BREVET DE TECHNICIEN SUPÉRIEUR
CONSTRUCTIONS MÉTALLIQUES
SESSION 2018

E5 : DESSIN DE CONCEPTION

U 51 – Conception

Durée : 4h – Coefficient : 3

ÉLÉMENTS DE CORRECTION

C 8 2

STABILITE LONGITUDINALE

1.1)

POTELET → PAN Jouxt → POUTRE SABLIERE → STABILITE LONG PAN → SOL

1.2)

a) "Amener" point stable au niveau toiture inférieure

b) Cas passage probablement Soufflé

ATTACHE POUTRE SABLIERE

2.1) Boulons:

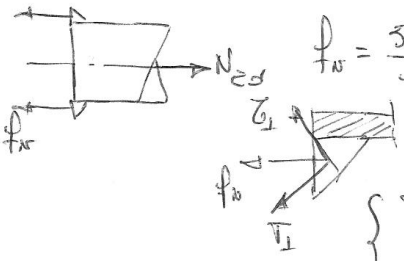
$$F_{t,Rd} = \frac{0,9 \times 600 \times 157}{1,25} 10^{-3} = 67,82 \text{ kN} > F_{t,Ed} = \frac{53,5}{2} = 26,75 \text{ kN}$$

2.2) Poinçonnement:

$$B_{p,Rd} = \frac{0,6 \cdot \pi \times 25,86 \times 9,5 \times 430}{1,25} 10^{-3} = 159,3 \text{ kN} > F_{t,Ed}$$

2.3) Soudure

$$A_w = (90 \times 3) \times 4 = 1080 \text{ mm}^2$$



$$f_N = \frac{53,5 \cdot 10^3}{1080} = 49,54 \text{ MPa}$$

$$\tau_\perp = \tau_\perp = 49,54 \frac{\sqrt{2}}{2} = 35,03 \text{ MPa}$$

$$\begin{cases} \tau_\perp < 0,9 \dfrac{f_u}{\gamma_{M2}} = \dfrac{0,9 \times 430}{1,25} = 309,6 \text{ MPa} \\ \sqrt{\tau_\perp^2 + 3(\tau_\perp^2 + \tau_{//}^2)} = \sqrt{4 \times 35,03^2} = 70,06 \text{ MPa} < \dfrac{f_u}{\beta_w \gamma_{M2}} = 64,7 \text{ MPa} \end{cases}$$

2.4) Intérêt

Faciliter le montage

ATTACHE BARRE STABILITE FILEH

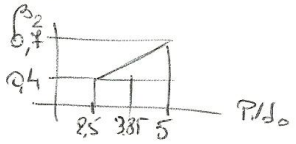
3.1) Resistance barre :

L 50.5 => $A_{nn} = 480 - 15 \times 5 = 405\ mm^2$

$\frac{p_1}{d_0} = \frac{50}{13} = 3,85$

$\beta_2 = 0,4 + \frac{0,3}{2,5} \times 1,35$

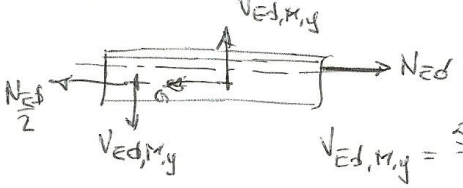
$\beta_2 = 0,56$



$N_{u,Rd} = \frac{0,56 \times 405 \times 430}{1,25} \cdot 10^{-3} = 78,02\ kN > N_{ed}$ $\quad N_{pl,Rd} = \frac{480 \times 275}{1} \times 10^{-3} = 132\ kN > N_{ed}$

3.2) Boulons

$F_{v,Rd} = \frac{0,5 \times 600 \times 115}{1,25} \cdot 10^{-3} = 27,6\ kN$



$V_{Ed,M,y} = \frac{53,5 \times (25 - 14)}{50} = 11,77\ kN$

$F_{v,Ed} = \sqrt{11,77^2 + 21,5^2} = 24,51\ kN < F_{v,Rd}$

3.3) Traction diametrale :

