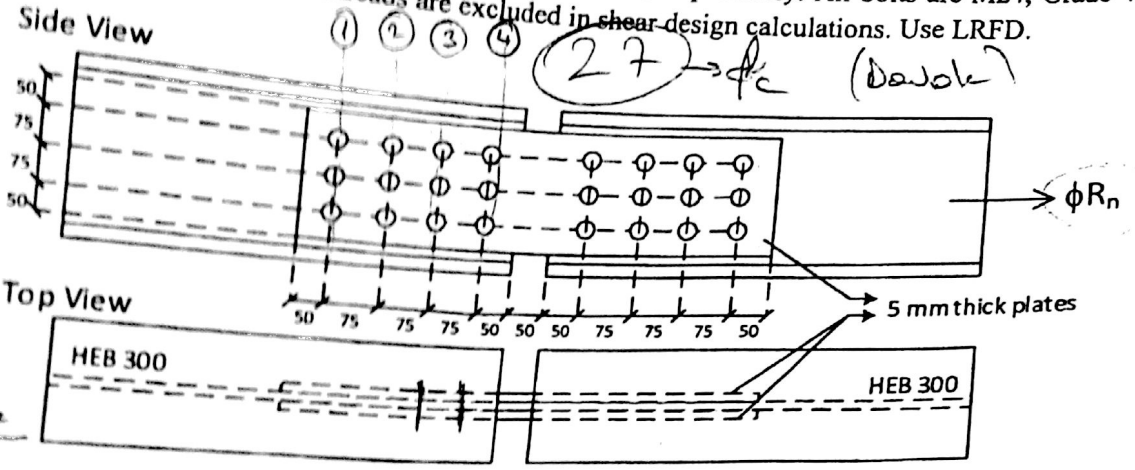
4. For the bearing type connection shown below, determine the connection's tensile force capacity (ϕR_n) based on bolted connection limit states only. The HEB 300 members and 5 mm plates are made of S235 (F_y (σ_y) = 235 MPa, F_u (σ_u) = 380 MPa) class steel and S275 (F_y (σ_y) = 275 MPa, F_u (σ_u) = 430 MPa) class steel, respectively. All bolts are M24, Grade 4.6 with standard holes. Threads are excluded in shear design calculations. Use LRFD.



27 → d_c (Davoki)

Double shear

HEB 300 → S235, t_w = 11mm (F_u = 380)
Plates → S275, t = 5mm (F_u = 430)
A325 → F_u = 400MPa, A_b = 452mm²
F_{nv} = 0,563 F_u = 225,2 MPa

Bolt Shear

$R_n = F_{nv} A_b$ = 101,79 kN
ϕR_n = 96,34 kN/bolt ×2

Bearing of plate

① → l_c = 50 + 27/2 = 36,5 < 48 = 2d
R_n = 1,2 l_c t F_u = 94,17
ϕR_n = 70,63 kN/bolt ×2

③④ l_c = 75 − 27 = 48 ≥ 2d = 48
R_n = 2,4 d t F_u = 123,84
ϕR_n = 92,88 kN/bolt ×2

Bearing HEB300 web

①②③ l_c = 75 − 27 = 48 ≥ 2d
R_n = 2,4 · 24 · 11 · 380 = 240kN
ϕR_n = 180,5 kN/bolt

④ l_c = 50 − 13,5 = 36,5 < 2d
R_n = 1,2 · 36,5 · 11 · 380 = 183
ϕR_n = 137,3 kN/bolt

For HEB30 section
↳ ϕR_n
For plate $\frac{\phi R_n}{2}$
Also 2 shear planes for each bolt

Shear	Plate Bear.	HEB 300 Bear.	N/A
152,68	141,26	180,58	141,26
152,68	185,76	180,58	152,68
152,68	185,76	180,58	152,68
152,68	185,76	137,3	+ 137,3

Σ = 583,92 × 3 (bolts in line) = 1751,76 kN = ϕR_n

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