

ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

Date: Ma 06-Nov-2000

Time: 19:26:39

Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

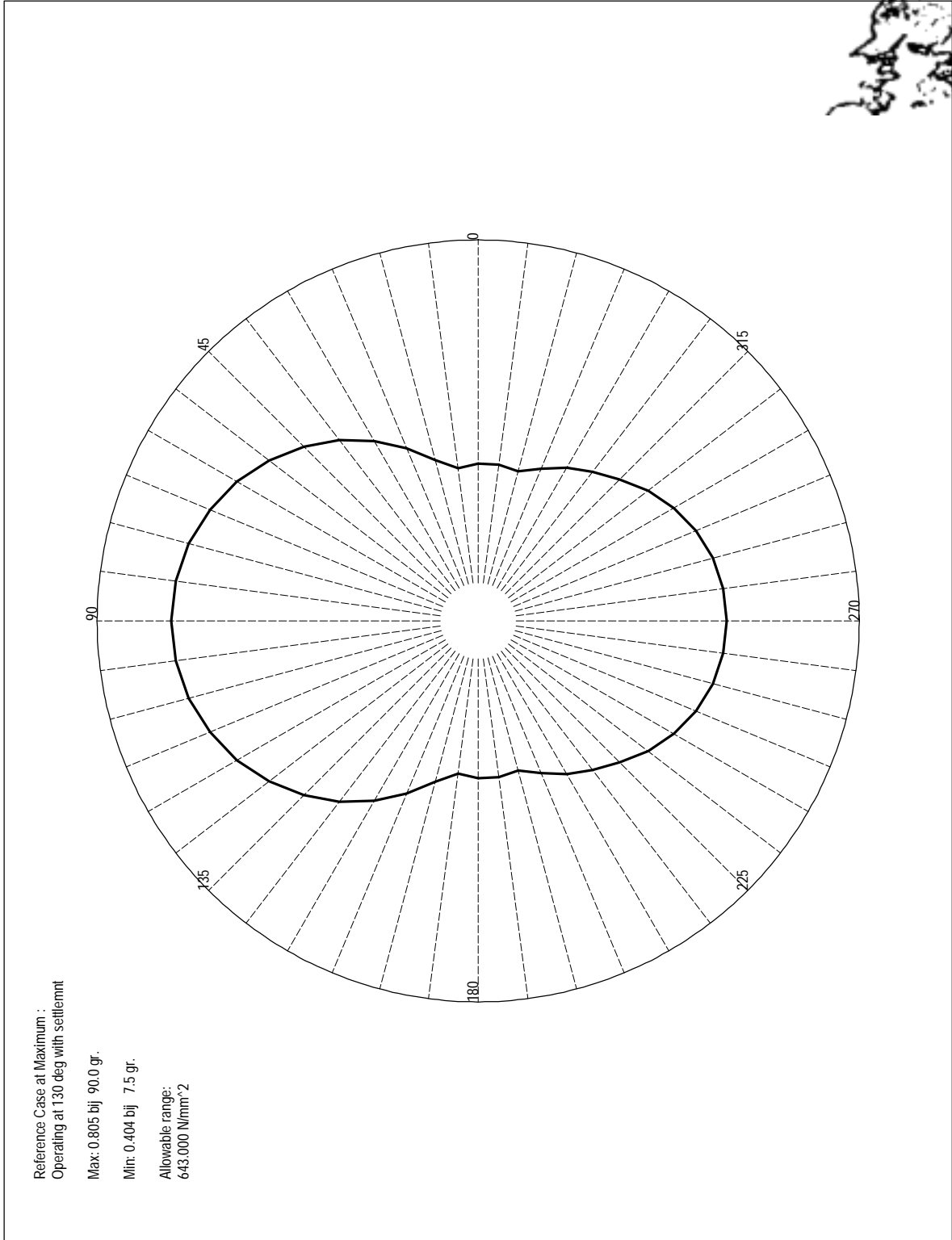
Jobnr: PV2000



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TRESCA analyse : RATIO_IT

Element : 715 LOADCASE: Zero loads at 10 deg C



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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Zero loads at 10 deg C

Refcase = Operating at 130 deg with settlement

SX = 0.0000
Loadcase

Sx = SX Refcase Sx = -419.2200

SF = 0.0000
Loadcase

Sf = SF Refcase Sf = 98.4780

TZ = 0.00000
Loadcase

Tz = TZ Refcase Tz = 0.00000

$$S_{1 \text{ or } 2} = \frac{(SX - Sx) + (SF - Sf)}{2} + \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

$$S_{2 \text{ or } 1} = \frac{(SX - Sx) + (SF - Sf)}{2} - \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

S₁ = 419.2200

S₂ = -98.4780

S₃ = 0

S_{1,2} = S₁ - S₂

S_{2,3} = S₂ - S₃

S_{3,1} = S₃ - S₁

S_{1,2} = 517.6980

S_{2,3} = -98.4780

S_{3,1} = -419.2200

Traject is the maximum absolute magnitude of:

$$\left| S_{1,2} \right|, \left| S_{2,3} \right| \text{ \& } \left| S_{3,1} \right|$$

Traject = 517.6980

Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 643.000

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 0.805

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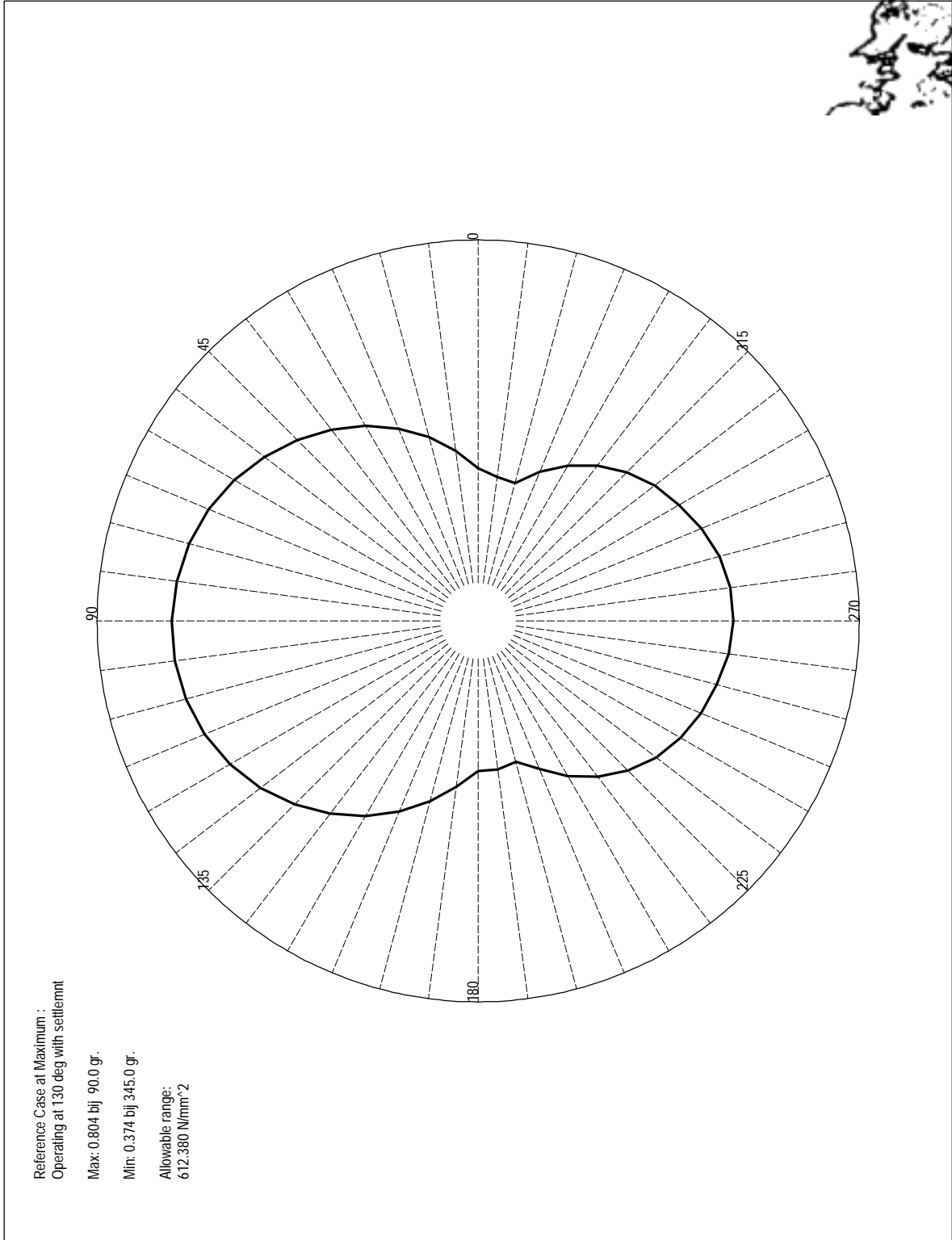
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TRESCA analyse : RATIO_IT

Element : 715 LOADCASE: Pre-stress at 70 deg C



Reference Case at Maximum :
 Operating at 130 deg with settlement
 Max: 0.804 bij 90.0 gr.
 Min: 0.374 bij 345.0 gr.
 Allowable range:
 612.380 N/mm²

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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Pre-stress at 70 deg C

