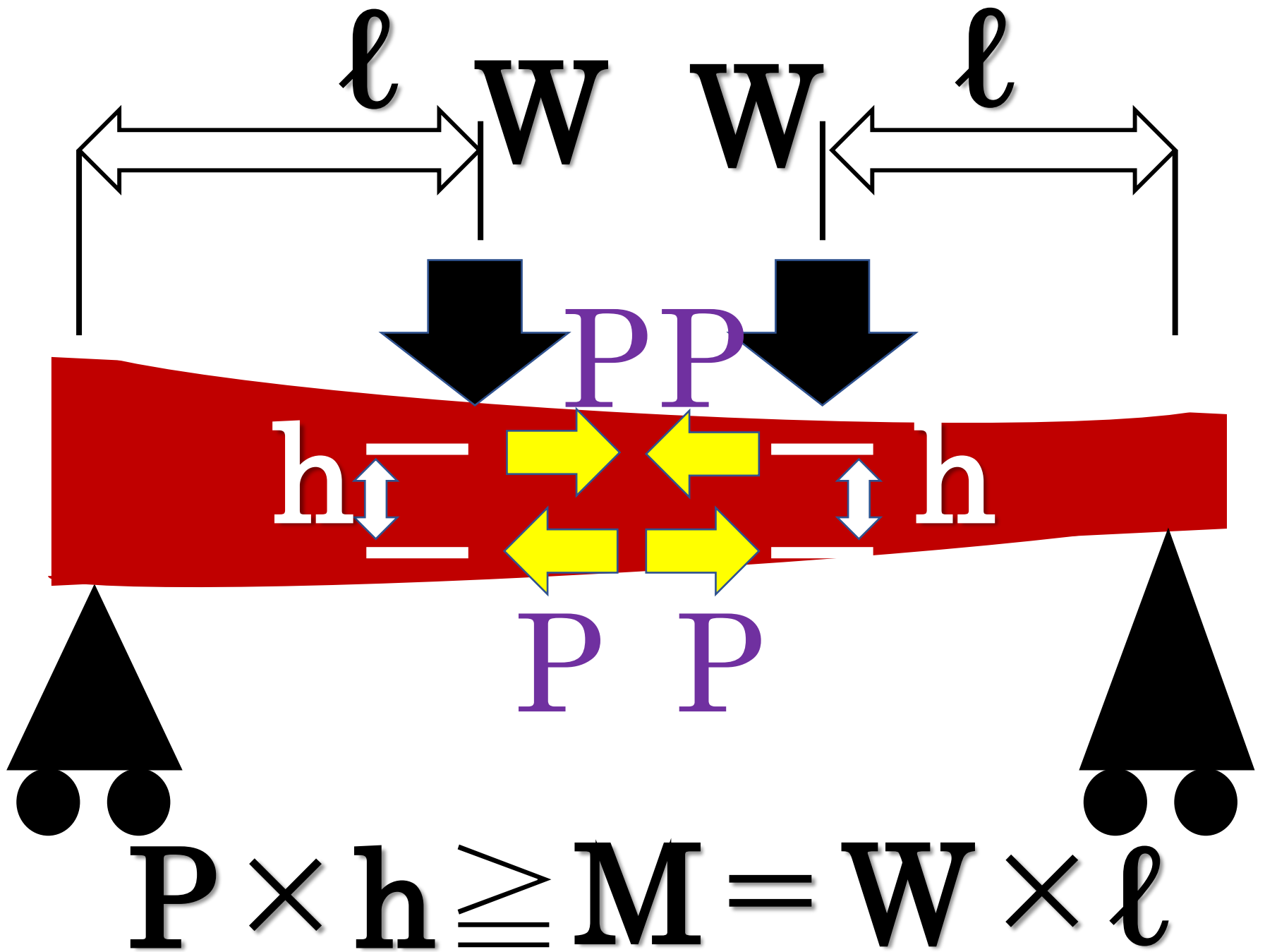


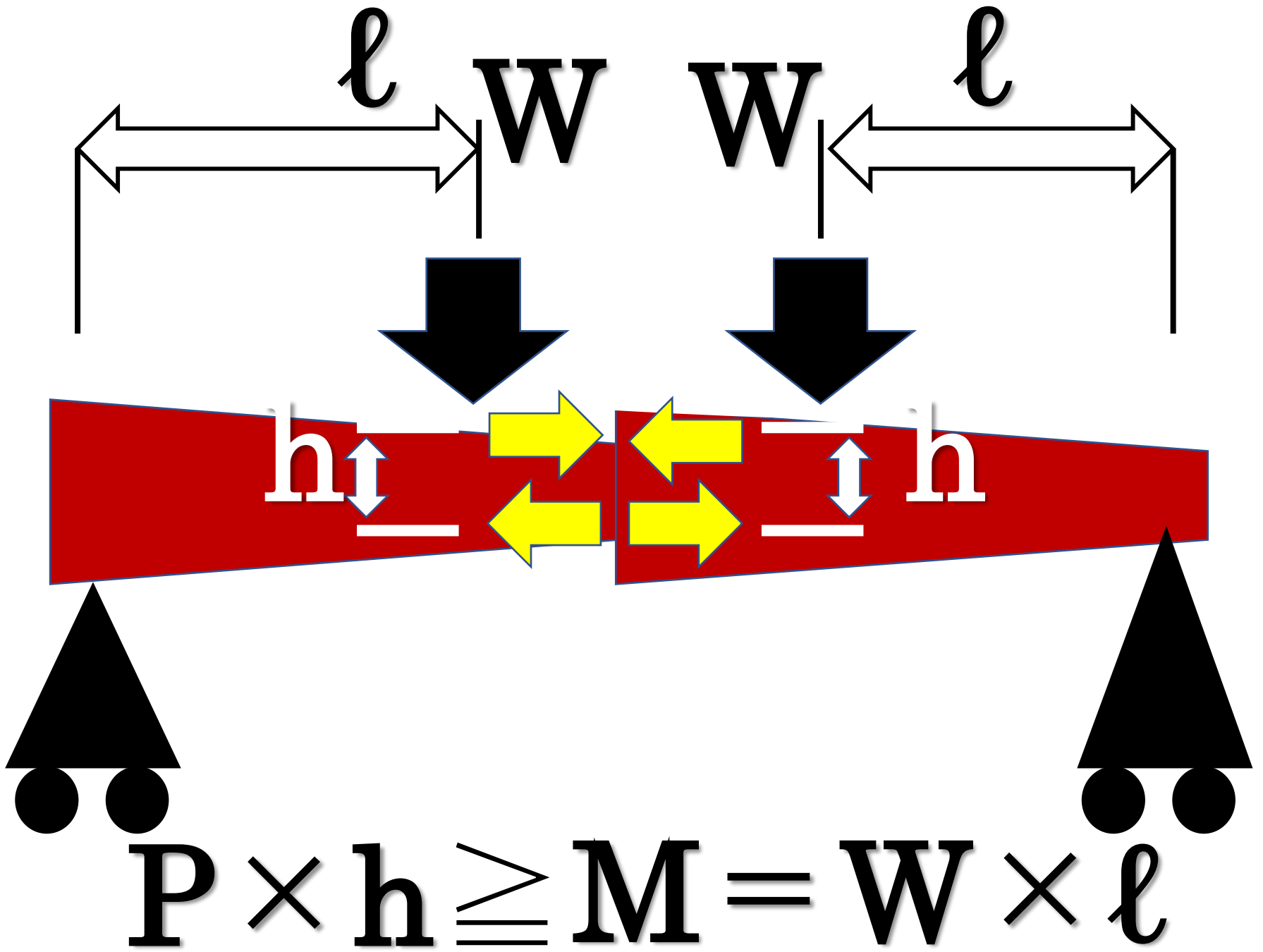


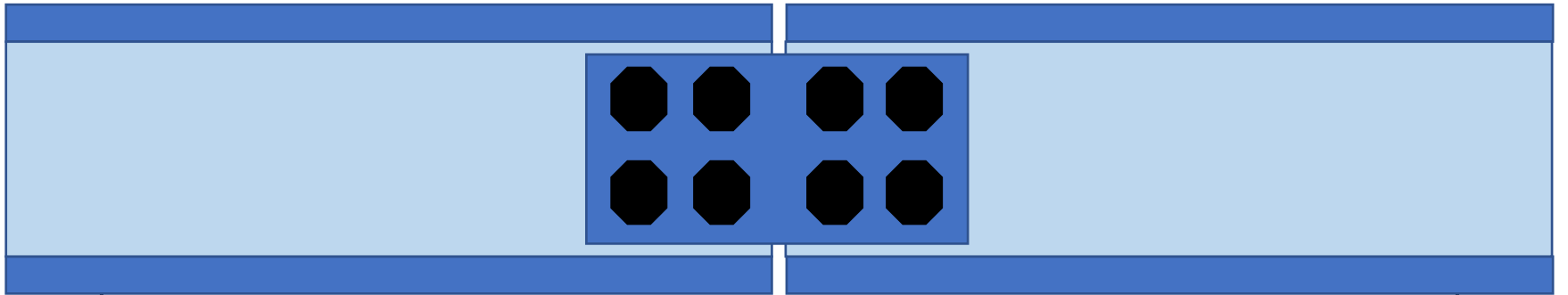
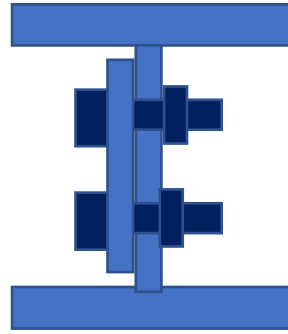
木材と木造建築の研修会

**木造トラスの構造計画と
接合部のポイント**

原田浩司







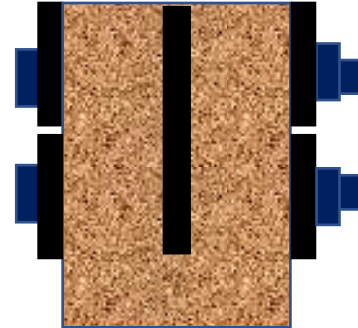
● ● 高力ボルト F10T, M20 ● ●

長期許容せん断力 = 47.1 kN/本

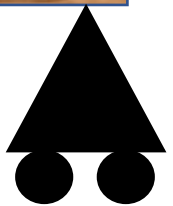
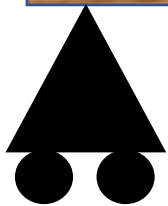
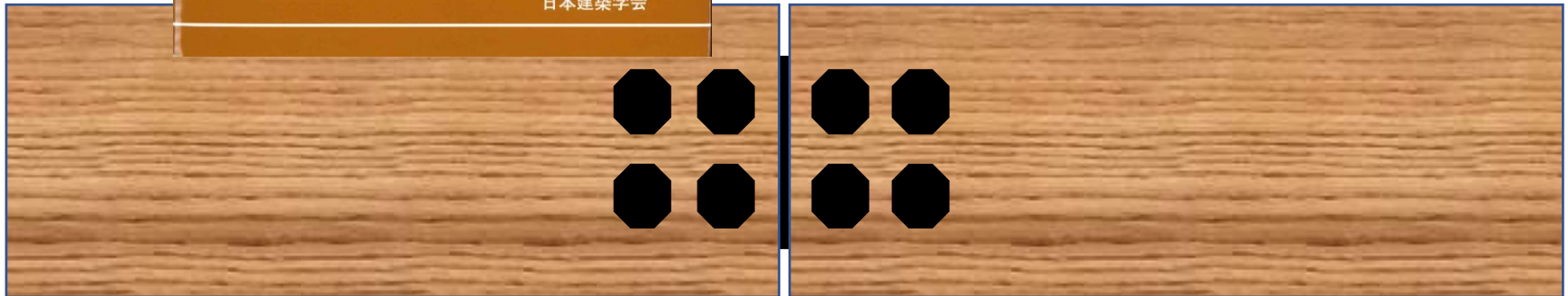
木質構造接合部設計事例集

