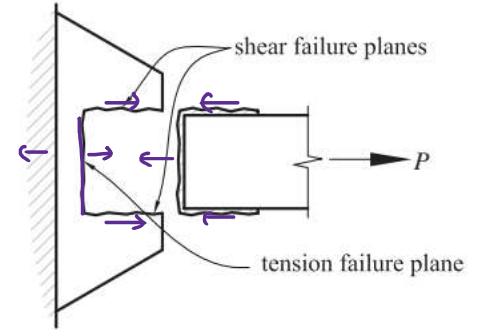
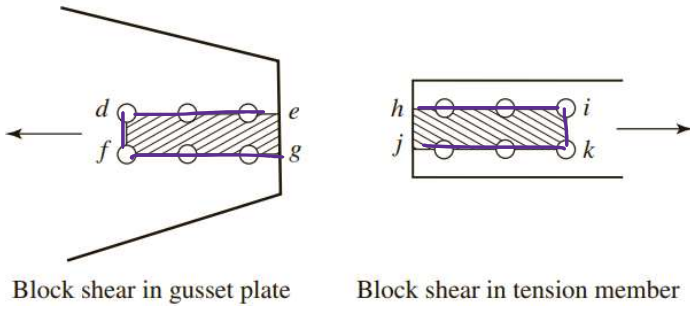
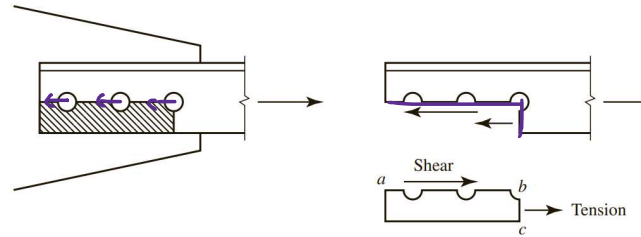
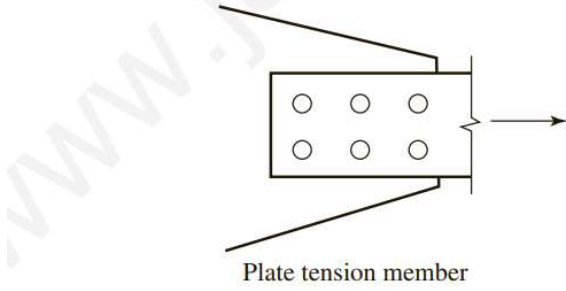
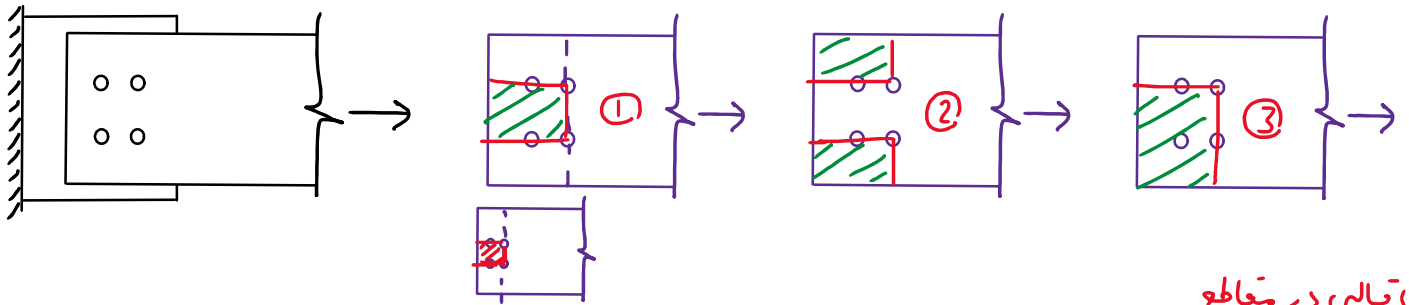


