

TS3

TIMBER STRUCTURES 3.0

Colonnes - Dalles - Prêt!





Timbatec Suisse (Thun, Bern, Zürich)

28 collaborateurs:

13 Ing. HTL / FH

7 Techniker HF

4 cand. Ing. BSc

4 administration / communication



Timbatec Austria (Wien)

5 collaborateurs:

3 Ing. TU / FH

1 cand. Ing. BSc

1 administration



Zertifiziert ISO 9001:2008

jährlich auditiert

TS3 AG

Créé en 2014
3 employés
2 Ingénieurs R&D
4 back office

Siège à Thoune



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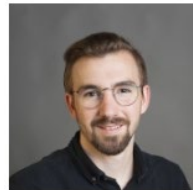
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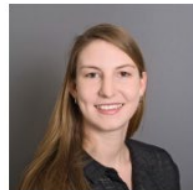
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Management Assistant
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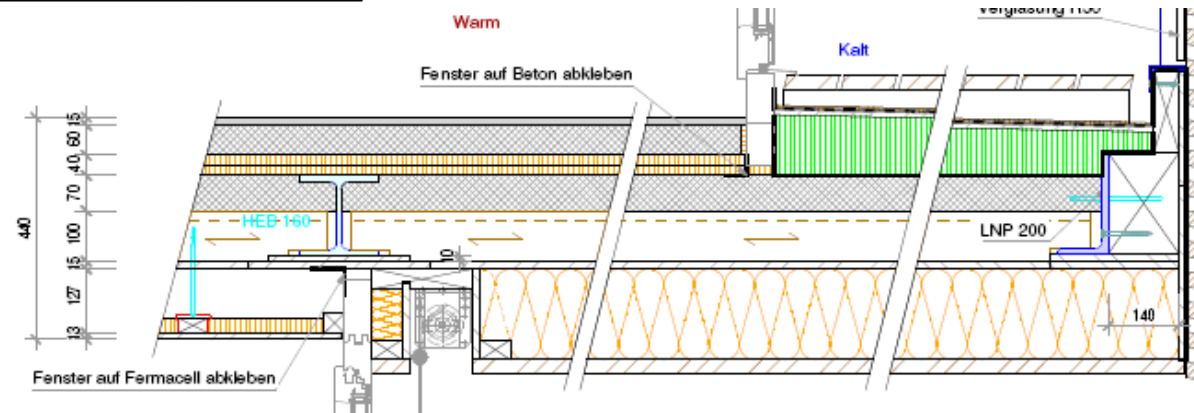
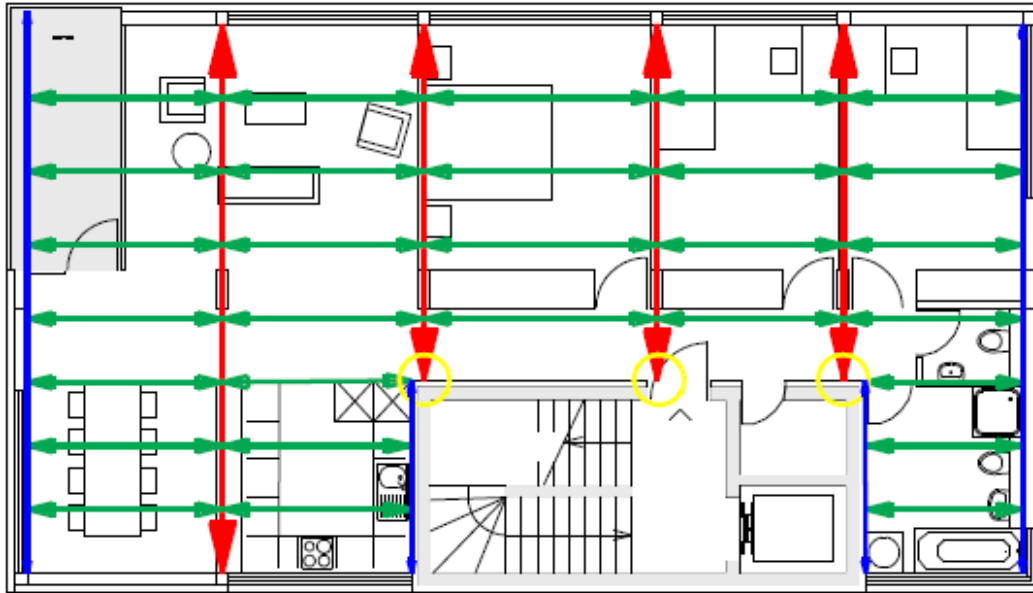


Silvia Stucki
Steel construction designer with FZ

Administration
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Construction en bois aujourd'hui : Défi 1 : Portance uniaxiale

Immeuble locatif Mühle Herbligen



Défi 2 : Les poutres interrompent les installations mécaniques

BFH Campus Biel / House of Natural Resources ETHZ



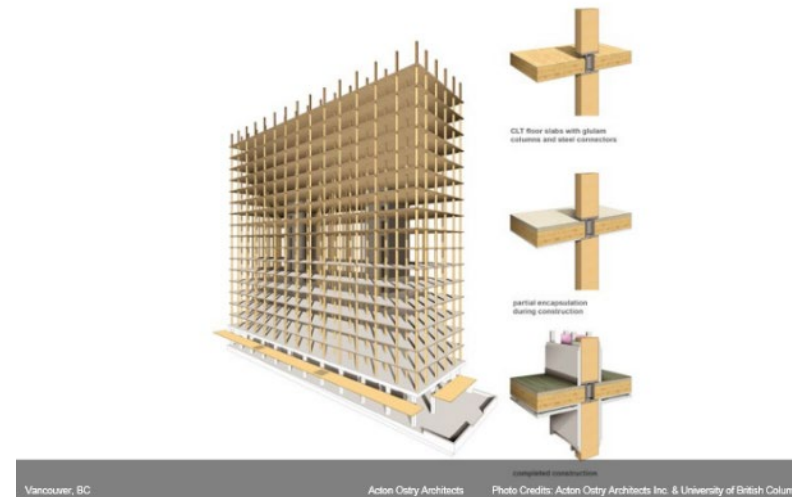
Défi 3 : Mélange de matériaux, acier - bois - béton

Immeuble locatif Mühle Herbligen



Défi 4 : Petite grille à colonnes (2,80 x 4,50 m)

Brock Commons Vancouver, 18-storey student residence

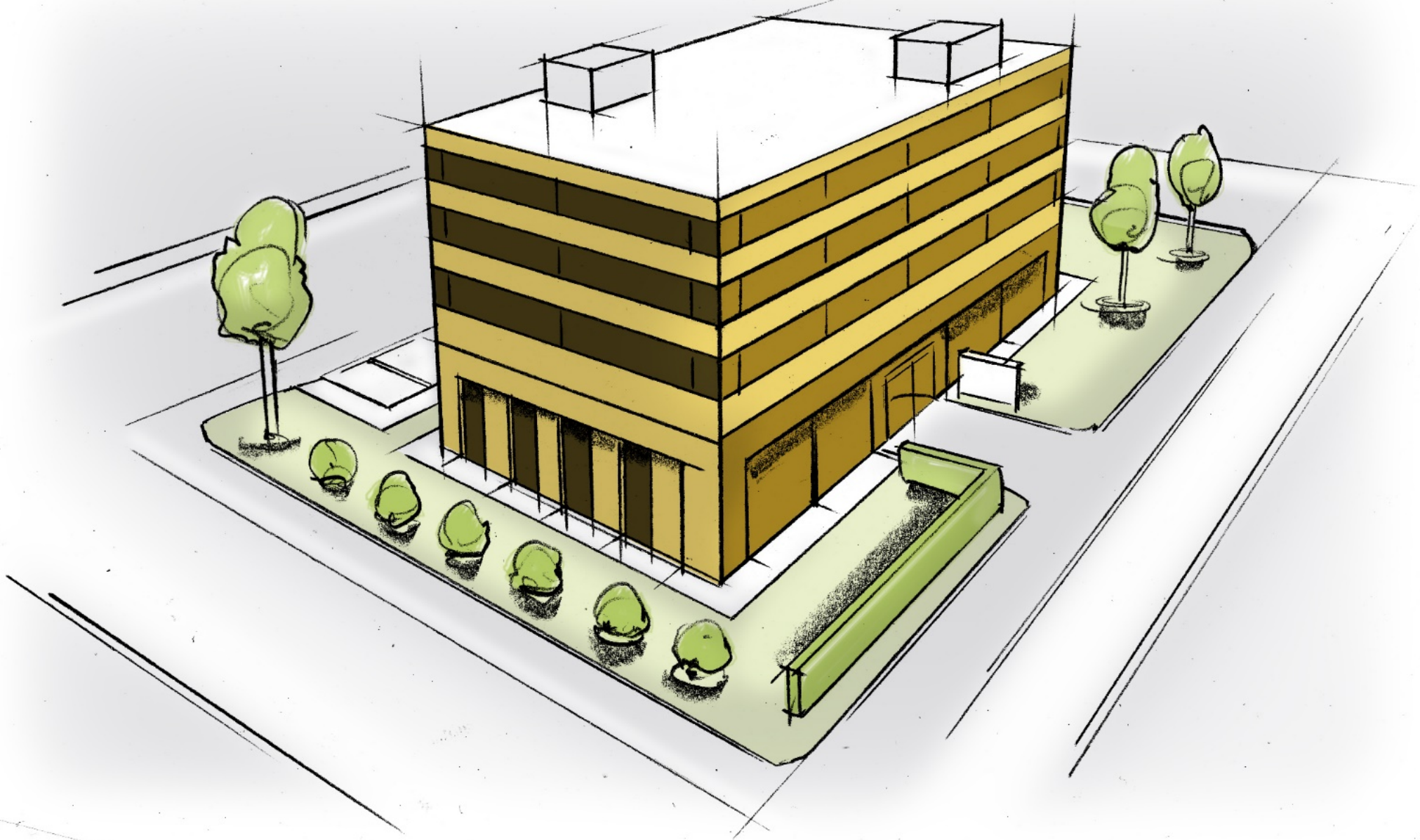


Pour comparaison : Dalles plates en béton armé

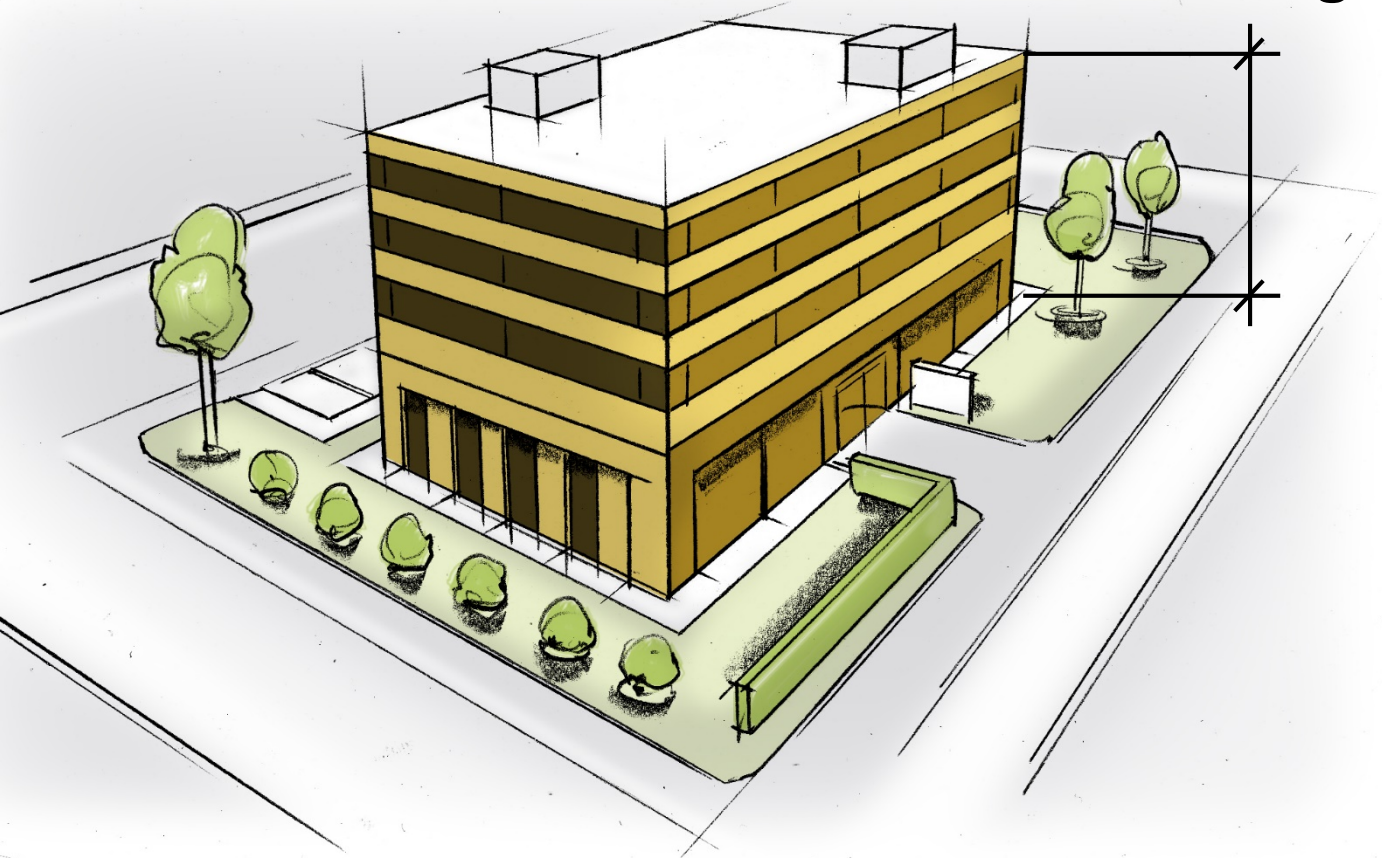
Administration Buildings Neumatt, Burgdorf, Switzerland



