Quizz of Monday afternoon

Truss beam

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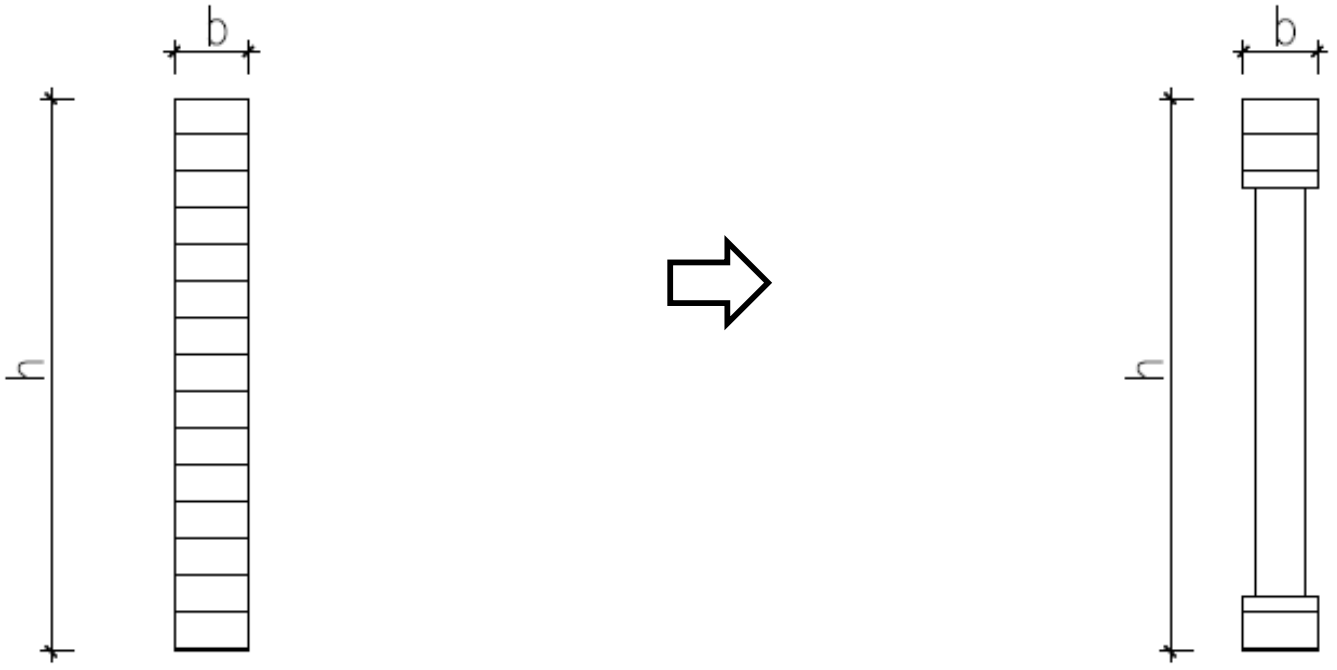
Ing. dipl. EPFL

EPFL

Why a truss beam?

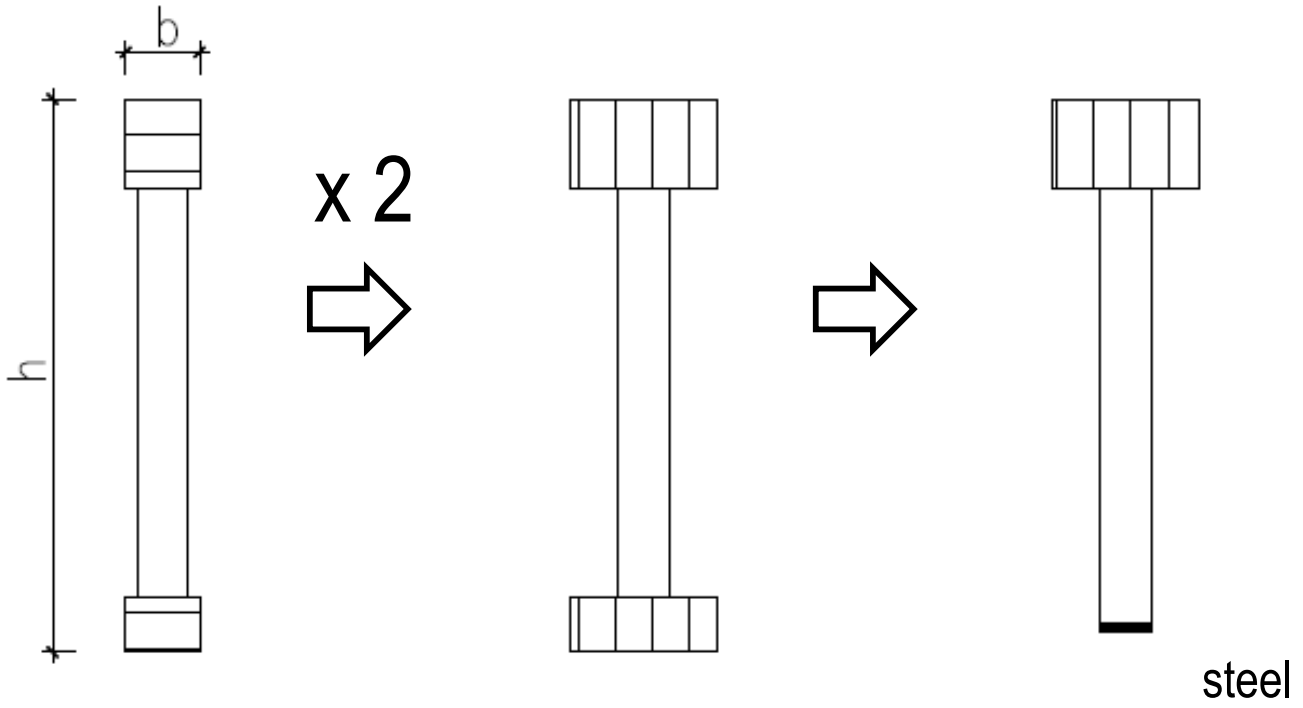
- Material optimisation < - > reduction of coasts

