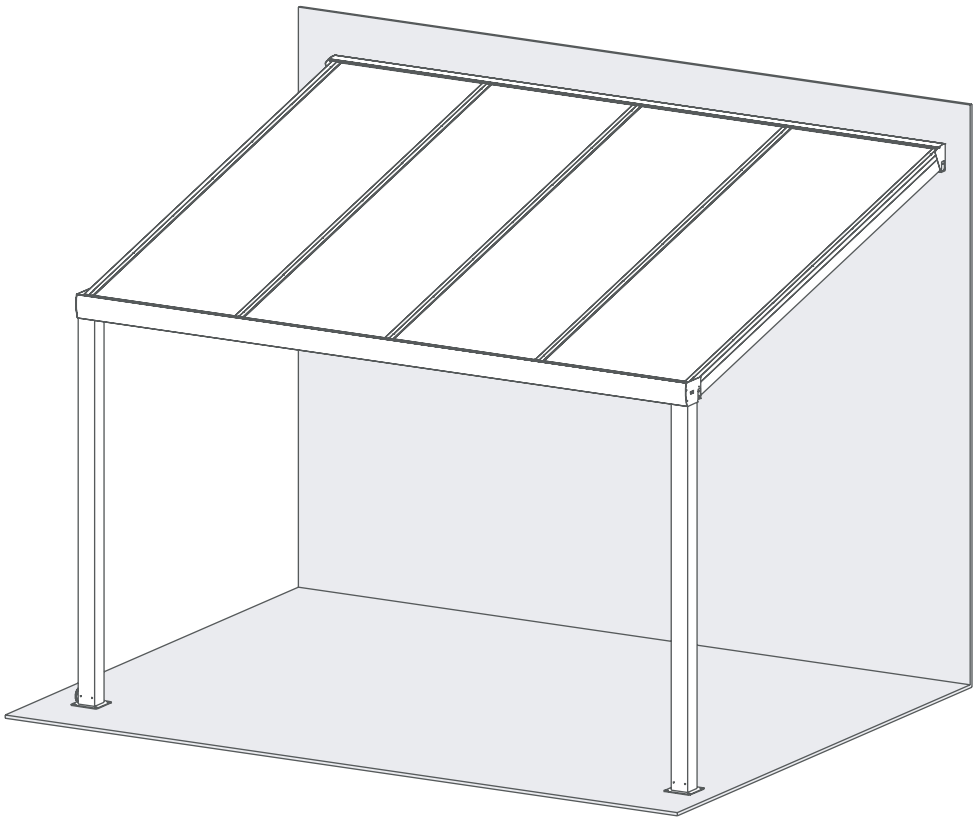
EVER



EVER PATIO SYSTEM
ORDER AND PROCESS CATALOGUE
WITH STRUCTURAL ANALYSIS REPORT

SUMMARY

Aluminium has in fact proved itself as a suitable material for load bearing structures for more than one hundred years. EVER veranda system has been designed using aluminium alloy ENAW6063 the most commonly used alloy for structural elements by understanding important aspects needed in design. This report proclaims and confirms the required properties and calculations have been taken into consideration with importance. From structural analysis to assembling the components, all information required by the installer is written, checked and published by professional authorities. This catalog includes system details, connection details and clarifies the maximum system dimensions.

INDEX

ADVICE

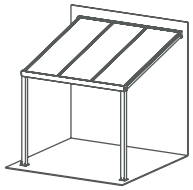
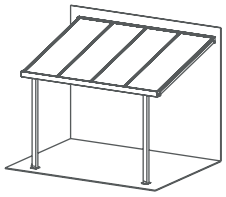
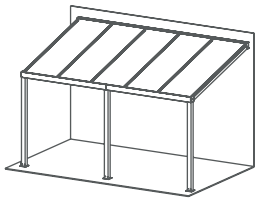
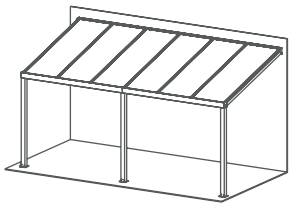
This instruction is developed for Ever patio system. This instruction ensure the profile processing and installation according to rules of engineering. The processor or site superviser has the responsibility to respect the system manufacturer and their advices.

CONSEQUENCES

Failure to comply with the processing and installation rules, even if it might improve the timeline or specific case of installation, will void the system warranty and might end up with unwanted consequences. The requested changes must be discussed with the system manufacturer and approved by them.

SYSTEM INFORMATION

System main aluminium beam profile is between two aluminium system columns. There are angled purlins in 1 meter openings between the main beam and the wall (or steel support). Design loads are carried by these purlins. System design is checked with four different instances. Due to analyses longer spans need steel reinforcements. System profiles and reinforcements are checked by SAP 2000 structural analysis software.

STRUCTURAL ANALYSIS

Structural analysis report has been prepared according to EUROCODE.
Structural analysis report written and checked by Mr. Erdeniz USTUNKAYA (BSc Civil Eng.),
System industrial design by Erdoganlar Aluminium, product development division,
System catalog prepared and published by Erdoganlar Aluminium, product development division.

MATERIAL INFORMATION

Aluminium profile alloy is defined as EN AW 6063 T6. Aluminium profile material spects are shown in the table (EC9) below.

Alloy ENAW	Temper	Thickness	f_o	f_u	A	$f_{o,haz}$	$f_{u,haz}$	HAZ-factor		BC	n_p
		mm	N/mm²		%	N/mm²		$\rho_{o,haz}$	$\rho_{u,haz}$		
6063	T5	t ≤ 3	130	175	8	60	100	0,46	0,57	B	16
		3 < t ≤ 25	110	160	7			0,55	0,63	B	13
	T6	t ≤ 25	160	195	8	65	110	0,41	0,56	A	24
		t ≤ 20	190	220	10			0,34	0,5	A	31
	T66	t ≤ 10	200	245	8	75	130	0,38	0,53	A	22
		10 < t ≤ 25	180	225	8			0,42	0,58	A	21
		t ≤ 20	195	230	10			0,38	0,57	A	28

Aluminium Young modulus: E= 7e109 kg/ m²
Aluminium thermal expansion coefficient: αt= 2,358e10-5
Aluminium shear modulus: G= 2,669e105 kg/ cm²
Aluminium specific gravity: 2.700 kg/ m3

SURFACE TREATMENT

The system profiles must be surface protected against oxidation and weather conditions. The fabricator has to determine suitable coating for outdoors. Anodising and powder coating surface treatments are recommended.

ANODISING

Anodic anodizing increases the thickness of the oxide layer formed on the aluminium to 10 - 25 microns and provides resistance to corrosive environments while also providing decorative appearance and color options.
Treatment is performed according to DIN 17611 and film thickness densification is according to DIN EN 12373-4 and DIN EN 12375-5. Aluminium anodising need many special precautions, please contact system manufacturer for any question or guideline.

POWDER COATING

Electrostatic powder coating is a dry coating system and solvent free coating. Treatment is performed according to QUALICOAT standards. The color variations are very rich with powder coating so it is highly recommended for decorative systems but the manufacturer has to be aware of the results of any insufficiency during pre-treatment and coating process.

SURFACE QUALITY CONTROL CRITERIA

To evaluate the decorative appearance recognize below viewing distances while profiles are 90 degree vertical ground;

Color difference comparisson: 1m
Vertical lines such as extrusion and anodising marks: 1m
Scratch, burr, dents and any other deformations not larger than 5-10mm: 2m
Deformations on parts to be installed above common human height such as Gutter profile: 3m
Deformations on parts to be installed completely away from visual angles such as Rafter top covering profiles: 5m

INSTALLATION

Please follow the instructions in this catalogue and installation manual. Unless the profile system is not one of the pre-determined standard dimension module prepared for end-users, the installation of non-standart modules must be done by professionals.

SAFETY ADVICE

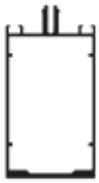
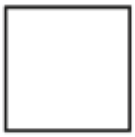
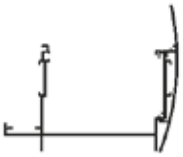
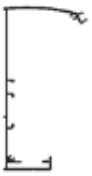
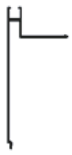
Two or more people to take part during installation is strongly recommended..
Keep children away from the area of installation.
Dispose of all packaging material safely.
Please be careful when handling components. Some parts may have sharp edges.
Wear gloves, eye protection, and long sleeves during installation or maintenance.
Please install the product during dry weather and environment conditions.
Please do not attempt to install the product if you are tired, are under medication, have taken drugs or alchohol, or are prone to dizziness.
Do not leave any profile free-standing or leaned against any area.
Do not hang or lean on the profiles during installation.
Do not climb or stand on the roof.
When using a stepladder or power tools, make sure you follow the manufacturer's safety advice.
Keep roof and gutter clear of snow, dirt and leaves.
Heavy snow load on roof can damage the product making it unsafe to stand below or nearby.
This product was designed and produced to be used as patio cover and carport only.

PREPERATION ADVICE

The terrace roofing is suitable for 16mm multiwall sheets made of polycarbonate or acrylic glass and 8mm laminated safety glass. Width of plates or glass should be 980mm.
Product must be installed on a solid base (such as concrete or asphalt) and anchored to the ground.
Choose your site carefully.
Sort the parts and check according to the contents parts list.
Site surface needs to be leveled (mainly below the poles).
Please consult your local authorities if any permits are required prior to installing the product.
Use only the parts registered in the content list, some parts (such as screws) may be surplus to prevent losing during installation.

CLEANING ADVICE

When your product needs cleaning, use a mild detergent solution and rinse with cold clean water.
Do not use acetone, abrasive cleaners, or others special detergents to clean the panels.
If product gets scratched it can be fixed with the similar tints of its RAL code.

