

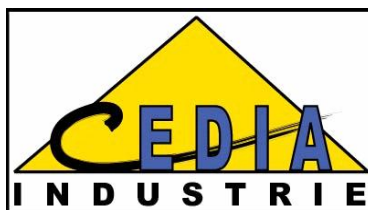
# **NOTE DE CALCUL**

**Projet: ST 1000**

**Note de calculs référence :04608-nc1.rtd**

**du: 13/05/08**

**B.E:**



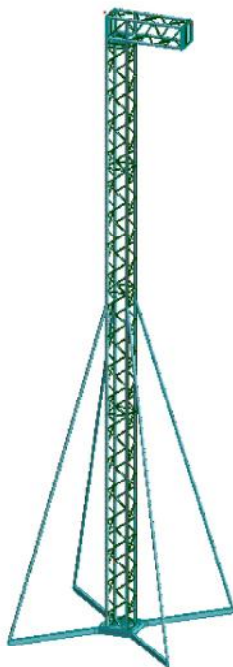
**POUR:**

**Client: A.S.D - 08460 LALOBBE**

**Auteur: S.C**

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## **Vue d'ensemble**



## Hypothèses de calcul

- Tour installée suivant notice de montage ST1000-ASD
- Utilisation du matériel d'origine ASD.
- Lest avant mini=180daN
- Lest arrière mini=500daN
- Charge de levage= 1000daN
- Surface au vent maxi cluster : face=2.82m<sup>2</sup> et coté 2.24m<sup>2</sup>
- Eloignement du bas du cluster par rapport au sol : maxi=5m30
- Hauteur de la tour maxi=10m
- Installation en extérieur, pour vent maxi de 50km/h
- Reprise de la partie inférieure du cluster par 2 câbles accrochés en vis-à-vis sur la tour verticale

## Note de calcul

Propriétés du projet: **ST 1000**

Type de structure : Portique spatial

Coordonnées du centre de gravité de la structure:

X = 0.029 (m)

Y = -0.000 (m)

Z = 2.071 (m)

Moments d'inertie centraux de la structure:

I<sub>x</sub> = 3503.250 (kg\*m<sup>2</sup>)

I<sub>y</sub> = 3465.262 (kg\*m<sup>2</sup>)

I<sub>z</sub> = 341.423 (kg\*m<sup>2</sup>)

Masse = 325.079 (kg)

Coordonnées du centre de gravité de la structure avec la prise en compte des masses dynamiques globales:

X = 0.905 (m)

Y = -0.000 (m)

Z = 8.070 (m)

Moments d'inertie centraux de la structure avec la prise en compte des masses dynamiques globales:

I<sub>x</sub> = 18935.499 (kg\*m<sup>2</sup>)

I<sub>y</sub> = 19226.768 (kg\*m<sup>2</sup>)

I<sub>z</sub> = 670.680 (kg\*m<sup>2</sup>)

Masse = 1344.795 (kg)

Description de la structure

|                                  |      |
|----------------------------------|------|
| Nombre de noeuds:                | 211  |
| Nombre de barres:                | 262  |
| Eléments finis linéiques:        | 393  |
| Eléments finis surfaciques:      | 0    |
| Eléments finis volumiques:       | 0    |
| Nbre de degrés de liberté stat.: | 1254 |
| Cas:                             | 14   |
| Combinaisons:                    | 0    |

### Liste de cas de charges/types de calculs

**Cas 1** : pp

Type d'analyse: Statique linéaire

**Cas 2** : 1t

Type d'analyse: Statique linéaire

**Cas 3** : EFF

Type d'analyse:

**Cas 4** : EFF+

Type d'analyse:

**Cas 5** : EFF-

Type d'analyse:

**Cas 6** : DEP

Type d'analyse:

**Cas 7** : DEP+

Type d'analyse:

**Cas 8** : DEP-

Type d'analyse:

**Cas 9** : Modale

Type d'analyse: Modale

**Données:**

|                                      |   |                           |
|--------------------------------------|---|---------------------------|
| Mode d'analyse                       | : | Modal                     |
| Type de matrices de masses           | : | Concentrée avec rotations |
| Nombre de modes                      | : | 10                        |
| Limites                              | : | 0.000                     |
| Coefficient des masses participantes | : | 0.000                     |

**Cas 10** : vf

Type d'analyse: Statique linéaire

**Cas 11** : vent arriere

Type d'analyse: Statique linéaire

**Cas 12** : vent de cote

Type d'analyse: Statique linéaire

**Cas 13** : 1t-lev

Type d'analyse: Statique linéaire

**Cas 15** : lest

Type d'analyse: Statique linéaire

## propriétés des profilés

### Caractéristiques de la section:

TREC 90x50x4



HY=50.0, HZ=90.0 [mm]

AX=10.480 [cm<sup>2</sup>]

IX=97.400, IY=108.800, IZ=42.450 [cm<sup>4</sup>]

Matériau=ACIER E24 Soudé

PLAT 80x40



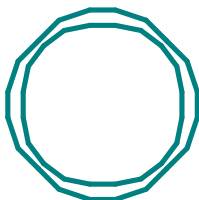
HY=80.0, HZ=40.0 [mm]

AX=32.000 [cm<sup>2</sup>]

IX=117.187, IY=42.667, IZ=170.667 [cm<sup>4</sup>]

Matériau=ACIER

50x3



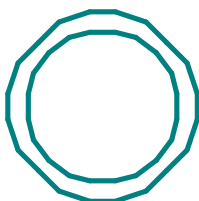
HY=50.0, HZ=50.0 [mm]

AX=4.430 [cm<sup>2</sup>]

IX=24.562, IY=12.281, IZ=12.281 [cm<sup>4</sup>]

Matériau=6005-T6

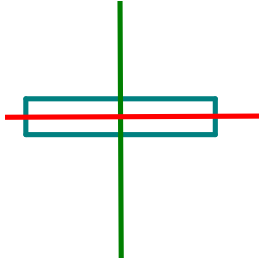
20x2



HY=20.0, HZ=20.0 [mm]

AX=1.131 [cm<sup>2</sup>]  
IX=0.927, IY=0.464, IZ=0.464 [cm<sup>4</sup>]  
Matériau=6005-T6

PLAT 50x10



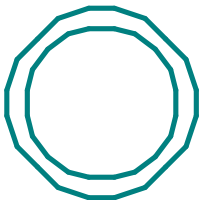
HY=50.0, HZ=10.0 [mm]  
AX=5.000 [cm<sup>2</sup>]  
IX=1.457, IY=0.417, IZ=10.417 [cm<sup>4</sup>]  
Matériau=6005-T6

PLAT 400x10



HY=400.0, HZ=10.0 [mm]  
AX=40.000 [cm<sup>2</sup>]  
IX=13.123, IY=3.333, IZ=5333.330 [cm<sup>4</sup>]  
Matériau=6005-T6

RONDE\_50x5



HY=50.0, HZ=50.0 [mm]  
AX=7.069 [cm<sup>2</sup>]  
IX=36.226, IY=18.113, IZ=18.113 [cm<sup>4</sup>]  
Matériau=6005-T6

## propriétés de l'affaire

Nom du projet : ST 1000

Adresse:

Ville:

Phase: APD

n° de correction:

Commentaire:

### Bureau d'études

Nom: CEDIA INDUSTRIE

Adresse: ROUTE D'ARREUX

Ville: 08090 TOURNES

Responsable: S.C

Téléphone: 03.24.55.60.05 Fax: 03.24.55.60.06 e-mail: [cedia@cedia-industrie.fr](mailto:cedia@cedia-industrie.fr)

### Entreprise

Nom: A.S.D

Adresse: ROUTE DE LA NEUVILLE

Ville: 08460 LALOBBE

Responsable:

Téléphone: Fax: e-mail:

## pondérations

### Pondérations suivant le règlement : AL 76

#### Paramètres de la création des pondérations

Type de pondérations : complètes

Liste de cas actifs :

#### Liste de modèles de combinaison :

|     |                               |
|-----|-------------------------------|
| EFF | normale (1 charge variable)   |
| EFF | normale (2 charges variables) |
| EFF | normale (3 charges variables) |
| DEP | Déplacement                   |

#### Liste de groupes définis :

|                 |    |           |
|-----------------|----|-----------|
| permanente:     | G1 | et,       |
| d'exploitation: | Q1 | ou excl., |
| vent:           | W1 | ou excl., |

#### Liste de relations définies :

|                 |    |
|-----------------|----|
| permanente:     | G1 |
| d'exploitation: | Q1 |
| vent:           | W1 |

## Définitions des pondérations - Cas: 3 6 [ AL 76 ] [ AL 76 ]

- Cas: 3 6 [ AL 76 ]

| Combinaison/Comp. | Définition                                |
|-------------------|-------------------------------------------|
| EFF/ 1            | $pp*1.50 + lest*1.50$                     |
| EFF/ 2            | $pp*1.50 + 1t*1.70 + lest*1.50$           |
| EFF/ 3            | $pp*1.50 + 1t-lev*1.70 + lest*1.50$       |
| EFF/ 4            | $pp*1.00 + lest*1.00$                     |
| EFF/ 5            | $pp*1.00 + 1t*1.70 + lest*1.00$           |
| EFF/ 6            | $pp*1.00 + 1t-lev*1.70 + lest*1.00$       |
| EFF/ 7            | $pp*1.50 + vf*1.70 + lest*1.50$           |
| EFF/ 8            | $pp*1.50 + va*1.70 + lest*1.50$           |
| EFF/ 9            | $pp*1.50 + vc*1.70 + lest*1.50$           |
| EFF/ 10           | $pp*1.00 + vf*1.70 + lest*1.00$           |
| EFF/ 11           | $pp*1.00 + va*1.70 + lest*1.00$           |
| EFF/ 12           | $pp*1.00 + vc*1.70 + lest*1.00$           |
| EFF/ 13           | $pp*1.50 + 1t*1.60 + vf*1.60 + lest*1.50$ |
| EFF/ 14           | $pp*1.50 + 1t*1.60 + va*1.60 + lest*1.50$ |