Design Manual
for
Engineered Timber Joints

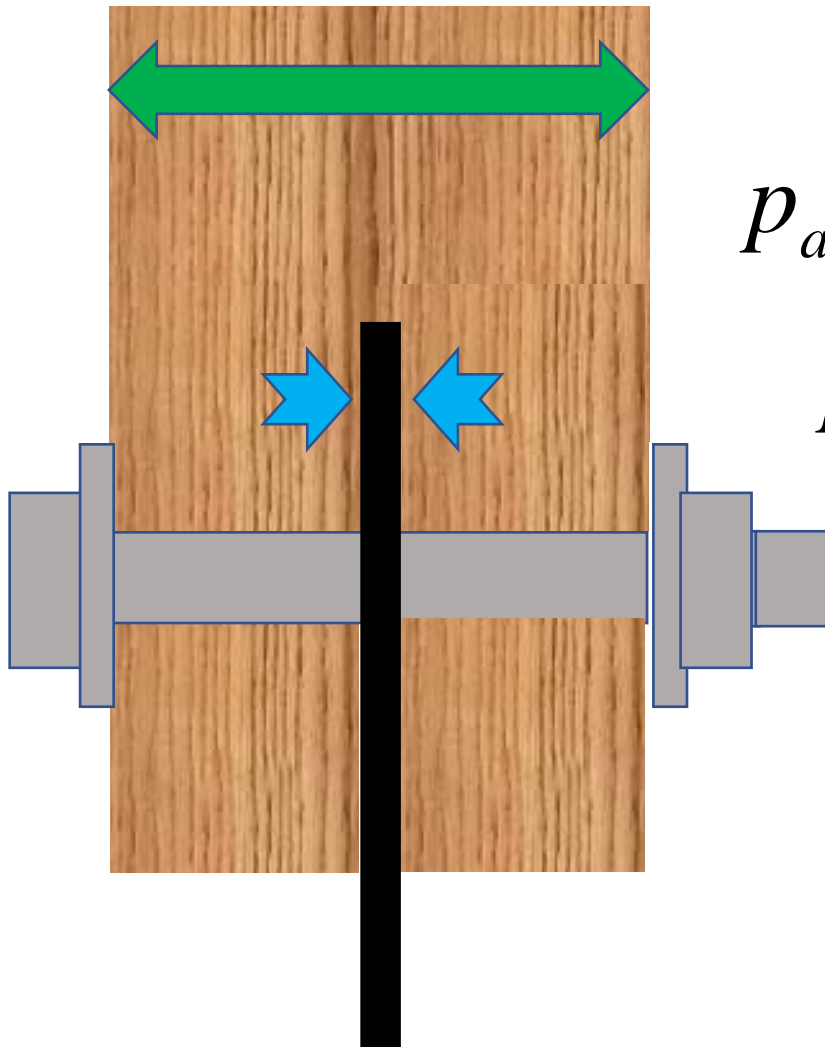
日本建築学会



M20



ボルトによる接合部の耐力



$$P_a = \frac{1}{3} \cdot_j K_d \cdot_j K_m \cdot r_u \cdot P_y$$

$$P_y = C \cdot F_e \cdot d \cdot l$$

$$F_e = 19.4 \quad N / mm^2$$

$$d = 20 \quad mm$$

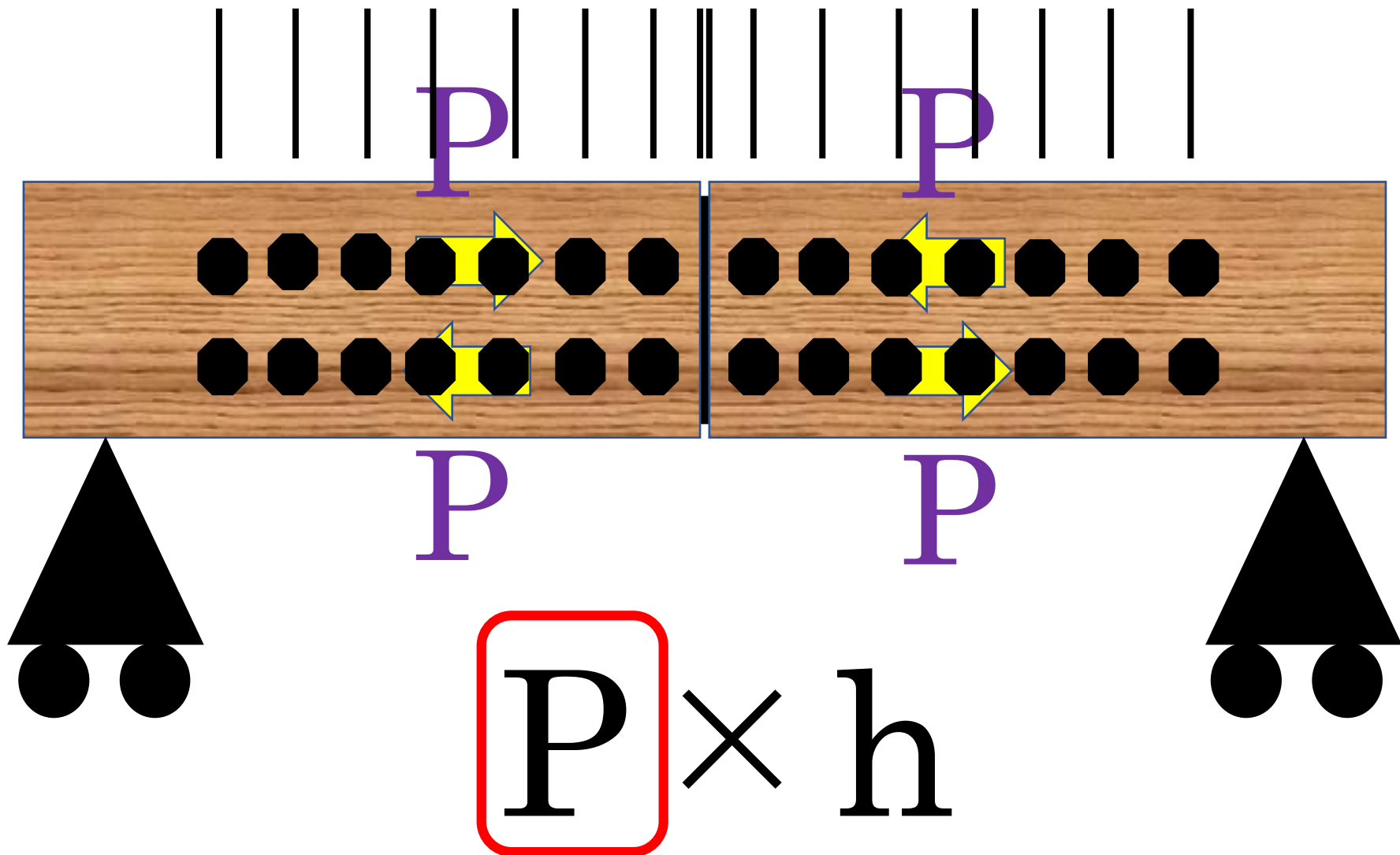
$$l = 180 - 11 = 169$$

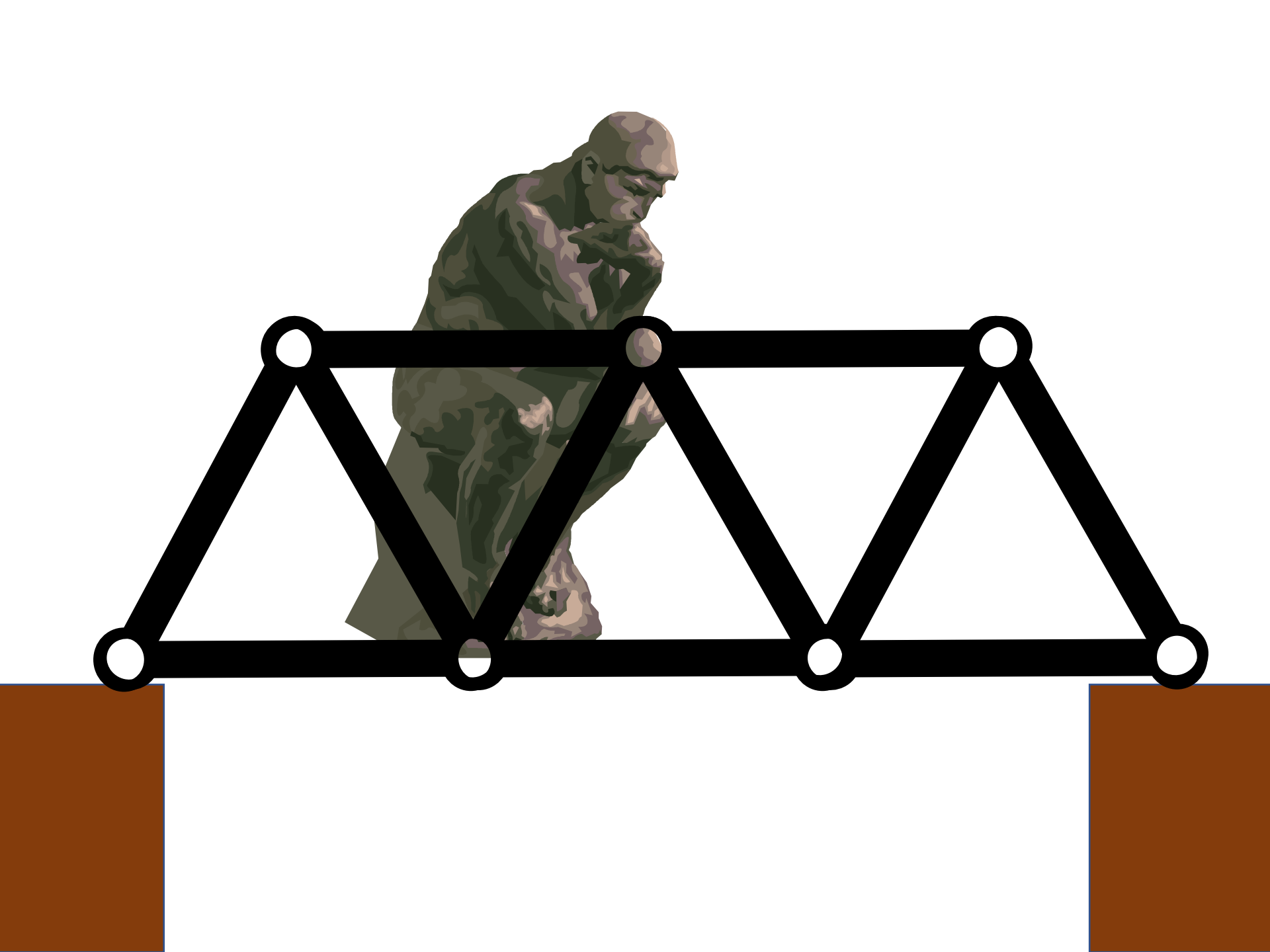
mm

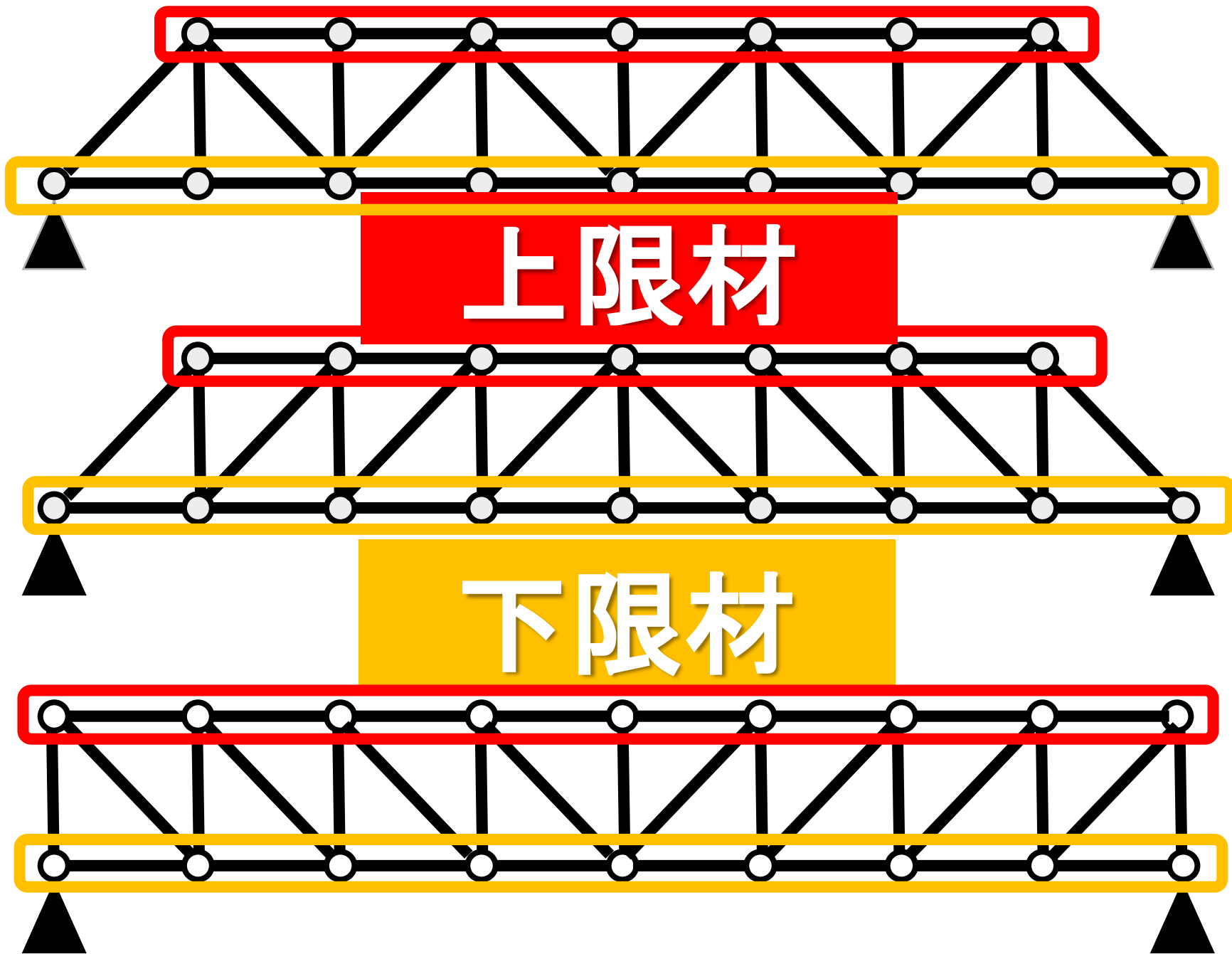
15.1 kN/本

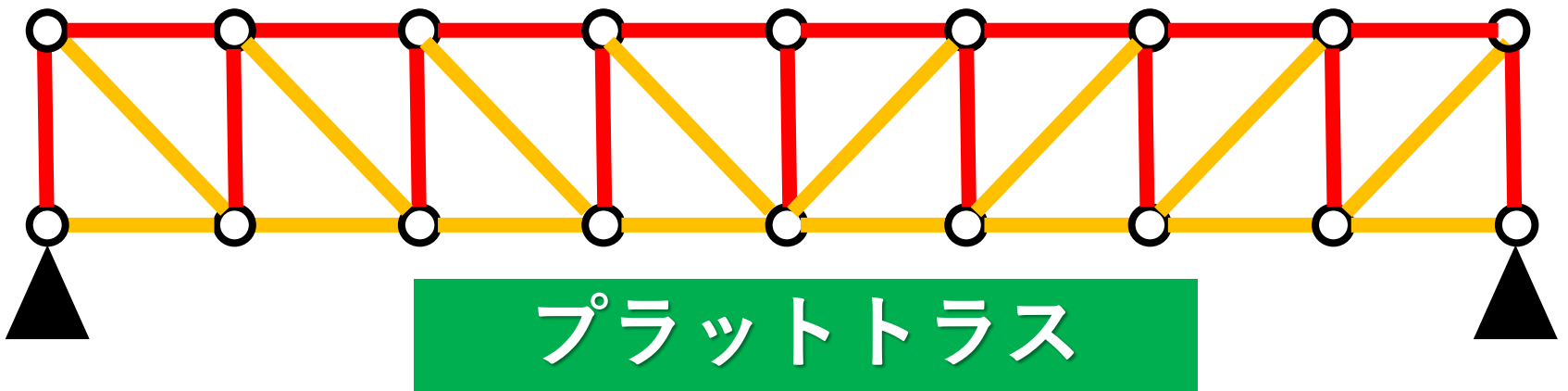
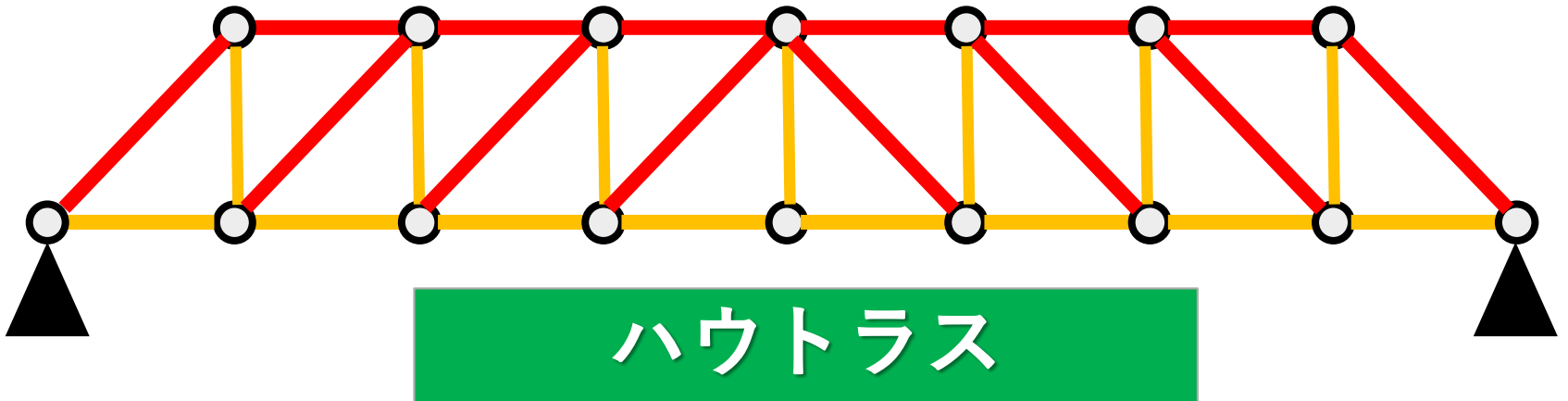
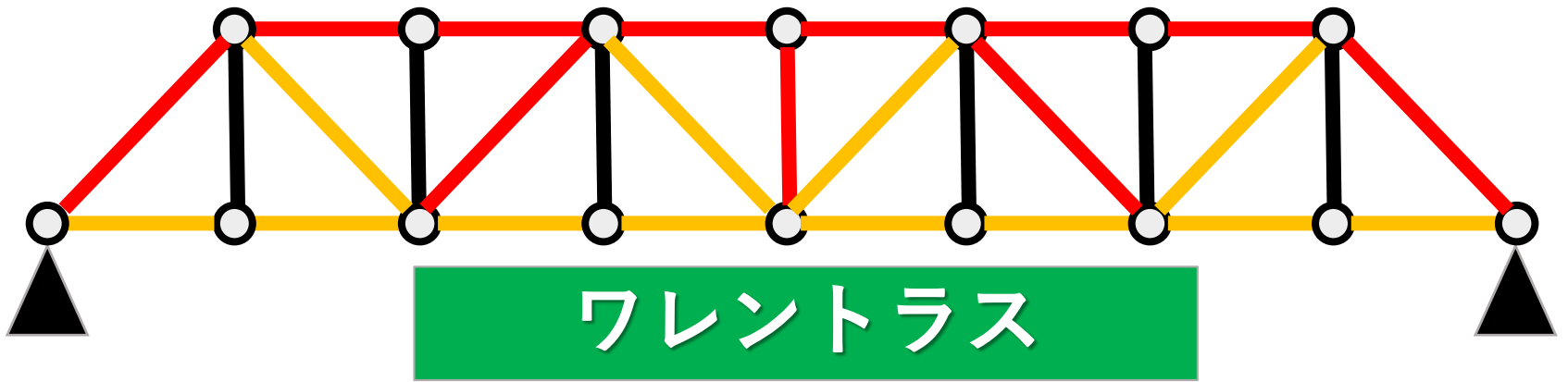


