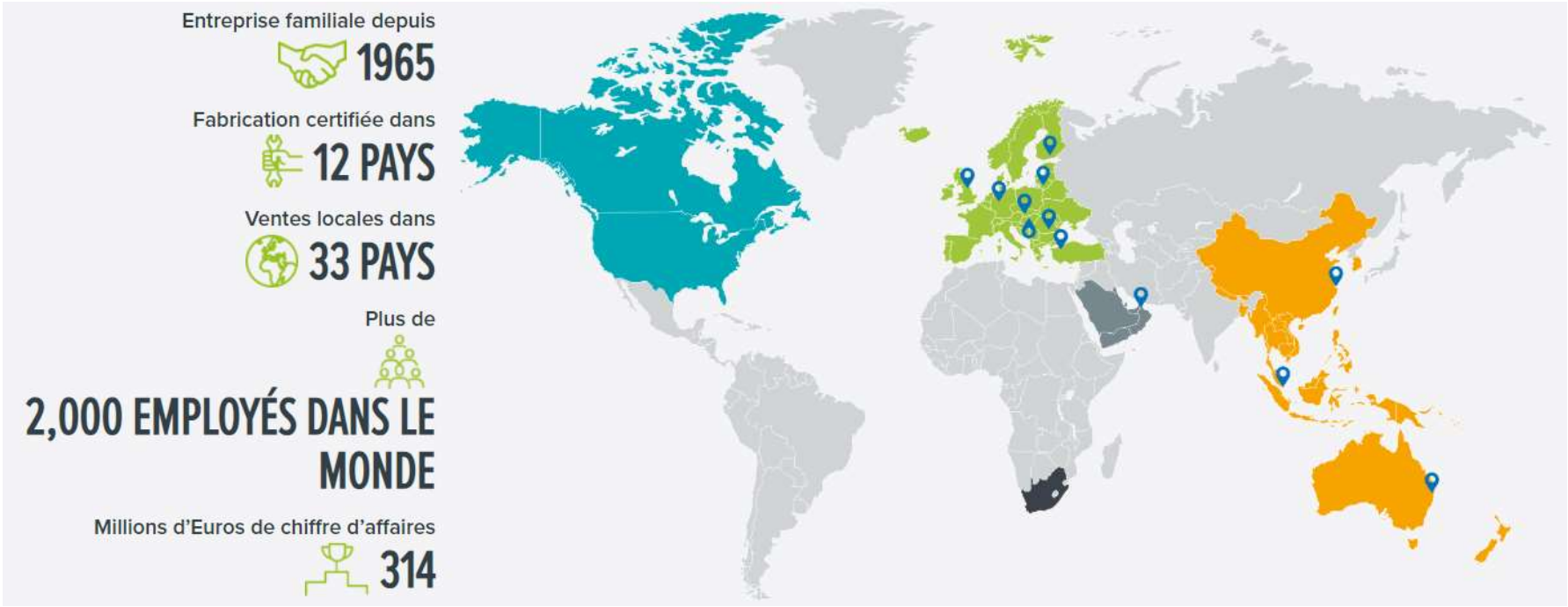
Innovative solutions for precast concrete construction

Jan Bujnak / 1st April 2025
jan.bujnak@peikko.com

Peikko Group

- Peikko Group : Entreprise finlandaise depuis 1965



Peikko Schweiz AG

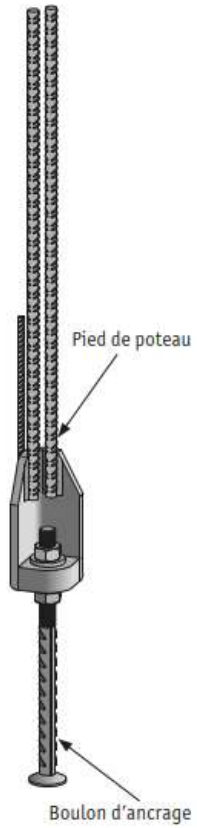
- depuis 2008 à Frauenfeld
- 3 ingénieurs commerciaux,
- 1 ingénieur d’étude
- Chiffres d'affaires 2023 ~5m CHF

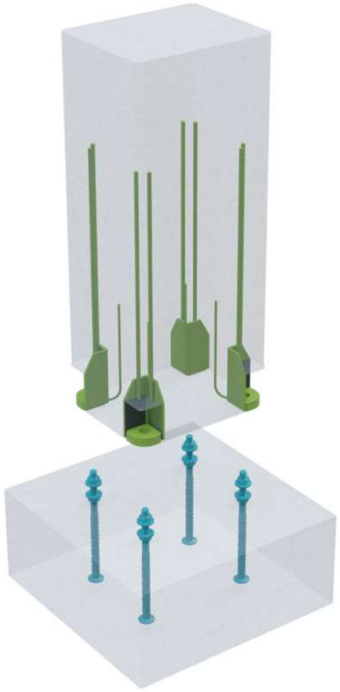
Solutions pour le béton préfabriqué

- Assemblages boulonnées
- Plancher mixte DELTABEAM®

peikko®

Système de connexion Poteau Peikko





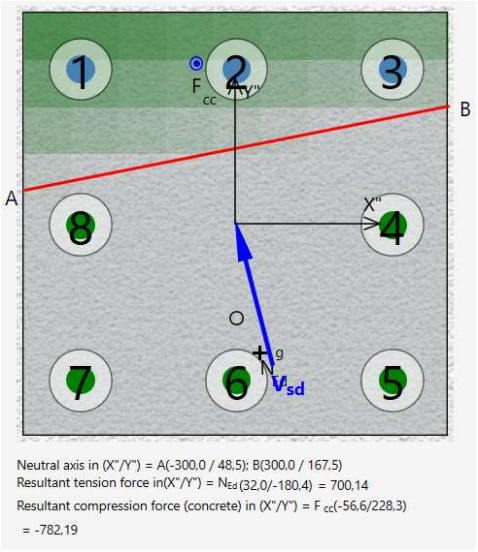
Poteau - Fondation

Poteau sur poteau

- Assemblage mécanique boulonné pendant le montage du poteau :

  → sans étayage du poteau

- Remplissage de mortier sans retrait : comportement béton armé



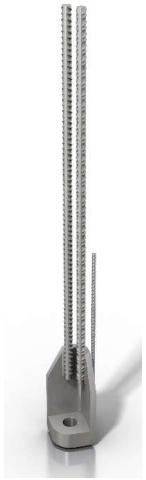
https://www.youtube.com/watch?v=-X3LcfsuGhE

Système de connexion Poteau Peikko

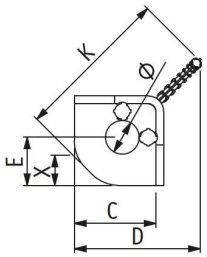
Composition du système

- Pied de poteau
  (dans le poteau porté)

- Normal :