Illustration	Technical Information	Item No	Description	Unit
	Weight: 2.059 kg/m Area: 759.97mm^2 Perimeter: 702.00mm Outside depth (t3): 95.50mm Outside width (t2): 55.00mm Flange thickness (tf): 4.45mm Web thickness (tw): 1.80mm Moments of inertia(mm^4) X: 329734.40 Y: 1128802.25	101.RFT.01	Rafter or Purlin	6.5m
	Weight: 2.341 kg/m Area: 864.00mm^2 Perimeter: 864.00mm Outside depth (t3): 110.00mm Outside width (t2): 110.00mm Flange thickness (tf): 2.00mm Web thickness (tw): 2.00mm Moments of inertia(mm^4) X: 1680192 Y: 1680192	101.PLR.01	Pillar or Column	6.5m
	Weight: 3.680 kg/m Area: 1358.12mm^2 Perimeter: 1276.83mm Outside depth (t3): 147.50mm Outside width (t2): 172.00mm Flange thickness (tf): 2.00mm Web thickness (tw): 4.53mm Moments of inertia(mm^4) X: 1520636.69 Y: 5080441.77	101.GTR.01 101.GTR.02	Gutter beam, gutter outer cover	6.5m
	Weight: 2.000 kg/m Area: 738.16mm^2 Perimeter: 748.06mm Outside depth (t3): 165.50mm Outside width (t2): 47.60mm Flange thickness (tf): 2.00mm Web thickness (tw): 2.75mm Moments of inertia(mm^4) X: 362490.99 Y: 3058196.54	101.WBM.01	Wall beam	6.5m
	Weight: 0.660 kg/m Area: 243.65mm^2 Perimeter: 328.07mm Outside depth (t3): 99.90mm Outside width (t2): 42.10mm Wall thickness: 1.50mm	101.GTR.03	Gutter inner conner	6.5m
	Weight: 0.523 kg/m Area: 192.93mm^2 Perimeter: 242.74mm Outside depth (t3): 23.50mm Outside width (t2): 55.00mm Wall thickness: 1.50mm	01.RFT.02	Rafter top cover	6.5m

(!) System is checked with similar forms and real mechanical properties.

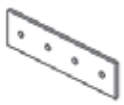
Illustration	Technical Information	Item No	Description	Unit
	Weight: 0.657 kg/m Area: 242.56mm^2 Perimeter: 295.77mm Outside depth (t3): 36.00mm Outside width (t2): 59.00mm Wall thickness: 1.50mm	**101.RFT.03**	Rafter end cover	6.5m
	Weight: 1.439 kg/m Area: 531.00mm^2 Perimeter: 360.00mm Outside depth (t3): 60.00mm Outside width (t2): 63.00mm Wall thickness: 3.00mm	**101.RFT.04**	Rafter connector	30mm
	Weight: 0.304 kg/m Area: 112.27mm^2 Perimeter: 188.00mm Outside depth (t3): 30.00mm Outside width (t2): 30.00mm Wall thickness: 1.20mm	**101.PLF.01**	Polycarbonate frame 16mm	6.5m
	Weight: 0.314 kg/m Area: 115.97mm^2 Perimeter: 119.00mm Outside depth (t3): 40.00mm Outside width (t2): 20.00mm Wall thickness: 2.00mm	**101.PLF.02**	Rafter front cap	60mm
	Weight: 0.260 kg/m Area: 96,00mm^2 Perimeter: 70.00mm Outside depth (t3): 120.00mm Outside width (t2): 32.00mm Wall thickness: 3.00mm	**101.GTR.04**	Gutter connector	32mm
	EPDM Gasket	**102.GTR.01**	Gutter gasket	50m/box
	EPDM Gasket	**102.RFT.01**	Rafter gasket	250m/box
	Punched aluminium sheet metal plate	**103.CAP.01**	Front end plate	2pcs/set

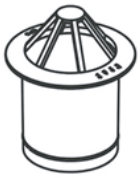
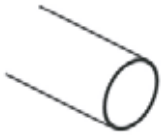
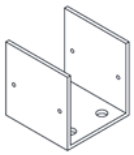
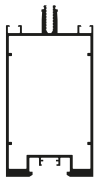
Illustration	Technical Information	Item No	Description	Unit
	Punched aluminium sheet metal plate	**103.CAP.02**	Rafter end cover	6.5m
	Conical PVC filter	**104.DRN.01**	Drainage filter	30mm
	PVC Pipe ISO 1452-2	**104.DRN.02**	Drainage pipe	6.5m
	PVC Elbow	**104.DRN.03**	Drainage elbow	60mm
	Welded steel support w/ flange	**105.PLR.01**	Steel anchor	32mm
	Welded steel support w/o flange	**105.PLR.02**	Steel anchor inner	50m/box
	5.5x38mm screw and washer	**106.SCW.01**	Leakproof screw	100pcs/box
	4.8x22mm screw	**106.SCW.02**	Fixing screw	100pcs/box

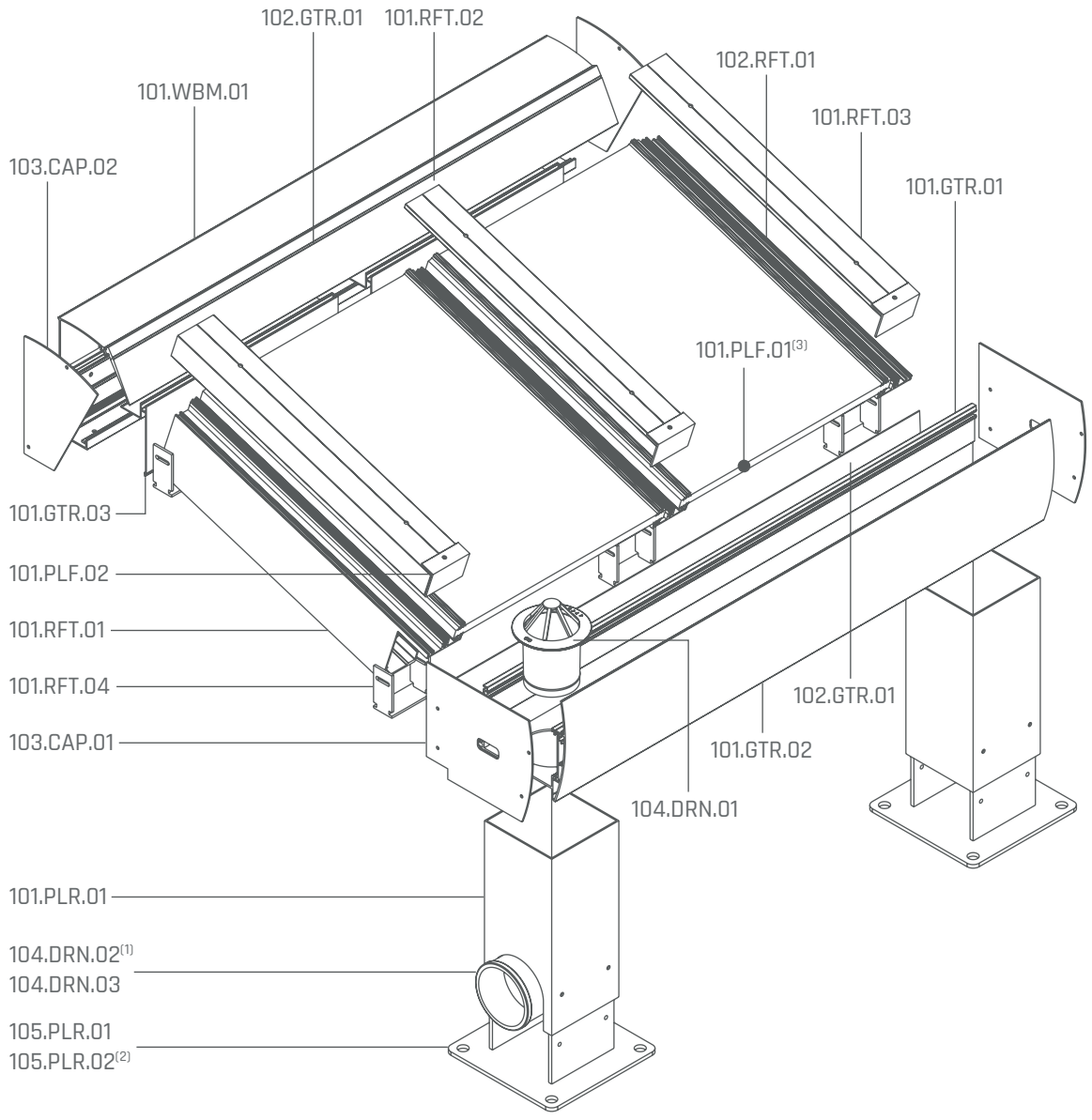
Illustration	Technical Information	Item No	Description	Unit
	3.9x22mm screw	**106.SCW.03**	Plate screw	100pcs/box
	7.5x80mm screw w/ 5/16 washer	**106.SCW.04**	Anchor screw	100pcs/box
	M6x8 set screw	**106.SCW.05**	Connector set screw	100pcs/box

ALTERNATE SYSTEM COMPONENTS

Illustration	Technical Information	Item No	Description	Unit
	Weight: 2.151 kg/m Area: 793.76mm^2 Perimeter: 774.00mm Outside depth (t3): 95.50mm Outside width (t2): 55.00mm Flange thickness (tf): 4.45mm Web thickness (tw): 1.80mm Moments of inertia(mm^4) X: 336967.85 Y: 1124214.43	**101.LED.01**	Rafter with LED slot	6.5m
	Pvc LED diffuser profile	**102.LED.01**	LED Diffuser	6.5m