  esthetic - technics



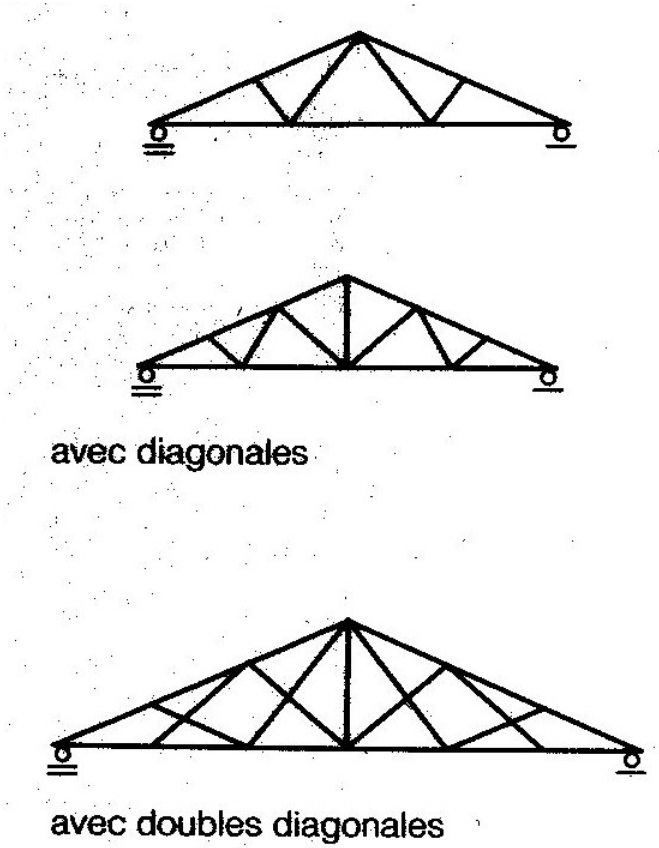
Pourquoi une poutre à treillis

- Optimisation of the material <-> mixity of materials

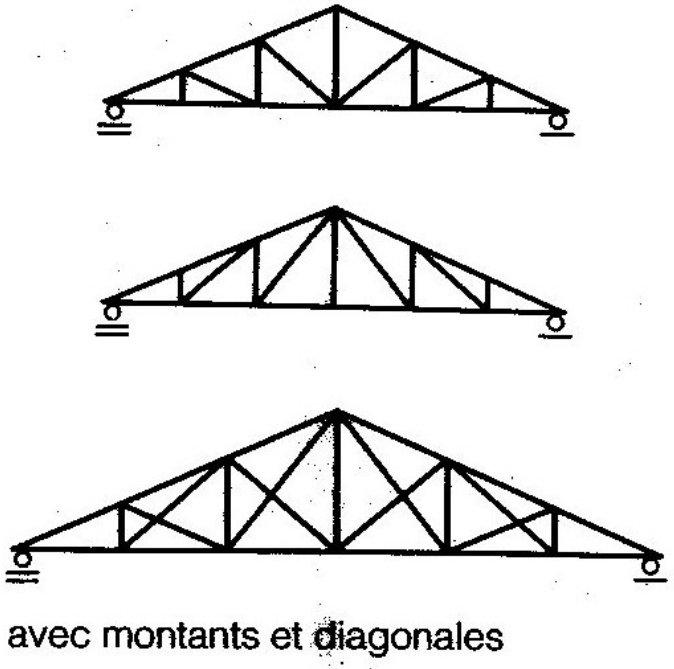


Typology of trusses

- With diagonal webs



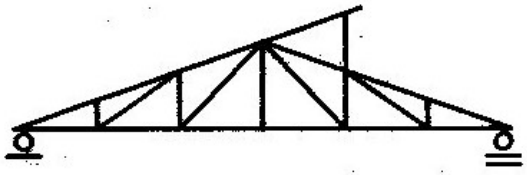
with vertical webs



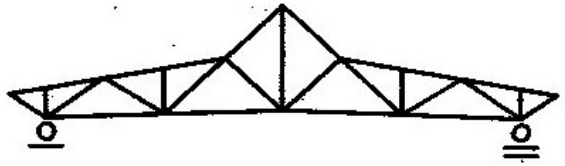
Typology of trusses

- Generics

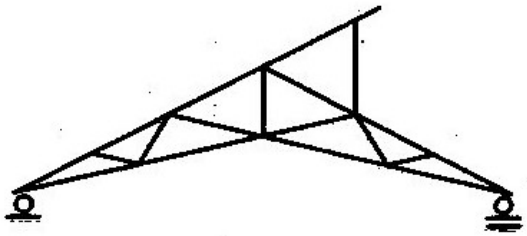
Triangulations



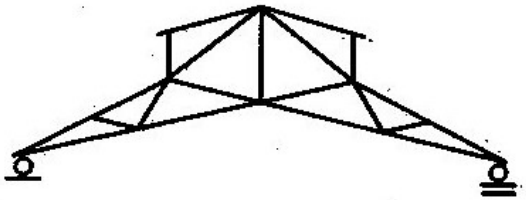
avec bande d'éclairage zénithal sur un côté



avec bande d'éclairage zénithal dans l'axe longitudinal



avec membrure inférieure surélevée et bande d'éclairage zénithal

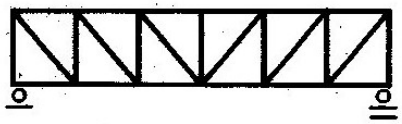


avec membrure inférieure surélevée; éclairage et aération possibles des deux côtés