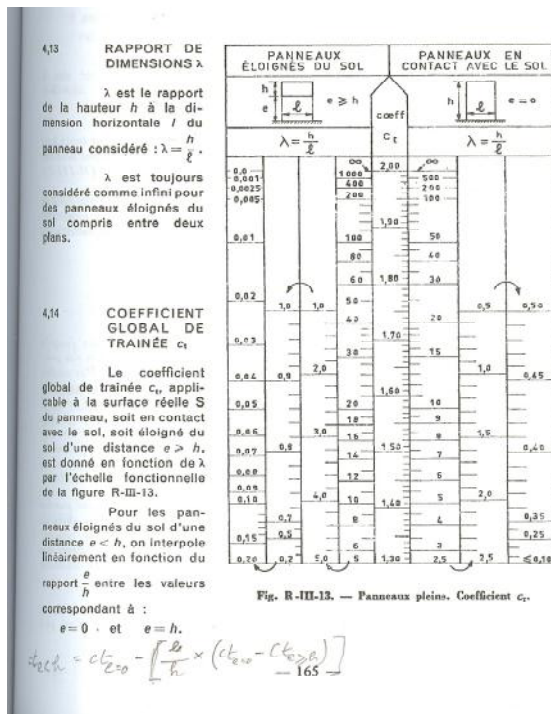
| Combinaison/Comp. | Définition                                    |
|-------------------|-----------------------------------------------|
| EFF/ 15           | $pp*1.50 + 1t*1.60 + vc*1.60 + lest*1.50$     |
| EFF/ 16           | $pp*1.50 + vf*1.60 + 1t-lev*1.60 + lest*1.50$ |
| EFF/ 17           | $pp*1.50 + va*1.60 + 1t-lev*1.60 + lest*1.50$ |
| EFF/ 18           | $pp*1.50 + vc*1.60 + 1t-lev*1.60 + lest*1.50$ |
| EFF/ 19           | $pp*1.00 + 1t*1.60 + vf*1.60 + lest*1.00$     |
| EFF/ 20           | $pp*1.00 + 1t*1.60 + va*1.60 + lest*1.00$     |
| EFF/ 21           | $pp*1.00 + 1t*1.60 + vc*1.60 + lest*1.00$     |
| EFF/ 22           | $pp*1.00 + vf*1.60 + 1t-lev*1.60 + lest*1.00$ |
| EFF/ 23           | $pp*1.00 + va*1.60 + 1t-lev*1.60 + lest*1.00$ |
| EFF/ 24           | $pp*1.00 + vc*1.60 + 1t-lev*1.60 + lest*1.00$ |
| DEP/ 1            | $pp*1.00 + lest*1.00$                         |
| DEP/ 2            | $pp*1.00 + 1t*1.00 + lest*1.00$               |
| DEP/ 3            | $pp*1.00 + 1t-lev*1.00 + lest*1.00$           |
| DEP/ 4            | $pp*1.00 + vf*1.00 + lest*1.00$               |
| DEP/ 5            | $pp*1.00 + va*1.00 + lest*1.00$               |
| DEP/ 6            | $pp*1.00 + vc*1.00 + lest*1.00$               |
| DEP/ 7            | $pp*1.00 + 1t*1.00 + vf*1.00 + lest*1.00$     |
| DEP/ 8            | $pp*1.00 + 1t*1.00 + va*1.00 + lest*1.00$     |
| DEP/ 9            | $pp*1.00 + 1t*1.00 + vc*1.00 + lest*1.00$     |
| DEP/ 10           | $pp*1.00 + vf*1.00 + 1t-lev*1.00 + lest*1.00$ |
| DEP/ 11           | $pp*1.00 + va*1.00 + 1t-lev*1.00 + lest*1.00$ |
| DEP/ 12           | $pp*1.00 + vc*1.00 + 1t-lev*1.00 + lest*1.00$ |

## Résultante du vent sur cluster vent de face

### calcul des efforts resultants d'un panneau isolé vertical

| dimensions de la structure hors tout |                       | articles   |
|--------------------------------------|-----------------------|------------|
| hauteur (h)                          | 3200                  |            |
| largeur (l)                          | 880 mm                |            |
| éloignement du panneau du sol - e-   | 5300 mm               |            |
| rapport des dimensions (lambda)      | 3.64                  | p.71 1.321 |
| rapport e/h                          | 1.66                  |            |
| <b>données du vent</b>               |                       |            |
| Vitesse du vent                      | 50 km/h               |            |
|                                      | 13.89 m/s             |            |
| pression de base du vent             | 12 daN/m <sup>2</sup> | 1.232      |
| coefficient de masque (Km)           | 1                     | 1.243      |
| coefficient de site (Ks)             | 1                     | 1.242      |
| Coefficient de hauteur maxi (Delta)  | 0.89                  | p.63 1.244 |
| qh/q10                               | 0.84                  | 1.241      |
| <b>Actions dynamiques</b>            |                       |            |
| Periode de structure                 | 2.20 s                |            |
| Coefficient de réponse (Xi)          | 2.40                  | p.83 1.511 |
| Coefficient de pulsation (Taux)      | 0.36                  | p.83 1.511 |
| Coefficient dynamique (Beta)         | 1.9                   | p.81 1.511 |
| Valeur Analytique                    |                       |            |
| de pression dyn. (qr)                | 17 daN/m <sup>2</sup> |            |

| Résultante des actions          |                          | articles   |
|---------------------------------|--------------------------|------------|
| Coefficient de traînée (Ct)     | 1.68                     | p.165 4.13 |
| Surface au vent (panneau plein) | 2.82 m <sup>2</sup>      |            |
| Action d'ensemble répartie      | 27.80 daN/m <sup>2</sup> |            |
| Action d'ensemble (Taux)        | 78 daN                   | p.167 4.15 |

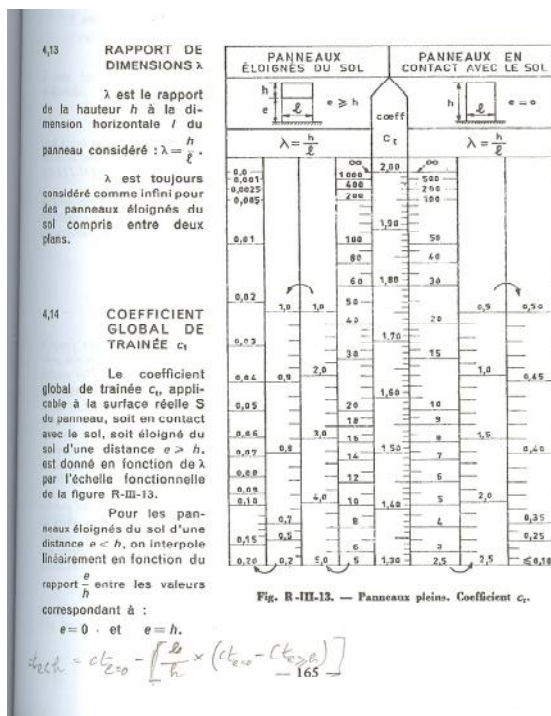


## Résultante du vent sur cluster vent de coté

### calcul des efforts resultants d'un panneau isolé vertical

| dimensions de la structure hors tout |                       | articles   |
|--------------------------------------|-----------------------|------------|
| hauteur (h)                          | 3200                  |            |
| largeur (l)                          | 700 mm                |            |
| éloignement du panneau du sol - e-   | 5300 mm               |            |
| rapport des dimensions (lambda)      | 4.57                  | p.71 1.321 |
| rapport e/h                          | 1.66                  |            |
| <b>données du vent</b>               |                       |            |
| Vitesse du vent                      | 50 km/h               |            |
|                                      | 13.89 m/s             |            |
| pression de base du vent             | 12 daN/m <sup>2</sup> | 1.232      |
| coefficient de masque (Km)           | 1                     | 1.243      |
| coefficient de site (Ks)             | 1                     | 1.242      |
| Coefficient de hauteur maxi (Delta)  | 0.89                  | p.63 1.244 |
| qh/q10                               | 0.84                  | 1.241      |
| <b>Actions dynamiques</b>            |                       |            |
| Periode de structure                 | 2.20 s                |            |
| Coefficient de réponse (Xi)          | 2.40                  | p.83 1.511 |
| Coefficient de pulsation (Taux)      | 0.36                  | p.83 1.511 |
| Coefficient dynamique (Beta)         | 1.9                   | p.81 1.511 |
| Valeur Analytique                    |                       |            |
| de pression dyn. (qr)                | 17 daN/m <sup>2</sup> |            |

| Résultante des actions          |                          | articles   |
|---------------------------------|--------------------------|------------|
| Coefficient de traînée (Ct)     | 1.68                     | p.165 4.13 |
| Surface au vent (panneau plein) | 2.24 m <sup>2</sup>      |            |
| Action d'ensemble répartie      | 27.80 daN/m <sup>2</sup> |            |
| Action d'ensemble (Taux)        | 62 daN                   | p.167 4.15 |



## Résultante du vent sur les treillis

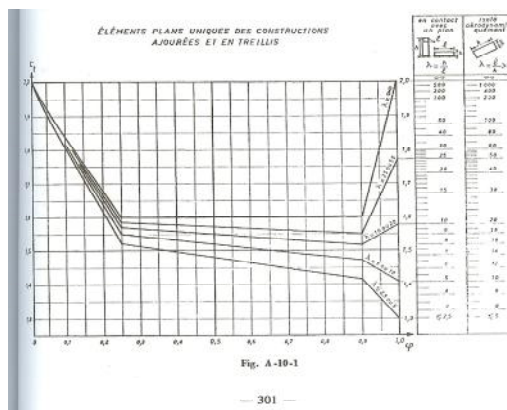
### calcul des efforts resultants au vent sur structures à treillis

| dimensions de la structure hors tout    |                       | articles   |
|-----------------------------------------|-----------------------|------------|
| hauteur                                 | 10000 mm              |            |
| largeur                                 | 400 mm                |            |
| rapport des dimensions (lambda)         | 25.00                 | p.71 1.321 |
| <b>données du vent</b>                  |                       |            |
| Vitesse du vent                         | 50 km/h               |            |
|                                         | 13.8888889 m/s        |            |
| pression de base du vent                | 12 daN/m <sup>2</sup> | 1.232      |
| coefficient de masque (Km)              | 1                     | 1.243      |
| coefficient de site (Ks)                | 1                     | 1.242      |
| Coefficient de hauteur maxi (Delta)     | 0.83                  | p.63 1.244 |
| qh/q10                                  | 1.00                  | 1.241      |
| <b>Actions dynamiques</b>               |                       |            |
| Période de structure                    | 2.20 s                |            |
| Coefficient de réponse (Xi)             | 2.40                  | p.83 1.511 |
| Coefficient de pulsation (Taux)         | 0.36                  | p.83 1.511 |
| Coefficient dynamique (Beta)            | 1.9                   | p.81 1.511 |
| Valeur Analytique de pression dyn. (qr) | 18 daN/m <sup>2</sup> |            |

| Résultante des actions              |             | articles |
|-------------------------------------|-------------|----------|
| Action d'ensemble (Taux)            | 49 daN      | 5.22     |
| Décomposition d'actions             |             |          |
| Mètre total des tubes (1f)          | 36.8 m      |          |
| <b>Vent de face (Faces 1 et 3)</b>  |             |          |
| efforts normal sur tubes par face   | 0.67 daN/ml |          |
| <b>Vent oblique (Faces 1/2/3/4)</b> |             |          |
| Coefficient de vent oblique (Khi)   | 1.25        |          |
| Action d'ensemble (Taux.Khi)        | 61 daN      |          |
| efforts normal sur tubes par face   | 0.30 daN/ml |          |