SYSTEM COMPONENT PREVIEW

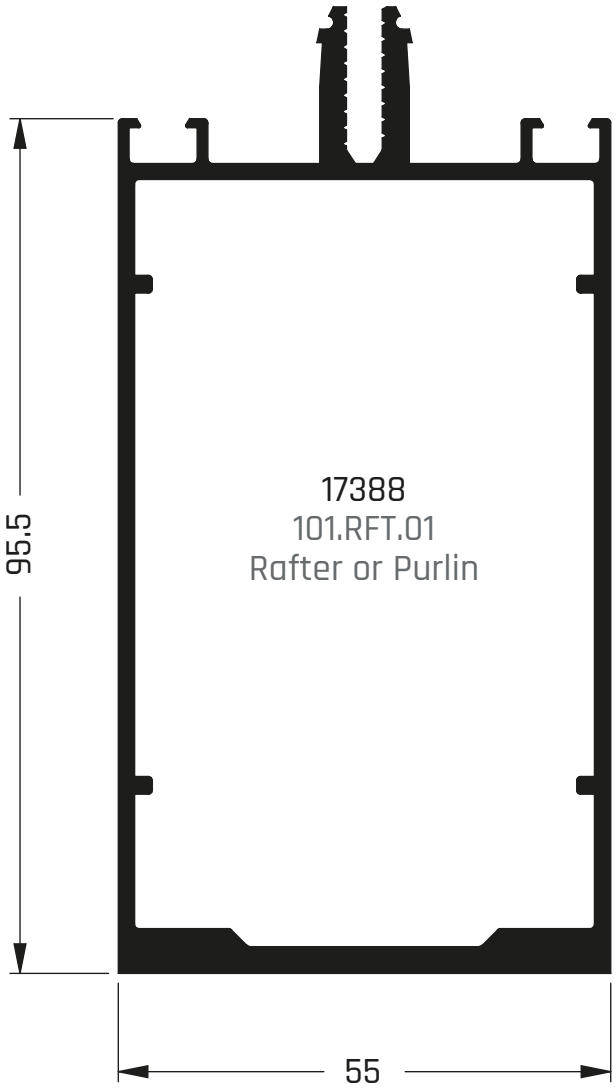
System components are shown in detail in the drawing below.



(1) Drainage pipe 75mm
(2) Optional inner steel anchor
(3) Optional polycarbonate frame (16mm), anti-dust tape

PROFILE SECTIONS

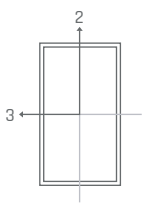
Further you can find profile section drawings with dimensions.

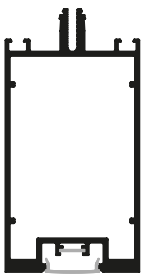


17388
101.RFT.01
Rafter or Purlin

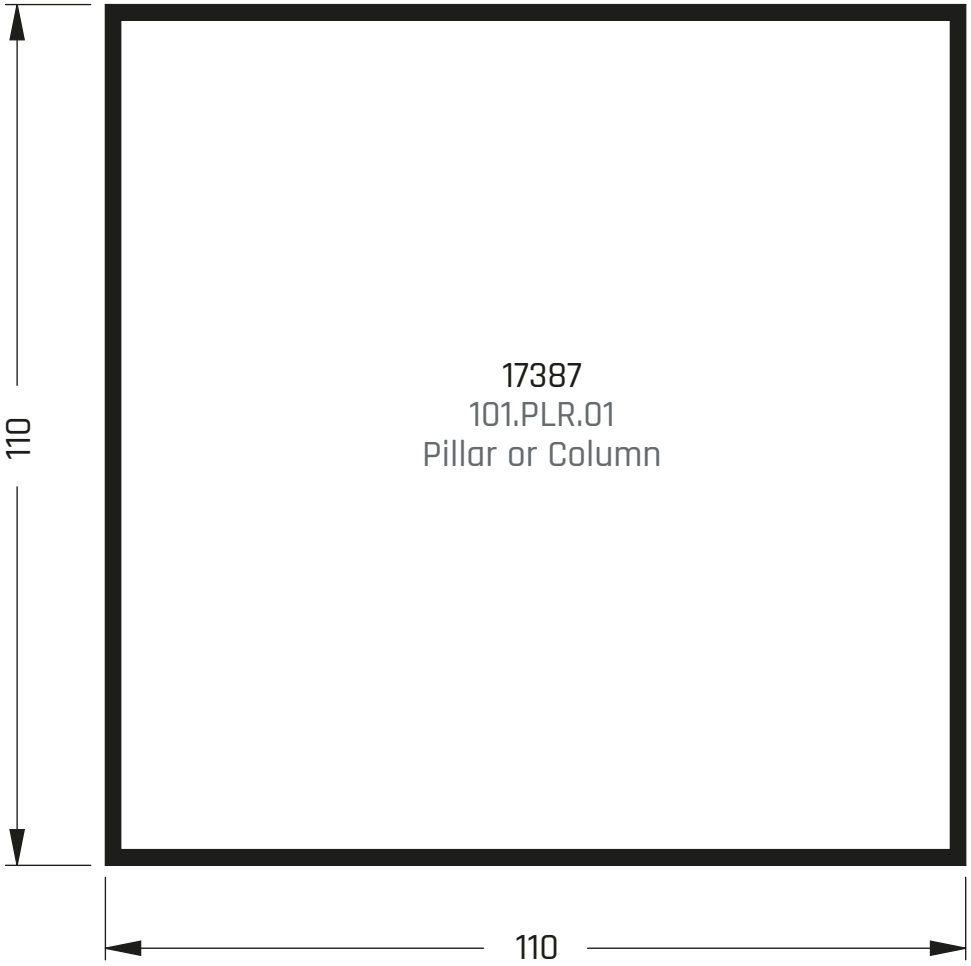
SAP2000 PROPERTY DATA

Cross-section (axial) area: 8,0810
Moment of Inertia about 3 axis: 112.3715
Moment of Inertia about 2 axis: 3.9273
Shear area in 2 direction: 3.7200
Shear area in 3 direction: 4.7170
Torsional constant: 73.1837
Section modulus about 3 axis: 24.1659
Section modulus about 2 axis: 12.4254
Plastic modulus about 3 axis: 24.9573
Plastic modulus about 2 axis: 14.8282
Radius of Gyration about 3 axis: 3.7290
Radius of Gyration about 2 axis: 2.0186

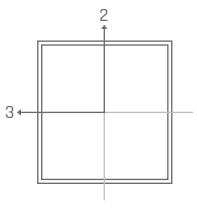


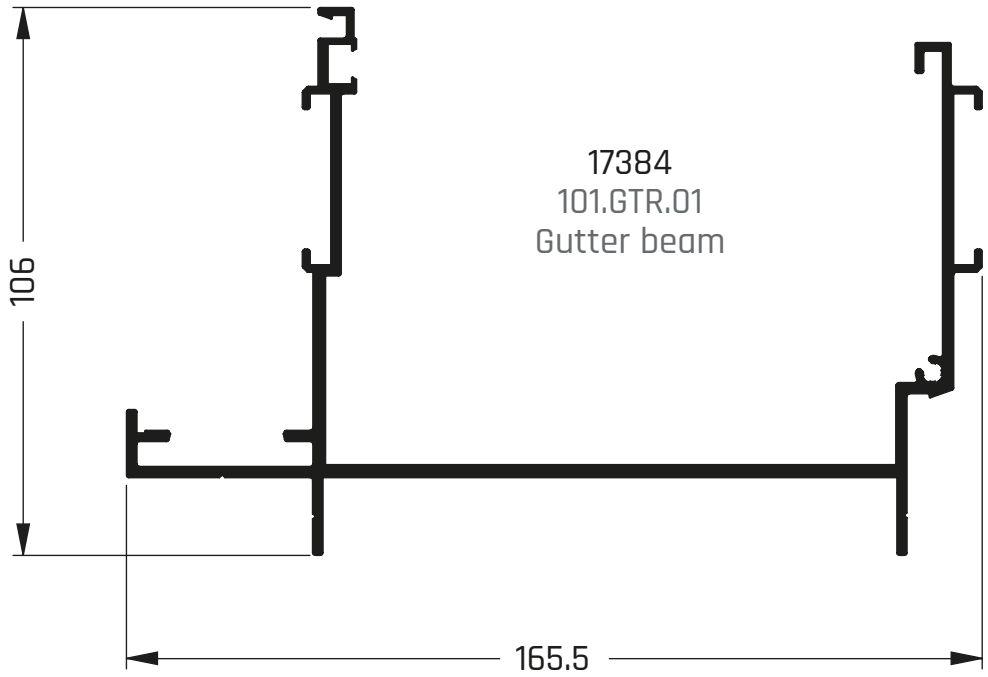


18210
101.LED.01
Rafter with LED slot

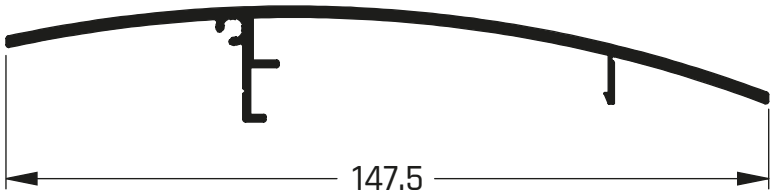


SAP2000 PROPERTY DATA
Cross-section (axial) area: 8,6400
Moment of Inertia about 3 axis: 168.0192
Moment of Inertia about 2 axis: 168.0192
Shear area in 2 direction: 4.4000
Shear area in 3 direction: 4.4000
Torsional constant: 251.9424
Section modulus about 3 axis: 30.5489
Section modulus about 2 axis: 30.5489
Plastic modulus about 3 axis: 34.9960
Plastic modulus about 2 axis: 34.9960
Radius of Gyration about 3 axis: 4.4098
Radius of Gyration about 2 axis: 4.4098



