

NOTE DE CALCUL
NC :02

AFF:4637

HYPPODROME DE DOUAI

GRIL HAUT ET BAS

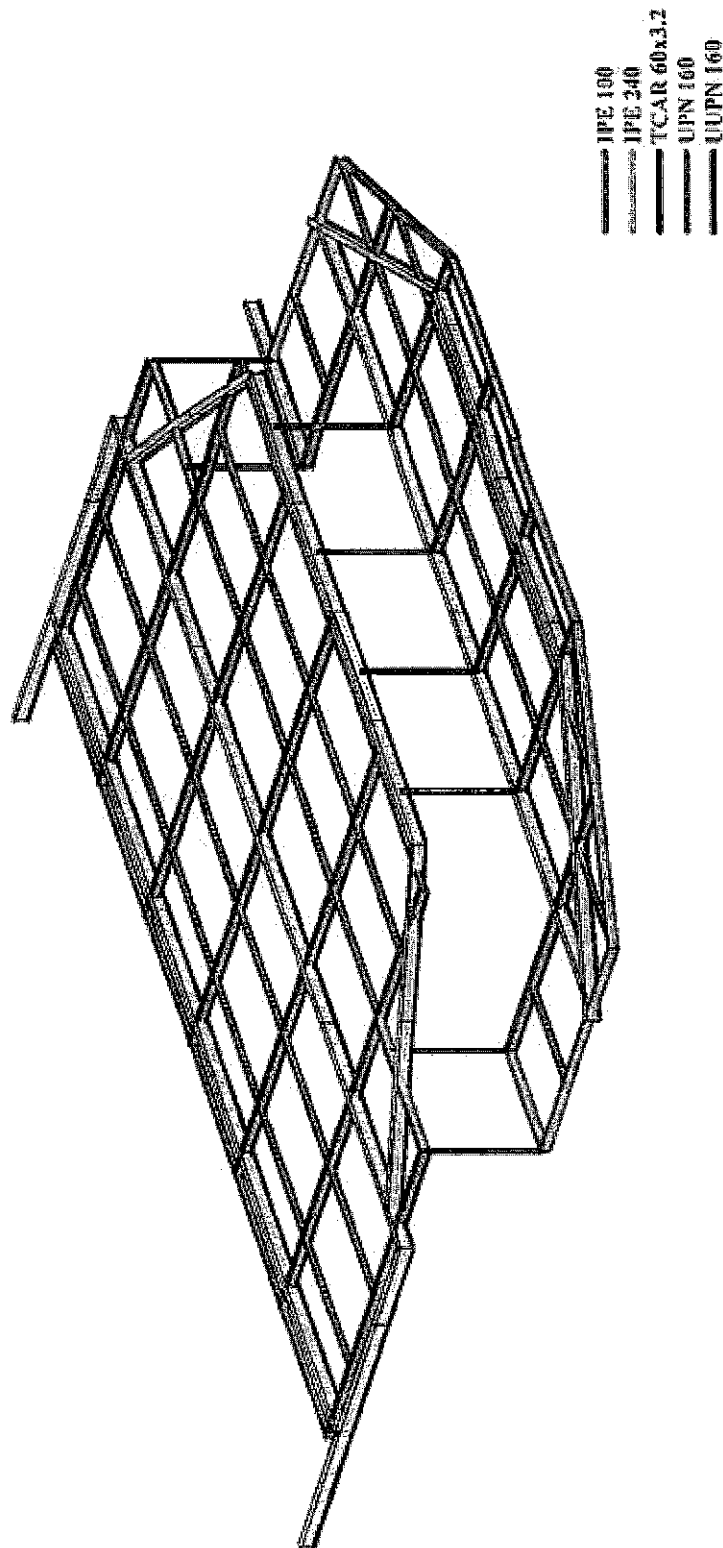
Hypothese de charges:

Poids mort caillebotis + machinerie 60daN/m²
SURCHARGES GRIL 10000daN total répartie
Soit env 50daN/m²

Auteur: SJ/CB



perspective





Données - Noeuds

Noeud	X (m)	Y (m)	Z (m)	Appui	Code de l'appui
1	-2.45	-9.14	2.00	ZX	b b b
2	2.45	-9.14	2.00	Z	b b
3	4.14	-9.14	2.00		
5	0.0	0.0	2.00	XYZ	bbb b
6	0.0	-9.14	2.00		
8	4.14	-4.17	2.00	Z	b b
9	4.14	0.0	2.00		
10	9.10	0.0	2.00		
11	9.10	-2.45	2.00	Z	b b
12	9.10	-5.15	2.00		
13	6.69	-6.69	2.00	Z	b b
14	4.14	-8.32	2.00		
16	-0.50	-8.70	2.00		
17	5.84	-8.70	2.00		
18	-0.50	-5.80	2.00		
19	8.75	-5.80	2.00		
20	-0.50	-2.90	2.00		
21	9.10	-2.90	2.00		
22	-0.50	0.0	2.00		
23	1.00	-8.70	2.00		
24	1.00	-5.80	2.00		
25	1.00	-2.90	2.00		
26	1.00	0.0	2.00		
27	2.58	-8.70	2.00		
28	2.58	-5.80	2.00		
29	2.58	-2.90	2.00		
30	2.58	0.0	2.00		
31	5.84	-5.80	2.00		
32	5.84	-2.90	2.00		
33	5.84	0.0	2.00		
34	7.30	-5.80	2.00		
35	7.30	-2.90	2.00		
36	7.30	0.0	2.00		
37	8.75	-2.90	2.00		
38	8.75	0.0	2.00		
39	-2.45	9.14	2.00	ZX	b b b
40	2.45	9.14	2.00	Z	b b
41	4.14	9.14	2.00		
42	0.0	9.14	2.00		
43	4.14	4.17	2.00	Z	b b
44	9.10	2.45	2.00	Z	b b
45	9.10	5.15	2.00		
46	6.69	6.69	2.00	Z	b b
47	4.14	8.32	2.00		
48	-0.50	8.70	2.00		
49	5.84	8.70	2.00		
50	-0.50	5.80	2.00		
51	8.75	5.80	2.00		
52	-0.50	2.90	2.00		
53	9.10	2.90	2.00		



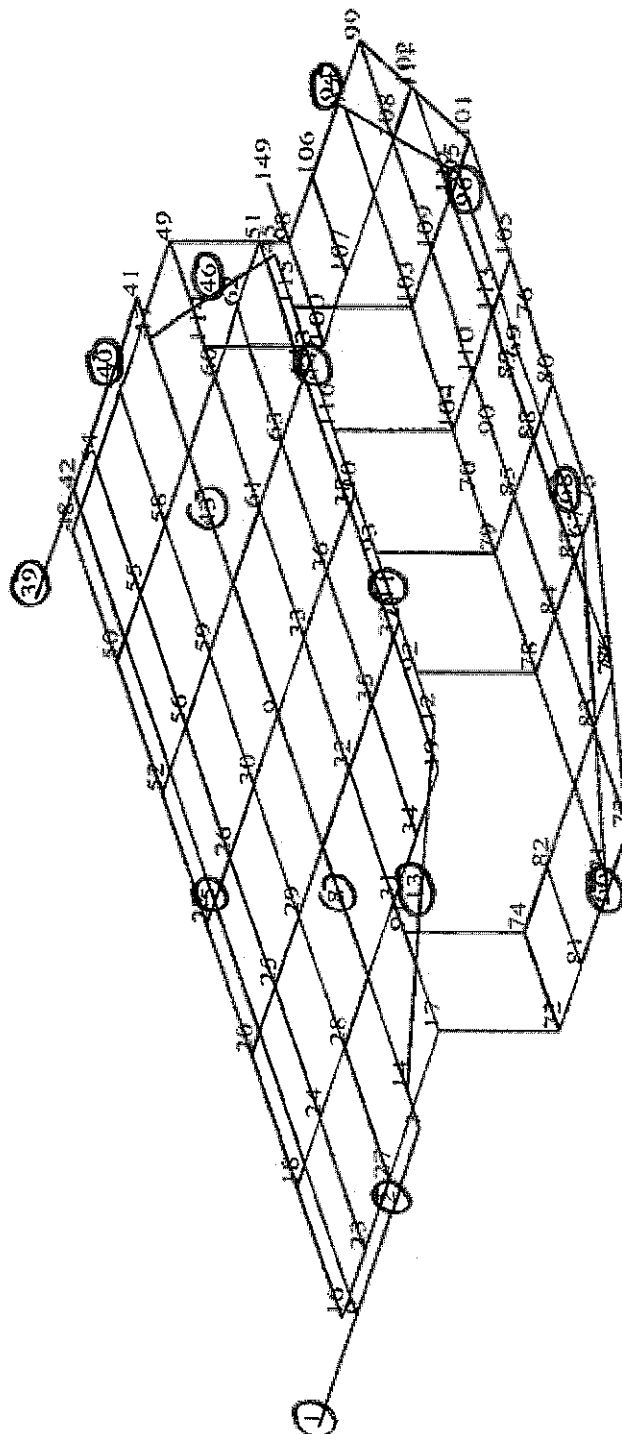
Noeud	X (m)	Y (m)	Z (m)	Appui	Code de l'appui
54	1.00	8.70	2.00		
55	1.00	5.80	2.00		
56	1.00	2.90	2.00		
57	2.58	8.70	2.00		
58	2.58	5.80	2.00		
59	2.58	2.90	2.00		
60	5.84	5.80	2.00		
61	5.84	2.90	2.00		
62	7.30	5.80	2.00		
63	7.30	2.90	2.00		
64	8.75	2.90	2.00		
66	8.84	-8.84	0.0	ZX	b b l l
67	12.10	-4.00	0.0		
68	12.10	-3.24	0.0	Z	l b l l
69	12.10	0.0	0.0		
70	9.10	0.0	0.0		
71	9.10	-8.45	0.0		
72	5.84	-8.70	0.0		
73	10.35	-8.70	0.0		
74	5.84	-6.50	0.0		
75	12.84	-4.00	0.0		
76	12.84	0.0	0.0		
77	11.52	-6.50	0.0		
78	9.10	-4.00	0.0		
79	9.10	-1.35	0.0		
80	12.84	-1.35	0.0		
81	7.30	-8.70	0.0		
82	7.30	-6.50	0.0		
83	10.35	-6.50	0.0		
84	10.35	-4.00	0.0		
85	10.35	-1.35	0.0		
86	11.60	-6.34	0.0		
87	11.60	-4.00	0.0		
88	11.60	-1.35	0.0		
89	11.60	0.0	0.0		
90	10.35	0.0	0.0		
91	5.84	-6.50	2.00		
92	9.10	-4.00	2.00		
93	9.10	-1.35	2.00		
94	8.84	8.84	0.0	ZX	b b l l
95	12.10	4.00	0.0		
96	12.10	3.24	0.0	Z	l b l l
97	9.10	8.45	0.0		
98	5.84	8.70	0.0		
99	10.35	8.70	0.0		
100	5.84	6.50	0.0		
101	12.84	4.00	0.0		
102	11.52	6.50	0.0		
103	9.10	4.00	0.0		
104	9.10	1.35	0.0		
105	12.84	1.35	0.0		
106	7.30	8.70	0.0		