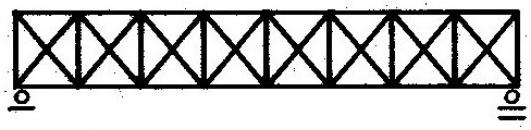
Typology of trusses

- N trusses

avec montant et diagonales comprimées



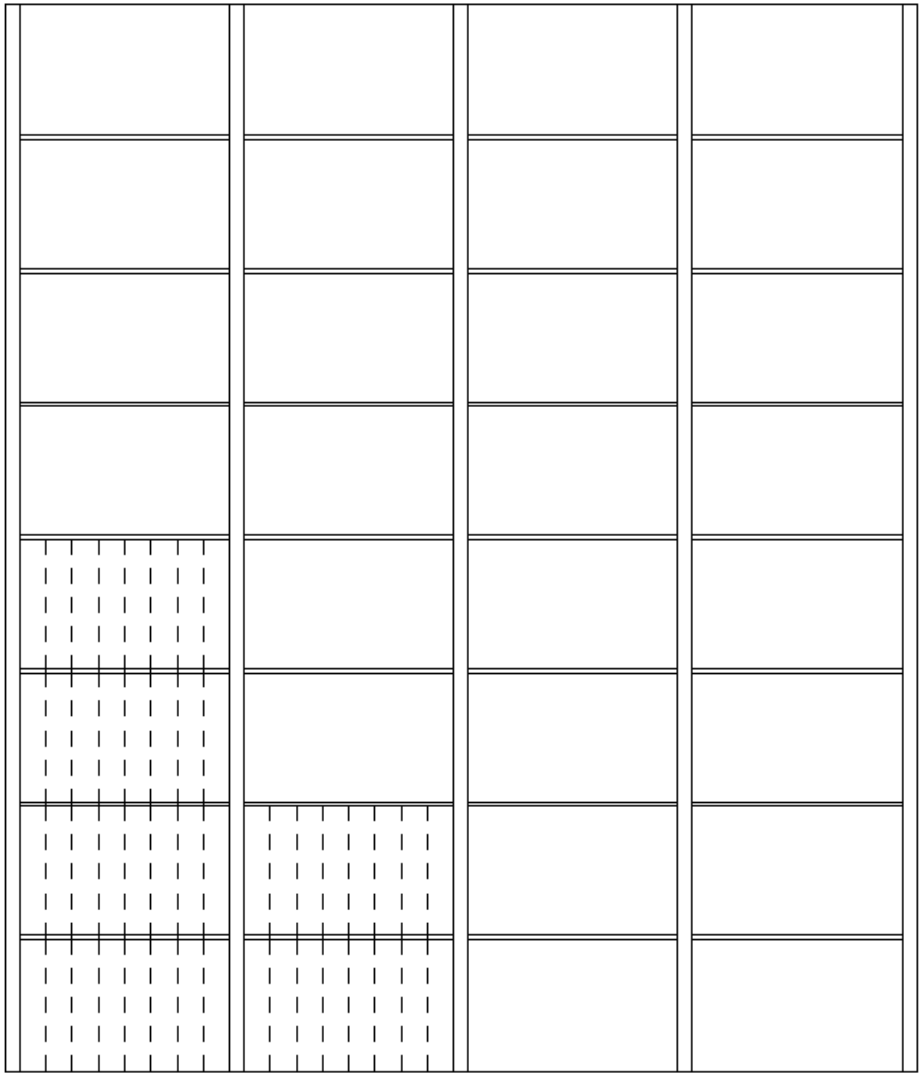
avec montant et diagonales tendues

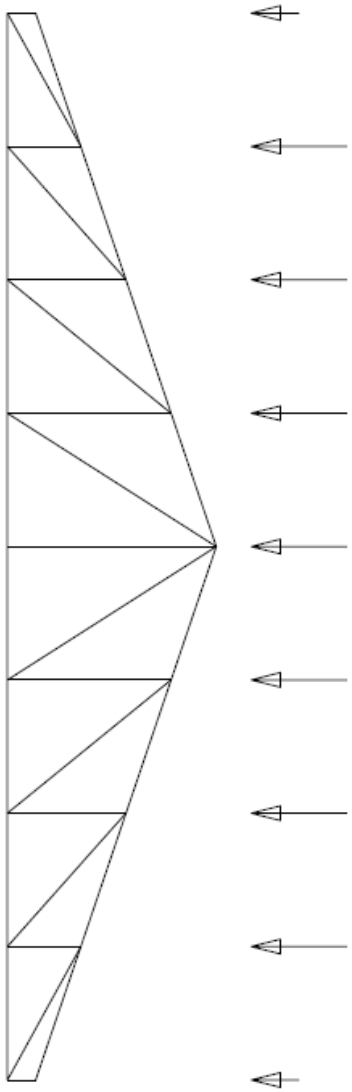


avec montant et diagonales croisées

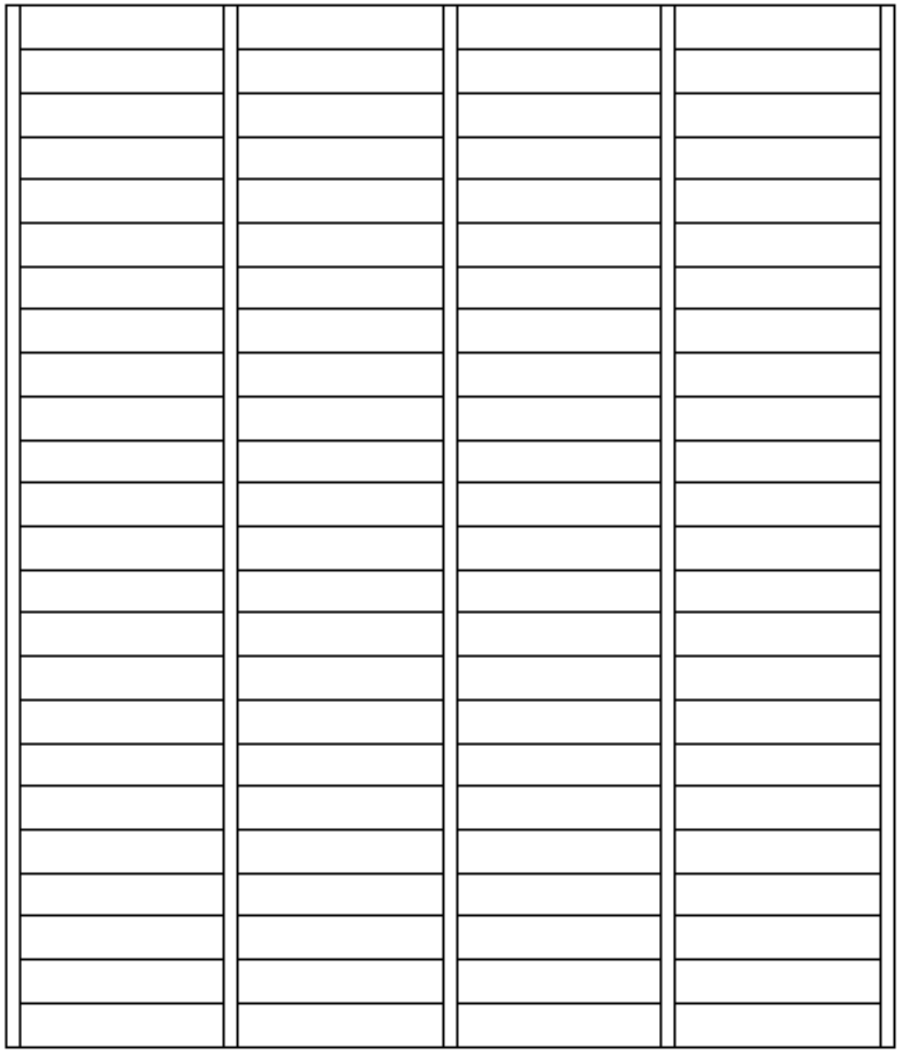
Loading of trusses

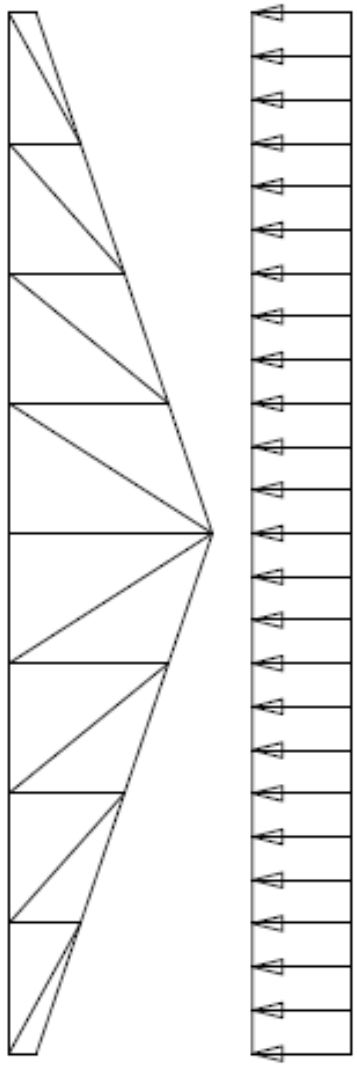
Loading of trusses





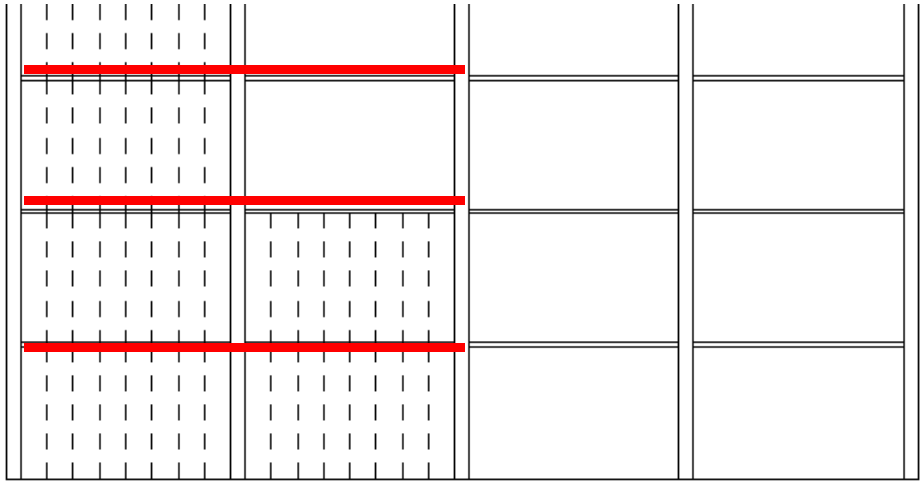
Loading of trusses

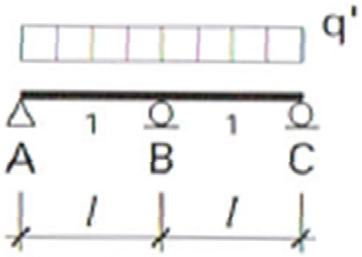




Take care

- Influence width, purlin on 3 supports
- >>> +25 %

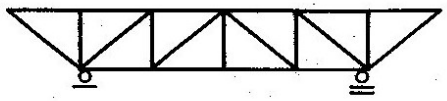