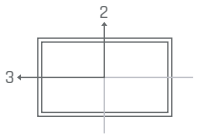


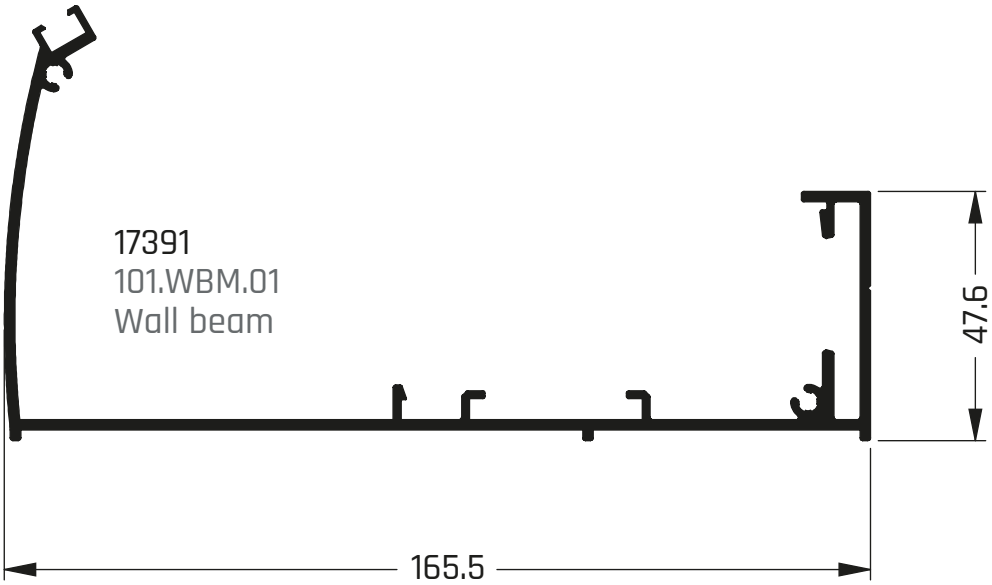
17384
101.GTR.01
Gutter beam

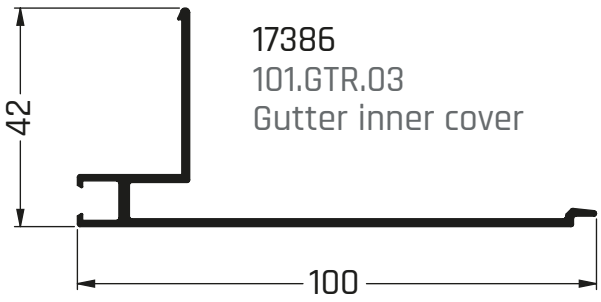


17385
101.GTR.02
Gutter outer cover

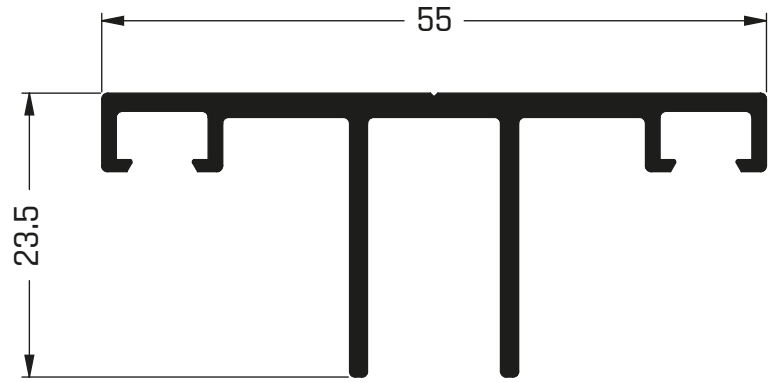
SAP2000 PROPERTY DATA
Cross-section (axial) area: 13,7111
Moment of Inertia about 3 axis: 152.2151
Moment of Inertia about 2 axis: 510.3260
Shear area in 2 direction: 7.7916
Shear area in 3 direction: 6.3000
Torsional constant: 339.3469
Section modulus about 3 axis: 35.3989
Section modulus about 2 axis: 68.0435
Plastic modulus about 3 axis: 41.5842
Plastic modulus about 2 axis: 77.5295
Radius of Gyration about 3 axis: 3.3319
Radius of Gyration about 2 axis: 6.1008



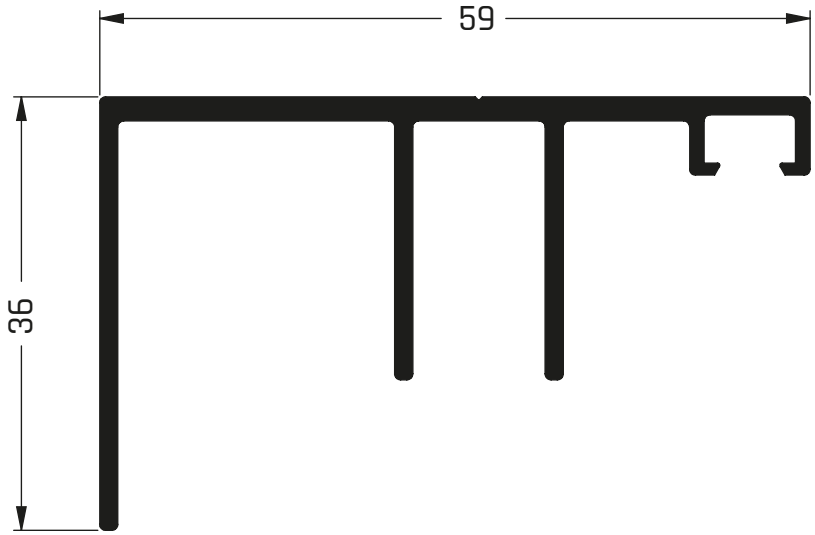

17391
101.WBM.01
Wall beam
47.6
165.5


17386
101.GTR.03
Gutter inner cover
42
100

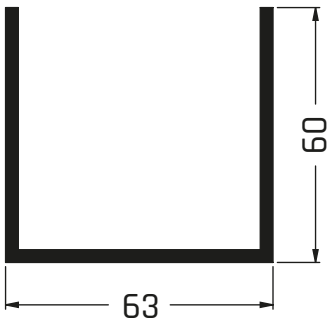
17389
101.RFT.02
Rafter top cover



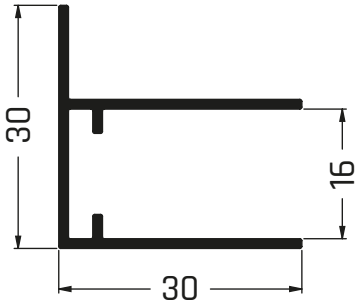
17390
101.RFT.03
Rafter end cover



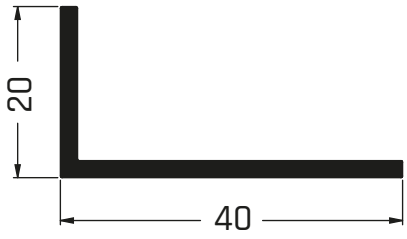
17392
101.RFT.04
Rafter Connector (U Profile)



16678
101.PLF.01
Polycarbonate Frame 16mm (F Profile)



5485
101.PLF.02
Rafter front cap (L Profile)



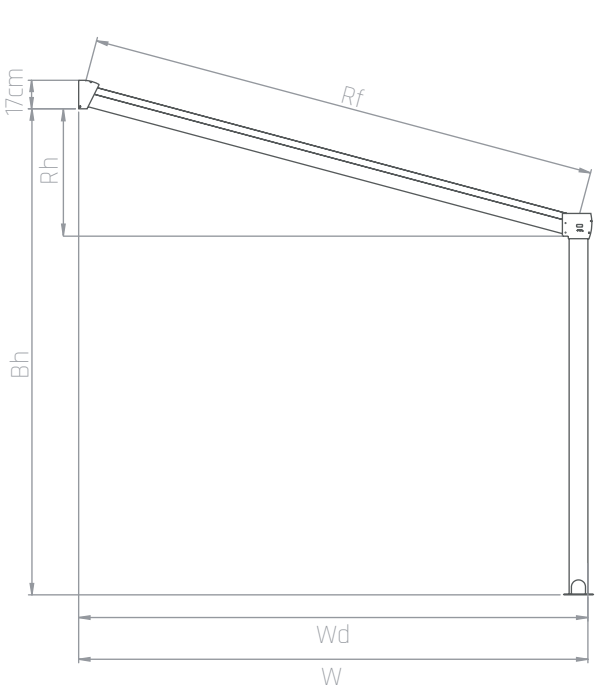
MEASUREMENT ASSISTANT

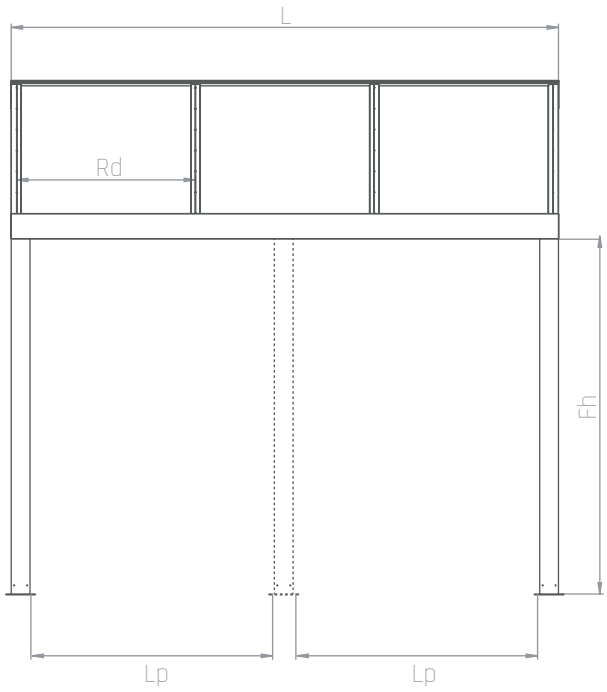
Please use this measurement assistant template in your projects to calculate system properties with precision. Later you can use these dimension with "FORMULAS" in page 20.

