/bottom in Element

Armado

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962

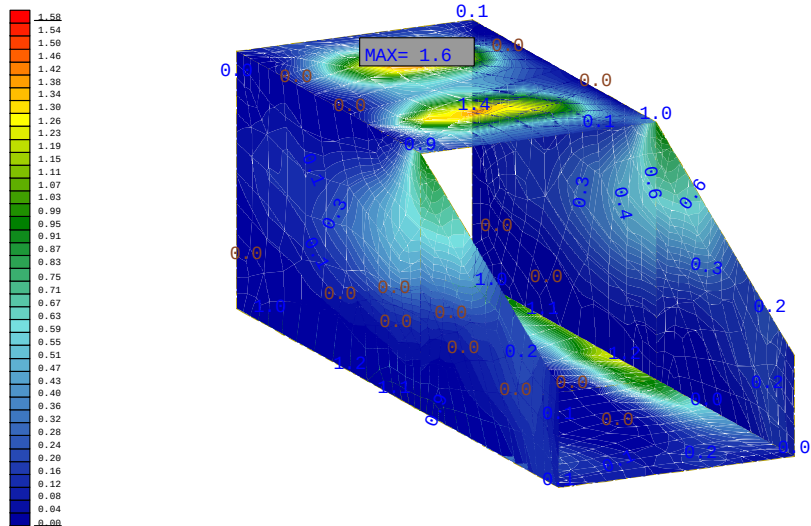


Z
X Y
Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗, Design Case 1 ULS design , from 0.00 to 1.2 step 0.0 cm2/m

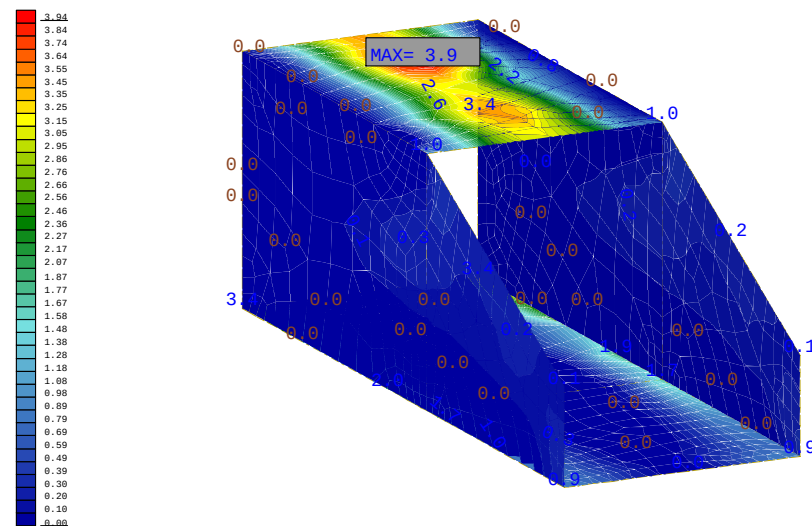


M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
X Y
Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 4.7 step 0.1 cm2/m

M 1 : 52
X * 0.331
Y * 0.990
Z * 0.954



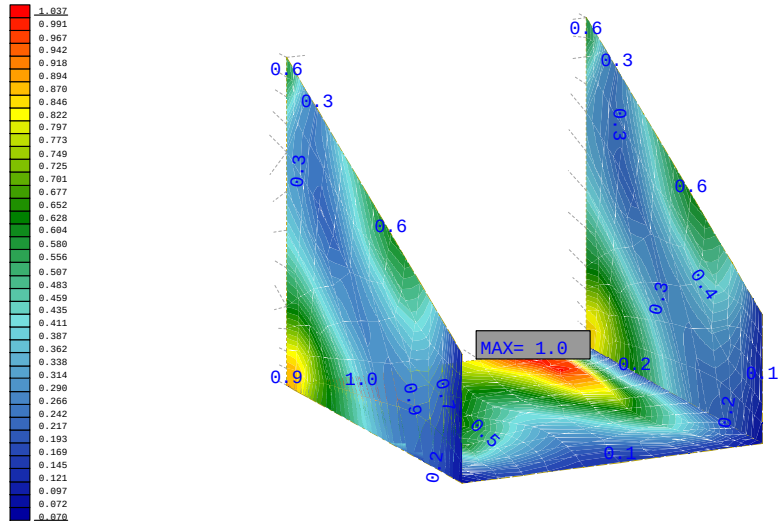
Z
X Y
Quadrilateral Elements , lower Principal reinforcements (1st layer) ↗, Design Case 1 ULS design , from 0.00 to 1.6 step 0.0 cm2/m



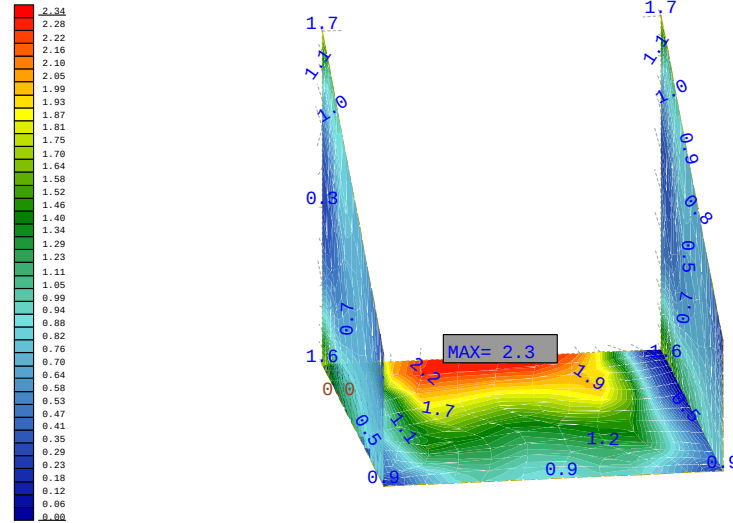
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962
Z
X Y
Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 3.9 step 0.1 cm2/m

M 1 : 52
X * 0.331
Y * 0.990
Z * 0.954

Armado

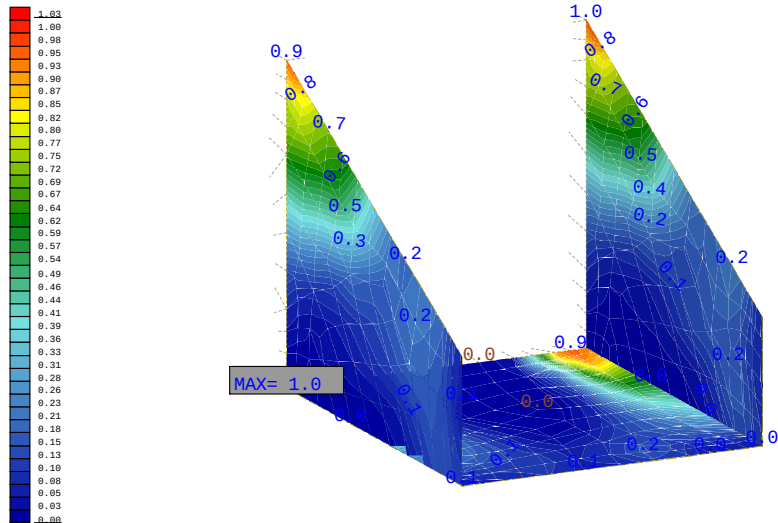


Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗, Design Case 1 ULS design , from 0.1 to 1.0 step 0.0 cm2/m

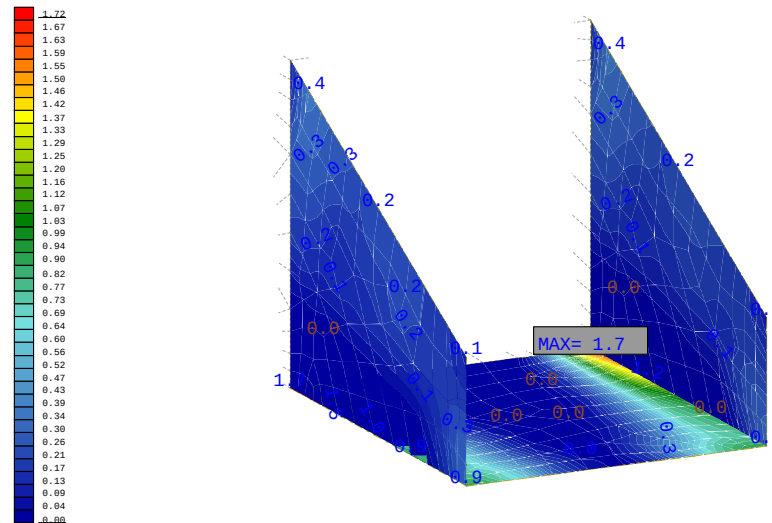


M 1 : 40
X * 0.502
Y * 0.906
Z * 0.962
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 2.3 step 0.1 cm2/m

M 1 : 39
X * 0.331
Y * 0.990
Z * 0.954



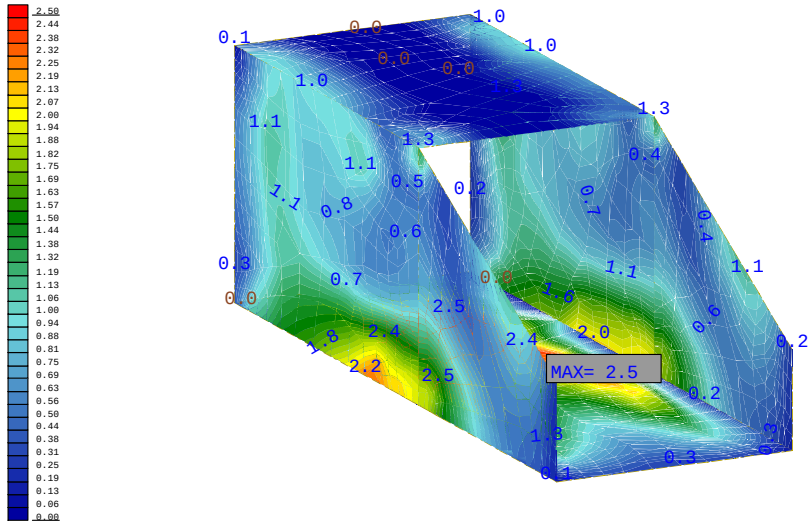
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Principal reinforcements (1st layer) ↗, Design Case 1 ULS design , from 0.00 to 1.0 step 0.0 cm2/m



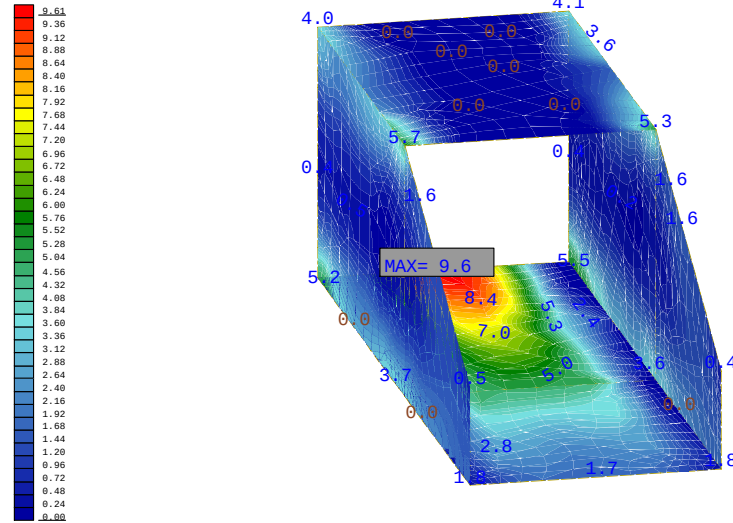
M 1 : 40
X * 0.502
Y * 0.906
Z * 0.962
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 1.7 step 0.0 cm2/m

M 1 : 40
X * 0.502
Y * 0.906
Z * 0.962

Armado

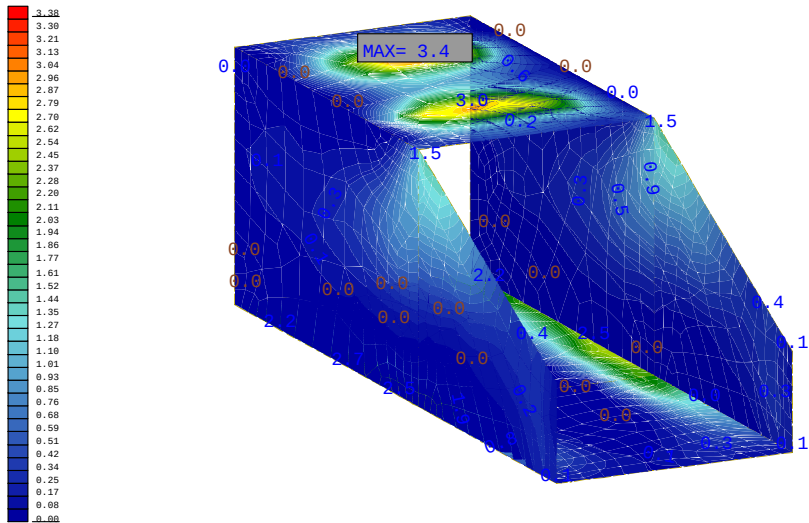


Z
Y
X Quadrilateral Elements , upper Principal reinforcements (1st layer) ↘, Design Case 2 After the crack width design , from 0.00 to 2.5 step 0.1 cm2/m

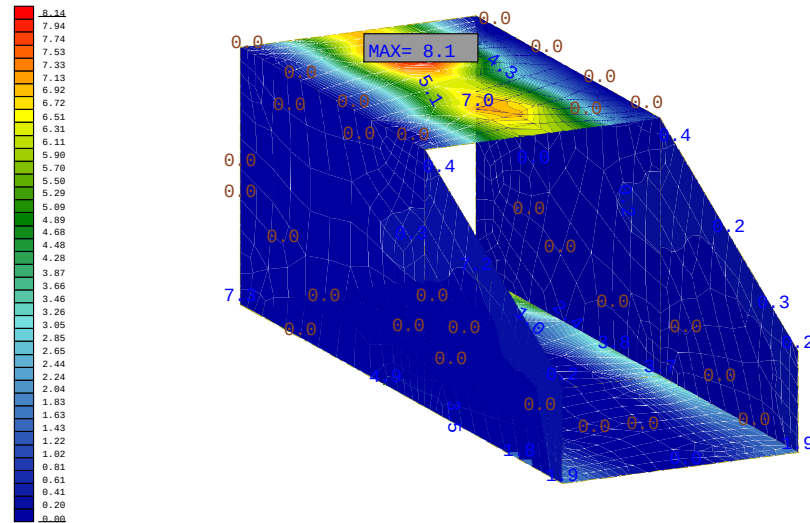


M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962 Z
Y
X Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 9.6 step 0.2 cm2/m

M 1 : 52
X * 0.358
Y * 0.979
Z * 0.956



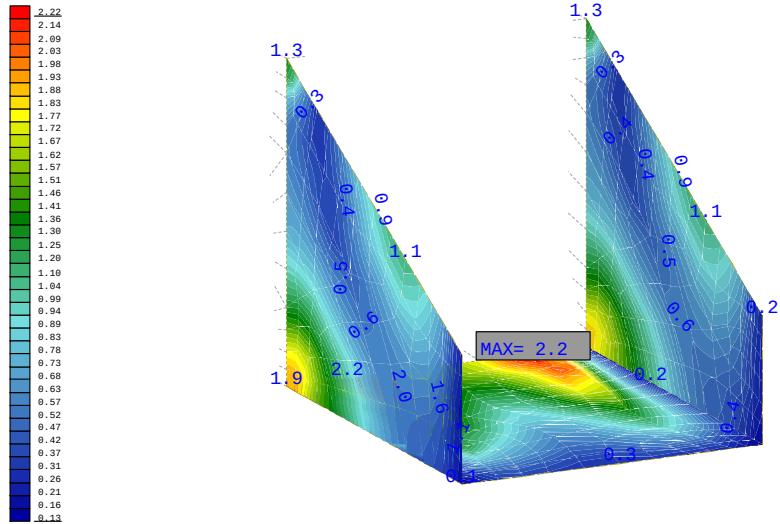
Z
Y
X Quadrilateral Elements , lower Principal reinforcements (1st layer) ↘, Design Case 2 After the crack width design , from 0.00 to 3.4 step 0.1 cm2/m



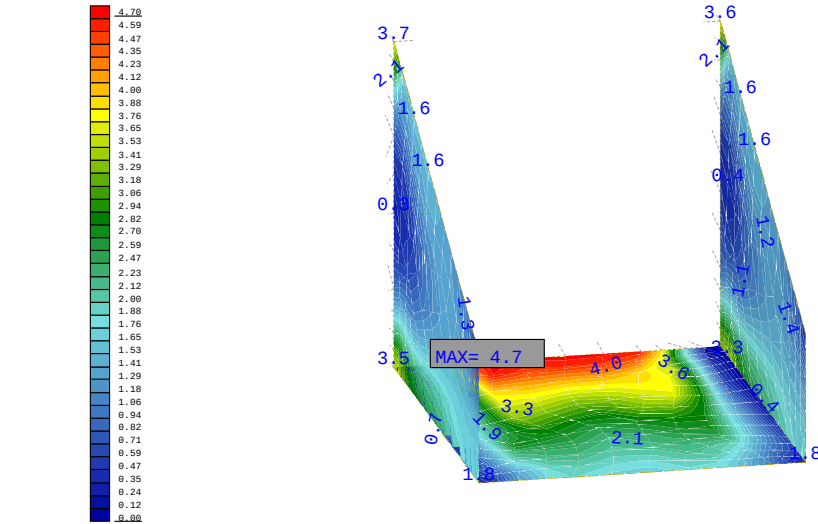
M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962 Z
Y
X Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 8.1 step 0.2 cm2/m

M 1 : 52
X * 0.358
Y * 0.979
Z * 0.956

Armado

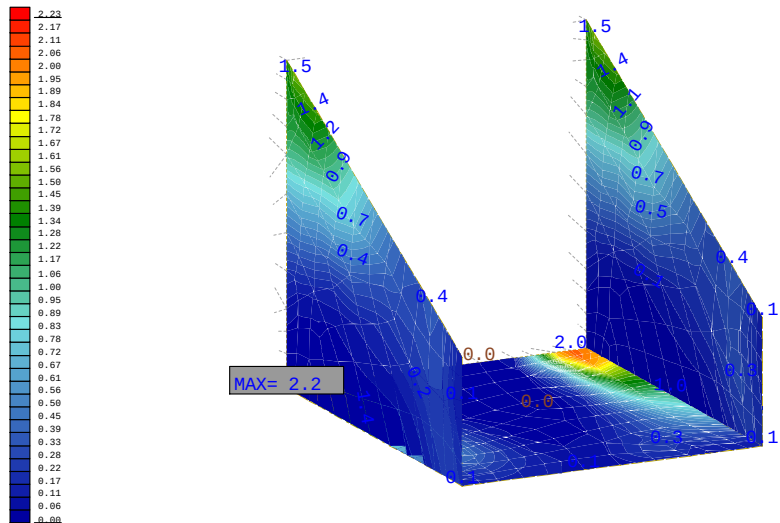


Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗, Design Case 2 After the crack width design , from 0.1 to 2.2 step 0.1 cm2/m

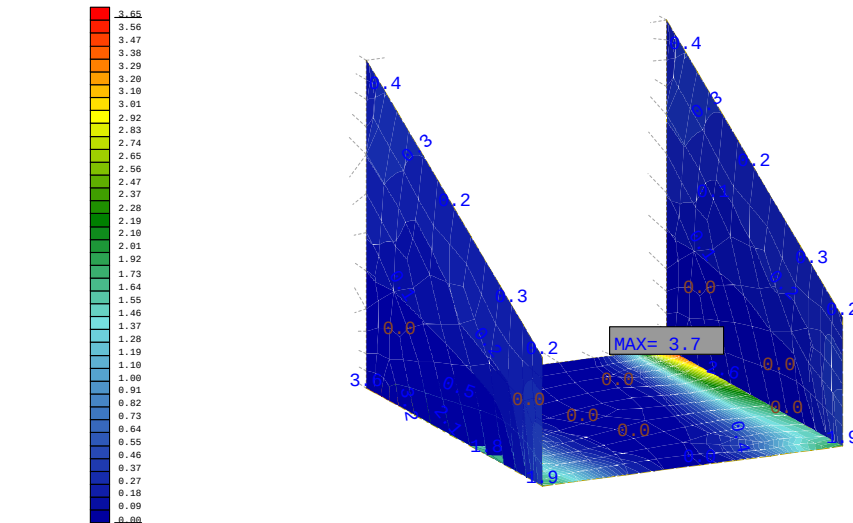


M 1 : 40
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 4.7 step 0.1 cm2/m

M 1 : 40
X * 0.358
Y * 0.979
Z * 0.956



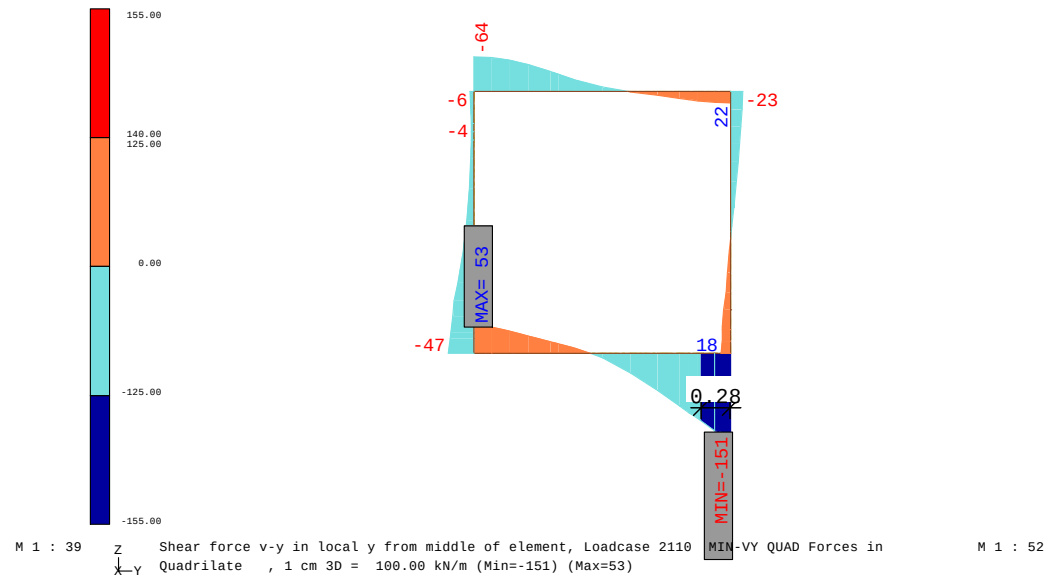
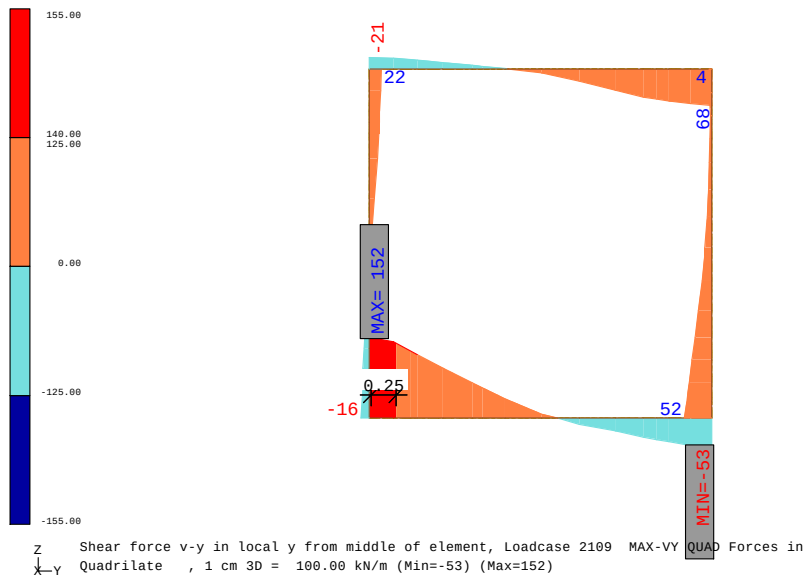
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Principal reinforcements (1st layer) ↗, Design Case 2 After the crack width design , from 0.00 to 2.2 step 0.1 cm2/m



M 1 : 40
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 3.7 step 0.1 cm2/m

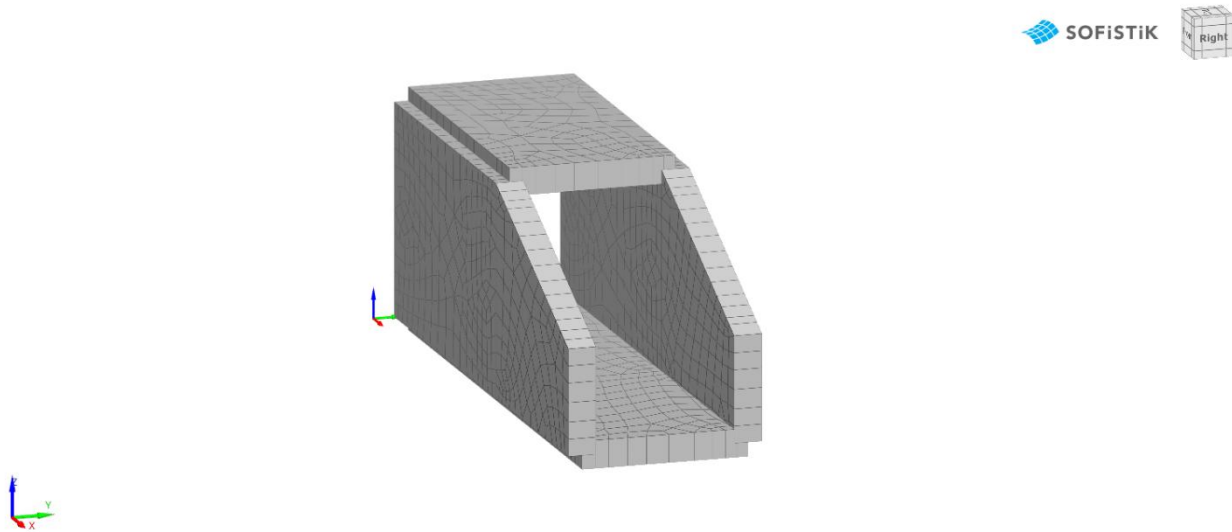
M 1 : 40
X * 0.502
Y * 0.906
Z * 0.962

Armado



10.2.- ODT 2

Se realiza un modelo FEM en 3D con elementos tipos placa.



A continuación, se muestra los resultados incluyendo:

6. Tablas con el cálculo de la armadura mínima y la resistencia a cortante sin armadura.
7. Características del modelo FEM.
8. Reacciones en el terreno por caso de carga y en ELS.
9. Esfuerzos por caso de carga y ELU.
10. Armado.

Cuantías mínimas

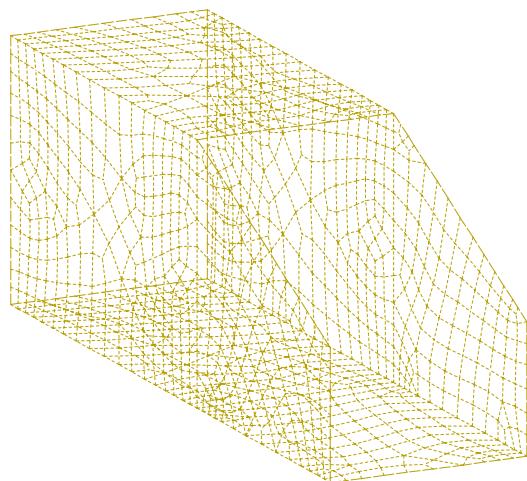
fck =30 Mpa			
Canto (m)	Cuantía (cm2/m)	s=15cm-->Ø	s=20cm-->Ø
0.25	4.2	12	12
0.35	5.8	12	16
0.4	6.7	12	16

Cortante sin armadura

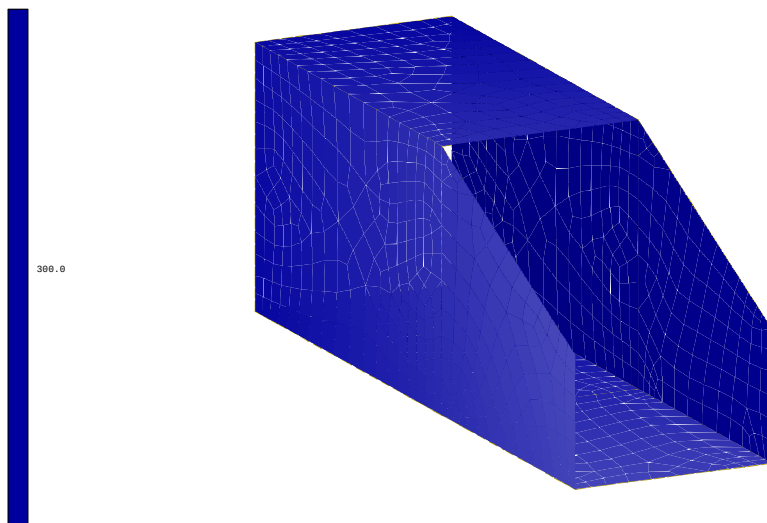
MATERIALES	
fck (Mpa)	30
f _{yk} (Mpa)	500
f _{yd} (Mpa)	435
f _{ct,m} (Mpa)	2.9

DIMENSIONES	
b0 (m)	1
H (m)	0.3
d (m)	0.25

CAPACIDAD SIN ARM	
ε	1.89
k	1.89
Vu2 min (kN) EHE	179
VRd,c min (kN) CE	125



Structure
Z
Y
X



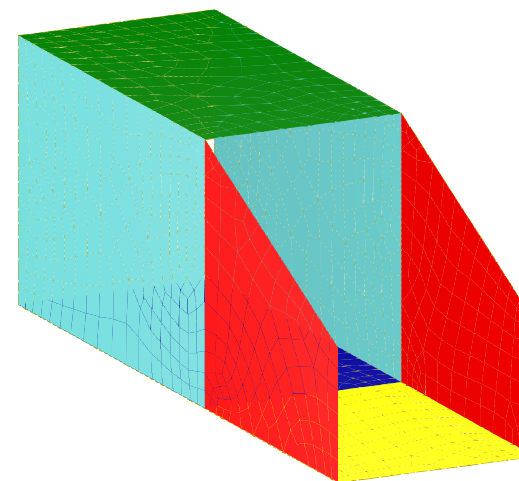
Quadrilateral Elements , Average plate thickness in mm (Max=300)
Z
Y
X

Características del modelo

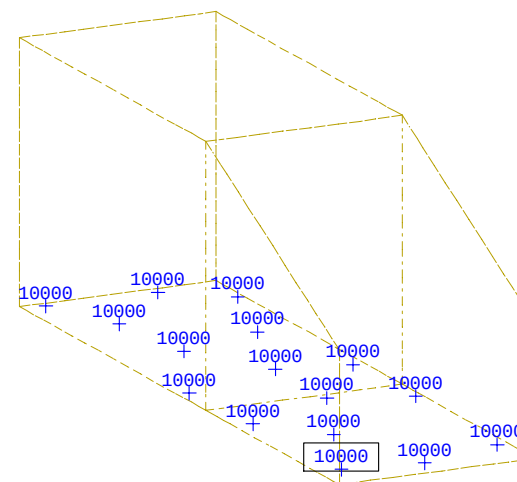


M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X

Quadrilateral Elements , Number of group (Max=50)



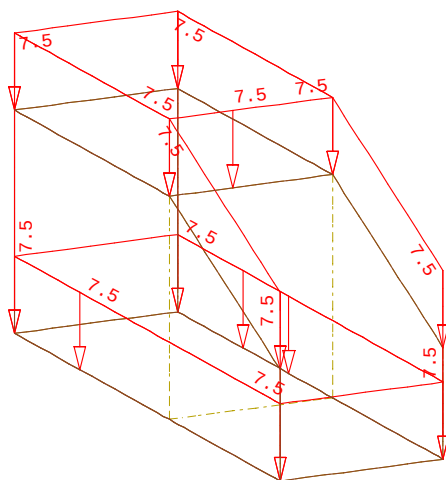
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X

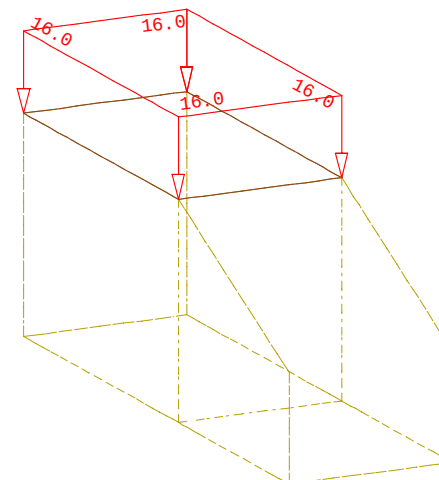
Elastic bedding in Element in kN/m3 (Max=10000)

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



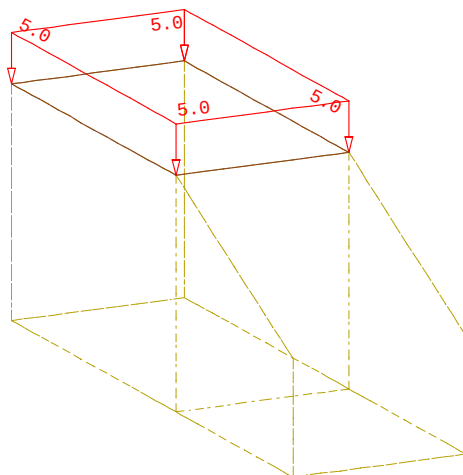
z All loads, Loadcase 1 Peso propio , (1 cm 3D = unit) QUAD-Area dead load in global Z in
x y Element (Unit=5.0 kN/m2) (Min=-7.5) (Max=-7.5)

M 1 : 53
x * 0.502
y * 0.906
z * 0.962



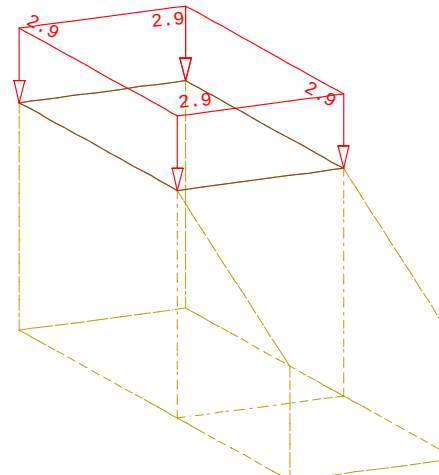
z All loads, Loadcase 2 Peso tierras , (1 cm 3D = unit) Free area load (force) in global Z
x y (Unit=10.0 kN/m2) (Min=-16.0) (Max=-16.0)

M 1 : 53
x * 0.502
y * 0.906
z * 0.962



z All loads, Loadcase 3 Peso aglomerado , (1 cm 3D = unit) Free area load (force) in global
x y Z (Unit=5.0 kN/m2) (Min=-5.0) (Max=-5.0)

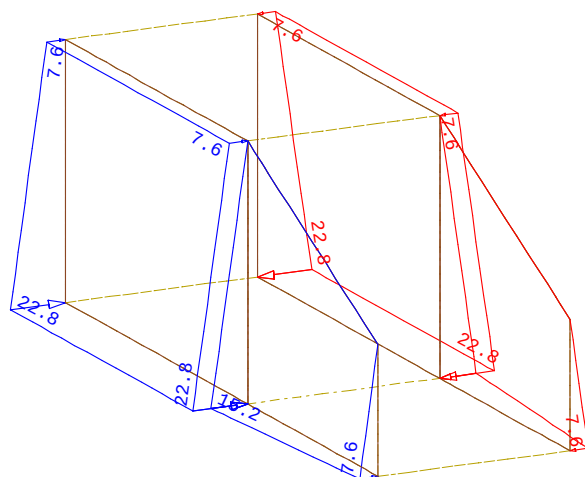
M 1 : 50
x * 0.502
y * 0.906
z * 0.962



z All loads, Loadcase 4 Rozamiento negativo , (1 cm 3D = unit) Free area load (force) in
x y global Z (Unit=2.0 kN/m2) (Min=-2.9) (Max=-2.9)

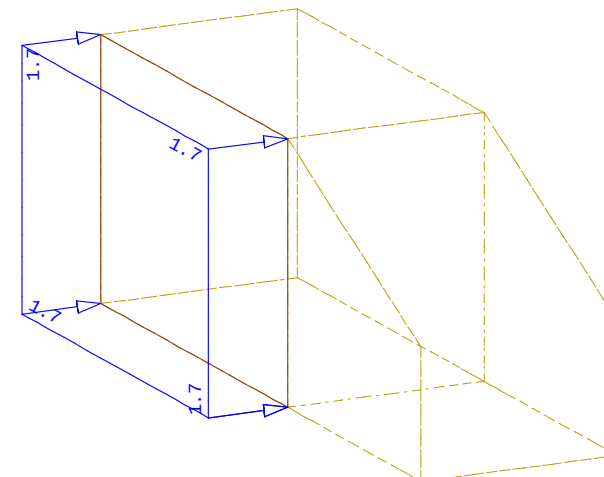
M 1 : 52
x * 0.502
y * 0.906
z * 0.962

Características del modelo



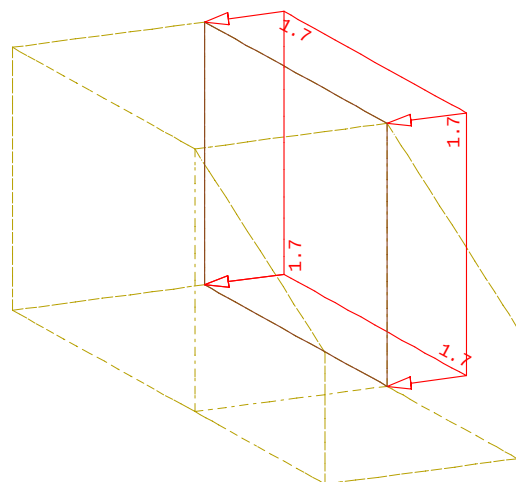
z All loads, Loadcase 5 Empuje tierras , (1 cm 3D = unit) Free area load (force) in global
Y (Unit=20.0 kN/m2 $\rightarrow$) (Min=-22.8) (Max=22.8)

M 1 : 45
X * 0.502
Y * 0.906
Z * 0.962



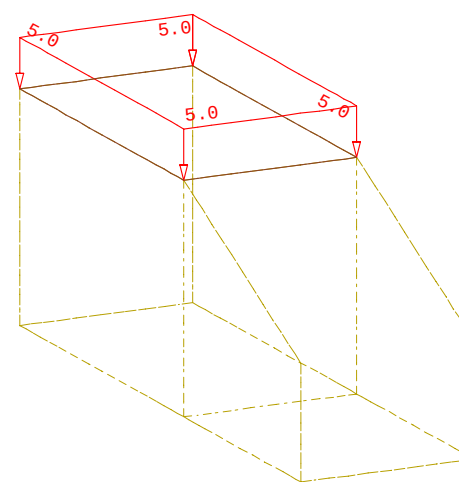
z All loads, Loadcase 6 Sobrecarga uso terraplenes 1 , (1 cm 3D = unit) Free area load
(force) in global Y (Unit=1.0 kN/m2 $\rightarrow$) (Max=1.6)

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



z All loads, Loadcase 7 Sobrecarga uso terraplenes 2 , (1 cm 3D = unit) Free area load
(force) in global Y (Unit=1.0 kN/m2 $\rightarrow$) (Min=-1.6) (Max=-1.6)

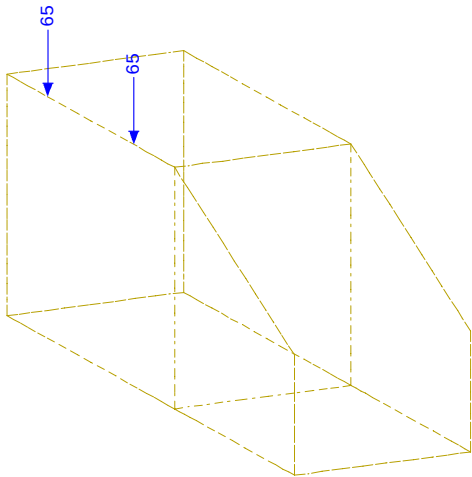
M 1 : 45
X * 0.502
Y * 0.906
Z * 0.962



z All loads, Loadcase 8 Sobrecarga uniforme , (1 cm 3D = unit) Free area load (force) in
global Z (Unit=5.0 kN/m2 $\rightarrow$) (Min=-5.0) (Max=-5.0)

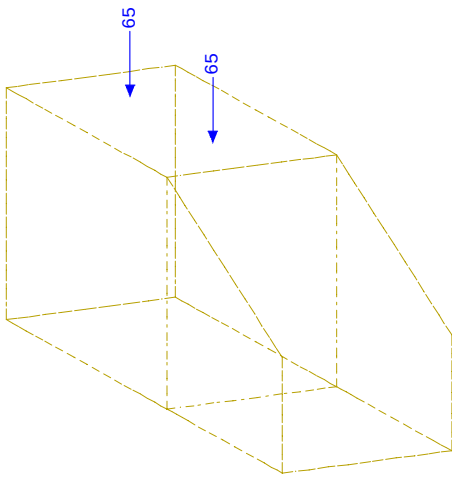
M 1 : 50
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo



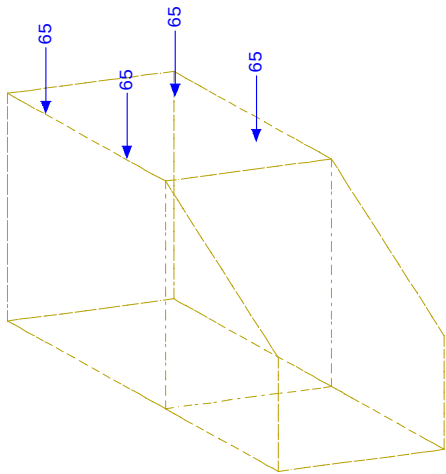
z All loads, Loadcase 9 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 49
x * 0.502
y * 0.906
z * 0.962



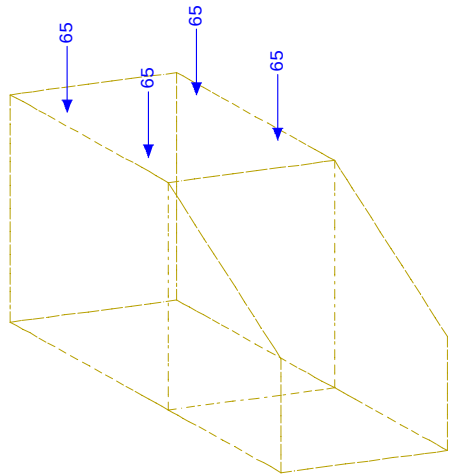
z All loads, Loadcase 10 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 51
x * 0.502
y * 0.906
z * 0.962



z All loads, Loadcase 11 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

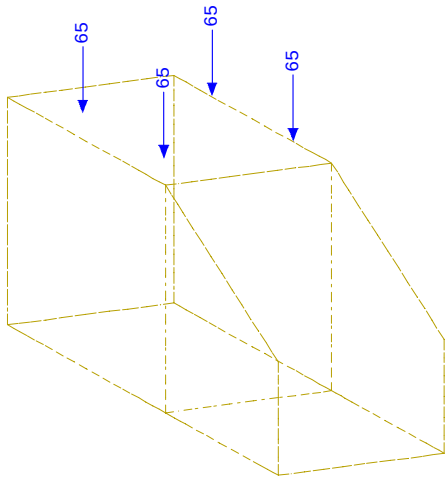
M 1 : 52
x * 0.502
y * 0.906
z * 0.962



z All loads, Loadcase 12 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

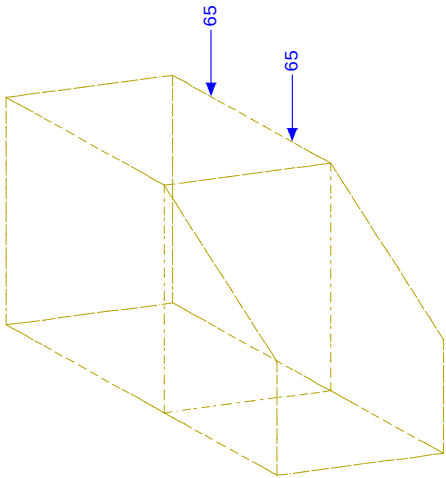
M 1 : 52
x * 0.502
y * 0.906
z * 0.962

Características del modelo



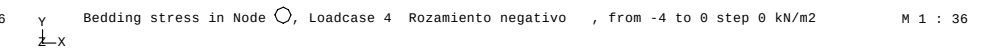
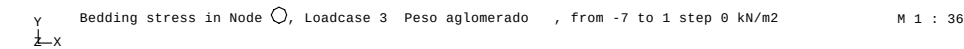
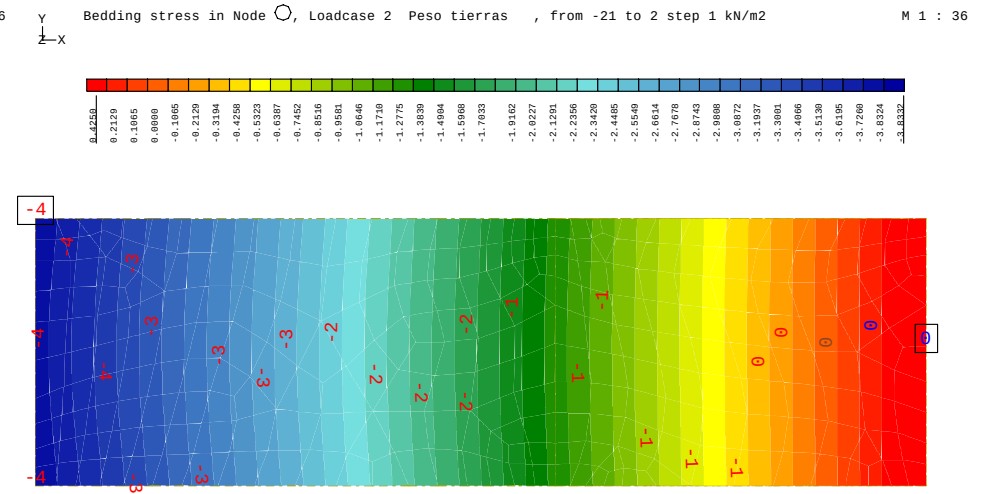
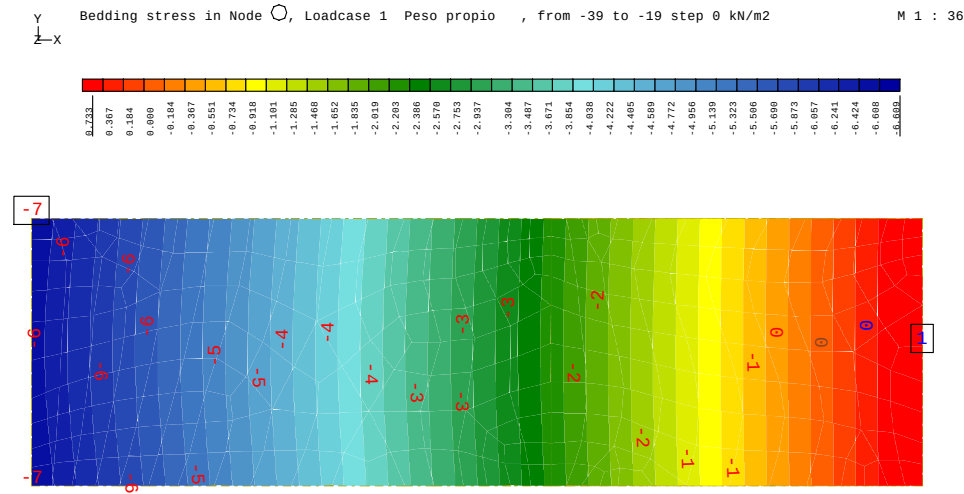
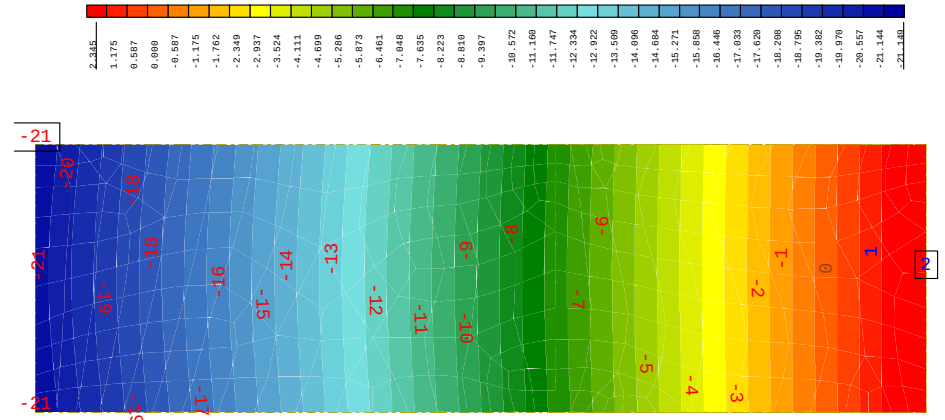
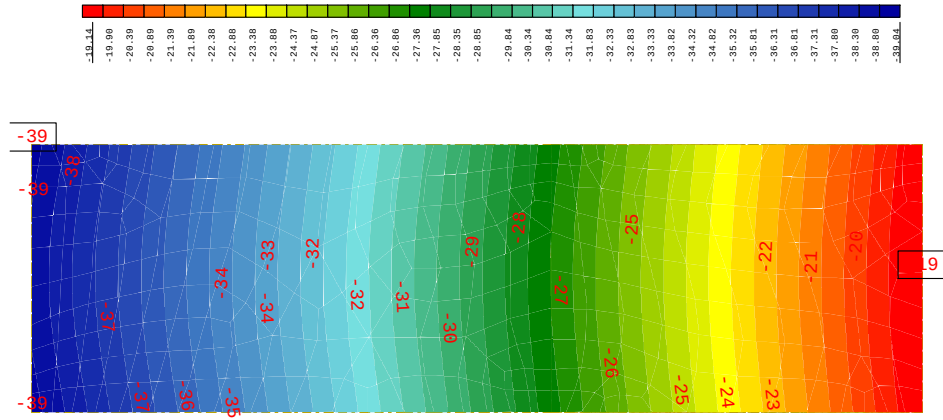
z All loads, Loadcase 13 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 52
x * 0.502
y * 0.906
z * 0.962

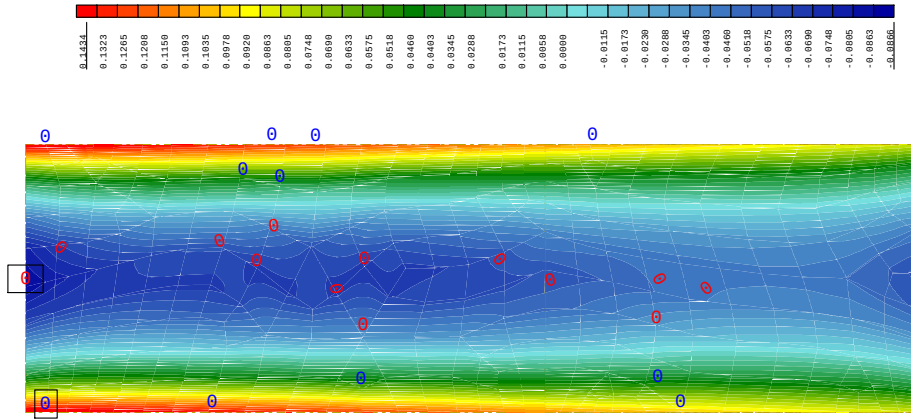


z All loads, Loadcase 14 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 52
x * 0.502
y * 0.906
z * 0.962

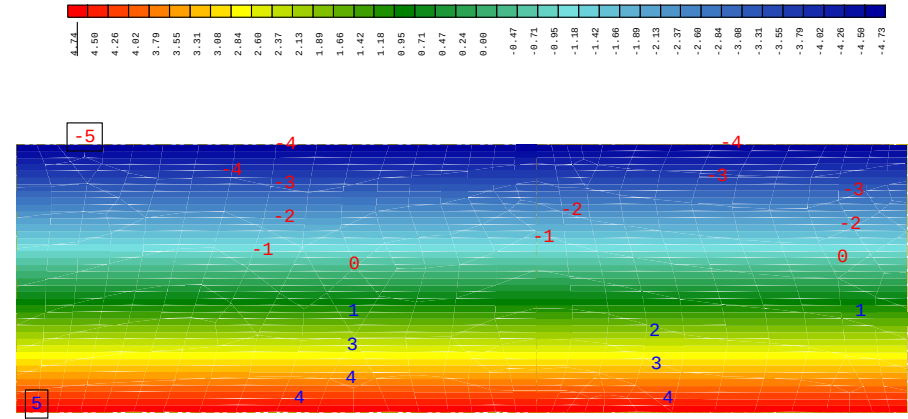


Reacciones terreno LC y ELS



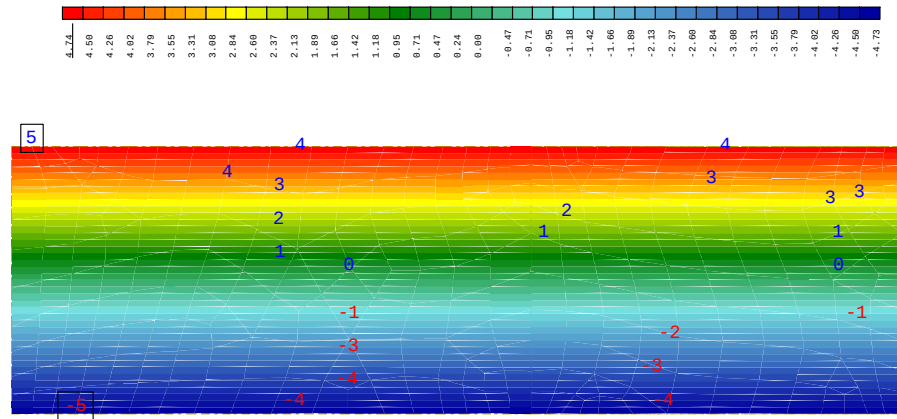
Y Bedding stress in Node ○, Loadcase 5 Empuje tierras , from 0 to 0 step 0 kN/m²
X

M 1 : 36



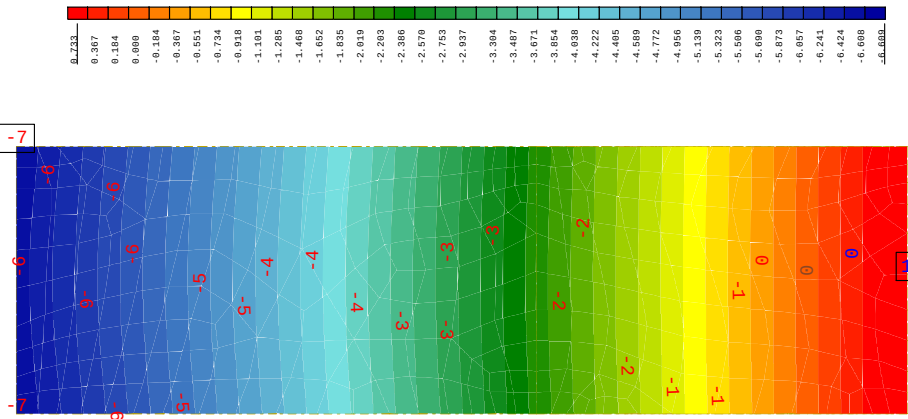
Y Bedding stress in Node ○, Loadcase 6 Sobrecarga uso terraplenes 1 , from -5 to 5 step 0 kN/m²
X

M 1 : 36



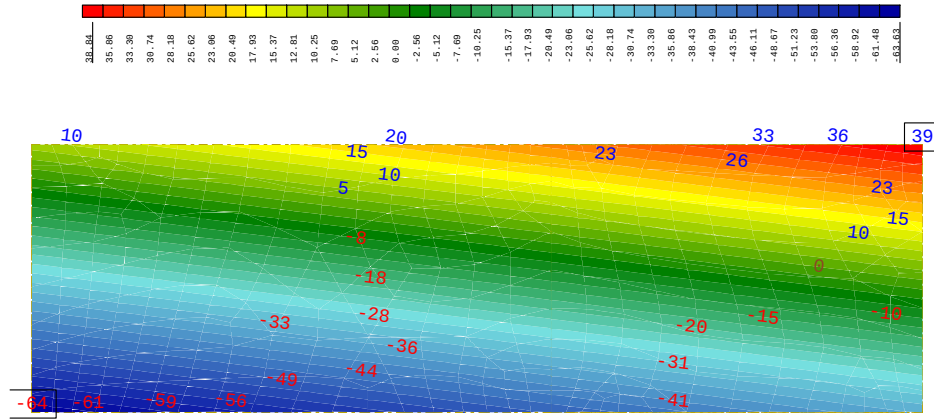
Y Bedding stress in Node ○, Loadcase 7 Sobrecarga uso terraplenes 2 , from -5 to 5 step 0 kN/m²
X

M 1 : 36



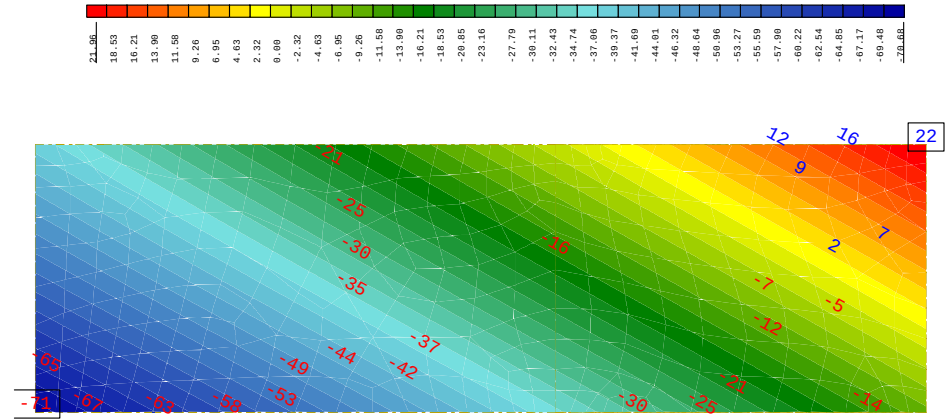
Y Bedding stress in Node ○, Loadcase 8 Sobrecarga uniforme , from -7 to 1 step 0 kN/m²
X

M 1 : 36



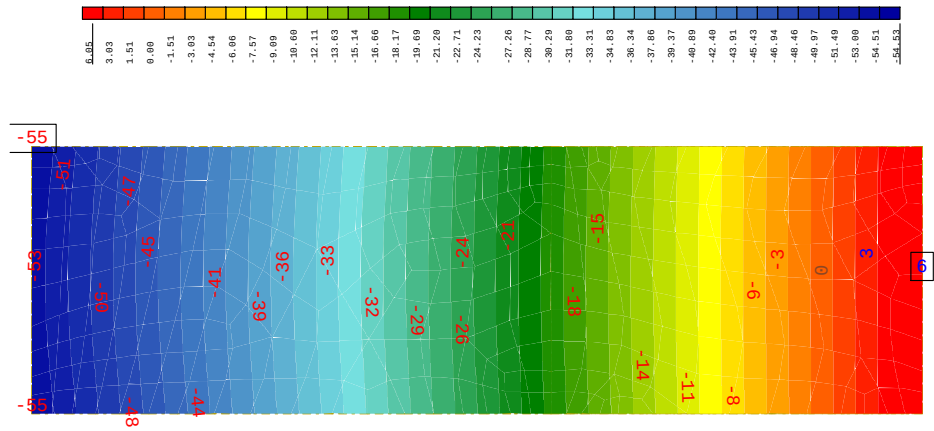
Y
Z-X Bedding stress in Node O, Loadcase 9 Carro , from -64 to 39 step 3 kN/m2

M 1 : 36



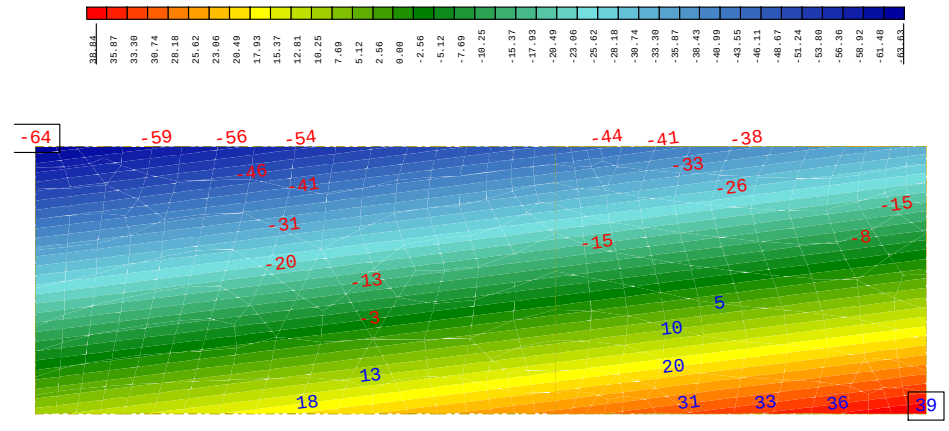
Y
Z-X Bedding stress in Node O, Loadcase 11 Carro , from -71 to 22 step 2 kN/m2

M 1 : 36



Y
Z-X Bedding stress in Node O, Loadcase 12 Carro , from -55 to 6 step 2 kN/m2

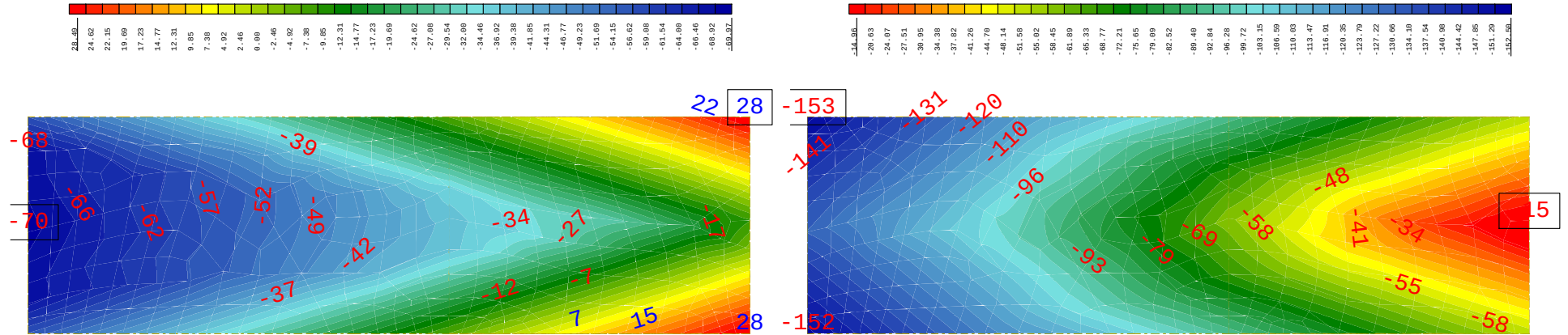
M 1 : 36



Y
Z-X Bedding stress in Node O, Loadcase 14 Carro , from -64 to 39 step 3 kN/m2

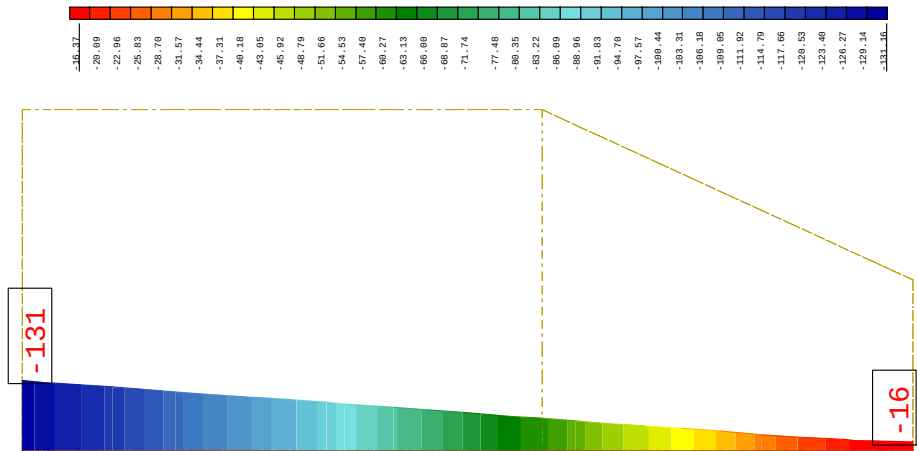
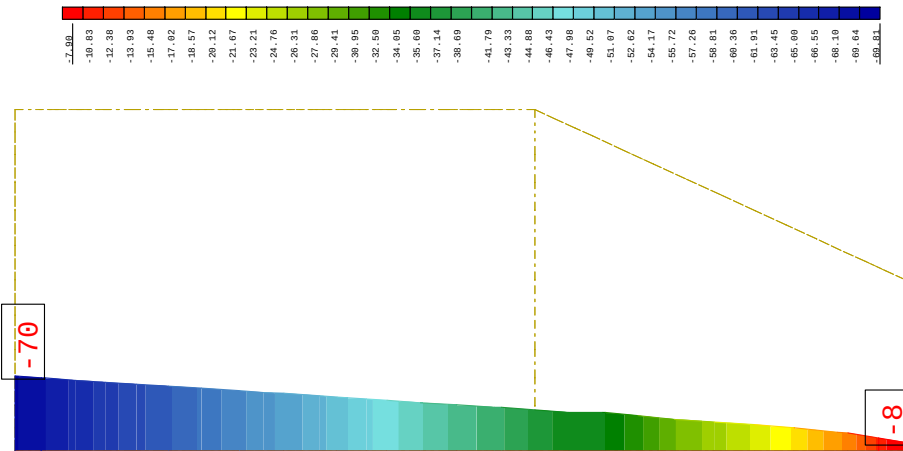
M 1 : 36

Reacciones terreno LC y ELS



Y Bedding stress in Node ○, Loadcase 1117 MAXR-P QUAD Bedding Stresses , from -70 to 28 M 1 : 36
step 2 kN/m2

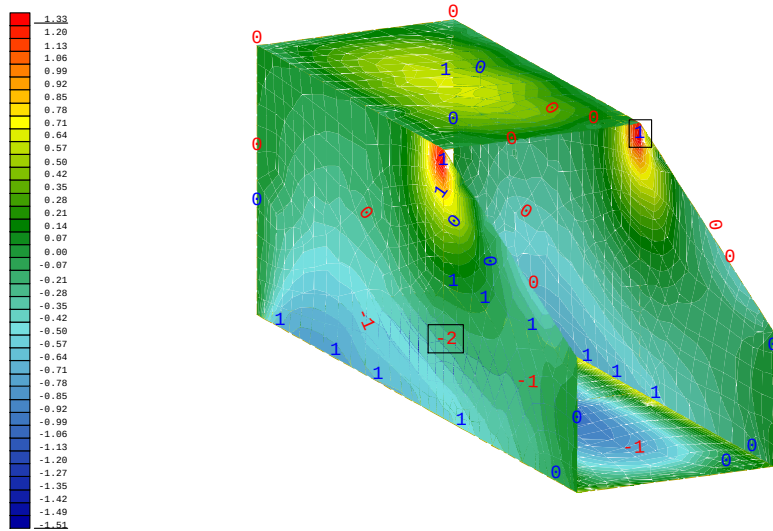
Y Bedding stress in Node ○, Loadcase 1118 MINR-P QUAD Bedding Stresses , from -153 to -15 M 1 : 36
step 3 kN/m2



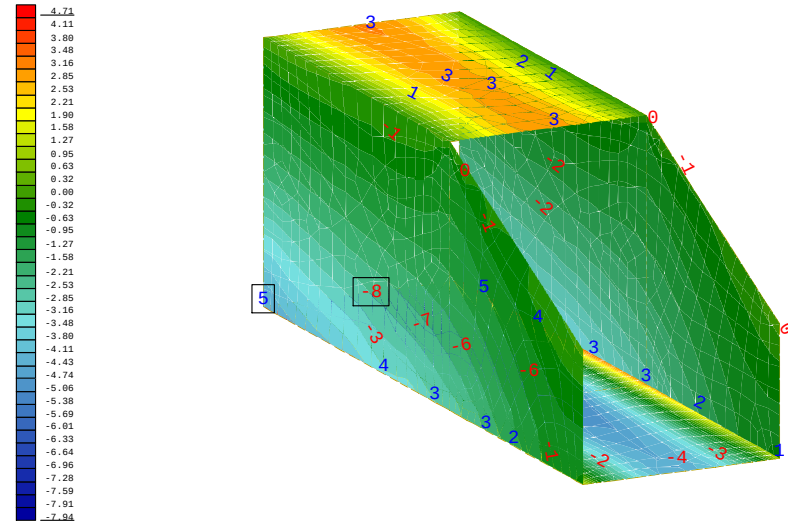
Z Bedding stress in Node ↓, Loadcase 1117 MAXR-P QUAD Bedding Stresses , 1 cm 3D = 50.000 M 1 : 36
kN/m2 (Min=-70) (Max=-8)

Z Bedding stress in Node ↓, Loadcase 1118 MINR-P QUAD Bedding Stresses , 1 cm 3D = 100.00 M 1 : 36
kN/m2 (Min=-131) (Max=-16)

Reacciones terreno LC y ELS

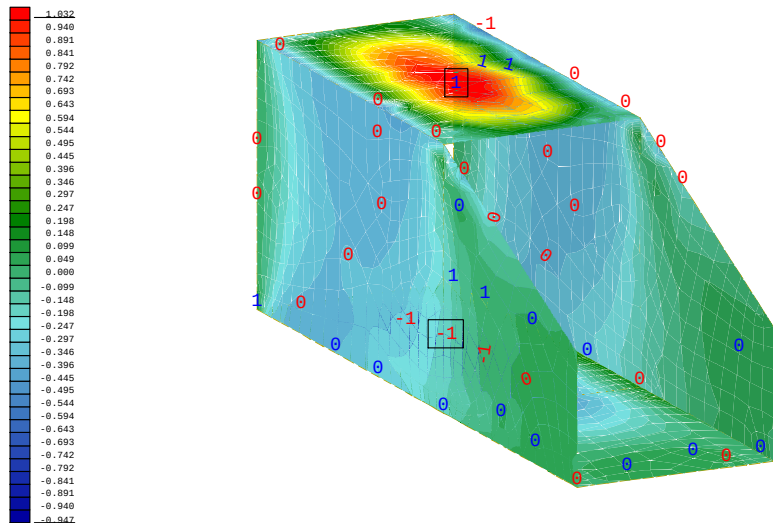


Bending moment m-xx in local x in Node $\rightarrow$, Loadcase 1 Peso propio , from -2 to 1 step 0
kNm/m

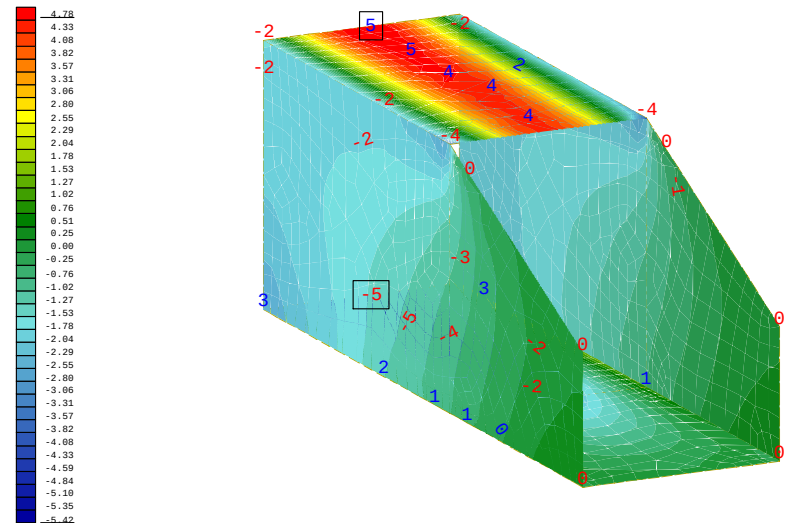


Bending moment m-yy in local y in Node, Loadcase 1 Peso propio , from -8 to 5 step 0 kNm/m
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



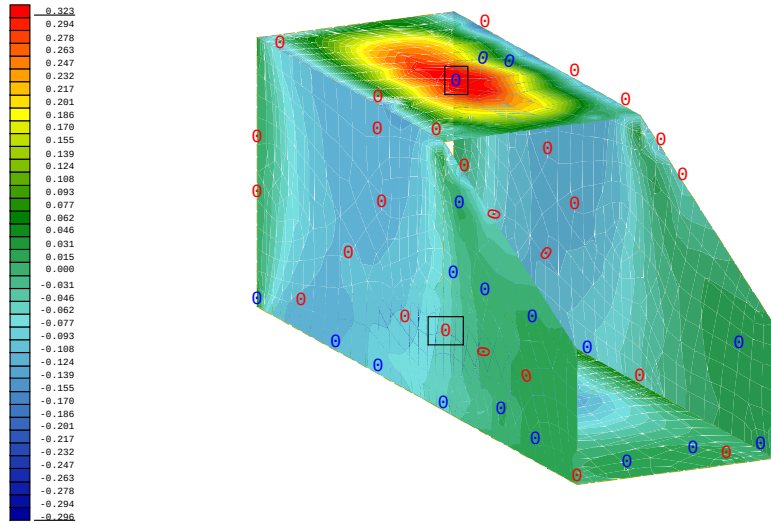
Bending moment m-xx in local x in Node $\rightarrow$, Loadcase 2 Peso tierras , from -1 to 1 step 0
kNm/m



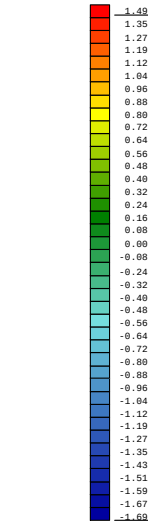
Bending moment m-yy in local y in Node, Loadcase 2 Peso tierras , from -5 to 5 step 0
kNm/m
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

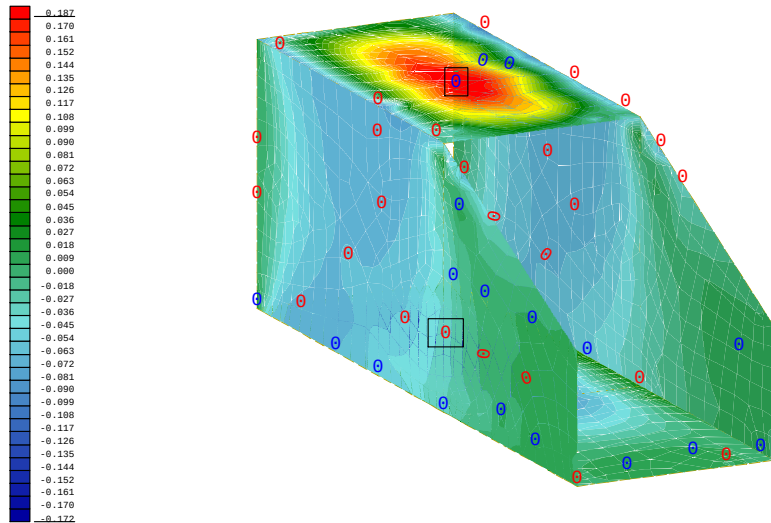


Bending moment m-xx in local x in Node $\rightarrow$, Loadcase 3 Peso aglomerado, from 0 to 0 step 0 kNm/m

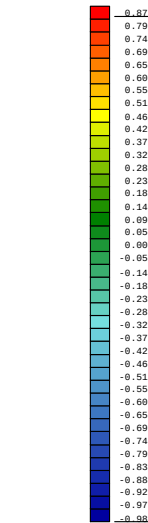


Bending moment m-yy in local y in Node, Loadcase 3 Peso aglomerado, from -2 to 1 step 0 kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



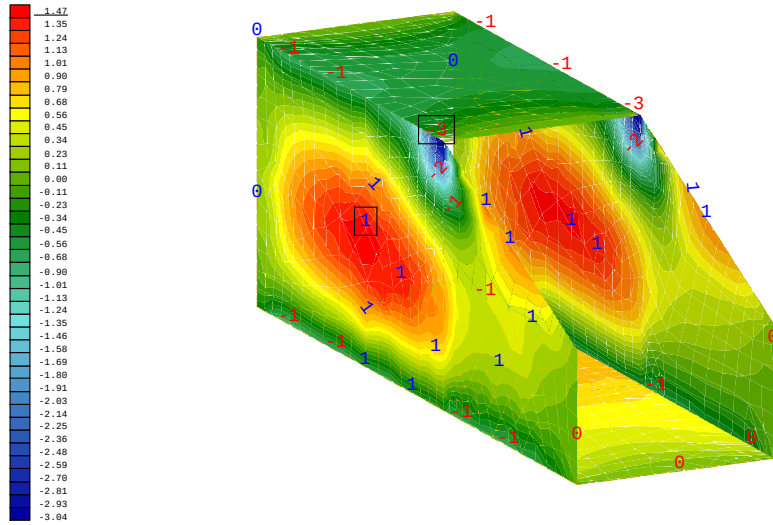
Bending moment m-xx in local x in Node $\rightarrow$, Loadcase 4 Rozamiento negativo, from 0 to 0 step 0 kNm/m



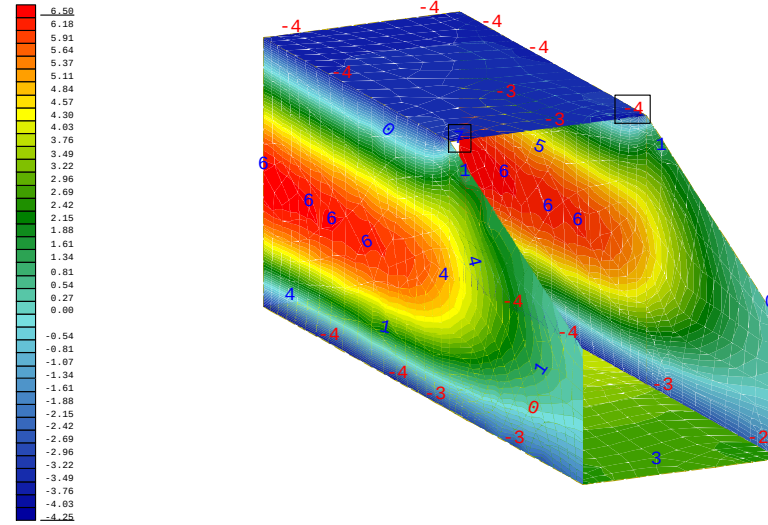
Bending moment m-yy in local y in Node, Loadcase 4 Rozamiento negativo, from -1 to 1 step 0 kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

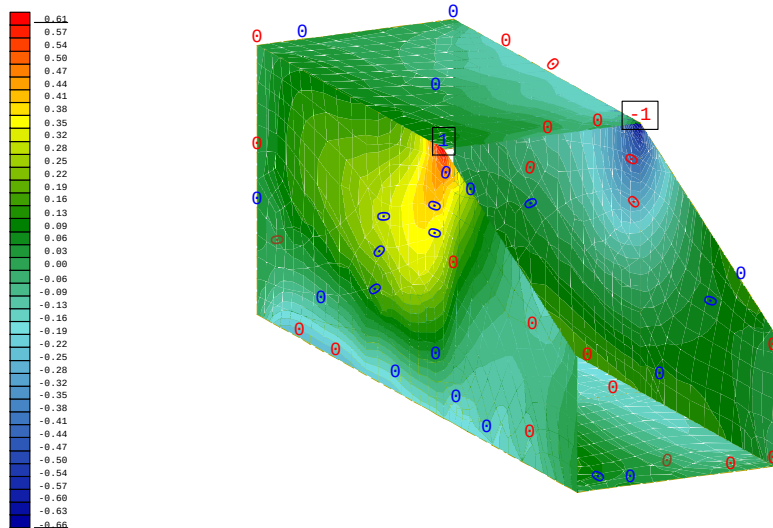


Bending moment m-xx in local x in Node $\rightarrow$, Loadcase 5 Empuje tierras , from -3 to 1 step 0
kNm/m

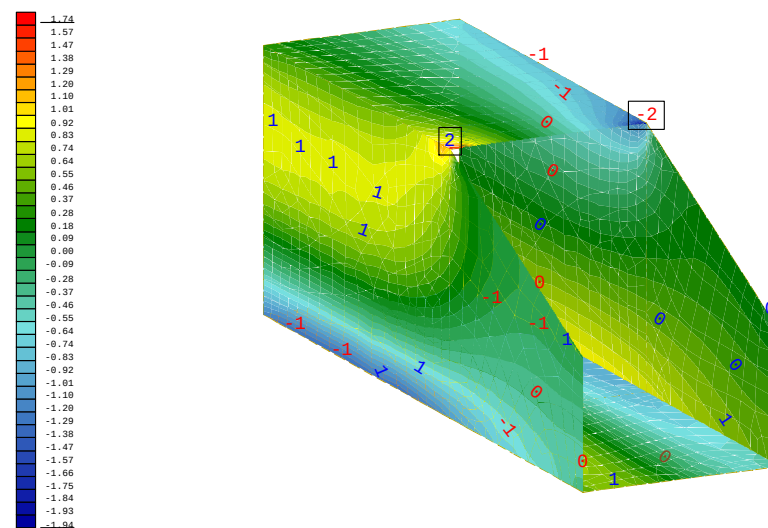


Bending moment m-yy in local y in Node, Loadcase 5 Empuje tierras , from -4 to 7 step 0
kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



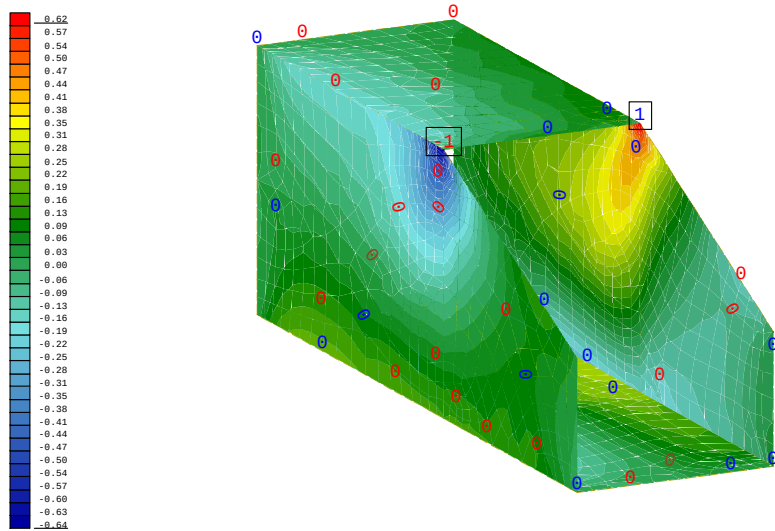
Bending moment m-xx in local x in Node $\rightarrow$, Loadcase 6 Sobrecarga uso terraplenes 1 , from -1 to 1 step 0 kNm/m



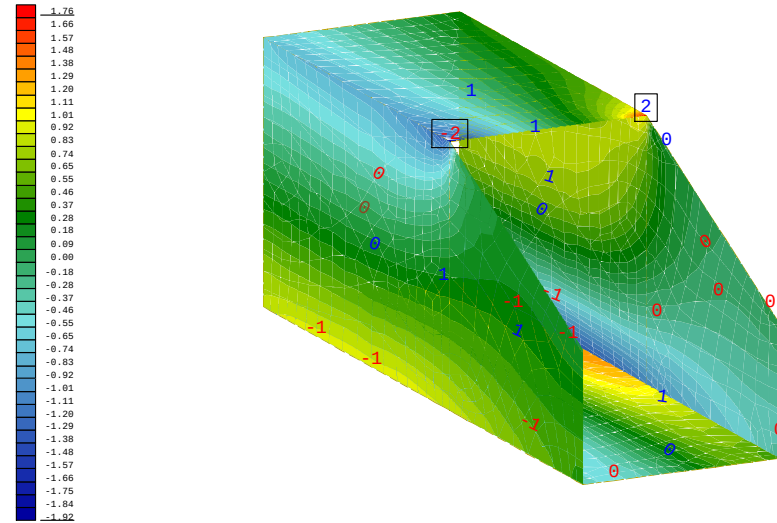
Bending moment m-yy in local y in Node, Loadcase 6 Sobrecarga uso terraplenes 1 , from -2 to 2 step 0 kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

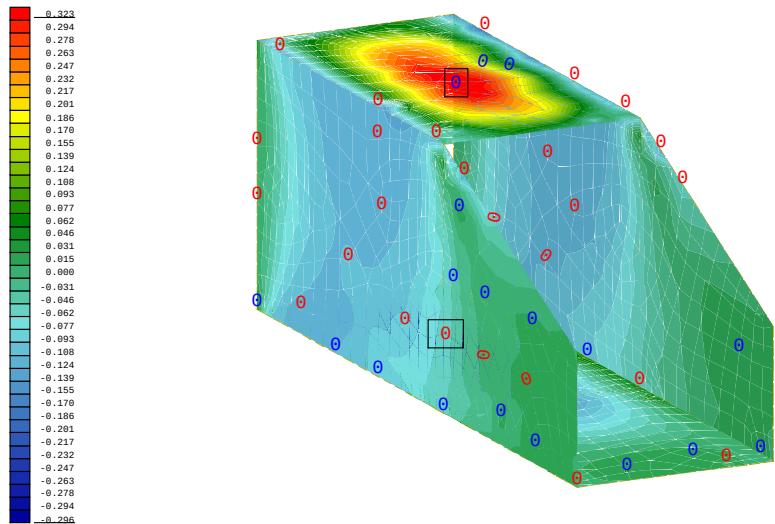


Bending moment m-xx in local x in Node , Loadcase 7 Sobrecarga uso terraplenes 2 , from -1 to 1 step 0 kNm/m

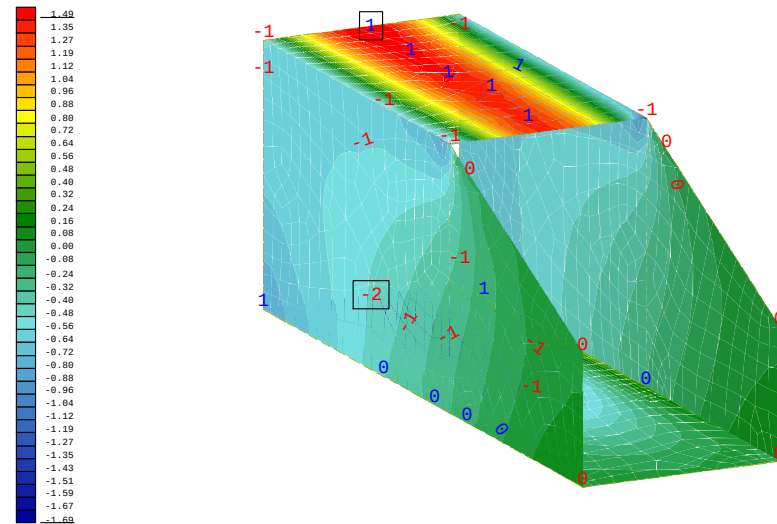


Bending moment m-yy in local y in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -2 to 2 step 0 kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



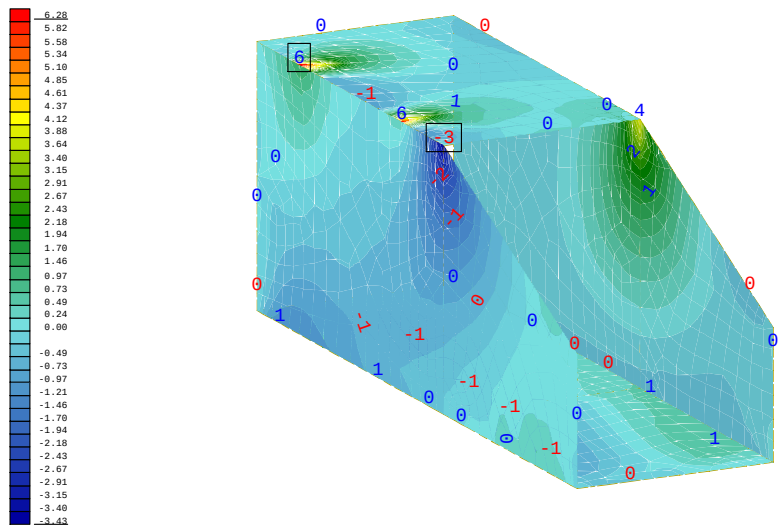
Bending moment m-xx in local x in Node , Loadcase 8 Sobrecarga uniforme , from 0 to 0 step 0 kNm/m



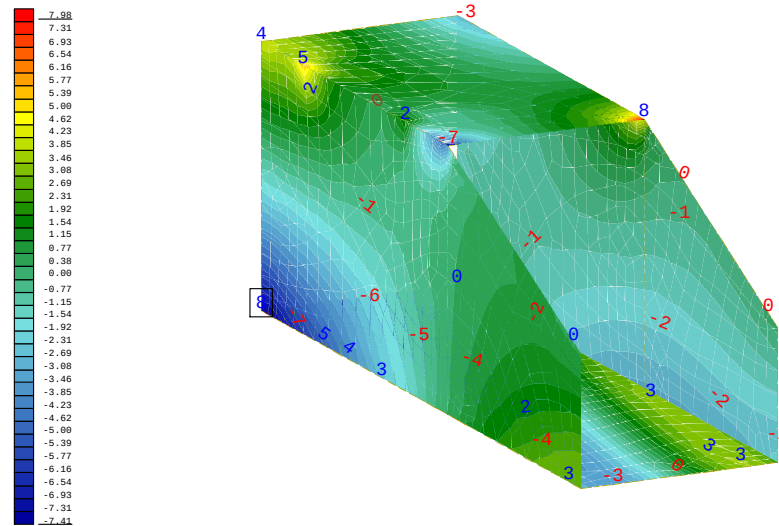
Bending moment m-yy in local y in Node, Loadcase 8 Sobrecarga uniforme , from -2 to 1 step 0 kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

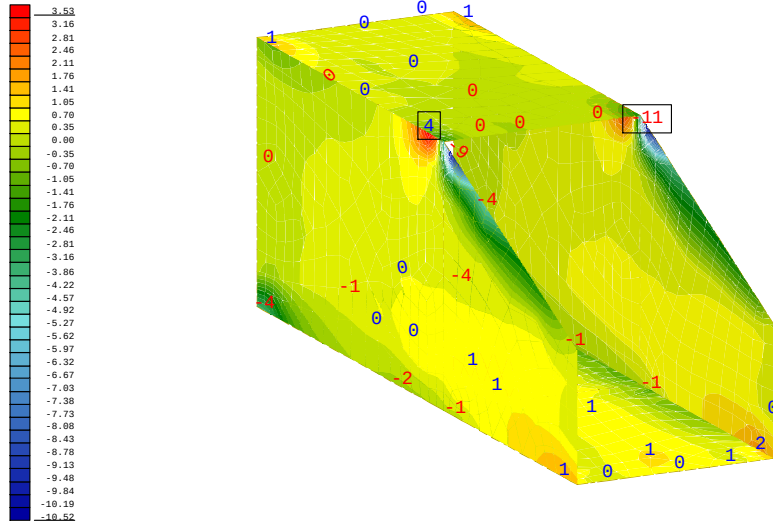


Bending moment m-xx in local x in Node 44, Loadcase 9 Carro, from -3 to 6 step 0 kNm/m

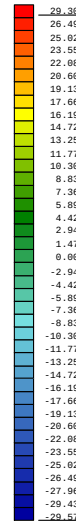


Bending moment m-yy in local y in Node, Loadcase 9 Carro, from -7 to 8 step 0 kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

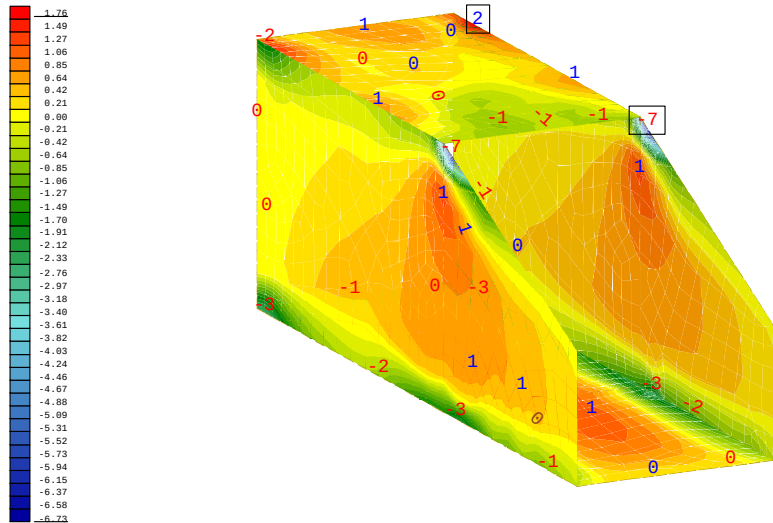


Shear force v-x in local x in Node $\rightarrow$, Loadcase 1 Peso propio, from -11 to 4 step 0 kN/m

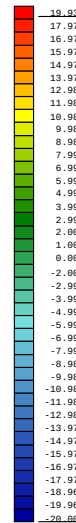


Shear force v-y in local y in Node, Loadcase 1 Peso propio, from -30 to 29 step 1 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



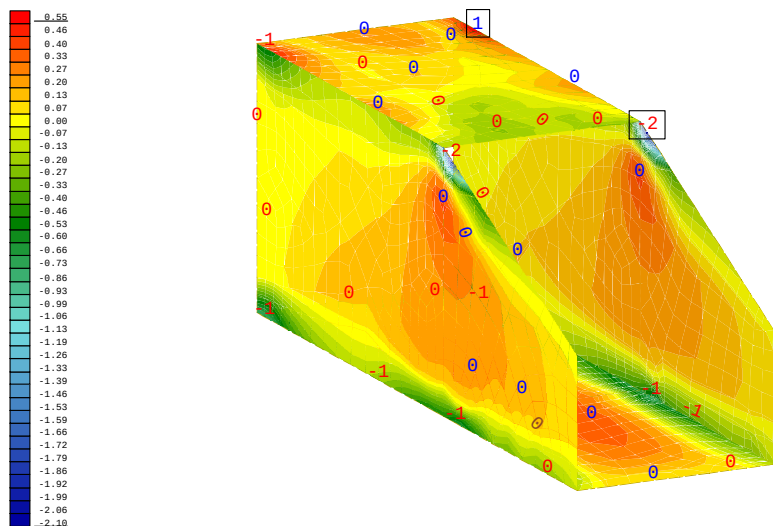
Shear force v-x in local x in Node $\rightarrow$, Loadcase 2 Peso tierras, from -7 to 2 step 0 kN/m



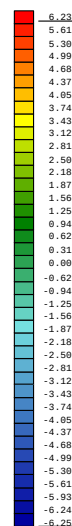
Shear force v-y in local y in Node, Loadcase 2 Peso tierras, from -20 to 20 step 1 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

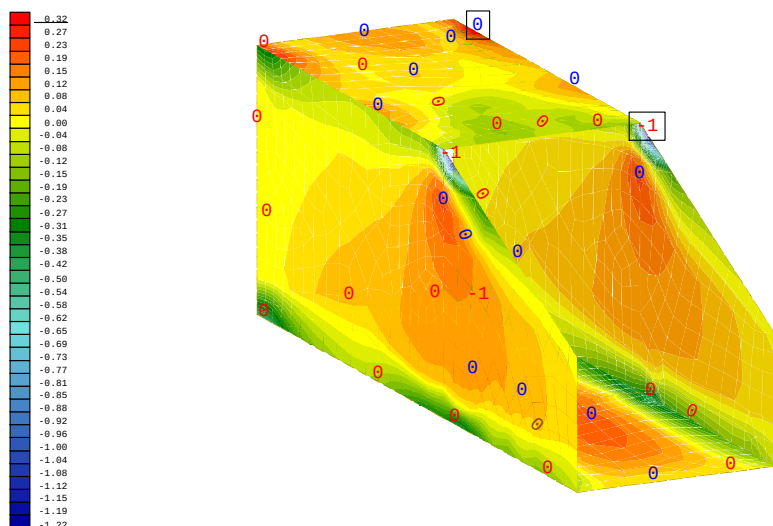


Shear force v-x in local x in Node 1, Loadcase 3 Peso aglomerado , from -2 to 1 step 0 kN/m