Refcase = Operating at 130 deg with settlement

SX = 11.0170
Loadcase

Sx = SX Refcase Sx = -419.2200

SF = 36.1800
Loadcase

Sf = SF Refcase Sf = 98.4780

TZ = 0.00000
Loadcase

Tz = TZ Refcase Tz = 0.00000

$$S_{1 \text{ or } 2} = \frac{(SX - Sx) + (SF - Sf)}{2} + \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

$$S_{2 \text{ or } 1} = \frac{(SX - Sx) + (SF - Sf)}{2} - \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

S₁ = 430.2370

S₂ = -62.2980

S₃ = 0

S_{1,2} = S₁ - S₂

S_{2,3} = S₂ - S₃

S_{3,1} = S₃ - S₁

S_{1,2} = 492.5350

S_{2,3} = -62.2980

S_{3,1} = -430.2370

Traject is the maximum absolute magnitude of:

$$\left| S_{1,2} \right| , \left| S_{2,3} \right| \text{ \& } \left| S_{3,1} \right|$$

Traject = 492.5350

Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 612.380

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 0.804

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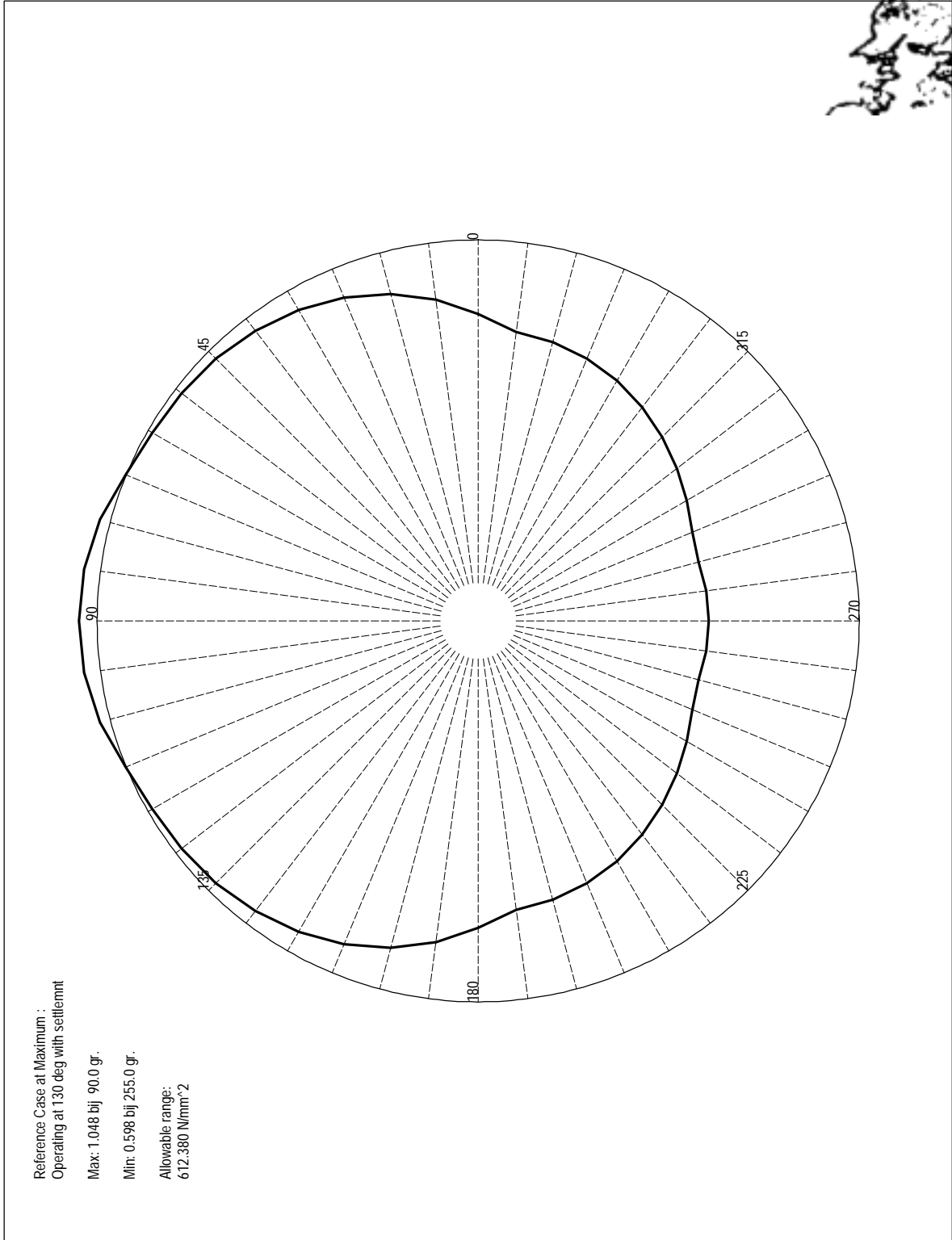
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Element : 715 LOADCASE: Decrease of temp from 70 to 10 deg TRESCA analyse : RATIO_IT



Reference Case at Maximum :
 Operating at 130 deg with settlement
 Max: 1.048 bij 90.0 gr.
 Min: 0.598 bij 255.0 gr.
 Allowable range:
 612.380 N/mm²

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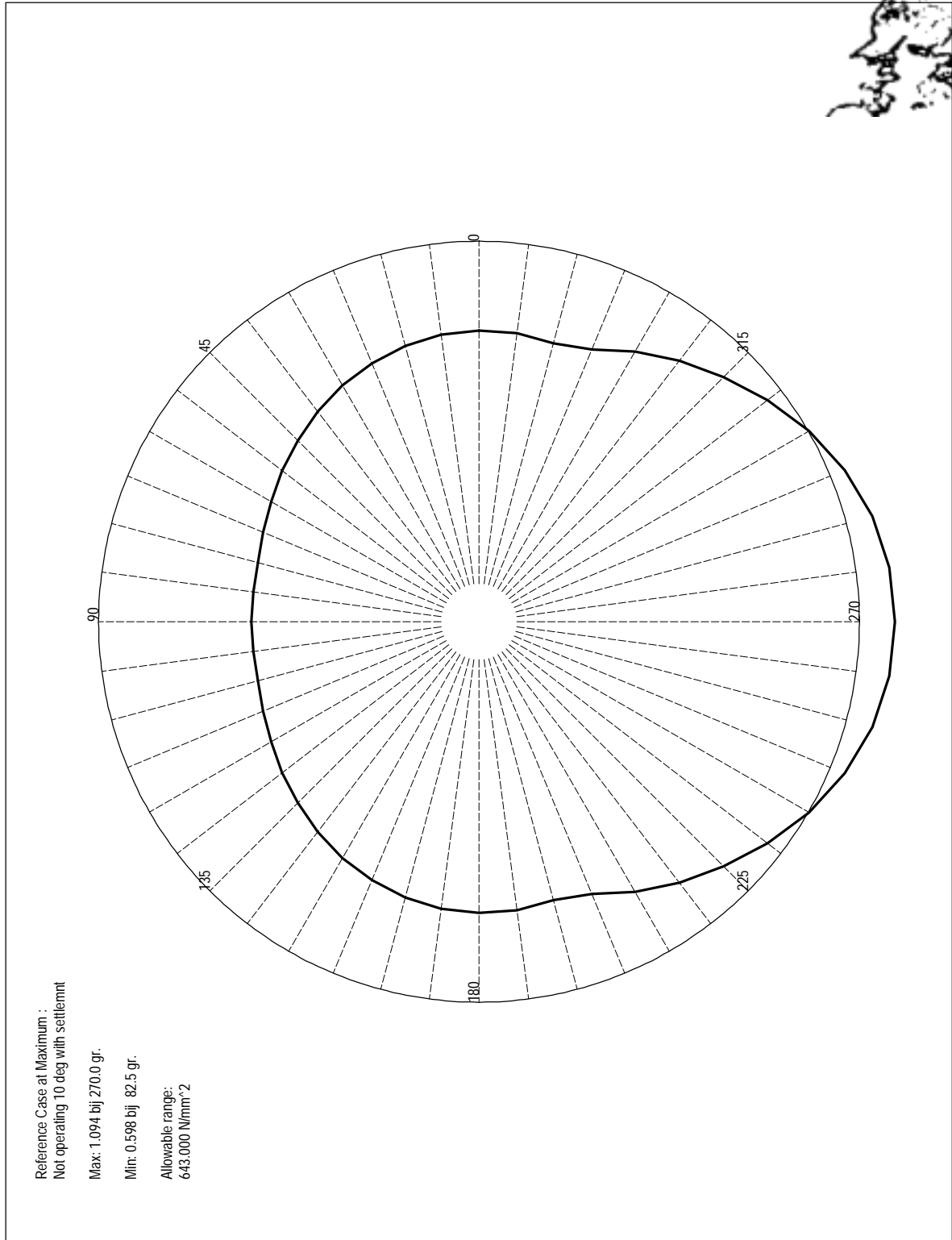
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Element : 715 LOADCASE: Operating at 130 deg no settlement TRESCA analyse : RATIO_IT



Reference Case at Maximum :
 Not operating 10 deg with settlement
 Max: 1.094 bij 270.0 gr.
 Min: 0.598 bij 82.5 gr.
 Allowable range:
 643.000 N/mm²

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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Operating at 130 deg no settlement Refcase = Not operating 10 deg with settlement