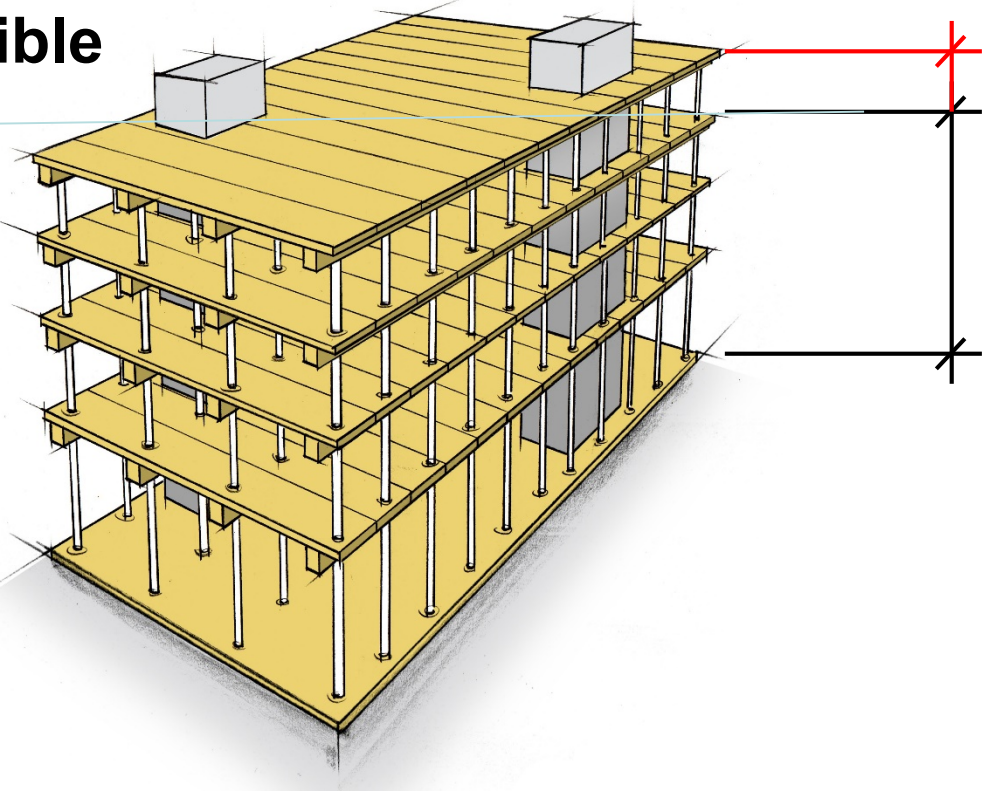
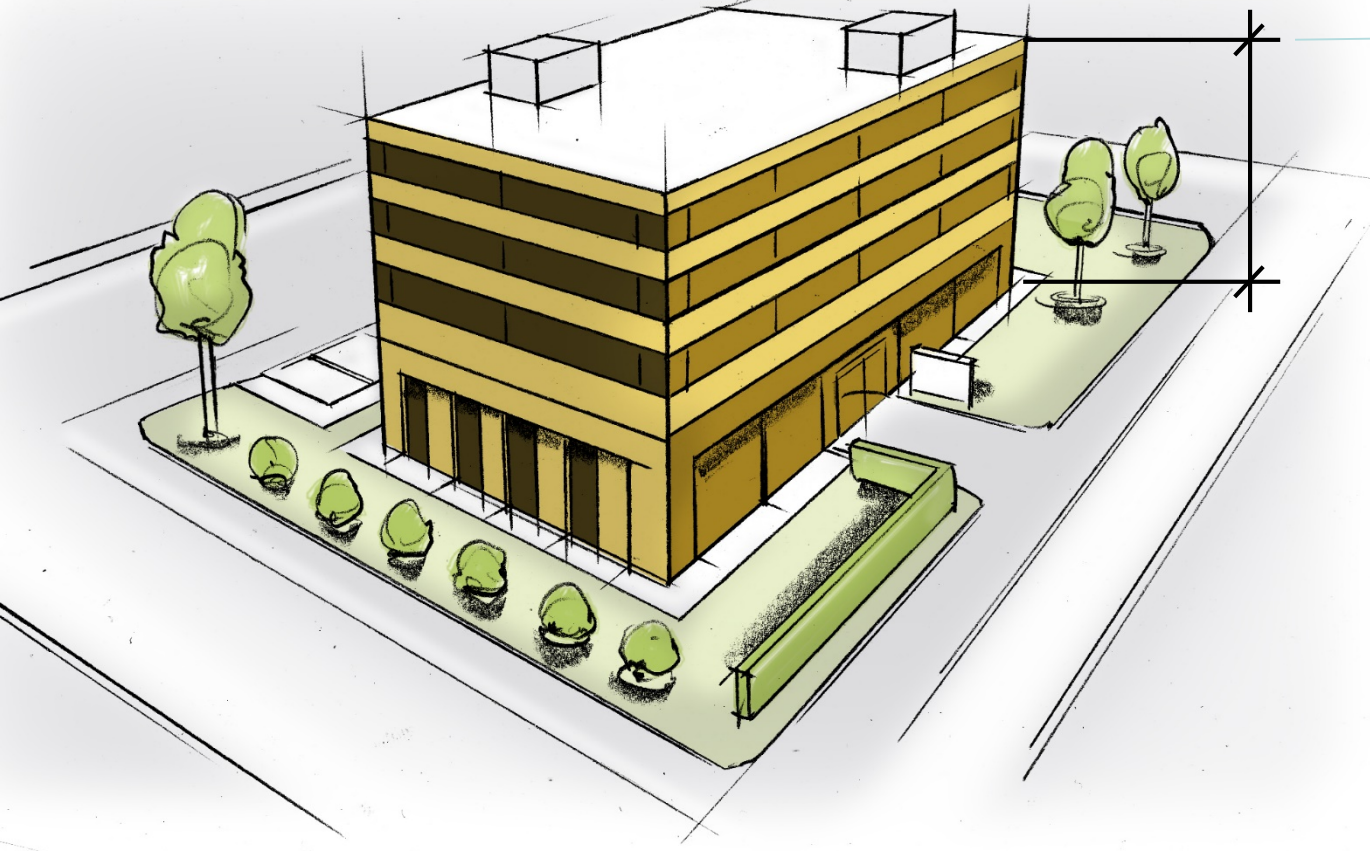
Le marché demande des bâtiments à usage flexible



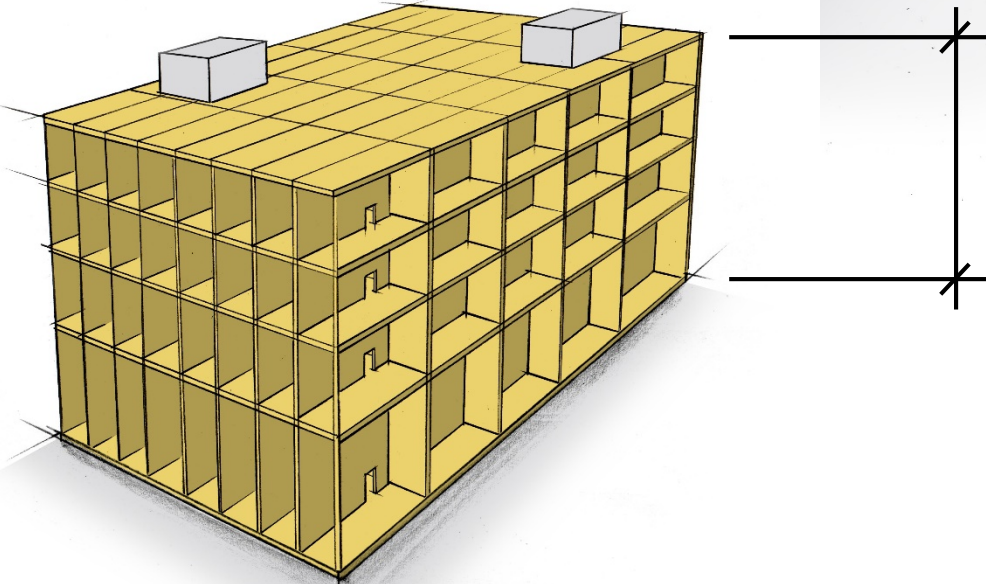
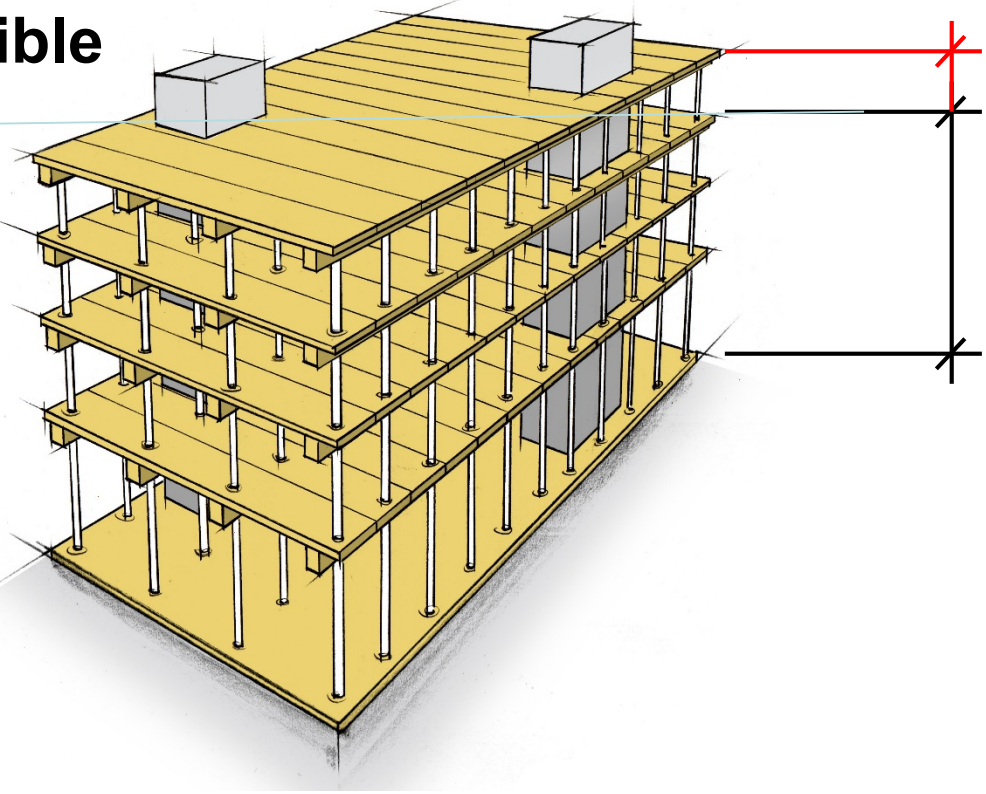
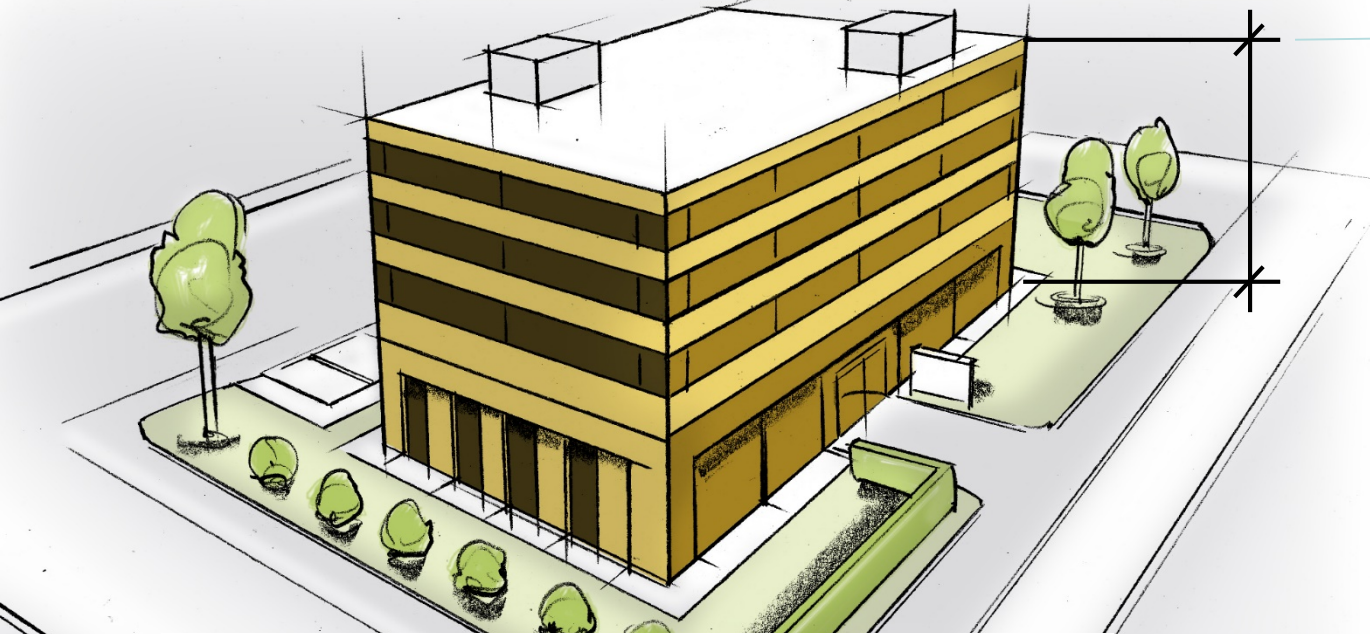
Le marché demande des bâtiments à usage flexible



