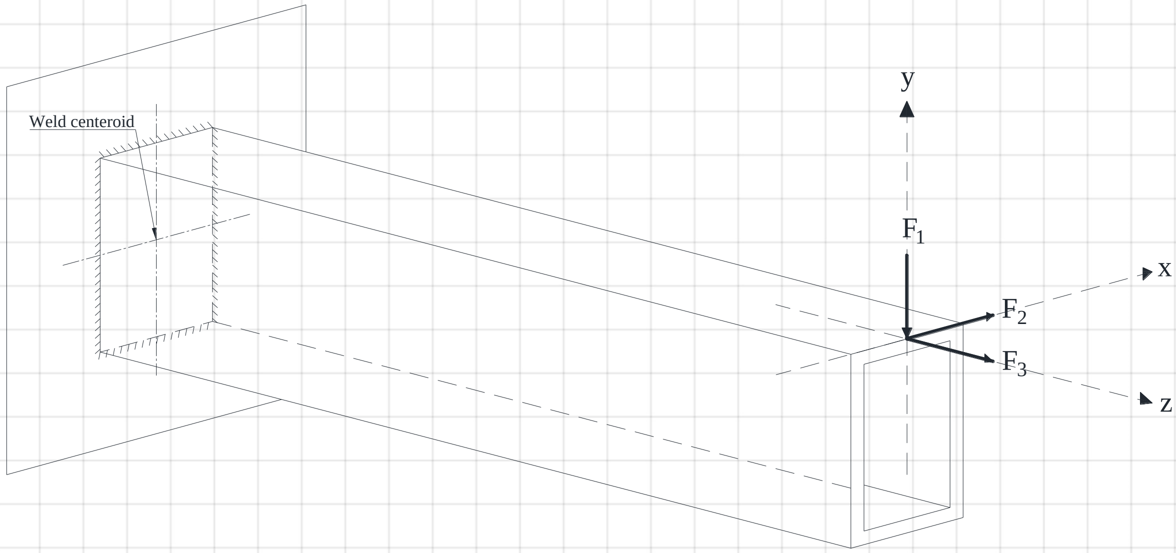
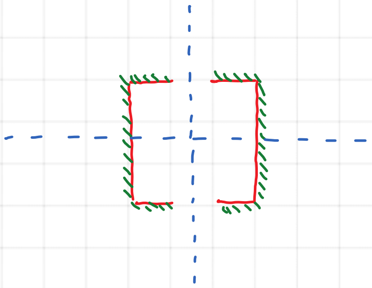
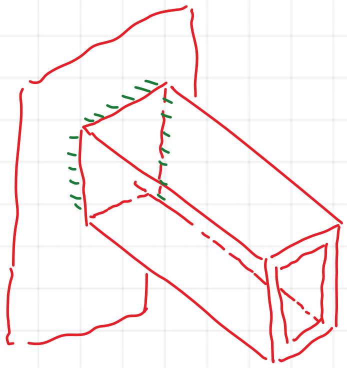
How the loads are transferred to the center of the fillet weld?

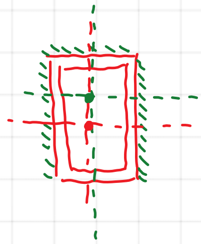
As you may have noticed and according to available statistics, almost 80% of welded joints are made by fillet welding. Because of the importance of this type of weld, we decided to record a playlist regarding the design of fillet welds according to Eurocode.

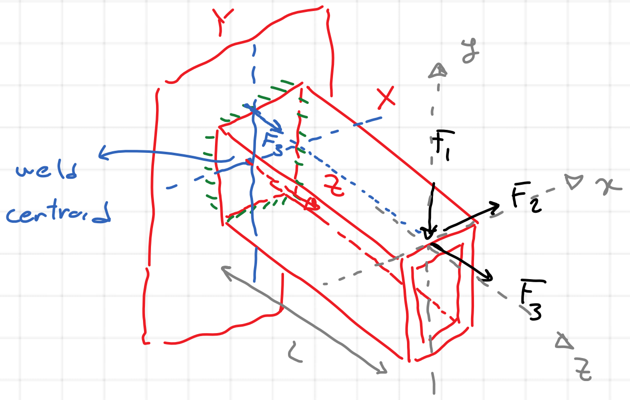
In this video, we solve multiple examples in which the loads in the structure are not necessarily applied at the center of the fillet weld, and we use statics principles to transfer the loads at the center of the fillet weld, considering all generated moments and torsions.











xy → parallel to weld surface

→ F_1 & F_2 → planar forces

F_3 → perpendicular to weld surface

F_1 → F_1 parallel to Y → Shear force (F_y)

F_1 Bending moment about x axis → Bending moment (M_x)

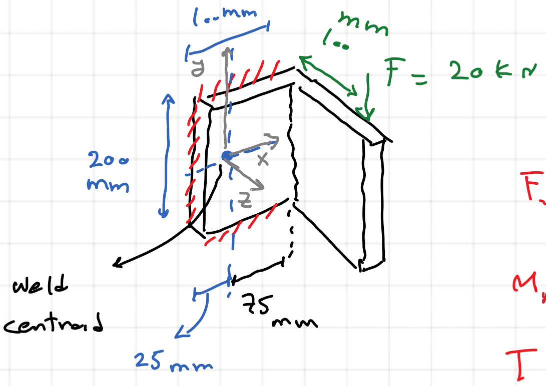
F_2 → F_2 parallel to X → Shear force (F_x)

