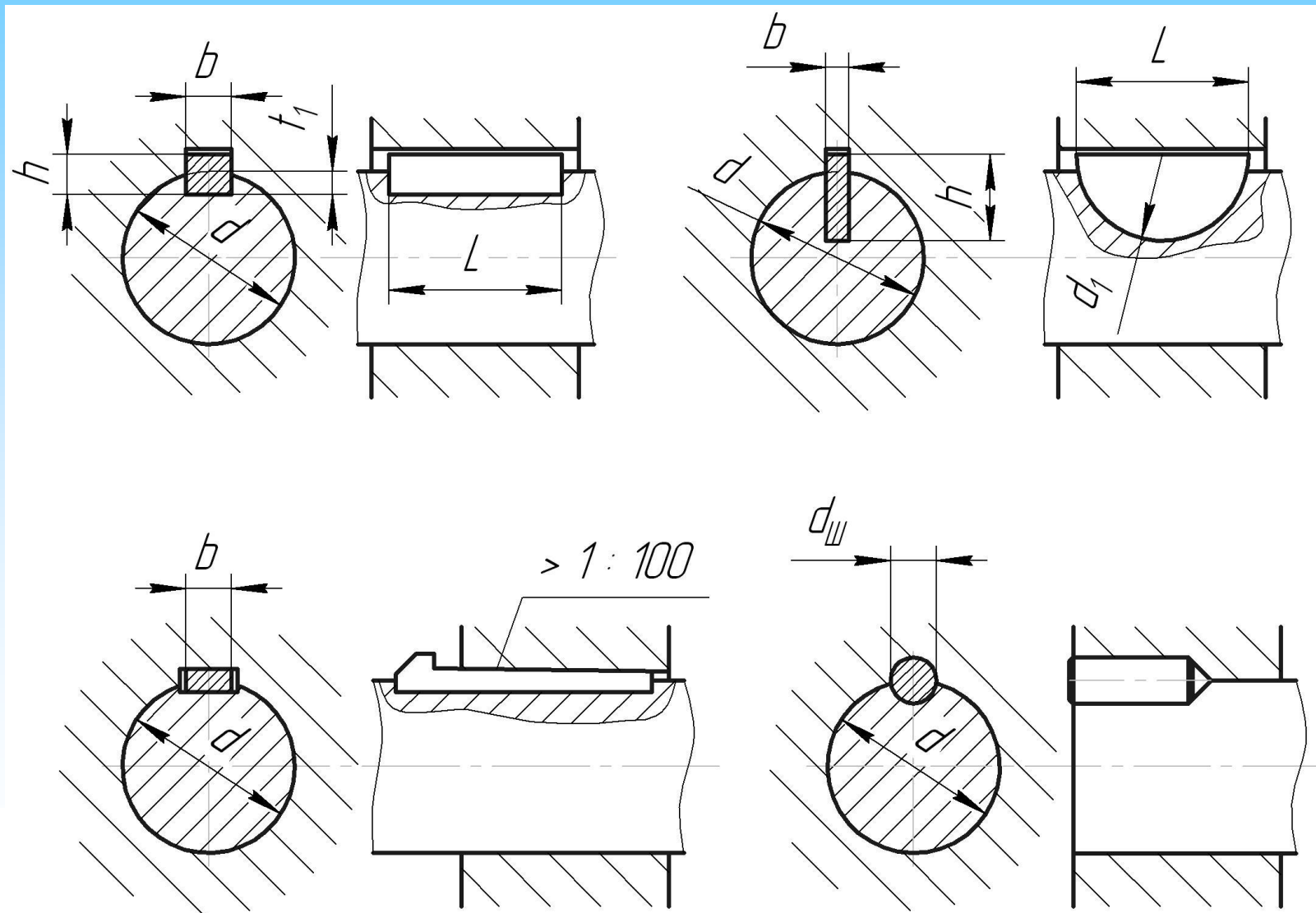