Noeud	X (m)	Y (m)	Z (m)	Appui	Code de l'appui
107	7.30	6.50	0.0		
108	10.35	6.50	0.0		
109	10.35	4.00	0.0		
110	10.35	1.35	0.0		
111	11.60	6.34	0.0		
112	11.60	4.00	0.0		
113	11.60	1.35	0.0		
114	5.84	6.50	2.00		
115	9.10	4.00	2.00		
116	9.10	1.35	2.00		
149	5.84	10.00	0.0		



reperage des noeuds





Données - Barres

Barre	Noeud 1	Noeud 2	Section	Matériau	Longueur (m)	Gamma (Deg)	Type de barre
1	1	2	IPE 240	ACIER	4.90	0.0	Poutre
2	3	2	IPE 240	ACIER	1.69	0.0	longrine
3	5	6	IPE 240	ACIER	9.14	0.0	longrine
4	3	8	IPE 240	ACIER	4.97	0.0	longrine
5	8	9	IPE 240	ACIER	4.17	0.0	longrine
6	10	11	IPE 240	ACIER	2.45	0.0	longrine
7	11	12	IPE 240	ACIER	2.70	0.0	longrine
8	12	13	IPE 240	ACIER	2.86	0.0	longrine
9	13	14	IPE 240	ACIER	3.03	0.0	longrine
10	16	17	UUPN 160	ACIER	6.34	0.0	chemin de moufle
11	18	19	UUPN 160	ACIER	9.25	0.0	chemin de moufle
12	20	21	UUPN 160	ACIER	9.60	0.0	chemin de moufle
13	22	10	UUPN 160	ACIER	9.50	0.0	chemin de moufle
14	23	24	IPE 100	ACIER	2.90	0.0	Solive_CM66
15	25	26	IPE 100	ACIER	2.90	0.0	Solive_CM66
16	24	25	IPE 100	ACIER	2.90	0.0	Solive_CM66
17	27	28	IPE 100	ACIER	2.90	0.0	Solive_CM66
18	28	29	IPE 100	ACIER	2.90	0.0	Solive_CM66
19	29	30	IPE 100	ACIER	2.90	0.0	Solive_CM66
20	17	31	UPN 160	ACIER	2.90	0.0	Barre
21	31	32	IPE 100	ACIER	2.90	0.0	Solive_CM66
22	32	33	IPE 100	ACIER	2.90	0.0	Solive_CM66
23	34	35	IPE 100	ACIER	2.90	0.0	Solive_CM66
24	35	36	IPE 100	ACIER	2.90	0.0	Solive_CM66
25	19	37	IPE 100	ACIER	2.90	0.0	Solive_CM66
26	37	38	IPE 100	ACIER	2.90	0.0	Solive_CM66
27	16	18	IPE 100	ACIER	2.90	0.0	Solive_CM66
28	18	20	IPE 100	ACIER	2.90	0.0	Solive_CM66
29	20	22	IPE 100	ACIER	2.90	0.0	Solive_CM66
30	39	40	IPE 240	ACIER	4.90	0.0	longrine
31	41	40	IPE 240	ACIER	1.69	0.0	longrine
32	5	42	IPE 240	ACIER	9.14	0.0	longrine
33	41	43	IPE 240	ACIER	4.97	0.0	longrine
34	43	9	IPE 240	ACIER	4.17	0.0	longrine
35	10	44	IPE 240	ACIER	2.45	0.0	longrine
36	44	45	IPE 240	ACIER	2.70	0.0	longrine
37	45	46	IPE 240	ACIER	2.86	0.0	longrine
38	46	47	IPE 240	ACIER	3.03	0.0	longrine
39	48	49	UUPN 160	ACIER	6.34	0.0	chemin de moufle
40	50	51	UUPN 160	ACIER	9.25	0.0	chemin de moufle
41	52	53	UUPN 160	ACIER	9.60	0.0	chemin de moufle
42	54	55	IPE 100	ACIER	2.90	0.0	Solive_CM66
43	56	26	IPE 100	ACIER	2.90	0.0	Solive_CM66
44	55	56	IPE 100	ACIER	2.90	0.0	Solive_CM66
45	57	58	IPE 100	ACIER	2.90	0.0	Solive_CM66
46	58	59	IPE 100	ACIER	2.90	0.0	Solive_CM66
47	59	30	IPE 100	ACIER	2.90	0.0	Solive_CM66
48	49	60	UPN 160	ACIER	2.90	0.0	Barre
49	60	61	IPE 100	ACIER	2.90	0.0	Solive_CM66
50	61	33	IPE 100	ACIER	2.90	0.0	Solive_CM66



ROBOT v 16.1.1

Auteur : AMG FECHOZ

Adresse : 46 RUE DUHESME 75018PARIS

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Fichier : DOUAI GRIL.rtd

Barre	Noeud 1	Noeud 2	Section	Matériau	Longueur (m)	Gamma (Deg)	Type de barre
51	62	63	IPE 100	ACIER	2.90	0.0	Solive_CM66
52	63	36	IPE 100	ACIER	2.90	0.0	Solive_CM66
53	51	64	IPE 100	ACIER	2.90	0.0	Solive_CM66
54	64	38	IPE 100	ACIER	2.90	0.0	Solive_CM66
55	48	50	IPE 100	ACIER	2.90	0.0	Solive_CM66
56	50	52	IPE 100	ACIER	2.90	0.0	Solive_CM66
57	52	22	IPE 100	ACIER	2.90	0.0	Solive_CM66
58	66	67	IPE 240	ACIER	5.84	0.0	longrine
59	67	68	IPE 240	ACIER	0.76	0.0	longrine
60	68	69	IPE 240	ACIER	3.24	0.0	longrine
61	70	71	IPE 240	ACIER	8.45	0.0	longrine
62	72	73	UPN 160	ACIER	4.51	0.0	Barre
63	72	74	UPN 160	ACIER	2.20	0.0	Barre
64	73	75	UPN 160	ACIER	5.32	0.0	Barre
65	75	76	UPN 160	ACIER	4.00	0.0	Barre
66	74	77	UUPN 160	ACIER	5.68	0.0	chemin de moufle
67	78	75	UUPN 160	ACIER	3.74	0.0	chemin de moufle
68	79	80	UUPN 160	ACIER	3.74	0.0	chemin de moufle
69	81	82	IPE 100	ACIER	2.20	0.0	Solive_CM66
70	73	83	IPE 100	ACIER	2.20	0.0	Solive_CM66
71	83	84	IPE 100	ACIER	2.50	0.0	Solive_CM66
72	84	85	IPE 100	ACIER	2.65	0.0	Solive_CM66
73	86	87	IPE 100	ACIER	2.34	0.0	Solive_CM66
74	87	88	IPE 100	ACIER	2.65	0.0	Solive_CM66
75	88	89	IPE 100	ACIER	1.35	0.0	Solive_CM66
76	85	90	IPE 100	ACIER	1.35	0.0	Solive_CM66
77	17	72	TCAR 60x3.2	ACIER	2.00	0.0	SUSPENTE
78	74	91	TCAR 60x3.2	ACIER	2.00	0.0	SUSPENTE
79	78	92	TCAR 60x3.2	ACIER	2.00	0.0	SUSPENTE
80	79	93	TCAR 60x3.2	ACIER	2.00	0.0	SUSPENTE
81	94	95	IPE 240	ACIER	5.84	0.0	longrine
82	95	96	IPE 240	ACIER	0.76	0.0	longrine
83	96	69	IPE 240	ACIER	3.24	0.0	longrine
84	70	97	IPE 240	ACIER	8.45	0.0	longrine
85	98	99	UPN 160	ACIER	4.51	0.0	Barre
86	98	100	IPE 240	ACIER	2.20	0.0	longrine
87	99	101	UPN 160	ACIER	5.32	0.0	Barre
88	101	76	UPN 160	ACIER	4.00	0.0	Barre
89	100	102	UUPN 160	ACIER	5.68	0.0	chemin de moufle
90	103	101	UUPN 160	ACIER	3.74	0.0	chemin de moufle
91	104	105	UUPN 160	ACIER	3.74	0.0	chemin de moufle
92	106	107	IPE 100	ACIER	2.20	0.0	Solive_CM66
93	99	108	IPE 100	ACIER	2.20	0.0	Solive_CM66
94	108	109	IPE 100	ACIER	2.50	0.0	Solive_CM66
95	109	110	IPE 100	ACIER	2.65	0.0	Solive_CM66
96	111	112	IPE 100	ACIER	2.34	0.0	Solive_CM66
97	112	113	IPE 100	ACIER	2.65	0.0	Solive_CM66
98	113	89	IPE 100	ACIER	1.35	0.0	Solive_CM66
99	110	90	IPE 100	ACIER	1.35	0.0	Solive_CM66
100	49	98	TCAR 60x3.2	ACIER	2.00	0.0	SUSPENTE
101	100	114	TCAR 60x3.2	ACIER	2.00	0.0	SUSPENTE
102	103	115	TCAR 60x3.2	ACIER	2.00	0.0	SUSPENTE