-> dans direction N_{Ed} :

$\alpha_b = \min\left(\frac{e_1}{3d_0} = \frac{25}{3 \times 15} = 0,556 ; \frac{f_{ub}}{f_u} = \frac{600}{430} = 1,4 ; 1\right) = 0,556$

$k_1 = \min\left(2,8\frac{e_2}{d_0} - 1,7 = 2,8 \times \frac{25}{15} - 1,7 = 2,97 ; 2,5\right) = 2,5$

$F_{b,Rd} = \frac{2,5 \times 0,556 \times 430 \times 14 \times 5}{1,25} \times 10^{-3} = 33,47\ kN > \frac{N_{Ed}}{2}$

-> dans direction $V_{Ed,M,y}$ (idem)

$F_{b,Rd} = 33,47\ kN > V_{Ed,M,y}$

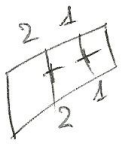
3.4) Cisaillement bloc.

$A_{nv} = (25 + 50 - 1,5 \times 15) \cdot 5 = 262,5\ mm^2$

$A_{nt} = (25 - 0,5 \times 15) \times 5 = 87,5\ mm^2$

$V_{eff,2,Rd} = \left(\frac{0,5 \times 430 \times 87,5}{1,25} + \frac{275 \times 262,5}{\sqrt{3} \times 1}\right) \cdot 10^{-3} = 56,727\ kN > N_{Ed}$

3.5) Resistance CT



22 :

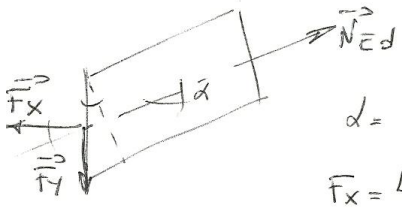
$A = 5 \times 50 = 250\ mm^2$

$A_m = 250 - 15 \times 5 = 175\ mm^2$

$N_{pl,Rd} = \frac{250 \times 275}{1} \cdot 10^{-3} = 68.75\ kN > N_{Ed}$

$N_{u,Rd} = \frac{0.9 \times 175 \times 430}{1.25} \cdot 10^{-3} = 54.18\ kN > N_{Ed}$

3.6) Resistance soudure

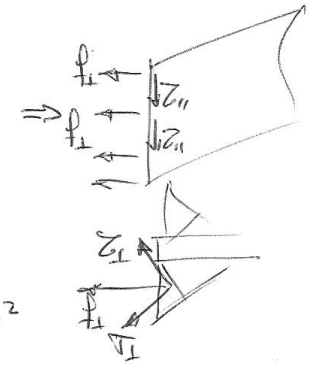


$\alpha = Atan \frac{5505}{6000} = 42,54°$

$F_X = 43 \cdot \cos\alpha = 31,684\ kN$

$F_Y = 43 \sin\alpha = 29,071\ kN$

$A_w = 2 \times \left(\frac{50}{\cos\alpha} - 2 \times 3\right) \times 3 = 371\ mm^2$



$\tau_{\parallel} = \frac{29,071 \cdot 10^3}{3711}$

$\tau_{\parallel} = 7.834\ MPa$

$f_\perp = \frac{31,684 \cdot 10^3}{3711} = 8,538\ MPa \Rightarrow \tau_\perp = \tau_\perp = 8.538 \frac{\sqrt{2}}{2} = 6,037\ MPa$

$\begin{cases} \tau_\perp = 6,04\ MPa < 0.9 \frac{f_u}{\gamma_{M2}} = 309.6\ MPa \\ \sqrt{\tau_\perp^2 + 3(\tau_\perp^2 + \tau_{\parallel}^2)} = \sqrt{4 \times 6,04^2 + 3 \times 7,834^2} = 18,2\ MPa < \frac{f_u}{\beta_w \cdot \gamma_{M2}} = 404,7\ MPa \end{cases}$