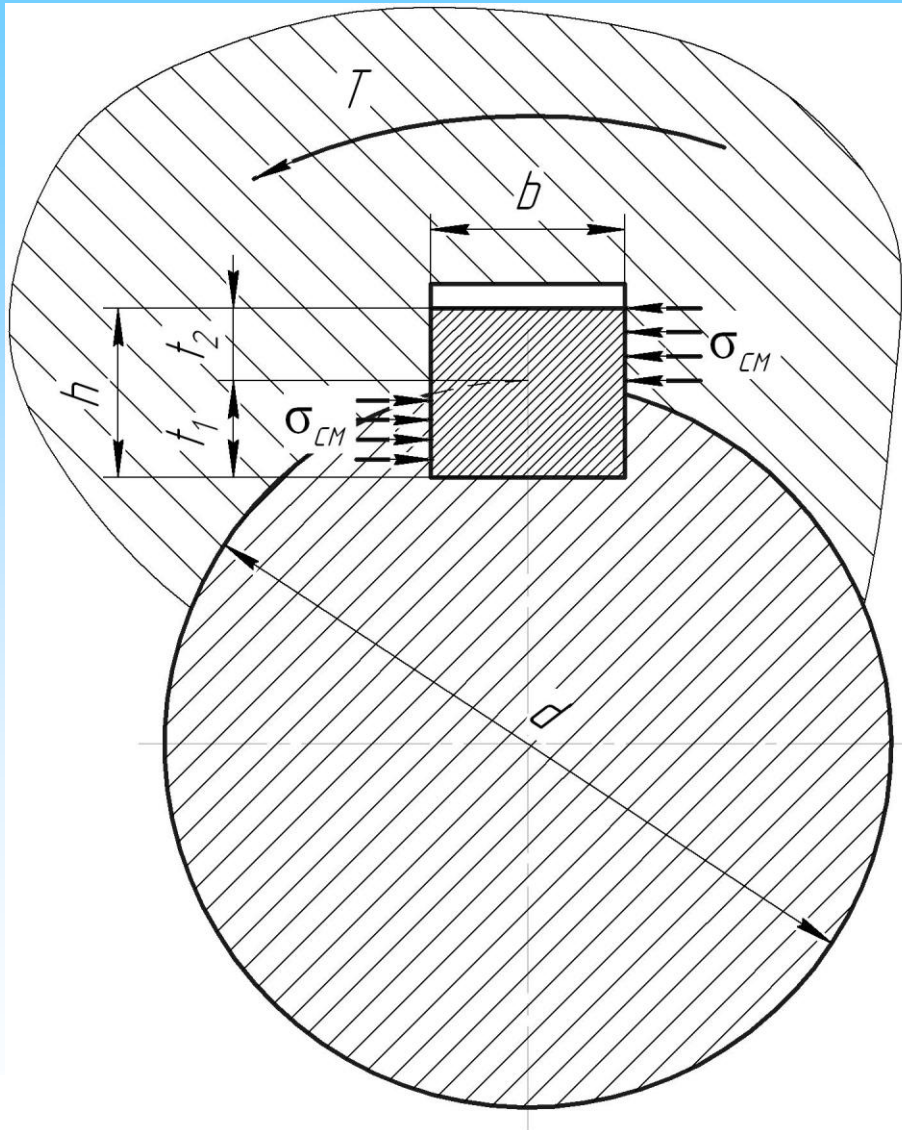