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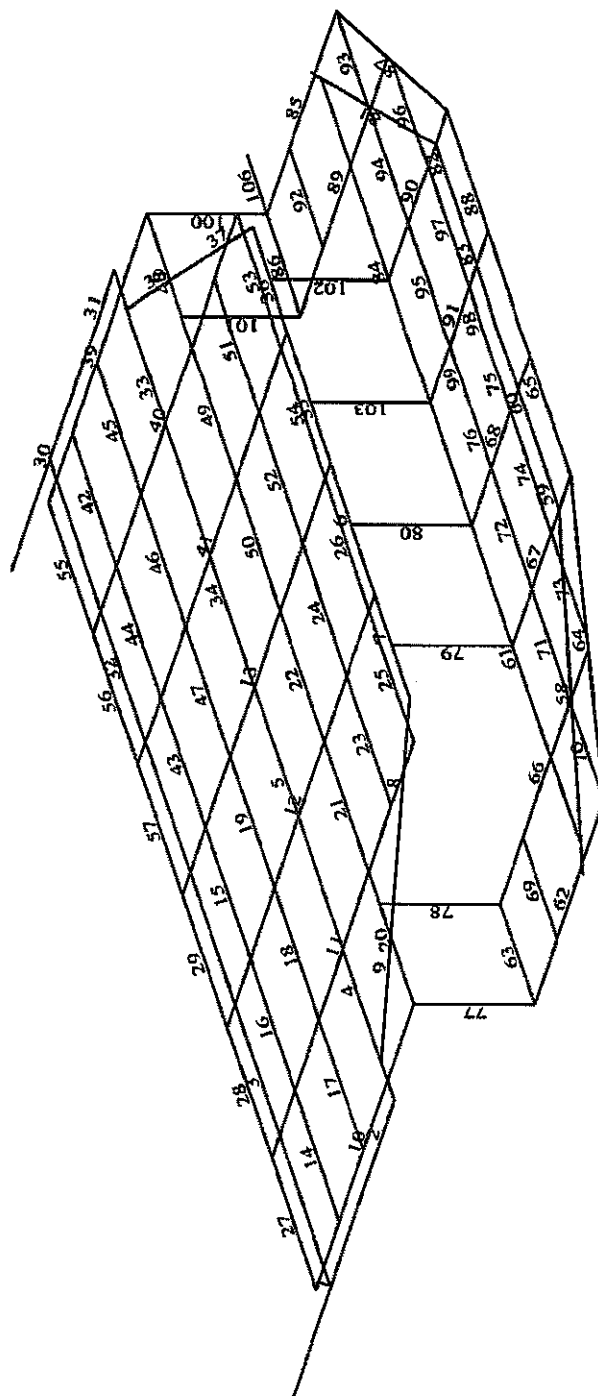
Barre	Noeud 1	Noeud 2	Section	Matériau	Longueur (m)	Gamma (Deg)	Type de barre
103	104	116	TCAR 60x3.2	ACIER	2.00	0.0	SUSPENTE
106	98	149	IPE 240	ACIER	1.30	0.0	longrine

Données - Sections

Nom de la section	Liste des barres	AX (cm ²)	AY (cm ²)	AZ (cm ²)	IX (cm ⁴)	IY (cm ⁴)	IZ (cm ⁴)
IPE 100	14A19 21A29 42A47 49A57 69A76 92A99	10.323	6.460	4.183	1.100	171.012	15.919
IPE 240	1A9 30A38 58A61 81A84 86 106	39.116	23.932	15.057	11.600	3891.630	283.634
TCAR 60x3.2	77A80 100A103	7.221	3.209	3.209	60.110	38.650	38.650
UPN 160	20 48 62A65 85 87 88	23.894	13.554	11.944	6.829	924.546	85.083
UUPN 160	10A13 39A41 66A66 89A91	47.788	27.108	23.888	26.850	1850.000	332.000



reperage des barres





Données - Chargements

Cas	Nom du cas	Type de charge	Liste	Valeurs de la charge
1	PERM1	poids propre	1A106	PZ Moins
1	PERM1	surfacique sur objet	104	PZ=-60(daN/m ²)
1	PERM1	surfacique sur objet	105	PZ=-60(daN/m ²)
1	PERM1	force sur barre	48	FZ=-150(daN) X=1.00(m)
1	PERM1	force sur barre	92	FZ=-150(daN) X=1.00(m)
1	PERM1	force sur barre	106	FZ=-300(daN) X=0.50 relatives
2	SURCHARGE	surfacique sur objet	104	PZ=-50(daN/m ²)
2	SURCHARGE	surfacique sur objet	105	PZ=-50(daN/m ²)
2	SURCHARGE	force sur barre	106	FZ=-200(daN) X=0.50 relatives

Combinaisons de cas - Cas: 3 4 : Valeurs: 1

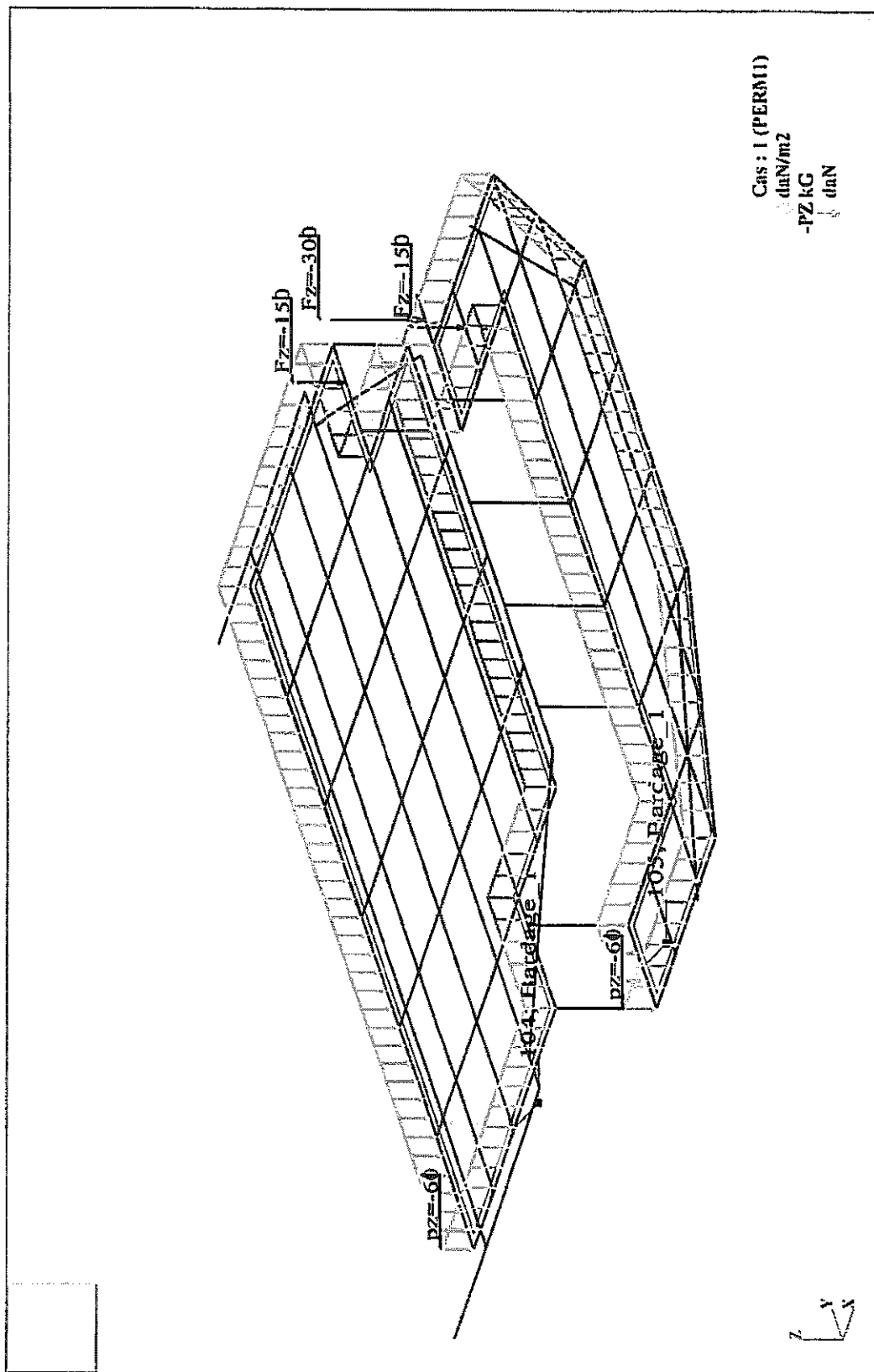
- Cas: 3 4

Filtre	Combinaison
Liste complète	3 4
Sélection	3 4
Nombre total	2
Nombre sélectionné	2