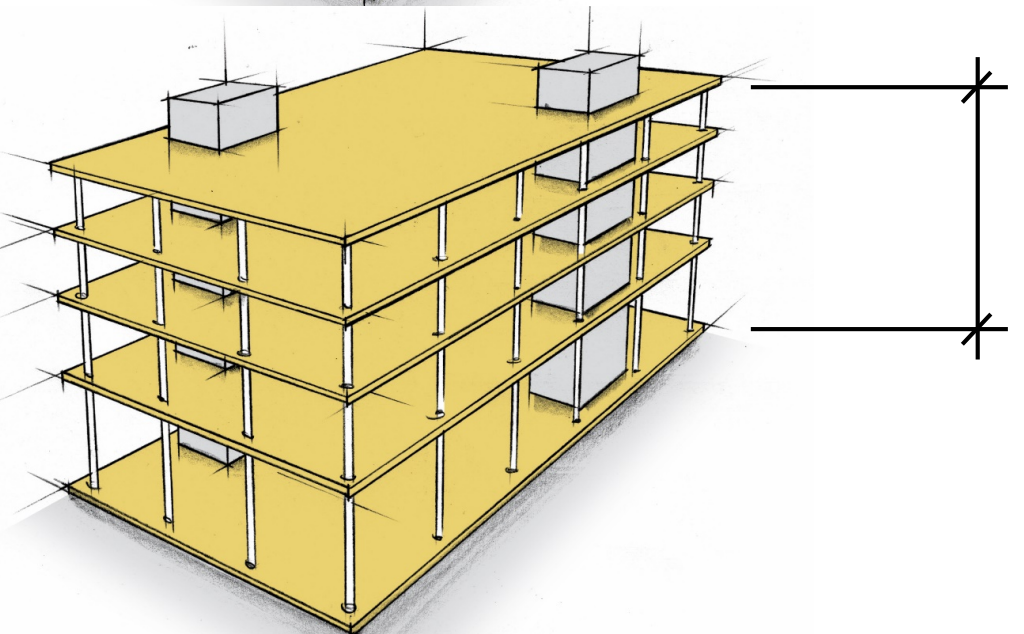
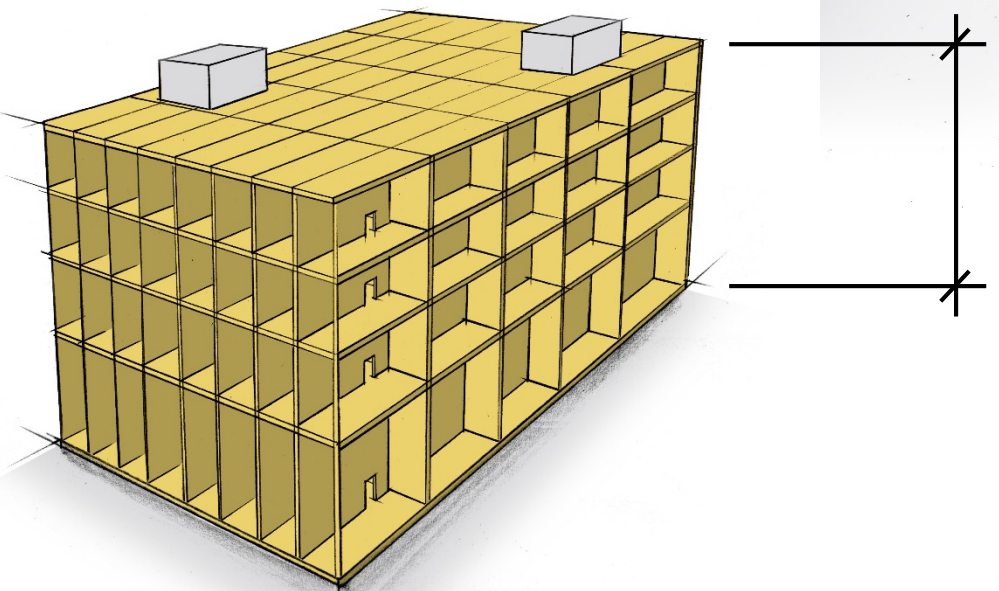
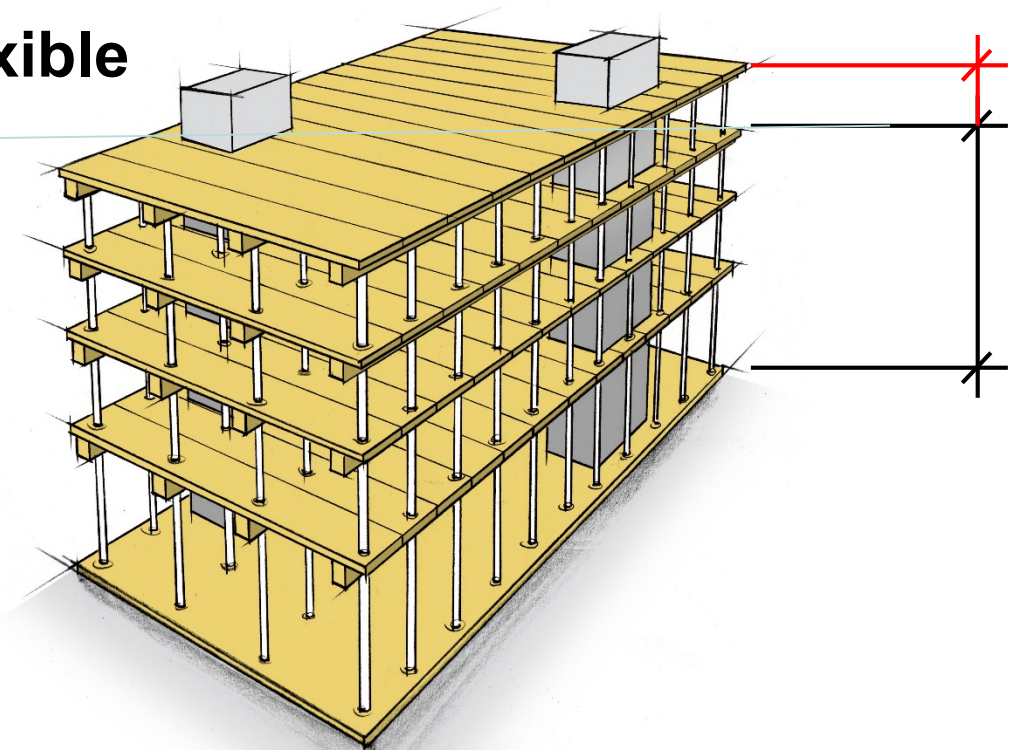
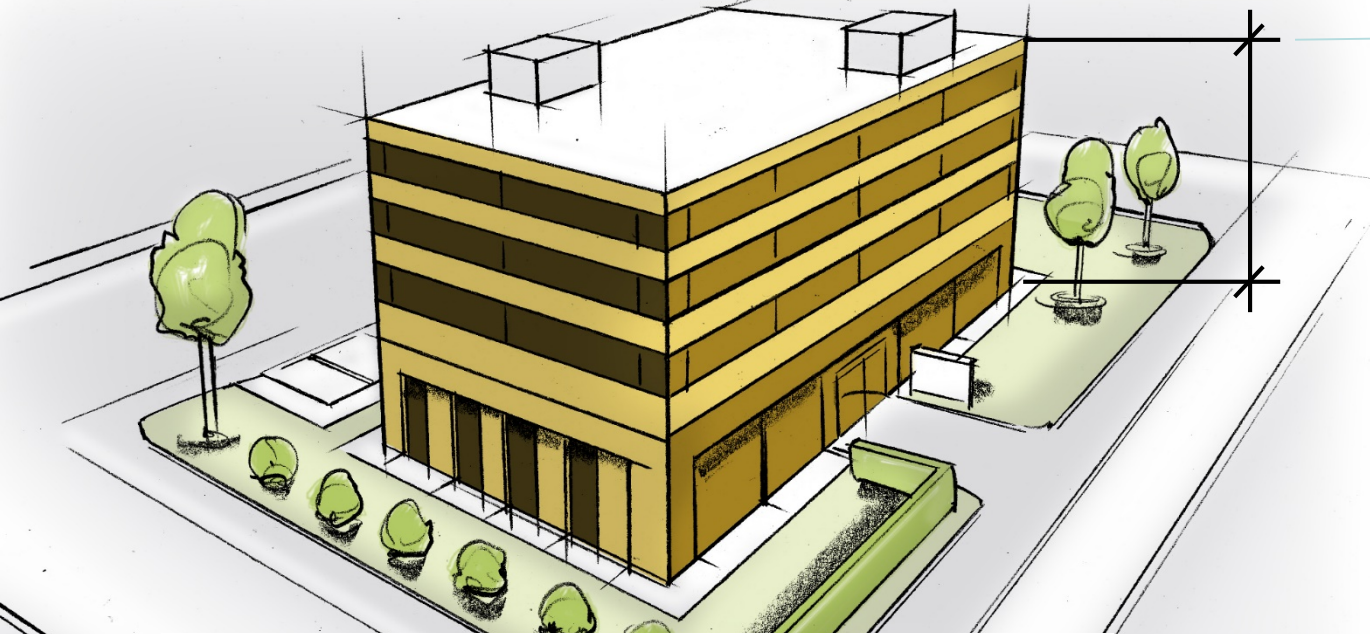
Le marché demande des bâtiments à usage flexible



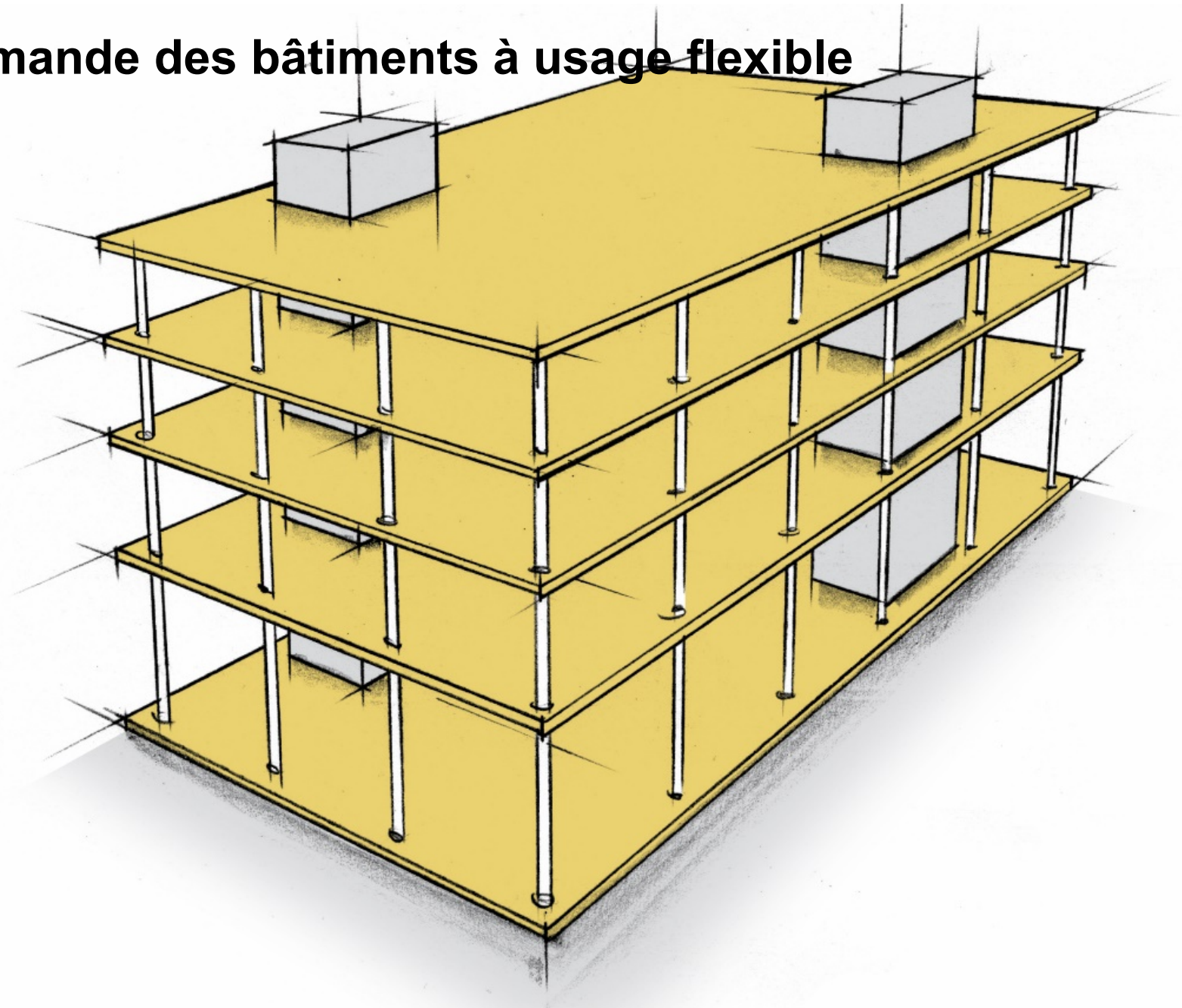
Le marché demande des bâtiments à usage flexible



Le marché demande des bâtiments à usage flexible

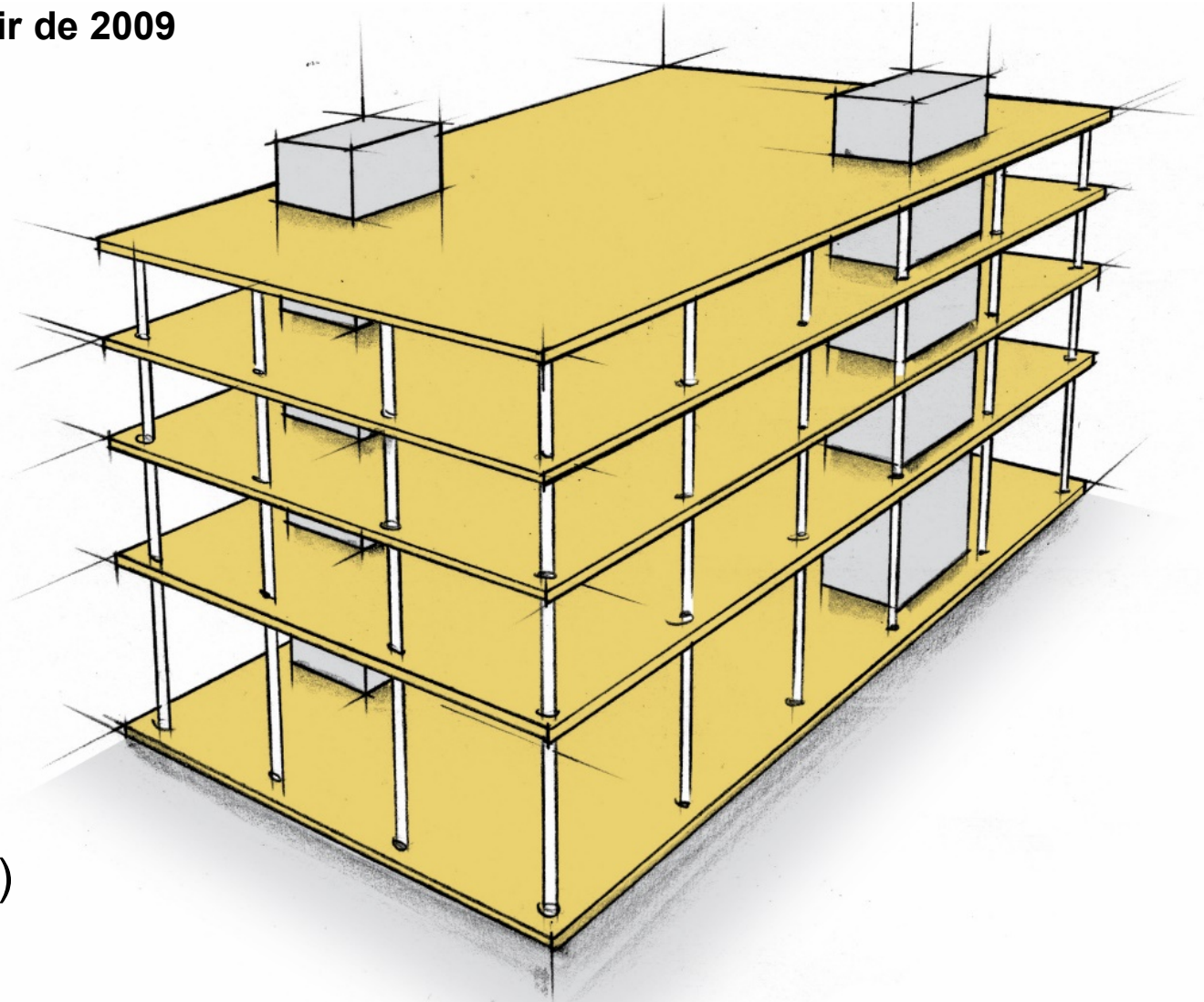


Le marché demande des bâtiments à usage flexible



Bâtiment échantillon „Boîte Avenir“

Projet «Dalles pour le commerce et l'industrie» à partir de 2009

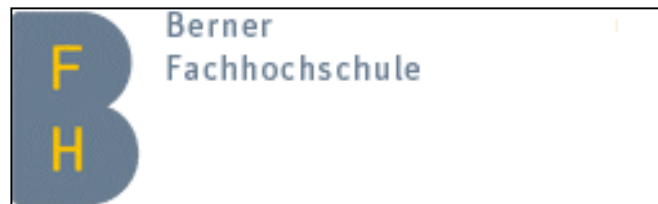
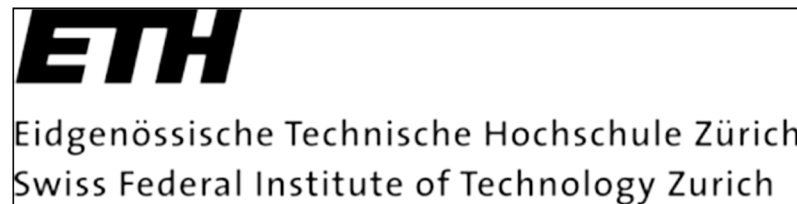


