ASSOCIAÇÃO BRASILEIRA DOS FABRICANTES DE TUBOS DE CONCRETO

RELATÓRIO DE DIMENSIONAMENTO DE ADUELA RETANGULAR MONOLÍTICA

quarta-feira, 2 de outubro de 2019

ASSOCIAÇÃO BRASILEIRA
DOS FABRICANTES DE
TUBOS DE CONCRETO

DADOS DO FABRICANTE

NOME:
CPF/CNPJ:
ENDEREÇO: ,
BAIRRO:
CIDADE:
ESTADO: Não Informado
CEP:
TEL.:
CEL.:
E-MAIL:
SITE:

DADOS DO CLIENTE

NOME: DEFESA CIVIL DO ESTADO DE SÃO PAULO
CPF/CNPJ:
ENDEREÇO: ,
BAIRRO:
CIDADE:
ESTADO: Não Informado
CEP:
TEL.:
CEL.:
E-MAIL:
SITE:

DADOS DA OBRA

NOME: ADUELA 1,50 X 1,50 M PARA ATERRO DE 0,50 M
ENDEREÇO: ,
BAIRRO:
CIDADE:
ESTADO: Não Informado
CEP:
TEL.:
CEL.:
E-MAIL:
SITE:

GEOMETRIA

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SEÇÃO CONSTANTE.........................:  SIM
FINALIDADE..............................:  ÁGUAS PLUVIAIS
COMPRIMENTO (cl)........................:  1.00 m
LARGURA LIVRE (bl)......................:  1.50 m
ALTURA LIVRE (hl).......................:  1.50 m
ALTURA DA LAJE DA COBERTURA (hc)........:  0.15 m
ESPESSURA DAS PAREDES LATERAIS (hp).....:  0.15 m
ALTURA DA LAJE DA BASE (hb).............:  0.15 m
MÍSULA HOR. DA COBERTURA................:  0.20 m
MÍSULA VERT. DA COBERTURA...............:  0.20 m
MÍSULA VERT. DA BASE....................:  0.20 m
MÍSULA HOR. DA BASE.....................:  0.20 m
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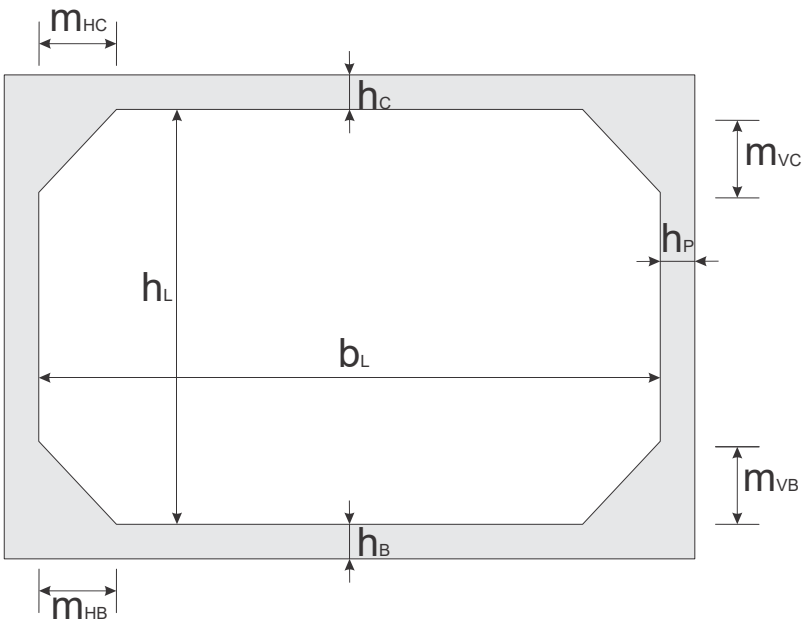
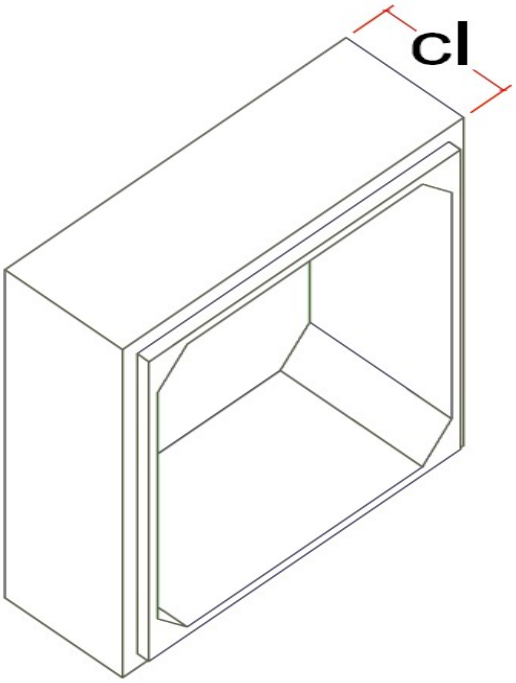




INSTALAÇÃO E MANUSEIO

ESPECIFICAÇÃO DO SOLO

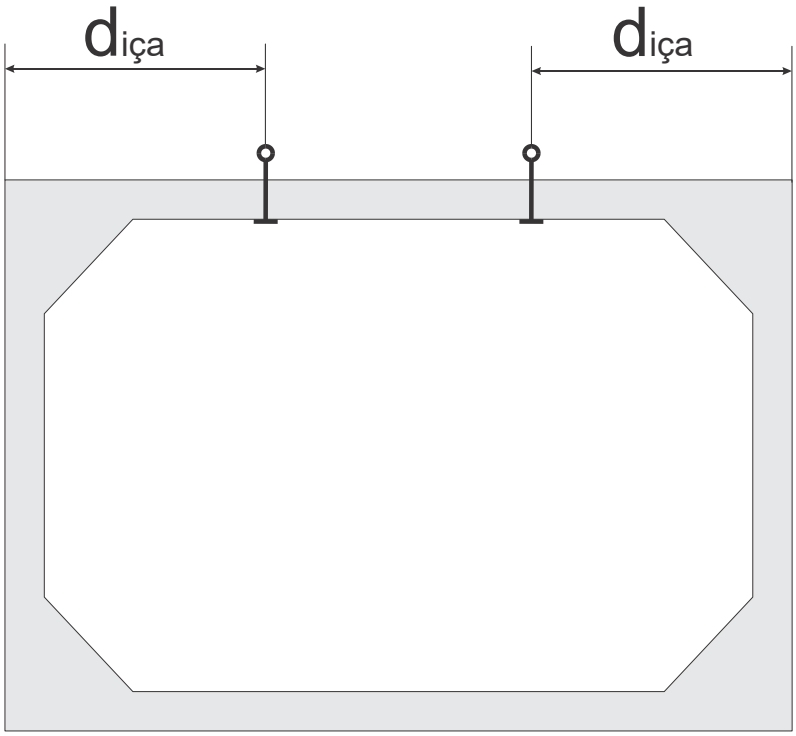
PESO ESPECÍFICO.....: 18.00 kN/m³
ÂNGULO DE ATRITO.....: 30.00 graus
COEFICIENTE DE ATRITO ATIVO.....: 0.33
COEFICIENTE DE ATRITO ESTÁTICO.....: 0.50
COEFICIENTE DE ATRITO.....: 0.58

DADOS DE INSTALAÇÃO

ALTURA DE TERRA.....: 0.20 m
ESPESSURA DO PAVIMENTO.....: 0.30 m
EFEITO DO ARQUEAMENTO.....: NÃO CONSIDERADO
TIPO DE INSTALAÇÃO.....: ---
LARGURA DA VALA.....: ---
0.80 x Ka x COEFICIENTE DE ATRITO.....: 0.15
RAZÃO DE RECALQUE.....: ---

