ALUMIDI

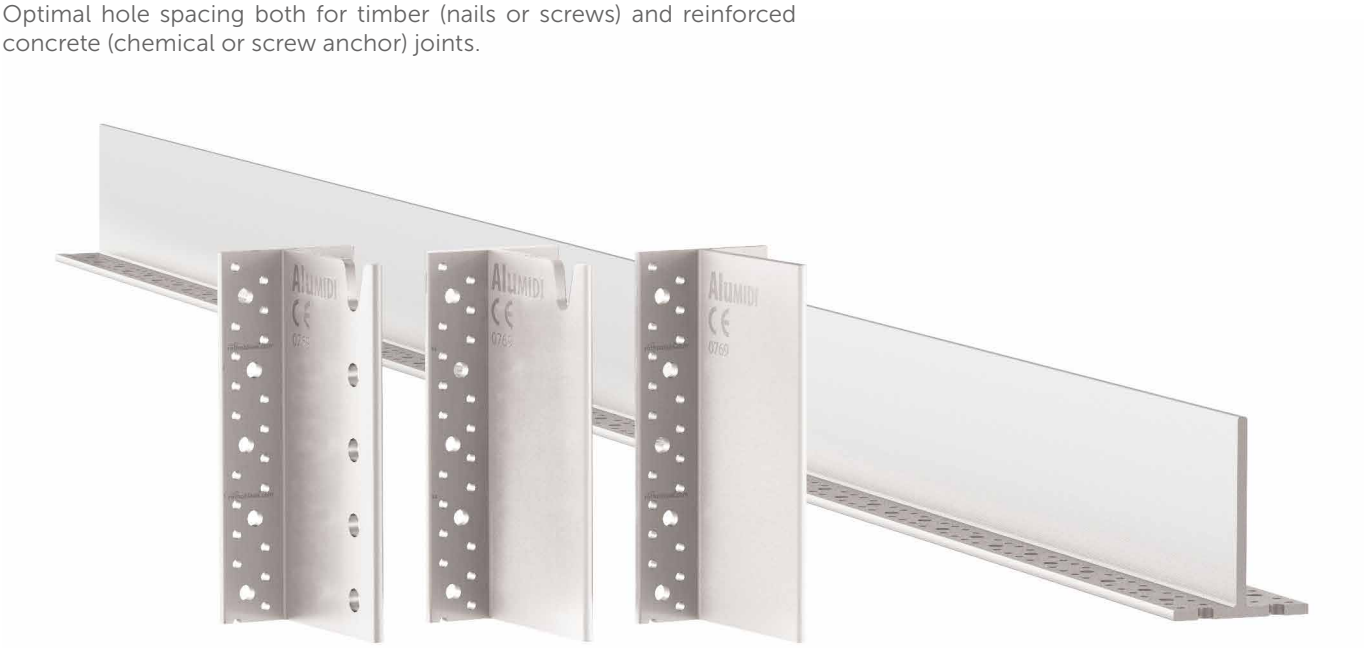
CALCULATION TOOL | VIDEO | CE ETA 09/0361

CONCEALED BRACKET WITH AND WITHOUT HOLES

INCLINED JOINTS
Certified strengths calculated in all directions: vertical, horizontal and axial. They can be used in seismic areas and in mixed-mode bending.

STEEL-ALUMINUM
EN AW-6005A high strength aluminium alloy bracket, obtained by extrusion and therefore weld-free.

TIMBER AND CONCRETE
Optimal hole spacing both for timber (nails or screws) and reinforced concrete (chemical or screw anchor) joints.