Exigences :

- Grille de colonnes 8,00 x 8,00 m
- Charge utile 500 kg/m²
- plafond plat
- Appui ponctuel
- Uniquement du bois (sans béton, sans acier)

Partners

Projet «Dalles pour le commerce et l'industrie» à partir de 2009

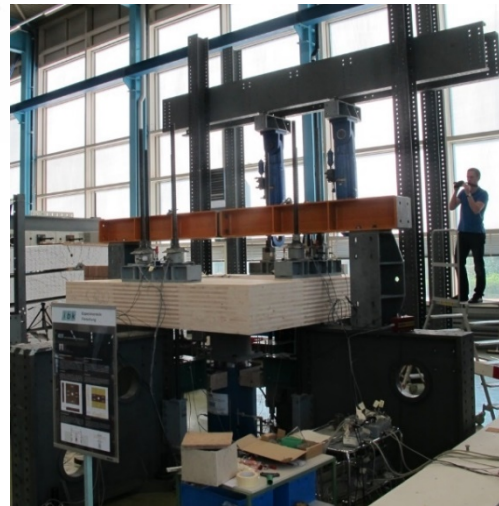
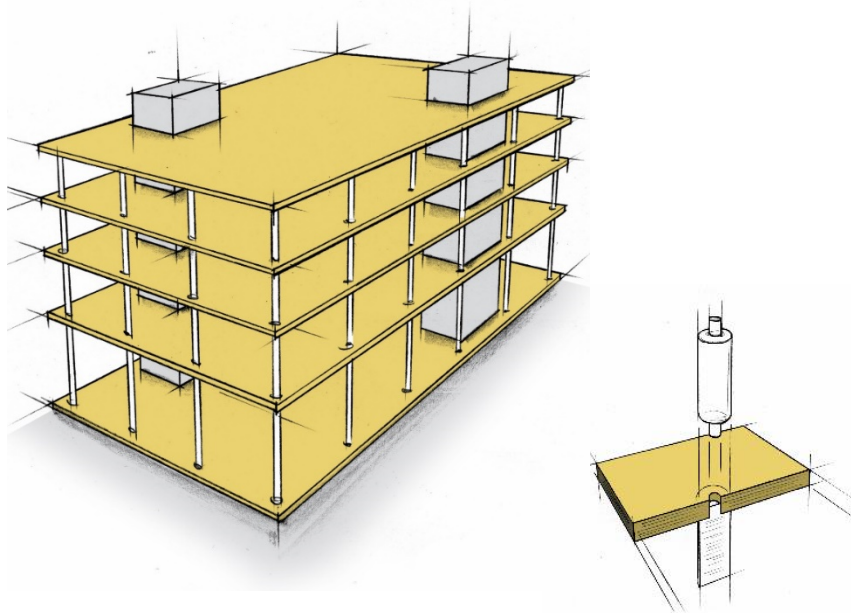


BAFU: Fonds zur Förderung der Wald- und Holzforschung

KTI Kommission für Technologie und Innovation

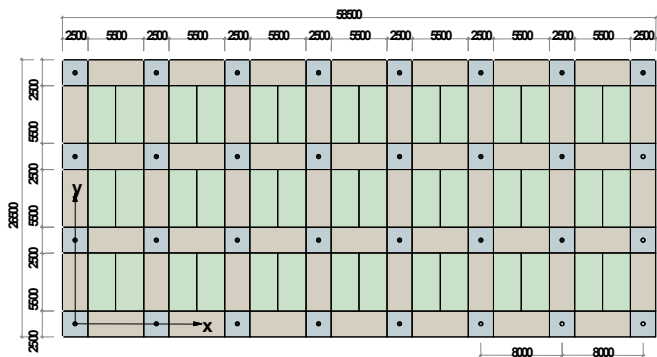
Technologiefonds

Solution Partie 1 : Têtes de colonnes et éléments de support

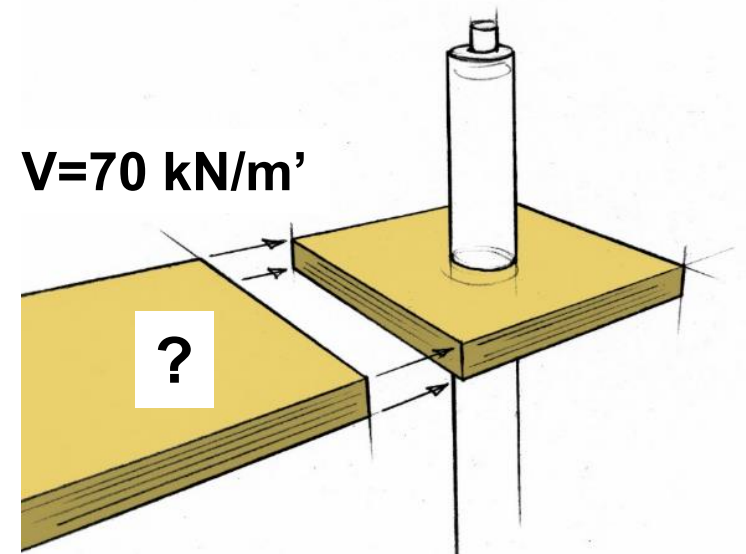


Essai de résistance à la rupture par flexion

Mais comment pouvons-nous transférer les forces latérales élevées des éléments de la dalle ?



$V=70 \text{ kN/m'}$



Solution Partie 2 : Raccordements adaptés aux chantiers

Essais de traction : Série 1 : Joints à doigts à distance

Série 2 : Joints émoussés à distance

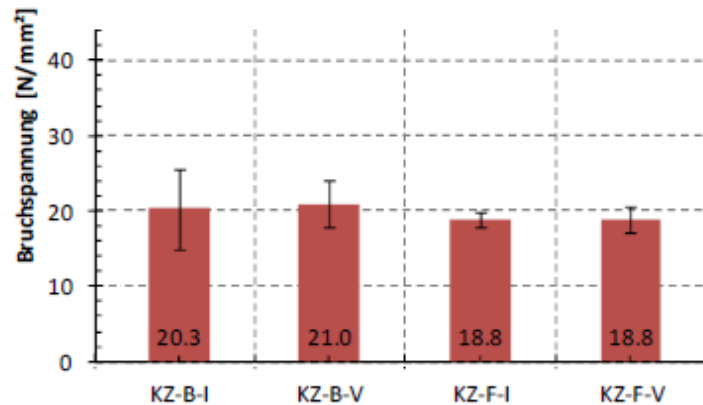
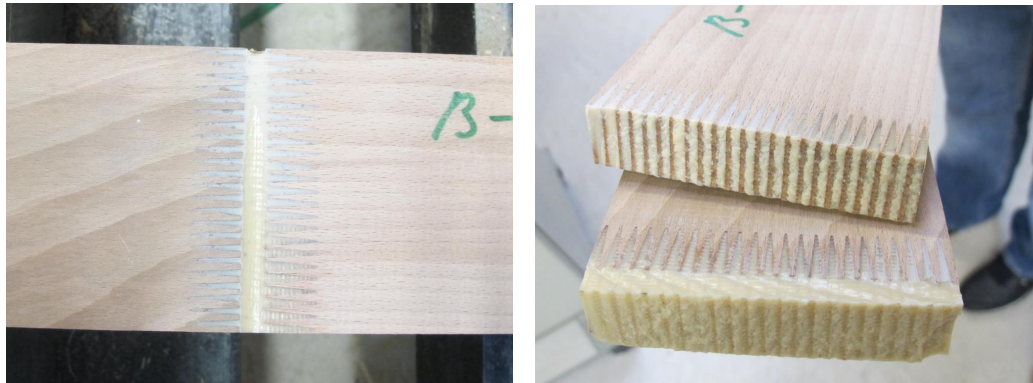
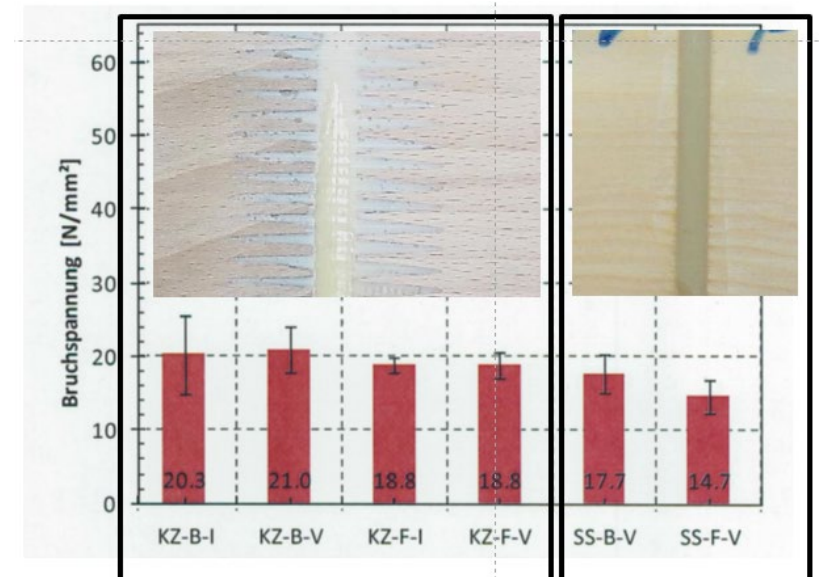
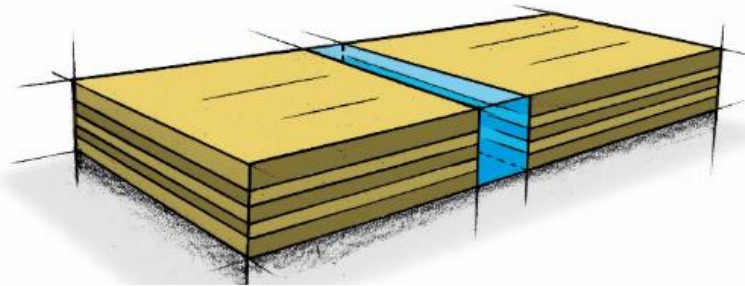
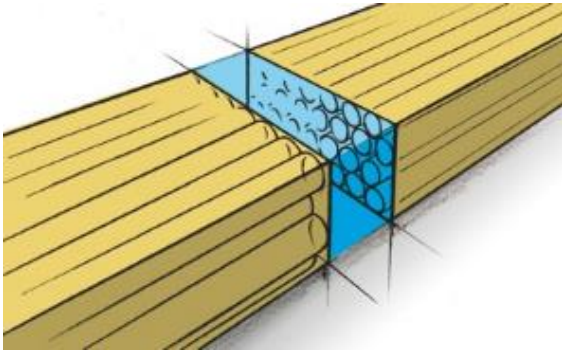


Abb. 15: Gegenüberstellung der Bruchspannungen aller Prüfserien



Solution Partie 2

Collage du bois rigide avec un joint émoussés à distance



Total 72 tests dans 2 séries

Essais de flexion et de climat à long terme des joints CLT



Total 250 tests dans 7 séries

Essais au feu : Petite échelle

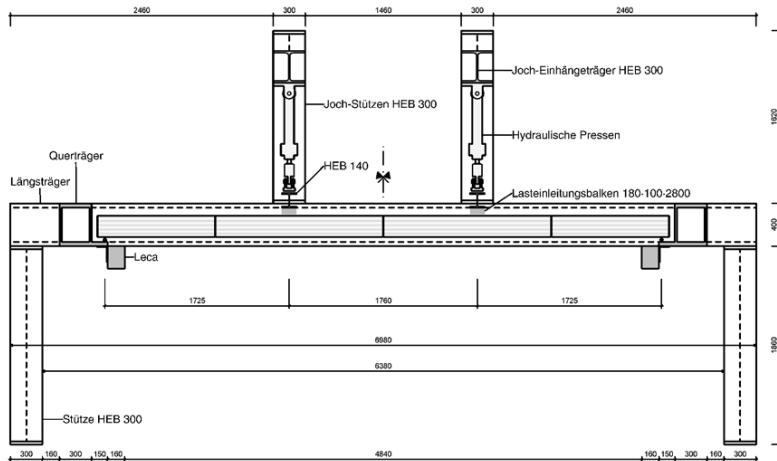


Fichte BSP	6mm Fuge	$\beta_0 = 0.59 \text{ mm/min}$
		$\beta_{\text{Schicht2}} = 0.77 \text{ mm/min}$
Fichte BSP	12mm Fuge	$\beta_0 = 0.52 \text{ mm/min}$
		$\beta_{\text{Schicht2}} = 0.53 \text{ mm/min}$
Buche FU	6mm Fuge	$\beta_0 = 0.66 \text{ mm/min}$
		$\beta_{\text{Schicht2}} = 1.07 \text{ mm/min}$
Buche FU	12mm Fuge	$\beta_0 = 0.66 \text{ mm/min}$
		$\beta_{\text{Schicht2}} = 0.78 \text{ mm/min}$

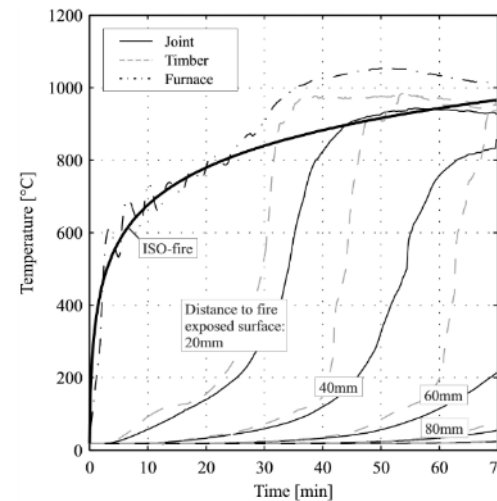
Total 6 tests dans 2 séries

CLT et contreplaqué

Essais au feu : Grande échelle sous charge de 32 kN



Total 1 test dans 1 série



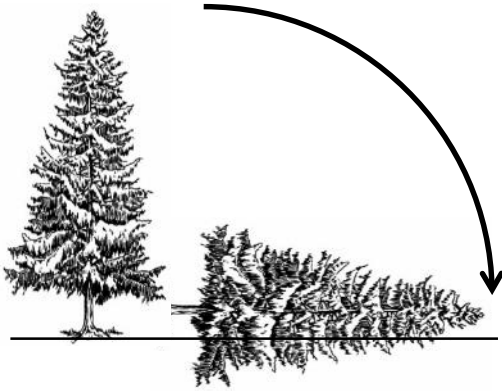
CLT 5.30 x 2.80 x 0.2 m

La plaque CLT avec joints collés bout à bout a atteint une résistance au feu de **69 minutes**.