ボルトの径の7倍以上

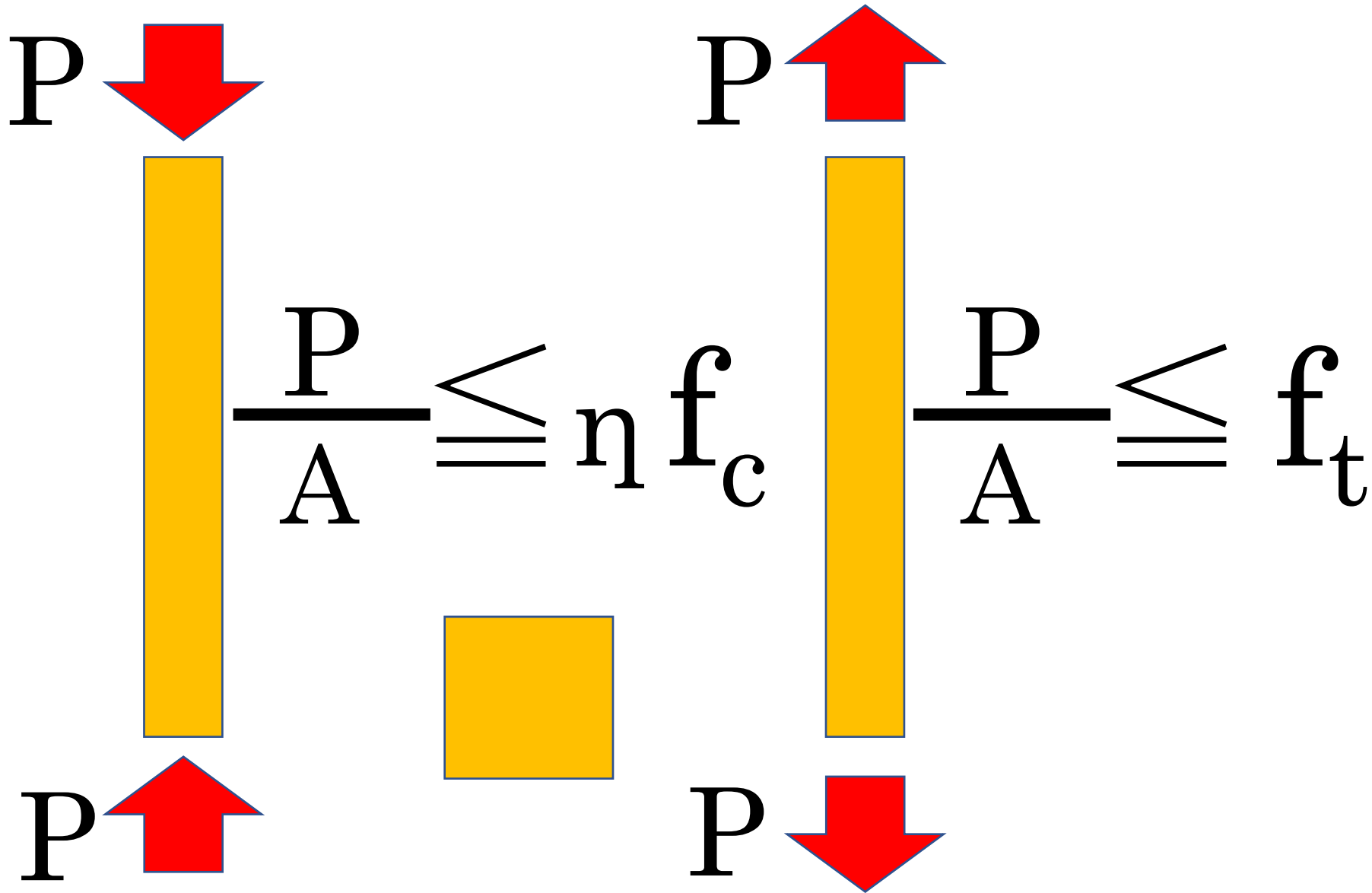




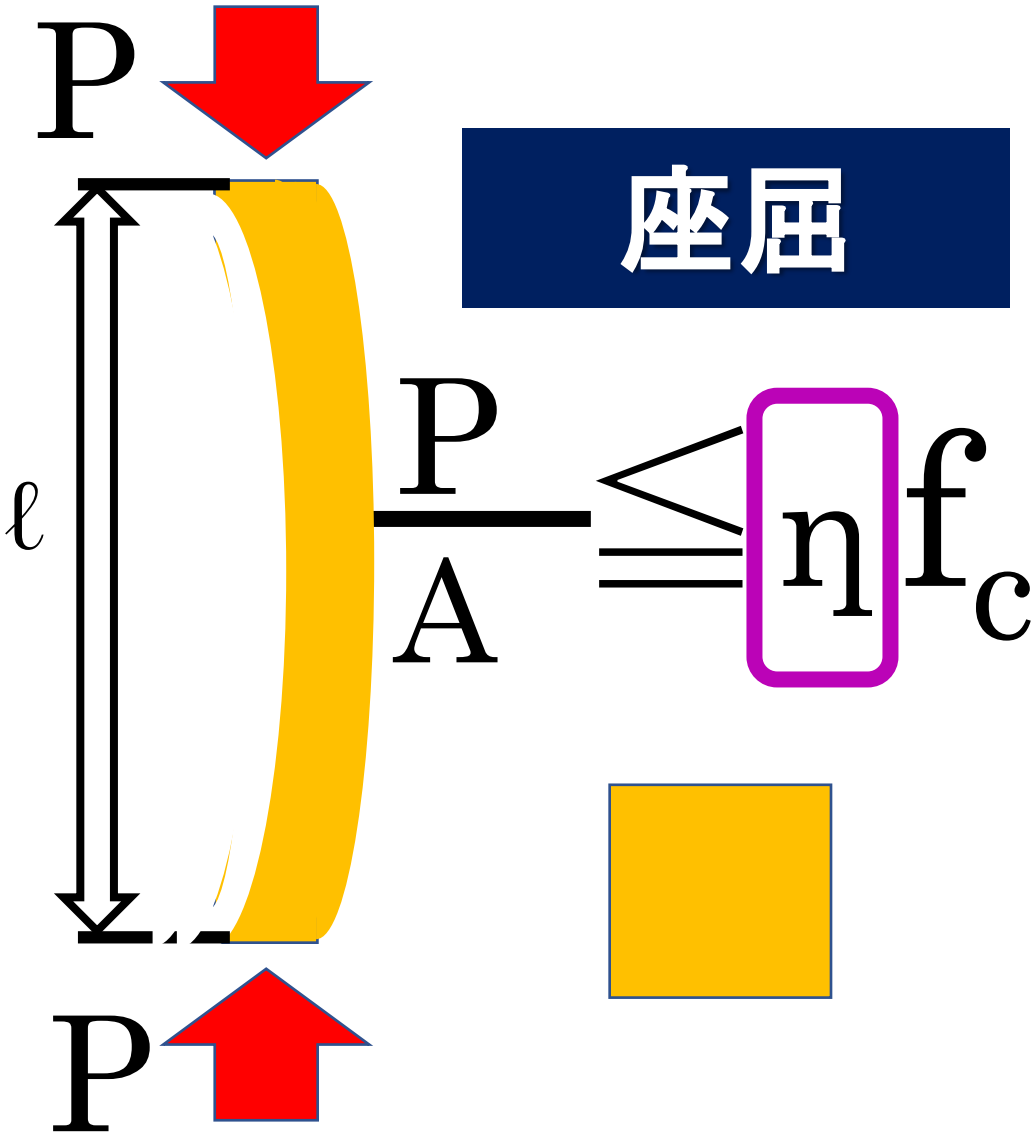




ポイント～材料の長さ



ポイント～材料の長さ



$$\lambda \leq 30$$

$$\eta = 1$$

$$30 < \lambda < 100$$

$$\eta = 1.3 - 0.01 \lambda$$

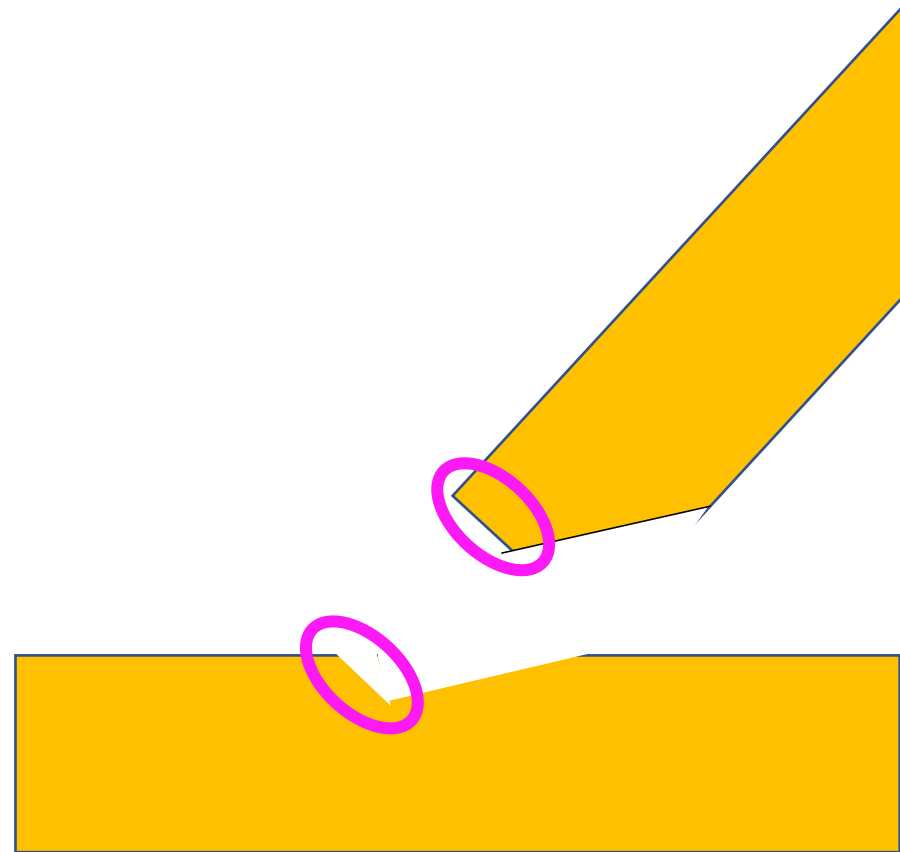
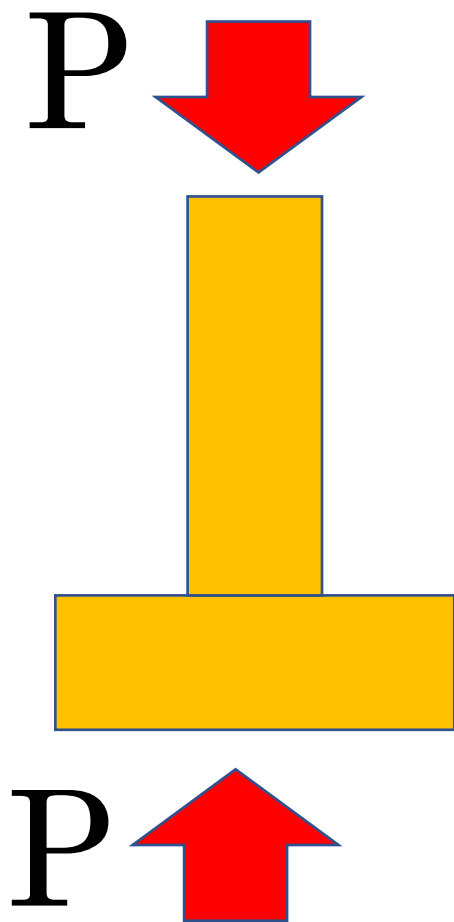
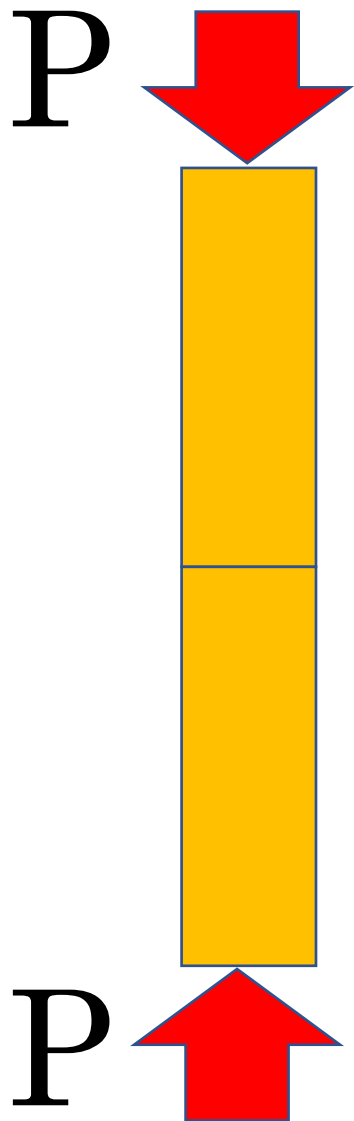
$$100 \leq \lambda$$

$$\eta = \frac{3000}{\lambda^2}$$

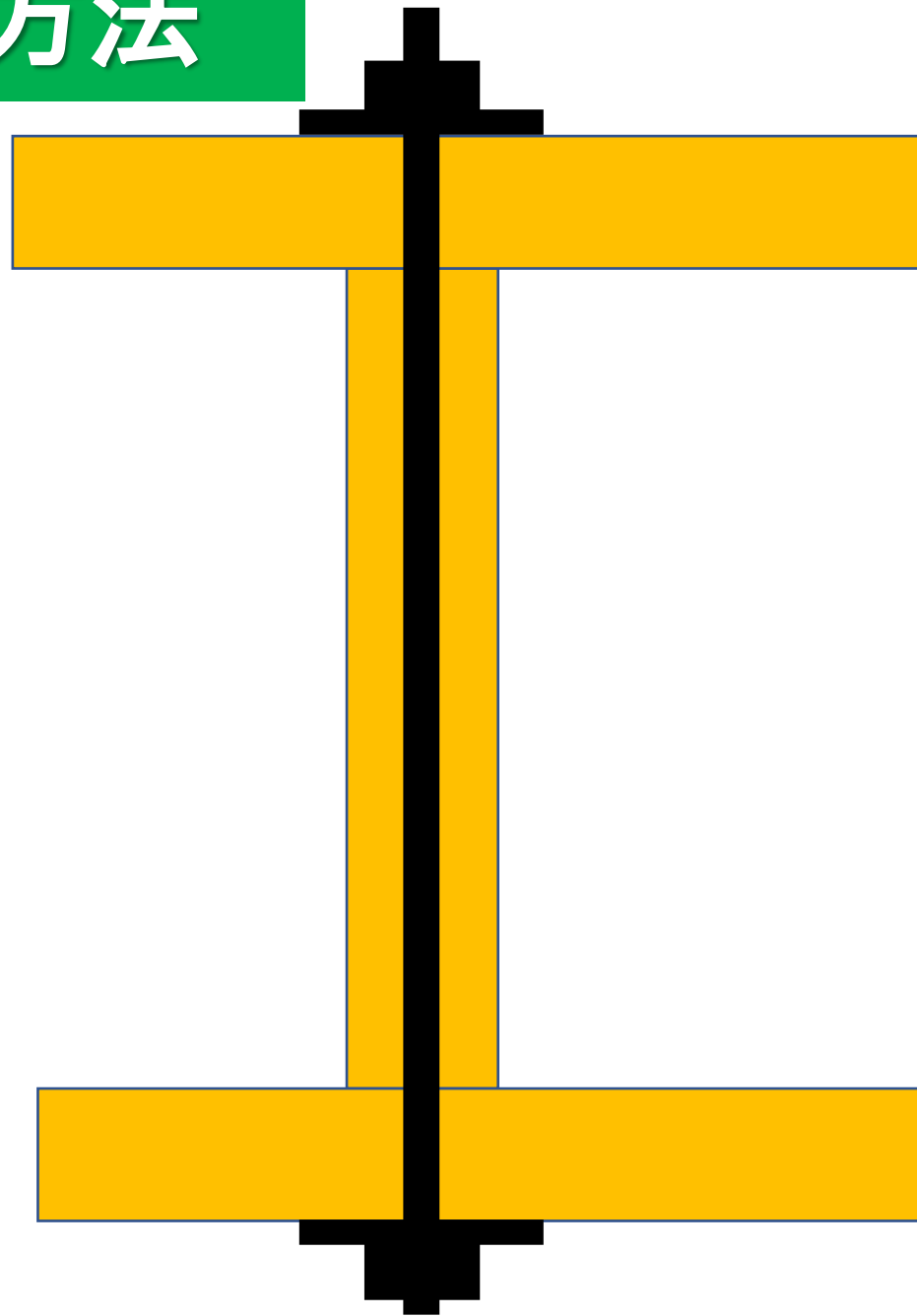
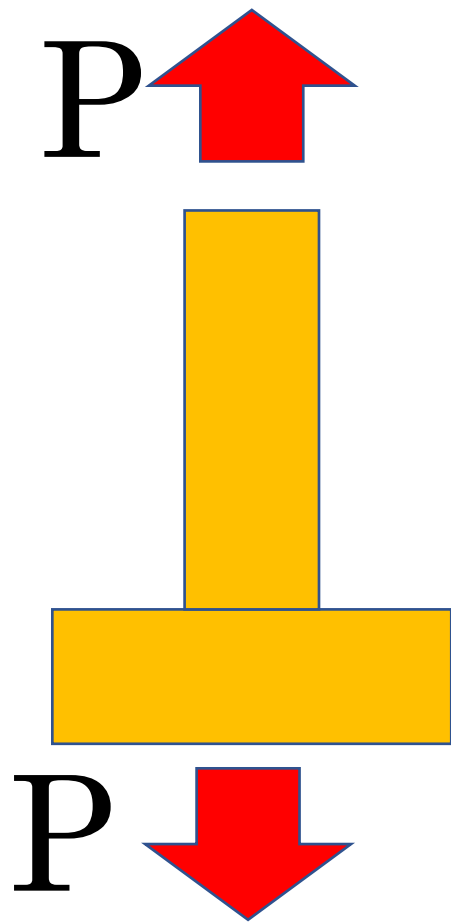
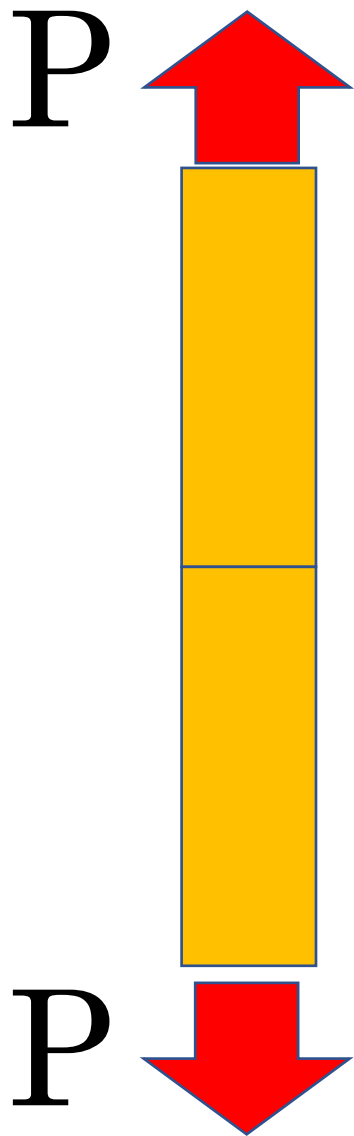
$$\lambda = \frac{\ell}{i}$$

$$i = \sqrt{\frac{I}{A}} = \frac{b}{3.46}$$

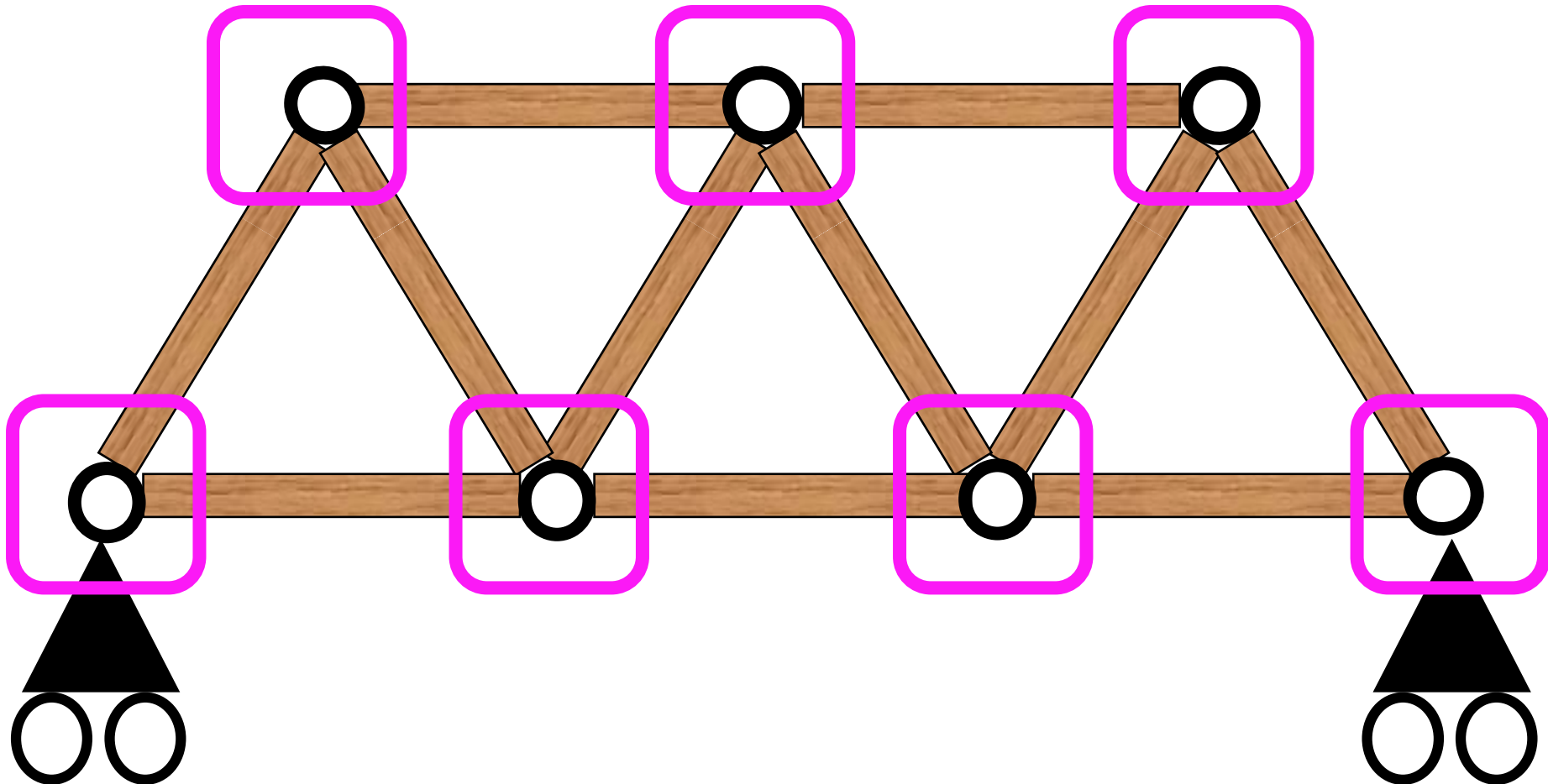
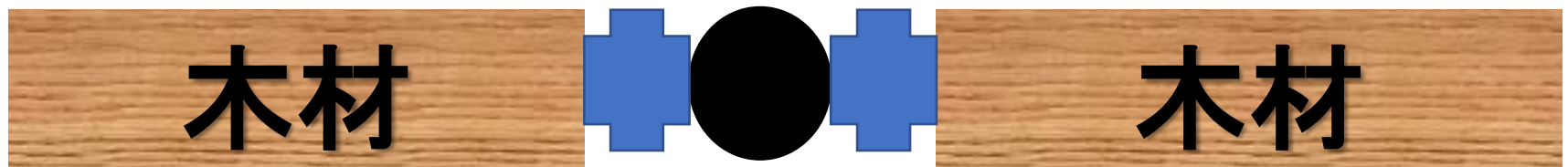
ポイント～接合方法