CUSTOMER: _____
PROJECT: _____
DATE: _____
SURFACE: _____

AREAS TO FILL

L (Length)	W (Width or Depth)	Fh (Front pillar height)	Bh[1] (Wall beam height)	Pq[2] (Pillar quantity)	Material (Glass or Polycarbonate)	Drainage[3] (Left or Right)





(1) For 90° roof slope (Fh) and (Bh) dimensions must be equal.
(2) Please add extra pillar for every 4m distance.
(3) Define drainage side (L/R) before punching. Refer to machining details in page 23.

FORMULAS

Further you can find cut, processing and assembly formulas. These calculations will be required while machining the profiles, assembling the system and adjusting roof slope.

Calculating true depth = $Wd = W - 110$

Calculating rise = $Rh = Bh - Fh$

Calculating rafter length = $Rf = \sqrt{Wd^2 + Rh^2} + 32$

Calculating roof slope = $\tan^{-1}(Rh/Wd)$ (Important: Maximum 15°)

Pannel quantity = Nq (Recommended: L / 1000 for polycarbonate, L / 800 for glass. Round the result.)

Rafter quantity = $Rq = Nq + 1$

Gutter inner cover quantity = $Nq * 2$

Rafter center to center distance = $Rd = ((L - (Rq * 55) - 6) / (Nq - 1)) + 55$

Gutter inner cover length = $Cd = Rd - 57$

Pannel L = Rf

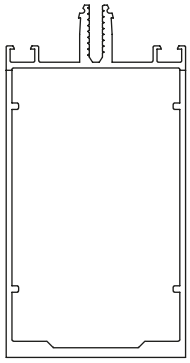
Pannel width = $Nw = Cd + 30$ or $Rd - 27$

Pillar quantity = Pq

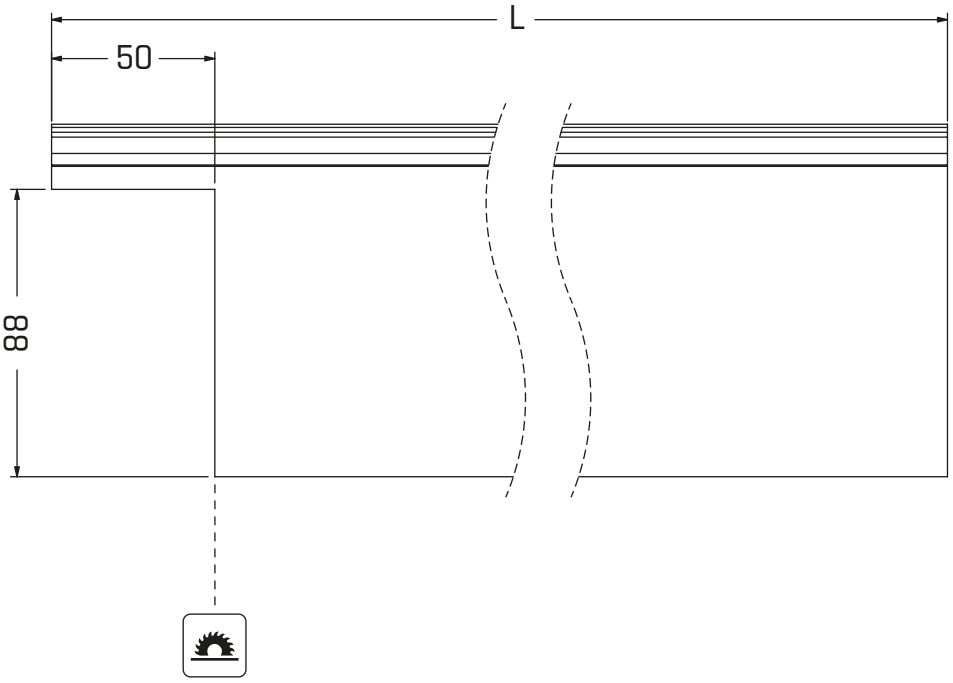
Pillar distance = $Lp = (L - (Pq * 110)) / (Pq - 1)$ (Important: Maximum 4m)

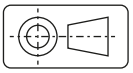
MACHINING AND PROCESSING

Further you can find machining and processing instructions.

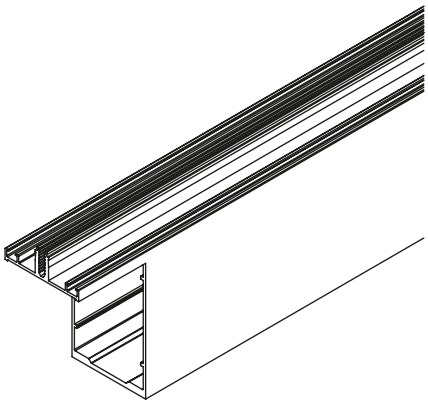


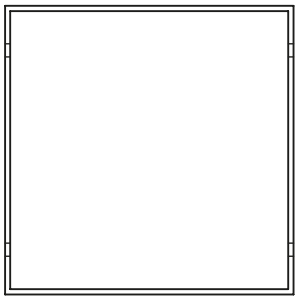
101.RFT.01 - M001
NOTCHING



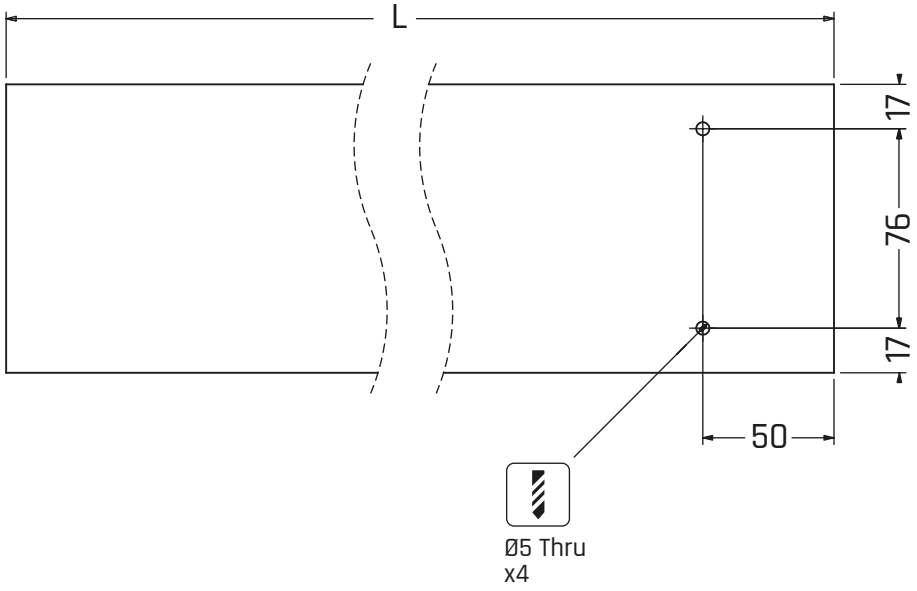


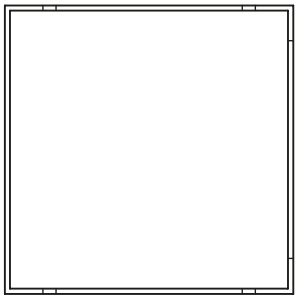
Saw or Cut



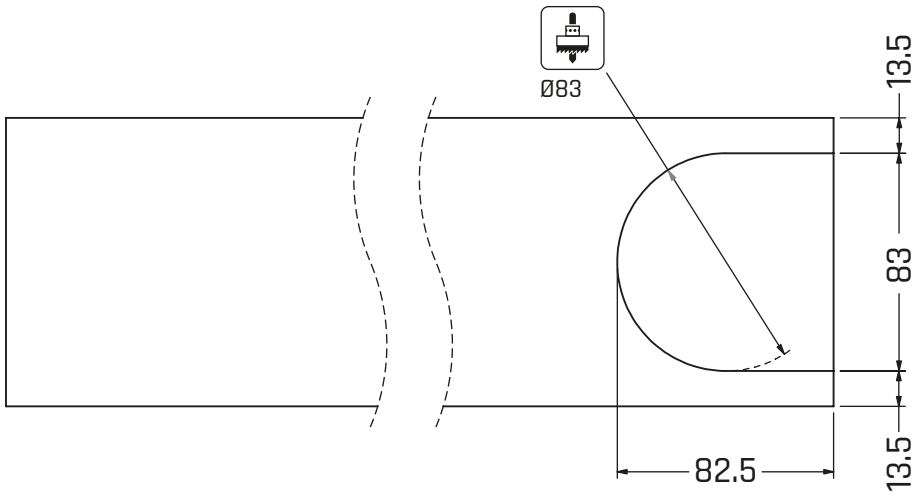


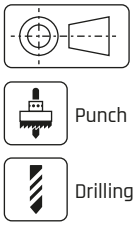
101.PLR.01 - M001 or M002
DRILLED FACES FOR
PILLAR CONNECTION