INFORMAÇÕES DE MANUSEIO

RESISTÊNCIA DO CONCRETO (fcj).....: 20.00 MPa
COEFICIENTE DE IMPACTO.....: 1.20
DISTÂNCIA DE IÇAMENTO.....: 50.00 cm



SOBRECARGA

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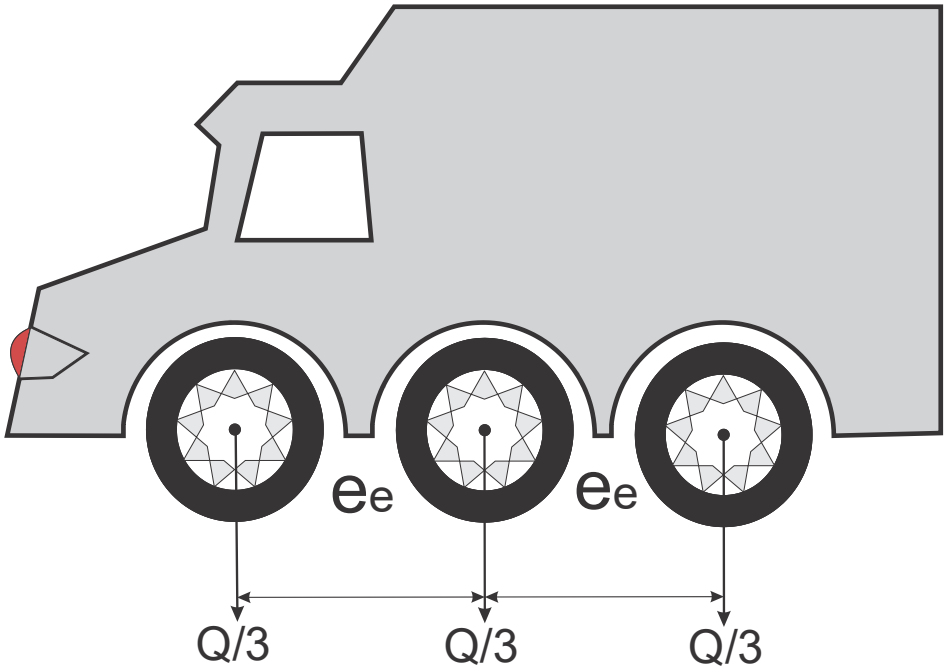
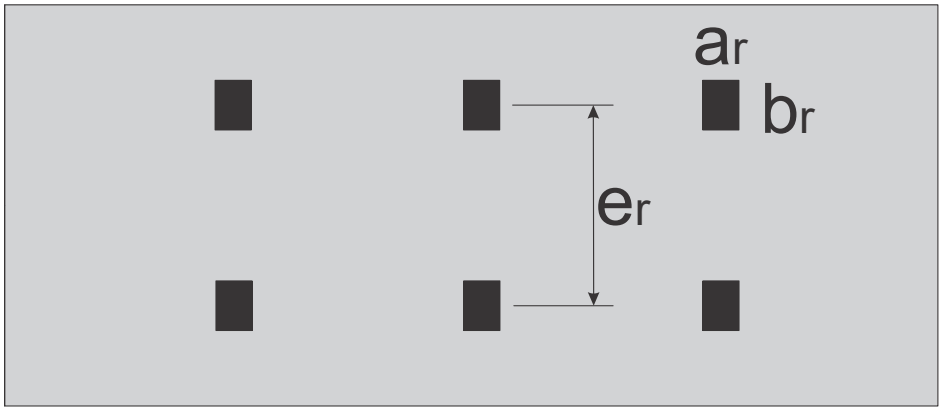
TIPO DE SOBRECARGA......................:  RODOVIÁRIO
TIPO DE TRÁFEGO.........................:  CLASSE 45
PESO DO VEÍCULO (Q).....................: 450.00 kN
DISTÂNCIA ENTRE EIXOS (ee)..............: 1.50 m
DISTÂNCIA ENTRE RODAS (er)..............: 2.00 m
ÁREA DE CONTATO DA RODA (ar)............: 0.20 m
ÁREA DE CONTATO DA RODA (br)............: 0.50 m
COEF. DE IMPACTO ADICIONAL..............: 1.25
COEF. DE IMPACTO EMPREGADO..............: 1.58
```





PARÂMETROS DA ARMADURA

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ABERTURA MÁX. DAS FISSURAS..................:  0.20 mm
DIMINUIÇÃO DA RIGIDEZ.......................:  1.00
RESISTÊNCIA DA ARMADURA DO COROAMENTO.......:  190.00 MPa
RESISTÊNCIA DA ARMADURA DA QUINA............:  105.00 MPa
COEF. DE PONDERAÇÃO DO CONCRETO.............:  1.30
COEF. DE PONDERAÇÃO DO AÇO..................:  1.15
ESPAÇAMENTO MÍN. ENTRE ARMADURAS............:  5.00 cm
ESPAÇAMENTO MÁX. ENTRE ARMADURAS............:  35.00 cm
COBRIMENTO DAS ARMADURAS....................:  4.00 cm
TELA PADRÃO INTERNA.........................:  L283
TELA PADRÃO EXTERNA.........................:  L283
CONSIDERAR ANCOR. DA ARM. INT. P/ CORTANTE..:  SIM
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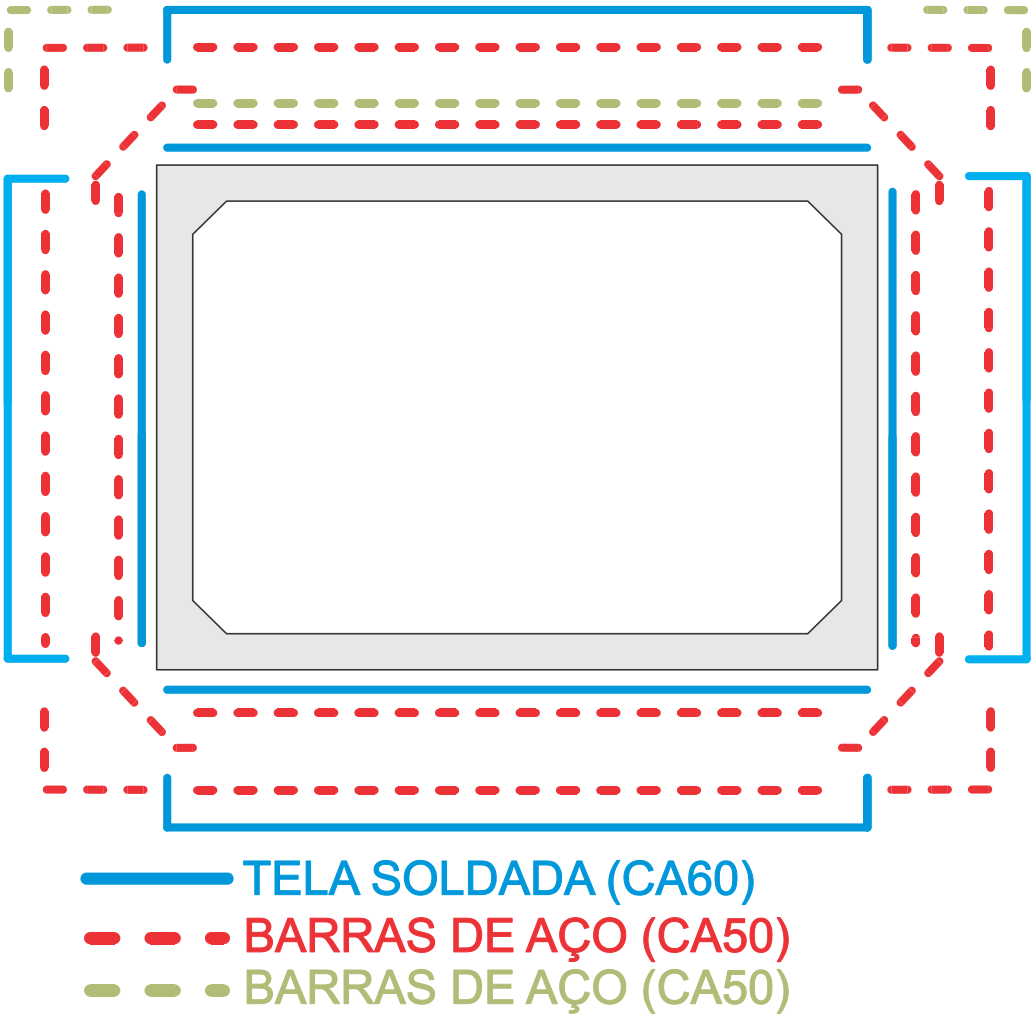

CRITÉRIOS E CONSTANTES

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RESISTÊNCIA CARACTERÍSTICA DO CONCRETO..:  30.00 MPa
PESO ESPECÍFICO DO CONCRETO.............:  25.00 kN/m³
PESO ESPECÍFICO DO AÇO..................:  78.00 kN/m³
MÓDULO DE DEFORMAÇÃO LONGITUDINAL.......:  26071.59 MPa
MÓDULO DE REAÇÃO DO SOLO................:  25.00 MPa/m
COMPRIMENTO DO ELEMENTO FINITO..........:  20.00 cm
# ELS:
COEFICIENTE DE PONDERAÇÃO PESO PRÓPRIO..:  1.00
COEFICIENTE DE PONDERAÇÃO SOLO..........:  1.00
COEFICIENTE DE PONDERAÇÃO FISSURAÇÃO....:  0.50
COEFICIENTE DE PONDERAÇÃO FADIGA........:  0.80
# ELU:
- VmaxHmin:
COEFICIENTE DE PONDERAÇÃO CARGA MÓVEL V.:  1.50
COEFICIENTE DE PONDERAÇÃO ATERRO........:  1.35
COEFICIENTE DE PONDERAÇÃO PESO PRÓPRIO..:  1.30
COEFICIENTE DE PONDERAÇÃO SOLO..........:  1.00
COEFICIENTE DE PONDERAÇÃO ÁGUA..........:  1.20
- VminHmax:
COEFICIENTE DE PONDERAÇÃO ATERRO........:  1.00
COEFICIENTE DE PONDERAÇÃO PESO PRÓPRIO..:  1.00
COEFICIENTE DE PONDERAÇÃO SOLO..........:  1.35
COEFICIENTE DE PONDERAÇÃO CARGA MÓVEL H.:  1.50
- VmaxHmax:
COEFICIENTE DE PONDERAÇÃO CARGA MÓVEL V.:  1.50
COEFICIENTE DE PONDERAÇÃO ATERRO........:  1.35
COEFICIENTE DE PONDERAÇÃO PESO PRÓPRIO..:  1.30
COEFICIENTE DE PONDERAÇÃO SOLO..........:  1.35
COEFICIENTE DE PONDERAÇÃO CARGA MÓVEL H.:  1.50
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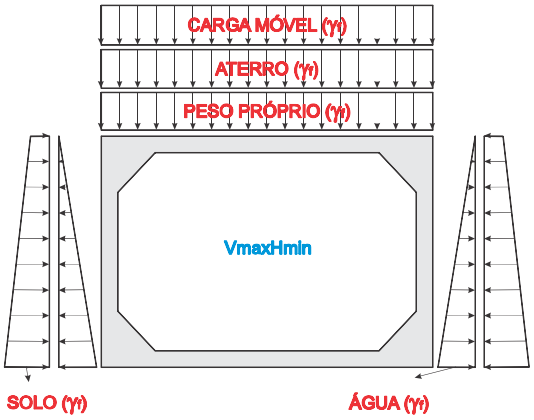
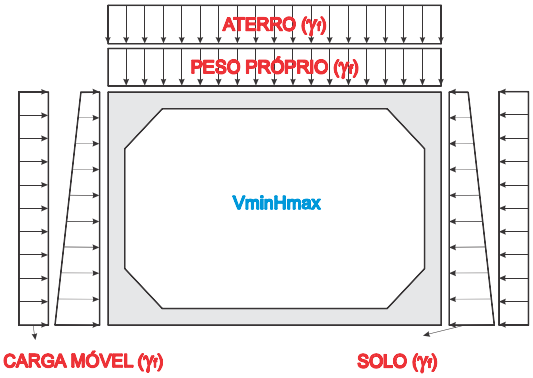
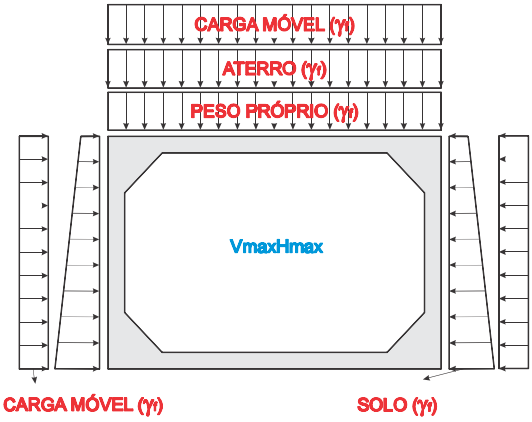
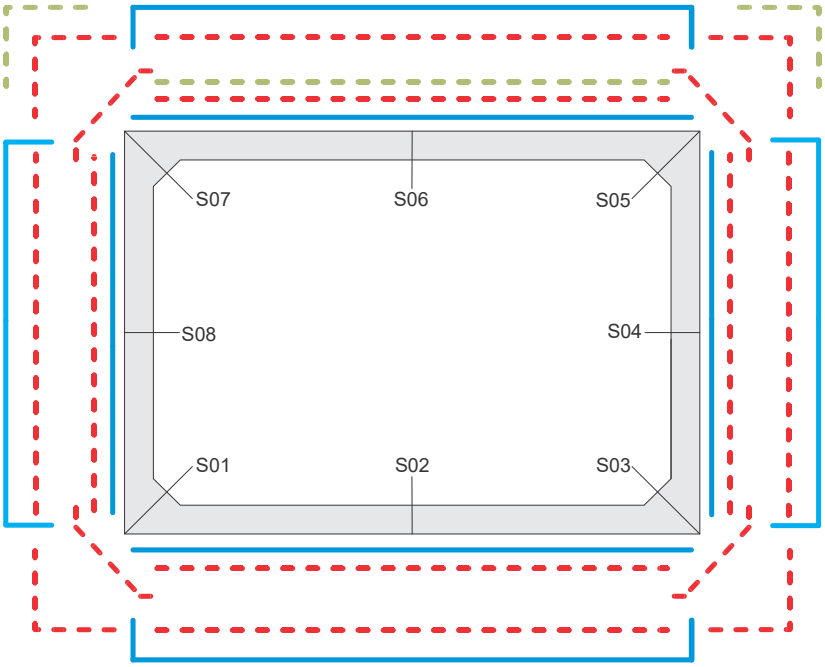






ESQUEMA P/ DETALHAMENTO



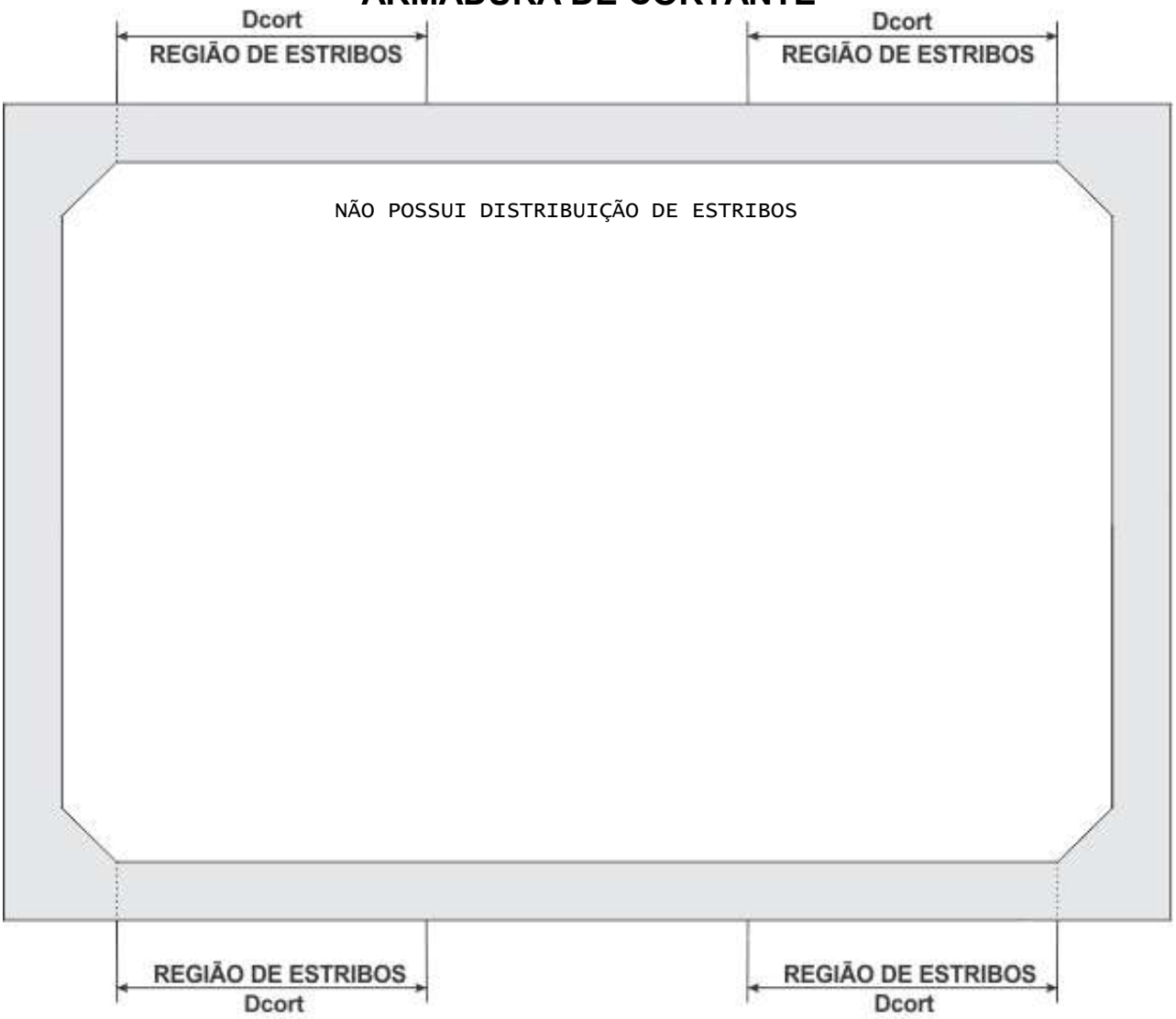
TELA SOLDADA (CA60) ARMADURA BÁSICA
BARRAS DE AÇO (CA50) ARMADURA COMPLEMENTAR
BARRAS DE AÇO (CA50) ARMADURA DE FADIGA

OBS.: VALORES POR METRO DE ADUELA.

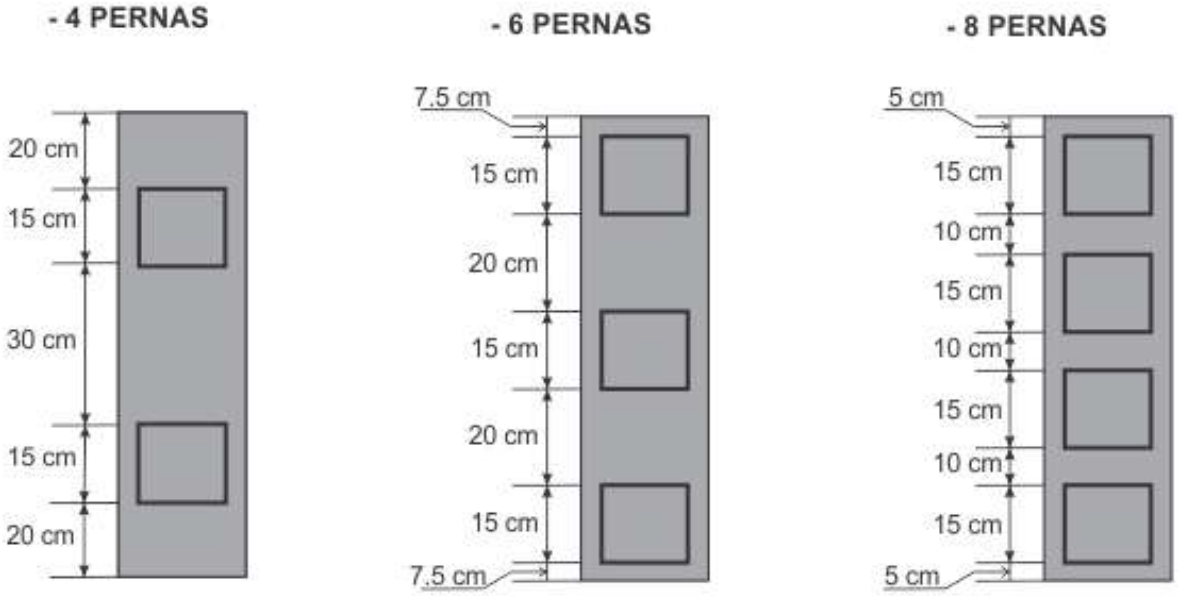
	TELA	ARMADURA COMPLEMENTAR	ARMADURA DE FADIGA
LADO EXTERNO	T-S02: L283 T-S04: L283 T-S06: L283 T-S08: L283	B-S01: 0.22 cm² de área acima B-S02: 0.61 cm² de área acima B-S03: 0.22 cm² de área acima B-S04: 4 Ø6.30 c/ 31 cm (65.12%) B-S05: 0.22 cm² de área acima B-S06: 0.61 cm² de área acima B-S07: 0.22 cm² de área acima B-S08: 4 Ø6.30 c/ 31 cm (65.12%)	B-S05: 0.00 cm² de área acima B-S07: 0.00 cm² de área acima
LADO INTERNO	T-S02: L283 T-S04: L283 T-S06: L283 T-S08: L283	B-S01: 4 Ø6.30 c/ 31 cm (0.00%) B-S02: 6 Ø8.00 c/ 18 cm (8.73%) B-S03: 4 Ø6.30 c/ 31 cm (0.00%) B-S04: 0.61 cm² de área acima B-S05: 4 Ø6.30 c/ 31 cm (0.00%) B-S06: 6 Ø8.00 c/ 18 cm (8.23%) B-S07: 4 Ø6.30 c/ 31 cm (0.00%) B-S08: 0.61 cm² de área acima	B-S06: 4 Ø8.00 c/ 31 cm (16.03%)

NOTA: Os valores entre parênteses representam a percentagem de área de aço que a seção apresenta acima (porcentagem positiva) ou a menos (porcentagem negativa) em relação ao necessário (calculado) para o tipo de armadura correspondente (armadura complementar ou armadura de fadiga) e não em relação a área total de aço na seção que é o resultado das áreas de tela, armadura complementar e armadura de fadiga. Assim sendo, se uma seção apresenta (X %) de área acima ou abaixo para armadura complementar, esta porcentagem é calculada em função da área de armadura complementar necessária e não em relação a área total de aço.

ARMADURA DE CORTANTE

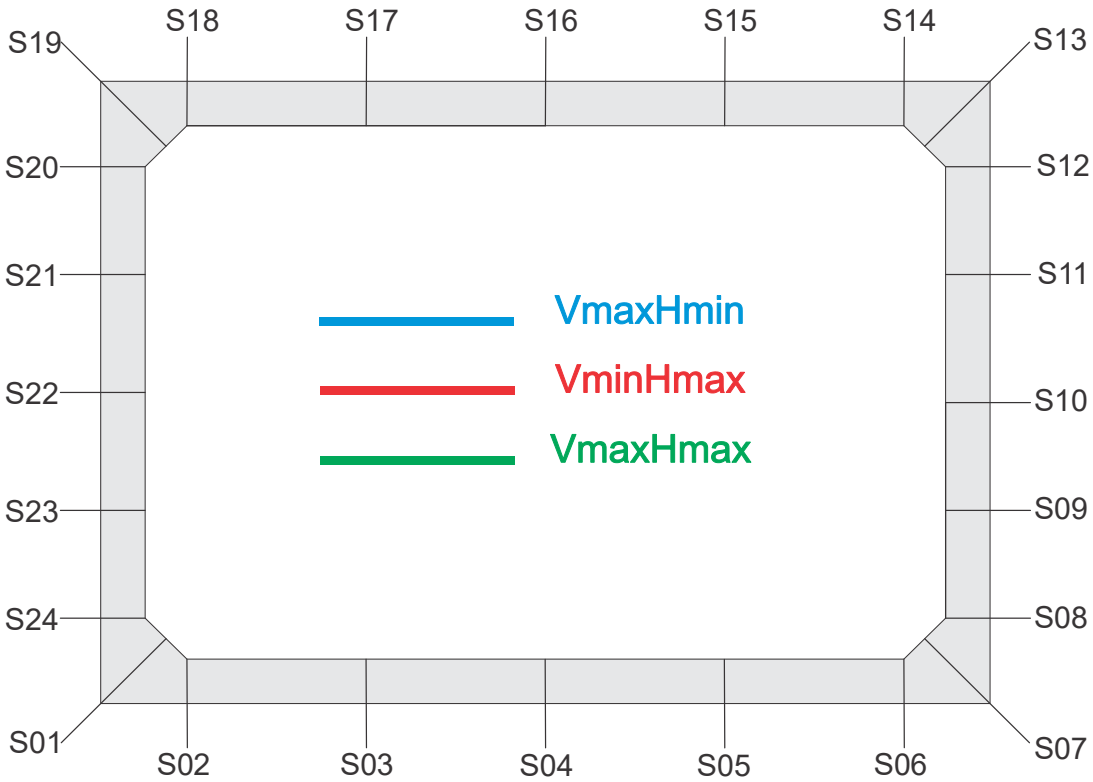


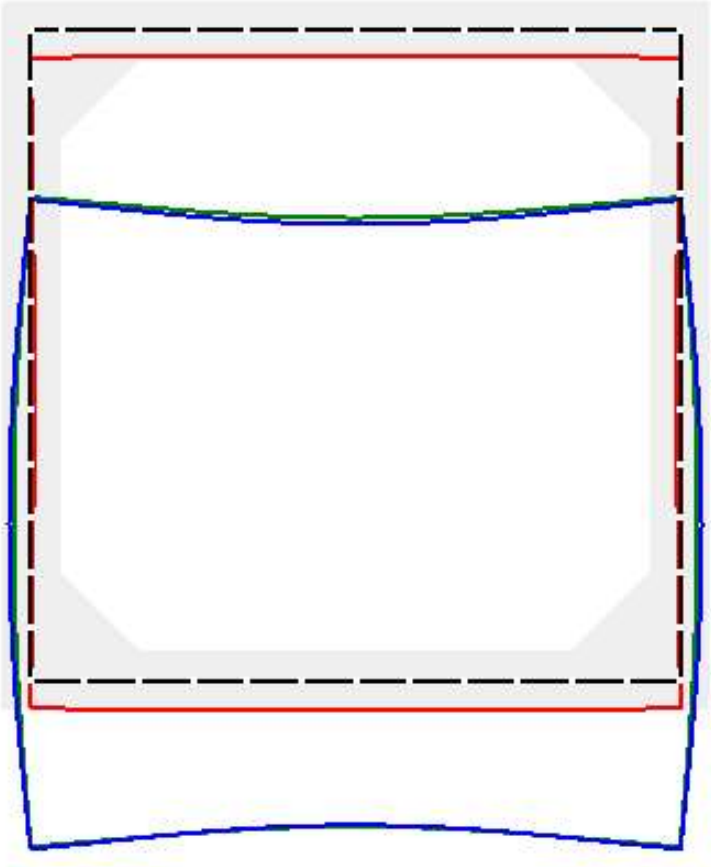
DISTRIBUIÇÃO (POR METRO LONGITUDINAL) DOS ESTRIBOS AO LONGO DE UMA FIADA:



OBSERVAÇÃO:
Quando houver necessidade de armadura transversal, esta deve ser colocada nas quatro regiões apontadas na figura esquemática acima (REGIÃO DE ESTRIBOS), ou seja, os estribos devem ser colocados tanto na laje de cobertura quanto na laje de base.

DESLOCAMENTOS





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#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VmaxHmin                       #
#######################################################
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DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	-2.76E-007	-6.29E-003
2	-2.20E-007	-5.87E-003
3	-1.10E-007	-5.51E-003
4	0.00E+000	-5.38E-003
5	1.10E-007	-5.51E-003
6	2.20E-007	-5.87E-003
7	2.76E-007	-6.29E-003