CHARACTERISTICS

FOCUS	concealed joints
TIMBER SECTIONS	from 80 x 100 mm to 200 x 520 mm **from 3 3/16 x 3 15/16 inch to 7 7/8 x 20 1/2 inch**
STRENGTH	$R_{v,k}$ up to 150 kN **adjusted load carrying capacity up to 9170 lbs**
FASTENERS	LBA, LBS, SBD, STA, SKR

VIDEO
Scan the QR Code and watch the video on our YouTube channel

MATERIAL

Extruded and perforated aluminum alloy knife plate connector

FIELDS OF USE

Timber-to-timber and timber-to-concrete shear joints, both perpendicular and inclined
- solid timber and glulam
- CLT, LVL
- timber based panels

INVISIBLE

The ALUMIDI connector can be partially or fully concealed to meet architectural and / or structural design challenges. Fire rating requirements can be satisfied with the surrounding timber protecting the metal connector.

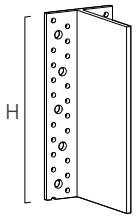
TIMBER AND CONCRETE

For applications on concrete or other uneven surfaces the self-drilling dowels allow a greater installation tolerance when fastening the timber element. Values are certified, tested and consolidated.

CODES AND DIMENSIONS

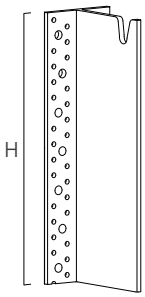
ALUMIDI WITHOUT HOLES

CODE	type	H		pcs
		[mm]	[in]	
ALUMIDI80	without holes	80	3.15	25
ALUMIDI120	without holes	120	4.72	25
ALUMIDI160	without holes	160	6.30	25
ALUMIDI200	without holes	200	7.78	15
ALUMIDI240	without holes	240	9.45	15
ALUMIDI2200	without holes	2200	86.61	1



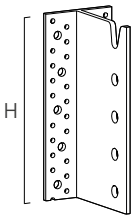
ALUMIDI WITHOUT HOLES WITH UPPER COUNTERSINK

CODE	type	H		pcs
		[mm]	[in]	
ALUMIDI280N	without holes	280	11.02	15
ALUMIDI320N	without holes	320	12.60	8
ALUMIDI360N	without holes	360	14.17	8
ALUMIDI400N	without holes	400	15.75	8
ALUMIDI440N	without holes	440	17.32	8



ALUMIDI WITH HOLES

CODE	type	H		pcs
		[mm]	[in]	
ALUMIDI120L	with holes	120	4.72	25
ALUMIDI160L	with holes	160	6.30	25
ALUMIDI200L	with holes	200	7.87	15
ALUMIDI240L	with holes	240	9.45	15
ALUMIDI280L	with holes	280	11.02	15
ALUMIDI320L	with holes	320	12.60	8
ALUMIDI360L	with holes	360	14.17	8



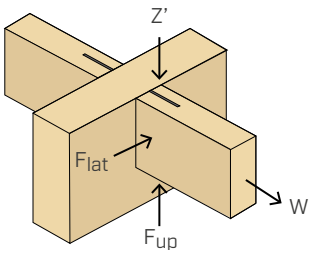
MATERIAL AND DURABILITY

ALUMIDI: EN AW-6005A aluminum alloy.
To be used in dry service conditions.

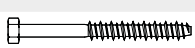
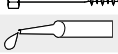
FIELDS OF USE

- Timber-to-timber, timber-to-concrete and timber-to-steel joints
- Secondary beam on main beam or on column
- Perpendicular and inclined joints