La plaque CLT s'est rompue à cause de la rupture fragile au joint collé

Evolution de la construction bois Timber Structures 1.0

Troncs et poutres



Bois rond



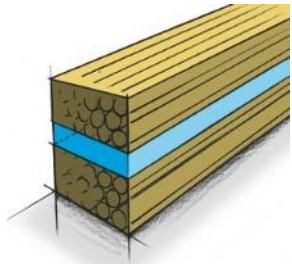
Bois scié (rectangulaire)



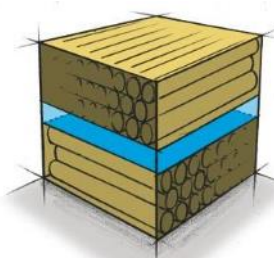
Evolution de la construction bois Timber Structures 2.0



Planches



BLC

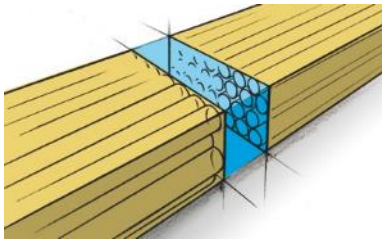


CLT

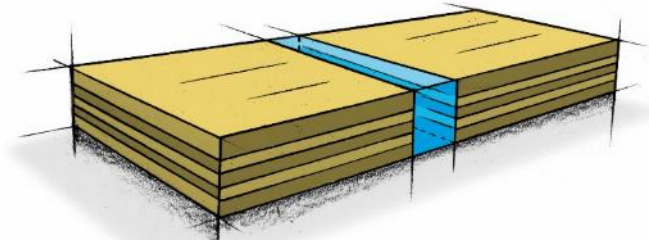


Evolution de la construction bois Timber Structures 3.0

Technologie de collage bout à bout



Connexion des barres

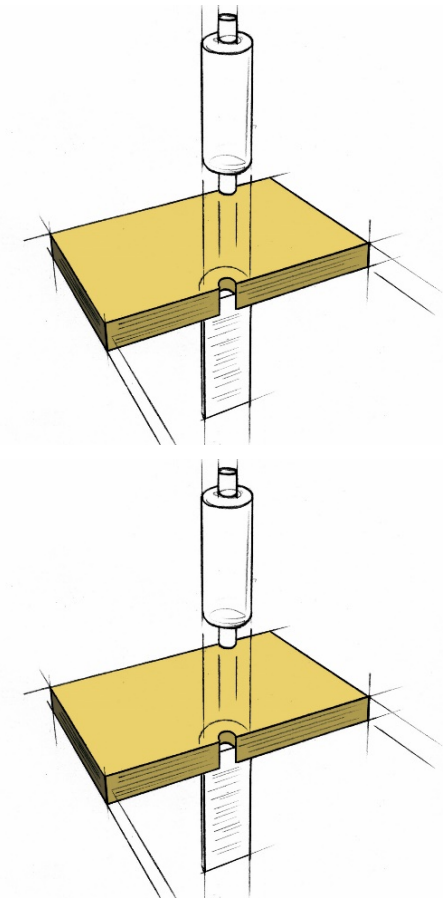
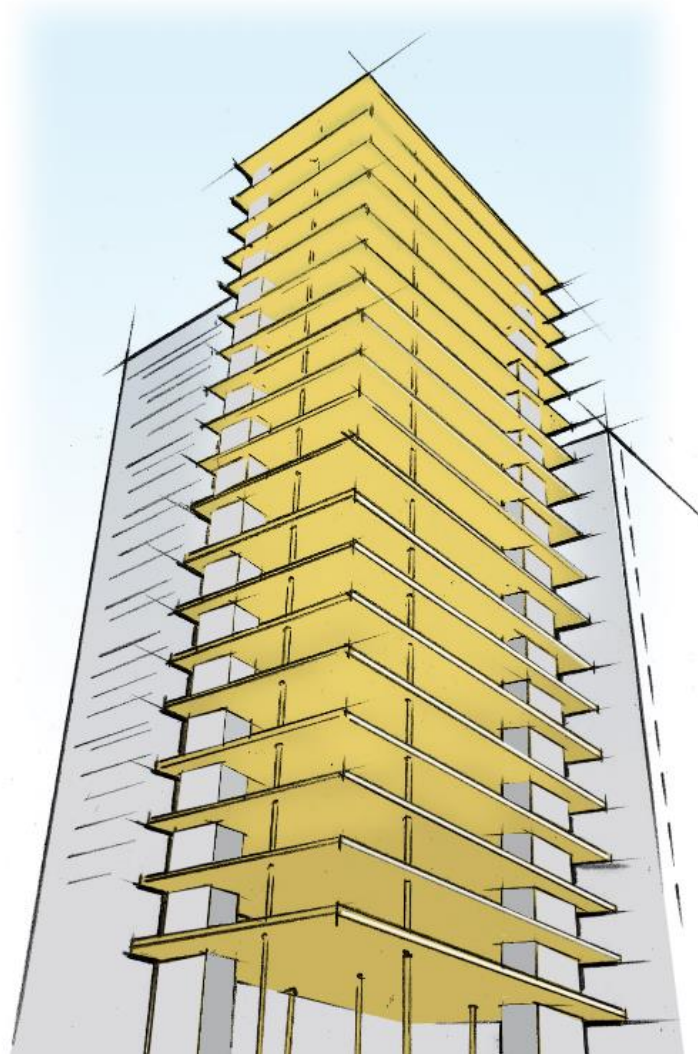
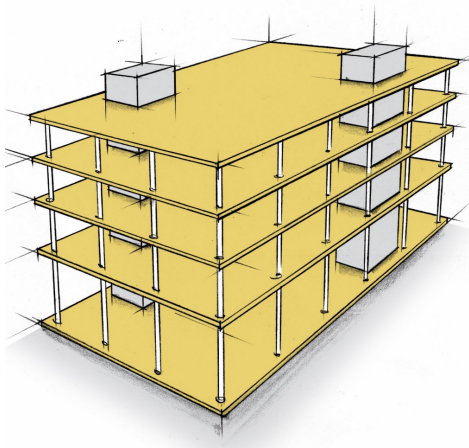
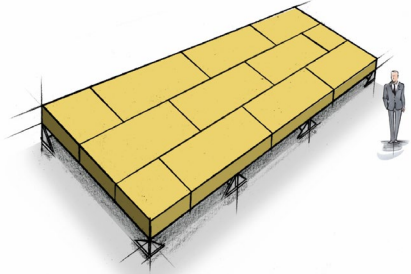


Connexion des panneaux, i.e. CLT



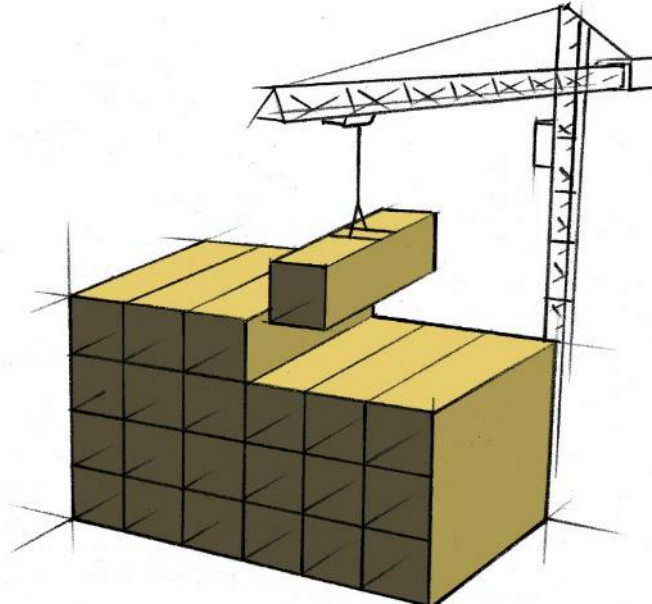
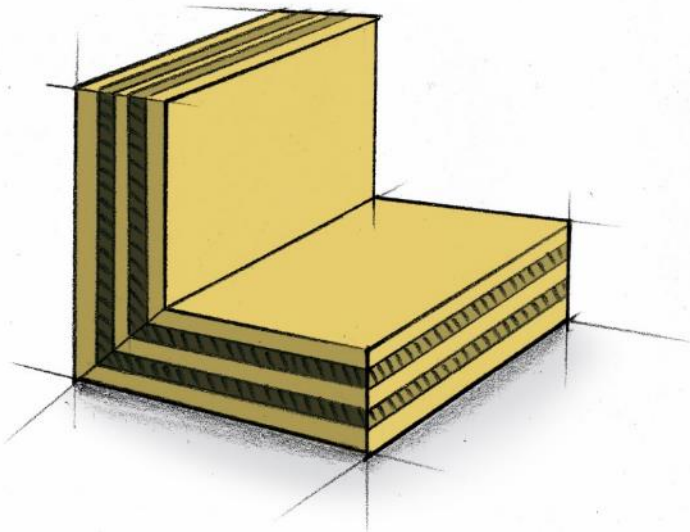
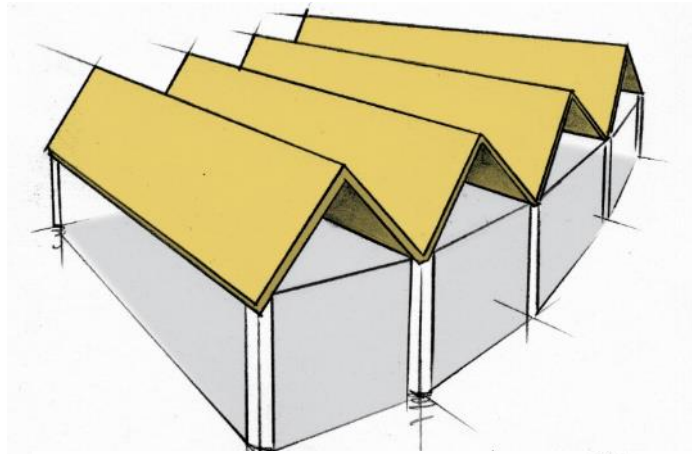
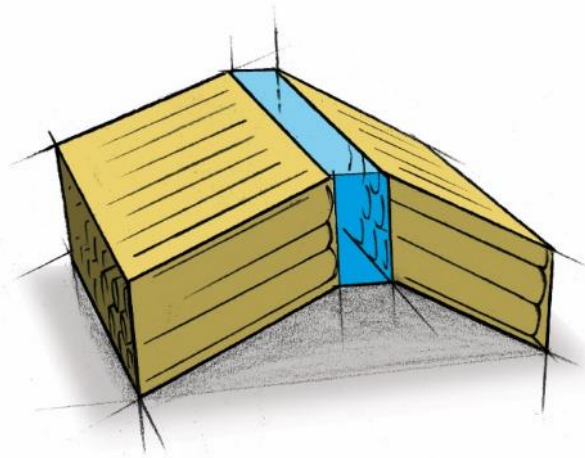
Applications possibles

- Planchers



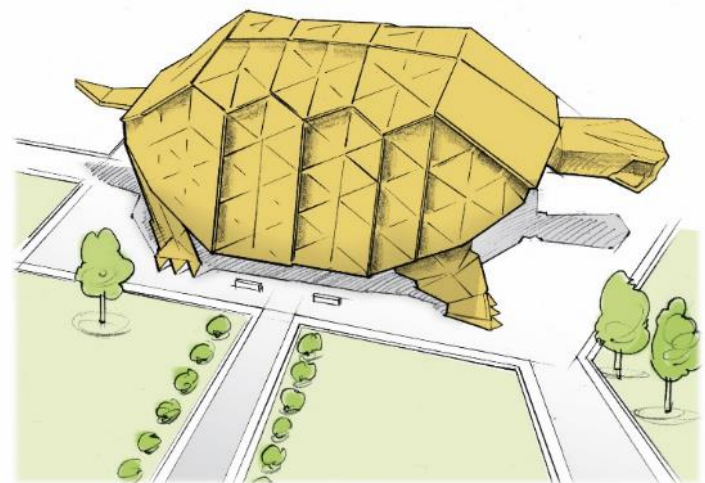
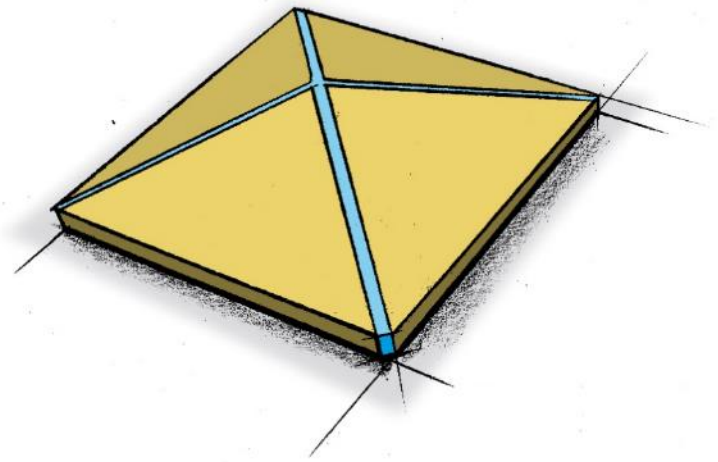
Applications possibles (need to have – nice to have)