Шпоночные соединения



Соединения деталей машин



$$\sigma_{CM} = \frac{F}{A_{CM}} \leq [\sigma_{CM}]$$

$$F = \frac{T}{r} = \frac{2T}{d} \quad A_{CM} = t_2 l_P$$

$$\sigma_{CM} = \frac{2T}{d t_2 l_P} \leq [\sigma_{CM}]$$

$$l_P = \frac{2T}{d t_2 [\sigma_{CM}]}$$

$$\tau_{CP} = \frac{F}{A_{CP}} \leq [\tau_{CP}]$$

$$A_{CP} = B l_P$$

$$\tau_{CP} = \frac{2T}{d B l_P} \leq [\tau_{CP}]$$

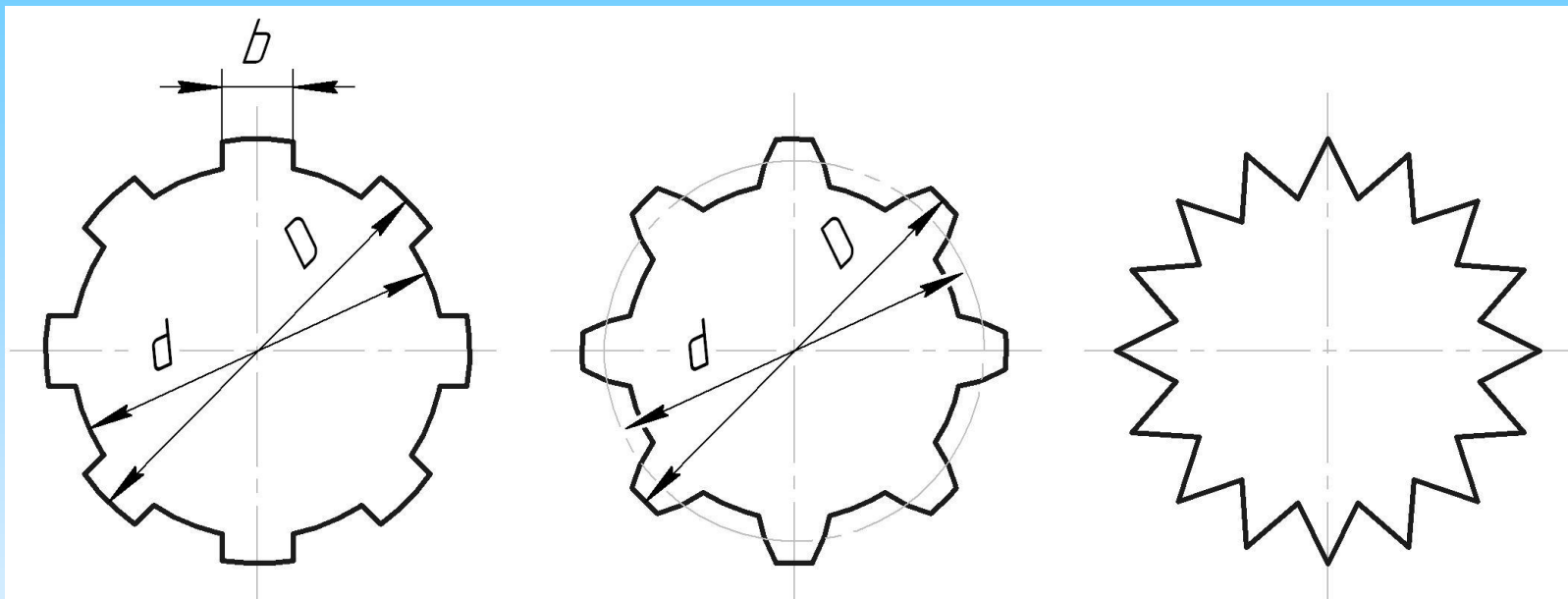
Допускаемые напряжения

$[\sigma_{см}] = 150 \div 180 \text{ МПа}$ - при стальной ступице,

$[\sigma_{см}] = 70 \div 100 \text{ МПа}$ - при чугунной ступице,

$[\tau_{ср}] = 60 \div 100 \text{ МПа}$

Шлицевые соединения



$$\sigma_{см} = \frac{2T}{d_{CP} A_{CM}} \leq [\sigma_{см}]$$