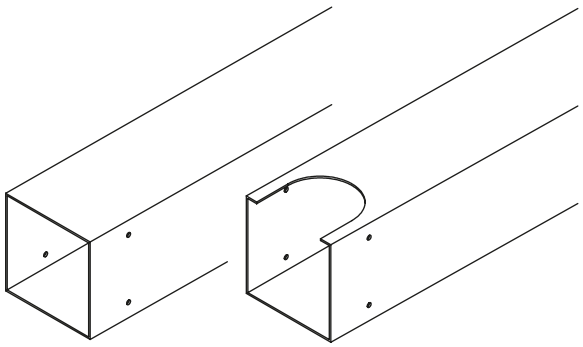


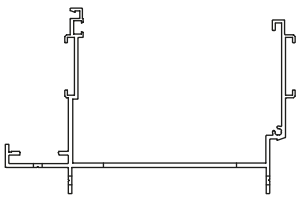


101.PLR.01 - M002
PUNCH FOR DRAINAGE

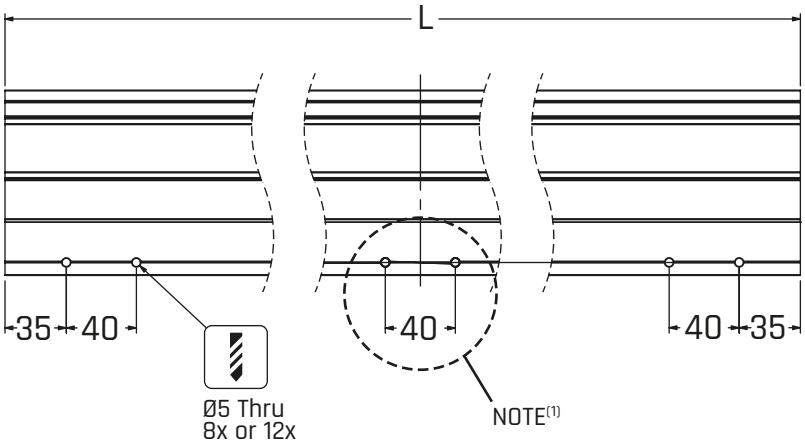


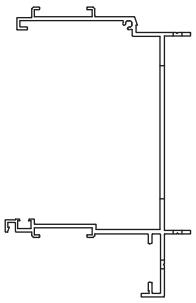




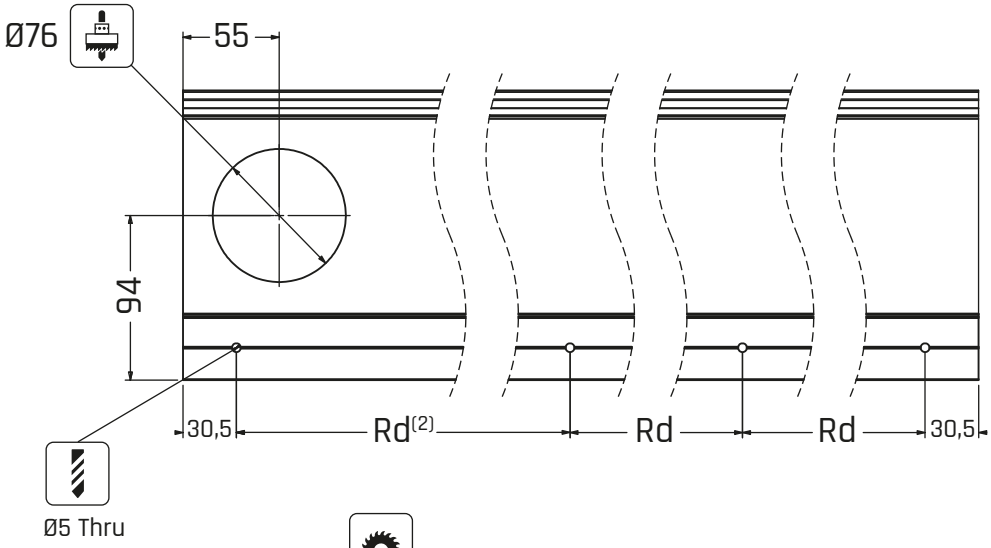


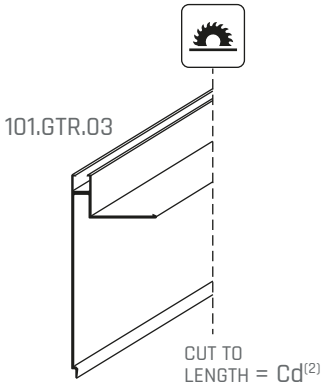
101.GTR.01 - M001
DRILLED FACES FOR
PILLAR CONNECTION

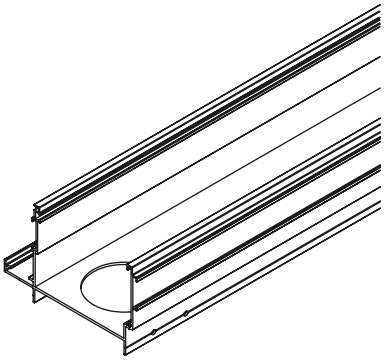


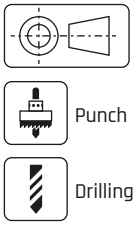


101.GTR.01 - M001
DRILLED FACES FOR
RAFTER CONNECTION

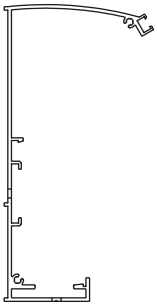




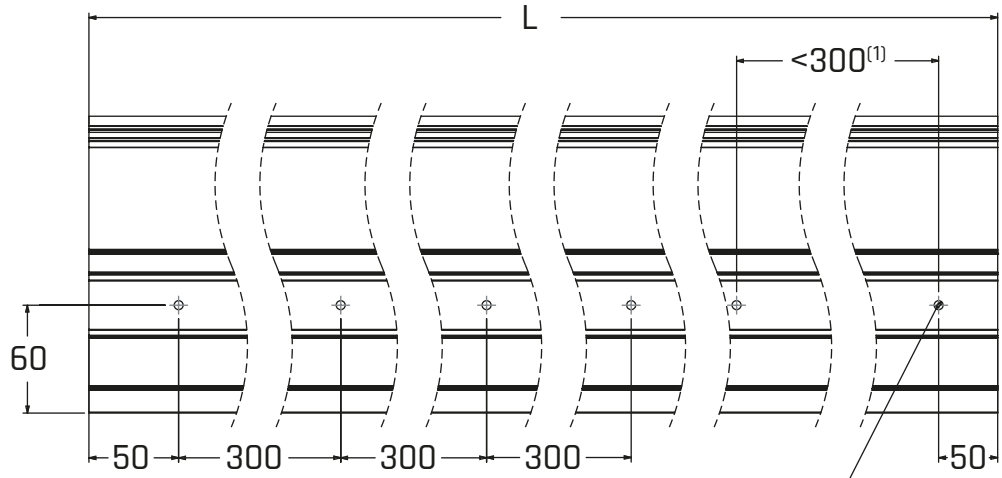


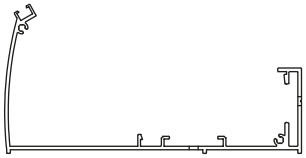


(1) Extra screw ports for each middle support pillar.
(2) See formulas to calculate Rd and Cd dimensions. (Page 19)
(3) Define drainage side (L/R) before punching.