8	4.07E-004	-6.29E-003
9	6.99E-004	-6.30E-003
10	7.97E-004	-6.31E-003
11	7.00E-004	-6.31E-003
12	4.08E-004	-6.32E-003
13	-2.67E-007	-6.33E-003
14	-2.20E-007	-6.75E-003
15	-1.10E-007	-7.11E-003
16	2.65E-013	-7.25E-003
17	1.10E-007	-7.11E-003
18	2.20E-007	-6.75E-003
19	2.67E-007	-6.33E-003
20	-4.08E-004	-6.32E-003
21	-7.00E-004	-6.31E-003
22	-7.97E-004	-6.31E-003
23	-6.99E-004	-6.30E-003
24	-4.07E-004	-6.29E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	1.52E-003
2	1.53E-003
3	9.50E-004
4	-1.56E-013
5	-9.50E-004
6	-1.53E-003
7	-1.52E-003
8	-1.41E-003
9	-7.10E-004
10	-1.87E-006
11	7.07E-004
12	1.42E-003
13	1.52E-003
14	1.54E-003
15	9.67E-004
16	-1.60E-013
17	-9.67E-004
18	-1.54E-003
19	-1.52E-003
20	-1.42E-003
21	-7.07E-004
22	1.87E-006
23	7.10E-004
24	1.41E-003

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#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VminHmax                       #
#######################################################
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DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	5.91E-006	-1.03E-003
2	4.70E-006	-1.07E-003
3	2.35E-006	-1.10E-003
4	0.00E+000	-1.10E-003
5	-2.35E-006	-1.10E-003
6	-4.70E-006	-1.07E-003
7	-5.91E-006	-1.03E-003
8	-6.03E-005	-1.03E-003
9	-1.15E-004	-1.03E-003
10	-1.39E-004	-1.03E-003
11	-1.17E-004	-1.03E-003
12	-6.27E-005	-1.03E-003
13	-4.61E-006	-1.03E-003
14	-3.80E-006	-9.79E-004
15	-1.90E-006	-9.44E-004
16	3.27E-014	-9.35E-004
17	1.90E-006	-9.44E-004
18	3.80E-006	-9.79E-004
19	4.61E-006	-1.03E-003
20	6.27E-005	-1.03E-003
21	1.17E-004	-1.03E-003
22	1.39E-004	-1.03E-003
23	1.15E-004	-1.03E-003
24	6.03E-005	-1.03E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	-1.87E-004
2	-1.54E-004
3	-4.30E-005
4	-1.92E-014
5	4.30E-005
6	1.54E-004
7	1.87E-004
8	2.08E-004
9	1.62E-004
10	4.80E-006
11	-1.55E-004
12	-2.18E-004
13	-2.03E-004
14	-1.88E-004
15	-7.31E-005
16	-1.98E-014
17	7.31E-005
18	1.88E-004
19	2.03E-004
20	2.18E-004
21	1.55E-004
22	-4.80E-006
23	-1.62E-004
24	-2.08E-004

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#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VmaxHmax                       #
#######################################################
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```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	3.72E-006	-6.20E-003
2	2.96E-006	-5.85E-003
3	1.48E-006	-5.55E-003
4	0.00E+000	-5.43E-003
5	-1.48E-006	-5.55E-003
6	-2.96E-006	-5.85E-003
7	-3.72E-006	-6.20E-003
8	3.26E-004	-6.20E-003
9	5.55E-004	-6.21E-003
10	6.31E-004	-6.22E-003
11	5.61E-004	-6.22E-003
12	3.32E-004	-6.23E-003
13	-3.29E-006	-6.23E-003
14	-2.71E-006	-6.59E-003
15	-1.35E-006	-6.89E-003
16	2.55E-013	-7.01E-003
17	1.35E-006	-6.89E-003
18	2.71E-006	-6.59E-003
19	3.29E-006	-6.23E-003
20	-3.32E-004	-6.23E-003
21	-5.61E-004	-6.22E-003
22	-6.31E-004	-6.22E-003
23	-5.55E-004	-6.21E-003
24	-3.26E-004	-6.20E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	1.24E-003
2	1.27E-003
3	8.24E-004
4	-1.50E-013
5	-8.24E-004
6	-1.27E-003
7	-1.24E-003
8	-1.14E-003
9	-5.45E-004
10	-1.20E-005
11	5.32E-004
12	1.15E-003
13	1.26E-003
14	1.29E-003
15	8.42E-004
16	-1.56E-013
17	-8.42E-004
18	-1.29E-003
19	-1.26E-003
20	-1.15E-003
21	-5.32E-004
22	1.20E-005
23	5.45E-004
24	1.14E-003

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#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VmaxHmin                       #
#######################################################
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DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	-3.10E-007	-7.91E-003
2	-2.47E-007	-6.84E-003
3	-1.23E-007	-5.85E-003
4	0.00E+000	-5.08E-003
5	1.23E-007	-4.56E-003
6	2.47E-007	-4.23E-003
7	3.10E-007	-3.96E-003
8	-2.86E-004	-3.96E-003
9	-6.77E-004	-3.97E-003
10	-1.25E-003	-3.98E-003
11	-2.00E-003	-3.98E-003
12	-2.93E-003	-3.99E-003
13	-3.97E-003	-3.99E-003
14	-3.97E-003	-5.05E-003
15	-3.97E-003	-6.05E-003
16	-3.97E-003	-6.85E-003
17	-3.97E-003	-7.38E-003
18	-3.97E-003	-7.70E-003
19	-3.97E-003	-7.95E-003
20	-3.71E-003	-7.95E-003
21	-3.33E-003	-7.94E-003
22	-2.76E-003	-7.93E-003
23	-2.00E-003	-7.92E-003
24	-1.06E-003	-7.91E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	3.87E-003
2	3.88E-003
3	3.26E-003
4	2.34E-003
5	1.47E-003
6	9.89E-004
7	1.00E-003
8	1.10E-003
9	1.75E-003
10	2.40E-003
11	3.06E-003
12	3.72E-003
13	3.82E-003
14	3.85E-003
15	3.35E-003
16	2.43E-003
17	1.49E-003
18	9.17E-004
19	9.29E-004
20	1.03E-003
21	1.72E-003
22	2.41E-003
23	3.10E-003
24	3.78E-003

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VminHmax                       #
#######################################################
-------------------------------------------------------
```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	5.92E-006	-1.03E-003
2	4.71E-006	-1.07E-003
3	2.36E-006	-1.10E-003
4	0.00E+000	-1.10E-003
5	-2.36E-006	-1.10E-003
6	-4.71E-006	-1.07E-003
7	-5.92E-006	-1.03E-003
8	-6.09E-005	-1.03E-003
9	-1.16E-004	-1.03E-003
10	-1.41E-004	-1.03E-003
11	-1.19E-004	-1.03E-003
12	-6.38E-005	-1.03E-003
13	-4.76E-006	-1.03E-003
14	-3.79E-006	-9.78E-004
15	-1.89E-006	-9.45E-004
16	-8.05E-015	-9.36E-004
17	1.89E-006	-9.45E-004
18	3.79E-006	-9.78E-004
19	4.76E-006	-1.03E-003
20	6.38E-005	-1.03E-003
21	1.19E-004	-1.03E-003
22	1.41E-004	-1.03E-003
23	1.16E-004	-1.03E-003
24	6.09E-005	-1.03E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	-1.89E-004
2	-1.55E-004
3	-4.40E-005
4	4.30E-015
5	4.40E-005
6	1.55E-004
7	1.89E-004
8	2.10E-004
9	1.64E-004
10	5.82E-006
11	-1.56E-004
12	-2.21E-004
13	-2.07E-004
14	-1.80E-004
15	-6.94E-005
16	4.51E-015
17	6.94E-005
18	1.80E-004
19	2.07E-004
20	2.21E-004
21	1.56E-004
22	-5.82E-006
23	-1.64E-004
24	-2.10E-004