- Cas: 3 4

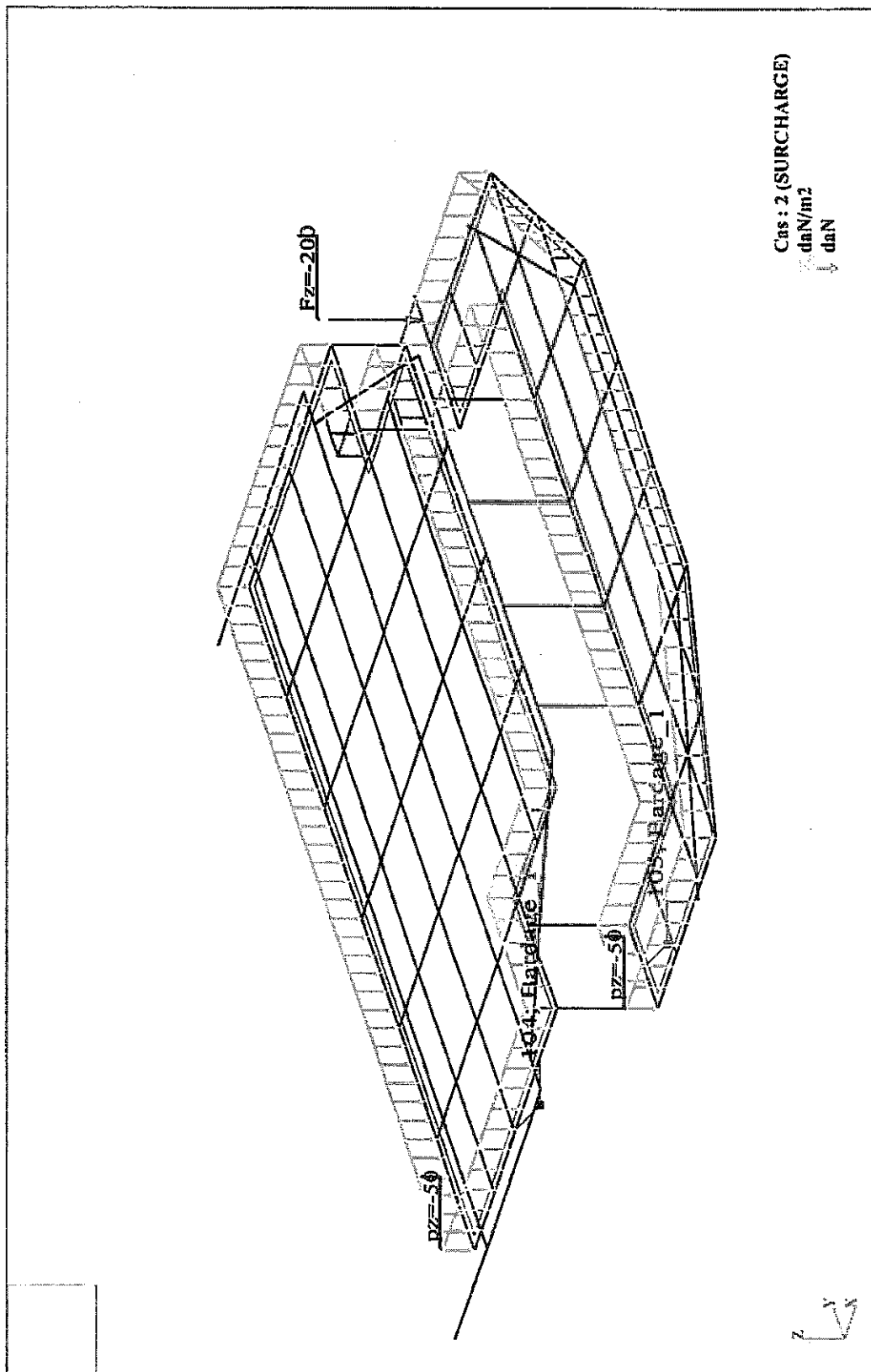
Combinaison	Nom	Type d'analyse	Nature de la combinaison	Nature du cas	Définition
3 (C)	CP+S	Combinaison lin	ELS	permanente	(1+2)*1.00
4 (C)	CP+S POND	Combinaison lin	ELU	permanente	1*1.33+2*1.50

Charges cas1 poids mort





charges cas 2 surcharges





Réactions - Valeurs

Repère global - Cas: 3 4

Noeud/Cas	FX (daN)	FY (daN)	FZ (daN)	MX (daNm)	MY (daNm)	MZ (daNm)
1/ 3 (C)	32	-0	379	0.0	0.00	0.00
1/ 4 (C)	45	-0	523	0.0	0.00	0.00
2/ 3 (C)	0	-0	2181	-0.00	0.00	-0.00
2/ 4 (C)	0	-0	3023	-0.00	0.00	-0.00
5/ 3 (C)	5	-0	3363	0.0	-0.00	0.00
5/ 4 (C)	6	-0	4682	0.0	-0.00	0.00
8/ 3 (C)	-0	0	3946	0.00	0.00	-0.00
8/ 4 (C)	-0	0	5506	0.00	0.00	-0.00
11/ 3 (C)	-0	-0	2736	0.00	-0.00	-0.00
11/ 4 (C)	-0	-0	3801	0.00	-0.00	-0.00
13/ 3 (C)	-0	0	1547	0.0	0.00	-0.00
13/ 4 (C)	-0	0	2140	0.00	0.00	-0.00
39/ 3 (C)	0	0.0	223	0.0	0.00	0.00
39/ 4 (C)	1	0.0	307	0.0	0.00	0.00
40/ 3 (C)	0.0	0.0	2655	0.00	0.00	-0.00
40/ 4 (C)	0.0	0	3679	0.00	0.00	-0.00
43/ 3 (C)	0	-0	3749	-0.00	0.00	-0.00
43/ 4 (C)	0	-0	5233	-0.00	0.00	-0.00
44/ 3 (C)	0	-0	2461	0.00	0.00	-0.00
44/ 4 (C)	0	-0	3418	0.00	0.00	-0.00
46/ 3 (C)	-0	0	2408	-0.00	-0.00	-0.00
46/ 4 (C)	-0	0	3327	-0.00	-0.00	-0.00
66/ 3 (C)	-35	-0	1138	0.00	0.00	-0.00
66/ 4 (C)	-49	-0	1576	0.00	0.00	-0.00
68/ 3 (C)	-0	0	2199	-0.00	0.00	0.00
68/ 4 (C)	-0	0	3051	-0.00	0.00	0.00
94/ 3 (C)	-2	-0	1182	-0.00	0.00	0.00
94/ 4 (C)	-3	-0	1634	-0.00	0.00	0.00
96/ 3 (C)	-0	0	2188	0.00	0.00	0.00
96/ 4 (C)	-0	0	3036	0.00	0.00	0.00
Cas 3 (C) CP+S						
Somme totale	-0	-0	32353	-0.00	0.00	-0.00
Somme réaction	-0	-0	32353	7521.88	-189481.58	-0.00
Somme efforts	0.0	0.0	-32353	-7521.88	189481.58	0.0
Vérification	-0	-0	-0	0.00	0.00	-0.00
Précision	3.22125e-013	7.29692e-028				
Cas 4 (C) CP+S POND						
Somme totale	-0	-0	44935	-0.00	0.00	-0.00
Somme réaction	-0	-0	44935	10338.73	-263010.82	-0.00
Somme efforts	0.0	0.0	-44935	-10338.73	263010.82	0.0
Vérification	-0	-0	-0	0.00	0.00	-0.00
Précision	4.83188e-013	1.05405e-027				