TOITURE BASSE

cf DTR2, DR3

BARDAGE DOUBLE PEAU

5.1) Pression : $w_p = 0,596 \times 1 = 0,596\ kN/m^2$ Depression : $w_d = 1.2 \times 0.596 = 0.715\ kN/m^2$

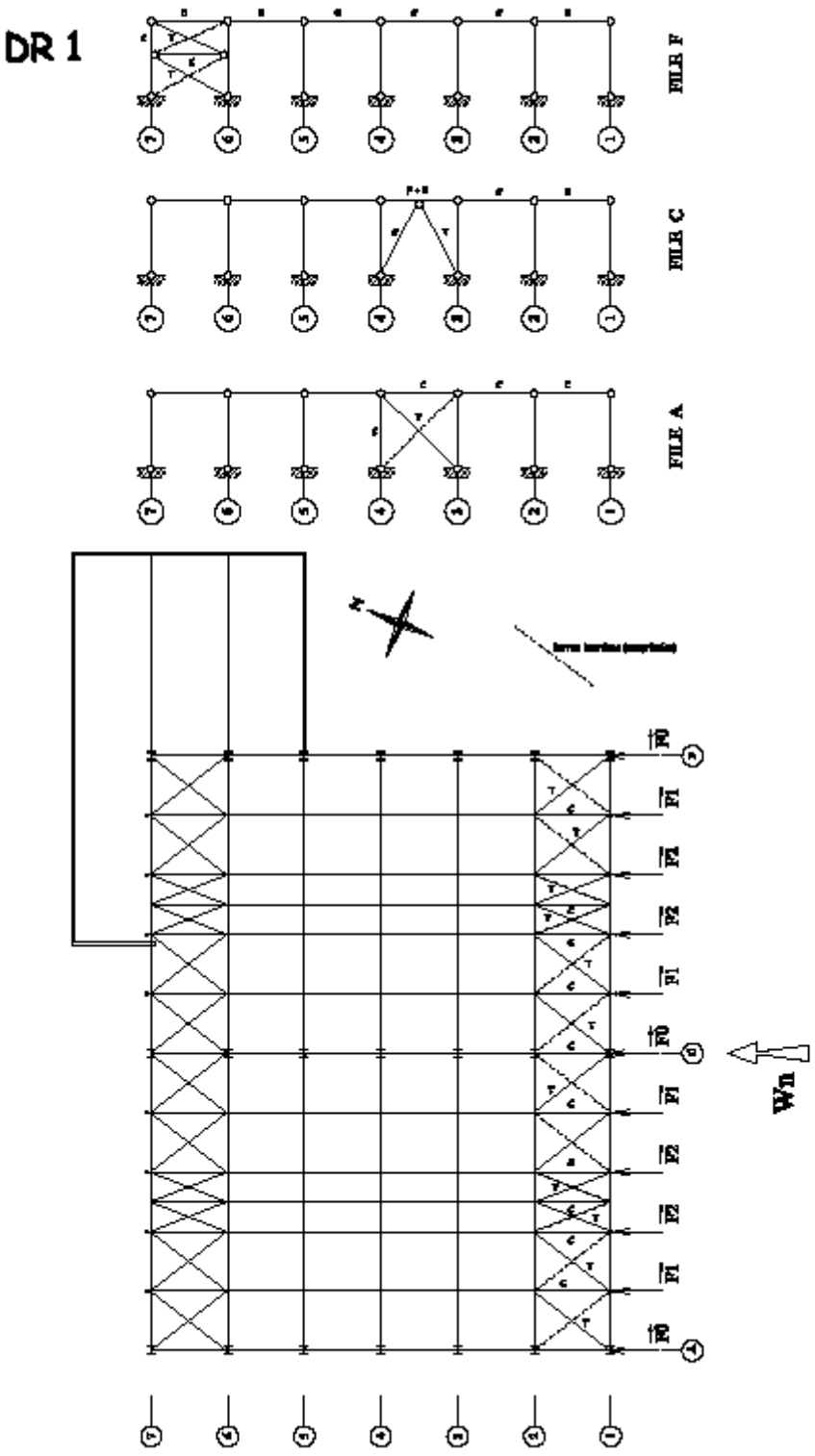
$w_p = 59.6\ daN/m^2$ $w_d = 71,5\ daN/m^2$