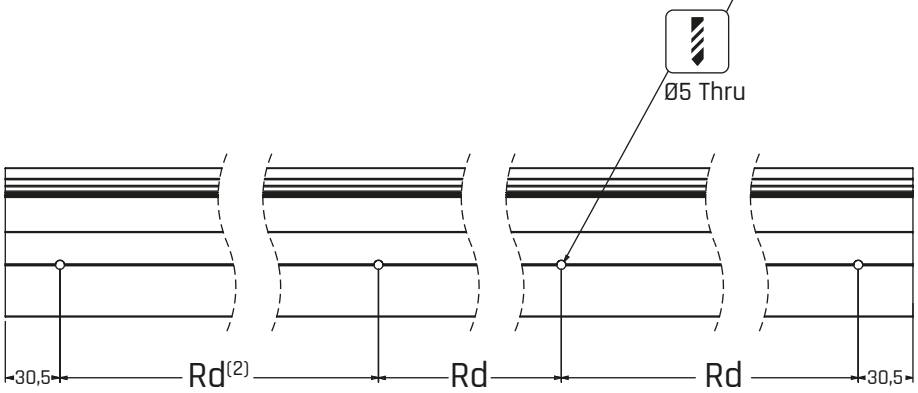


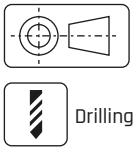
101.WBM.01 - M001
DRILLED FACES FOR
WALL CONNECTION



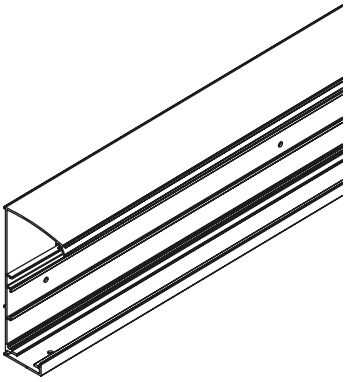


101.WBM.01 - M001
DRILLED FACES FOR
RAFTER CONNECTION

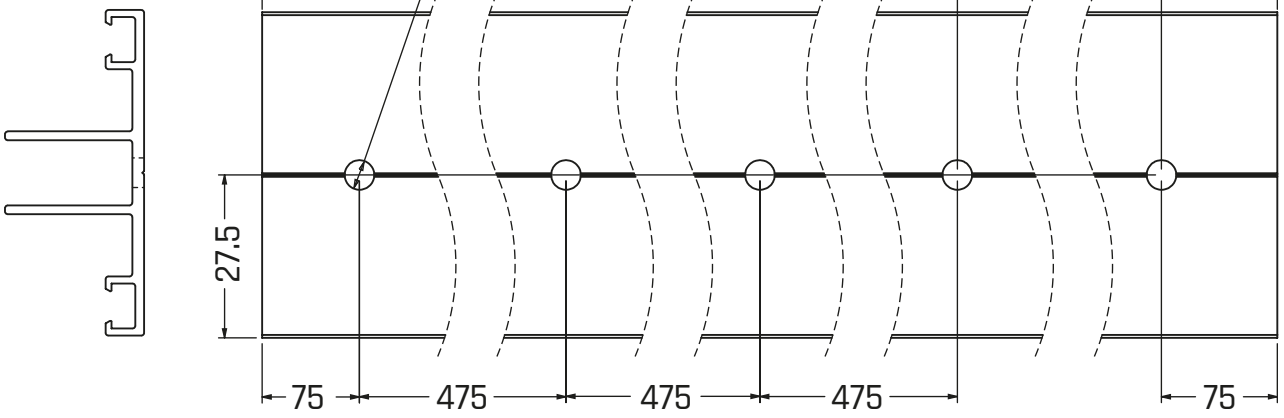




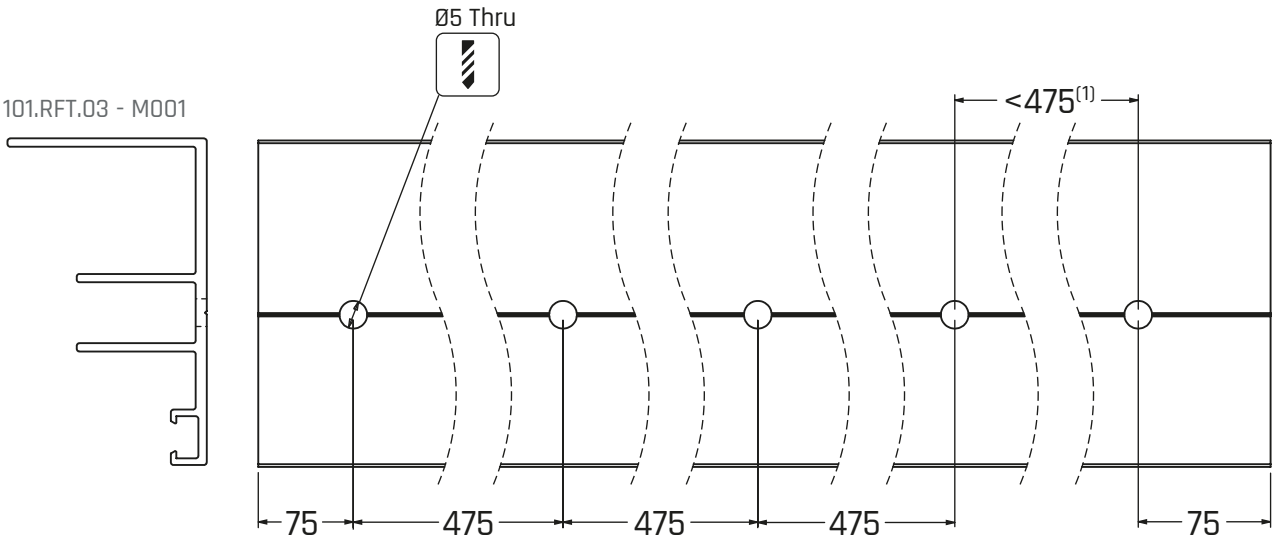
(1) Extra drilling required unless the dimension is <300mm.
(2) See formulas to calculate Rd dimension. (Page 19)

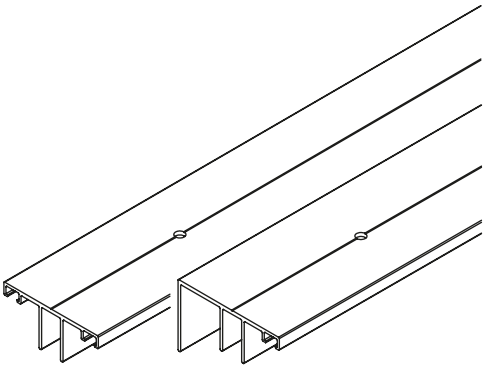


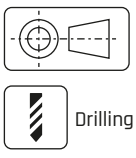
101.RFT.02 - M001



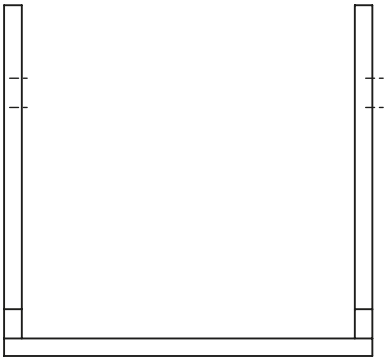
101.RFT.03 - M001



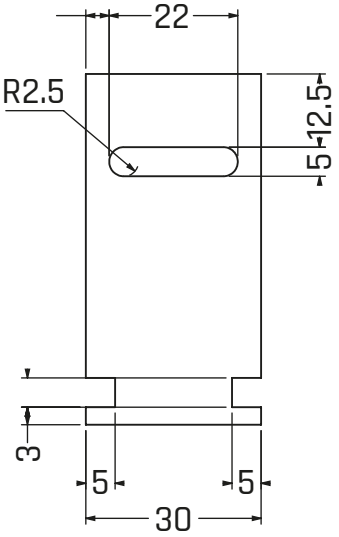


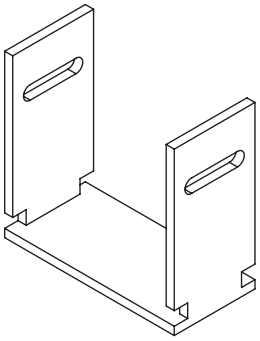


(1) Extra drilling required unless the dimension is <475mm.