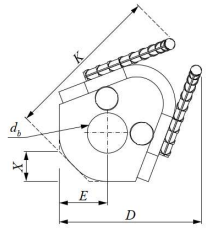


HPKM® 16 à HPKM® 39
HELKA® 24 à HELKA® 39

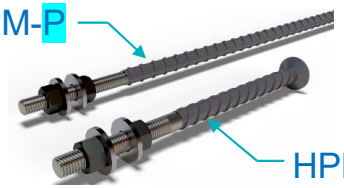


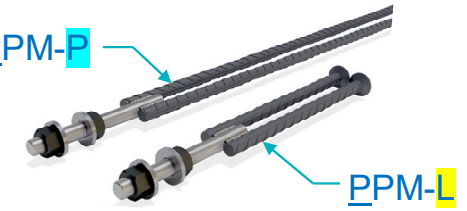
- Haute résistance :

BOLDA® 30 à
BOLDA® 52



- Boulon d'ancrage
  (dans le support : fondation
  ou poteau porteur)





Application

Structure béton

Fondation-poteau

Poteau-poteau

Application

- ✓ Utilisé dans plusieurs types de projet :
  - ❖ Infrastructure, bassin de rétention d'eau, passerelle piétonne, …
  - ❖ Usine, stockage industriel, centre de maintenance ferroviaire, ….
  - ❖ Bâtiment tertiaire, parking silo,…
- ✓ Connu par l'ensemble du secteur :
  - ❖ Entreprise gros œuvre : Eiffage, Vinci, Bouygues, Demathieu & Bard, …
  - ❖ Bureau d'étude
  - ❖ Préfabriquant
  - ❖ Bureau de contrôle

Chaufferie Biomasse pour Airbus à Blagnac (31700)
Poteau de 22mht sur 1 levé

Système de connexion Poteau Peikko

Maroquinerie à Châteauneuf-sur-Isère

Poteaux avec drapeau préfabriqué; auto-stabilité complète

Système de connexion Poteau Peikko

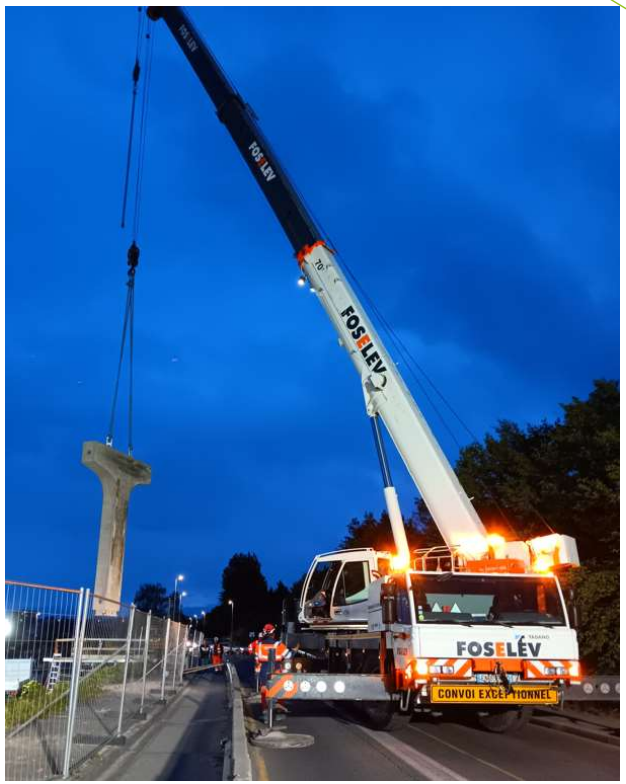
Réservoir d’eau à Valence (2021)

Système de connexion Poteau Peikko

Passerelle piéton BROUAZ à Annemasse (74100)

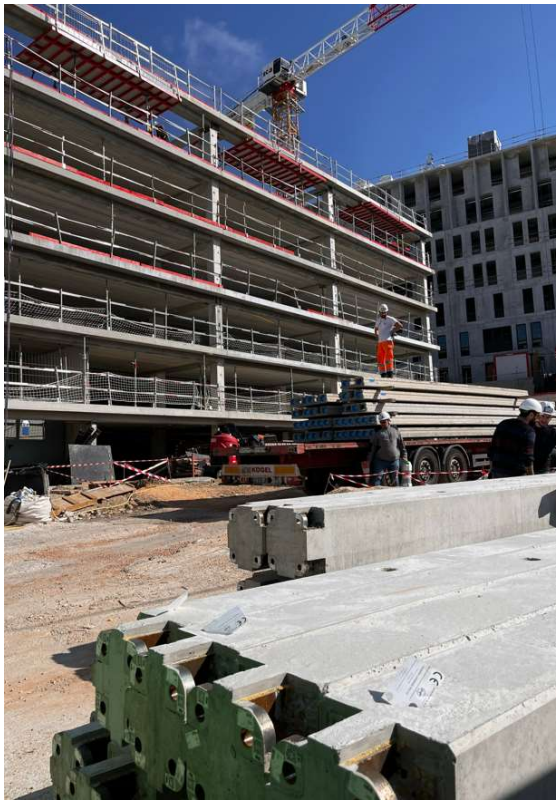
Ouvrage d’art

Zone 4 sismicité



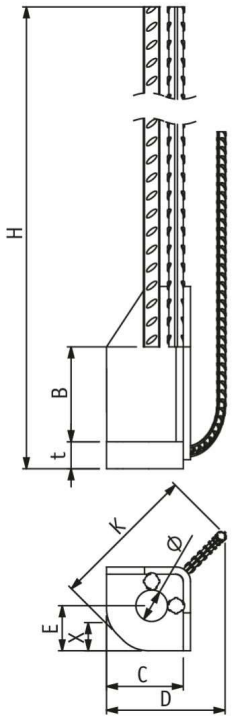
Système de connexion Poteau Peikko

Parking Silo R+7 à Toulon (83000)



Produits certifiés par ETAs et les marquages CE

HPKM



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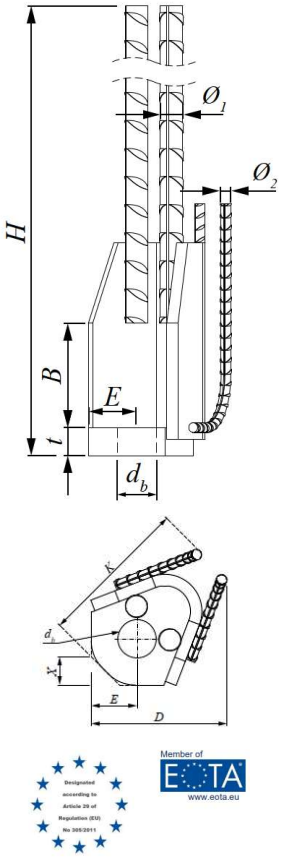
FI-02150 Espoo, FINLAND

