RIGID

Connection system for rigid frame corners.

Innovative timber connection systems for highest requirements.

ETA-10/0413 ETA-15/0187

Pitzl Metallbau GmbH & Co. KG
DIN EN 1090-2

ZiNiP max protection

schwerlast HVP heavy duty

General

With the Pitzl - RIGID system connector allows to build bending resistance connections between timber columns and beams (frame corners). The combination of the well - known HVP connector with an tension plate on the upper side replaces braces for example in carports. Larger versions may are also able to brace hall constructions in combination.

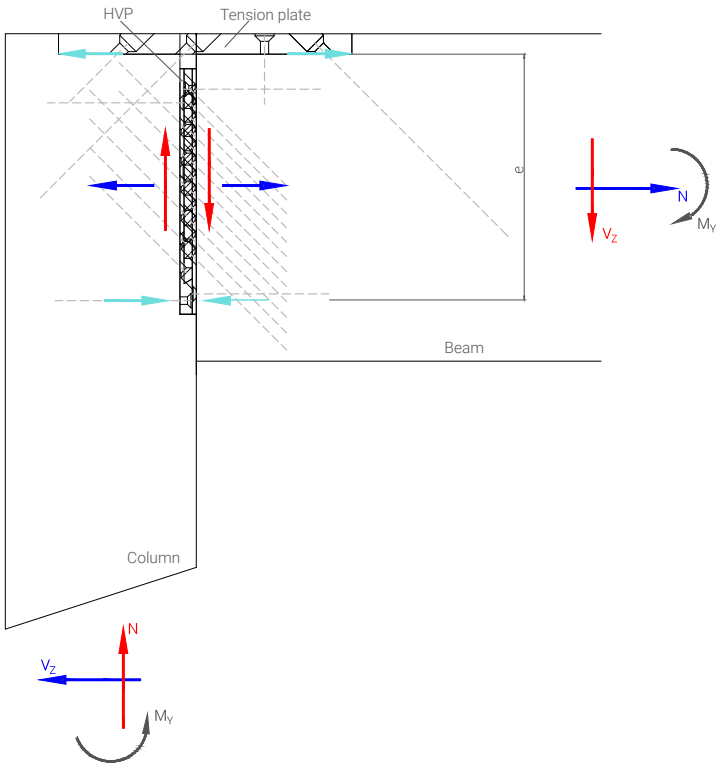
With the Pitzl - RIGID, the designer has the possibility to work with joints with a very high rotational spring stiffness. Due to the assembling of the beam to the column nearby the totally height of the inner lever can be used. This is one of the great advantages compared to other systems where the beams are directly supported on the head of the columns. Since in most of the constructions the height of the beams are greater than the dimensions of columns, the sideward connection enables a optimized joint method.

By a combination with the HVP connector, which enables to hang in the beam and afterwards the fixing of the tension plate - the system is very easy to install.

Source: www.holzon.de

Functionality

The acting bending moment M_y is devided into a couple of forces with an inner lever distance e. The tension forces are transmitted with inclined screws in the tension plate. Shear forces V_z and tension forces N in the beam are transmitted with the HVP-connector.



Version, minimum dimensions of the timber parts and characteristic parameters

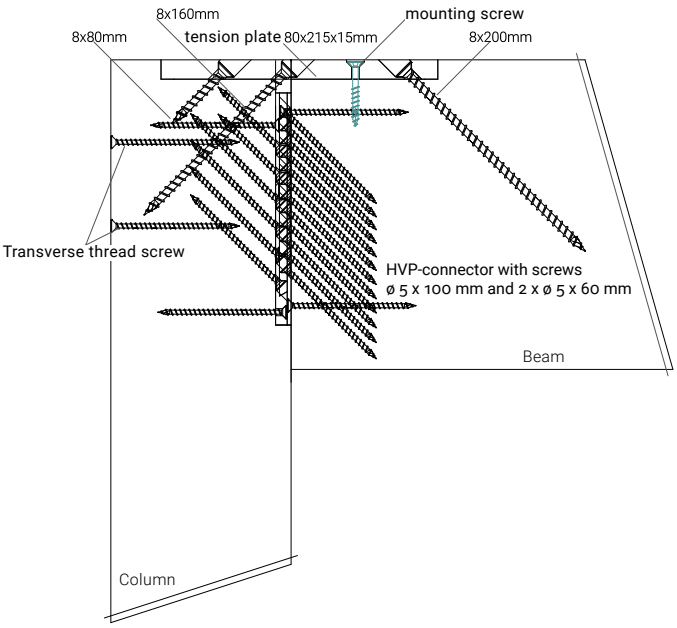
The load carrying-capacities were experimentally determined at the TVFA-Innsbruck.