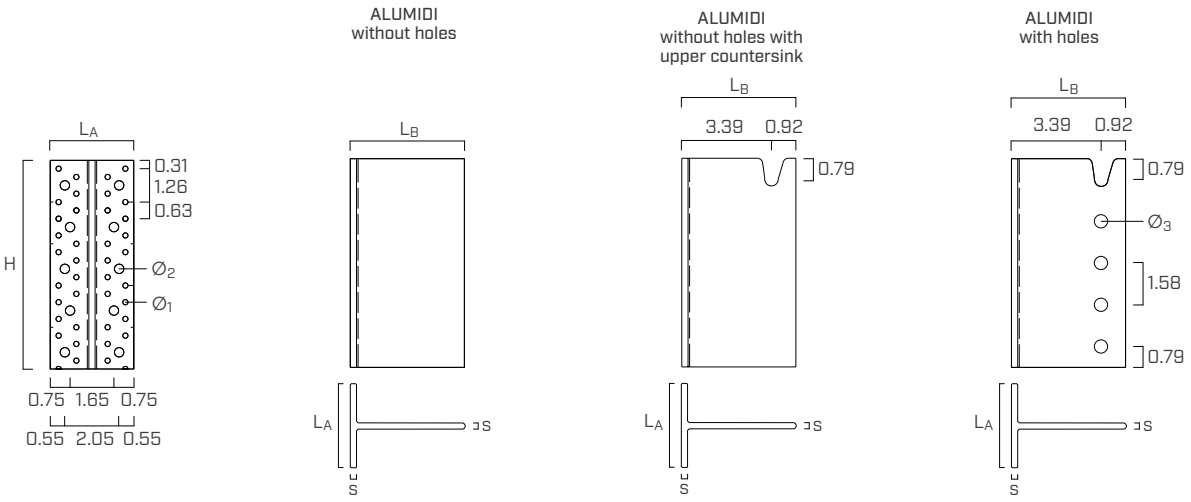
EXTERNAL LOADS



ADDITIONAL PRODUCTS - FASTENING

type	description		d		support
			[mm]	[in]	
LBA	Anker nail		4	0.16	
LBS	screw for plates		5	0.20	
SBD	self-drilling dowel		7,5	0.30	
STA	smooth dowel		12	0.48	
SKR	screw anchor		10	0.40	
VIN-FIX PRO	chemical anchor		M8	0.32	
EPO-FIX PLUS	chemical anchor		M8	0.32	

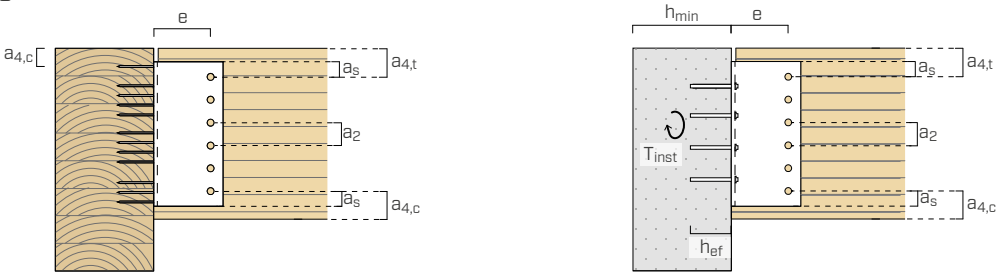
GEOMETRY



ALUMIDI		[mm]	[in]
thickness	**s**	6	0.24
wing width	**L_A**	80	3.15
web length	**L_B**	109,4	4.30
small flange-holes	**$Ø_1$**	5,0	0.20
large flange-holes	**$Ø_2$**	9,0	0.35
web holes (dowels)	**$Ø_3$**	13,0	0.51

INSTALLATION

MINIMUM DISTANCES



secondary beam-timber				self-drilling dowel SBD Ø0.30	smooth dowel STA Ø0.48
dowel-dowel	a_2	[in]	≥ 3 d	≥ 0.90	≥ 1.44
dowel-top of beam	$a_{4,t}$	[in]	≥ 3 d	≥ 0.90	≥ 1.44
dowel-bottom of beam	$a_{4,c}$	[in]	≥ 1,5 d	≥ 0.45	≥ 0.7
dowel-bracket edge	a_s	[in]	≥ 1,2 d_0 (1)	≥ 0.39	≥ 0.63
dowel-main beam	**e**	[in]		3.39	3.39

(1) Hole diameter.