پریش قالبی Block Shear

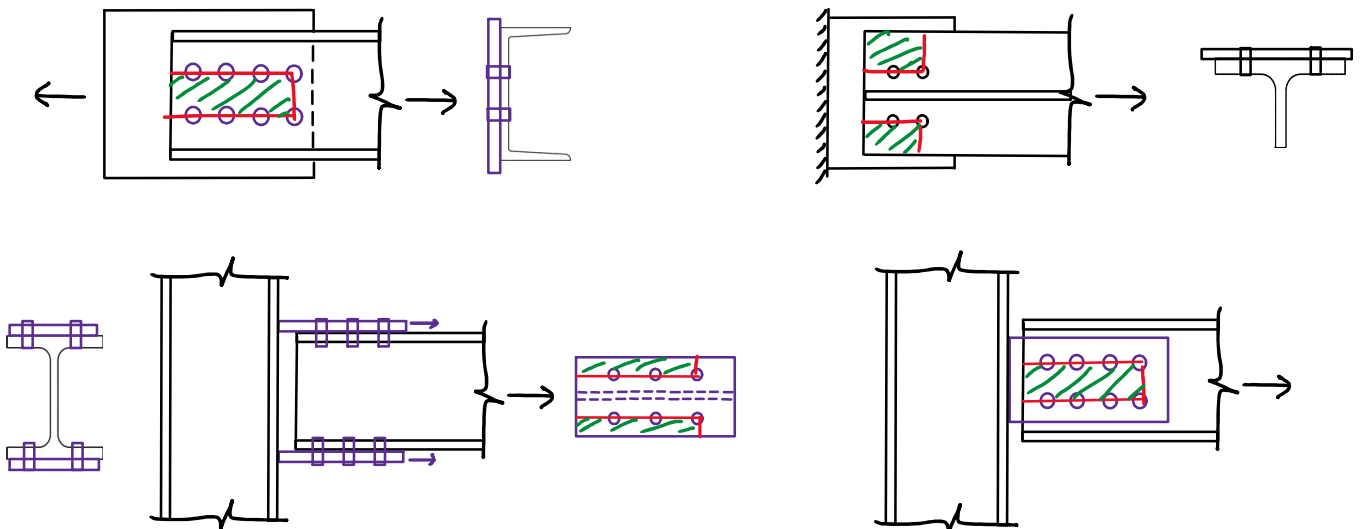


پریش قالبی در ورق

$$F_u A_e$$



پریش قالبی در مقاطع



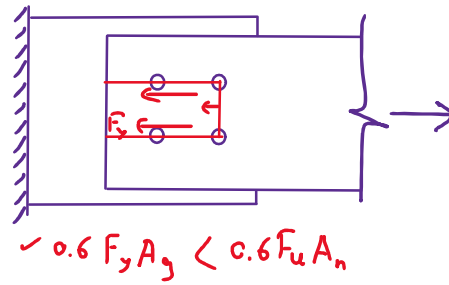
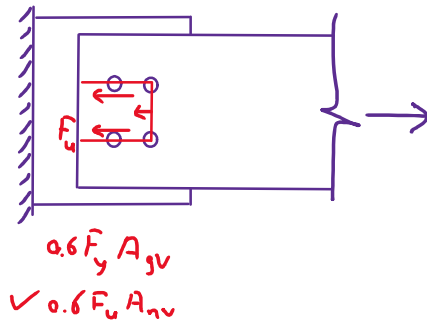
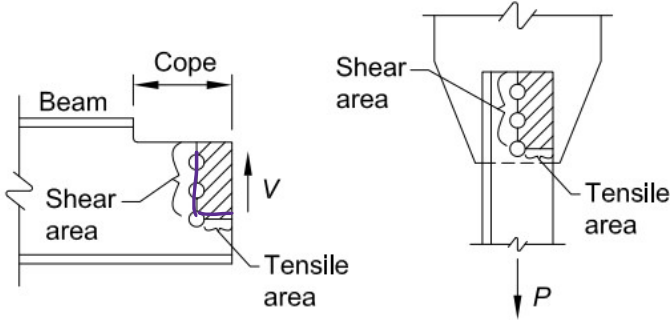
برش نالی مبحث دهم ۱۴۰۱ ص ۲۱۹