| elements de structures           |                     | articles        |
|----------------------------------|---------------------|-----------------|
| membrures sur 1 face             |                     |                 |
| diametres membrures              | 50 mm               |                 |
| nb membrures                     | 2                   |                 |
| lg membrures                     | 10000 mm            |                 |
| surface au vent M                | 1.00 m <sup>2</sup> |                 |
| metre total des membrures(1f)    | 20.00 m             |                 |
| treillis sur 1 face              |                     |                 |
| diametres treillis               | 20 mm               |                 |
| nb treillis                      | 40                  |                 |
| lg treillis                      | 420 mm              |                 |
| surface au vent T                | 0.34 m <sup>2</sup> |                 |
| metre total des treillis(1f)     | 16.80 m             |                 |
| surface 1 face pleine (S)        | 4.00 m <sup>2</sup> | p.181 5.11      |
| Surface totale tubes 1 face (Sp) | 1.67 m <sup>2</sup> | p.181 5.11      |
| % sections pleines (Phi)         | 0.42                | p.181 5.11      |
| Coefficient de trainée (Ct)      | 1.60                | p.187/301 5.231 |

$$0.08 \leq j \leq 0.35$$



**caractéristiques - Barres**

|  | Nom de la section | Liste des barres                                                                   | AX<br>[cm2] | AY<br>[cm2] | AZ<br>[cm2] | IX<br>[cm4] | IY<br>[cm4] | IZ<br>[cm4]  |
|--|-------------------|------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|
|  | TREC 90x50x4      | 2 4A7 43 70                                                                        | 10.480      | 4.658       | 4.658       | 97.400      | 108.800     | 42.450       |
|  | PLAT 80x40        | 1 41 68 93 133<br>135A137                                                          | 32.000      | 26.667      | 26.667      | 117.187     | 42.667      | 170.667      |
|  | 50x3              | 3 9A12 37A40<br>53A56 67 69 94<br>95 132 138A141<br>178A181 218A223<br>239 240 246 | 4.430       | 2.215       | 2.215       | 24.562      | 12.281      | 12.281       |
|  | 20x2              | 8 13A36 44A52<br>57A66 71A91<br>96A131 142A177<br>182A217 42<br>224A238 241A245    | 1.131       | 0.954       | 0.954       | 0.927       | 0.464       | 0.464        |
|  | PLAT 50x10        | 247A254 257 258<br>261 262                                                         | 5.000       | 4.167       | 4.167       | 1.457       | 0.417       | 10.417       |
|  | PLAT 400x10       | 259 260                                                                            | 40.000      | 33.333      | 33.333      | 13.123      | 3.333       | 5333.33<br>0 |
|  | RONDE_50x5        | 263A266                                                                            | 7.069       | 5.964       | 5.964       | 36.226      | 18.113      | 18.113       |

**caractéristiques - Matériaux**

|   | Matériau              | E<br>[daN/mm <sup>2</sup> ] | G<br>[daN/mm <sup>2</sup> ] | N<br>U           | LX [1/°C] | RO<br>[daN/m <sup>3</sup> ] | Re<br>[daN/mm <sup>2</sup> ] |
|---|-----------------------|-----------------------------|-----------------------------|------------------|-----------|-----------------------------|------------------------------|
| 1 | 6005-T6               | 7950.00                     | 2780.00                     | 0<br>.<br>3<br>4 | 0.00      | 2700.00                     | 26.00                        |
| 2 | ACIER<br>E24<br>Soudé | 21000.00                    | 8080.00                     | 0<br>.<br>3<br>0 | 0.00      | 7701.00                     | 23.50                        |
| 3 | ACIER                 | 21000.00                    | 8080.00                     | 0<br>.<br>3<br>0 | 0.00      | 7701.00                     | 23.50                        |

**noeuds**

| Noeud | X [m]       | Y [m]       | Z [m]  | Code de l'appui | Appui  |
|-------|-------------|-------------|--------|-----------------|--------|
| 1     | -<br>0.3100 | 0.3100      | 0.0    |                 |        |
| 2     | 0.3100      | -<br>0.3100 | 0.0    |                 |        |
| 3     | -<br>0.3100 | -<br>0.3100 | 0.0    |                 |        |
| 4     | 0.0         | 0.0         | 0.0    |                 |        |
| 5     | 0.3100      | 0.3100      | 0.0    |                 |        |
| 6     | -<br>0.2600 | -<br>0.2600 | 0.0    |                 |        |
| 7     | -<br>0.2600 | 0.2600      | 0.0    |                 |        |
| 8     | 0.2600      | 0.2600      | 0.0    |                 |        |
| 9     | 0.2600      | -<br>0.2600 | 0.0    |                 |        |
| 10    | 0.1695      | 0.1695      | 0.0    |                 |        |
| 11    | -<br>0.1695 | 0.1695      | 0.0    |                 |        |
| 12    | -<br>0.1695 | -<br>0.1695 | 0.0    |                 |        |
| 13    | 0.1695      | -<br>0.1695 | 0.0    |                 |        |
| 14    | 0.1695      | 0.1695      | 1.2500 |                 |        |
| 15    | -<br>1.3268 | 1.3268      | 0.0    | bbblll          | Rotule |
| 16    | -<br>1.3268 | -<br>1.3268 | 0.0    | bbblll          | Rotule |
| 17    | 1.3269      | -<br>1.3269 | 0.0    | bbblll          | Rotule |
| 18    | 1.3268      | 1.3268      | 0.0    | bbblll          | Rotule |
| 19    | -<br>0.1698 | 0.1695      | 1.5000 |                 |        |
| 20    | 0.1693      | 0.1695      | 1.5000 |                 |        |
| 21    | 0.1693      | -<br>0.1695 | 1.5000 |                 |        |
| 22    | -<br>0.1698 | -<br>0.1695 | 1.5000 |                 |        |
| 23    | 0.1695      | -<br>0.1695 | 1.2500 |                 |        |
| 24    | 0.1695      | 0.1695      | 1.0000 |                 |        |
| 25    | 0.1695      | -<br>0.1695 | 0.7500 |                 |        |
| 26    | 0.1695      | 0.1695      | 0.5000 |                 |        |
| 27    | 0.1695      | -<br>0.1695 | 0.2500 |                 |        |
| 28    | -<br>0.1695 | 0.1695      | 1.0000 |                 |        |
| 29    | 0.1695      | 0.1695      | 0.7500 |                 |        |
| 30    | -<br>0.1695 | 0.1695      | 0.5000 |                 |        |
| 31    | 0.1695      | 0.1695      | 0.2500 |                 |        |
| 32    | -<br>0.1695 | 0.1695      | 1.2500 |                 |        |

| Noeud | X [m]       | Y [m]       | Z [m]  | Code de l'appui | Appui |
|-------|-------------|-------------|--------|-----------------|-------|
| 33    | -<br>0.1695 | -<br>0.1695 | 1.0000 |                 |       |
| 34    | -<br>0.1695 | 0.1695      | 0.7500 |                 |       |
| 35    | -<br>0.1695 | -<br>0.1695 | 0.5000 |                 |       |
| 36    | -<br>0.1695 | 0.1695      | 0.2500 |                 |       |
| 37    | -<br>0.1695 | -<br>0.1695 | 1.2500 |                 |       |
| 38    | 0.1695      | -<br>0.1695 | 1.0000 |                 |       |
| 39    | -<br>0.1695 | -<br>0.1695 | 0.7500 |                 |       |
| 40    | 0.1695      | -<br>0.1695 | 0.5000 |                 |       |
| 41    | -<br>0.1695 | -<br>0.1695 | 0.2500 |                 |       |
| 42    | -<br>0.1700 | 0.1695      | 5.5000 |                 |       |
| 43    | 0.1690      | 0.1695      | 5.5000 |                 |       |
| 44    | 0.1690      | -<br>0.1695 | 5.5000 |                 |       |
| 45    | -<br>0.1700 | -<br>0.1695 | 5.5000 |                 |       |
| 46    | -<br>0.1700 | 0.1695      | 4.7500 |                 |       |
| 47    | -<br>0.1700 | -<br>0.1695 | 5.0000 |                 |       |
| 48    | 0.1690      | -<br>0.1695 | 4.7500 |                 |       |
| 49    | 0.1690      | 0.1695      | 4.5000 |                 |       |
| 50    | 0.1690      | -<br>0.1695 | 4.2500 |                 |       |
| 51    | 0.1690      | 0.1695      | 4.0000 |                 |       |
| 52    | 0.1690      | -<br>0.1695 | 3.7500 |                 |       |
| 53    | -<br>0.1700 | 0.1695      | 5.2500 |                 |       |
| 54    | 0.1690      | 0.1695      | 4.7500 |                 |       |
| 55    | -<br>0.1700 | 0.1695      | 4.5000 |                 |       |
| 56    | 0.1690      | 0.1695      | 4.2500 |                 |       |
| 57    | -<br>0.1700 | 0.1695      | 4.0000 |                 |       |
| 58    | 0.1690      | 0.1695      | 3.7500 |                 |       |
| 59    | -<br>0.1700 | -<br>0.1695 | 4.5000 |                 |       |
| 60    | -<br>0.1700 | 0.1695      | 4.2500 |                 |       |
| 61    | -<br>0.1700 | -<br>0.1695 | 4.0000 |                 |       |
| 62    | -<br>0.1700 | 0.1695      | 3.7500 |                 |       |
| 63    | -<br>0.1700 | -<br>0.1695 | 4.7500 |                 |       |
| 64    | -<br>0.1700 | 0.1695      | 3.5000 |                 |       |

| Noeud | X [m]       | Y [m]       | Z [m]  | Code de l'appui | Appui |
|-------|-------------|-------------|--------|-----------------|-------|
| 66    | 0.1690      | 0.1695      | 3.5000 |                 |       |
| 68    | 0.1690      | -<br>0.1695 | 3.5000 |                 |       |
| 70    | -<br>0.1700 | -<br>0.1695 | 3.5000 |                 |       |
| 72    | 0.1690      | -<br>0.1695 | 2.7500 |                 |       |
| 73    | 0.1690      | 0.1695      | 2.5000 |                 |       |
| 74    | 0.1690      | -<br>0.1695 | 2.2500 |                 |       |
| 75    | 0.1690      | 0.1695      | 2.0000 |                 |       |
| 76    | 0.1690      | -<br>0.1695 | 1.7500 |                 |       |
| 77    | 0.1690      | 0.1695      | 2.7500 |                 |       |
| 78    | -<br>0.1700 | 0.1695      | 2.5000 |                 |       |
| 79    | 0.1690      | 0.1695      | 2.2500 |                 |       |
| 80    | -<br>0.1700 | 0.1695      | 2.0000 |                 |       |
| 81    | 0.1690      | 0.1695      | 1.7500 |                 |       |
| 82    | -<br>0.1700 | 0.1695      | 2.7500 |                 |       |
| 83    | -<br>0.1700 | -<br>0.1695 | 2.5000 |                 |       |
| 84    | -<br>0.1700 | 0.1695      | 2.2500 |                 |       |
| 85    | -<br>0.1700 | -<br>0.1695 | 2.0000 |                 |       |
| 86    | -<br>0.1700 | 0.1695      | 1.7500 |                 |       |
| 87    | -<br>0.1700 | -<br>0.1695 | 2.7500 |                 |       |
| 88    | 0.1690      | -<br>0.1695 | 2.5000 |                 |       |
| 89    | -<br>0.1700 | -<br>0.1695 | 2.2500 |                 |       |
| 90    | 0.1690      | -<br>0.1695 | 2.0000 |                 |       |
| 91    | -<br>0.1700 | -<br>0.1695 | 1.7500 |                 |       |
| 92    | -<br>0.1700 | -<br>0.1695 | 3.0000 |                 |       |
| 93    | -<br>0.1700 | 0.1695      | 3.2500 |                 |       |
| 94    | 0.1690      | -<br>0.1695 | 3.0000 |                 |       |
| 95    | -<br>0.1700 | -<br>0.1695 | 3.2500 |                 |       |
| 96    | 0.1690      | 0.1695      | 3.0000 |                 |       |
| 97    | 0.1690      | -<br>0.1695 | 3.2500 |                 |       |
| 98    | -<br>0.1700 | 0.1695      | 3.0000 |                 |       |
| 99    | 0.1690      | 0.1695      | 3.2500 |                 |       |
| 100   | 0.1690      | -<br>0.1695 | 5.0000 |                 |       |
| 101   | 0.1690      | -<br>0.1695 | 4.5000 |                 |       |