Member of EOTA www.eota.eu

European Technical Assessment ETA 18/0037
of 15/11/2018

HELKA



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European Technical Assessment ETA 24/0589
of 05/08/2024

HPM

Deutsches Institut für Bautechnik DIBt

Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body for construction products

Member of EOTA www.eota.eu

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-02/0006
of 13 August 2024

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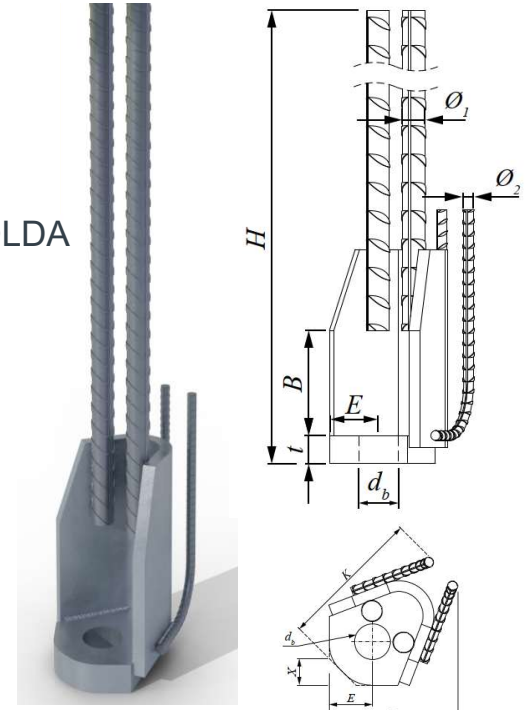
Produits certifiés par ETAs et les marquages CE

BOLDA



Deutsches Institut für Bautechnik DIBt

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA www.eota.eu

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-20/0529 of 16 July 2021

PPM

Deutsches Institut für Bautechnik DIBt

Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body for construction products

Member of EOTA www.eota.eu

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-19/0814 of 29 April 2024

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Méthode de calcul de Pied de poteau

Assesment method – EAD 200102-00-0302 (theorical design + test experimental)

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the column shoes is assessed in relation to the essential characteristics.

Table 2.1.1 Essential characteristic of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Resistance to tension and shear loads	2.2.2	Level k_L [-], η_d [-], k_s [-], $N_{Rd,S(shoe)}$ [kN]
Basic Works Requirement 2: Safety in case of fire			
2	Reaction to fire	2.2.3	Class
3	Resistance to fire – steel temperature as a function of the duration of fire exposure	2.2.4	Level $T_{cr}(t_i)$ [°C]

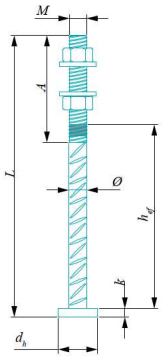
Characteristic	Number of tests	Identification	Requirement
Bending stiffness factor *kL*	2	HE24-BS, H39-BS	Two BS tests, one with the smallest and one with the largest
Bending resistance factor *ηd*	5*	B24-BR, B30-BR, B39,BR, B24-BS.b, B39-BS.b	In addition to using 2 bending tests, at least 3 BR test shall be carried out
Shear resistance factor *ks*	2	HE24-S, HE39-S	Two shear tests, one with the smallest and one with the largest
Resistance to fire *Tcr(ti)*	3	HELKA 24, HELKA 30, HELKA 39	If determined only by testing, each column shoe size shall be tested

*Bending stiffness test arrangements (HE24-BS & HE39-BS) were rearranged to study the final bending resistance (HE24-BS.b & HE39-BS.b)

ETA 18/0037 (HPKM)
ETA 24/0589 (HELKA)
ETA 20/0529 (BOLDA)

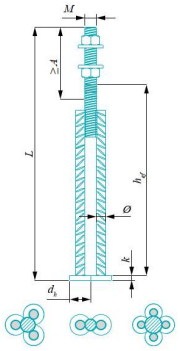
Méthode de calcul de Boulon d'ancrage

Calcul suivant Eurocodes + tests expérimentaux



	HPM 16 L	HPM 20 L	HPM 24 L	HPM 30 L	HPM 39 L
M	M16	M20	M24	M30	M39
A	140	140	170	190	200
Stress area of the thread	157	245	352	561	976
Ø	16	20	25	32	40
L	280	350	430	500	700
Washer	Ø40-6	Ø44-6	Ø56-6	Ø65-8	Ø90-10
h_{ef}	165	223	287	335	502
d_h	38	46	55	70	90
k	10	12	13	15	18
Weight	0.7	1.2	2.2	4.1	9.2
Color code	Yellow	Blue	Grey	Green	Orange

ETA 02/0006 (HPM-L)



	PPM 30 L	PPM 36 L	PPM 39 L	PPM 45 L	PPM 52 L	PPM 60 L
M Metric thread	M30	M36	M39	M45	M52	M60
A Minimum thread length	190	190	190	220	250	310
Stress area of the thread	561	817	976	1306	1758	2362
Ø	2Ø25	4Ø20	3Ø25	4Ø25	4Ø32	4Ø32
L	670	740	880	980	1140	1330
Washer	Ø65-8	Ø80-8	Ø90-10	Ø100-10	Ø100-12	Ø115-15
h_{ef} (suitable for BOLDA®)	522	568	692	777	905	-
d_h	55	46	55	55	70	70
k	13	12	13	13	15	15
Weight	6.2	9.4	12.7	18.6	32.6	42.0
Color code	Black	Red	Brown	Purple	White	

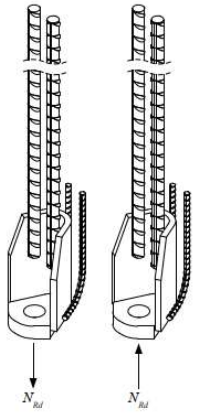
ETA 19/0814 (PPM-L)

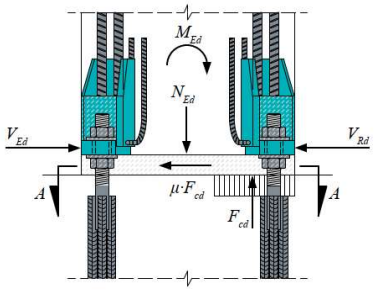
- Les boulons longs (type P) sont les barres HA travaillent par la longueur d'ancrage ou par la longueur de recouvrement

Domaine d’application

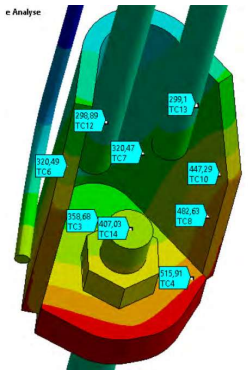
- Système de connexion résiste aux efforts de
- compression / traction
- cisaillement
- et ses combinaisons