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VmaxHmax                       #
#######################################################
-------------------------------------------------------
```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	3.69E-006	-7.82E-003
2	2.94E-006	-6.82E-003
3	1.47E-006	-5.88E-003
4	0.00E+000	-5.13E-003
5	-1.47E-006	-4.59E-003
6	-2.94E-006	-4.21E-003
7	-3.69E-006	-3.87E-003
8	-3.67E-004	-3.87E-003
9	-8.22E-004	-3.88E-003
10	-1.41E-003	-3.88E-003
11	-2.14E-003	-3.89E-003
12	-3.01E-003	-3.89E-003
13	-3.98E-003	-3.90E-003
14	-3.98E-003	-4.88E-003
15	-3.97E-003	-5.84E-003
16	-3.97E-003	-6.62E-003
17	-3.97E-003	-7.17E-003
18	-3.97E-003	-7.54E-003
19	-3.97E-003	-7.86E-003
20	-3.63E-003	-7.86E-003
21	-3.19E-003	-7.85E-003
22	-2.59E-003	-7.84E-003
23	-1.86E-003	-7.83E-003
24	-9.75E-004	-7.82E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	3.60E-003
2	3.62E-003
3	3.14E-003
4	2.34E-003
5	1.60E-003
6	1.25E-003
7	1.28E-003
8	1.38E-003
9	1.92E-003
10	2.39E-003
11	2.89E-003
12	3.46E-003
13	3.56E-003
14	3.60E-003
15	3.22E-003
16	2.43E-003
17	1.61E-003
18	1.16E-003
19	1.19E-003
20	1.30E-003
21	1.90E-003
22	2.42E-003
23	2.93E-003
24	3.50E-003

```
#######################################################
#              VERIFICAÇÃO DA FADIGA (ELS)            #
#                        VmaxHmin                     #
#######################################################
-------------------------------------------------------
```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	1.60E-006	-3.66E-003
2	1.27E-006	-3.45E-003
3	6.37E-007	-3.26E-003
4	0.00E+000	-3.19E-003
5	-6.37E-007	-3.26E-003
6	-1.27E-006	-3.45E-003
7	-1.60E-006	-3.66E-003
8	2.03E-004	-3.66E-003
9	3.47E-004	-3.67E-003
10	3.96E-004	-3.67E-003
11	3.50E-004	-3.68E-003
12	2.06E-004	-3.68E-003
13	-9.90E-007	-3.68E-003
14	-8.15E-007	-3.90E-003
15	-4.08E-007	-4.09E-003
16	1.52E-013	-4.16E-003
17	4.08E-007	-4.09E-003
18	8.15E-007	-3.90E-003
19	9.90E-007	-3.68E-003
20	-2.06E-004	-3.68E-003
21	-3.50E-004	-3.68E-003
22	-3.96E-004	-3.67E-003
23	-3.47E-004	-3.67E-003
24	-2.03E-004	-3.66E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	7.69E-004
2	7.83E-004
3	5.01E-004
4	-8.91E-014
5	-5.01E-004
6	-7.83E-004
7	-7.69E-004
8	-7.09E-004
9	-3.46E-004
10	-5.78E-006
11	3.40E-004
12	7.15E-004
13	7.76E-004
14	7.89E-004
15	5.05E-004
16	-9.25E-014
17	-5.05E-004
18	-7.89E-004
19	-7.76E-004
20	-7.15E-004
21	-3.40E-004
22	5.78E-006
23	3.46E-004
24	7.09E-004

```
#######################################################
#              VERIFICAÇÃO DA FADIGA (ELS)            #
#                       VminHmax                      #
#######################################################
-------------------------------------------------------
```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	3.91E-006	-1.08E-003
2	3.11E-006	-1.08E-003
3	1.56E-006	-1.08E-003
4	0.00E+000	-1.08E-003
5	-1.56E-006	-1.08E-003
6	-3.11E-006	-1.08E-003
7	-3.91E-006	-1.08E-003
8	-1.74E-005	-1.08E-003
9	-3.77E-005	-1.08E-003
10	-4.90E-005	-1.08E-003
11	-4.07E-005	-1.08E-003
12	-2.04E-005	-1.08E-003
13	-2.79E-006	-1.08E-003
14	-2.30E-006	-1.07E-003
15	-1.15E-006	-1.06E-003
16	3.81E-014	-1.06E-003
17	1.15E-006	-1.06E-003
18	2.30E-006	-1.07E-003
19	2.79E-006	-1.08E-003
20	2.04E-005	-1.08E-003
21	4.07E-005	-1.08E-003
22	4.90E-005	-1.08E-003
23	3.77E-005	-1.08E-003
24	1.74E-005	-1.08E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	-3.96E-005
2	-1.69E-005
3	2.45E-005
4	-2.23E-014
5	-2.45E-005
6	1.69E-005
7	3.96E-005
8	5.97E-005
9	6.95E-005
10	6.05E-006
11	-6.18E-005
12	-7.08E-005
13	-5.74E-005
14	-4.74E-005
15	-3.07E-006
16	-2.33E-014
17	3.07E-006
18	4.74E-005
19	5.74E-005
20	7.08E-005
21	6.18E-005
22	-6.05E-006
23	-6.95E-005
24	-5.97E-005

```
#######################################################
#              VERIFICAÇÃO DA FADIGA (ELS)            #
#                        VmaxHmax                     #
#######################################################
-------------------------------------------------------
```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	2.49E-006	-3.64E-003
2	1.98E-006	-3.44E-003
3	9.89E-007	-3.27E-003
4	0.00E+000	-3.21E-003
5	-9.89E-007	-3.27E-003
6	-1.98E-006	-3.44E-003
7	-2.49E-006	-3.64E-003
8	1.83E-004	-3.64E-003
9	3.10E-004	-3.65E-003
10	3.51E-004	-3.65E-003
11	3.12E-004	-3.65E-003
12	1.85E-004	-3.66E-003
13	-1.98E-006	-3.66E-003
14	-1.63E-006	-3.86E-003
15	-8.14E-007	-4.03E-003
16	1.49E-013	-4.10E-003
17	8.14E-007	-4.03E-003
18	1.63E-006	-3.86E-003
19	1.98E-006	-3.66E-003
20	-1.85E-004	-3.66E-003
21	-3.12E-004	-3.65E-003
22	-3.51E-004	-3.65E-003
23	-3.10E-004	-3.65E-003
24	-1.83E-004	-3.64E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	6.98E-004
2	7.18E-004
3	4.68E-004
4	-8.75E-014
5	-4.68E-004
6	-7.18E-004
7	-6.98E-004
8	-6.37E-004
9	-3.00E-004
10	-4.11E-006
11	2.96E-004
12	6.42E-004
13	7.03E-004
14	7.19E-004
15	4.70E-004
16	-8.97E-014
17	-4.70E-004
18	-7.19E-004
19	-7.03E-004
20	-6.42E-004
21	-2.96E-004
22	4.11E-006
23	3.00E-004
24	6.37E-004