SX = -137.1500 Sx = SX Sx = 463.0100
Loadcase Refcase

SF = 151.0000 Sf = SF Sf = 47.5980
Loadcase Refcase

TZ = 0.00000 Tz = TZ Tz = -0.00000
Loadcase Refcase

$$S_{1 \text{ or } 2} = \frac{(SX - Sx) + (SF - Sf)}{2} + \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

$$S_{2 \text{ or } 1} = \frac{(SX - Sx) + (SF - Sf)}{2} - \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

S₁ = -600.1600 S₂ = 103.4020 S₃ = 0

S_{1,2} = S₁ - S₂ S_{2,3} = S₂ - S₃ S_{3,1} = S₃ - S₁

S_{1,2} = -703.5620 S_{2,3} = 103.4020 S_{3,1} = 600.1600

Traject is the maximum absolute magnitude of:

|S_{1,2}| , |S_{2,3}| & |S_{3,1}|

Traject = 703.5620 Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 643.000

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 1.094

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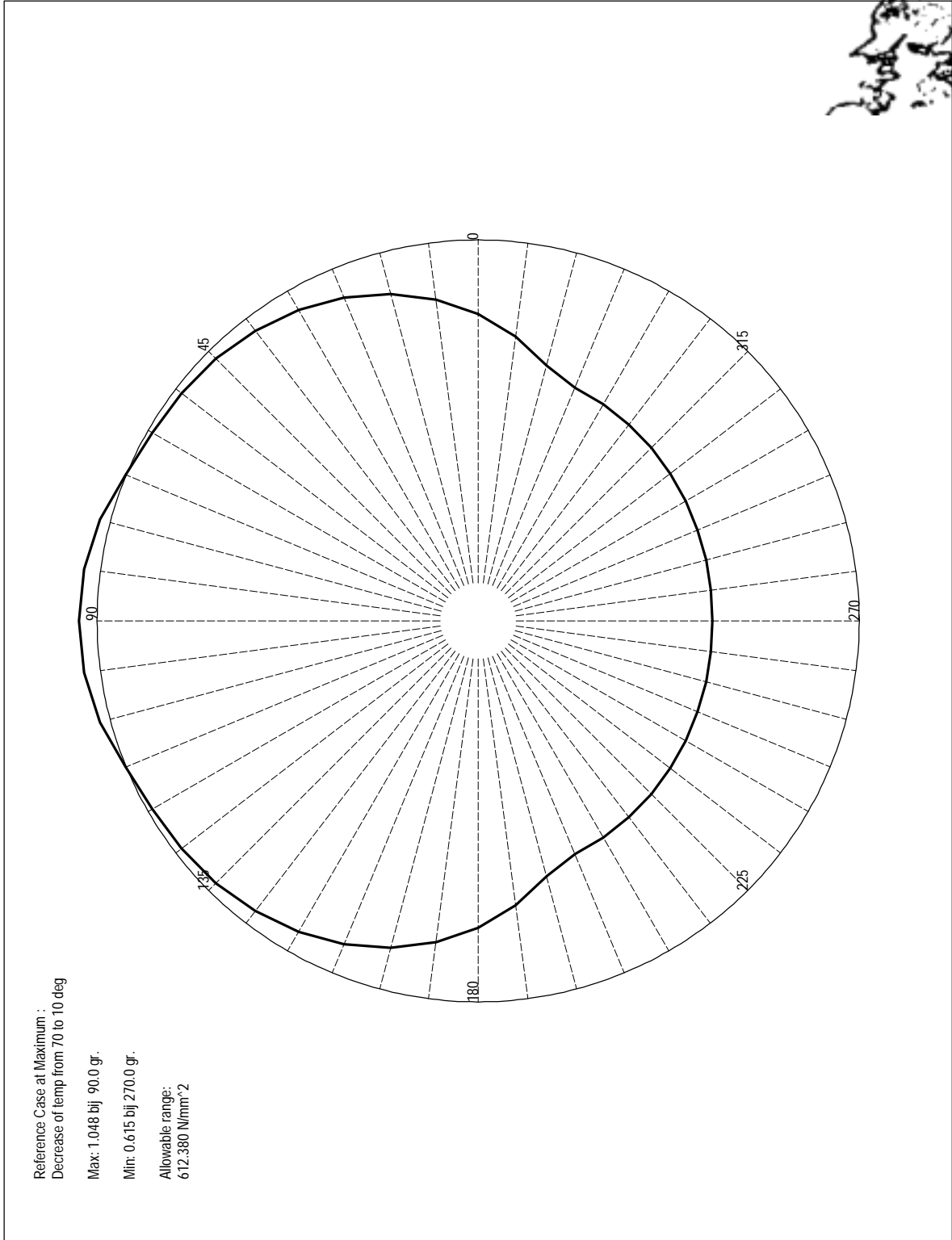
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Element : 715 LOADCASE: Operating at 130 deg with settlement TRESCA analyse : RATIO_IT



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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Operating at 130 deg with settlement Refcase = Decrease of temp from 70 to 10 deg

SX = -419.2200 Sx = SX Sx = 222.5700
 Loadcase Refcase

SF = 98.4780 Sf = SF Sf = 133.0500
 Loadcase Refcase

TZ = 0.00000 Tz = TZ Tz = -0.00000
 Loadcase Refcase

$$S_{1 \text{ or } 2} = \frac{(SX - Sx) + (SF - Sf)}{2} + \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

$$S_{2 \text{ or } 1} = \frac{(SX - Sx) + (SF - Sf)}{2} - \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

S₁ = -641.7900 S₂ = -34.5720 S₃ = 0

S_{1,2} = S₁ - S₂ S_{2,3} = S₂ - S₃ S_{3,1} = S₃ - S₁

S_{1,2} = -607.2180 S_{2,3} = -34.5720 S_{3,1} = 641.7900

Traject is the maximum absolute magnitude of:

|S_{1,2}| , |S_{2,3}| & |S_{3,1}|

Traject = 641.7900 Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 612.380

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 1.048

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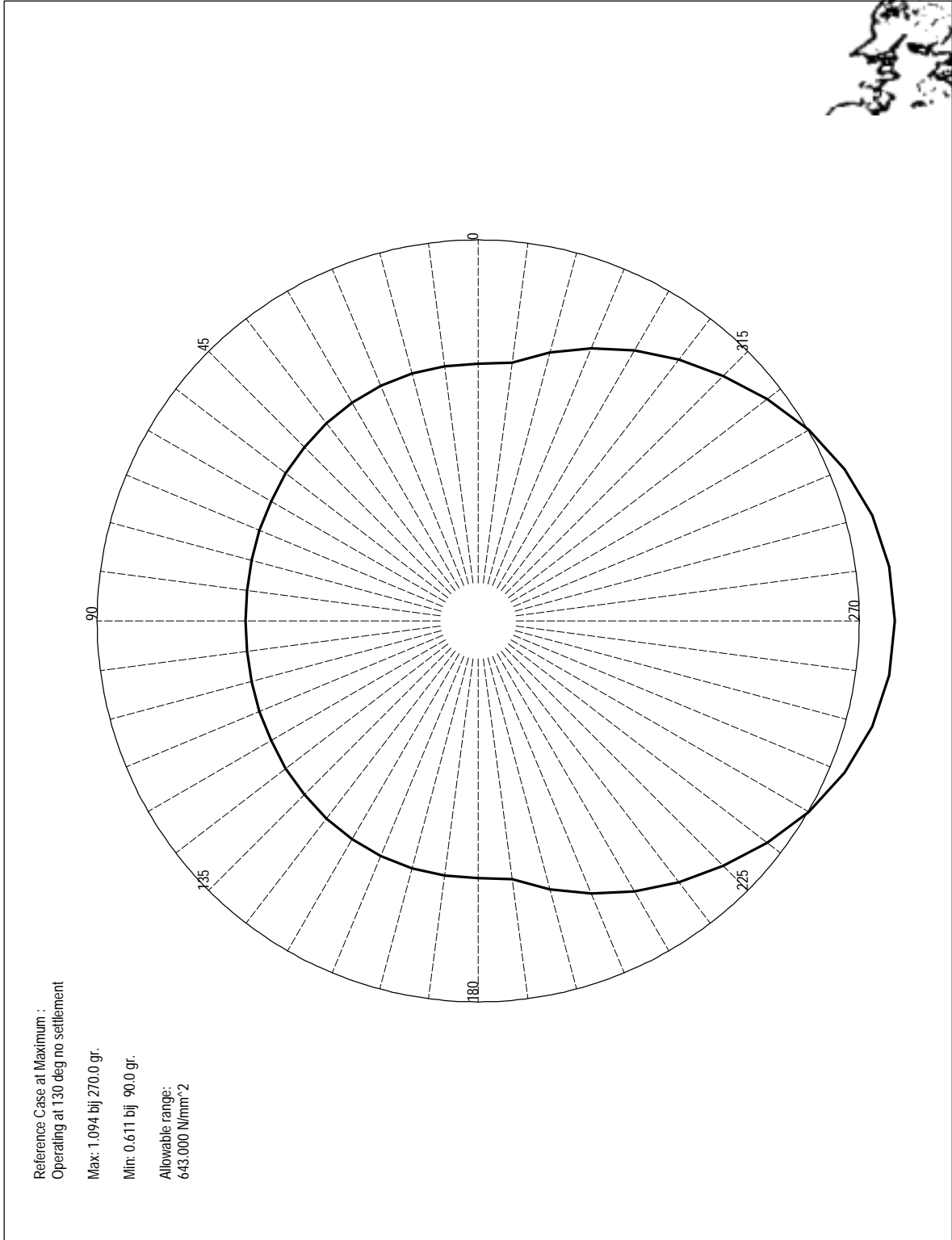
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Element : 715 LOADCASE: Not operating 10 deg with settlement TRESCA analyse : RATIO_IT