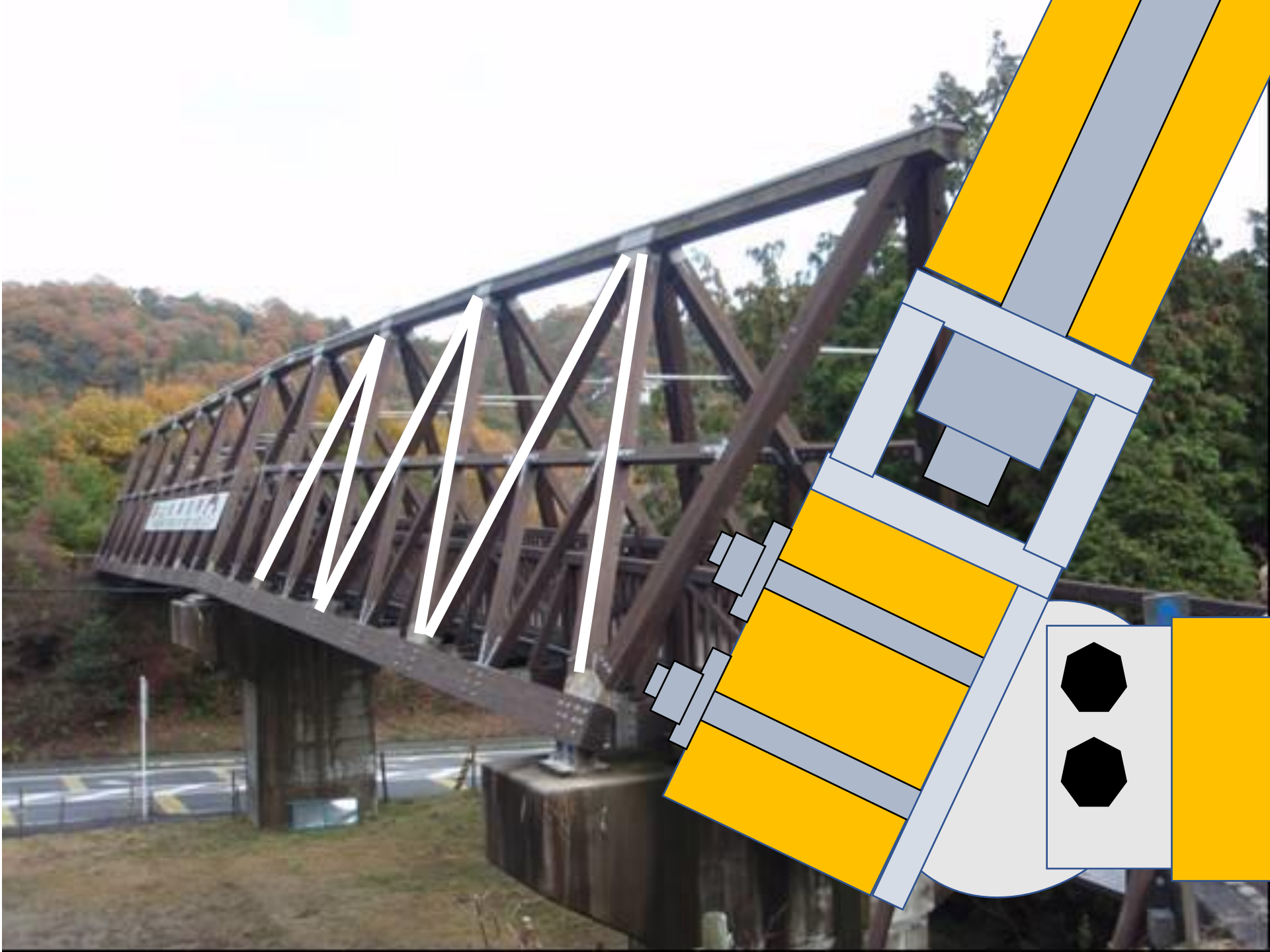


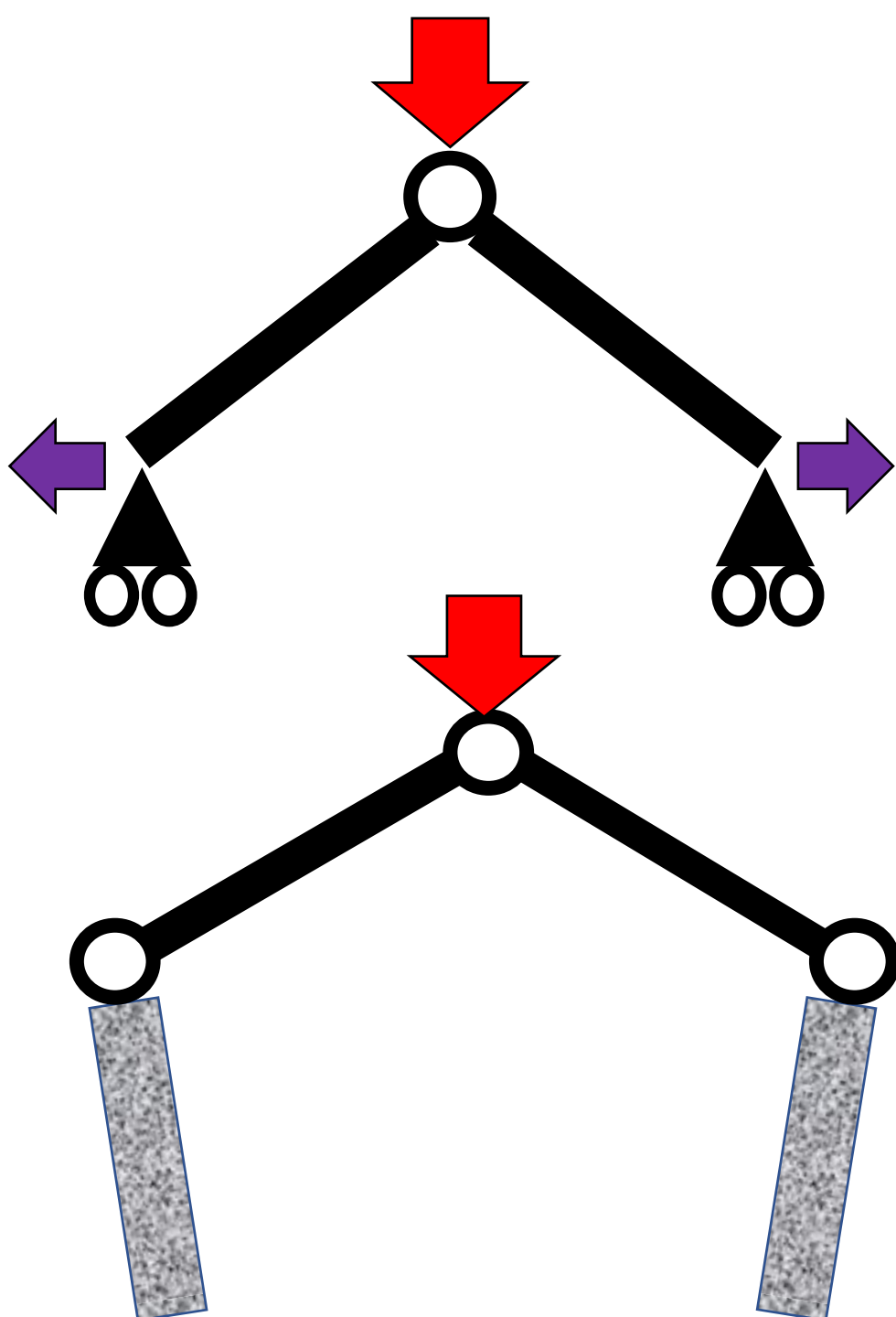
ポイント～接合方法

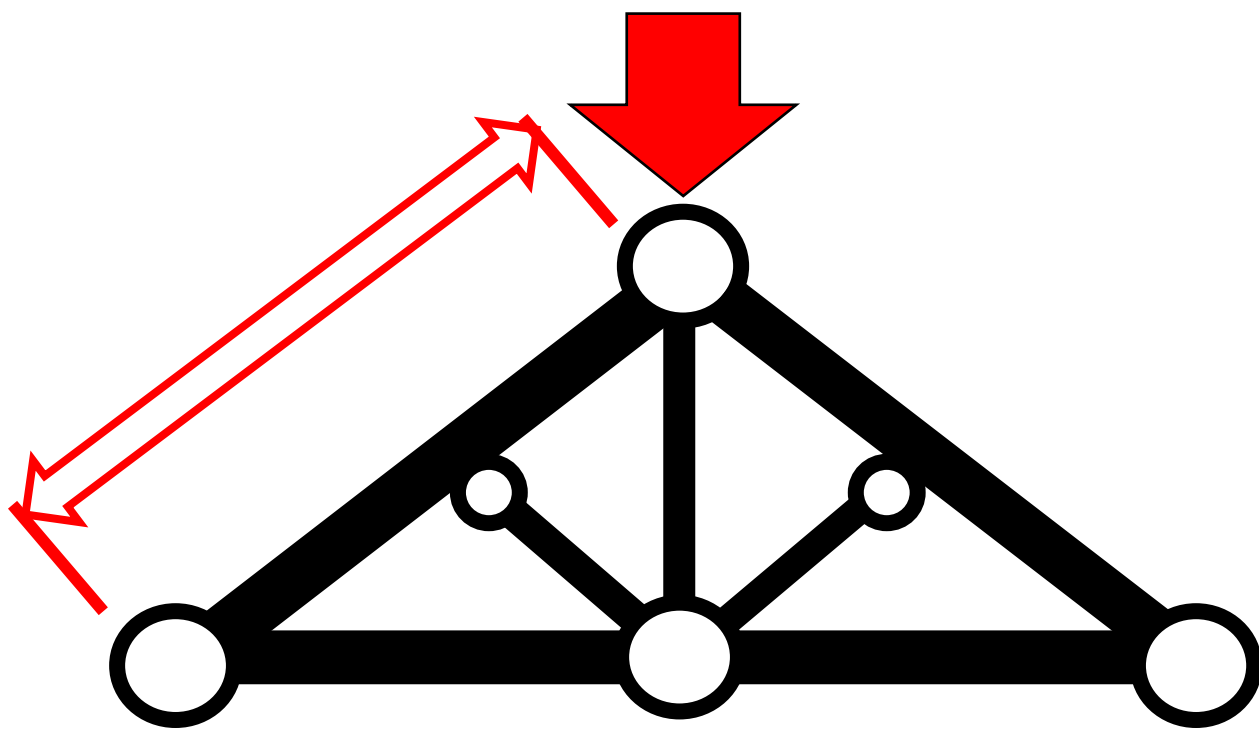


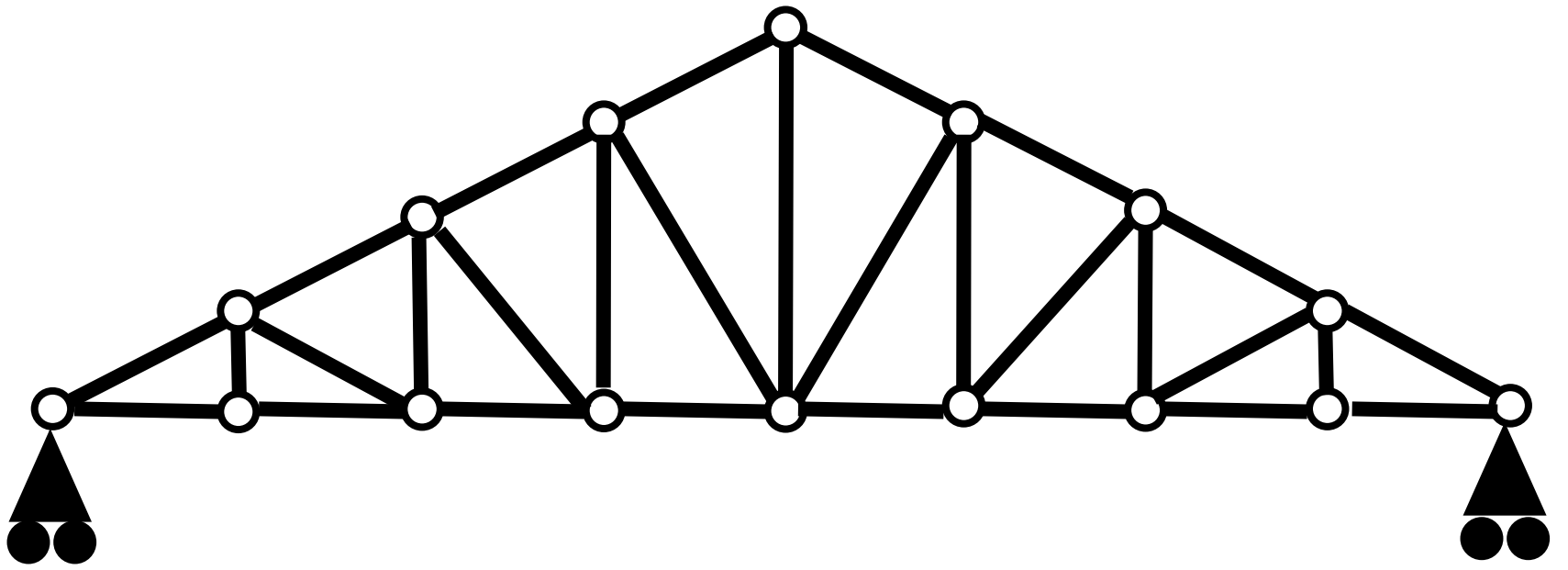
ポイント～接合方法



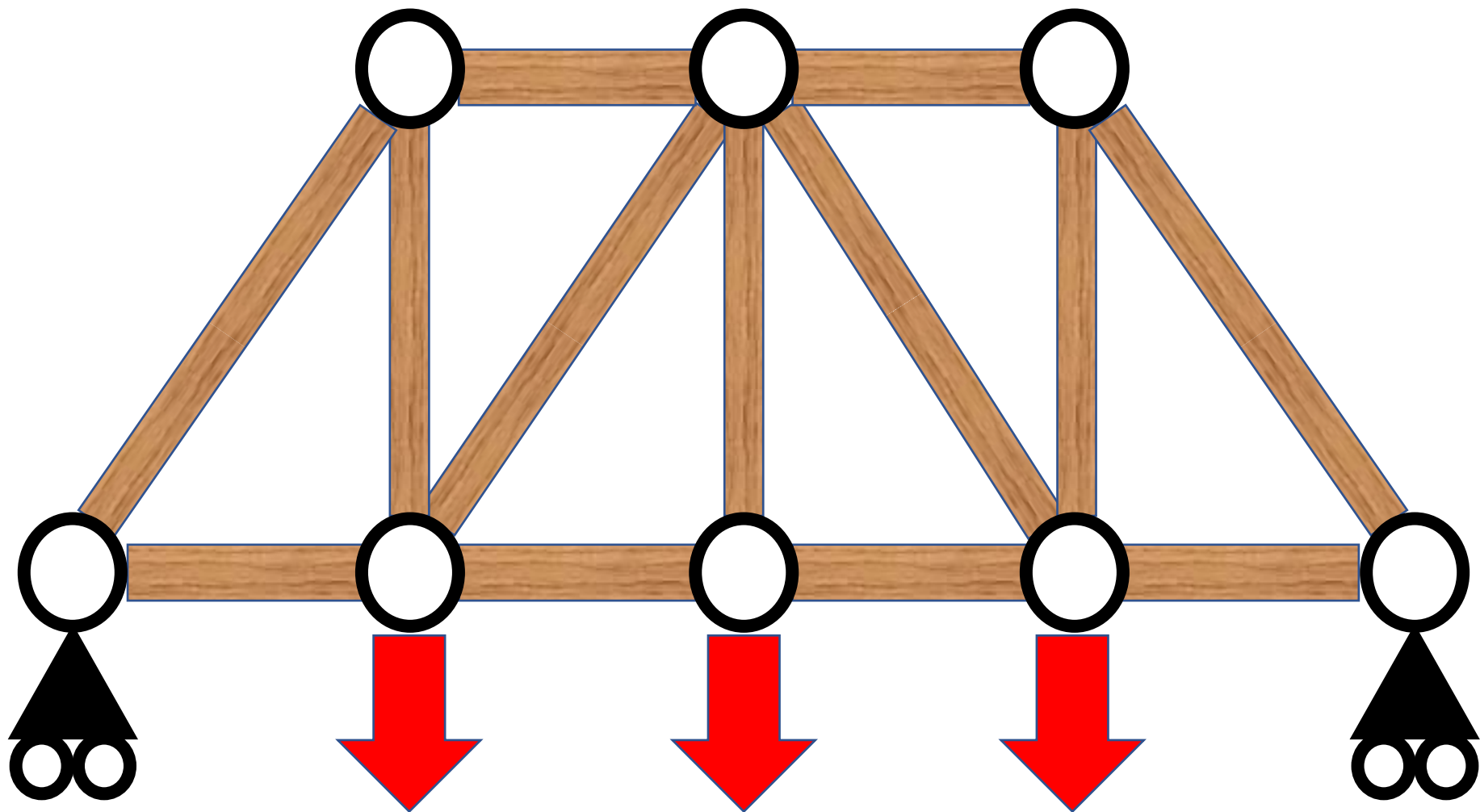




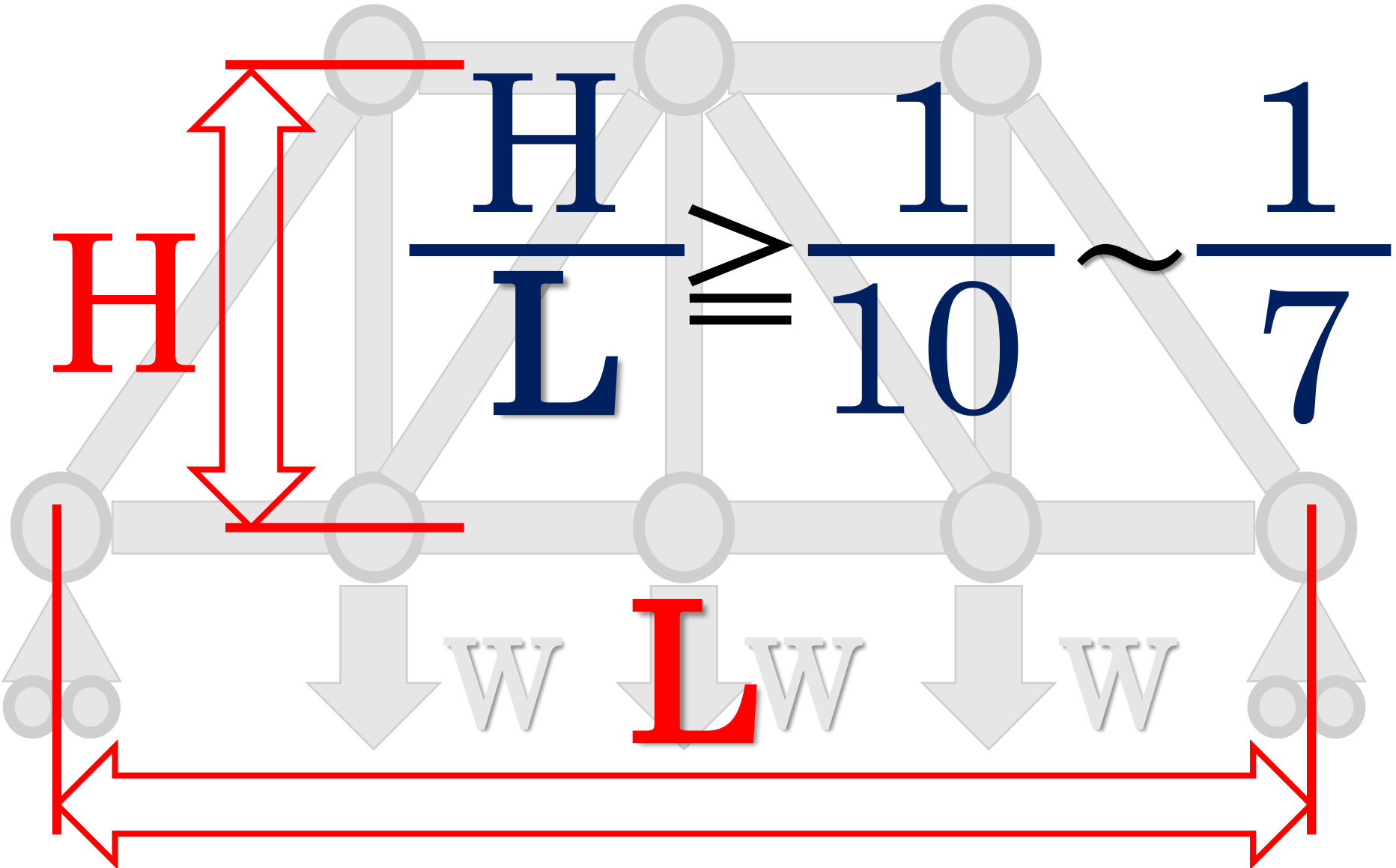


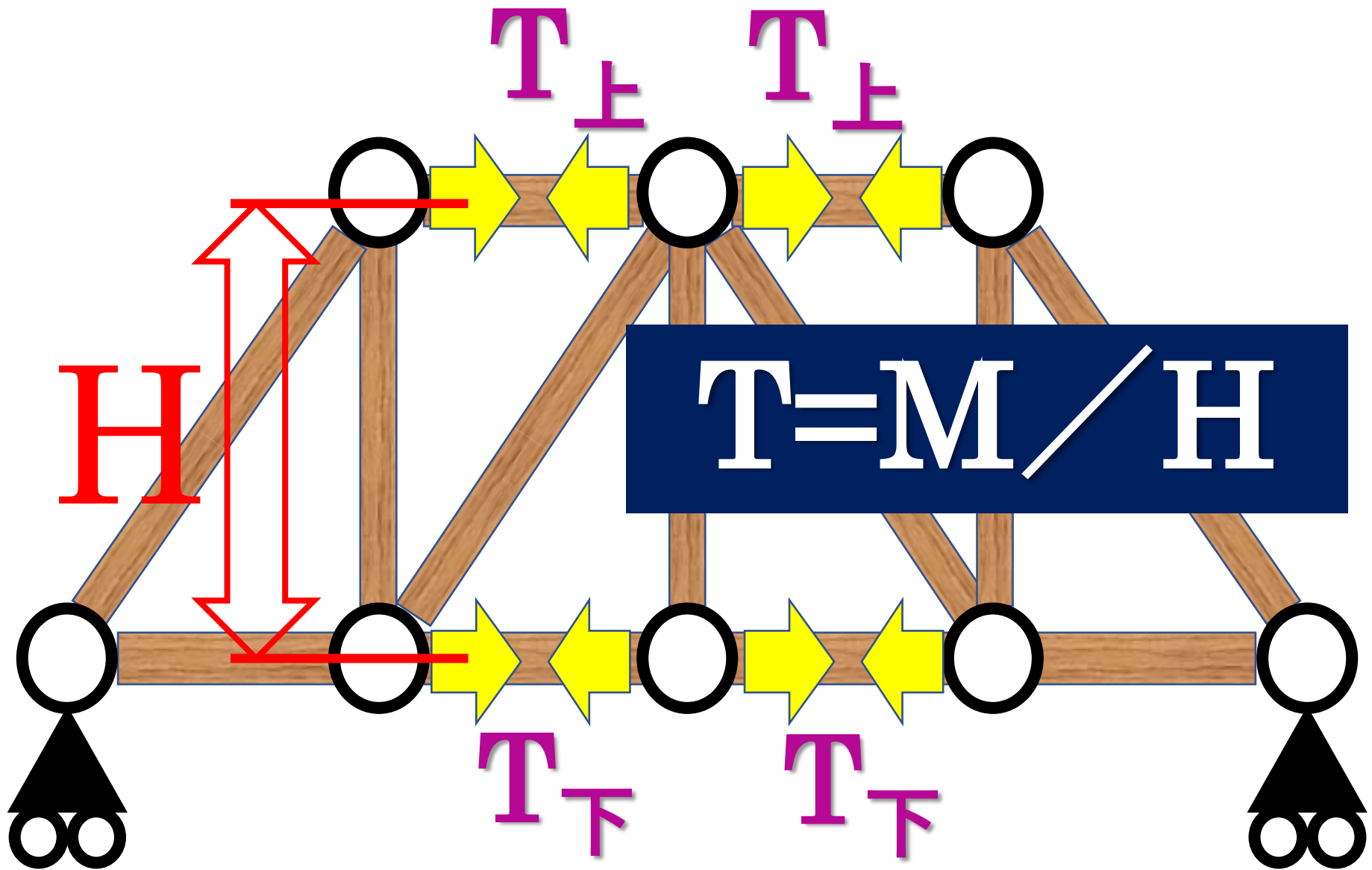


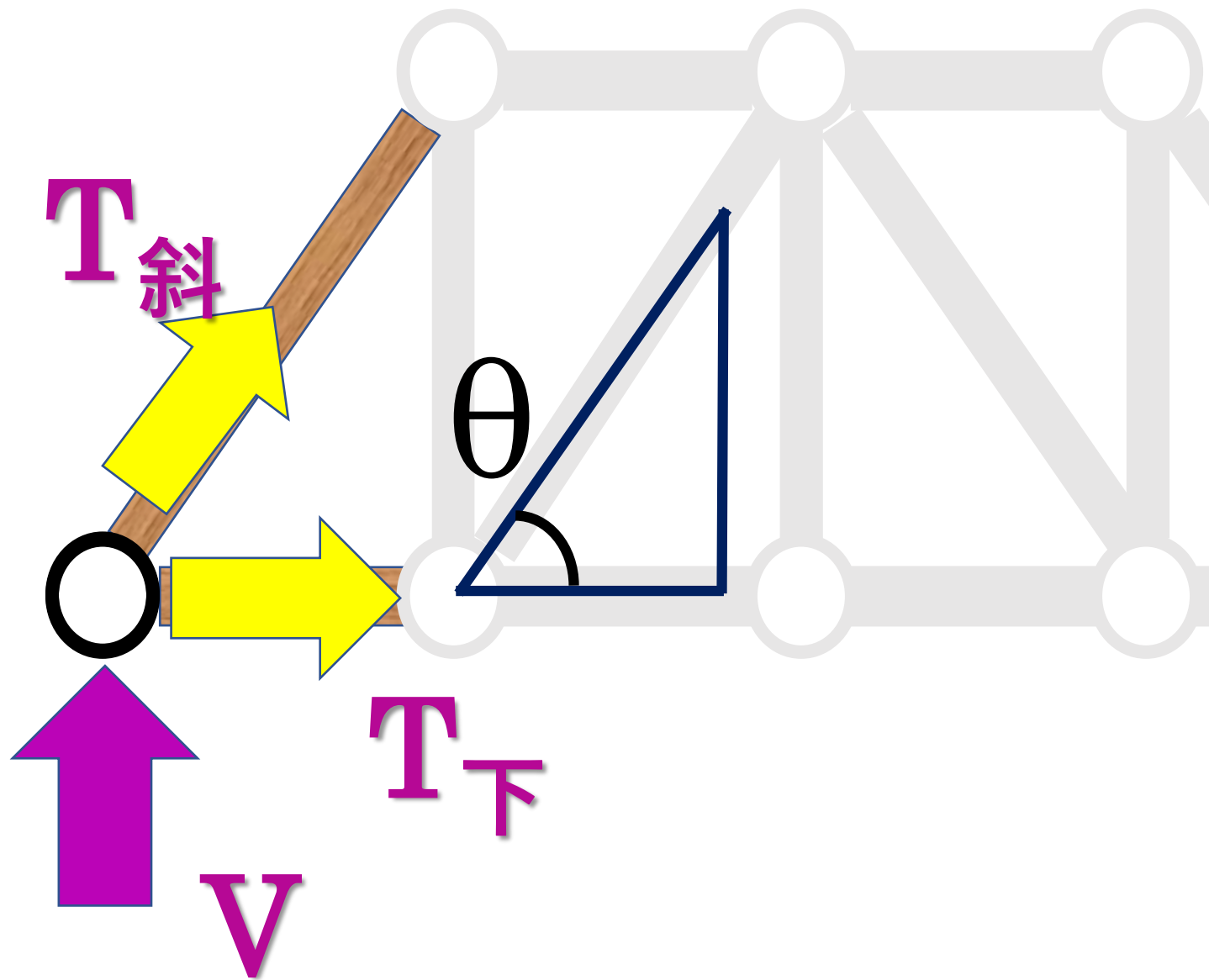
トラスの計画



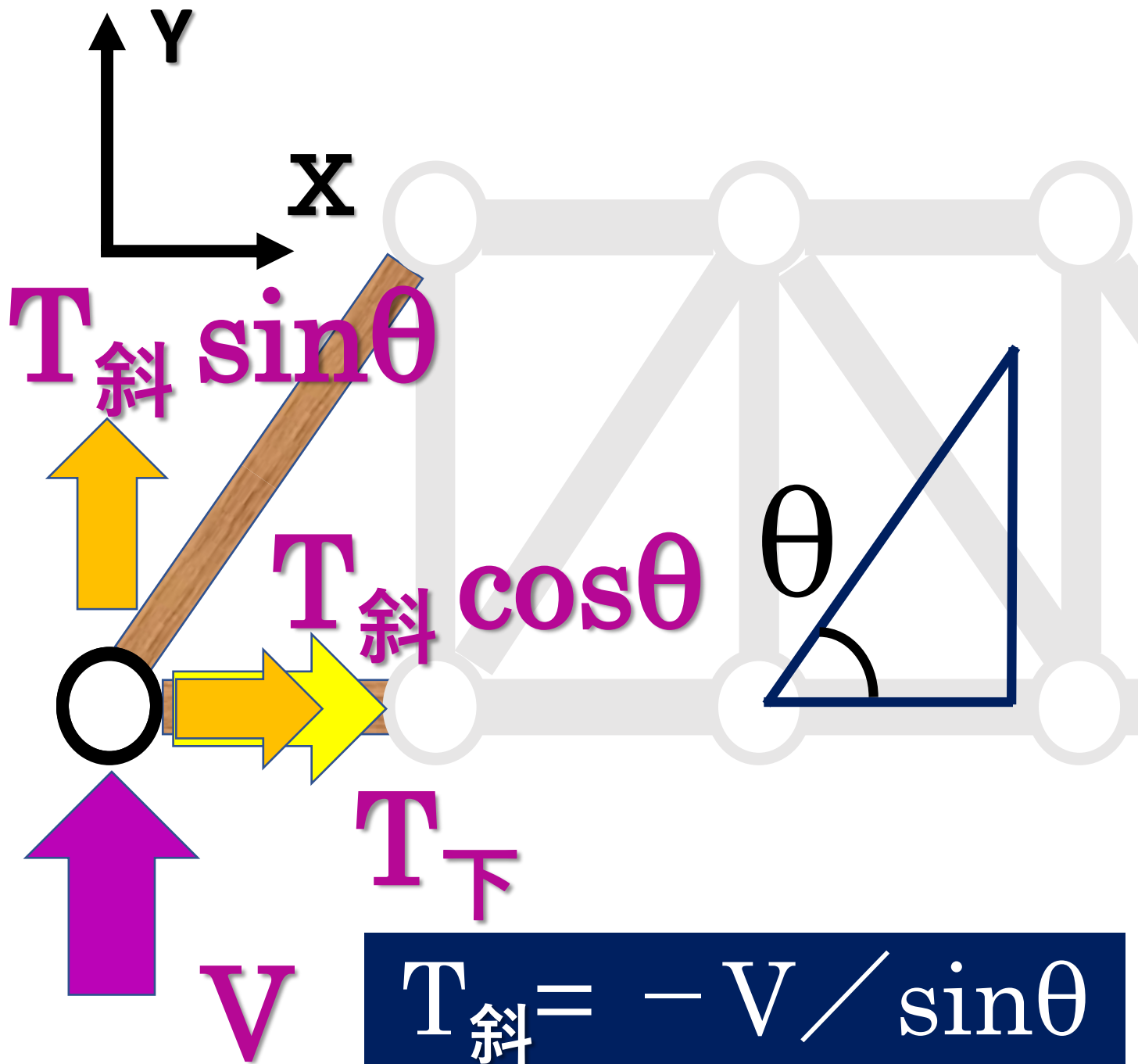