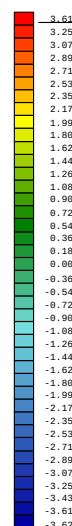


Shear force v-y in local y in Node, Loadcase 3 Peso aglomerado , from -6 to 6 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



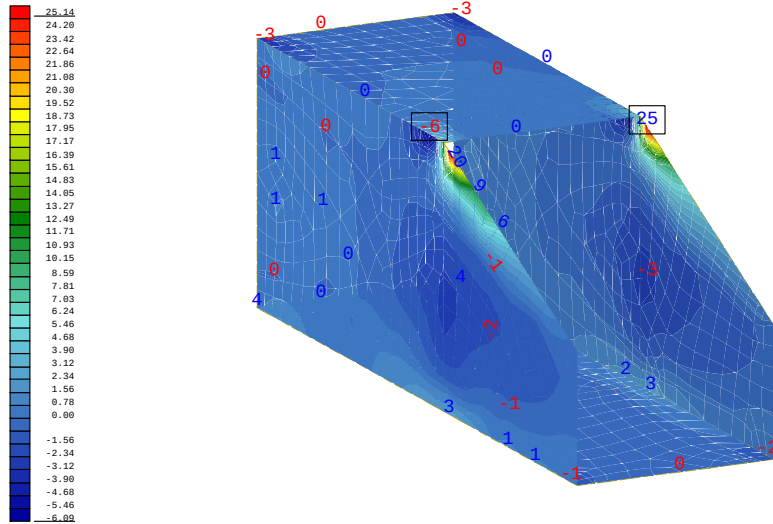
Shear force v-x in local x in Node 1, Loadcase 4 Rozamiento negativo , from -1 to 0 step 0 kN/m



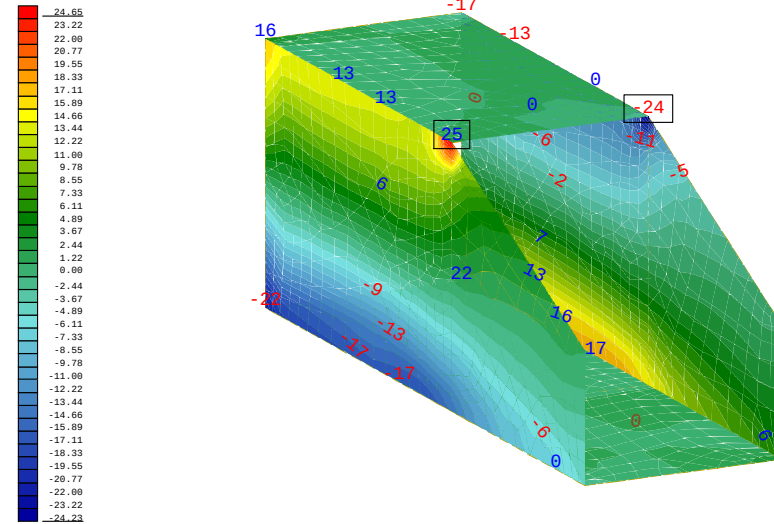
Shear force v-y in local y in Node, Loadcase 4 Rozamiento negativo , from -4 to 4 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

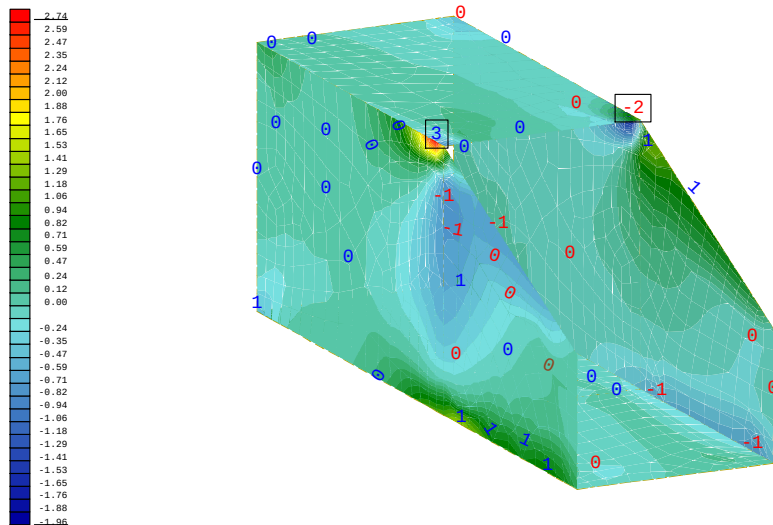


Shear force v-x in local x in Node 1, Loadcase 5 Empuje tierras, from -6 to 25 step 1 kN/m

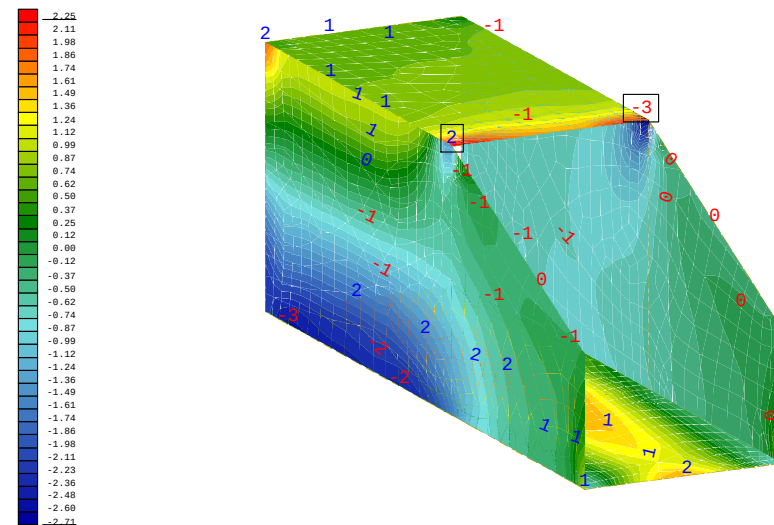


Shear force v-y in local y in Node, Loadcase 5 Empuje tierras, from -24 to 25 step 1 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



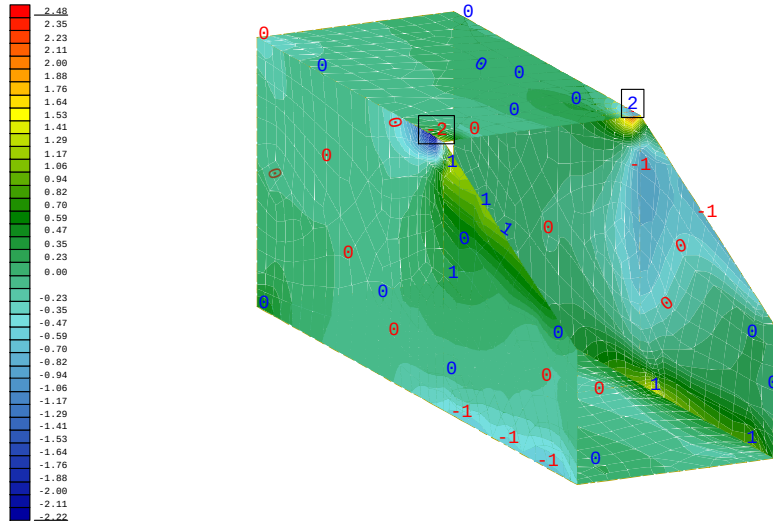
Shear force v-x in local x in Node 1, Loadcase 6 Sobrecarga uso terraplenes 1, from -2 to 3 step 0 kN/m



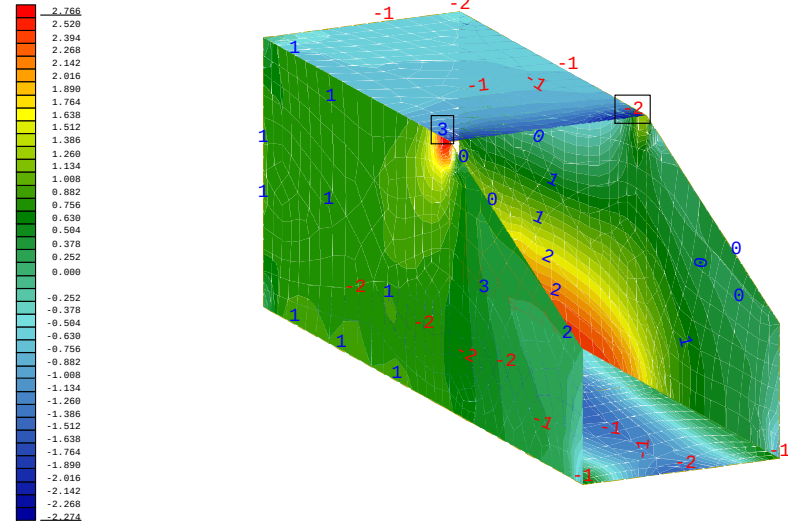
Shear force v-y in local y in Node, Loadcase 6 Sobrecarga uso terraplenes 1, from -3 to 2 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

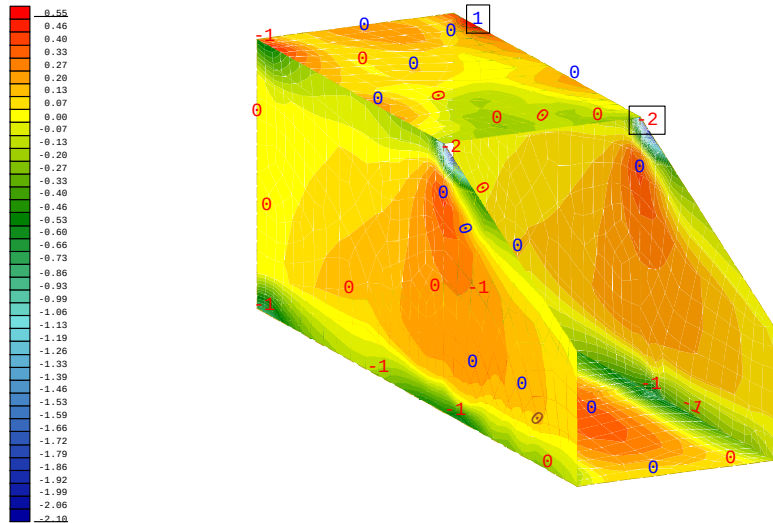


Shear force v-x in local x in Node 1, Loadcase 7 Sobrecarga uso terraplenes 2, from -2 to 2 step 0 kN/m

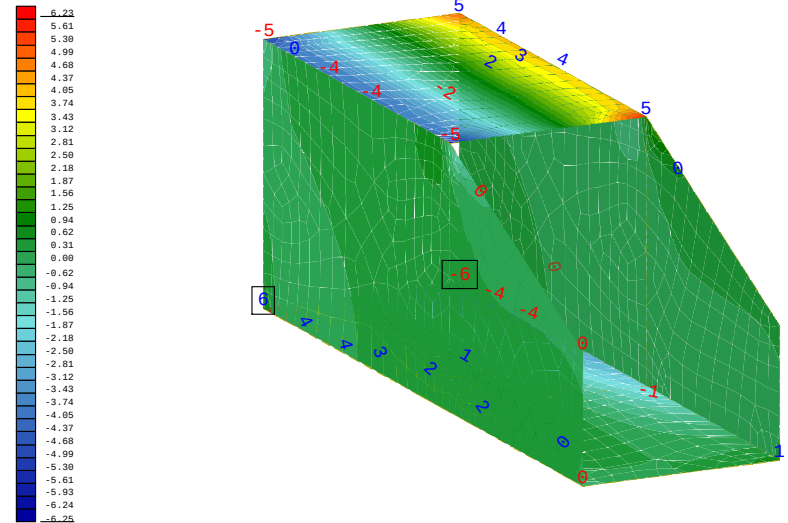


Shear force v-y in local y in Node 1, Loadcase 7 Sobrecarga uso terraplenes 2, from -2 to 2 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



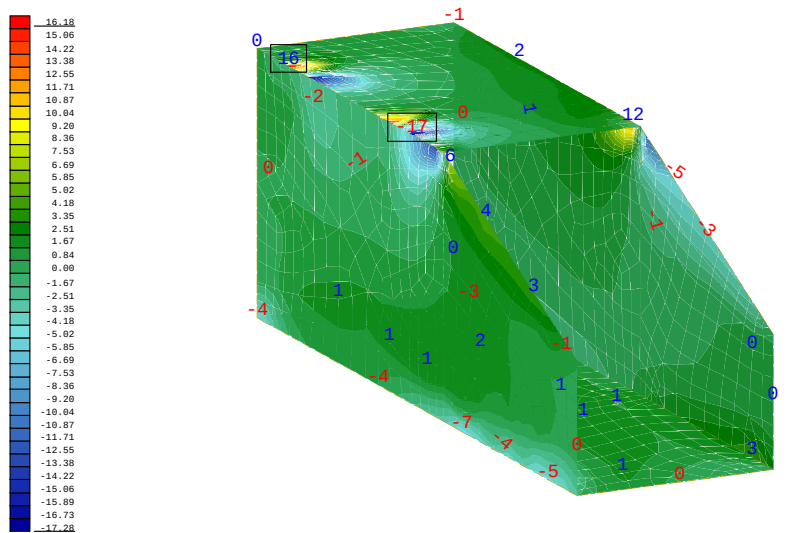
Shear force v-x in local x in Node 1, Loadcase 8 Sobrecarga uniforme, from -2 to 1 step 0 kN/m



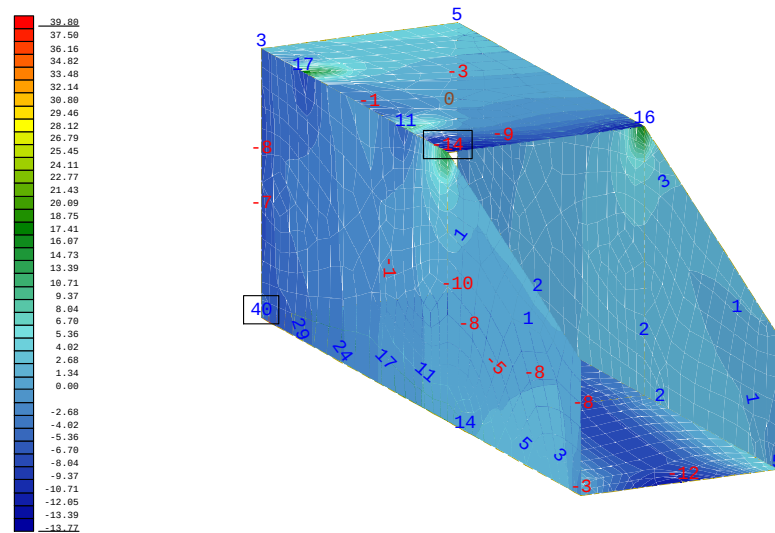
Shear force v-y in local y in Node 1, Loadcase 8 Sobrecarga uniforme, from -6 to 6 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

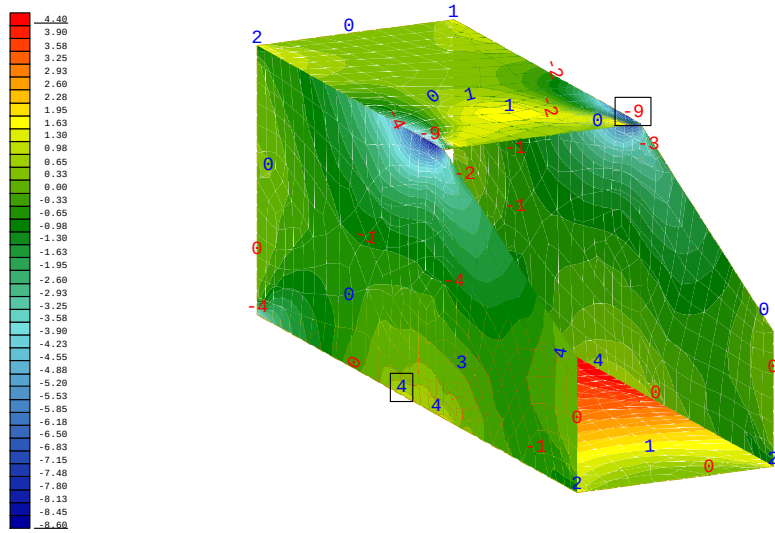


Shear force v-x in local x in Node, Loadcase 9 Carro, from -17 to 16 step 1 kN/m
Z
X Y

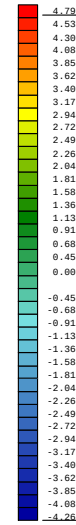


Shear force v-y in local y in Node, Loadcase 9 Carro, from -14 to 40 step 1 kN/m
Z
X Y
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

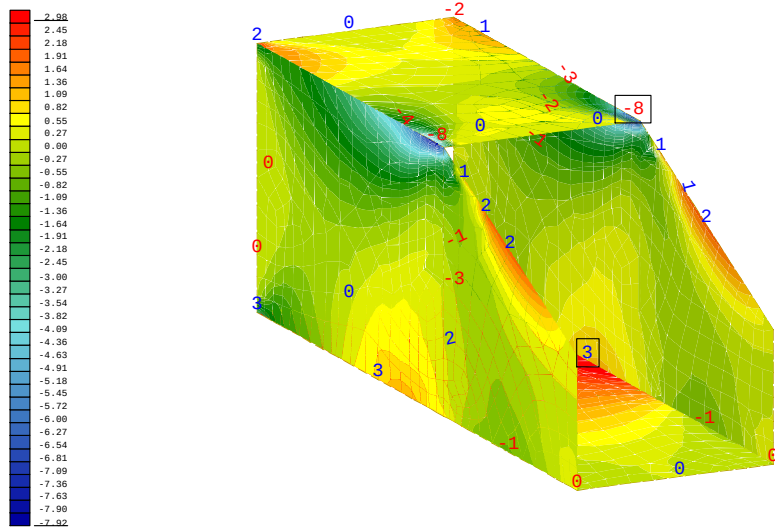


Membrane force n-xx in local x in Node, Loadcase 1 Peso propio, from -9 to 4 step 0 kN/m

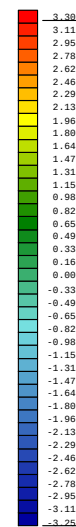


Membrane shear force n-xy in local xy in Node, Loadcase 1 Peso propio, from -4 to 5 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



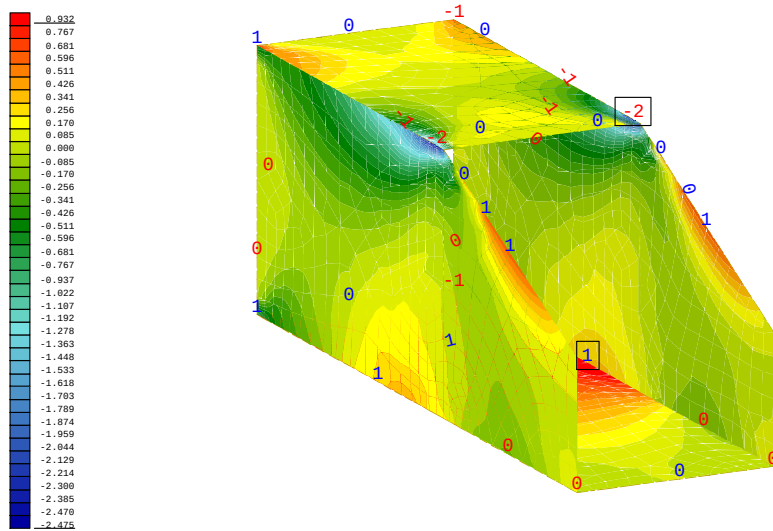
Membrane force n-xx in local x in Node, Loadcase 2 Peso tierras, from -8 to 3 step 0 kN/m



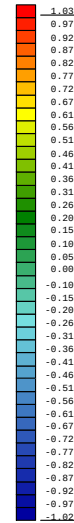
Membrane shear force n-xy in local xy in Node, Loadcase 2 Peso tierras, from -3 to 3 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

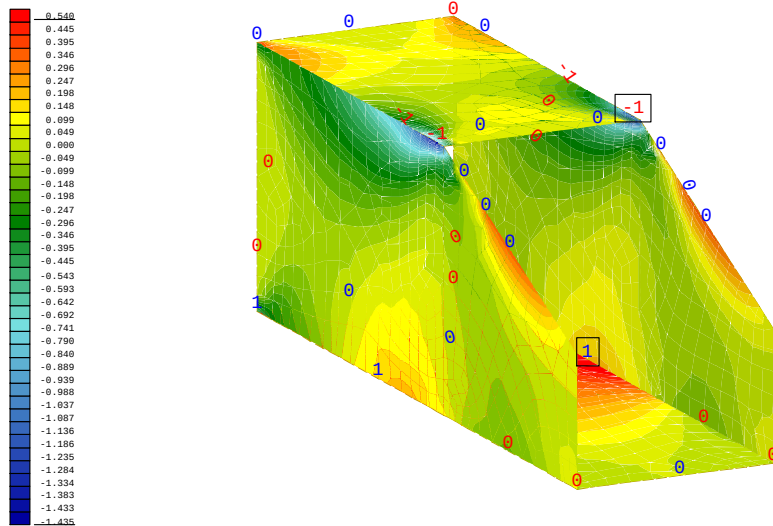


Membrane force n-xx in local x in Node, Loadcase 3 Peso aglomerado, from -2 to 1 step 0 kN/m

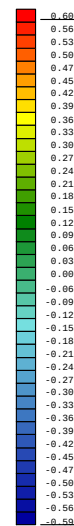


Membrane shear force n-xy in local xy in Node, Loadcase 3 Peso aglomerado, from -1 to 1 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



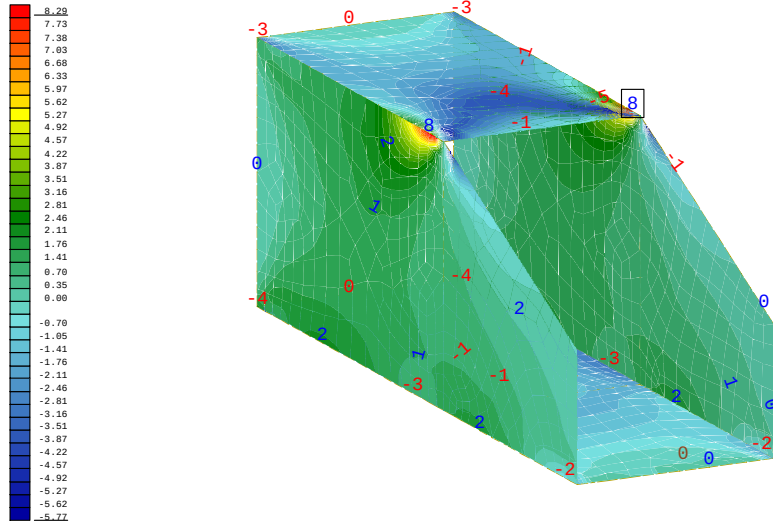
Membrane force n-xx in local x in Node, Loadcase 4 Rozamiento negativo, from -1 to 1 step 0 kN/m



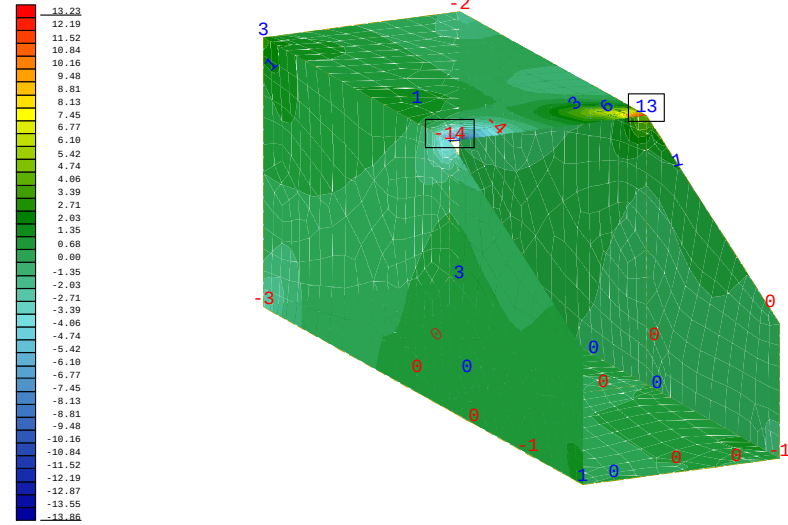
Membrane shear force n-xy in local xy in Node, Loadcase 4 Rozamiento negativo, from -1 to 1 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

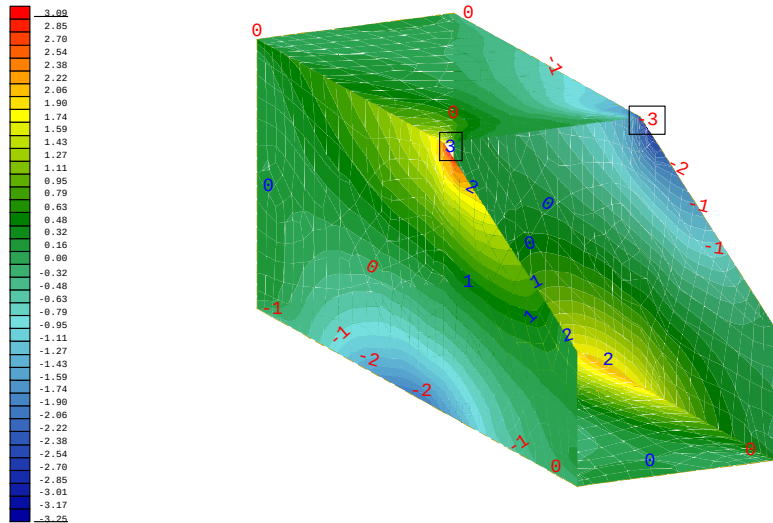


Membrane force n-xx in local x in Node, Loadcase 5 Empuje tierras, from -6 to 8 step 0 kN/m

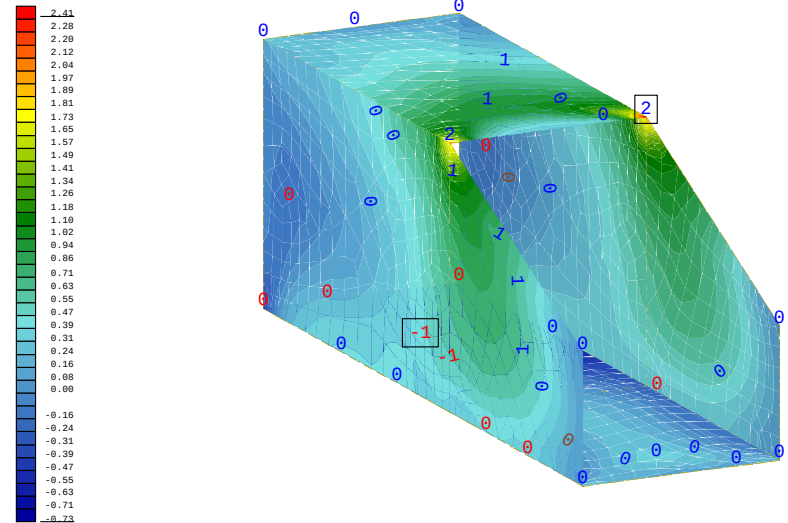


Membrane shear force n-xy in local xy in Node, Loadcase 5 Empuje tierras, from -14 to 13 step 1 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



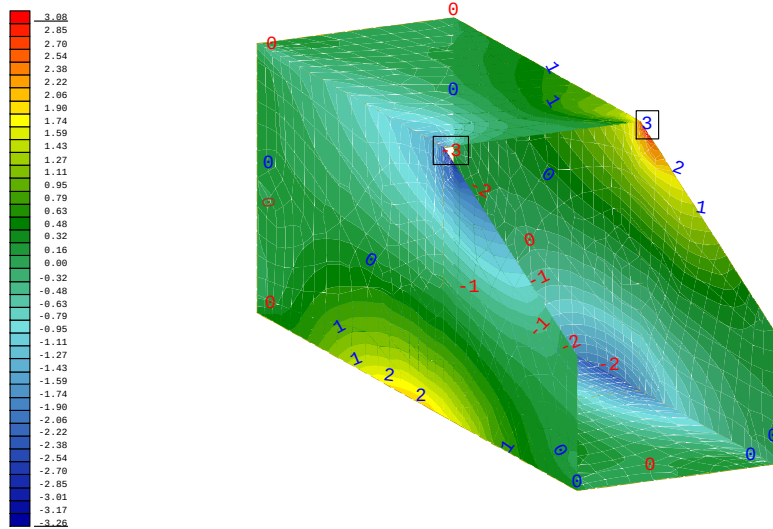
Membrane force n-xx in local x in Node, Loadcase 6 Sobrecarga uso terraplenes 1, from -3 to 3 step 0 kN/m



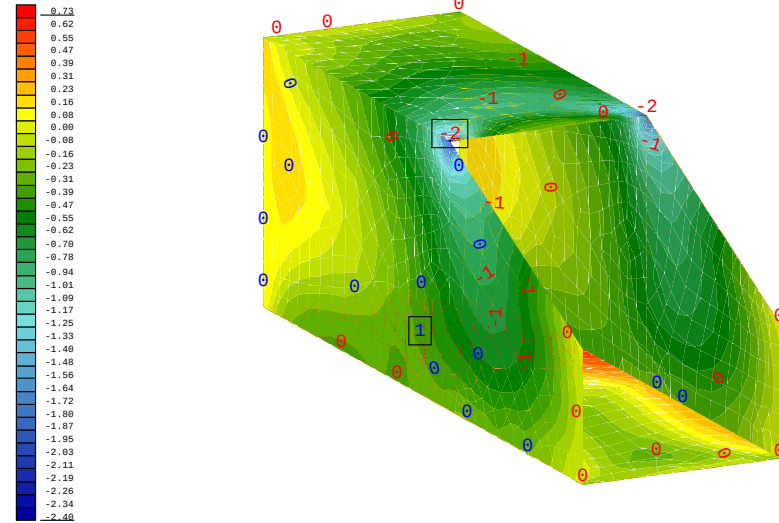
Membrane shear force n-xy in local xy in Node, Loadcase 6 Sobrecarga uso terraplenes 1, from -1 to 2 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

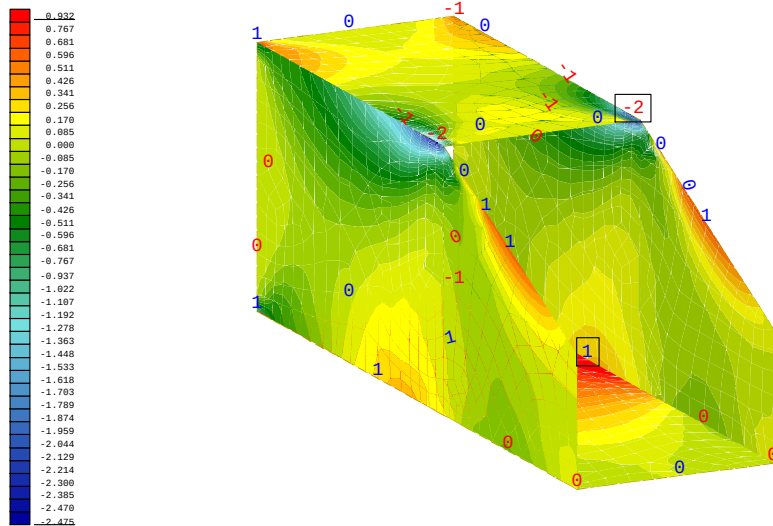


Membrane force n-xx in local x in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -3 to 3 step 0 kN/m

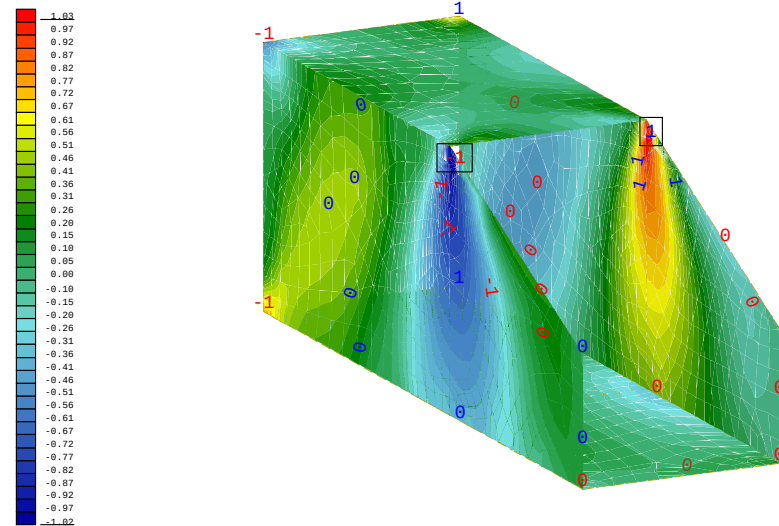


Membrane shear force n-xy in local xy in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -2 to 1 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



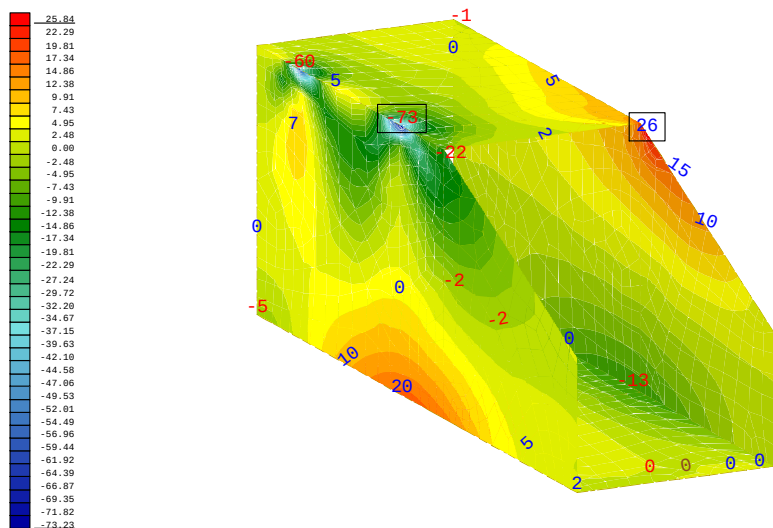
Membrane force n-xx in local x in Node, Loadcase 8 Sobrecarga uniforme , from -2 to 1 step 0 kN/m



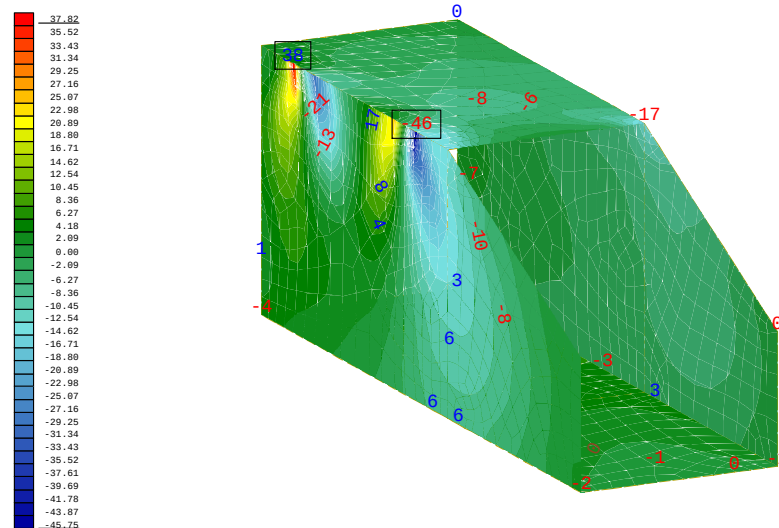
Membrane shear force n-xy in local xy in Node, Loadcase 8 Sobrecarga uniforme , from -1 to 1 step 0 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

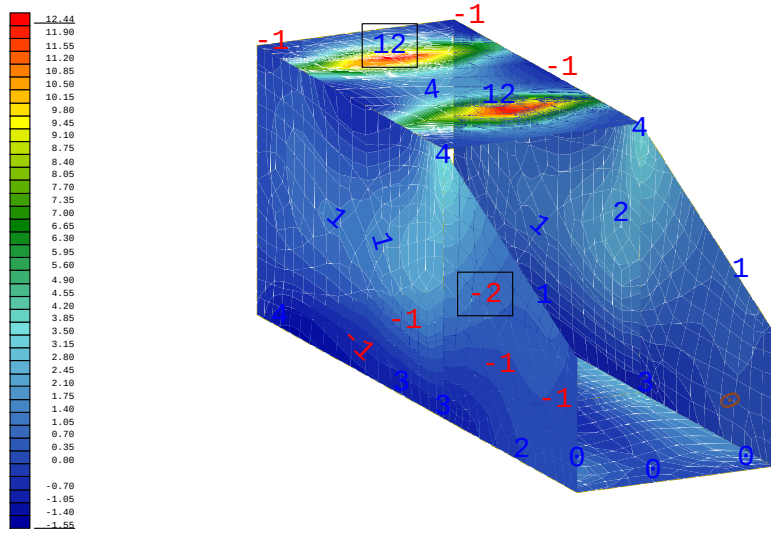


Membrane force n-xx in local x in Node, Loadcase 9 Carro, from -73 to 26 step 2 kN/m

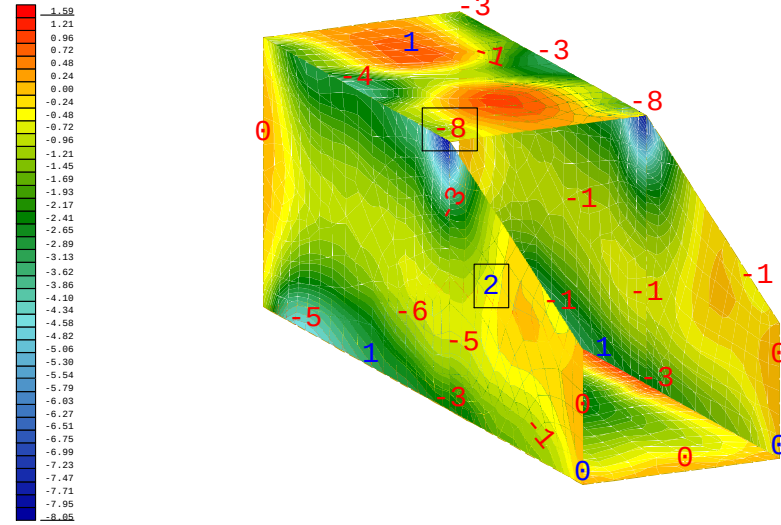


Membrane shear force n-xy in local xy in Node, Loadcase 9 Carro, from -46 to 38 step 2 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

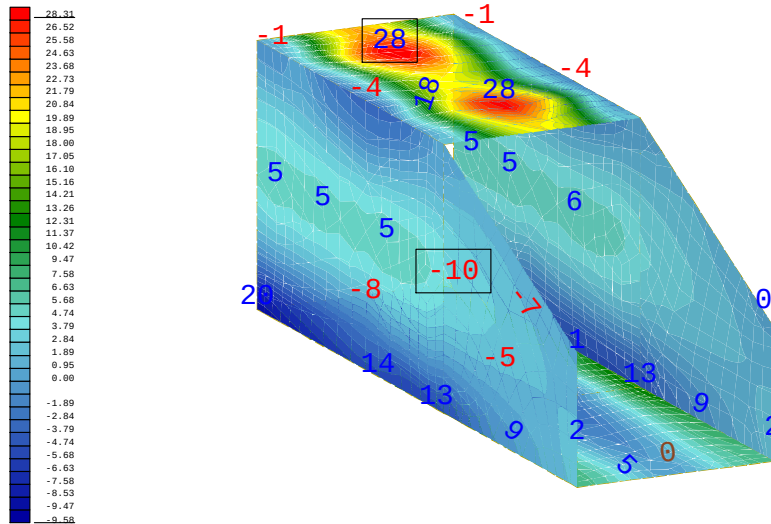


Z Bending moment m-xx in local x from middle of element, Loadcase 2101 MAX-MXX QUAD Forces
X Y in Quadrilat, from -2 to 12 step 0 kNm/m

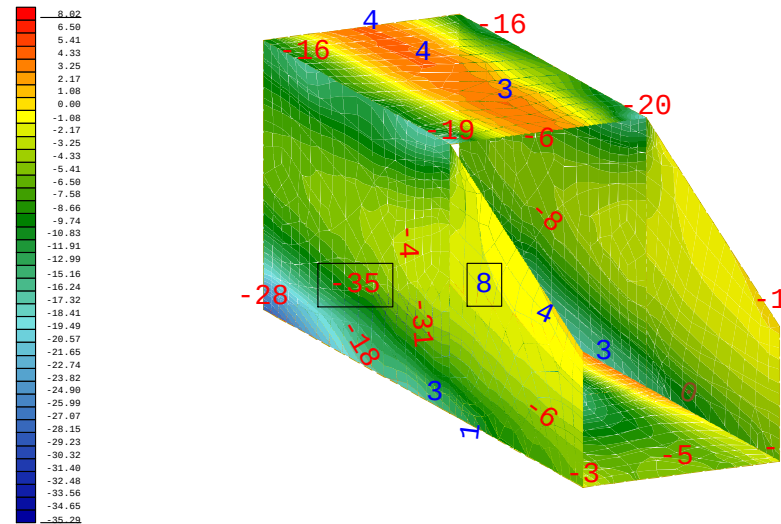


M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962
Z Bending moment m-xx in local x from middle of element, Loadcase 2102 MIN-MXX QUAD Forces
X Y in Quadrilat, from -8 to 2 step 0 kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



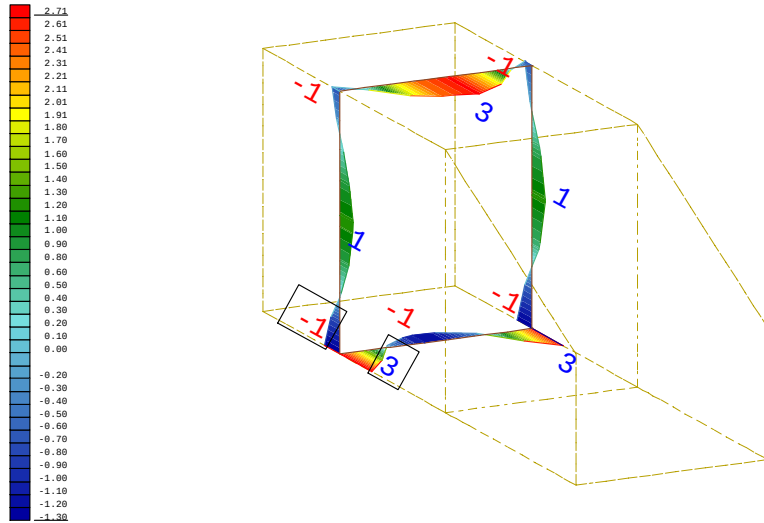
Z Bending moment m-yy in local y from middle of element, Loadcase 2103 MAX-MYY QUAD Forces in
X Y Quadrilat, from -10 to 28 step 1 kNm/m



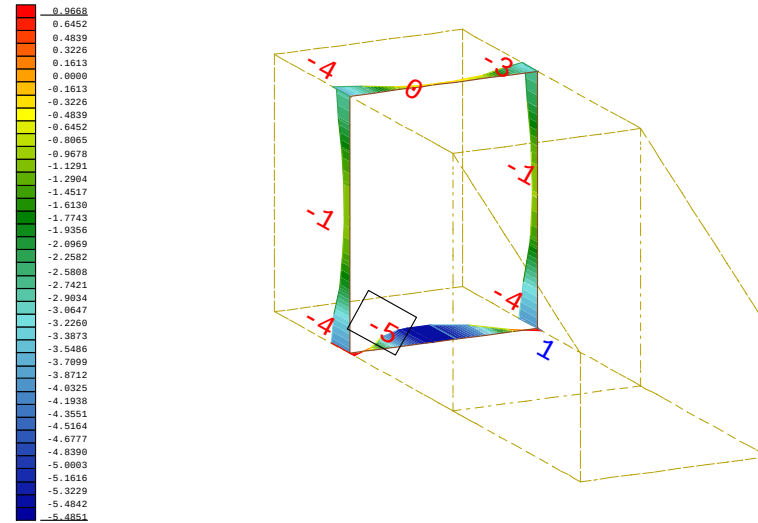
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962
Z Bending moment m-yy in local y from middle of element, Loadcase 2104 MIN-MYY QUAD Forces in
X Y Quadrilat, from -35 to 8 step 1 kNm/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

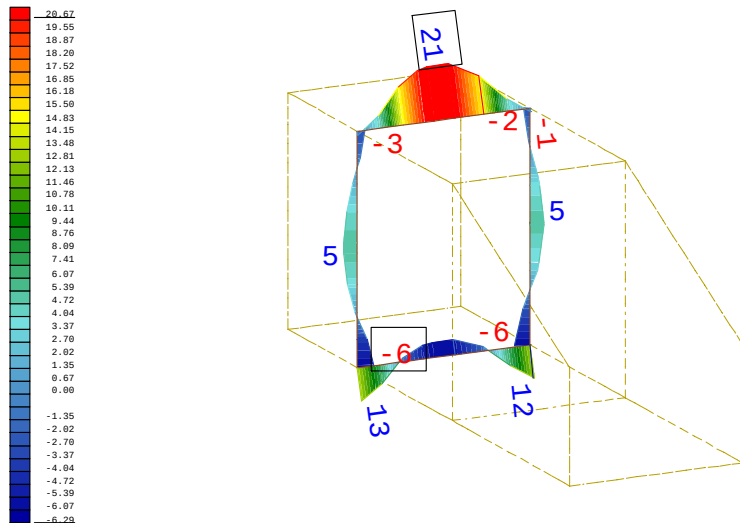


Z Bending moment m-xx in local x from middle of element ↗, Loadcase 2101 MAX-MXX QUAD Forces
Y in Quadrilat , 1 cm 3D = 2.0000 kNm/m (Min=-1) (Max=3)

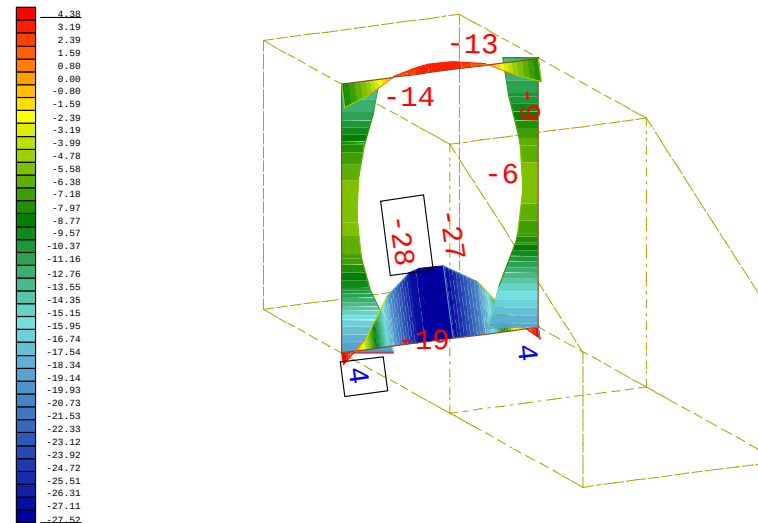


Z Bending moment m-xx in local x from middle of element ↗, Loadcase 2102 MIN-MXX QUAD Forces
Y in Quadrilat , 1 cm 3D = 5.0000 kNm/m (Min=-5) (Max=1)
M 1 : 45
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 46
X * 0.502
Y * 0.906
Z * 0.962



Z Bending moment m-yy in local y from middle of element, Loadcase 2103 MAX-MYY QUAD Forces in
Y Quadrilat , 1 cm 3D = 20.000 kNm/m (Min=-6) (Max=21)



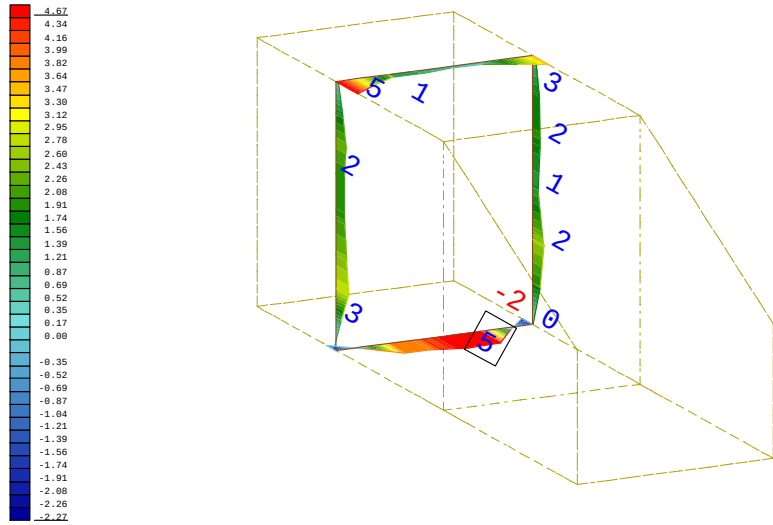
Z Bending moment m-yy in local y from middle of element, Loadcase 2104 MIN-MYY QUAD Forces in
Y Quadrilat , 1 cm 3D = 20.000 kNm/m (Min=-28) (Max=4)
M 1 : 50
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

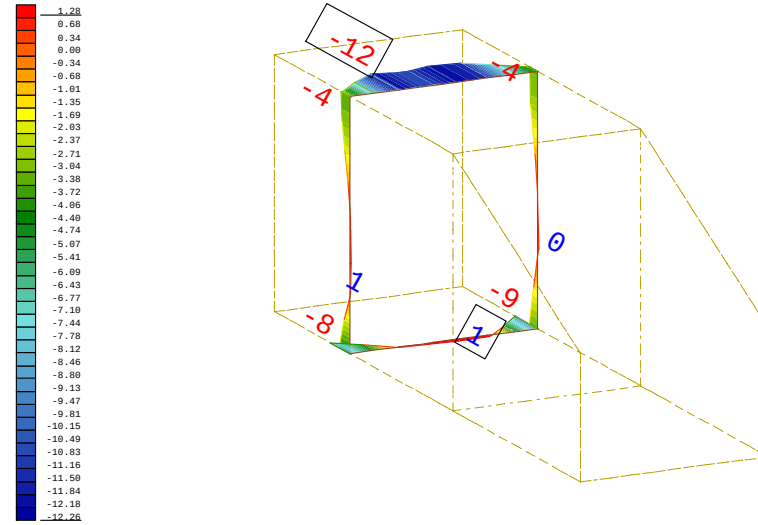
Esfuerzos LC y ELU

A 3D surface plot showing a function of two variables. The surface is colored according to a vertical color bar on the left, which ranges from -163.00 (dark blue) to 51.42 (dark red). The surface has a prominent peak on the left side, reaching a value of 51.42, and a deep valley on the right side, reaching a value of -163.00. The surface is marked with contour lines and numerical labels indicating specific values. The axes are not explicitly labeled, but the plot is presented in a 3D perspective.

C.202518

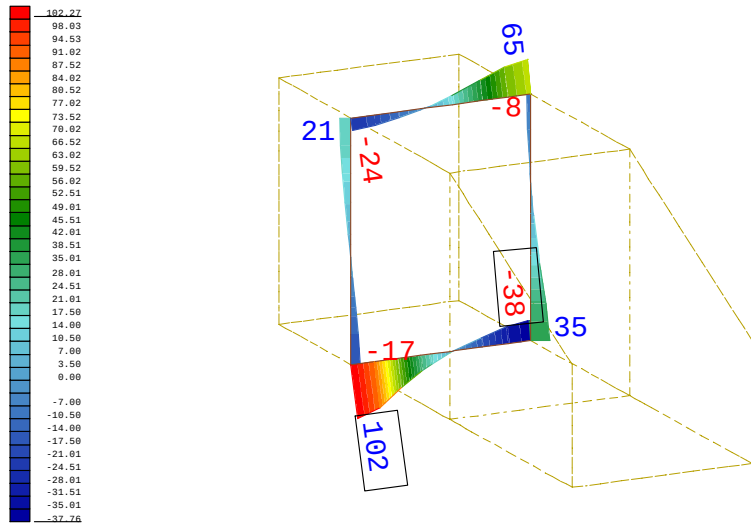


Shear force v-x in local x from middle of element, Loadcase 2107 MAX-VX QUAD Forces in
Quadrilate, 1 cm 3D = 5.0000 kN/m (Min=-2) (Max=5)

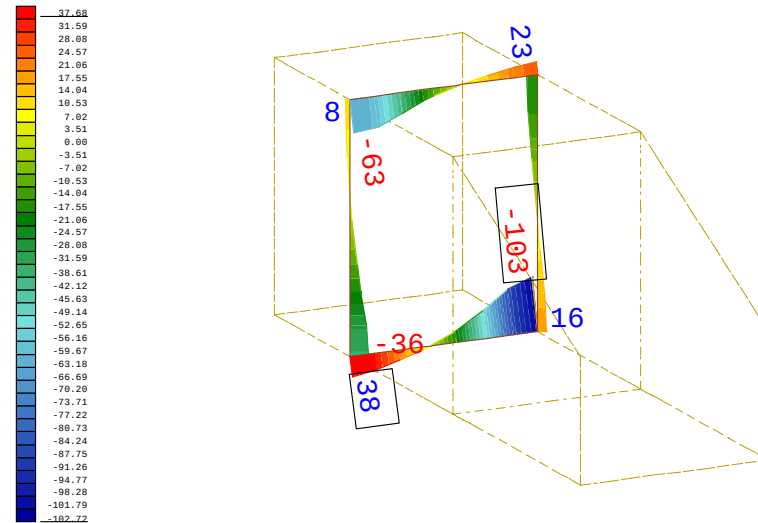


Shear force v-x in local x from middle of element, Loadcase 2108 MIN-VX QUAD Forces in
Quadrilate, 1 cm 3D = 10.000 kN/m (Min=-12) (Max=1)

M 1 : 46
X * 0.502
Y * 0.906
Z * 0.962



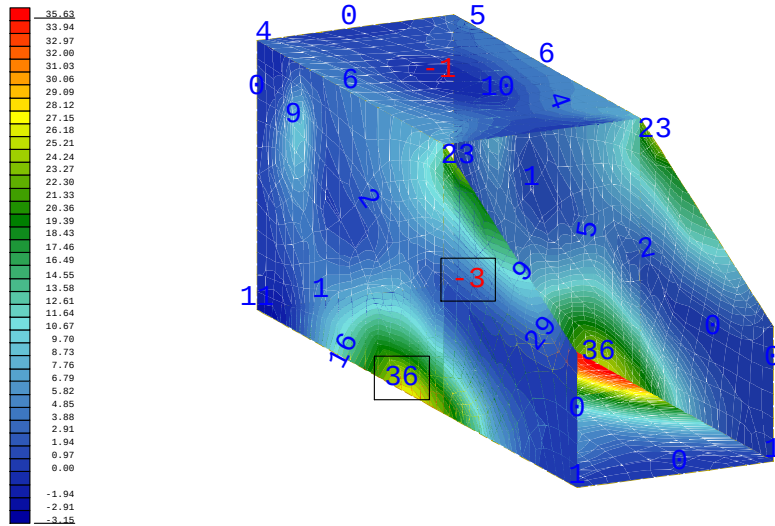
Shear force v-y in local y from middle of element, Loadcase 2109 MAX-VY QUAD Forces in
Quadrilate, 1 cm 3D = 100.00 kN/m (Min=-38) (Max=102)



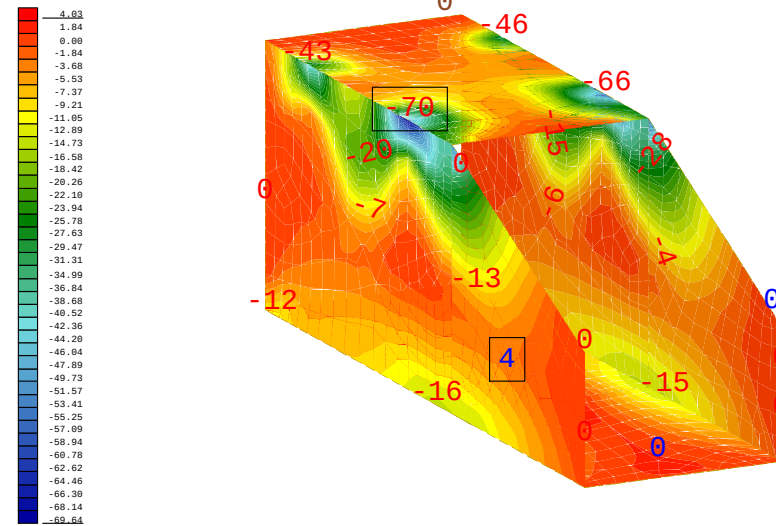
Shear force v-y in local y from middle of element, Loadcase 2110 MIN-VY QUAD Forces in
Quadrilate, 1 cm 3D = 100.00 kN/m (Min=-103) (Max=38)

M 1 : 46
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

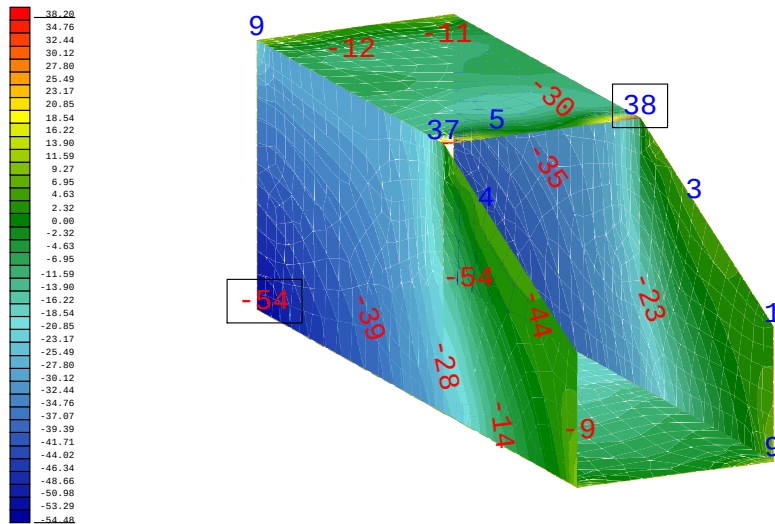


Z
Y X Membrane force n-xx in local x from middle of element, Loadcase 2111 MAX-NXX QUAD Forces in Quadrilat, from -3 to 36 step 1 kN/m

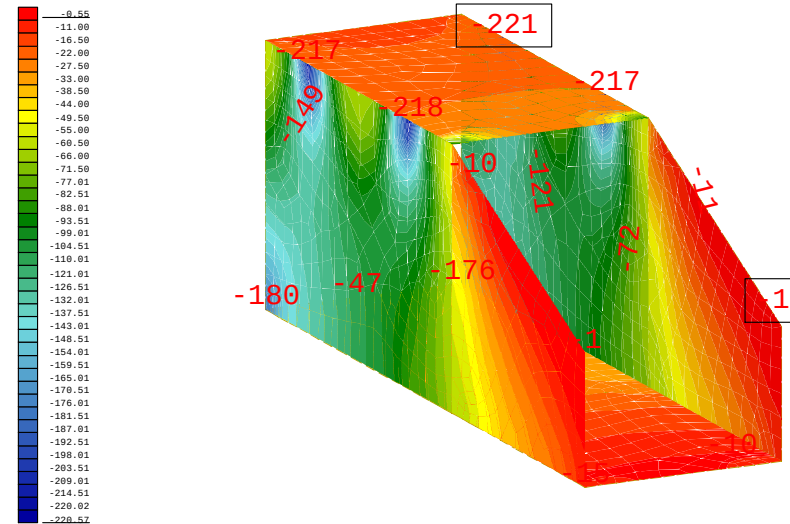


M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962
Z
Y X Membrane force n-xx in local x from middle of element, Loadcase 2112 MIN-NXX QUAD Forces in Quadrilat, from -70 to 4 step 2 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



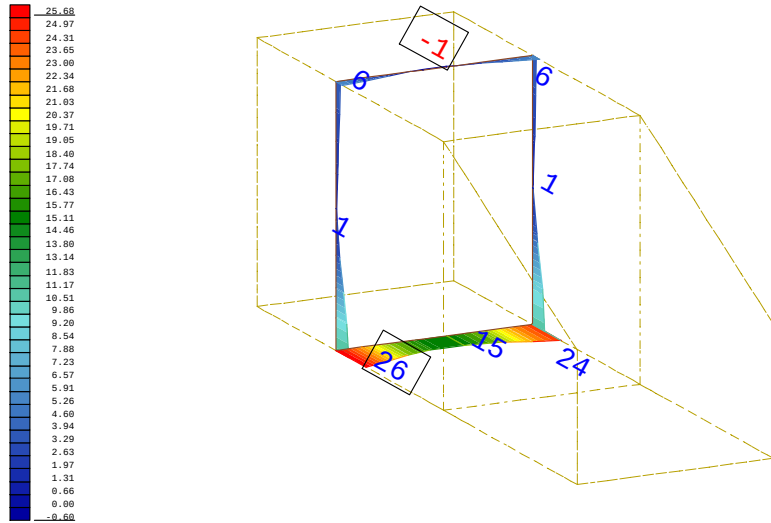
Z
Y X Membrane force n-yy in local y from middle of element, Loadcase 2113 MAX-NYY QUAD Forces in Quadrilat, from -54 to 38 step 2 kN/m



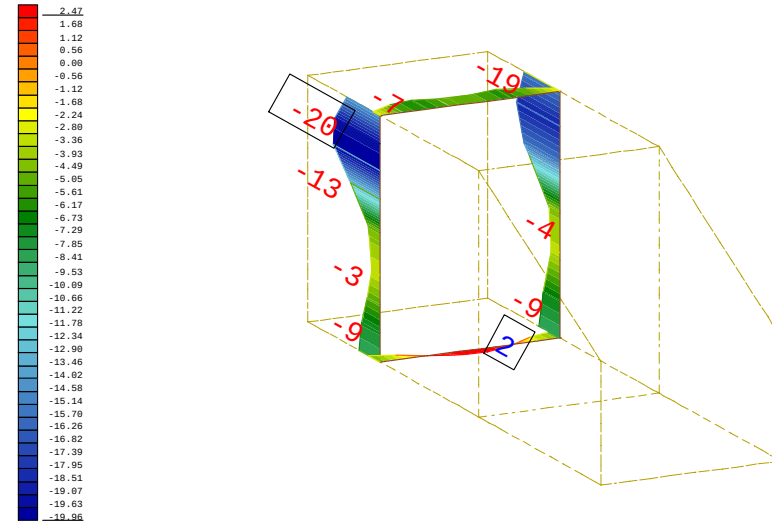
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962
Z
Y X Membrane force n-yy in local y from middle of element, Loadcase 2114 MIN-NYY QUAD Forces in Quadrilat, from -221 to -1 step 6 kN/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

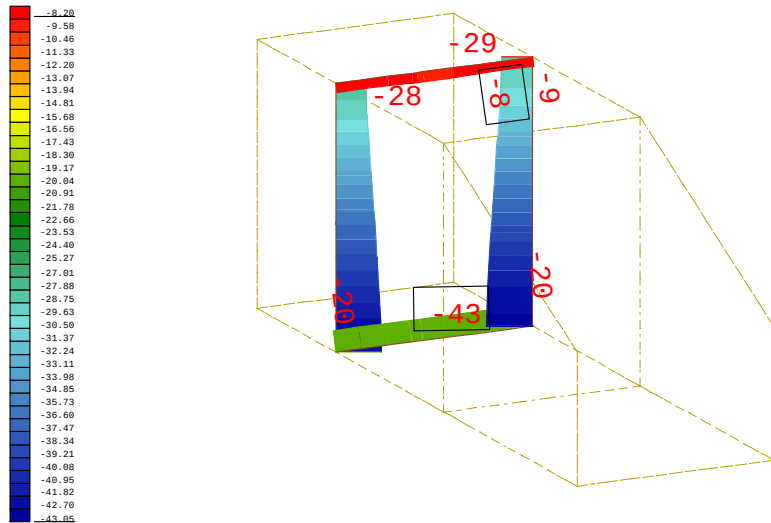


Z
Y X Membrane force n-xx in local x from middle of element, Loadcase 2111 MAX-NXX QUAD Forces in Quadrilat, 1 cm 3D = 20.000 kN/m (Min=-1) (Max=26)

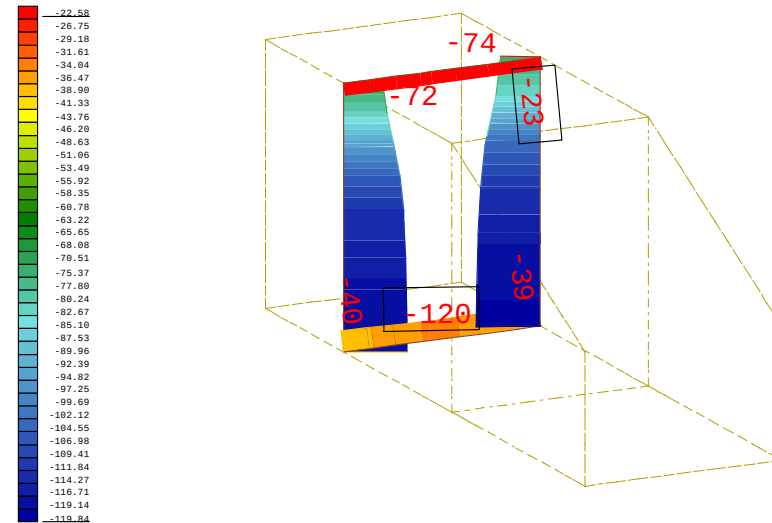


M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962
Z
Y X Membrane force n-xx in local x from middle of element, Loadcase 2112 MIN-NXX QUAD Forces in Quadrilat, 1 cm 3D = 10.000 kN/m (Min=-20) (Max=2)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



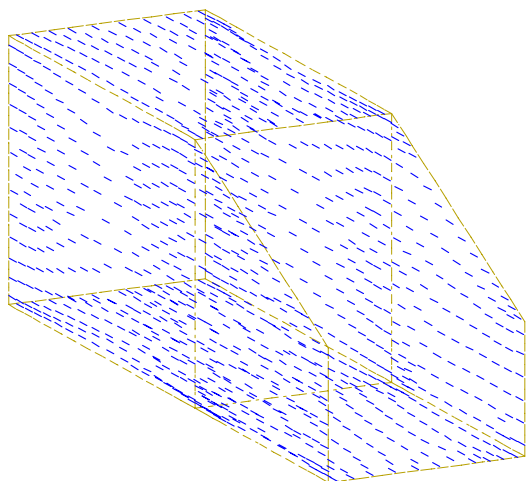
Z
Y X Membrane force n-yy in local y from middle of element, Loadcase 2113 MAX-NYY QUAD Forces in Quadrilat, 1 cm 3D = 50.000 kN/m (Min=-43) (Max=-8)



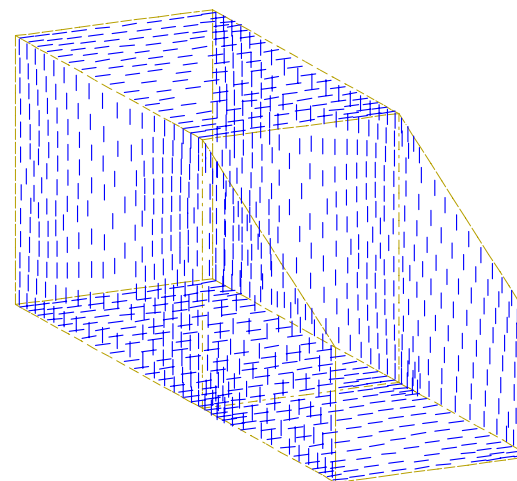
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962
Z
Y X Membrane force n-yy in local y from middle of element, Loadcase 2114 MIN-NYY QUAD Forces in Quadrilat, 1 cm 3D = 100.00 kN/m (Min=-120) (Max=-23)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



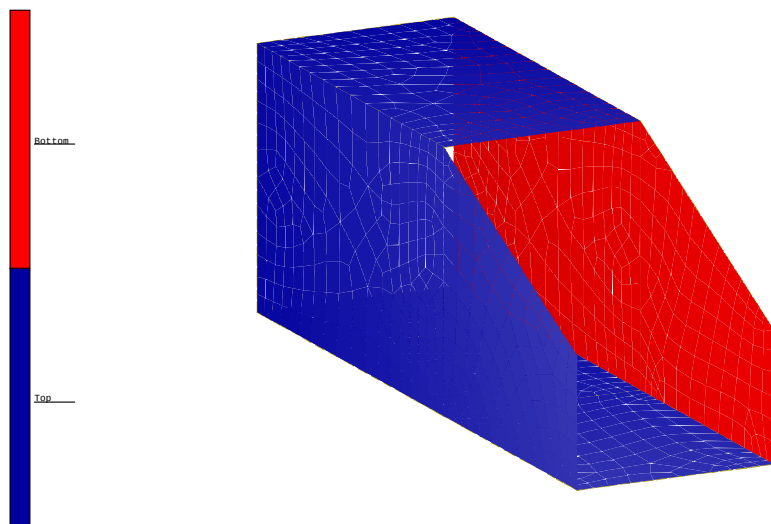
Z
└─Y
X Quadrilateral Elements , Direction of prescribed upper Principal reinforcements (1st layer) (———)



Z
└─Y
X Quadrilateral Elements , Direction of prescribed upper Cross reinforcements (2nd layer) (———)

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

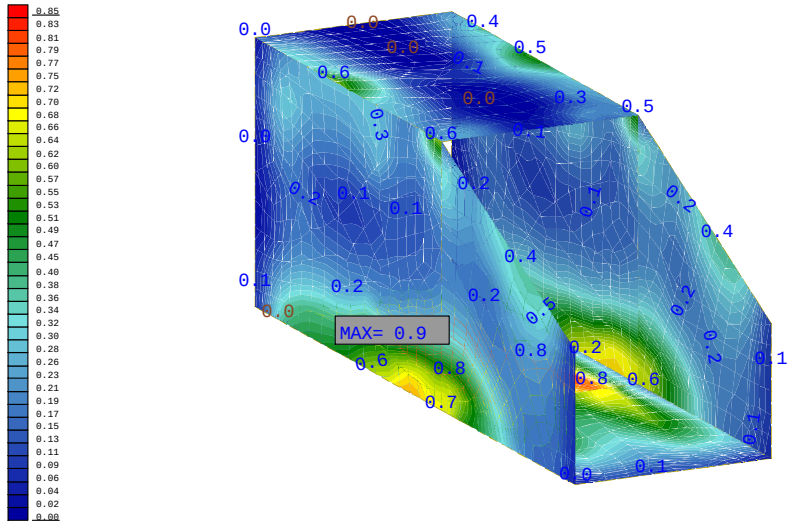
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



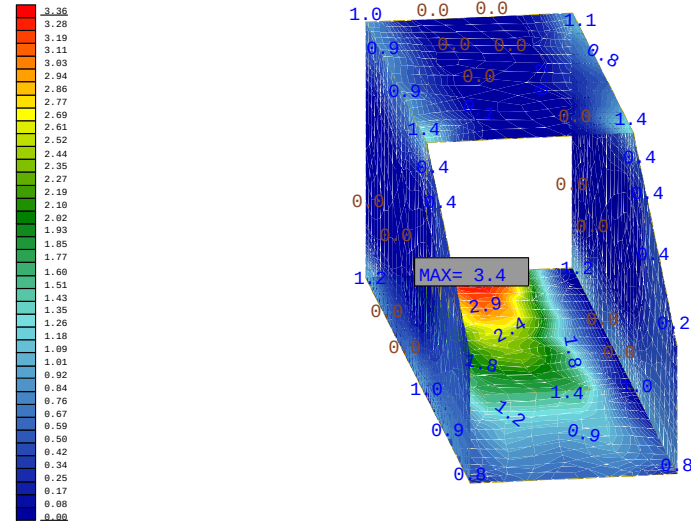
Z
└─Y
X Visible QUAD surface top/bottom in Element

Armado

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

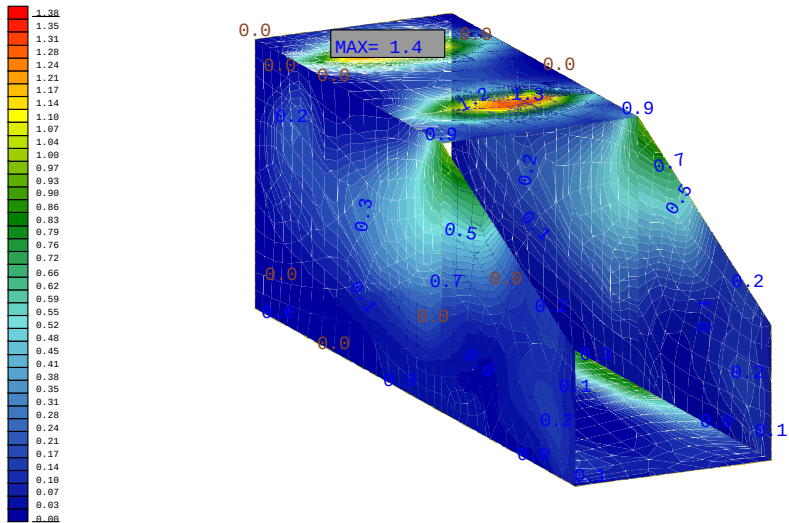


Z
Y X Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗, Design Case 1 ULS design , from 0.00 to 0.9 step 0.0 cm2/m

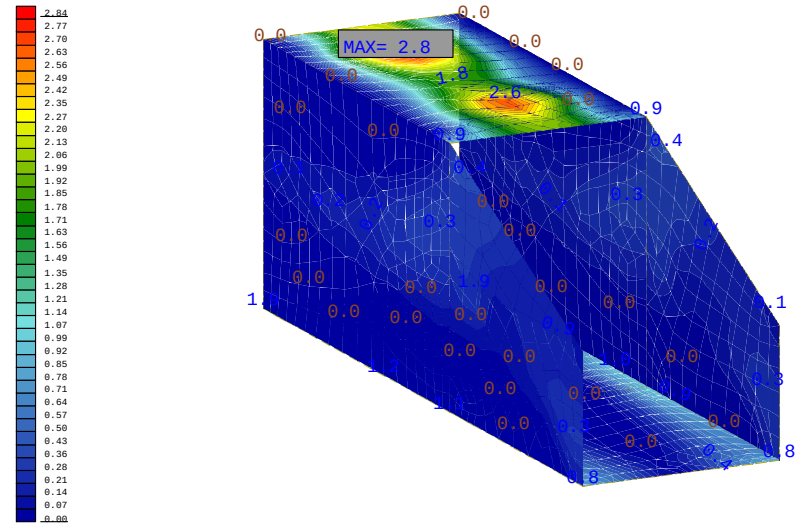


M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962 Z Y X Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 3.4 step 0.1 cm2/m

M 1 : 46
X * 0.331
Y * 0.990
Z * 0.954



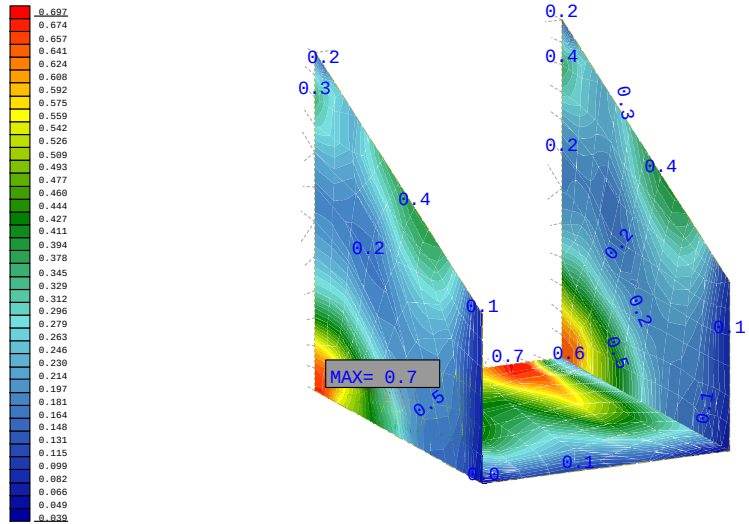
Z
Y X Quadrilateral Elements , lower Principal reinforcements (1st layer) ↗, Design Case 1 ULS design , from 0.00 to 1.4 step 0.0 cm2/m



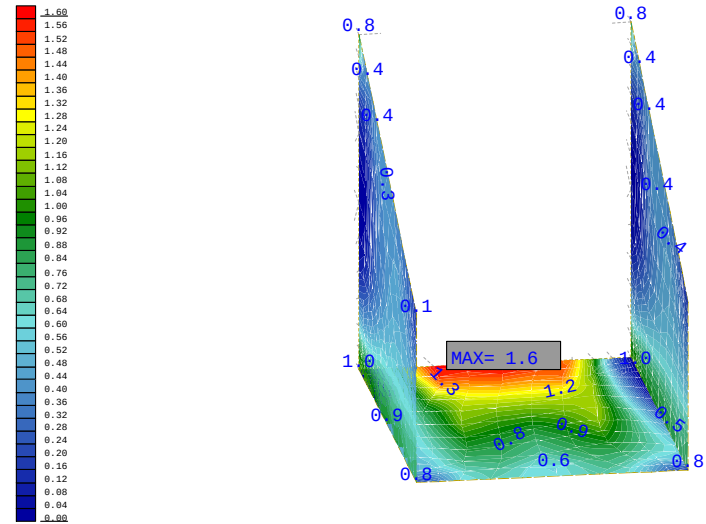
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962 Z Y X Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 2.8 step 0.1 cm2/m

M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962

Armado

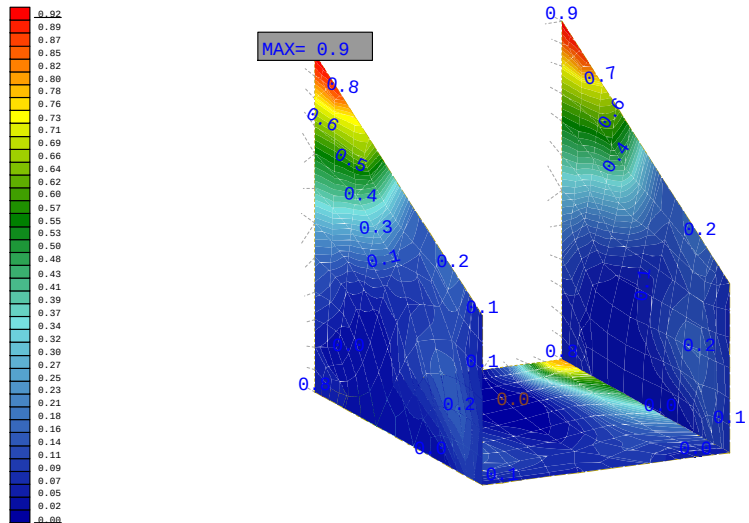


Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Principal reinforcements (1st layer) , Design Case 1 ULS design , from 0.0 to 0.7 step 0.0 cm2/m

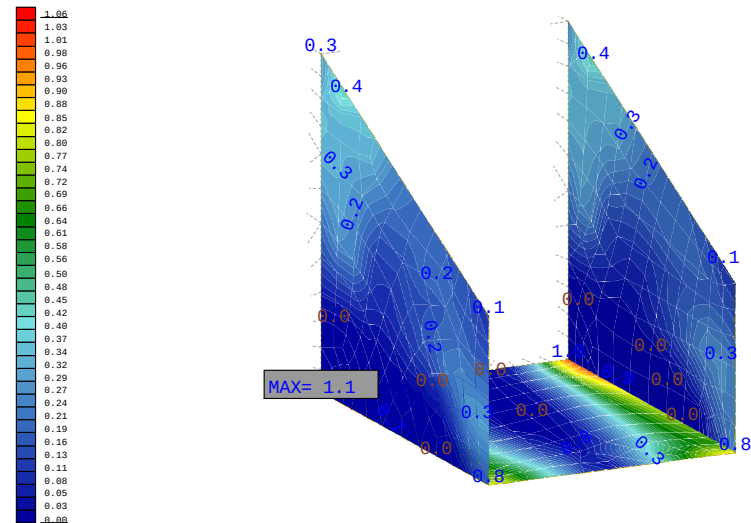


M 1 : 35
X * 0.502
Y * 0.906
Z * 0.962
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 1.6 step 0.0 cm2/m

M 1 : 35
X * 0.331
Y * 0.990
Z * 0.954



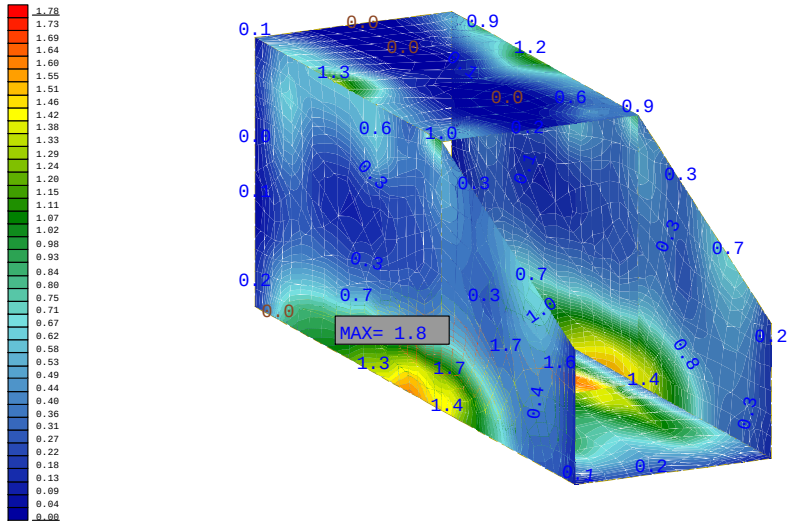
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Principal reinforcements (1st layer) , Design Case 1 ULS design , from 0.00 to 0.9 step 0.0 cm2/m



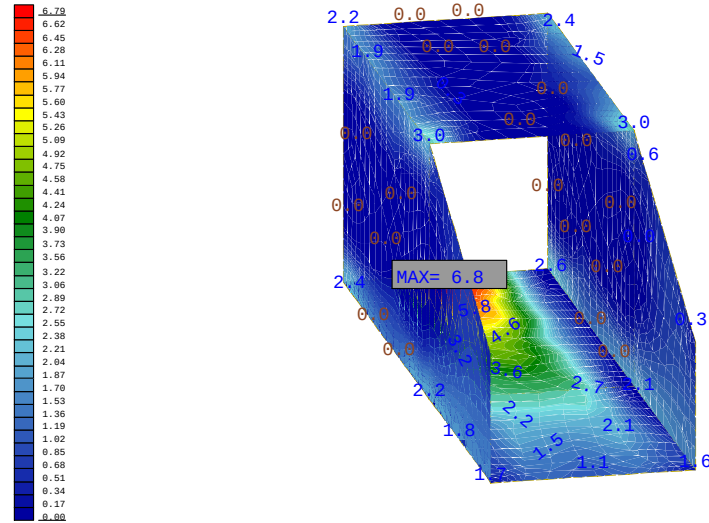
M 1 : 35
X * 0.502
Y * 0.906
Z * 0.962
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 1.1 step 0.0 cm2/m

M 1 : 35
X * 0.502
Y * 0.906
Z * 0.962

Armado

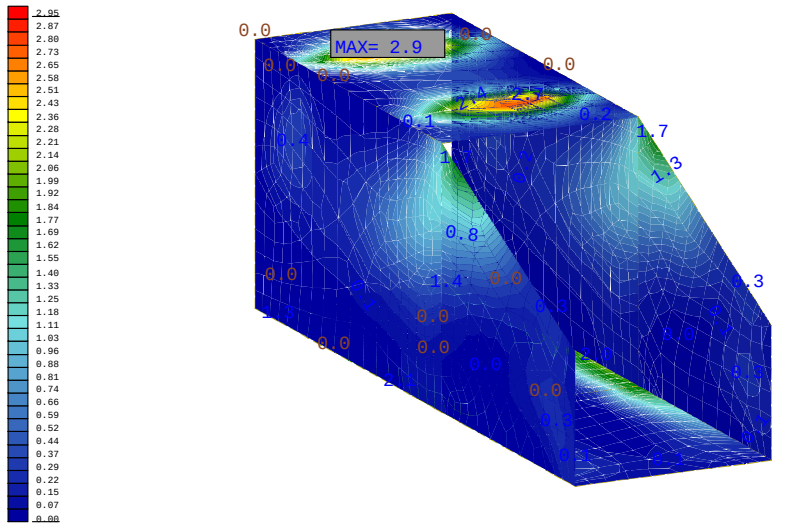


Z
Y
X Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗, Design Case 2 After the crack width design , from 0.00 to 1.8 step 0.0 cm2/m

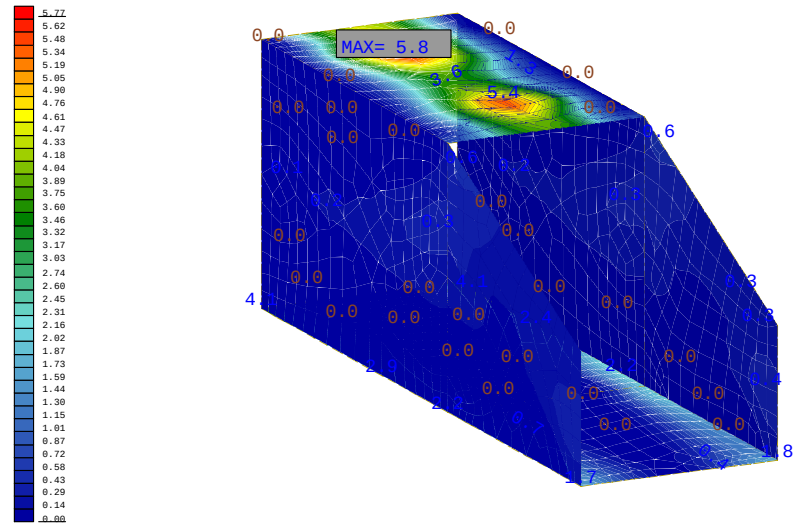


M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962 Z
Y
X Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 6.8 step 0.2 cm2/m

M 1 : 46
X * 0.358
Y * 0.979
Z * 0.956



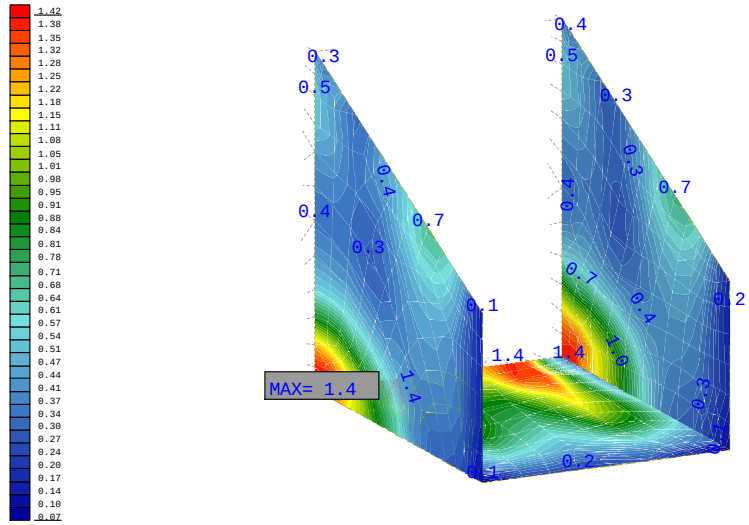
Z
Y
X Quadrilateral Elements , lower Principal reinforcements (1st layer) ↗, Design Case 2 After the crack width design , from 0.00 to 2.9 step 0.1 cm2/m



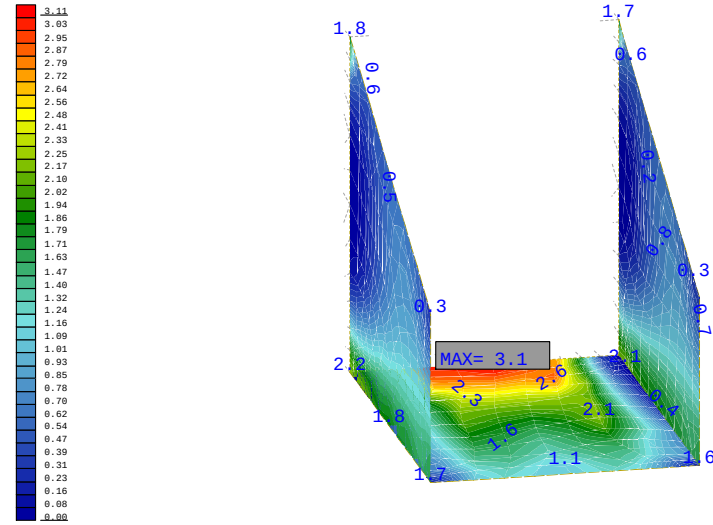
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962 Z
Y
X Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 5.8 step 0.1 cm2/m

M 1 : 46
X * 0.358
Y * 0.979
Z * 0.956

Armado

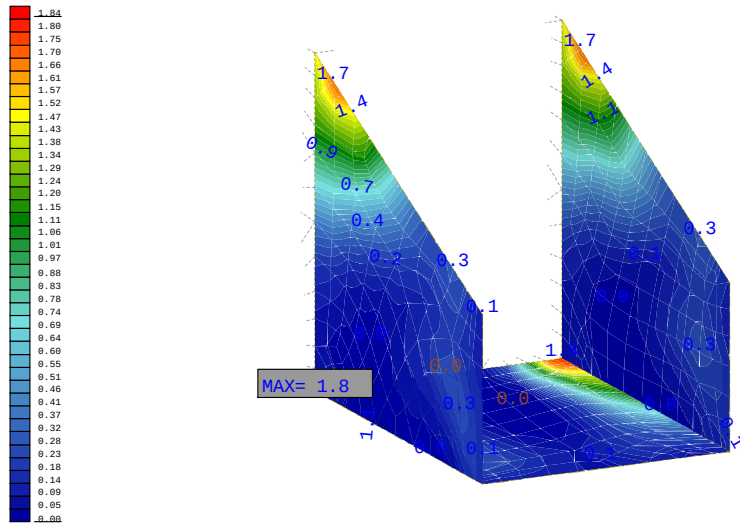


Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗, Design Case 2 After the crack width design , from 0.1 to 1.4 step 0.0 cm2/m

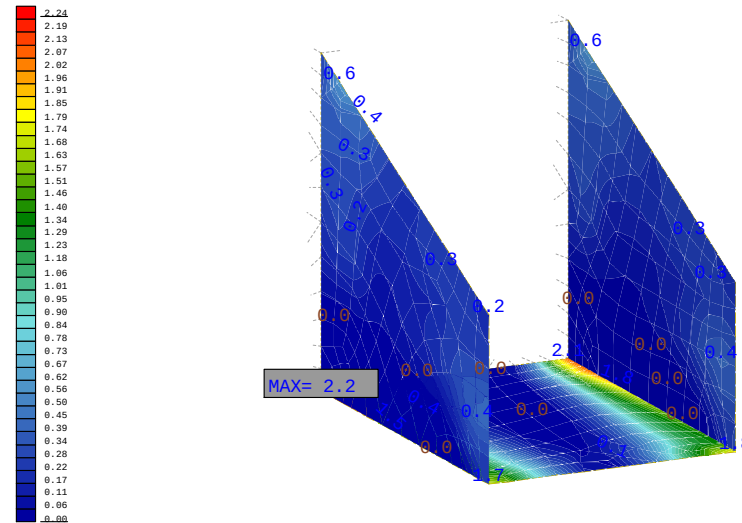


M 1 : 35
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 3.1 step 0.1 cm2/m

M 1 : 35
X * 0.358
Y * 0.979
Z * 0.956



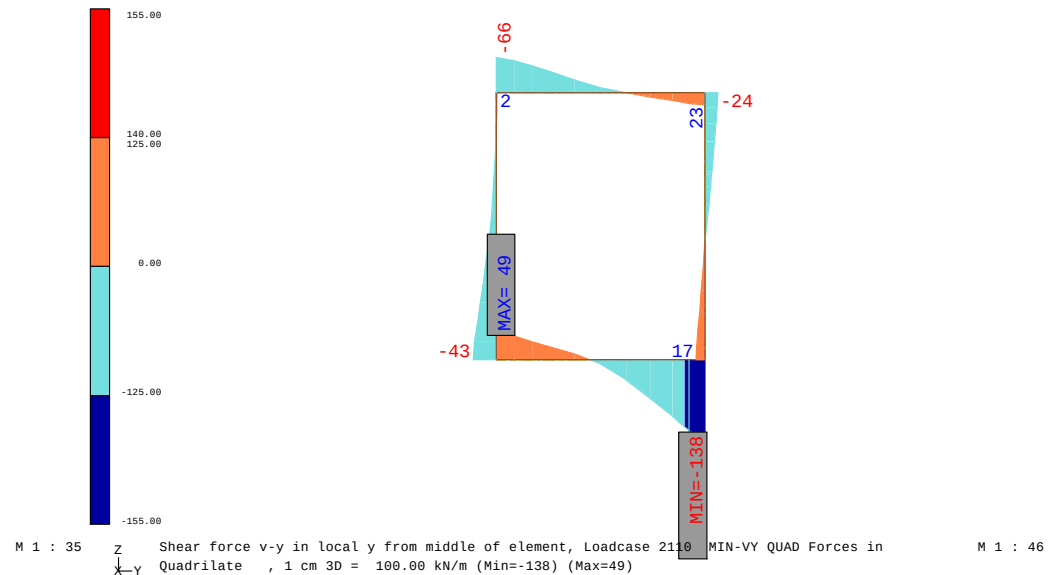
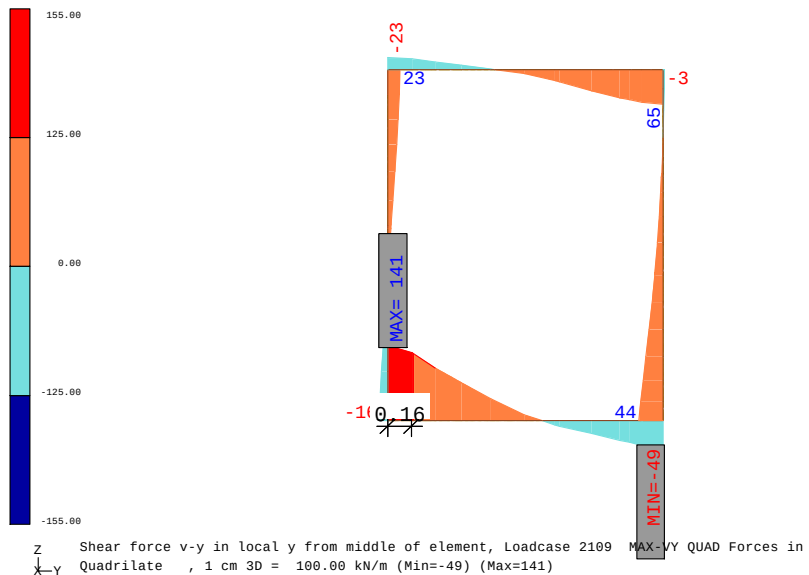
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Principal reinforcements (1st layer) ↗, Design Case 2 After the crack width design , from 0.00 to 1.8 step 0.0 cm2/m



M 1 : 35
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 2.2 step 0.1 cm2/m

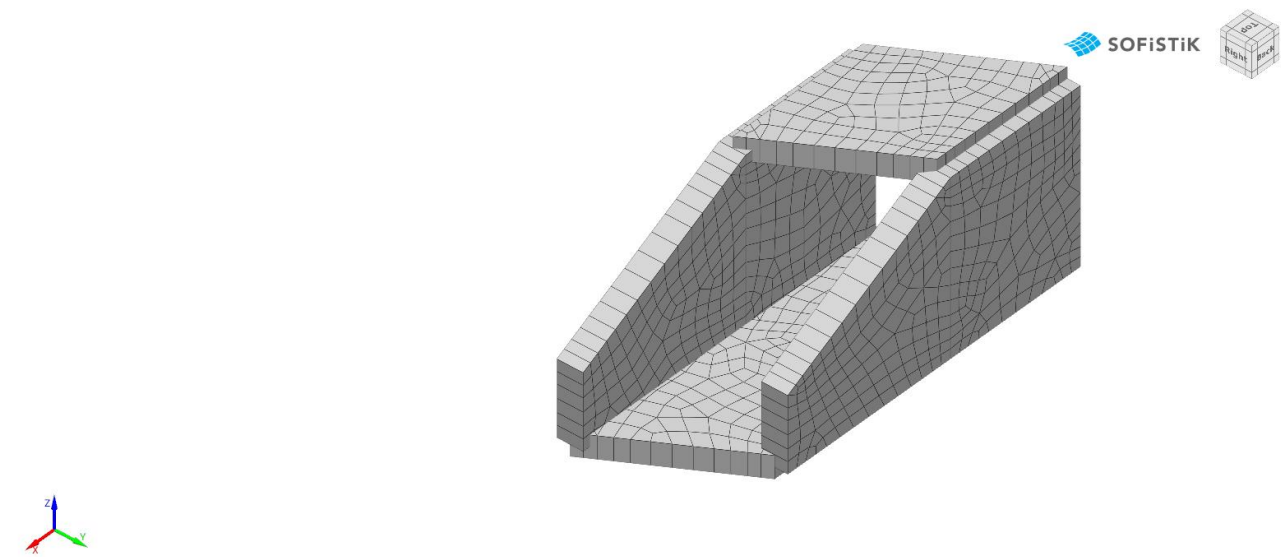
M 1 : 35
X * 0.502
Y * 0.906
Z * 0.962

Armado



10.3.- ODT 3

Se realiza un modelo FEM en 3D con elementos tipos placa.