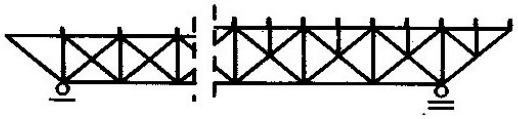
$$A = C = 0{,}375 \cdot q' \cdot l$$
$$B = 1{,}25 \cdot q' \cdot l$$

Disposition of the webs

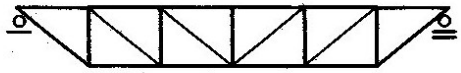
- Depends of the purlins/webs



avec porte-à-faux



avec montants intermédiaires pour pannes

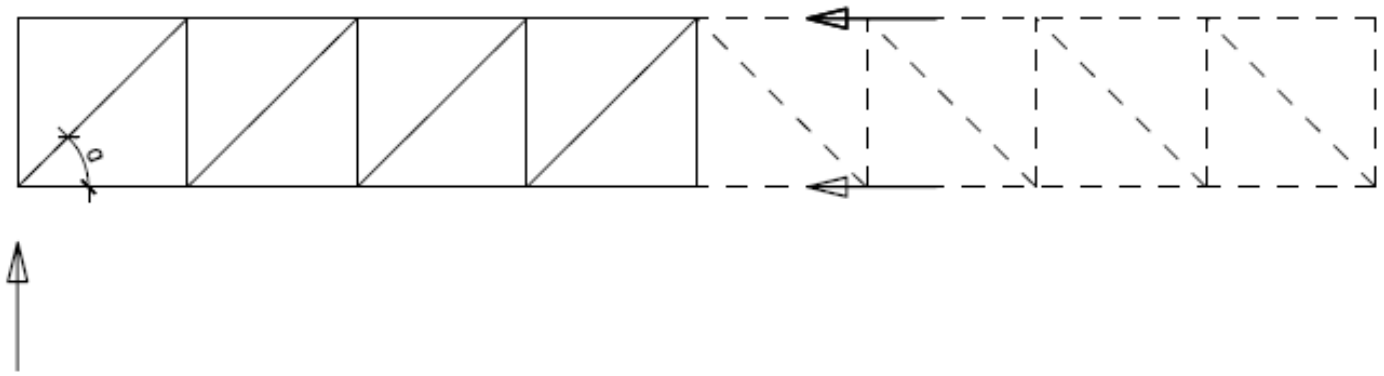


avec membrure inférieure décalée vers le bas (poutre suspendue)

triangulation à diagonales multiples avec porte-à-faux

Design of the truss

- The statics of the truss



Design of the truss

- Bottom chord – in traction
  - Net surface
  - Reduction of the section due to connectors -> 65% env.