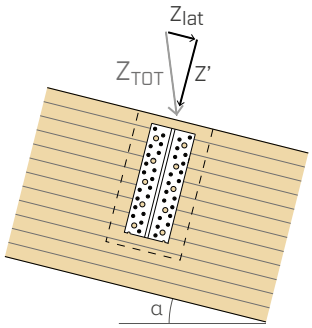
main beam-timber				Anker nail LBA Ø0.16	screw LBS Ø0.20
first connector-top of beam / column	$a_{4,c}$ / $a_{3,c}$	[in]	≥ 5 d	≥ 0.79	≥ 0.98

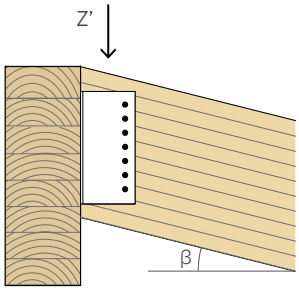
The minimum spacing and distances of Rotho Blaas fasteners are according to the European Technical Assessment ETA-09/0361 and to the Eurocode 5. The values from ETA-09/0361 are based on experimental tests carried out according to ETAG015 for several configurations. The values from Eurocode 5 are based on extensive research studies.

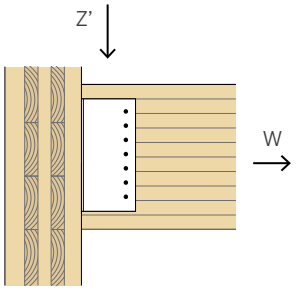
main beam-concrete			chemical anchor VIN FIX-PRO Ø0.32	screw anchor SKR-E Ø0.40
minimum support thickness	h_{min}	[in]	h_{ef} + 1.18 ≥ 3.94	4.33
concrete hole diameter	d_0	[in]	0.39	0.31
tightening torque	T_{inst}	[ft·lb]	5.16	36.88

h_{ef} = effective anchoring depth in concrete.

APPLICATION EXAMPLES



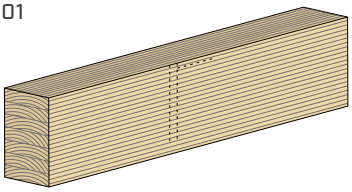




ASSEMBLY

VIDEO

01



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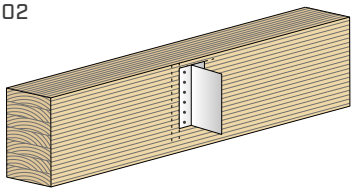

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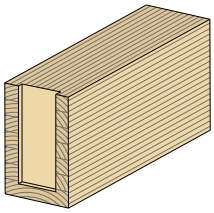
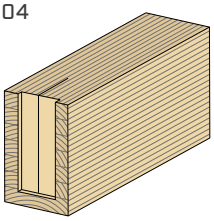


ALUMIDI WITHOUT HOLES, WITH SBD SELF-TAPPING DOWELS

04



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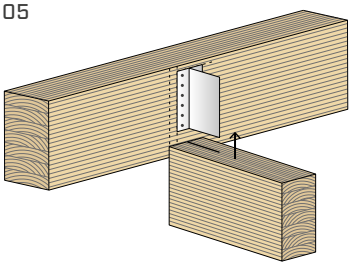

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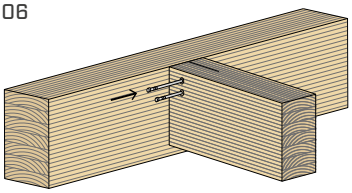

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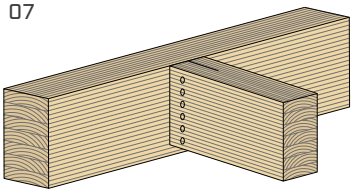
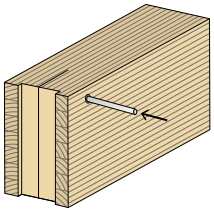


ALUMIDI WITHOUT HOLES WITH UPPER COUNTERSINK, WITH STA SMOOTH DOWEL AND SBD SELF-TAPPING DOWELS

04



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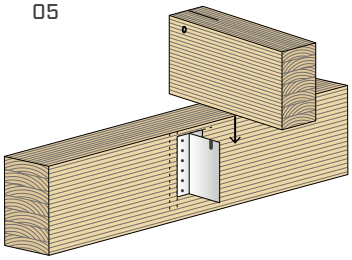

