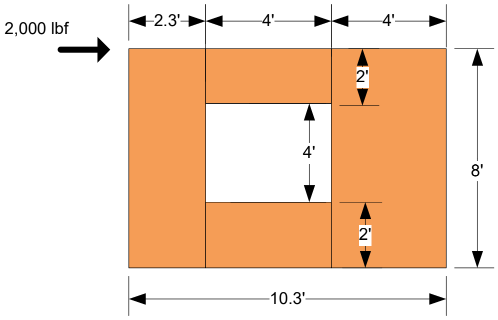
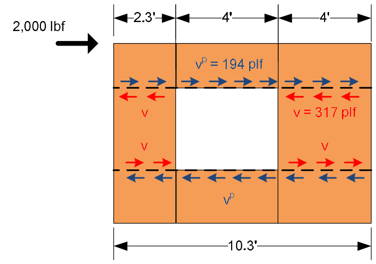
Force Transfer Around Openings (FTAO) Design Examples

Design Examples



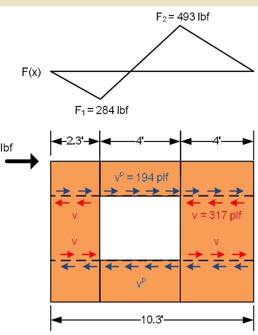
Ex. 1 – Drag Strut Analogy

- v^p = 2,000/(10.3) = 194 plf
- v = 2,000/(2.3 + 4) = 317 plf



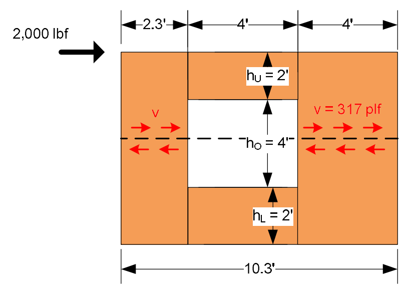
Ex. 1 – Drag Strut Analogy

- F_1 = (317-194)*2.3 = 284 lbf
- F_2 = (317-194)*4 = 493 lbf



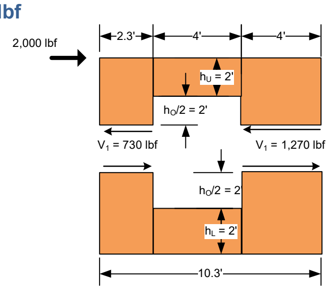
Ex. 2 – Cantilever Beam Analogy

- v = 2,000/(2.3 + 4) = 317 plf



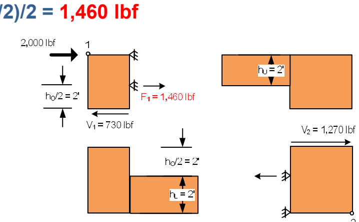
Ex. 2 – Cantilever Beam Analogy

- V_1 = 317 * 2.3 = 730 lbf
- V_2 = 317 * 4 = 1,270 lbf



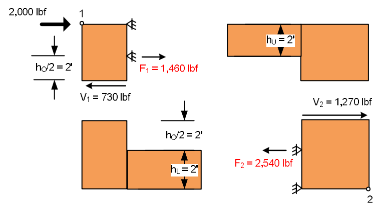
Ex. 2 – Cantilever Beam Analogy

- ΣM_1
- $F_1 * h_U = V_1 * (h_U + h_O/2)$
- F_1 * 2 = 730 * (2 + 4/2)
- F_1 = 730 * (2 + 4/2)/2 = 1,460 lbf



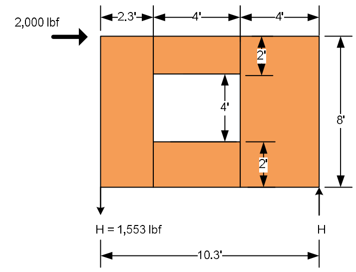
Ex. 2 – Cantilever Beam Analogy

- **ΣM_2**
- **$F_2 * h_L = V_2 * (h_L + h_O/2)$**
- **$F_2 * 2 = 1{,}270 * (2 + 4/2)$**
- **$F_2 = 1{,}270 * (2 + 4/2)/2 = 2{,}540$ lbf**