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Auteur : AMG FECHOZ

Adresse : 46 RUE DUHESME 75018PARIS

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Fichier : DOUAI GRIL.rtd

Déplacements - Valeurs**- Cas: 3 (CP+S)**

Noeud/Cas	UX (cm)	UY (cm)	UZ (cm)	RX (Rad)	RY (Rad)	RZ (Rad)
1/ 3 (C)	0.0	-0.0054	0.0	-0.010	0.001	0.000
2/ 3 (C)	-0.0001	0.0007	0.0	-0.006	0.001	-0.000
3/ 3 (C)	-0.0002	0.0016	-0.3586	-0.002	0.003	0.000
5/ 3 (C)	0.0	0.0	0.0	-0.000	0.015	-0.000
6/ 3 (C)	-0.0001	-0.0000	-0.1030	-0.010	-0.000	0.000
8/ 3 (C)	0.0122	0.0016	0.0	0.004	-0.002	0.000
9/ 3 (C)	-0.0000	0.0016	-3.9280	0.000	0.002	0.000
10/ 3 (C)	-0.0000	-0.0272	-0.0888	-0.000	-0.014	-0.000
11/ 3 (C)	0.0088	-0.0272	0.0	0.000	-0.006	0.000
12/ 3 (C)	0.0172	-0.0272	-0.1611	0.000	0.002	-0.000
13/ 3 (C)	0.0039	-0.0063	0.0	-0.000	-0.001	-0.000
14/ 3 (C)	-0.0011	0.0016	-0.5514	-0.002	-0.004	-0.000
16/ 3 (C)	-0.0008	0.0001	-0.4950	-0.011	0.001	-0.000
17/ 3 (C)	-0.0010	-0.0007	-0.2504	0.001	-0.001	-0.000
18/ 3 (C)	0.0123	0.0001	-2.9344	-0.004	-0.004	-0.000
19/ 3 (C)	0.0124	-0.0259	0.0035	-0.003	-0.001	-0.000
20/ 3 (C)	0.0094	0.0001	-2.4843	0.007	-0.000	-0.000
21/ 3 (C)	0.0094	-0.0272	-0.0194	0.001	-0.008	-0.000
22/ 3 (C)	-0.0000	0.0001	0.7287	-0.000	0.015	-0.000
23/ 3 (C)	-0.0009	-0.0000	-0.6243	-0.008	0.001	-0.000
24/ 3 (C)	0.0123	-0.0000	-2.2597	-0.003	-0.005	0.000
25/ 3 (C)	0.0094	-0.0000	-2.4321	0.003	-0.001	0.000
26/ 3 (C)	-0.0000	-0.0000	-1.4285	-0.000	0.013	0.000
27/ 3 (C)	-0.0009	0.0005	-0.6331	-0.005	-0.001	0.000
28/ 3 (C)	0.0123	0.0005	-1.4163	-0.002	-0.006	0.000
29/ 3 (C)	0.0094	0.0005	-2.2217	-0.004	-0.002	0.000
30/ 3 (C)	-0.0000	0.0005	-3.1696	0.000	0.008	0.000
31/ 3 (C)	0.0124	-0.0006	-0.2463	-0.001	-0.001	-0.000
32/ 3 (C)	0.0094	-0.0001	-1.7270	-0.008	-0.002	-0.000
33/ 3 (C)	-0.0000	0.0003	-3.6187	-0.000	-0.005	-0.000
34/ 3 (C)	0.0124	-0.0121	-0.1037	-0.005	-0.001	-0.000
35/ 3 (C)	0.0094	-0.0121	-1.2420	-0.005	-0.005	-0.000
36/ 3 (C)	-0.0000	-0.0121	-2.4095	-0.000	-0.011	-0.000
37/ 3 (C)	0.0094	-0.0261	-0.2885	-0.001	-0.008	-0.000
38/ 3 (C)	-0.0000	-0.0261	-0.5754	-0.000	-0.014	-0.000
39/ 3 (C)	0.0	-0.0004	0.0	0.010	0.000	0.000
40/ 3 (C)	-0.0000	0.0012	0.0	0.007	0.002	0.000
41/ 3 (C)	-0.0000	0.0016	-0.6620	0.002	0.005	-0.000
42/ 3 (C)	-0.0000	-0.0000	0.0288	0.010	-0.001	0.000
43/ 3 (C)	-0.0138	0.0016	0.0	-0.005	-0.003	-0.000
44/ 3 (C)	-0.0110	-0.0272	0.0	-0.000	-0.006	0.000
45/ 3 (C)	-0.0181	-0.0272	-0.0391	0.000	0.001	-0.000
46/ 3 (C)	-0.0038	-0.0046	0.0	-0.002	-0.001	-0.000
47/ 3 (C)	0.0000	0.0016	-0.7982	0.001	-0.004	-0.000
48/ 3 (C)	-0.0001	0.0002	-0.3665	0.011	0.001	-0.000
49/ 3 (C)	-0.0001	0.0019	-1.0215	-0.006	0.002	0.000
50/ 3 (C)	-0.0132	0.0002	-2.8884	0.004	-0.004	-0.000
51/ 3 (C)	-0.0133	-0.0259	0.1072	0.003	-0.001	-0.000
52/ 3 (C)	-0.0114	0.0001	-2.4995	-0.007	-0.000	-0.000



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Adresse : 46 RUE DUHESME 75018PARIS

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Fichier : DOUAI GRIL.rtd

Noeud/Cas	UX (cm)	UY (cm)	UZ (cm)	RX (Rad)	RY (Rad)	RZ (Rad)
53/ 3 (C)	-0.0114	-0.0272	-0.0107	-0.000	-0.008	-0.000
54/ 3 (C)	-0.0001	-0.0001	-0.5369	0.009	0.001	0.000
55/ 3 (C)	-0.0132	-0.0001	-2.2952	0.004	-0.004	0.000
56/ 3 (C)	-0.0114	-0.0000	-2.4480	-0.003	-0.001	0.000
57/ 3 (C)	-0.0001	0.0006	-0.6501	0.005	0.000	0.000
58/ 3 (C)	-0.0132	0.0005	-1.5052	0.002	-0.006	0.000
59/ 3 (C)	-0.0114	0.0005	-2.2329	0.004	-0.002	0.000
60/ 3 (C)	-0.0133	0.0015	-0.1635	0.001	-0.002	-0.000
61/ 3 (C)	-0.0114	0.0009	-1.7105	0.009	-0.002	-0.000
62/ 3 (C)	-0.0133	-0.0119	0.0066	0.005	-0.001	-0.000
63/ 3 (C)	-0.0114	-0.0120	-1.2227	0.005	-0.005	-0.000
64/ 3 (C)	-0.0114	-0.0260	-0.2769	0.001	-0.008	-0.000
66/ 3 (C)	0.0	-0.1182	0.0	-0.002	0.000	-0.000
67/ 3 (C)	-0.0114	-0.1102	-0.0237	0.001	-0.001	0.000
68/ 3 (C)	-0.0091	-0.1101	0.0	-0.000	-0.001	-0.000
69/ 3 (C)	0.0077	-0.1100	-0.1828	-0.000	-0.000	-0.000
70/ 3 (C)	0.0081	-0.1200	-0.0456	-0.000	0.001	-0.000
71/ 3 (C)	0.0016	-0.1193	-0.0635	-0.001	0.001	-0.000
72/ 3 (C)	0.0009	-0.0296	-0.2522	0.000	-0.001	-0.000
73/ 3 (C)	0.0009	-0.1166	-0.1222	-0.001	0.001	0.000
74/ 3 (C)	-0.0070	-0.0297	-0.1715	0.001	0.000	-0.000
75/ 3 (C)	-0.0114	-0.1099	0.0335	0.000	-0.001	-0.000
76/ 3 (C)	0.0078	-0.1099	-0.1418	-0.000	-0.000	-0.000
77/ 3 (C)	-0.0071	-0.1121	-0.2427	0.001	0.000	0.000
78/ 3 (C)	-0.0114	-0.1195	-0.1133	0.001	0.000	0.000
79/ 3 (C)	0.0017	-0.1198	-0.0451	0.000	0.001	-0.000
80/ 3 (C)	0.0017	-0.1099	-0.0978	-0.001	-0.000	-0.000
81/ 3 (C)	0.0009	-0.0762	-0.1393	-0.002	-0.001	-0.000
82/ 3 (C)	-0.0070	-0.0762	-0.2178	0.001	0.000	-0.000
83/ 3 (C)	-0.0071	-0.1168	-0.2314	-0.000	0.000	0.000
84/ 3 (C)	-0.0114	-0.1170	-0.1402	0.000	-0.000	0.000
85/ 3 (C)	0.0017	-0.1173	-0.1521	-0.000	0.000	0.000
86/ 3 (C)	-0.0079	-0.1117	-0.2328	0.001	0.000	0.000
87/ 3 (C)	-0.0114	-0.1113	-0.0688	0.000	-0.001	0.000
88/ 3 (C)	0.0017	-0.1108	-0.1512	-0.000	-0.000	0.000
89/ 3 (C)	0.0077	-0.1106	-0.2157	0.000	-0.000	-0.000
90/ 3 (C)	0.0079	-0.1175	-0.2164	-0.000	0.000	-0.000
91/ 3 (C)	0.0064	-0.0006	-0.1682	-0.001	-0.000	-0.000
92/ 3 (C)	0.0130	-0.0273	-0.1007	0.001	-0.000	0.000
93/ 3 (C)	0.0034	-0.0272	-0.0373	-0.001	-0.001	0.000
94/ 3 (C)	0.0	-0.1259	0.0	0.003	-0.002	0.000
95/ 3 (C)	0.0237	-0.1099	-0.0225	-0.000	-0.001	-0.000
96/ 3 (C)	0.0214	-0.1099	0.0	0.000	-0.001	-0.000
97/ 3 (C)	0.0075	-0.1209	-0.0597	0.001	0.001	0.000
98/ 3 (C)	0.0029	-0.4397	-1.0325	-0.004	-0.003	0.000
99/ 3 (C)	0.0033	-0.1196	0.2111	0.003	-0.001	0.000
100/ 3 (C)	0.0242	-0.4396	-0.1356	-0.004	0.001	0.001
101/ 3 (C)	0.0236	-0.1098	0.0244	0.000	-0.001	0.000
102/ 3 (C)	0.0239	-0.1095	-0.1121	0.001	-0.000	0.000
103/ 3 (C)	0.0237	-0.1205	-0.0639	-0.000	0.001	-0.000
104/ 3 (C)	0.0139	-0.1201	-0.0447	0.000	0.001	-0.000
105/ 3 (C)	0.0139	-0.1099	-0.1047	0.001	-0.000	-0.000