A continuación, se muestra los resultados incluyendo:

1. Tablas con el cálculo de la armadura mínima y la resistencia a cortante sin armadura.
2. Características del modelo FEM.
3. Reacciones en el terreno por caso de carga y en ELS.
4. Esfuerzos por caso de carga y ELU.
5. Armado.

Cuantías mínimas

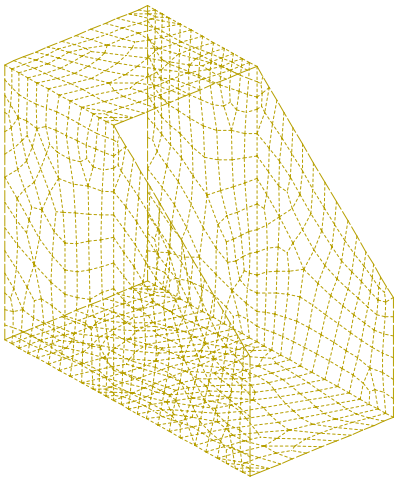
fck =30 Mpa			
Canto (m)	Cuantía (cm2/m)	s=15cm-->Ø	s=20cm-->Ø
0.25	4.2	12	12
0.35	5.8	12	16
0.4	6.7	12	16

Cortante sin armadura

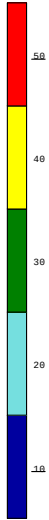
MATERIALES	
fck (Mpa)	30
f _{yk} (Mpa)	500
f _{yd} (Mpa)	435
f _{ct,m} (Mpa)	2.9

DIMENSIONES	
b0 (m)	1
H (m)	0.3
d (m)	0.25

CAPACIDAD SIN ARM	
ε	1.89
k	1.89
Vu2 min (kN) EHE	179
VRd,c min (kN) CE	125

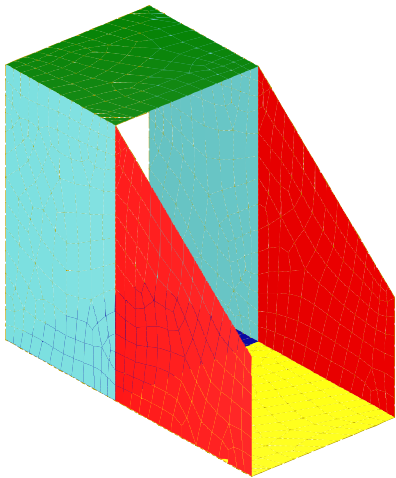


Structure
Z
Y
X

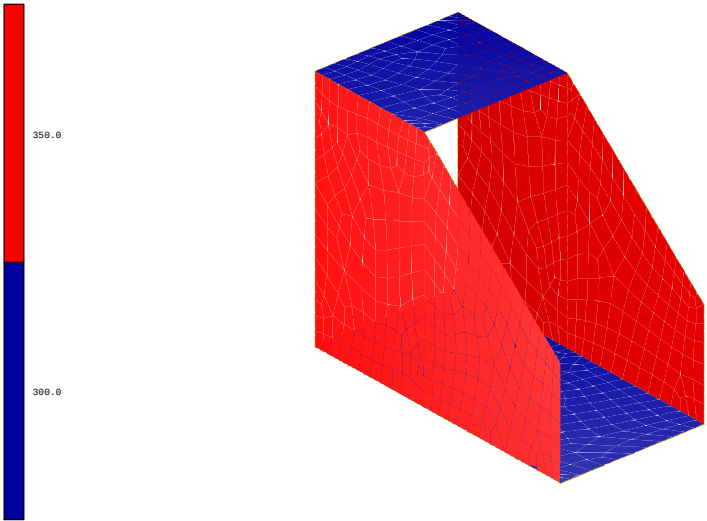


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X

Quadrilateral Elements , Number of group (Max=50)

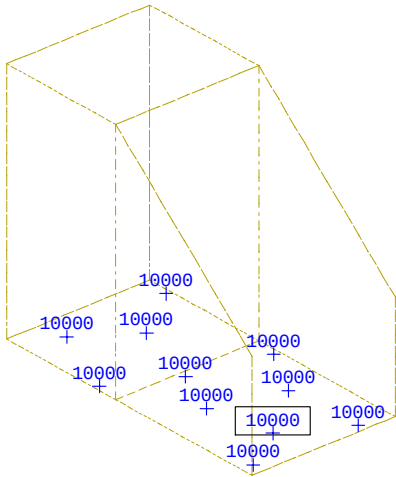


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



Quadrilateral Elements , Average plate thickness in mm (Max=350)
Z
Y
X

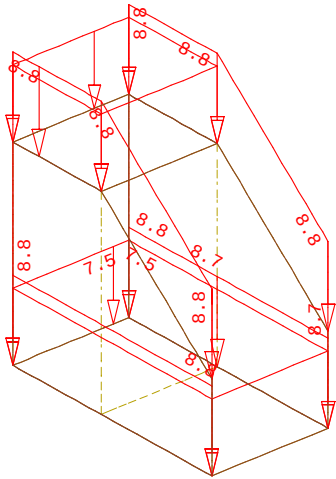
Características del modelo



M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X

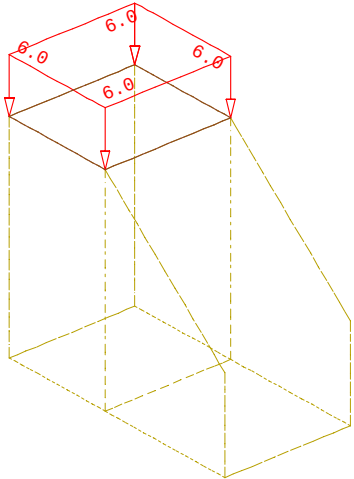
Elastic bedding in Element in kN/m3 (Max=10000)

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



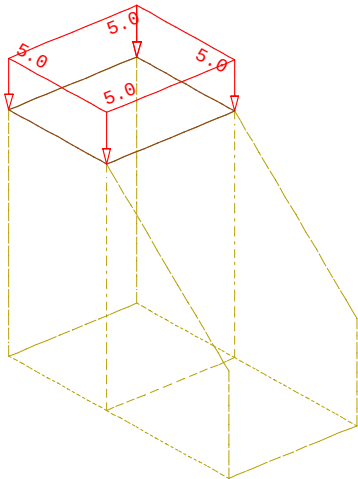
z All loads, Loadcase 1 Peso propio , (1 cm 3D = unit) QUAD-Area dead load in global Z in
x y Element (Unit=5.0 kN/m2 ∇) (Min=-8.8) (Max=-7.5)

M 1 : 53
x * 0.502
y * 0.906
z * 0.962



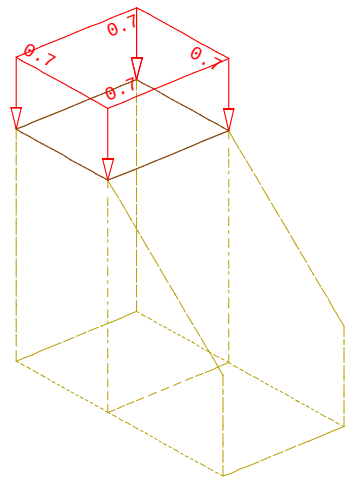
z All loads, Loadcase 2 Peso tierras , (1 cm 3D = unit) Free area load (force) in global Z
x y (Unit=5.0 kN/m2 ∇) (Min=-6.0) (Max=-6.0)

M 1 : 49
x * 0.502
y * 0.906
z * 0.962



z All loads, Loadcase 3 Peso aglomerado , (1 cm 3D = unit) Free area load (force) in global
x y Z (Unit=5.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)

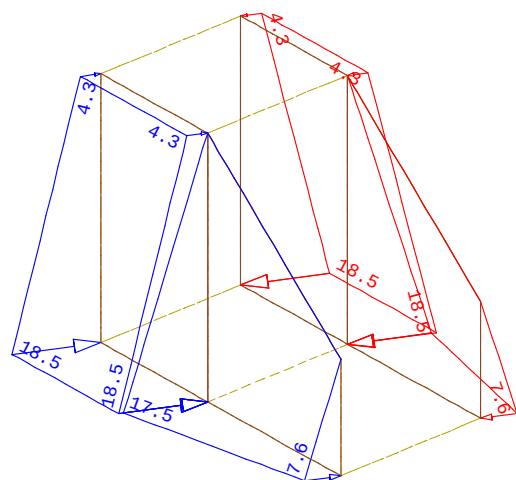
M 1 : 48
x * 0.502
y * 0.906
z * 0.962



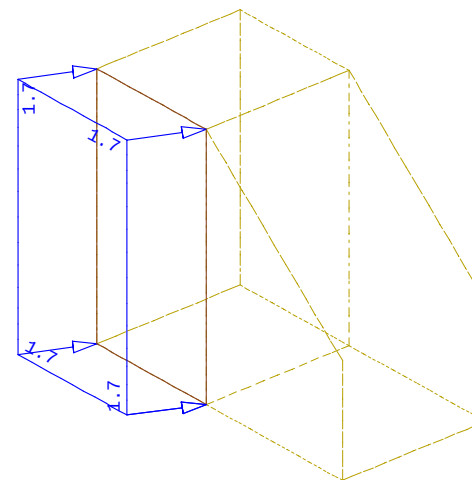
z All loads, Loadcase 4 Rozamiento negativo , (1 cm 3D = unit) Free area load (force) in
x y global Z (Unit=0.5 kN/m2 ∇) (Min=-0.7) (Max=-0.7)

M 1 : 51
x * 0.502
y * 0.906
z * 0.962

Características del modelo

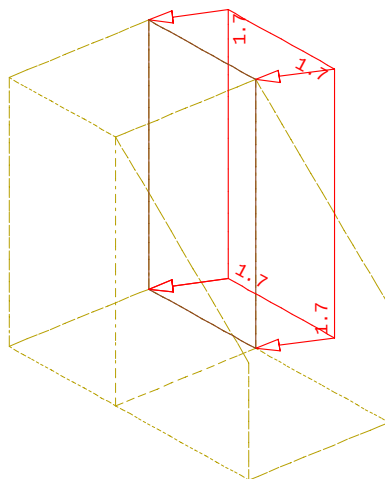


Z
Y All loads, Loadcase 5 Empuje tierras , (1 cm 3D = unit) Free area load (force) in global Y (Unit=10.0 kN/m2) (Min=-18.5) (Max=18.5)



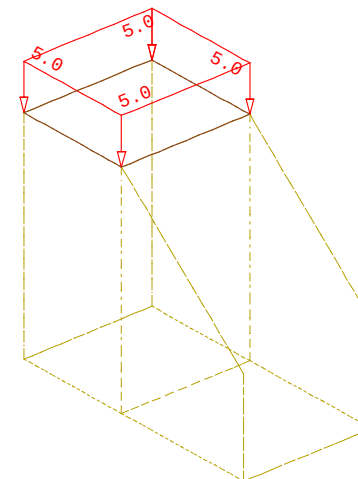
Z
Y All loads, Loadcase 6 Sobrecarga uso terraplenes 1 , (1 cm 3D = unit) Free area load (force) in global Y (Unit=1.0 kN/m2) (Max=1.6)

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



Z
Y All loads, Loadcase 7 Sobrecarga uso terraplenes 2 , (1 cm 3D = unit) Free area load (force) in global Y (Unit=1.0 kN/m2) (Min=-1.6) (Max=-1.6)

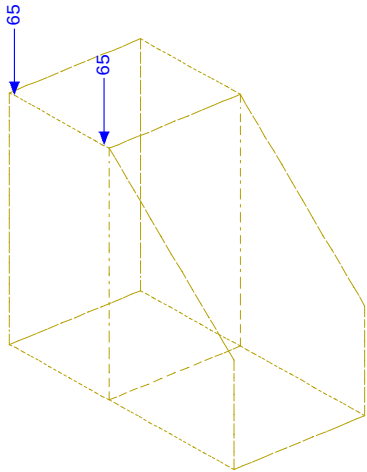
M 1 : 44
X * 0.502
Y * 0.906
Z * 0.962



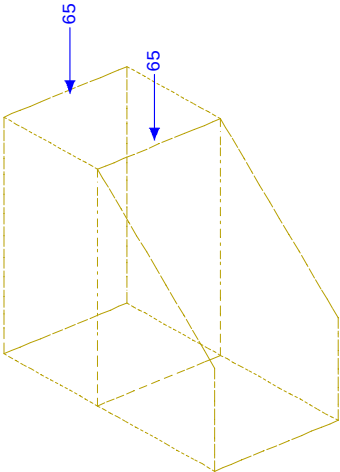
Z
Y All loads, Loadcase 8 Sobrecarga uniforme , (1 cm 3D = unit) Free area load (force) in global Z (Unit=5.0 kN/m2) (Min=-5.0) (Max=-5.0)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo

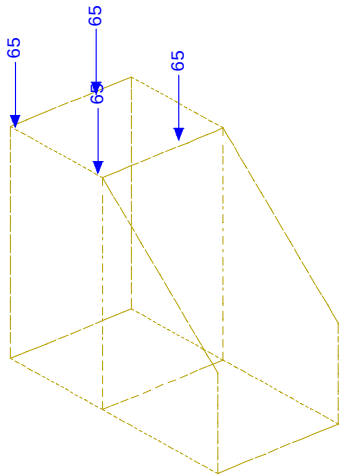


z All loads, Loadcase 9 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

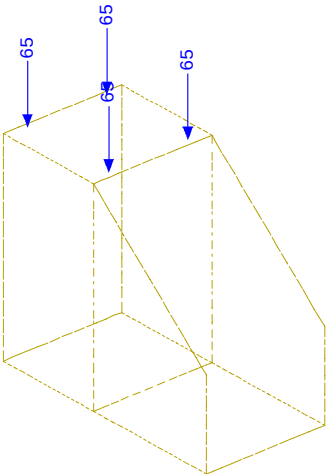


z All loads, Loadcase 10 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 50
x * 0.502
y * 0.906
z * 0.962



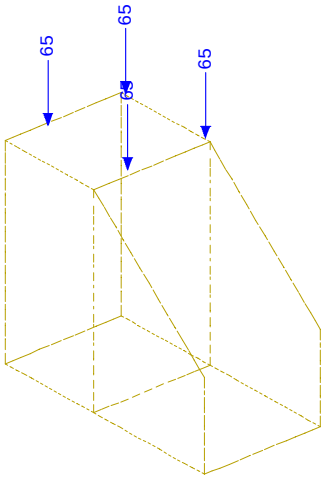
z All loads, Loadcase 11 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)



z All loads, Loadcase 12 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

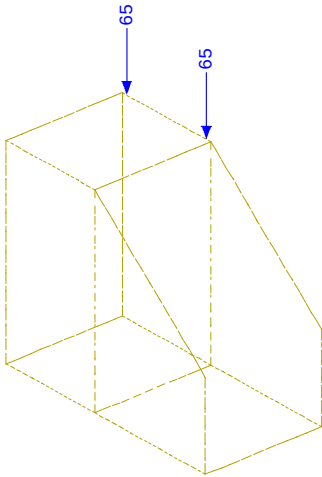
M 1 : 52
x * 0.502
y * 0.906
z * 0.962

Características del modelo



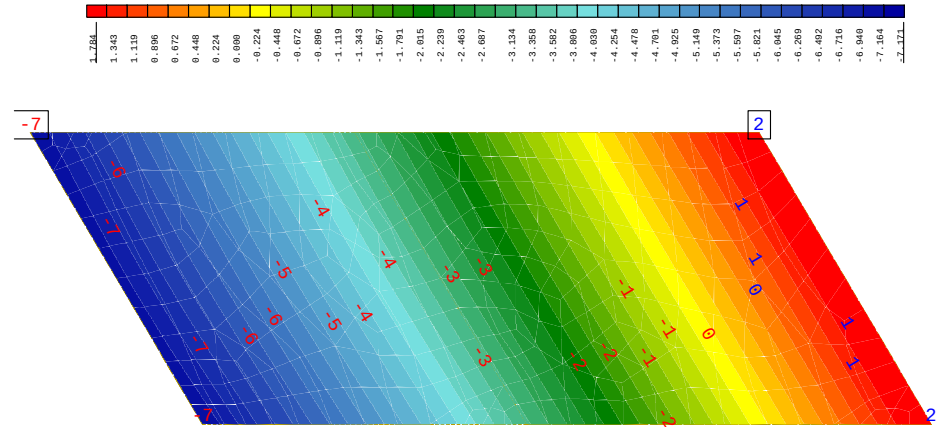
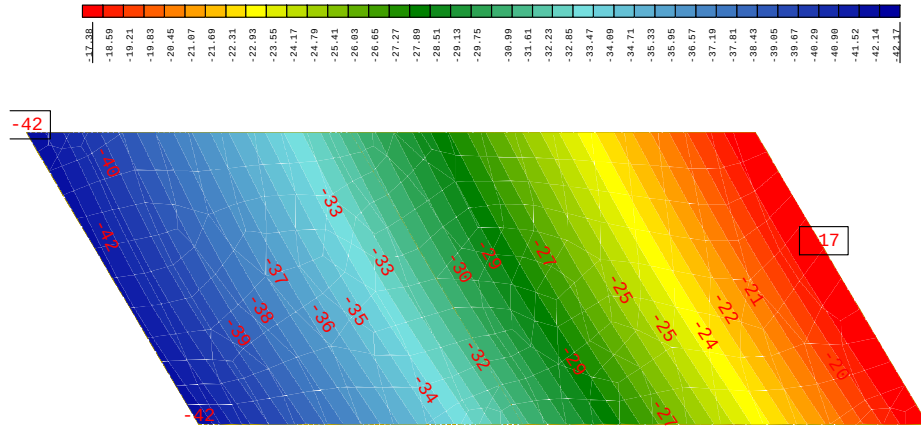
z All loads, Loadcase 13 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 53
x * 0.502
y * 0.906
z * 0.962



z All loads, Loadcase 14 Carro , (1 cm 3D = unit) Free single load (force) vector (Unit=50
x y kN (Max=65)

M 1 : 53
x * 0.502
y * 0.906
z * 0.962

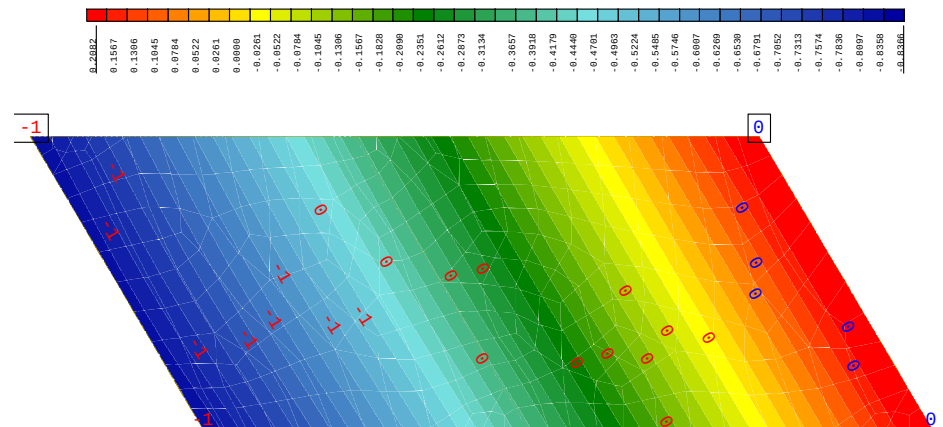
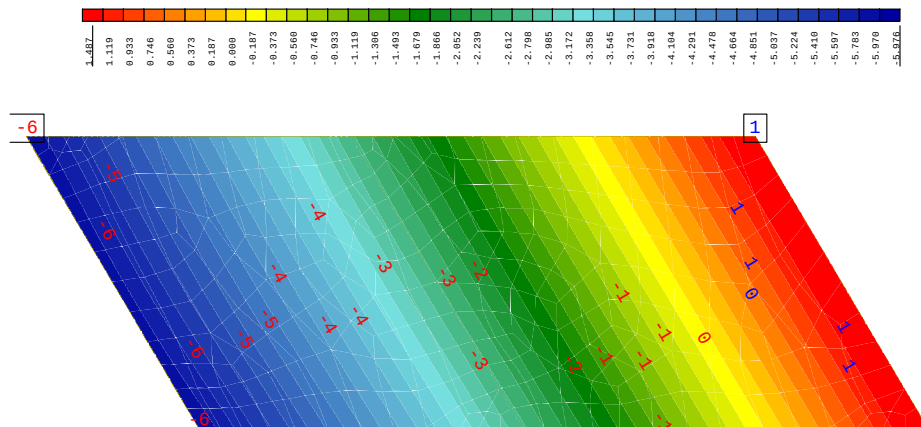


Bedding stress in Node O, Loadcase 1 Peso propio, from -42 to -17 step 1 kN/m²

M 1 : 33

Bedding stress in Node O, Loadcase 2 Peso tierras, from -7 to 2 step 0 kN/m²

M 1 : 33



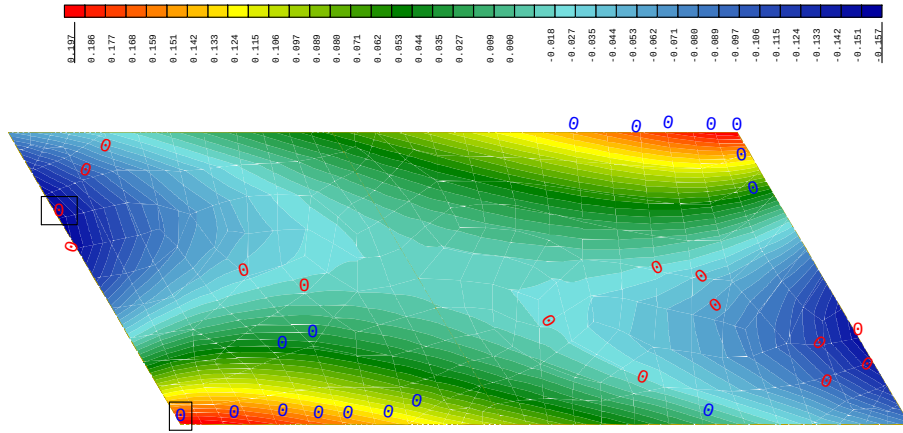
Bedding stress in Node O, Loadcase 3 Peso aglomerado, from -6 to 1 step 0 kN/m²

M 1 : 33

Bedding stress in Node O, Loadcase 4 Rozamiento negativo, from -1 to 0 step 0 kN/m²

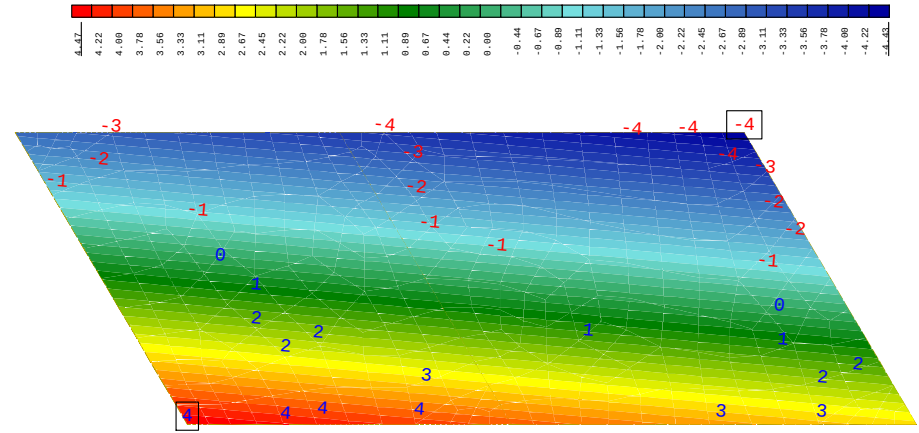
M 1 : 33

Reacciones terreno LC y ELS



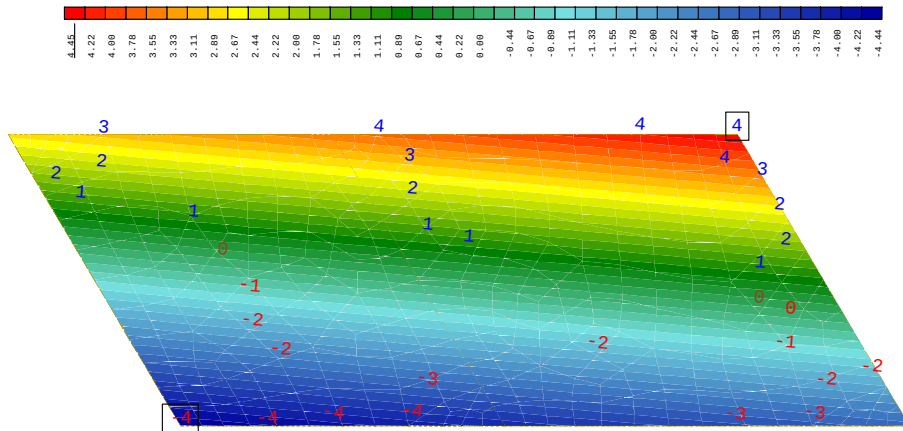
Bedding stress in Node O, Loadcase 5 Empuje tierras , from 0 to 0 step 0 kN/m2

M 1 : 33



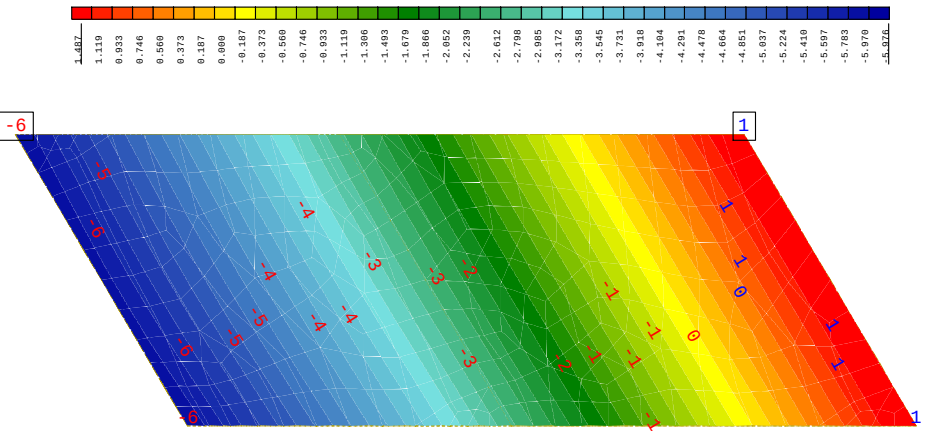
Bedding stress in Node O, Loadcase 6 Sobrecarga uso terraplenes 1 , from -4 to 4 step 0 kN/m2

M 1 : 33



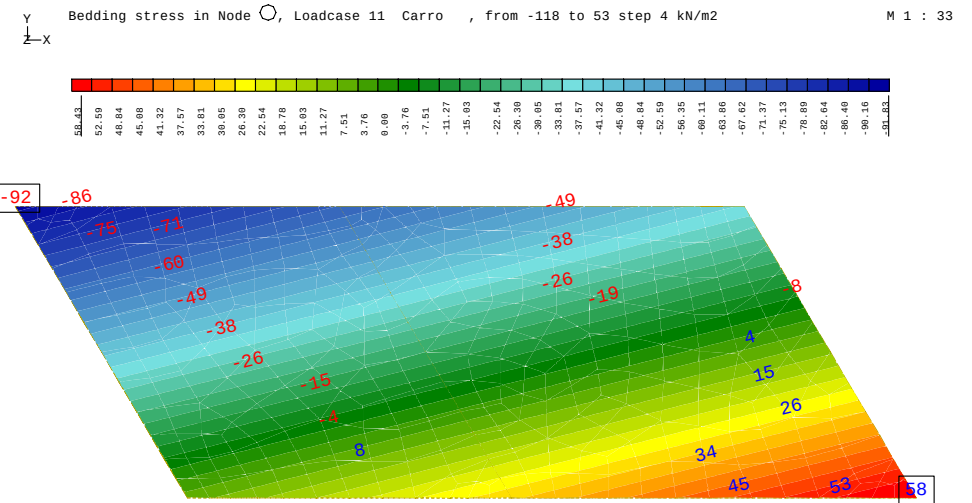
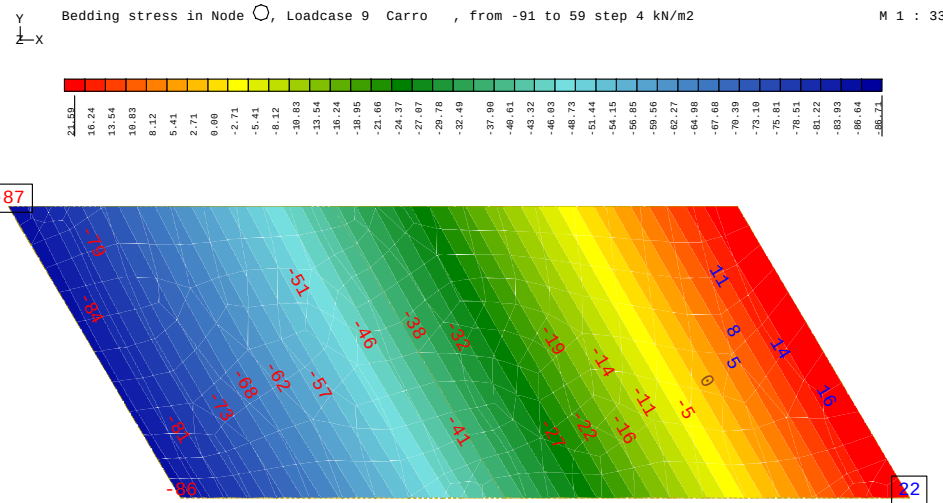
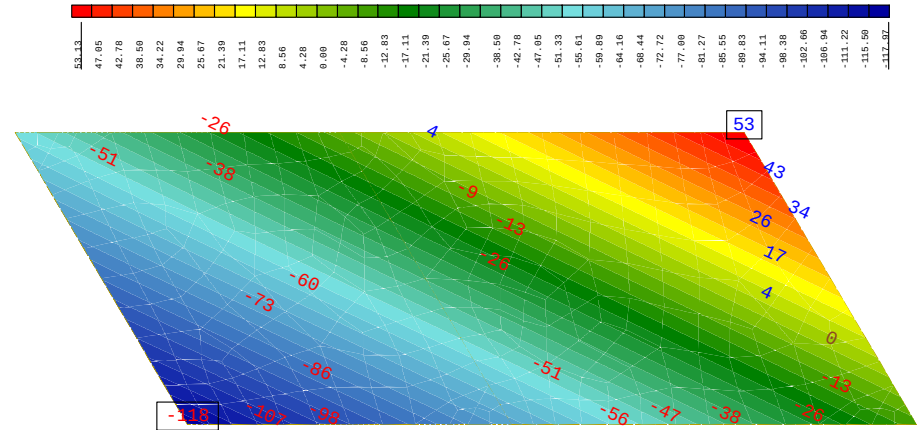
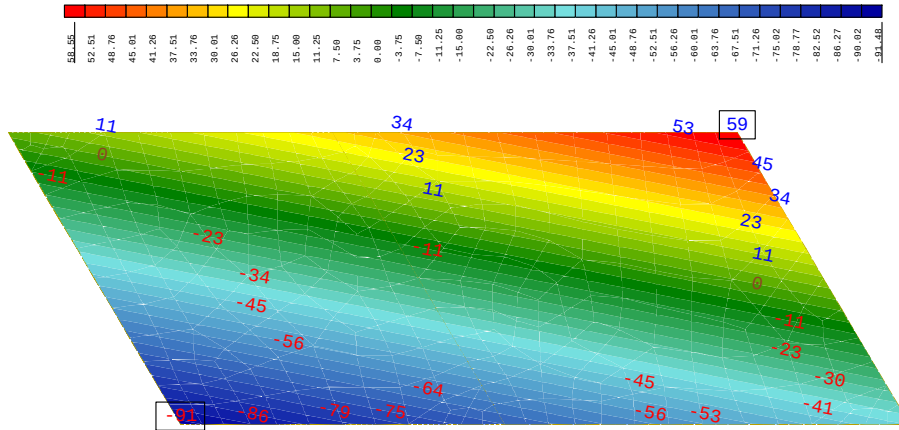
Bedding stress in Node O, Loadcase 7 Sobrecarga uso terraplenes 2 , from -4 to 4 step 0 kN/m2

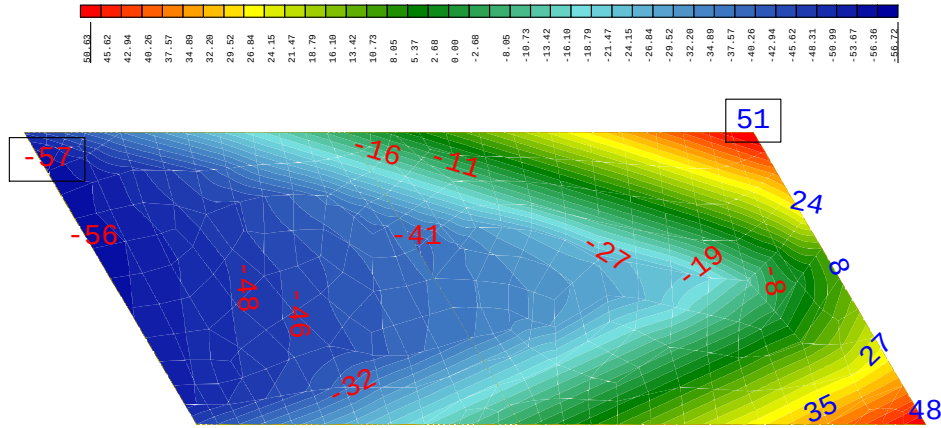
M 1 : 33



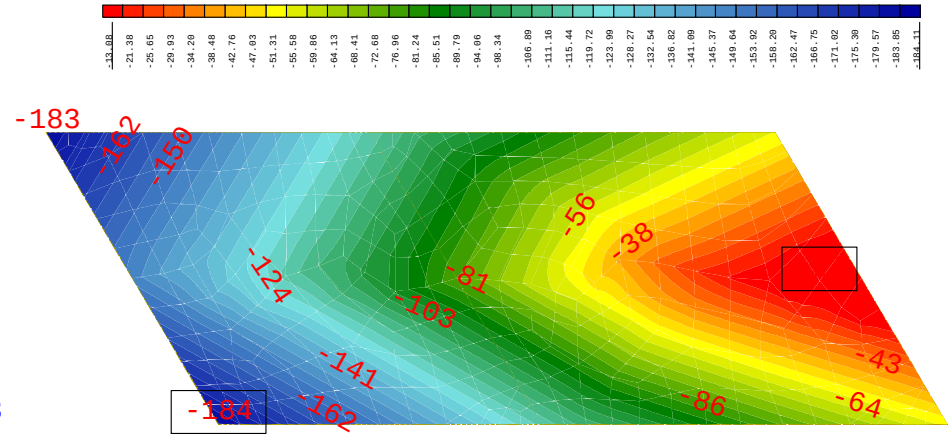
Bedding stress in Node O, Loadcase 8 Sobrecarga uniforme , from -6 to 1 step 0 kN/m2

M 1 : 33

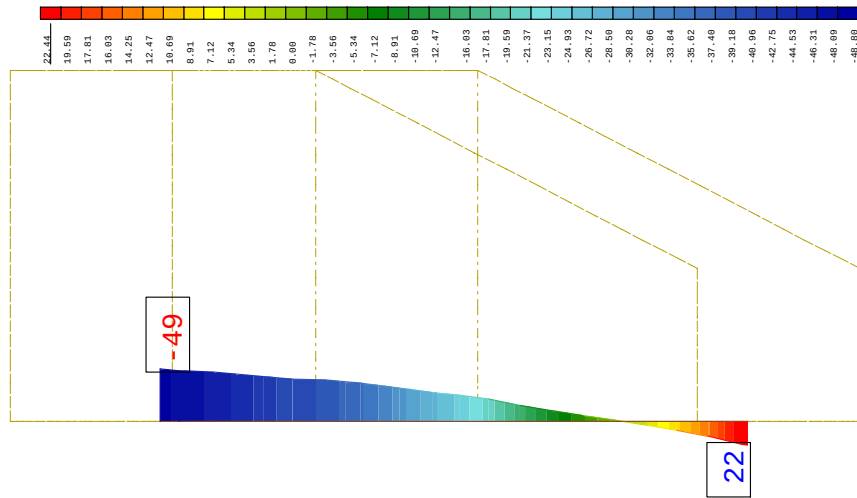




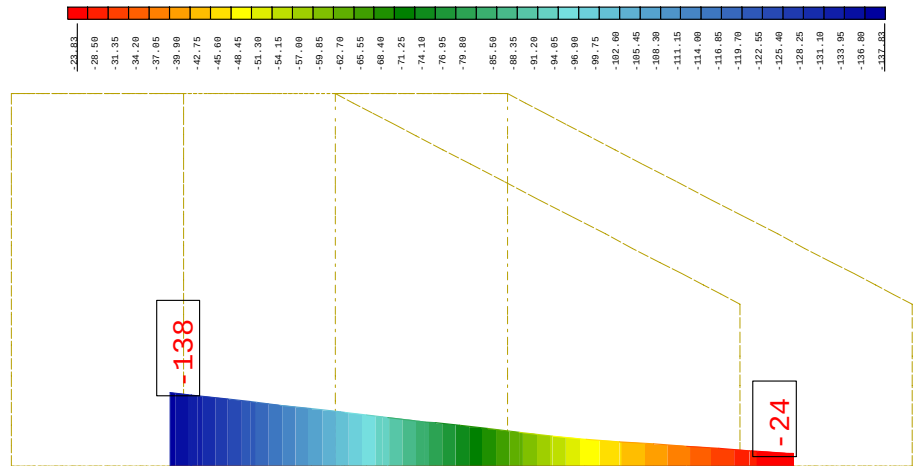
Y Bedding stress in Node O, Loadcase 1117 MAXR-P QUAD Bedding Stresses , from -57 to 51 M 1 : 33
step 3 kN/m2



Y Bedding stress in Node O, Loadcase 1118 MINR-P QUAD Bedding Stresses , from -184 to -13 M 1 : 33
step 4 kN/m2

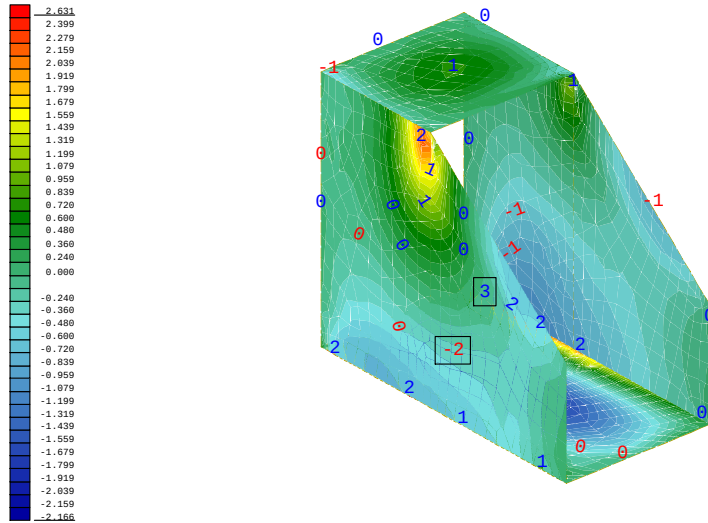


Z Bedding stress in Node O, Loadcase 1117 MAXR-P QUAD Bedding Stresses , 1 cm 3D = 50.000 M 1 : 35
kN/m2 (Min=-49) (Max=22)

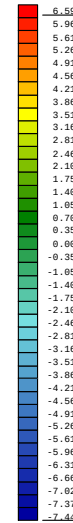


Z Bedding stress in Node O, Loadcase 1118 MINR-P QUAD Bedding Stresses , 1 cm 3D = 100.00 M 1 : 33
kN/m2 (Min=-138) (Max=-24)

Reacciones terreno LC y ELS

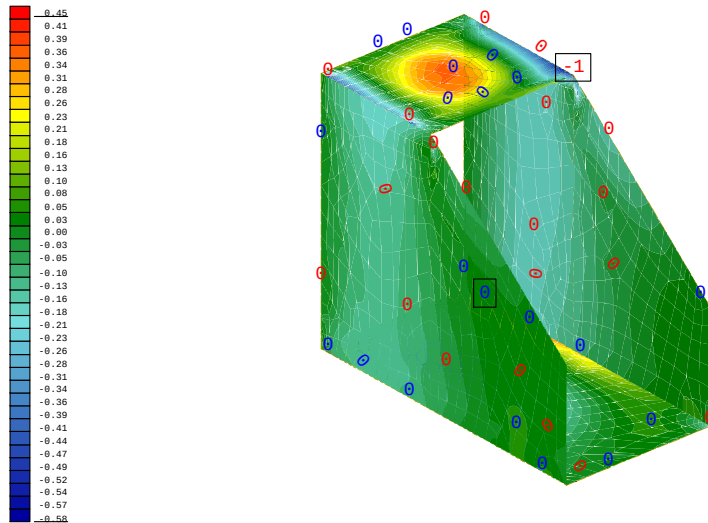


Bending moment m-xx in local x in Node, Loadcase 1 Peso propio , from -2 to 3 step 0 kNm/m

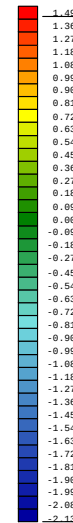


Bending moment m-yy in local y in Node, Loadcase 1 Peso propio , from -7 to 7 step 0 kNm/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



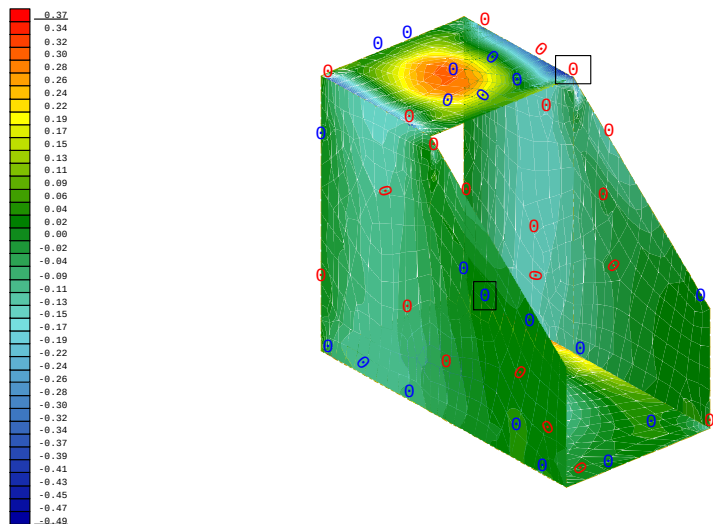
Bending moment m-xx in local x in Node, Loadcase 2 Peso tierras , from -1 to 0 step 0 kNm/m



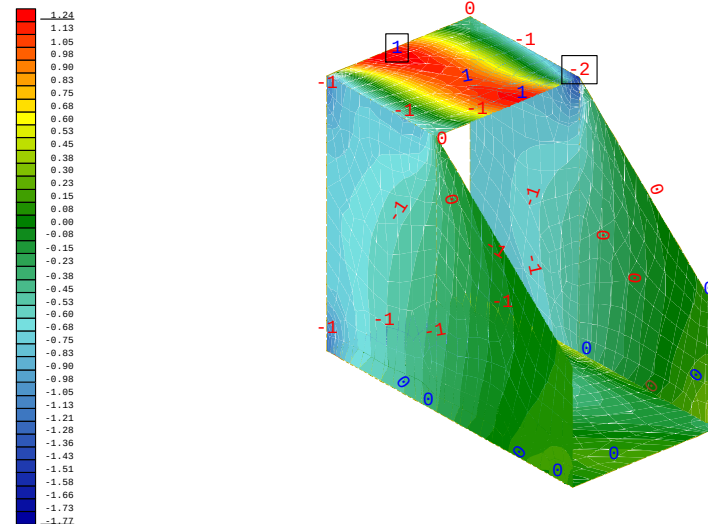
Bending moment m-yy in local y in Node, Loadcase 2 Peso tierras , from -2 to 1 step 0 kNm/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

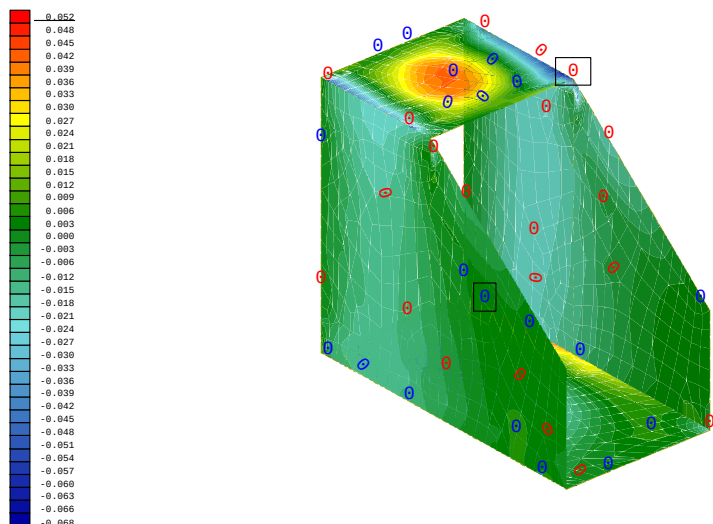


Bending moment m-xx in local x in Node, Loadcase 3 Peso aglomerado , from 0 to 0 step 0
kNm/m

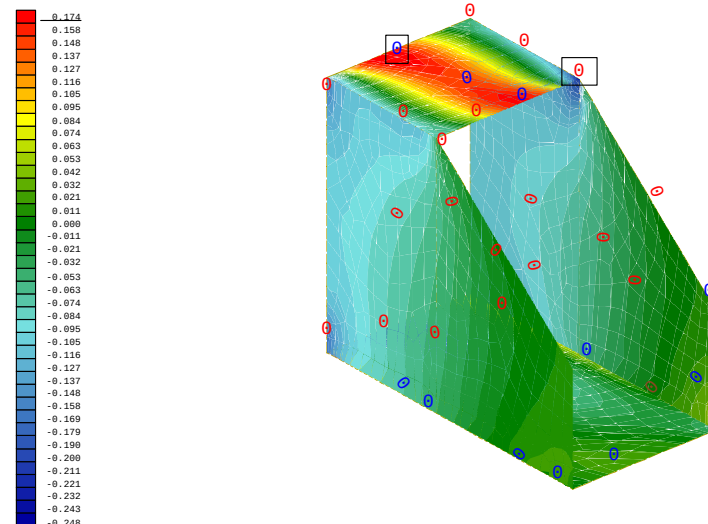


Bending moment m-yy in local y in Node, Loadcase 3 Peso aglomerado , from -2 to 1 step 0
kNm/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



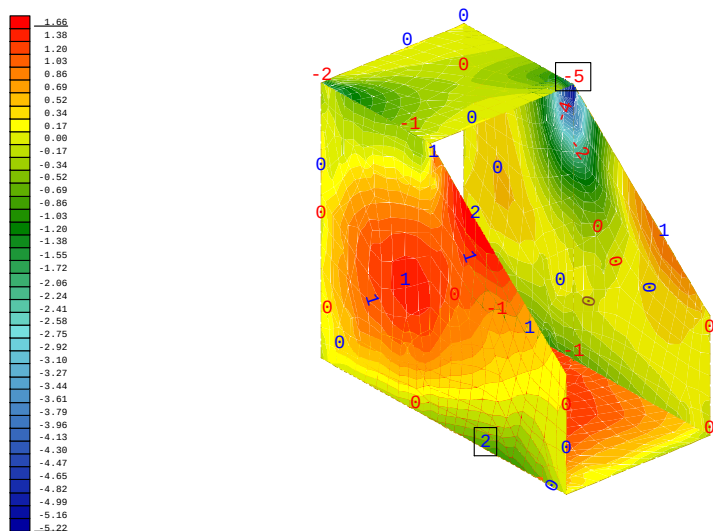
Bending moment m-xx in local x in Node, Loadcase 4 Rozamiento negativo , from 0 to 0 step 0 kNm/m



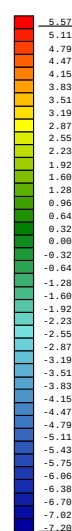
Bending moment m-yy in local y in Node, Loadcase 4 Rozamiento negativo , from 0 to 0 step 0 kNm/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

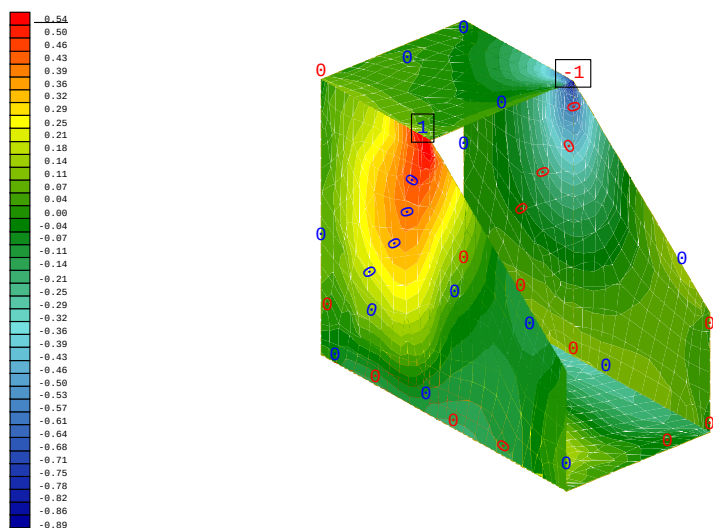


Bending moment m-xx in local x in Node, Loadcase 5 Empuje tierras , from -5 to 2 step 0
kNm/m

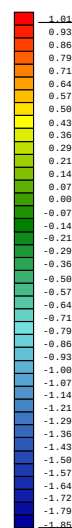


Bending moment m-yy in local y in Node, Loadcase 5 Empuje tierras , from -7 to 6 step 0
kNm/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



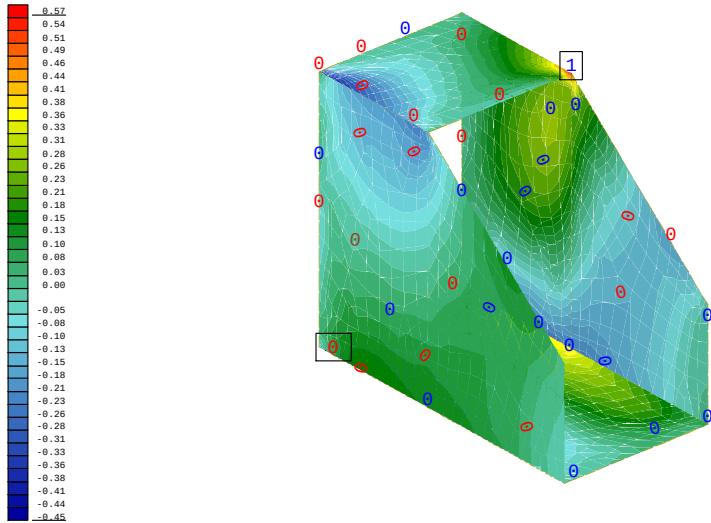
Bending moment m-xx in local x in Node, Loadcase 6 Sobrecarga uso terraplenes 1 , from -1 to 1 step 0 kNm/m



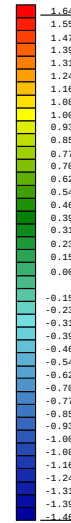
Bending moment m-yy in local y in Node, Loadcase 6 Sobrecarga uso terraplenes 1 , from -2 to 1 step 0 kNm/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

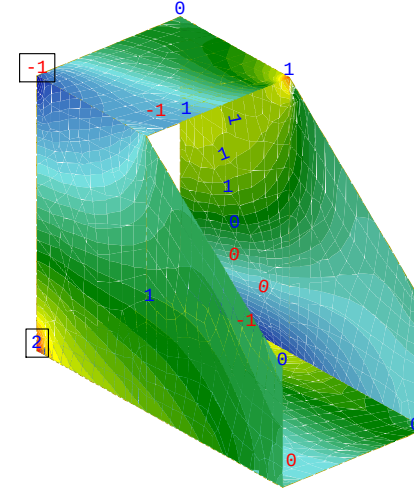
Esfuerzos LC y ELU



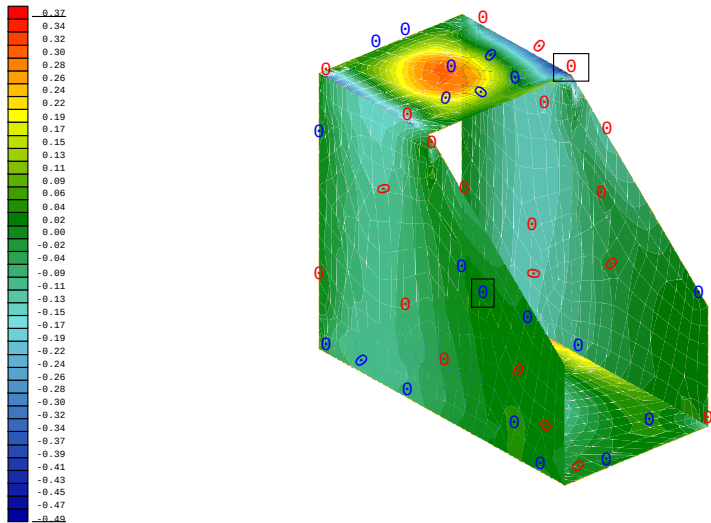
Bending moment m-xx in local x in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from 0 to 1 step 0 kNm/m



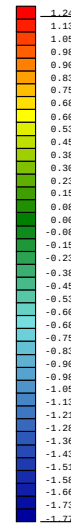
Bending moment m-yy in local y in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -1 to 2 step 0 kNm/m



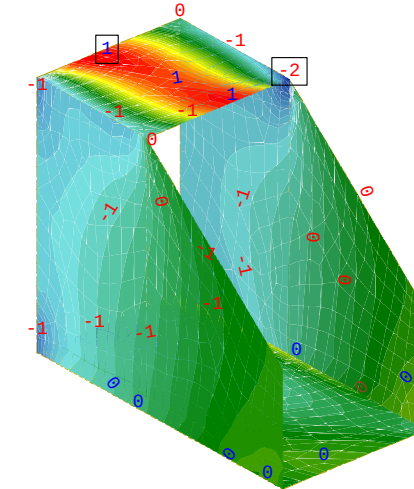
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



Bending moment m-xx in local x in Node, Loadcase 8 Sobrecarga uniforme , from 0 to 0 step 0 kNm/m

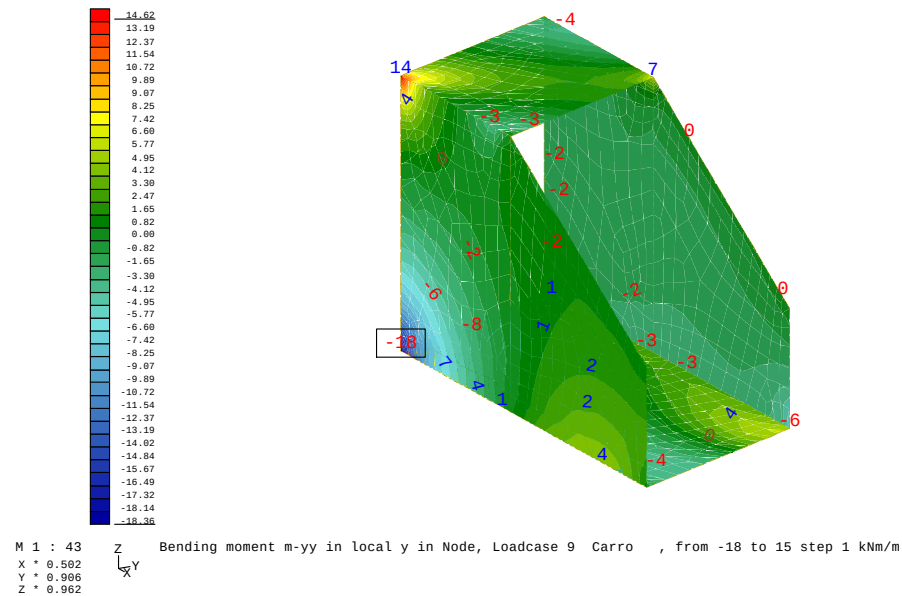
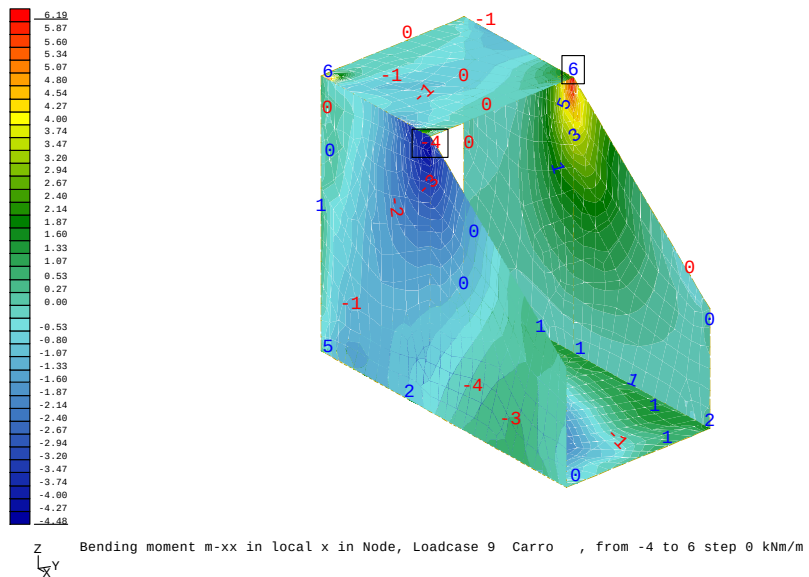


Bending moment m-yy in local y in Node, Loadcase 8 Sobrecarga uniforme , from -2 to 1 step 0 kNm/m

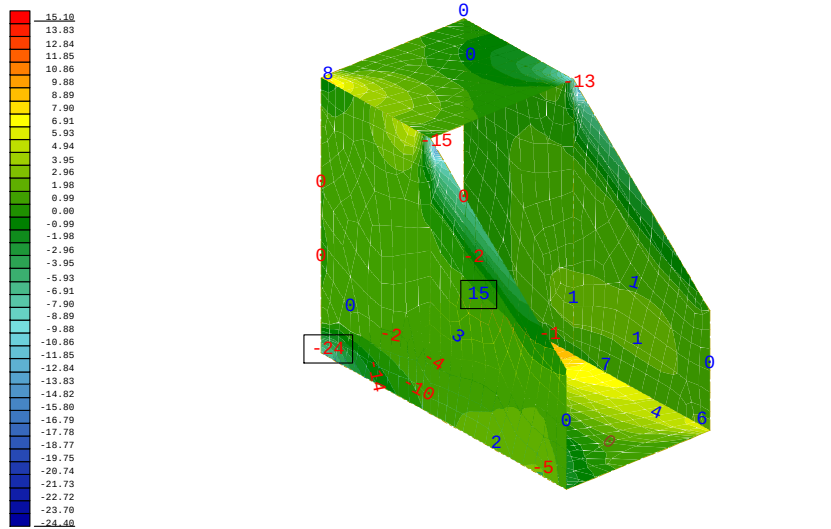


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

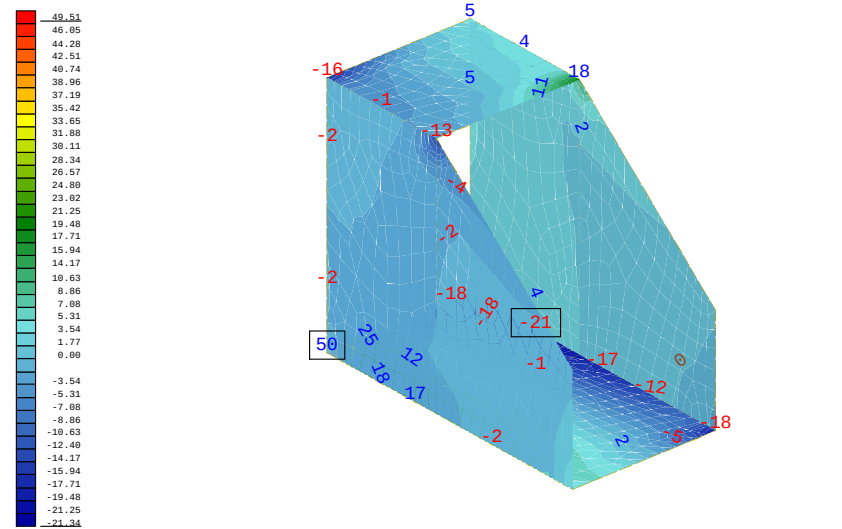
Esfuerzos LC y ELU



M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

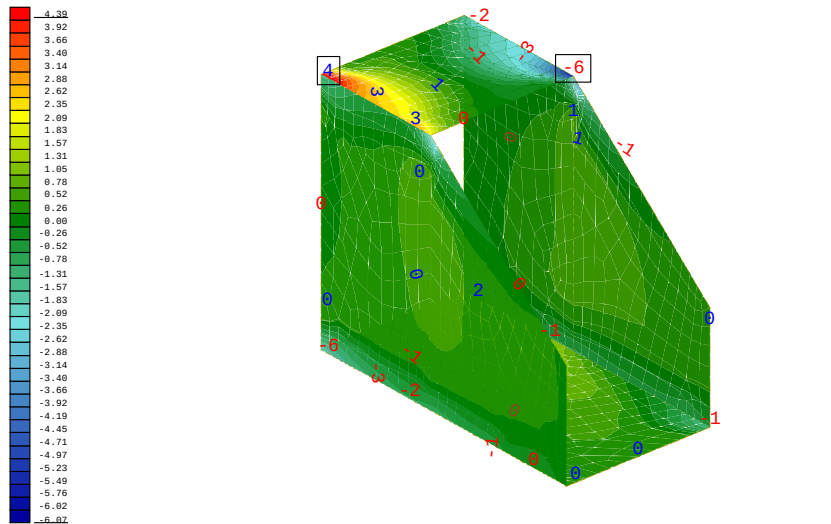


Shear force v-x in local x in Node, Loadcase 1 Peso propio , from -24 to 15 step 1 kN/m
Z
X Y

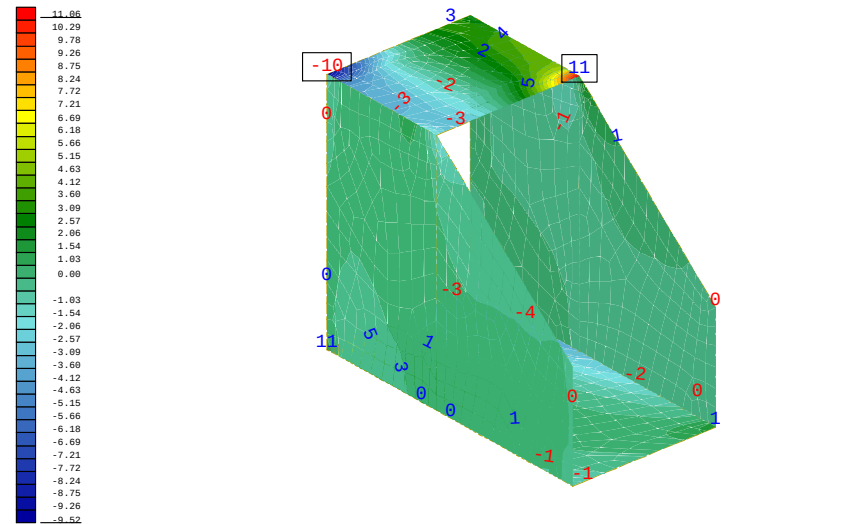


Shear force v-y in local y in Node, Loadcase 1 Peso propio , from -21 to 50 step 2 kN/m
Z
X Y
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



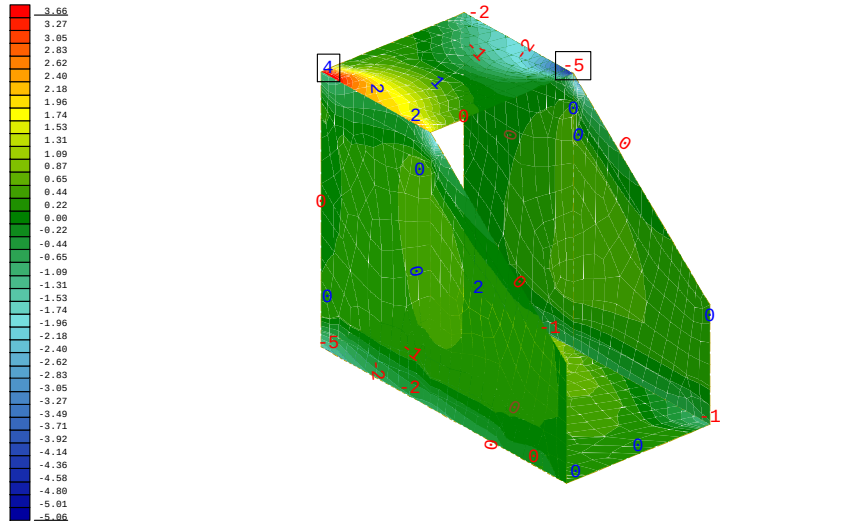
Shear force v-x in local x in Node, Loadcase 2 Peso tierras , from -6 to 4 step 0 kN/m
Z
X Y



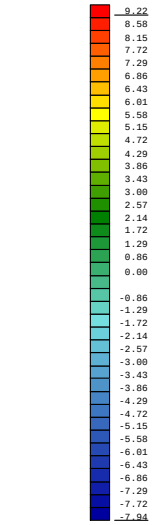
Shear force v-y in local y in Node, Loadcase 2 Peso tierras , from -10 to 11 step 1 kN/m
Z
X Y
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

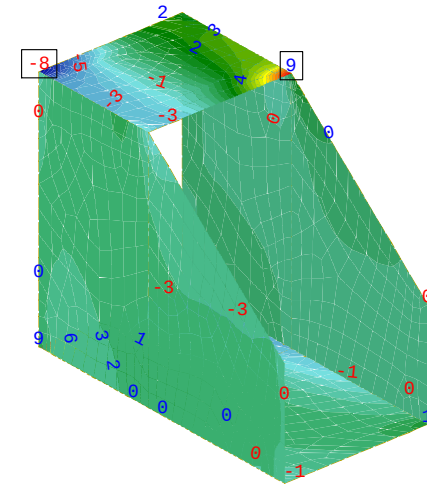
Esfuerzos LC y ELU



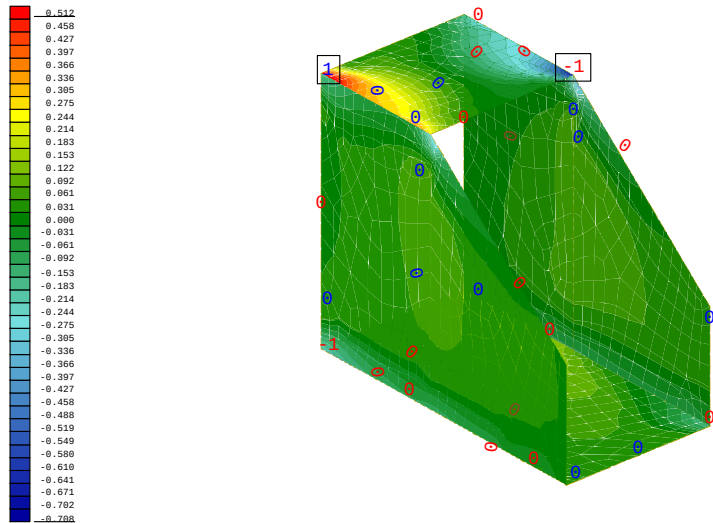
Shear force v-x in local x in Node, Loadcase 3 Peso aglomerado , from -5 to 4 step 0 kN/m



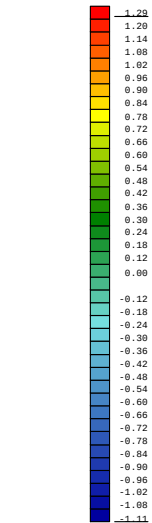
Shear force v-y in local y in Node, Loadcase 3 Peso aglomerado , from -8 to 9 step 0 kN/m



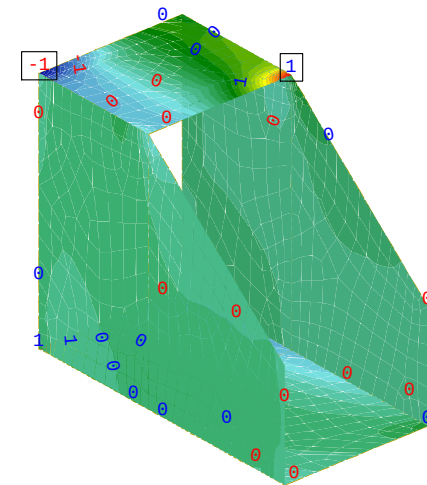
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



Shear force v-x in local x in Node, Loadcase 4 Rozamiento negativo , from -1 to 1 step 0 kN/m

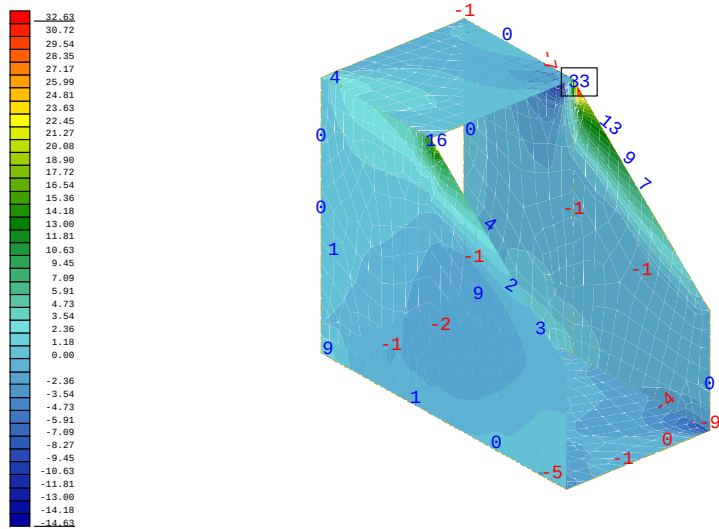


Shear force v-y in local y in Node, Loadcase 4 Rozamiento negativo , from -1 to 1 step 0 kN/m

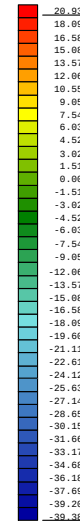


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

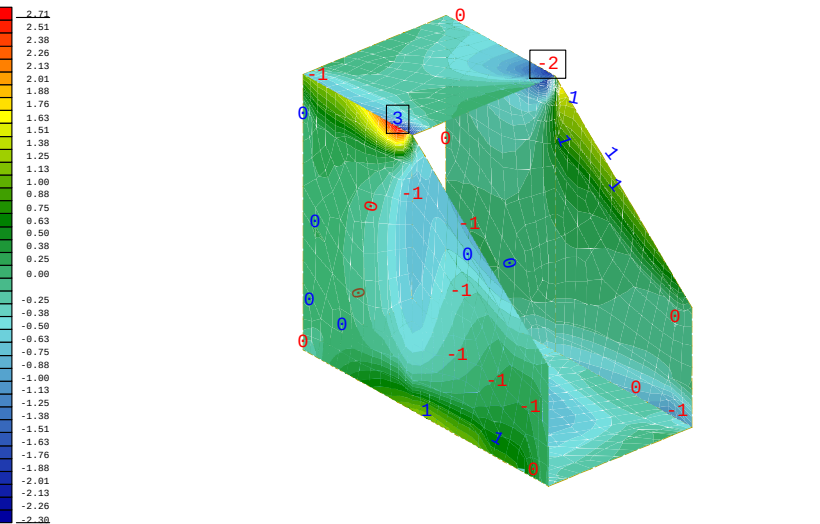
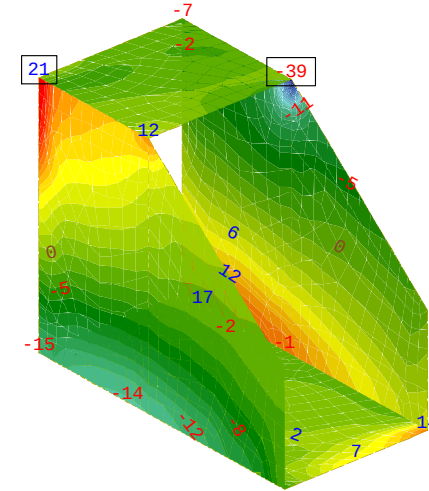
Esfuerzos LC y ELU



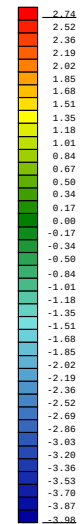
Shear force v-x in local x in Node, Loadcase 5 Empuje tierras , from -15 to 33 step 1 kN/m



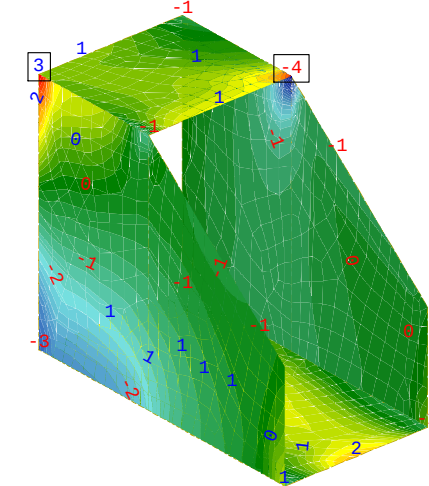
Shear force v-y in local y in Node, Loadcase 5 Empuje tierras , from -39 to 21 step 2 kN/m



Shear force v-x in local x in Node, Loadcase 6 Sobrecarga uso terraplenes 1 , from -2 to 3 step 0 kN/m

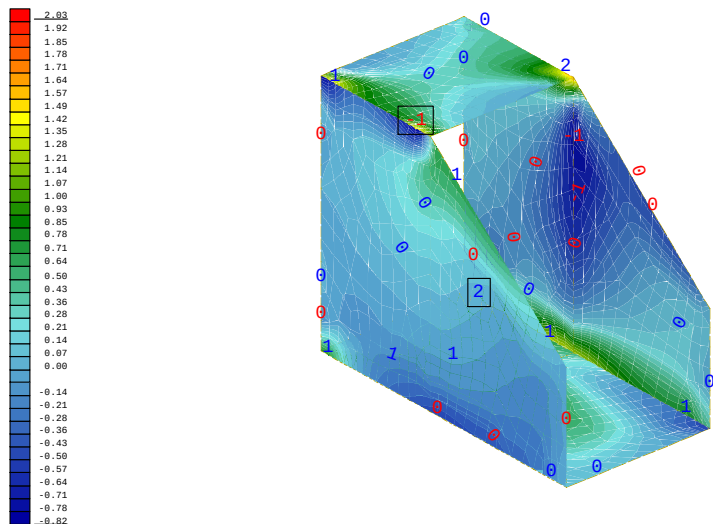


Shear force v-y in local y in Node, Loadcase 6 Sobrecarga uso terraplenes 1 , from -4 to 3 step 0 kN/m

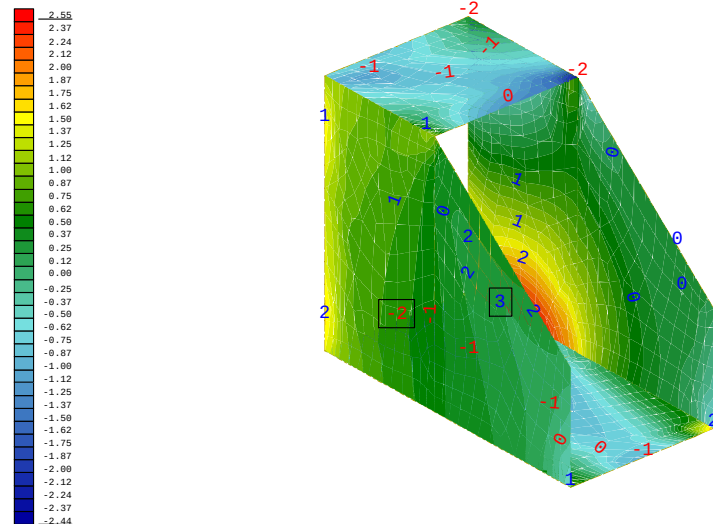


Shear force v-x in local x in Node, Loadcase 6 Sobrecarga uso terraplenes 1 , from -2 to 3 step 0 kN/m

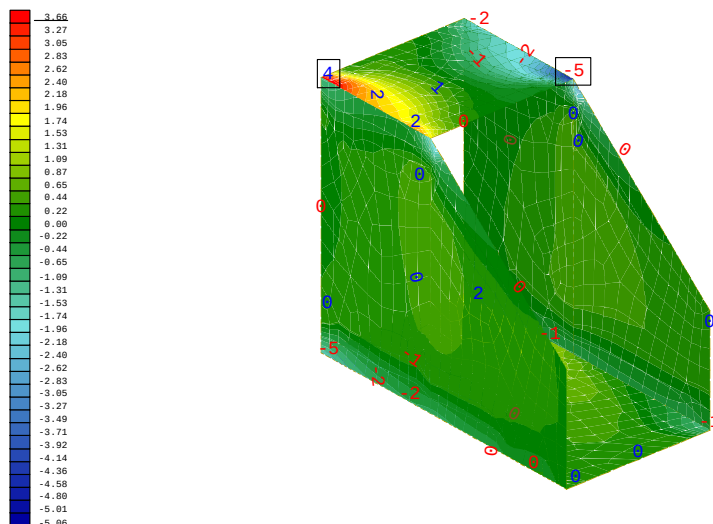
Esfuerzos LC y ELU



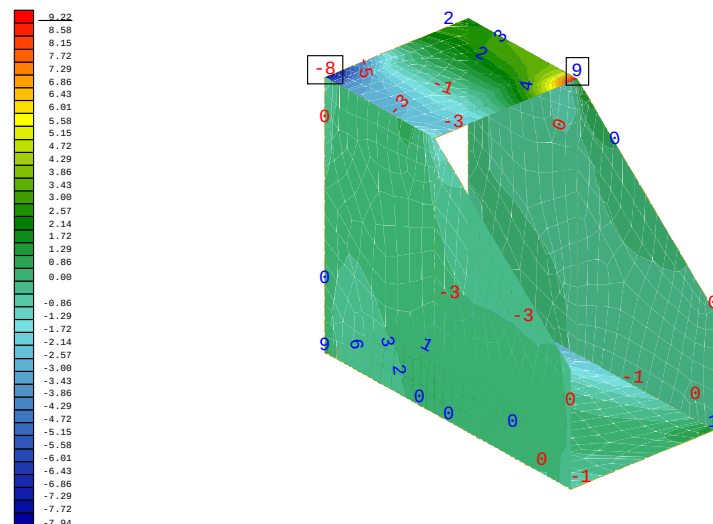
Shear force v-x in local x in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -1 to 2 step 0 kN/m



Shear force v-y in local y in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -2 to 3 step 0 kN/m



Shear force v-x in local x in Node, Loadcase 8 Sobrecarga uniforme , from -5 to 4 step 0 kN/m

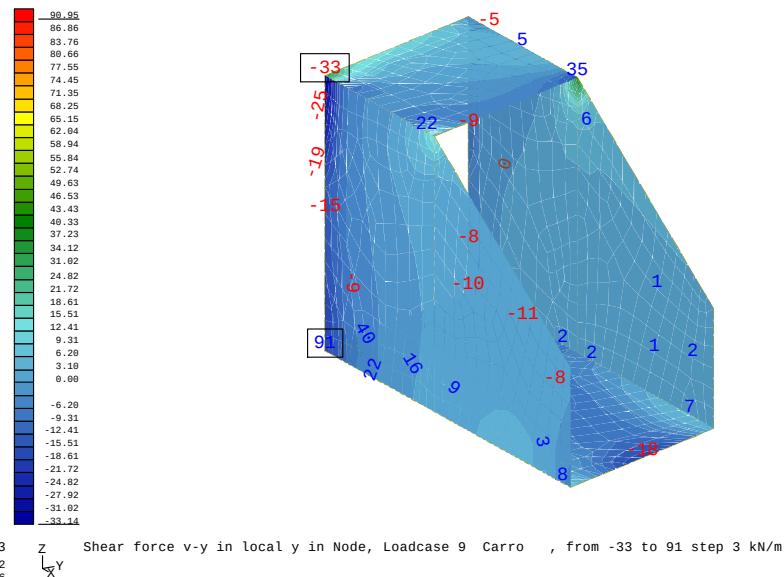
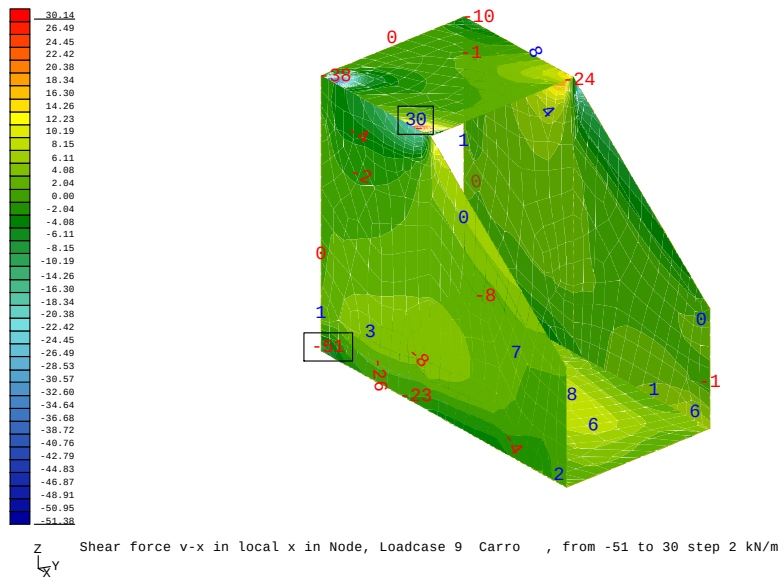


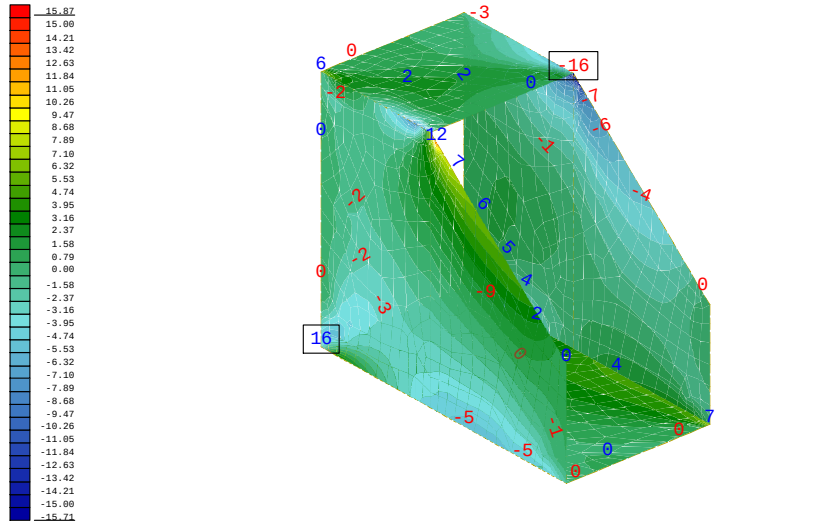
Shear force v-y in local y in Node, Loadcase 8 Sobrecarga uniforme , from -8 to 9 step 0 kN/m

Esfuerzos LC y ELU

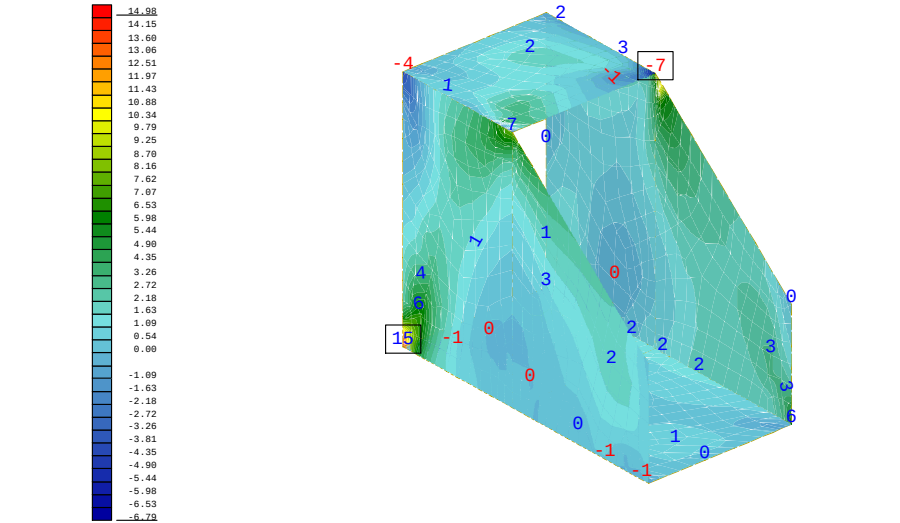
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



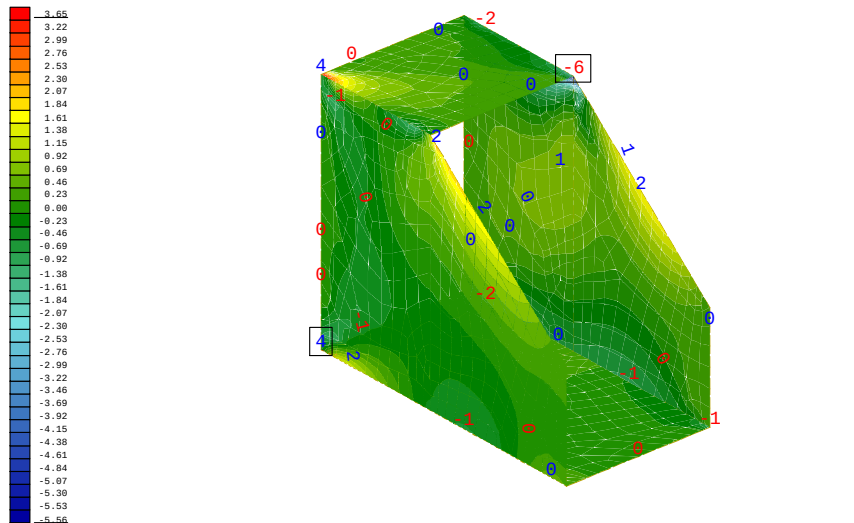


Membrane force n-xx in local x in Node, Loadcase 1 Peso propio , from -16 to 16 step 1 kN/m

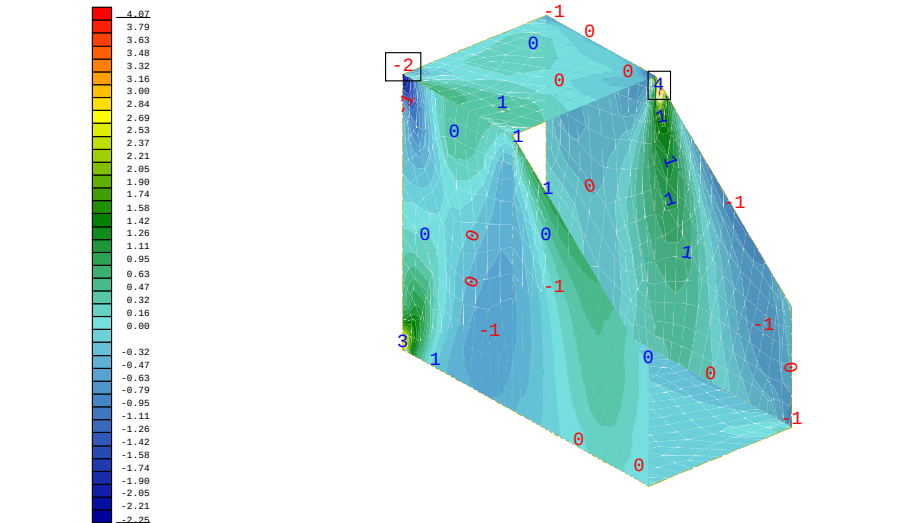


Membrane shear force n-xy in local xy in Node, Loadcase 1 Peso propio , from -7 to 15 step 1 kN/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



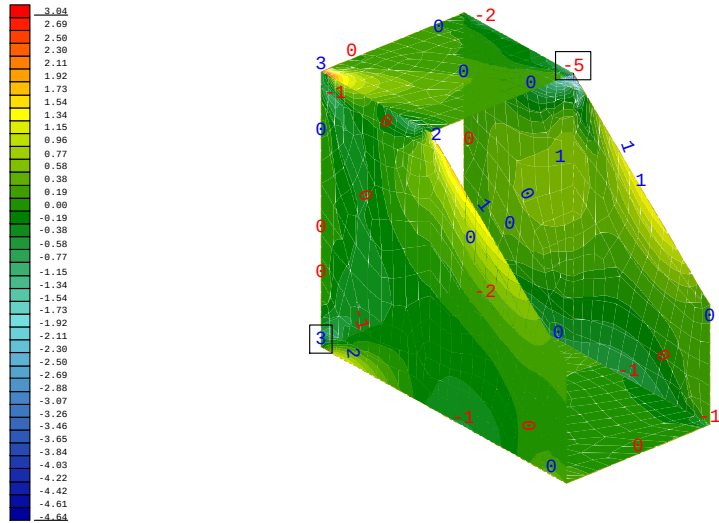
Membrane force n-xx in local x in Node, Loadcase 2 Peso tierras , from -6 to 4 step 0 kN/m



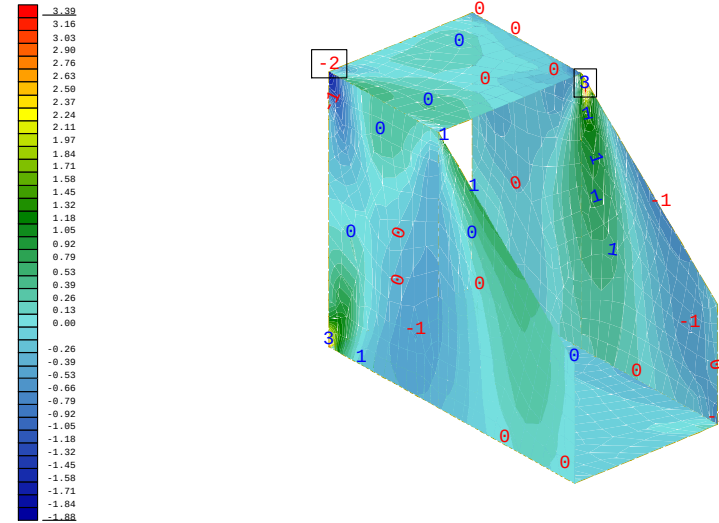
Membrane shear force n-xy in local xy in Node, Loadcase 2 Peso tierras , from -2 to 4 step 0 kN/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

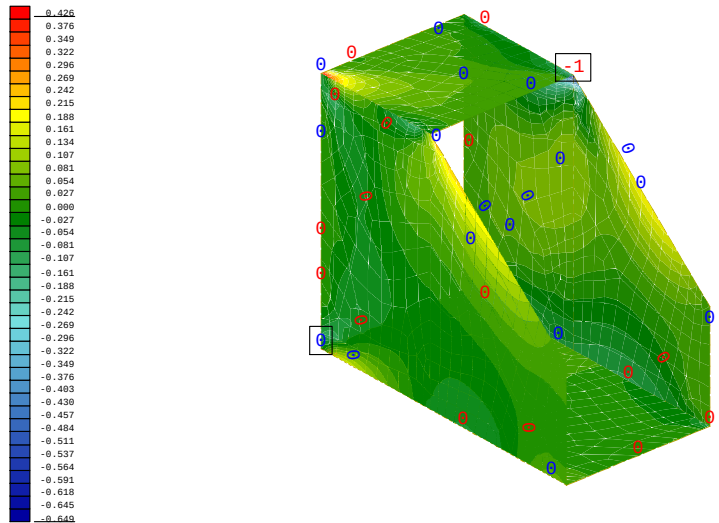


Z
X Y
Membrane force n-xx in local x in Node, Loadcase 3 Peso aglomerado , from -5 to 3 step 0
kN/m

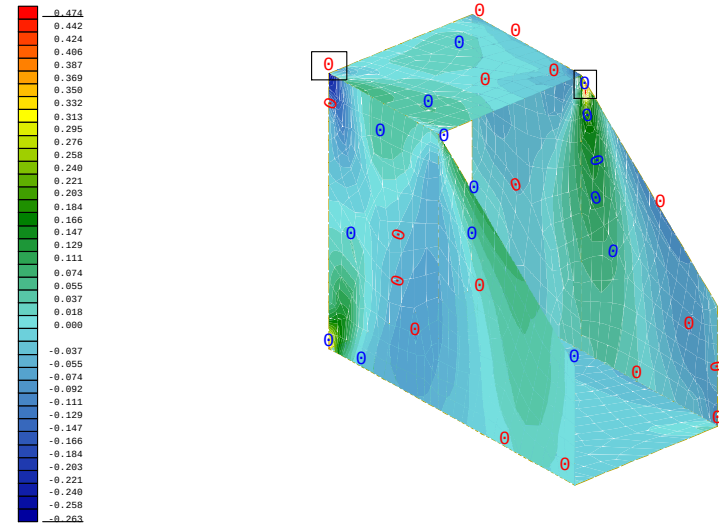


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z
X Y
Membrane shear force n-xy in local xy in Node, Loadcase 3 Peso aglomerado , from -2 to 3 step 0 kN/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