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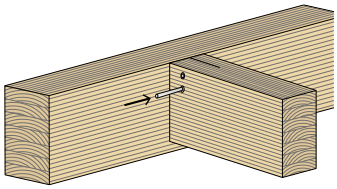

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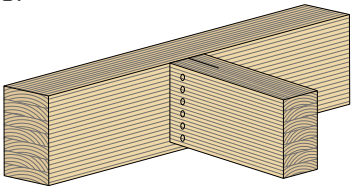
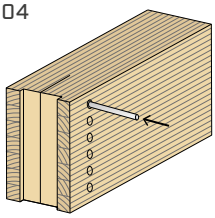


ALUMIDI WITH HOLES , WITH STA SMOOTH DOWELS

04



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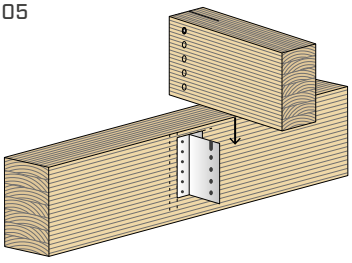

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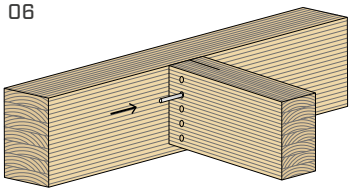

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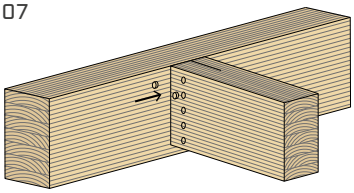


ADJUSTED DESIGN VALUES | TIMBER-TO-TIMBER JOINT

FULL NAILING - CONNECTION WITH NAILS PERPENDICULAR TO THE GRAIN

nails perpendicular to the grain

ALUMIDI with SBD dowels and LBA nails - full nailing

ASD DESIGN VALUES

ALUMIDI H		dowels SBD Ø7.5 mm | 0.30"	nails LBA Ø4 x 60 mm | 0.16 x 2 3/8"	full Z'
[mm]	[in]	[pcs. - L]	[pcs.]	[lbs]
80	3.15	3 - 115mm | 4 9/16"	14	1033
120	4.72	4 - 115mm | 4 9/16"	22	2205
160	6.23	5 - 115mm | 4 9/16"	30	2756
200	7.87	7 - 115mm | 4 9/16"	38	3859
240	9.45	9 - 115mm | 4 9/16"	46	4962
280	11.02	10 - 135mm | 5 5/16"	54	5513
320	12.60	11 - 135mm | 5 5/16"	62	6064
360	14.17	12 - 135mm | 5 5/16"	70	6615
400	15.75	13 - 135mm | 5 5/16"	78	7167
440	17.32	14 - 135mm | 5 5/16"	86	7718

C_d, C_M, C_T = 1
Specific gravity = 0.49
Recommended minimum beam size: 3 1/8" | 80 mm

ALUMIDI with STA dowels and LBA nails - full nailing

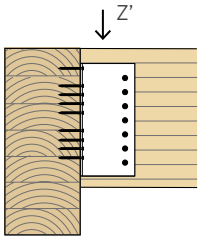
ASD DESIGN VALUES

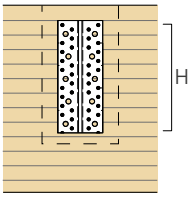
ALUMIDI H		dowels STA Ø12 mm | 0.48"	nails LBA Ø4 x 60 mm | 0.16 x 2 3/8"	full Z'
[mm]	[in]	[pcs. - L]	[pcs.]	[lbs]
120	4.72	3 - 120mm | 4 3/4"	22	2333
160	6.23	4 - 120mm | 4 3/4"	30	3334
200	7.87	5 - 120mm | 4 3/4"	38	4168
240	9.45	6 - 120mm | 4 3/4"	46	5002
280	11.02	7 - 140mm | 5 1/2"	54	5835
320	12.60	8 - 140mm | 5 1/2"	62	6669
360	14.17	9 - 160mm | 6 5/16"	70	7502
400	15.75	10 - 160mm | 6 5/16"	78	8336
440	17.32	11 - 160mm | 6 5/16"	86	9170