Noeud/Cas	UX (cm)	UY (cm)	UZ (cm)	RX (Rad)	RY (Rad)	RZ (Rad)
106/ 3 (C)	0.0030	-0.2893	-0.5620	0.001	-0.004	0.001
107/ 3 (C)	0.0241	-0.2892	-0.1996	-0.004	0.000	0.001
108/ 3 (C)	0.0240	-0.1185	-0.1495	0.001	-0.000	-0.000
109/ 3 (C)	0.0237	-0.1180	-0.1124	-0.000	0.000	0.000
110/ 3 (C)	0.0139	-0.1176	-0.1503	0.000	0.000	0.000
111/ 3 (C)	0.0248	-0.1090	-0.1154	-0.000	0.001	0.000
112/ 3 (C)	0.0237	-0.1099	-0.0607	0.000	-0.001	0.000
113/ 3 (C)	0.0139	-0.1104	-0.1514	0.000	-0.000	0.000
114/ 3 (C)	-0.0082	0.0016	-0.1331	-0.000	-0.001	-0.000
115/ 3 (C)	-0.0146	-0.0272	-0.0492	-0.000	-0.001	0.000
116/ 3 (C)	-0.0056	-0.0272	-0.0399	0.001	-0.001	0.000
149/ 3 (C)	-0.0183	-0.4397	-1.6056	-0.004	-0.003	0.000



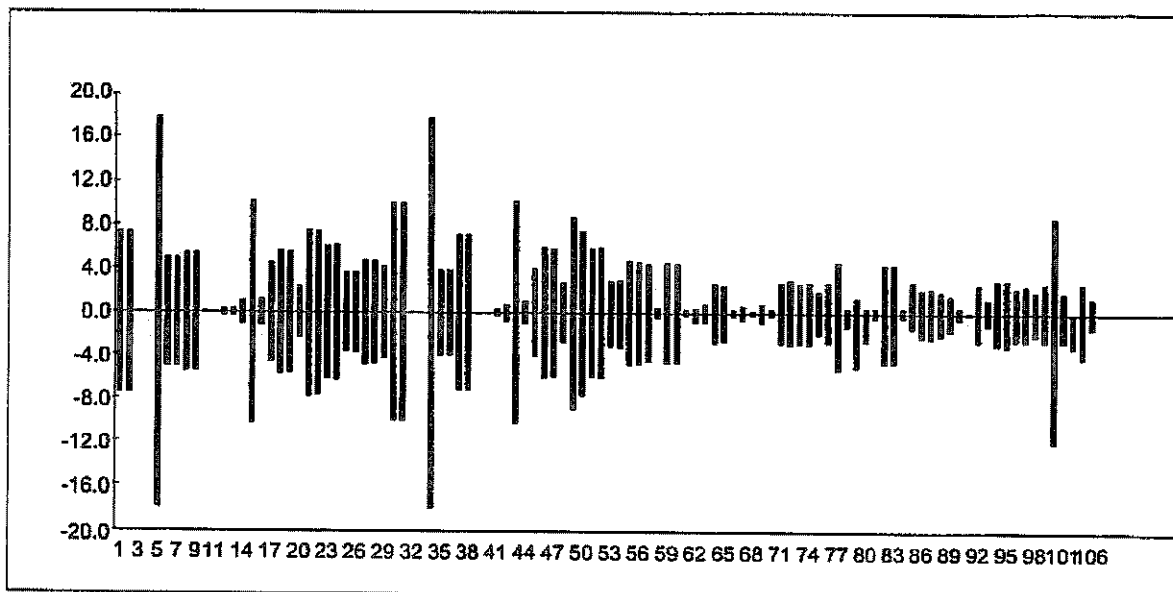
ROBOT v 16.1.1

Auteur : AMG FECHOZ

Adresse : 46 RUE DUHESME 75018PARIS

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Fichier : DOUAI GRIL.rtd

Analyse globale - barres : : 1

Nom	Limite inférieure	Limite supérieure	En dehors du domaine	Dans le domaine	Couleur	Min.	Max.
Sigma (daN/mm	0.0	0.0	1A103 106			-18.26	18.26



Vérification des familles des barres acier/aluminium

CALCUL DES STRUCTURES ACIER

NORME : CM66

TYPE D'ANALYSE : Vérification des familles

FAMILLE : 1 longrine

PIECE : 34

POINT : 3

COORDONNEE : x=1.00 L

CHARGEMENTS :

Cas de charge décisif : 4 CP+S POND 1*1.33+2*1.50

MATERIAU :

ACIER $f_y = 23.50 \text{ daN/mm}^2$



PARAMETRES DE LA SECTION : IPE 240

ht=24.0 cm

bf=12.0 cm

ea=0.6 cm

es=1.0 cm

$A_y = 23.520 \text{ cm}^2$

$I_y = 3891.630 \text{ cm}^4$

$W_{ely} = 324.302 \text{ cm}^3$

$A_z = 14.880 \text{ cm}^2$

$I_z = 283.634 \text{ cm}^4$

$W_{elz} = 47.272 \text{ cm}^3$

$A_x = 39.116 \text{ cm}^2$

$I_x = 11.600 \text{ cm}^4$

CONTRAINTES :

$\text{SigN} = -2/39.116 = -0.00 \text{ daN/mm}^2$

$\text{SigFy} = 5901.86/324.302 = 18.20 \text{ daN/mm}^2$

$\text{SigFz} = 3.11/47.272 = 0.07 \text{ daN/mm}^2$



PARAMETRES DE DEVERSEMENT :

y=1.00

ID_{sup}=1.25 m

B=1.00

C=1.00

D=1.08

kD=1.02

Sig D=8.89 daN/mm²

PARAMETRES DE FLAMBEMENT :



en y :



en z :

FORMULES DE VERIFICATION :

$\text{SigN} + kD \cdot \text{SigFy} + \text{SigFz} = -0.00 + 1.02 \cdot 18.20 + 0.07 = 18.66 < 23.50 \text{ daN/mm}^2 \text{ (3.731)}$

$1.54 \cdot \text{Tauy} = |1.54 \cdot -0.00| = |-0.00| < 23.50 \text{ daN/mm}^2 \text{ (1.313)}$

$1.54 \cdot \text{Tauz} = 1.54 \cdot 0.18 = 0.28 < 23.50 \text{ daN/mm}^2 \text{ (1.313)}$

Profil correct !!!



CALCUL DES STRUCTURES ACIER

NORME : CM66

TYPE D'ANALYSE : Vérification des familles

FAMILLE : 2 chemin de mofles

PIECE : 13

POINT : 1

COORDONNEE : x=0.66 L

CHARGEMENTS :

Cas de charge décisif: 4 CP+S POND 1*1.33+2*1.50

MATERIAU :

ACIER $f_y = 23.50 \text{ daN/mm}^2$



PARAMETRES DE LA SECTION : UUPN 160

ht=16.0 cm

bf=13.0 cm

ea=0.8 cm

es=1.1 cm

$A_y = 13.650 \text{ cm}^2$

$I_y = 1850.000 \text{ cm}^4$

$W_{ely} = 231.250 \text{ cm}^3$

$A_z = 24.000 \text{ cm}^2$

$I_z = 332.000 \text{ cm}^4$

$W_{elz} = 51.077 \text{ cm}^3$

$A_x = 47.788 \text{ cm}^2$

$I_x = 26.850 \text{ cm}^4$

CONTRAINTES :

$\text{SigN} = 5/47.788 = 0.00 \text{ daN/mm}^2$

$\text{SigFy} = 2294.67/231.250 = 9.92 \text{ daN/mm}^2$

$\text{SigFz} = 7.25/51.077 = 0.14 \text{ daN/mm}^2$



PARAMETRES DE DEVERSEMENT :

y=1.00

ID_{sup}=9.60 m

B=1.00

C=1.81

D=6.81

kD=1.06

$\text{Sig D} = 11.55 \text{ daN/mm}^2$

PARAMETRES DE FLAMBEMENT :



en y :



en z :

FORMULES DE VERIFICATION :

$\text{SigN} + kD \cdot kF_y \cdot \text{SigFy} + kF_z \cdot \text{SigFz} = 0.00 + 1.06 \cdot 1.00 \cdot 9.92 + 1.00 \cdot 0.14 = 10.65 < 23.50 \text{ daN/mm}^2 \text{ (3.731)}$

$1.54 \cdot \text{Tau}_y = 1.54 \cdot 0.00 = 0.01 < 23.50 \text{ daN/mm}^2 \text{ (1.313)}$

$1.54 \cdot \text{Tau}_z = |1.54 \cdot -0.11| = |-0.17| < 23.50 \text{ daN/mm}^2 \text{ (1.313)}$

Profil correct !!!