| Noeud | X [m]       | Y [m]       | Z [m]  | Code de l'appui | Appui |
|-------|-------------|-------------|--------|-----------------|-------|
| 102   | -<br>0.1700 | -<br>0.1695 | 4.2500 |                 |       |
| 103   | 0.1690      | -<br>0.1695 | 4.0000 |                 |       |
| 104   | -<br>0.1700 | -<br>0.1695 | 3.7500 |                 |       |
| 105   | -<br>0.1700 | -<br>0.1695 | 5.2500 |                 |       |
| 106   | 0.1690      | 0.1695      | 5.0000 |                 |       |
| 107   | 0.1690      | -<br>0.1695 | 5.2500 |                 |       |
| 108   | -<br>0.1700 | 0.1695      | 5.0000 |                 |       |
| 109   | 0.1690      | 0.1695      | 5.2500 |                 |       |
| 110   | -<br>0.1700 | 0.1695      | 7.5000 |                 |       |
| 111   | 0.1690      | 0.1695      | 7.5000 |                 |       |
| 112   | 0.1690      | -<br>0.1695 | 7.5000 |                 |       |
| 113   | -<br>0.1700 | 0.1695      | 7.5000 |                 |       |
| 114   | -<br>0.1700 | 0.1695      | 6.7500 |                 |       |
| 115   | -<br>0.1700 | -<br>0.1695 | 7.0000 |                 |       |
| 116   | 0.1690      | -<br>0.1695 | 6.7500 |                 |       |
| 117   | 0.1690      | 0.1695      | 6.5000 |                 |       |
| 118   | 0.1690      | -<br>0.1695 | 6.2500 |                 |       |
| 119   | 0.1690      | 0.1695      | 6.0000 |                 |       |
| 120   | 0.1690      | -<br>0.1695 | 5.7500 |                 |       |
| 121   | -<br>0.1700 | 0.1695      | 7.2500 |                 |       |
| 122   | 0.1690      | 0.1695      | 6.7500 |                 |       |
| 123   | -<br>0.1700 | 0.1695      | 6.5000 |                 |       |
| 124   | 0.1690      | 0.1695      | 6.2500 |                 |       |
| 125   | -<br>0.1700 | 0.1695      | 6.0000 |                 |       |
| 126   | 0.1690      | 0.1695      | 5.7500 |                 |       |
| 127   | -<br>0.1700 | -<br>0.1695 | 6.5000 |                 |       |
| 128   | -<br>0.1700 | 0.1695      | 6.2500 |                 |       |
| 129   | -<br>0.1700 | -<br>0.1695 | 6.0000 |                 |       |
| 130   | -<br>0.1700 | 0.1695      | 5.7500 |                 |       |
| 131   | -<br>0.1700 | -<br>0.1695 | 6.7500 |                 |       |
| 132   | 0.1690      | -<br>0.1695 | 7.0000 |                 |       |
| 133   | 0.1690      | -<br>0.1695 | 6.5000 |                 |       |
| 134   | -<br>0.1700 | -<br>0.1695 | 6.2500 |                 |       |

| Noeud | X [m]       | Y [m]       | Z [m]  | Code de l'appui | Appui |
|-------|-------------|-------------|--------|-----------------|-------|
| 135   | 0.1690      | -<br>0.1695 | 6.0000 |                 |       |
| 136   | -<br>0.1700 | -<br>0.1695 | 5.7500 |                 |       |
| 137   | -<br>0.1700 | -<br>0.1695 | 7.2500 |                 |       |
| 138   | 0.1690      | 0.1695      | 7.0000 |                 |       |
| 139   | 0.1690      | -<br>0.1695 | 7.2500 |                 |       |
| 140   | -<br>0.1700 | 0.1695      | 7.0000 |                 |       |
| 141   | 0.1690      | 0.1695      | 7.2500 |                 |       |
| 142   | -<br>0.1700 | 0.1695      | 9.5000 |                 |       |
| 143   | 0.1690      | 0.1695      | 9.5000 |                 |       |
| 144   | 0.1690      | -<br>0.1695 | 9.5000 |                 |       |
| 145   | -<br>0.1700 | -<br>0.1695 | 9.5000 |                 |       |
| 146   | -<br>0.1700 | 0.1695      | 8.7500 |                 |       |
| 147   | -<br>0.1700 | -<br>0.1695 | 9.0000 |                 |       |
| 148   | 0.1690      | -<br>0.1695 | 8.7500 |                 |       |
| 149   | 0.1690      | 0.1695      | 8.5000 |                 |       |
| 150   | 0.1690      | -<br>0.1695 | 8.2500 |                 |       |
| 151   | 0.1690      | 0.1695      | 8.0000 |                 |       |
| 152   | 0.1690      | -<br>0.1695 | 7.7500 |                 |       |
| 153   | -<br>0.1700 | 0.1695      | 9.2500 |                 |       |
| 154   | 0.1690      | 0.1695      | 8.7500 |                 |       |
| 155   | -<br>0.1700 | 0.1695      | 8.5000 |                 |       |
| 156   | 0.1690      | 0.1695      | 8.2500 |                 |       |
| 157   | -<br>0.1700 | 0.1695      | 8.0000 |                 |       |
| 158   | 0.1690      | 0.1695      | 7.7500 |                 |       |
| 159   | -<br>0.1700 | -<br>0.1695 | 8.5000 |                 |       |
| 160   | -<br>0.1700 | 0.1695      | 8.2500 |                 |       |
| 161   | -<br>0.1700 | -<br>0.1695 | 8.0000 |                 |       |
| 162   | -<br>0.1700 | 0.1695      | 7.7500 |                 |       |
| 163   | -<br>0.1700 | -<br>0.1695 | 8.7500 |                 |       |
| 164   | 0.1690      | -<br>0.1695 | 9.0000 |                 |       |
| 165   | 0.1690      | -<br>0.1695 | 8.5000 |                 |       |
| 166   | -<br>0.1700 | -<br>0.1695 | 8.2500 |                 |       |
| 167   | 0.1690      | -<br>0.1695 | 8.0000 |                 |       |

| Noeud | X [m]       | Y [m]       | Z [m]  | Code de l'appui | Appui |
|-------|-------------|-------------|--------|-----------------|-------|
| 168   | -<br>0.1700 | -<br>0.1695 | 7.7500 |                 |       |
| 169   | -<br>0.1700 | -<br>0.1695 | 9.2500 |                 |       |
| 170   | 0.1690      | 0.1695      | 9.0000 |                 |       |
| 171   | 0.1690      | -<br>0.1695 | 9.2500 |                 |       |
| 172   | -<br>0.1700 | 0.1695      | 9.0000 |                 |       |
| 173   | 0.1690      | 0.1695      | 9.2500 |                 |       |
| 174   | 0.1695      | 0.1695      | 5.3000 |                 |       |
| 175   | 0.1690      | -<br>0.1695 | 5.3000 |                 |       |
| 176   | -<br>0.1700 | -<br>0.1695 | 9.9830 |                 |       |
| 177   | 1.0845      | -<br>0.1695 | 9.9830 |                 |       |
| 178   | -<br>0.1700 | 0.1695      | 9.9830 |                 |       |
| 179   | 1.0845      | 0.1695      | 9.9830 |                 |       |
| 180   | -<br>0.1700 | -<br>0.1695 | 9.6440 |                 |       |
| 181   | 1.0845      | -<br>0.1695 | 9.6440 |                 |       |
| 182   | -<br>0.1700 | 0.1695      | 9.6440 |                 |       |
| 183   | 1.0845      | 0.1695      | 9.6440 |                 |       |
| 184   | 0.1690      | -<br>0.1695 | 9.5720 |                 |       |
| 185   | 0.1690      | 0.1695      | 9.6440 |                 |       |
| 186   | -<br>0.1700 | -<br>0.1695 | 9.5720 |                 |       |
| 187   | 0.1690      | -<br>0.1695 | 9.6440 |                 |       |
| 188   | -<br>0.1700 | 0.1695      | 9.5720 |                 |       |
| 189   | 0.1690      | 0.1695      | 9.5720 |                 |       |
| 190   | 0.3845      | 0.1695      | 9.9830 |                 |       |
| 191   | 0.5995      | 0.1695      | 9.6440 |                 |       |
| 192   | 0.8095      | 0.1695      | 9.9830 |                 |       |
| 193   | 0.1690      | 0.1695      | 9.9830 |                 |       |
| 194   | 0.3845      | -<br>0.1695 | 9.9830 |                 |       |
| 195   | 0.5995      | 0.1695      | 9.9830 |                 |       |
| 196   | 0.8095      | -<br>0.1695 | 9.9830 |                 |       |
| 197   | 0.1690      | -<br>0.1695 | 9.9830 |                 |       |
| 198   | 0.3845      | -<br>0.1695 | 9.6440 |                 |       |
| 199   | 0.5995      | -<br>0.1695 | 9.9830 |                 |       |
| 200   | 0.8095      | -<br>0.1695 | 9.6440 |                 |       |
| 201   | -<br>0.1700 | 0.0         | 9.9830 |                 |       |
| 202   | 0.5995      | -<br>0.1695 | 9.6440 |                 |       |

| Noeud      | X [m]       | Y [m]       | Z [m]  | Code de l'appui | Appui |
|------------|-------------|-------------|--------|-----------------|-------|
| <b>203</b> | 0.3845      | 0.1695      | 9.6440 |                 |       |
| <b>204</b> | 0.8095      | 0.1695      | 9.6440 |                 |       |
| <b>205</b> | -<br>0.1700 | 0.0         | 9.6440 |                 |       |
| <b>206</b> | 1.0845      | 0.0         | 9.9830 |                 |       |
| <b>207</b> | 1.0845      | 0.0         | 9.6440 |                 |       |
| <b>208</b> | 1.1845      | 0.0         | 9.9830 |                 |       |
| <b>209</b> | -<br>0.2700 | 0.0         | 9.9830 |                 |       |
| <b>212</b> | -<br>0.1700 | -<br>0.1695 | 5.3000 |                 |       |
| <b>214</b> | -<br>0.1700 | 0.1695      | 5.3000 |                 |       |