Pignon : $\alpha = 4,66°$ => $ép = 0,75\ mm$ fixer 2 appuis (92 daN/m² en pression et 95 daN/m² en dépression)

Long pan : $\alpha = 6°$ => $ép = 0,75\ mm$ fixer 3 appuis (85 daN/m² en pression et 78 daN/m² en dépression)

5.2) Plaque perforé pour améliorer la correction acoustique.

DR 1



DR 2

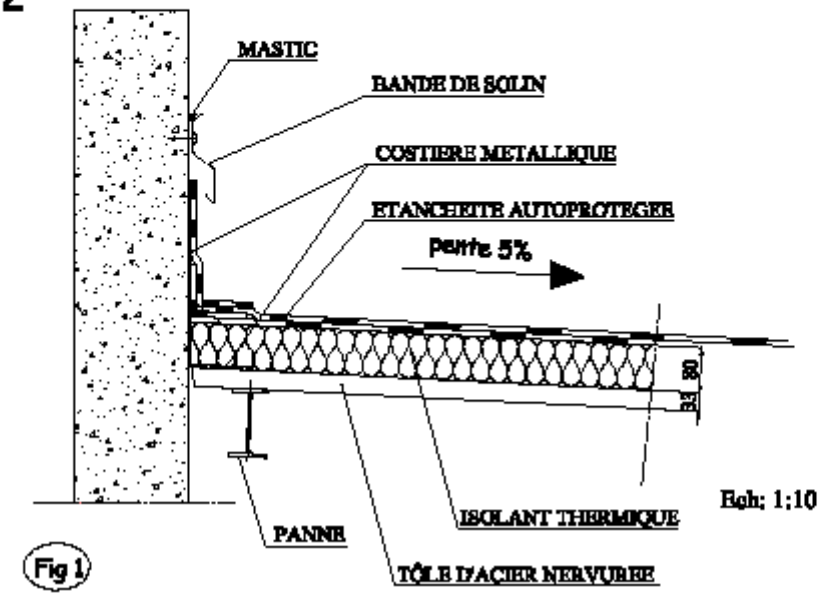
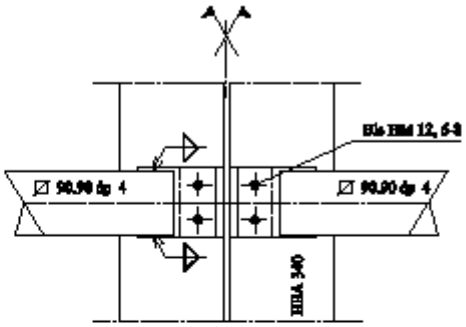