Reference Case at Maximum :
 Operating at 130 deg no settlement
 Max: 1.094 bij 270.0 gr.
 Min: 0.611 bij 90.0 gr.
 Allowable range:
 643.000 N/mm²

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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Not operating 10 deg with settlement Refcase = Operating at 130 deg no settlement

SX = 463.0100 Sx = SX Sx = -137.1500
Loadcase Refcase

SF = 47.5980 Sf = SF Sf = 151.0000
Loadcase Refcase

TZ = -0.00000 Tz = TZ Tz = 0.00000
Loadcase Refcase

$$S_{1 \text{ or } 2} = \frac{(SX - Sx) + (SF - Sf)}{2} + \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

$$S_{2 \text{ or } 1} = \frac{(SX - Sx) + (SF - Sf)}{2} - \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

S₁ = 600.1600 S₂ = -103.4020 S₃ = 0

S_{1,2} = S₁ - S₂ S_{2,3} = S₂ - S₃ S_{3,1} = S₃ - S₁

S_{1,2} = 703.5620 S_{2,3} = -103.4020 S_{3,1} = -600.1600

Traject is the maximum absolute magnitude of:

$$\left| S_{1,2} \right| , \left| S_{2,3} \right| \text{ \& } \left| S_{3,1} \right|$$

Traject = 703.5620 Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 643.000

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 1.094

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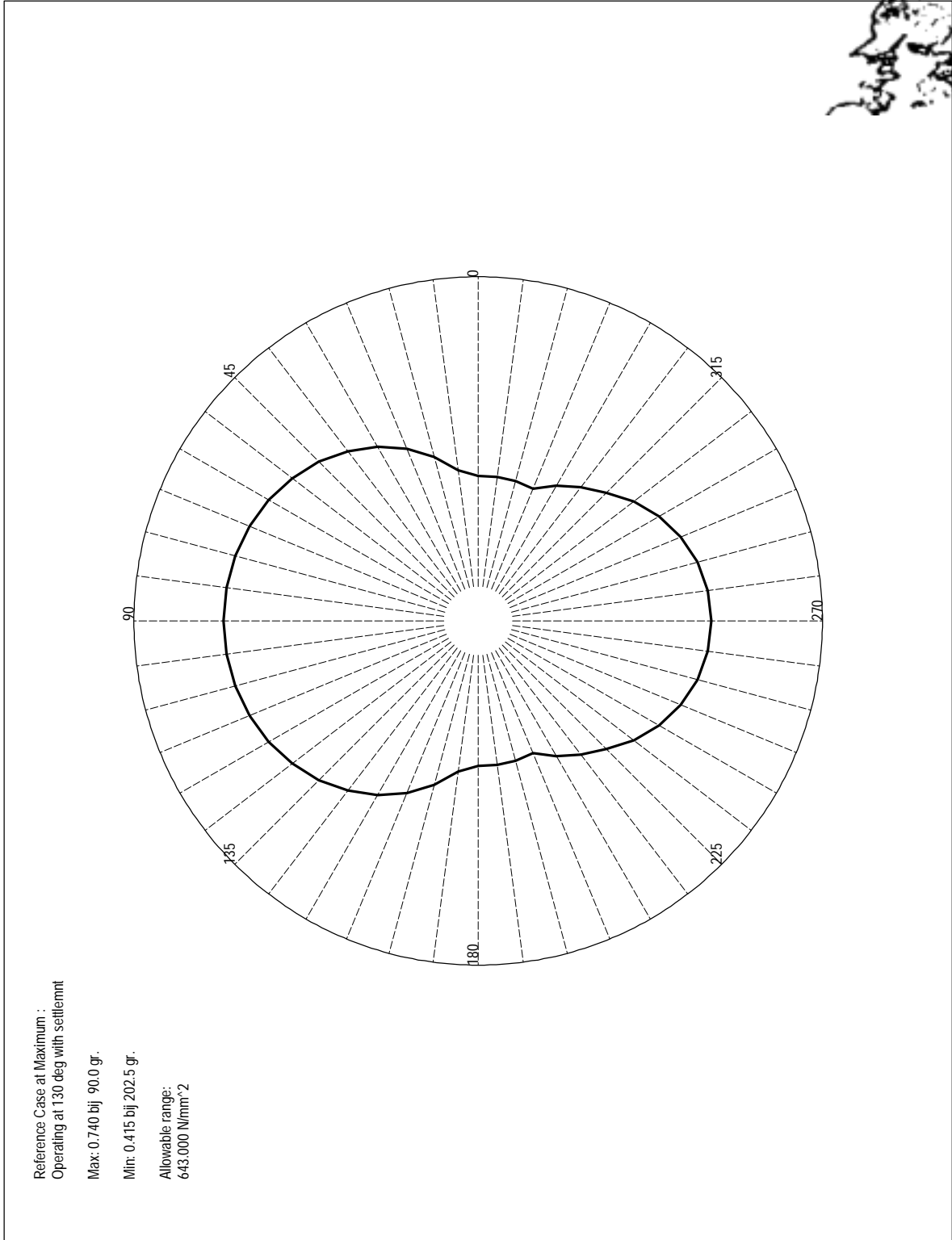
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TRESCA analyse : RATIO_OT

LOADCASE: Zero loads at 10 deg C
Element : 715



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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Zero loads at 10 deg C

Refcase = Operating at 130 deg with settlement

SX = 0.0000
 Loadcase

Sx = SX Refcase Sx = -437.2400

SF = 0.0000
 Loadcase

Sf = SF Refcase Sf = 38.4330

TZ = 0.00000
 Loadcase

Tz = TZ Refcase Tz = 0.00000

$$S_{1 \text{ or } 2} = \frac{(SX - Sx) + (SF - Sf)}{2} + \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

$$S_{2 \text{ or } 1} = \frac{(SX - Sx) + (SF - Sf)}{2} - \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

S₁ = 437.2400

S₂ = -38.4330

S₃ = 0

S_{1,2} = S₁ - S₂

S_{2,3} = S₂ - S₃

S_{3,1} = S₃ - S₁

S_{1,2} = 475.6730

S_{2,3} = -38.4330

S_{3,1} = -437.2400

Traject is the maximum absolute magnitude of:

$$\left| S_{1,2} \right|, \left| S_{2,3} \right| \text{ \& } \left| S_{3,1} \right|$$

Traject = 475.6730

Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 643.000

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 0.740

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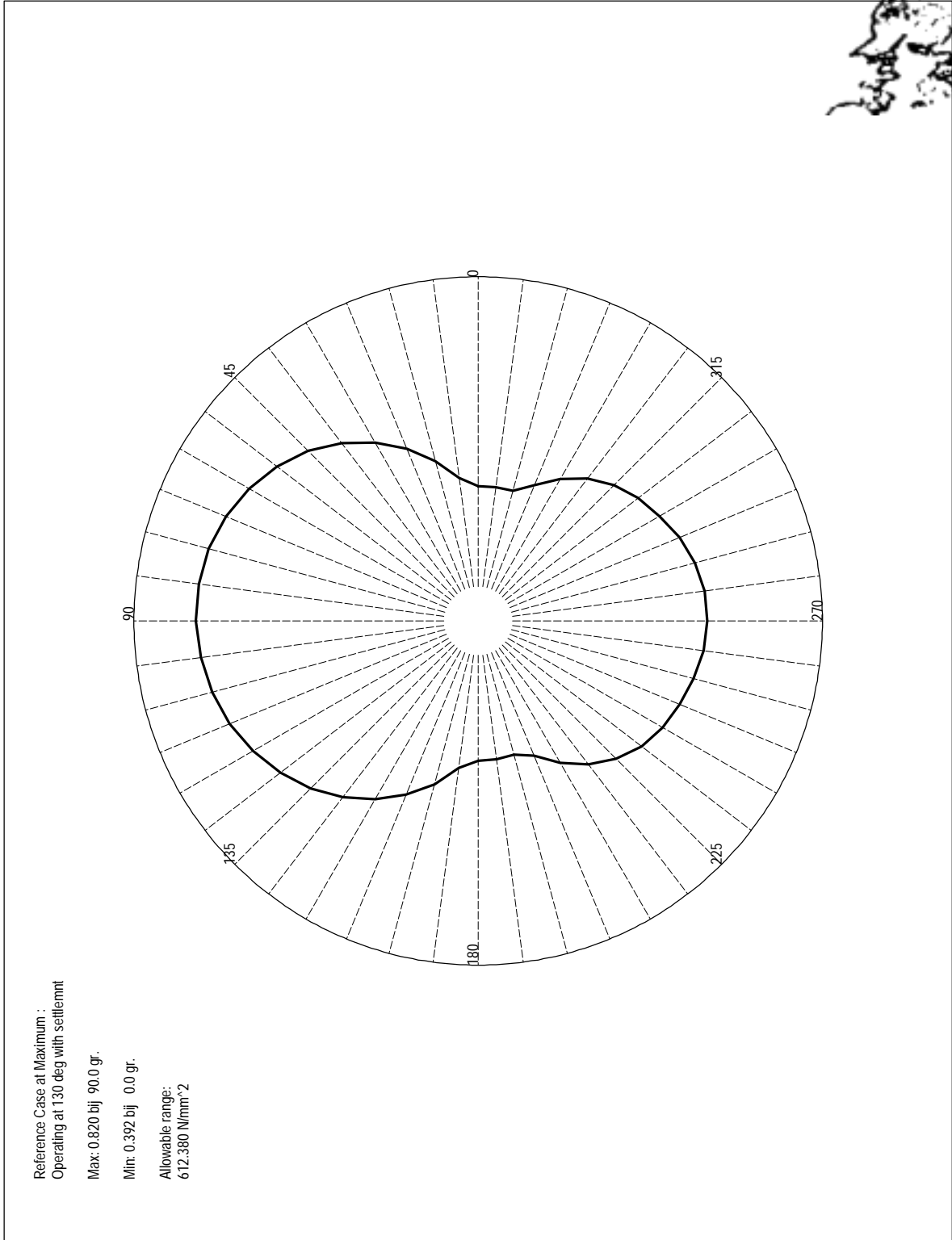
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TRESCA analyse : RATIO_OT