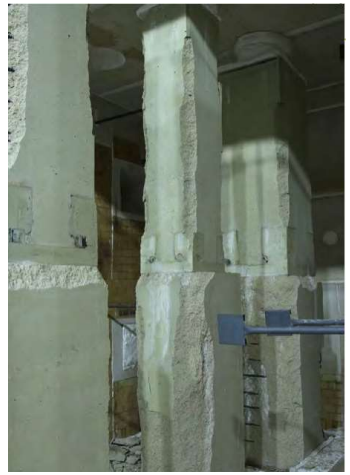
- Sous les charges statiques et quasi-statique (ETAs)





- En cas d’incendie :
- Classe de réaction au feu A1 suivant les Euroclasses (EN 13501-1) : imcombustible (NFP 92-501)
- Résistance au feu jusqu’à R120 : justifié par la méthode avancée de l’EC2 avec la température des connexions testées (ETAs) ; ou par l’enrobage adéquate (EC2)

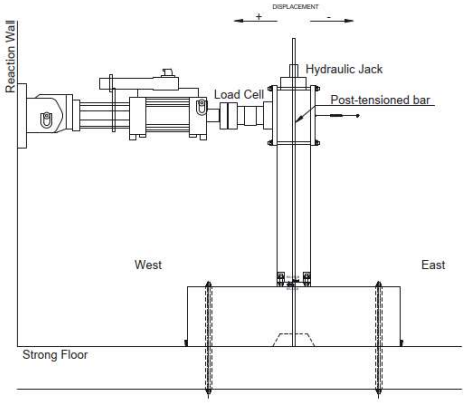




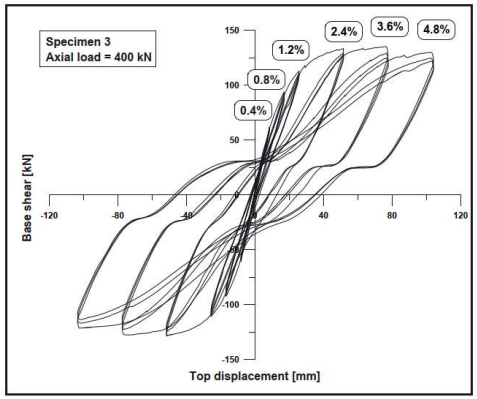
Domaine d’application

Séisme

- Test laboratoire sous la charge cyclique pour l’application sismique et fatigue



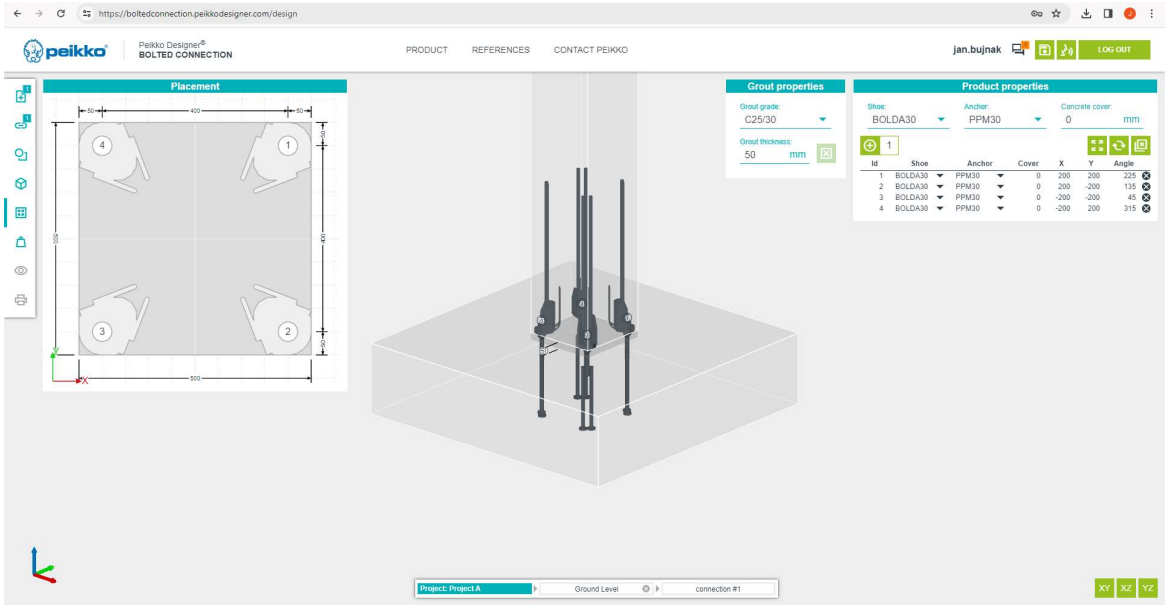
- Méthodologie de calcul :
- Pour la classe de ductilité limité (DCL) : EC8 ne s’applique pas
- Pour la classe de ductilité moyenne (DCM) : Surdimensionnement de l’assemblage (§5.11.1.2 NF EN 1998-1) pour que l’assemblage reste dans le comportement élastique



Logiciel de calcul Peikko Designer

- Vérification de résistance de produit (ETAs)
- Vérification de résistance du support (Eurocodes)
- Renforcement le cas échéant (EC2-4)