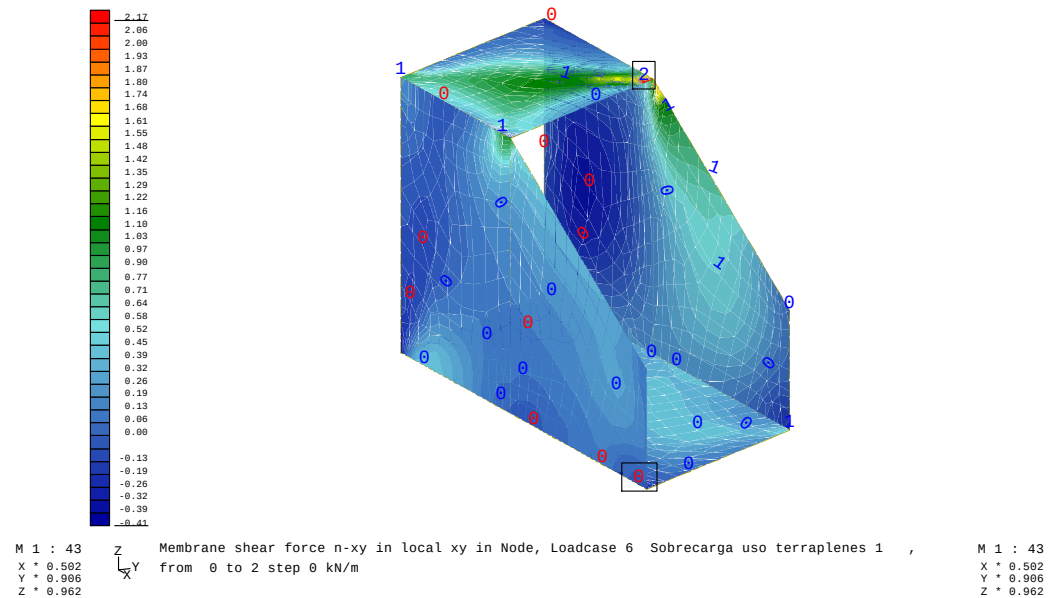
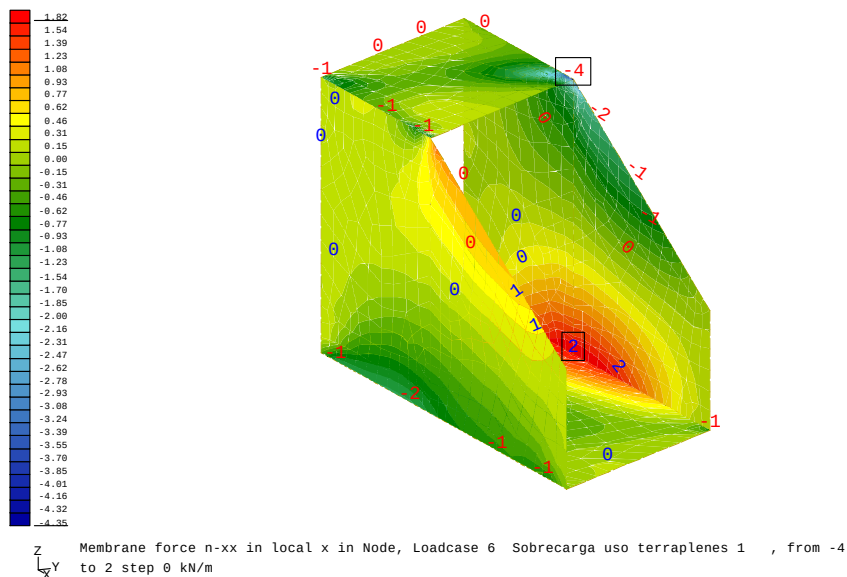
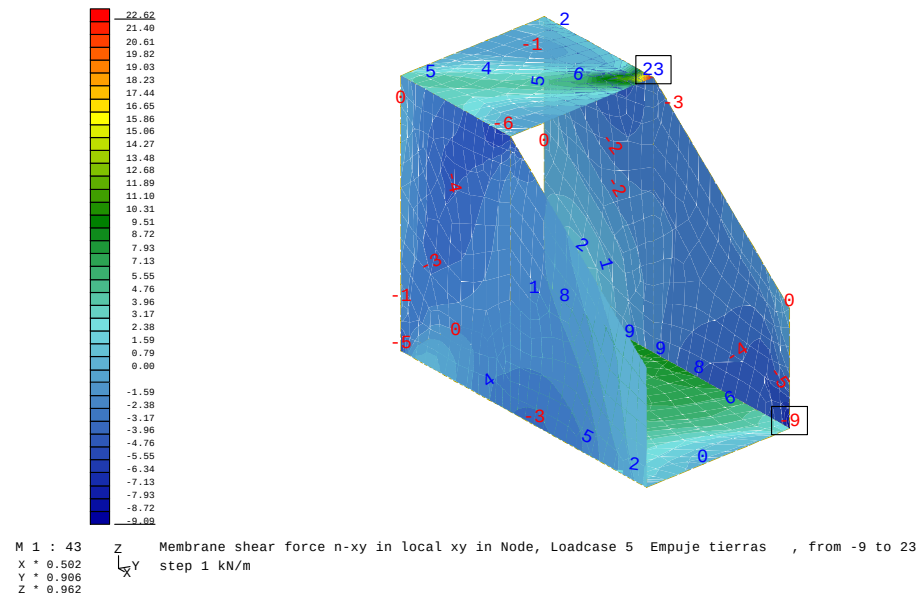
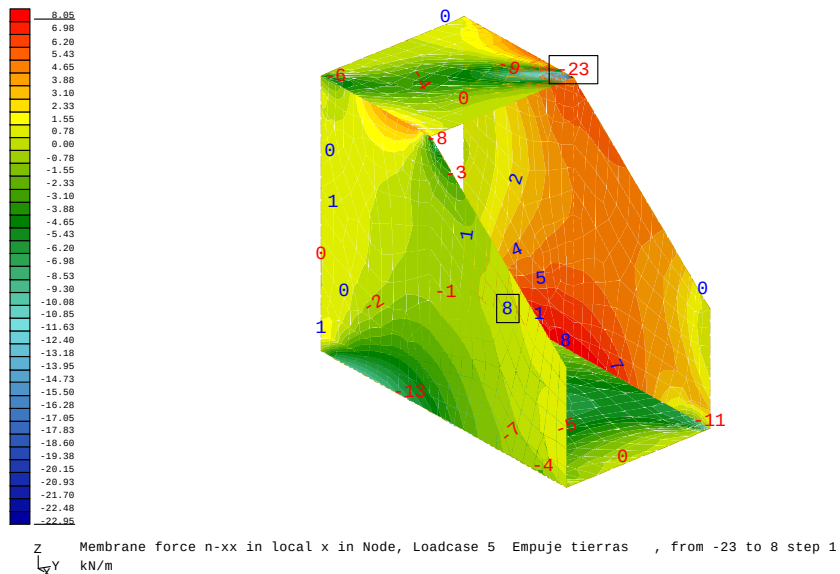
Z
X Y
Membrane force n-xx in local x in Node, Loadcase 4 Rozamiento negativo , from -1 to 0 step 0 kN/m



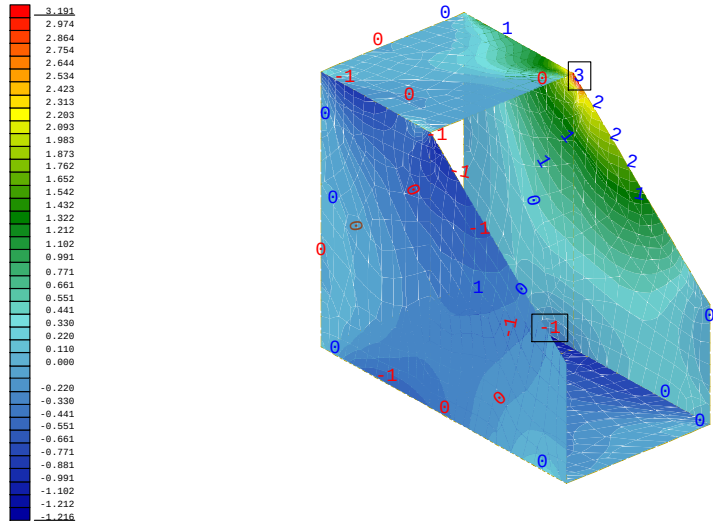
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z
X Y
Membrane shear force n-xy in local xy in Node, Loadcase 4 Rozamiento negativo , from 0 to 0 step 0 kN/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

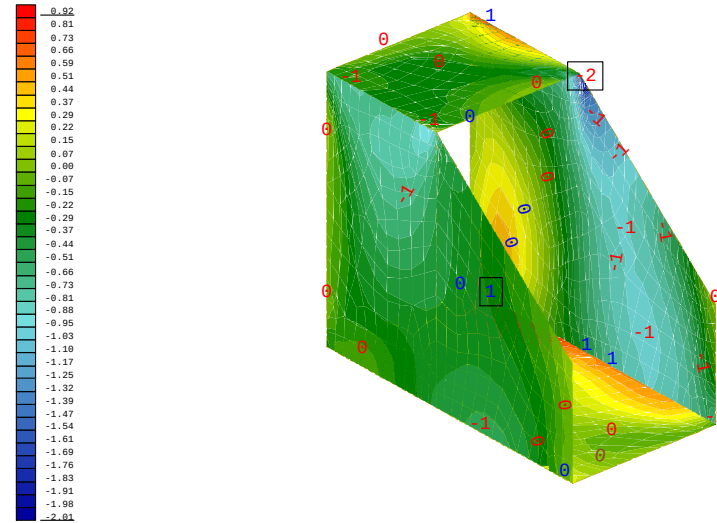
Esfuerzos LC y ELU



Esfuerzos LC y ELU

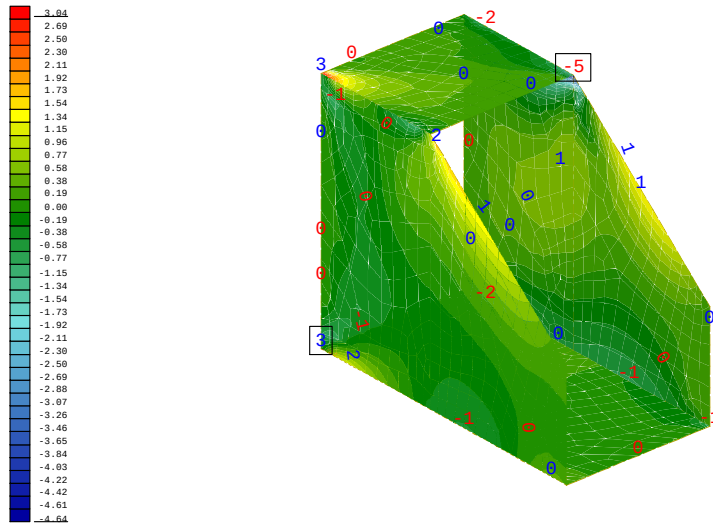


Z
Y
X Membrane force n-xx in local x in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -1 to 3 step 0 kN/m

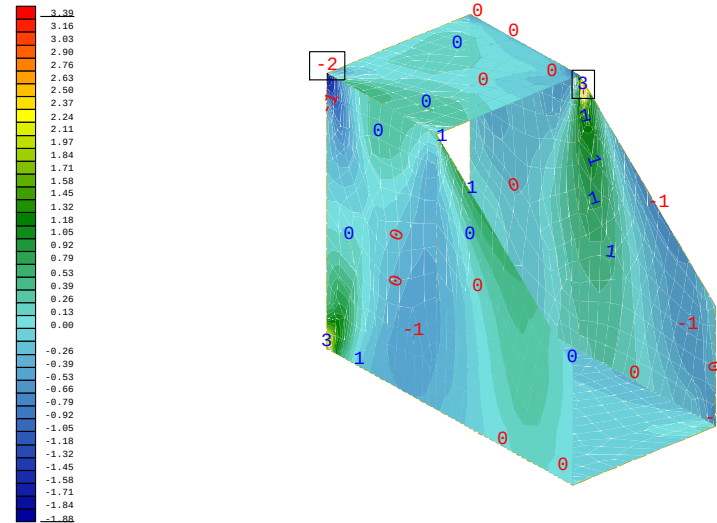


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962 Z
Y
X Membrane shear force n-xy in local xy in Node, Loadcase 7 Sobrecarga uso terraplenes 2 , from -2 to 1 step 0 kN/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



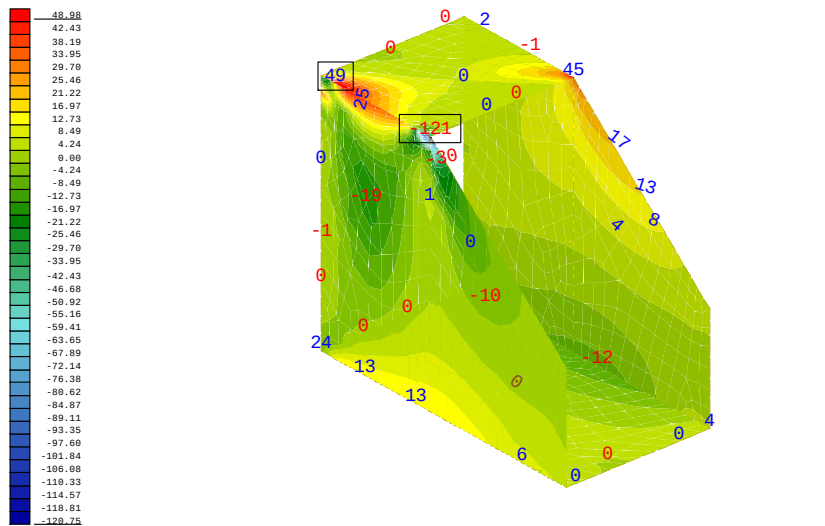
Z
Y
X Membrane force n-xx in local x in Node, Loadcase 8 Sobrecarga uniforme , from -5 to 3 step 0 kN/m



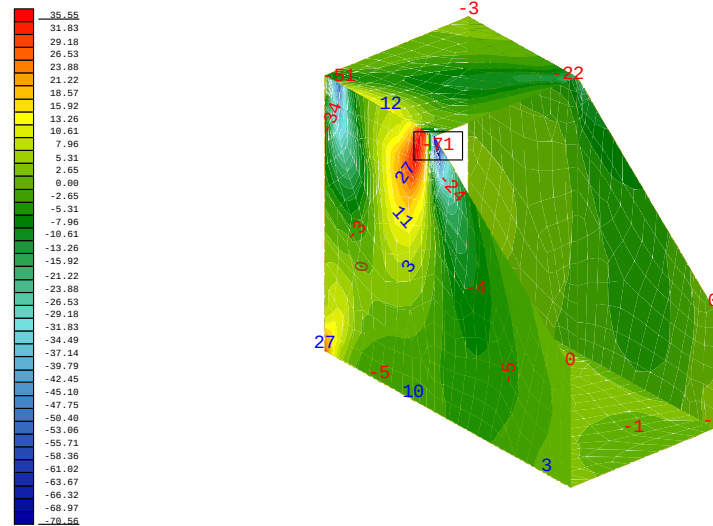
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962 Z
Y
X Membrane shear force n-xy in local xy in Node, Loadcase 8 Sobrecarga uniforme , from -2 to 3 step 0 kN/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

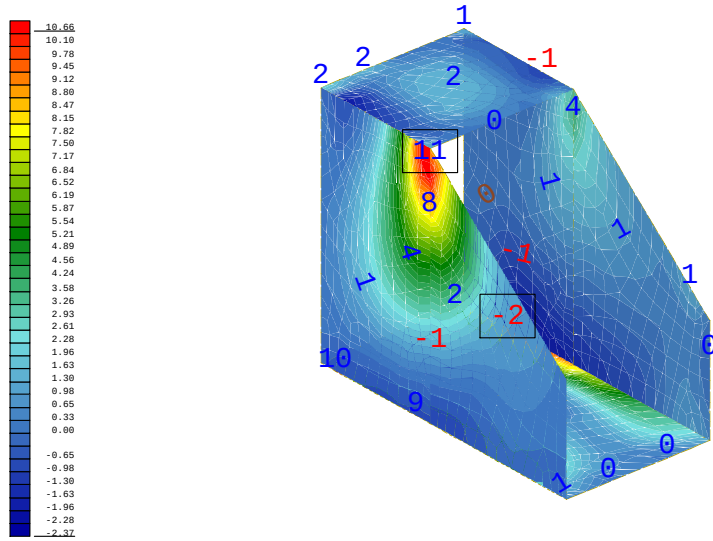


Membrane force n-xx in local x in Node, Loadcase 9 Carro , from -121 to 49 step 4 kN/m

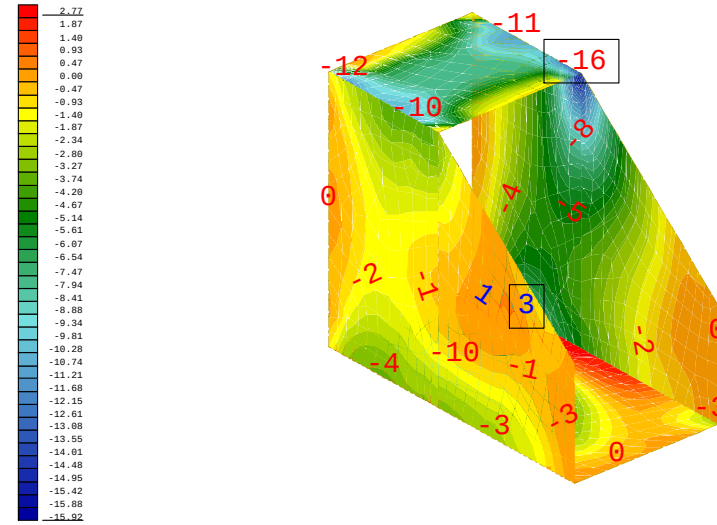


Membrane shear force n-xy in local xy in Node, Loadcase 9 Carro , from -71 to 36 step 3 kN/m

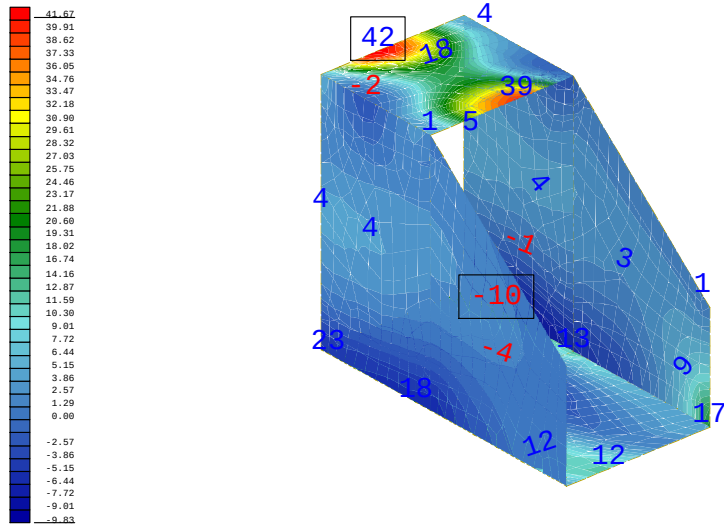
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



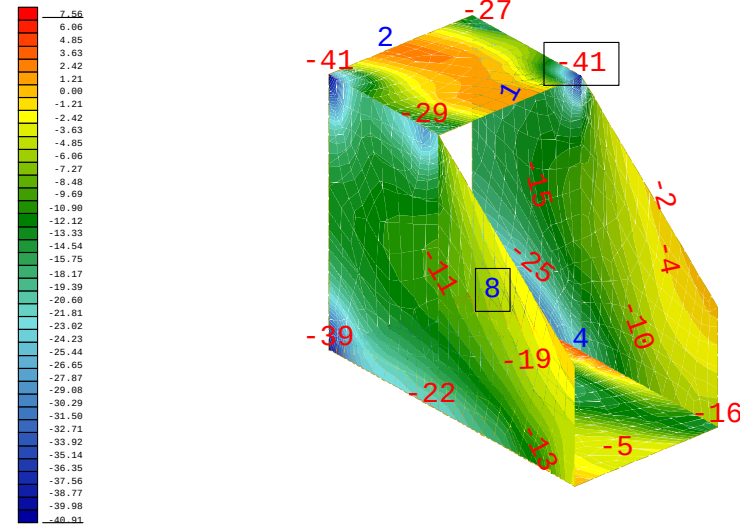
Z Bending moment m-xx in local x from middle of element, Loadcase 2101 MAX-MXX QUAD Forces in
X Y Quadrilat , from -2 to 11 step 0 kNm/m



M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z Bending moment m-xx in local x from middle of element, Loadcase 2102 MIN-MXX QUAD Forces in
X Y Quadrilat , from -16 to 3 step 0 kNm/m



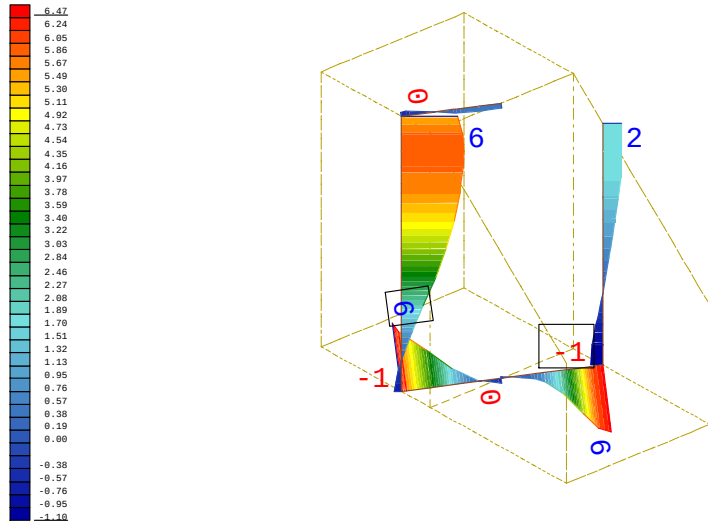
Z Bending moment m-yy in local y from middle of element, Loadcase 2103 MAX-MYY QUAD Forces in
X Y Quadrilat , from -10 to 42 step 1 kNm/m



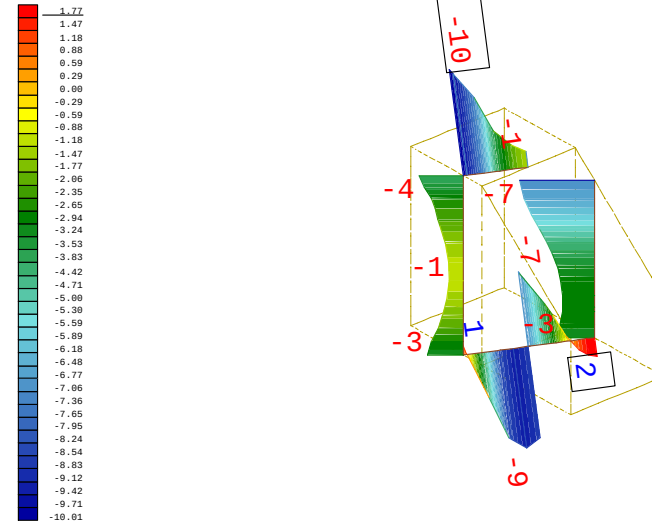
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z Bending moment m-yy in local y from middle of element, Loadcase 2104 MIN-MYY QUAD Forces in
X Y Quadrilat , from -41 to 8 step 1 kNm/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

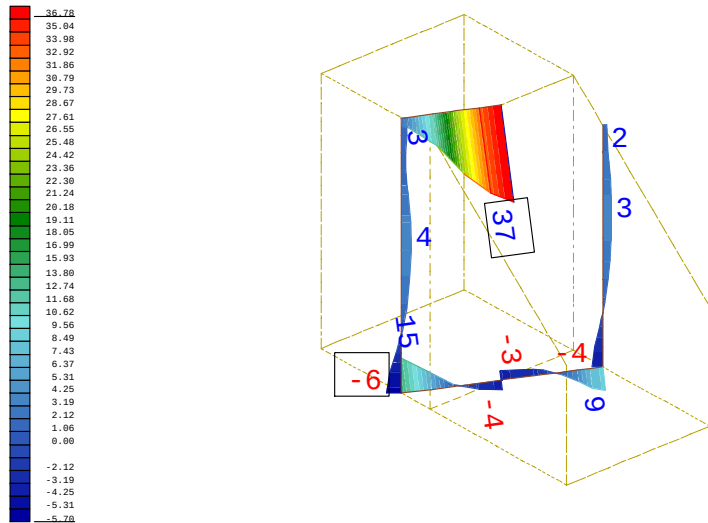


Bending moment m-xx in local x from middle of element, Loadcase 2101 MAX-MXX QUAD Forces in
Quadrilat , 1 cm 3D = 5.0000 kNm/m (Min=-1) (Max=6)

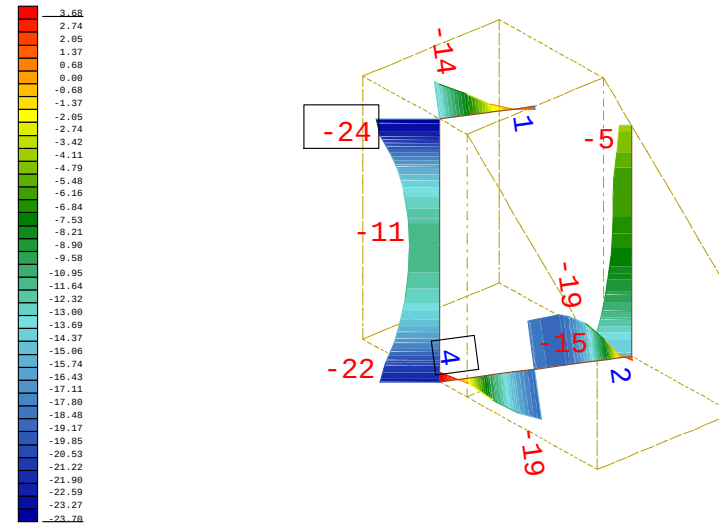


Bending moment m-xx in local x from middle of element, Loadcase 2102 MIN-MXX QUAD Forces in
Quadrilat , 1 cm 3D = 5.0000 kNm/m (Min=-10) (Max=2)

M 1 : 66
X * 0.502
Y * 0.906
Z * 0.962



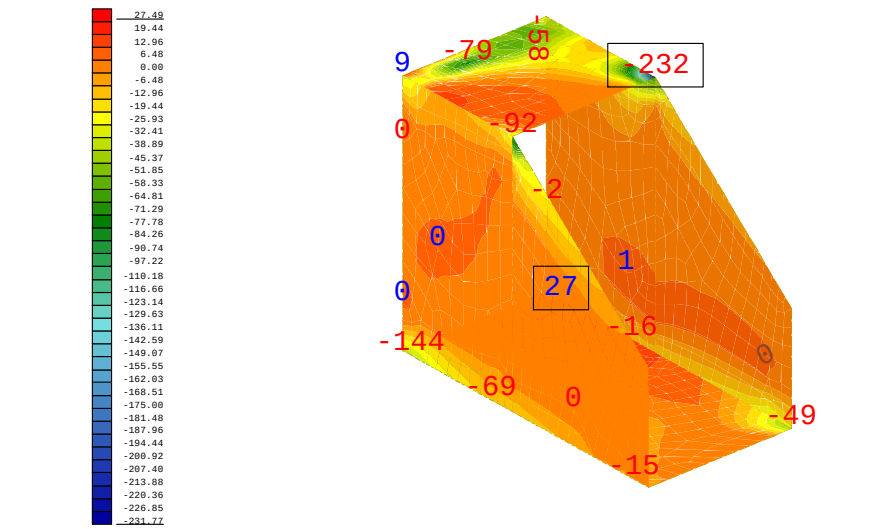
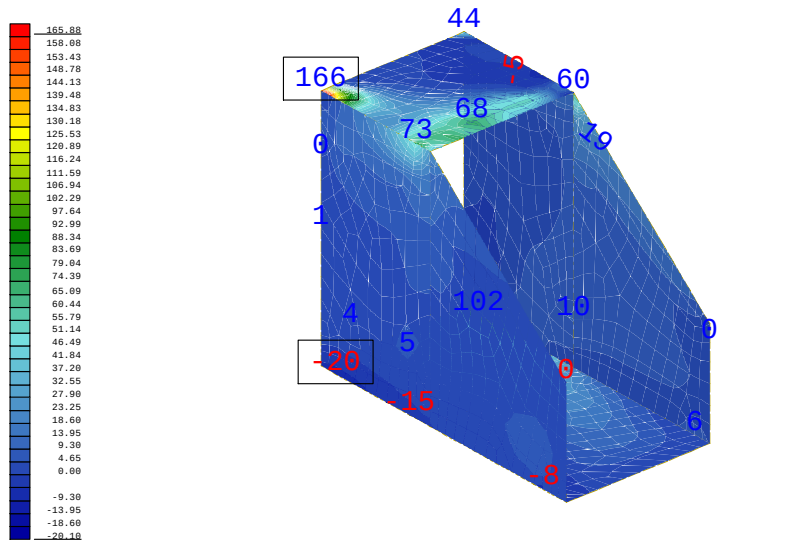
Bending moment m-yy in local y from middle of element, Loadcase 2103 MAX-MYY QUAD Forces in
Quadrilat , 1 cm 3D = 20.0000 kNm/m (Min=-6) (Max=37)



Bending moment m-yy in local y from middle of element, Loadcase 2104 MIN-MYY QUAD Forces in
Quadrilat , 1 cm 3D = 20.0000 kNm/m (Min=-24) (Max=4)

M 1 : 45
X * 0.502
Y * 0.906
Z * 0.962

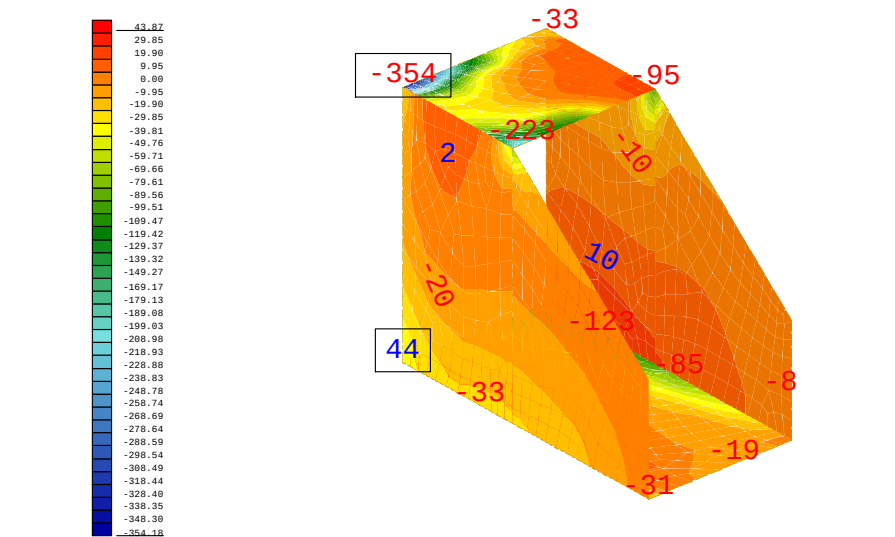
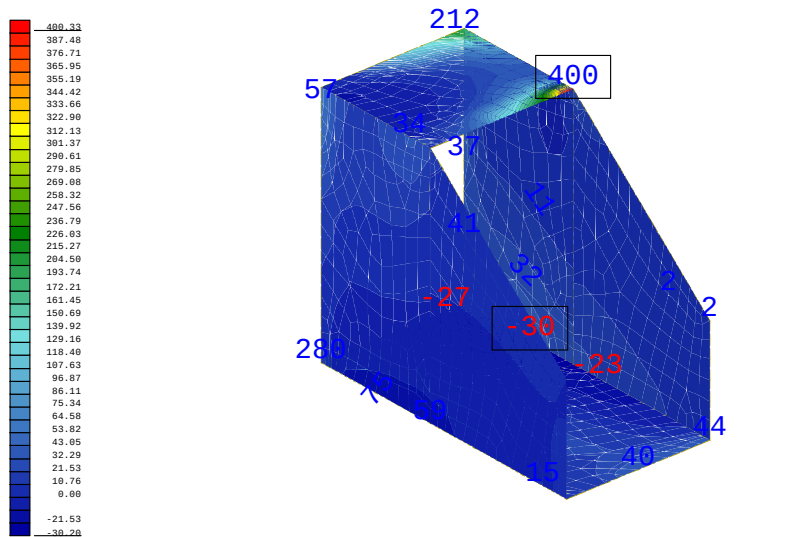
Esfuerzos LC y ELU



M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

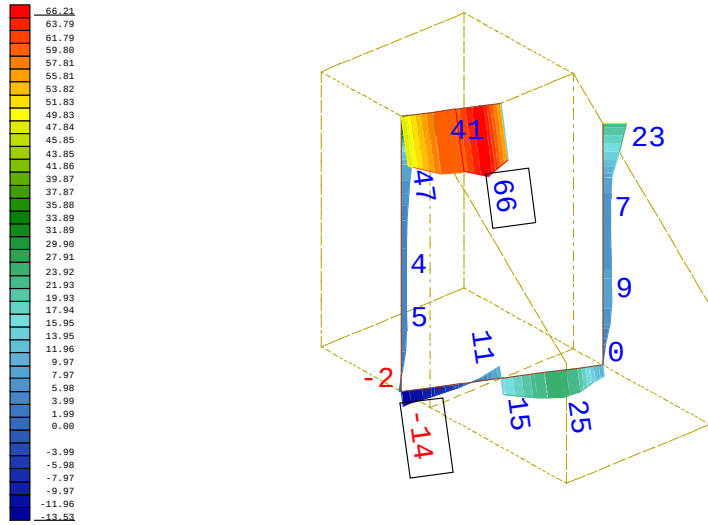
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



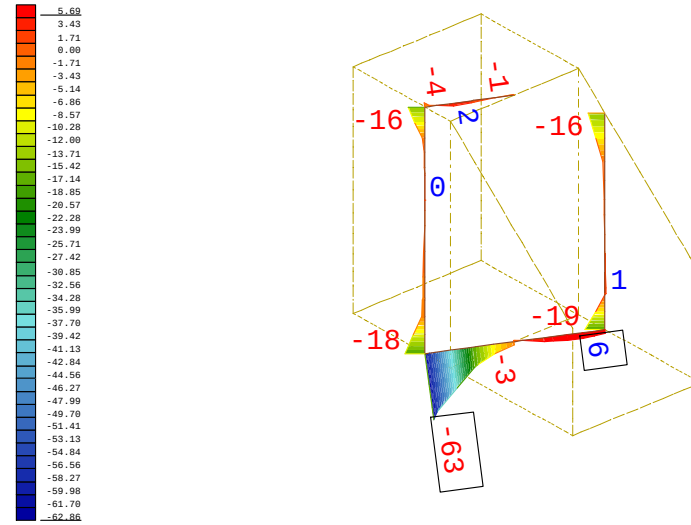
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

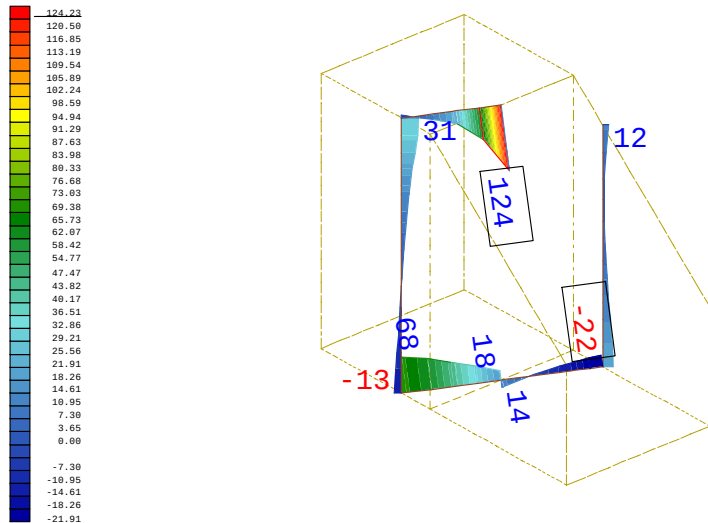


Z Shear force v-x in local x from middle of element, Loadcase 2107 MAX-VX QUAD Forces in
X Y Quadriplate , 1 cm 3D = 50.000 kN/m (Min=-14) (Max=66)

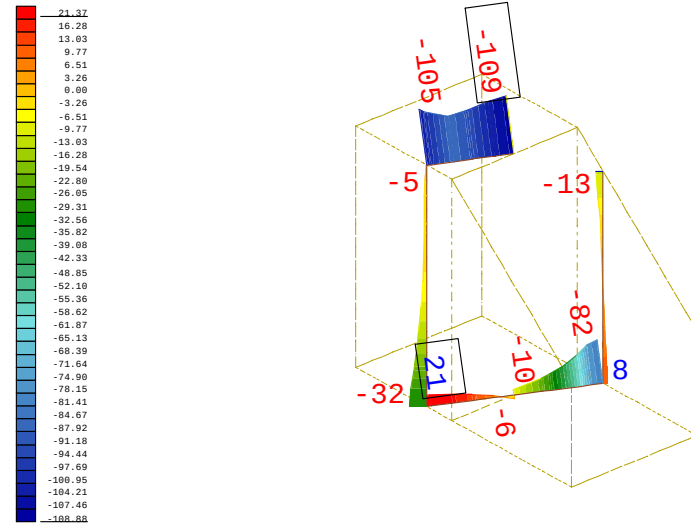


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z Shear force v-x in local x from middle of element, Loadcase 2108 MIN-VX QUAD Forces in
X Y Quadriplate , 1 cm 3D = 50.000 kN/m (Min=-63) (Max=6)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



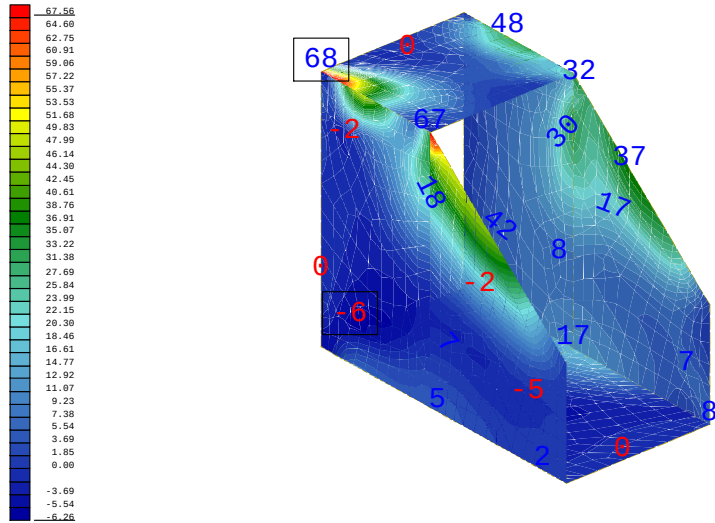
Z Shear force v-y in local y from middle of element, Loadcase 2109 MAX-VY QUAD Forces in
X Y Quadriplate , 1 cm 3D = 100.00 kN/m (Min=-22) (Max=124)



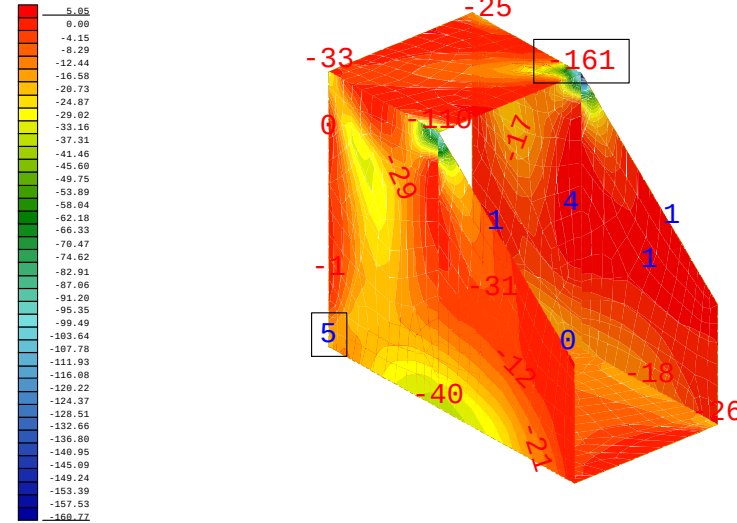
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z Shear force v-y in local y from middle of element, Loadcase 2110 MIN-VY QUAD Forces in
X Y Quadriplate , 1 cm 3D = 100.00 kN/m (Min=-109) (Max=21)

M 1 : 49
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

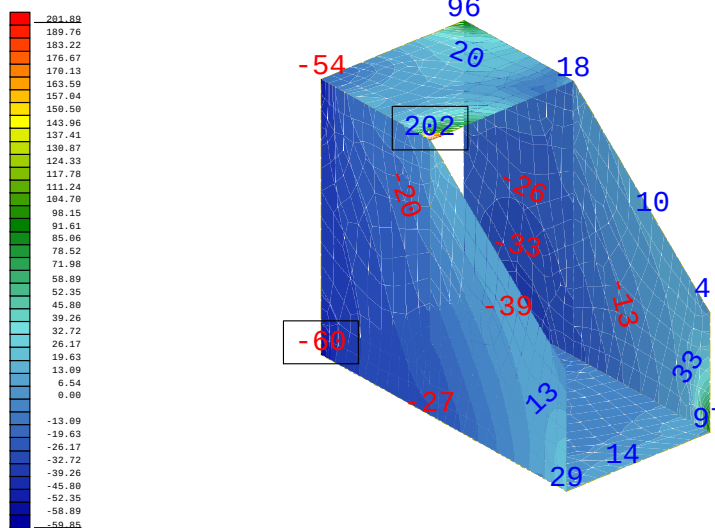


Z
X Y Membrane force n-xx in local x from middle of element, Loadcase 2111 MAX-NXX QUAD Forces in
Quadrilat , from -6 to 68 step 2 kN/m

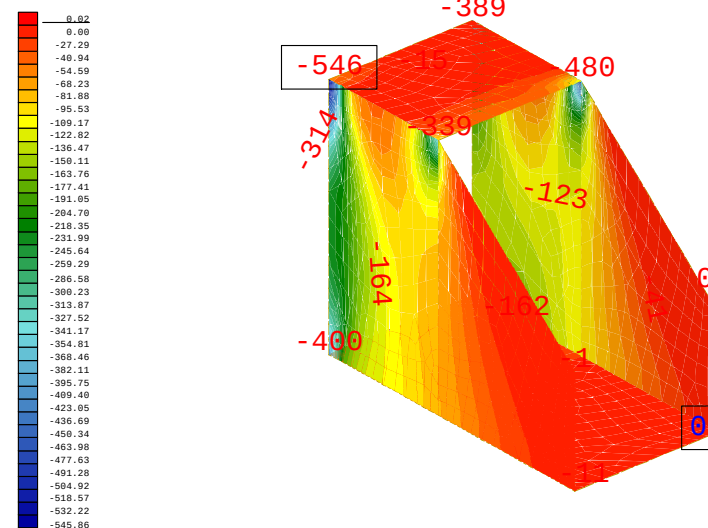


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962 Z
X Y Membrane force n-xx in local x from middle of element, Loadcase 2112 MIN-NXX QUAD Forces in
Quadrilat , from -161 to 5 step 4 kN/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



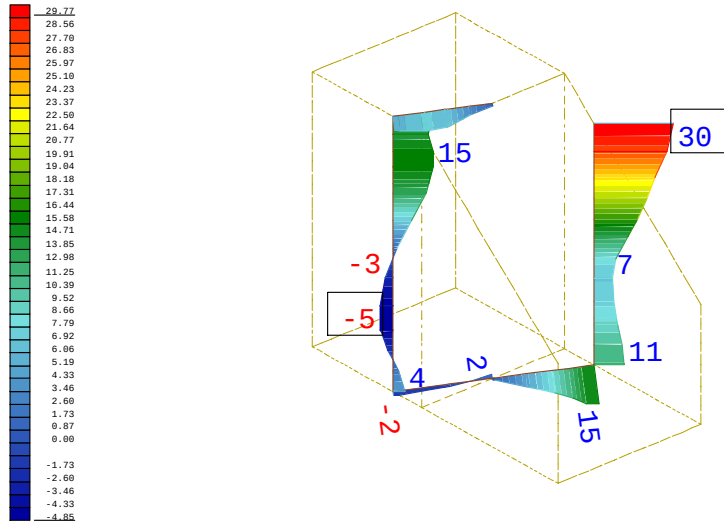
Z
X Y Membrane force n-yy in local y from middle of element, Loadcase 2113 MAX-NYY QUAD Forces in
Quadrilat , from -60 to 202 step 7 kN/m



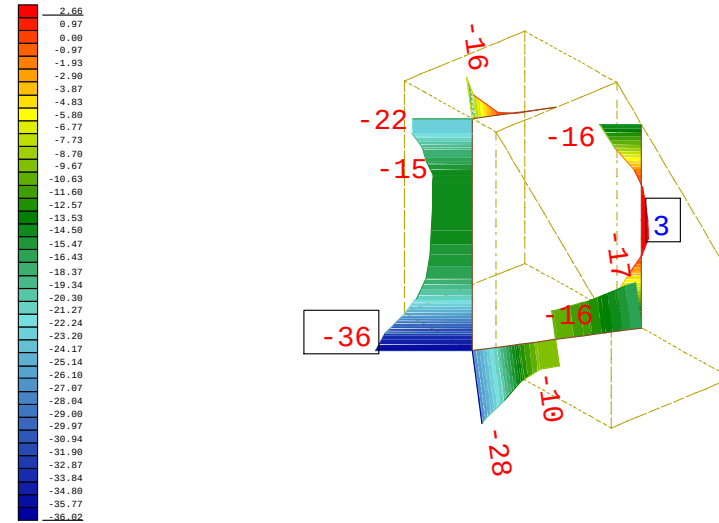
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962 Z
X Y Membrane force n-yy in local y from middle of element, Loadcase 2114 MIN-NYY QUAD Forces in
Quadrilat , from -546 to 0 step 14 kN/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

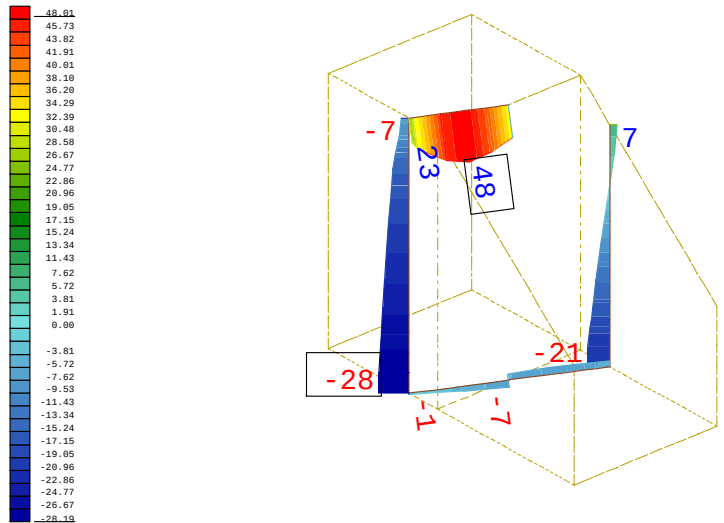


Z Membrane force n-xx in local x from middle of element, Loadcase 2111 MAX-NXX QUAD Forces in
X Y Quadrilat , 1 cm 3D = 20.000 kN/m (Min=-5) (Max=30)

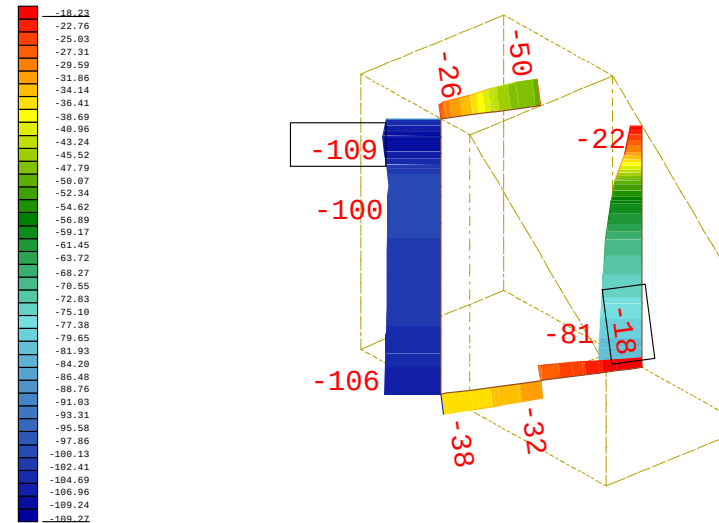


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z Membrane force n-xx in local x from middle of element, Loadcase 2112 MIN-NXX QUAD Forces in
X Y Quadrilat , 1 cm 3D = 20.000 kN/m (Min=-36) (Max=3)

M 1 : 51
X * 0.502
Y * 0.906
Z * 0.962



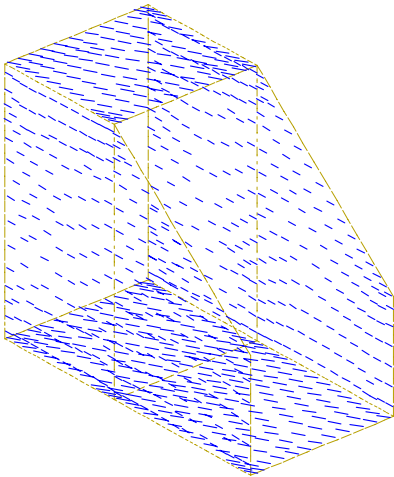
Z Membrane force n-yy in local y from middle of element, Loadcase 2113 MAX-NYY QUAD Forces in
X Y Quadrilat , 1 cm 3D = 50.000 kN/m (Min=-28) (Max=48)



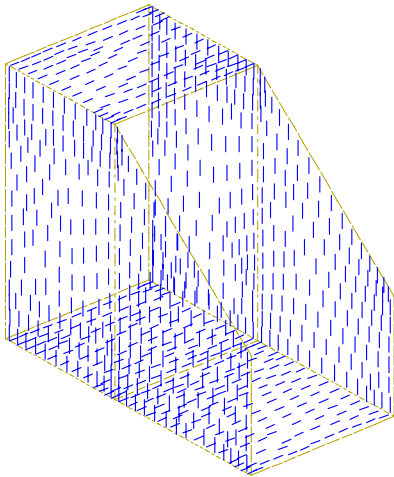
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962
Z Membrane force n-yy in local y from middle of element, Loadcase 2114 MIN-NYY QUAD Forces in
X Y Quadrilat , 1 cm 3D = 100.00 kN/m (Min=-109) (Max=-18)

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU

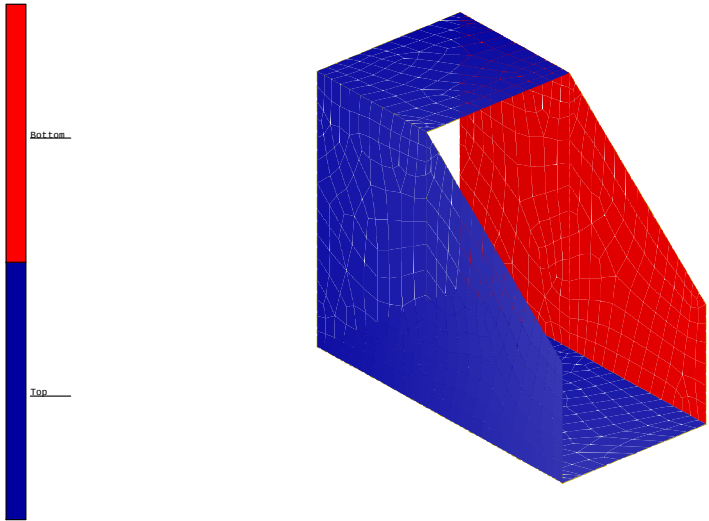


Z
└─┐ Y
X Quadrilateral Elements , Direction of prescribed upper Principal reinforcements (1st layer)
 ()



Z
└─┐ Y
X Quadrilateral Elements , Direction of prescribed upper Cross reinforcements (2nd layer) ()

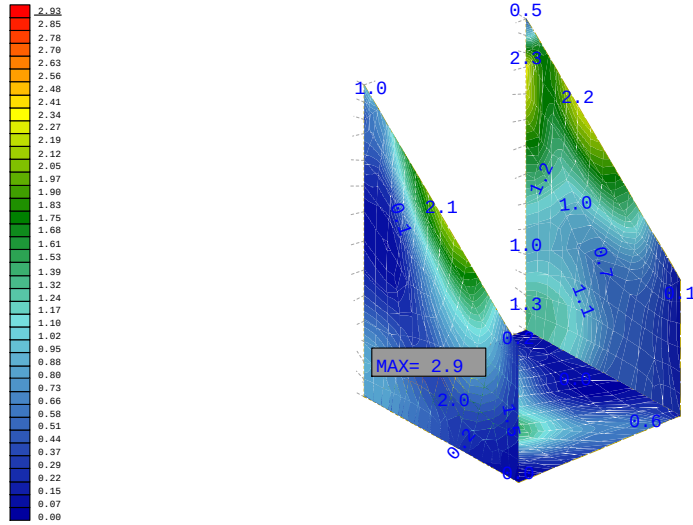
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962



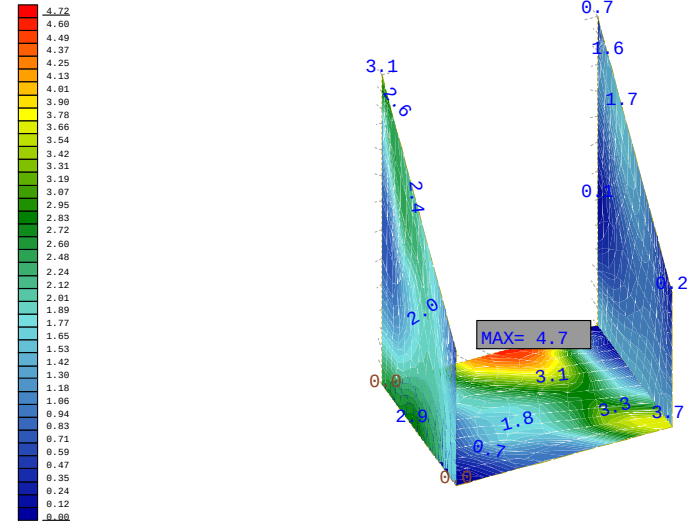
Z
└─┐ Y
X Visible QUAD surface top/bottom in Element

Armado

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

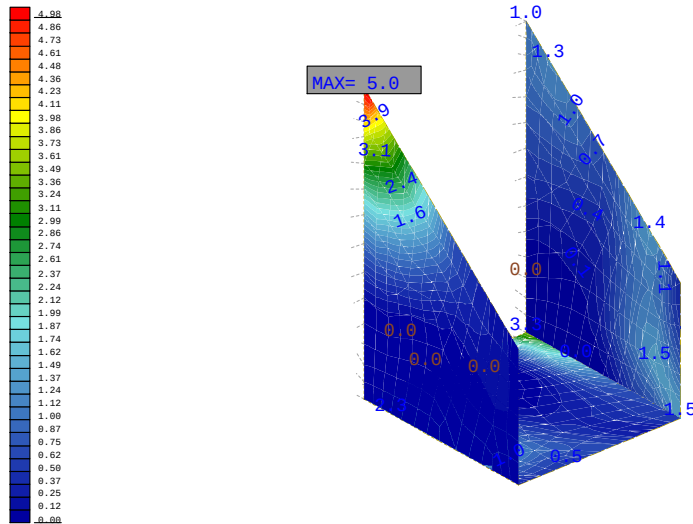


Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Principal reinforcements (1st layer), Design Case 2 After the crack width design , from 0.0 to 2.9 step 0.1 cm2/m

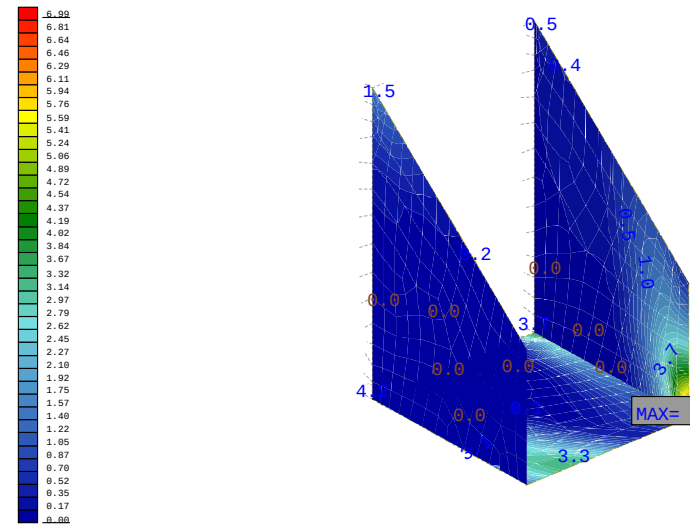


M 1 : 38
X * 0.502
Y * 0.906
Z * 0.962
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 4.7 step 0.1 cm2/m

M 1 : 38
X * 0.358
Y * 0.979
Z * 0.956



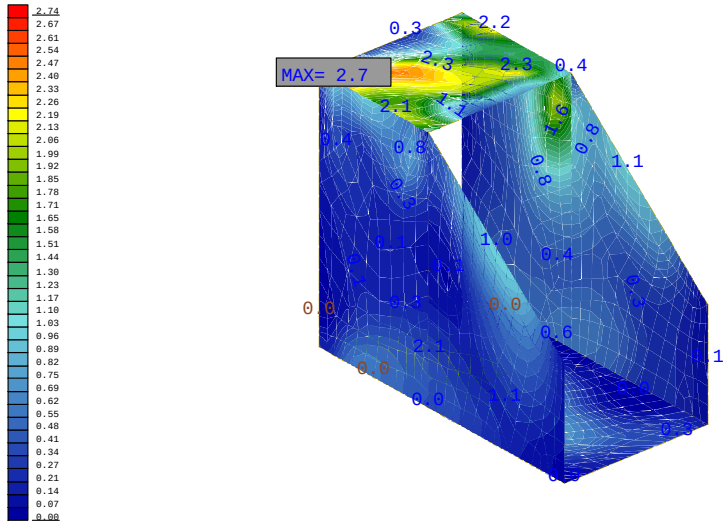
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Principal reinforcements (1st layer), Design Case 2 After the crack width design , from 0.00 to 5.0 step 0.1 cm2/m



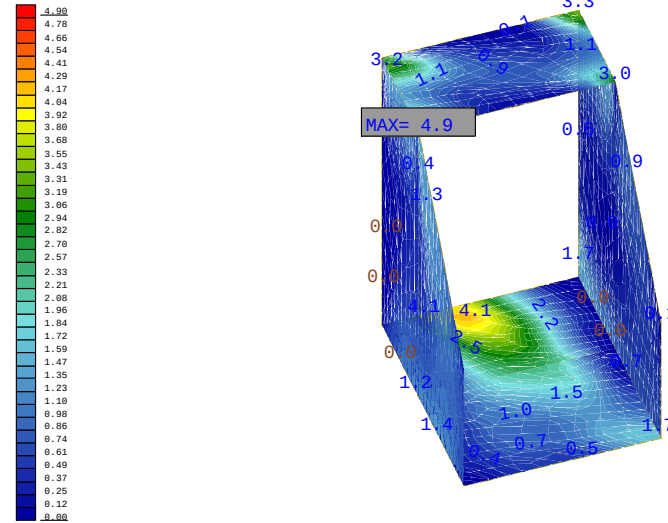
M 1 : 38
X * 0.502
Y * 0.906
Z * 0.962
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 7.0 step 0.2 cm2/m

M 1 : 38
X * 0.502
Y * 0.906
Z * 0.962

Armado

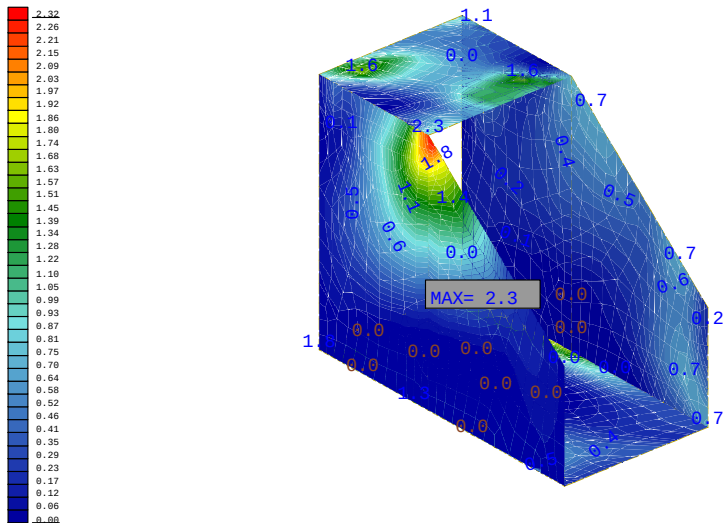


Z
Y
X Quadrilateral Elements , upper Principal reinforcements (1st layer), Design Case 1 ULS design , from 0.00 to 2.7 step 0.1 cm2/m

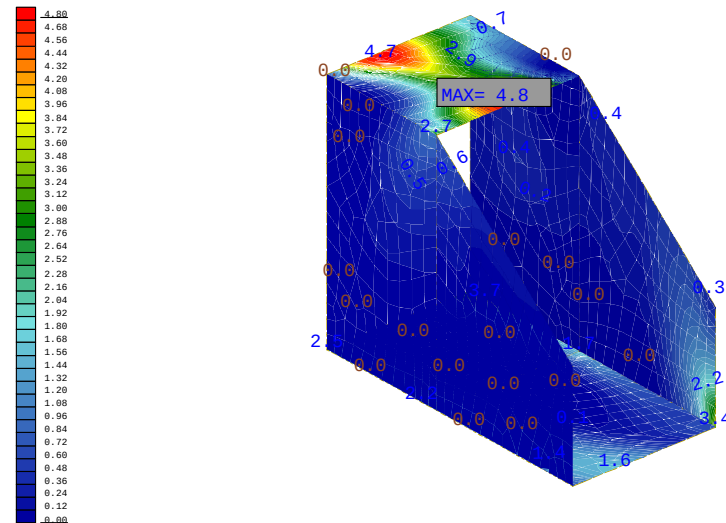


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962 Z Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 4.9 step 0.1 cm2/m

M 1 : 44
X * 0.331
Y * 0.990
Z * 0.954



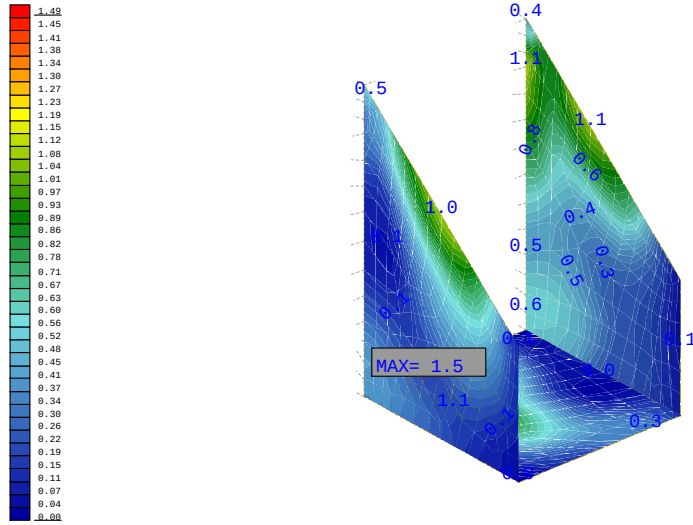
Z
Y
X Quadrilateral Elements , lower Principal reinforcements (1st layer), Design Case 1 ULS design , from 0.00 to 2.3 step 0.1 cm2/m



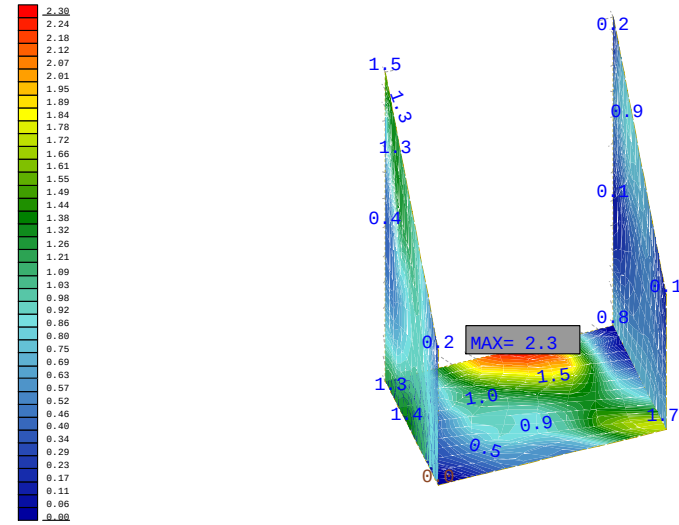
M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962 Z Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 4.8 step 0.1 cm2/m

M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962

Armado

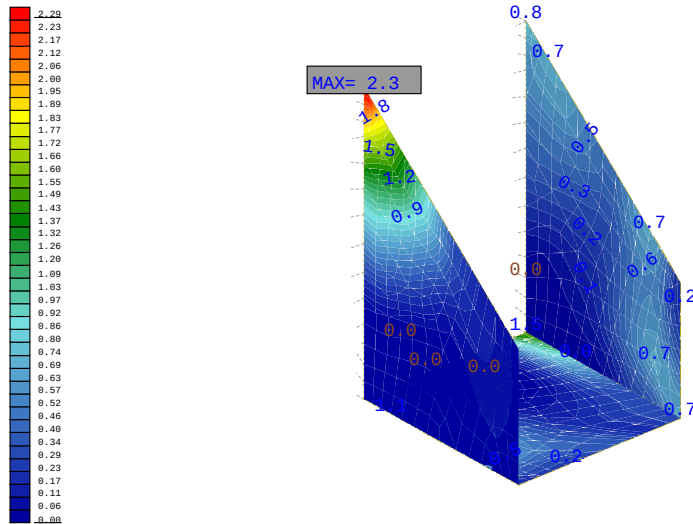


Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Principal reinforcements (1st layer), Design Case 1 ULS design , from 0.0 to 1.5 step 0.0 cm2/m

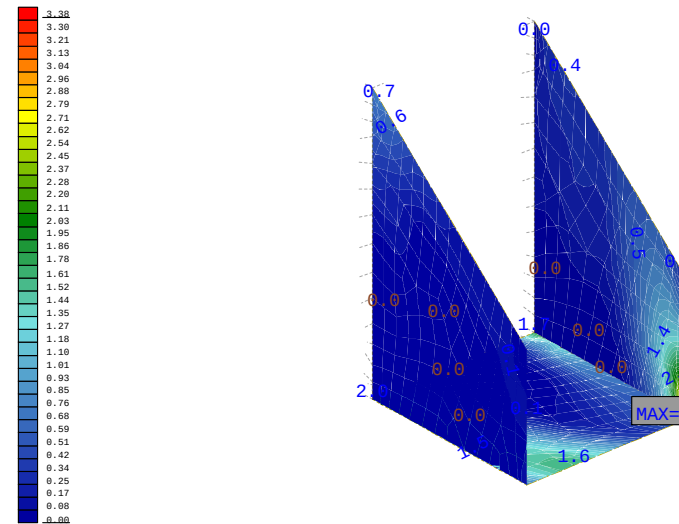


M 1 : 38
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 2.3 step 0.1 cm2/m

M 1 : 38
X * 0.331
Y * 0.990
Z * 0.954



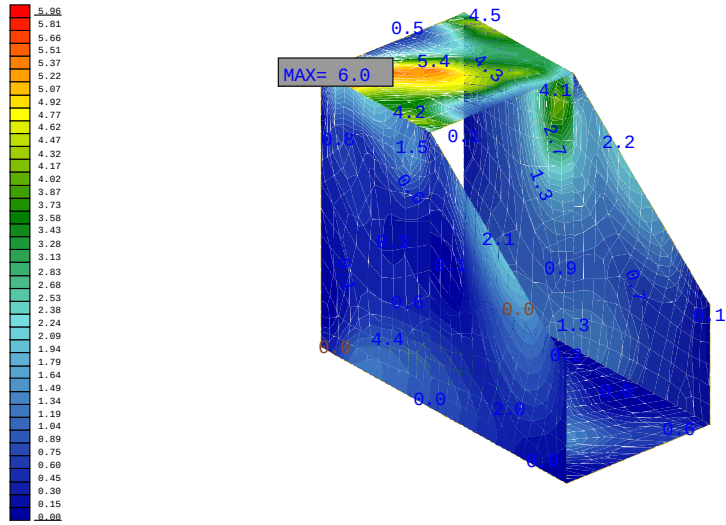
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Principal reinforcements (1st layer), Design Case 1 ULS design , from 0.00 to 2.3 step 0.1 cm2/m



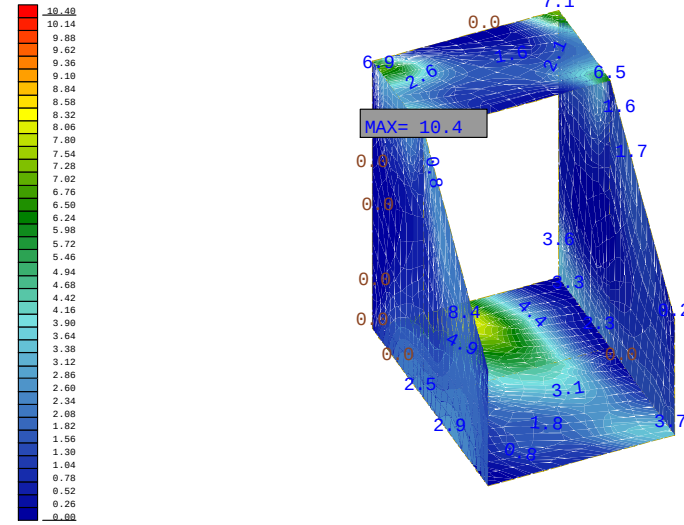
M 1 : 38
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X
Sector of system Quadrilateral Elements Group 40 50
Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 1 ULS design , from 0.00 to 3.4 step 0.1 cm2/m

M 1 : 38
X * 0.502
Y * 0.906
Z * 0.962

Armado

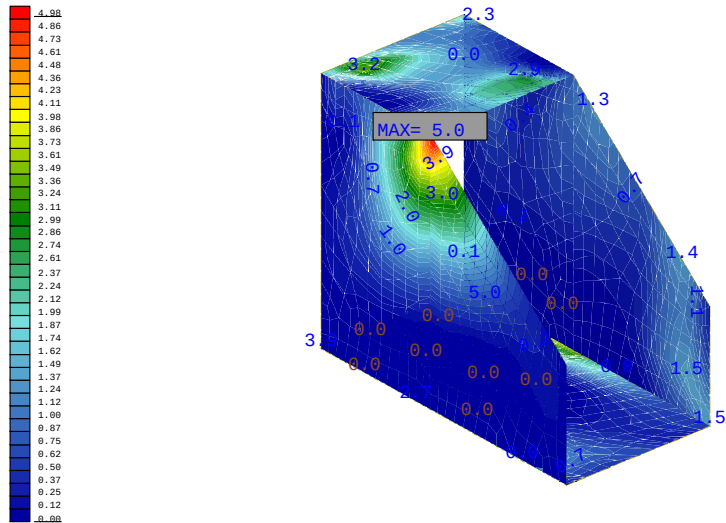


Z
Y
X Quadrilateral Elements , upper Principal reinforcements (1st layer), Design Case 2 After the crack width design , from 0.00 to 6.0 step 0.1 cm2/m

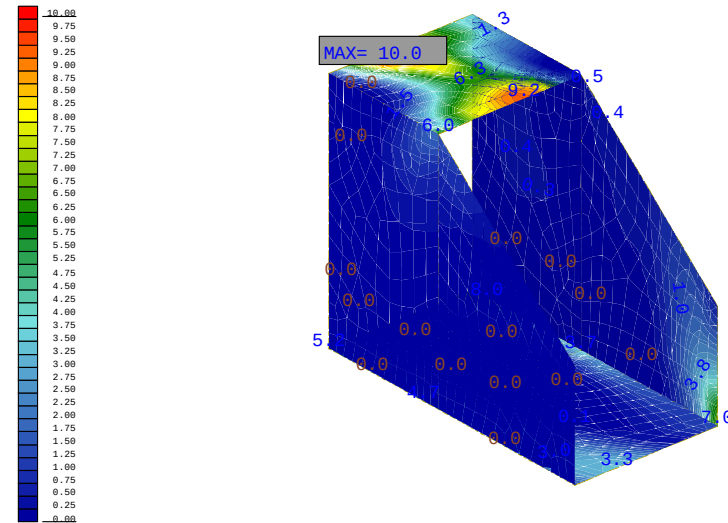


M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962 Z
Y
X Quadrilateral Elements , upper Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 10.4 step 0.3 cm2/m

M 1 : 44
X * 0.358
Y * 0.979
Z * 0.956



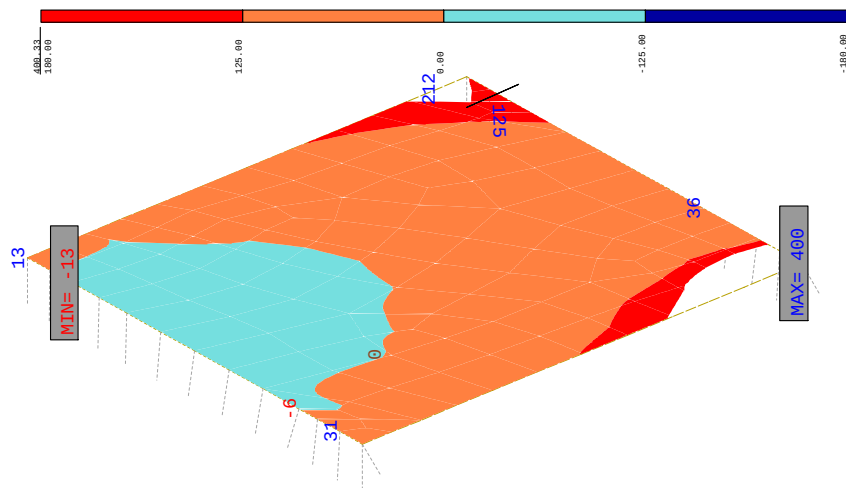
Z
Y
X Quadrilateral Elements , lower Principal reinforcements (1st layer), Design Case 2 After the crack width design , from 0.00 to 5.0 step 0.1 cm2/m



M 1 : 43
X * 0.502
Y * 0.906
Z * 0.962 Z
Y
X Quadrilateral Elements , lower Cross reinforcements (2nd layer), Design Case 2 After the crack width design , from 0.00 to 10.0 step 0.3 cm2/m

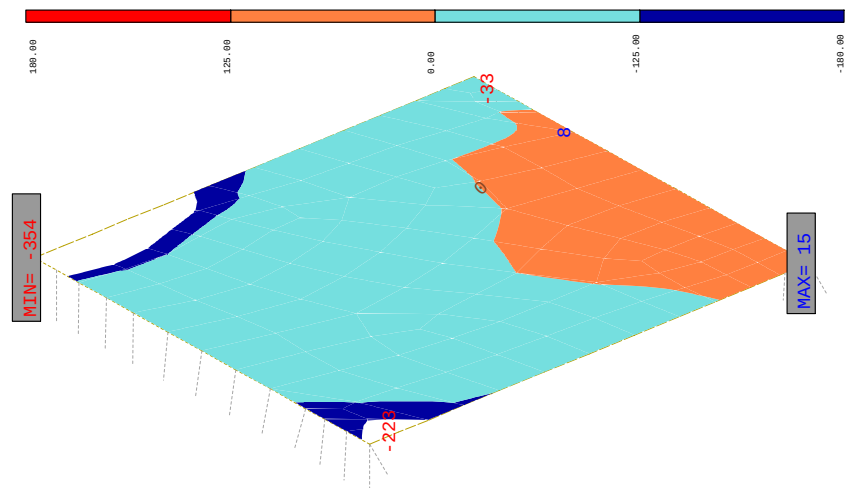
M 1 : 44
X * 0.358
Y * 0.979
Z * 0.956

Armado



Z
X Y
Sector of system Group 30
Shear force v-y in local y from middle of element ↗, Loadcase 2109 MAX-VY QUAD Forces in
Quadrilate , from -13 to 180 step -180,-125,0,125,180 kN/m

M 1 : 14
X * 0.502
Y * 0.906
Z * 0.962



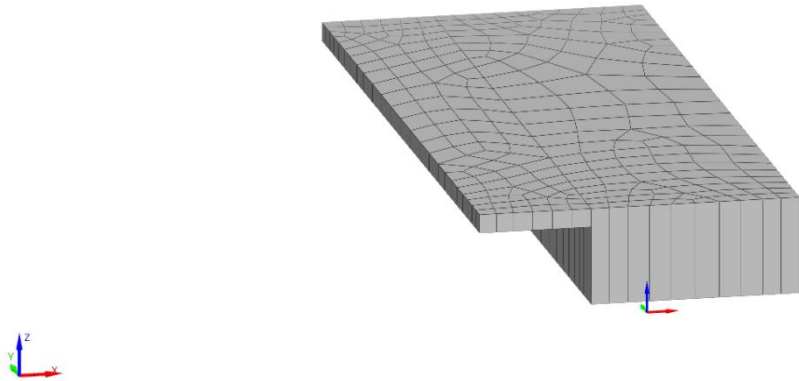
Z
X Y
Sector of system Group 30
Shear force v-y in local y from middle of element ↗, Loadcase 2110 MIN-VY QUAD Forces in
Quadrilate , from -180 to 15 step -180,-125,0,125,180 kN/m

M 1 : 14
X * 0.502
Y * 0.906
Z * 0.962

10.4.- ODT 4

Se realizan dos modelos FEM en 3D con elementos tipos placa y tipo viga

Un modelo para la sección de contrapeso y voladizo.



A continuación, se muestra los resultados incluyendo:

1. Tablas con el cálculo armadura mínima, la resistencia a cortante sin armadura y estabilidad.
2. Características del modelo.
3. Reacciones en el terreno por caso de carga y en ELS.
4. Esfuerzos por caso de carga y ELU.
5. Armado.

Cuantías mínimas

fck =30 Mpa			
Canto (m)	Cuantía (cm2/m)	s=15cm-->Ø	s=20cm-->Ø
0.25	4.2	12	12
0.35	5.8	12	16
0.4	6.7	12	16

Cortante sin armadura

MATERIALES	
fck (Mpa)	30
f _{yk} (Mpa)	500
f _{yd} (Mpa)	435
f _{ct,m} (Mpa)	2.9

DIMENSIONES	
b0 (m)	1
H (m)	0.25
d (m)	0.2

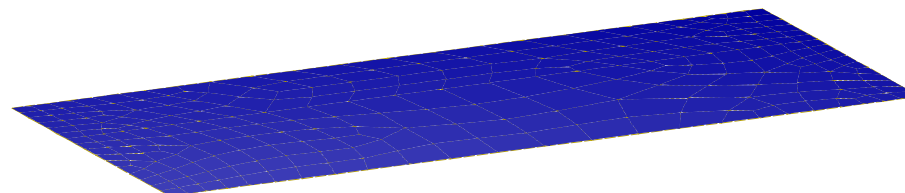
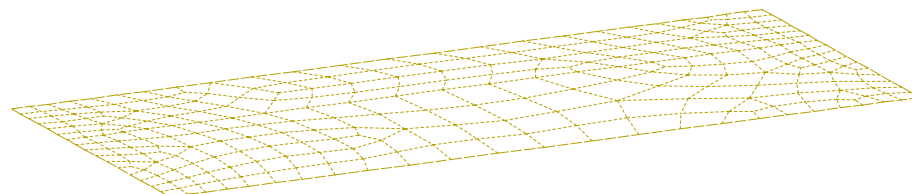
CAPACIDAD SIN ARM	
ε	2.00
k	2.00
Vu2 min (kN) EHE	155
VRd,c min (kN) CE	108

Datos

Espesor contrapeso	1.05	m	
Ancho paseo	4.3	m	
Ancho ala voladizo	1.5	m	
Ancho contrapeso	2.8	m	
Ancho ala paseo	0	m	
Ancho barandilla	0.3	m	
Espesor losa	0.25	m	
Sobrecarga	5	kN/m ²	
Eje camión	92.9	kN	130/1.4
Distancia ruedas	1.8	m	
Vuelco	V (kN)	H (kN)	M (kNm)
Voladizo	9.4		7.0
Sobrecarga voladizo	7.5		5.6
Camión	46.4		55.7
Empuje		6.76	2.9
Sobrecarga paramento		5.20	3.4
Contrapeso	91.0		127.4
Losa ala paseo	0.0		0.0
Camión	46.4		27.9
Mdest	74.7		
Mest	155.3		
FS	2.08		



4



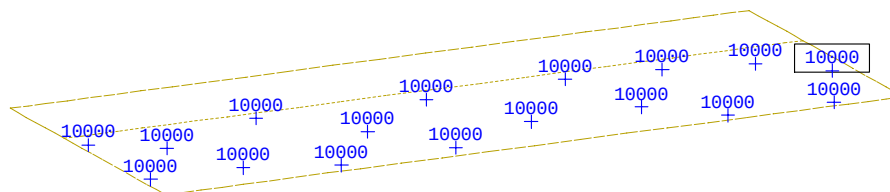
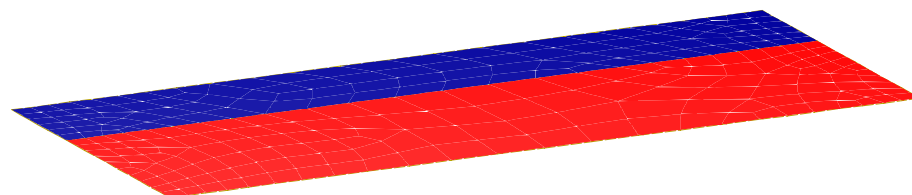
Z
Y
X Structure



M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Z
Y
X Quadrilateral Elements , Number of group (Max=1)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z
Y
X Quadrilateral Elements , Average plate thickness in mm (Max=1300)

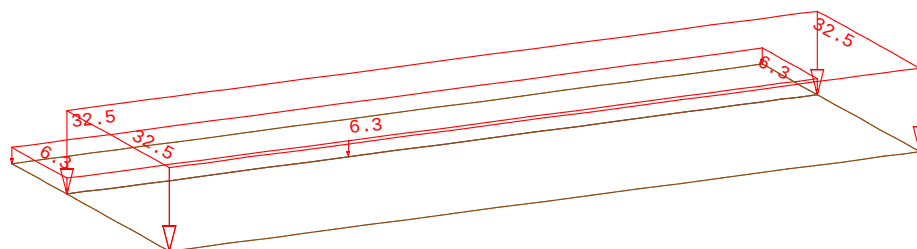
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Z
Y
X Elastic bedding in Element in kN/m3 (Max=10000)

M 1 : 65
X * 0.502
Y * 0.906
Z * 0.962

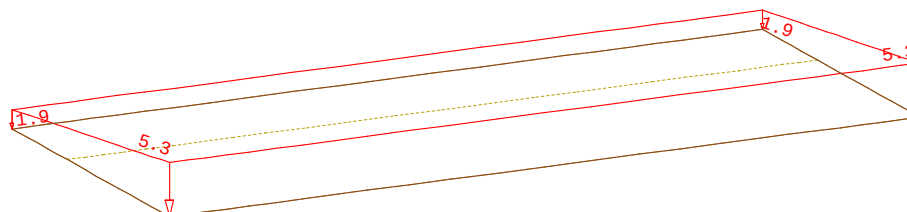
Características del modelo

PAGE 1



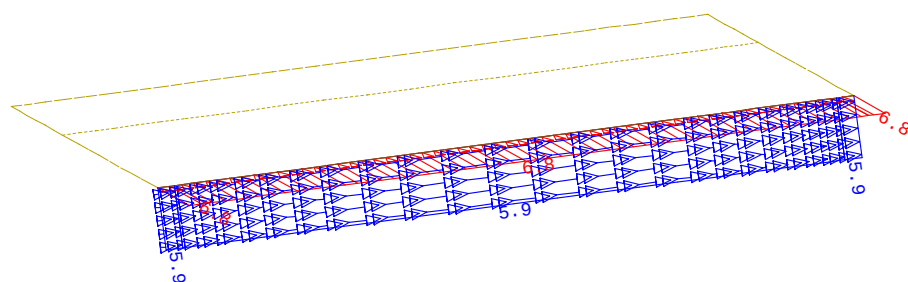
Z All loads, Loadcase 1 Peso propio , (1 cm 3D = unit) QUAD-Area dead load in global Z in
 Element (Unit=20.0 kN/m2 $\rightarrow$) (Min=-32.5) (Max=-6.2)

M 1 : 64
 X * 0.502
 Y * 0.906
 Z * 0.962



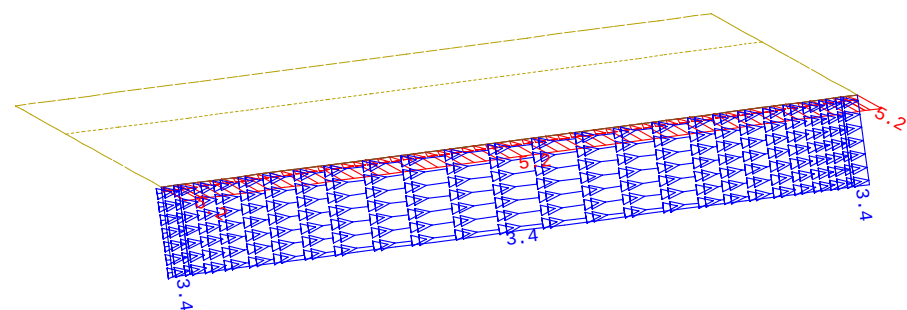
Z All loads, Loadcase 2 Asfalto , (1 cm 3D = unit) Free area load (force) in global Z
 (Unit=5.0 kN/m2 $\rightarrow$) (Min=-5.2) (Max=-1.9)

M 1 : 64
 X * 0.502
 Y * 0.906
 Z * 0.962



Z All loads, Loadcase 3 Empuje , (1 cm 3D = unit) Free line load (force) in global X
 (Unit=5.0 kN/m, Min=-6.8 Max=-6.8 $\rightarrow$), Free line load (moment) about global Y (Unit=5.0
 kNm/m, Max=5.0 $\rightarrow$)

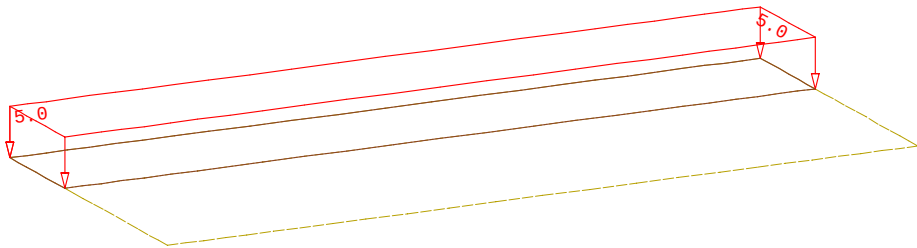
M 1 : 69
 X * 0.502
 Y * 0.906
 Z * 0.962



Z All loads, Loadcase 4 SC Terraplen , (1 cm 3D = unit) Free line load (force) in global X
 (Unit=5.0 kN/m, Min=-5.2 Max=-5.2 $\rightarrow$), Free line load (moment) about global Y (Unit=2.0
 kNm/m, Max=3.0 $\rightarrow$)

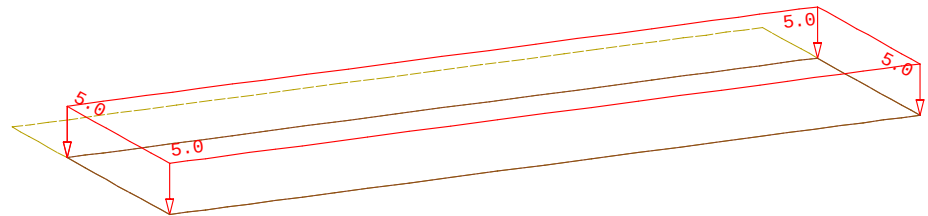
M 1 : 69
 X * 0.502
 Y * 0.906
 Z * 0.962

Características del modelo



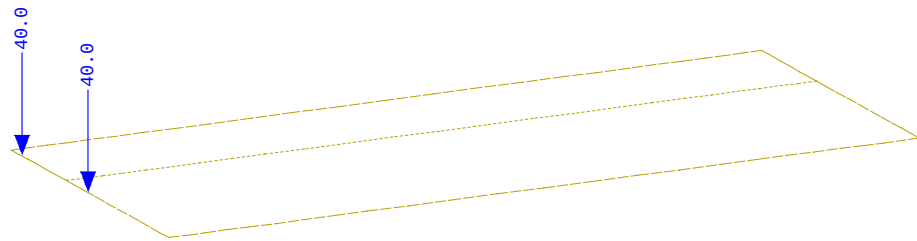
Z All loads, Loadcase 5 SCU1 , (1 cm 3D = unit) Free area load (force) in global Z
X Y (Unit=5.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



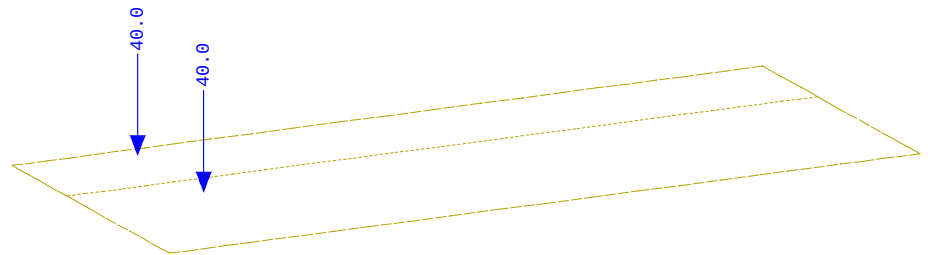
Z All loads, Loadcase 6 SCU2 , (1 cm 3D = unit) Free area load (force) in global Z
X Y (Unit=5.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z All loads, Loadcase 7 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
X Y (Unit=20.0 kN $\blacktriangleright$) (Max=40.0)

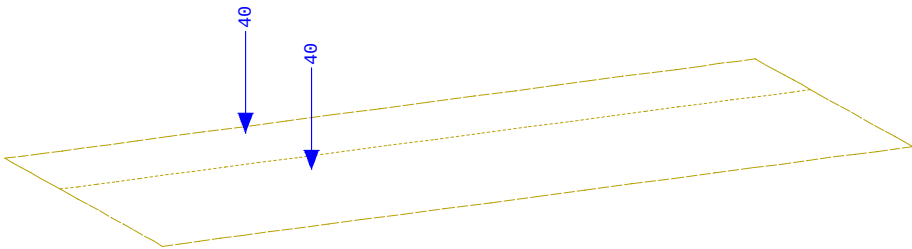
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z All loads, Loadcase 8 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
X Y (Unit=20.0 kN $\blacktriangleright$) (Max=40.0)

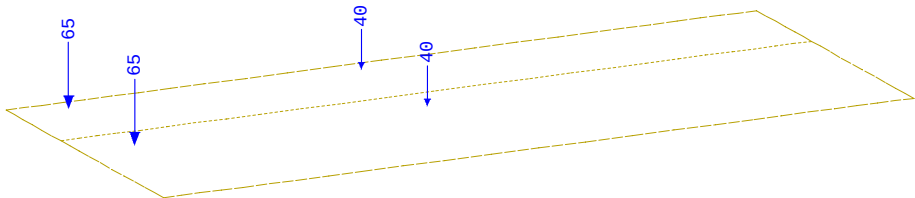
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo



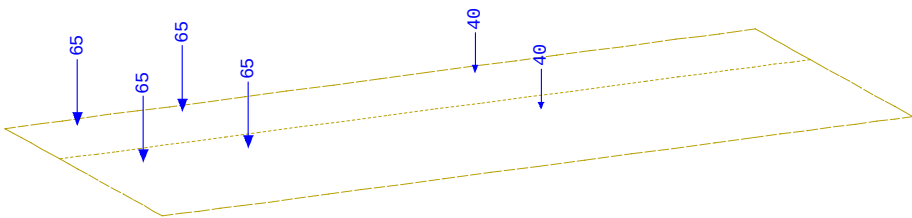
Z All loads, Loadcase 9 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
X Y (Unit=20 kN) (Max=40)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



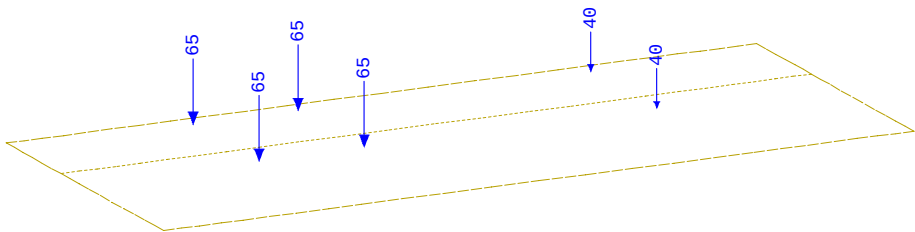
Z All loads, Loadcase 10 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
X Y (Unit=50 kN) (Max=65)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z All loads, Loadcase 11 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
X Y (Unit=50 kN) (Max=65)

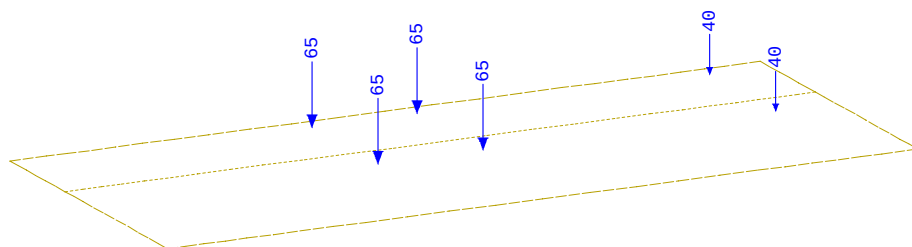
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z All loads, Loadcase 12 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
X Y (Unit=50 kN) (Max=65)

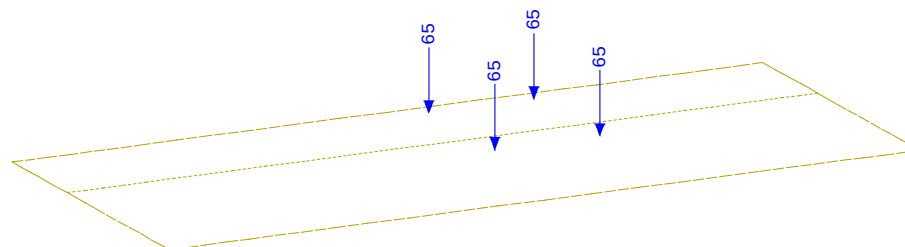
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo



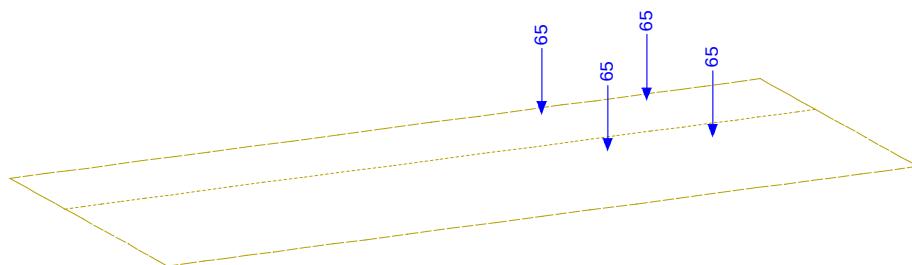
Z
X Y All loads, Loadcase 13 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
(Unit=50 kN ) (Max=65)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



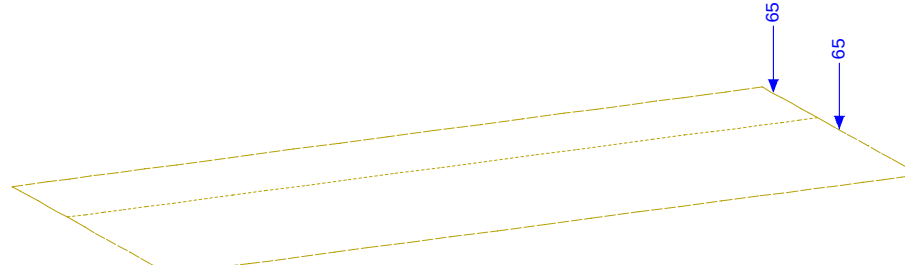
Z
X Y All loads, Loadcase 14 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
(Unit=50 kN ) (Max=65)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z
X Y All loads, Loadcase 15 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
(Unit=50 kN ) (Max=65)