$$d_{CP} = \frac{D+d}{2}$$

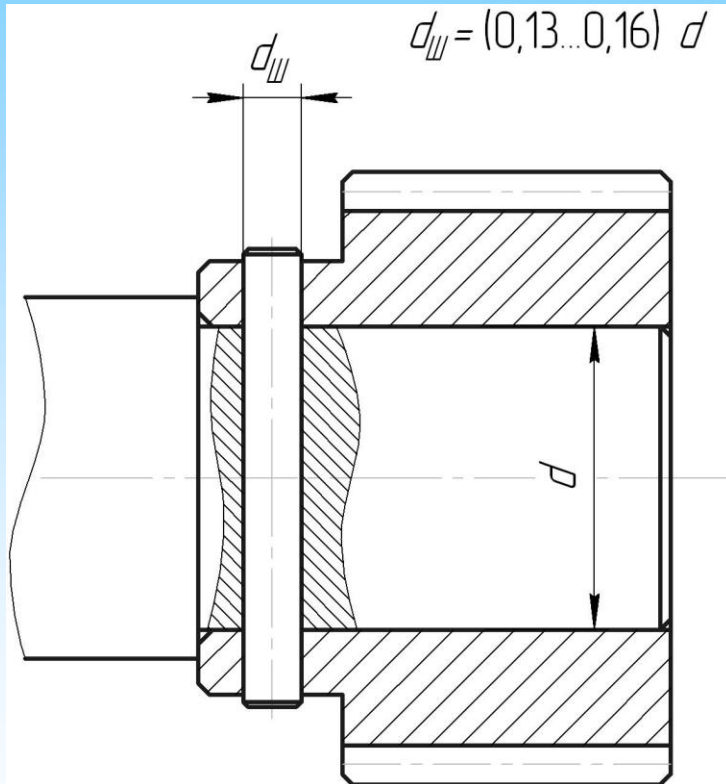
$$A_{CM} = h_P l z$$

$$\sigma_{см} = \frac{2T}{d A_{CM}} \leq [\sigma_{см}]$$

$$d = m z$$

$$h_P = 0,8 m$$

Штифтовые соединения



$$\tau = \frac{F}{A} \leq [\tau_{ср}]$$

$$F = \frac{T}{r} = \frac{2T}{d}$$

$$\tau = \frac{F}{A} = \frac{8T}{d i \pi d_{ш}^2} \leq [\tau_{ср}]$$

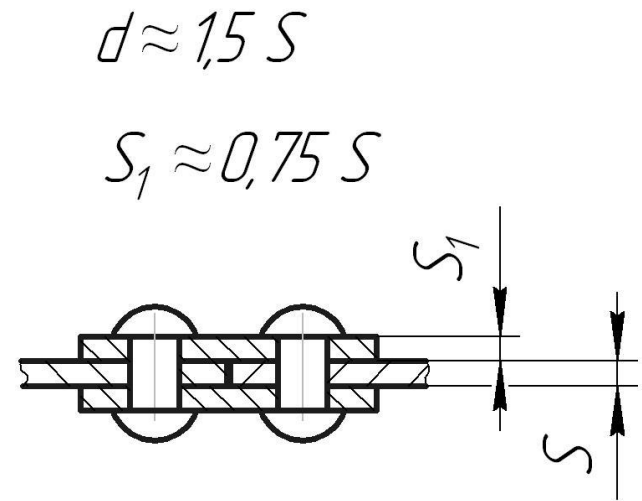
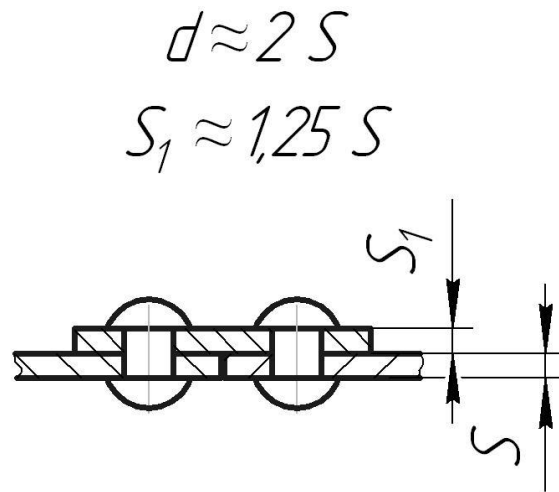
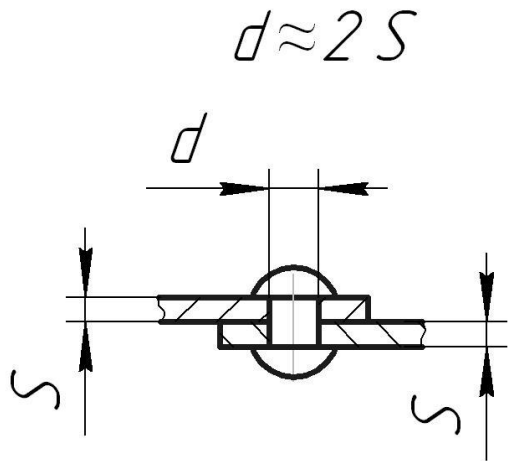
$$\sigma_{сш} = \frac{F}{A_{сш}} \leq [\sigma_{сш}]$$

$$A_{сш} = (D - d) d_{ш}$$

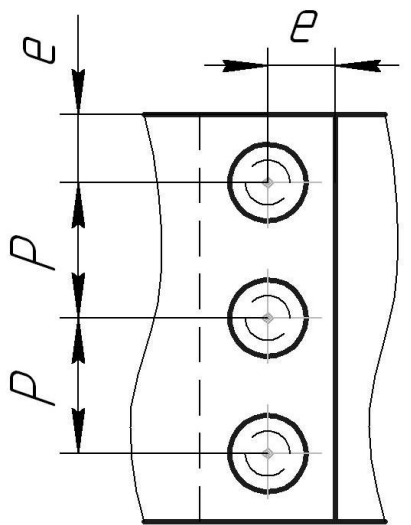
$$\sigma_{сш} = \frac{2T}{d (D - d) d_{ш}} \leq [\sigma_{сш}].$$