トラスの計画



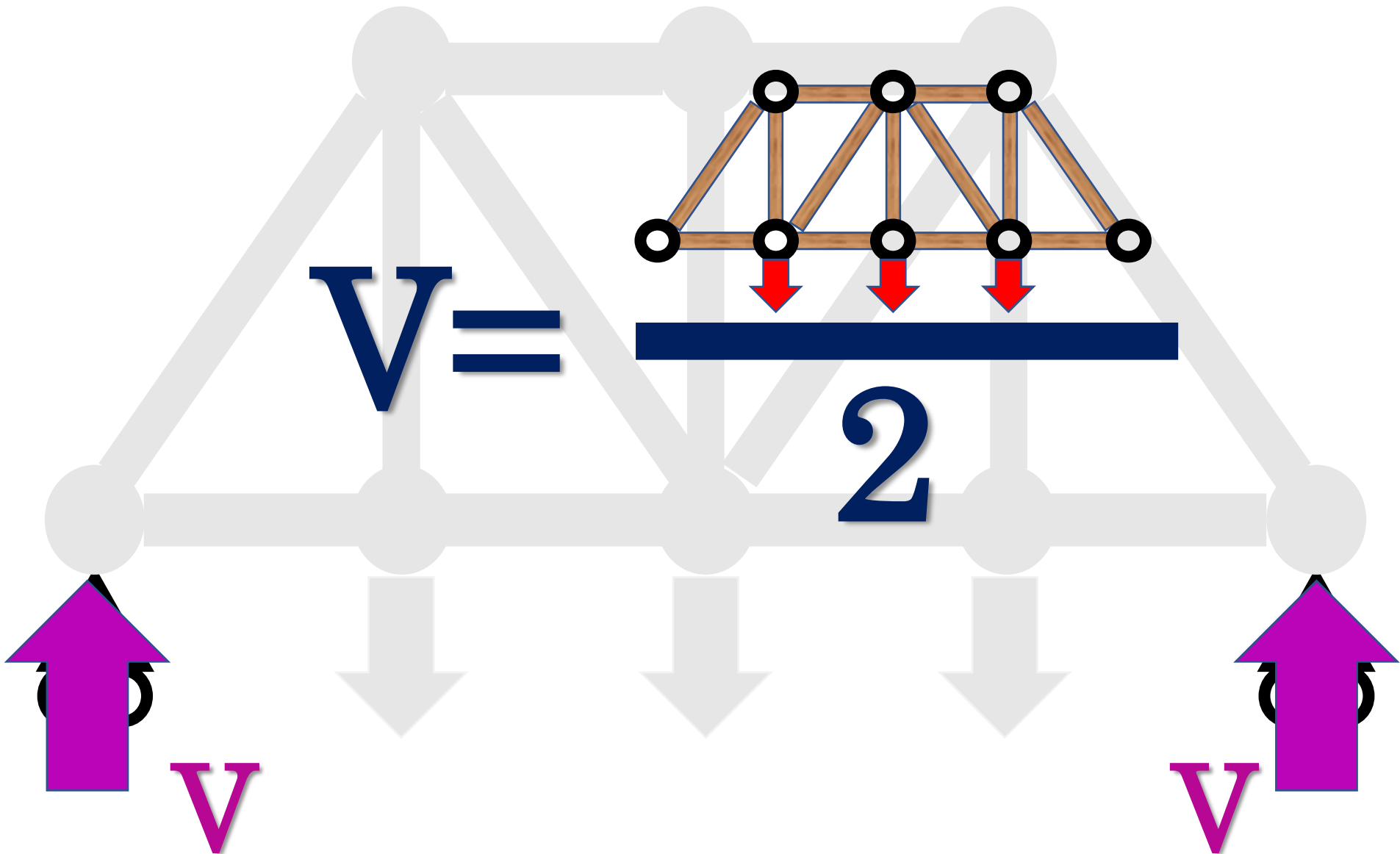




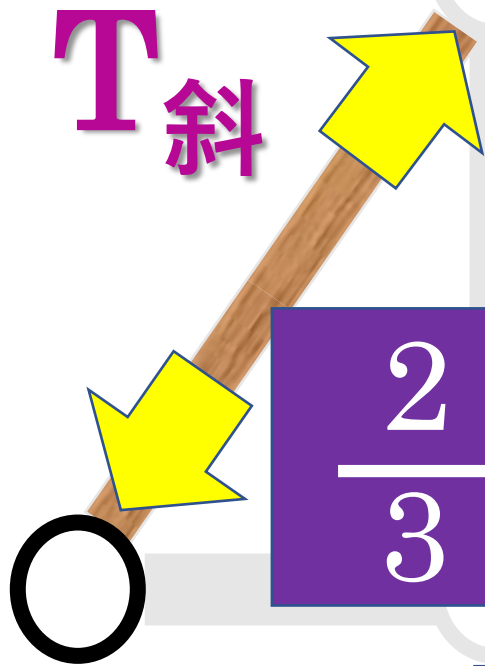
$$T_{\text{斜}} \sin \theta + V = 0$$



$$T_{\text{斜}} = -V / \sin \theta$$

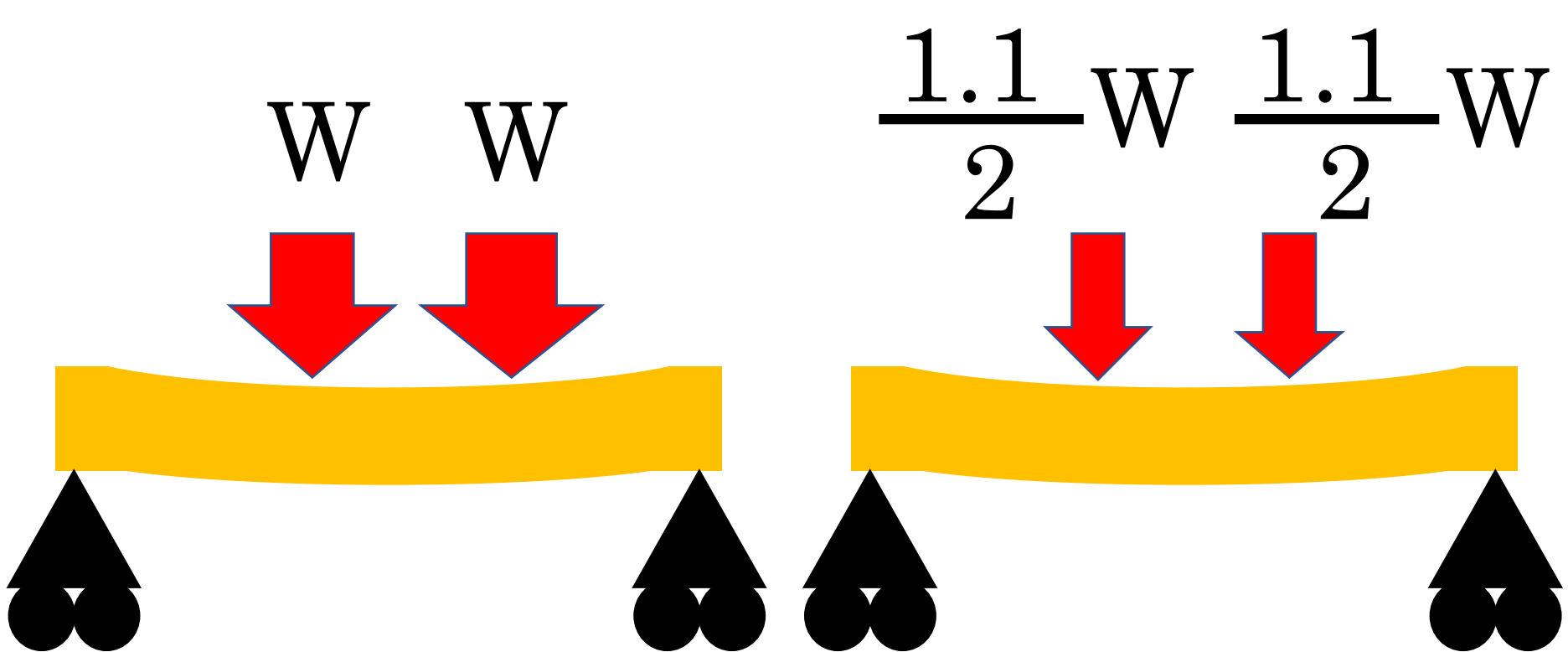


等級	基準強度(N/mm ²)			
	圧縮	引張	曲げ	せ
E 50	19.2	14.4	24.0	
E 70	23.4	17.4	29.4	
E 90	28.2	21.0	34.8	
E110	32.4	24.6	40.8	
E130	37.2	27.6	46.2	
E150	41.4	31.2	51.6	