LOADCASE: Pre-stress at 70 deg C
Element : 715



Reference Case at Maximum :
Operating at 130 deg with settlement
Max: 0.820 bij 90.0 gr.
Min: 0.392 bij 0.0 gr.
Allowable range:
612.380 N/mm²

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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Pre-stress at 70 deg C

Refcase = Operating at 130 deg with settlement

SX Loadcase = -11.0170

Sx = SX Refcase Sx = -437.2400

SF Loadcase = -37.2680

Sf = SF Refcase Sf = 38.4330

TZ Loadcase = 0.00000

Tz = TZ Refcase Tz = 0.00000

$$S_{1 \text{ or } 2} = \frac{(SX - Sx) + (SF - Sf)}{2} + \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

$$S_{2 \text{ or } 1} = \frac{(SX - Sx) + (SF - Sf)}{2} - \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

S₁ = 426.2230

S₂ = -75.7010

S₃ = 0

S_{1,2} = S₁ - S₂

S_{2,3} = S₂ - S₃

S_{3,1} = S₃ - S₁

S_{1,2} = 501.9240

S_{2,3} = -75.7010

S_{3,1} = -426.2230

Traject is the maximum absolute magnitude of:

$$\left| S_{1,2} \right|, \left| S_{2,3} \right| \text{ \& } \left| S_{3,1} \right|$$

Traject = 501.9240

Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 612.380

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 0.820

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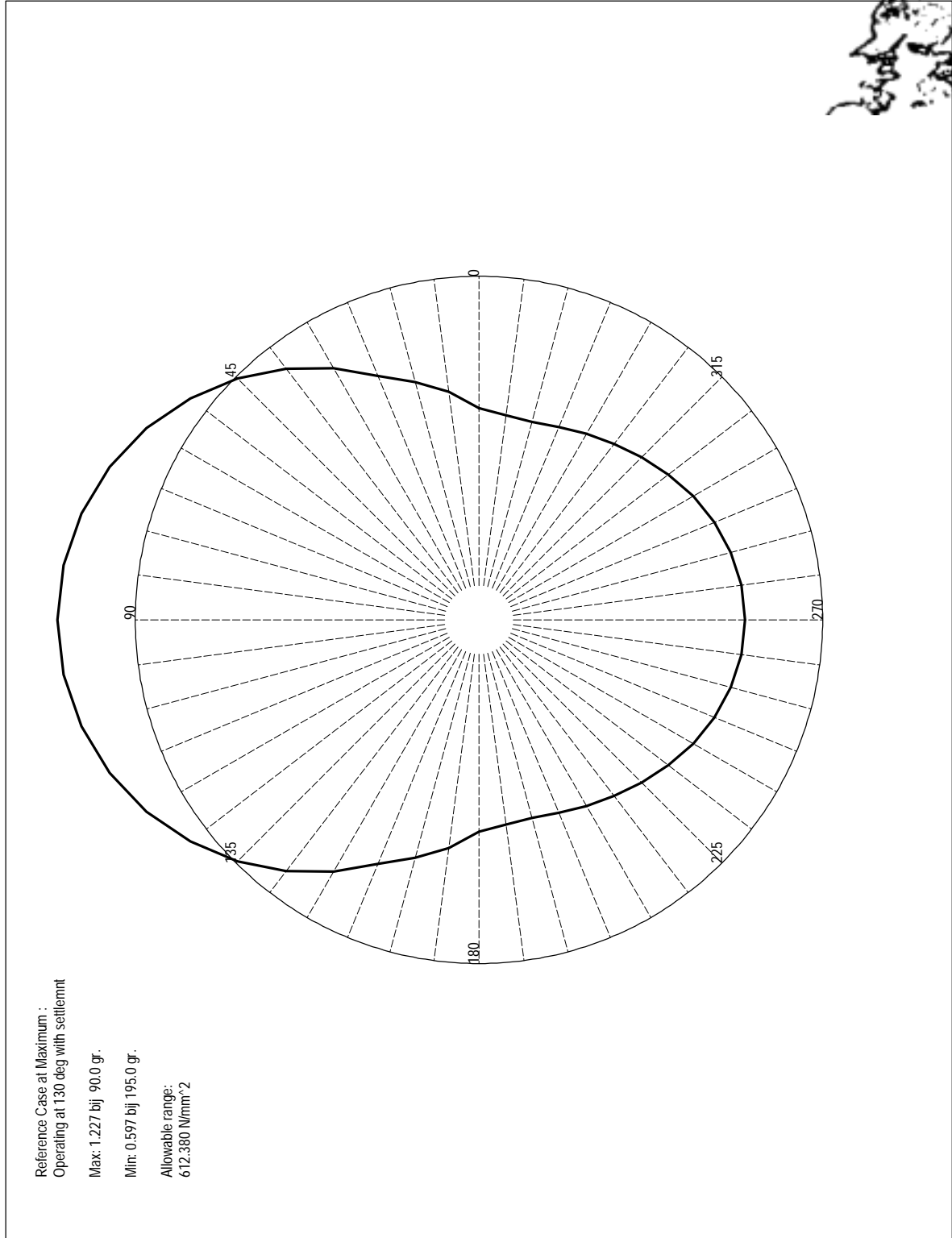
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Element : 715 LOADCASE: Decrease of temp from 70 to 10 deg TRESCA analyse : RATIO_OT



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ALTERNATING YIELDING ASSESSMENT
 TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

Date: Ma 06-Nov-2000

Time: 19:26:39

Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

Jobnr: PV2000



Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Decrease of temp from 70 to 10 deg Refcase = Operating at 130 deg with settlemnt

$$S_X \text{ Loadcase} = 142.9000 \qquad S_x = S_X \text{ Refcase} \qquad S_x = -437.2400$$

$$S_F \text{ Loadcase} = -132.5300 \qquad S_f = S_F \text{ Refcase} \qquad S_f = 38.4330$$

$$T_Z \text{ Loadcase} = -0.00000 \qquad T_z = T_Z \text{ Refcase} \qquad T_z = 0.00000$$

$$S_{1 \text{ or } 2} = \frac{(S_X - S_x) + (S_F - S_f)}{2} + \sqrt{\left[\frac{(S_X - S_x) - (S_F - S_f)}{2} \right]^2 + (T_Z - T_z)^2}$$

$$S_{2 \text{ or } 1} = \frac{(S_X - S_x) + (S_F - S_f)}{2} - \sqrt{\left[\frac{(S_X - S_x) - (S_F - S_f)}{2} \right]^2 + (T_Z - T_z)^2}$$

$$S_1 = 580.1400 \qquad S_2 = -170.9630 \qquad S_3 = 0$$

$$S_{1,2} = S_1 - S_2 \qquad S_{2,3} = S_2 - S_3 \qquad S_{3,1} = S_3 - S_1$$

$$S_{1,2} = 751.1030 \qquad S_{2,3} = -170.9630 \qquad S_{3,1} = -580.1400$$

Traject is the maximum absolute magnitude of:

$$\left| S_{1,2} \right| , \left| S_{2,3} \right| \text{ \& } \left| S_{3,1} \right|$$

$$\text{Traject} = 751.1030 \qquad \text{Allowable} = Re_{\text{Loadcase}} + Re_{\text{Refcase}}$$

$$\text{Allowable} = 612.380$$

$$\text{Ratio} = \frac{\text{Traject}}{\text{Allowable}}$$

$$\text{Ratio} = 1.227$$

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ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