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$$R_n = 0.60F_u A_{nv} + U_{bs} F_u A_{nt} \leq 0.60F_y A_{gv} + U_{bs} F_u A_{nt}$$

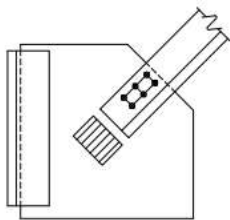
$$\phi = 0.75 \text{ (LRFD)} \quad \Omega = 2.00 \text{ (ASD)}$$

Failure by tearing out of shaded portion

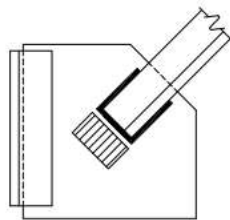


ضریب توزیع تنش  $U_{bs}$

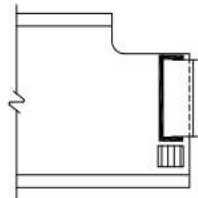
\* در اعضا کتی همیشه  $U_{bs} = 1.0$  است.



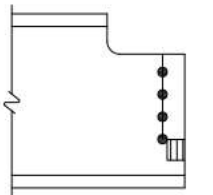
Bolted Angle



Welded Angle



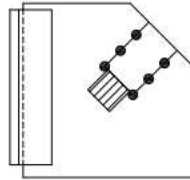
Welded Angle



Single-Row Beam End Connections

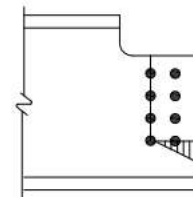


Angle Ends



Gusset Plates

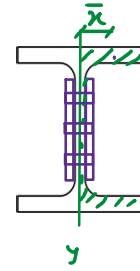
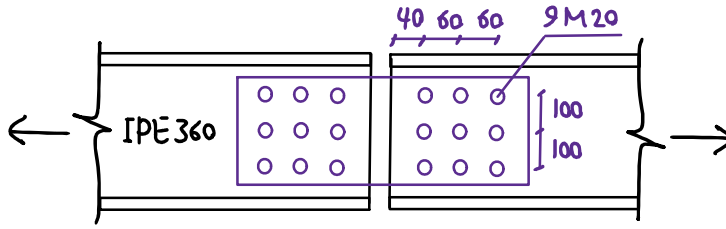
(a) Cases for which  $U_{bs} = 1.0$



Multiple-Row Beam-End Connections

(b) Cases for which  $U_{bs} = 0.5$

مثال: مقاومت طراحی عضو را به دست آورید و در صورت نیاز طرح را اصلاح کنید.



IPE360:  $A_g = 72.7 \times 10^2 \text{ mm}^2$ ,  $b_f = 170$ ,  $t_w = 8$ ,  $t_f = 12.7$   
 $Z_x = 1019 \times 10^3 \text{ mm}^3$ ,  $Z_y = 191 \times 10^3 \text{ mm}^3$

① Yield of Gross Section

$\phi P_n = 0.6 F_y A_g = 0.6 \times 235 \times 72.7 \times 10^2 = \underline{1538} \text{ kN}$

② Fracture of Net Section

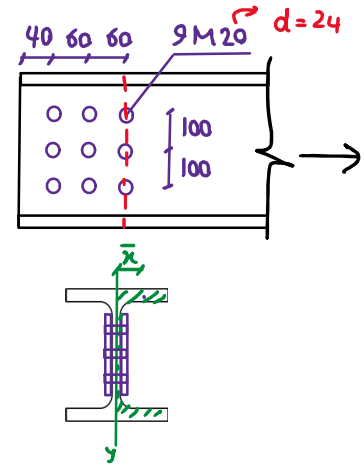
$A_n = 72.7 \times 10^2 - 3(24 \times 8) = 66.9 \times 10^2 \text{ mm}^2$