$$\frac{2}{3} \times \frac{1}{2} \times 1.1 \times \text{基準強度}$$

$$\frac{T_{\text{斜}}}{A} \leq \eta f_c$$

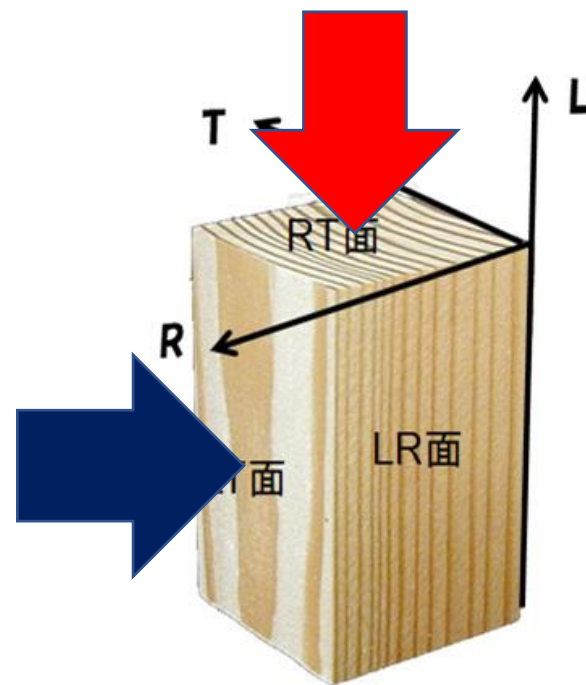
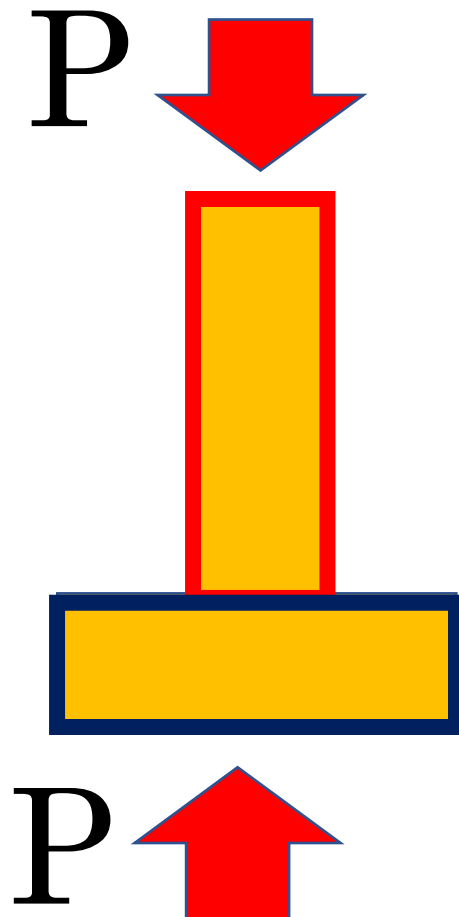
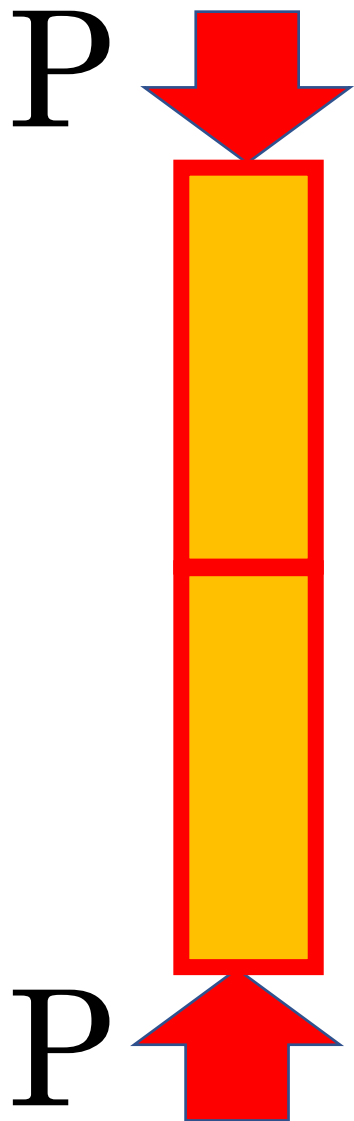


安全係数

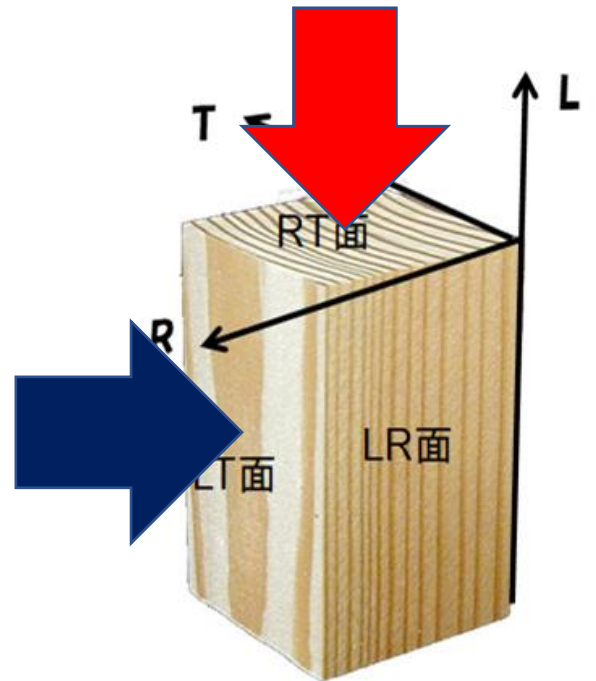
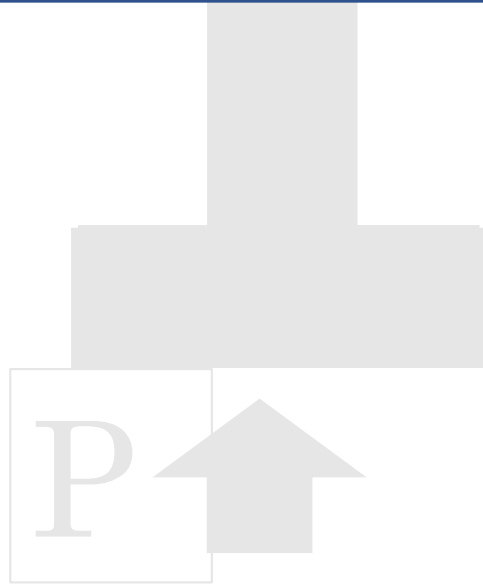
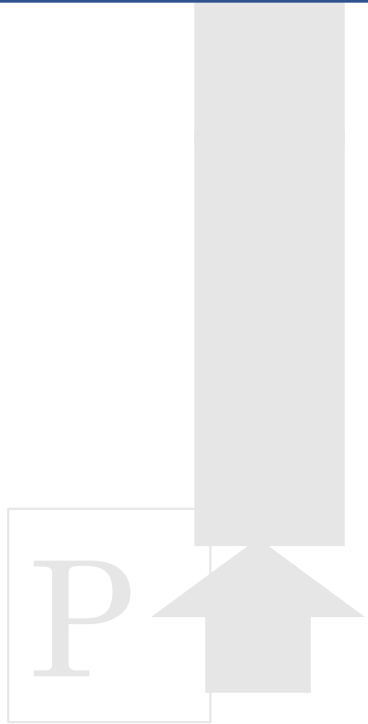
50年

$$\frac{2}{3} \times \frac{1}{2} \times 1.1 \times \text{基準強度}$$

トラスの基本設計

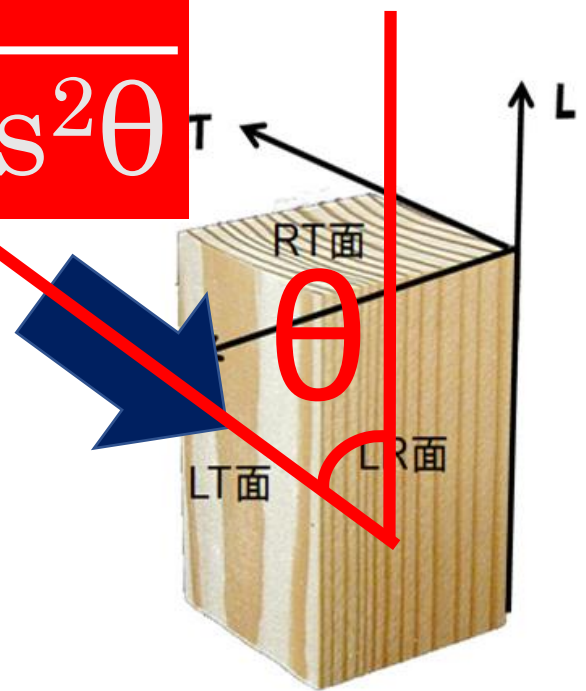
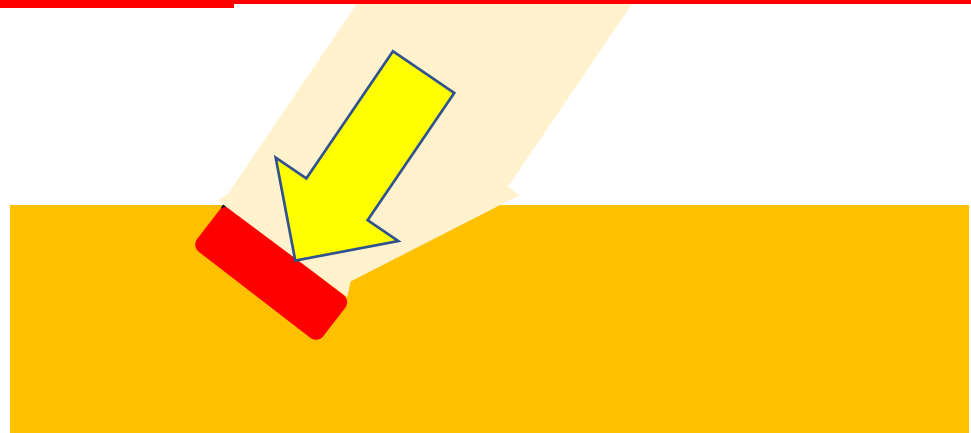


等級	基準強度(N/mm ²)				
	圧縮	引張	曲げ	せん断	めり込み
E 50	19.2	14.4	24.0	1.8	6.0
E 70	23.4	17.4	29.4		
E 90	28.2	21.0	34.8		
E110	32.4	24.6	40.8		
E130	37.2	27.6	46.2		
E150	41.4	31.2	51.6		

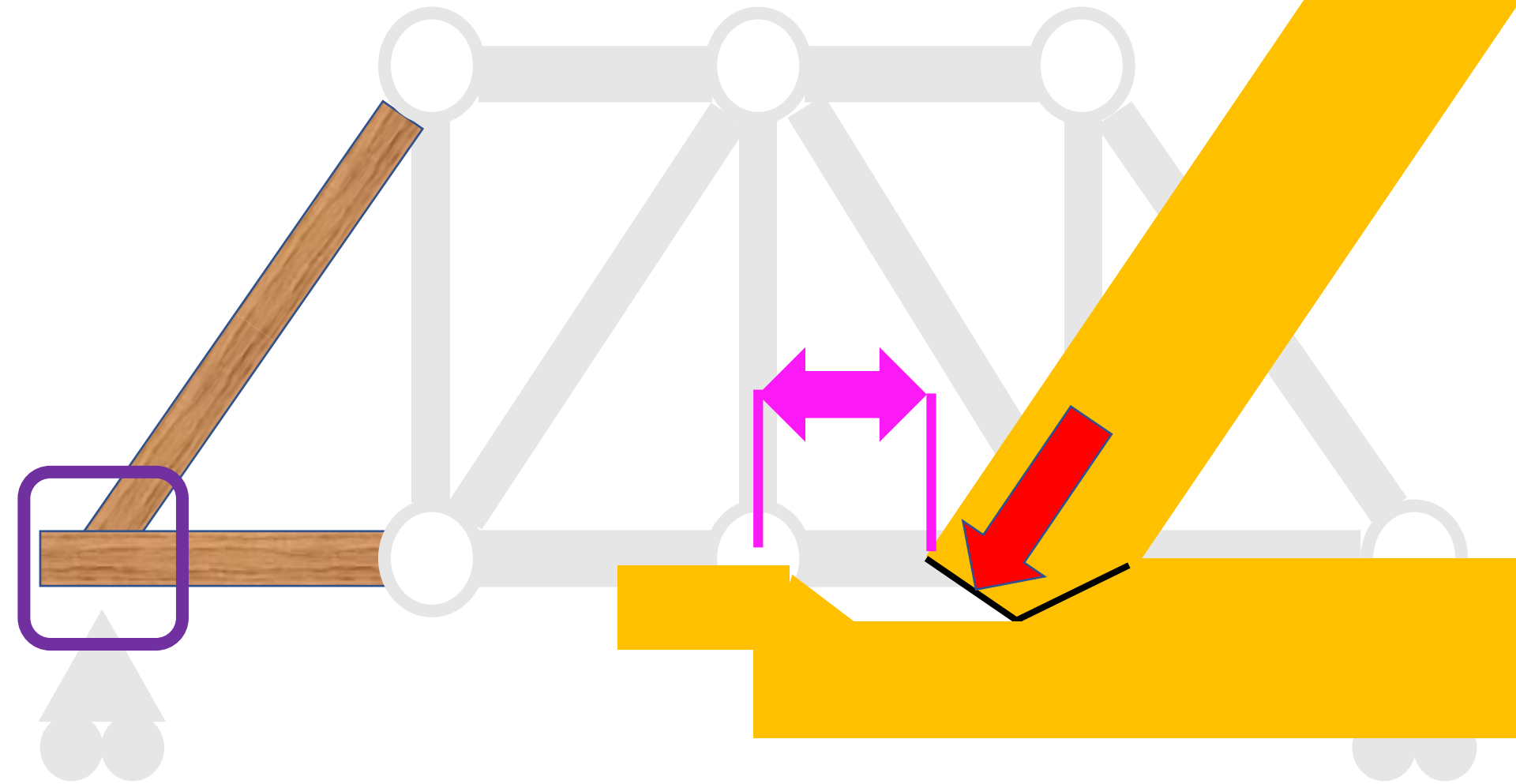


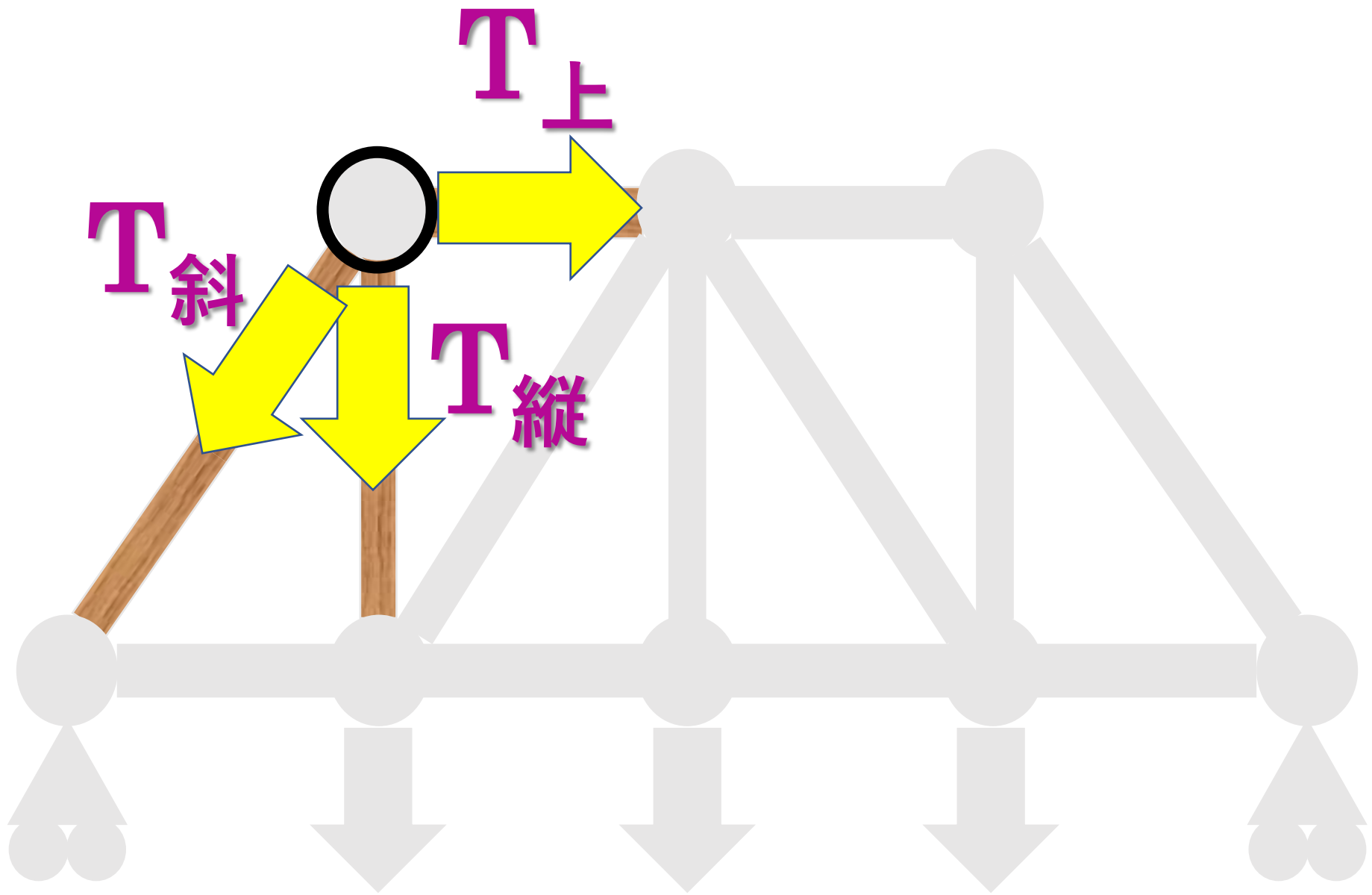
等級	基準強度(N/mm ²)			
	圧縮	引張	曲げ	せん断
E 50	19.2	14.4	19.0	1.8
E 70	23.4	17.5	23.4	2.2
E 90	28.2	21.1	34.8	2.7
E110	32.4	24.3	40.8	3.2
E130	37.2	28.0	46.2	3.6