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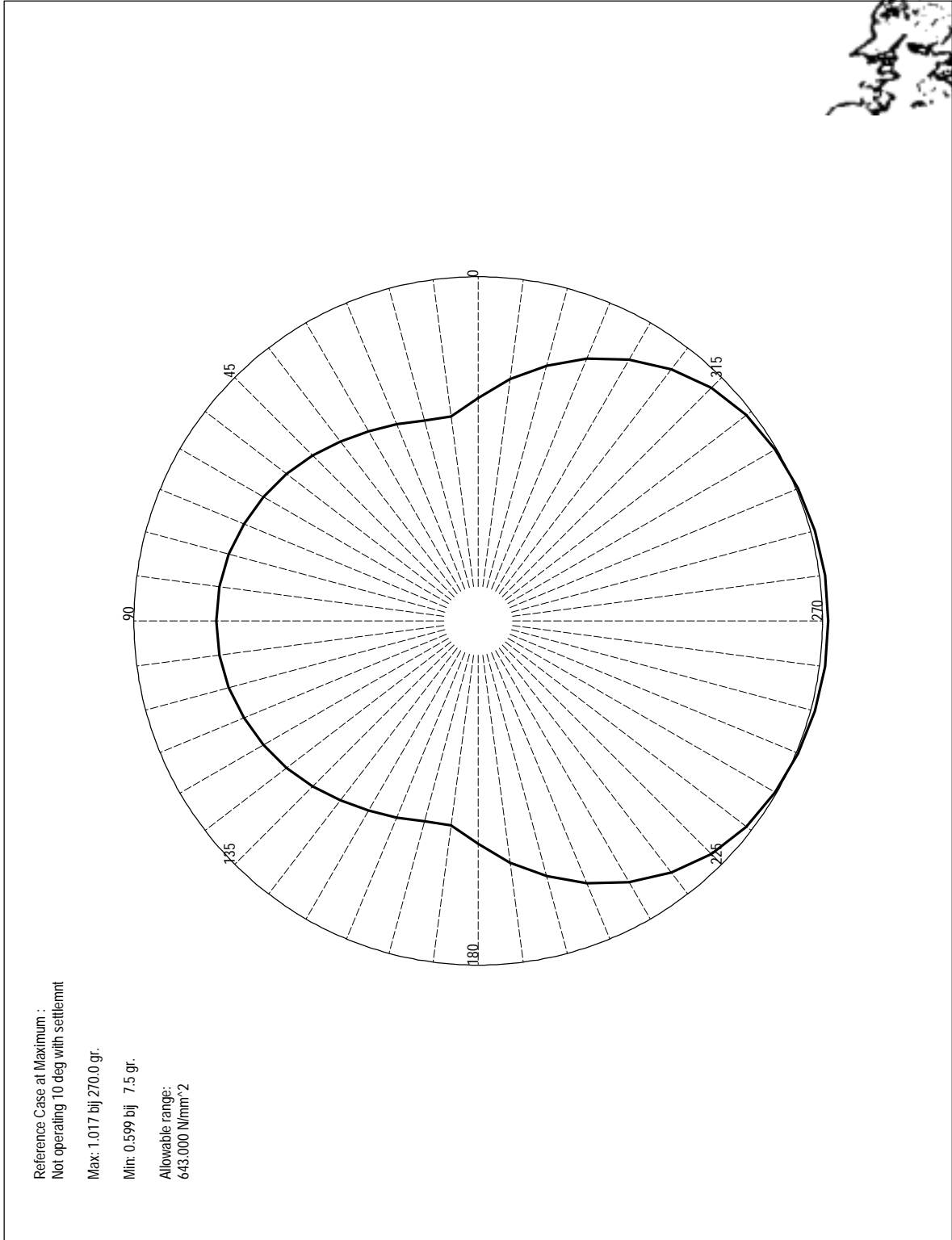
Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

Jobnr: PV2000



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Element : 715 LOADCASE: Operating at 130 deg no settlement TRESCA analyse : RATIO_OT



Reference Case at Maximum :
 Not operating 10 deg with settlement
 Max: 1.017 bij 270.0 gr.
 Min: 0.599 bij 7.5 gr.
 Allowable range:
 643.000 N/mm²

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ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

Date: Ma 06-Nov-2000

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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Operating at 130 deg no settlement Refcase = Not operating 10 deg with settlement

SX = -186.4700 Sx = SX Sx = 434.9800
Loadcase Refcase

SF = -13.3980 Sf = SF Sf = -45.8530
Loadcase Refcase

TZ = 0.00000 Tz = TZ Tz = -0.00000
Loadcase Refcase

$$S_{1 \text{ or } 2} = \frac{(SX - Sx) + (SF - Sf)}{2} + \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

$$S_{2 \text{ or } 1} = \frac{(SX - Sx) + (SF - Sf)}{2} - \sqrt{\left[\frac{(SX - Sx) - (SF - Sf)}{2} \right]^2 + (TZ - Tz)^2}$$

S₁ = -621.4500 S₂ = 32.4550 S₃ = 0

S_{1,2} = S₁ - S₂ S_{2,3} = S₂ - S₃ S_{3,1} = S₃ - S₁

S_{1,2} = -653.9050 S_{2,3} = 32.4550 S_{3,1} = 621.4500

Traject is the maximum absolute magnitude of:

|S_{1,2}| , |S_{2,3}| & |S_{3,1}|

Traject = 653.9050 Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 643.000

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 1.017

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ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

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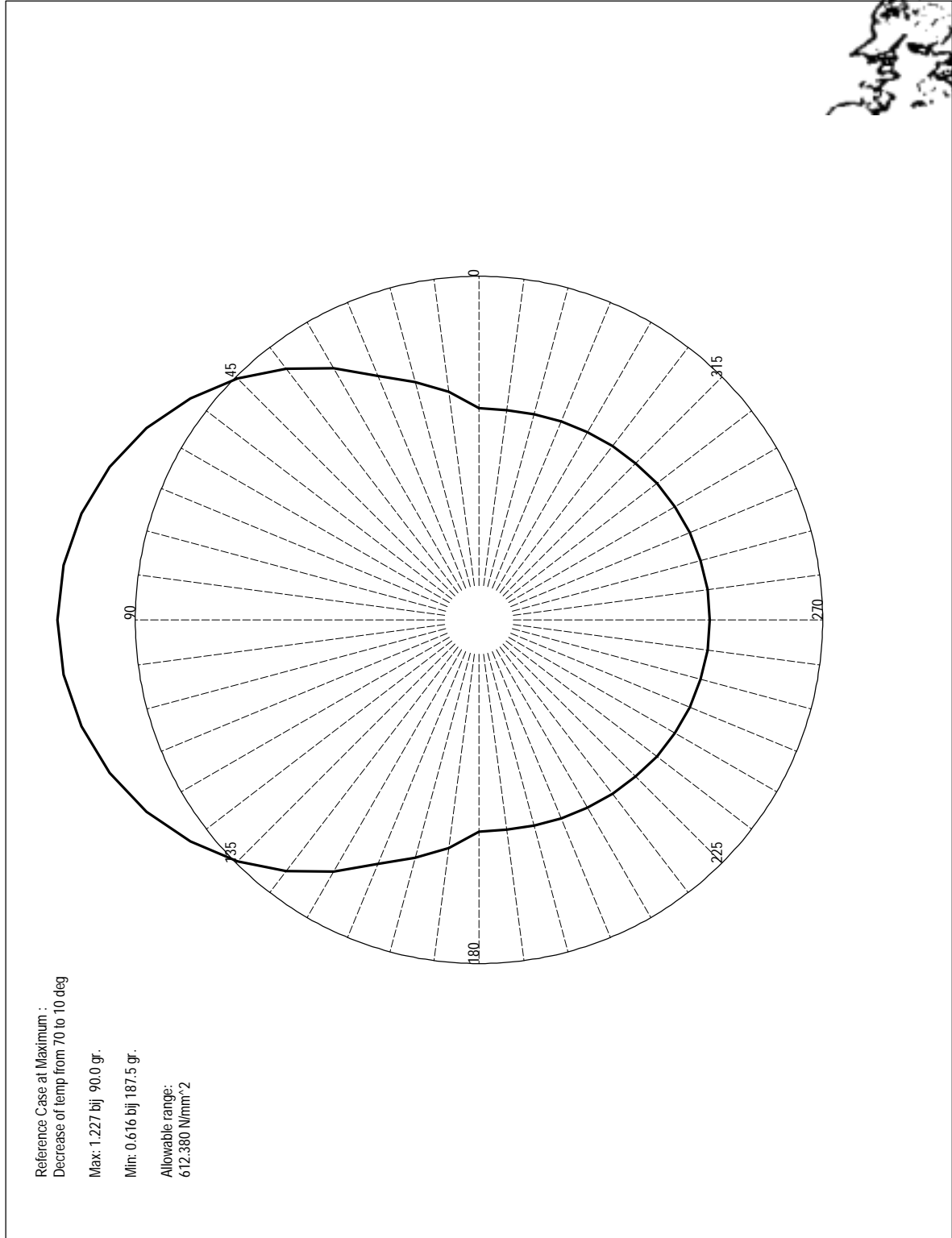
Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

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Element : 715 LOADCASE: Operating at 130 deg with settlement TRESCA analyse : RATIO_OT



Reference Case at Maximum :
 Decrease of temp from 70 to 10 deg
 Max: 1.227 bij 90.0 gr.
 Min: 0.616 bij 187.5 gr.
 Allowable range:
 612.380 N/mm²

ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

Date: Ma 06-Nov-2000

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Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Operating at 130 deg with settlement Refcase = Decrease of temp from 70 to 10 deg

SX_{Loadcase} = -437.2400 S_x = SX_{Refcase} S_x = 142.9000

SF_{Loadcase} = 38.4330 S_f = SF_{Refcase} S_f = -132.5300

TZ_{Loadcase} = 0.00000 T_z = TZ_{Refcase} T_z = -0.00000

$$S_{1 \text{ or } 2} = \frac{(S_X - S_x) + (S_F - S_f)}{2} + \sqrt{\left[\frac{(S_X - S_x) - (S_F - S_f)}{2} \right]^2 + (T_Z - T_z)^2}$$

$$S_{2 \text{ or } 1} = \frac{(S_X - S_x) + (S_F - S_f)}{2} - \sqrt{\left[\frac{(S_X - S_x) - (S_F - S_f)}{2} \right]^2 + (T_Z - T_z)^2}$$