CALCUL DES STRUCTURES ACIER

NORME : CM66

TYPE D'ANALYSE : Vérification des familles

FAMILLE : 3 solive

PIECE : 49

POINT : 1

COORDONNEE : x=0.00 L

CHARGEMENTS :

Cas de charge décisif: 4 CP+S POND 1*1.33+2*1.50

MATERIAU :

ACIER $f_y = 23.50 \text{ daN/mm}^2$



PARAMETRES DE LA SECTION : IPE 100

ht=10.0 cm

bf=5.5 cm

ea=0.4 cm

es=0.6 cm

Ay=6.270 cm²

Iy=171.012 cm⁴

Wely=34.202 cm³

Az=4.100 cm²

Iz=15.919 cm⁴

Welz=5.789 cm³

Ax=10.323 cm²

Ix=1.100 cm⁴

CONTRAINTES :

SigN = $-66/10.323 = -0.06 \text{ daN/mm}^2$

SigFy = $307.00/34.202 = 8.98 \text{ daN/mm}^2$

SigFz = $0.58/5.789 = 0.10 \text{ daN/mm}^2$



PARAMETRES DE DEVERSEMENT :

y=1.00

ID_inf=2.90 m

B=1.00

C=1.18

D=3.17

kD=1.48

Sig D=9.58 daN/mm²

PARAMETRES DE FLAMBEMENT :



en y :



en z :

FORMULES DE VERIFICATION :

SigN + kD*SigFy + SigFz = $-0.06 + 1.48*8.98 + 0.10 = 13.33 < 23.50 \text{ daN/mm}^2$ (3.731)

$1.54*Tau_y = |1.54*-0.00| = |-0.00| < 23.50 \text{ daN/mm}^2$ (1.313)

$1.54*Tau_z = 1.54*0.70 = 1.08 < 23.50 \text{ daN/mm}^2$ (1.313)

Profil correct !!!



CALCUL DES STRUCTURES ACIER

NORME : CM66

TYPE D'ANALYSE : Vérification des familles

FAMILLE : 4 suspente

PIECE : 100

POINT : 3

COORDONNEE : x=1.00 L

CHARGEMENTS :

Cas de charge décisif : 4 CP+S POND 1*1.33+2*1.50

MATERIAU :

ACIER $f_y = 23.50 \text{ daN/mm}^2$



PARAMETRES DE LA SECTION : T CAR 60x3.2

ht=6.0 cm

bf=6.0 cm

ea=0.3 cm

es=0.3 cm

$A_y = 3.611 \text{ cm}^2$

$I_y = 38.650 \text{ cm}^4$

$W_{ely} = 12.883 \text{ cm}^3$

$A_z = 3.611 \text{ cm}^2$

$I_z = 38.650 \text{ cm}^4$

$W_{elz} = 12.883 \text{ cm}^3$

$A_x = 7.221 \text{ cm}^2$

$I_x = 60.110 \text{ cm}^4$

CONTRAINTES :

$\text{SigN} = -1159/7.221 = -1.61 \text{ daN/mm}^2$

$\text{SigFy} = -45.31/12.883 = -3.52 \text{ daN/mm}^2$

$\text{SigFz} = -91.64/12.883 = -7.11 \text{ daN/mm}^2$



PARAMETRES DE DEVERSEMENT :



PARAMETRES DE FLAMBEMENT :

en y :



en z :

FORMULES DE VERIFICATION :

$\text{SigN} + \text{SigFy} + \text{SigFz} = -1.61 + -3.52 + -7.11 = -12.24 < 23.50 \text{ daN/mm}^2 \text{ (3.731)}$

$1.54 * \text{Tauy} = |1.54 * -0.28| = |-0.44| < 23.50 \text{ daN/mm}^2 \text{ (1.313)}$

$1.54 * \text{Tauz} = 1.54 * 0.05 = 0.08 < 23.50 \text{ daN/mm}^2 \text{ (1.313)}$

Profil correct !!!



CALCUL DES STRUCTURES ACIER

NORME : CM66

TYPE D'ANALYSE : Vérification des familles

FAMILLE : 5 fer de rive

PIECE : 48

POINT : 1

COORDONNEE : x=0.51 L

CHARGEMENTS :

Cas de charge décisif : 4 CP+S POND 1*1.33+2*1.50

MATERIAU :

ACIER $f_y = 23.50 \text{ daN/mm}^2$



PARAMETRES DE LA SECTION : UPN 160

ht=16.0 cm

bf=6.5 cm

ea=0.8 cm

es=1.1 cm

Ay=13.650 cm²

Iy=924.546 cm⁴

Wely=115.568 cm³

Az=12.000 cm²

Iz=85.083 cm⁴

Welz=18.259 cm³

Ax=23.894 cm²

Ix=6.829 cm⁴

CONTRAINTES :

SigN = $-87/23.894 = -0.04 \text{ daN/mm}^2$

SigFy = $-1360.62/115.568 = -11.77 \text{ daN/mm}^2$

SigFz = $-4.54/18.259 = -0.25 \text{ daN/mm}^2$



PARAMETRES DE DEVERSEMENT :

PARAMETRES DE FLAMBEMENT :



en y :



en z :

FORMULES DE VERIFICATION :

SigN + SigFy + SigFz = $-0.04 + -11.77 + -0.25 = -12.06 < 23.50 \text{ daN/mm}^2$ (3.731)

$1.54 \cdot \text{Tau}_y = 1.54 \cdot 0.00 = 0.01 < 23.50 \text{ daN/mm}^2$ (1.313)

$1.54 \cdot \text{Tau}_z = 1.54 \cdot 0.79 = 1.21 < 23.50 \text{ daN/mm}^2$ (1.313)

Profil correct !!!



CALCUL DES STRUCTURES ACIER

NORME : CM66

TYPE D'ANALYSE : Vérification des familles

FAMILLE : 1 longrine

PIECE : 32

POINT :

COORDONNEE :



PARAMETRES DE LA SECTION : IPE 240

ht=24.0 cm

bf=12.0 cm

ea=0.6 cm

es=1.0 cm

Ay=23.520 cm²

Iy=3891.630 cm⁴

Wey=324.302 cm³

Az=14.880 cm²

Iz=283.634 cm⁴

Welz=47.272 cm³

Ax=39.116 cm²

Ix=11.600 cm⁴

DEPLACEMENTS LIMITES



Flèches

uy = 0.0134 cm < uy max = L/200.00 = 4.5688 cm

Vérifié

Cas de charge décisif: 3 CP+S (1+2)*1.00

uz = 2.9622 cm < uz max = L/200.00 = 4.5688 cm

Vérifié

Cas de charge décisif: 3 CP+S (1+2)*1.00



Déplacements Non analysé

Profil correct !!!



CALCUL DES STRUCTURES ACIER

NORME : CM66

TYPE D'ANALYSE : Vérification des familles

FAMILLE : 2 chemin de mofles

PIECE : 13

POINT :

COORDONNEE :



PARAMETRES DE LA SECTION : UUPN 160

ht=16.0 cm

bf=13.0 cm

ea=0.8 cm

es=1.1 cm

Ay=13.650 cm²

Iy=1850.000 cm⁴

Wey=231.250 cm³

Az=24.000 cm²

Iz=332.000 cm⁴

Welz=51.077 cm³

Ax=47.788 cm²

Ix=26.850 cm⁴

DEPLACEMENTS LIMITES



Flèches

uy = 0.0186 cm < uy max = L/200.00 = 4.8000 cm

Vérifié

Cas de charge décisif : 3 CP+S (1+2)*1.00

uz = 4.2699 cm < uz max = L/200.00 = 4.8000 cm

Vérifié

Cas de charge décisif : 3 CP+S (1+2)*1.00



Déplacements Non analysé

Profil correct !!!



CALCUL DES STRUCTURES ACIER

NORME : CM66

TYPE D'ANALYSE : Vérification des familles

FAMILLE : 3 solive

PIECE : 56

POINT :

COORDONNEE :



PARAMETRES DE LA SECTION : IPE 100

ht=10.0 cm

bf=5.5 cm

ea=0.4 cm

es=0.6 cm

Ay=6.270 cm²

Iy=171.012 cm⁴

Wey=34.202 cm³

Az=4.100 cm²

Iz=15.919 cm⁴

Welz=5.789 cm³

Ax=10.323 cm²

Ix=1.100 cm⁴

DEPLACEMENTS LIMITES



Flèches

uz = 0.4289 cm < uz max = L/300.00 = 0.9667 cm

Vérifié

Cas de charge décisif : 3 CP+S (1+2)*1.00



Déplacements Non analysé

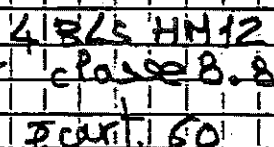
Profil correct !!!