- Structures pliées simples



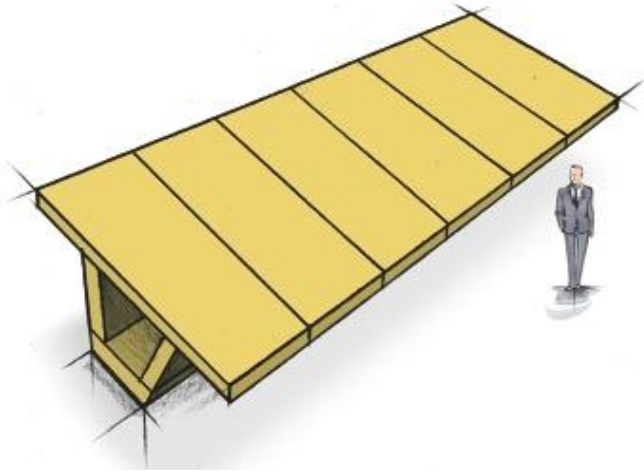
Possible applications

- Structures pliées complexes



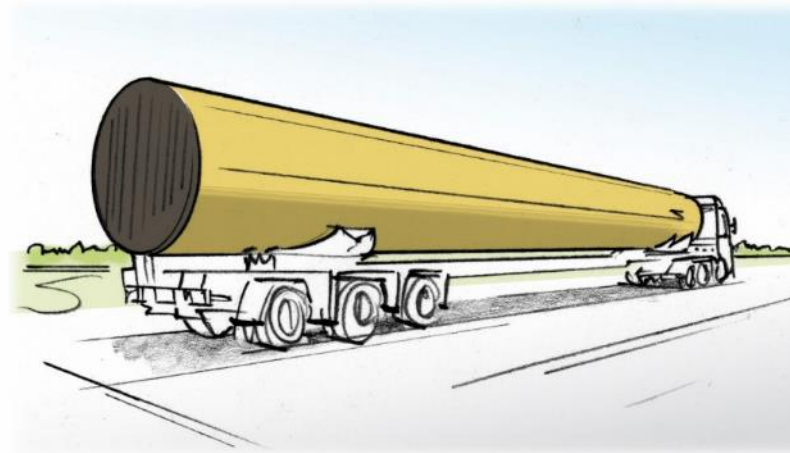
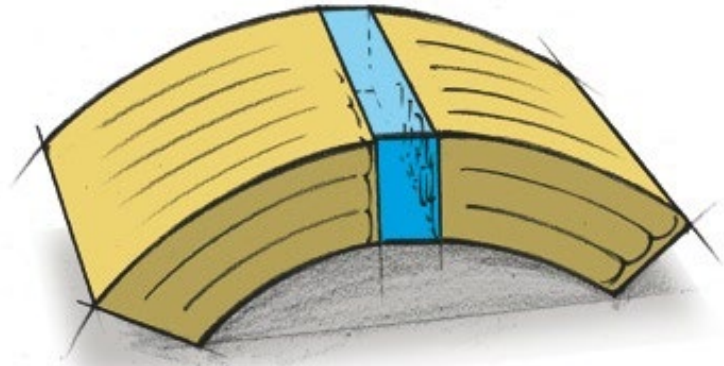
Applications possibles

- Profilés composites, par exemple pour ponts précontraints



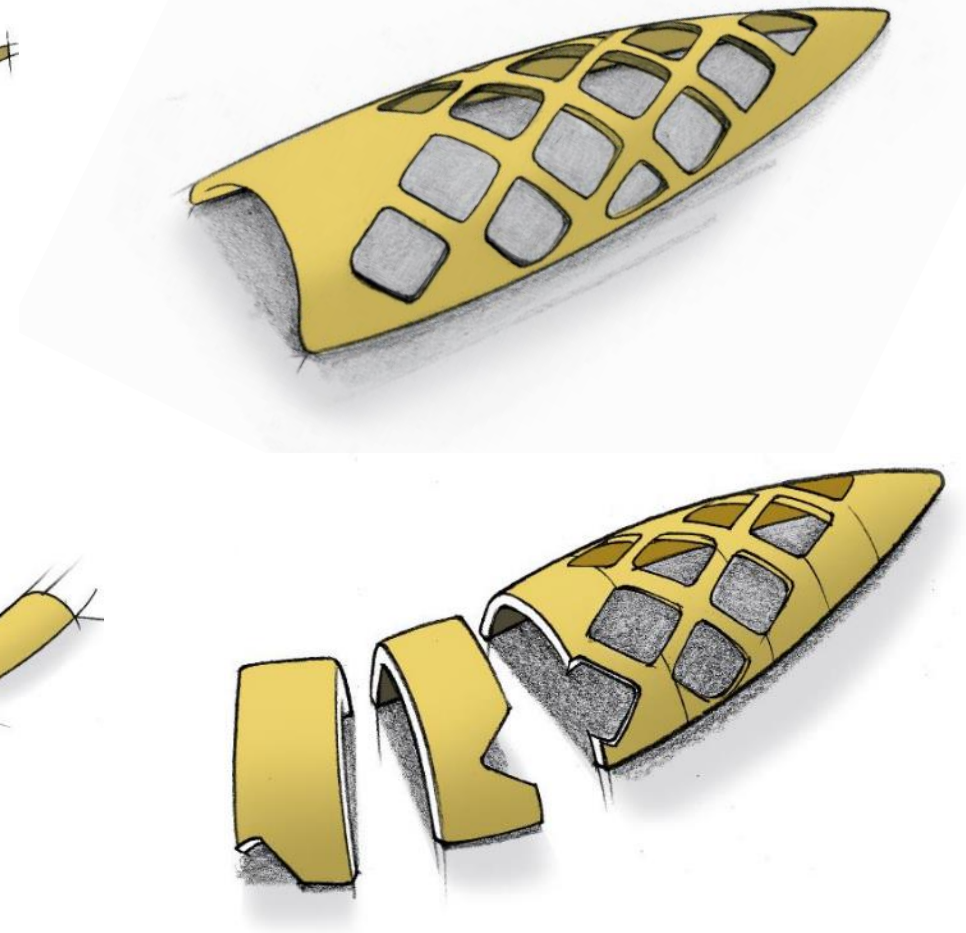
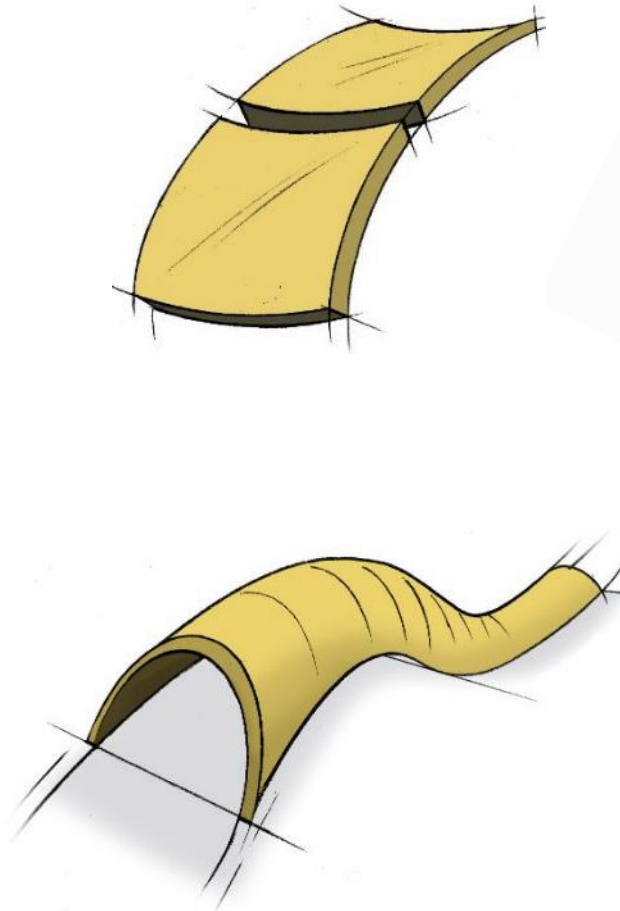
Applications possibles

- Coques, par exemple tubes pour éoliennes



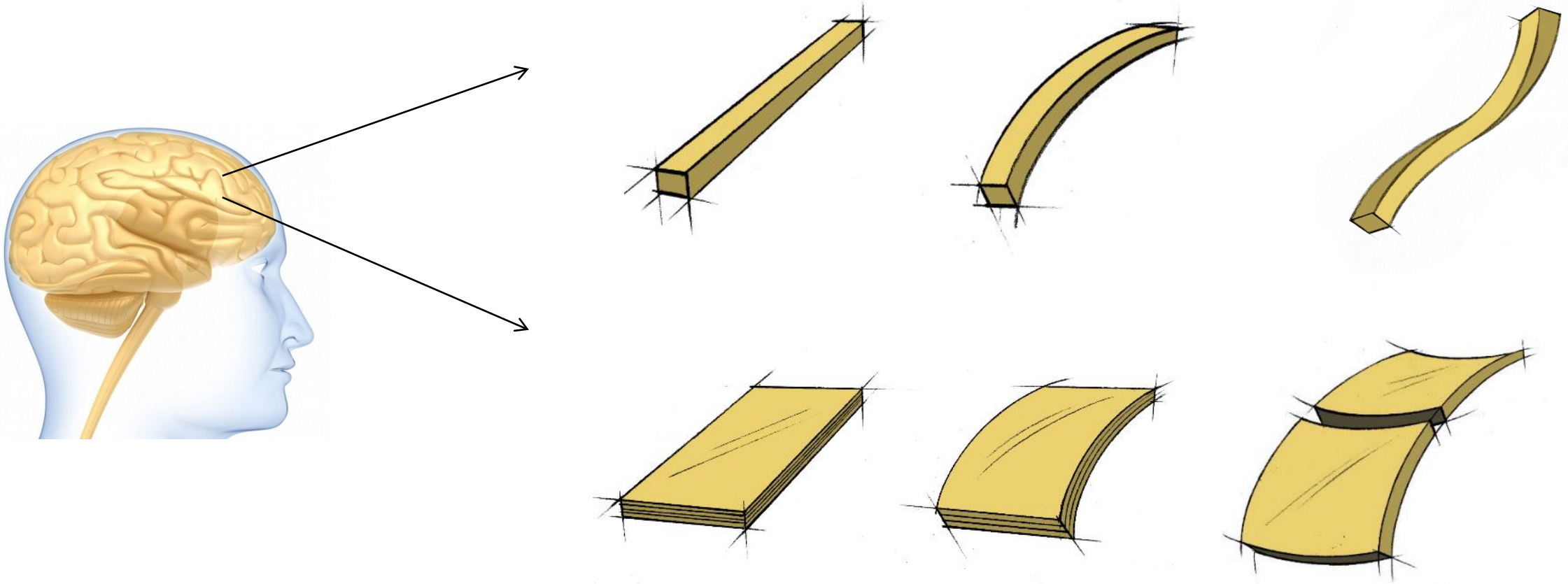
Applications possibles

- Free forms, Nurbs (Non-Uniform Rational B-Splines)



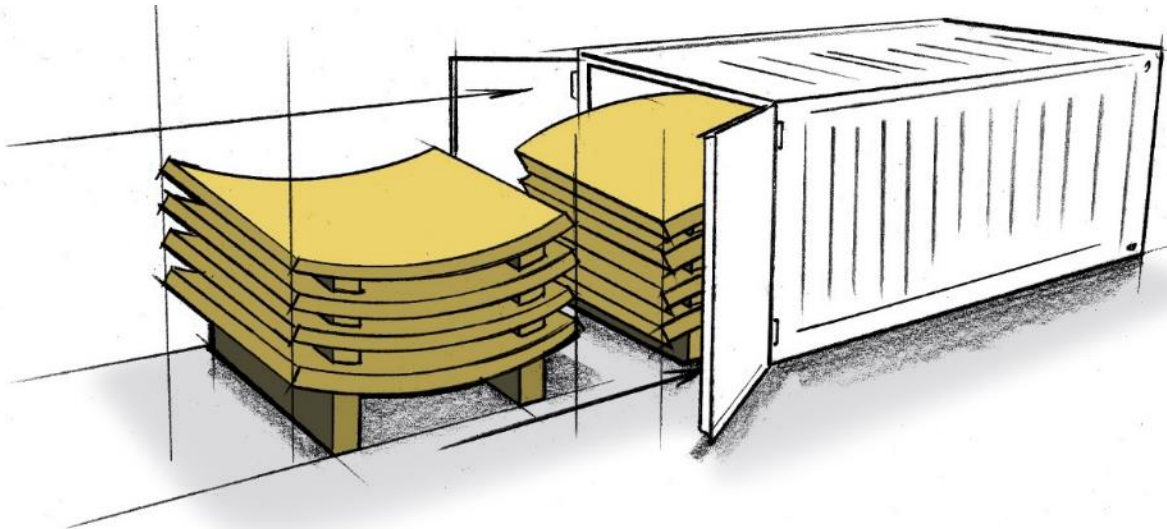
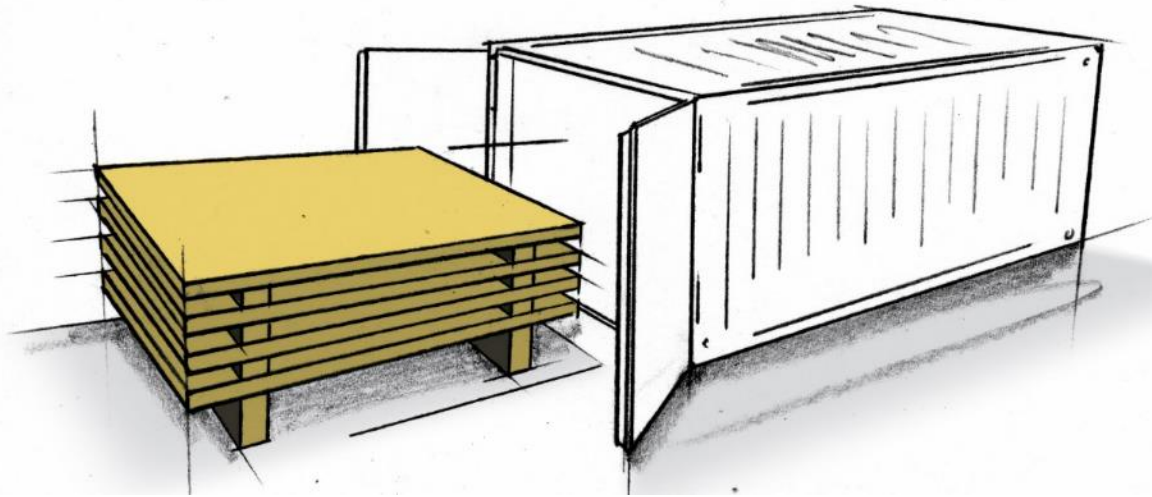
Applications possibles