Соединения деталей машин

Заклепочное соединение

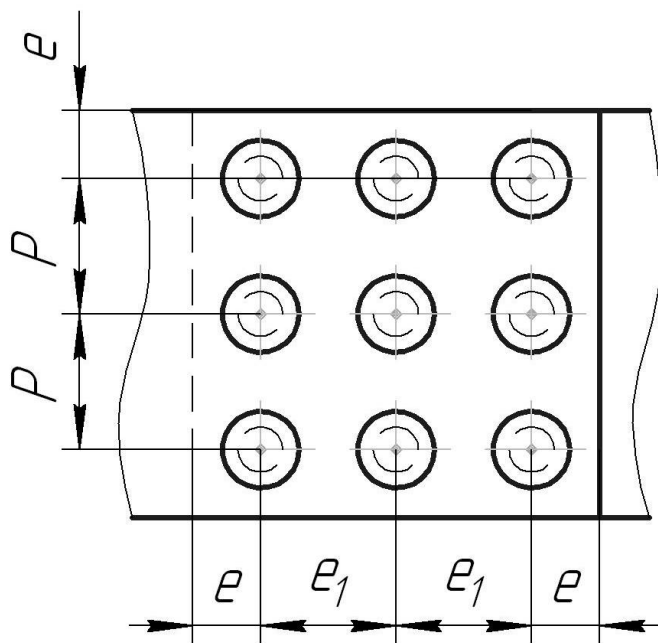


Соединения деталей машин



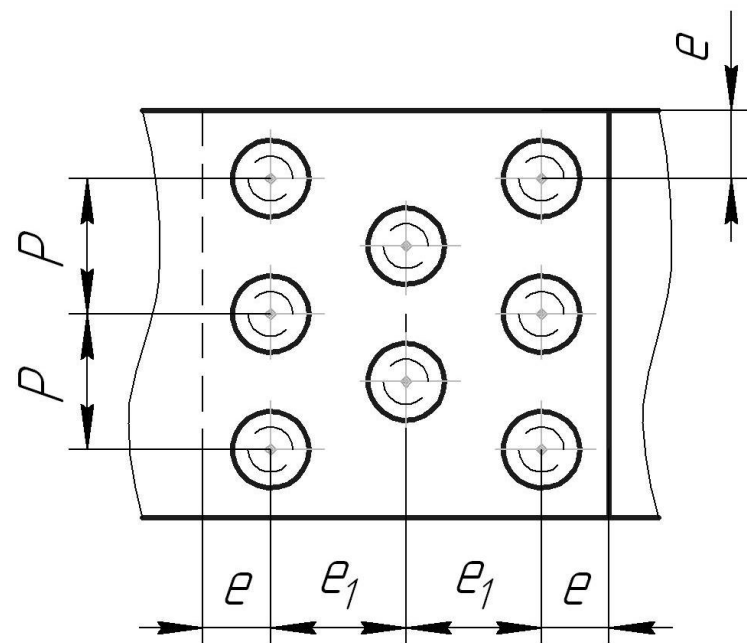
$$e = (1,5 \dots 2) d$$

$$P \geq 3 d$$



$$e_1 = (3 \dots 6) d$$

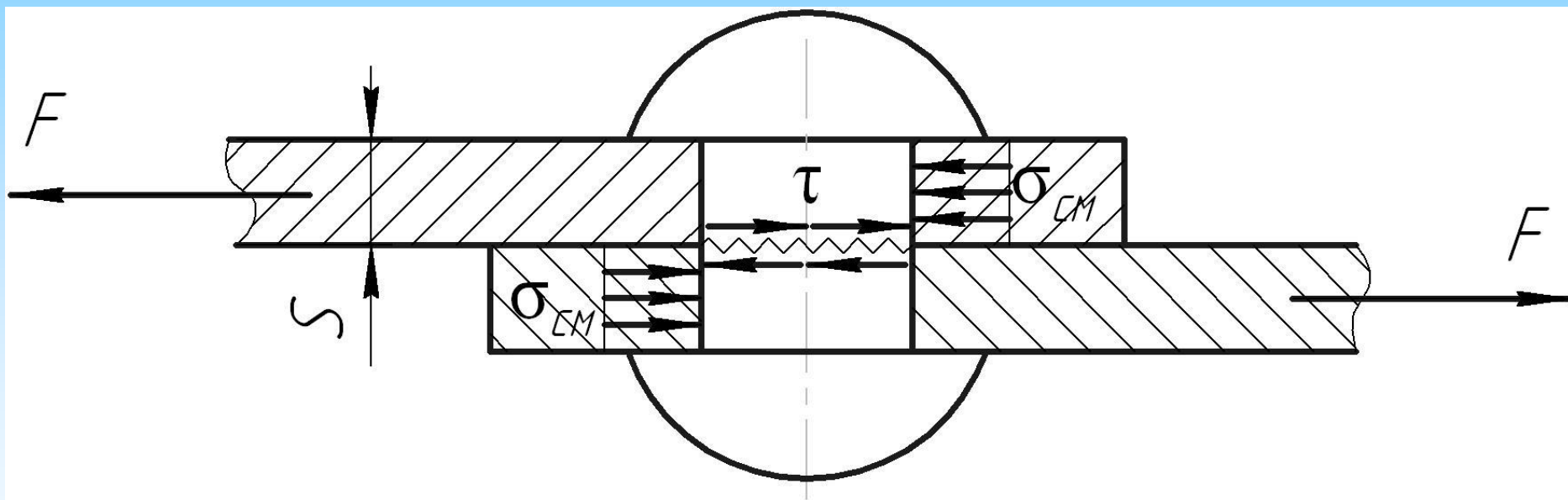