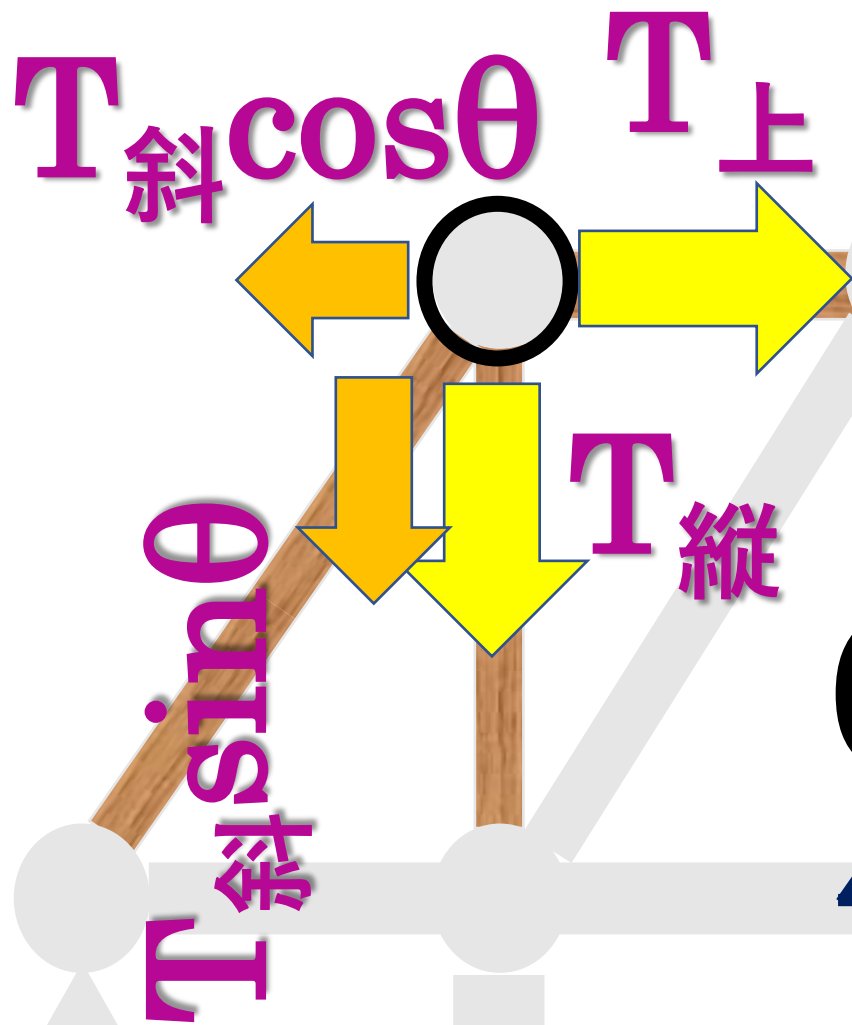
$$F_{\theta} = \frac{F_0 \times F_{90}}{F_0 \sin^2 \theta + F_{90} \cos^2 \theta}$$



トラスの基本設計







$$T_{縦} = -T_{斜} \sin \theta$$

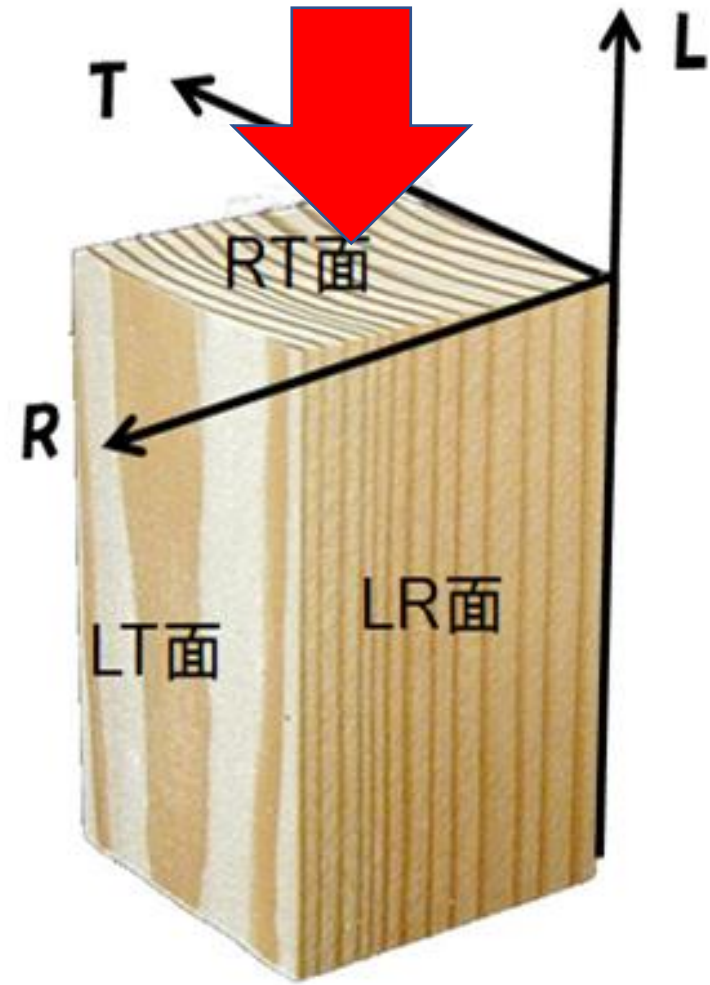
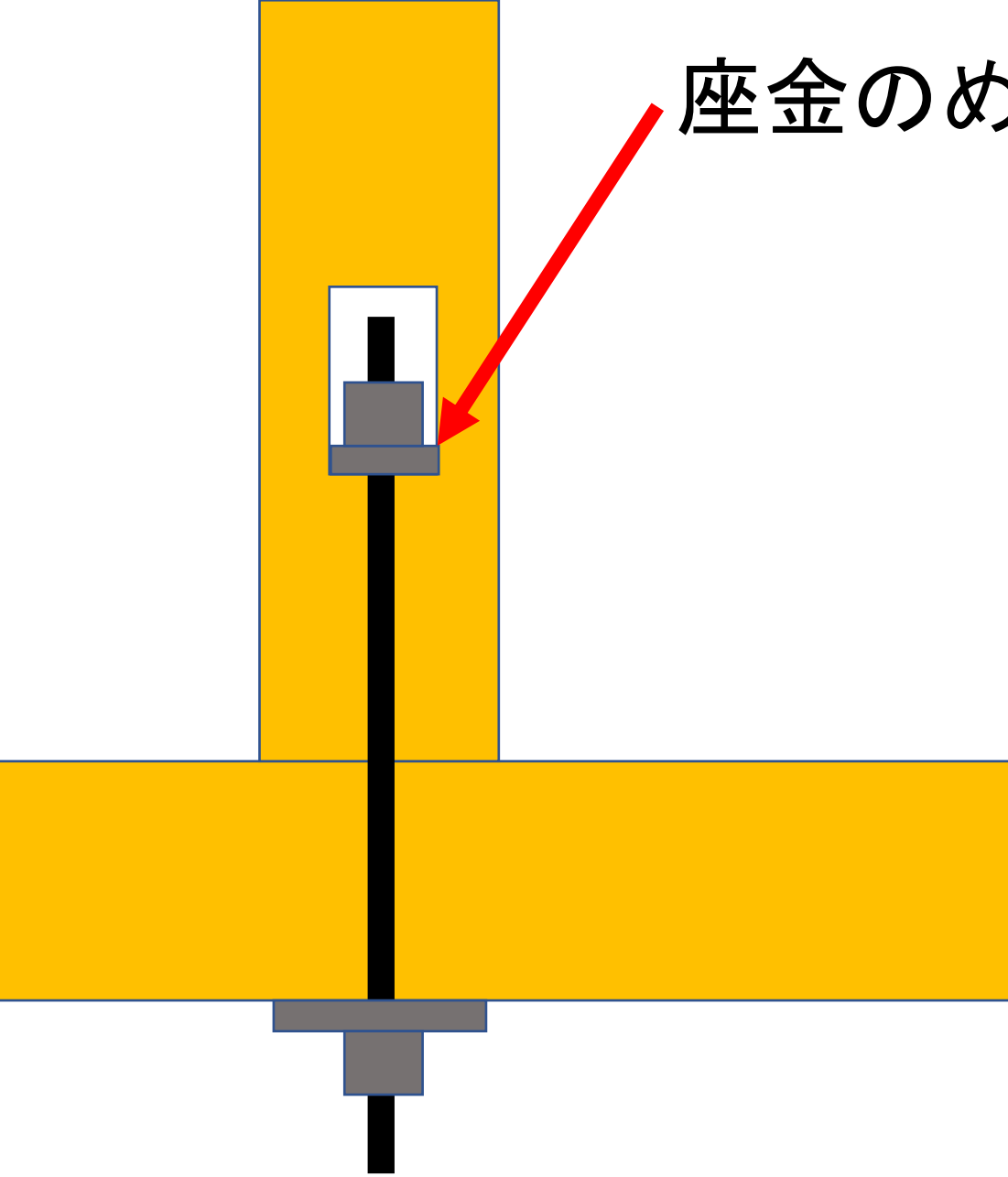
$$T_{縦} = V$$

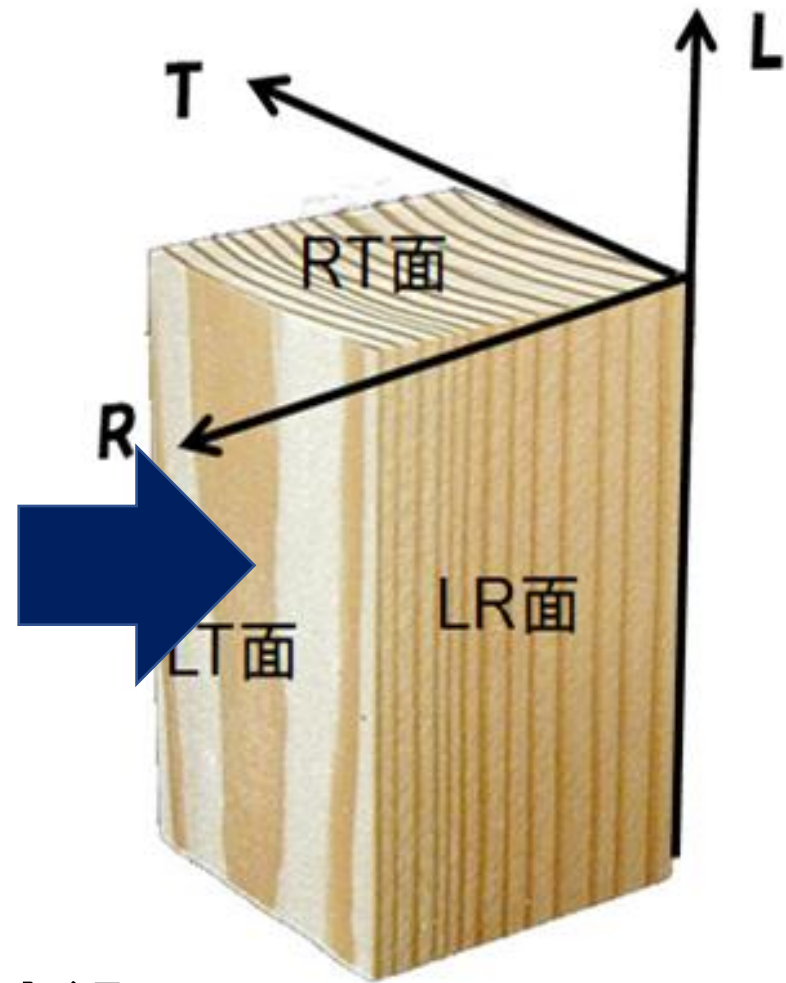
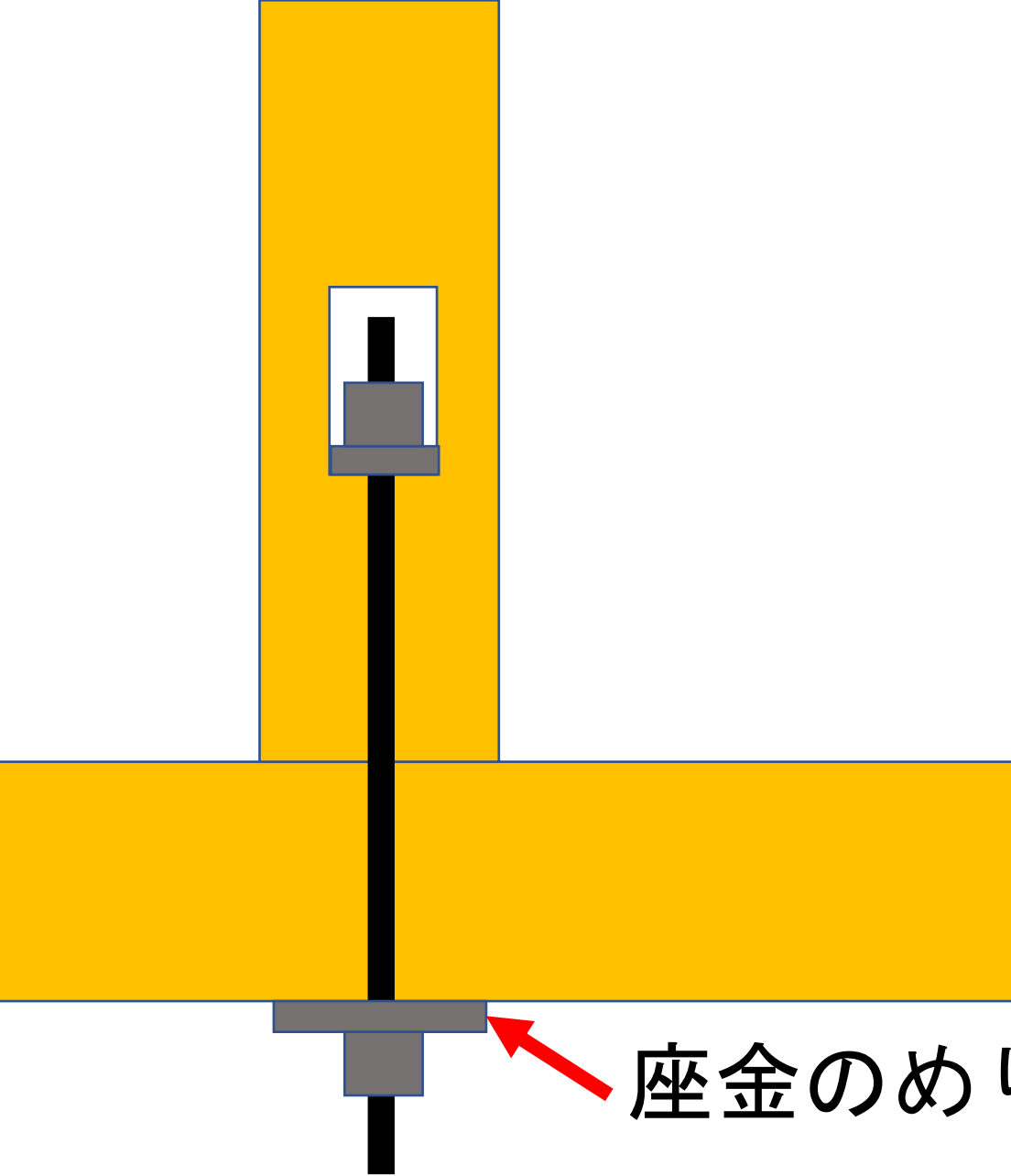
等級	基準強度(N/mm ²)				
	圧縮	引張	曲げ	せん断	めり込み
E 50	19.2	14.4	24.0	1.8	6.0
E 70	23.4	17.4	29.4		
E 90	28.2	21.0	34.8		
E110	32.4	24.6	40.8		
E130	37.2	27.6	46.2		
E150	41.4	31.2	51.6		

$$\frac{T_{\text{縦}}}{A} \leq f_t$$

$$\frac{2}{3} \times \frac{1}{2} \times 1.1 \times \text{基準強度}$$

座金のめり込み



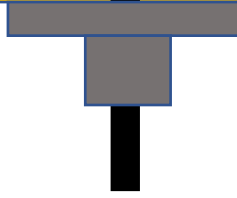


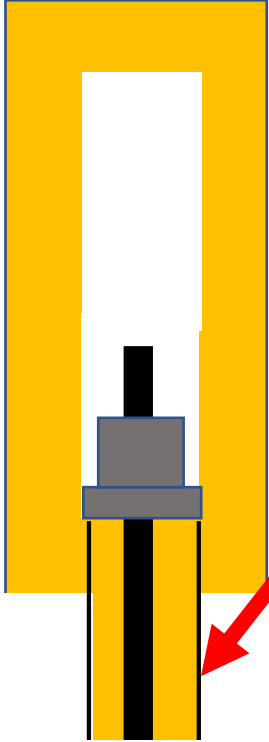
座金のめり込み

座金の曲げ



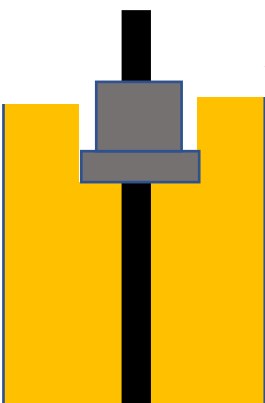
座金の曲げ





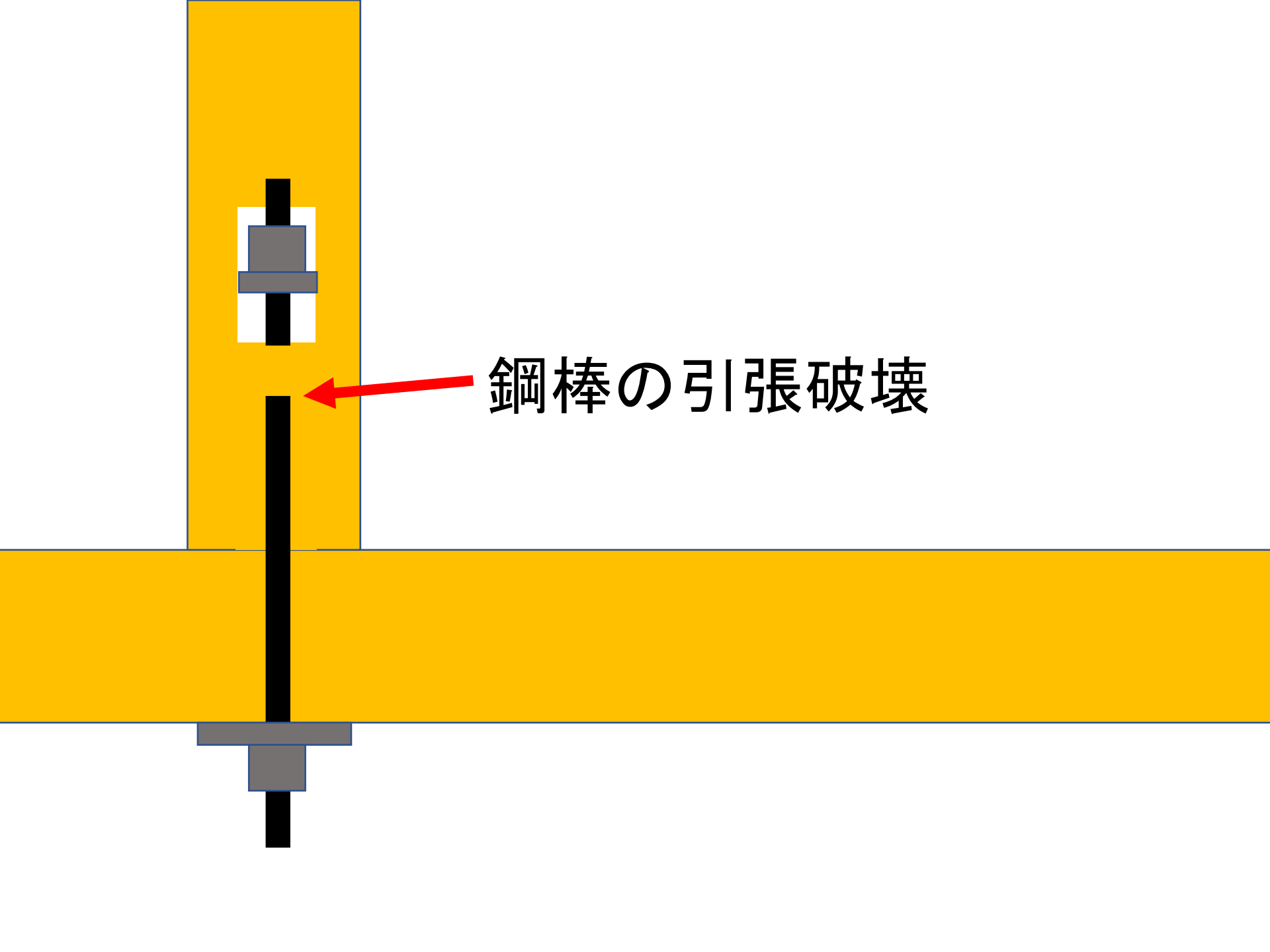
木材のせん断破壊

等級	基準強度(N/mm ²)				
	圧縮	引張	曲げ	せん断	めり込み
E 50	19.2	14.4	24.0	1.8	6.0
E 70	23.4	17.4	29.4		
E 90	28.2	21.0	34.8		
E110	32.4	24.6	40.8		
E130	37.2	27.6	46.2		
E150	41.4	31.2	51.6		