Design of the truss

- Bottom chord – traction

$Coef_A$ Valeurs indicatives du rapport, section nette sur section complète pour le prédimensionnement (*TCB1*)

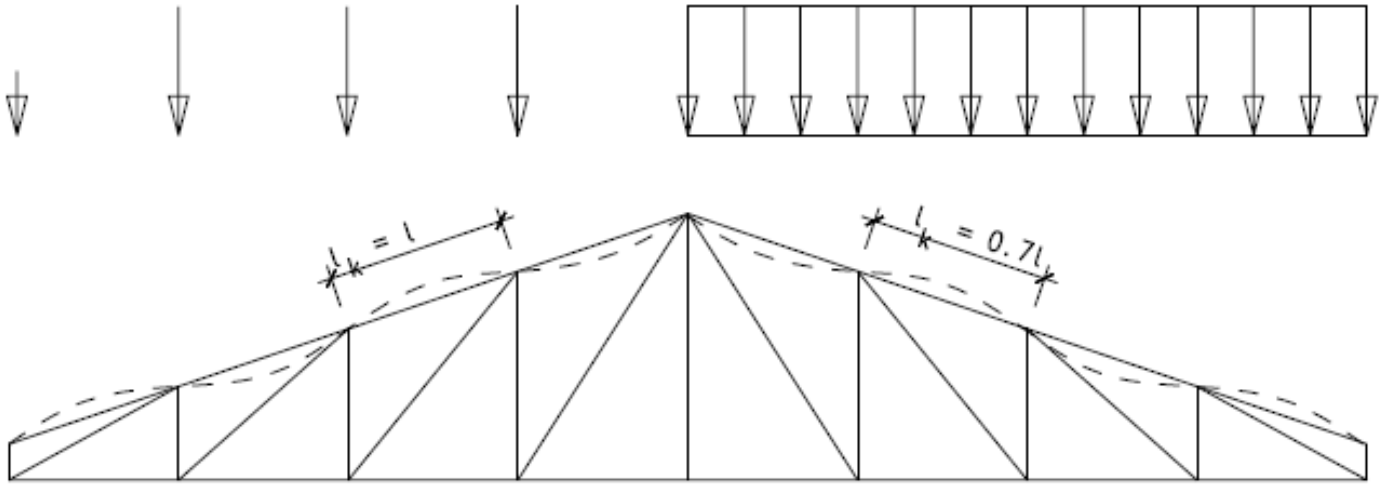
Moyens d'assemblage	Remarques	A_{nette} / A
Clous sans préperçage	$d_N \leq 5$ mm	1.00
	$d_N > 5$ mm	0.80
Clous avec préperçage		0.75
Broches	Bois-bois	0.65
	Acier-bois	0.60
Boulons (de charpente)	Bois-bois	0.60
Vis à bois	Universelles ou avec préperçage	0.75
Goujons annulaires	Avec le boulon correspondant	0.50

$Coef_A$: Valeur indicative du rapport entre la section affaiblie et la section complète

A_{nette} Selon la norme SIA 265 pour la définition de la section nette, il faut tenir compte de tous les moyens d'assemblages situés dans la zone délimitée par une longueur de 150 mm (*SIA 265 – 6.1.1.8*).