$\bar{x} = \frac{Z_y}{A_g} = \frac{191 \times 10^3}{72.7 \times 10^2} = 26.3 \text{ mm}$

Case 2:  $U = 1 - \frac{\bar{x}}{l} = 1 - \frac{26.3}{120} = 0.78 > \frac{A_1}{A_g} \checkmark$

$A_e = U A_n = 0.78 \times 66.9 \times 10^2 = 52.2 \times 10^2 \text{ mm}^2$

$\phi P_n = 0.75 F_u A_e = 0.75 \times 360 \times 52.2 \times 10^2 = \underline{1409} \text{ kN}$



③ Block shear Fracture

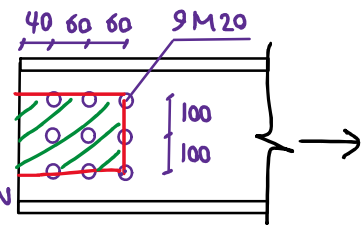
$\phi P_n = 0.75 [\min(0.6 F_u A_{nt}, 0.6 F_y A_{gv}) + F_u A_{nt}]$

$A_{gv} = 2 \times (160 \times 8) = 25.6 \times 10^2 \rightarrow 0.6 F_y A_{gv} = 0.6 \times 235 \times 25.6 \times 10^2 = 361 \text{ kN}$

$A_{nv} = 2 \times (160 - 2.5 \times 24) \times 8 = 16 \times 10^2 \rightarrow 0.6 F_u A_{nv} = 0.6 \times 360 \times 16 \times 10^2 = 346 \text{ kN}$

$A_{nt} = (200 - 2 \times 24) \times 8 = 12.2 \times 10^2 \rightarrow F_u A_{nt} = 360 \times 12.2 \times 10^2 = 439 \text{ kN}$

$\phi P_n = 0.75 [\min(361, 346) + 439] = \underline{589} \text{ kN}$



Limit States  $\phi P_n$  for IPE360

yield 1538 kN

fracture 1409 kN

block shear 589 kN ← Controls

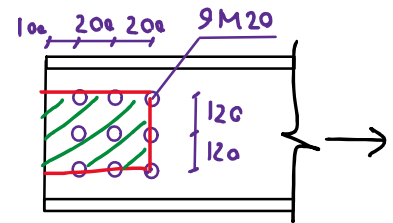
\* طرح بهین قابل قبولی که است. طرح بهین را اصلاح نکنیم.

$$A_{gv} = 2 \times 500 \times 8 = 80 \times 10^2 \quad \rightarrow 0.6 F_y A_{gv} = 1128 \text{ kN}$$

$$A_{nv} = 2 \times (500 - 2 \times 24) \times 8 = 70 \times 10^2 \quad \rightarrow 0.6 F_u A_{nv} = 1512 \text{ kN}$$

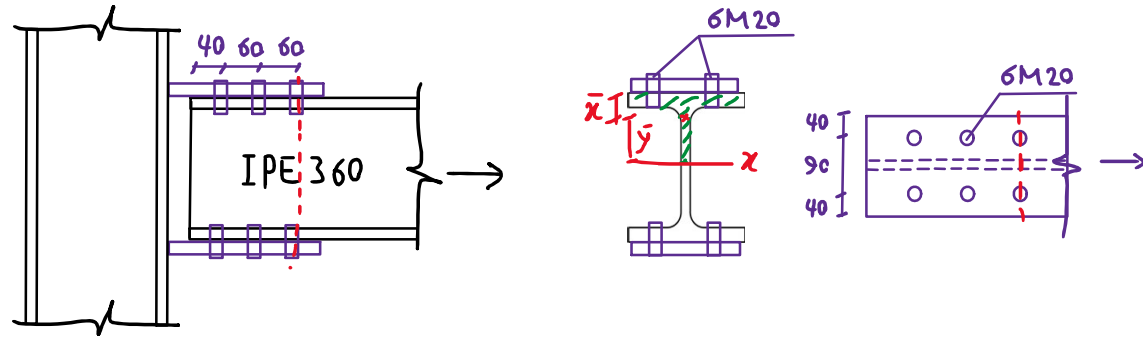
$$A_{nt} = (240 - 2 \times 24) \times 8 = 15.4 \times 10^2 \quad \rightarrow F_u A_{nt} = 554 \text{ kN}$$