	Dimension w x h x d		Minimum dimensions b x h		Characteristic value			
Version	HVP [mm]	Tension plate [mm]	Column [cm]	Beam [cm]	N_{Rk} [kN]	V_{Rk} [kN]	$M_{y,Rk}$ [kNm]	K_φ [kNm/rad]
88318.4000	80 x 180 x 12	80 x 215 x 15	14 x 14	14 x 24	31,4	72,6	6,5	249
88430.4000	120 x 300 x 15	120 x 250 x 15	16 x 16	16 x 36	48,3	93,2	10,9	415
88555.4000	140 x 550 x 20	120 x 325 x 15	16 x 21	16 x 68	59,8	345,9	18,2	692

Assembly and installation

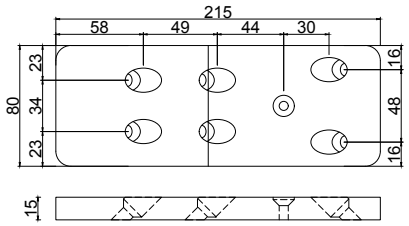
The HVP connector is mounted to the column and girding beam (milled into the column).
During assembling, the columns are mounted and then the girders are hang in with the HVP-connectors.
Afterwards the the tension plate is screwed in with inclined screws. Also in that case the plate can milled in.

Installation drawing 88318.4000 with a beam height between 240 - 280 mm

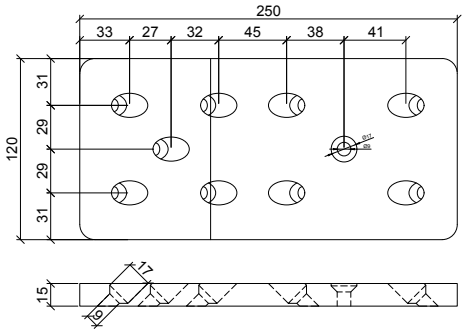


Drawing tension plate

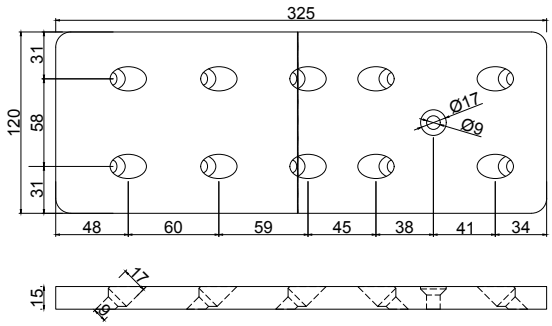
Tension plate 215 x 80 x 15



Tension plate 250 x 120 x 15



Tension plate 325 x 120 x 15

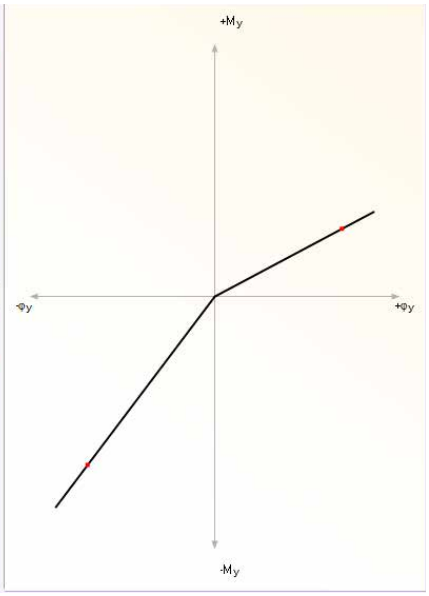


Modelling of the RIGID joint

In the calculation the rotational bending stiffness must be taken into account. At a negatic bending moment in the frame corner the RIGID system is working. The rotational stiffness K_{φ} can be taken from the table. For example for the 88318.4000 the characteristic value is 249 kNm/rad. In the other direction the bending stiffness of the HVP-connector can be calculated according to the ETA-15/0187. So the PITZI RIGID is a joint with a bilinear bending moment-rotation behavior, and can be calculated with the following diagram:

	+φy [rad]	My [kNm]
1	0.0000	0.000
2	1.0000	100.000

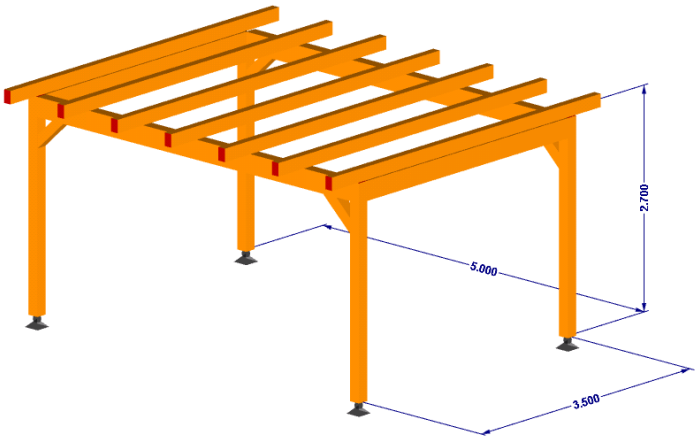
	-φy [rad]	My [kNm]
1	0.0000	0.000
2	-1.0000	-249.000

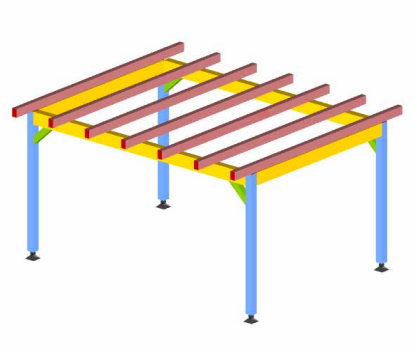


Example carport

Description

The carport is 3.5 m wide, 5.0 m long and 2.7 m high. The long side is braced diagonally.
The narrow side (entrance) is stiffened with the RIGID 88318.4000.





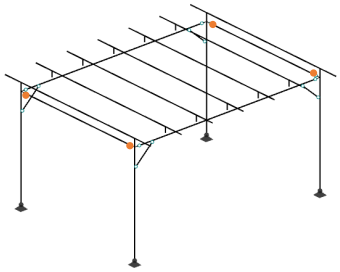
- 1: ST-solid timber 140/140; softwood C24
- 2: ST-solid timber 140/240; softwood C24
- 3: ST-solid timber 100/160; softwood C24
- 4: ST-solid timber 120/120; softwood C24

Load assumption

Permanent load:	Ribbed roof	g_k = 0,35 kN/m²
Snow load:	Zone 2, altitude 480 m, flat roof	s_k = 0,8 * 1,53 kN/m² = 1,22 kN/m²
Wind load:	Zone 2, wind suction and pressure onto the columns: onto the roof:	w_k=(0,5+0,8)*0,65 kN/m² = 0,85 kN/m² 0,85 kN/m² * 0,14 m = 0,12 kN/m 0,85 kN/m² * 0,4 m = 0,34 kN/m