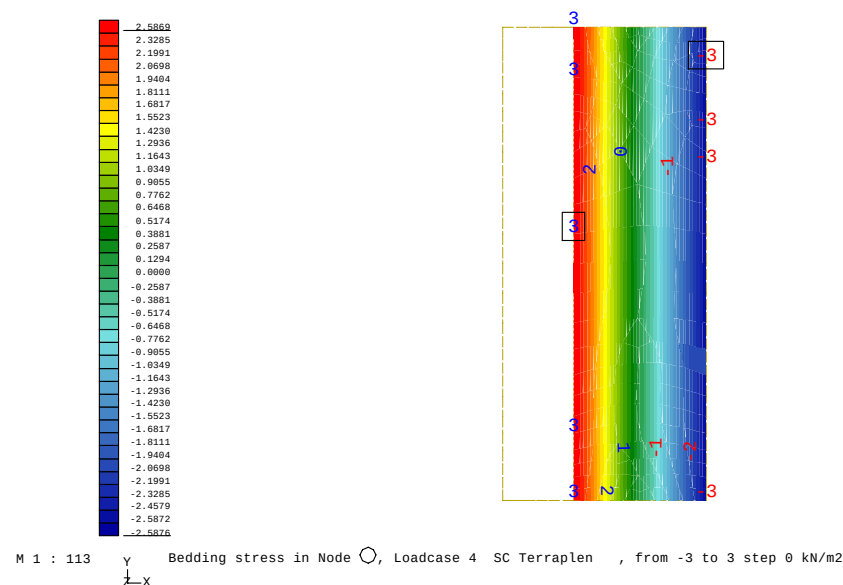
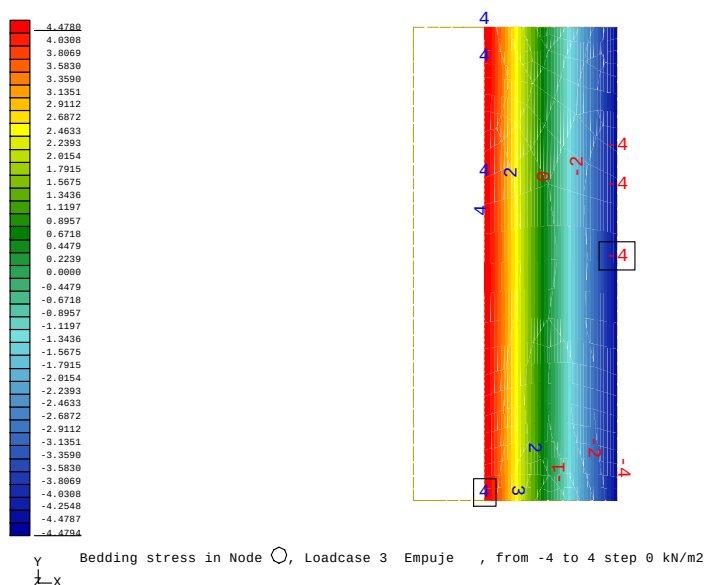
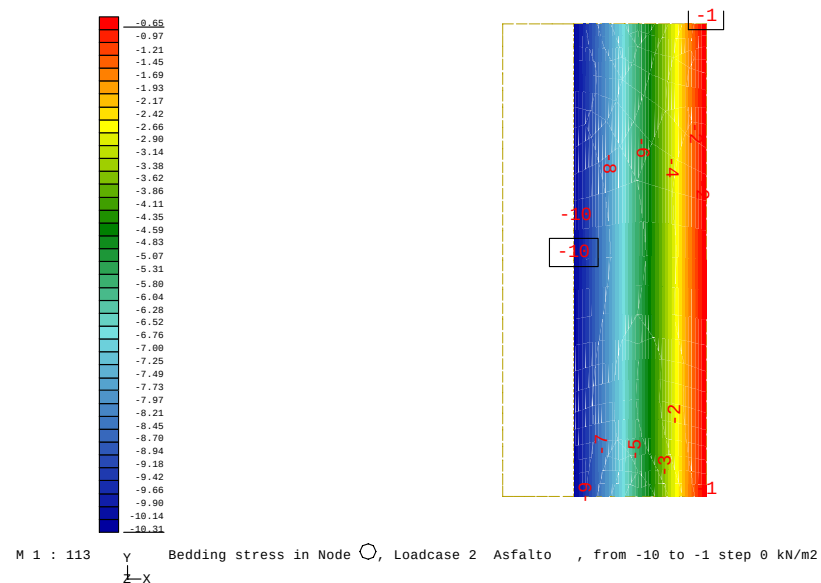
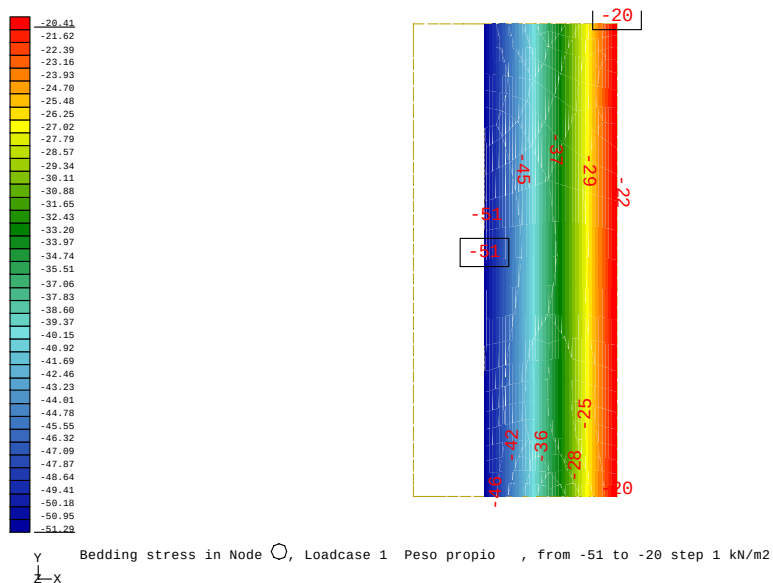
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



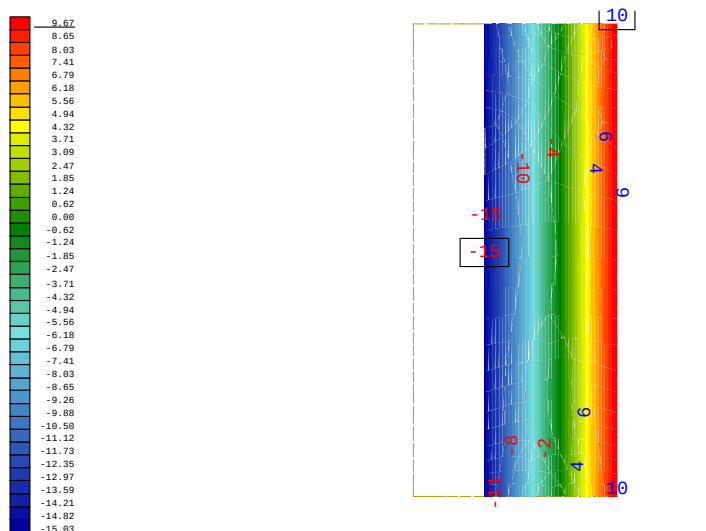
Z
X Y All loads, Loadcase 17 Camion Mant. , (1 cm 3D = unit) Free single load (force) vector
(Unit=50 kN ) (Max=65)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

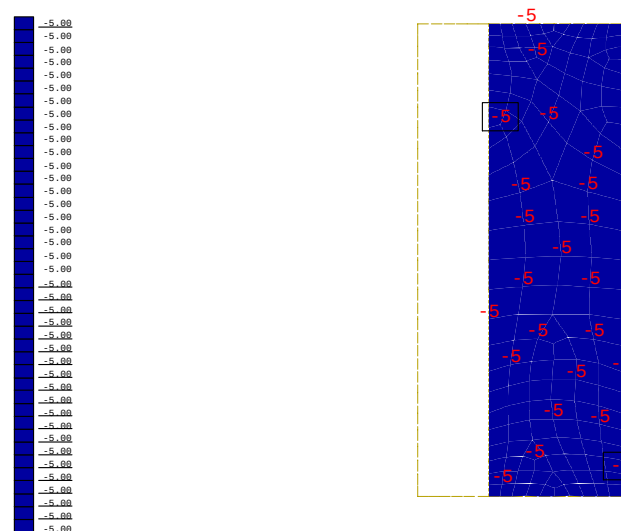
Características del modelo



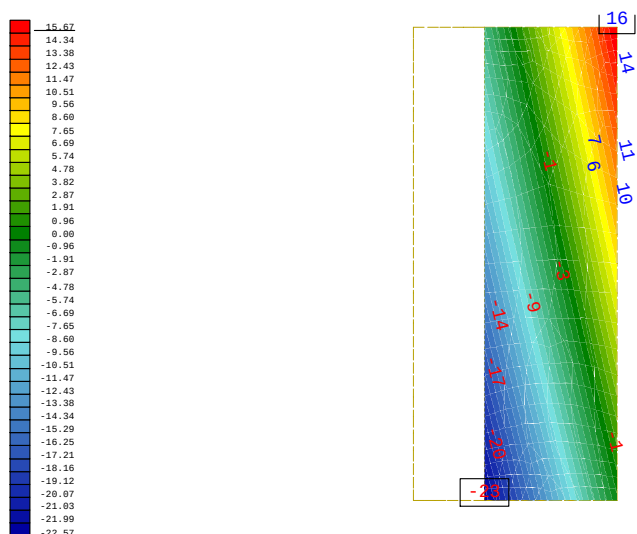
Reacciones terreno LC y ELS



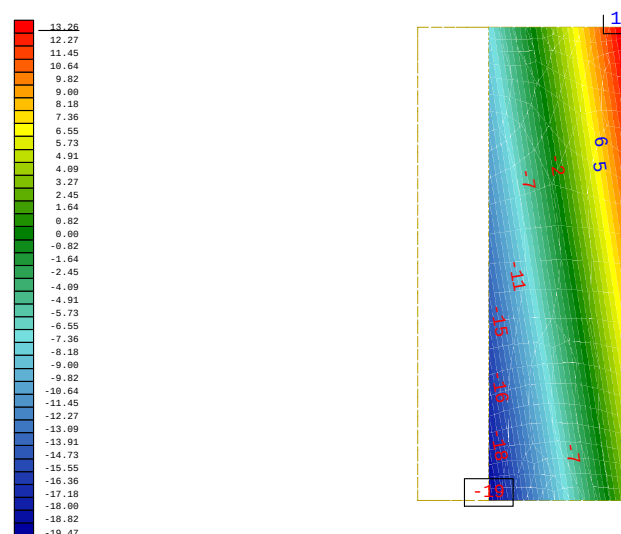
Bedding stress in Node O, Loadcase 5 SCU1, from -15 to 10 step 1 kN/m2



Bedding stress in Node O, Loadcase 6 SCU2, from -5 to -5 step 0 kN/m2



Bedding stress in Node O, Loadcase 7 Camion Mant., from -23 to 16 step 1 kN/m2

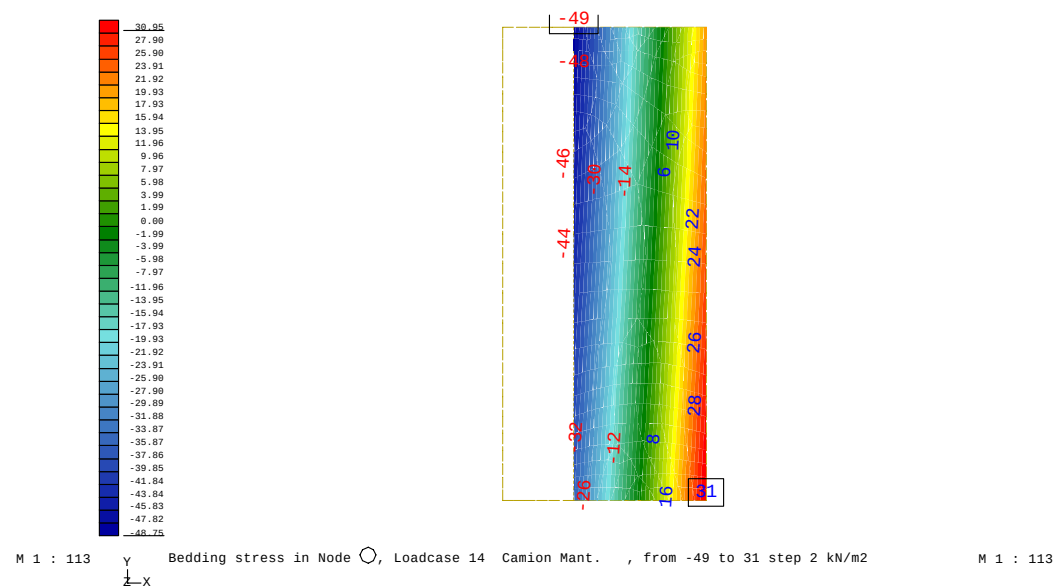
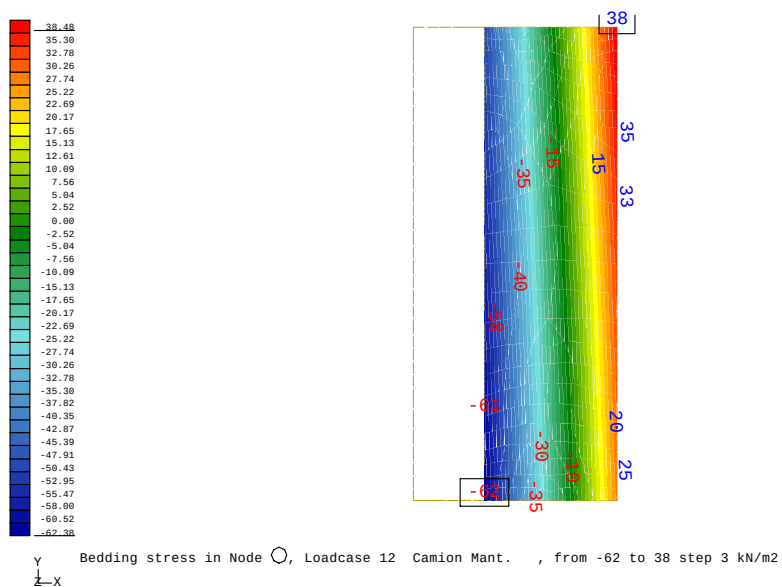
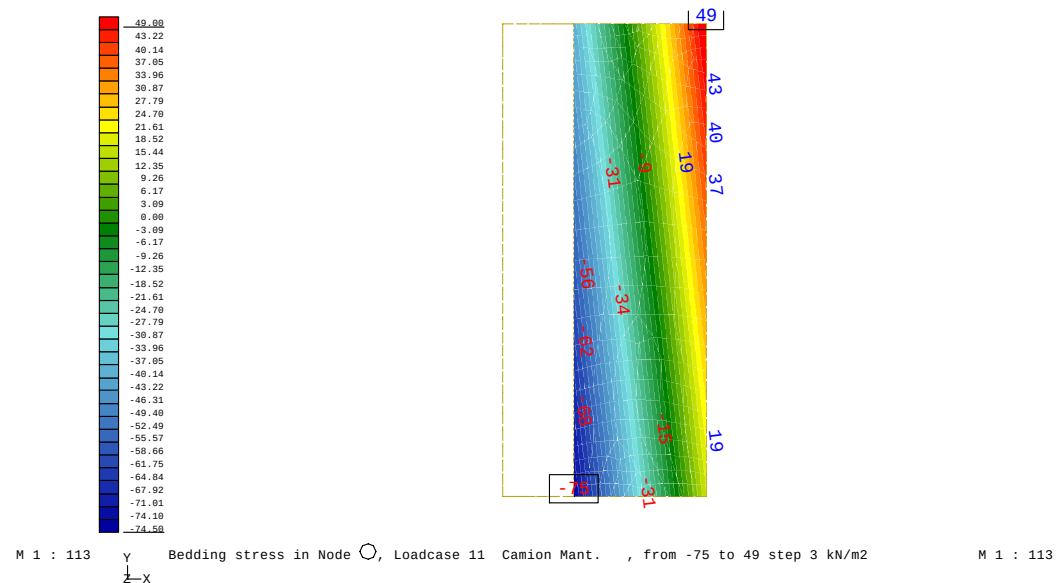
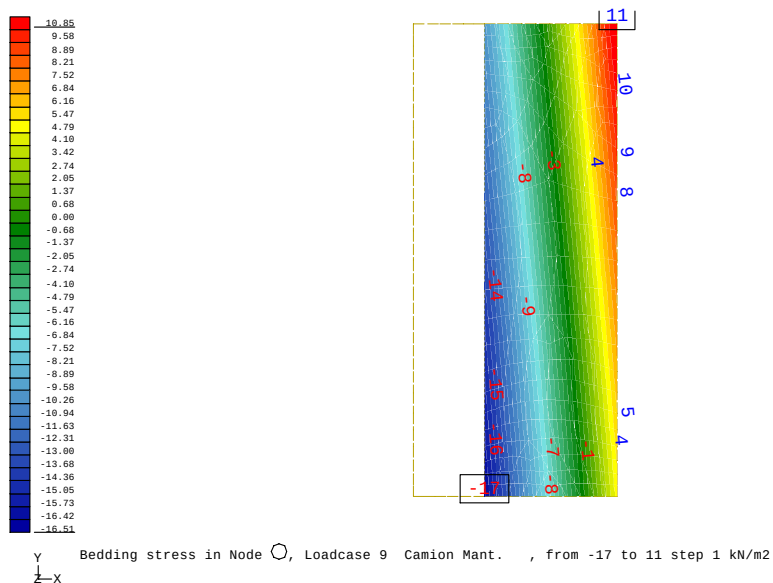


Bedding stress in Node O, Loadcase 8 Camion Mant., from -19 to 13 step 1 kN/m2

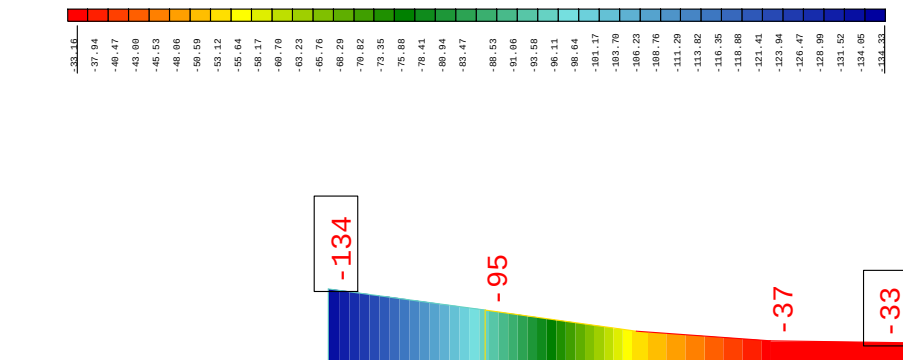
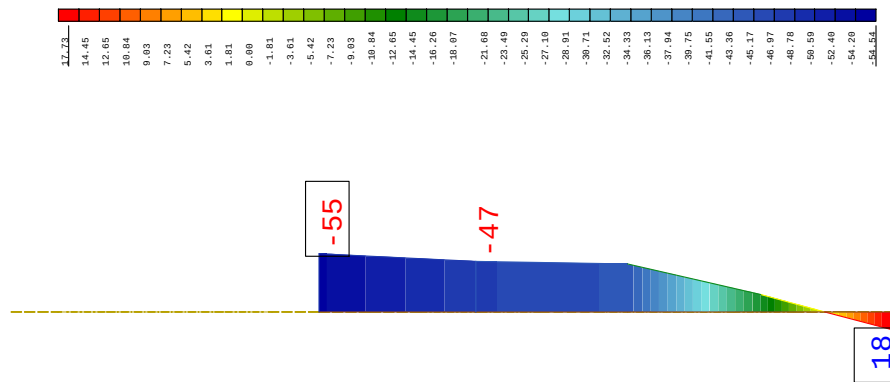
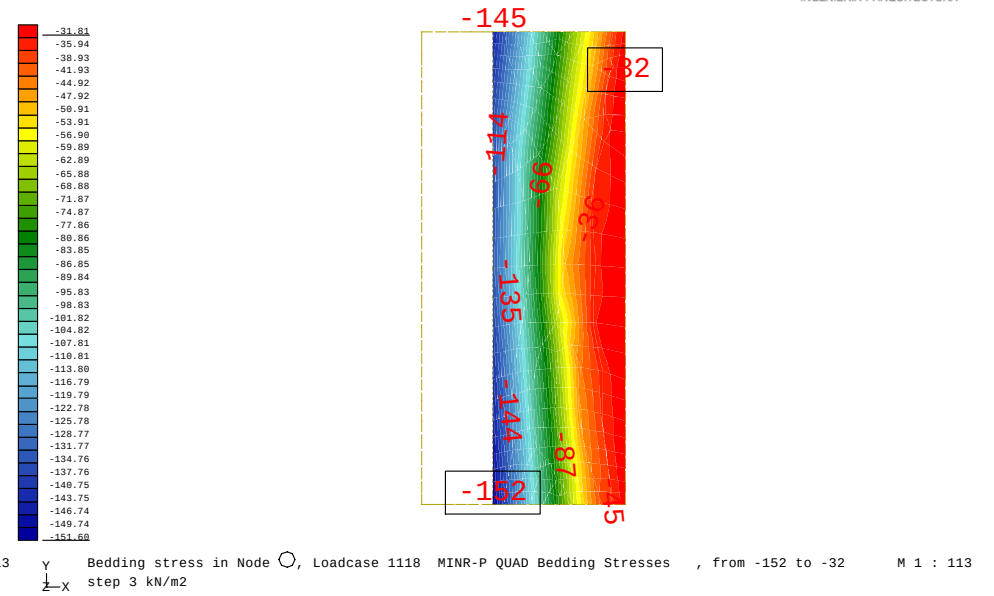
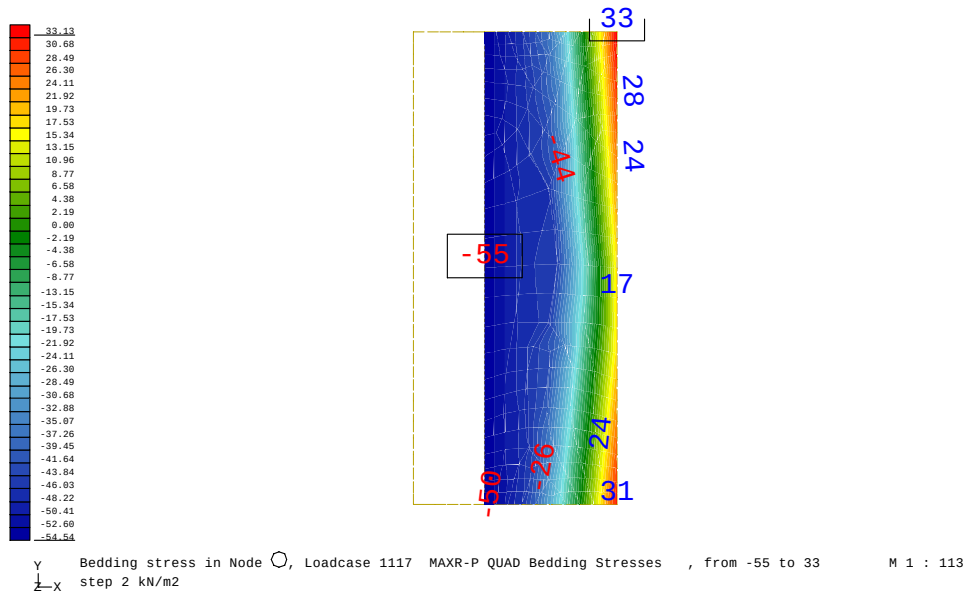
Reacciones terreno LC y ELS

M 1 : 113

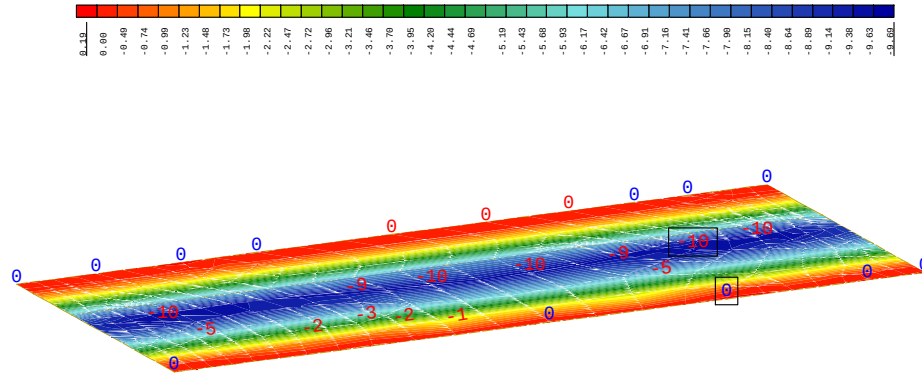
M 1 : 113



Reacciones terreno LC y ELS

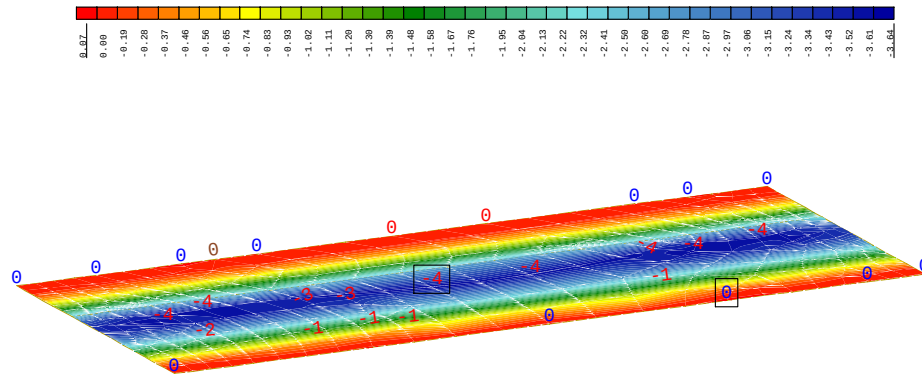


Reacciones terreno LC y ELS



Bending moment m-xx in local x in Node ↖↗, Loadcase 1 Peso propio , from -10 to 0 step 0 kNm/m

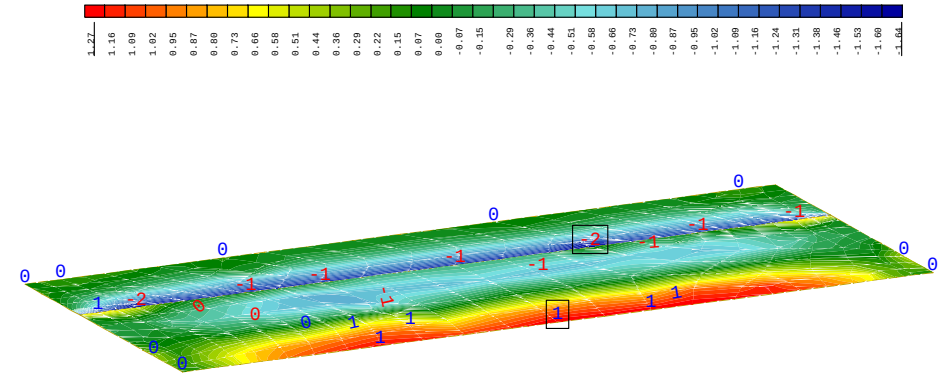
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Bending moment m-xx in local x in Node ↖↗, Loadcase 2 Asfalto , from -4 to 0 step 0 kNm/m

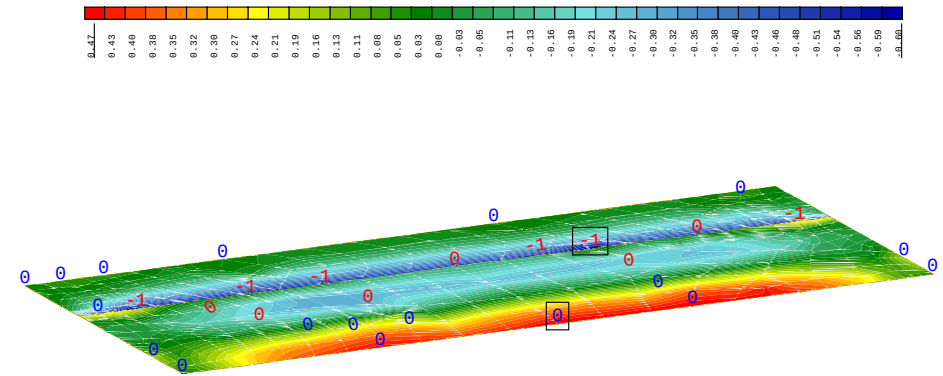
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



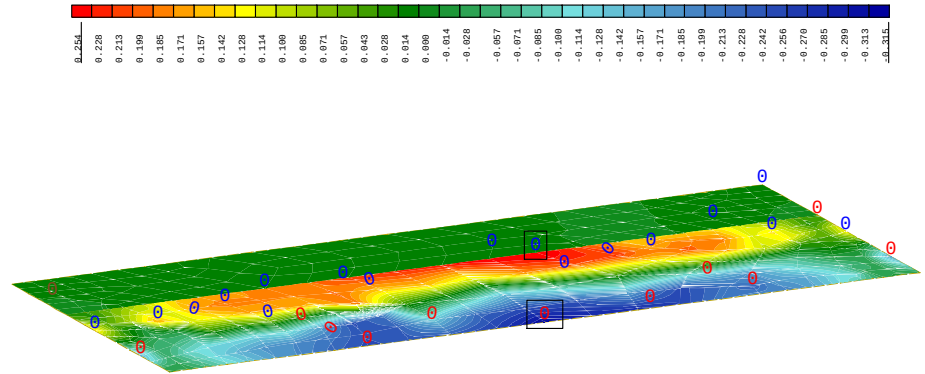
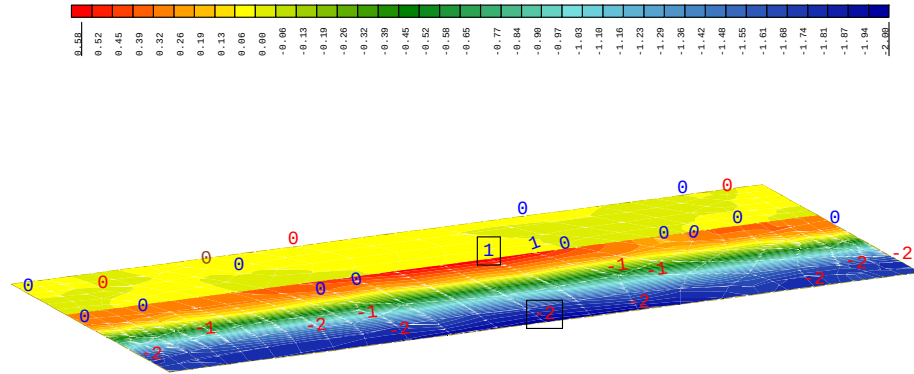
Bending moment m-yy in local y in Node ↔↔, Loadcase 1 Peso propio , from -2 to 1 step 0 kNm/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



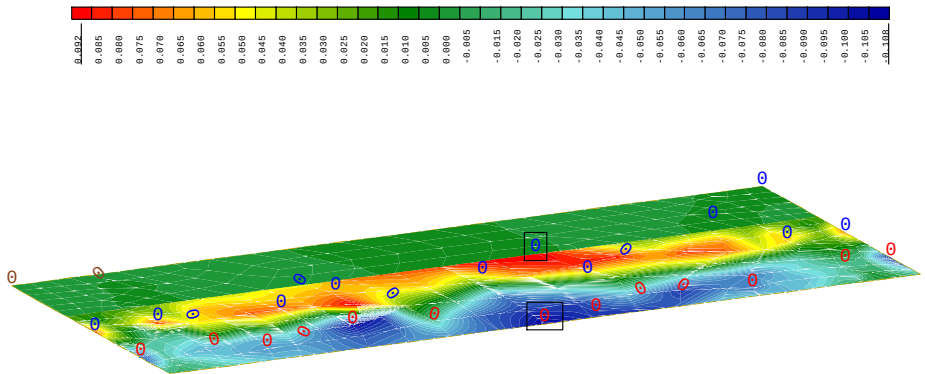
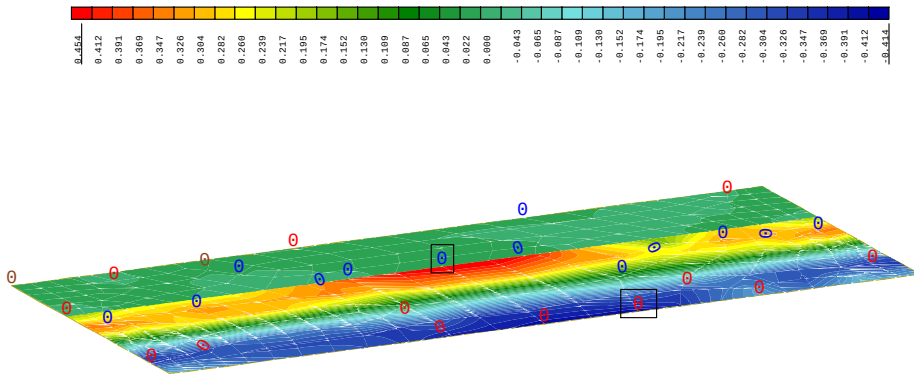
Bending moment m-yy in local y in Node ↔↔, Loadcase 2 Asfalto , from -1 to 0 step 0 kNm/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Bending moment m-xx in local x in Node ↗, Loadcase 3 Empuje , from -2 to 1 step 0 kNm/m
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

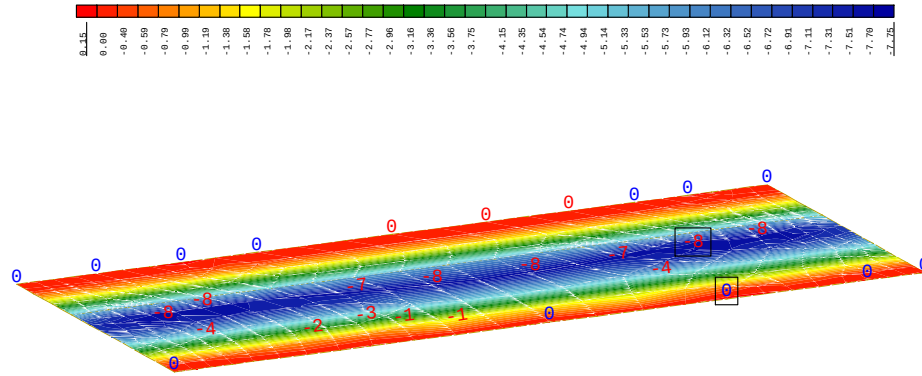
Bending moment m-yy in local y in Node ↖, Loadcase 3 Empuje , from 0 to 0 step 0 kNm/m
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Bending moment m-xx in local x in Node ↗, Loadcase 4 SC Terraplen , from 0 to 0 step 0 kNm/m
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

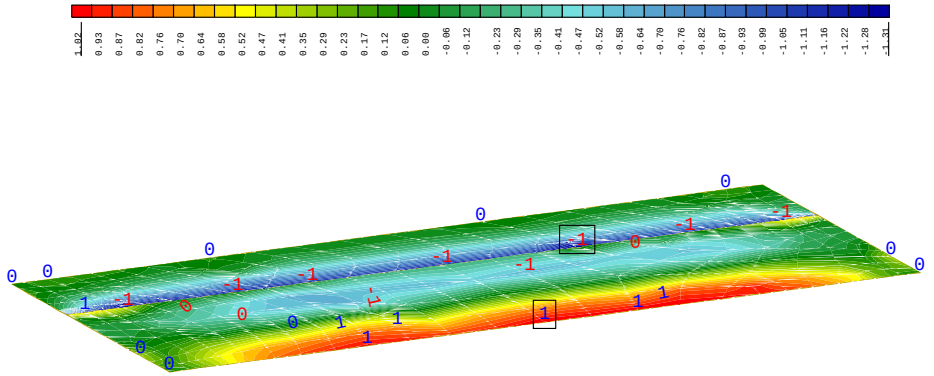
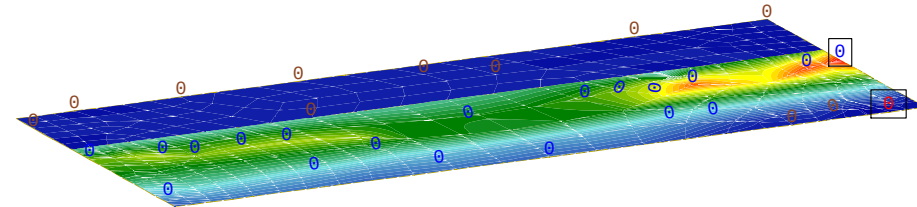
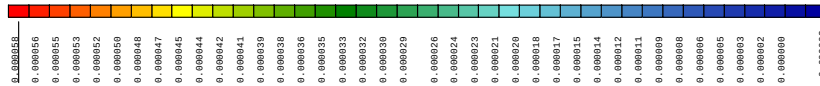
Bending moment m-yy in local y in Node ↖, Loadcase 4 SC Terraplen , from 0 to 0 step 0 kNm/m
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



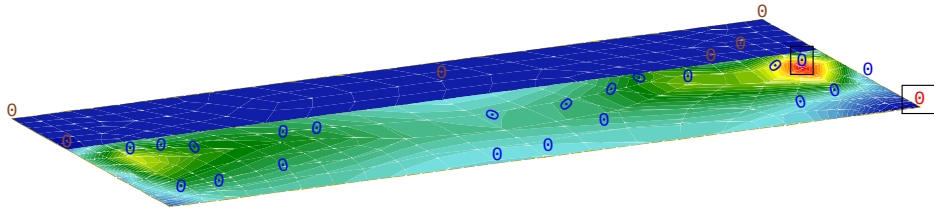
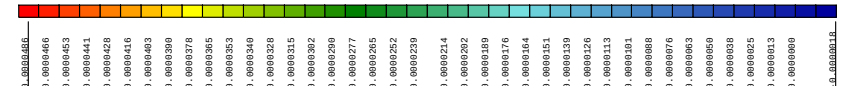
Bending moment m-xx in local x in Node ↖, Loadcase 5 SCU1 , from -8 to 0 step 0 kNm/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Bending moment m-yy in local y in Node ↔, Loadcase 5 SCU1 , from -1 to 1 step 0 kNm/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



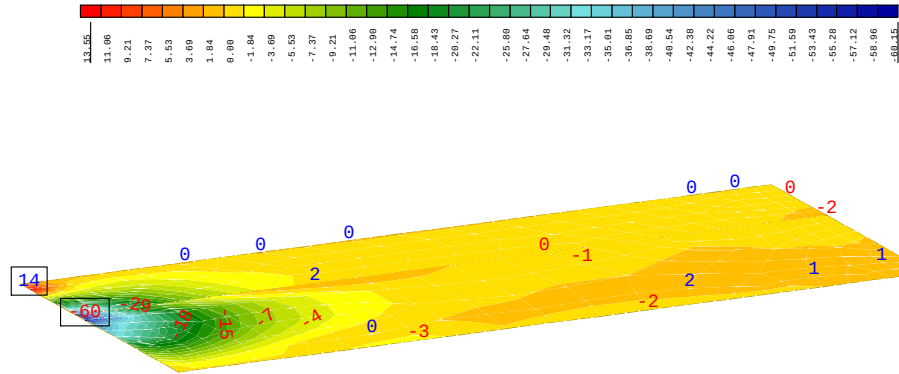
Bending moment m-xx in local x in Node ↖, Loadcase 6 SCU2 , from 0 to 0 step 0 kNm/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

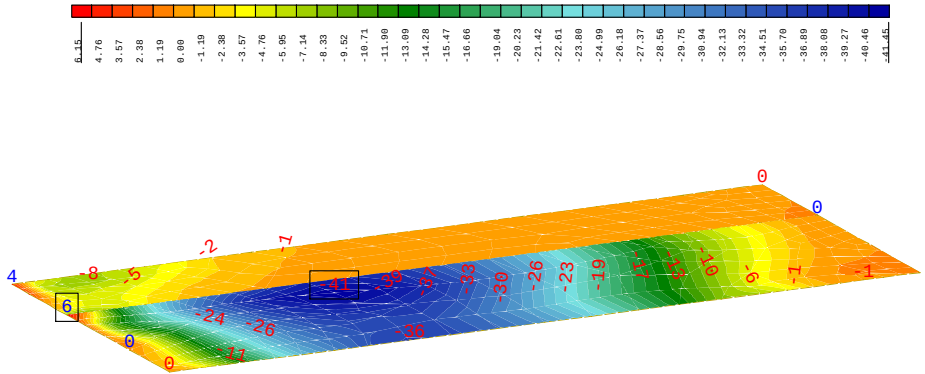
Bending moment m-yy in local y in Node ↔, Loadcase 6 SCU2 , from 0 to 0 step 0 kNm/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

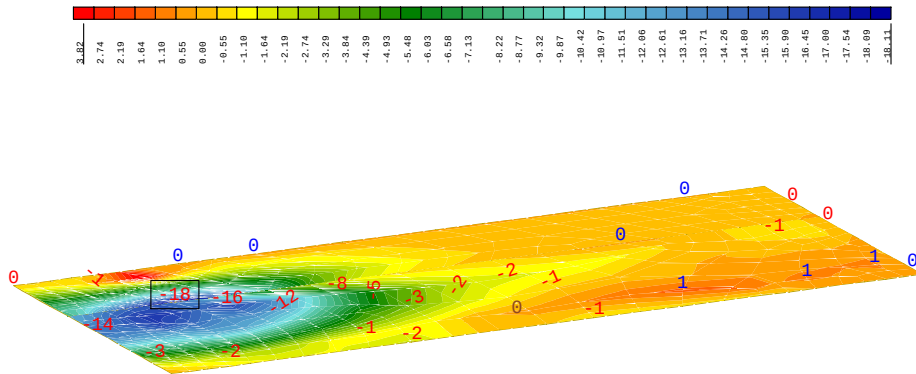
Esfuerzos LC y ELU



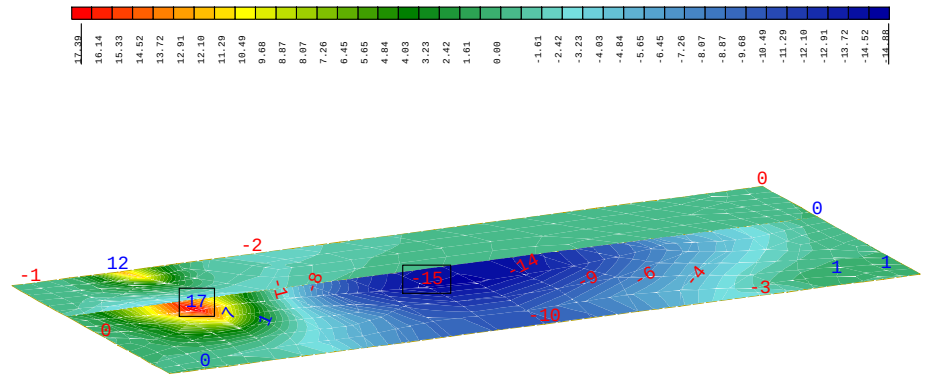
Z
X Y
Bending moment m-xx in local x in Node ↗, Loadcase 7 Camion Mant. , from -60 to 14 step 2 M 1 : 64
kNm/m X * 0.502
Y * 0.906
Z * 0.962



Z
X Y
Bending moment m-yy in local y in Node ↖, Loadcase 7 Camion Mant. , from -41 to 6 step 1 M 1 : 64
kNm/m X * 0.502
Y * 0.906
Z * 0.962

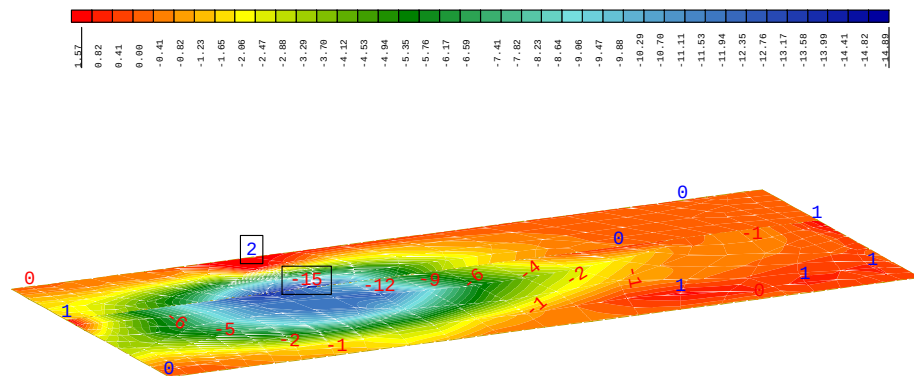


Z
X Y
Bending moment m-xx in local x in Node ↗, Loadcase 8 Camion Mant. , from -18 to 4 step 1 M 1 : 64
kNm/m X * 0.502
Y * 0.906
Z * 0.962



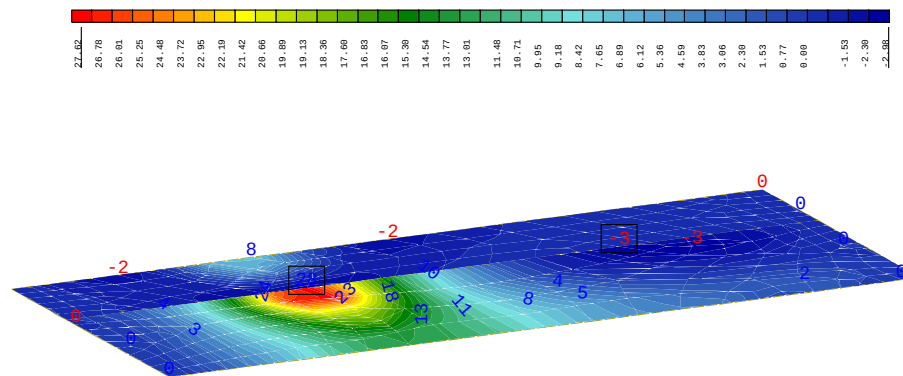
Z
X Y
Bending moment m-yy in local y in Node ↖, Loadcase 8 Camion Mant. , from -15 to 17 step 1 M 1 : 64
kNm/m X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



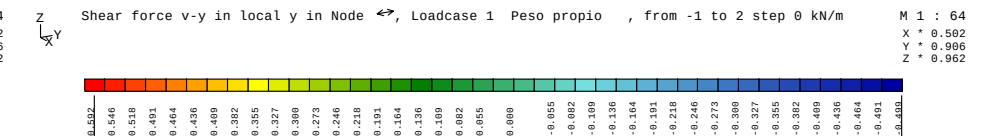
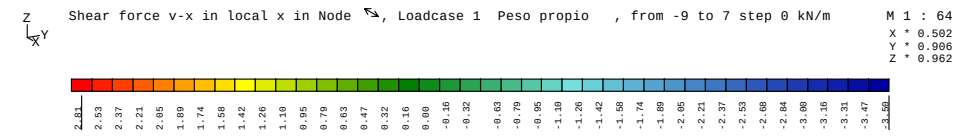
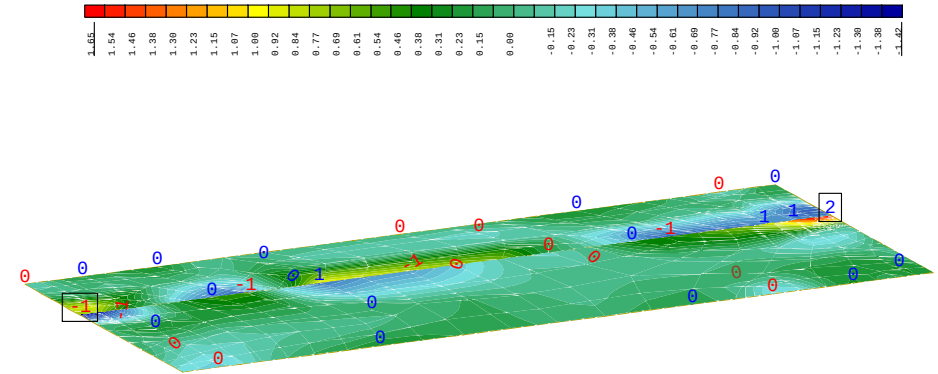
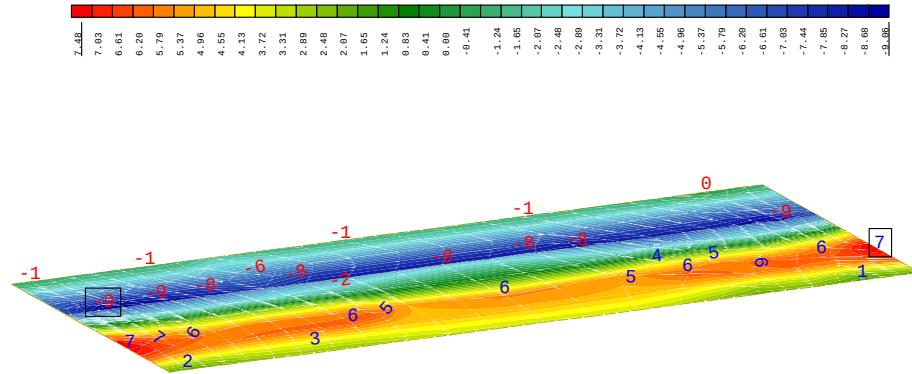
Z Bending moment m-xx in local x in Node 64, Loadcase 9 Camion Mant. , from -15 to 2 step 0
X Y kNm/m

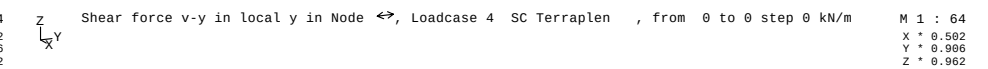
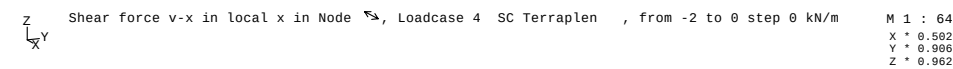
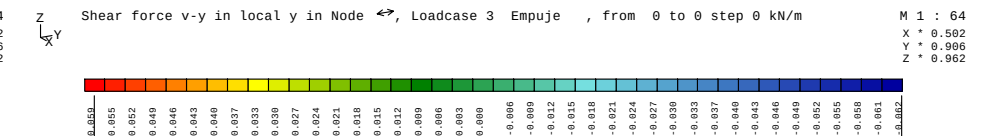
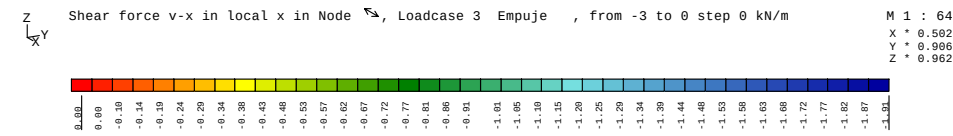
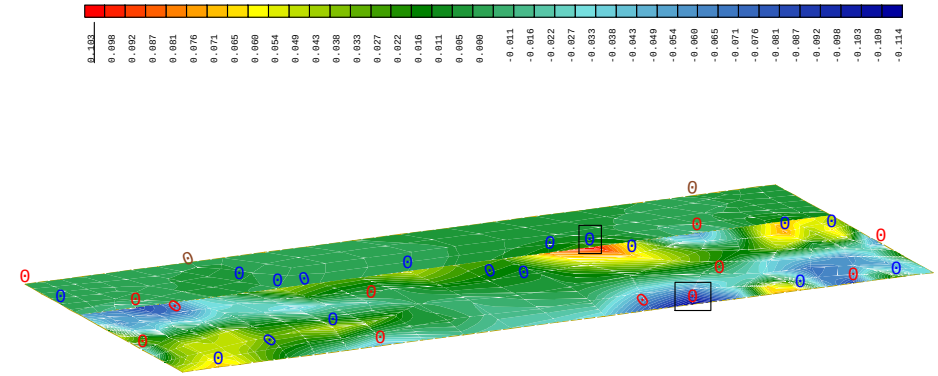
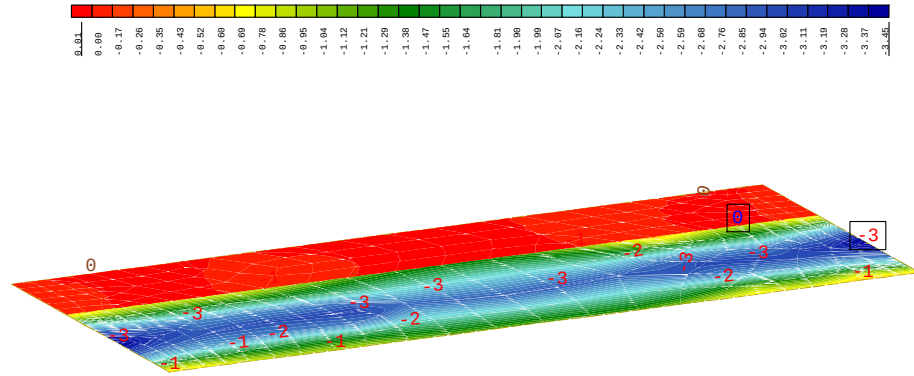
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



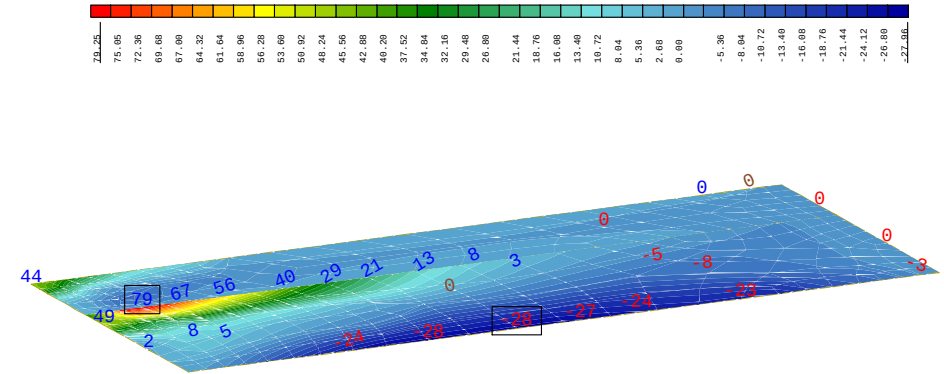
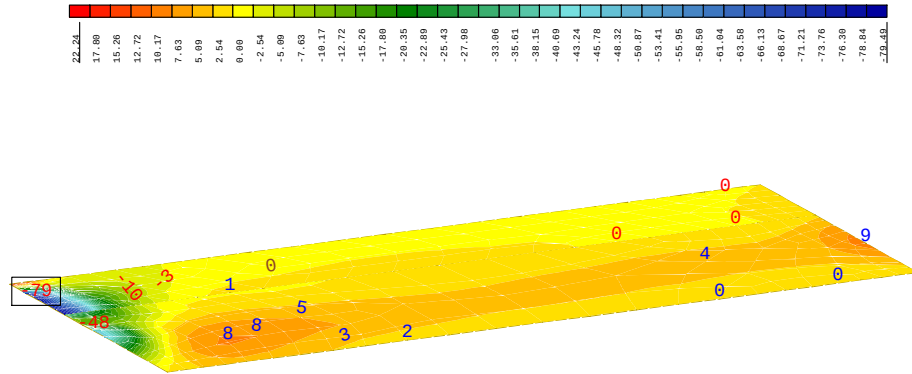
Z Bending moment m-yy in local y in Node 64, Loadcase 9 Camion Mant. , from -3 to 28 step 1
X Y kNm/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



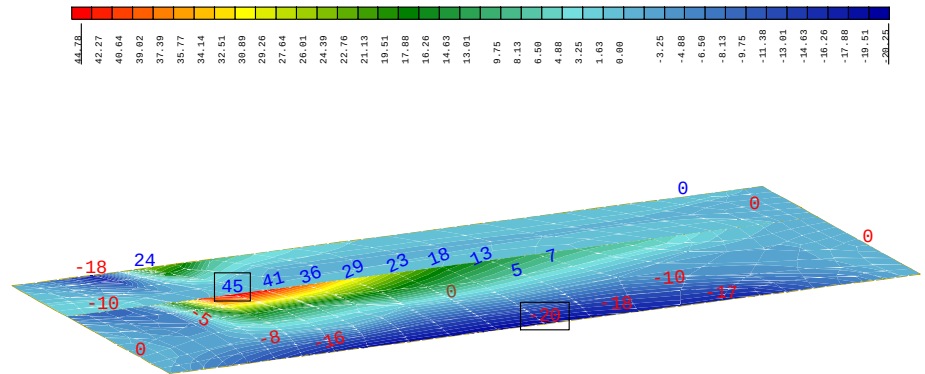
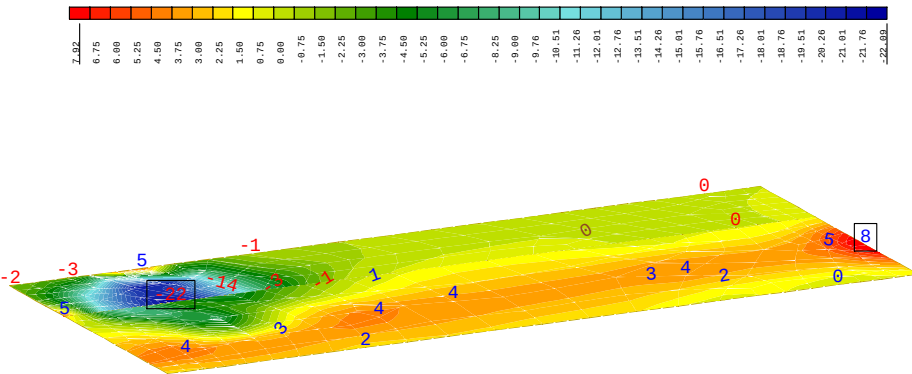


Esfuerzos LC y ELU



Shear force v-x in local x in Node ↗, Loadcase 7 Camion Mant. , from -79 to 22 step 3 kN/m M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

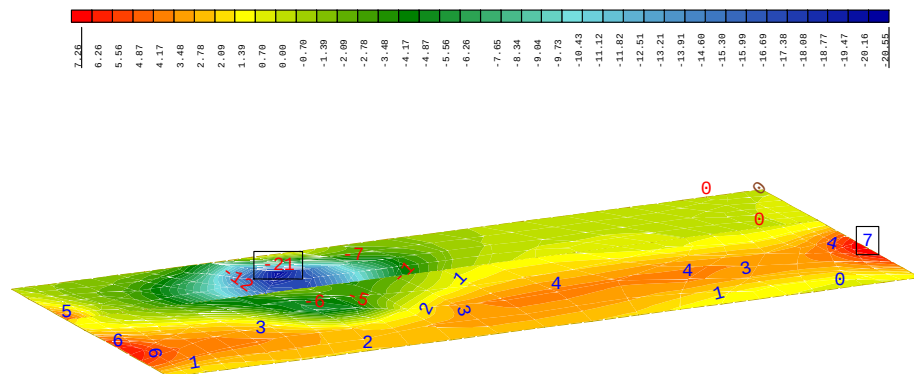
Shear force v-y in local y in Node ↖, Loadcase 7 Camion Mant. , from -28 to 79 step 3 kN/m M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Shear force v-x in local x in Node ↗, Loadcase 8 Camion Mant. , from -22 to 8 step 1 kN/m M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Shear force v-y in local y in Node ↖, Loadcase 8 Camion Mant. , from -20 to 45 step 2 kN/m M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

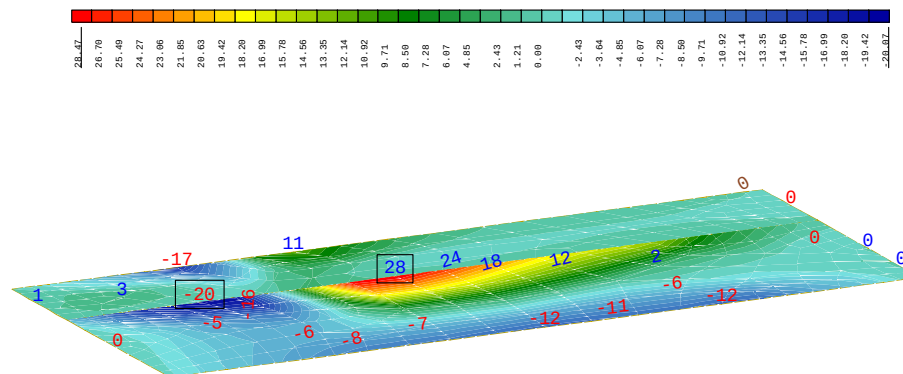
Esfuerzos LC y ELU



Z
Y
X

Shear force v-x in local x in Node 7, Loadcase 9 Camion Mant. , from -21 to 7 step 1 kN/m

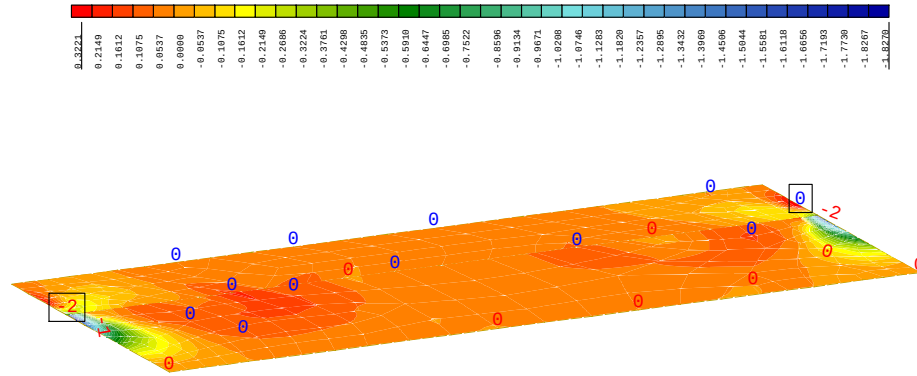
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z
Y
X

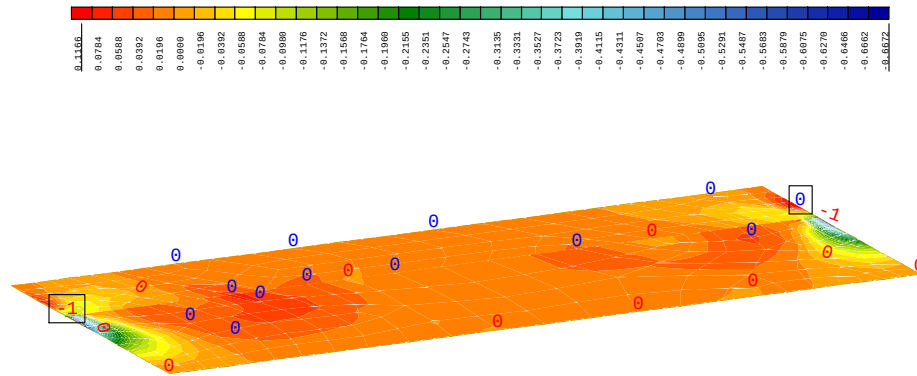
Shear force v-y in local y in Node 7, Loadcase 9 Camion Mant. , from -20 to 28 step 1 kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z
Y
X Membrane force n-xx in local x in Node ↗, Loadcase 1 Peso propio, from -2 to 0 step 0 kN/m

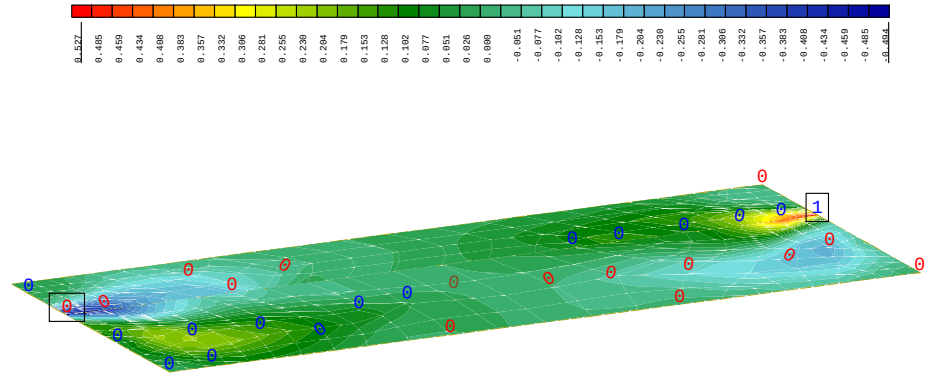
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z
Y
X Membrane force n-xx in local x in Node ↗, Loadcase 2 Asfalto, from -1 to 0 step 0 kN/m

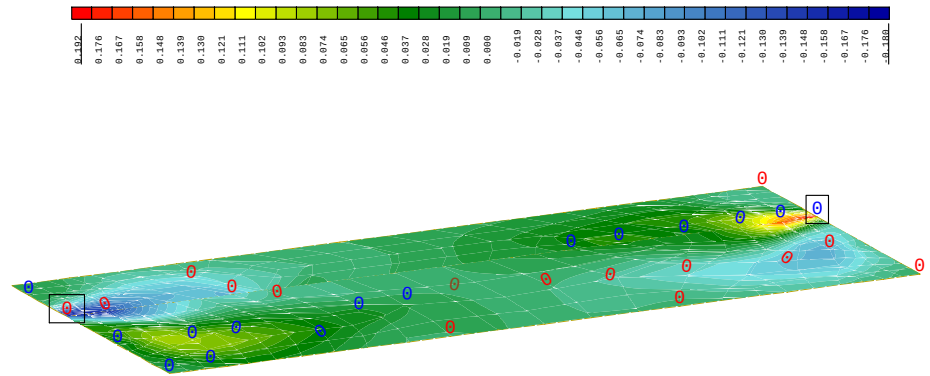
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



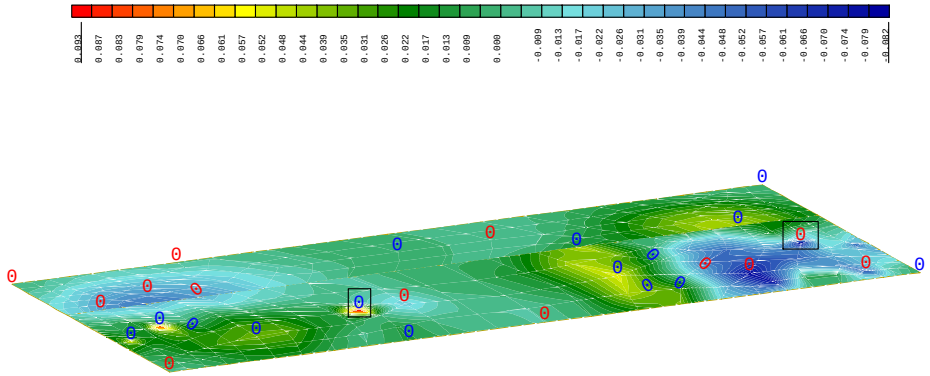
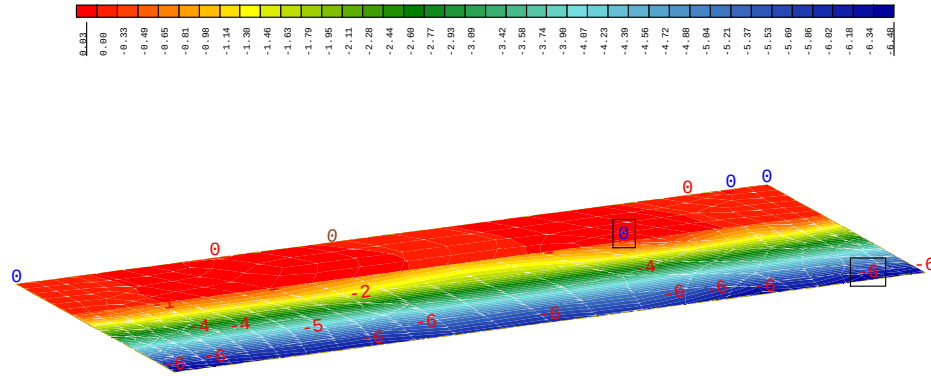
Z
Y
X Membrane shear force n-xy in local xy in Node ↓, Loadcase 1 Peso propio, from 0 to 1 step 0 kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



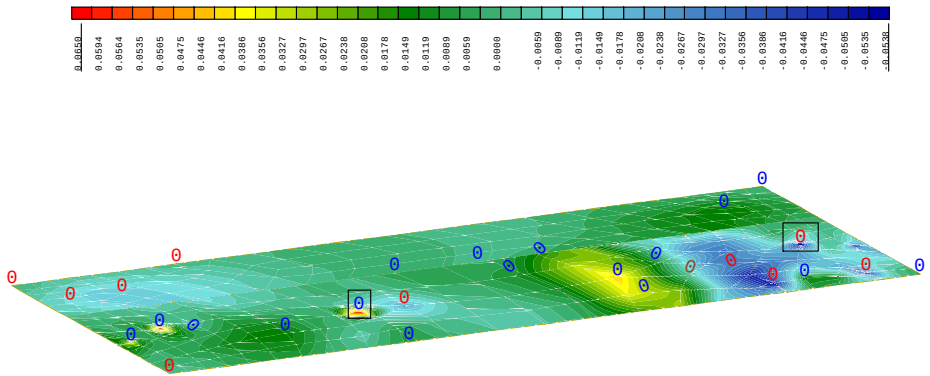
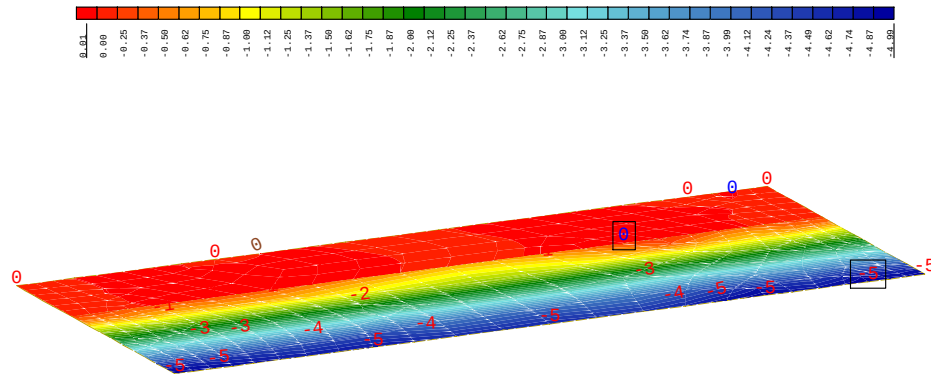
Z
Y
X Membrane shear force n-xy in local xy in Node ↓, Loadcase 2 Asfalto, from 0 to 0 step 0 kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Membrane force n-xx in local x in Node ↗, Loadcase 3 Empuje, from -6 to 0 step 0 kN/m
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

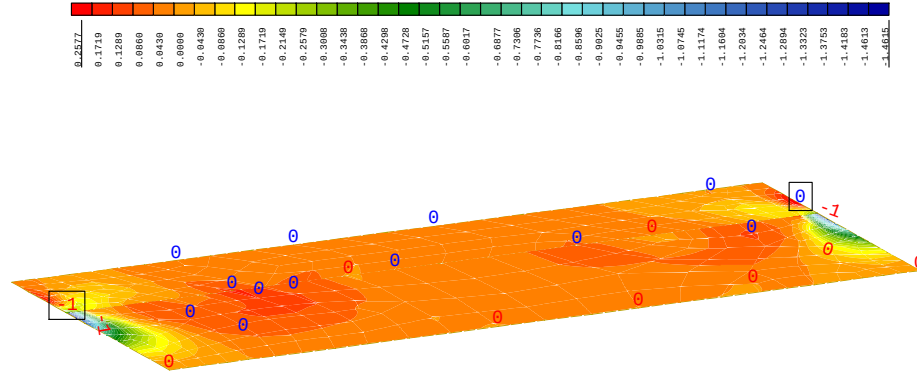
Membrane shear force n-xy in local xy in Node ↕, Loadcase 3 Empuje, from 0 to 0 step 0 kN/m
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Membrane force n-xx in local x in Node ↗, Loadcase 4 SC Terraplen, from -5 to 0 step 0 kN/m
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

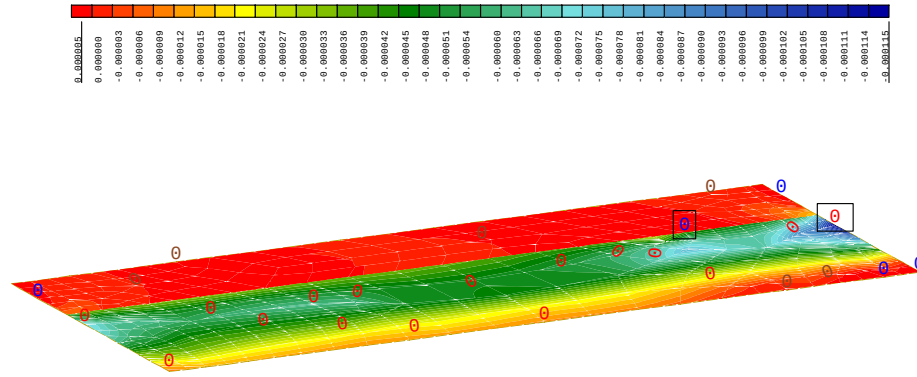
Membrane shear force n-xy in local xy in Node ↕, Loadcase 4 SC Terraplen, from 0 to 0 step 0 kN/m
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



Z
Y
X
Membrane force n-xx in local x in Node ↗, Loadcase 5 SCU1, from -1 to 0 step 0 kN/m

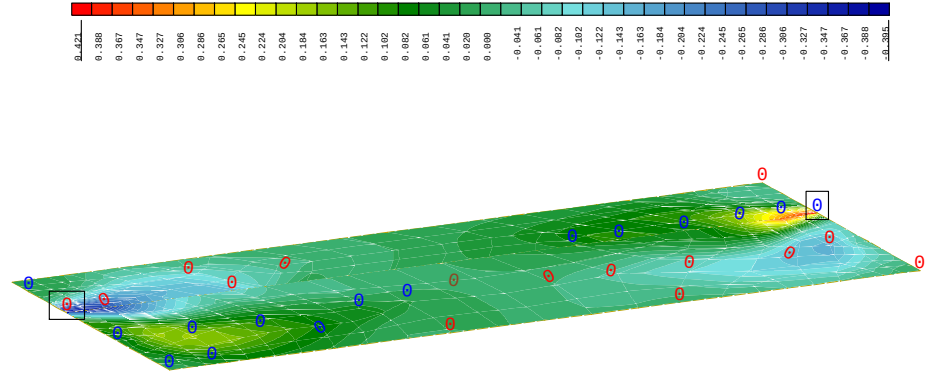
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z
Y
X
Membrane force n-xx in local x in Node ↗, Loadcase 6 SCU2, from 0 to 0 step 0 kN/m

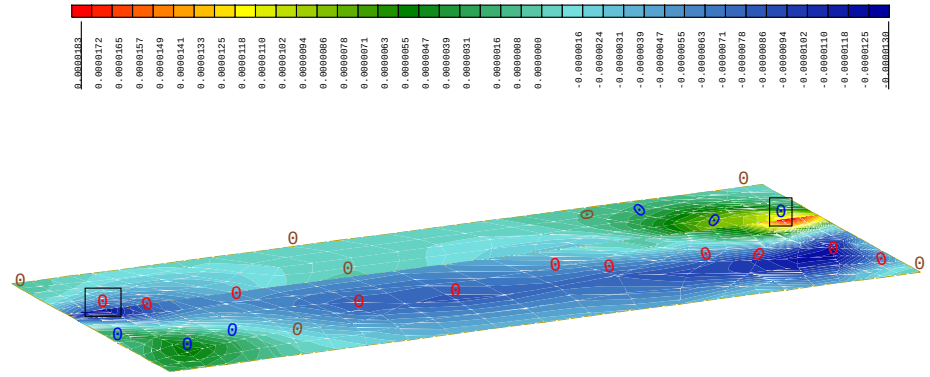
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



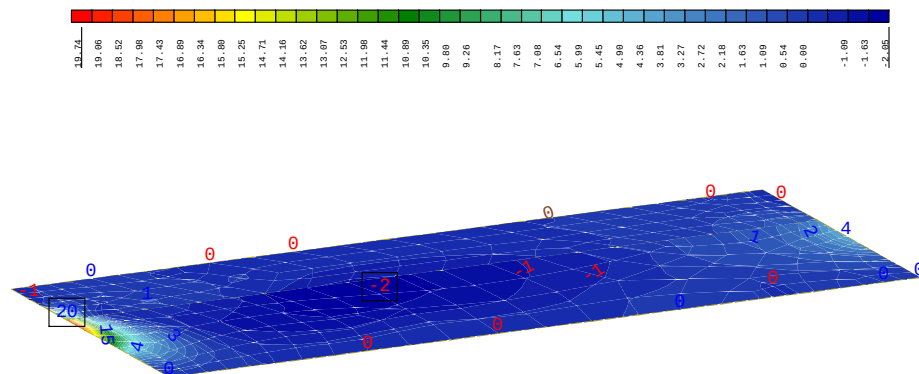
Z
Y
X
Membrane shear force n-xy in local xy in Node ↓, Loadcase 5 SCU1, from 0 to 0 step 0 kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



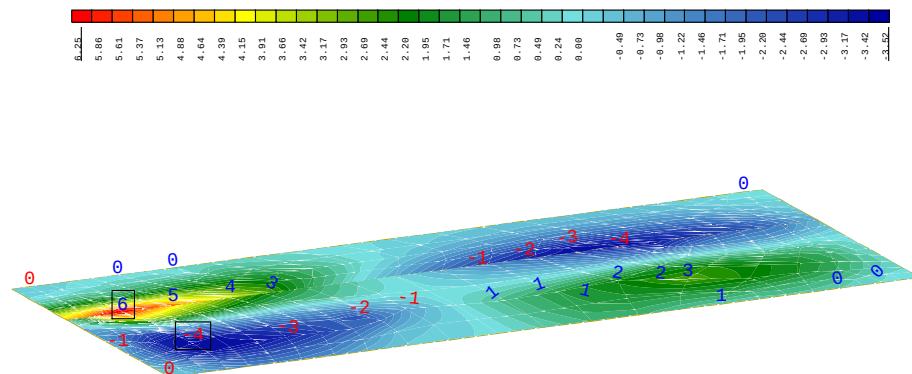
Z
Y
X
Membrane shear force n-xy in local xy in Node ↓, Loadcase 6 SCU2, from 0 to 0 step 0 kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



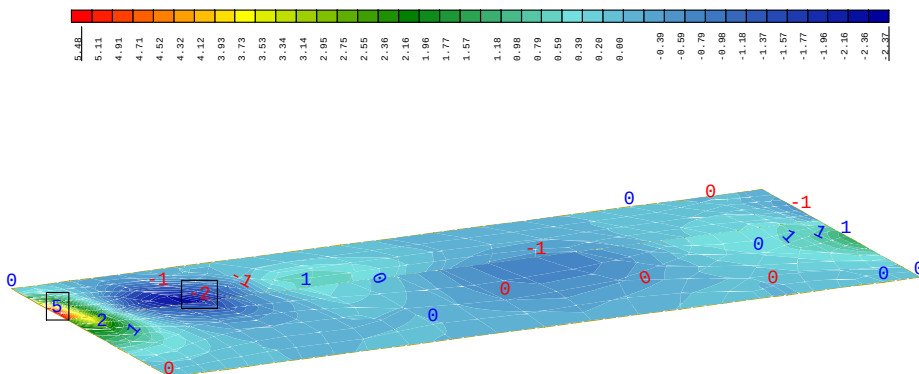
Membrane force n-xx in local x in Node $\nearrow$, Loadcase 7 Camion Mant. , from -2 to 20 step 1
kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



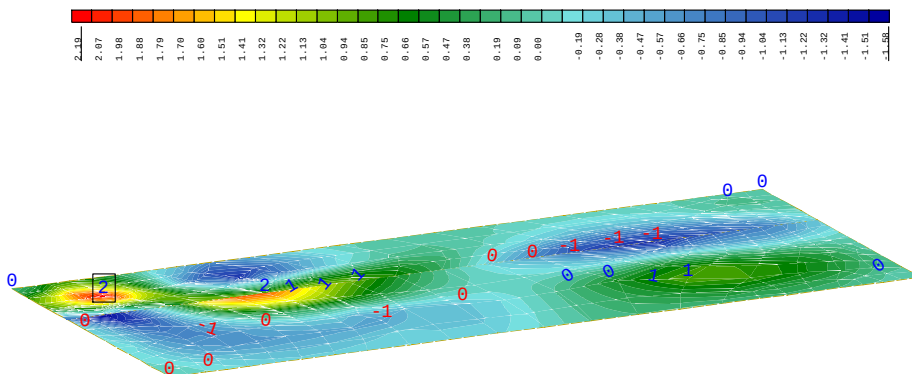
Membrane shear force n-xy in local xy in Node $\updownarrow$, Loadcase 7 Camion Mant. , from -4 to 6
step 0 kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Membrane force n-xx in local x in Node $\nearrow$, Loadcase 8 Camion Mant. , from -2 to 5 step 0
kN/m

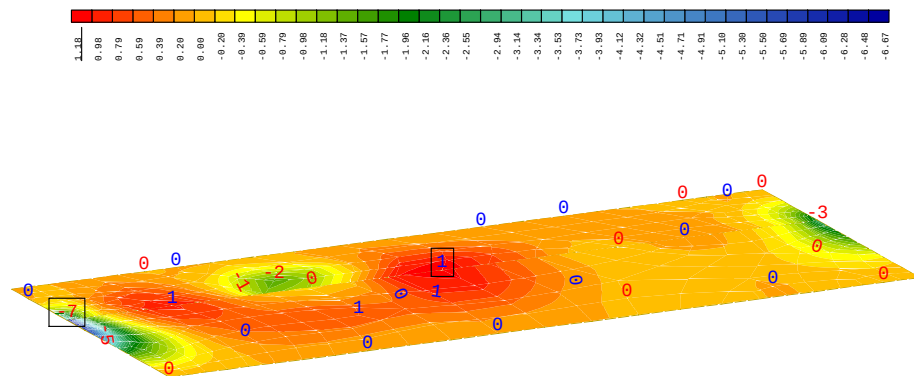
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Membrane shear force n-xy in local xy in Node $\updownarrow$, Loadcase 8 Camion Mant. , from -2 to 2
step 0 kN/m

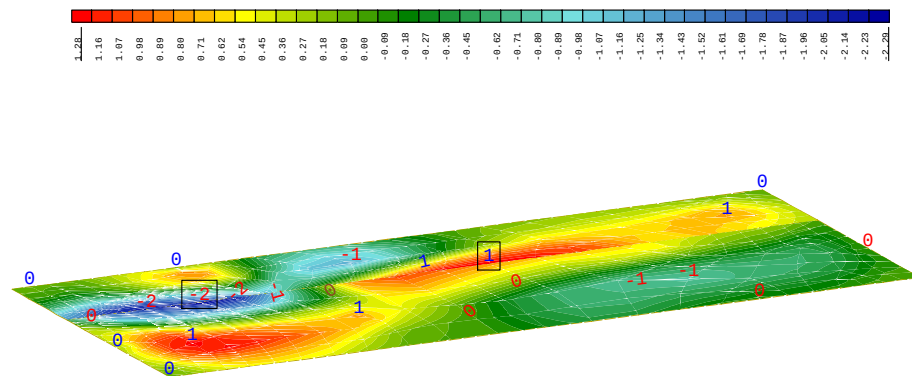
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



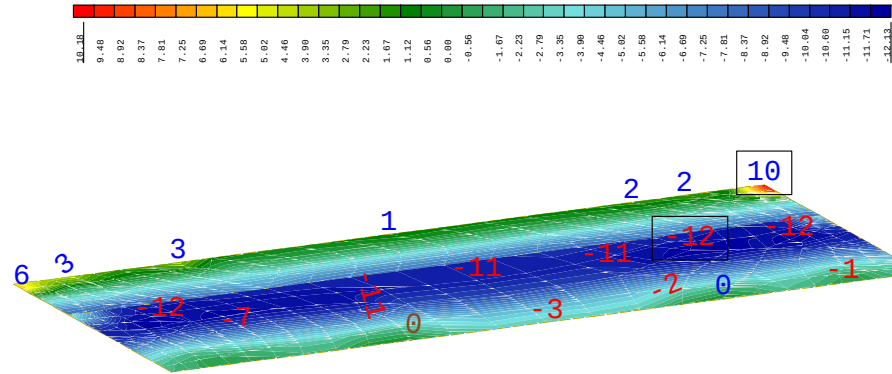
Z
Y
X Membrane force n-xx in local x in Node 7, Loadcase 9 Camion Mant. , from -7 to 1 step 0
kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

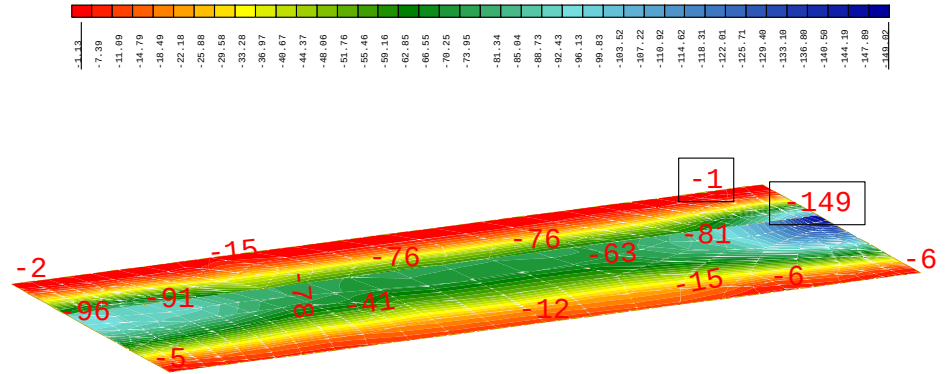


Z
Y
X Membrane shear force n-xy in local xy in Node 2, Loadcase 9 Camion Mant. , from -2 to 1
step 0 kN/m

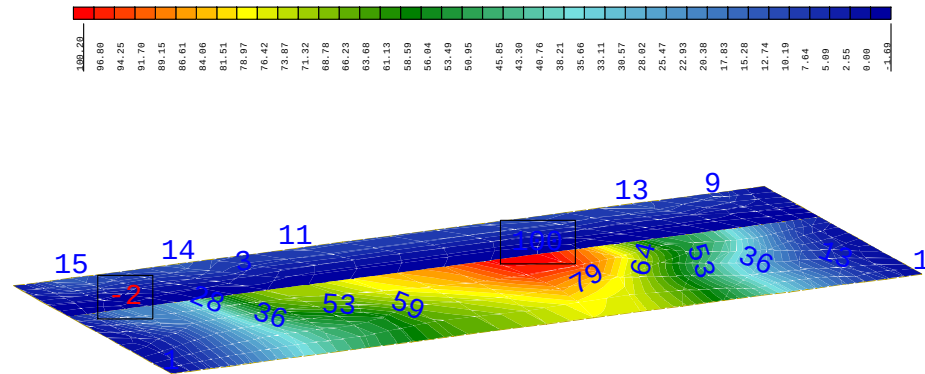
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



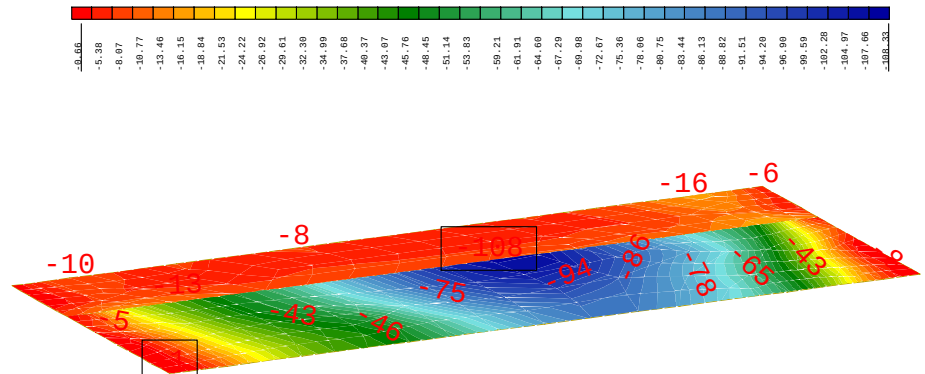
Z Bending moment m_{xx} in local x from middle of element ↗, Loadcase 2101 MAX-MXX QUAD Forces M 1 : 64
 ↙ in Quadrilat , from -12 to 10 step 1 kNm/m X * 0.502
 Y * 0.906
 Z * 0.962



Z Bending moment m_{xx} in local x from middle of element ↗, Loadcase 2102 MIN-MXX QUAD Forces M 1 : 64
 ↙ in Quadrilat , from -149 to -1 step 4 kNm/m X * 0.502
 Y * 0.906
 Z * 0.962

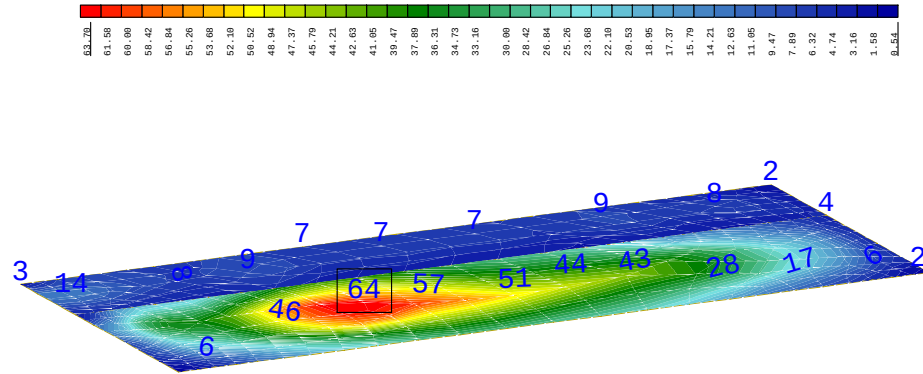


Z Bending moment m_{yy} in local y from middle of element ↗, Loadcase 2103 MAX-MYY QUAD Forces M 1 : 64
 ↙ in Quadrilat , from -2 to 100 step 3 kNm/m X * 0.502
 Y * 0.906
 Z * 0.962



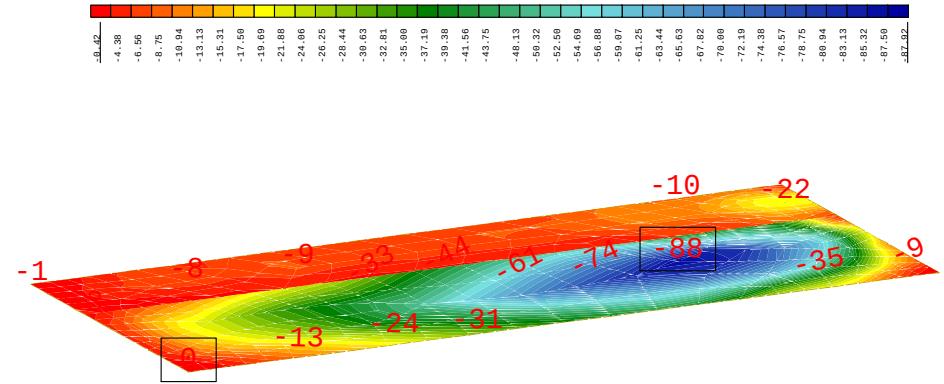
Z Bending moment m_{yy} in local y from middle of element ↗, Loadcase 2104 MIN-MYY QUAD Forces M 1 : 64
 ↙ in Quadrilat , from -108 to -1 step 3 kNm/m X * 0.502
 Y * 0.906
 Z * 0.962

Esfuerzos LC y ELU



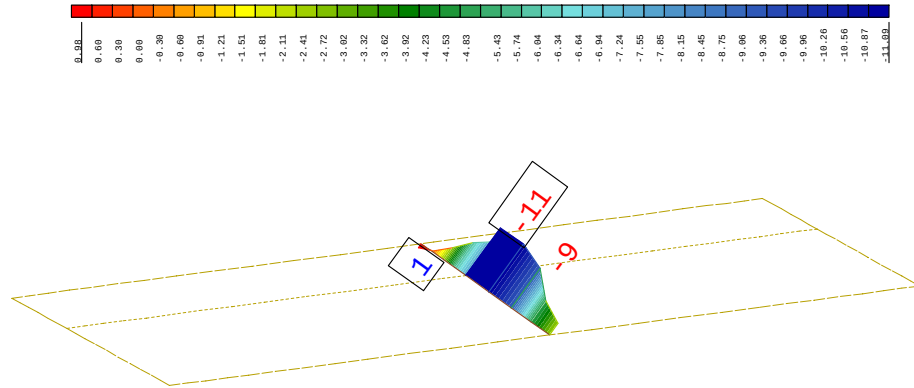
Z
└─Y
X Twisting moment m-xy in local xy from middle of element ↕ , Loadcase 2105 MAX-MXY QUAD
Forces in Quadrilat , from 1 to 64 step 2 kNm/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

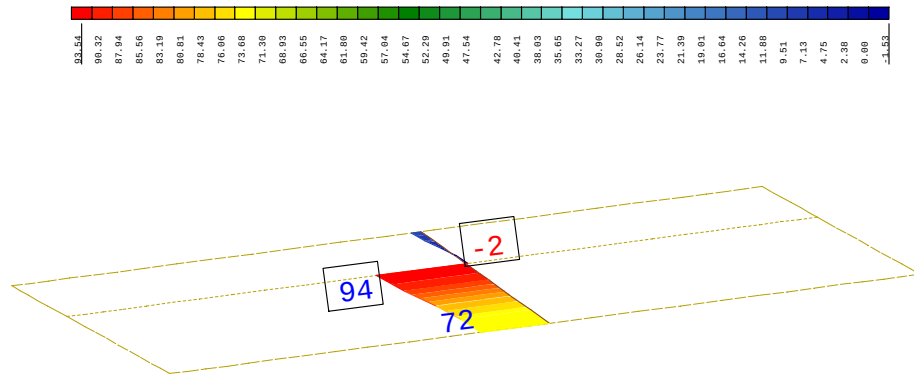


Z
└─Y
X Twisting moment m-xy in local xy from middle of element ↕ , Loadcase 2106 MIN-MXY QUAD
Forces in Quadrilat , from -88 to 0 step 2 kNm/m

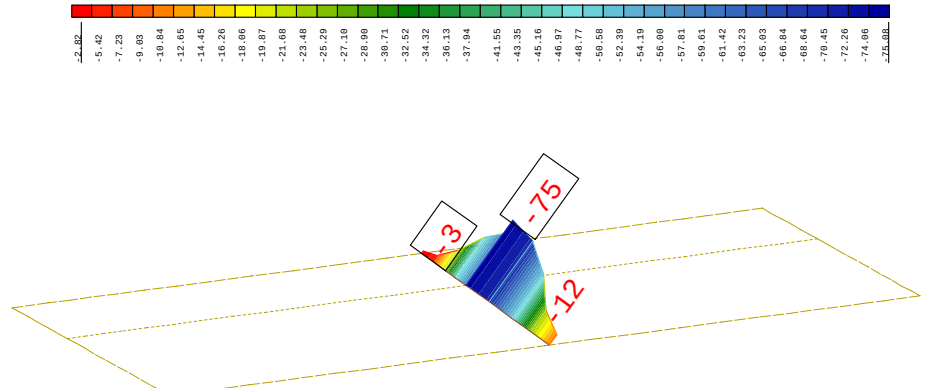
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