$$\phi P_n = 0.75 (1128 + 554) = \underline{1261} \text{ kN} \leftarrow \text{controls}$$



\* با افزایش فاصله بین ما مطابق تنس موق، ظرفیت عضو تنسی از 589 kN به 1261 kN افزایش یافت.

مثال: مقارنت طراحی عضو تنسی را به دست آورید.



IPE 360:  $A_g = 72.7 \times 10^2 \text{ mm}^2$ ,  $b_f = 170$ ,  $t_w = 8$ ,  $t_f = 12.7$   
 $Z_x = 1019 \times 10^3 \text{ mm}^3$ ,  $Z_y = 191 \times 10^3 \text{ mm}^3$

① Yield of Gross Section

$$\phi P_n = 0.6 F_y A_g = 0.6 \times 235 \times 72.7 \times 10^2 = \underline{1538} \text{ kN}$$

② Fracture of Net Section

$$A_n = 72.7 \times 10^2 - 4(24 \times 12.7) = 60.5 \times 10^2$$

$$\bar{y} = \frac{Z_x}{A_g} = \frac{1019 \times 10^3}{72.7 \times 10^2} = 140 \text{ mm}, \quad \bar{x} = 180 - 140 = 40 \text{ mm}$$

Case 2:  $U = 1 - \frac{\bar{x}}{L} = 1 - \frac{40}{120} = 0.67 > \frac{A_t}{A_g} = \frac{2 \times 170 \times 12.7}{72.7 \times 10^2} = 0.6 \checkmark \rightarrow U = \max(0.67, 0.85) = \underline{0.85}$

Case 7:  $b_f < \frac{2}{3} d \rightarrow U = 0.85$

$$A_e = U A_n = 0.85 \times 60.5 \times 10^2 = 51.4 \times 10^2$$

$$\phi P_n = 0.75 F_u A_e = 0.75 \times 360 \times 51.4 \times 10^2 = \underline{1388} \text{ kN}$$

③ Block shear Fracture

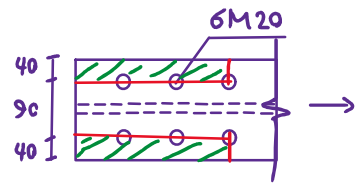
$$\phi P_n = 0.75 [\min(0.6 F_u A_{nv}, 0.6 F_y A_{gv}) + F_u A_{nt}]$$

$$A_{gv} = 2 \times (2 \times 160 \times 12.7) = 81.3 \times 10^2 \quad \rightarrow \quad 0.6 F_y A_g = 1146 \text{ kN}$$

$$A_{nv} = 2 \times [2 \times (160 - 2.5 \times 24) \times 12.7] = 50.8 \times 10^2 \quad \rightarrow \quad 0.6 F_u A_{nv} = 1097 \text{ kN}$$

$$A_{nt} = 2 \times [2 \times (40 - 0.5 \times 24) \times 12.7] = 14.2 \times 10^2 \quad \rightarrow \quad F_u A_{nt} = 511 \text{ kN}$$

$$\phi P_n = 0.75 (1097 + 511) = \underline{\underline{1206 \text{ kN}}}$$



Limit States	$\phi P_n$ for IPE 360
yield	1538 kN
fracture	1388 kN
block shear	1206 kN ← Controls