**barres**

| Barre | Noeu<br>d 1 | Noeu<br>d 2 | Section             | Matériau              | Longueur<br>[m] | Gamma<br>[Deg] | Type de<br>barre |
|-------|-------------|-------------|---------------------|-----------------------|-----------------|----------------|------------------|
| 1     | 3           | 12          | PLAT<br>80x40       | ACIER                 | 0.1987          | 90.0           | Barre            |
| 2     | 10          | 4           | TREC<br>90x50<br>x4 | ACIER<br>E24<br>Soudé | 0.2397          | 0.0            | embase_15<br>0   |
| 3     | 45          | 212         | 50x3                | 6005-T6               | 0.2000          | 0.0            | membrure_<br>150 |
| 4     | 6           | 7           | TREC<br>90x50<br>x4 | ACIER<br>E24<br>Soudé | 0.5200          | 0.0            | embase_15<br>0   |
| 5     | 7           | 8           | TREC<br>90x50<br>x4 | ACIER<br>E24<br>Soudé | 0.5200          | 0.0            | embase_15<br>0   |
| 6     | 9           | 8           | TREC<br>90x50<br>x4 | ACIER<br>E24<br>Soudé | 0.5200          | -0.0           | embase_15<br>0   |
| 7     | 9           | 6           | TREC<br>90x50<br>x4 | ACIER<br>E24<br>Soudé | 0.5200          | -0.0           | embase_15<br>0   |
| 8     | 21          | 20          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 9     | 43          | 174         | 50x3                | 6005-T6               | 0.2000          | 0.0            | membrure_<br>150 |
| 10    | 174         | 66          | 50x3                | 6005-T6               | 1.8000          | 0.0            | membrure_<br>150 |
| 11    | 44          | 175         | 50x3                | 6005-T6               | 0.2000          | 0.0            | membrure_<br>150 |
| 12    | 175         | 68          | 50x3                | 6005-T6               | 1.8000          | 0.0            | membrure_<br>150 |
| 13    | 26          | 27          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 14    | 27          | 10          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 15    | 13          | 12          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 16    | 11          | 12          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 17    | 11          | 10          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 18    | 10          | 13          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 19    | 19          | 14          | 20x2                | 6005-T6               | 0.4214          | 0.0            | treillis_150     |
| 20    | 14          | 28          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 21    | 28          | 29          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 22    | 29          | 30          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 23    | 30          | 31          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 24    | 31          | 11          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 25    | 22          | 32          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 26    | 32          | 33          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 27    | 33          | 34          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 28    | 34          | 35          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 29    | 35          | 36          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 30    | 36          | 12          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 31    | 21          | 37          | 20x2                | 6005-T6               | 0.4210          | 0.0            | treillis_150     |
| 32    | 37          | 38          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 33    | 38          | 39          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 34    | 39          | 40          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 35    | 40          | 41          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 36    | 41          | 13          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 37    | 19          | 11          | 50x3                | 6005-T6               | 1.5000          | 0.0            | membrure_<br>150 |

| Barre | Noeu<br>d 1 | Noeu<br>d 2 | Section             | Matériau              | Longueur<br>[m] | Gamma<br>[Deg] | Type de<br>barre |
|-------|-------------|-------------|---------------------|-----------------------|-----------------|----------------|------------------|
| 38    | 20          | 10          | 50x3                | 6005-T6               | 1.5000          | 0.0            | membrure_150     |
| 39    | 21          | 13          | 50x3                | 6005-T6               | 1.5000          | 0.0            | membrure_150     |
| 40    | 22          | 12          | 50x3                | 6005-T6               | 1.5000          | 0.0            | membrure_150     |
| 41    | 1           | 11          | PLAT<br>80x40       | ACIER                 | 0.1987          | 90.0           | Barre            |
| 42    | 19          | 22          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 43    | 11          | 13          | TREC<br>90x50<br>x4 | ACIER<br>E24<br>Soudé | 0.4794          | 0.0            | embase_150       |
| 44    | 20          | 23          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 45    | 23          | 24          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 46    | 24          | 25          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 47    | 25          | 26          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 48    | 96          | 97          | 20x2                | 6005-T6               | 0.4212          | -0.0           | treillis_150     |
| 49    | 97          | 66          | 20x2                | 6005-T6               | 0.4212          | -0.0           | treillis_150     |
| 50    | 77          | 98          | 20x2                | 6005-T6               | 0.4212          | -0.0           | treillis_150     |
| 51    | 98          | 99          | 20x2                | 6005-T6               | 0.4212          | -0.0           | treillis_150     |
| 52    | 99          | 64          | 20x2                | 6005-T6               | 0.4212          | -0.0           | treillis_150     |
| 53    | 64          | 19          | 50x3                | 6005-T6               | 2.0000          | 0.0            | membrure_150     |
| 54    | 66          | 20          | 50x3                | 6005-T6               | 2.0000          | 0.0            | membrure_150     |
| 55    | 68          | 21          | 50x3                | 6005-T6               | 2.0000          | 0.0            | membrure_150     |
| 56    | 70          | 22          | 50x3                | 6005-T6               | 2.0000          | 0.0            | membrure_150     |
| 57    | 68          | 70          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 58    | 64          | 70          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 59    | 64          | 66          | 20x2                | 6005-T6               | 0.3390          | 0.0            | treillis_150     |
| 60    | 68          | 66          | 20x2                | 6005-T6               | 0.3390          | -0.0           | treillis_150     |
| 61    | 82          | 92          | 20x2                | 6005-T6               | 0.4212          | -0.0           | treillis_150     |
| 62    | 72          | 73          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 63    | 73          | 74          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 64    | 74          | 75          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 65    | 75          | 76          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 66    | 76          | 20          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 67    | 176         | 177         | 50x3                | 6005-T6               | 1.2545          | 0.0            | membrure_150     |
| 68    | 2           | 13          | PLAT<br>80x40       | ACIER                 | 0.1987          | -90.0          | Barre            |
| 69    | 178         | 179         | 50x3                | 6005-T6               | 1.2545          | -0.0           | membrure_150     |
| 70    | 12          | 4           | TREC<br>90x50<br>x4 | ACIER<br>E24<br>Soudé | 0.2397          | 0.0            | embase_150       |
| 71    | 92          | 93          | 20x2                | 6005-T6               | 0.4212          | -0.0           | treillis_150     |
| 72    | 77          | 78          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 73    | 78          | 79          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 74    | 79          | 80          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 75    | 80          | 81          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 76    | 81          | 19          | 20x2                | 6005-T6               | 0.4210          | 0.0            | treillis_150     |
| 77    | 93          | 70          | 20x2                | 6005-T6               | 0.4212          | -0.0           | treillis_150     |
| 78    | 82          | 83          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 79    | 83          | 84          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |
| 80    | 84          | 85          | 20x2                | 6005-T6               | 0.4212          | 0.0            | treillis_150     |

| Barre | Noeu<br>d 1 | Noeu<br>d 2 | Section       | Matériau | Longueur<br>[m] | Gamma<br>[Deg] | Type de<br>barre |
|-------|-------------|-------------|---------------|----------|-----------------|----------------|------------------|
| 81    | 85          | 86          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 82    | 86          | 22          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 83    | 87          | 94          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 84    | 87          | 88          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 85    | 88          | 89          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 86    | 89          | 90          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 87    | 90          | 91          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 88    | 91          | 21          | 20x2          | 6005-T6  | 0.4214          | 0.0            | treillis_150     |
| 89    | 94          | 95          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 90    | 95          | 68          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 91    | 72          | 96          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 93    | 5           | 10          | PLAT<br>80x40 | ACIER    | 0.1987          | -90.0          | Barre            |
| 94    | 212         | 70          | 50x3          | 6005-T6  | 1.8000          | 0.0            | membrane_150     |
| 95    | 42          | 214         | 50x3          | 6005-T6  | 0.2000          | 0.0            | membrane_150     |
| 96    | 44          | 45          | 20x2          | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 97    | 42          | 45          | 20x2          | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 98    | 42          | 43          | 20x2          | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 99    | 44          | 43          | 20x2          | 6005-T6  | 0.3390          | -0.0           | treillis_150     |
| 100   | 46          | 47          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 101   | 48          | 49          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 102   | 49          | 50          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 103   | 50          | 51          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 104   | 51          | 52          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 105   | 52          | 66          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 106   | 47          | 53          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 107   | 54          | 55          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 108   | 55          | 56          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 109   | 56          | 57          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 110   | 57          | 58          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 111   | 58          | 64          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 112   | 53          | 45          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 113   | 46          | 59          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 114   | 59          | 60          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 115   | 60          | 61          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 116   | 61          | 62          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 117   | 62          | 70          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 118   | 63          | 100         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 119   | 63          | 101         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 120   | 101         | 102         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 121   | 102         | 103         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 122   | 103         | 104         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 123   | 104         | 68          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 124   | 100         | 105         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 125   | 105         | 44          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 126   | 48          | 106         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 127   | 106         | 107         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 128   | 107         | 43          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 129   | 54          | 108         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 130   | 108         | 109         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 131   | 109         | 42          | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 132   | 214         | 64          | 50x3          | 6005-T6  | 1.8000          | 0.0            | membrane_150     |
| 133   | 15          | 1           | PLAT<br>80x40 | ACIER    | 1.4380          | -90.0          | Barre            |

| Barre | Noeu<br>d 1 | Noeu<br>d 2 | Section       | Matériau | Longueur<br>[m] | Gamma<br>[Deg] | Type de<br>barre |
|-------|-------------|-------------|---------------|----------|-----------------|----------------|------------------|
| 135   | 16          | 3           | PLAT<br>80x40 | ACIER    | 1.4380          | -90.0          | Barre            |
| 136   | 18          | 5           | PLAT<br>80x40 | ACIER    | 1.4380          | -90.0          | Barre            |
| 137   | 17          | 2           | PLAT<br>80x40 | ACIER    | 1.4382          | -90.0          | Barre            |
| 138   | 110         | 42          | 50x3          | 6005-T6  | 2.0000          | 0.0            | membrure_<br>150 |
| 139   | 111         | 43          | 50x3          | 6005-T6  | 2.0000          | 0.0            | membrure_<br>150 |
| 140   | 112         | 44          | 50x3          | 6005-T6  | 2.0000          | 0.0            | membrure_<br>150 |
| 141   | 113         | 45          | 50x3          | 6005-T6  | 2.0000          | 0.0            | membrure_<br>150 |
| 142   | 112         | 113         | 20x2          | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 143   | 110         | 113         | 20x2          | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 144   | 110         | 111         | 20x2          | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 145   | 112         | 111         | 20x2          | 6005-T6  | 0.3390          | -0.0           | treillis_150     |
| 146   | 114         | 115         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 147   | 116         | 117         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 148   | 117         | 118         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 149   | 118         | 119         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 150   | 119         | 120         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 151   | 120         | 43          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 152   | 115         | 121         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 153   | 122         | 123         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 154   | 123         | 124         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 155   | 124         | 125         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 156   | 125         | 126         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 157   | 126         | 42          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 158   | 121         | 113         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 159   | 114         | 127         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 160   | 127         | 128         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 161   | 128         | 129         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 162   | 129         | 130         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 163   | 130         | 45          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 164   | 131         | 132         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 165   | 131         | 133         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 166   | 133         | 134         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 167   | 134         | 135         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 168   | 135         | 136         | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 169   | 136         | 44          | 20x2          | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 170   | 132         | 137         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 171   | 137         | 112         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 172   | 116         | 138         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 173   | 138         | 139         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 174   | 139         | 111         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 175   | 122         | 140         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 176   | 140         | 141         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 177   | 141         | 110         | 20x2          | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 178   | 142         | 110         | 50x3          | 6005-T6  | 2.0000          | 0.0            | membrure_<br>150 |
| 179   | 143         | 111         | 50x3          | 6005-T6  | 2.0000          | 0.0            | membrure_<br>150 |
| 180   | 144         | 112         | 50x3          | 6005-T6  | 2.0000          | 0.0            | membrure_<br>150 |