- En bref : tout ce qui peut être retracé jusqu'à une tige ou un panneau



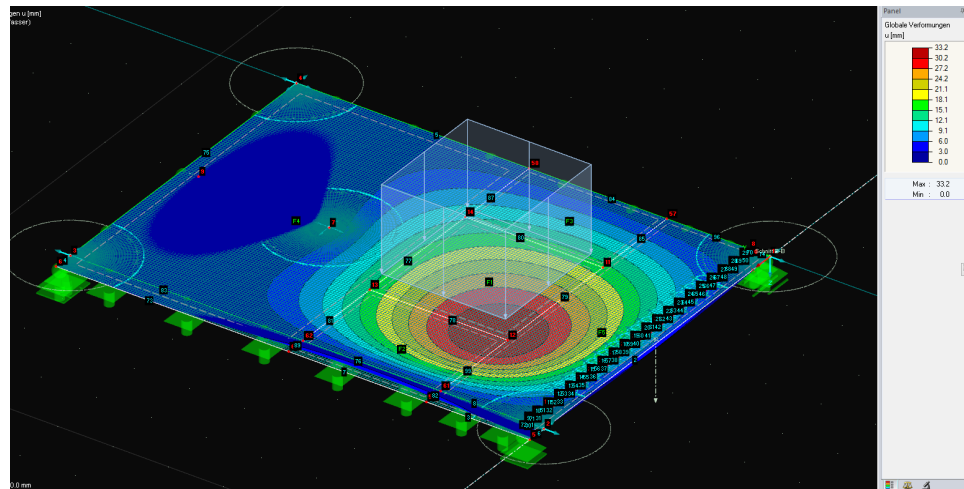
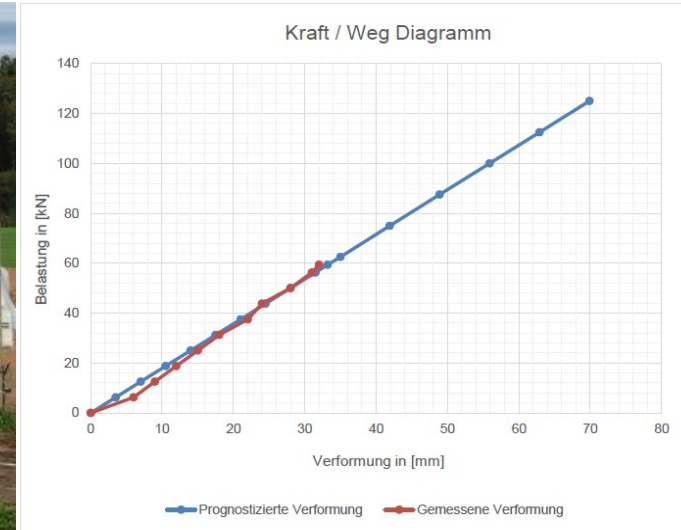
Taille du composant

- Camion ou container 20 ou 40 pieds



Exemples réalisés

2013 Carport Brügger St. Antoni, 54 m² panneaux CLT



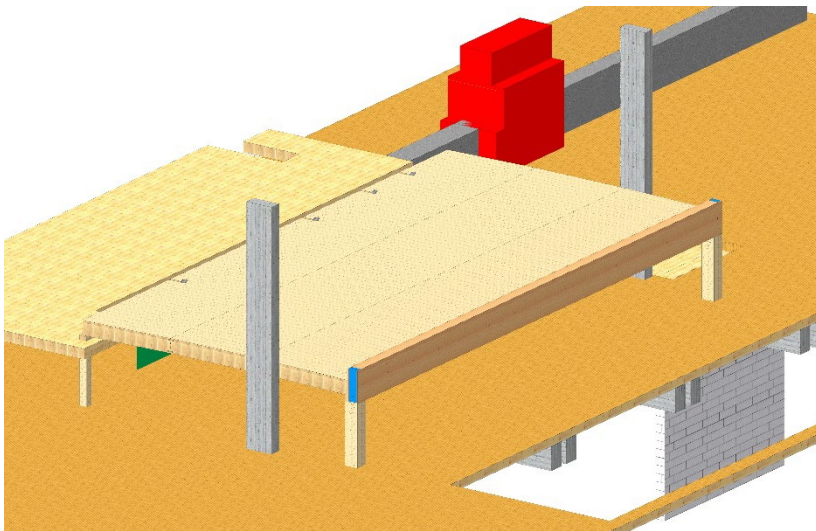
Exemples réalisés

2015 Résidence locatif Thun, 230 m² panneaux CLT



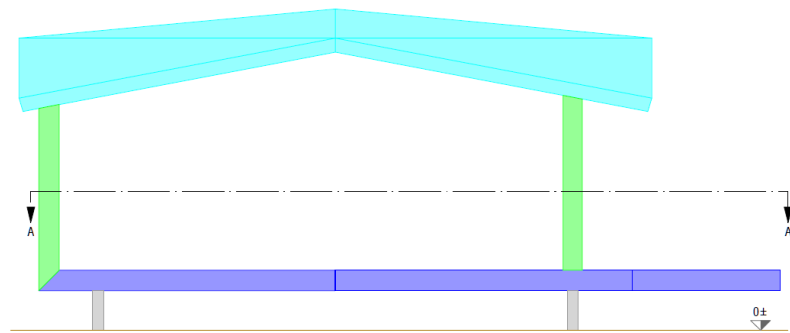
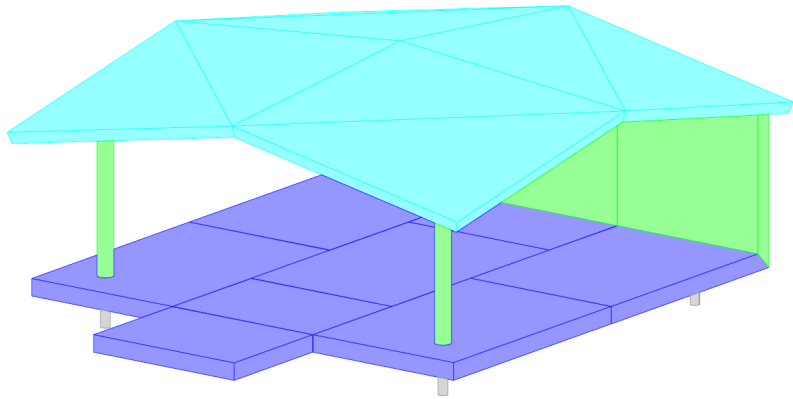
Exemples réalisés

2018 Plate-forme pour charges lourdes Flück Holzbau, Zürich, 110 m² panneaux CLT



Exemples réalisés

2018 banc d'essai externe BFH Bienne, 140 m² panneaux CLT





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Timber Structures 3.0

001

BE-408183

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Exemples réalisés

2018 Aussenprüfstand BFH Biel, 140 m2 CLT-Platten









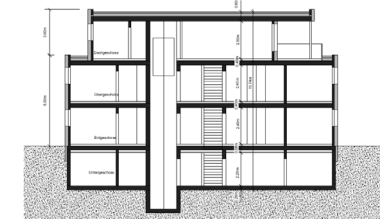
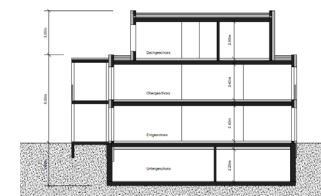
Exemples réalisés

2018 banc d'essai externe BFH Bienne, 140 m² panneaux CLT



Exemples réalisés

2018 4 immeubles locatifs, 20 appartements, Grossaffoltern, 2'300 m² panneaux CLT



Exemples réalisés

2018 4 immeubles locatifs, 20 appartements, Grossaffoltern, 2'300 m² panneaux CLT



Exemples réalisés

2018 4 immeubles locatifs, 20 appartements, Grossaffoltern, 2'300 m² panneaux CLT



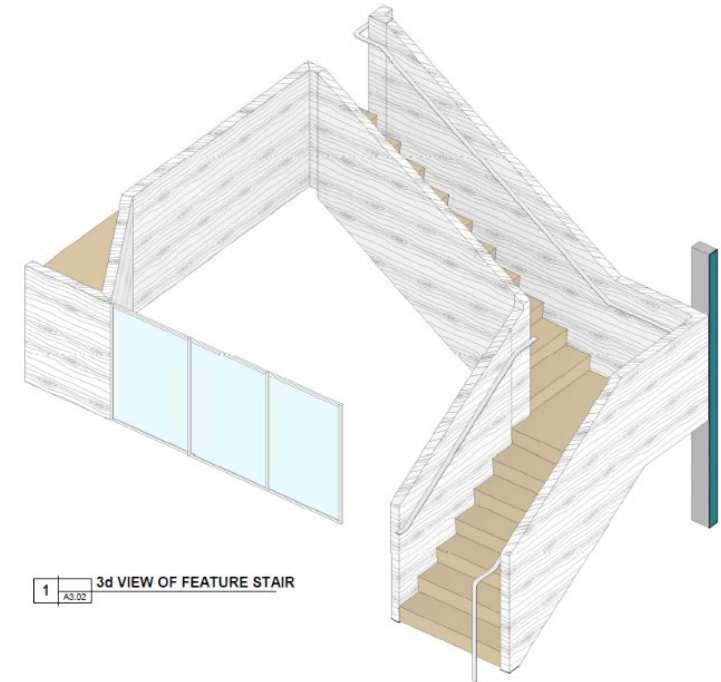
Exemples réalisés

2018 4 immeubles locatifs, 20 appartements, Grossaffoltern, 2'300 m² panneaux CLT



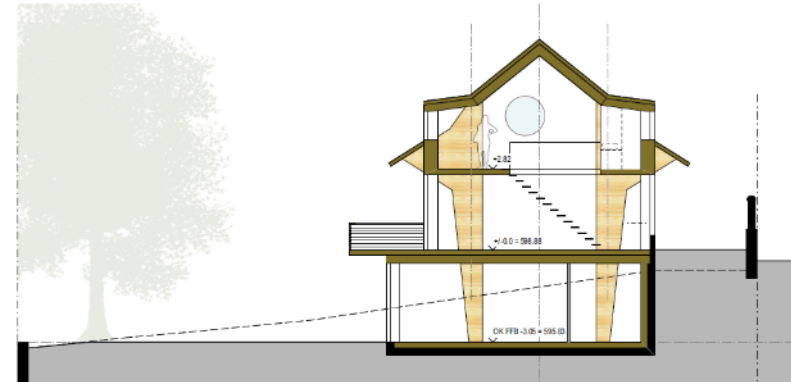
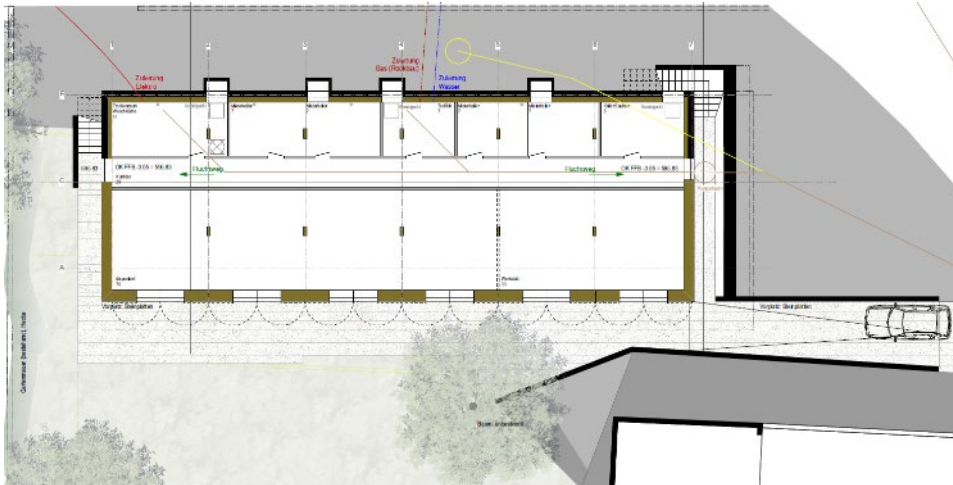
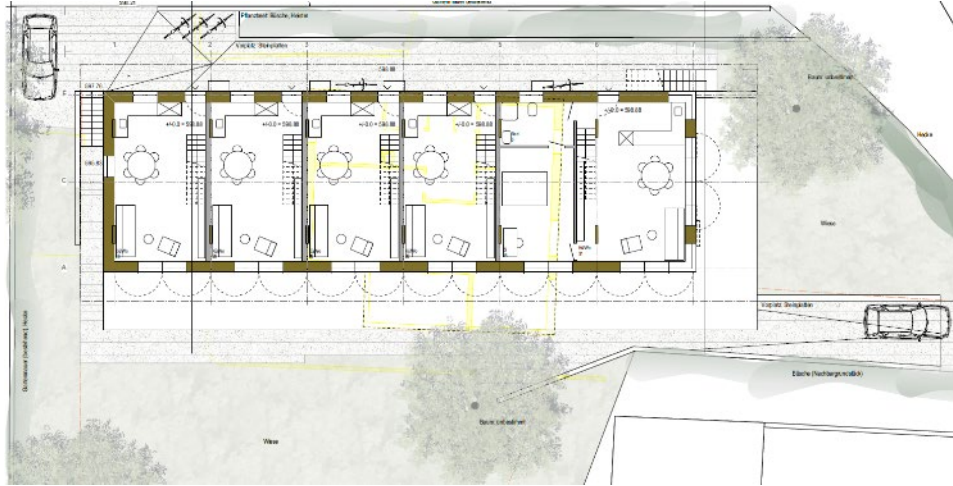
Exemples réalisés