$$P = (3 \dots 6) d$$



$$e_1 = (2 \dots 3) d$$

$$P = (3 \dots 6) d$$

Соединения деталей машин



Условие прочности на срез

$$\tau = \frac{F}{A} = \frac{4 F}{z \pi d^2 i} \leq [\tau_{ср}]$$

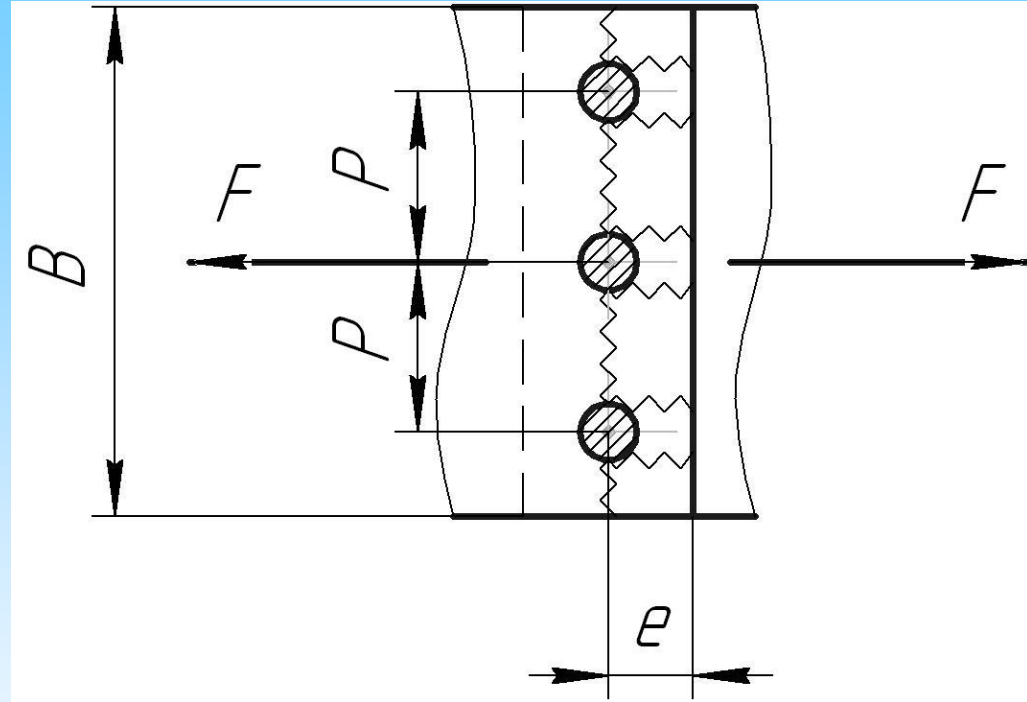
Условие прочности на смятие