C_d, C_M, C_T = 1
Specific gravity = 0.49
Recommended minimum beam size: 3 1/8" | 80 mm

ADJUSTED DESIGN VALUES | TIMBER-TO-TIMBER JOINT

FULL NAILING - CONNECTION WITH SCREWS PERPENDICULAR TO THE GRAIN





ALUMIDI with SBD dowels and LBS screws - full nailing

ASD DESIGN VALUES

ALUMIDI H		dowels SBD Ø7.5 mm | 0.30"	screws LBS Ø5 x 60 mm | 0.20 x 2 3/8"	full Z'
[mm]	[in]	[pcs. - L]	[pcs.]	[lbs]
80	3.15	3 - 115mm | 4 9/16"	14	1136
120	4.72	4 - 115mm | 4 9/16"	22	2205
160	6.23	5 - 115mm | 4 9/16"	30	2756
200	7.87	7 - 115mm | 4 9/16"	38	3859
240	9.45	9 - 115mm | 4 9/16"	46	4962
280	11.02	10 - 135mm | 5 5/16"	54	5513
320	12.60	11 - 135mm | 5 5/16"	62	6064
360	14.17	12 - 135mm | 5 5/16"	70	6615
400	15.75	13 - 135mm | 5 5/16"	78	7167
440	17.32	14 - 135mm | 5 5/16"	86	7718

C_d, C_M, C_T = 1
Specific gravity = 0.49
Recommended minimum beam size: 3 1/8" | 80 mm

ALUMIDI with STA dowels and LBS screws - full nailing

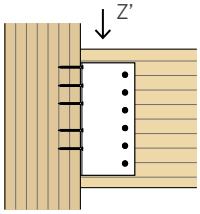
ASD DESIGN VALUES

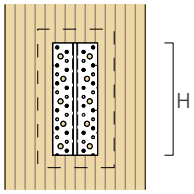
ALUMIDI H		dowels STA Ø12 mm | 0.48"	screws LBS Ø5 x 60 mm | 0.20 x 2 3/8"	full Z'
[mm]	[in]	[pcs. - L]	[pcs.]	[lbs]
120	4.72	3 - 120mm | 4 3/4"	22	2225
160	6.23	4 - 120mm | 4 3/4"	30	3334
200	7.87	5 - 120mm | 4 3/4"	38	4168
240	9.45	6 - 120mm | 4 3/4"	46	5002
280	11.02	7 - 140mm | 5 1/2"	54	5835
320	12.60	8 - 140mm | 5 1/2"	62	6669
360	14.17	9 - 160mm | 6 5/16"	70	7502
400	15.75	10 - 160mm | 6 5/16"	78	8336
440	17.32	11 - 160mm | 6 5/16"	86	9170

C_d, C_M, C_T = 1
Specific gravity = 0.49
Recommended minimum beam size: 3 1/8" | 80 mm

ADJUSTED DESIGN VALUES | TIMBER-TO-TIMBER JOINT

PARTIAL NAILING - CONNECTION WITH NAILS PARALLEL TO THE GRAIN





ALUMIDI with SBD dowels and LBA nails - partial nailing

ASD DESIGN VALUES

ALUMIDI H [mm]	ALUMIDI H [in]	dowels SBD Ø7.5 mm | 0.30" [pcs. - L]	nails LBA Ø4 x 60 mm | 0.16 x 2 3/8" [pcs.]	partial Z' [lbs]
80	3.15	3 - 115mm | 4 9/16"	7	866
120	4.72	4 - 115mm | 4 9/16"	11	1703
160	6.23	5 - 115mm | 4 9/16"	15	2560
200	7.87	7 - 115mm | 4 9/16"	19	3406
240	9.45	9 - 115mm | 4 9/16"	23	4237
280	11.02	10 - 135mm | 5 5/16"	27	5059
320	12.60	11 - 135mm | 5 5/16"	31	5842
360	14.17	12 - 135mm | 5 5/16"	35	6615
400	15.75	13 - 135mm | 5 5/16"	39	7167
440	17.32	14 - 135mm | 5 5/16"	43	7718