- Note de calcul complète
- Détail DWG, TEKLA

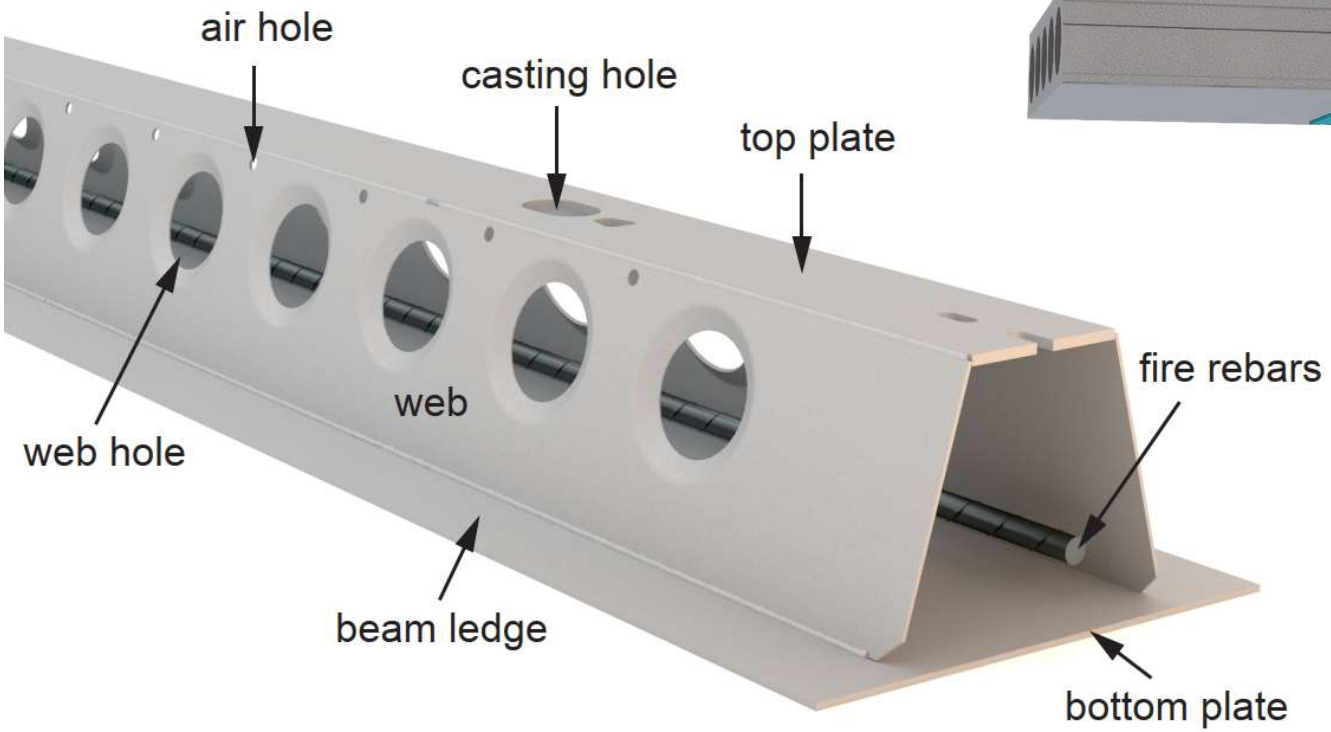


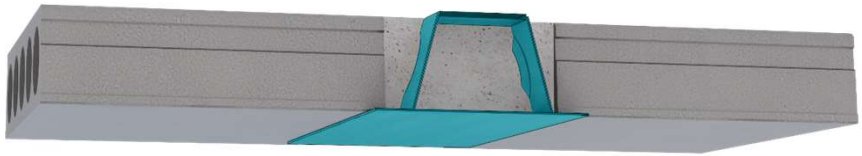
https://boltedconnection.peikkodesigner.com/design

Poutre mixte acier-béton : DELTABEAM®

Profilé reconstitué soudé (PRS)

Intégration de la DELTABEAM® dans l'épaisseur du plancher



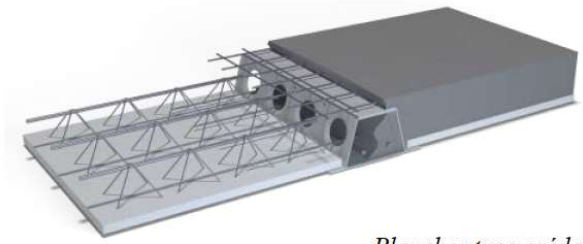


Poutre mixte acier-béton : DELTABEAM®

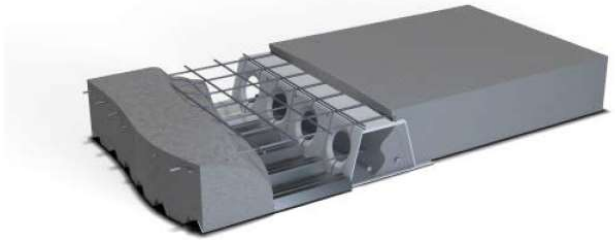
Domaine d'utilisation :

- Tout type de bâtiment (bureau, logement, commerce, réunion, stockage, parking de stationnement, …)
- Poutre support vertical de plusieurs types de plancher

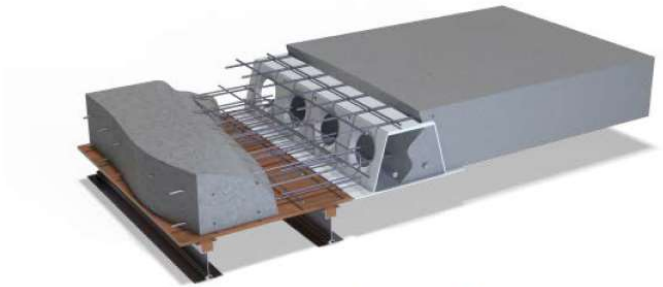
Dalle alvéolée



Plancher type prédalle



Plancher bac acier



Plancher béton coulé en place

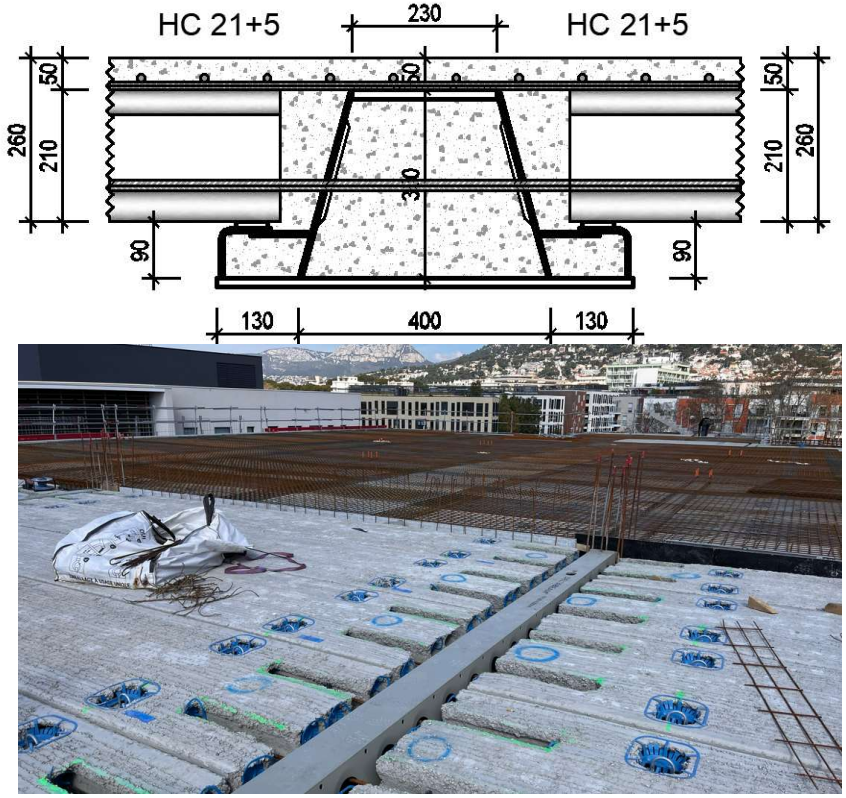
- Poutre sismique secondaire, ne participe pas au contreventement du bâtiment
- Protection au feu rapportée ou armature au feu intégrée (Appréciation N°AL 19-247, CSTB), jusqu'à R90