```
#######################################################
#              VERIFICAÇÃO DA FADIGA (ELS)            #
#                       VminHmin                      #
#######################################################
-------------------------------------------------------
```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	1.79E-006	-1.13E-003
2	1.42E-006	-1.09E-003
3	7.11E-007	-1.06E-003
4	0.00E+000	-1.05E-003
5	-7.11E-007	-1.06E-003
6	-1.42E-006	-1.09E-003
7	-1.79E-006	-1.13E-003
8	2.85E-005	-1.13E-003
9	4.52E-005	-1.13E-003
10	4.79E-005	-1.13E-003
11	4.19E-005	-1.13E-003
12	2.52E-005	-1.13E-003
13	-8.10E-007	-1.13E-003
14	-6.67E-007	-1.16E-003
15	-3.34E-007	-1.19E-003
16	4.39E-014	-1.20E-003
17	3.34E-007	-1.19E-003
18	6.67E-007	-1.16E-003
19	8.10E-007	-1.13E-003
20	-2.52E-005	-1.13E-003
21	-4.19E-005	-1.13E-003
22	-4.79E-005	-1.13E-003
23	-4.52E-005	-1.13E-003
24	-2.85E-005	-1.13E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	1.18E-004
2	1.30E-004
3	9.69E-005
4	-2.59E-014
5	-9.69E-005
6	-1.30E-004
7	-1.18E-004
8	-9.96E-005
9	-2.98E-005
10	6.81E-006
11	3.83E-005
12	8.77E-005
13	9.95E-005
14	1.04E-004
15	7.24E-005
16	-2.70E-014
17	-7.24E-005
18	-1.04E-004
19	-9.95E-005
20	-8.77E-005
21	-3.83E-005
22	-6.81E-006
23	2.98E-005
24	9.96E-005

```
#######################################################
#          VERIFICAÇÃO DA FISSURAÇÃO (ELS)            #
#                      VmaxHmin                       #
#######################################################
-------------------------------------------------------
```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	1.67E-006	-2.71E-003
2	1.33E-006	-2.57E-003
3	6.64E-007	-2.44E-003
4	0.00E+000	-2.39E-003
5	-6.64E-007	-2.44E-003
6	-1.33E-006	-2.57E-003
7	-1.67E-006	-2.71E-003
8	1.38E-004	-2.71E-003
9	2.34E-004	-2.72E-003
10	2.65E-004	-2.72E-003
11	2.35E-004	-2.72E-003
12	1.38E-004	-2.73E-003
13	-9.23E-007	-2.73E-003
14	-7.60E-007	-2.87E-003
15	-3.80E-007	-3.00E-003
16	1.11E-013	-3.05E-003
17	3.80E-007	-3.00E-003
18	7.60E-007	-2.87E-003
19	9.23E-007	-2.73E-003
20	-1.38E-004	-2.73E-003
21	-2.35E-004	-2.72E-003
22	-2.65E-004	-2.72E-003
23	-2.34E-004	-2.72E-003
24	-1.38E-004	-2.71E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	5.25E-004
2	5.38E-004
3	3.49E-004
4	-6.52E-014
5	-3.49E-004
6	-5.38E-004
7	-5.25E-004
8	-4.80E-004
9	-2.27E-004
10	-1.06E-006
11	2.27E-004
12	4.80E-004
13	5.23E-004
14	5.32E-004
15	3.43E-004
16	-6.72E-014
17	-3.43E-004
18	-5.32E-004
19	-5.23E-004
20	-4.80E-004
21	-2.27E-004
22	1.06E-006
23	2.27E-004
24	4.80E-004

```
#######################################################
#          VERIFICAÇÃO DA FISSURAÇÃO (ELS)            #
#                      VminHmax                       #
#######################################################
-------------------------------------------------------
```

DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	3.41E-006	-1.09E-003
2	2.71E-006	-1.09E-003
3	1.36E-006	-1.08E-003
4	0.00E+000	-1.07E-003
5	-1.36E-006	-1.08E-003
6	-2.71E-006	-1.09E-003
7	-3.41E-006	-1.09E-003
8	-5.88E-006	-1.09E-003
9	-1.67E-005	-1.09E-003
10	-2.41E-005	-1.09E-003
11	-1.92E-005	-1.09E-003
12	-8.42E-006	-1.09E-003
13	-2.24E-006	-1.09E-003
14	-1.84E-006	-1.09E-003
15	-9.20E-007	-1.09E-003
16	3.96E-014	-1.10E-003
17	9.20E-007	-1.09E-003
18	1.84E-006	-1.09E-003
19	2.24E-006	-1.09E-003
20	8.42E-006	-1.09E-003
21	1.92E-005	-1.09E-003
22	2.41E-005	-1.09E-003
23	1.67E-005	-1.09E-003
24	5.88E-006	-1.09E-003

DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	1.93E-007
2	2.00E-005
3	4.27E-005
4	-2.32E-014
5	-4.27E-005
6	-2.00E-005
7	-1.93E-007
8	1.94E-005
9	4.34E-005
10	5.11E-006
11	-3.66E-005
12	-2.94E-005
13	-1.63E-005
14	-7.85E-006
15	1.67E-005
16	-2.39E-014
17	-1.67E-005
18	7.85E-006
19	1.63E-005
20	2.94E-005
21	3.66E-005
22	-5.11E-006
23	-4.34E-005
24	-1.94E-005

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                       VmaxHmax                      #
#######################################################
-------------------------------------------------------
```

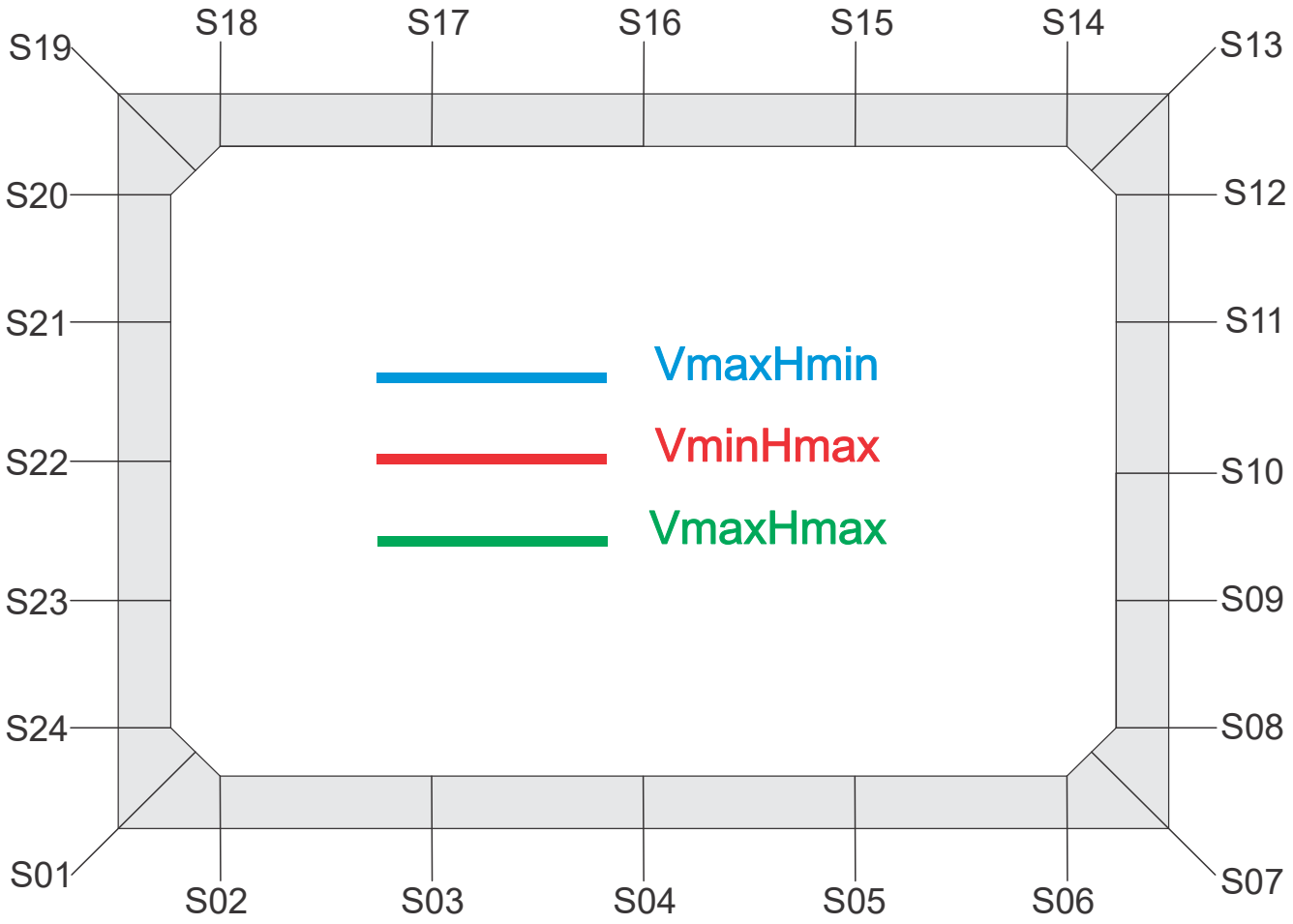
DESLOCAMENTOS DOS NÓS DA ESTRUTURA NAS DIREÇÕES X E Y

SEÇÃO	DIREÇÃO X (m)	DIREÇÃO Y (m)
1	2.22E-006	-2.70E-003
2	1.77E-006	-2.56E-003
3	8.85E-007	-2.44E-003
4	0.00E+000	-2.40E-003
5	-8.85E-007	-2.44E-003
6	-1.77E-006	-2.56E-003
7	-2.22E-006	-2.70E-003
8	1.25E-004	-2.70E-003
9	2.11E-004	-2.70E-003
10	2.38E-004	-2.71E-003
11	2.11E-004	-2.71E-003
12	1.25E-004	-2.71E-003
13	-1.54E-006	-2.71E-003
14	-1.27E-006	-2.85E-003
15	-6.34E-007	-2.96E-003
16	1.10E-013	-3.01E-003
17	6.34E-007	-2.96E-003
18	1.27E-006	-2.85E-003
19	1.54E-006	-2.71E-003
20	-1.25E-004	-2.71E-003
21	-2.11E-004	-2.71E-003
22	-2.38E-004	-2.71E-003
23	-2.11E-004	-2.70E-003
24	-1.25E-004	-2.70E-003

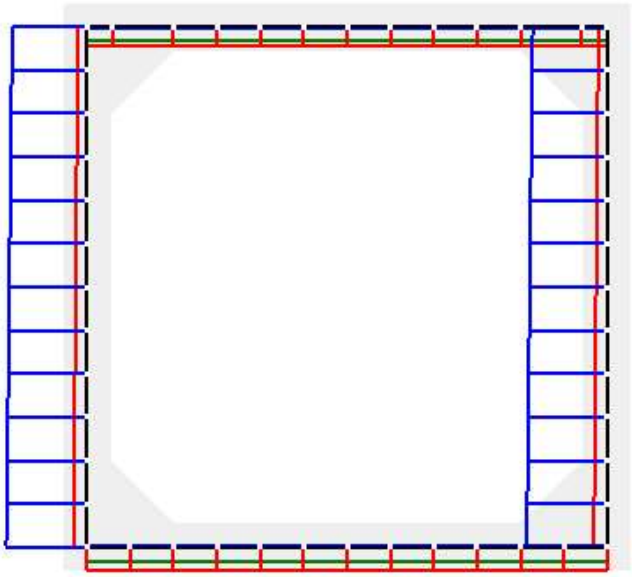
DESLOCAMENTOS DOS NÓS DA ESTRUTURA (ROTAÇÃO)

SEÇÃO	ROTAÇÃO (rad)
1	4.81E-004
2	4.97E-004
3	3.29E-004
4	-6.42E-014
5	-3.29E-004
6	-4.97E-004
7	-4.81E-004
8	-4.36E-004
9	-1.98E-004
10	-1.41E-008
11	1.99E-004
12	4.34E-004
13	4.77E-004
14	4.88E-004
15	3.21E-004
16	-6.67E-014
17	-3.21E-004
18	-4.88E-004
19	-4.77E-004
20	-4.34E-004
21	-1.99E-004
22	1.41E-008
23	1.98E-004
24	4.36E-004

NOMENCLATURA DAS SEÇÕES PARA VERSÃO COMPLETA DO RELATÓRIO



ESFORÇO NORMAL



```
#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VmaxHmin                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-113.80	1.56
2	1.56	1.56
3	1.56	1.56
4	1.56	1.56
5	1.56	1.56
6	1.56	1.56
7	1.56	-113.80
8	-112.14	-112.14
9	-110.80	-110.80
10	-109.46	-109.46
11	-108.12	-108.12
12	-106.78	-106.78
13	-105.11	-1.56
14	-1.56	-1.56
15	-1.56	-1.56
16	-1.56	-1.56
17	-1.56	-1.56
18	-1.56	-1.56
19	-1.56	-105.11
20	-106.78	-106.78
21	-108.12	-108.12
22	-109.46	-109.46
23	-110.80	-110.80
24	-112.14	-112.14