Dimensionnement

- Top chord
- Compression > buckling > in the plane

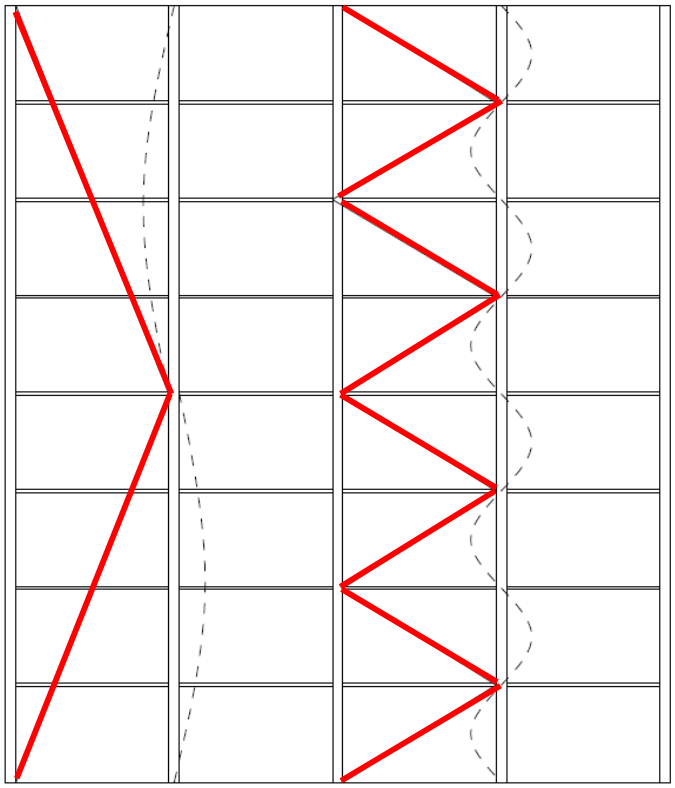


Design of the truss

- Top chord
- Compression > buckling > out of the plane

Var II = l_k = portée/8

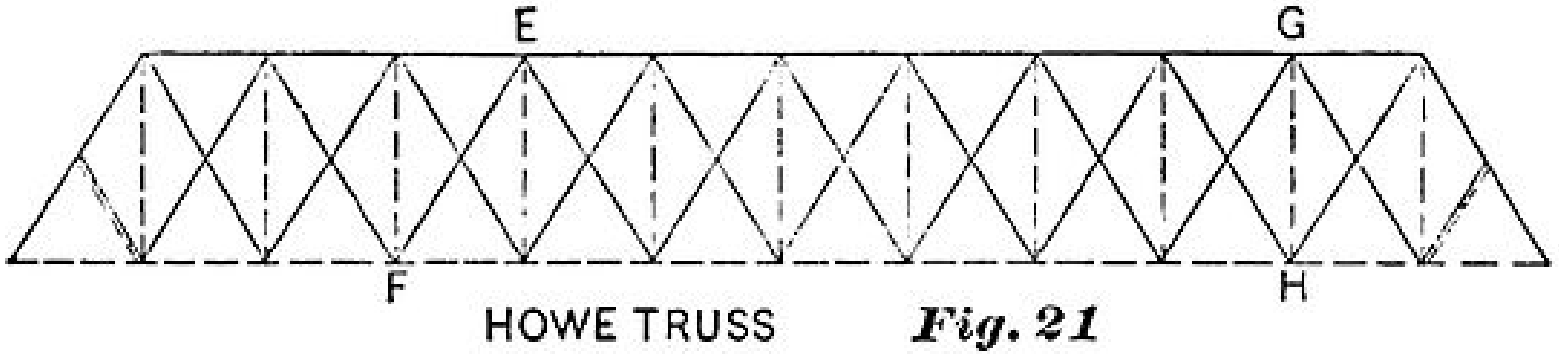
Var I : l_k = portée/2



it depends of the stabilisation system

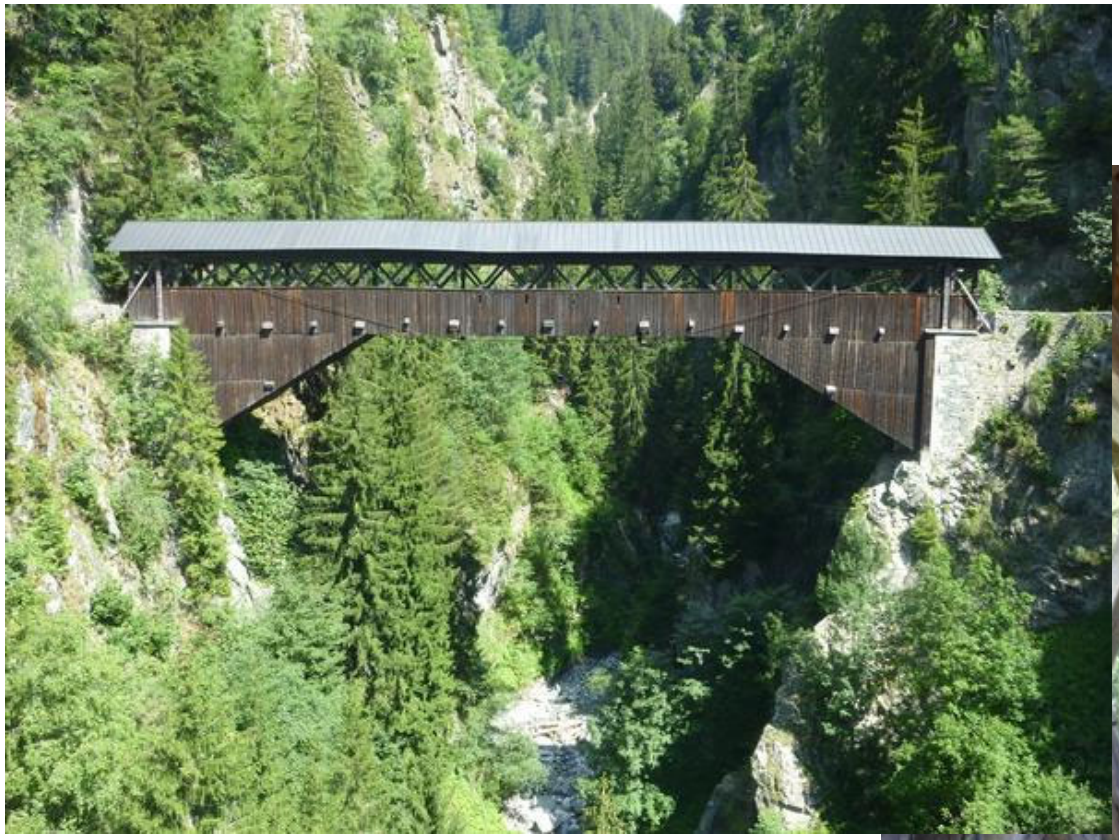
William Howe (1803 – 1852) Architekt

- American engineer who invented the truss of his name