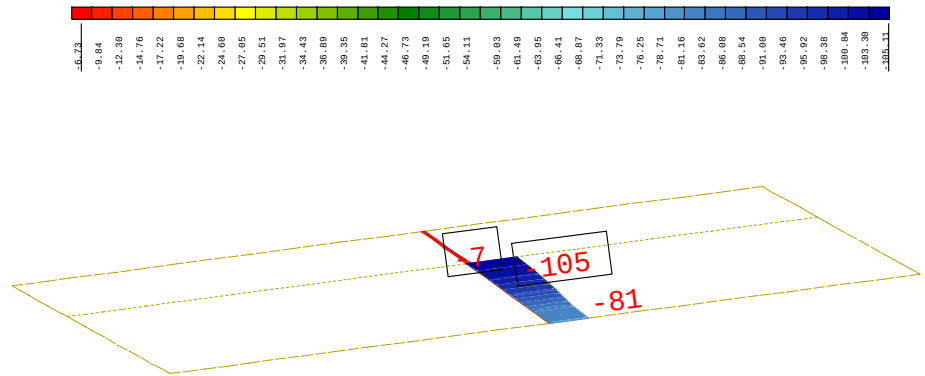
Z Bending moment m-xx in local x from middle of element ↗, Loadcase 2101 MAX-MXX QUAD Forces M 1 : 64
 ↙ in Quadrilat , 1 cm 3D = 10.000 kNm/m (Min=-11) (Max=1) X * 0.502
 Y * 0.906
 Z * 0.962



Z Bending moment m-yy in local y from middle of element ↗, Loadcase 2103 MAX-MYY QUAD Forces M 1 : 64
 ↙ in Quadrilat , 1 cm 3D = 50.000 kNm/m (Min=-2) (Max=94) X * 0.502
 Y * 0.906
 Z * 0.962

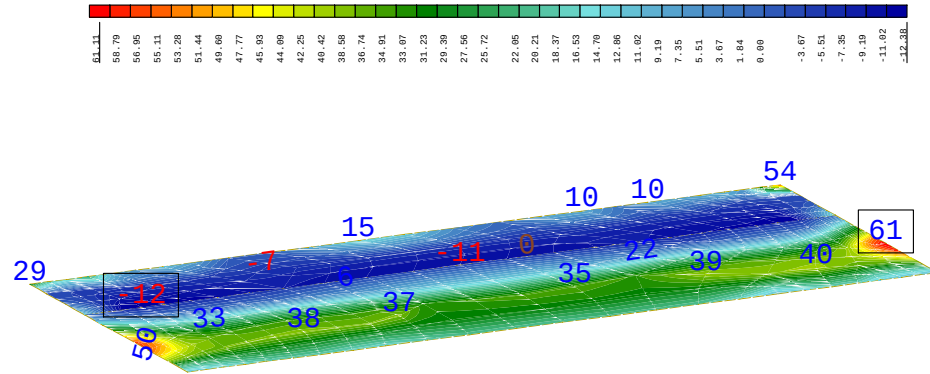


Z Bending moment m-xx in local x from middle of element ↗, Loadcase 2102 MIN-MXX QUAD Forces M 1 : 64
 ↙ in Quadrilat , 1 cm 3D = 50.000 kNm/m (Min=-75) (Max=-3) X * 0.502
 Y * 0.906
 Z * 0.962



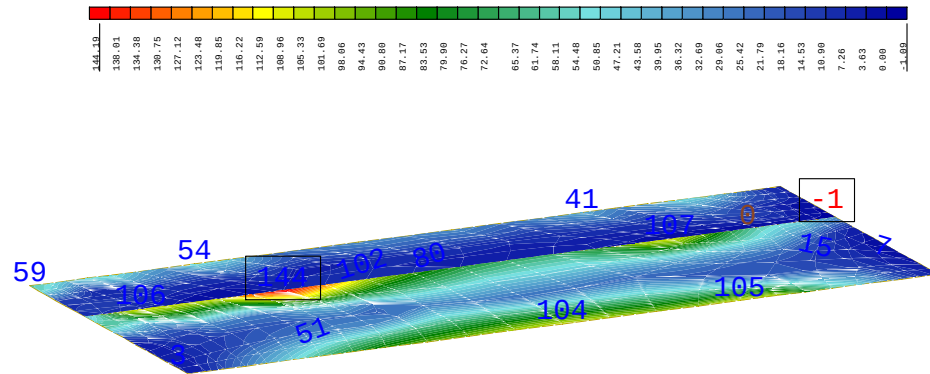
Z Bending moment m-yy in local y from middle of element ↗, Loadcase 2104 MIN-MYY QUAD Forces M 1 : 64
 ↙ in Quadrilat , 1 cm 3D = 100.00 kNm/m (Min=-105) (Max=-7) X * 0.502
 Y * 0.906
 Z * 0.962

Esfuerzos LC y ELU



Shear force v-x in local x from middle of element ↗, Loadcase 2107 MAX-VX QUAD Forces in
Quadrilate , from -12 to 61 step 2 kN/m

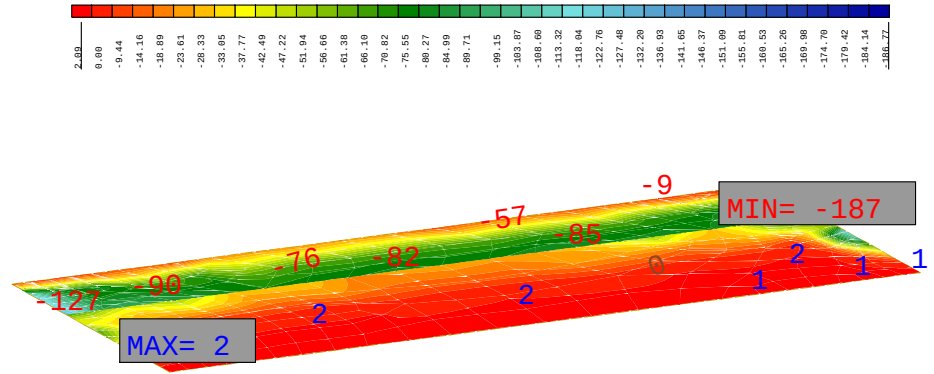
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Shear force v-y in local y from middle of element ↗, Loadcase 2109 MAX-VY QUAD Forces in
Quadrilate , from -1 to 144 step 4 kN/m

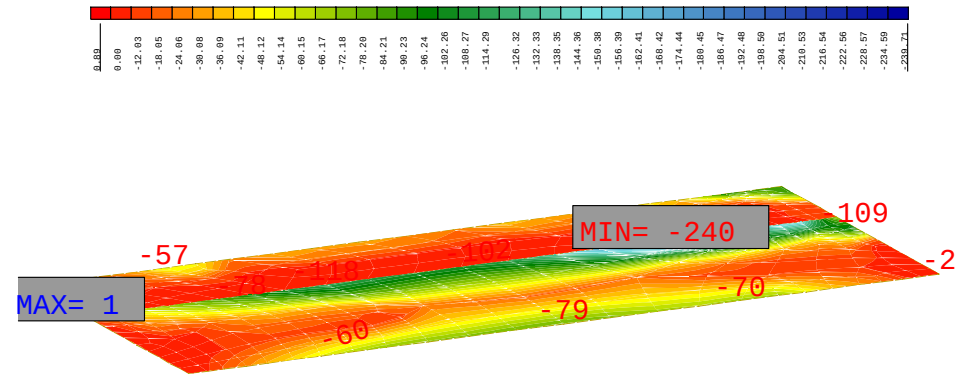
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



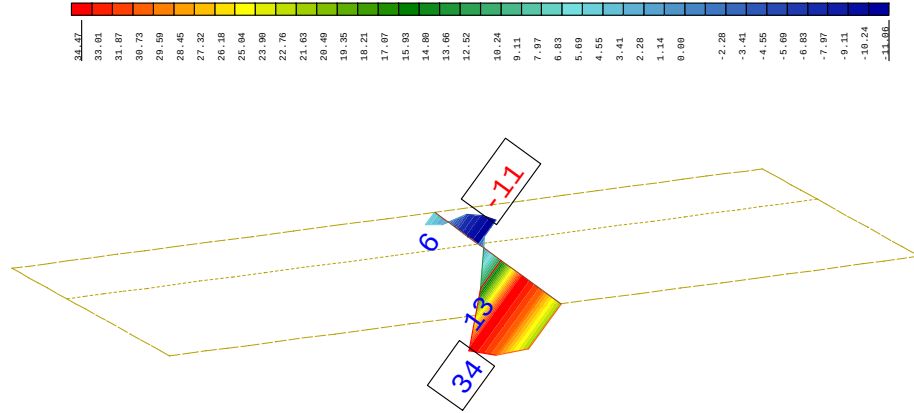
Shear force v-x in local x from middle of element ↗, Loadcase 2108 MIN-VX QUAD Forces in
Quadrilate , from -187 to 2 step 5 kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

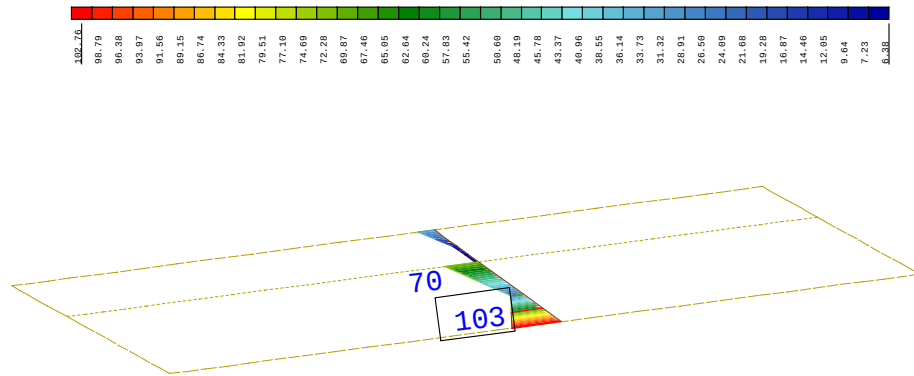


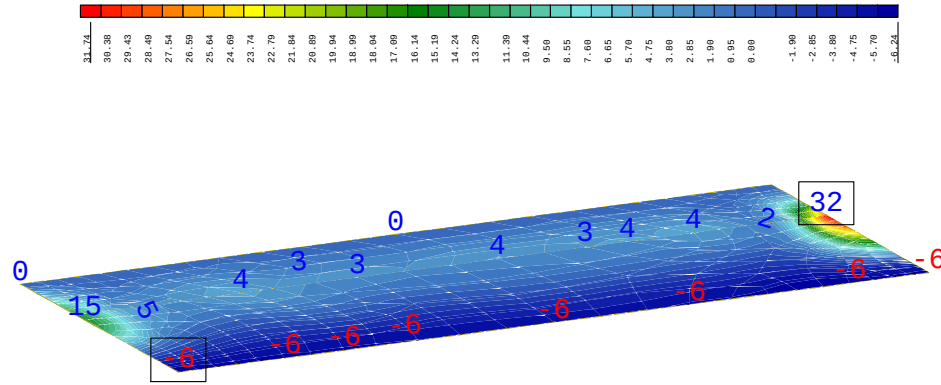
Shear force v-y in local y from middle of element ↗, Loadcase 2110 MIN-VY QUAD Forces in
Quadrilate , from -240 to 1 step 6 kN/m

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

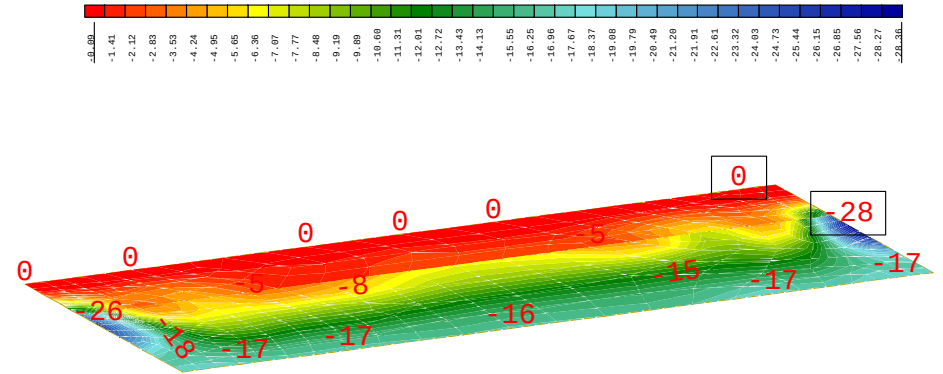


Z
Y
X Shear force v-x in local x from middle of element ↗, Loadcase 2107 MAX-VX QUAD Forces in
Quadrilate , 1 cm 3D = 20.000 kN/m (Min=-11) (Max=34) M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

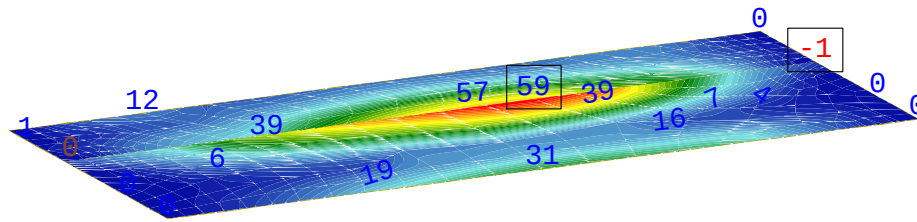




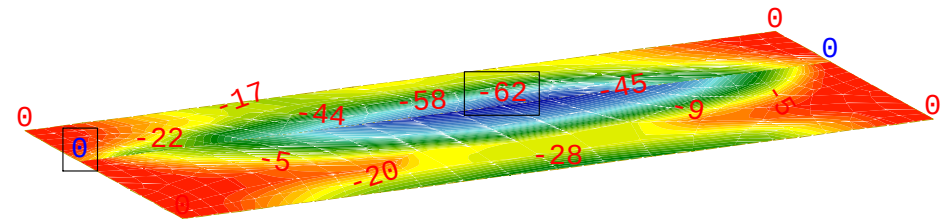
Z
Y
X Membrane force n-xx in local x from middle of element ↗, Loadcase 2111 MAX-NXX QUAD Forces M 1 : 64
in Quadrilat , from -6 to 32 step 1 kN/m X * 0.502
Y * 0.906
Z * 0.962



Z
Y
X Membrane force n-xx in local x from middle of element ↗, Loadcase 2112 MIN-NXX QUAD Forces M 1 : 64
in Quadrilat , from -28 to 0 step 1 kN/m X * 0.502
Y * 0.906
Z * 0.962

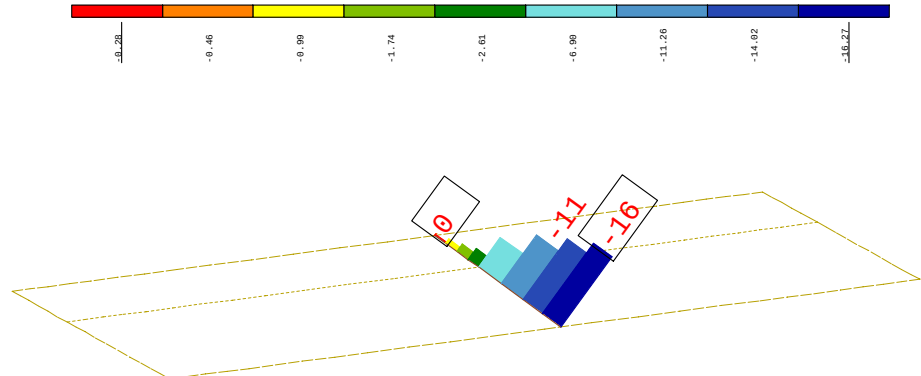
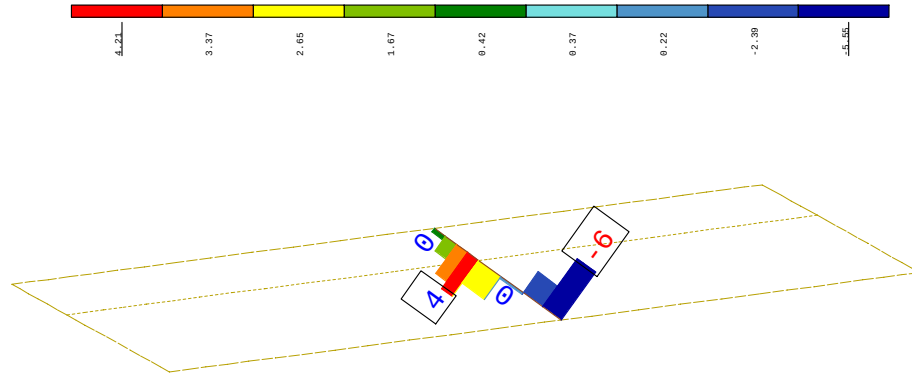


Z
Y
X Membrane force n-yy in local y from middle of element ↖, Loadcase 2113 MAX-NYY QUAD Forces M 1 : 64
in Quadrilat , from -1 to 59 step 1 kN/m X * 0.502
Y * 0.906
Z * 0.962



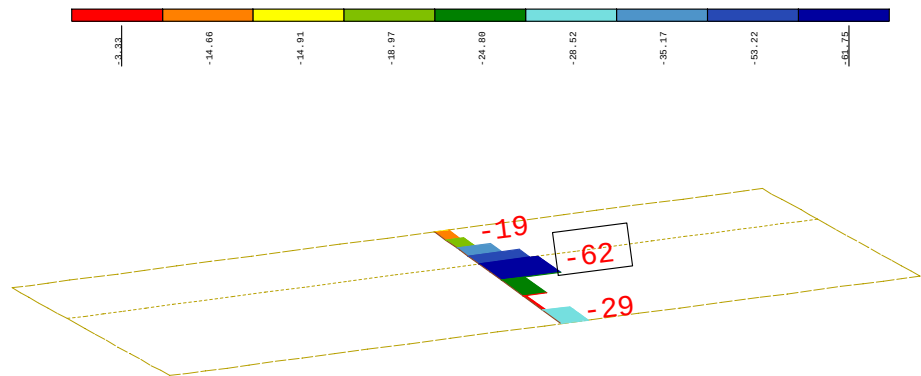
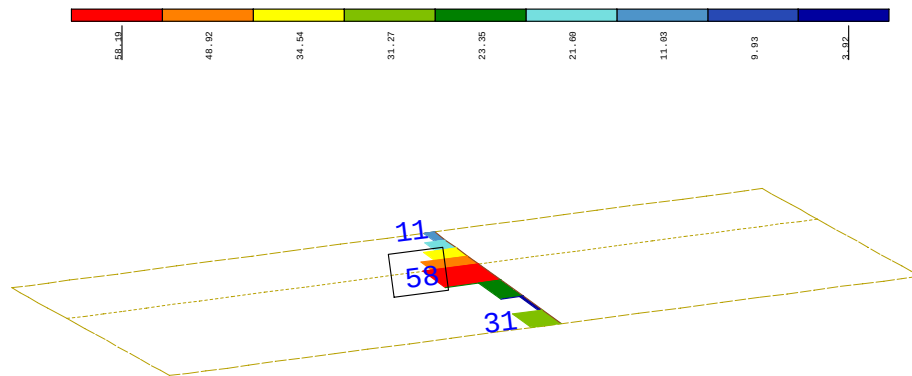
Z
Y
X Membrane force n-yy in local y from middle of element ↖, Loadcase 2114 MIN-NYY QUAD Forces M 1 : 64
in Quadrilat , from -62 to 0 step 2 kN/m X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU



Membrane force n-xx in local x ↗, Loadcase 2111 MAX-NXX QUAD Forces in Quadilat , 1 cm
3D = 5.0000 kN/m (Min=-6) (Max=4)
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

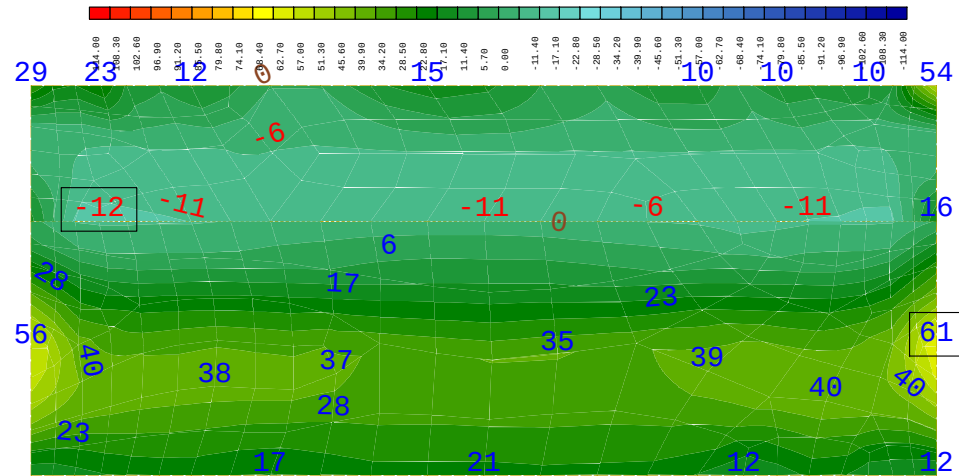
Membrane force n-xx in local x ↗, Loadcase 2112 MIN-NXX QUAD Forces in Quadilat , 1 cm
3D = 10.000 kN/m (Min=-16) (Max= 0)
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



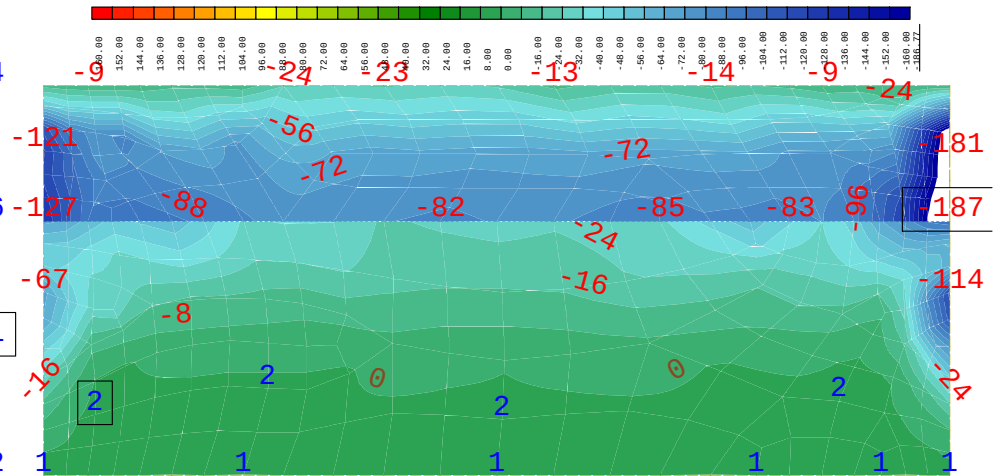
Membrane force n-yy in local y ↗, Loadcase 2113 MAX-NYY QUAD Forces in Quadilat , 1 cm
3D = 50.000 kN/m (Max=58)
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Membrane force n-yy in local y ↗, Loadcase 2114 MIN-NYY QUAD Forces in Quadilat , 1 cm
3D = 50.000 kN/m (Min=-62) (Max=-3)
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

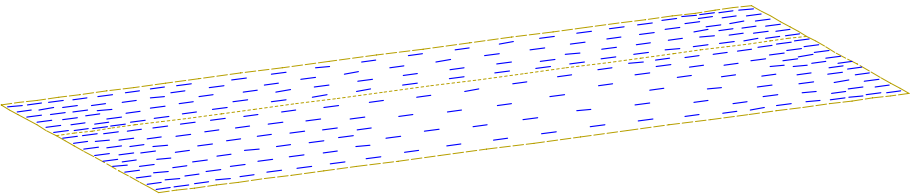
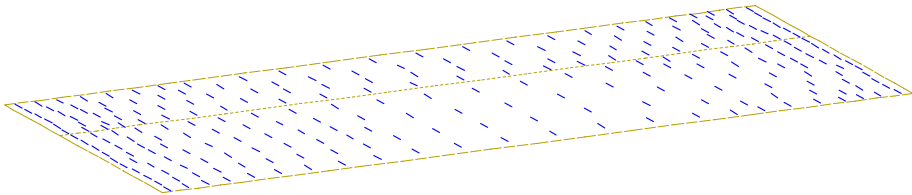
Esfuerzos LC y ELU



Shear force v-x in local x from middle of element $\updownarrow$, Loadcase 2107 MAX-VX QUAD Forces in M 1 : 59
Quadrilate , from -12 to 61 step 6 kN/m

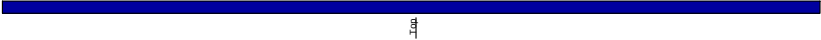


Shear force v-x in local x from middle of element $\updownarrow$, Loadcase 2108 MIN-VX QUAD Forces in M 1 : 59
Quadrilate , from -160 to 2 step 8 kN/m



Z
└─Y
X
Quadrilateral Elements , Direction of prescribed upper Principal reinforcements (1st layer)
(———)

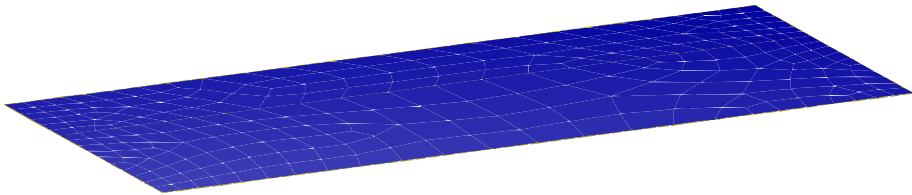
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



mm

Z
└─Y
X
Quadrilateral Elements , Direction of prescribed upper Cross reinforcements (2nd layer) (———)

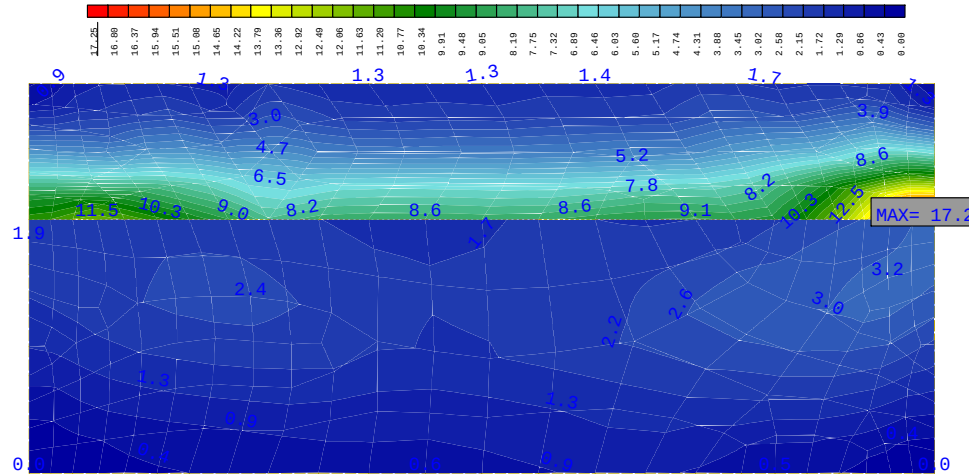
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



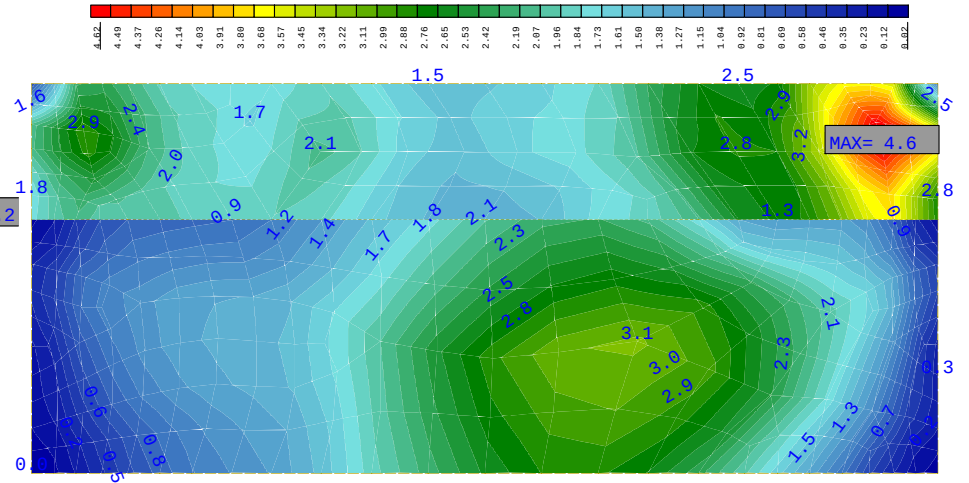
Z
└─Y
X
Visible QUAD surface top/bottom in Element

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

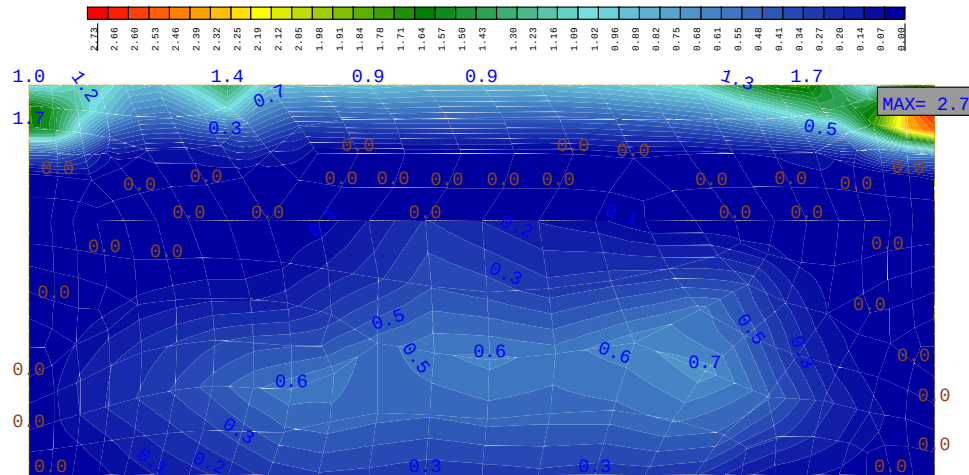
Armado



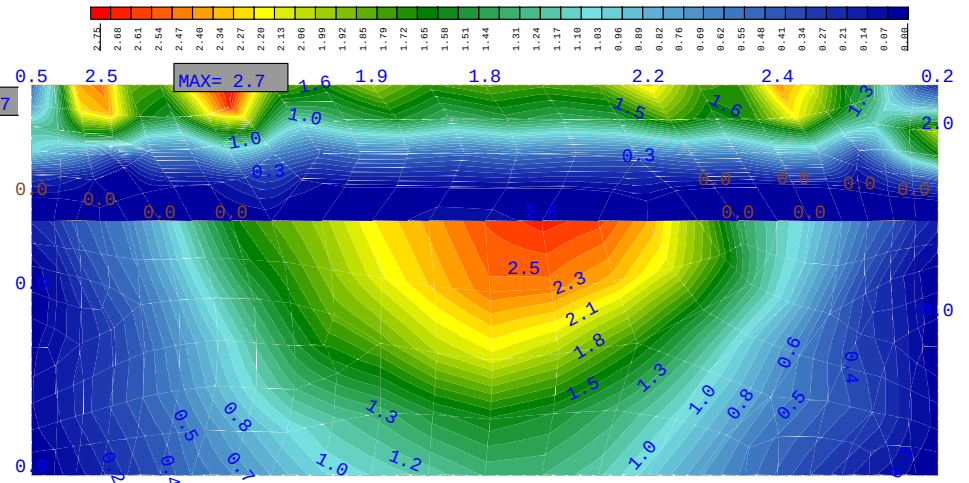
Quadrilateral Elements , upper Principal reinforcements (1st layer) ↴ , Design Case 1 ULS design , from 0.0 to 17.2 step 0.4 cm²/m M 1 : 59



Quadrilateral Elements , upper Cross reinforcements (2nd layer) ↴ , Design Case 1 ULS design , from 0.0 to 4.6 step 0.1 cm²/m M 1 : 59

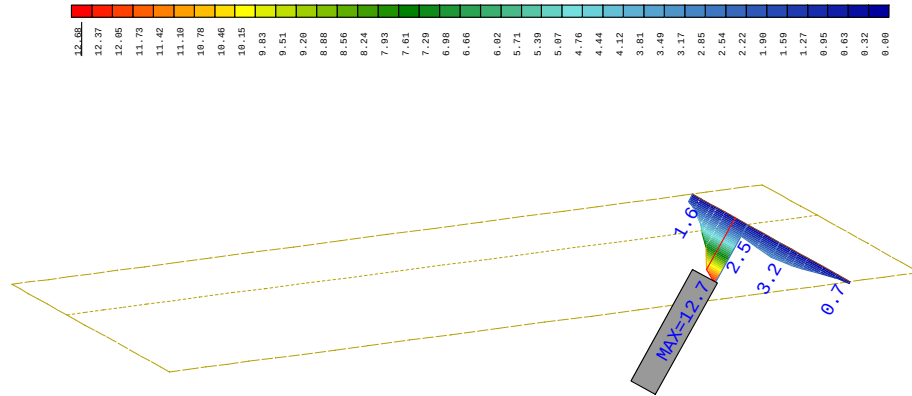


Quadrilateral Elements , lower Principal reinforcements (1st layer) ↴ , Design Case 1 ULS design , from 0.00 to 2.7 step 0.1 cm²/m M 1 : 59



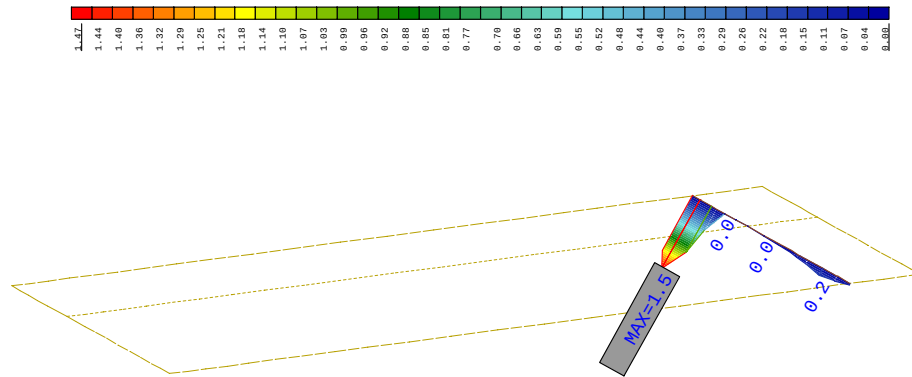
Quadrilateral Elements , lower Cross reinforcements (2nd layer) ↴ , Design Case 1 ULS design , from 0.00 to 2.7 step 0.1 cm²/m M 1 : 59

Armado



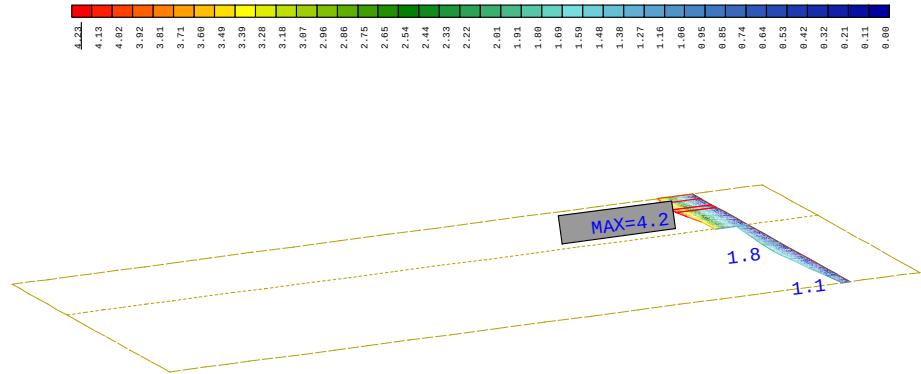
Z
Y X Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗, Design Case 1 ULS design , 1 cm 3D = 10.000 cm2/m (Max=12.7)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



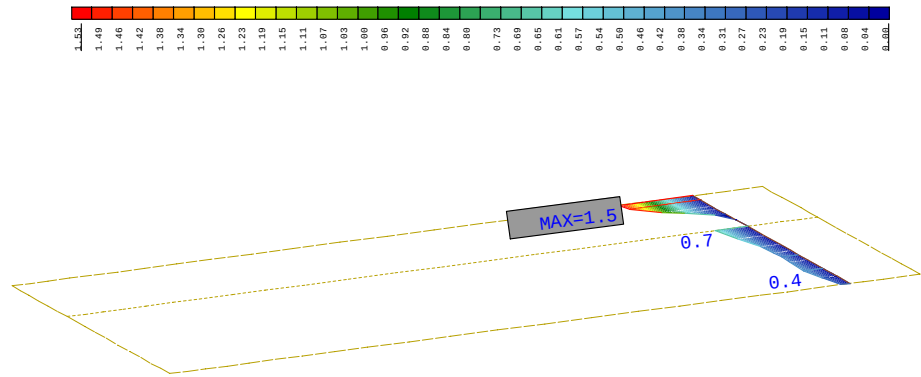
Z
Y X Quadrilateral Elements , lower Principal reinforcements (1st layer) ↘, Design Case 1 ULS design , 1 cm 3D = 1.0000 cm2/m (Max=1.5)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z
Y X Quadrilateral Elements , upper Cross reinforcements (2nd layer) ↗, Design Case 1 ULS design , 1 cm 3D = 5.0000 cm2/m (Max=4.2)

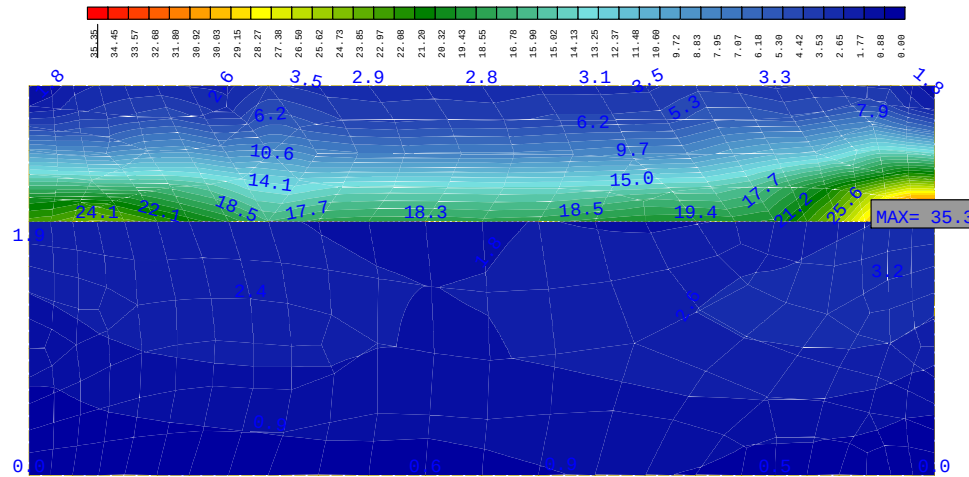
M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



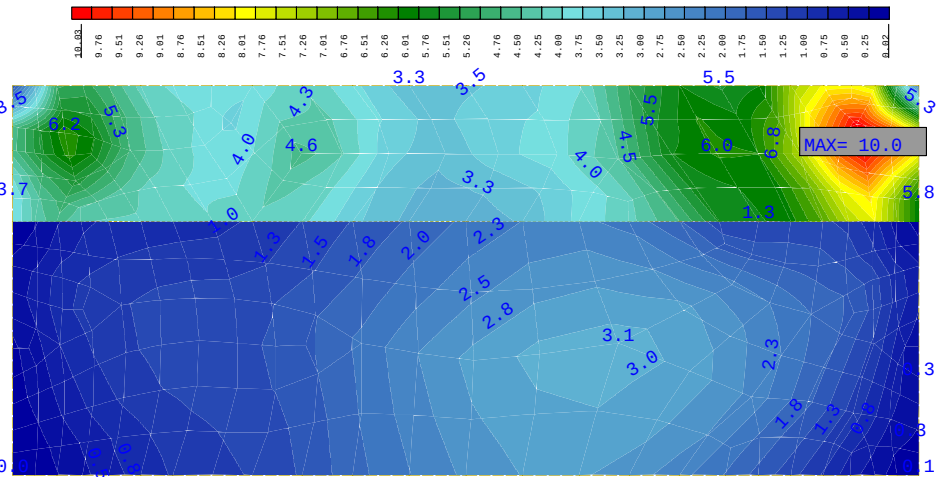
Z
Y X Quadrilateral Elements , lower Cross reinforcements (2nd layer) ↘, Design Case 1 ULS design , 1 cm 3D = 1.0000 cm2/m (Max=1.5)

M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

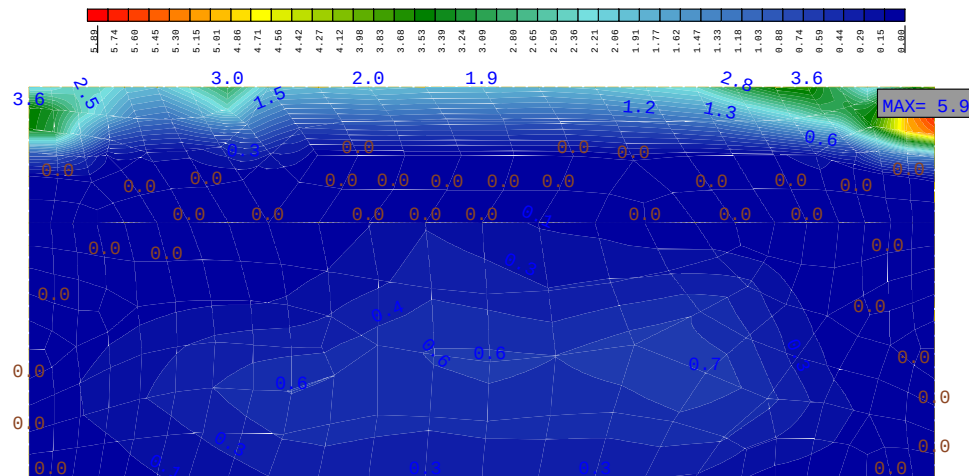
Armado



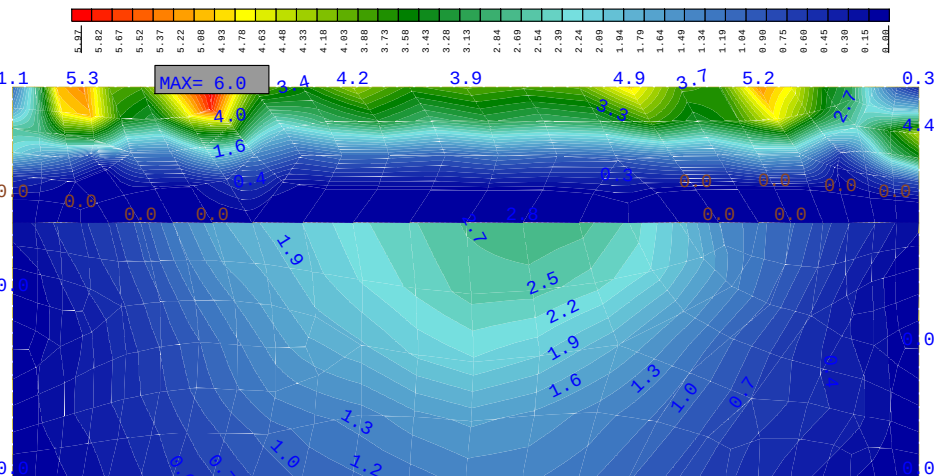
Quadrilateral Elements , upper Principal reinforcements (1st layer) ↱ , Design Case 2 After the crack width design , from 0.0 to 35.3 step 0.9 cm²/m M 1 : 59



Quadrilateral Elements , upper Cross reinforcements (2nd layer) ↲ , Design Case 2 After the crack width design , from 0.0 to 10.0 step 0.3 cm²/m M 1 : 59

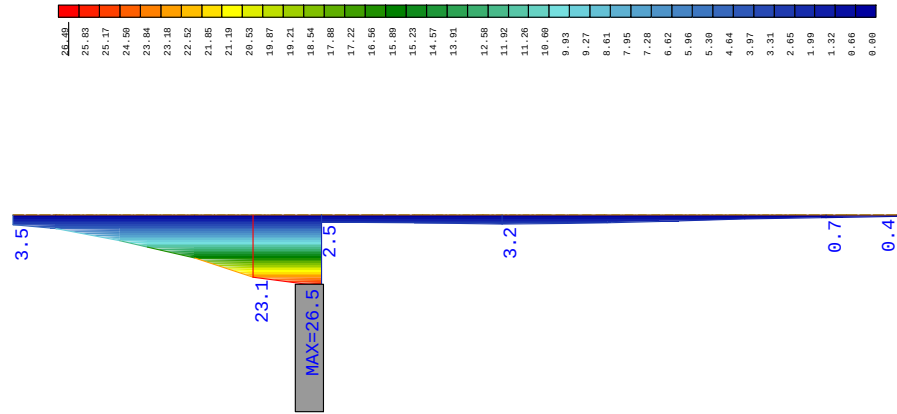


Quadrilateral Elements , lower Principal reinforcements (1st layer) ↱ , Design Case 2 After the crack width design , from 0.00 to 5.9 step 0.1 cm²/m M 1 : 59

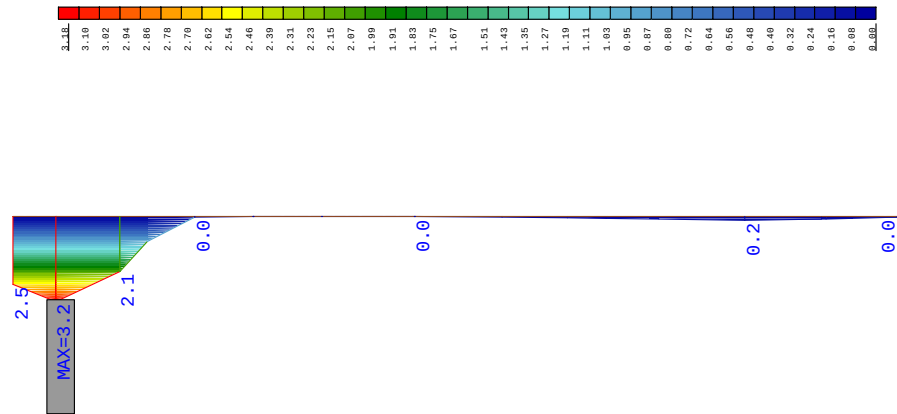


Quadrilateral Elements , lower Cross reinforcements (2nd layer) ↲ , Design Case 2 After the crack width design , from 0.00 to 6.0 step 0.1 cm²/m M 1 : 59

Armado

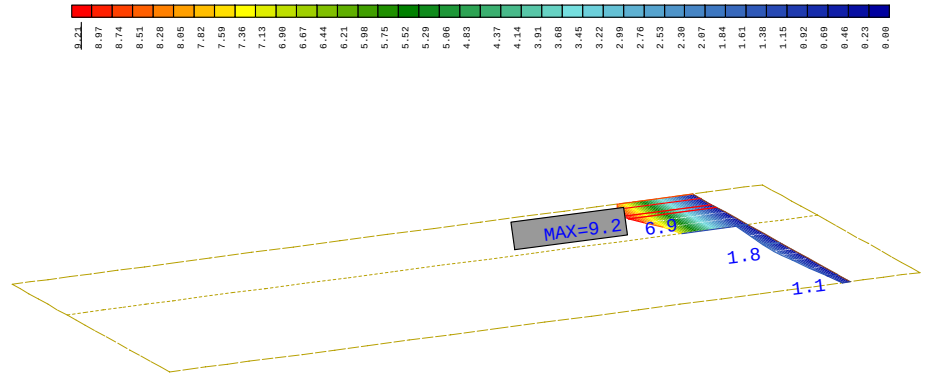


Z
X
Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗, Design Case 2 After the crack width design , 1 cm 3D = 20.000 cm2/m (Max=26.5) M 1 : 26

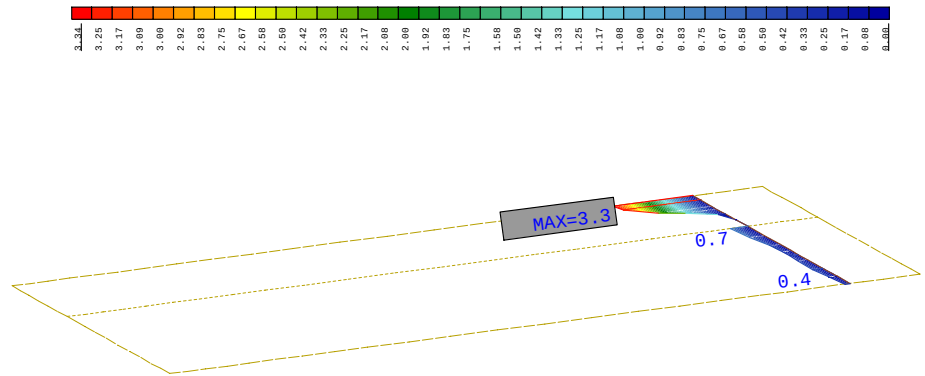


Z
X
Quadrilateral Elements , lower Principal reinforcements (1st layer) ↖, Design Case 2 After the crack width design , 1 cm 3D = 2.0000 cm2/m (Max=3.2) M 1 : 26

Armado

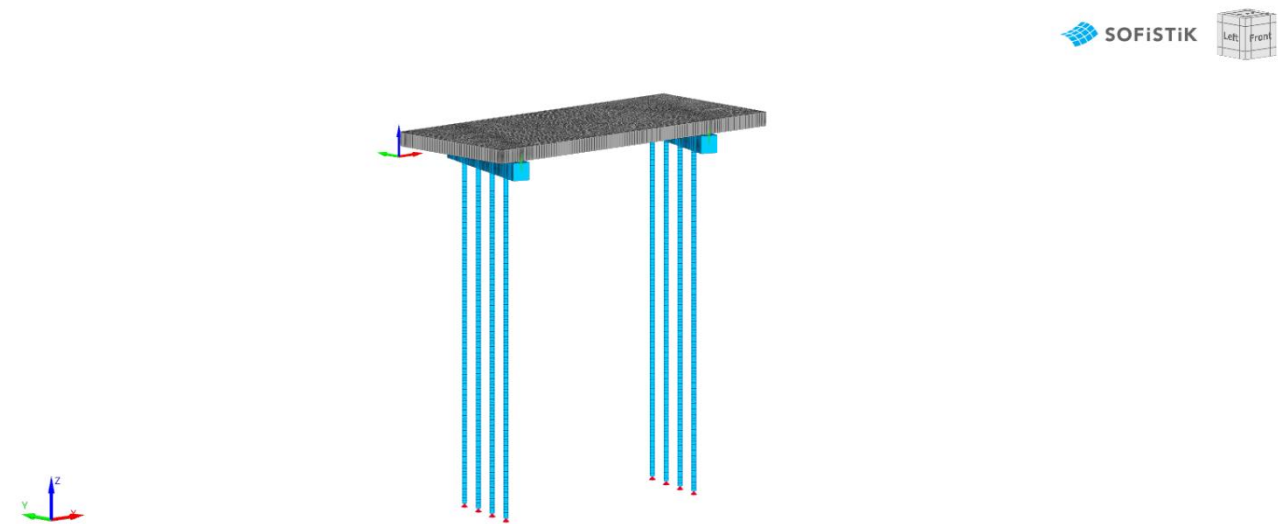


Z
Y
Quadrilateral Elements , upper Cross reinforcements (2nd layer) ↗, Design Case 2 After the crack width design , 1 cm 3D = 5.0000 cm2/m (Max=9.2) M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962



Z
Y
Quadrilateral Elements , lower Cross reinforcements (2nd layer) ↖, Design Case 2 After the crack width design , 1 cm 3D = 2.0000 cm2/m (Max=3.3) M 1 : 64
X * 0.502
Y * 0.906
Z * 0.962

Un modelo para el puenteo de la ODT existente.



Cuantías mínimas

fck =30 Mpa			
Canto (m)	Cuantía (cm2/m)	s=15cm-->Ø	s=20cm-->Ø
0.25	4.2	12	12
0.35	5.8	12	16
0.4	6.7	12	16

Cortante sin armadura

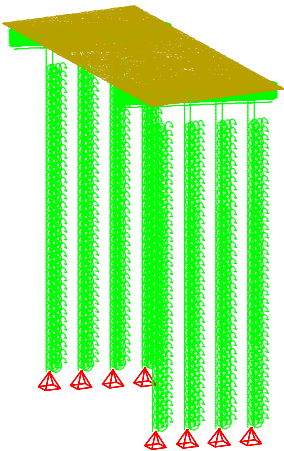
MATERIALES	
fck (Mpa)	30
f _{yk} (Mpa)	500
f _{yd} (Mpa)	435
f _{ct,m} (Mpa)	2.9

A continuación, se muestra los resultados incluyendo:

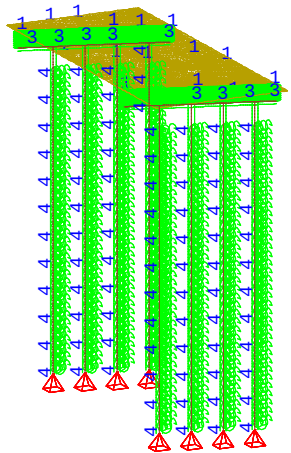
1. Tablas con el cálculo de la armadura mínima y la resistencia a cortante sin armadura.
2. Características del modelo.
3. Esfuerzos pilotes por caso de carga y ELS.
4. Esfuerzos losa por caso de carga y ELU.
5. Armado losa.
6. Esfuerzos vigas por caso de carga y ELU.
7. Deformaciones
8. Comprobación de vigas.
9. Comprobación de micropilotes

DIMENSIONES	
b0 (m)	1
H (m)	0.4
d (m)	0.35

CAPACIDAD SIN ARM	
ε	1.76
k	1.76
Vu2 min (kN) EHE	223
VRd,c min (kN) CE	156

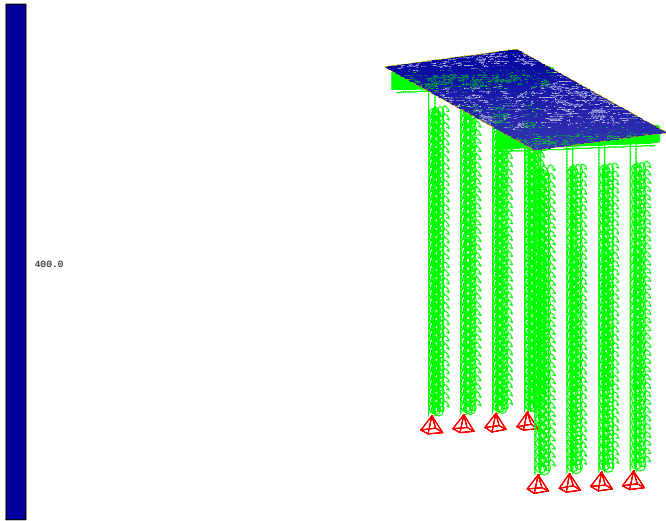


Structure
Z
Y
X

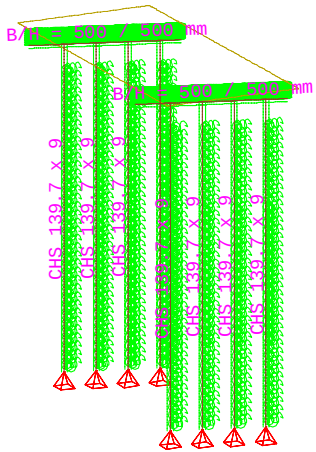


M 1 : 157
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X
Quadrilateral Elements , Number of group (Max=1)
Beam Elements , Number of group (Max=4)

M 1 : 157
X * 0.502
Y * 0.906
Z * 0.962



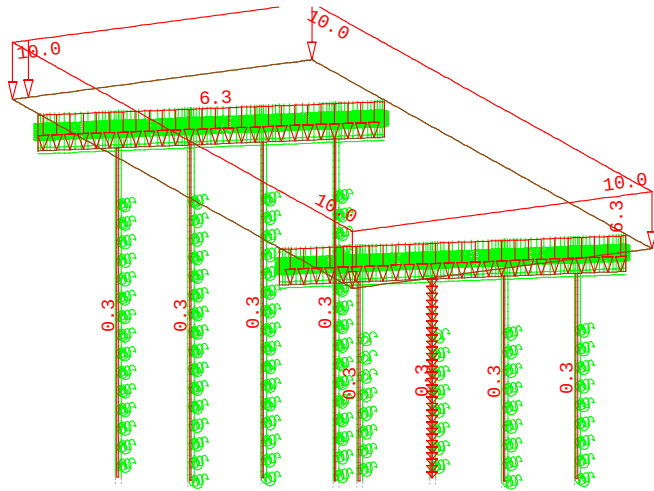
Quadrilateral Elements , Average plate thickness in mm (Max=400)
Z
Y
X



M 1 : 157
X * 0.502
Y * 0.906
Z * 0.962
Z
Y
X
Beam Elements , Sectional Designations

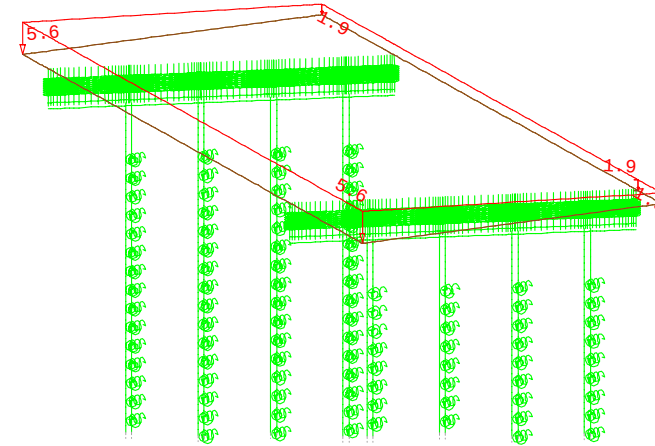
M 1 : 157
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo



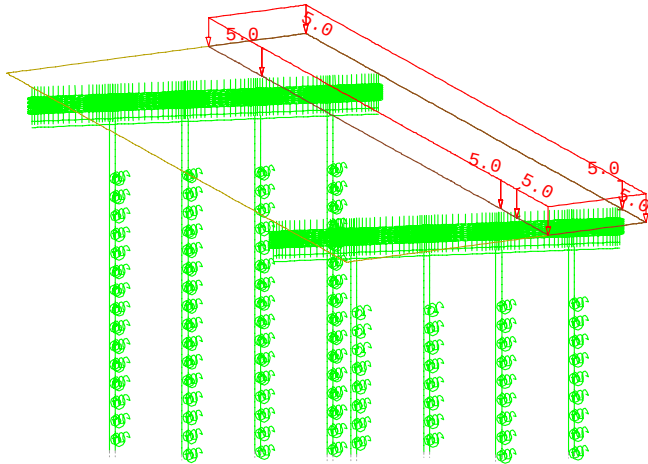
Sector of system
All loads, Loadcase 1 Peso propio , (1 cm 3D = unit) QUAD-Area dead load in global Z in Element (Unit=9.0 kN/m2,Min=-10.0 Max=-10.0 ∇), Beam dead load in global Z (Unit=9.0

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



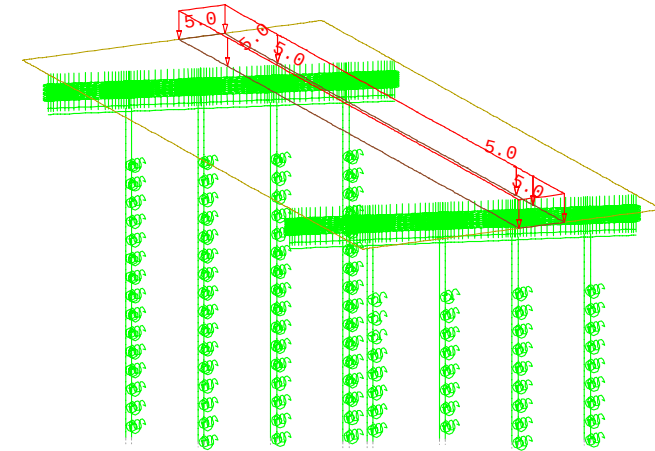
Sector of system
All loads, Loadcase 2 Asfalto , (1 cm 3D = unit) Free area load (force) in global Z (Unit=9.0 kN/m2 ∇) (Min=-5.6) (Max=-1.9)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



Sector of system
All loads, Loadcase 3 SCU1 , (1 cm 3D = unit) Free area load (force) in global Z (Unit=9.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)

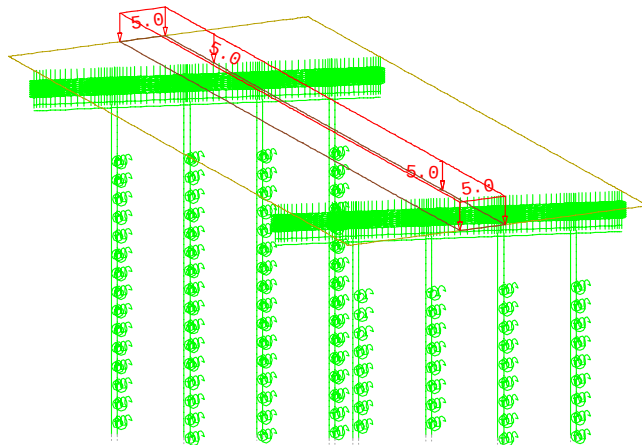
M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



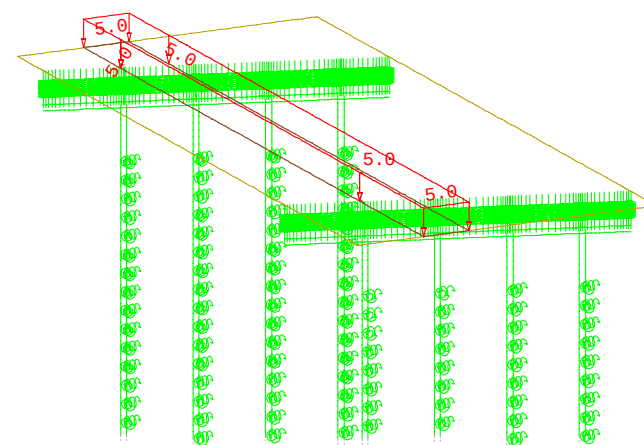
Sector of system
All loads, Loadcase 4 SCU2 , (1 cm 3D = unit) Free area load (force) in global Z (Unit=9.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962

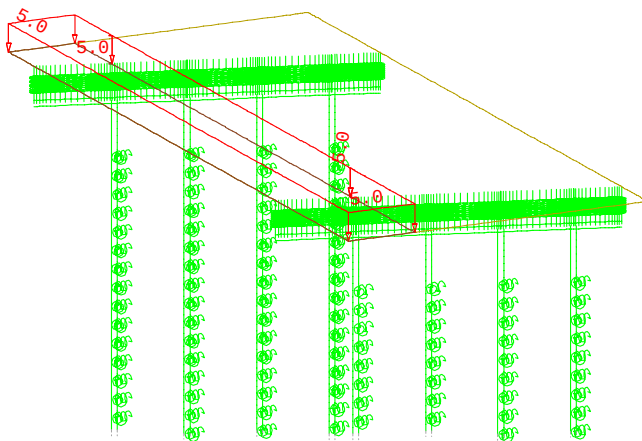
Características del modelo



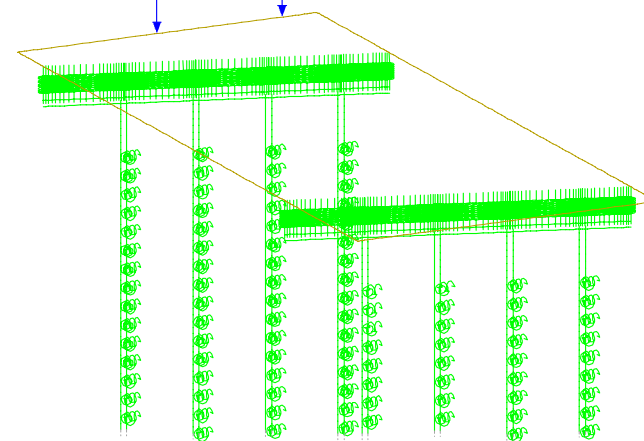
Sector of system
All loads, Loadcase 5 SCU3 , (1 cm 3D = unit) Free area load (force) in global Z
(Unit=9.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)



Sector of system
All loads, Loadcase 6 SCU4 , (1 cm 3D = unit) Free area load (force) in global Z
(Unit=9.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)



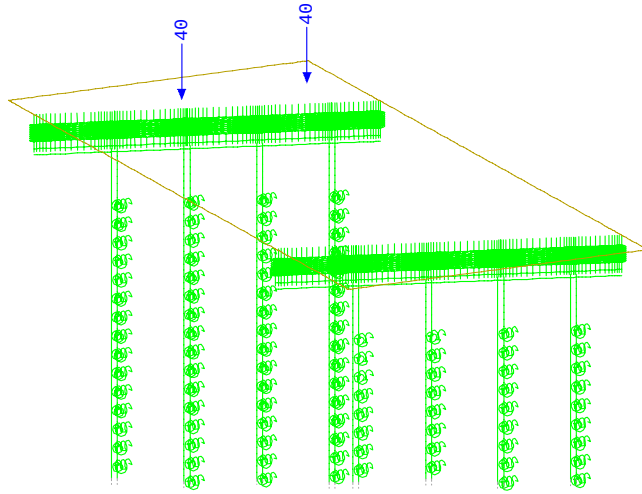
Sector of system
All loads, Loadcase 7 SCU5 , (1 cm 3D = unit) Free area load (force) in global Z
(Unit=9.0 kN/m2 ∇) (Min=-5.0) (Max=-5.0)



Sector of system
All loads, Loadcase 8 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=36.1 kN $\blacktriangleright$) (Max=40.0)

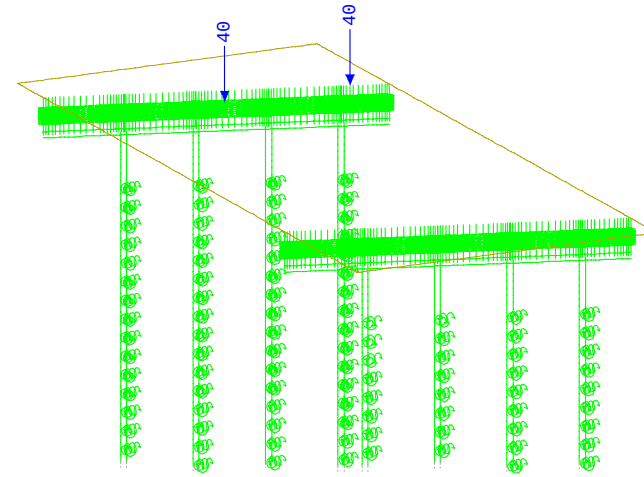
Características del modelo

Sector of system
All loads, Loadcase 8 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=36.1 kN $\blacktriangleright$) (Max=40.0)



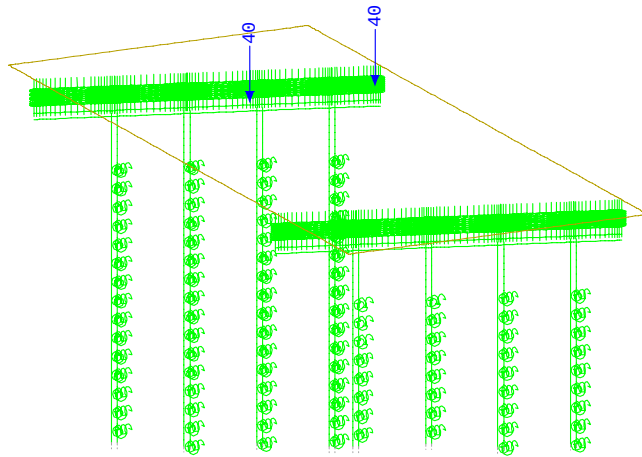
Sector of system
All loads, Loadcase 9 VH Mant , (1 cm 3D = unit) Free single load (force) vector (Unit=36 kN) (Max=40)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



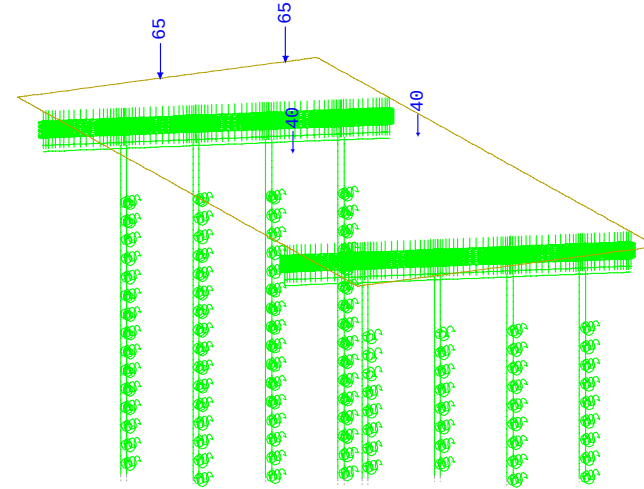
Sector of system
All loads, Loadcase 10 VH Mant , (1 cm 3D = unit) Free single load (force) vector (Unit=36 kN) (Max=40)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



Sector of system
All loads, Loadcase 11 VH Mant , (1 cm 3D = unit) Free single load (force) vector (Unit=36 kN) (Max=40)

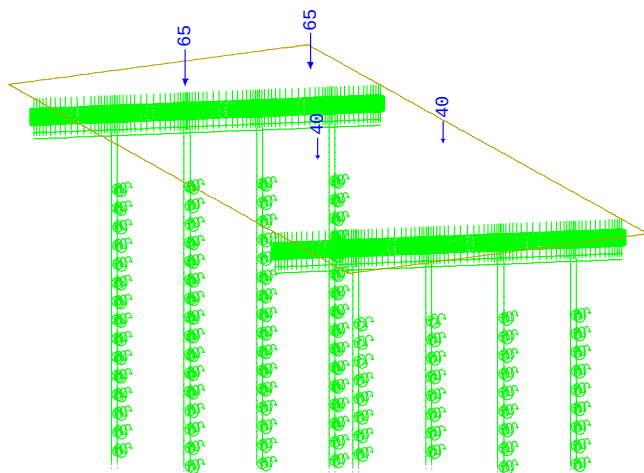
M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



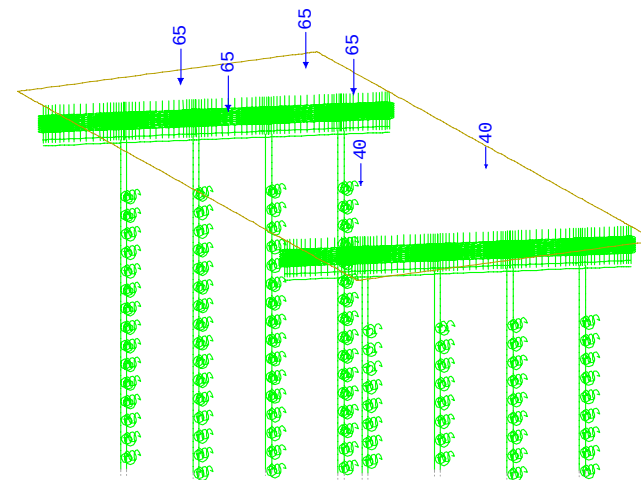
Sector of system
All loads, Loadcase 12 VH Mant , (1 cm 3D = unit) Free single load (force) vector (Unit=90 kN) (Max=65)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo

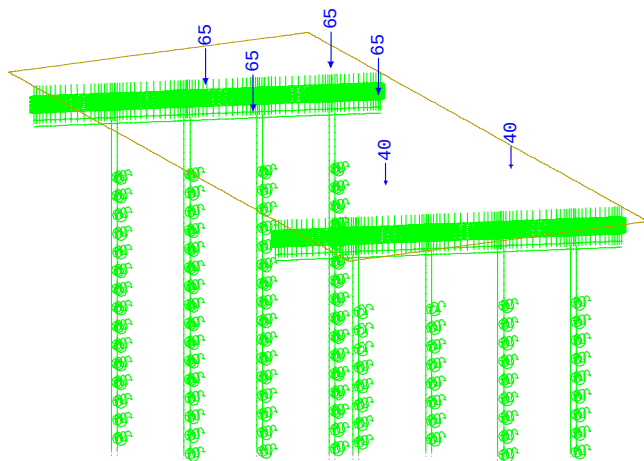


Sector of system
All loads, Loadcase 13 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

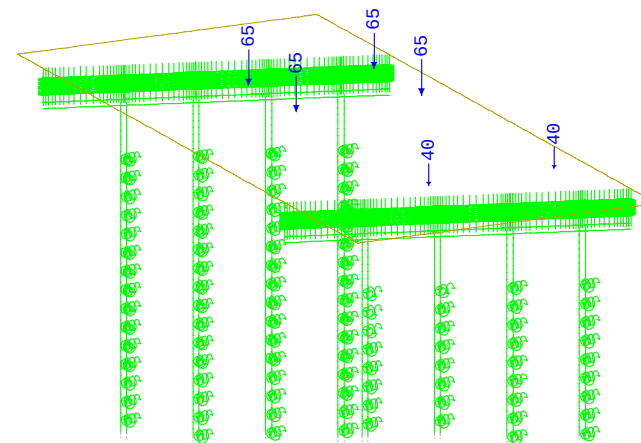


Sector of system
All loads, Loadcase 14 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



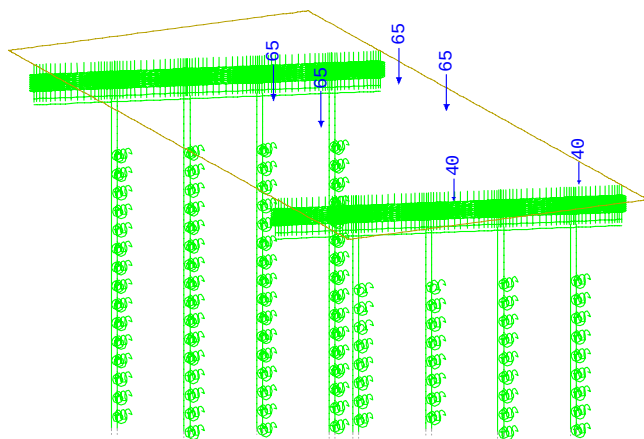
Sector of system
All loads, Loadcase 15 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)



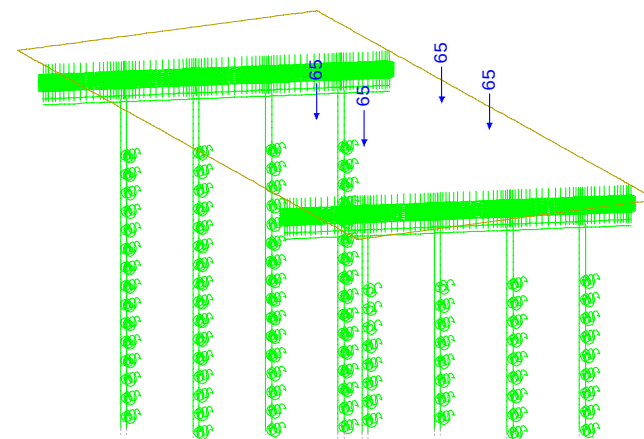
Sector of system
All loads, Loadcase 16 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo

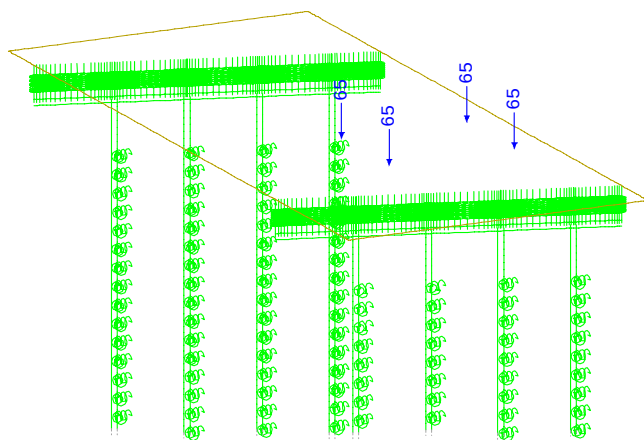


Sector of system
All loads, Loadcase 17 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

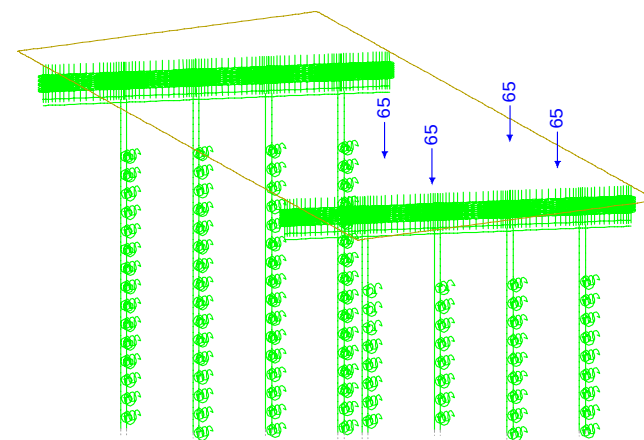


M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962
Sector of system
All loads, Loadcase 18 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



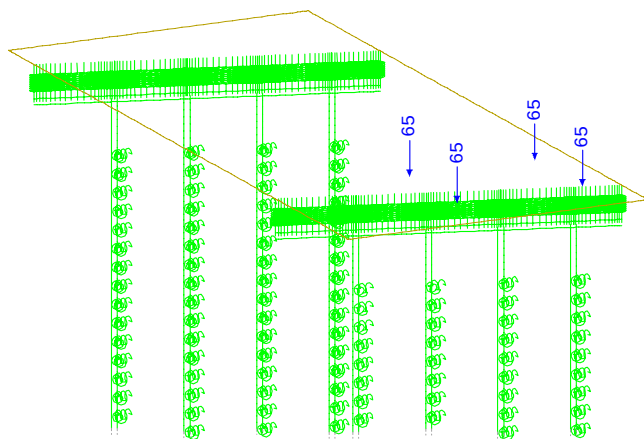
Sector of system
All loads, Loadcase 19 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)



M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962
Sector of system
All loads, Loadcase 20 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo

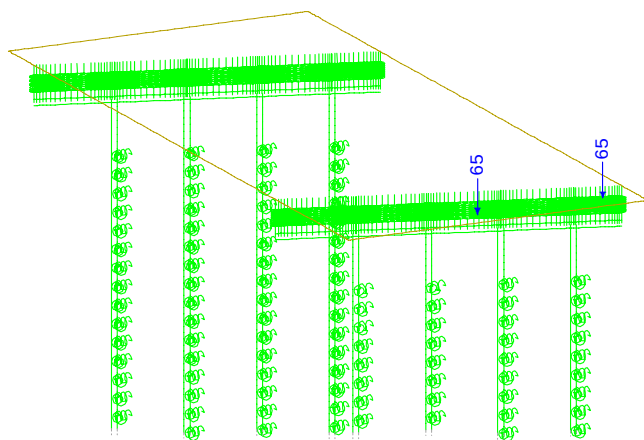


Sector of system
All loads, Loadcase 21 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962

Sector of system
All loads, Loadcase 22 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

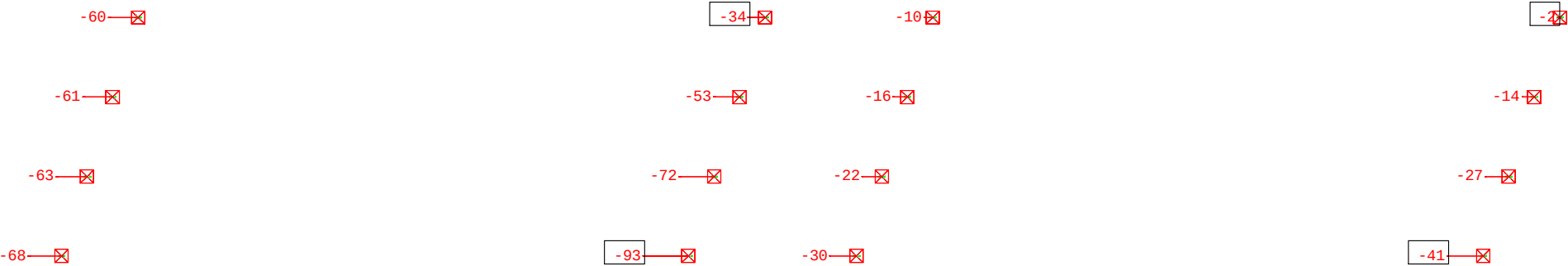
M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962



Sector of system
All loads, Loadcase 23 VH Mant , (1 cm 3D = unit) Free single load (force) vector
(Unit=90 kN) (Max=65)

M 1 : 69
X * 0.502
Y * 0.906
Z * 0.962

Características del modelo

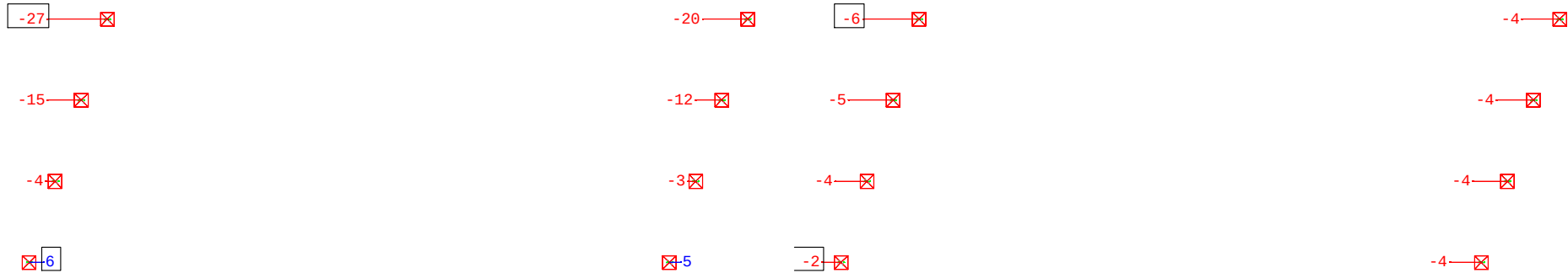


Y Sector of system Group 4
└─X Beam Elements , Normal force N_x , Loadcase 1 Peso propio , 1 cm 3D = 90.234 kN (Min=-93) (Max=-34)

M 1 : 50

Y Sector of system Group 4
└─X Beam Elements , Normal force N_x , Loadcase 2 Asfalto , 1 cm 3D = 50.000 kN (Min=-41) (Max=-2)

M 1 : 50



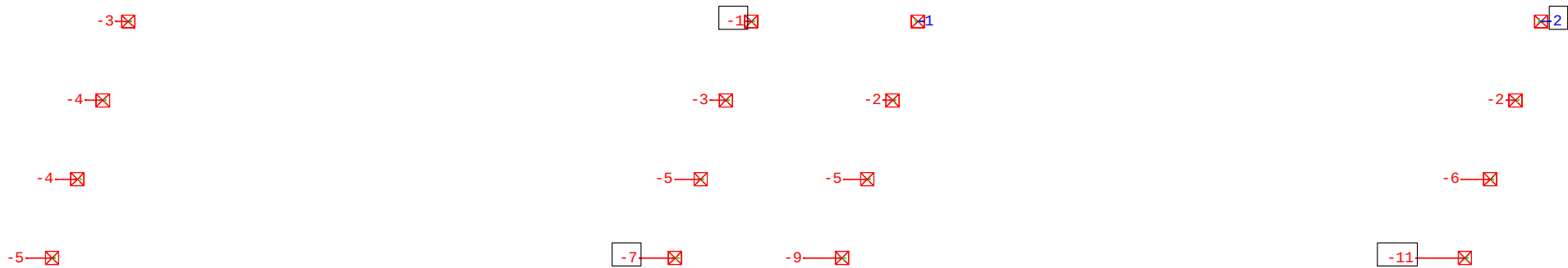
Y Sector of system Group 4
└─X Beam Elements , Normal force N_x , Loadcase 3 SCU1 , 1 cm 3D = 20.000 kN (Min=-27) (Max=6)

M 1 : 50

Y Sector of system Group 4
└─X Beam Elements , Normal force N_x , Loadcase 4 SCU2 , 1 cm 3D = 5.0000 kN (Min=-6) (Max=-2)

M 1 : 50

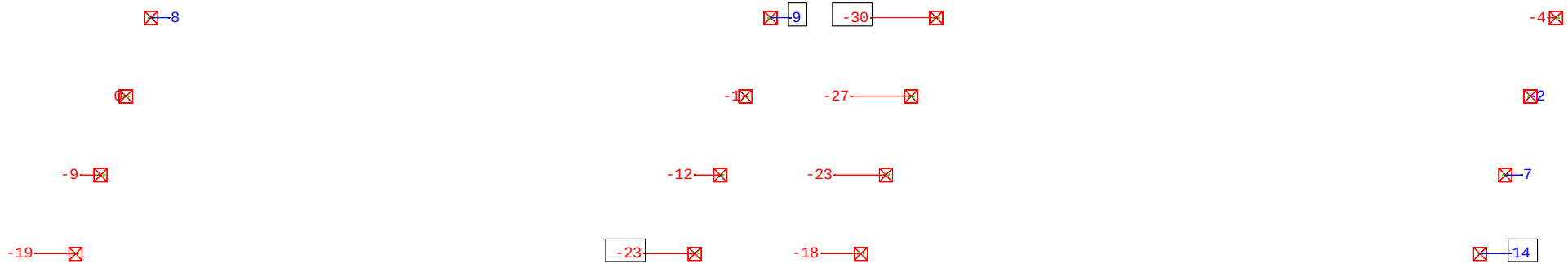
Pilotes



Y Sector of system Group 4
X Beam Elements , Normal force N_x , Loadcase 5 SCU3 , 1 cm 3D = 9.0234 kN (Min=-7) (Max=-1)

M 1 : 50 Y Sector of system Group 4
X Beam Elements , Normal force N_x , Loadcase 6 SCU4 , 1 cm 3D = 10.000 kN (Min=-11) (Max=2)

M 1 : 50

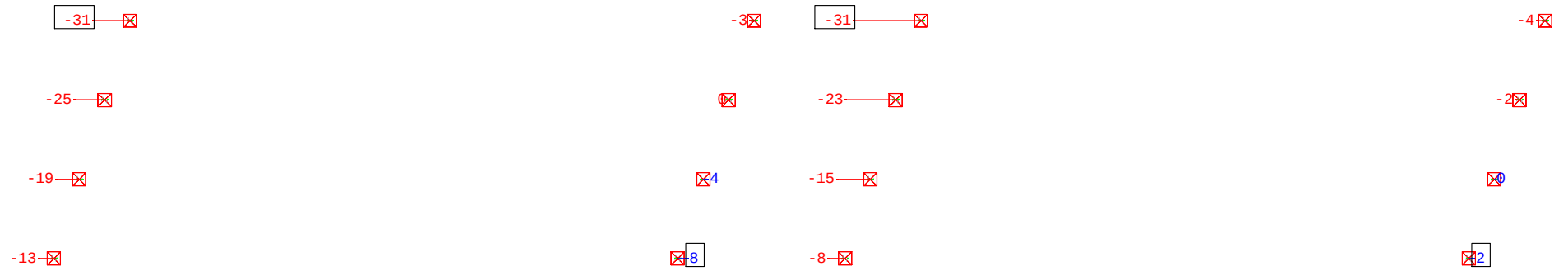


Y Sector of system Group 4
X Beam Elements , Normal force N_x , Loadcase 7 SCU5 , 1 cm 3D = 20.000 kN (Min=-23) (Max=9)

M 1 : 50 Y Sector of system Group 4
X Beam Elements , Normal force N_x , Loadcase 8 VH Mant , 1 cm 3D = 20.000 kN (Min=-30) (Max=14)

M 1 : 50

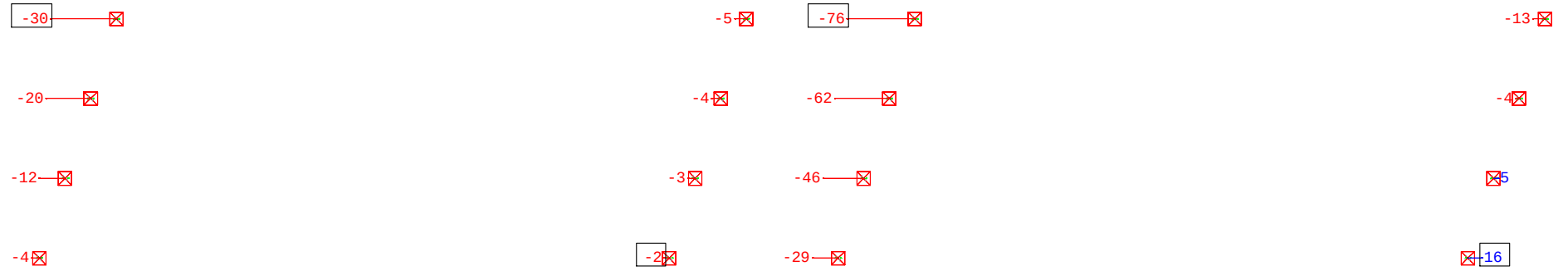
Pilotes



Y Sector of system Group 4
 Beam Elements , Normal force N_x , Loadcase 9 VH Mant , 1 cm 3D = 36.094 kN (Min=-31)
 (Max=8)

M 1 : 50 Y Sector of system Group 4
 Beam Elements , Normal force N_x , Loadcase 10 VH Mant , 1 cm 3D = 20.000 kN (Min=-31)
 (Max=2)

M 1 : 50

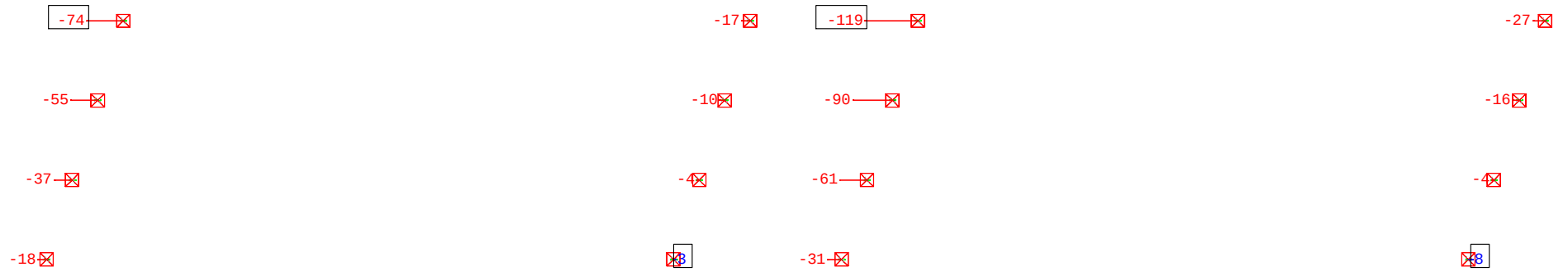


Y Sector of system Group 4
 Beam Elements , Normal force N_x , Loadcase 11 VH Mant , 1 cm 3D = 20.000 kN (Min=-30)
 (Max=-2)

M 1 : 50 Y Sector of system Group 4
 Beam Elements , Normal force N_x , Loadcase 12 VH Mant , 1 cm 3D = 50.000 kN (Min=-76)
 (Max=16)

M 1 : 50

Pilotes

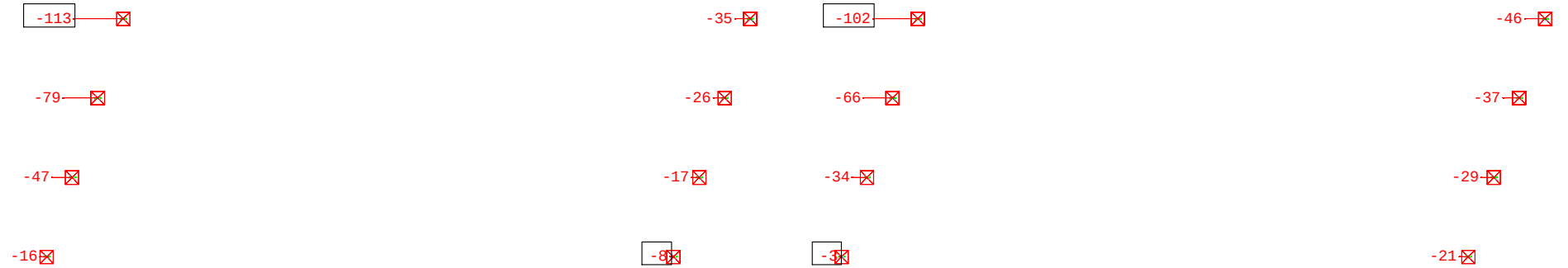


Y Sector of system Group 4
 Beam Elements , Normal force Nx, Loadcase 13 VH Mant , 1 cm 3D = 90.234 kN (Min=-74)
 (Max=3)

M 1 : 50

Y Sector of system Group 4
 Beam Elements , Normal force Nx, Loadcase 14 VH Mant , 1 cm 3D = 100.00 kN (Min=-119)
 (Max=8)

M 1 : 50



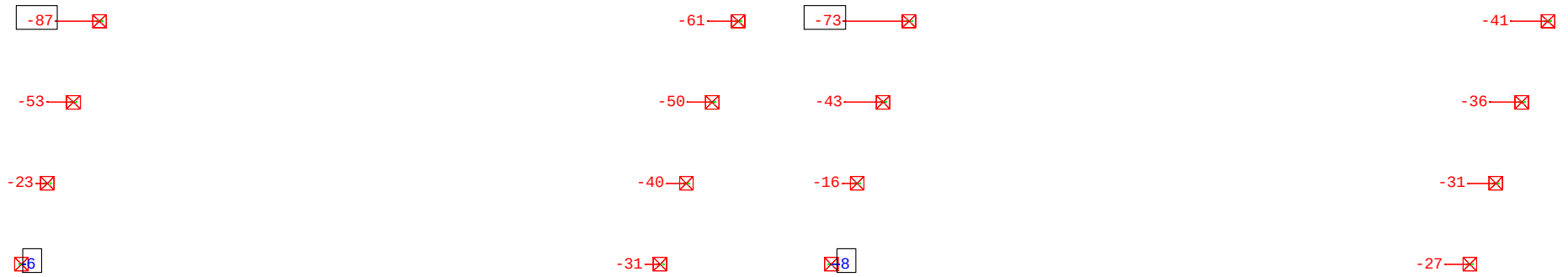
Y Sector of system Group 4
 Beam Elements , Normal force Nx, Loadcase 15 VH Mant , 1 cm 3D = 100.00 kN (Min=-113)
 (Max=-8)

M 1 : 50

Y Sector of system Group 4
 Beam Elements , Normal force Nx, Loadcase 16 VH Mant , 1 cm 3D = 100.00 kN (Min=-102)
 (Max=-3)

M 1 : 50

Pilotes

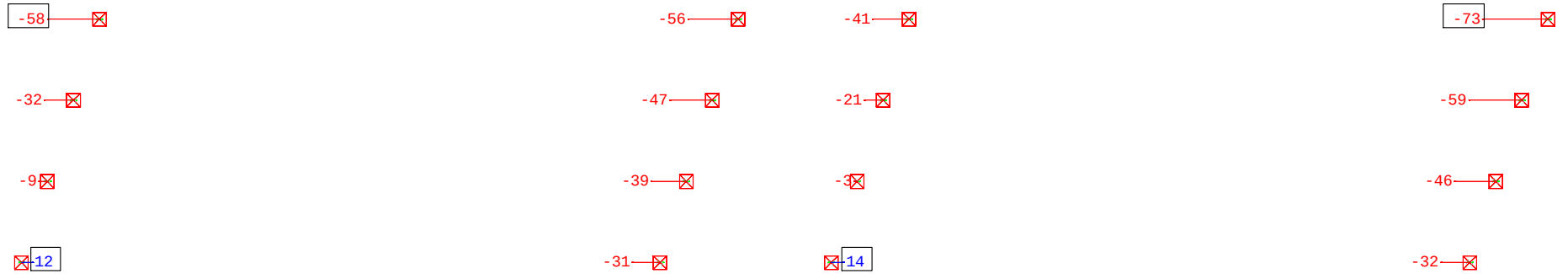


Y Sector of system Group 4
 1-X Beam Elements , Normal force Nx, Loadcase 17 VH Mant , 1 cm 3D = 90.234 kN (Min=-87)
 (Max=6)

M 1 : 50

Y Sector of system Group 4
 1-X Beam Elements , Normal force Nx, Loadcase 18 VH Mant , 1 cm 3D = 50.000 kN (Min=-73)
 (Max=8)