```
#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VminHmax                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-18.94	-33.43
2	-33.43	-33.43
3	-33.43	-33.43
4	-33.43	-33.43
5	-33.43	-33.43
6	-33.43	-33.43
7	-33.43	-18.94
8	-17.66	-17.66
9	-16.63	-16.63
10	-15.60	-15.60
11	-14.57	-14.57
12	-13.54	-13.54
13	-12.25	-26.99
14	-26.99	-26.99
15	-26.99	-26.99
16	-26.99	-26.99
17	-26.99	-26.99
18	-26.99	-26.99
19	-26.99	-12.25
20	-13.54	-13.54
21	-14.57	-14.57
22	-15.60	-15.60
23	-16.63	-16.63
24	-17.66	-17.66

```
#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VmaxHmax                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-113.80	-21.02
2	-21.02	-21.02
3	-21.02	-21.02
4	-21.02	-21.02
5	-21.02	-21.02
6	-21.02	-21.02
7	-21.02	-113.80
8	-112.14	-112.14
9	-110.80	-110.80
10	-109.46	-109.46
11	-108.12	-108.12
12	-106.78	-106.78
13	-105.11	-19.26
14	-19.26	-19.26
15	-19.26	-19.26
16	-19.26	-19.26
17	-19.26	-19.26
18	-19.26	-19.26
19	-19.26	-105.11
20	-106.78	-106.78
21	-108.12	-108.12
22	-109.46	-109.46
23	-110.80	-110.80
24	-112.14	-112.14

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VmaxHmin                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-121.32	1.75
2	1.75	1.75
3	1.75	1.75
4	1.75	1.75
5	1.75	1.75
6	1.75	1.75
7	1.75	-93.00
8	-91.34	-91.34
9	-90.00	-90.00
10	-88.66	-88.66
11	-87.32	-87.32
12	-85.97	-85.97
13	-84.31	-1.75
14	-1.75	-1.75
15	-1.75	-1.75
16	-1.75	-1.75
17	-1.75	-1.75
18	-1.75	-1.75
19	-1.75	-112.63
20	-114.29	-114.29
21	-115.63	-115.63
22	-116.98	-116.98
23	-118.32	-118.32
24	-119.66	-119.66

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VminHmax                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-18.94	-33.51
2	-33.51	-33.51
3	-33.51	-33.51
4	-33.51	-33.51
5	-33.51	-33.51
6	-33.51	-33.51
7	-33.51	-18.94
8	-17.66	-17.66
9	-16.63	-16.63
10	-15.60	-15.60
11	-14.57	-14.57
12	-13.53	-13.53
13	-12.25	-26.91
14	-26.91	-26.91
15	-26.91	-26.91
16	-26.91	-26.91
17	-26.91	-26.91
18	-26.91	-26.91
19	-26.91	-12.25
20	-13.53	-13.53
21	-14.57	-14.57
22	-15.60	-15.60
23	-16.63	-16.63
24	-17.66	-17.66

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VmaxHmax                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-121.32	-20.88
2	-20.88	-20.88
3	-20.88	-20.88
4	-20.88	-20.88
5	-20.88	-20.88
6	-20.88	-20.88
7	-20.88	-93.00
8	-91.34	-91.34
9	-90.00	-90.00
10	-88.66	-88.66
11	-87.32	-87.32
12	-85.97	-85.97
13	-84.31	-19.40
14	-19.40	-19.40
15	-19.40	-19.40
16	-19.40	-19.40
17	-19.40	-19.40
18	-19.40	-19.40
19	-19.40	-112.63
20	-114.29	-114.29
21	-115.63	-115.63
22	-116.98	-116.98
23	-118.32	-118.32
24	-119.66	-119.66

```
#######################################################
#            VERIFICAÇÃO DA FADIGA (ELS)              #
#                      VmaxHmin                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-66.27	-9.05
2	-9.05	-9.05
3	-9.05	-9.05
4	-9.05	-9.05
5	-9.05	-9.05
6	-9.05	-9.05
7	-9.05	-66.27
8	-64.99	-64.99
9	-63.95	-63.95
10	-62.92	-62.92
11	-61.89	-61.89
12	-60.86	-60.86
13	-59.58	-5.80
14	-5.80	-5.80
15	-5.80	-5.80
16	-5.80	-5.80
17	-5.80	-5.80
18	-5.80	-5.80
19	-5.80	-59.58
20	-60.86	-60.86
21	-61.89	-61.89
22	-62.92	-62.92
23	-63.95	-63.95
24	-64.99	-64.99

```
#######################################################
#             VERIFICAÇÃO DA FADIGA (ELS)             #
#                       VminHmax                      #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-18.94	-22.13
2	-22.13	-22.13
3	-22.13	-22.13
4	-22.13	-22.13
5	-22.13	-22.13
6	-22.13	-22.13
7	-22.13	-18.94
8	-17.66	-17.66
9	-16.63	-16.63
10	-15.60	-15.60
11	-14.57	-14.57
12	-13.54	-13.54
13	-12.25	-16.34
14	-16.34	-16.34
15	-16.34	-16.34
16	-16.34	-16.34
17	-16.34	-16.34
18	-16.34	-16.34
19	-16.34	-12.25
20	-13.54	-13.54
21	-14.57	-14.57
22	-15.60	-15.60
23	-16.63	-16.63
24	-17.66	-17.66

```
#######################################################
#             VERIFICAÇÃO DA FADIGA (ELS)             #
#                       VmaxHmax                      #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-66.27	-14.07
2	-14.07	-14.07
3	-14.07	-14.07
4	-14.07	-14.07
5	-14.07	-14.07
6	-14.07	-14.07
7	-14.07	-66.27
8	-64.99	-64.99
9	-63.95	-63.95
10	-62.92	-62.92
11	-61.89	-61.89
12	-60.86	-60.86
13	-59.58	-11.57
14	-11.57	-11.57
15	-11.57	-11.57
16	-11.57	-11.57
17	-11.57	-11.57
18	-11.57	-11.57
19	-11.57	-59.58
20	-60.86	-60.86
21	-61.89	-61.89
22	-62.92	-62.92
23	-63.95	-63.95
24	-64.99	-64.99

```
#######################################################
#             VERIFICAÇÃO DA FADIGA (ELS)             #
#                       VminHmin                      #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-18.94	-10.11
2	-10.11	-10.11
3	-10.11	-10.11
4	-10.11	-10.11
5	-10.11	-10.11
6	-10.11	-10.11
7	-10.11	-18.94
8	-17.66	-17.66
9	-16.63	-16.63
10	-15.60	-15.60
11	-14.57	-14.57
12	-13.54	-13.54
13	-12.25	-4.74
14	-4.74	-4.74
15	-4.74	-4.74
16	-4.74	-4.74
17	-4.74	-4.74
18	-4.74	-4.74
19	-4.74	-12.25
20	-13.54	-13.54
21	-14.57	-14.57
22	-15.60	-15.60
23	-16.63	-16.63
24	-17.66	-17.66

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                       VmaxHmin                      #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-48.52	-9.45
2	-9.45	-9.45
3	-9.45	-9.45
4	-9.45	-9.45
5	-9.45	-9.45
6	-9.45	-9.45
7	-9.45	-48.52
8	-47.24	-47.24
9	-46.21	-46.21
10	-45.18	-45.18
11	-44.14	-44.14
12	-43.11	-43.11
13	-41.83	-5.40
14	-5.40	-5.40
15	-5.40	-5.40
16	-5.40	-5.40
17	-5.40	-5.40
18	-5.40	-5.40
19	-5.40	-41.83
20	-43.11	-43.11
21	-44.14	-44.14
22	-45.18	-45.18
23	-46.21	-46.21
24	-47.24	-47.24

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                      VminHmax                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

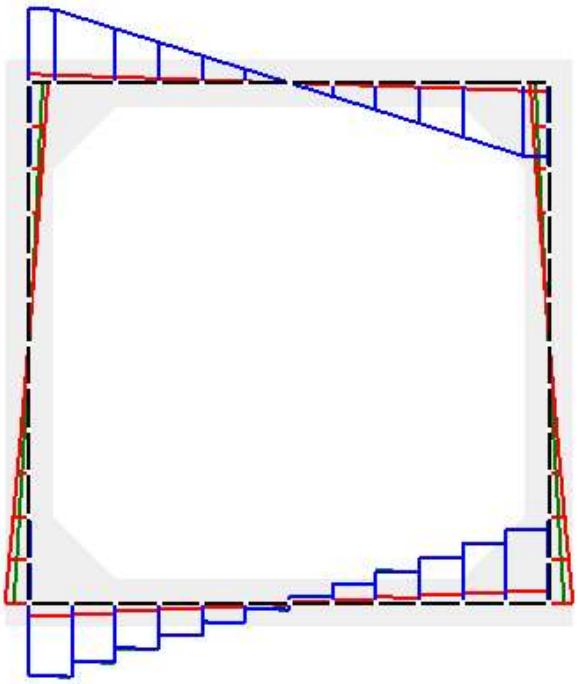
SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-18.94	-19.30
2	-19.30	-19.30
3	-19.30	-19.30
4	-19.30	-19.30
5	-19.30	-19.30
6	-19.30	-19.30
7	-19.30	-18.94
8	-17.66	-17.66
9	-16.63	-16.63
10	-15.60	-15.60
11	-14.57	-14.57
12	-13.54	-13.54
13	-12.25	-13.09
14	-13.09	-13.09
15	-13.09	-13.09
16	-13.09	-13.09
17	-13.09	-13.09
18	-13.09	-13.09
19	-13.09	-12.25
20	-13.54	-13.54
21	-14.57	-14.57
22	-15.60	-15.60
23	-16.63	-16.63
24	-17.66	-17.66

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                      VmaxHmax                       #
#######################################################
```

ESFORÇO NORMAL DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-48.52	-12.58
2	-12.58	-12.58
3	-12.58	-12.58
4	-12.58	-12.58
5	-12.58	-12.58
6	-12.58	-12.58
7	-12.58	-48.52
8	-47.24	-47.24
9	-46.21	-46.21
10	-45.18	-45.18
11	-44.14	-44.14
12	-43.11	-43.11
13	-41.83	-9.01
14	-9.01	-9.01
15	-9.01	-9.01
16	-9.01	-9.01
17	-9.01	-9.01
18	-9.01	-9.01
19	-9.01	-41.83
20	-43.11	-43.11
21	-44.14	-44.14
22	-45.18	-45.18
23	-46.21	-46.21
24	-47.24	-47.24

ESFORÇO CORTANTE



```
#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VmaxHmin                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-1.56	-103.00
2	-83.77	-63.61
3	-45.46	-26.51
4	-9.24	9.24
5	26.51	45.46
6	63.61	83.77
7	103.00	1.56
8	0.74	0.74
9	0.24	0.24
10	0.08	0.08
11	0.24	0.24
12	0.74	0.74
13	1.56	-105.11
14	-76.38	-76.38
15	-38.19	-38.19
16	0.00	0.00
17	38.19	38.19
18	76.38	76.38
19	105.11	-1.56
20	-0.74	-0.74
21	-0.24	-0.24
22	-0.08	-0.08
23	-0.24	-0.24
24	-0.74	-0.74

```
#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VminHmax                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	33.43	-17.18
2	-14.84	-11.15
3	-8.43	-4.66
4	-1.90	1.90
5	4.66	8.43
6	11.15	14.84
7	17.18	-33.43
8	-21.71	-21.71
9	-10.65	-10.65
10	-0.25	-0.25
11	9.49	9.49
12	18.57	18.57
13	26.99	-12.25
14	-8.00	-8.00
15	-4.00	-4.00
16	0.00	0.00
17	4.00	4.00
18	8.00	8.00
19	12.25	-26.99
20	-18.57	-18.57
21	-9.49	-9.49
22	0.25	0.25
23	10.65	10.65
24	21.71	21.71

```
#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VmaxHmax                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	21.02	-103.16
2	-84.12	-64.01
3	-45.82	-26.76
4	-9.33	9.33
5	26.76	45.82
6	64.01	84.12
7	103.16	-21.02
8	-13.20	-13.20
9	-5.83	-5.83
10	1.10	1.10
11	7.60	7.60
12	13.65	13.65
13	19.26	-105.11
14	-76.38	-76.38
15	-38.19	-38.19
16	0.00	0.00
17	38.19	38.19
18	76.38	76.38
19	105.11	-19.26
20	-13.65	-13.65
21	-7.60	-7.60
22	-1.10	-1.10
23	5.83	5.83
24	13.20	13.20

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VmaxHmin                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	-1.75	-107.73
2	-84.03	-60.52
3	-40.12	-20.02
4	-2.69	14.75
5	29.87	45.53
6	59.24	73.78
7	86.20	1.75
8	0.93	0.93
9	0.43	0.43
10	0.27	0.27
11	0.43	0.43
12	0.93	0.93
13	1.75	-84.31
14	-78.63	-78.63
15	-40.45	-40.45
16	-2.26	-2.26
17	35.93	35.93
18	74.12	74.12
19	112.63	-1.75
20	-0.93	-0.93
21	-0.43	-0.43
22	-0.27	-0.27
23	-0.43	-0.43
24	-0.93	-0.93

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VminHmax                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	33.51	-17.18
2	-14.85	-11.15
3	-8.44	-4.66
4	-1.90	1.90
5	4.66	8.44
6	11.15	14.85
7	17.18	-33.51
8	-21.79	-21.79
9	-10.73	-10.73
10	-0.33	-0.33
11	9.41	9.41
12	18.49	18.49
13	26.91	-12.25
14	-8.00	-8.00
15	-4.00	-4.00
16	0.00	0.00
17	4.00	4.00
18	8.00	8.00
19	12.25	-26.91
20	-18.49	-18.49
21	-9.41	-9.41
22	0.33	0.33
23	10.73	10.73
24	21.79	21.79

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VmaxHmax                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	20.88	-107.89
2	-84.38	-60.93
3	-40.49	-20.27
4	-2.78	14.84
5	30.12	45.90
6	59.65	74.13
7	86.36	-20.88
8	-13.07	-13.07
9	-5.70	-5.70
10	1.24	1.24
11	7.73	7.73
12	13.79	13.79
13	19.40	-84.31
14	-78.63	-78.63
15	-40.45	-40.45
16	-2.26	-2.26
17	35.93	35.93
18	74.12	74.12
19	112.63	-19.40
20	-13.79	-13.79
21	-7.73	-7.73
22	-1.24	-1.24
23	5.70	5.70
24	13.07	13.07