S₁ = -580.1400 S₂ = 170.9630 S₃ = 0

S_{1,2} = S₁ - S₂ S_{2,3} = S₂ - S₃ S_{3,1} = S₃ - S₁

S_{1,2} = -751.1030 S_{2,3} = 170.9630 S_{3,1} = 580.1400

Traject is the maximum absolute magnitude of:

$|S_{1,2}|$, $|S_{2,3}|$ & $|S_{3,1}|$

Traject = 751.1030 Allowable = Re_{Loadcase} + Re_{Refcase}

Allowable = 612.380

Ratio = $\frac{\text{Traject}}{\text{Allowable}}$

Ratio = 1.227

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ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

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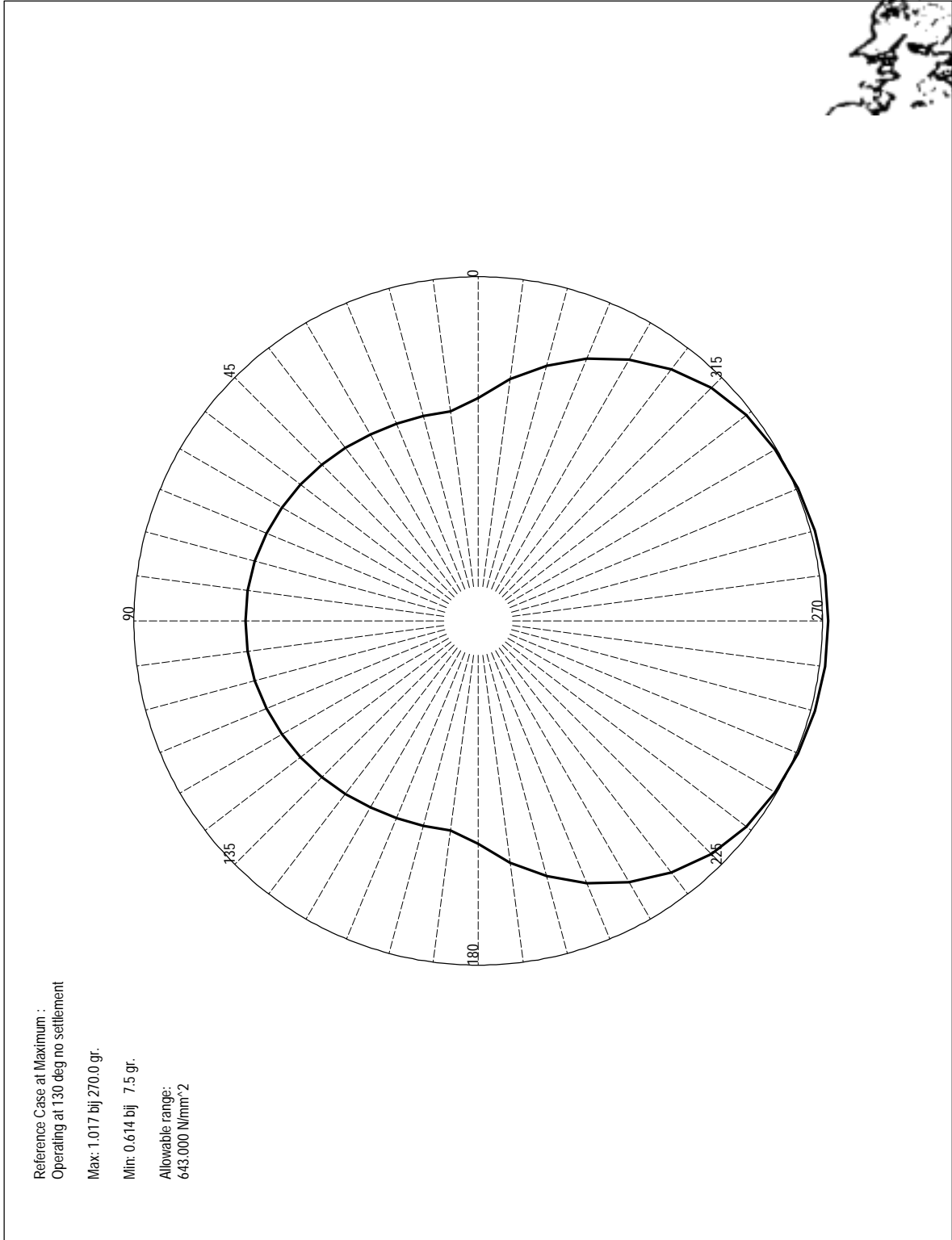
Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

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Element : 715 LOADCASE: Not operating 10 deg with settlement TRESCA analyse : RATIO_OT



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ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

Date: Ma 06-Nov-2000

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Calculation according ASME VIII div. 2 appendix 5 par. 5-110.3b at the location with the combination giving the highest ratio:

Loadcase = Not operating 10 deg with settlement Refcase = Operating at 130 deg no settlement

$$S_X \text{ Loadcase} = 434.9800 \qquad S_x = S_X \text{ Refcase} \qquad S_x = -186.4700$$

$$S_F \text{ Loadcase} = -45.8530 \qquad S_f = S_F \text{ Refcase} \qquad S_f = -13.3980$$

$$T_Z \text{ Loadcase} = -0.00000 \qquad T_z = T_Z \text{ Refcase} \qquad T_z = 0.00000$$

$$S_{1 \text{ or } 2} = \frac{(S_X - S_x) + (S_F - S_f)}{2} + \sqrt{\left[\frac{(S_X - S_x) - (S_F - S_f)}{2} \right]^2 + (T_Z - T_z)^2}$$

$$S_{2 \text{ or } 1} = \frac{(S_X - S_x) + (S_F - S_f)}{2} - \sqrt{\left[\frac{(S_X - S_x) - (S_F - S_f)}{2} \right]^2 + (T_Z - T_z)^2}$$

$$S_1 = 621.4500 \qquad S_2 = -32.4550 \qquad S_3 = 0$$

$$S_{1,2} = S_1 - S_2 \qquad S_{2,3} = S_2 - S_3 \qquad S_{3,1} = S_3 - S_1$$

$$S_{1,2} = 653.9050 \qquad S_{2,3} = -32.4550 \qquad S_{3,1} = -621.4500$$

Traject is the maximum absolute magnitude of:

$$|S_{1,2}| \quad , \quad |S_{2,3}| \quad \& \quad |S_{3,1}|$$

$$\text{Traject} = 653.9050 \qquad \text{Allowable} = Re_{\text{Loadcase}} + Re_{\text{Refcase}}$$

$$\text{Allowable} = 643.000$$

$$\text{Ratio} = \frac{\text{Traject}}{\text{Allowable}}$$

$$\text{Ratio} = 1.017$$

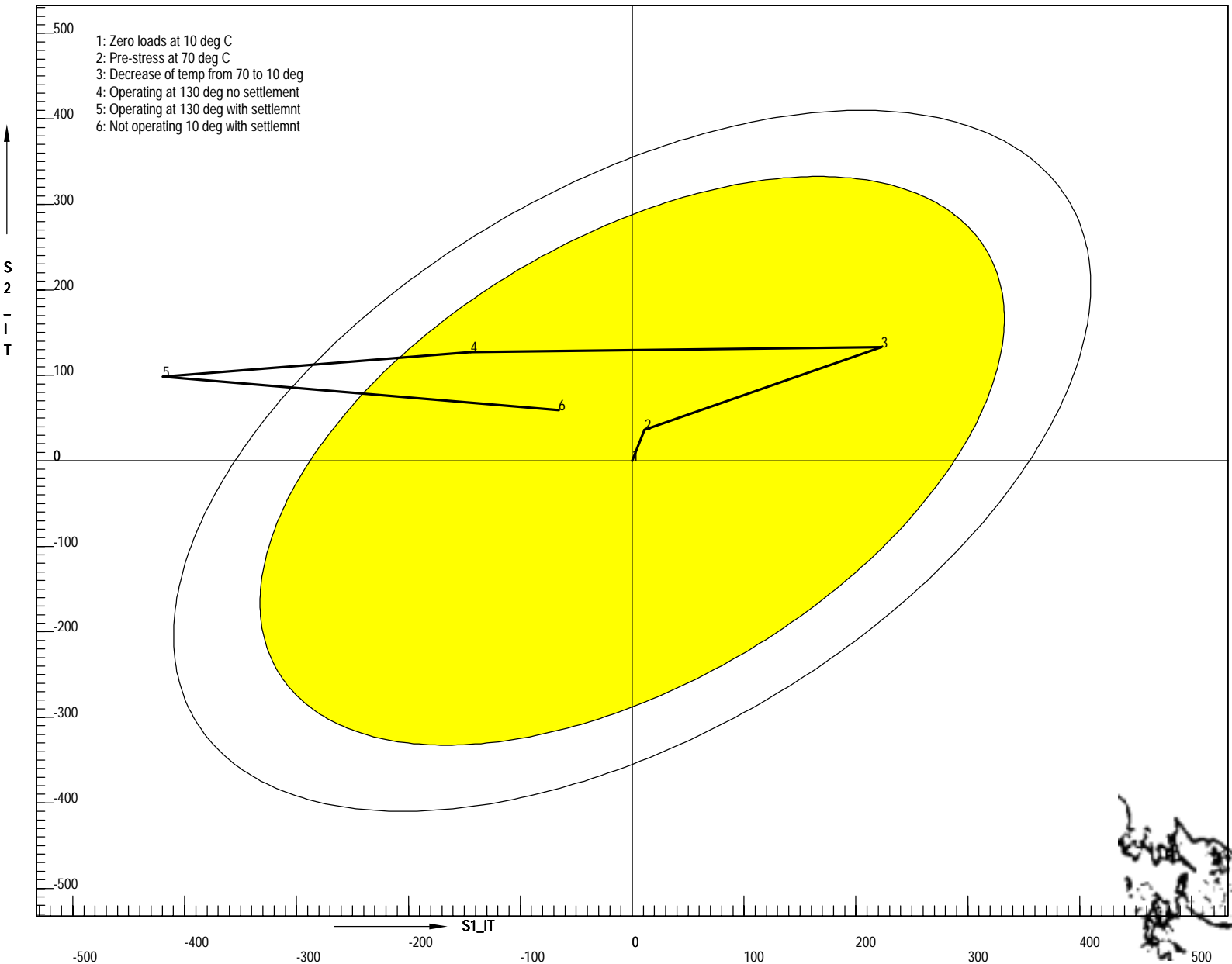
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ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