$$\sigma_{см} = \frac{F}{A_{см}} = \frac{F}{z S_{\min} d} \leq [\sigma_{см}]$$

Соединения деталей машин

Условие прочности листа на растяжение

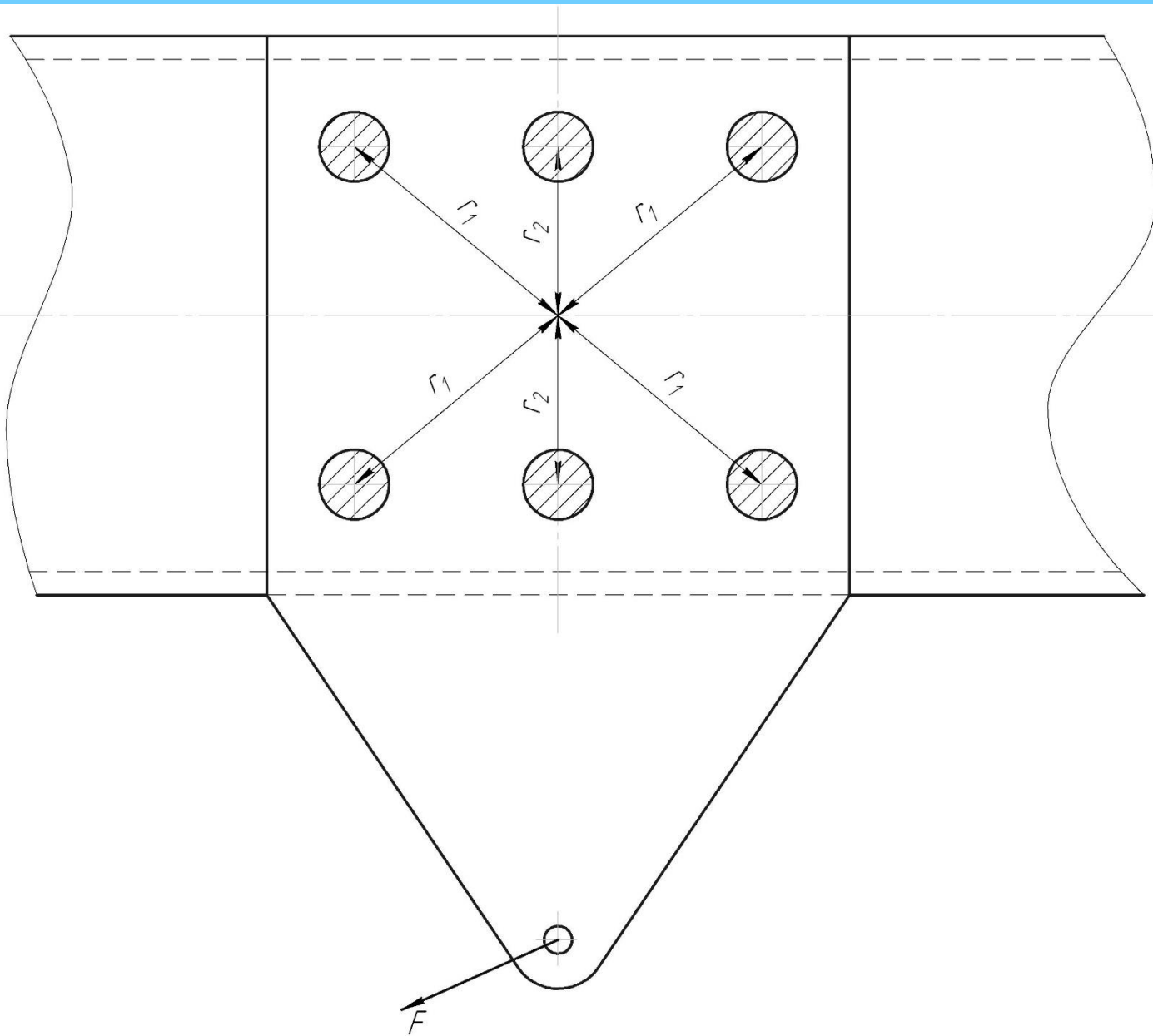
$$\sigma_p = \frac{F}{A} = \frac{F}{S_{\min} (B - z d)} \leq [\sigma_p]$$