M 1 : 50



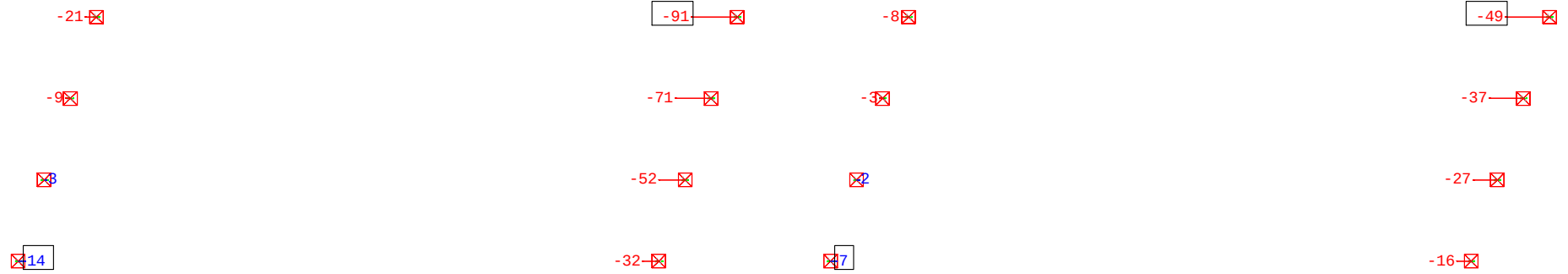
Y Sector of system Group 4
 1-X Beam Elements , Normal force Nx, Loadcase 19 VH Mant , 1 cm 3D = 50.000 kN (Min=-58)
 (Max=12)

M 1 : 50

Y Sector of system Group 4
 1-X Beam Elements , Normal force Nx, Loadcase 20 VH Mant , 1 cm 3D = 50.000 kN (Min=-73)
 (Max=14)

M 1 : 50

Pilotes

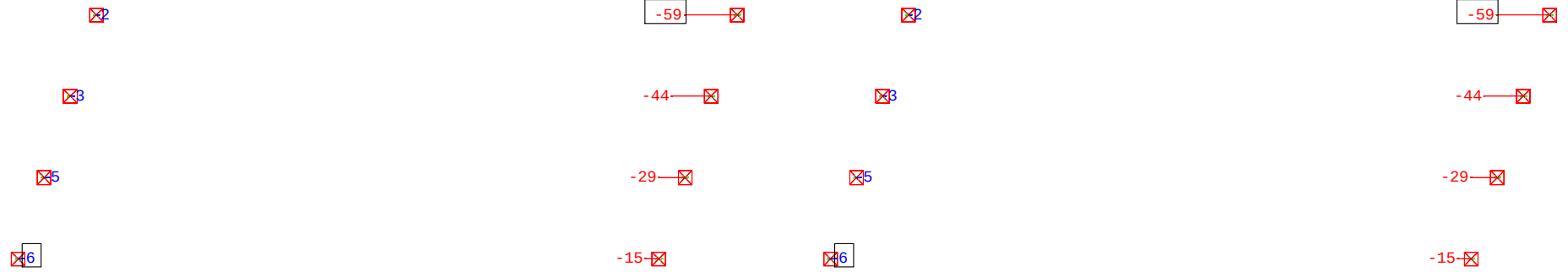


Y Sector of system Group 4
 1-X Beam Elements , Normal force Nx, Loadcase 21 VH Mant , 1 cm 3D = 90.234 kN (Min=-91)
 (Max=14)

M 1 : 50

Y Sector of system Group 4
 1-X Beam Elements , Normal force Nx, Loadcase 22 VH Mant , 1 cm 3D = 50.000 kN (Min=-49)
 (Max=7)

M 1 : 50



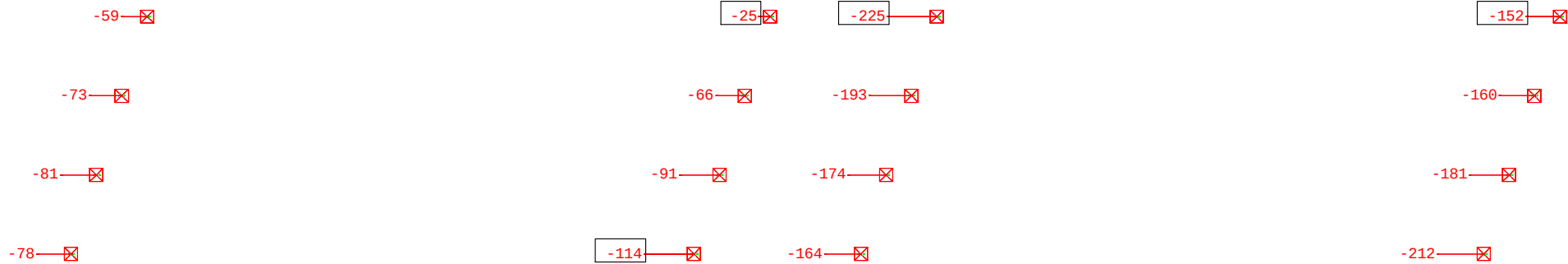
Y Sector of system Group 4
 1-X Beam Elements , Normal force Nx, Loadcase 23 VH Mant , 1 cm 3D = 50.000 kN (Min=-59)
 (Max=6)

M 1 : 50

Y Sector of system Group 4
 1-X Beam Elements , Normal force Nx, Loadcase 23 VH Mant , 1 cm 3D = 50.000 kN (Min=-59)
 (Max=6)

M 1 : 50

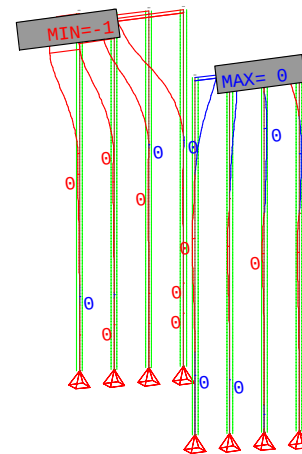
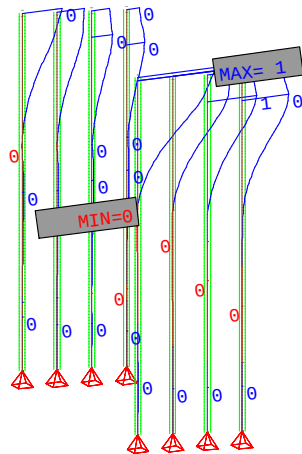
Pilotes



Y Sector of system Group 4
Beam Elements , Normal force N_x , Loadcase 1121 MAXR-N BEAM Forces in Beam Eleme , 1 cm 3D
= 100.00 kN (Min=-114) (Max=-25)

M 1 : 50 Y Sector of system Group 4
Beam Elements , Normal force N_x , Loadcase 1122 MINR-N BEAM Forces in Beam Eleme , 1 cm 3D
= 200.00 kN (Min=-225) (Max=-152)

M 1 : 50

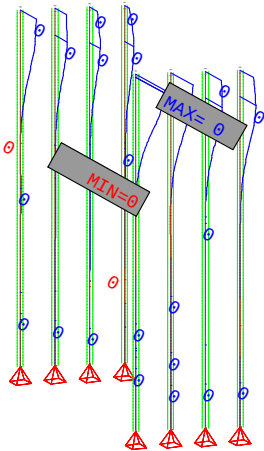


Z Sector of system Group 4
Beam Elements , Bending moment M_y , Loadcase 1129 MAXR-MY BEAM Forces in Beam Elem , 1 cm
3D = 0.50000 kNm (Min= 0) (Max=1)

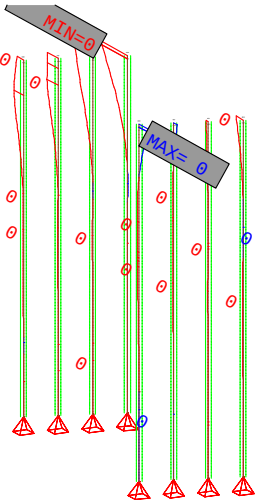
M 1 : 144 Z Sector of system Group 4
Beam Elements , Bending moment M_y , Loadcase 1130 MINR-MY BEAM Forces in Beam Elem , 1 cm
3D = 0.50000 kNm (Min=-1) (Max=0)

M 1 : 144
X * 0.502
Y * 0.906
Z * 0.962

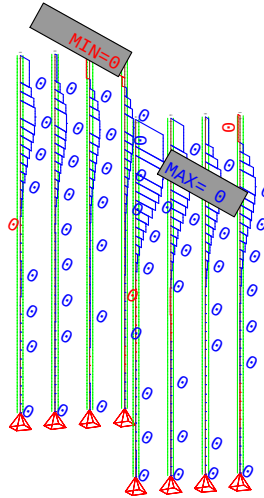
Pilotes



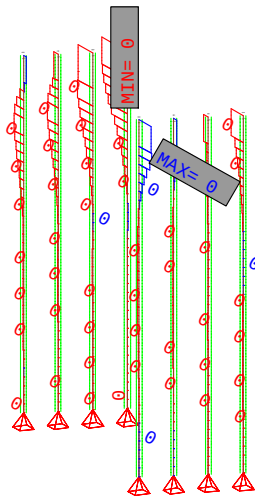
Sector of system Group 4
Beam Elements , Bending moment Mz, Loadcase 1131 MAXR-MZ BEAM Forces in Beam Elem , 1 cm
3D = 0.20000 kNm (Min= 0) (Max=0)



Sector of system Group 4
Beam Elements , Bending moment Mz, Loadcase 1132 MINR-MZ BEAM Forces in Beam Elem , 1 cm
3D = 0.20000 kNm (Min= 0) (Max=0)

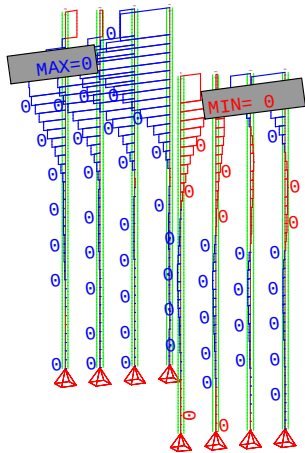


Sector of system Group 4
Beam Elements , Shear force Vy, Loadcase 1123 MAXR-VY BEAM Forces in Beam Elem , 1 cm 3D
= 0.10000 kN (Min= 0) (Max=0)



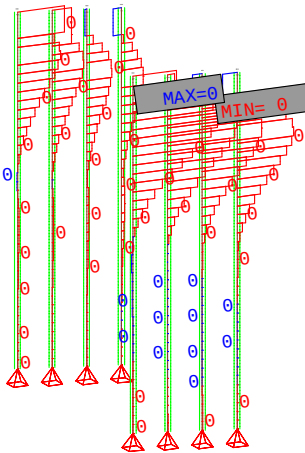
Sector of system Group 4
Beam Elements , Shear force Vy, Loadcase 1124 MINR-VY BEAM Forces in Beam Elem , 1 cm 3D
= 0.10000 kN (Min= 0) (Max=0)

Pilotes



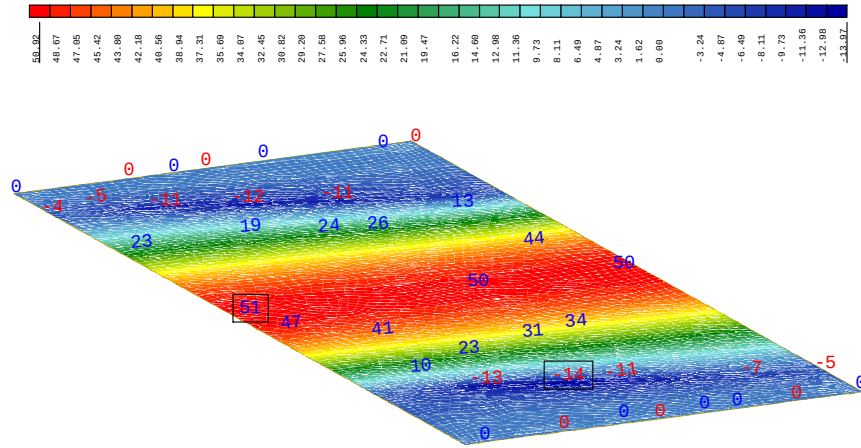
Z
└─Y
Sector of system Group 4
Beam Elements , Shear force Vz, Loadcase 1125 MAXR-VZ BEAM Forces in Beam Elem , 1 cm 3D
= 0.20000 kN (Min= 0) (Max=0)

M 1 : 144
X * 0.502
Y * 0.906
Z * 0.962



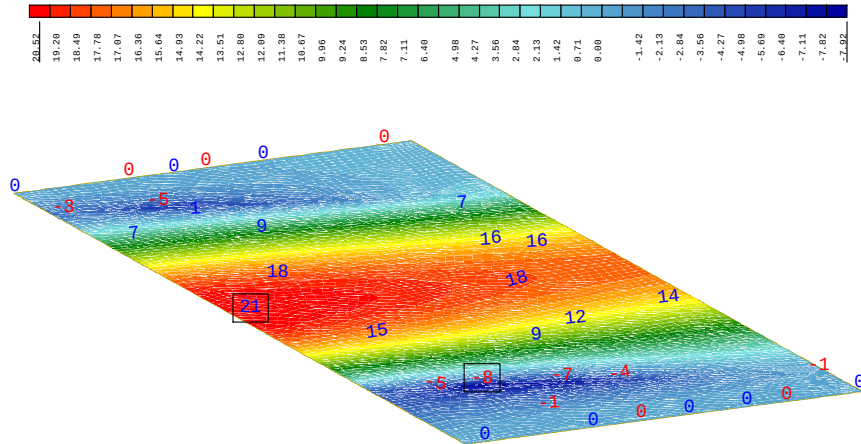
Z
└─Y
Sector of system Group 4
Beam Elements , Shear force Vz, Loadcase 1126 MINR-VZ BEAM Forces in Beam Elem , 1 cm 3D
= 0.20000 kN (Min= 0) (Max=0)

M 1 : 144
X * 0.502
Y * 0.906
Z * 0.962



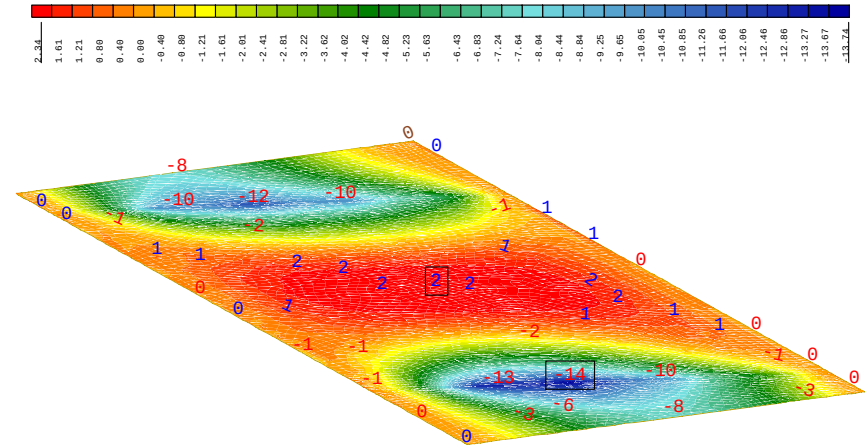
Sector of system Group 1
Bending moment m-xx in local x in Node ↘, Loadcase 1 Peso propio , from -14 to 51 step 2
kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



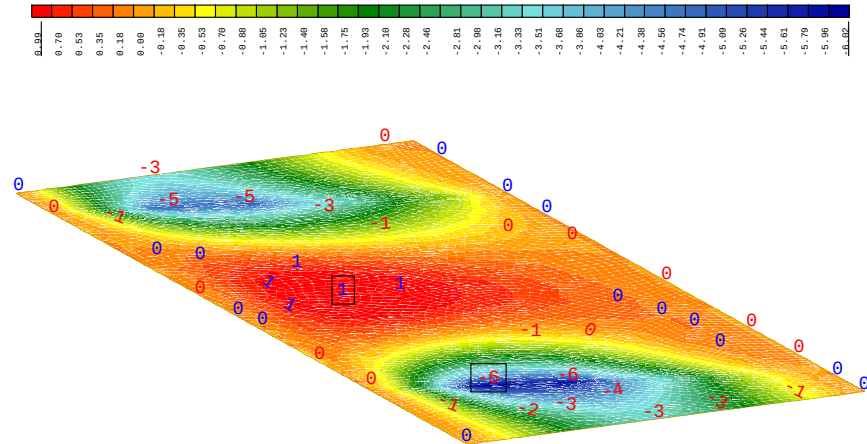
Sector of system Group 1
Bending moment m-xx in local x in Node ↘, Loadcase 2 Asfalto , from -8 to 21 step 1 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y in Node ↔, Loadcase 1 Peso propio , from -14 to 2 step 0
kNm/m

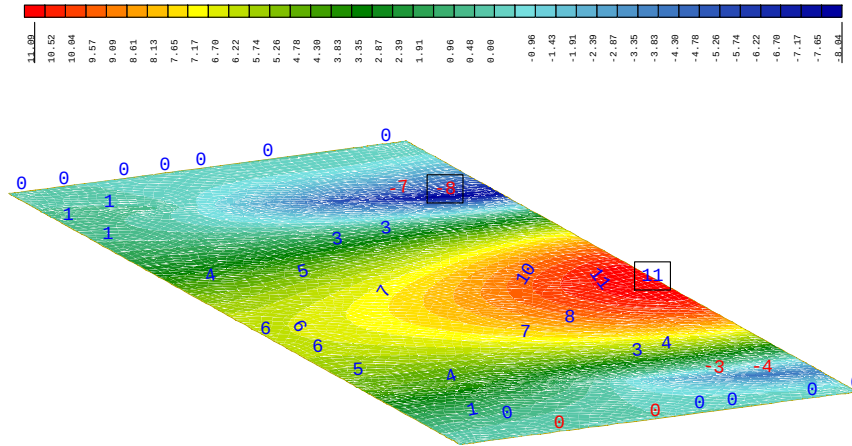
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y in Node ↔, Loadcase 2 Asfalto , from -6 to 1 step 0 kNm/m

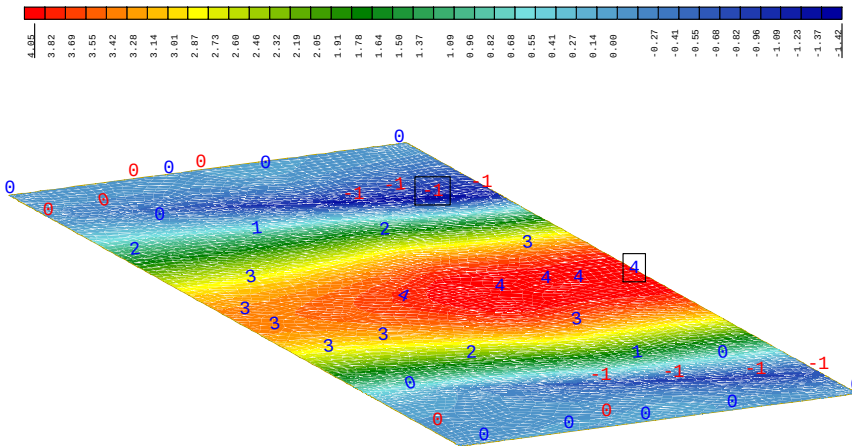
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



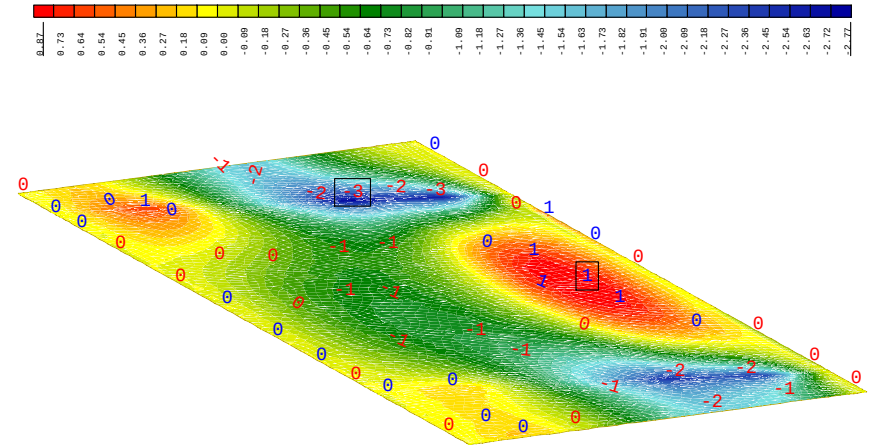
Sector of system Group 1
Bending moment m-xx in local x in Node ↗, Loadcase 3 SCU1, from -8 to 11 step 0 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



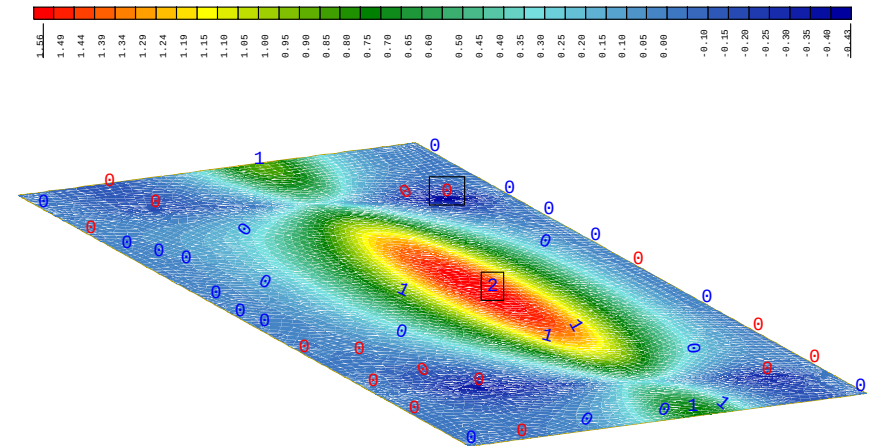
Sector of system Group 1
Bending moment m-xx in local x in Node ↗, Loadcase 4 SCU2, from -1 to 4 step 0 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y in Node ↗, Loadcase 3 SCU1, from -3 to 1 step 0 kNm/m

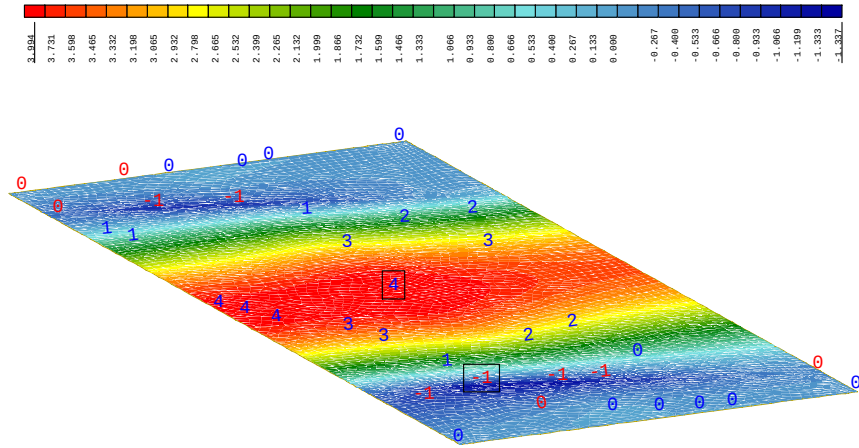
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y in Node ↗, Loadcase 4 SCU2, from 0 to 2 step 0 kNm/m

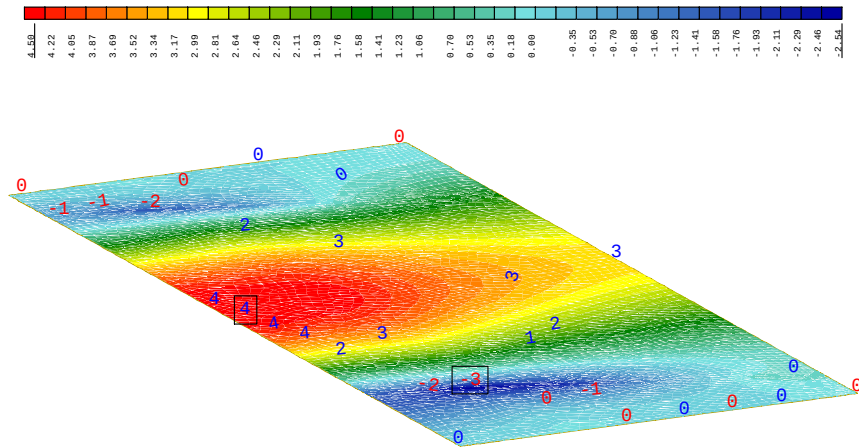
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



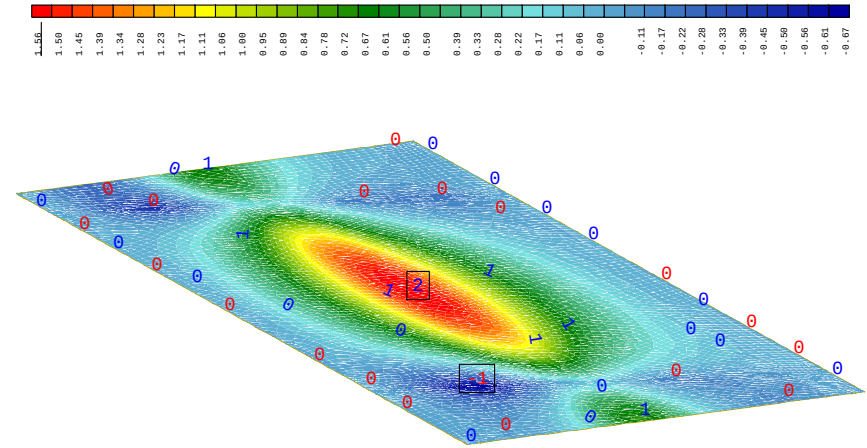
Sector of system Group 1
Bending moment m-xx in local x in Node ↗, Loadcase 5 SCU3 , from -1 to 4 step 0 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



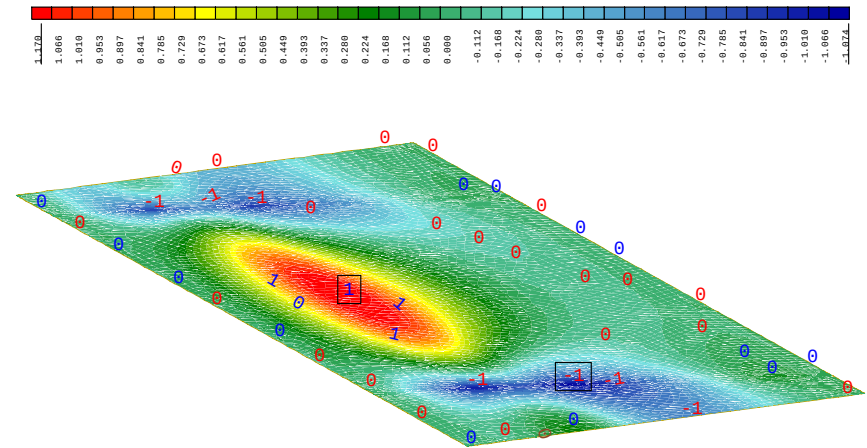
Sector of system Group 1
Bending moment m-xx in local x in Node ↗, Loadcase 6 SCU4 , from -3 to 4 step 0 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y in Node ↔, Loadcase 5 SCU3 , from -1 to 2 step 0 kNm/m

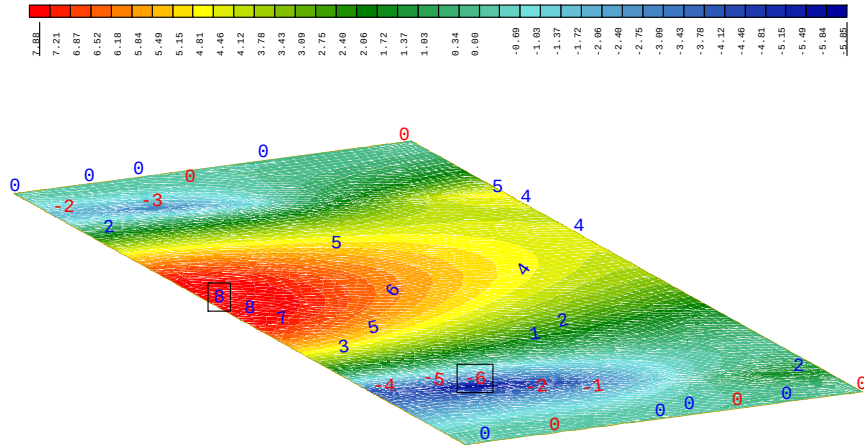
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y in Node ↔, Loadcase 6 SCU4 , from -1 to 1 step 0 kNm/m

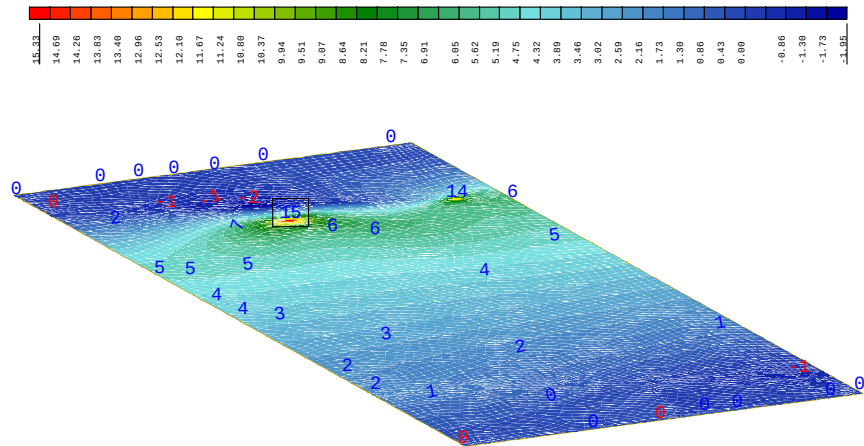
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



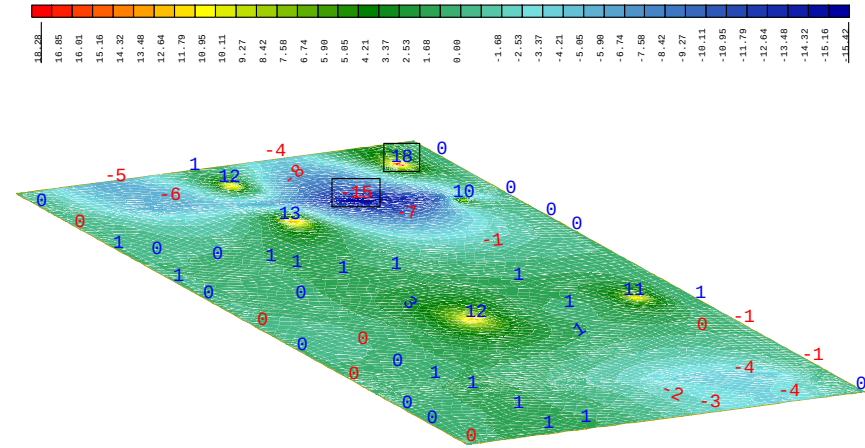
Sector of system Group 1
Bending moment m-xx in local x in Node ↗, Loadcase 7 SCU5 , from -6 to 8 step 0 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



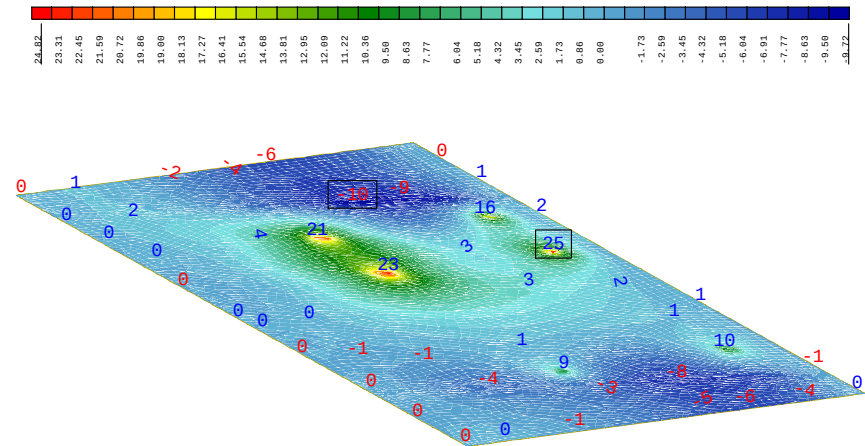
Sector of system Group 1
Bending moment m-xx in local x in Node ↗, Loadcase 10 VH Mant , from -2 to 15 step 0 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y in Node ↔, Loadcase 14 VH Mant , from -15 to 18 step 1 kNm/m

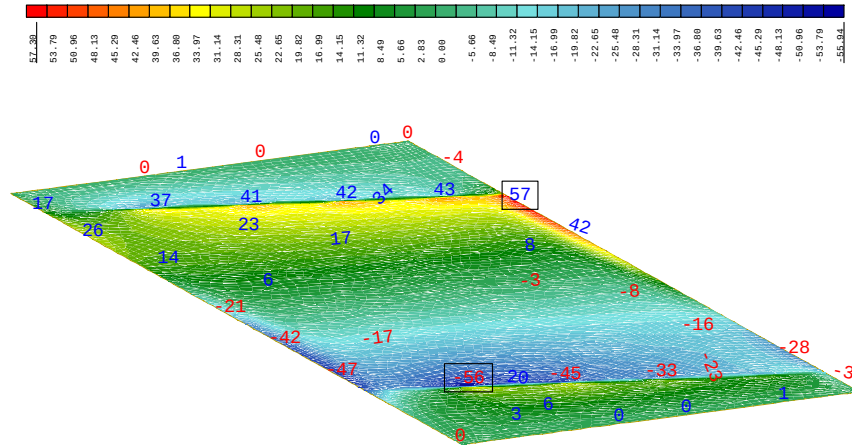
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y in Node ↔, Loadcase 16 VH Mant , from -10 to 25 step 1 kNm/m

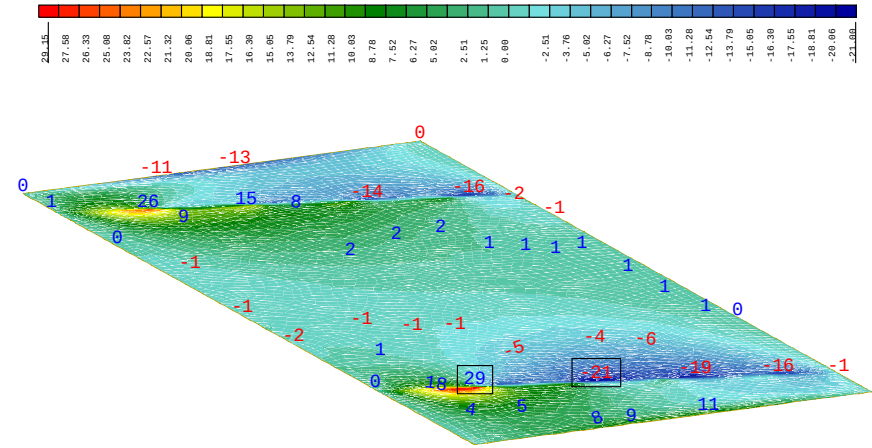
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



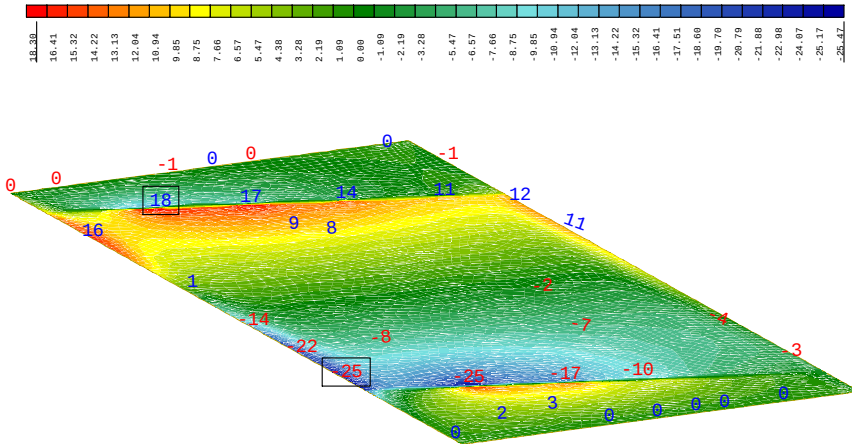
Sector of system Group 1
Shear force v-x in local x in Node ↗, Loadcase 1 Peso propio , from -56 to 57 step 3 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



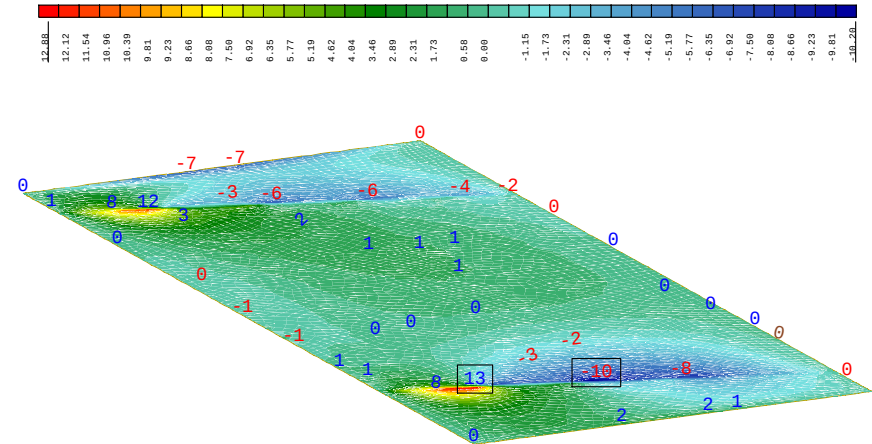
Sector of system Group 1
Shear force v-y in local y in Node ↔, Loadcase 1 Peso propio , from -21 to 29 step 1 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-x in local x in Node ↗, Loadcase 2 Asfalto , from -25 to 18 step 1 kN/m

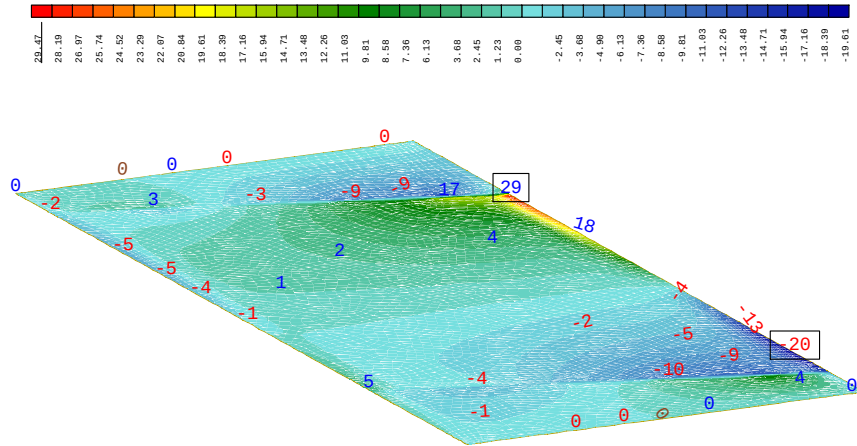
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-y in local y in Node ↔, Loadcase 2 Asfalto , from -10 to 13 step 1 kN/m

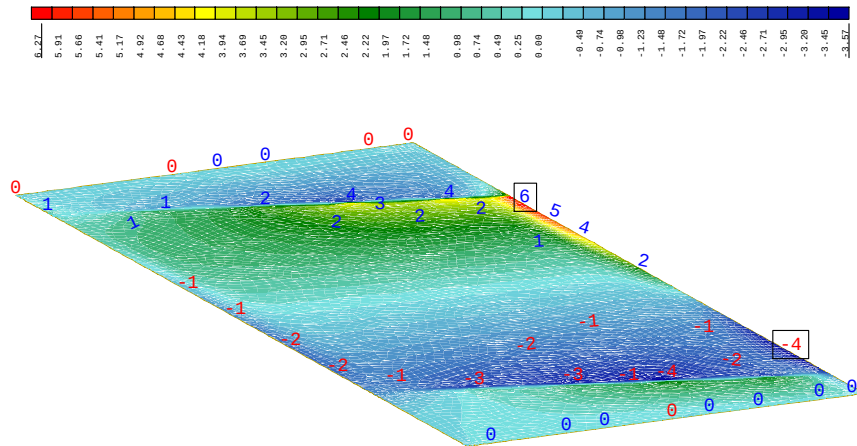
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



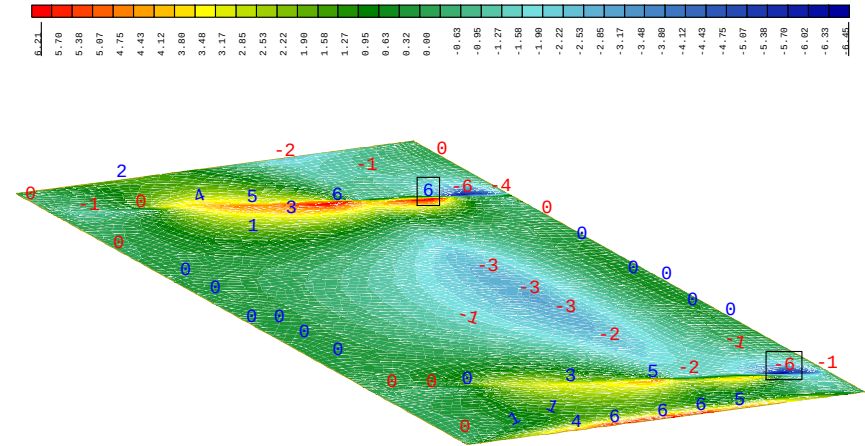
Sector of system Group 1
Shear force v-x in local x in Node 29, Loadcase 3 SCU1, from -20 to 29 step 1 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



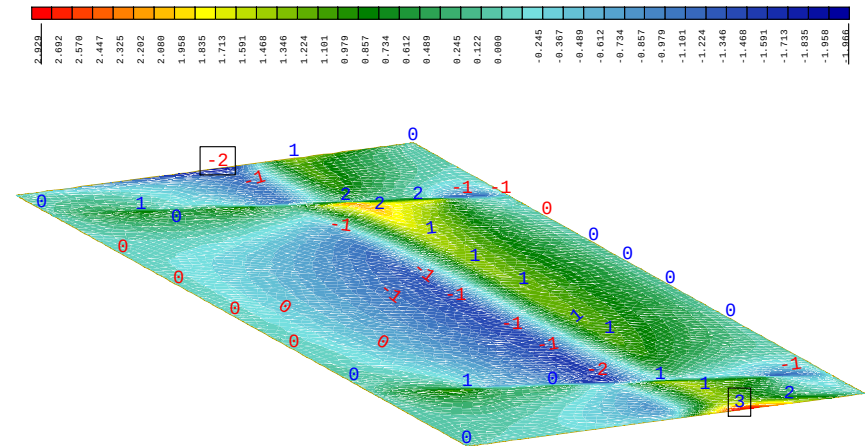
Sector of system Group 1
Shear force v-x in local x in Node 6, Loadcase 4 SCU2, from -4 to 6 step 0 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-y in local y in Node 6, Loadcase 3 SCU1, from -6 to 6 step 0 kN/m

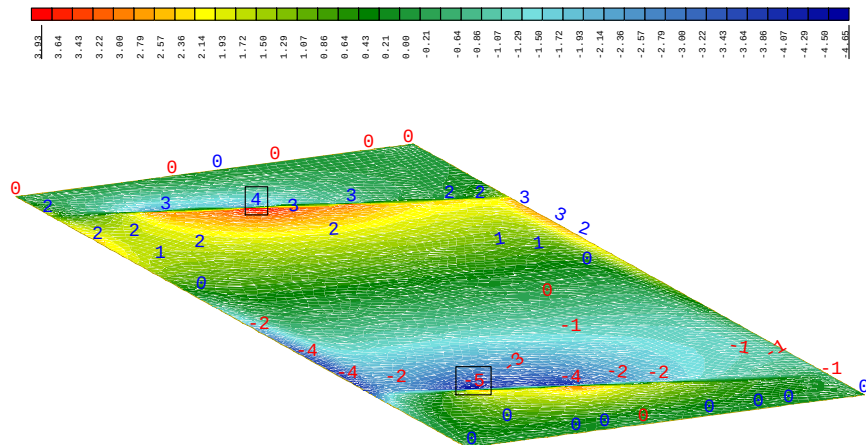
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-y in local y in Node 3, Loadcase 4 SCU2, from -2 to 3 step 0 kN/m

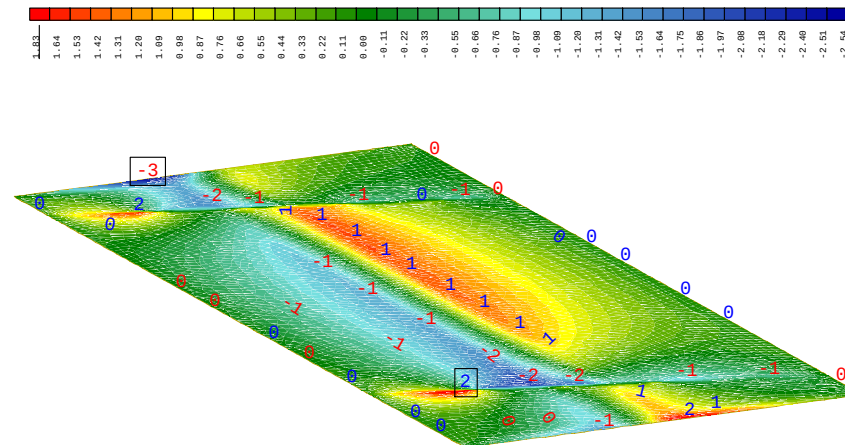
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



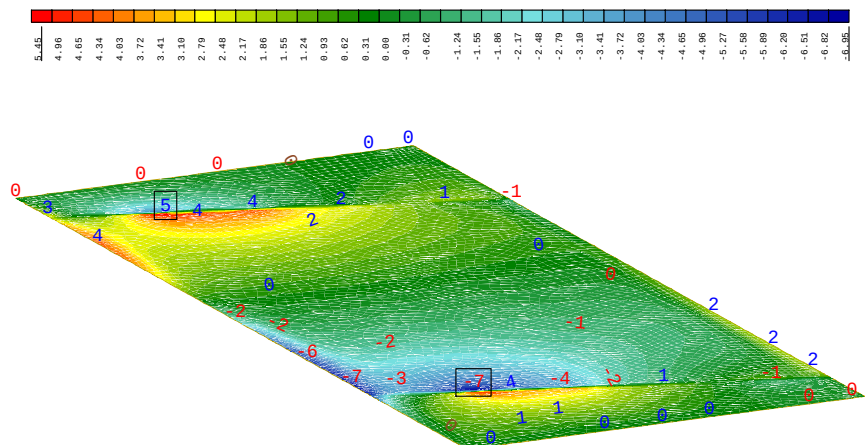
Sector of system Group 1
Shear force v-x in local x in Node 5, Loadcase 5 SCU3, from -5 to 4 step 0 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



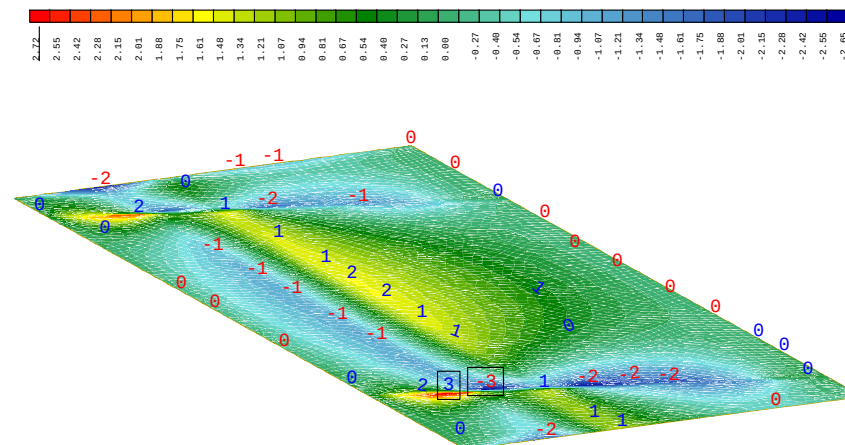
Sector of system Group 1
Shear force v-y in local y in Node 2, Loadcase 5 SCU3, from -3 to 2 step 0 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-x in local x in Node 7, Loadcase 6 SCU4, from -7 to 5 step 0 kN/m

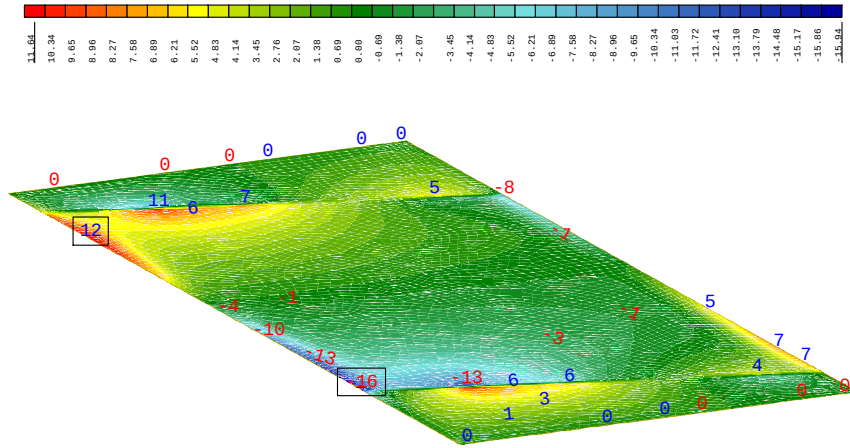
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-y in local y in Node 3, Loadcase 6 SCU4, from -3 to 3 step 0 kN/m

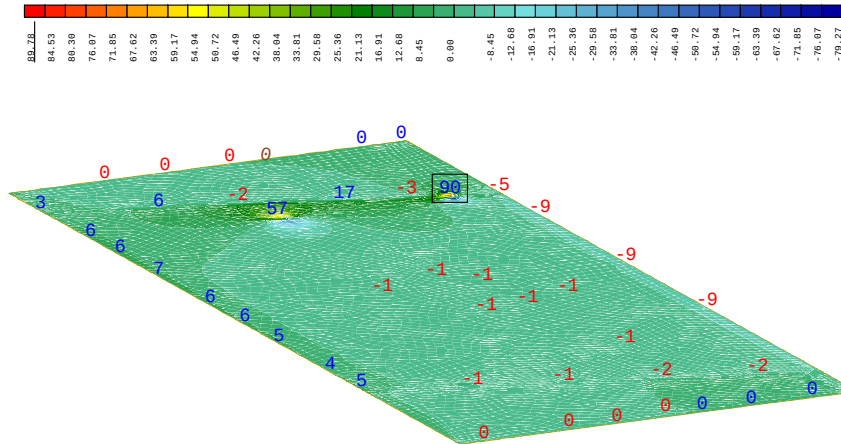
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



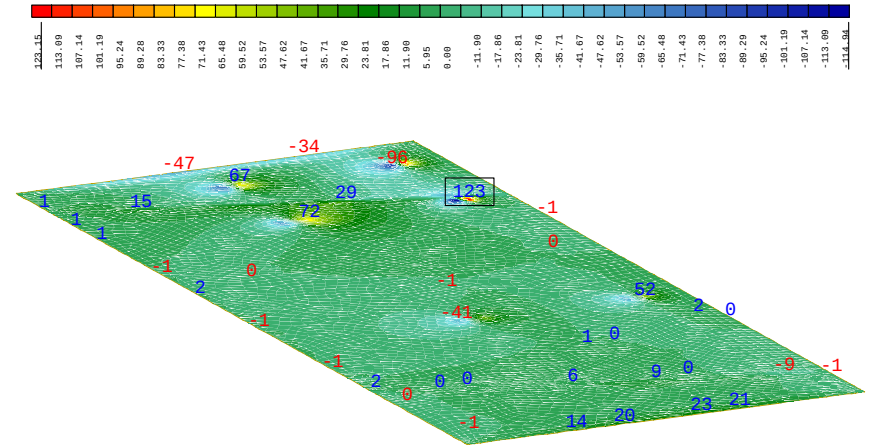
Sector of system Group 1
Shear force v-x in local x in Node ↗, Loadcase 7 SCU5 , from -16 to 12 step 1 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



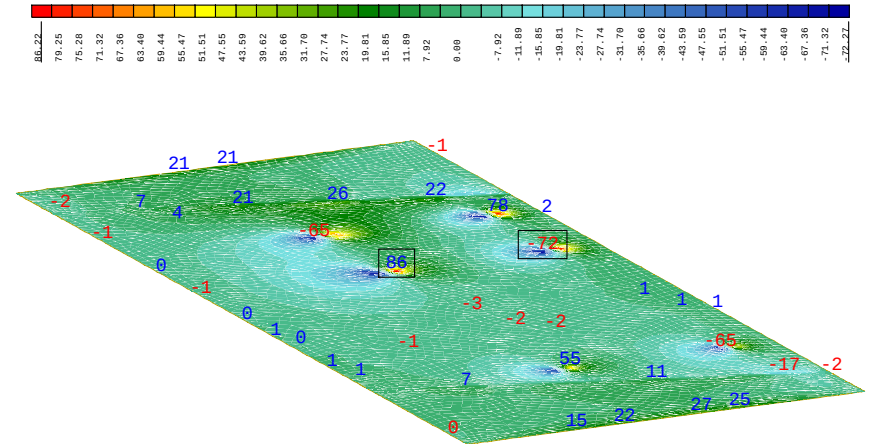
Sector of system Group 1
Shear force v-x in local x in Node ↗, Loadcase 10 VH Mant , from -79 to 90 step 4 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-y in local y in Node ↔, Loadcase 14 VH Mant , from -115 to 123 step 6 kN/m

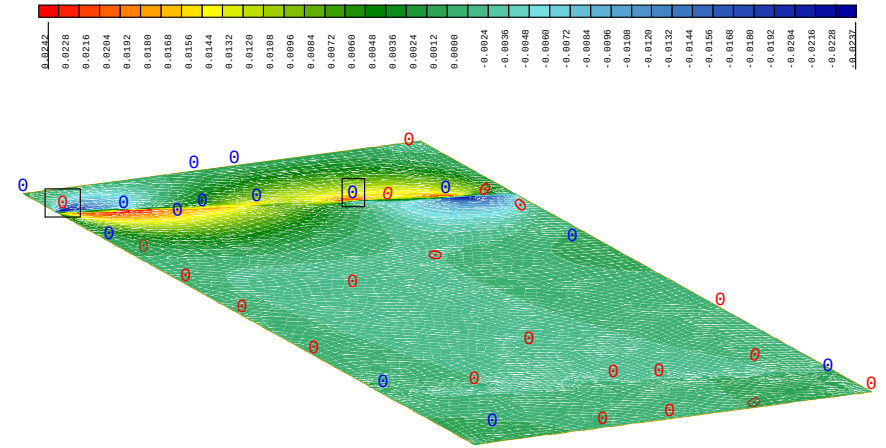
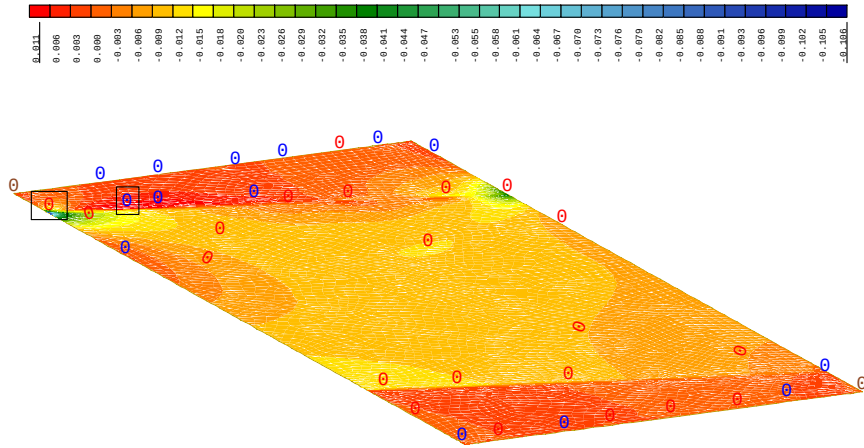
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-y in local y in Node ↔, Loadcase 16 VH Mant , from -72 to 86 step 4 kN/m

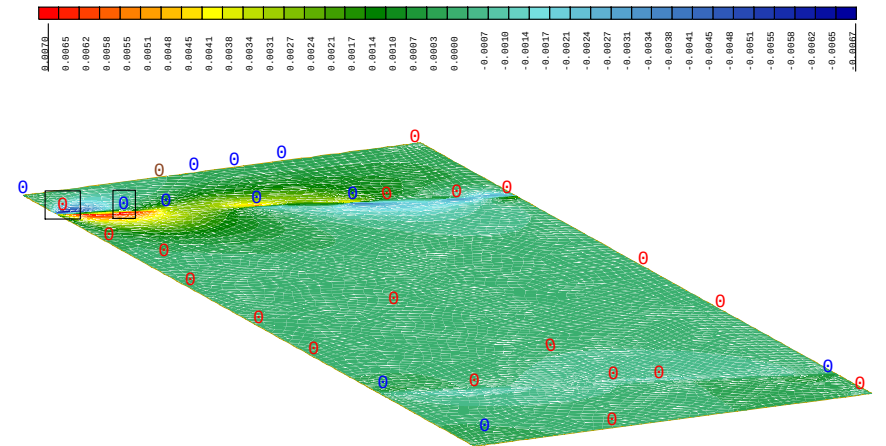
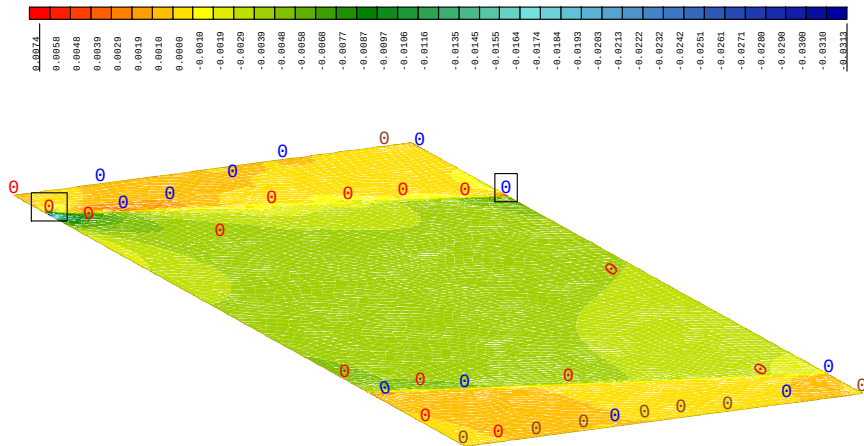
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



Sector of system Group 1
Membrane force n-xx in local x in Node ↘, Loadcase 1 Peso propio, from 0 to 0 step 0 kN/m
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

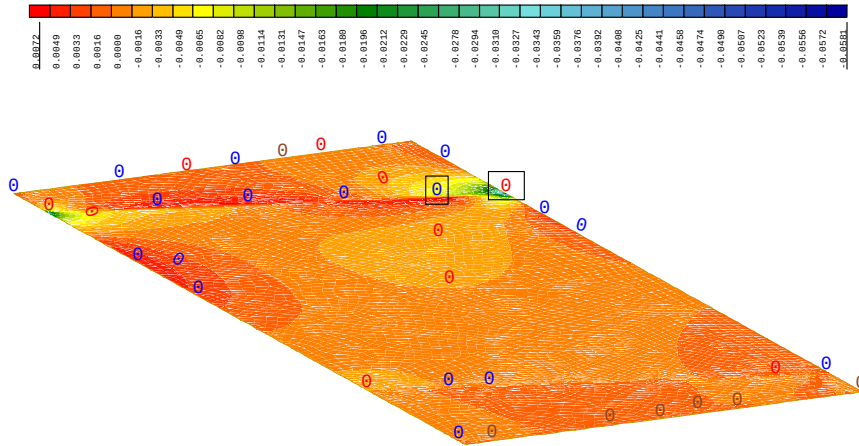
Sector of system Group 1
Membrane shear force n-xy in local xy in Node ↕, Loadcase 1 Peso propio, from 0 to 0 step 0 kN/m
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Membrane force n-xx in local x in Node ↘, Loadcase 2 Asfalto, from 0 to 0 step 0 kN/m
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

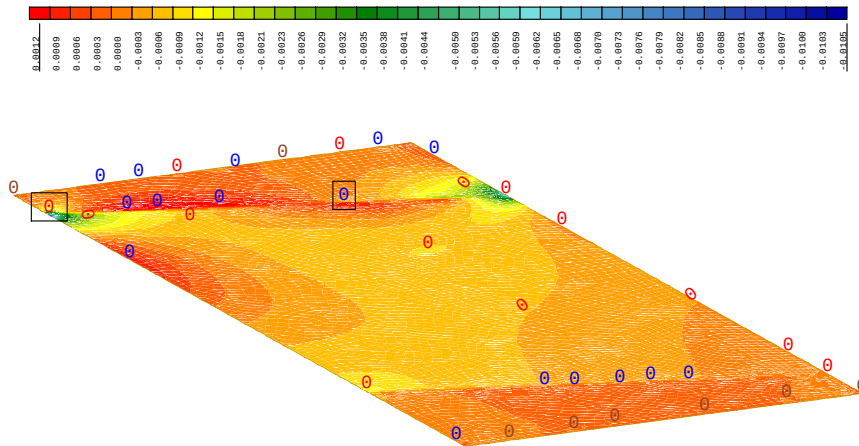
Sector of system Group 1
Membrane shear force n-xy in local xy in Node ↕, Loadcase 2 Asfalto, from 0 to 0 step 0 kN/m
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



Sector of system Group 1
Membrane force n-xx in local x in Node ↗, Loadcase 3 SCU1, from 0 to 0 step 0 kN/m

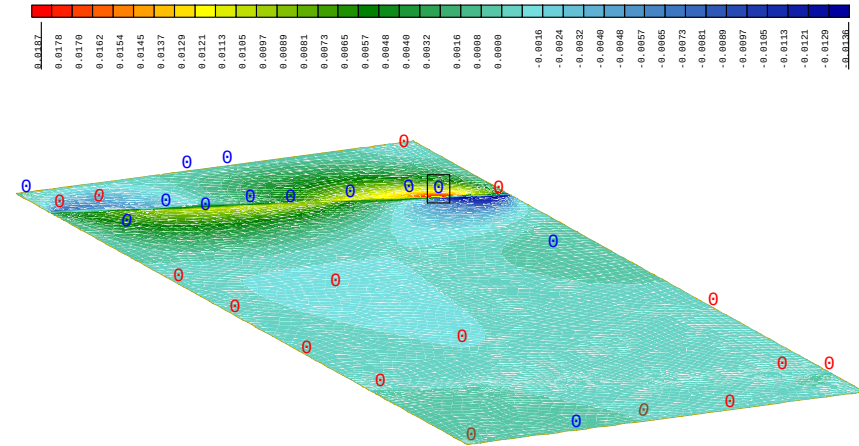
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Membrane force n-xx in local x in Node ↗, Loadcase 4 SCU2, from 0 to 0 step 0 kN/m

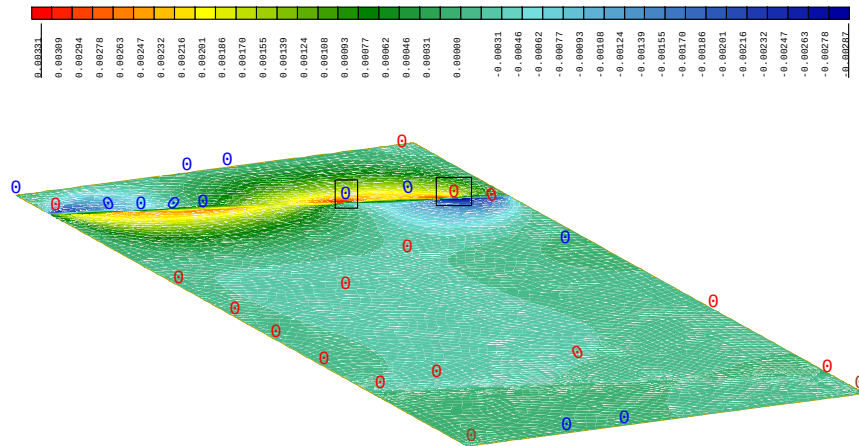
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



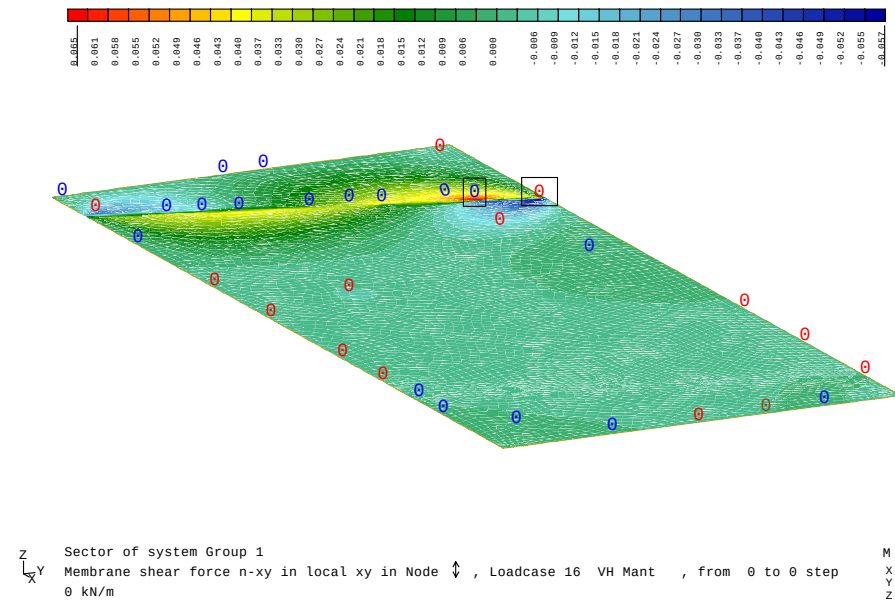
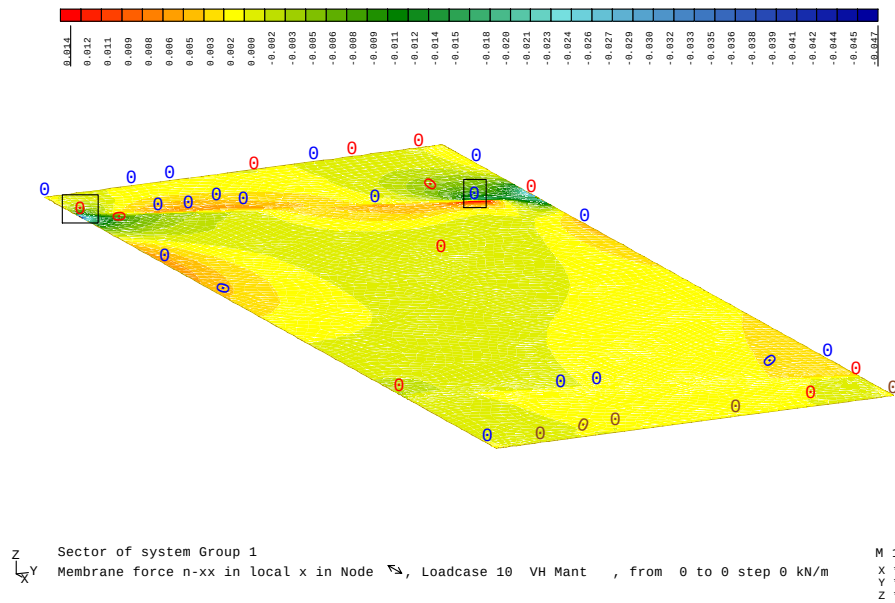
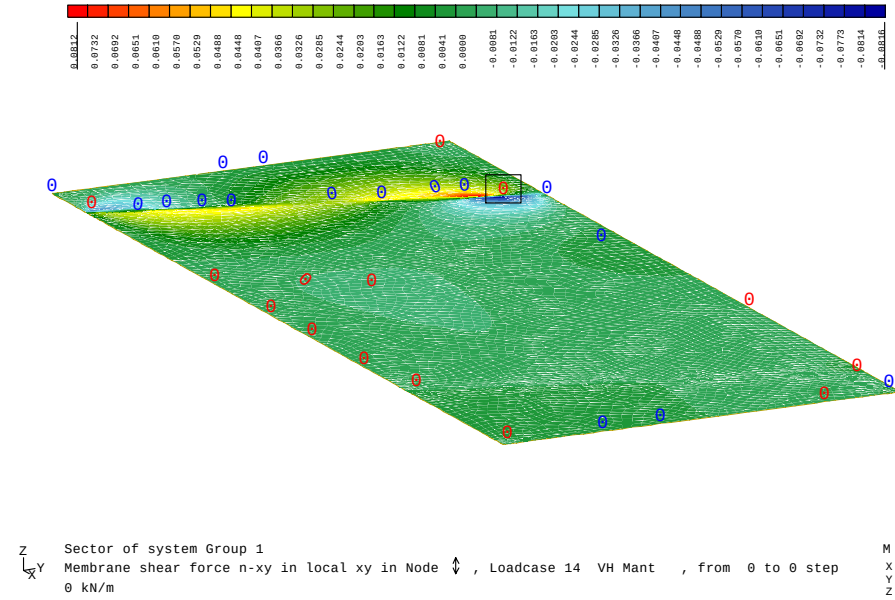
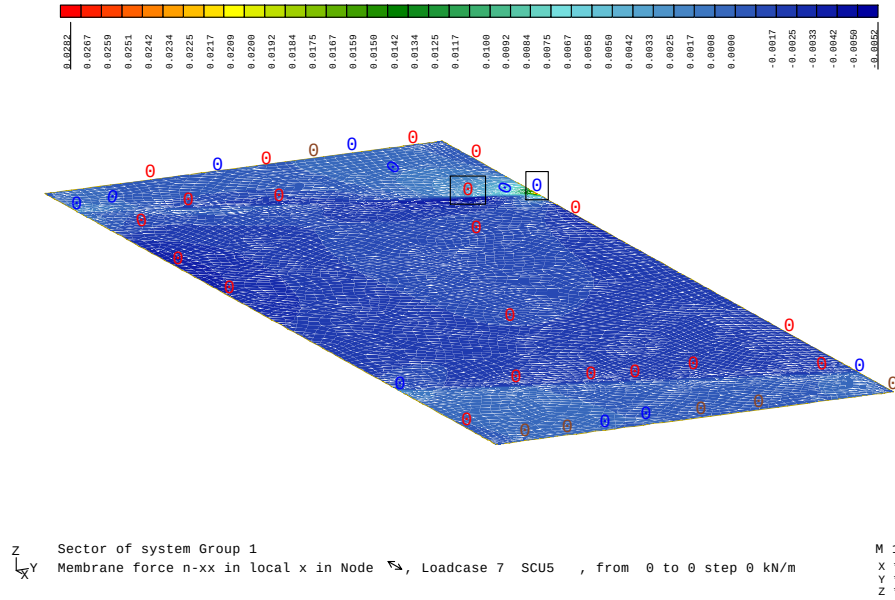
Sector of system Group 1
Membrane shear force n-xy in local xy in Node ↕, Loadcase 3 SCU1, from 0 to 0 step 0 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

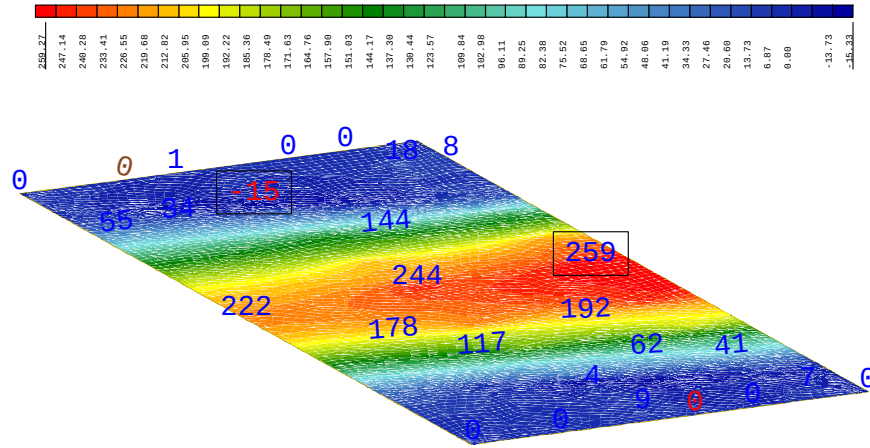


Sector of system Group 1
Membrane shear force n-xy in local xy in Node ↕, Loadcase 4 SCU2, from 0 to 0 step 0 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

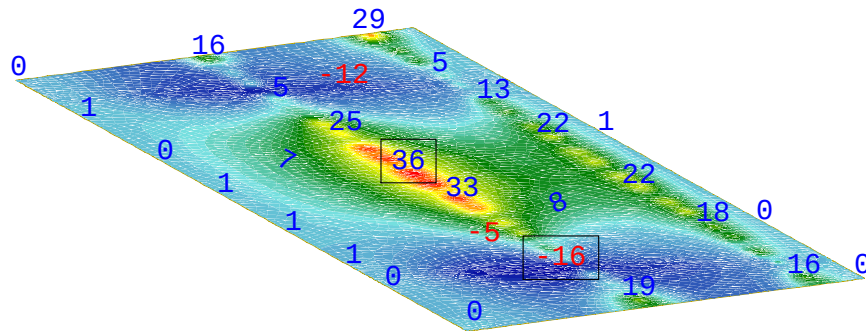
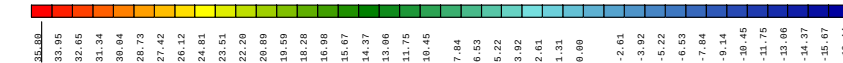


Esfuerzos LC y ELU (LOSA)



Sector of system Group 1
Bending moment m-xx in local x from middle of element ↗, Loadcase 2101 MAX-MXX QUAD Forces in Quadrilat , from -15 to 259 step 7 kNm/m

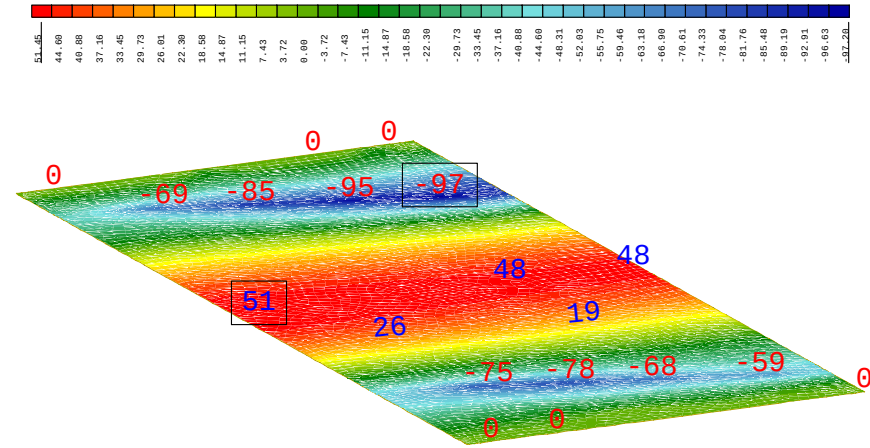
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y from middle of element ↔, Loadcase 2103 MAX-MYY QUAD Forces in Quadrilat , from -16 to 36 step 1 kNm/m

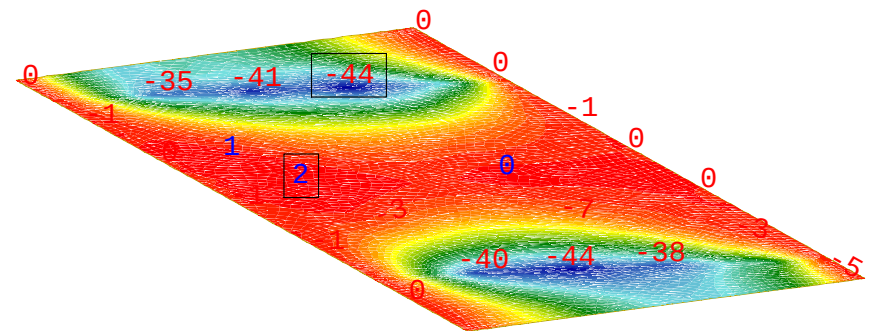
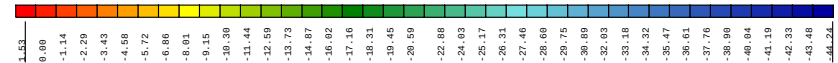
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



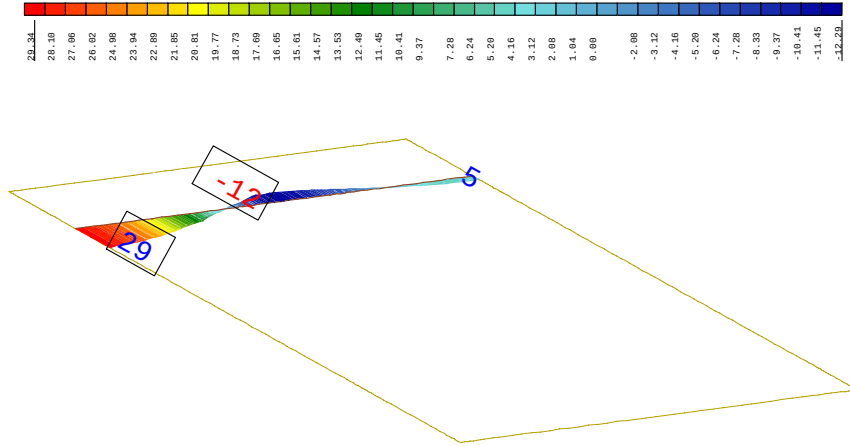
Sector of system Group 1
Bending moment m-xx in local x from middle of element ↗, Loadcase 2102 MIN-MXX QUAD Forces in Quadrilat , from -97 to 51 step 4 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



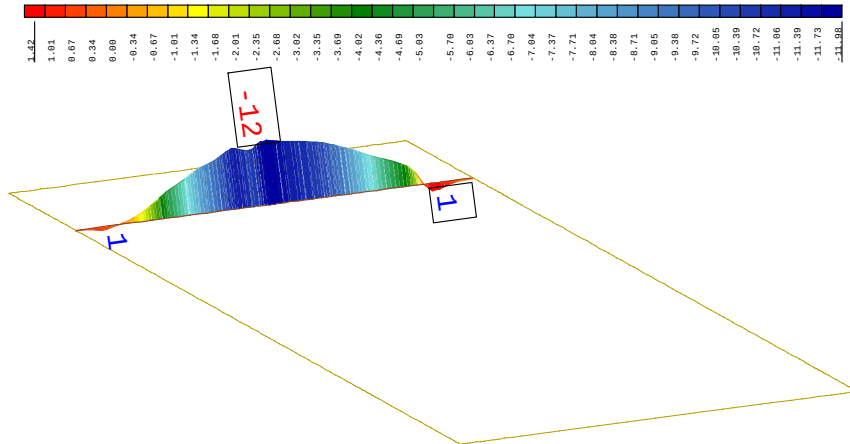
Sector of system Group 1
Bending moment m-yy in local y from middle of element ↔, Loadcase 2104 MIN-MYY QUAD Forces in Quadrilat , from -44 to 2 step 1 kNm/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-xx in local x from middle of element ↗, Loadcase 2101 MAX-MXX QUAD Forces
in Quadrilat , 1 cm 3D = 20.000 kNm/m (Min=-12) (Max=29)

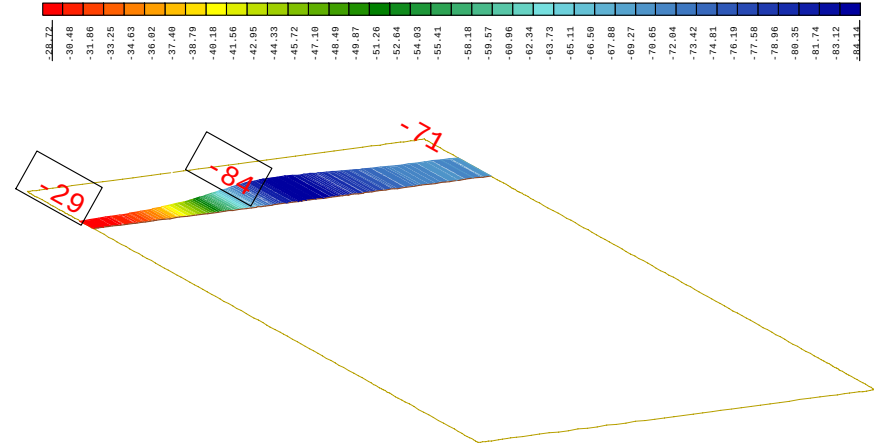
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Bending moment m-yy in local y from middle of element ↖, Loadcase 2103 MAX-MYY QUAD Forces
in Quadrilat , 1 cm 3D = 10.000 kNm/m (Min=-12) (Max=1)

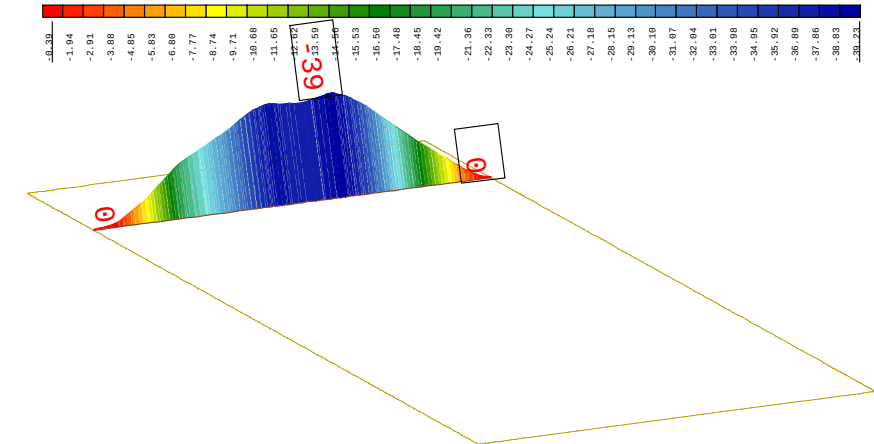
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



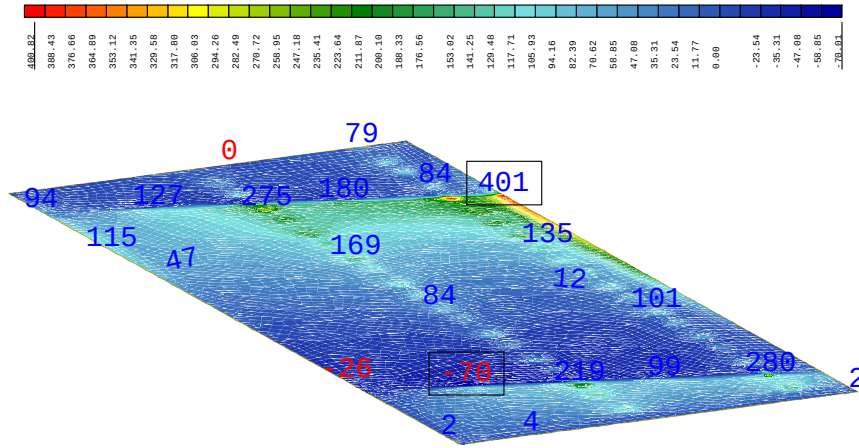
Sector of system Group 1
Bending moment m-xx in local x from middle of element ↗, Loadcase 2102 MIN-MXX QUAD Forces
in Quadrilat , 1 cm 3D = 50.000 kNm/m (Min=-84) (Max=-29)

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



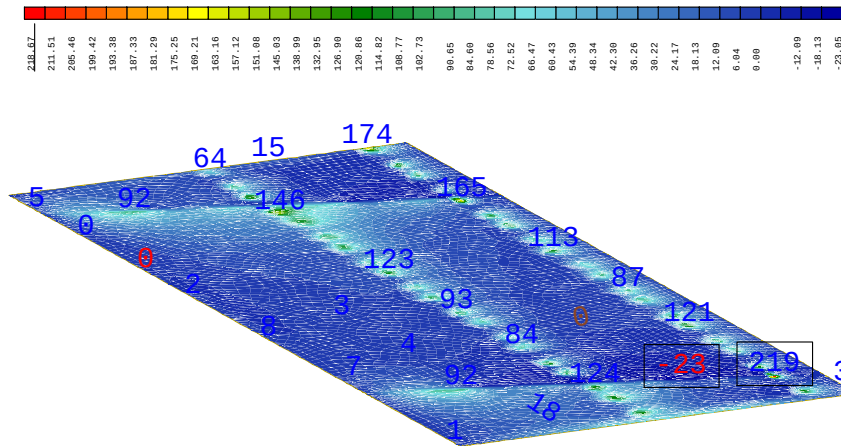
Sector of system Group 1
Bending moment m-yy in local y from middle of element ↖, Loadcase 2104 MIN-MYY QUAD Forces
in Quadrilat , 1 cm 3D = 20.000 kNm/m (Min=-39) (Max=0)

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-x in local x from middle of element $\rightarrow$, Loadcase 2107 MAX-VX QUAD Forces in
Quadrilate , from -70 to 401 step 12 kN/m

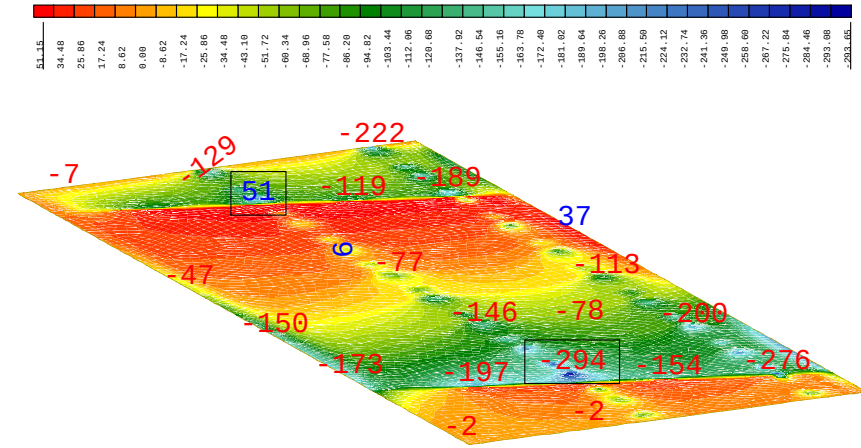
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-y in local y from middle of element $\leftrightarrow$, Loadcase 2109 MAX-VY QUAD Forces in
Quadrilate , from -23 to 219 step 6 kN/m

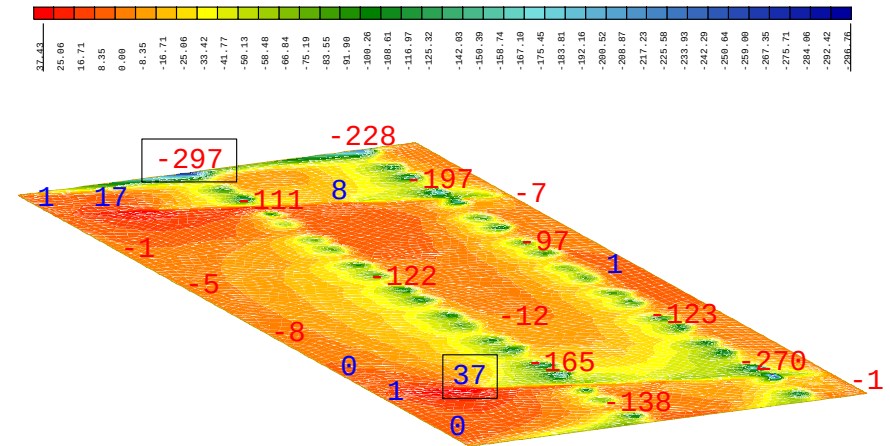
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



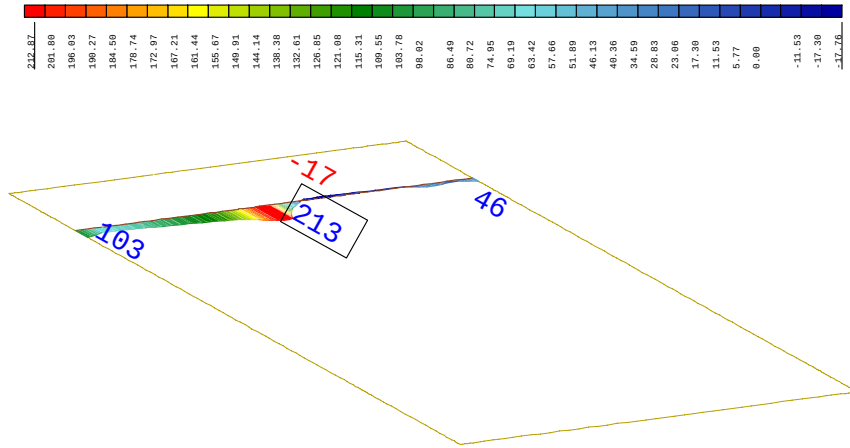
Sector of system Group 1
Shear force v-x in local x from middle of element $\rightarrow$, Loadcase 2108 MIN-VX QUAD Forces in
Quadrilate , from -294 to 51 step 9 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



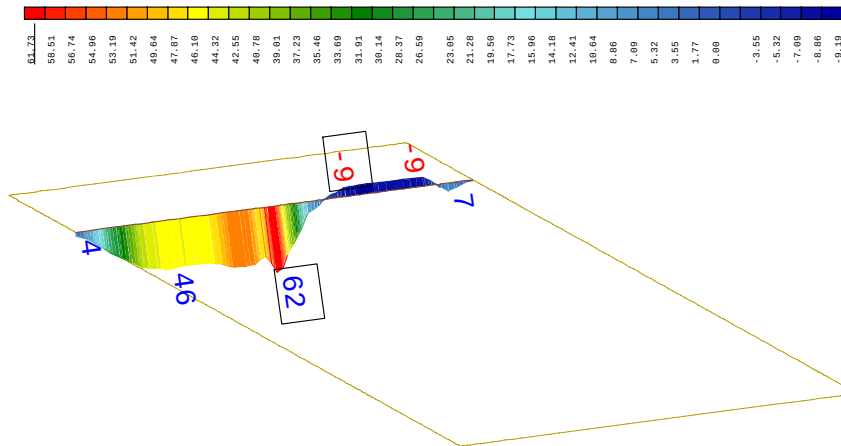
Sector of system Group 1
Shear force v-y in local y from middle of element $\leftrightarrow$, Loadcase 2110 MIN-VY QUAD Forces in
Quadrilate , from -297 to 37 step 8 kN/m

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-x in local x from middle of element ↗, Loadcase 2107 MAX-VX QUAD Forces in
Quadrilate , 1 cm 3D = 200.00 kN/m (Min=-18) (Max=213)

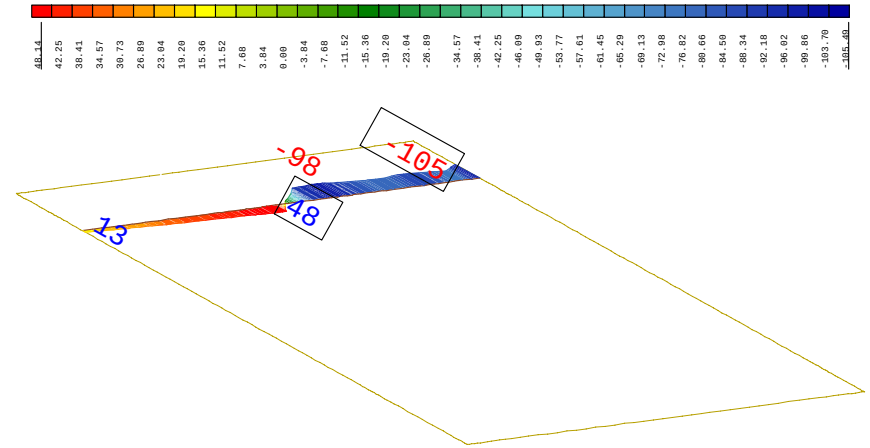
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Shear force v-y in local y from middle of element ↖, Loadcase 2109 MAX-VY QUAD Forces in
Quadrilate , 1 cm 3D = 50.000 kN/m (Min=-9) (Max=62)

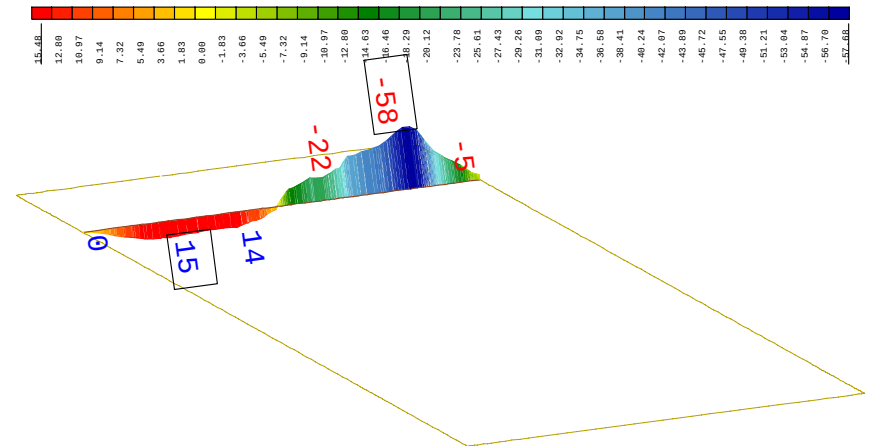
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



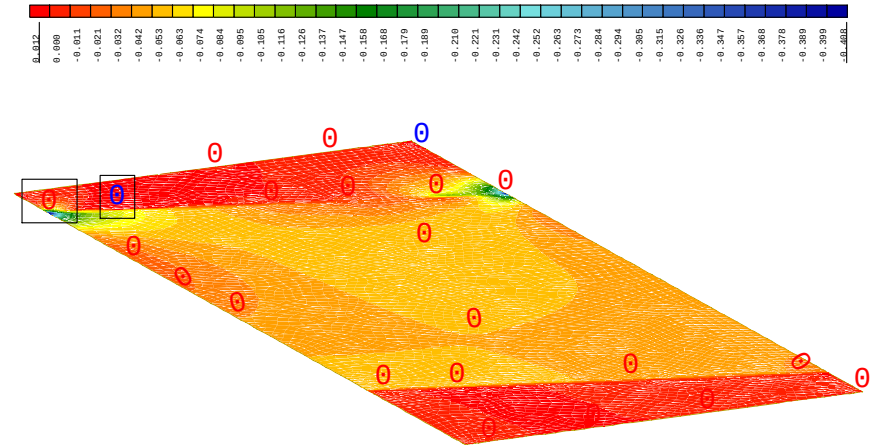
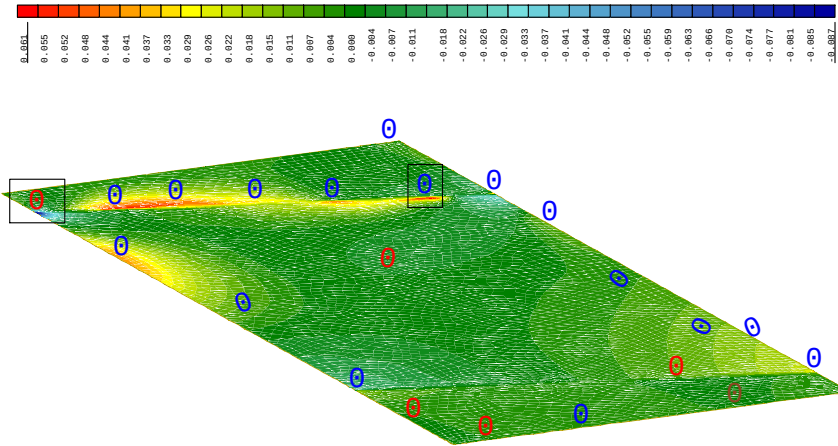
Sector of system Group 1
Shear force v-x in local x from middle of element ↗, Loadcase 2108 MIN-VX QUAD Forces in
Quadrilate , 1 cm 3D = 100.00 kN/m (Min=-105) (Max=48)