2018 Naikoon Office, Escalier, Vancouver CA, 45 m² panneaux CLT



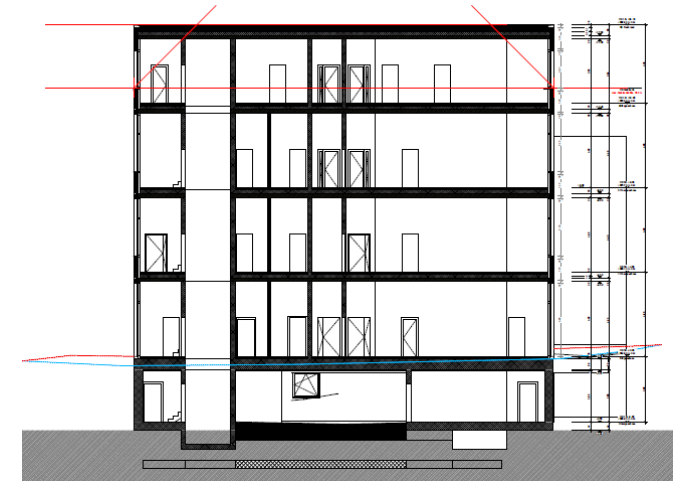
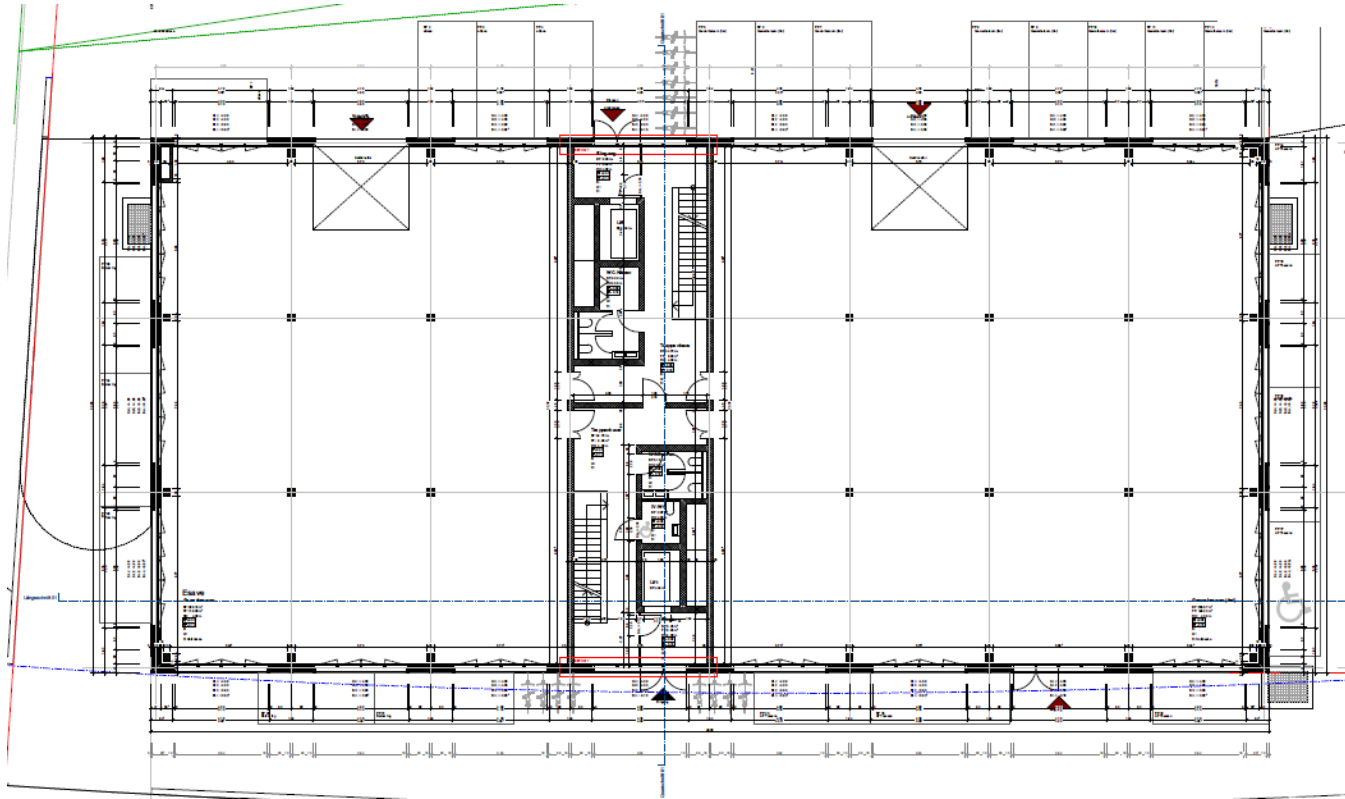
Contrats de projet

2019 1 immeuble locatif, 5 appartements, Thun, 1'000 m² panneaux CLT



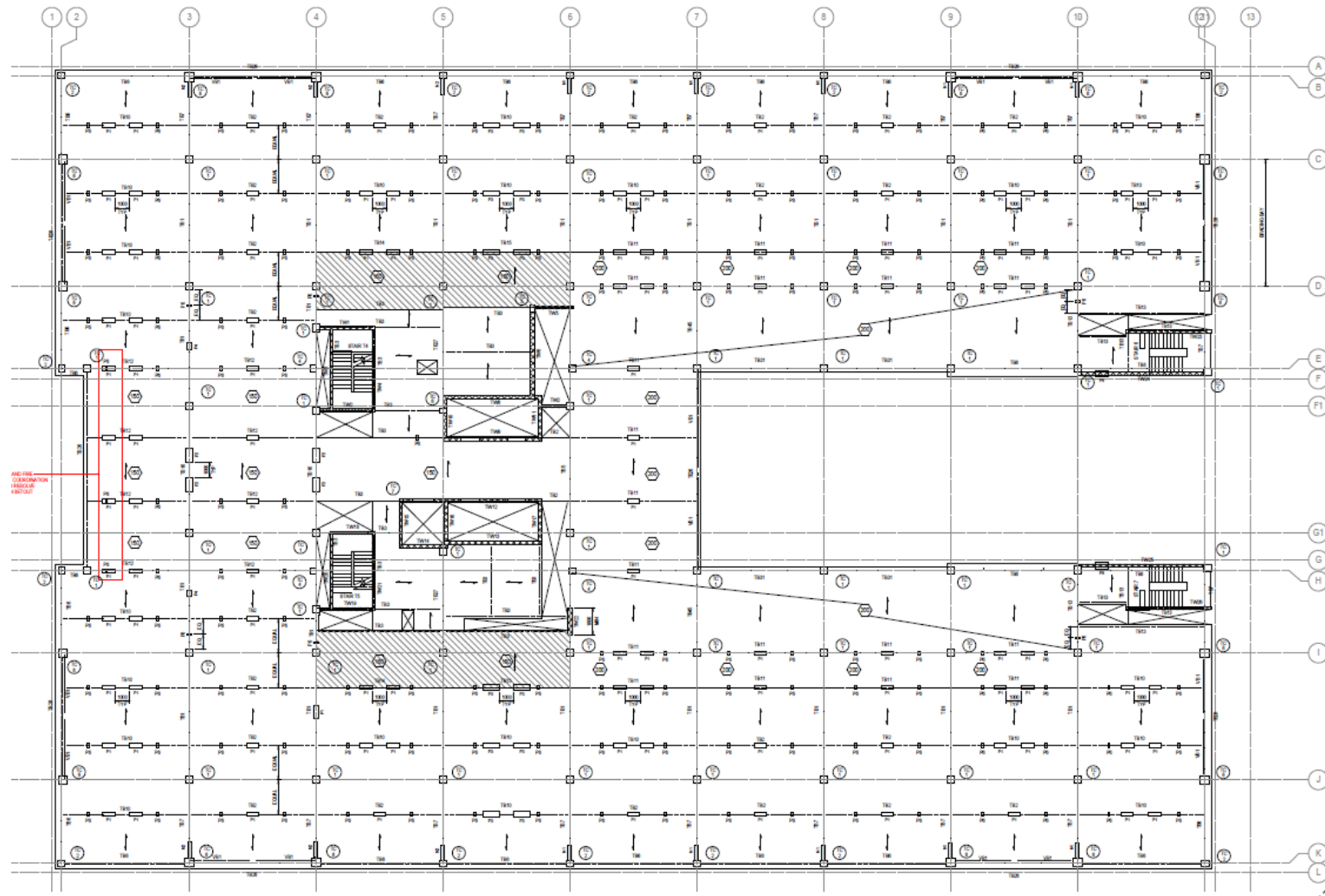
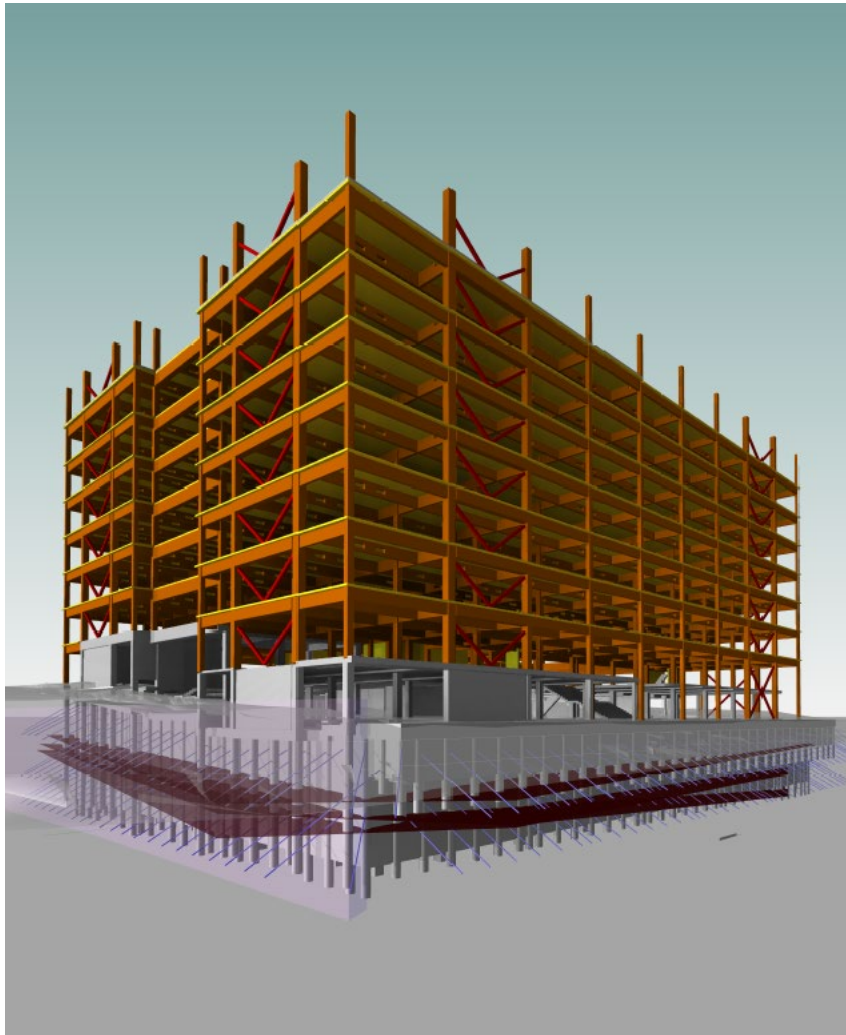
Contrats de projet

2019 Bâtiment commercial Rossboden Coire, 3'900 m² panneaux CLT



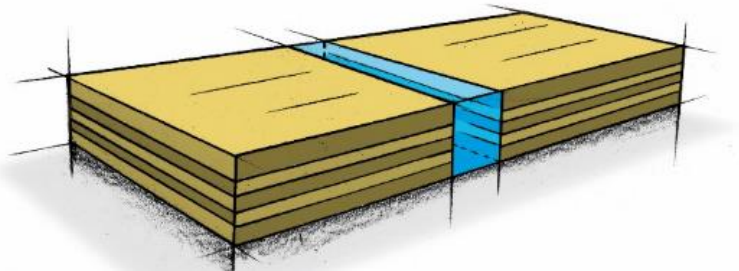
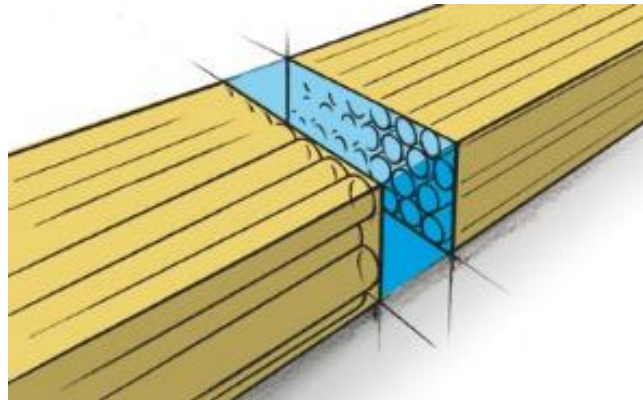
Projekte in Pipeline

2019 Talavera Road Project Sydney, Renggli International AG, 24'000 m² CLT-Platten



Patents

1: Joints bout à bout

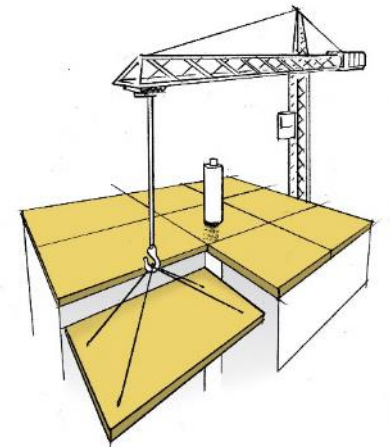
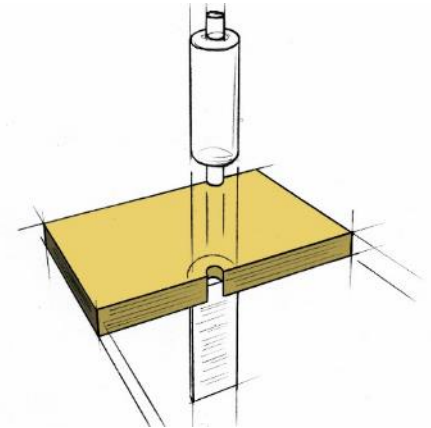
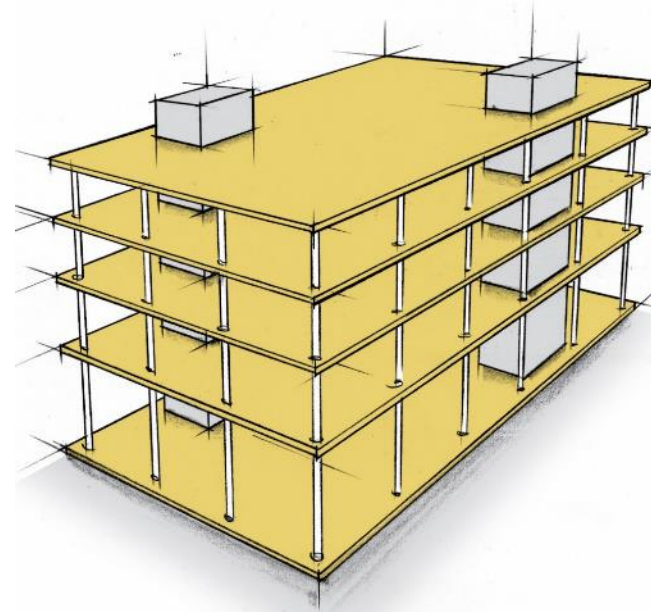


Switzerland: Granted

EU: Pending

USA: Pending

2: Structure du bâtiment Colonnes - dalles



Switzerland: Granted

EU: Granted

USA: Granted

TS3

TIMBER STRUCTURES 3.0

Colonnes - Dalles - Prêt!
Merci!