C_d, C_M, C_T = 1
Specific gravity = 0.49
Recommended minimum beam size: 3 1/8" | 80 mm

ALUMIDI with STA dowels and LBA nails - partial nailing

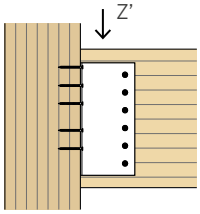
ASD DESIGN VALUES

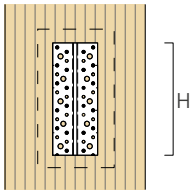
ALUMIDI H [mm]	ALUMIDI H [in]	dowels STA Ø12 mm | 0.48" [pcs. - L]	nails LBA Ø4 x 60 mm | 0.16 x 2 3/8" [pcs.]	partial Z' [lbs]
120	4.72	3 - 120mm | 4 3/4"	11	1703
160	6.23	4 - 120mm | 4 3/4"	15	2560
200	7.87	5 - 120mm | 4 3/4"	19	3406
240	9.45	6 - 120mm | 4 3/4"	23	4237
280	11.02	7 - 140mm | 5 1/2"	27	5059
320	12.60	8 - 140mm | 5 1/2"	31	5842
360	14.17	9 - 160mm | 6 5/16"	35	6615
400	15.75	10 - 160mm | 6 5/16"	39	7167
440	17.32	11 - 160mm | 6 5/16"	43	7718

C_d, C_M, C_T = 1
Specific gravity = 0.49
Recommended minimum beam size: 3 1/8" | 80 mm

ADJUSTED DESIGN VALUES | TIMBER-TO-TIMBER JOINT

PARTIAL NAILING - CONNECTION WITH SCREWS PARALLEL TO THE GRAIN





ALUMIDI with SBD dowels and LBS screws - partial nailing

ASD DESIGN VALUES

ALUMIDI H		dowels SBD Ø7.5 mm | 0.30"	screws LBS Ø5 x 60 mm | 0.20 x 2 3/8"	partial Z'
[mm]	[in]	[pcs. - L]	[pcs.]	[lbs]
80	3.15	3 - 115mm | 4 9/16"	7	762
120	4.72	4 - 115mm | 4 9/16"	11	1307
160	6.23	5 - 115mm | 4 9/16"	15	1837
200	7.87	7 - 115mm | 4 9/16"	19	2360
240	9.45	9 - 115mm | 4 9/16"	23	2878
280	11.02	10 - 135mm | 5 5/16"	27	3393
320	12.60	11 - 135mm | 5 5/16"	31	3907
360	14.17	12 - 135mm | 5 5/16"	35	4419
400	15.75	13 - 135mm | 5 5/16"	39	4931
440	17.32	14 - 135mm | 5 5/16"	43	5430

C_d, C_M, C_T = 1
Specific gravity = 0.49
Recommended minimum beam size: 3 1/8" | 80 mm

ALUMIDI with STA dowels and LBS screws - partial nailing

ASD DESIGN VALUES

ALUMIDI H		dowels STA Ø12 mm | 0.48"	screws LBS Ø5 x 60 mm | 0.20 x 2 3/8"	partial Z'
[mm]	[in]	[pcs. - L]	[pcs.]	[lbs]
120	4.72	3 - 120mm | 4 3/4"	11	1307
160	6.23	4 - 120mm | 4 3/4"	15	1837
200	7.87	5 - 120mm | 4 3/4"	19	2360
240	9.45	6 - 120mm | 4 3/4"	23	2878
280	11.02	7 - 140mm | 5 1/2"	27	3393
320	12.60	8 - 140mm | 5 1/2"	31	3907
360	14.17	9 - 160mm | 6 5/16"	35	4419
400	15.75	10 - 160mm | 6 5/16"	39	4931
440	17.32	11 - 160mm | 6 5/16"	43	5430

