<div style="background-color:red; text-align:center;">

Buckling Proof according to EC 1993 Part 1-5

</div>

<div style="background-color:red; text-align:center;">

3.2 Effective width for elastic shear lag

</div>

Shear lag reduction for flange 1

Shear Lag is not neglectable

alpha_0: 1.6

Beta: 0.3760575260584114

N. Hasler, V. Müller

Shear lag reduction for flange 3

Shear Lag is not neglectable

alpha_0: 1.3

Beta: 0.5236984959156253

4.4 Plate elements without longitudinal stiffeners

Iteratively changing the widths until M_Rd_el_eff converges to a limit of 0.02

4.5 Stiffened plate elements with longitudinal stiffeners

Side 2

4.5.2 Plate type behaviour

sigma_cr = 647.1173214885462

Lambda: 0.4925948314552917

Rho_Global: 1.0

4.5.3 Column type buckling behaviour

Column number 9

A_sl=11037.28, A_sl_eff=11037.28, I_sl=3667917.75

sigma_cr_c=6.88

e1=46.26, e2=19.18

All tension =False

Buckling Values 9

beta_A_c =1.0

lambda_c_bar =5.841115057257947

Phi_c =18.6183345221545

Chi_c =0.027550732239723413

Critical buckling values

Chi_c: 0.027550732239723413

sigma_cr_c: 6.887733583276271

4.5.4 Interaction between plate and column buckling

all_tension: False

rho_c = 1.0

Side 3

4.5.2 Plate type behaviour

sigma_cr = 196.97070245156127

Lambda: 1.0221661849854666

Rho_Global: 0.7677526624989135

4.5.3 Column type buckling behaviour

Column number 9

A_sl=11236.06, A_sl_eff=9727.08, I_sl=3669574.27

sigma_cr_c=6.76

e1=46.6, e2=18.85

All tension =False

Buckling Values 9

beta_A_c =0.865702138054174

lambda_c_bar =5.482239366006242

Phi_c =16.51763569613497

Chi_c =0.031153667484684

Column number 10

A_sl=10736.06, A_sl_eff=9627.68, I_sl=3665407.6

sigma_cr_c=7.07

e1=45.72, e2=19.72

All tension =False

Buckling Values 10

beta_A_c =0.8967606941363484

lambda_c_bar =5.457254166667382

Phi_c =16.380149308576772

Chi_c =0.03142234143914499

Column number 11

A_sl=11236.06, A_sl_eff=9727.08, I_sl=3669574.27

sigma_cr_c=6.76

e1=46.6, e2=18.85

All tension =False

Buckling Values 11

beta_A_c =0.865702138054174

lambda_c_bar =5.482239366006242

Phi_c =16.51763569613497

Chi_c =0.031153667484684

Critical buckling values

Chi_c: 0.031153667484684

sigma_cr_c: 6.768935327624952

4.5.4 Interaction between plate and column buckling

all_tension: False

rho_c = 0.7677526624989135

Side 4

4.5.2 Plate type behaviour

sigma_cr = 336.11819665066594

Lambda: 0.6834950138534629

Rho_Global: 1.0

4.5.3 Column type buckling behaviour

Column number 12

A_sl=11037.28, A_sl_eff=11037.28, I_sl=3667917.75

sigma_cr_c=6.88

e1=46.26, e2=19.18

All tension =False

Buckling Values 12

beta_A_c =1.0

lambda_c_bar =5.841115057257945

Phi_c =18.618334522154488

Chi_c =0.02755073223972343

Critical buckling values

Chi_c: 0.02755073223972343

sigma_cr_c: 6.887733583276276

4.5.4 Interaction between plate and column buckling

all_tension: False

rho_c = 1.0

Resistance to shear and interaction shear force and bending moment for side 1

5. Resistance to shear

   stiffened plate; EBPlate

   k_tau: 948.2774921507366

   eta_3: 0.051375883668685667

7.1 Interaction between shear force, bending moment and axial force

Flange -> (7.1), comment (5)

   eta_3 <= 0.5; no interaction needed

   utilisation: -1

Proofing Resistance to shear for each subpanel

5. Resistance to shear

   unstiffened plate; (A.5)

   k_tau: 5.357777777777778

   eta_3: 0.03606453706148659

   eta_3_panel < 1: pass subpanel

5. Resistance to shear

   unstiffened plate; (A.5)

   k_tau: 5.357777777777778

   eta_3: 0.030912460338417068

   eta_3_panel < 1: pass subpanel

5. Resistance to shear

   unstiffened plate; (A.5)

   k_tau: 5.357777777777778

   eta_3: 0.025760383615347562

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.020608306892278043

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.01545623016920853

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.010304153446139021

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.005152076723069509

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 4.392924827586891e-18

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.005152076723069517

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.010304153446139028

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.015456230169208544

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.020608306892278053

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.025760383615347566

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.03091246033841709

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.357777777777778

eta_3: 0.036064537061486594

eta_3_panel < 1: pass subpanel

<div style="background-color:red; color:black; text-align:center; padding:8px;">

Resistance to shear and interaction shear force and bending moment for side 2

</div>

5. Resistance to shear

stiffened plate; EBPlate

k_tau: 14.216809210526318

eta_3: 0.17032488529657744

7.1 Interaction between shear force, bending moment and axial force

Web -> (7.1) without iterating

eta_3 <= 0.5; no interaction needed

utilisation: -1

<div style="background-color:red; text-align:center;">Resistance to shear and interaction shear force and bending moment for side 3</div>

5. Resistance to shear

  stiffened plate; EBPlate

  k_tau: 136.7972160282359

  eta_3: 0.04757437788172558

7.1 Interaction between shear force, bending moment and axial force

Flange -> (7.1), comment (5)

  eta_3 <= 0.5; no interaction needed

  utilisation: -1

Proofing Resistance to shear for each subpanel

5. Resistance to shear

  unstiffened plate; (A.5)

  k_tau: 5.445625

  eta_3: 0.03903292055389067

  eta_3_panel < 1: pass subpanel

5. Resistance to shear

  unstiffened plate; (A.5)

  k_tau: 5.35

  eta_3: 0.024914630140781283

  eta_3_panel < 1: pass subpanel

5. Resistance to shear

  unstiffened plate; (A.5)

  k_tau: 5.4156249999999995

  eta_3: 0.01245731507039064

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.35

eta_3: 0.001660975342718752

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.4156249999999995

eta_3: 0.01245731507039064

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.35

eta_3: 0.024914630140781283

eta_3_panel < 1: pass subpanel

5. Resistance to shear

unstiffened plate; (A.5)

k_tau: 5.445625

eta_3: 0.03903292055389067

eta_3_panel < 1: pass subpanel

<div style="background-color:red">Resistance to shear and interaction shear force and bending moment for side 4</div>

5. Resistance to shear

stiffened plate; EBPlate

k_tau: 14.216809210526318

eta_3: 0.17032488529657744

7.1 Interaction between shear force, bending moment and axial force

Web -> (7.1) without iterating

eta_3 <= 0.5; no interaction needed

utilisation: -1