HOWE TRUSS *Fig. 21*

Bridge of Russeintobel
structurae.info



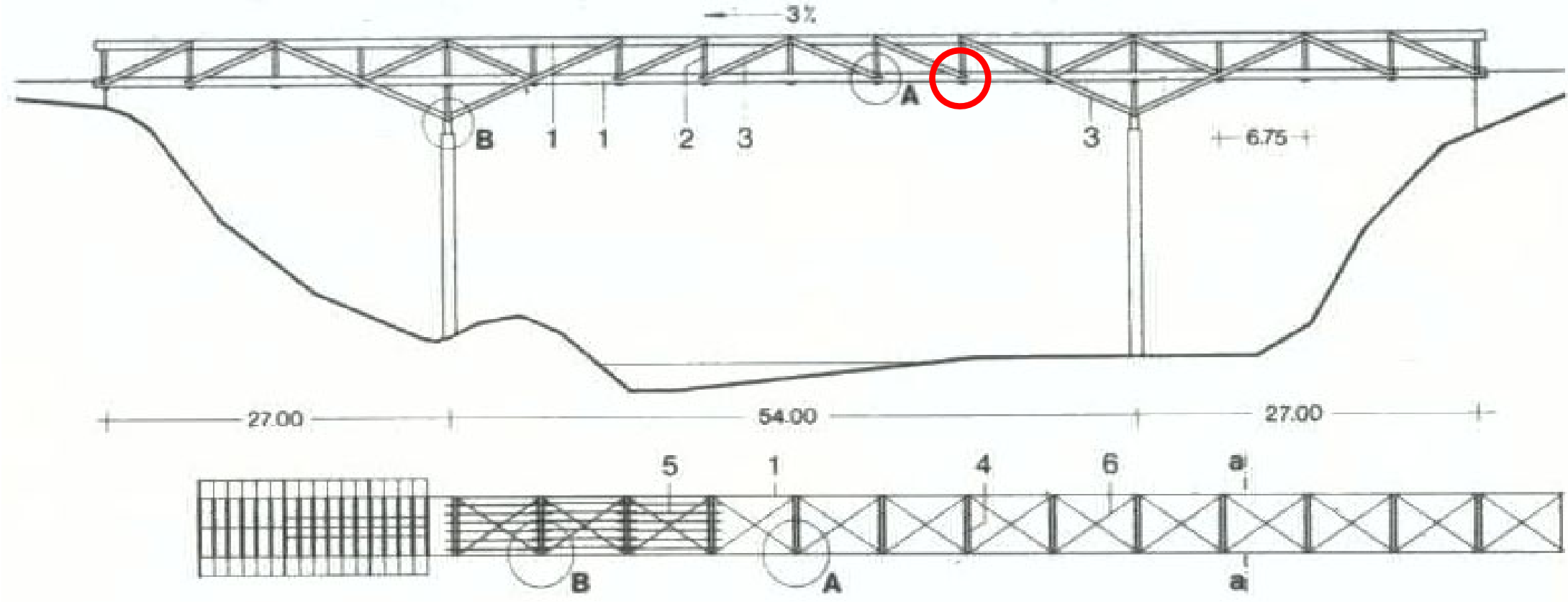
Some examples

- Foot bridge

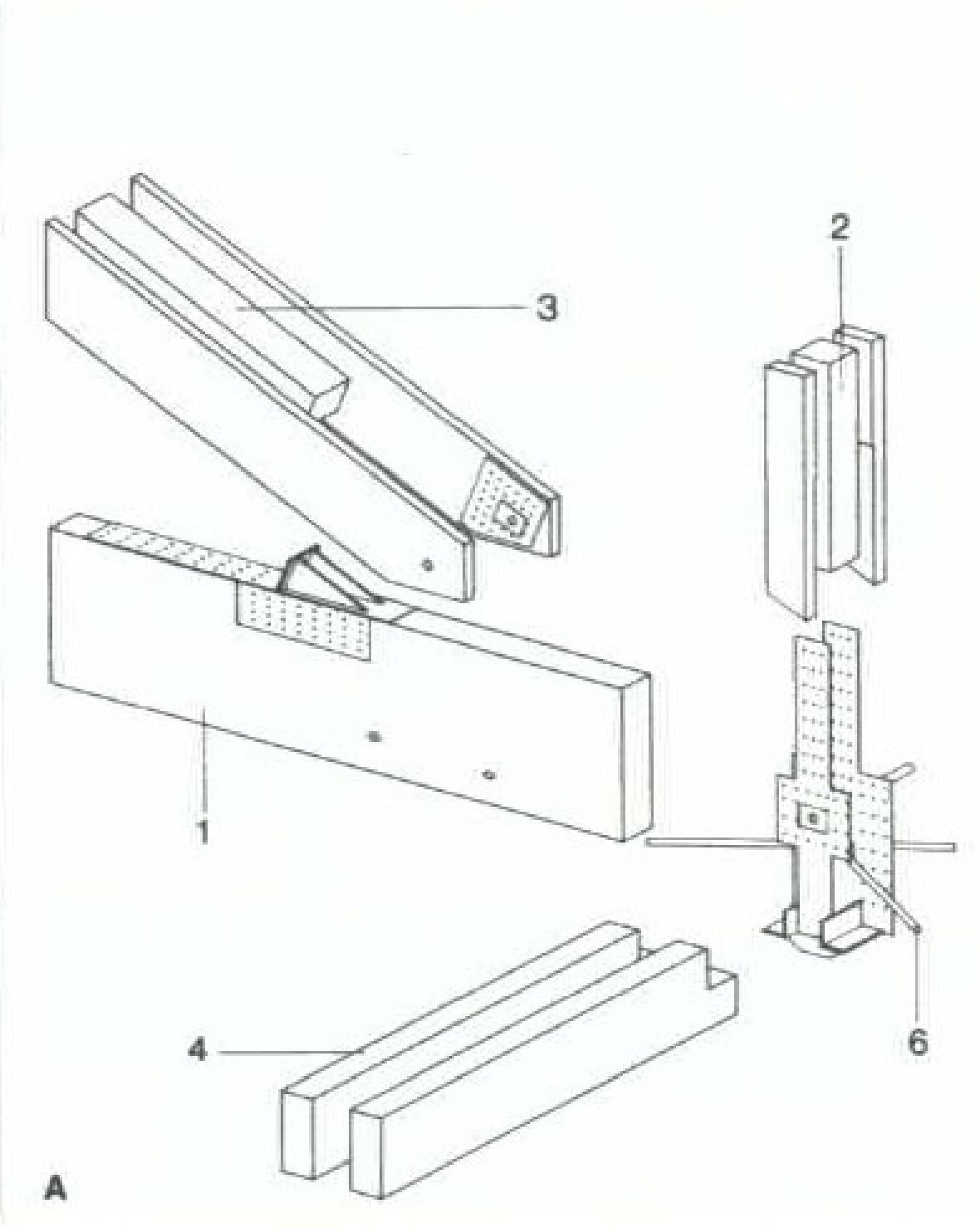

ROTH

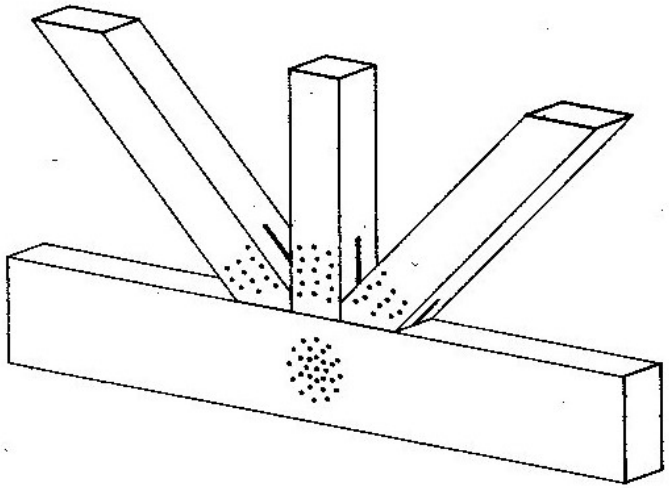
Analyse of detail

- The foot bridge on the Simme

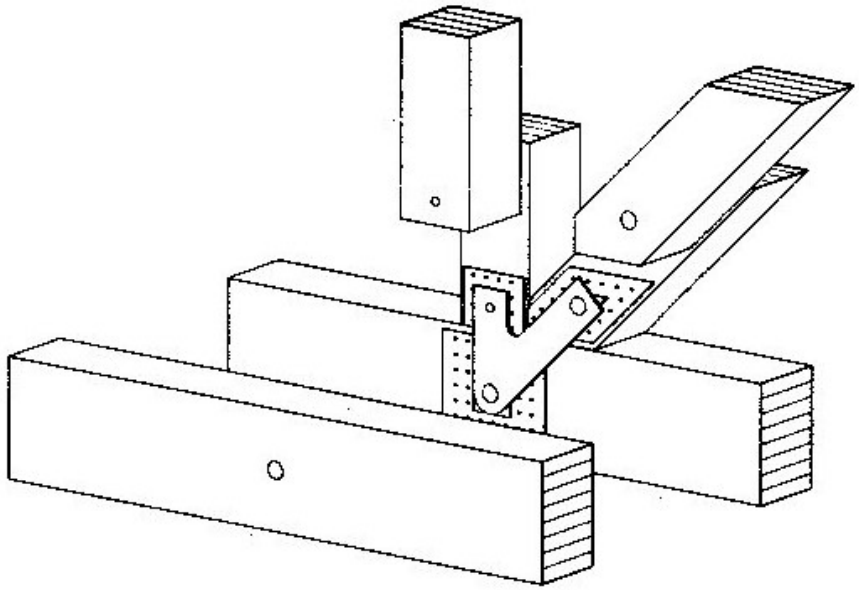


- 1: BLC 20/70
- 2: BLC 20/20 + 2x8/20
- 3:BLC 24/36 + 2 x 7.5/40
- 4:BLC 2x16/36
- 6: fer rond d=16-32mm