| Barre | Noeu<br>d 1 | Noeu<br>d 2 | Section | Matériau | Longueur<br>[m] | Gamma<br>[Deg] | Type de<br>barre |
|-------|-------------|-------------|---------|----------|-----------------|----------------|------------------|
| 181   | 145         | 113         | 50x3    | 6005-T6  | 2.0000          | 0.0            | membrure_150     |
| 182   | 144         | 145         | 20x2    | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 183   | 142         | 145         | 20x2    | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 184   | 142         | 143         | 20x2    | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 185   | 144         | 143         | 20x2    | 6005-T6  | 0.3390          | -0.0           | treillis_150     |
| 186   | 146         | 147         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 187   | 148         | 149         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 188   | 149         | 150         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 189   | 150         | 151         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 190   | 151         | 152         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 191   | 152         | 111         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 192   | 147         | 153         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 193   | 154         | 155         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 194   | 155         | 156         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 195   | 156         | 157         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 196   | 157         | 158         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 197   | 158         | 110         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 198   | 153         | 145         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 199   | 146         | 159         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 200   | 159         | 160         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 201   | 160         | 161         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 202   | 161         | 162         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 203   | 162         | 113         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 204   | 163         | 164         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 205   | 163         | 165         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 206   | 165         | 166         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 207   | 166         | 167         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 208   | 167         | 168         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 209   | 168         | 112         | 20x2    | 6005-T6  | 0.4212          | 0.0            | treillis_150     |
| 210   | 164         | 169         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 211   | 169         | 144         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 212   | 148         | 170         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 213   | 170         | 171         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 214   | 171         | 143         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 215   | 154         | 172         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 216   | 172         | 173         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 217   | 173         | 142         | 20x2    | 6005-T6  | 0.4212          | -0.0           | treillis_150     |
| 218   | 180         | 181         | 50x3    | 6005-T6  | 1.2545          | 0.0            | membrure_150     |
| 219   | 182         | 183         | 50x3    | 6005-T6  | 1.2545          | -0.0           | membrure_150     |
| 220   | 182         | 142         | 50x3    | 6005-T6  | 0.1440          | -0.0           | membrure_150     |
| 221   | 185         | 143         | 50x3    | 6005-T6  | 0.1440          | -0.0           | membrure_150     |
| 222   | 187         | 144         | 50x3    | 6005-T6  | 0.1440          | 0.0            | membrure_150     |
| 223   | 180         | 145         | 50x3    | 6005-T6  | 0.1440          | 0.0            | membrure_150     |
| 224   | 178         | 185         | 20x2    | 6005-T6  | 0.4794          | -0.0           | treillis_150     |
| 225   | 185         | 190         | 20x2    | 6005-T6  | 0.4017          | -0.0           | treillis_150     |
| 226   | 190         | 191         | 20x2    | 6005-T6  | 0.4014          | -0.0           | treillis_150     |
| 227   | 191         | 192         | 20x2    | 6005-T6  | 0.3988          | -0.0           | treillis_150     |
| 228   | 192         | 183         | 20x2    | 6005-T6  | 0.4365          | -0.0           | treillis_150     |
| 229   | 176         | 193         | 20x2    | 6005-T6  | 0.4794          | 0.0            | treillis_150     |
| 230   | 193         | 194         | 20x2    | 6005-T6  | 0.4017          | -0.0           | treillis_150     |

| Barre | Noeu<br>d 1 | Noeu<br>d 2 | Section        | Matériau | Longueur<br>[m] | Gamma<br>[Deg] | Type de<br>barre |
|-------|-------------|-------------|----------------|----------|-----------------|----------------|------------------|
| 231   | 194         | 195         | 20x2           | 6005-T6  | 0.4014          | 0.0            | treillis_150     |
| 232   | 195         | 196         | 20x2           | 6005-T6  | 0.3988          | -0.0           | treillis_150     |
| 233   | 196         | 179         | 20x2           | 6005-T6  | 0.4365          | 0.0            | treillis_150     |
| 234   | 180         | 197         | 20x2           | 6005-T6  | 0.4794          | 0.0            | treillis_150     |
| 235   | 197         | 198         | 20x2           | 6005-T6  | 0.4017          | 0.0            | treillis_150     |
| 236   | 198         | 199         | 20x2           | 6005-T6  | 0.4014          | 0.0            | treillis_150     |
| 237   | 199         | 200         | 20x2           | 6005-T6  | 0.3988          | 0.0            | treillis_150     |
| 238   | 200         | 177         | 20x2           | 6005-T6  | 0.4365          | 0.0            | treillis_150     |
| 239   | 187         | 185         | 50x3           | 6005-T6  | 0.3390          | 0.0            | membrure_150     |
| 240   | 187         | 197         | 50x3           | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 241   | 202         | 203         | 20x2           | 6005-T6  | 0.4014          | 0.0            | treillis_150     |
| 242   | 203         | 187         | 20x2           | 6005-T6  | 0.4017          | -0.0           | treillis_150     |
| 243   | 187         | 182         | 20x2           | 6005-T6  | 0.4794          | 0.0            | treillis_150     |
| 244   | 202         | 204         | 20x2           | 6005-T6  | 0.3988          | 0.0            | treillis_150     |
| 245   | 181         | 204         | 20x2           | 6005-T6  | 0.4365          | 0.0            | treillis_150     |
| 246   | 185         | 193         | 50x3           | 6005-T6  | 0.3390          | -0.0           | treillis_150     |
| 247   | 177         | 179         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 180.0          | treillis_150     |
| 248   | 179         | 183         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 90.0           | treillis_150     |
| 249   | 183         | 181         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 180.0          | treillis_150     |
| 250   | 181         | 177         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 90.0           | treillis_150     |
| 251   | 176         | 178         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 180.0          | treillis_150     |
| 252   | 178         | 182         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 90.0           | treillis_150     |
| 253   | 182         | 180         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 180.0          | treillis_150     |
| 254   | 180         | 176         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 90.0           | treillis_150     |
| 257   | 184         | 186         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 90.0           | treillis_150     |
| 258   | 186         | 188         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 90.0           | treillis_150     |
| 259   | 201         | 205         | PLAT<br>400x10 | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 260   | 206         | 207         | PLAT<br>400x10 | 6005-T6  | 0.3390          | 0.0            | treillis_150     |
| 261   | 188         | 189         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 90.0           | treillis_150     |
| 262   | 189         | 184         | PLAT<br>50x10  | 6005-T6  | 0.3390          | 90.0           | treillis_150     |
| 263   | 18          | 174         | ROND<br>E_50x5 | 6005-T6  | 5.5470          | 0.0            | membrure_150     |
| 264   | 17          | 175         | ROND<br>E_50x5 | 6005-T6  | 5.5471          | 0.0            | membrure_150     |
| 265   | 16          | 212         | ROND<br>E_50x5 | 6005-T6  | 5.5469          | 0.0            | membrure_150     |

| Barre | Noeu<br>d 1 | Noeu<br>d 2 | Section            | Matériau | Longueur<br>[m] | Gamma<br>[Deg] | Type de<br>barre |
|-------|-------------|-------------|--------------------|----------|-----------------|----------------|------------------|
| 266   | 15          | 214         | ROND<br>E_50x<br>5 | 6005-T6  | 5.5469          | 0.0            | membrane_<br>150 |

**charges**

- Cas: 1A13 15

|  | Cas | Type de charge  | Liste                                                                                                                                                                                                                                                  | Valeurs de la charge | Préfixe         |
|--|-----|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|
|  | 1   | poids propre    | 1A91<br>93A133<br>135A254<br>257A266                                                                                                                                                                                                                   | PZ Moins Coef=1.00   | pp              |
|  | 2   | force nodale    | 208                                                                                                                                                                                                                                                    | FZ=-1000.00[daN]     | 1t<br>cluster   |
|  | 10  | charge uniforme | 3 8A14<br>16 18<br>25A30<br>37A40<br>42<br>44A49<br>53A56<br>58<br>60A66<br>71<br>77A82<br>91 94 95<br>97<br>99A106<br>112A117<br>126A128<br>132<br>138A141<br>143<br>145A152<br>158A163<br>172A174<br>178A181<br>183<br>185A192<br>198A203<br>212A214 | PX=-0.71[daN/m]      | Vent<br>face    |
|  | 10  | force nodale    | 208                                                                                                                                                                                                                                                    | FX=-84.00[daN]       | Vent<br>face    |
|  | 11  | force nodale    | 174 175<br>208                                                                                                                                                                                                                                         | FX=28.00[daN]        | Vent<br>arrière |

|  | Cas | Type de charge  | Liste                                                                                                                                                                                                                                                  | Valeurs de la charge           | Préfixe             |
|--|-----|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------|
|  | 11  | charge uniforme | 3 8A14<br>16 18<br>25A30<br>37A40<br>42<br>44A49<br>53A56<br>58<br>60A66<br>71<br>77A82<br>91 94 95<br>97<br>99A106<br>112A117<br>126A128<br>132<br>138A141<br>143<br>145A152<br>158A163<br>172A174<br>178A181<br>183<br>185A192<br>198A203<br>212A214 | PX=0.71[daN/m]                 | Vent<br>arrière     |
|  | 12  | force nodale    | 175 208                                                                                                                                                                                                                                                | FY=33.50[daN]                  | Vent<br>coté        |
|  | 12  | charge uniforme | 3 6 9A12<br>15 17<br>19A24<br>31A40<br>50A57<br>59<br>72A76<br>83A90<br>94A96<br>98<br>107A111<br>118A125<br>129A132<br>138A142<br>144<br>153A157<br>164A171<br>175A182<br>184<br>193A197<br>204A211<br>215A217                                        | PY=0.71[daN/m]                 | Vent<br>coté        |
|  | 13  | force nodale    | 208                                                                                                                                                                                                                                                    | FZ=-1000.00[daN]               | 1t-<br>levage       |
|  | 13  | force nodale    | 209                                                                                                                                                                                                                                                    | FZ=-1000.00[daN]               | 1t-<br>leveva<br>ge |
|  | 15  | force sur barre | 136 137                                                                                                                                                                                                                                                | FZ=-250.00[daN]<br>X=0.6000[m] | Lest                |
|  | 15  | force sur barre | 133 135                                                                                                                                                                                                                                                | FZ=-90.00[daN] X=0.6000[m]     | lest                |