```
#######################################################
#            VERIFICAÇÃO DA FADIGA (ELS)              #
#                      VmaxHmin                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	9.05	-59.97
2	-49.03	-37.18
3	-26.71	-15.49
4	-5.49	5.49
5	15.49	26.71
6	37.18	49.03
7	59.97	-9.05
8	-5.34	-5.34
9	-2.12	-2.12
10	0.60	0.60
11	2.83	2.83
12	4.56	4.56
13	5.80	-59.58
14	-43.03	-43.03
15	-21.51	-21.51
16	0.00	0.00
17	21.51	21.51
18	43.03	43.03
19	59.58	-5.80
20	-4.56	-4.56
21	-2.83	-2.83
22	-0.60	-0.60
23	2.12	2.12
24	5.34	5.34

```
#######################################################
#              VERIFICAÇÃO DA FADIGA (ELS)            #
#                       VminHmax                      #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	22.13	-17.09
2	-14.66	-10.93
3	-8.24	-4.52
4	-1.85	1.85
5	4.52	8.24
6	10.93	14.66
7	17.09	-22.13
8	-14.32	-14.32
9	-7.07	-7.07
10	-0.38	-0.38
11	5.75	5.75
12	11.32	11.32
13	16.34	-12.25
14	-8.00	-8.00
15	-4.00	-4.00
16	0.00	0.00
17	4.00	4.00
18	8.00	8.00
19	12.25	-16.34
20	-11.32	-11.32
21	-5.75	-5.75
22	0.38	0.38
23	7.07	7.07
24	14.32	14.32

```
#######################################################
#              VERIFICAÇÃO DA FADIGA (ELS)            #
#                       VmaxHmax                      #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	14.07	-60.01
2	-49.12	-37.28
3	-26.80	-15.56
4	-5.51	5.51
5	15.56	26.80
6	37.28	49.12
7	60.01	-14.07
8	-8.86	-8.86
9	-4.03	-4.03
10	0.43	0.43
11	4.52	4.52
12	8.23	8.23
13	11.57	-59.58
14	-43.03	-43.03
15	-21.51	-21.51
16	0.00	0.00
17	21.51	21.51
18	43.03	43.03
19	59.58	-11.57
20	-8.23	-8.23
21	-4.52	-4.52
22	-0.43	-0.43
23	4.03	4.03
24	8.86	8.86

```
#######################################################
#              VERIFICAÇÃO DA FADIGA (ELS)            #
#                       VminHmin                      #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	10.11	-17.00
2	-14.46	-10.70
3	-8.03	-4.38
4	-1.80	1.80
5	4.38	8.03
6	10.70	14.46
7	17.00	-10.11
8	-6.39	-6.39
9	-3.18	-3.18
10	-0.45	-0.45
11	1.77	1.77
12	3.51	3.51
13	4.74	-12.25
14	-8.00	-8.00
15	-4.00	-4.00
16	0.00	0.00
17	4.00	4.00
18	8.00	8.00
19	12.25	-4.74
20	-3.51	-3.51
21	-1.77	-1.77
22	0.45	0.45
23	3.18	3.18
24	6.39	6.39

```
#######################################################
#            VERIFICAÇÃO DA FISSURAÇÃO (ELS)          #
#                       VmaxHmin                      #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	9.45	-43.86
2	-36.07	-27.25
3	-19.70	-11.32
4	-4.10	4.10
5	11.32	19.70
6	27.25	36.07
7	43.86	-9.45
8	-5.73	-5.73
9	-2.52	-2.52
10	0.21	0.21
11	2.43	2.43
12	4.17	4.17
13	5.40	-41.83
14	-29.89	-29.89
15	-14.95	-14.95
16	0.00	0.00
17	14.95	14.95
18	29.89	29.89
19	41.83	-5.40
20	-4.17	-4.17
21	-2.43	-2.43
22	-0.21	-0.21
23	2.52	2.52
24	5.73	5.73

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                      VminHmax                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

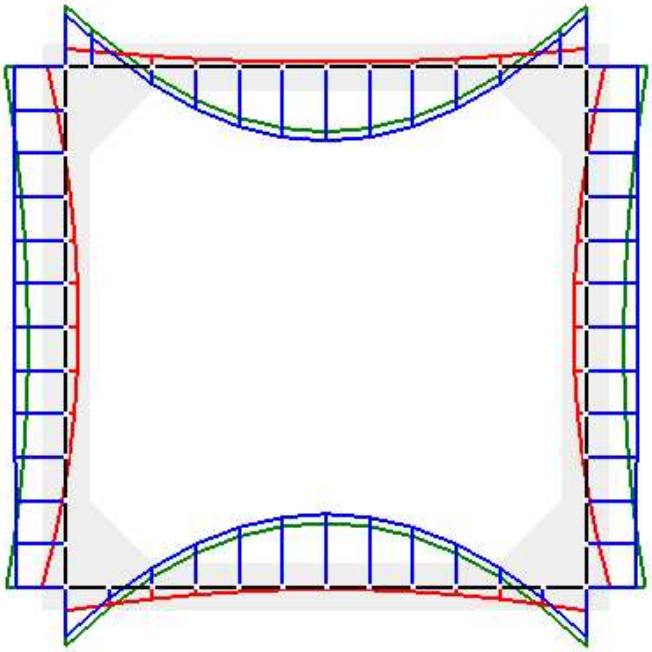
SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	19.30	-17.07
2	-14.61	-10.87
3	-8.19	-4.49
4	-1.84	1.84
5	4.49	8.19
6	10.87	14.61
7	17.07	-19.30
8	-12.33	-12.33
9	-5.99	-5.99
10	-0.28	-0.28
11	4.80	4.80
12	9.26	9.26
13	13.09	-12.25
14	-8.00	-8.00
15	-4.00	-4.00
16	0.00	0.00
17	4.00	4.00
18	8.00	8.00
19	12.25	-13.09
20	-9.26	-9.26
21	-4.80	-4.80
22	0.28	0.28
23	5.99	5.99
24	12.33	12.33

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                      VmaxHmax                       #
#######################################################
```

ESFORÇOS CORTANTE DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN)	DIREITA (kN)
1	12.58	-43.88
2	-36.12	-27.31
3	-19.76	-11.36
4	-4.12	4.12
5	11.36	19.76
6	27.31	36.12
7	43.88	-12.58
8	-7.94	-7.94
9	-3.71	-3.71
10	0.10	0.10
11	3.49	3.49
12	6.46	6.46
13	9.01	-41.83
14	-29.89	-29.89
15	-14.95	-14.95
16	0.00	0.00
17	14.95	14.95
18	29.89	29.89
19	41.83	-9.01
20	-6.46	-6.46
21	-3.49	-3.49
22	-0.10	-0.10
23	3.71	3.71
24	7.94	7.94

MOMENTO FLETOR



```
#######################################################
#            SOLICITAÇÕES NORMAIS (ELU)               #
#                      VmaxHmin                       #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-18.41	18.41
2	-7.27	-7.27
3	-22.27	-22.27
4	-27.18	-27.18
5	-22.27	-22.27
6	-7.27	-7.27
7	18.41	18.41
8	18.72	18.72
9	18.85	18.85
10	18.88	18.88
11	18.92	18.92
12	19.05	19.05
13	19.36	-19.36
14	6.54	6.54
15	22.29	22.29
16	27.55	27.55
17	22.29	22.29
18	6.54	6.54
19	-19.36	-19.36
20	-19.05	-19.05
21	-18.92	-18.92
22	-18.88	-18.88
23	-18.85	-18.85
24	-18.72	-18.72

```
#####################################################
#            SOLICITAÇÕES NORMAIS (ELU)             #
#                     VminHmax                      #
#####################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-8.80	8.80
2	4.40	4.40
3	1.71	1.71
4	0.80	0.80
5	1.71	1.71
6	4.40	4.40
7	8.80	8.80
8	1.23	1.23
9	-3.20	-3.20
10	-4.69	-4.69
11	-3.40	-3.40
12	0.47	0.47
13	6.75	-6.75
14	-3.97	-3.97
15	-2.32	-2.32
16	-1.77	-1.77
17	-2.32	-2.32
18	-3.97	-3.97
19	-6.75	-6.75
20	-0.47	-0.47
21	3.40	3.40
22	4.69	4.69
23	3.20	3.20
24	-1.23	-1.23

```
#####################################################
#            SOLICITAÇÕES NORMAIS (ELU)             #
#                     VmaxHmax                      #
#####################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-21.98	21.98
2	-3.77	-3.77
3	-18.87	-18.87
4	-23.83	-23.83
5	-18.87	-18.87
6	-3.77	-3.77
7	21.98	21.98
8	17.29	17.29
9	14.68	14.68
10	14.04	14.04
11	15.25	15.25
12	18.18	18.18
13	22.71	-22.71
14	3.19	3.19
15	18.94	18.94
16	24.19	24.19
17	18.94	18.94
18	3.19	3.19
19	-22.71	-22.71
20	-18.18	-18.18
21	-15.25	-15.25
22	-14.04	-14.04
23	-14.68	-14.68
24	-17.29	-17.29

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VmaxHmin                       #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-17.65	17.65
2	-8.71	-8.71
3	-22.55	-22.55
4	-25.67	-25.67
5	-19.54	-19.54
6	-5.13	-5.13
7	16.87	16.87
8	17.23	17.23
9	17.41	17.41
10	17.50	17.50
11	17.59	17.59
12	17.77	17.77
13	18.13	-18.13
14	4.28	4.28
15	20.65	20.65
16	26.52	26.52
17	21.89	21.89
18	6.76	6.76
19	-18.92	-18.92
20	-18.55	-18.55
21	-18.37	-18.37
22	-18.28	-18.28
23	-18.20	-18.20
24	-18.02	-18.02

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                      VminHmax                       #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-8.83	8.83
2	4.42	4.42
3	1.73	1.73
4	0.83	0.83
5	1.73	1.73
6	4.42	4.42
7	8.83	8.83
8	1.24	1.24
9	-3.22	-3.22
10	-4.72	-4.72
11	-3.46	-3.46
12	0.39	0.39
13	6.65	-6.65
14	-3.87	-3.87
15	-2.22	-2.22
16	-1.67	-1.67
17	-2.22	-2.22
18	-3.87	-3.87
19	-6.65	-6.65
20	-0.39	-0.39
21	3.46	3.46
22	4.72	4.72
23	3.22	3.22
24	-1.24	-1.24

```
#######################################################
#          SOLICITAÇÕES TANGENCIAIS (ELU)             #
#                     VmaxHmax                        #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-21.25	21.25
2	-5.19	-5.19
3	-19.14	-19.14
4	-22.30	-22.30
5	-16.12	-16.12
6	-1.61	-1.61
7	20.46	20.46
8	15.80	15.80
9	13.23	13.23
10	12.63	12.63
11	13.87	13.87
12	16.84	16.84
13	21.41	-21.41
14	0.99	0.99
15	17.37	17.37
16	23.24	23.24
17	18.61	18.61
18	3.48	3.48
19	-22.20	-22.20
20	-17.63	-17.63
21	-14.66	-14.66
22	-13.41	-13.41
23	-14.02	-14.02
24	-16.59	-16.59

```
#######################################################
#            VERIFICAÇÃO DA FADIGA (ELS)              #
#                     VmaxHmin                        #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-12.22	12.22
2	-2.77	-2.77
3	-11.56	-11.56
4	-14.44	-14.44
5	-11.56	-11.56
6	-2.77	-2.77
7	12.22	12.22
8	10.25	10.25
9	9.24	9.24
10	9.04	9.04
11	9.52	9.52
12	10.55	10.55
13	11.98	-11.98
14	2.63	2.63
15	11.50	11.50
16	14.46	14.46
17	11.50	11.50
18	2.63	2.63
19	-11.98	-11.98
20	-10.55	-10.55
21	-9.52	-9.52
22	-9.04	-9.04
23	-9.24	-9.24
24	-10.25	-10.25

```
#######################################################
#             VERIFICAÇÃO DA FADIGA (ELS)             #
#                      VminHmax                       #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-6.89	6.89
2	2.53	2.53
3	-0.11	-0.11
4	-0.99	-0.99
5	-0.11	-0.11
6	2.53	2.53
7	6.89	6.89
8	1.89	1.89
9	-1.03	-1.03
10	-2.04	-2.04
11	-1.29	-1.29
12	1.07	1.07
13	4.88	-4.88
14	-2.10	-2.10
15	-0.45	-0.45
16	0.10	0.10
17	-0.45	-0.45
18	-2.10	-2.10
19	-4.88	-4.88
20	-1.07	-1.07
21	1.29	1.29
22	2.04	2.04
23	1.03	1.03
24	-1.89	-1.89