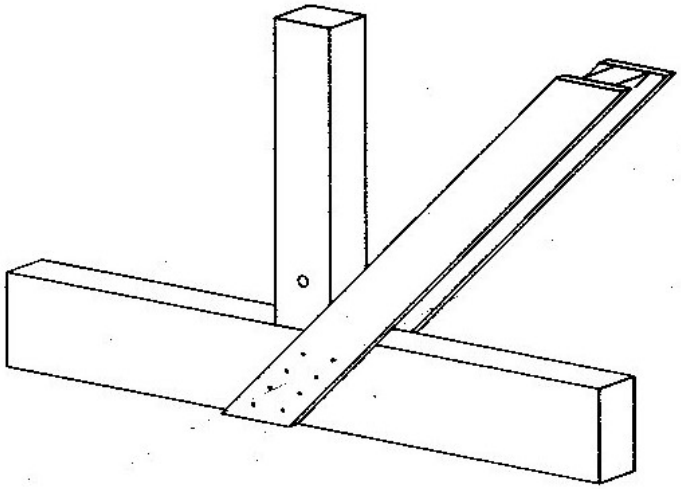




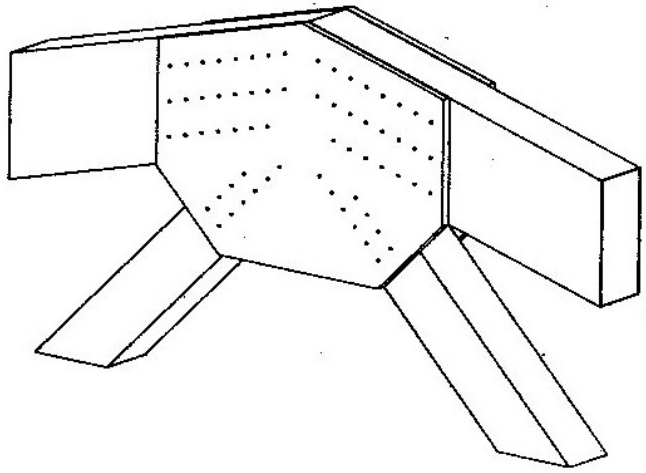
tôle clouée de part en part ou fixation par broche avec tôle prépercée



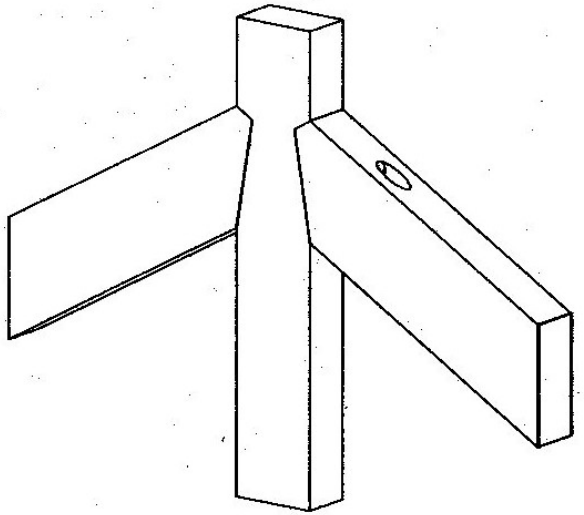
tôles à clouer et à insérer pour transmission des efforts entre boulon d'articulation et bois

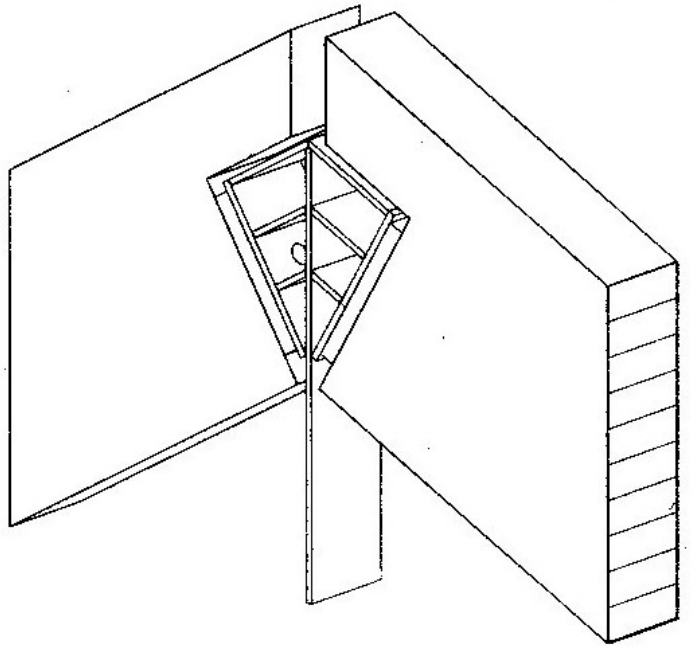


diagonale à trois éléments clouée sur membrure inférieure, montant comprimé assemblé par boulon Simplex



contreplaqués cloués ou goussets estampés appliqués par compression

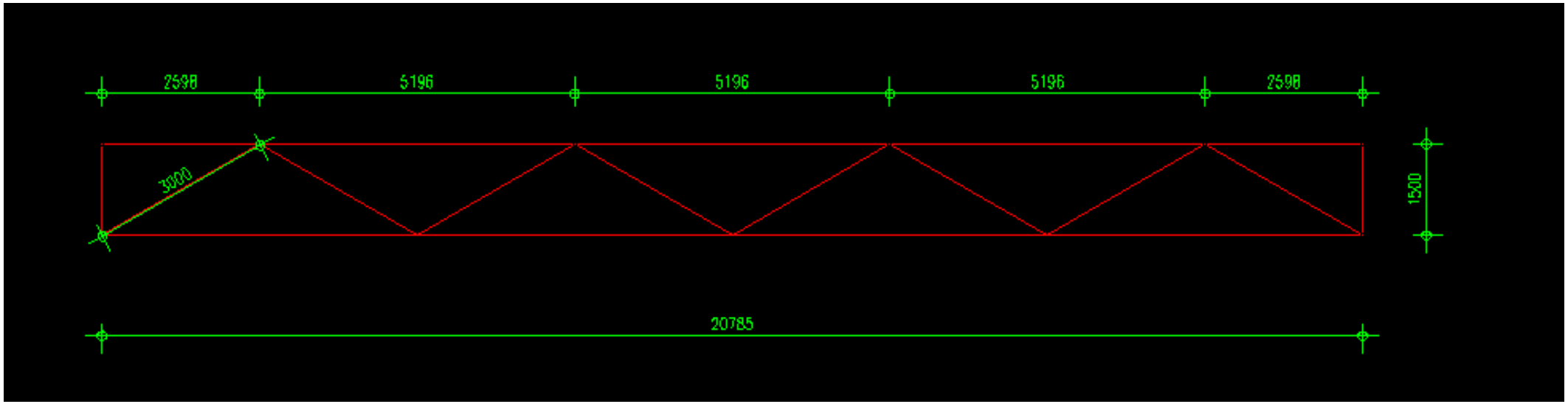




avec métal

Example

- Truss



- Span 20.8m, hight 1.5m
- Angle of the web 30°
- Selweight 1.5 kN/m2 sno 0.9 kN/m2
- distance between the truss 5m