## **Résultats : dynamique - Cas: 9 (Modale ) Modes actifs : 1..10; CQC: Valeurs: 1**

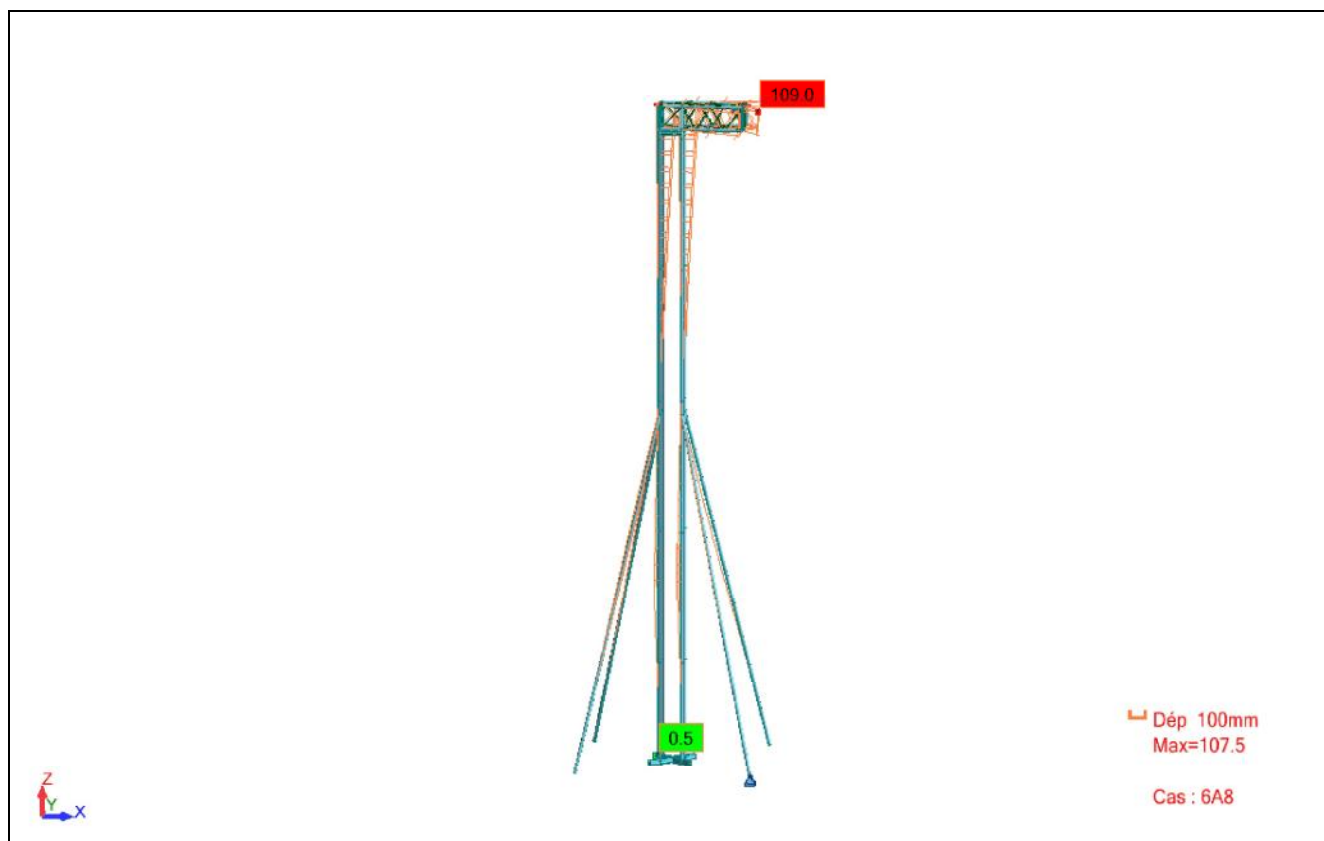
- Cas: 9

| Cas/Mode | Fréquence [Hz] | Période [sec] | Masses Cumulées UX [%] | Masses Cumulées UY [%] | Masses Cumulées UZ [%] | Masse Modale UX [%] |
|----------|----------------|---------------|------------------------|------------------------|------------------------|---------------------|
| 9/ 1     | 0.45           | 2.20          | 0.03                   | 79.75                  | 0.00                   | 0.03                |
| 9/ 2     | 0.92           | 1.09          | 72.67                  | 79.78                  | 7.52                   | 72.64               |
| 9/ 3     | 5.28           | 0.19          | 80.78                  | 79.78                  | 80.24                  | 8.11                |
| 9/ 4     | 7.14           | 0.14          | 80.79                  | 80.31                  | 80.25                  | 0.00                |
| 9/ 5     | 15.00          | 0.07          | 85.94                  | 80.31                  | 80.27                  | 5.16                |
| 9/ 6     | 15.78          | 0.06          | 85.94                  | 85.93                  | 80.27                  | 0.00                |
| 9/ 7     | 24.74          | 0.04          | 86.23                  | 86.06                  | 80.28                  | 0.29                |
| 9/ 8     | 28.93          | 0.03          | 86.24                  | 86.06                  | 80.28                  | 0.01                |
| 9/ 9     | 30.93          | 0.03          | 86.26                  | 86.33                  | 80.48                  | 0.02                |
| 9/ 10    | 31.54          | 0.03          | 86.26                  | 86.33                  | 80.49                  | 0.00                |

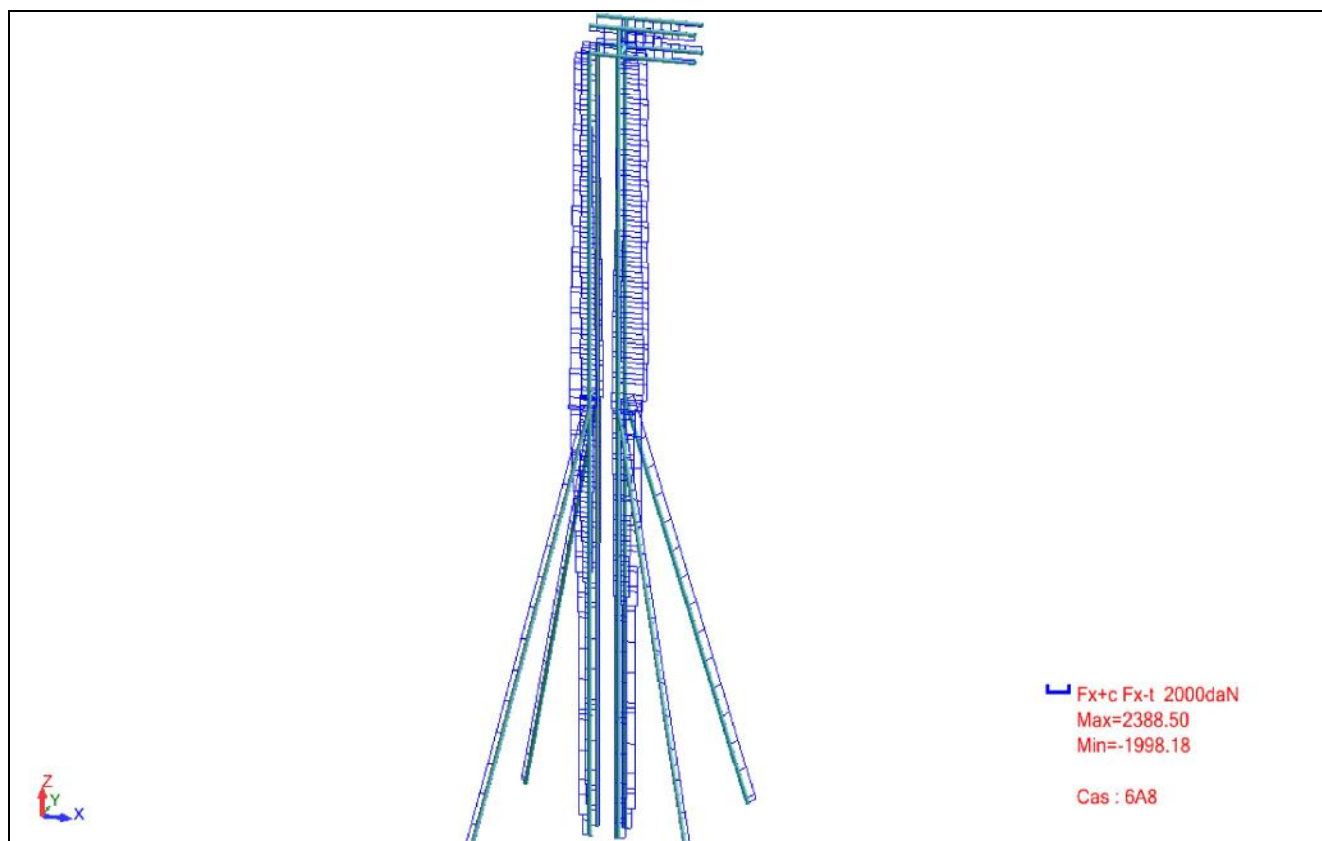
(Modale ) Modes actifs : 1..10; CQC

| Cas/Mode | Masse Modale UY [%] | Masse Modale UZ [%] | Tot.mas.U X [kg] | Tot.mas.U Y [kg] | Tot.mas.U Z [kg] |
|----------|---------------------|---------------------|------------------|------------------|------------------|
| 9/ 1     | 79.75               | 0.00                | 1293.05          | 1293.05          | 1293.05          |
| 9/ 2     | 0.03                | 7.51                | 1293.05          | 1293.05          | 1293.05          |
| 9/ 3     | 0.00                | 72.73               | 1293.05          | 1293.05          | 1293.05          |
| 9/ 4     | 0.52                | 0.00                | 1293.05          | 1293.05          | 1293.05          |
| 9/ 5     | 0.00                | 0.03                | 1293.05          | 1293.05          | 1293.05          |
| 9/ 6     | 5.63                | 0.00                | 1293.05          | 1293.05          | 1293.05          |
| 9/ 7     | 0.12                | 0.01                | 1293.05          | 1293.05          | 1293.05          |
| 9/ 8     | 0.00                | 0.00                | 1293.05          | 1293.05          | 1293.05          |
| 9/ 9     | 0.27                | 0.20                | 1293.05          | 1293.05          | 1293.05          |
| 9/ 10    | 0.00                | 0.00                | 1293.05          | 1293.05          | 1293.05          |