C_d, C_M, C_T = 1
Specific gravity = 0.49
Recommended minimum beam size: 3 1/8" | 80 mm

NOTES:

- Download the latest version of this document from www.rothoblaas.com.
- Concerning the provisions of table 12.5.1F of the NDS: the space between the outer rows of bolts in a steel knife plate should be maximum 10" unless special detailing is provided to accomodate cross-grain shrinkage of the member.
  In dry timber, as proven by the many examples with dry glulam at 12%, the splitting of the timber section does not occour or it is not a structural issue.
  In case the ALU is inserted in wet timber, to mitigate the splitting of the timber member, it is possible to insert full threaded screws perpendicular to the grain.

GENERAL PRINCIPLES:

- Contact Rothoblaas' technical office for more information about the product.
- Dimensioning and verification of the timber elements must be carried out separately.
- Strength values of the connection system are valid under the calculation hypotheses listed in the table.
- All reference lateral design values are calculated in accordance with the NDS. The analytical model is outlined in ETA-09/0361.

LABORATORY TESTING

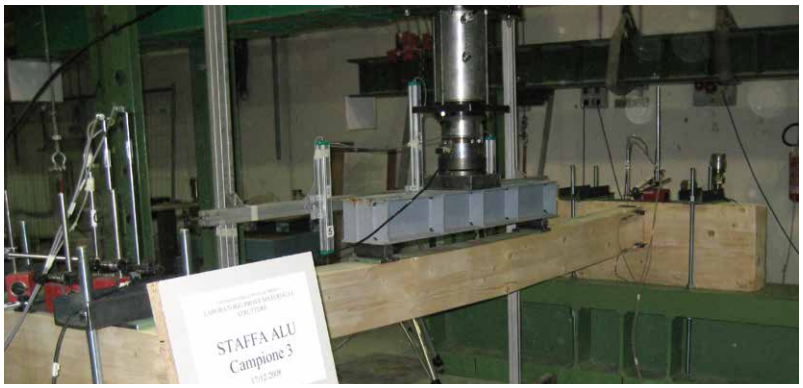
EXPERIMENTAL INVESTIGATION

A comprehensive experimental campaign aimed at defining the real behaviour of the ALU brackets was carried out in collaboration the University of Trento. A numerical model has then been proposed and validated on the experimental results (Rothoblaas experimental method).

RESEARCH AND DEVELOPMENT

Experimental investigation – Materials and Structures Tests Laboratory (Faculty of Engineering, Trento).

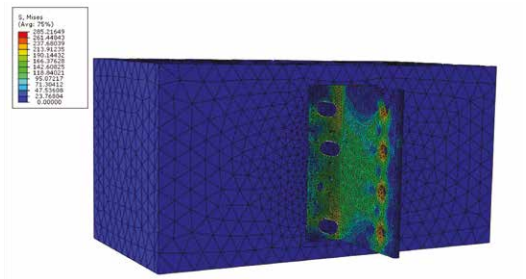
Tests on specimens with reduced dimensions (timber-to-timber and timber-to-concrete).



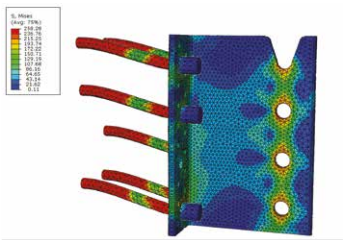
Tests on full-scale specimens (main-secondary beam connection).

NUMERICAL MODELING

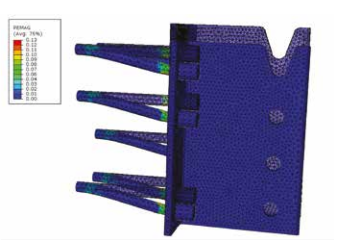
Investigation on the plastic deformation history of anchors and ALU brackets through finite element analysis.



Solid model of ALU bracket on concrete



Mises stress history on anchors and ALU bracket



Comparison between undeformed and deformed shape at the end of the test