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



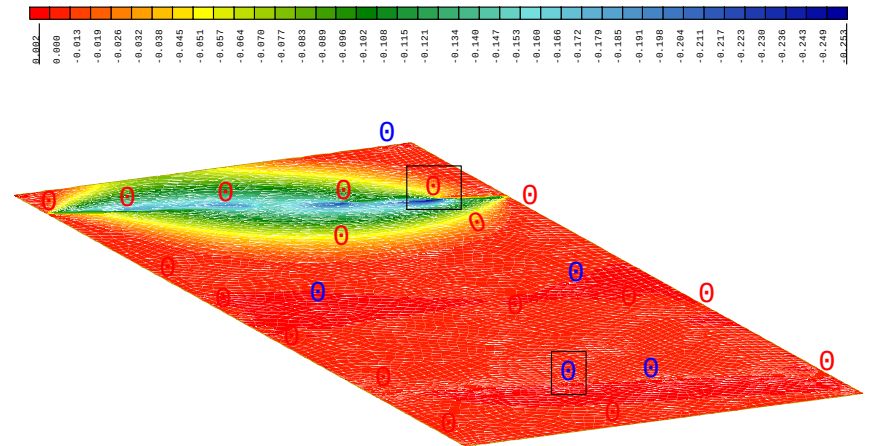
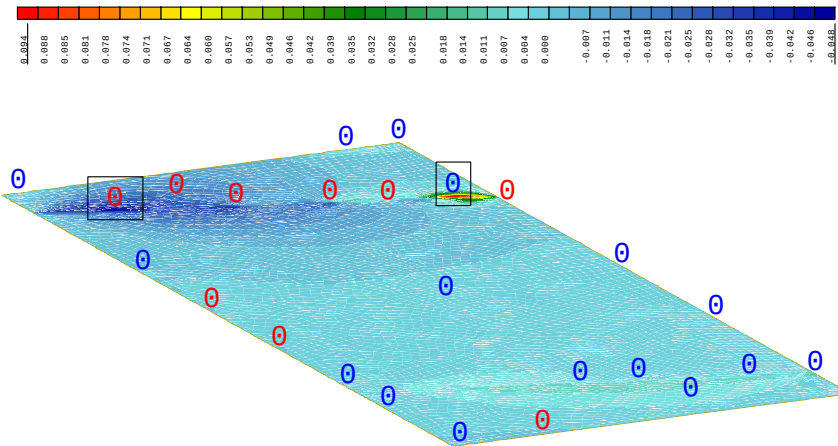
Sector of system Group 1
Shear force v-y in local y from middle of element ↖, Loadcase 2110 MIN-VY QUAD Forces in
Quadrilate , 1 cm 3D = 50.000 kN/m (Min=-58) (Max=15)

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Membrane force n-xx in local x from middle of element ↗, Loadcase 2111 MAX-NXX QUAD Forces in Quadilat, from 0 to 0 step 0 kN/m
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

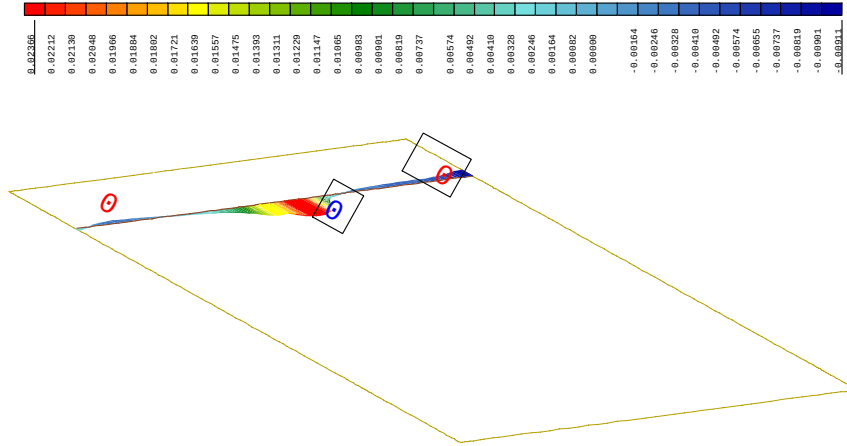
Sector of system Group 1
Membrane force n-xx in local x from middle of element ↗, Loadcase 2112 MIN-NXX QUAD Forces in Quadilat, from 0 to 0 step 0 kN/m
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Membrane force n-yy in local y from middle of element ↔, Loadcase 2113 MAX-NYY QUAD Forces in Quadilat, from 0 to 0 step 0 kN/m
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

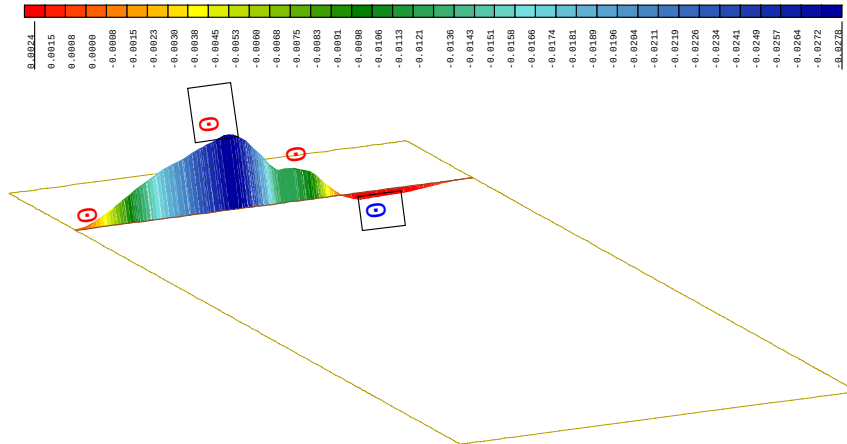
Sector of system Group 1
Membrane force n-yy in local y from middle of element ↔, Loadcase 2114 MIN-NYY QUAD Forces in Quadilat, from 0 to 0 step 0 kN/m
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



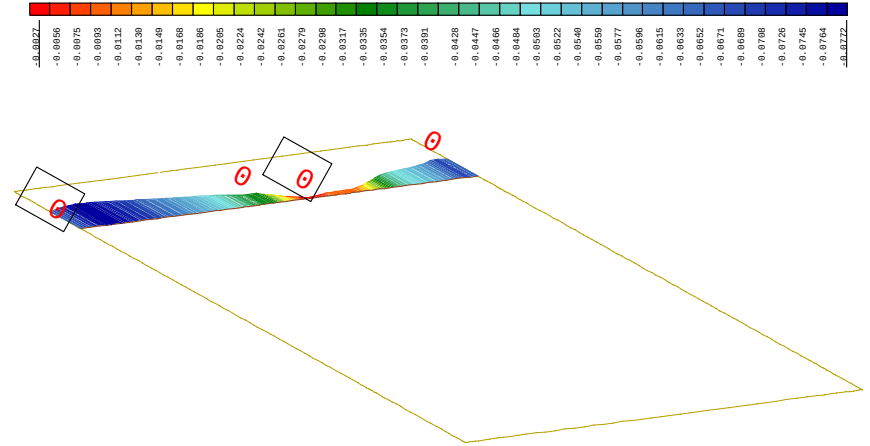
Sector of system Group 1
Membrane force n-xx in local x from middle of element ↗, Loadcase 2111 MAX-NXX QUAD Forces
in Quadrilat , 1 cm 3D = 0.020000 kN/m (Min= 0) (Max=0)

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



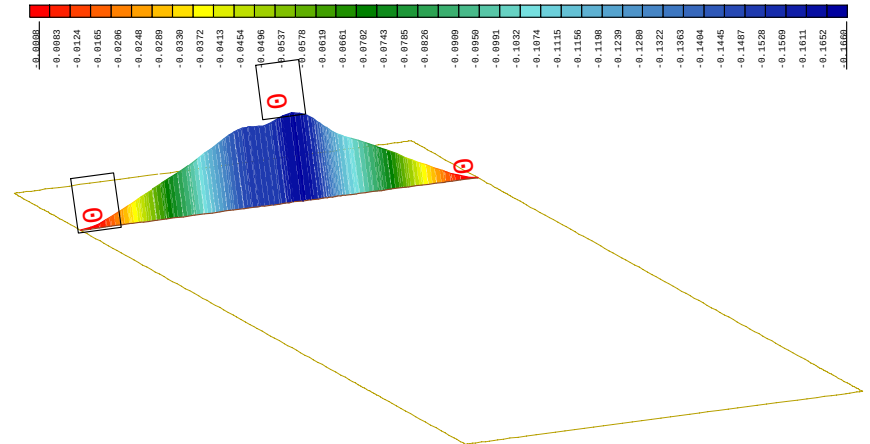
Sector of system Group 1
Membrane force n-yy in local y from middle of element ↖, Loadcase 2113 MAX-NYY QUAD Forces
in Quadrilat , 1 cm 3D = 0.020000 kN/m (Min= 0) (Max=0)

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Membrane force n-xx in local x from middle of element ↗, Loadcase 2112 MIN-NXX QUAD Forces
in Quadrilat , 1 cm 3D = 0.050000 kN/m (Min= 0) (Max= 0)

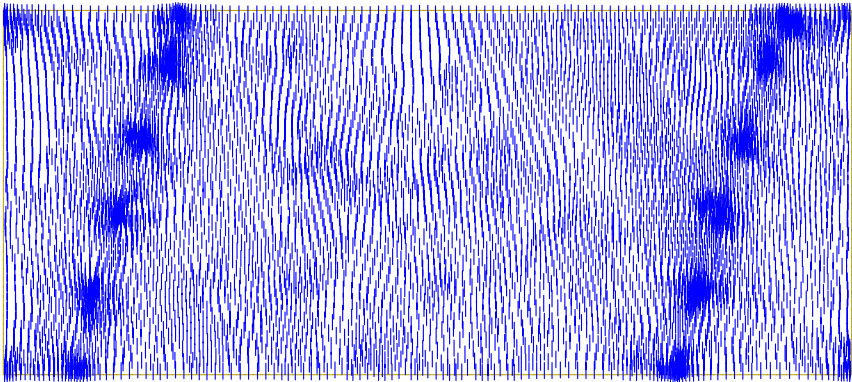
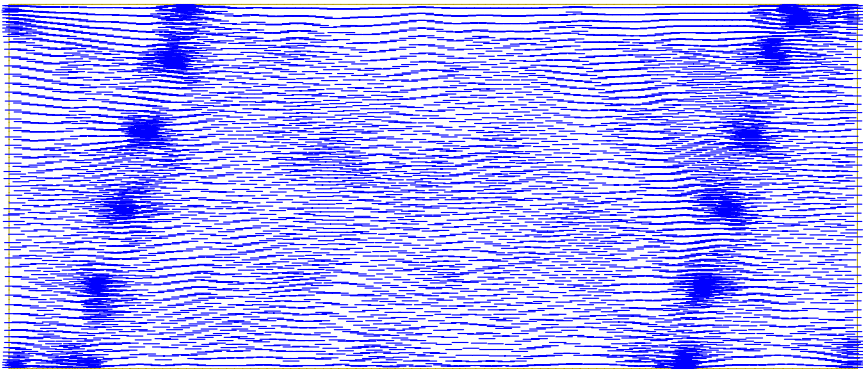
M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 1
Membrane force n-yy in local y from middle of element ↖, Loadcase 2114 MIN-NYY QUAD Forces
in Quadrilat , 1 cm 3D = 0.10000 kN/m (Min= 0) (Max= 0)

M 1 : 52
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (LOSA)



Y Sector of system Group 1
X Quadrilateral Elements , Direction of prescribed upper Principal reinforcements (1st layer)
(—)

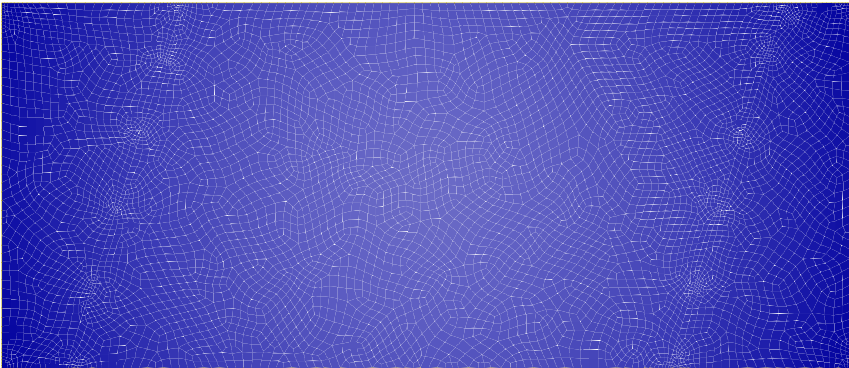
M 1 : 63

Y Sector of system Group 1
X Quadrilateral Elements , Direction of prescribed upper Cross reinforcements (2nd layer) (—)

M 1 : 63

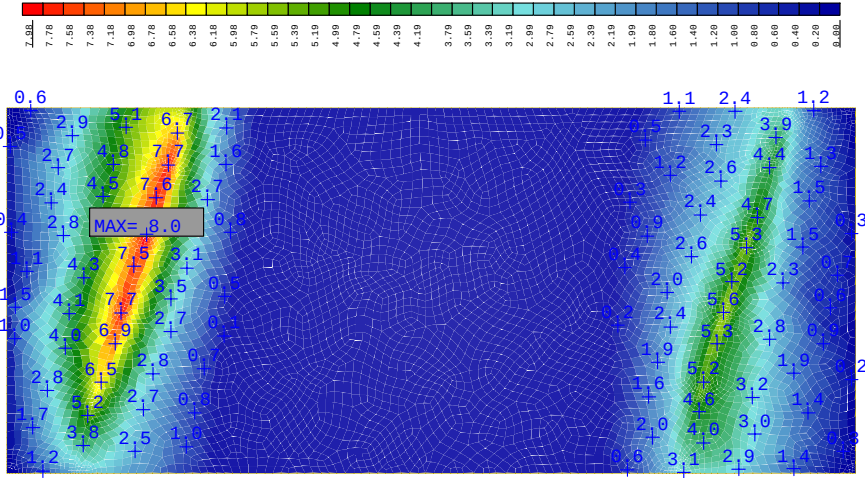


mm

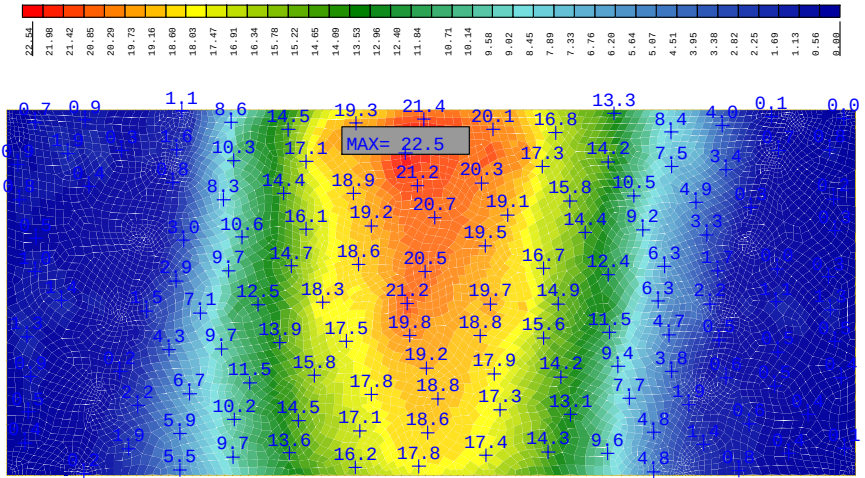


Y Sector of system Group 1
X Visible QUAD surface top/bottom in Element

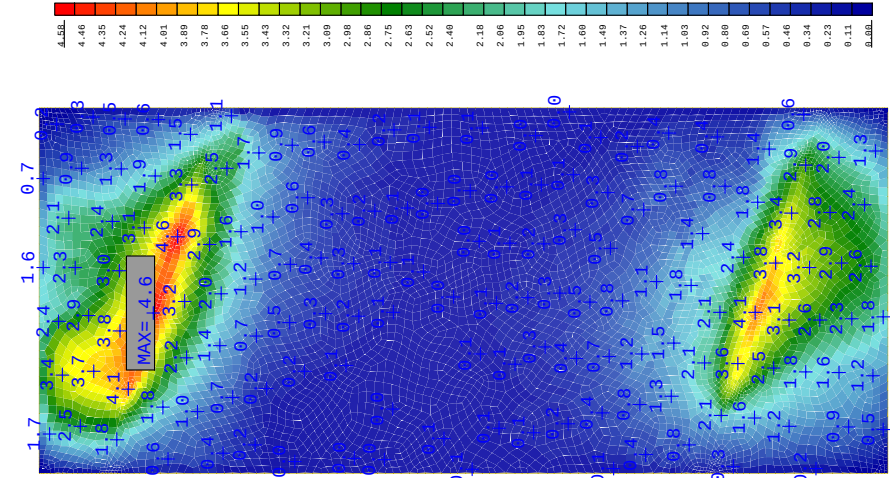
M 1 : 63



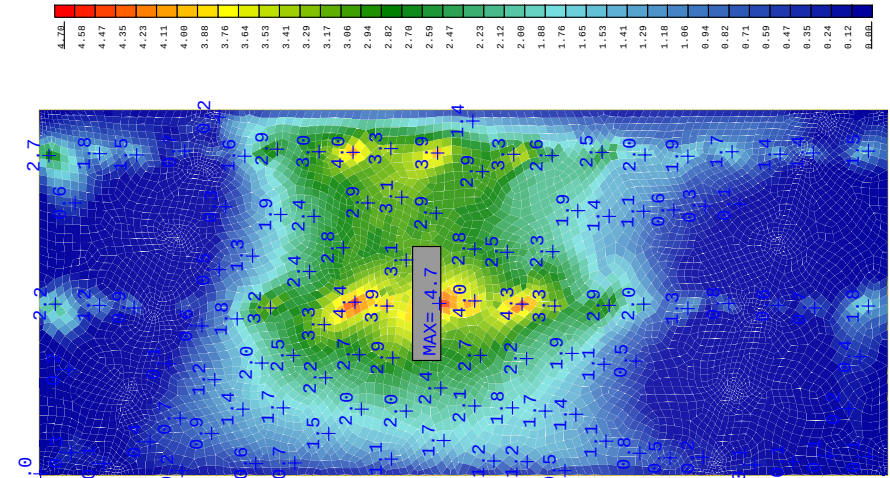
Y
X
Sector of system Group 1
Quadrilateral Elements , upper Principal reinforcements (1st layer) ↗ in cm²/m, Design Case 1 ULS design (Max=8.0)



Y
X
Sector of system Group 1
Quadrilateral Elements , lower Principal reinforcements (1st layer) ↗ in cm²/m, Design Case 1 ULS design (Max=22.5)

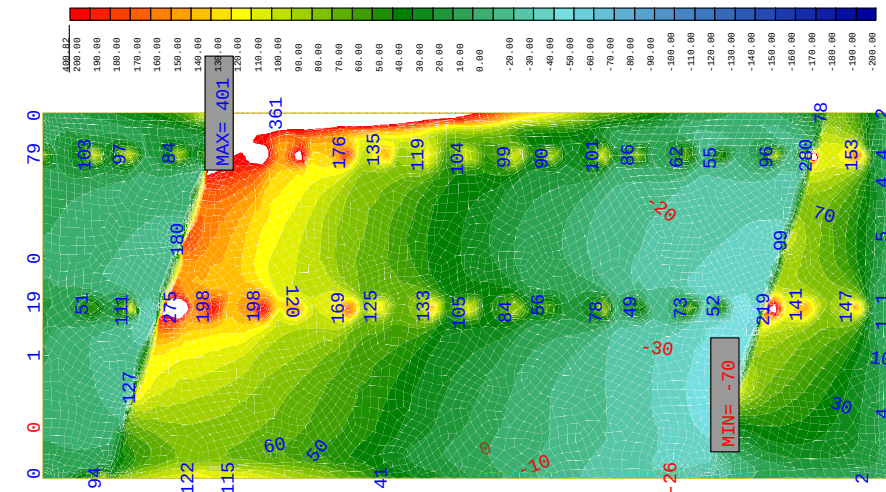


Y
X
Sector of system Group 1
Quadrilateral Elements , upper Cross reinforcements (2nd layer) ↗ in cm²/m, Design Case 1 ULS design (Max=4.6)

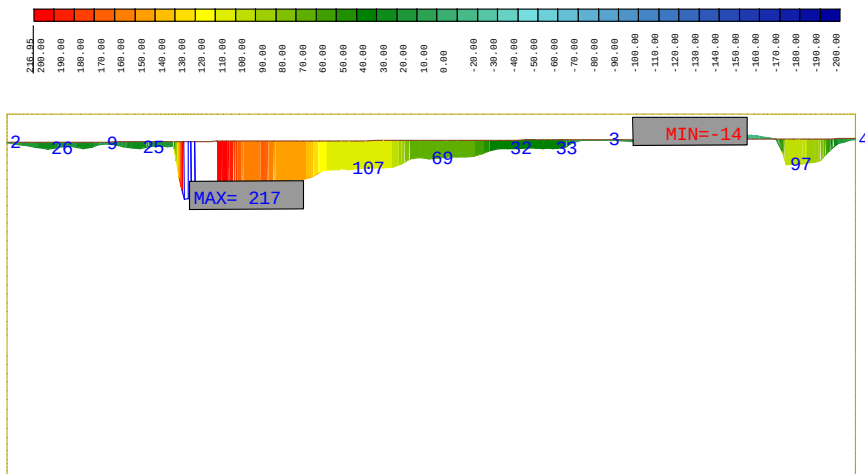


Y
X
Sector of system Group 1
Quadrilateral Elements , lower Cross reinforcements (2nd layer) ↗ in cm²/m, Design Case 1 ULS design (Max=4.7)

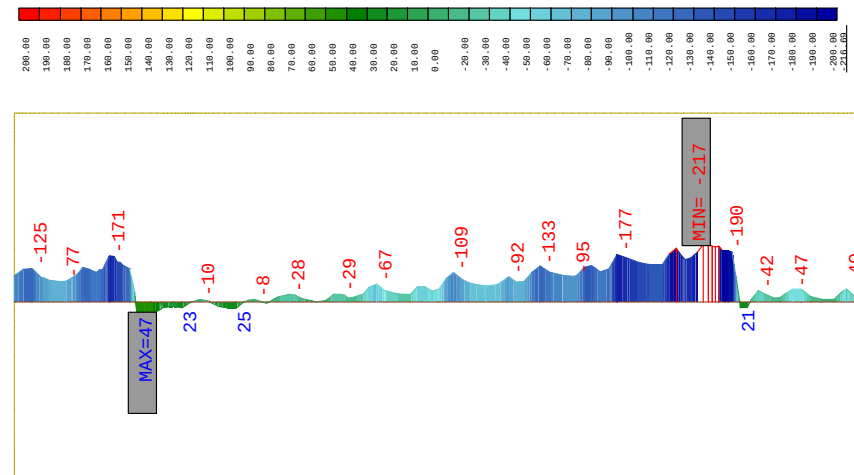
Armado Losa



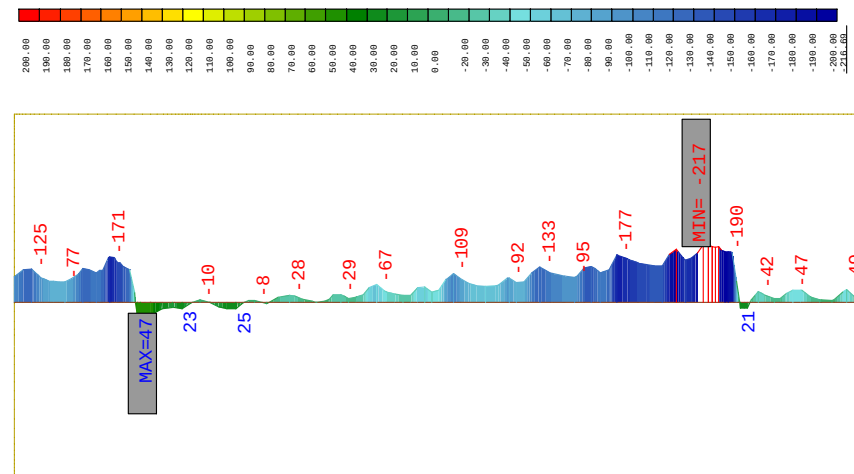
Y
X
Sector of system Group 1
Shear force v-x in local x from middle of element ↔, Loadcase 2107 MAX-VX QUAD Forces in Quadrilate, from -70 to 200 step 10 kN/m
M 1 : 63



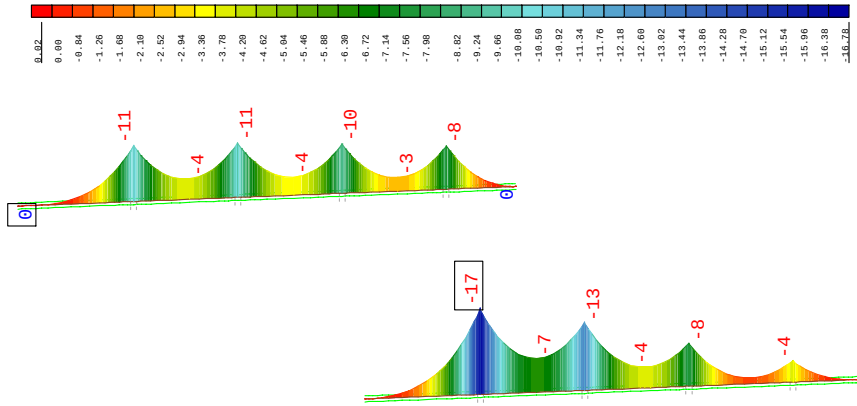
Y
X
Sector of system Group 1
Shear force v-x in local x from middle of element ↔, Loadcase 2107 MAX-VX QUAD Forces in Quadrilate, 1 cm 3D = 200.00 kN/m (Min=-14) (Max=217)
M 1 : 63



Y
X
Sector of system Group 1
Shear force v-x in local x from middle of element ↔, Loadcase 2108 MIN-VX QUAD Forces in Quadrilate, 1 cm 3D = 200.00 kN/m (Min=-217) (Max=47)
M 1 : 63

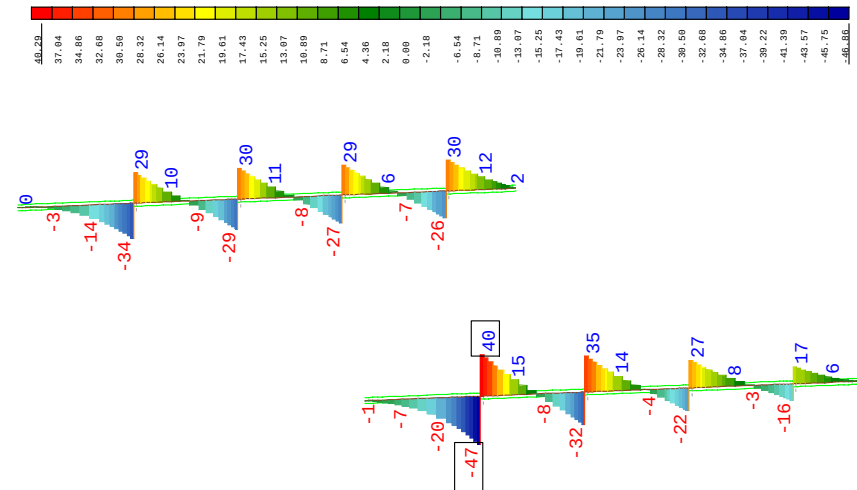


Y
X
Sector of system Group 1
Shear force v-x in local x from middle of element ↔, Loadcase 2108 MIN-VX QUAD Forces in Quadrilate, 1 cm 3D = 200.00 kN/m (Min=-217) (Max=47)
M 1 : 63



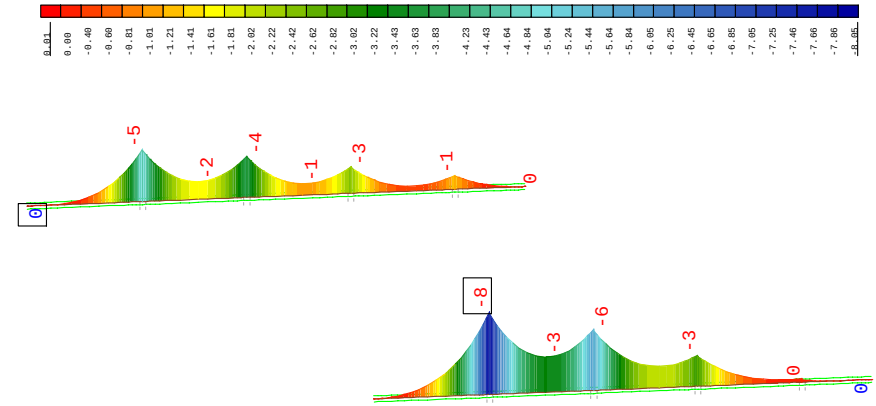
Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 1 Peso propio , 1 cm 3D = 10.000 kNm
(Min=-17) (Max=0)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



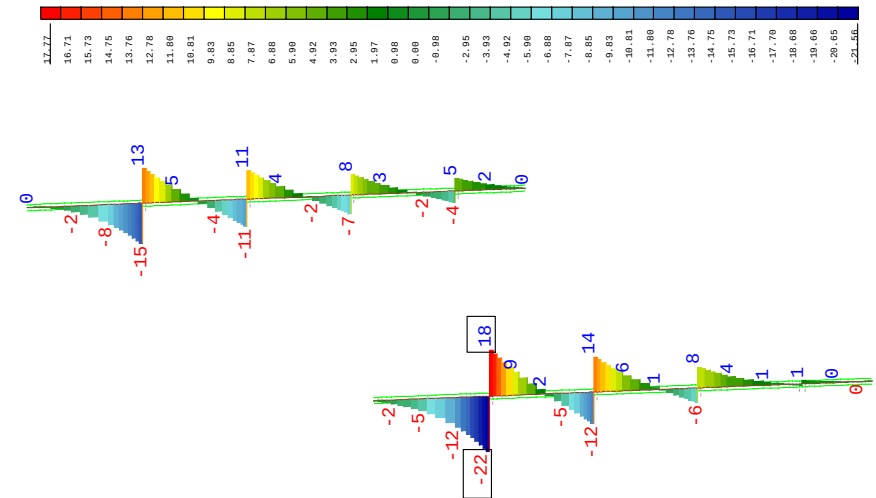
Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 1 Peso propio , 1 cm 3D = 50.000 kN (Min=-47)
(Max=40)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 2 Asfalto , 1 cm 3D = 5.0000 kNm (Min=-8)
(Max=0)

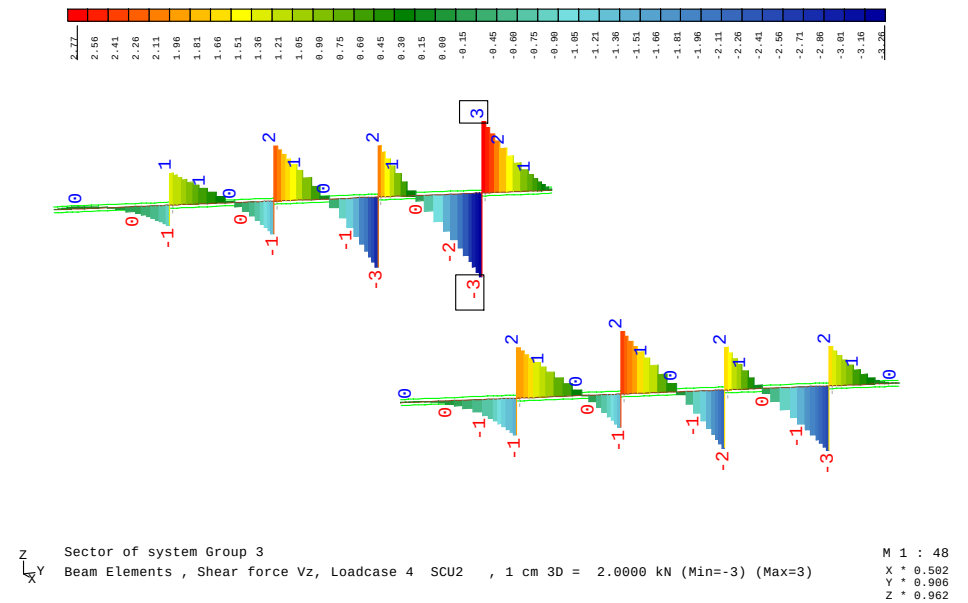
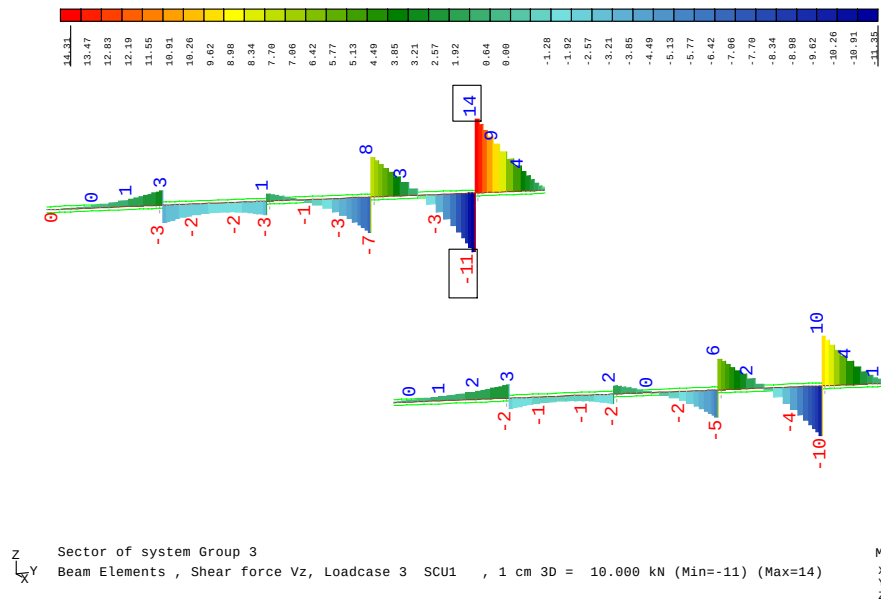
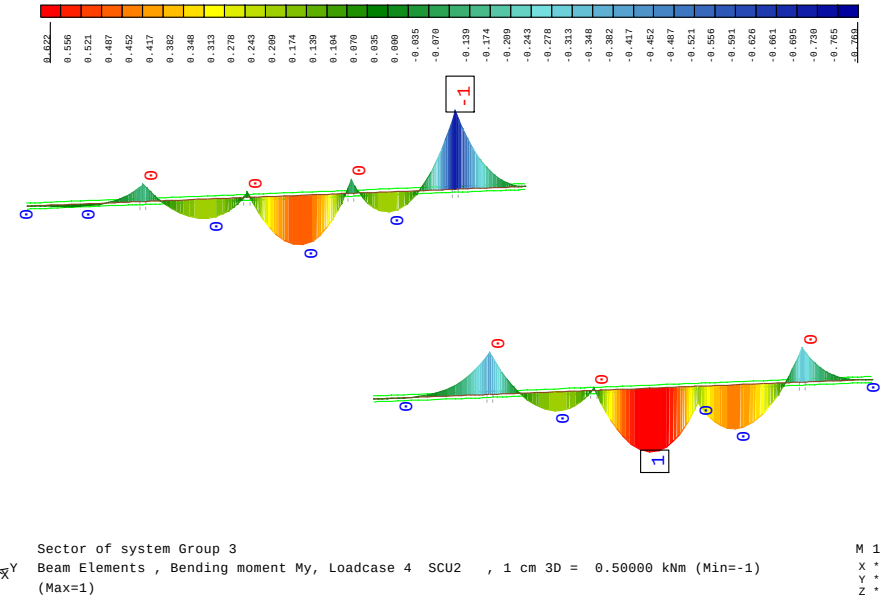
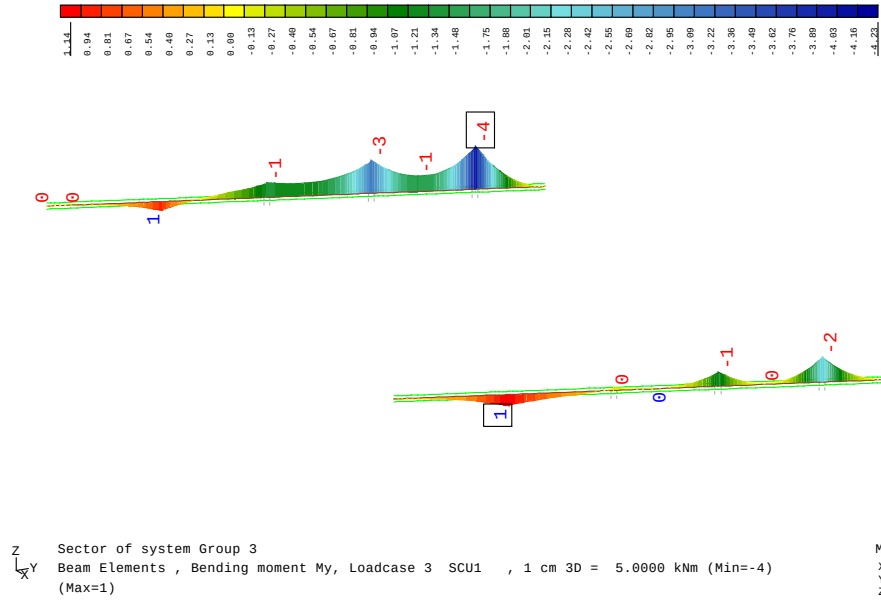
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



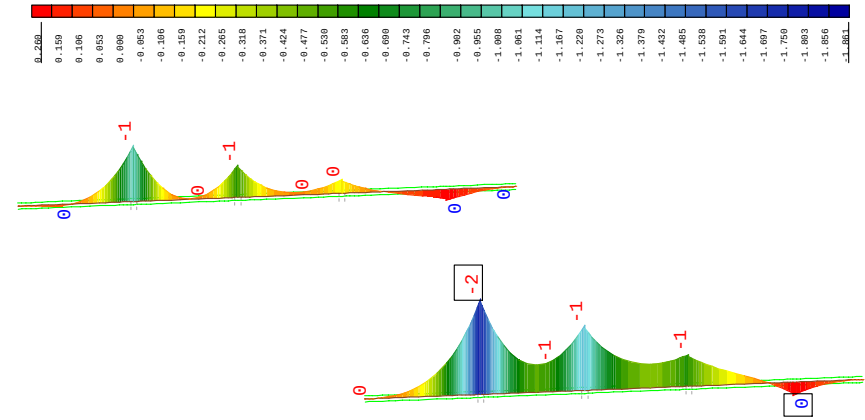
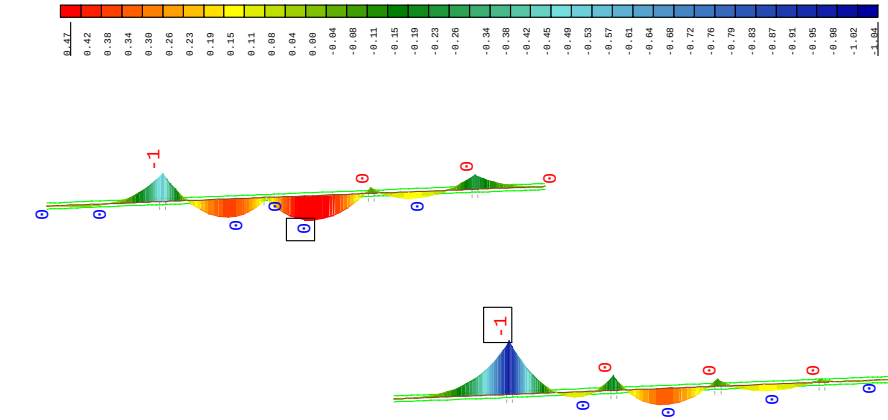
Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 2 Asfalto , 1 cm 3D = 20.000 kN (Min=-22)
(Max=18)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (VIGAS)

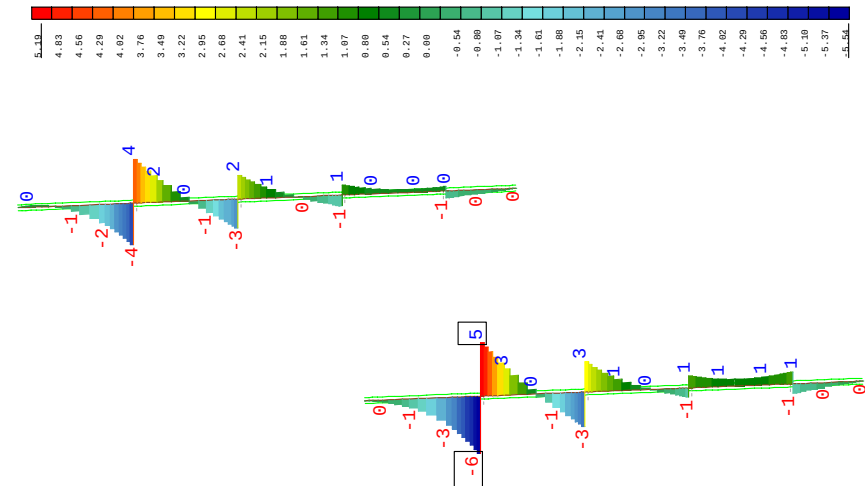
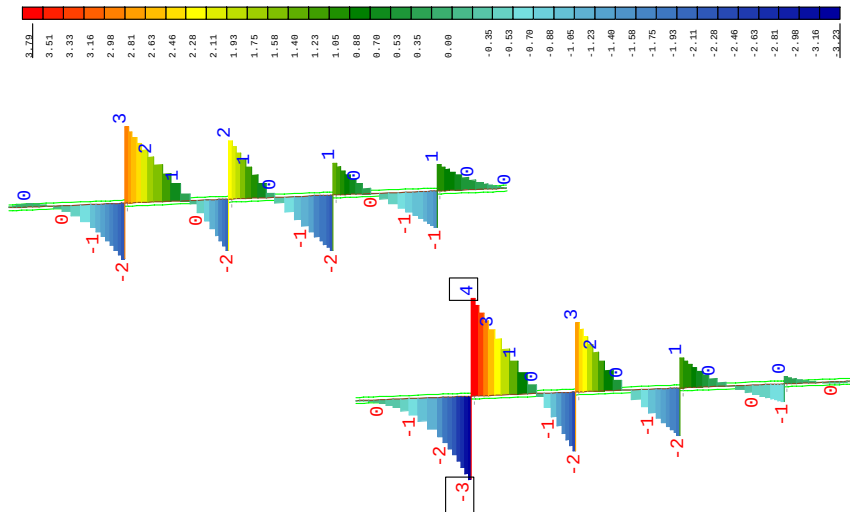


Esfuerzos LC y ELU (VIGAS)



Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 5 SCU3 , 1 cm 3D = 1.0000 kNm (Min=-1) (Max=0)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 6 SCU4 , 1 cm 3D = 1.0000 kNm (Min=-2) (Max=0)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



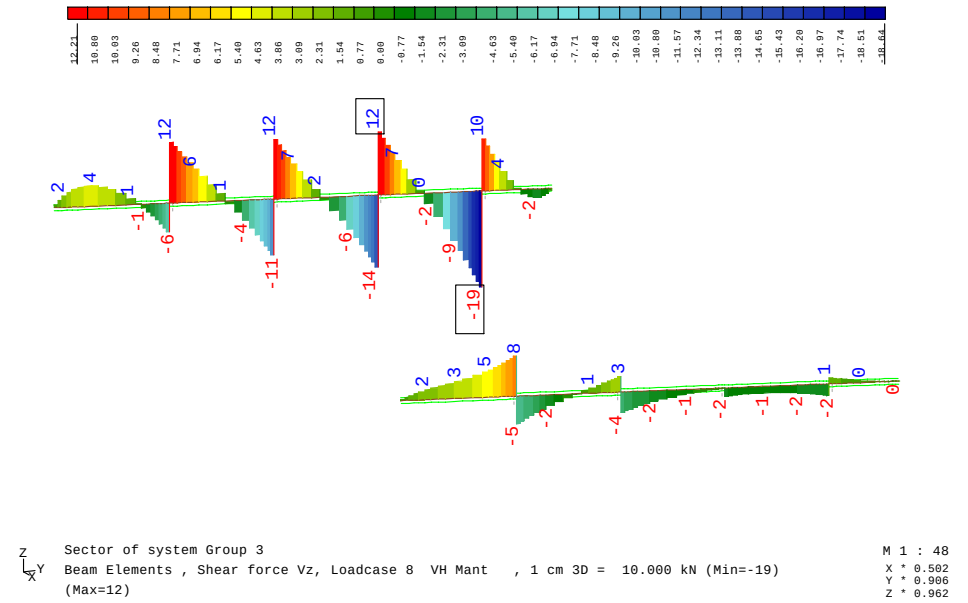
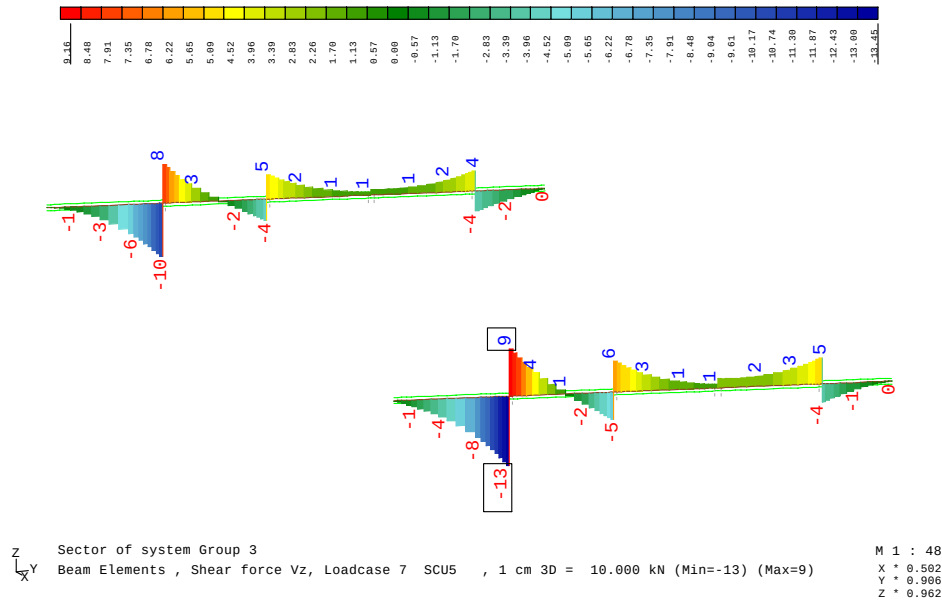
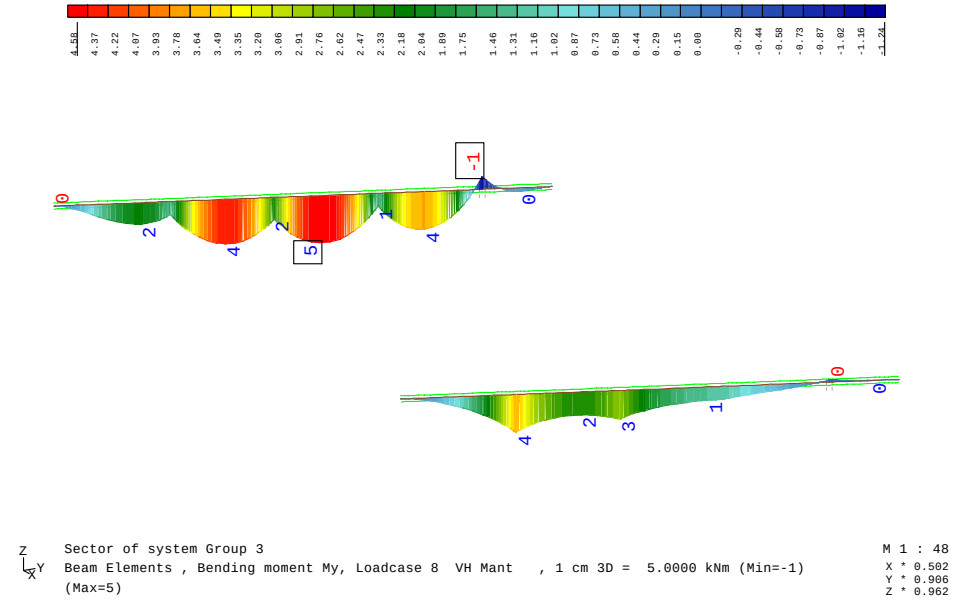
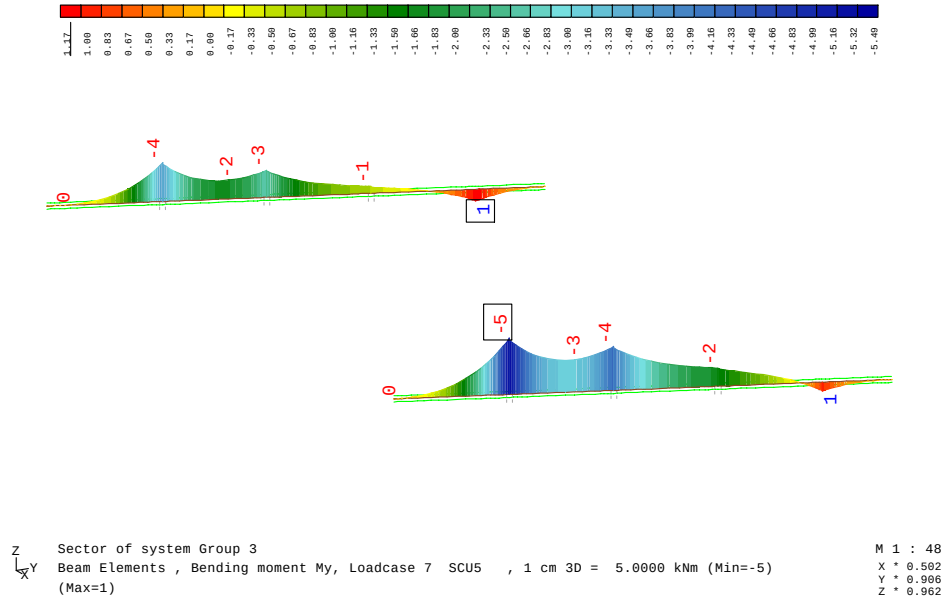
Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 5 SCU3 , 1 cm 3D = 2.0000 kN (Min=-3) (Max=4)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

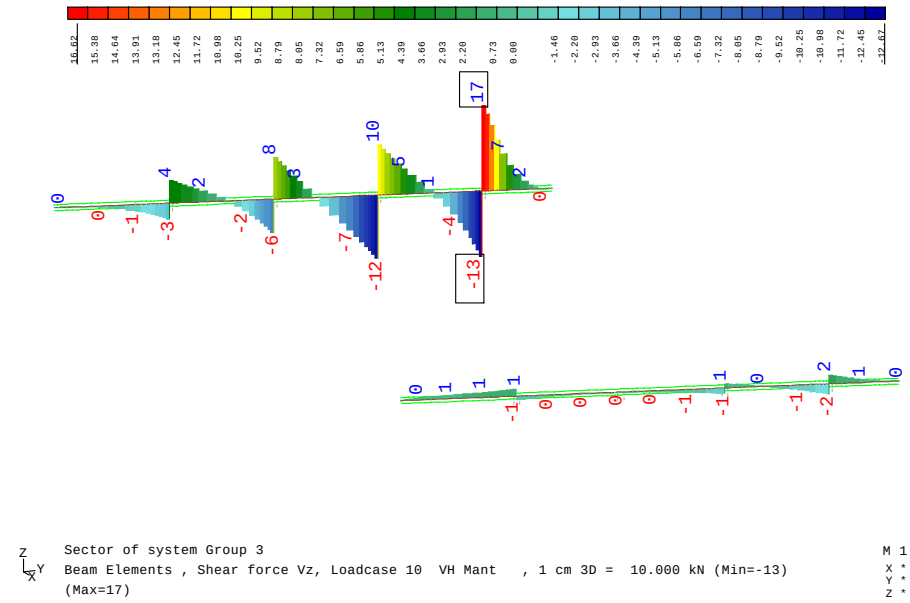
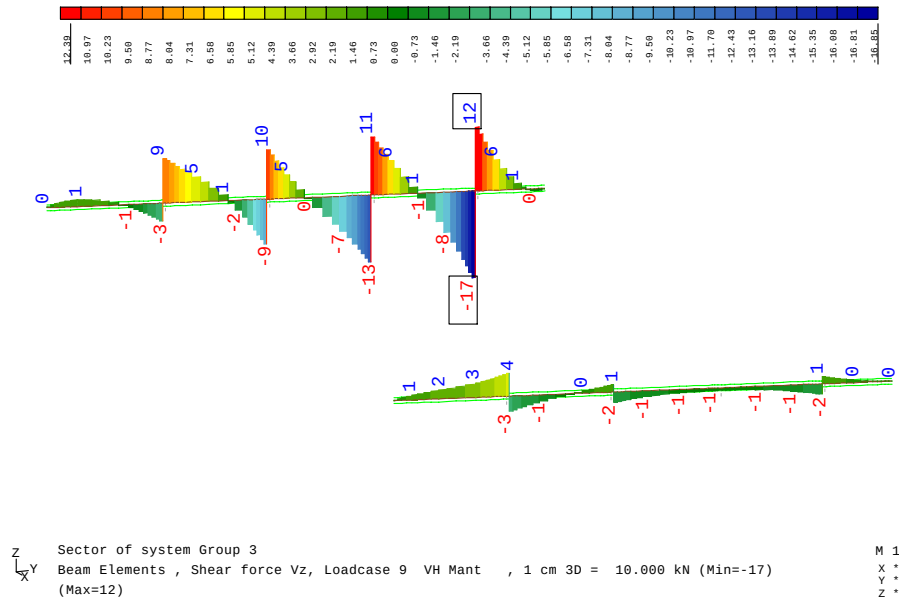
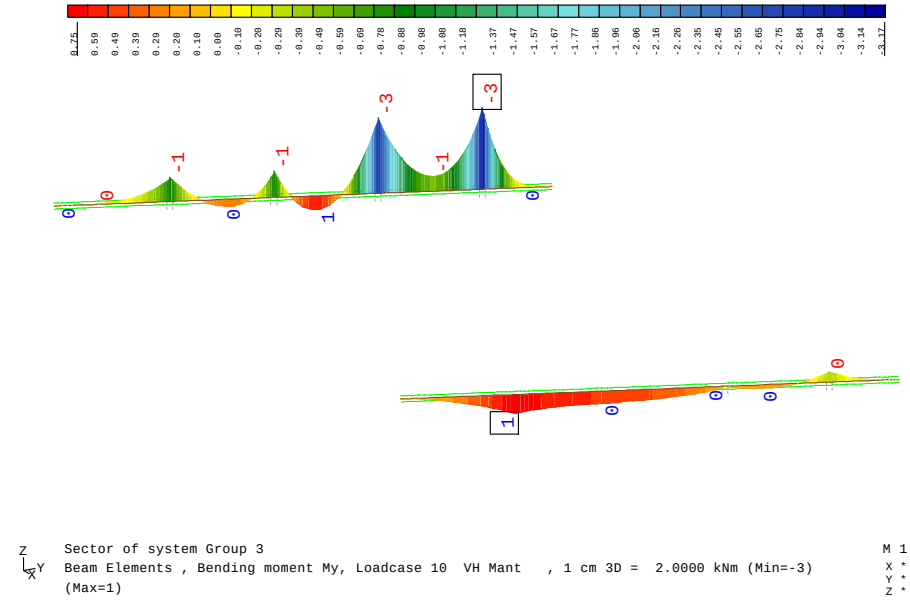
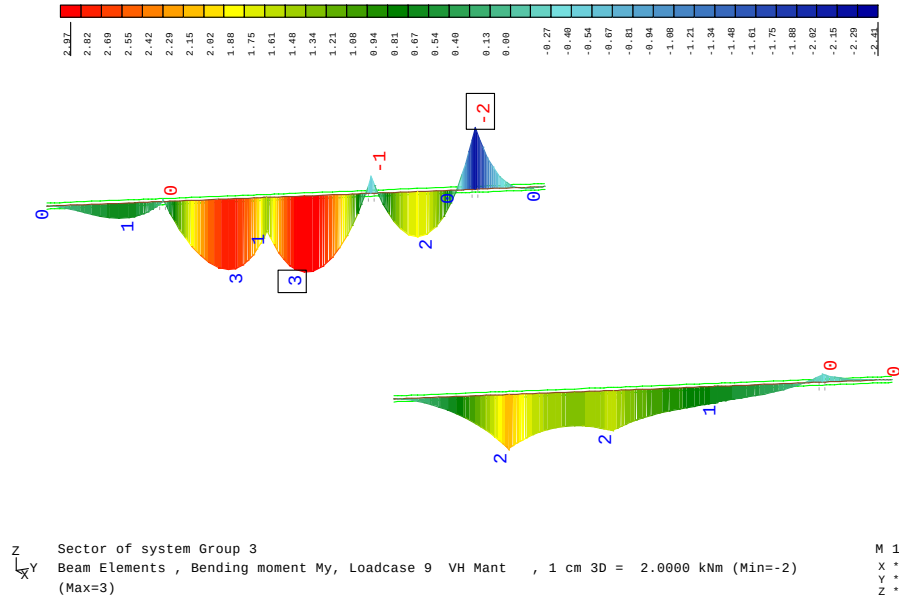
Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 6 SCU4 , 1 cm 3D = 5.0000 kN (Min=-6) (Max=5)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

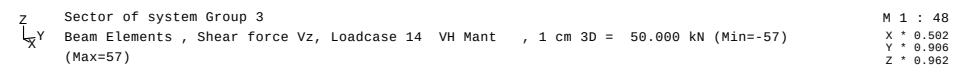
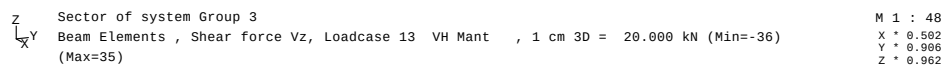
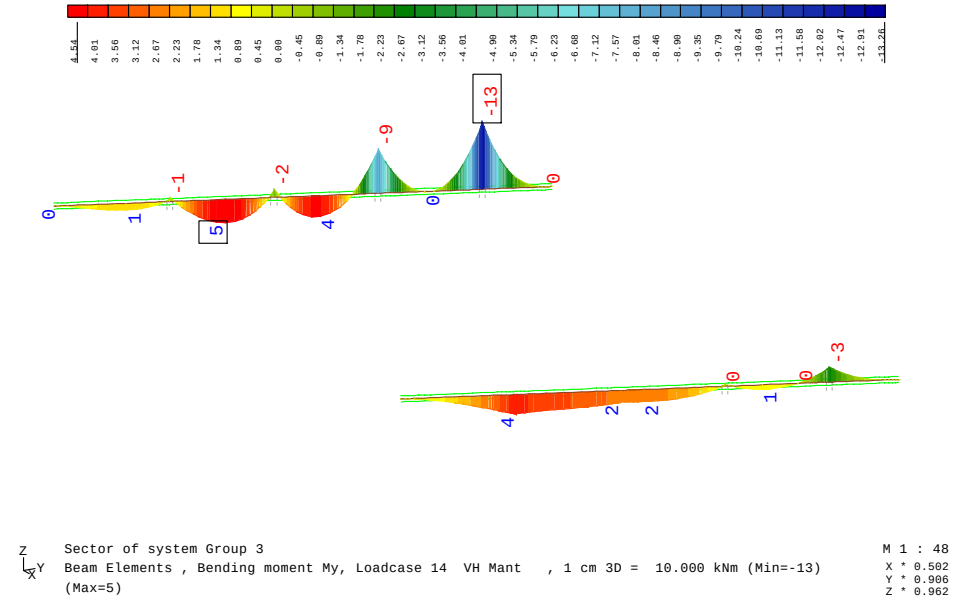
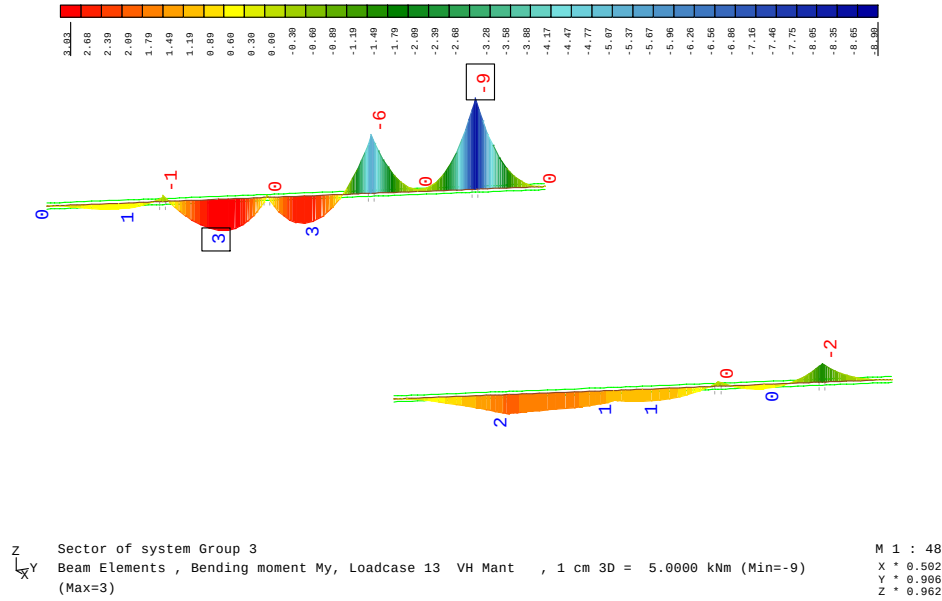
Esfuerzos LC y ELU (VIGAS)



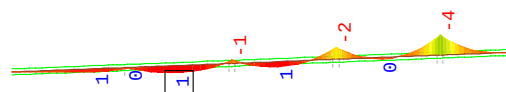
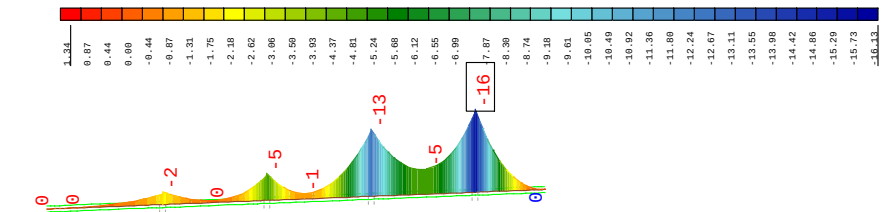
Esfuerzos LC y ELU (VIGAS)



Esfuerzos LC y ELU (VIGAS)

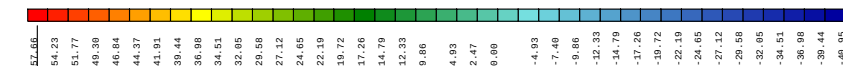
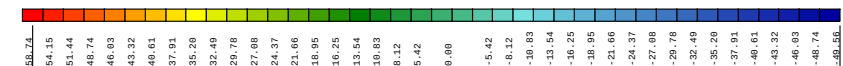


Esfuerzos LC y ELU (VIGAS)



Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 15 VH Mant , 1 cm 3D = 10.000 kNm (Min=-16) (Max=1)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

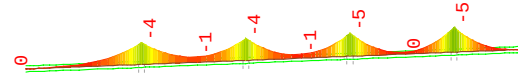
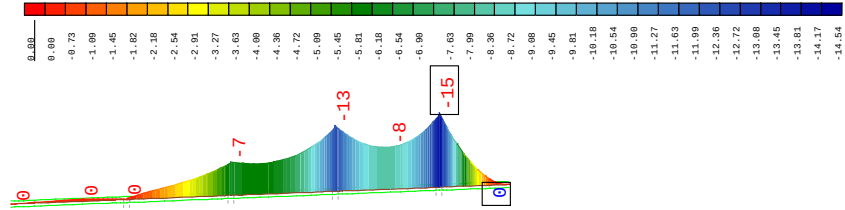
Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 16 VH Mant , 1 cm 3D = 10.000 kNm (Min=-18) (Max=1)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 15 VH Mant , 1 cm 3D = 50.000 kN (Min=-50) (Max=59)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

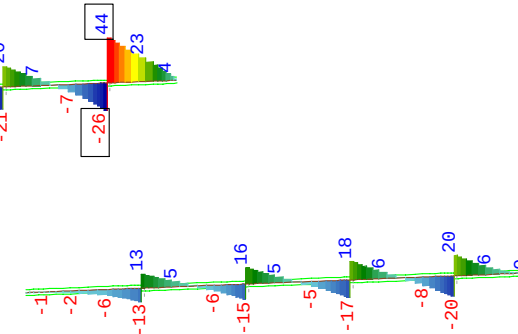
Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 16 VH Mant , 1 cm 3D = 50.000 kN (Min=-41) (Max=58)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

Esfuerzos LC y ELU (VIGAS)



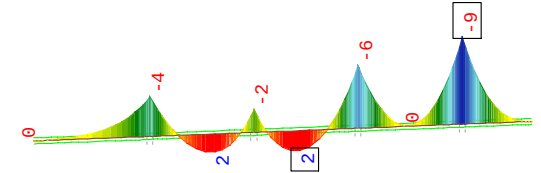
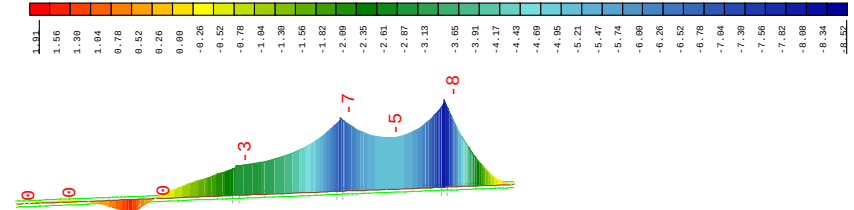
Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 18 VH Mant , 1 cm 3D = 10.000 kNm (Min=-15)
(Max=0)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



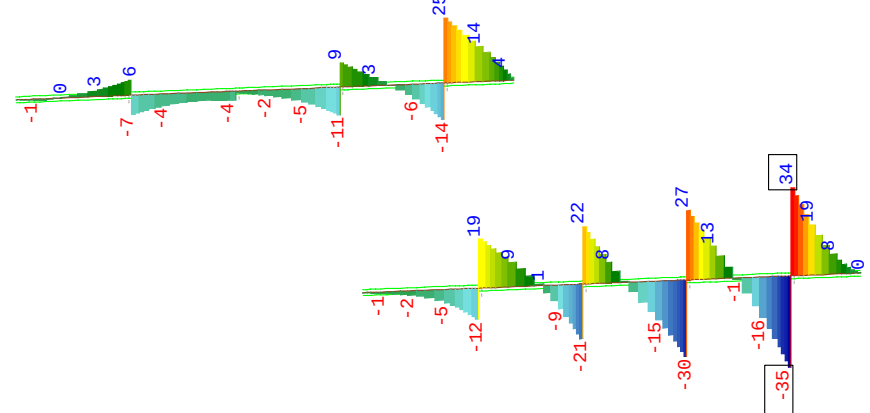
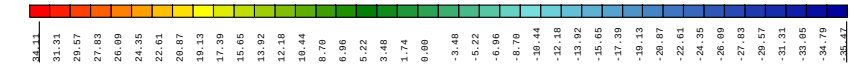
Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 18 VH Mant , 1 cm 3D = 50.000 kN (Min=-26)
(Max=44)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 20 VH Mant , 1 cm 3D = 5.0000 kNm (Min=-9)
(Max=2)

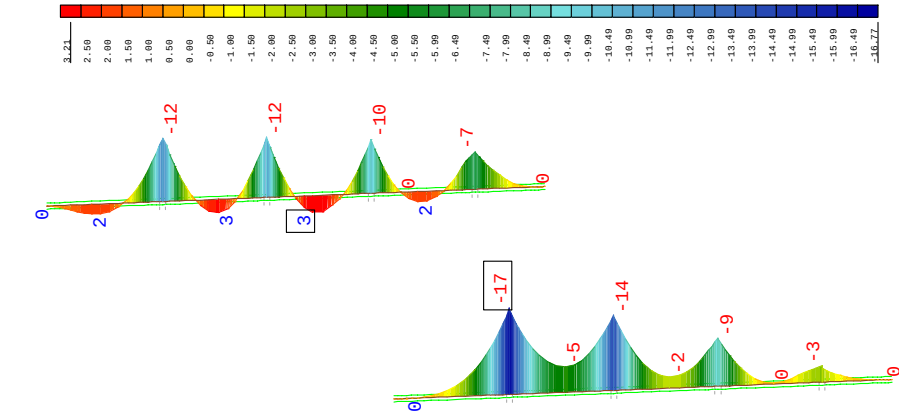
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



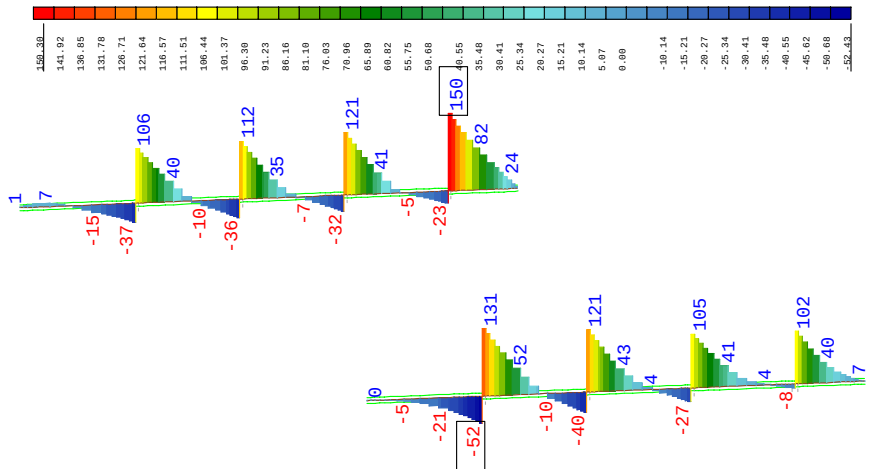
Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 20 VH Mant , 1 cm 3D = 20.000 kN (Min=-35)
(Max=34)

M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

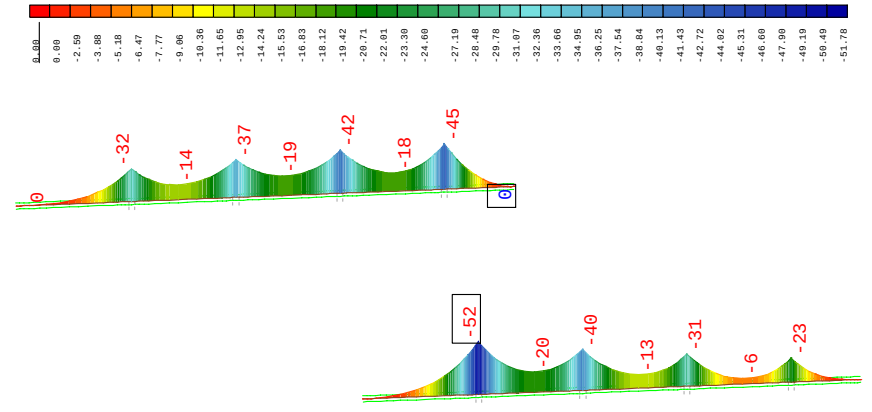
Esfuerzos LC y ELU (VIGAS)



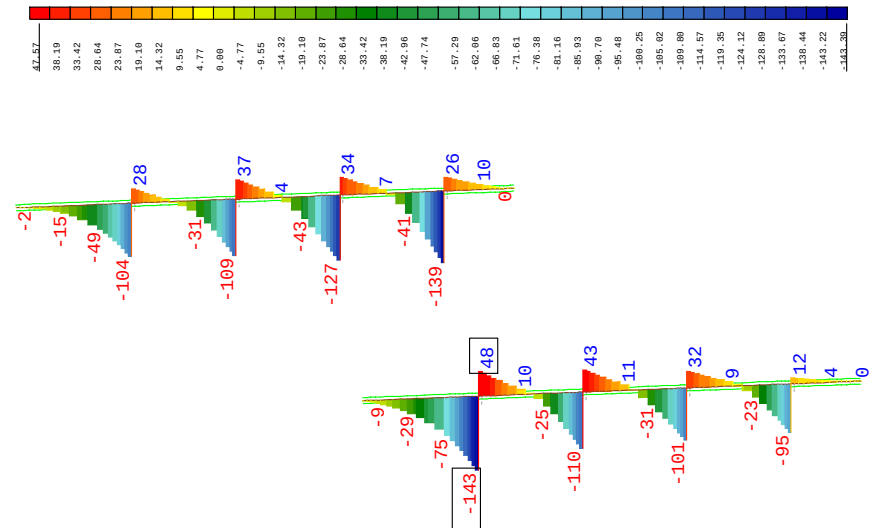
Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 2129 MAX-MY BEAM Forces in Beam Eleme , 1 cm
3D = 10.000 kNm (Min=-17) (Max=3)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962



Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 2125 MAX-VZ BEAM Forces in Beam Eleme , 1 cm 3D
= 100.00 kN (Min=-52) (Max=150)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

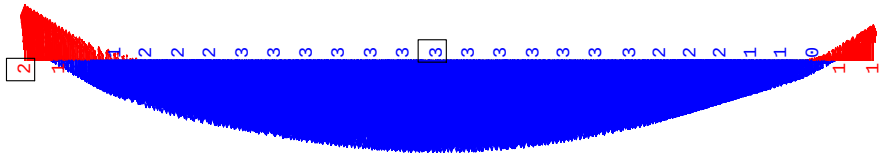


Sector of system Group 3
Beam Elements , Bending moment My, Loadcase 2130 MIN-MY BEAM Forces in Beam Eleme , 1 cm
3D = 50.000 kNm (Min=-52) (Max=0)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

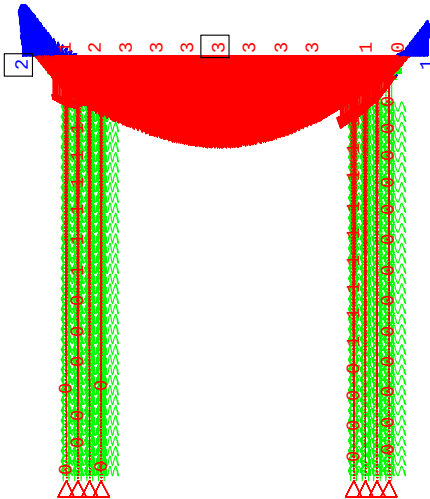


Sector of system Group 3
Beam Elements , Shear force Vz, Loadcase 2126 MIN-VZ BEAM Forces in Beam Eleme , 1 cm 3D
= 100.00 kN (Min=-143) (Max=48)
M 1 : 48
X * 0.502
Y * 0.906
Z * 0.962

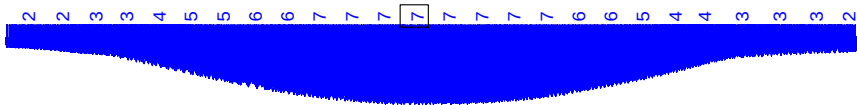
Esfuerzos LC y ELU (VIGAS)



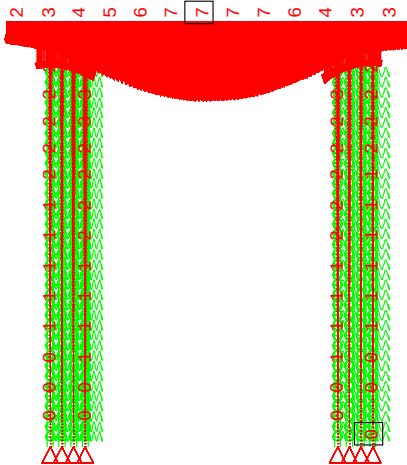
z Sector of system Group 1
↓x Quadrilateral Elements , Displacement in local z in Node, Loadcase 1175 MAXR-UZ NODE Nodal Displacements , 1 cm 3D = 2.0000 mm (Min=-2) (Max=3)



M 1 : 63 z Nodal displacement in global Z, Loadcase 1175 MAXR-UZ NODE Nodal Displacements , 1 cm 3D = 2.0000 mm (Min=-3) (Max=2) M 1 : 132

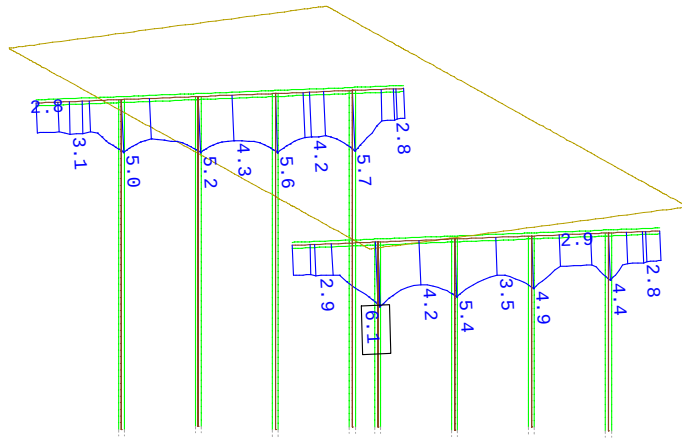


z Sector of system Group 1
↓x Quadrilateral Elements , Displacement in local z in Node, Loadcase 1176 MINR-UZ NODE Nodal Displacements , 1 cm 3D = 5.0000 mm (Max=7)

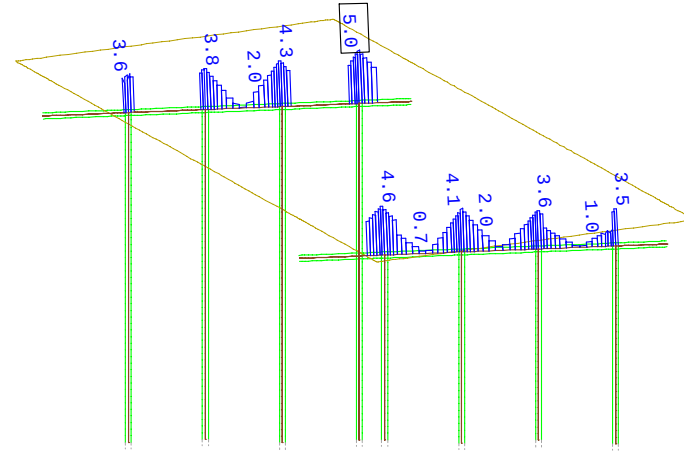


M 1 : 63 z Nodal displacement in global Z, Loadcase 1176 MINR-UZ NODE Nodal Displacements , 1 cm 3D = 5.0000 mm (Min=-7) (Max=0) M 1 : 132

Deformaciones

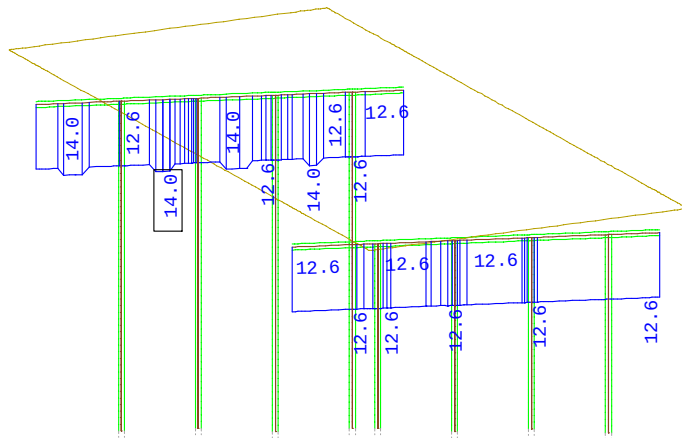


Z
X Y
Sector of system Beam Elements, Quadrilateral Elements
Beam Elements , Longitudinal reinforcements (total), Design Case 2 , 1 cm 3D = 5.0000 cm2 (Max=6.1)

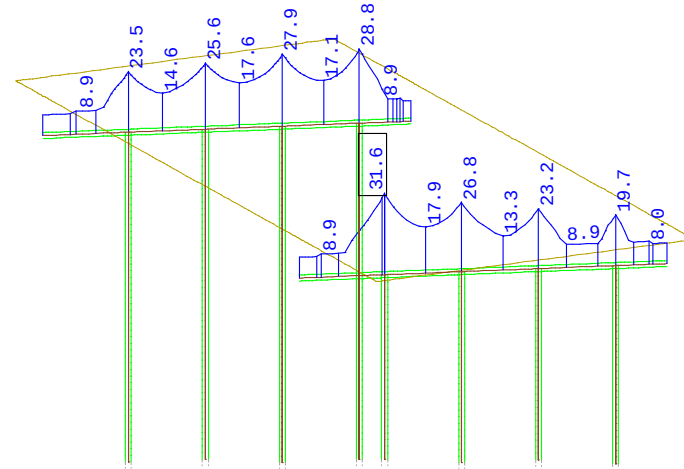


M 1 : 65
X * 0.502
Y * 0.906
Z * 0.962
Z
X Y
Sector of system Beam Elements, Quadrilateral Elements
Beam Elements , Shear reinforcements (maximum), Design Case 2 , 1 cm 3D = 5.0000 cm2/m (Max=5.0)

M 1 : 65
X * 0.502
Y * 0.906
Z * 0.962



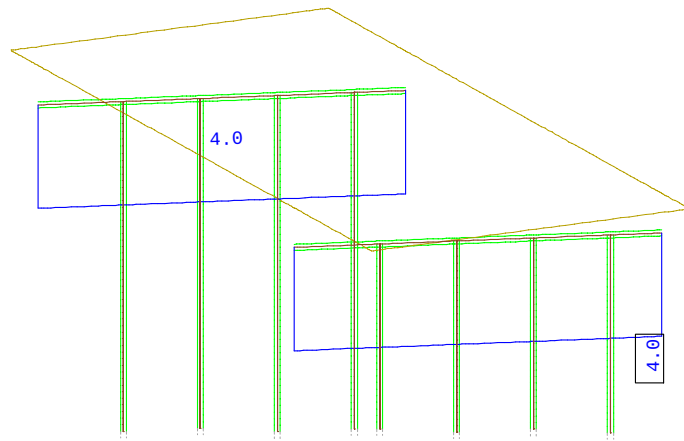
Z
X Y
Sector of system Beam Elements, Quadrilateral Elements
Beam Elements , Longitudinal Reinforcements Lay. 1, Design Case 2 , 1 cm 3D = 10.000 cm2 (Max=14.0)



M 1 : 65
X * 0.502
Y * 0.906
Z * 0.962
Z
X Y
Sector of system Beam Elements, Quadrilateral Elements
Beam Elements , Longitudinal Reinforcements Lay. 2, Design Case 2 , 1 cm 3D = 20.000 cm2 (Max=31.6)

M 1 : 65
X * 0.502
Y * 0.906
Z * 0.962

Comprobación viga



Z
 Y
 X
 Sector of system Beam Elements, Quadrilateral Elements
 Beam Elements , Longitudinal Reinforcements Lay. 3, Design Case 2 , 1 cm 3D = 2.0000 cm2
 (Max=4.0)

M 1 : 65
 X * 0.502
 Y * 0.906
 Z * 0.962

Comprobación viga

PAGE 2

MICRO

Características Geométricas del Micropilote		
Diámetro de la perforación	Dp (mm)	200.00
Diámetro del micropilote	Dm (mm)	180.00
Diámetro exterior de la armadura tubular	de (mm)	139.00
Espesor de la armadura tubular	e (mm)	9.00
Reducción de espesor de la armadura tubular por corrosión	re (mm)	3.00

Características Geométricas del refuerzo del micropilote		
Diámetro de la armadura pasiva	φp (mm)	0.00

Separación entre micropilotes	sep (m)	1.00
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Propiedades de los materiales				
Resistencia de diseño del hormigón del micropilote	fck (Mpa)	25.00	fcd (Mpa)	16.67
Resistencia de diseño del acero tubular	fyk (Mpa)	560.00	fyd (Mpa)	400.00
Resistencia de diseño del acero pasivo	fsk (Mpa)	500.00	fsd (Mpa)	400.00

Módulo de elasticidad del acero	E (Mpa)	210000.00
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Coeficiente de mayoración de acciones	γf	1.50
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		Servicio	Límite
Axil de cálculo (Compresión)	N (kN/m)	226.00	339
Axil de cálculo (Tracción)	Nt (kN/m)	0.00	0
Esfuerzo cortante característico máximo	V (kN/m)	2.00	3
Momento flector característico máximo	M (kNm/m)	2.00	3

RESULTADOS

		Servicio	Límite
Carga de Hundimiento	Re (kN)	377	565
Resistencia a Compresión	NR (kN)	355	532
Resistencia a Tracción	Nt,R (kN)	290	435
Resistencia a Cortante	VR (kN)	235	352
Resistencia a Flexión	MR (kNm)	26	39

COMPROBACIÓN DE LA CARGA DE HUNDIMIENTO DEL MICROPILOTE

Axil de cálculo	N (kN/m)	226.00
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Esfuerzo axil de cálculo (Nd=N*sep*γf)	Nd (kN)	339.00
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Resistencia unitaria de cálculo por punta	qpd (kPa)	0.00
Resistencia unitaria de cálculo por fuste	fed (kPa)	200.00
Longitud de empotramiento en roca del micropilote	Ler (m)	5.00

Resistencia del empotramiento en roca:	Red (kN)	565.49
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$$Red := \left(\pi \cdot \frac{D_m^2}{4} \cdot q_{pd} + \pi \cdot D_m \cdot L_{er} \cdot 1000 \cdot f_{ed} \right) \cdot 10^{-6}$$

RESISTENCIA ESTRUCTURAL DEL MICROPILOTE A COMPRESIÓN

Coeficiente de minoración del área tubular en función del tipo de unión.	Fuc	1.00
Área de la armadura tubular:	Aa (mm ²)	2393.89
Área de la armadura pasiva:	As (mm ²)	0.00
Sección neta de hormigón o mortero del micropilote:	Ac (mm ²)	23053.01
Coeficiente dependiente del tipo de terreno y perforación:	Fe	1.50
Diámetro del micropilote en la zona del pandeo	D=de (mm)	139.00
Longitud de la zona libre del Micropilote	H (m)	2.00
	Cr	12.00
Coeficiente de reducción de la capacidad estructural del micropilote por efecto del pandeo.	Remp	0.75
Resistencia de cálculo del hormigón	fcd (Mpa)	16.67
Resistencia de calculo del acero de la armadura tubular	fyd (Mpa)	400.00
Resistencia de calculo del acero de las armaduras corrugadas	fsd (Mpa)	400.00
Esfuerzo axil de cálculo (Nd=N*sep*γf)	Nd (KN)	339.00
Resistencia estructural del micropilote a compresión	NRd (KN)	532.21

RESISTENCIA ESTRUCTURAL DEL MICROPILOTE A TRACCIÓN

Área de la armadura tubular:	Aa (mm ²)	1196.95
Área de la armadura pasiva:	As (mm ²)	0.00
Resistencia de cálculo del hormigón	fcd (Mpa)	16.67
Resistencia de calculo del acero de la armadura tubular	fyd (Mpa)	400.00
Resistencia de calculo del acero de las armaduras corrugadas	fsd (Mpa)	400.00
Resistencia estructural del micropilote a tracción	Nt,Rd (KN)	435.25

RESISTENCIA ESTRUCTURAL DEL MICROPILOTE A CORTANTE

Esfuerzo cortante característico máximo	V (kN/m)	2.00
Esfuerzo cortante de cálculo (Vd=V*sep*γf)	Vd (kN)	3.00
Área de la armadura tubular:	Aa (mm ²)	2393.89
Resistencia de calculo del acero de la armadura tubular	f _{yd} (Mpa)	400.00
Resistencia estructural del micropilote a cortante	V_{Rd} (kN)	351.95

$$V_{Rd} := \frac{2 \cdot A_a}{\pi} \cdot \frac{1}{\sqrt{3}} \cdot f_{yd} \cdot 10^{-3}$$

RESISTENCIA ESTRUCTURAL DEL MICROPILOTE FRENTE A FLEXIÓN

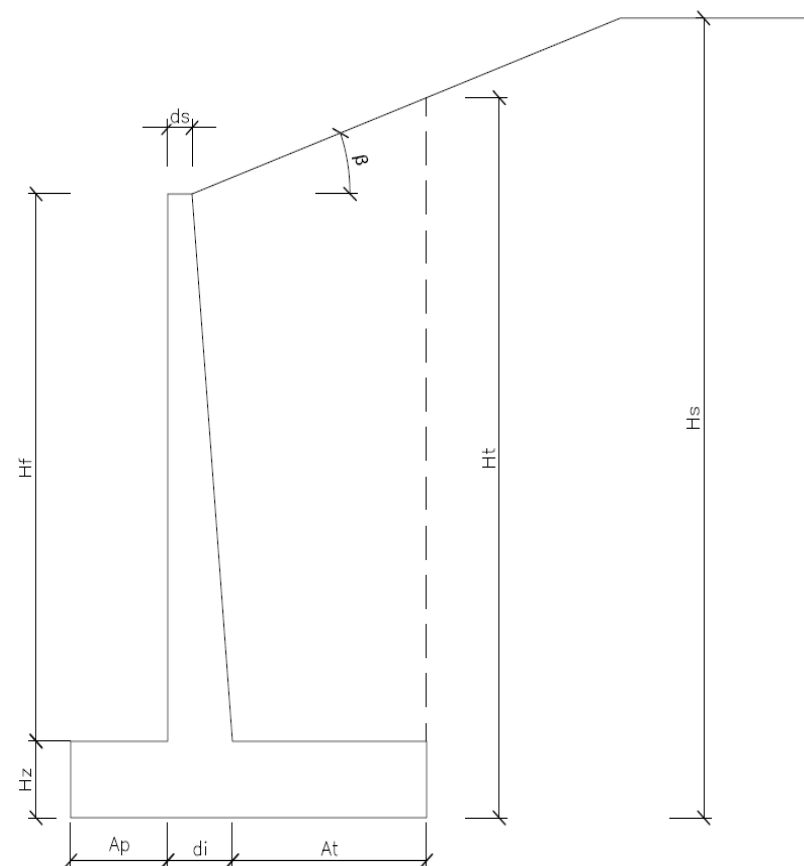
Momento flector característico máximo	M (kNm/m)	2.00
Momento flector de cálculo (Md=M*sep*γf)	Md (kNm)	3.00
Módulo plástico de la sección	W _p (mm ³)	96846.00
Módulo elástico de la sección	W _e (mm ³)	72739.27
	W (mm ³)	96846.00

Resistencia estructural del micropilote a flexión

Coefficiente de minoración del módulo resistente de la armadura tubular por el tipo de unión:	F _{uf}	1.00
Resistencia de cálculo del acero tubular	f _{yd} (Mpa)	400.00
Resistencia estructural del micropilote a flexión	M_{Rd} (kNm)	38.74

10.1.- ODT 5

Se comprueban las dos secciones de muro.



CÁLCULO DE EMPUJES

DATOS DE ENTRADA

GEOMETRÍA

Altura del muro

h 1.70 m

Altura de la plataforma

H 1.70 m

Ángulo del talud

β 33.70 °

Ángulo inclinación del trasdós

γ 90.00 °

Ángulo empuje

δ 10.00 °

PROPIEDADES DEL TERRENO

Peso específico tierras

γ_t 2.00 t/m³

Ángulo de rozamiento interno del terreno

φ 30.00 °

% de desarrollo efectivo del rozamiento

0.66

Cohesión

C 0.00 kN/m²

CARGAS

Sobrecarga

q 5.00 kN/m²

Aceleración eje y (vertical)

g_y -9.83 m/s²

Aceleración eje x (horizontal)

g_x -0.82 m/s²

RESULTADOS

Cohesión

C 0.00 kN

Peso de la cuña

W 25.49 kN

Reacción del terreno

R 27.01 kN

Empuje

Q 17.53 kN

Coefficiente de empuje

k 0.47

Ángulo pésimo cuña

ρ 55.00 kN

A continuación, se muestra los resultados del modelo incluyendo:

1. Empujes del terreno
2. Comprobación muro

DEFINICIÓN GEOMÉTRICA

FUSTE		
Hf=	1.4	m
ds=	0.3	m
di=	0.3	m
ZAPATA		
Hz =	0.3	m
Ap =	0	m
At =	0.9	m
A =	1.2	m
TALUD		
β=	30	°
Hs=	1.70	m
Ht=	1.70	m

MATERIALES

Resistencia de hormigón de zapatas	fck=	30.0	N/mm2	fcd=	20.0	N/mm2
	fctm=	2.9	N/mm2			
Resistencia de hormigón de fustes	fck=	30.0	N/mm2	fcd=	20.0	N/mm2
	fctm=	2.9	N/mm2			
Resistencia de cálculo del acero	fyk=	500.0	N/mm2	fyd=	434.8	N/mm2
Peso específico del terreno	γ=	20.0	kN/m3			
Ángulo de rozamiento zapata-terreno	φc=	25.0	°			

ACCIONES

Ángulo de rozamiento interno del terreno	φ=	30.0	°			
Ángulo de rozamiento tierras -tierras	δ=φ/3=	10.0	°			
Tensión máxima admisible	σ adm=	1.0	kg/cm2	σ adma=	1.000	kg/cm2
Coeficiente de empuje al reposo	λp=	0.5				
Coeficiente de empuje estabilidad	λ=	0.5		λa=	0.550	
Coeficiente de empuje armado fuste	λpf=	0.5		λpf=	0.550	
Sobrecarga uniforme sobre el terraplén	q=	5.0	kN/m2			
Distancia de aplicación de la sobrecarga	X=	0.0	m	0	m distancia a berma	
Carga barandilla	Qa=	1.5	kN/ml			
Distancia aplicación vertical	dQa=	1.2	m			
Aceleración horizontal de cálculo (g)		0.050				

COMPROBACIONES

	V (kN)	MV puntera (k MV cdg (kNm)		H (kN)	MH 0 (kN)
Peso Alzado	10.5	1.6	4.7		
Peso Zapata	9.0	5.4	0.0		
Peso Tierras	25.2	18.9	-3.8		
Empuje Tierra:	2.4	2.8	-1.4	13.4	7.6
Sobrecarga	5.2	4.2		3.9	3.3
Empuje Sismo	0.4	0.5		2.3	2.6
Inercial Alzado				0.5	0.5
Inercial Zapata				0.5	0.1
Inercial Tierras				1.3	1.3
Barandilla				1.5	4.4

DESGLIZAMIENTO

	PERM	CAR	SIS	ACC
V (kN)	47.1	52.3	47.5	52.3
H (kN)	13.4	18.8	17.9	17.3
Fest (kN)	22.0	24.4	22.1	24.4
Fdes (kN)	13.4	18.8	17.9	17.3
FS	1.6	1.3	1.2	1.4
LÍMITE	1.5	1.3	1.1	1.1

VUELCO

	PERM	CAR	SIS	ACC
Mest (kNm)	28.72	32.93	29.20	28.72
Mdes (kNm)	7.59	15.29	12.03	7.59
FS	3.78	2.15	2.43	3.78
LÍMITE	2.00	1.80	1.50	1.50

TENSIONES SOBRE EL TERRENO

	PERM	CAR	SIS	ACC
V (kN)	47.08	52.27	47.48	47.08
Mcdg (kNm)	7.12	14.82	11.56	7.12
e (m)	0.15	0.28	0.24	0.15
σ puntera (kg/ 0.69		1.10	0.89	0.69
σ talón (kg/cr 0.10		0.00	0.00	0.10
Lapoyada (m)	1.20	0.95	1.07	1.20
σ media (kg/cr 0.39		0.55	0.44	0.39
LÍMITE	1.00	1.00	1.00	1.00
σ max (kg/cm: 0.69		1.10	0.89	0.69
LÍMITE	1.25	1.25	1.25	1.25