Fig 1



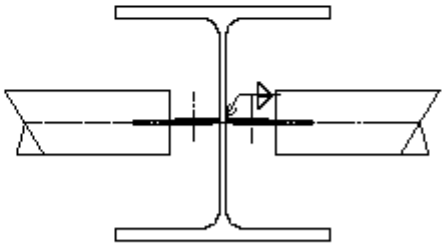
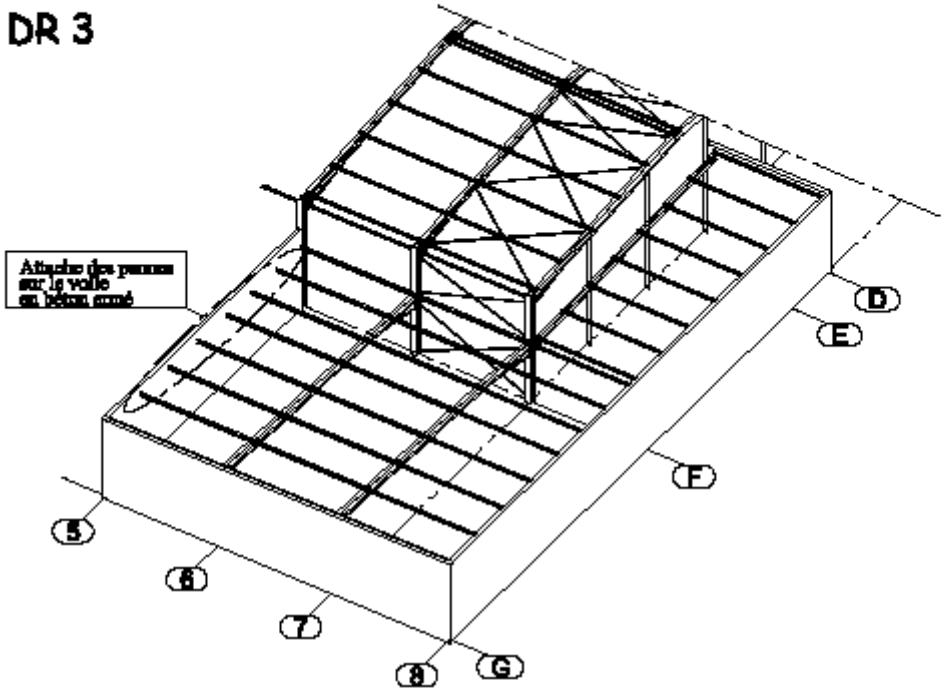
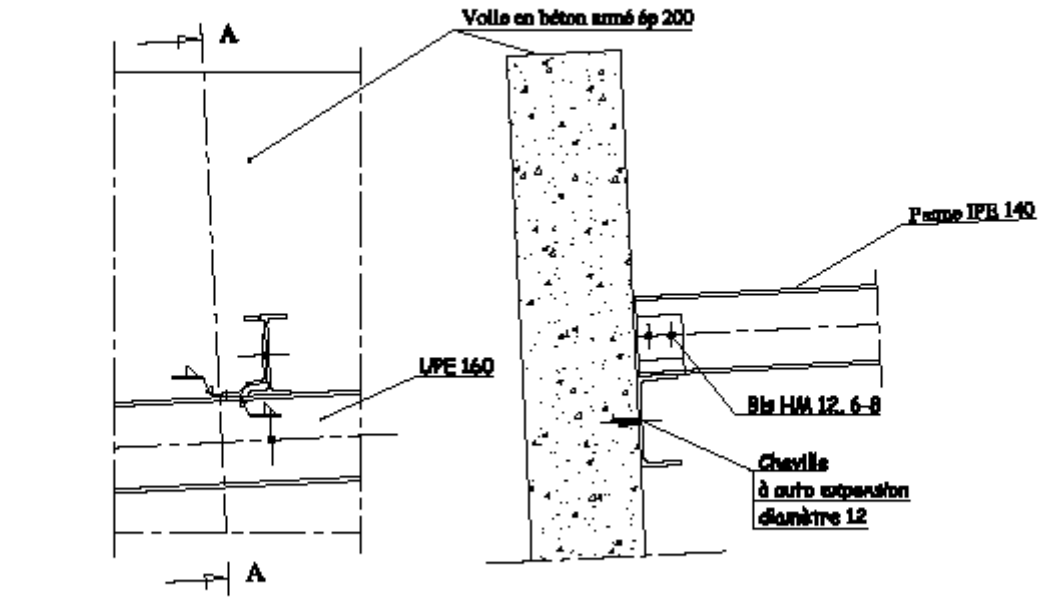


Fig 2

DR 3





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A-A