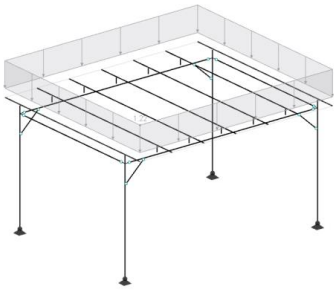
Modelling RIGID joint

- RIGID joint

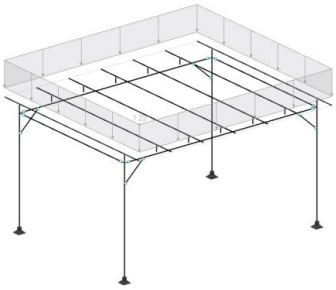


Load case

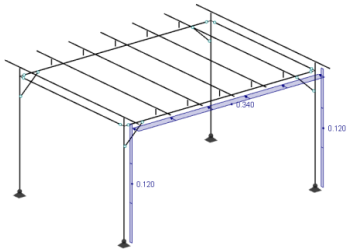
LF 1: Permanent load



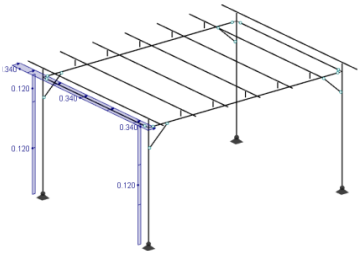
LF 2: Snow load



LF 3: Wind in x - direction

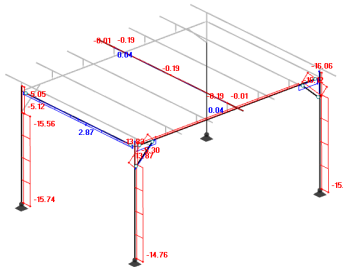


LF 4: Wind in y - direction

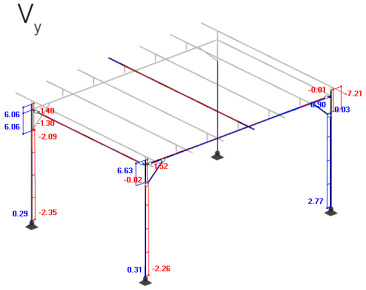


Stress resultant for the decisive load combination in the ultimate limit state (ULS)

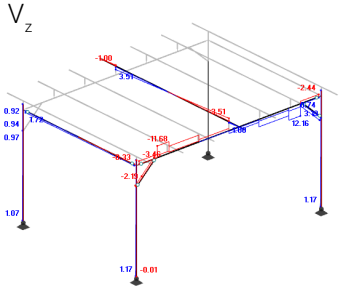
N



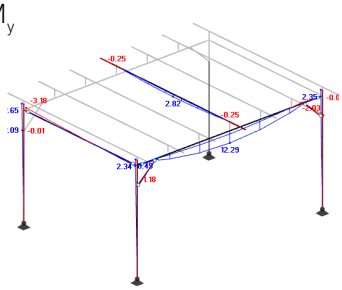
V_y



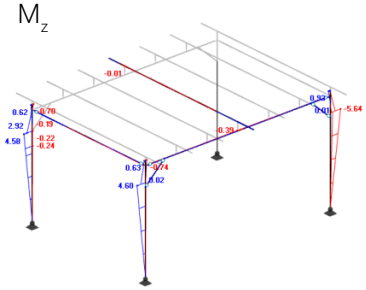
V_z



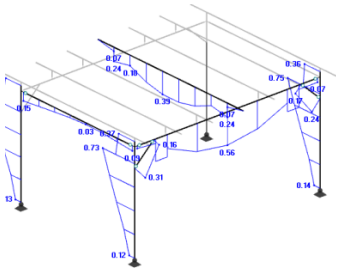
M_y



M_z

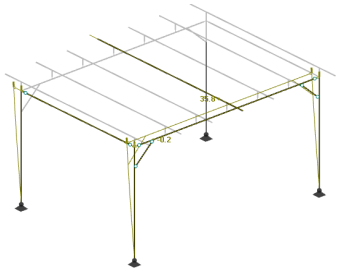


Utilization of the cross sections for ULS

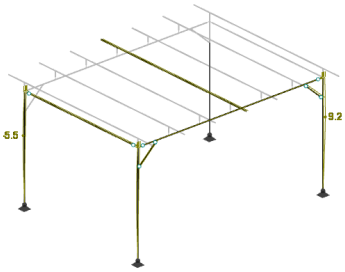


Deformations

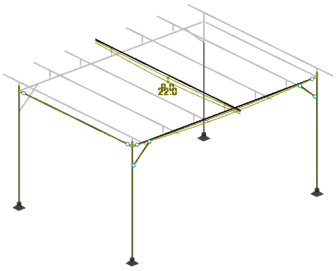
in x



in y



in z



Proof of the RIGID connector

Decisive stress situation due to wind forces

LDC=short/instantaneous action, service class 1 -> k_{mod} = 1,0

Material partial safety-factor: γ_m = 1,3

Stresses:

N_{Ed} = 2,87 kN

$V_{z,Ed}$ = 1,72 kN

$M_{y,Ed}$ = -2,34 kNm

Bearing capacity:

N_{Rd} = 31,4 kN * 1,0/1,3 = 24,2 kN

V_{Rd} = 72,6 kN * 1,0/1,3 = 55,8 kN

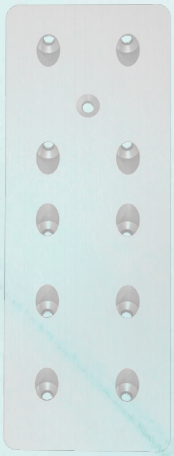
$M_{y,Rd}$ = 6,5 kN * 1,0/1,3 = 5,0 kN

Proof:

2,87/24,2 = 0,12 < 1,0

1,72/55,8 = 0,03 < 1,0

2,34/5,0 = 0,47 < 1,0



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