Poutre mixte acier-béton : DELTABEAM®

Description technique

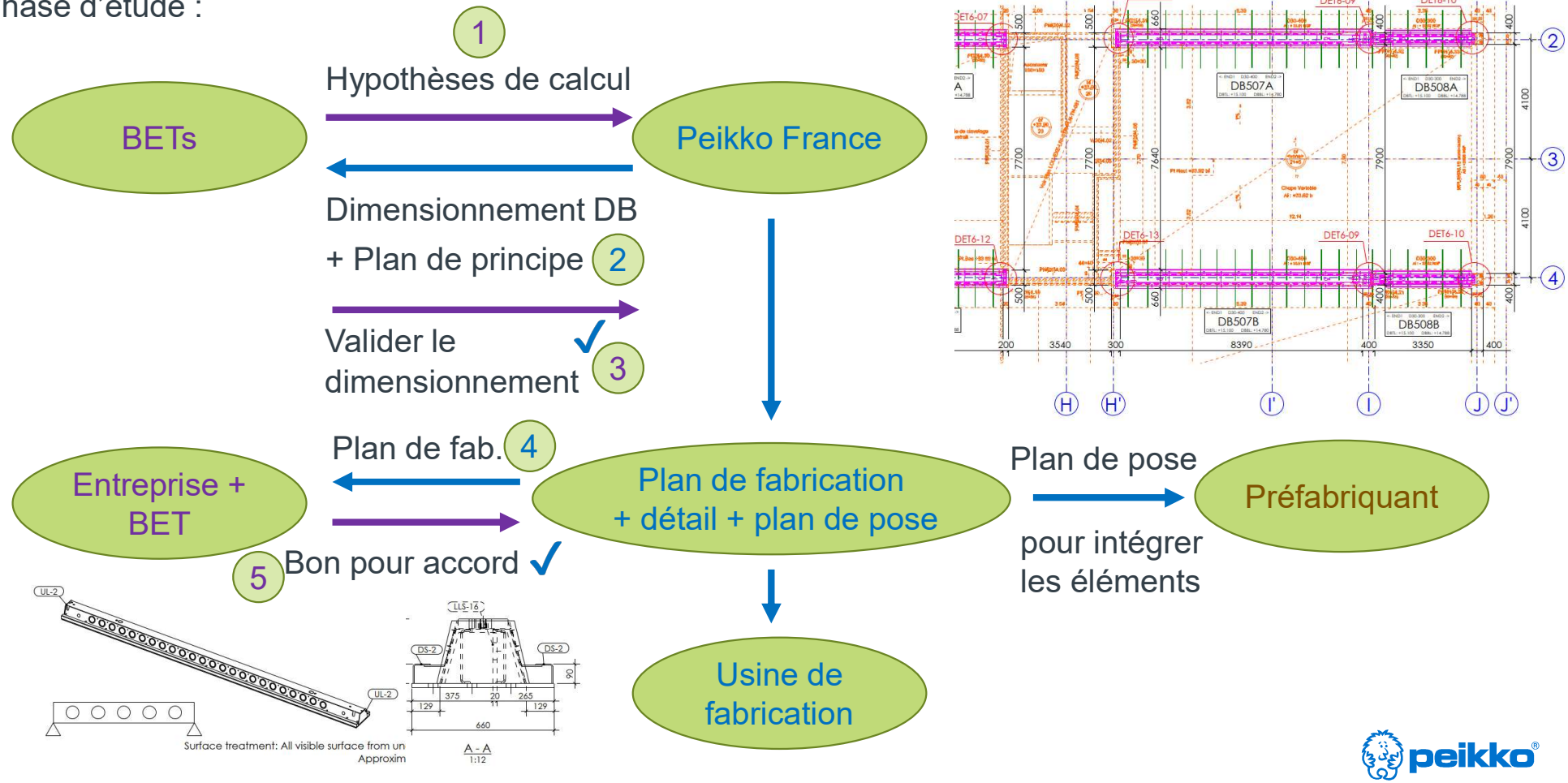
- Pendant le montage : poutre métallique

- Phase service : poutre mixte acier-béton



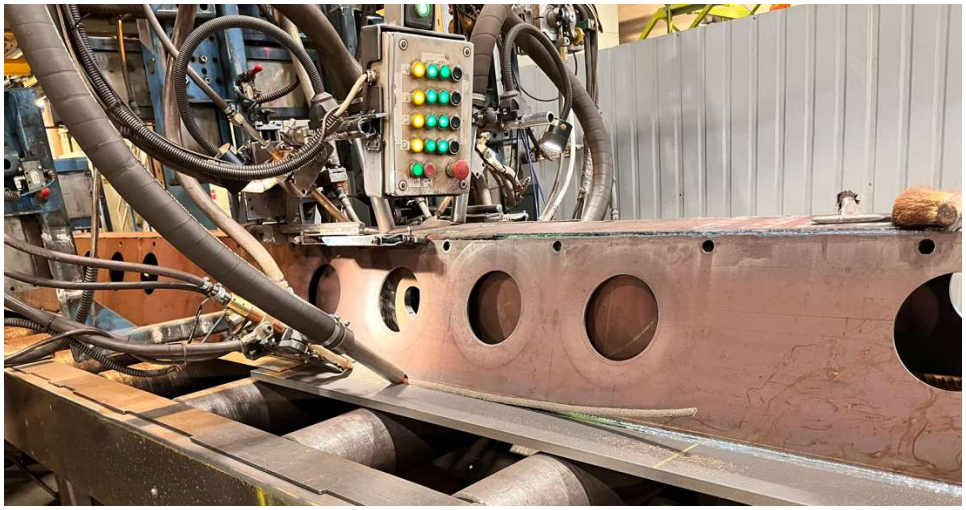
Poutre mixte acier-béton : DELTABEAM®

Phase d'étude :



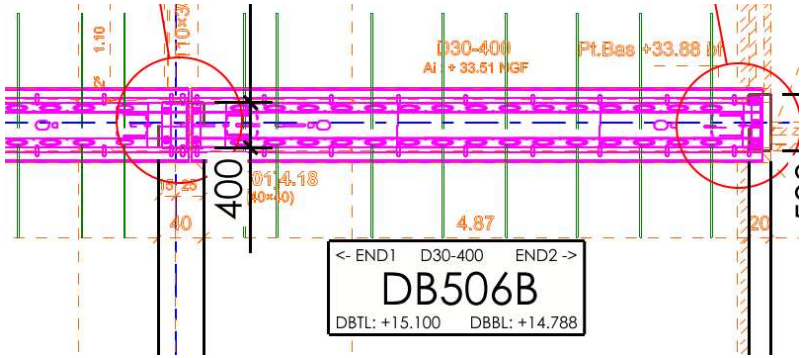
Poutre mixte acier-béton : DELTABEAM®

Usine de fabrication :