A
M
G

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Sustentabile SI:



Traction maxi adm.
3700 daN/Bl.

$F = 4682$ d'at pondéré - voir nc n° 2
page 14 - noeud 5

Suivant C.H. art 403:

$$F = 375 \frac{t_e}{C_F} \cdot \frac{S_e}{S_e + t_e} \quad \text{avec } t_e = 52 \quad C_e = 43,5$$

$$F = \frac{375 \times 15 \times 25}{43,5} \times \frac{60}{60 + 52} = 1227 \text{ daN maxi admissible par boulon}$$

$$1727 \times 4 = 6910 \text{ daN} > 4682 \text{ daN}$$

Soudures: cordon Frontal

$a = 6 \quad \angle g = 200 \quad 8a = 152 \text{ mm}$
 $a = 4 \quad \angle g = 80 \times 2 \quad 4a = 144 \text{ mm}$

$$\sigma = \frac{4682}{0,85 \times 5 \times 296} = \frac{4682}{1255,5} \approx 3,73 \text{ daN/mm}^2 < 24$$

NOTE DE CALCULS

AFFAIRE: 4637- HIPPODROME DE DOUAI

TITRE: Gril de Scène

NC N° 2

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2 - Suspente S3

$F = 5506 \text{ daN (P)}$

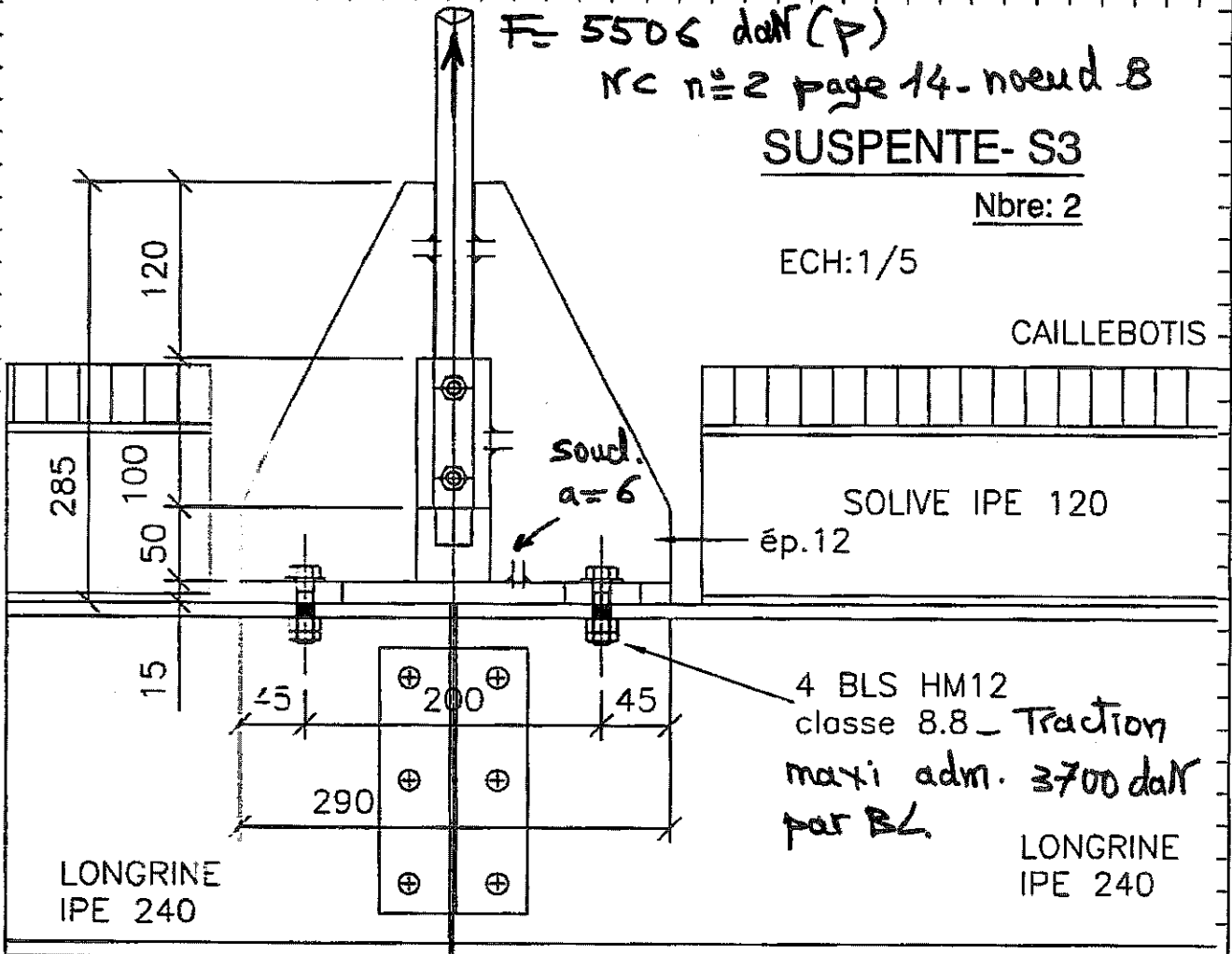
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SUSPENTE- S3

Nbre: 2

ECH: 1/5

CAILLEBOTIS



Soudure: cordon frontal

$$a = 6 \quad \Sigma g = (2 \times 290) - 4a = 556 \text{ mm.}$$

$$n \alpha = 5$$

$$\sigma = \frac{5506}{0,85 \alpha \times P} = \frac{5506}{0,85 \times 5 \times 556} = 2,3 \text{ daN/mm}^2 < 24$$

DRESSE LE: 7/3/05

PAR

IND.

LE:

NOTE DE CALCULS

AFFAIRE: 4637- HIPPODROME DE DOUAI

TITRE:

NC n° 2

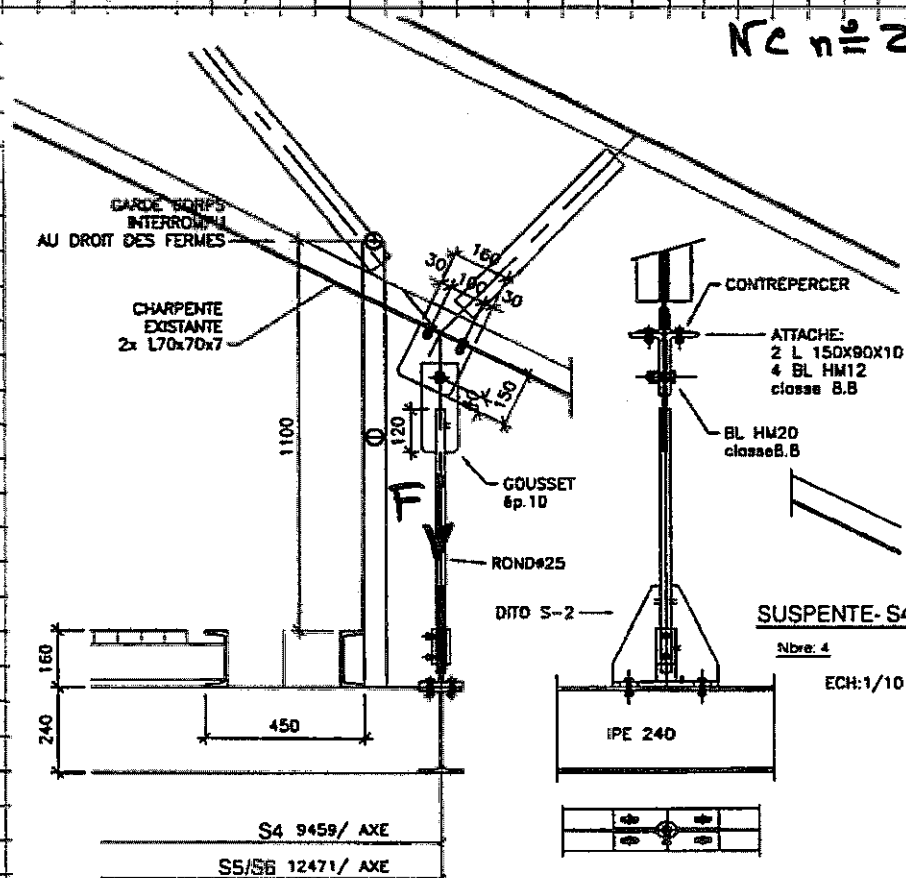
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3. suspente S4.

F = 3036 daN pondérale

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noeud 36



Attache: 4 BLS = $4 \times 3700 = 14800 \text{ daN} > 3036 \text{ daN}$

Axe: 1 BL $\phi 20$ classe 8.8 double usilletement
effort maxi admissible = 17500 daN

soudure haute:

cordon Patéaux $a = 5$ $\alpha = 4,8$

$$L_g = (4 \times 120) - 8a = 448 \text{ mm.}$$

$$\sigma = \frac{3036}{0,75 \cdot \alpha \cdot l} = \frac{3036}{0,75 \times 4,8 \times 448} = 1,9 \text{ daN/mm}^2 < 24$$

DRESSE LE: 7/3/05

PAR

IND.

LE: