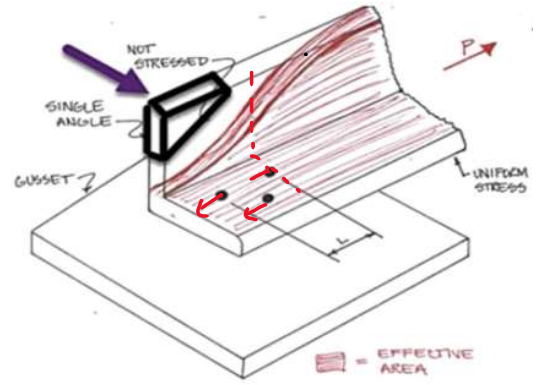
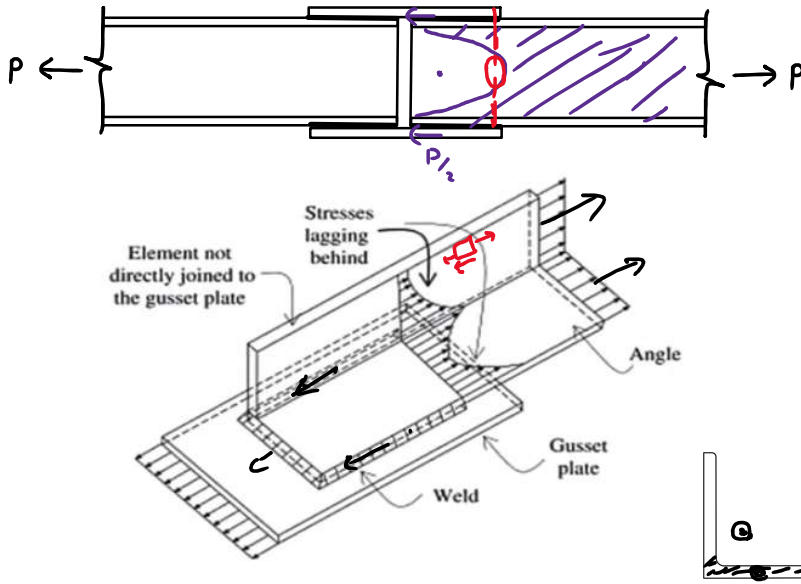


$A_e = U A_n$ سطح مقطع موثر

تاخیر پرشی shear lag



Text from Salmon

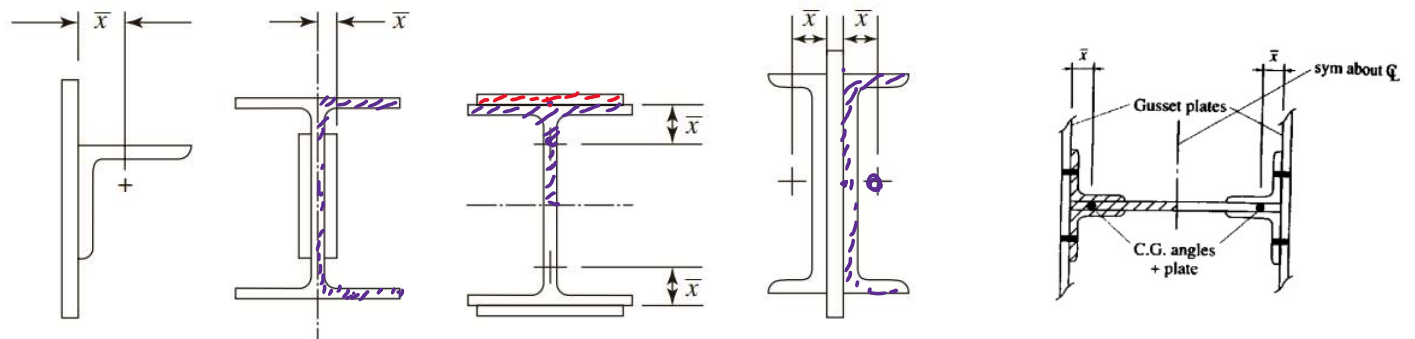
- When a tensile load is applied eccentrically to a wide plate, the stress distribution across the width of the plate is nonuniform.
- The mechanism by which stress gets transmitted from the location of the applied load to sections distant from the load is by shear stresses acting in the plane of the plate.
- The fact that the stress is lower the farther the location is from the applied load means that the shear transfer "lags" or is inefficient.
- Thus, the nonuniformity of stress in wide plates or plate elements of rolled sections when a tensile load is applied nonuniformly, is referred to as "shear lag".

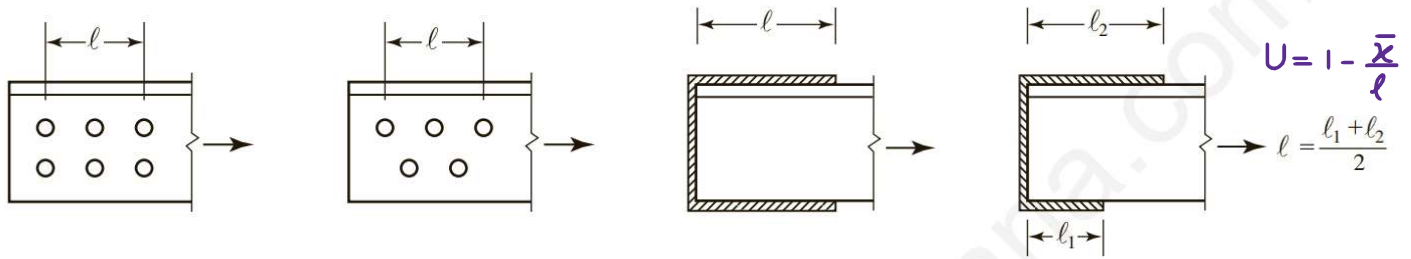
ضریب تاخیر پرشی U

$$\left\{ \begin{array}{l} \text{Bolted } A_e = U A_n \\ \text{Welded } A_e = U A_g \end{array} \right.$$

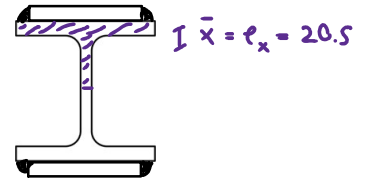
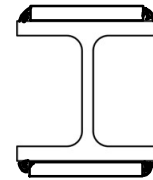
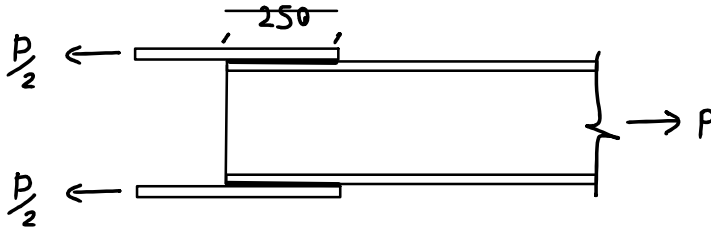
$U = 1 - \frac{\bar{x}}{l} > \frac{A_1}{A_2} \neq \frac{A_1}{A_n}$

رابطه U در همه موارد به جز چند استثنا





مثال: سطح مقطع مؤثر را برابر عضو گسستی با نبیخ IPE180 به دست آورید.

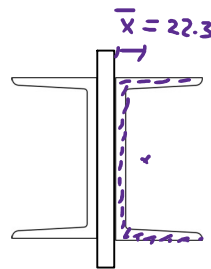
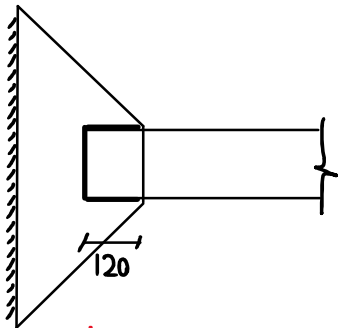


$$A_g = 23.9 \times 10^2 \text{ mm}^2, \quad \bar{x} = 20.5 \text{ mm}$$

$$U = 1 - \frac{\bar{x}}{L} = 1 - \frac{20.5}{250} = 0.918$$

$$A_e = U A_g = 0.918 \times 23.9 \times 10^2 = \underline{21.94 \times 10^2 \text{ mm}^2}$$

مثال: برای اتصال عضو خرابی 2UNP240 به ورق اتصال جوشی مطابق شکل زیر استفاده شده است. مناسب طراحی چقدر است؟



$$\text{UNP240: } A_g = 42.3 \times 10^2 \text{ mm}^2$$

$$U = 1 - \frac{\bar{x}}{L} = 1 - \frac{22.3}{120} = 0.814$$

$$A_e = U A_g = 0.814 \times 42.3 \times 10^2 = 34.4 \times 10^2$$

$$\text{yield: } \phi P_n = 0.9 F_y A_g = 0.9 \times 235 \times (2 \times 42.3 \times 10^2) = 1789 \text{ kN}$$

$$\text{fracture: } \phi P_n = 0.75 F_u A_e = 0.75 \times 360 \times (2 \times 34.4 \times 10^2) = 1859 \text{ kN}$$

Limit State ϕP_n for 2UNP240

yield 1789 kN ← Controls

fracture 1859 kN

$$\boxed{\phi P_n = 1789 \text{ kN}}$$