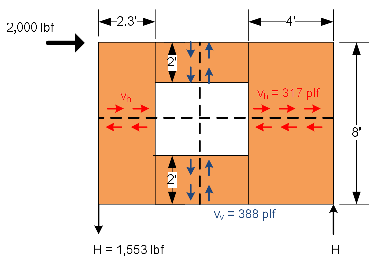
Ex. 3 – Diekmann Technique

- **H = (2,000 * 8)/10.3 = 1,553 lbf**



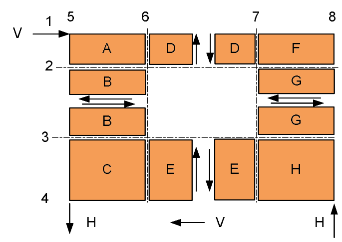
Ex. 3 – Diekmann Technique

- **$v_h = 2{,}000/(2.3+4) = 317$ plf**
- **$v_v = 1{,}553/(2+2) = 388$ plf**



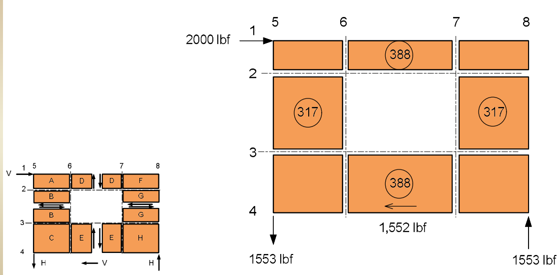
Ex. 3 – Diekmann Technique

- **$v_h = 2{,}000/(2.3+4) = 317$ plf = $(V_B = V_G)$**
- **$v_v = 1{,}553/(2+2) = 388$ plf = $(V_E = V_D)$**



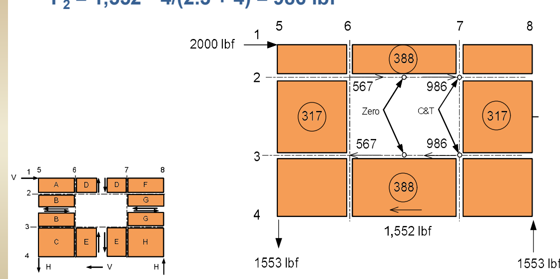
Ex. 3 – Diekmann Technique

- **F = 388 * 4 = 1,552 lbf**



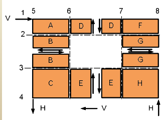
Ex. 3 – Diekmann Technique

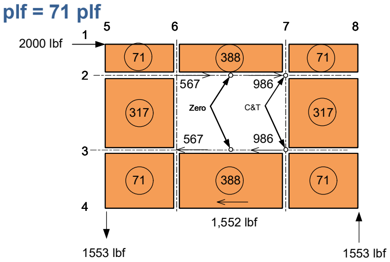
- **$F_1 = 1{,}552 * 2.3/(2.3 + 4) = 567$ lbf**
- **$F_2 = 1{,}552 * 4/(2.3 + 4) = 986$ lbf**



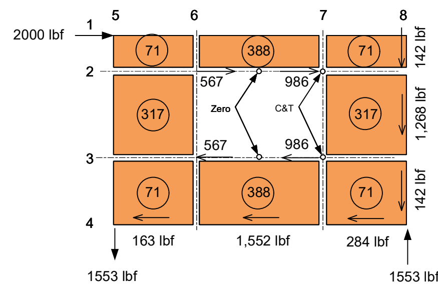
Ex. 3 – Diekmann Technique

- $V_A = V_C = V_F = V_H =$
  567/2.3 = 246 plf
  317 plf – 246 plf = 71 plf





Ex. 3 – Diekmann Technique



Design Example Summary

Drag Strut Analogy

- F_1 = 284 lbf
- F_2 = 493 lbf

Cantilever Beam Analogy

- F_1 = 1,460 lbf
- F_2 = 2,540 lbf

Diekmann Method

- F_1 = 567 lbf
- F_2 = 986 lbf