```
#######################################################
#             VERIFICAÇÃO DA FADIGA (ELS)             #
#                      VmaxHmax                       #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-13.14	13.14
2	-1.87	-1.87
3	-10.68	-10.68
4	-13.58	-13.58
5	-10.68	-10.68
6	-1.87	-1.87
7	13.14	13.14
8	9.99	9.99
9	8.23	8.23
10	7.74	7.74
11	8.43	8.43
12	10.19	10.19
13	12.92	-12.92
14	1.69	1.69
15	10.57	10.57
16	13.52	13.52
17	10.57	10.57
18	1.69	1.69
19	-12.92	-12.92
20	-10.19	-10.19
21	-8.43	-8.43
22	-7.74	-7.74
23	-8.23	-8.23
24	-9.99	-9.99

```
#######################################################
#             VERIFICAÇÃO DA FADIGA (ELS)             #
#                     VminHmin                        #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-4.84	4.84
2	0.52	0.52
3	-2.06	-2.06
4	-2.91	-2.91
5	-2.06	-2.06
6	0.52	0.52
7	4.84	4.84
8	2.59	2.59
9	1.28	1.28
10	0.79	0.79
11	0.99	0.99
12	1.73	1.73
13	2.87	-2.87
14	-0.09	-0.09
15	1.56	1.56
16	2.11	2.11
17	1.56	1.56
18	-0.09	-0.09
19	-2.87	-2.87
20	-1.73	-1.73
21	-0.99	-0.99
22	-0.79	-0.79
23	-1.28	-1.28
24	-2.59	-2.59

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                     VmaxHmin                        #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-9.45	9.45
2	-1.54	-1.54
3	-7.99	-7.99
4	-10.11	-10.11
5	-7.99	-7.99
6	-1.54	-1.54
7	9.45	9.45
8	7.38	7.38
9	6.25	6.25
10	5.95	5.95
11	6.32	6.32
12	7.24	7.24
13	8.57	-8.57
14	1.61	1.61
15	7.78	7.78
16	9.83	9.83
17	7.78	7.78
18	1.61	1.61
19	-8.57	-8.57
20	-7.24	-7.24
21	-6.32	-6.32
22	-5.95	-5.95
23	-6.25	-6.25
24	-7.38	-7.38

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                      VminHmax                       #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-6.37	6.37
2	2.02	2.02
3	-0.60	-0.60
4	-1.47	-1.47
5	-0.60	-0.60
6	2.02	2.02
7	6.37	6.37
8	2.04	2.04
9	-0.47	-0.47
10	-1.31	-1.31
11	-0.68	-0.68
12	1.27	1.27
13	4.36	-4.36
14	-1.57	-1.57
15	0.08	0.08
16	0.63	0.63
17	0.08	0.08
18	-1.57	-1.57
19	-4.36	-4.36
20	-1.27	-1.27
21	0.68	0.68
22	1.31	1.31
23	0.47	0.47
24	-2.04	-2.04

```
#######################################################
#           VERIFICAÇÃO DA FISSURAÇÃO (ELS)           #
#                      VmaxHmax                       #
#######################################################
```

MOMENTO FLETOR DOS NÓS DA ESTRUTURA

SEÇÃO	ESQUERDA (kN.m)	DIREITA (kN.m)
1	-10.03	10.03
2	-0.97	-0.97
3	-7.45	-7.45
4	-9.58	-9.58
5	-7.45	-7.45
6	-0.97	-0.97
7	10.03	10.03
8	7.21	7.21
9	5.62	5.62
10	5.14	5.14
11	5.64	5.64
12	7.02	7.02
13	9.15	-9.15
14	1.02	1.02
15	7.19	7.19
16	9.25	9.25
17	7.19	7.19
18	1.02	1.02
19	-9.15	-9.15
20	-7.02	-7.02
21	-5.64	-5.64
22	-5.14	-5.14
23	-5.62	-5.62
24	-7.21	-7.21

ARMADURAS P/ SOLICITAÇÕES NORMAIS

Seção	As-CA60ext(cm²/m)	As-CA50ext(cm²/m)	As-CA60int(cm²/m)	As-CA50int(cm²/m)
1	5.47	6.57	1.26	1.26
2	2.32	2.79	2.32	2.79
3	2.32	2.79	4.15	4.98
4	2.32	2.79	5.11	6.13
5	2.32	2.79	4.15	4.98
6	2.32	2.79	2.32	2.79
7	5.47	6.57	1.26	1.26
8	3.10	3.72	2.32	2.79
9	3.14	3.77	2.32	2.79
10	3.17	3.80	2.32	2.79
11	3.20	3.84	2.32	2.79
12	3.24	3.89	2.32	2.79
13	5.47	6.57	1.26	1.26
14	2.32	2.79	2.32	2.79
15	2.32	2.79	4.09	4.91
16	2.32	2.79	5.12	6.15
17	2.32	2.79	4.09	4.91
18	2.32	2.79	2.32	2.79
19	5.47	6.57	1.26	1.26
20	3.24	3.89	2.32	2.79
21	3.20	3.84	2.32	2.79
22	3.17	3.80	2.32	2.79
23	3.14	3.77	2.32	2.79
24	3.10	3.72	2.32	2.79

NOTA: A tabela acima mostra as áreas de aço calculadas para parte interna e externa das seções de interesse. Estas áreas são mostradas para o caso de se utilizar apenas aço do tipo CA60 (As-CA60ext e As-CA60int) e os correspondentes valores para o caso de se utilizar apenas aço do tipo CA50 (As-CA50ext e As-CA50int). Possibilitando os cálculos para o uso combinado dos tipos de aço: CA60 contido nas telas soldadas e o CA50 presentes nas barras.

VERIFICAÇÃO DA FADIGA

Seção	Nsdmax(kN)	Msdmax(kN.m)	Nsdmin(kN)	Msdmin(kN.m)	DSs(MPa)	Asad(cm²/m)
12	-60.86	10.19	-13.54	1.73	104.96	0.00
13	-59.58	12.92	-4.74	2.87	30.74	0.00
14	-11.57	1.69	-4.74	0.09	4.94	0.00
16	-5.80	14.46	-16.34	0.10	241.89	1.68
18	-11.57	1.69	-4.74	0.09	4.94	0.00
19	-59.58	12.92	-4.74	2.87	30.74	0.00
20	-60.86	10.19	-13.54	1.73	104.96	0.00

VERIFICAÇÃO DA CORTANTE

Seção	fck(MPa)	fcd(MPa)	fctm(MPa)	fctk,inf(MPa)	fctd(MPa)	Trd(MPa)
1	30.00	23.08	2.90	2.03	1.56	0.39
7	30.00	23.08	2.90	2.03	1.56	0.39
2	30.00	23.08	2.90	2.03	1.56	0.39
6	30.00	23.08	2.90	2.03	1.56	0.39
13	30.00	23.08	2.90	2.03	1.56	0.39
19	30.00	23.08	2.90	2.03	1.56	0.39
14	30.00	23.08	2.90	2.03	1.56	0.39
18	30.00	23.08	2.90	2.03	1.56	0.39

Seção	As(cm²/m)	ro	Vsd(kN)	Vrd1(kN)	Vrd2(kN)	Asw(cm²/m/m)
1	6.57	2.12E-003	89.67	187.97	0.00	0.00
7	6.57	2.12E-003	89.67	187.97	0.00	0.00
2	2.79	2.53E-003	77.92	79.48	0.00	0.00
6	2.79	2.53E-003	77.92	79.48	0.00	0.00
13	6.57	2.12E-003	82.78	185.36	0.00	0.00
19	6.57	2.12E-003	82.78	185.36	0.00	0.00
14	2.79	2.53E-003	77.07	80.20	0.00	0.00
18	2.79	2.53E-003	77.07	80.20	0.00	0.00

OBSERVAÇÃO: A verificação da resistência à força cortante é feita a uma distância d/2 das seções das mísulas.

VERIFICAÇÃO DA FISSURAÇÃO

VmaxHmin

Seção	As(cm²/m)	Nsd(kN)	Msd(kN.m)	Ø(mm)	w(mm)
1	6.57	-28.98	9.45	6.30	0.002
2	2.79	-9.45	1.54	6.30	0.002
3	4.98	-9.45	7.99	6.30	0.027
4	6.13	-9.45	10.11	6.30	0.029
5	4.98	-9.45	7.99	6.30	0.027
6	2.79	-9.45	1.54	6.30	0.002
7	6.57	-28.98	9.45	6.30	0.002
8	3.72	-47.24	7.38	6.30	0.027
9	3.77	-46.21	6.25	6.30	0.017
10	3.80	-45.18	5.95	6.30	0.015
11	3.84	-44.14	6.32	6.30	0.018
12	3.89	-43.11	7.24	6.30	0.025
13	6.57	-23.62	8.57	6.30	0.002
14	2.79	-5.40	1.61	6.30	0.003
15	4.91	-5.40	7.78	6.30	0.027
16	6.15	-5.40	9.83	6.30	0.028
17	4.91	-5.40	7.78	6.30	0.027
18	2.79	-5.40	1.61	6.30	0.003
19	6.57	-23.62	8.57	6.30	0.002
20	3.89	-43.11	7.24	6.30	0.025
21	3.84	-44.14	6.32	6.30	0.018
22	3.80	-45.18	5.95	6.30	0.015
23	3.77	-46.21	6.25	6.30	0.017
24	3.72	-47.24	7.38	6.30	0.027

VminHmax

Seção	As(cm²/m)	Nsd(kN)	Msd(kN.m)	Ø(mm)	w(mm)
1	6.57	-19.12	6.37	6.30	0.001
2	2.79	-19.30	2.02	6.30	0.003
3	4.98	-19.30	0.60	6.30	0.000
4	6.13	-19.30	1.47	6.30	0.000
5	4.98	-19.30	0.60	6.30	0.000
6	2.79	-19.30	2.02	6.30	0.003
7	6.57	-19.12	6.37	6.30	0.001
8	3.72	-17.66	2.04	6.30	0.002
9	3.77	-16.63	0.47	6.30	0.000
10	3.80	-15.60	1.31	6.30	0.000
11	3.84	-14.57	0.68	6.30	0.000
12	3.89	-13.54	1.27	6.30	0.000
13	6.57	-12.67	4.36	6.30	0.000
14	2.79	-13.09	1.57	6.30	0.002
15	4.91	-13.09	0.08	6.30	0.000
16	6.15	-13.09	0.63	6.30	0.000
17	4.91	-13.09	0.08	6.30	0.000
18	2.79	-13.09	1.57	6.30	0.002
19	6.57	-12.67	4.36	6.30	0.000
20	3.89	-13.54	1.27	6.30	0.000
21	3.84	-14.57	0.68	6.30	0.000
22	3.80	-15.60	1.31	6.30	0.000
23	3.77	-16.63	0.47	6.30	0.000
24	3.72	-17.66	2.04	6.30	0.002

VERIFICAÇÃO DA FISSURAÇÃO (CONT.)

VmaxHmax

Seção	As(cm²/m)	Nsd(kN)	Msd(kN.m)	Ø(mm)	w(mm)
1	6.57	-30.55	10.03	6.30	0.002
2	2.79	-12.58	0.97	6.30	0.000
3	4.98	-12.58	7.45	6.30	0.022
4	6.13	-12.58	9.58	6.30	0.025
5	4.98	-12.58	7.45	6.30	0.022
6	2.79	-12.58	0.97	6.30	0.000
7	6.57	-30.55	10.03	6.30	0.002
8	3.72	-47.24	7.21	6.30	0.025
9	3.77	-46.21	5.62	6.30	0.013
10	3.80	-45.18	5.14	6.30	0.010
11	3.84	-44.14	5.64	6.30	0.013
12	3.89	-43.11	7.02	6.30	0.023
13	6.57	-25.42	9.15	6.30	0.002
14	2.79	-9.01	1.02	6.30	0.001
15	4.91	-9.01	7.19	6.30	0.022
16	6.15	-9.01	9.25	6.30	0.024
17	4.91	-9.01	7.19	6.30	0.022
18	2.79	-9.01	1.02	6.30	0.001
19	6.57	-25.42	9.15	6.30	0.002
20	3.89	-43.11	7.02	6.30	0.023
21	3.84	-44.14	5.64	6.30	0.013
22	3.80	-45.18	5.14	6.30	0.010
23	3.77	-46.21	5.62	6.30	0.013
24	3.72	-47.24	7.21	6.30	0.025

NOTA:
* Seção com aumento na armadura devido a fissuração.