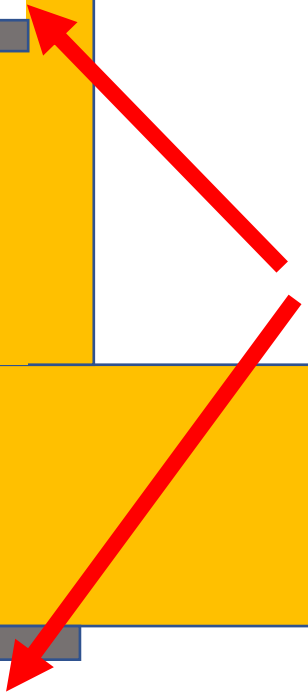
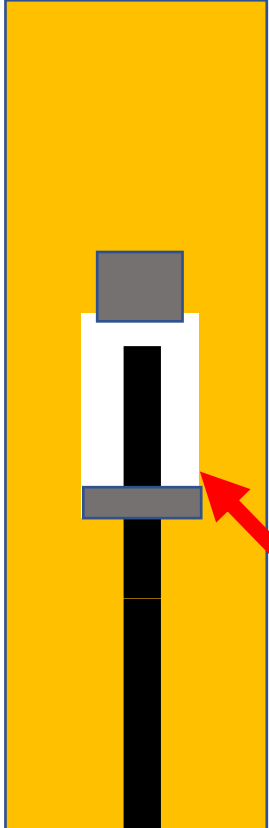


木材の引張破壊

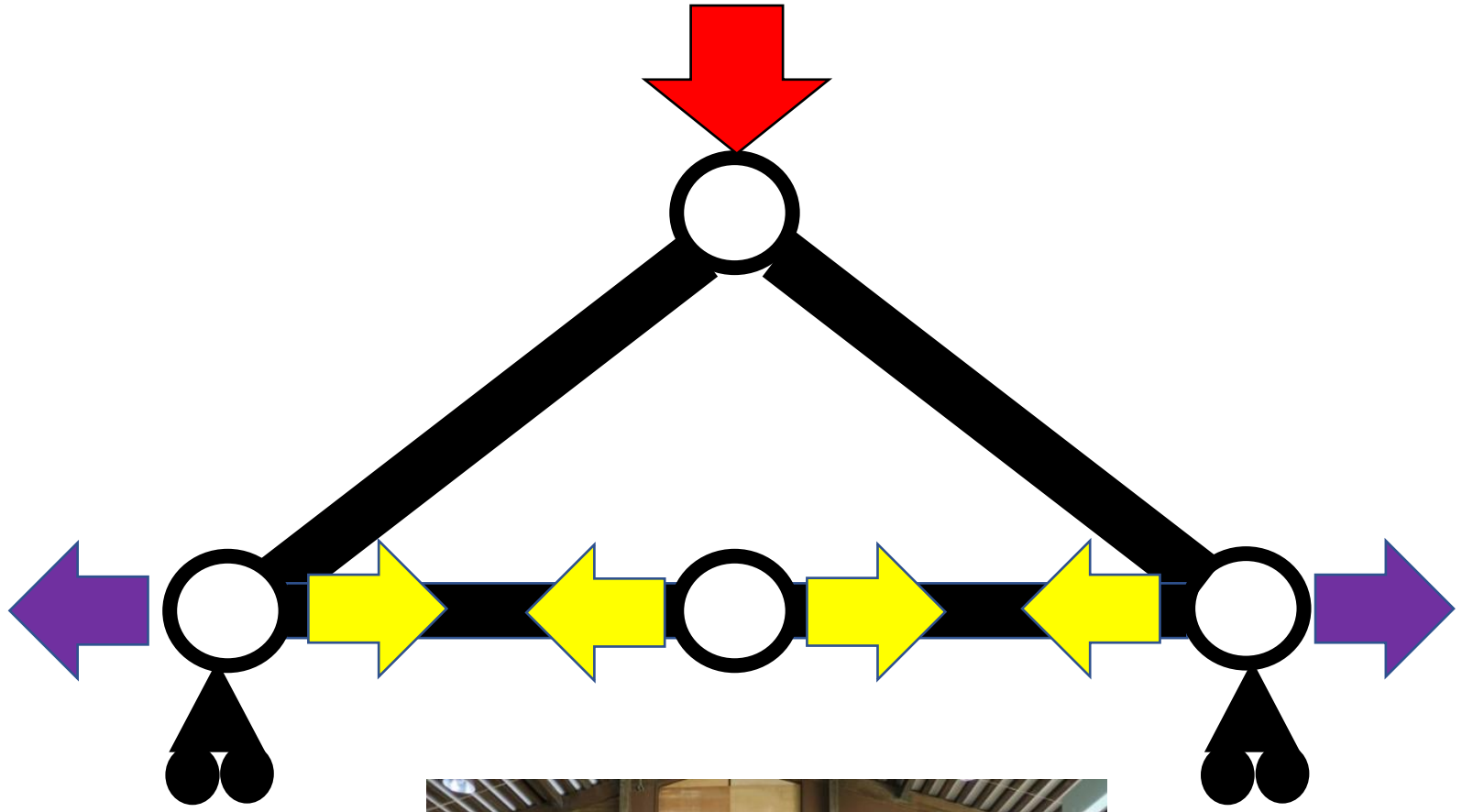
等級	基準強度(N/mm ²)				
	圧縮	引張	曲げ	せん断	めり込み
E 50	19.2	14.4	24.0	1.8	6.0
E 70	23.4	17.4	29.4		
E 90	28.2	21.0	34.8		
E110	32.4	24.6	40.8		
E130	37.2	27.6	46.2		
E150	41.4	31.2	51.6		

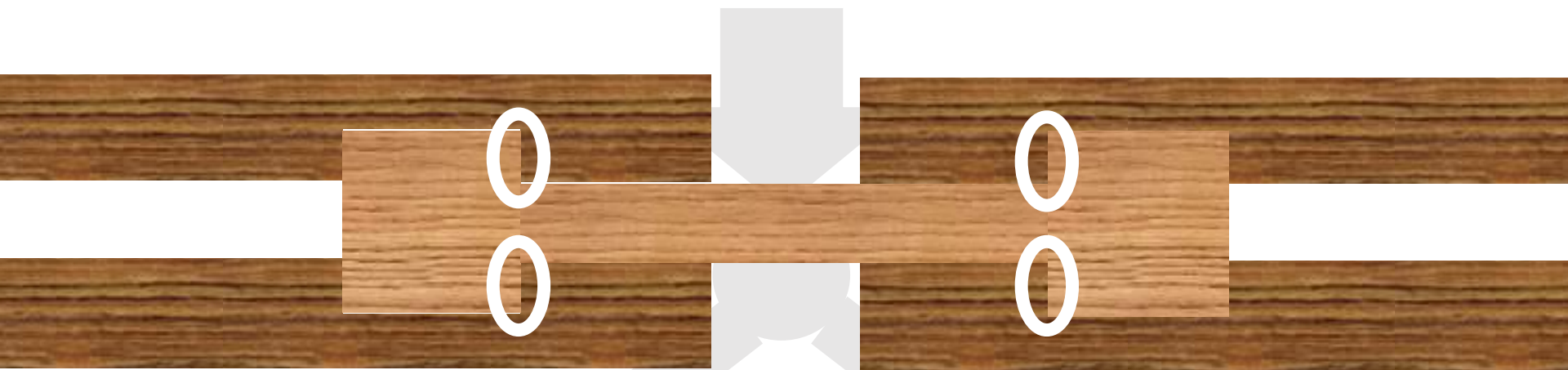


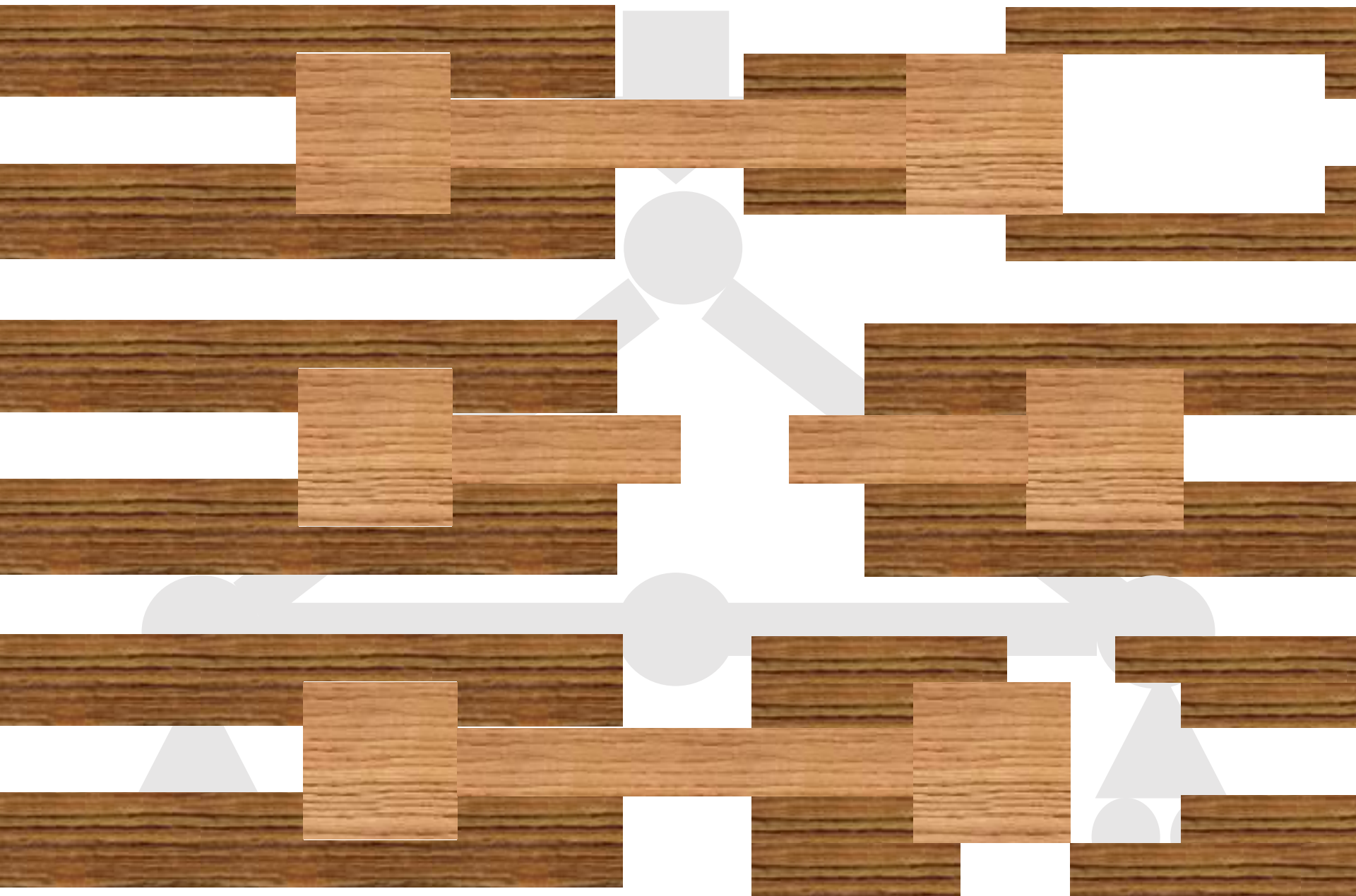
鋼棒の引張破壊



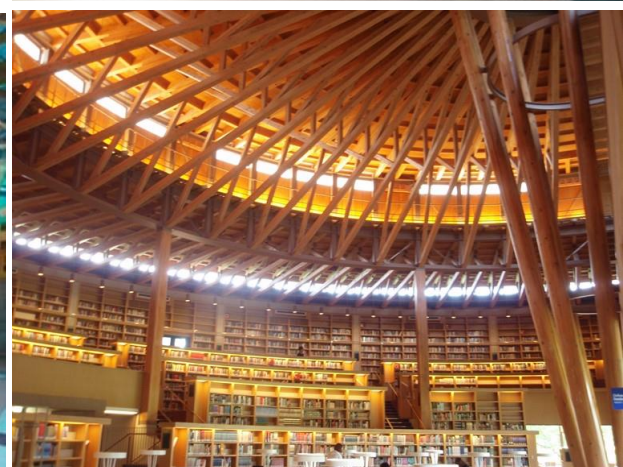
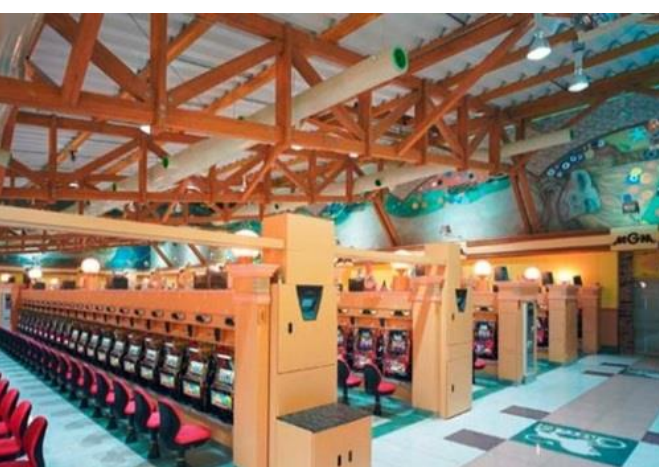
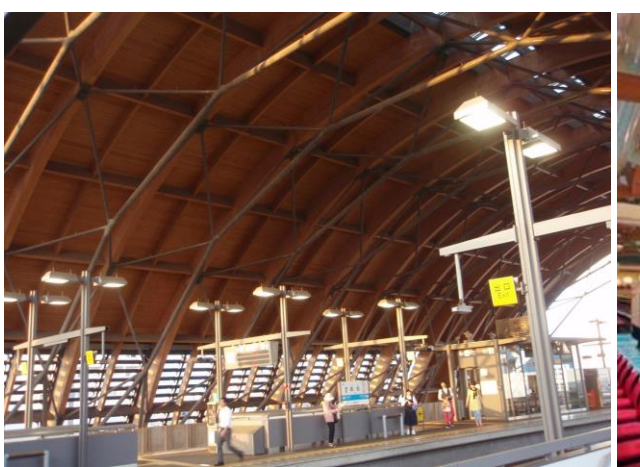
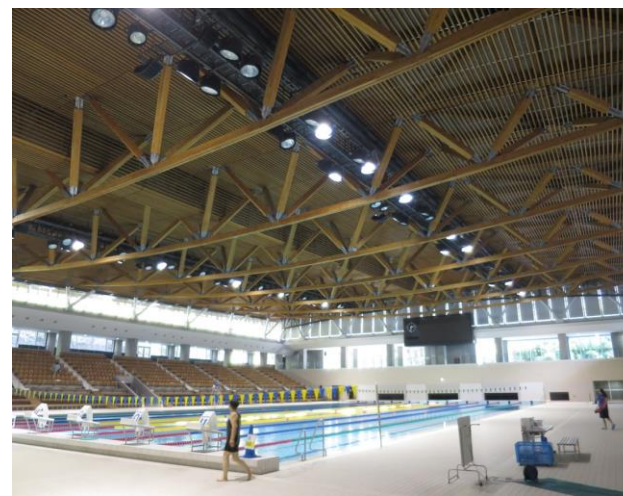
ナットの脱落



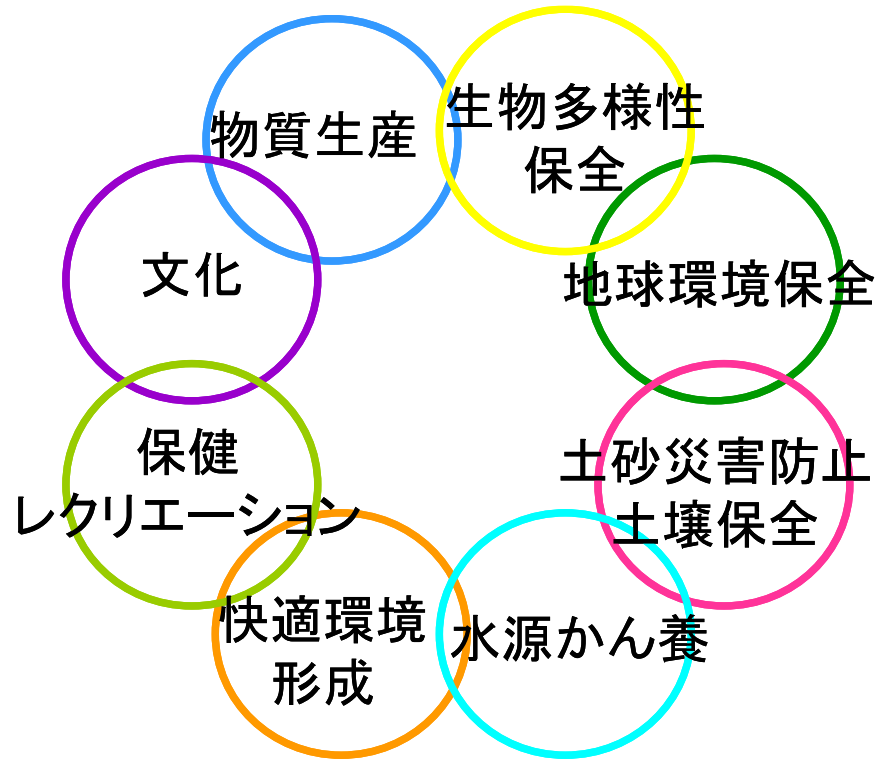
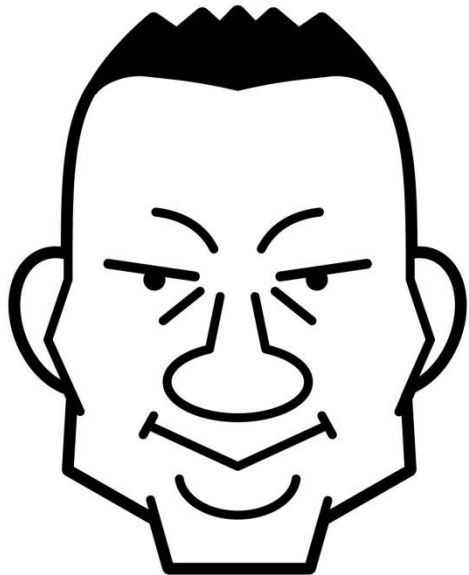








‘森’も見た
‘木’遣いを
願い



原田浩司

Mailアドレス :

cozy_in_woodstock@nifty.com