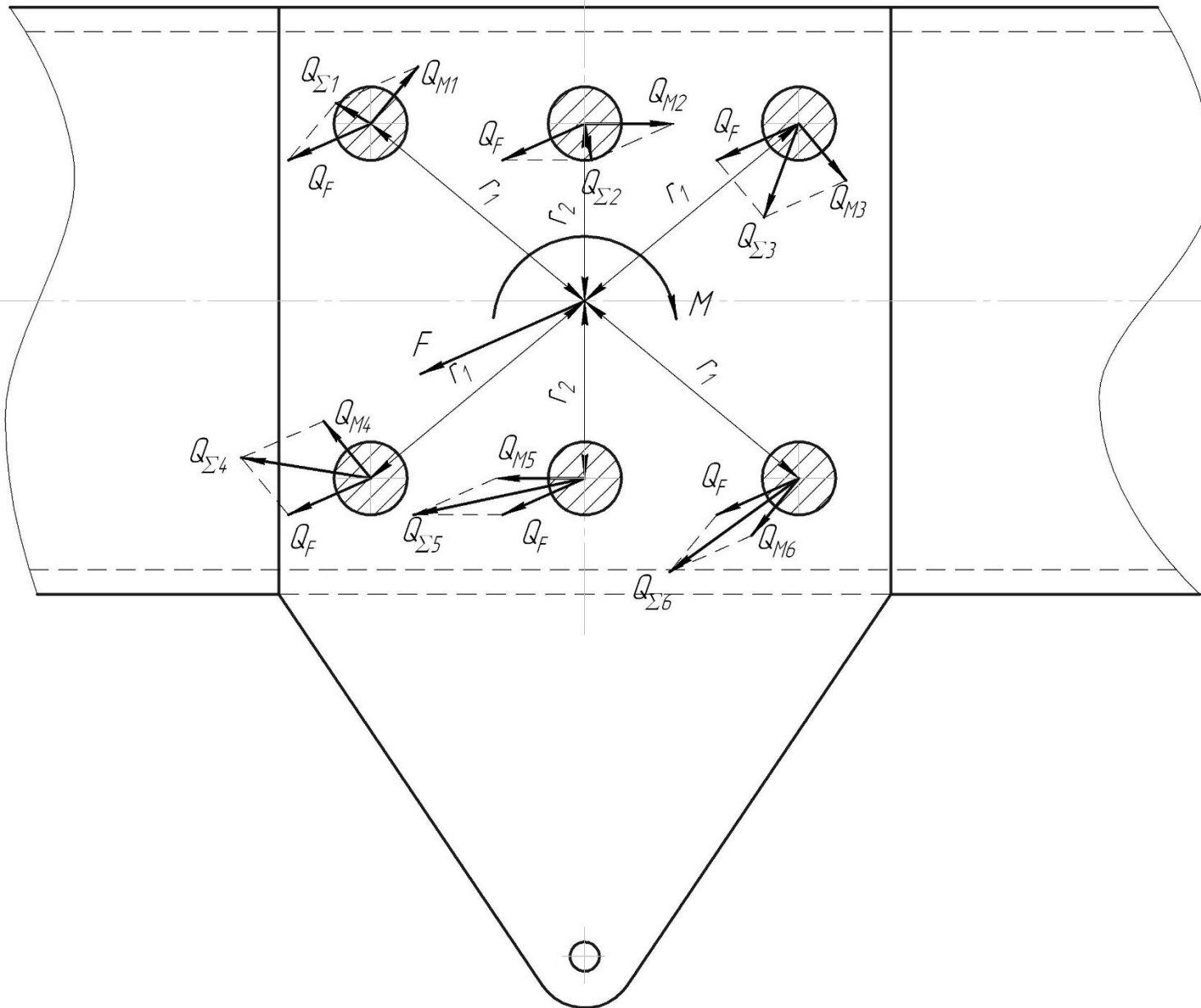
Условие прочности листа на срез

$$\tau = \frac{F}{A} = \frac{F}{2 S_{\min} (e - 0,5 d) z} \leq [\tau_{ср}]$$

Соединения деталей машин



Соединения деталей машин



Соединения деталей машин

$$Q_F = \frac{F}{z}, \quad Q_{Mi} = \frac{M r_i}{\sum_{i=1}^n r_i^2},$$

$$Q_{M1} = Q_{M3} = Q_{M4} = Q_{M6} = \frac{M r_1}{4r_1^2 + 2r_2^2},$$

$$Q_{M2} = Q_{M5} = \frac{M r_2}{4r_1^2 + 2r_2^2},$$

$$Q_{\max} = Q_{\Sigma 6} = \sqrt{Q_F^2 + Q_{M6}^2 + 2Q_F Q_{M6} \cos \alpha}$$