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Element: 715 YIELDING ENVELOPE Angle: 90.0



ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

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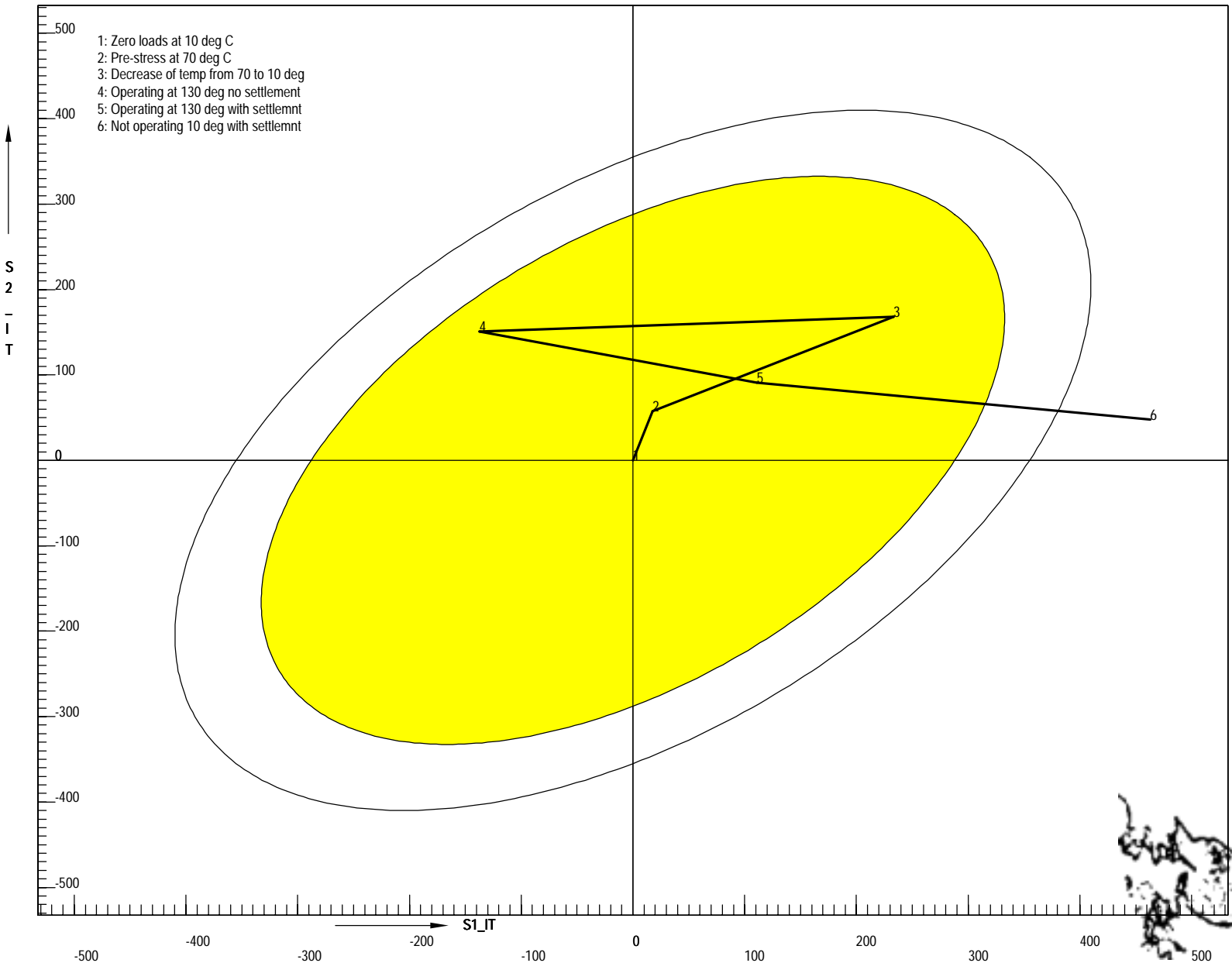
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Element: 715 YIELDING ENVELOPE Angle: 270.0



ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

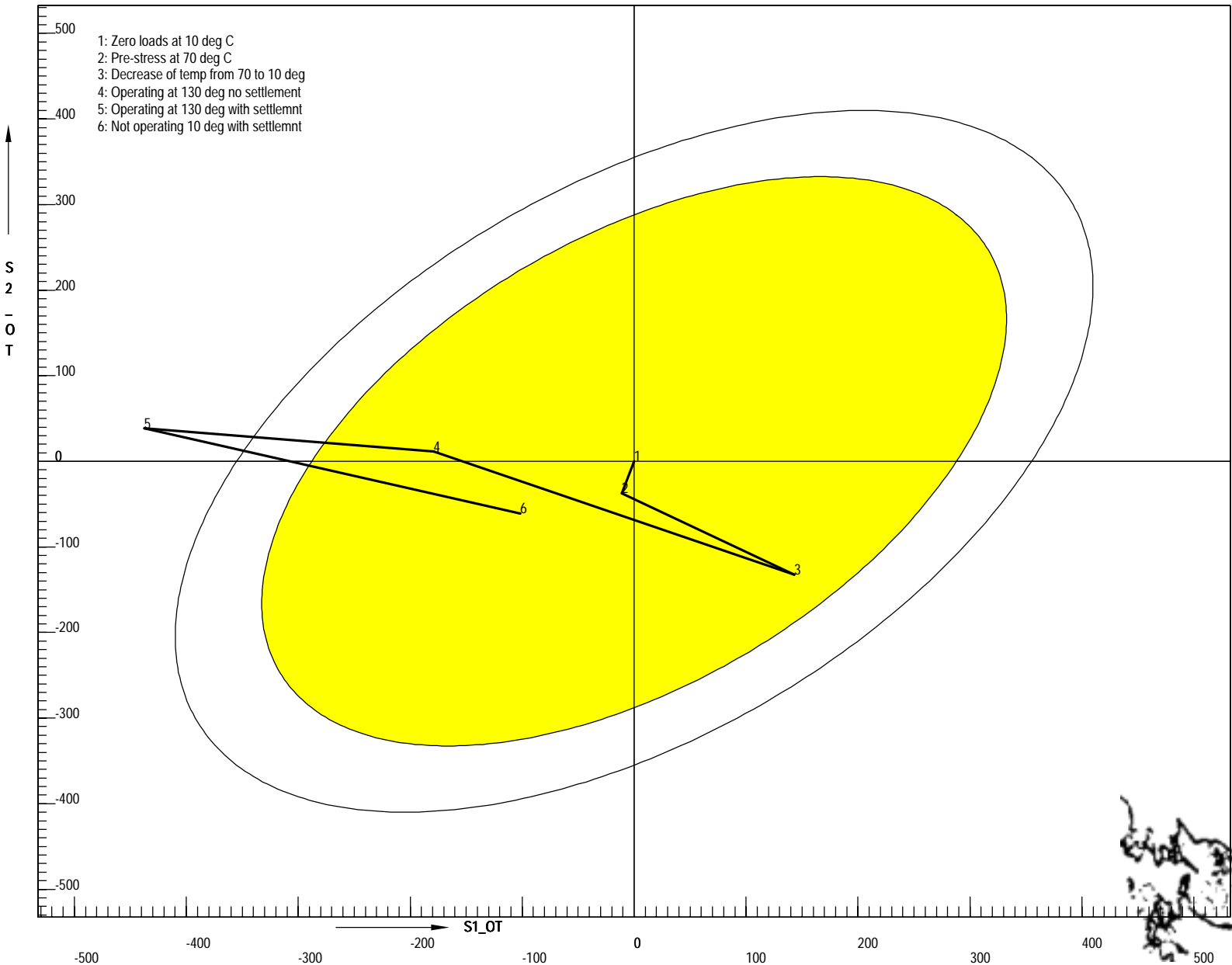
Project: IMPROVEMENTS OF FUTURE DEVELOPMENTS

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Element: 715 YIELDING ENVELOPE Angle: 90.0



ALTERNATING YIELDING ASSESSMENT
TRESCA SHEAR ANALYSIS AND YIELDING ENVELOPE METHOD

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Element: 715 YIELDING ENVELOPE Angle: 270.0