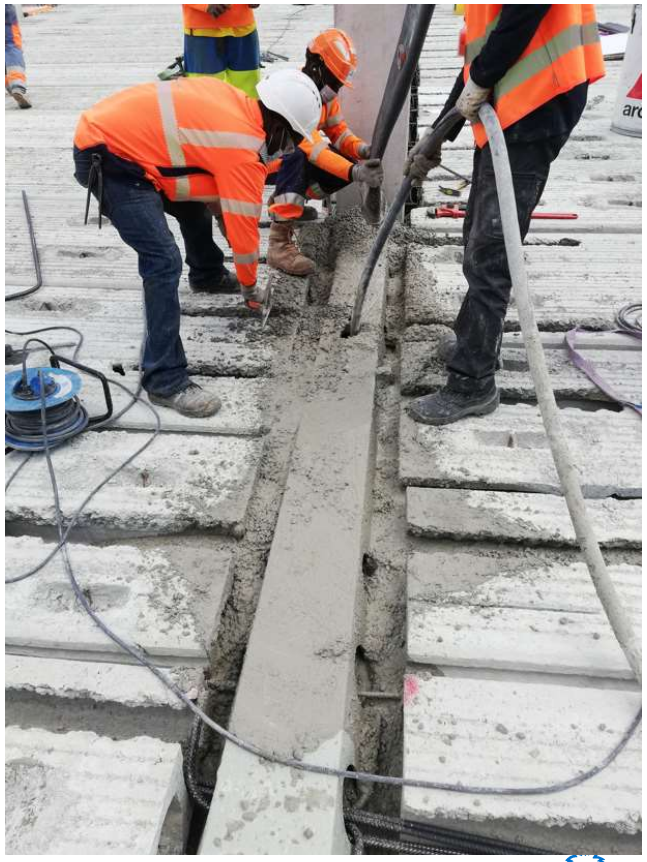
Poutre mixte acier-béton : DELTABEAM®

Chantier :



Projets réalisés depuis 2021

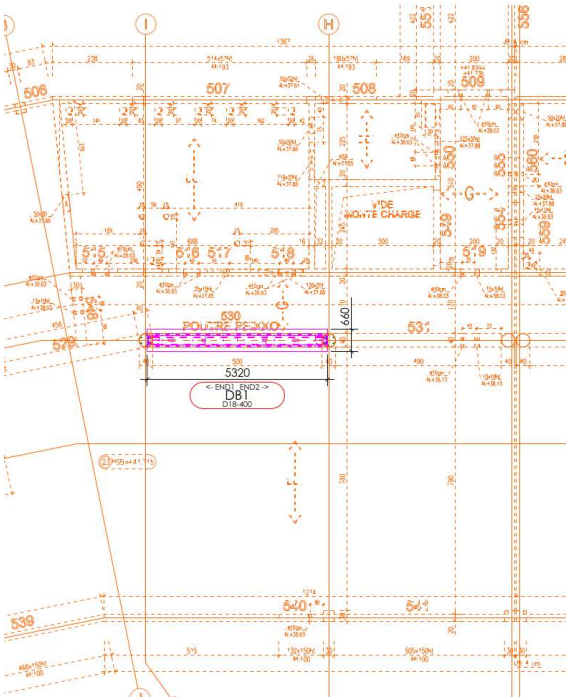
Data Center MRS4 à Marseille (2021)



https://www.youtube.com/watch?v=VYKyPiZP9vE
https://www.youtube.com/watch?v=Q7HxF-j_phs

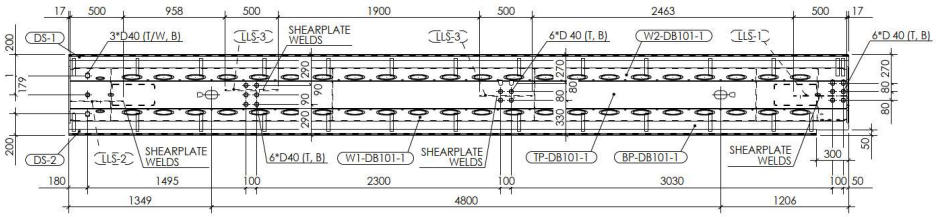
Projets réalisés depuis 2021

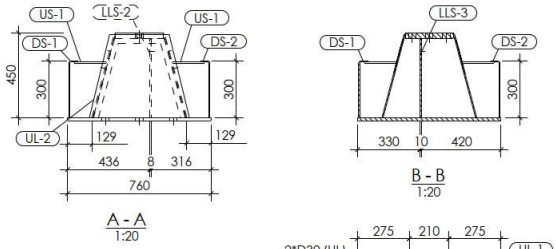
Bureau AGPM à Toulon (2022)

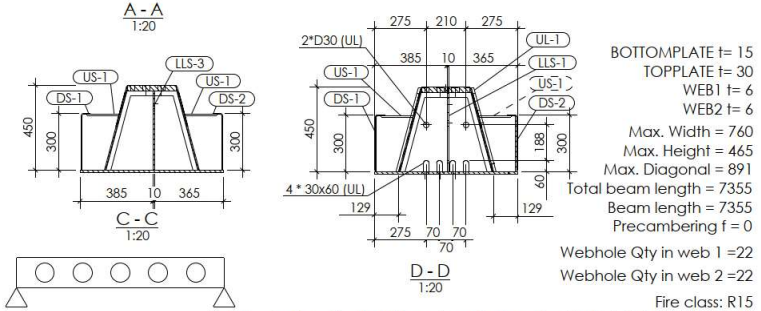


Projets réalisés depuis 2021

Centre Médico-Social à Terrasson (2023)



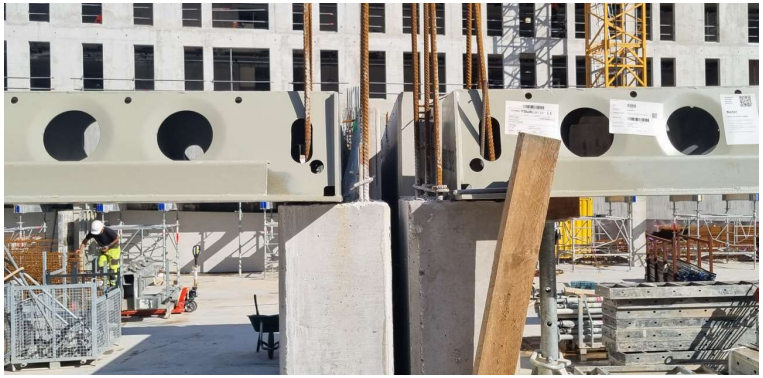




BOTTOMPLATE t= 15
TOPPLATE t= 30
WEB1 t= 6
WEB2 t= 6
Max. Width = 760
Max. Height = 465
Max. Diagonal = 891
Total beam length = 7355
Beam length = 7355
Precambering f = 0
Webhole Qty in web 1 =22
Webhole Qty in web 2 =22
Fire class: R15
Surface treatment: All visible surface from underside FeSa2,5 + Epoxy 80µm
Approximate painting area: 25.675 m²