F_2 Bending moment about Y axis → Bending moment (M_y)

F_2 Torsional moment about z axis → Torsion ($M_z = T$)

F_3 → F_3 in the z direction → Axial force (F_z)

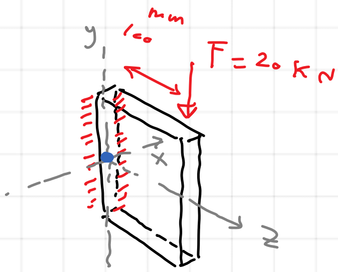
F_3 Bending moment about x axis (M_x)



$F_y = 20\,kN$

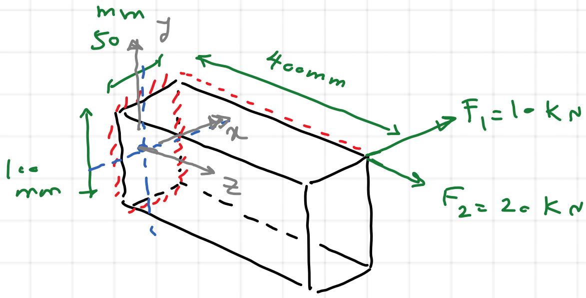
$M_x = 20\,kN \times 0.1\,m = 2\,kN\cdot m$

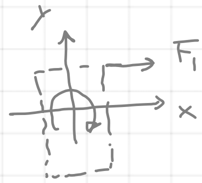
$T = 20\,kN \times 0.075\,m = 1.5\,kN\cdot m$



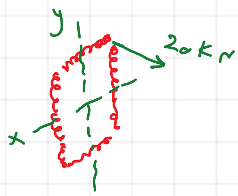
$F_y = 20\,kN$

$M_x = 20\,kN \times 0.1\,m = 2\,kN\cdot m$

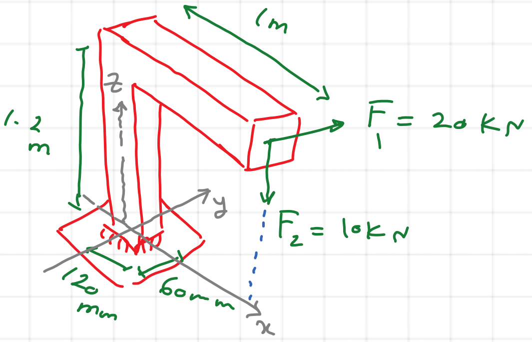




$F_1 : \begin{cases} F_x = 10\,kN \\ M_y = 10\,kN \times 0.4\,m = 4\,kN\cdot m \\ T = 10\,kN \times \underbrace{0.05\,m}_{\frac{100\,mm}{2}} = 0.5\,kN\cdot m \end{cases}$

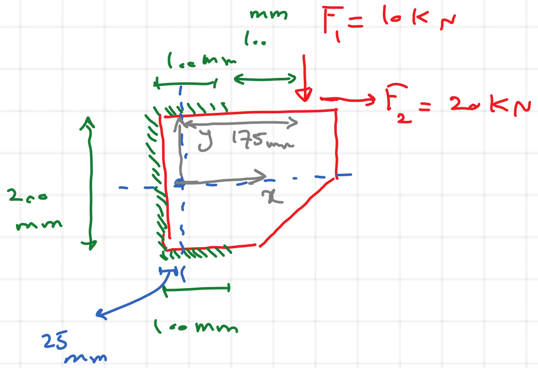


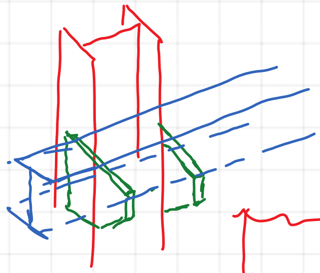
$F_2 : \begin{cases} F_z = 20\,kN \\ M_x = 20\,kN \times \frac{100\,mm}{2} = 1\,kN\cdot m \\ M_y = 20\,kN \times \frac{50\,mm}{2} = 0.5\,kN\cdot m \end{cases}$

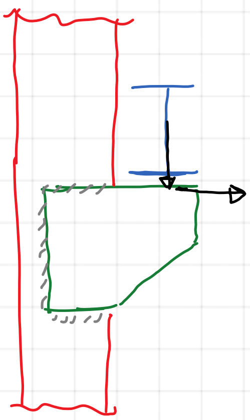


$$F_1: \begin{cases} F_y = 20 \text{ kN} \\ M_z = T = 20\text{kN} \times 1\text{m} = 20 \text{ kN}\cdot\text{m} \\ M_x = 20 \text{ kN} \times 1.2\text{m} = 24 \text{ kN}\cdot\text{m} \end{cases}$$

$$F_2: \begin{cases} F_z = -10 \text{ kN} \quad (\text{compression}) \\ M_y = 10 \text{ kN} \times 1 \text{ m} = 10 \text{ kN}\cdot\text{m} \end{cases}$$







$$F_1 \begin{cases} F_y = 10 \text{ kN} \\ M_z = T_{(F_1)} = 10\text{kN} \times 0.175 = 1.75 \text{ kN}\cdot\text{m} \end{cases}$$

$$F_2: \begin{cases} F_x = 20 \text{ kN} \\ M_z = T_{(F_2)} = 20 \text{ kN} \times \frac{200 \text{ mm}}{2} = 2 \text{ kN}\cdot\text{m} \end{cases}$$