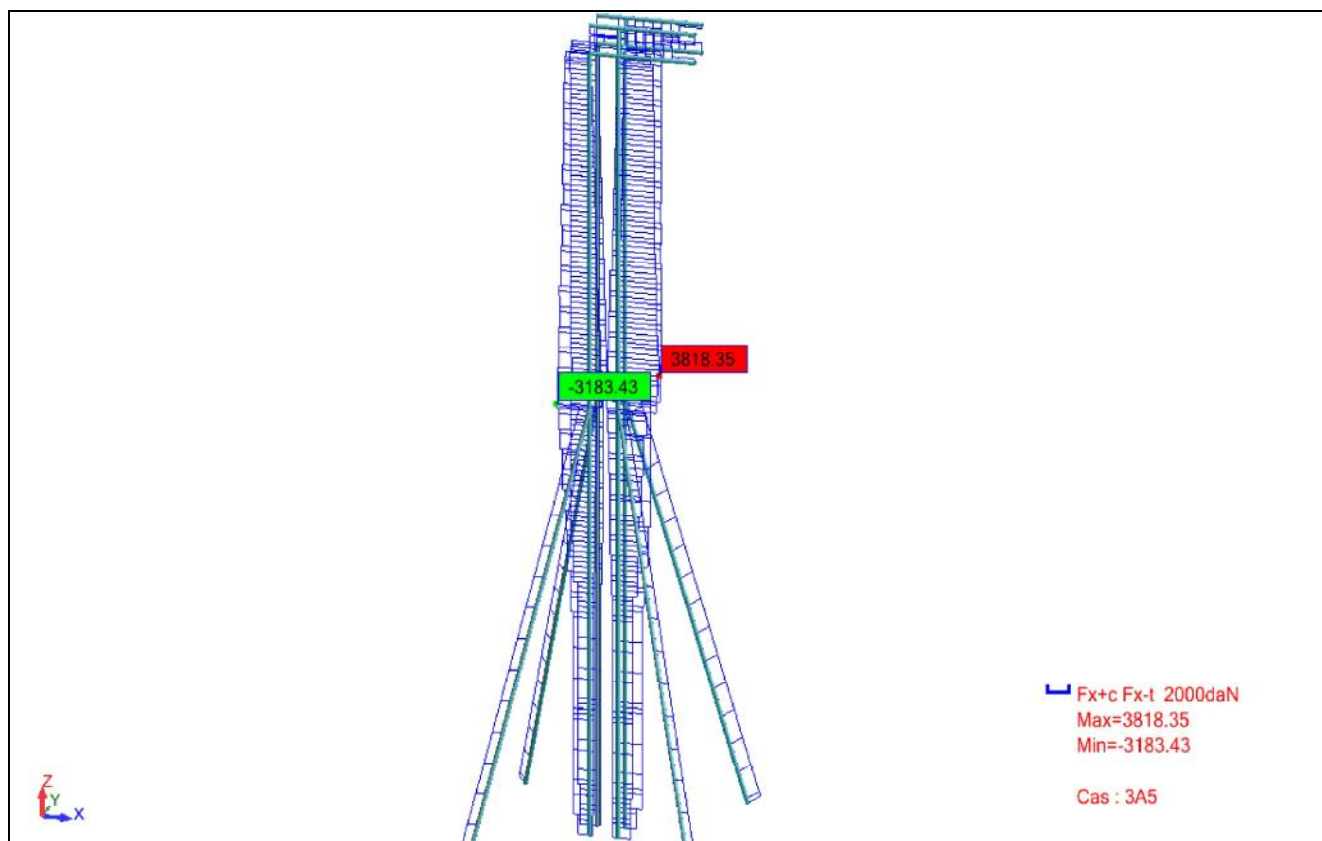
## deformee - Déformée exacte; Cas : ELS

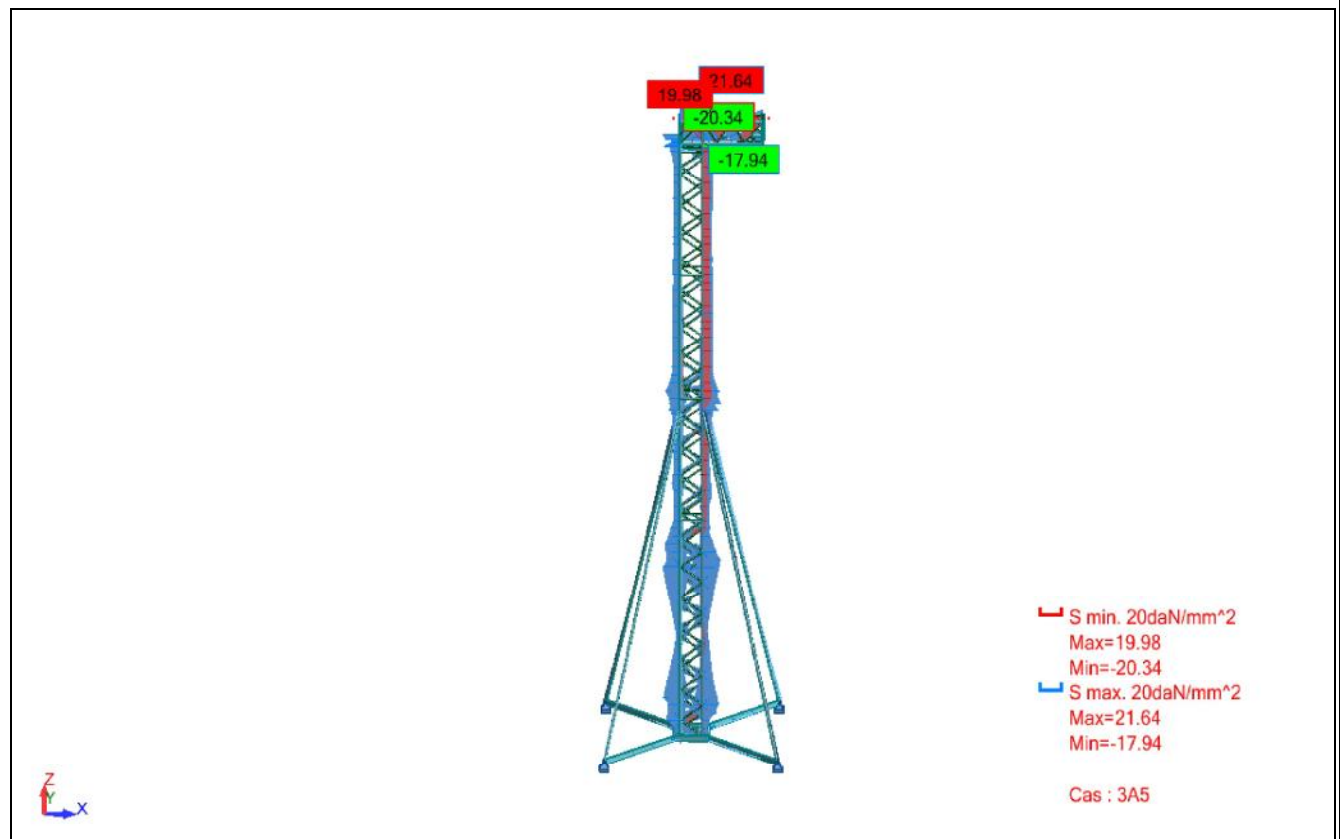


## **Membrures - FX; Cas : ELS**

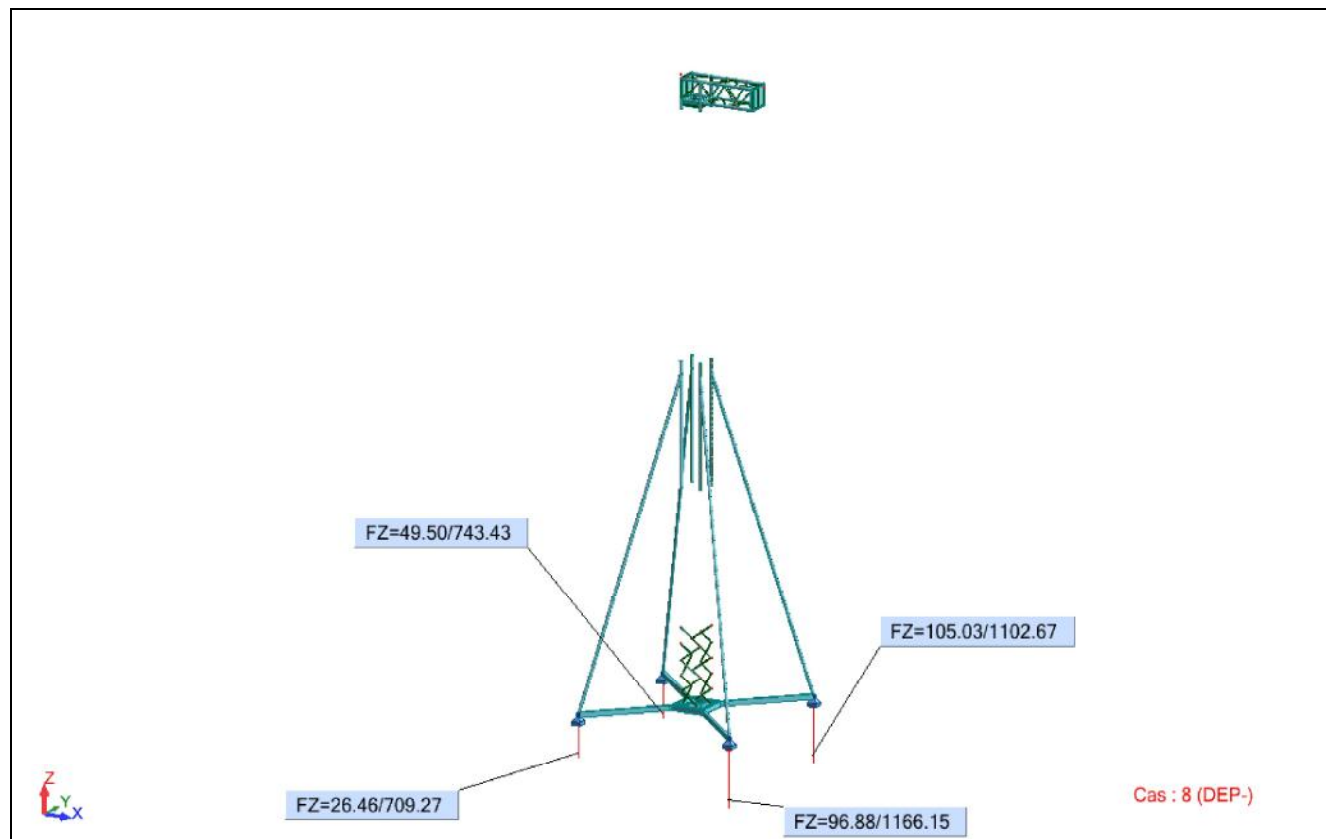


## Membrures - FX; Cas : ELU



**sigma - S max;S min; Cas : ELU**

## Réactions au sol - Forces de réaction(daN); Cas : ELS



## Conclusion ;

Au vu du respect des hypothèses de la page.4 la structure est correctement dimensionnée.

Elle laissera apparaître une flèche théorique d'environ 110mm.

Un lest de 180 daN à l'avant de tour et 500 daN à l'arrière de celle-ci sera impérative pour être compatible avec un vent de 50km/h.

Au delà de cette vitesse de vent la tour devra être démontée.