Projets réalisés depuis 2021

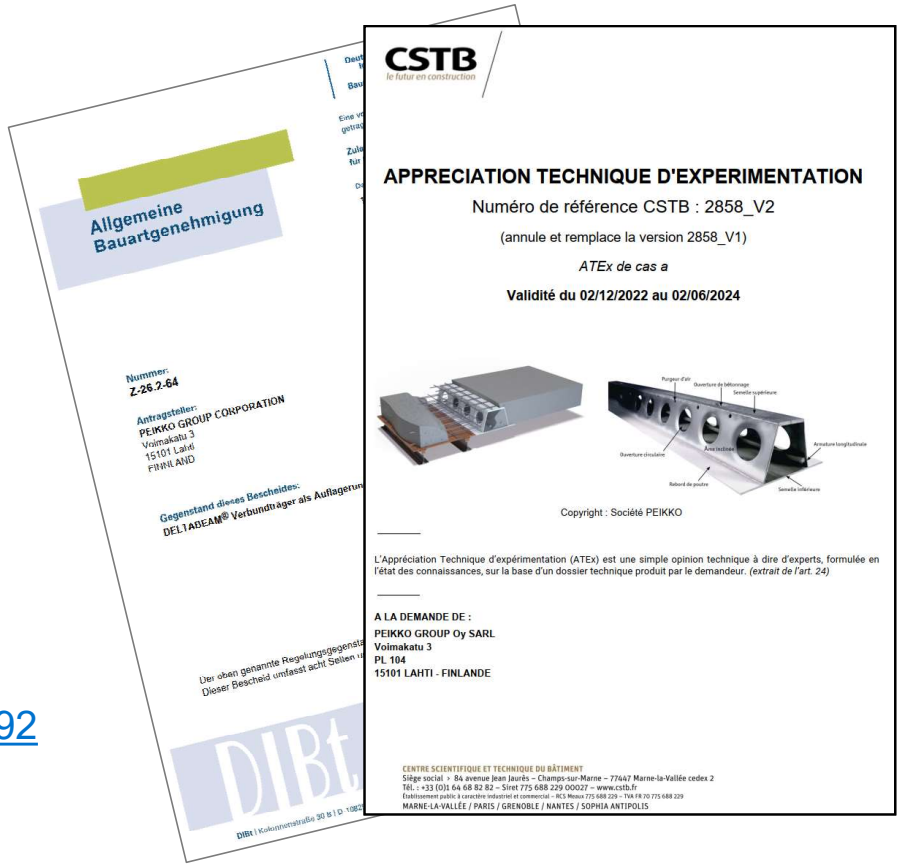
Parking Silo R+7 La Loubière à Toulon (2024)



Poutre mixte acier-béton : Deltabeam

Agréments techniques

Finland: EUFI29-19002502-C (en | fi | no)
France: CSTB ATEx n°2858-v2
Germany: Z-26.2-49
Germany: Z-26.2-64
Hungary: ATB-15/2015
Poland: ITB-KOT-2019/0779 wydanie 1
Slovakia: SK TP - 23/0006
Slovakia: SK04 - ZSV - 3201
Switzerland: VKF Nr. 27330 (de | fr)
Switzerland: VKF Nr. 27511 (de | fr)
UAE: TAC15080145 (2022)
Ukraine: UA.GS.2.34.003-22
Czech: 204/C5/2006/060-025293 / 060-025292



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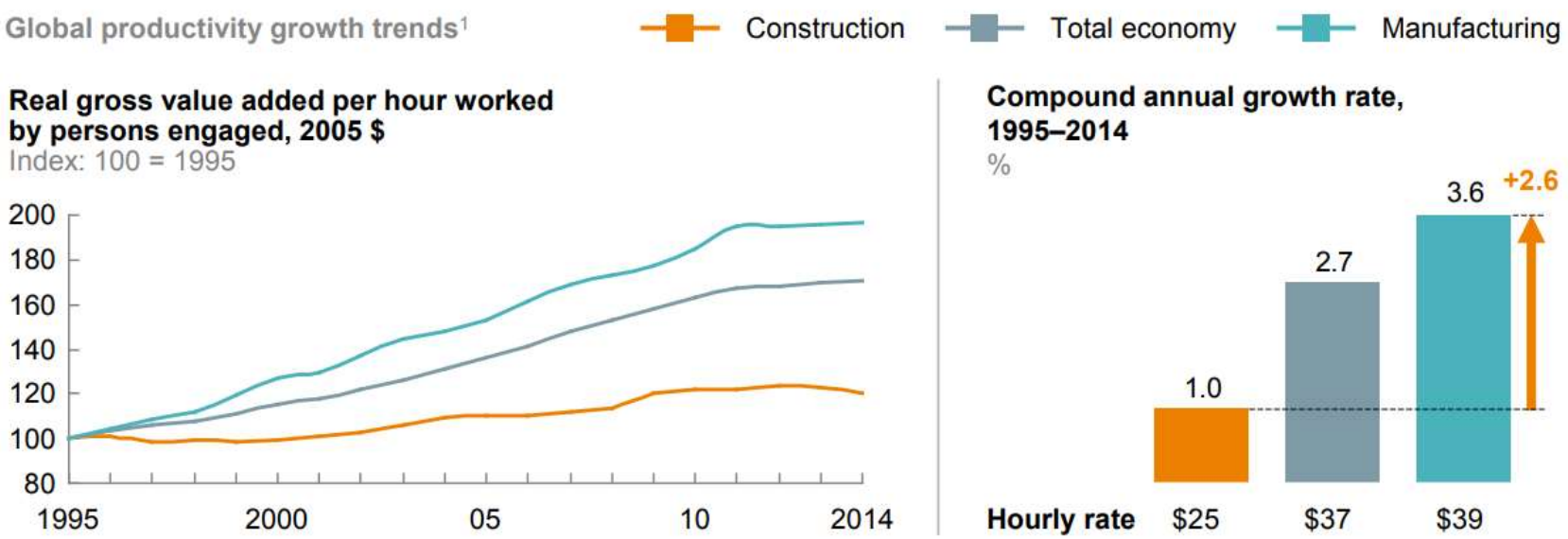
Design for disassembly

https://www.youtube.com/watch?v=EzppFH_Fg4w

https://www.youtube.com/watch?v=aeWOQiu1un4

WHY TO INNOVATE?

Globally, labor-productivity growth lags behind that of manufacturing and the total economy



1 Based on a sample of 41 countries that generate 96% of global GDP.

SOURCE: OECD; WIOD; GGCD-10, World Bank; BEA; BLS; national statistical agencies of Turkey, Malaysia, and Singapore; Rosstat; McKinsey Global Institute analysis

https://www.mckinsey.com/~/media/mckinsey/business%20functions/operations/our%20insights/reinventing%20construction%20through%20a%20productivity%20revolution/mgi-reinventing-construction-a-route-to-higher-productivity-full-report.pdf

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