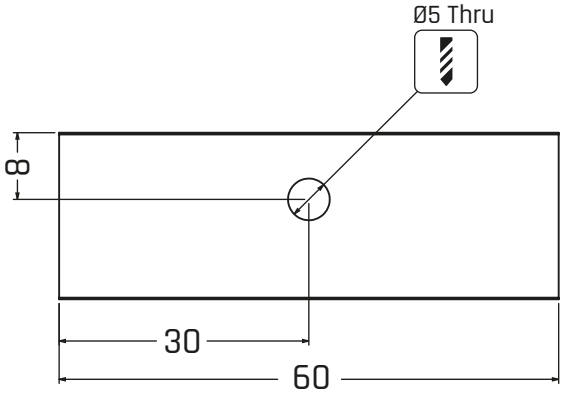


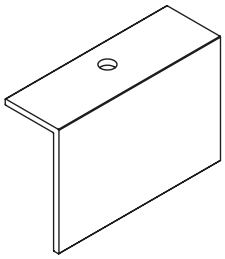
101.RFT.04 - M001

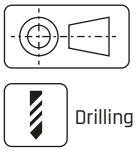




101.PLF.02 - M001

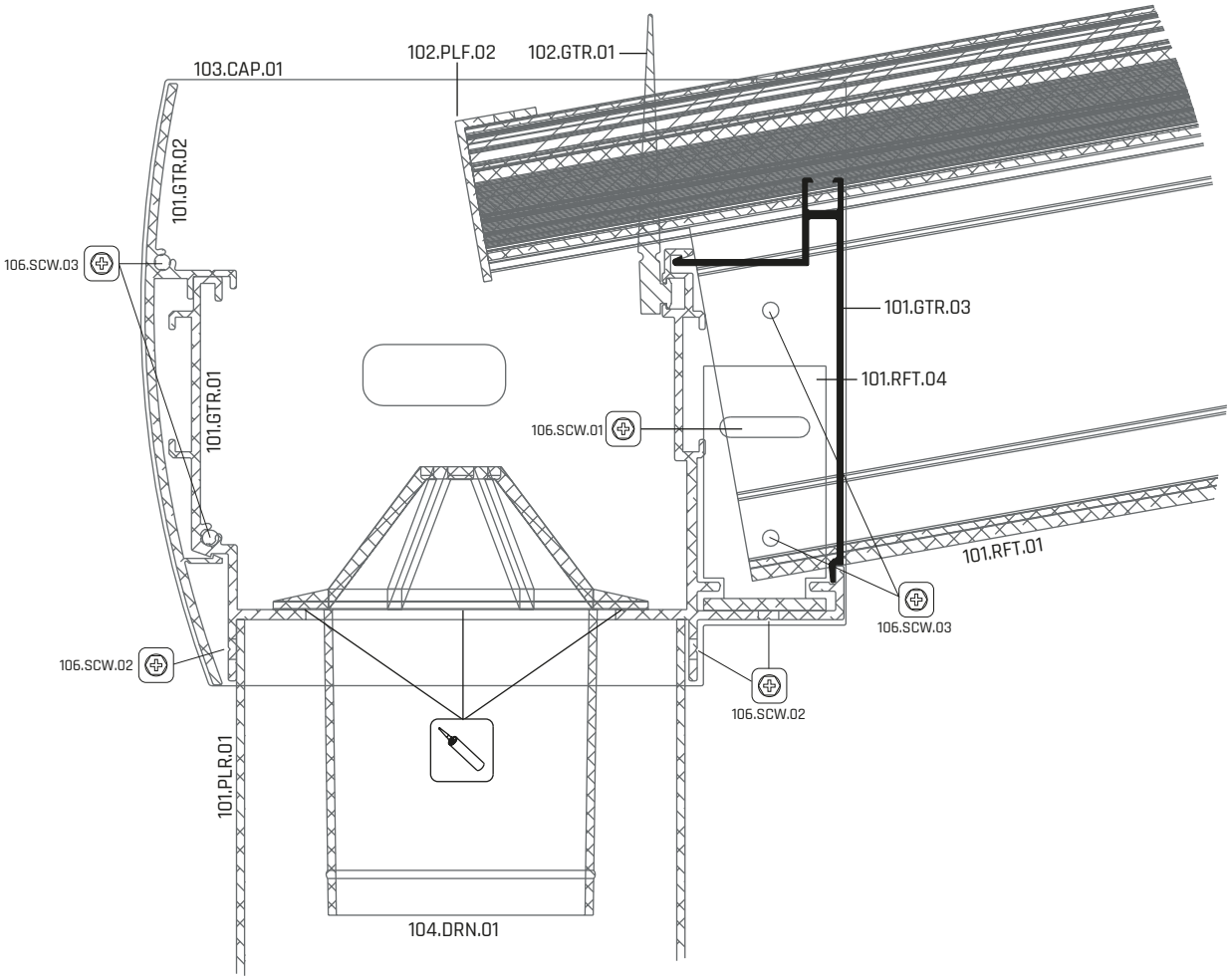


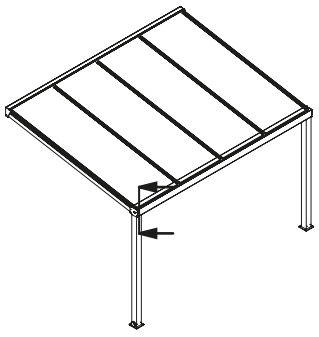




SYSTEM SECTIONS

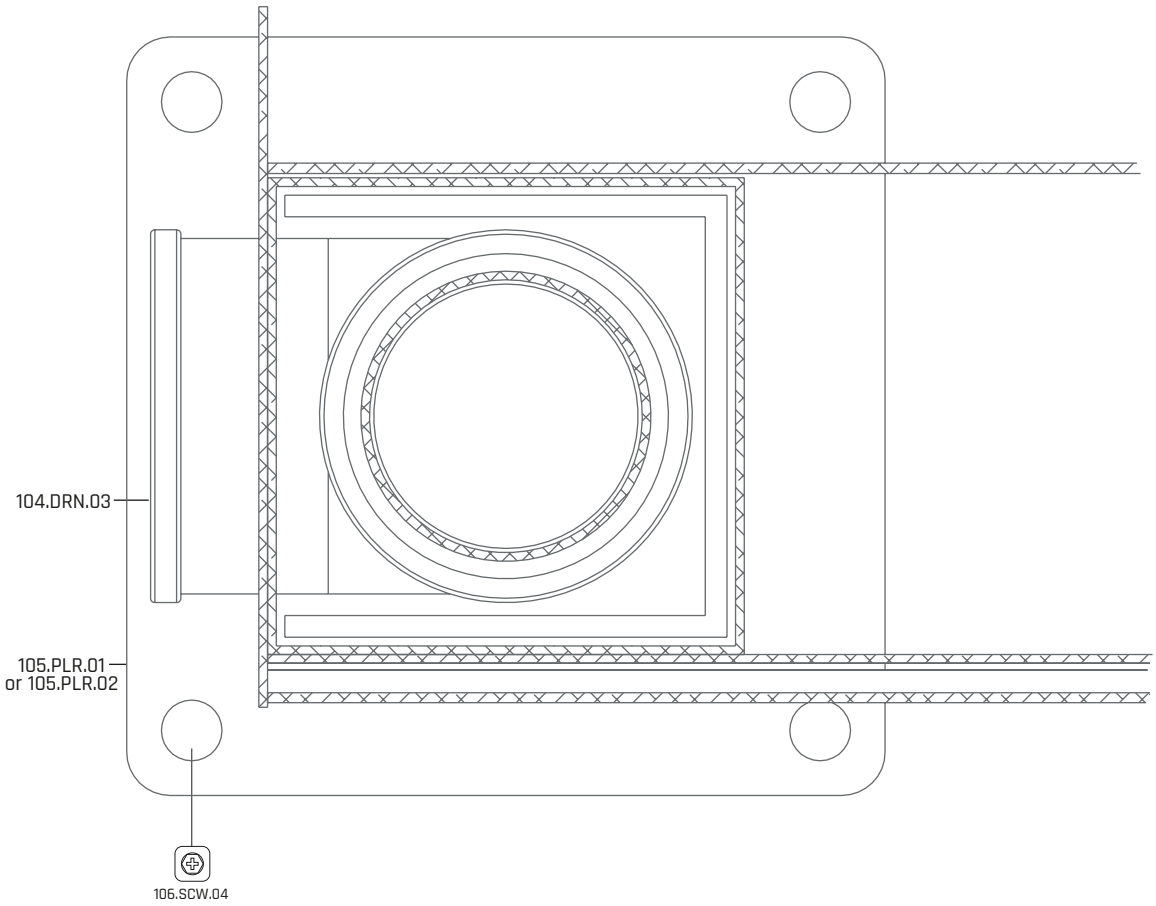
Further you can find system section drawings and part codes.

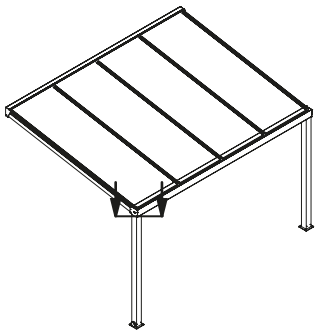




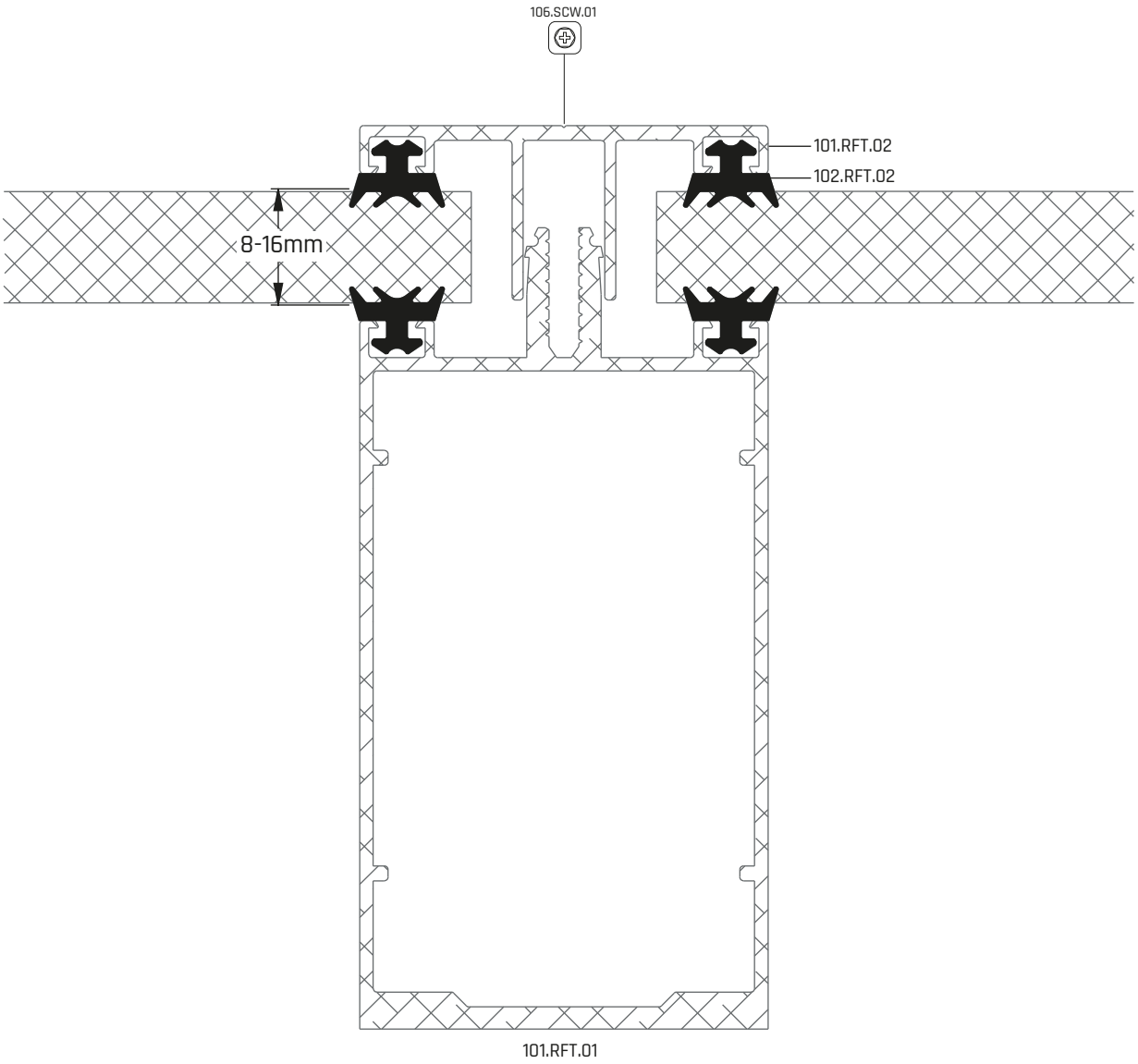
Screw Port

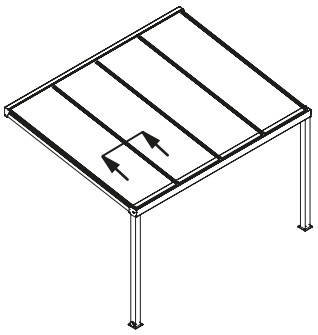
Silicone



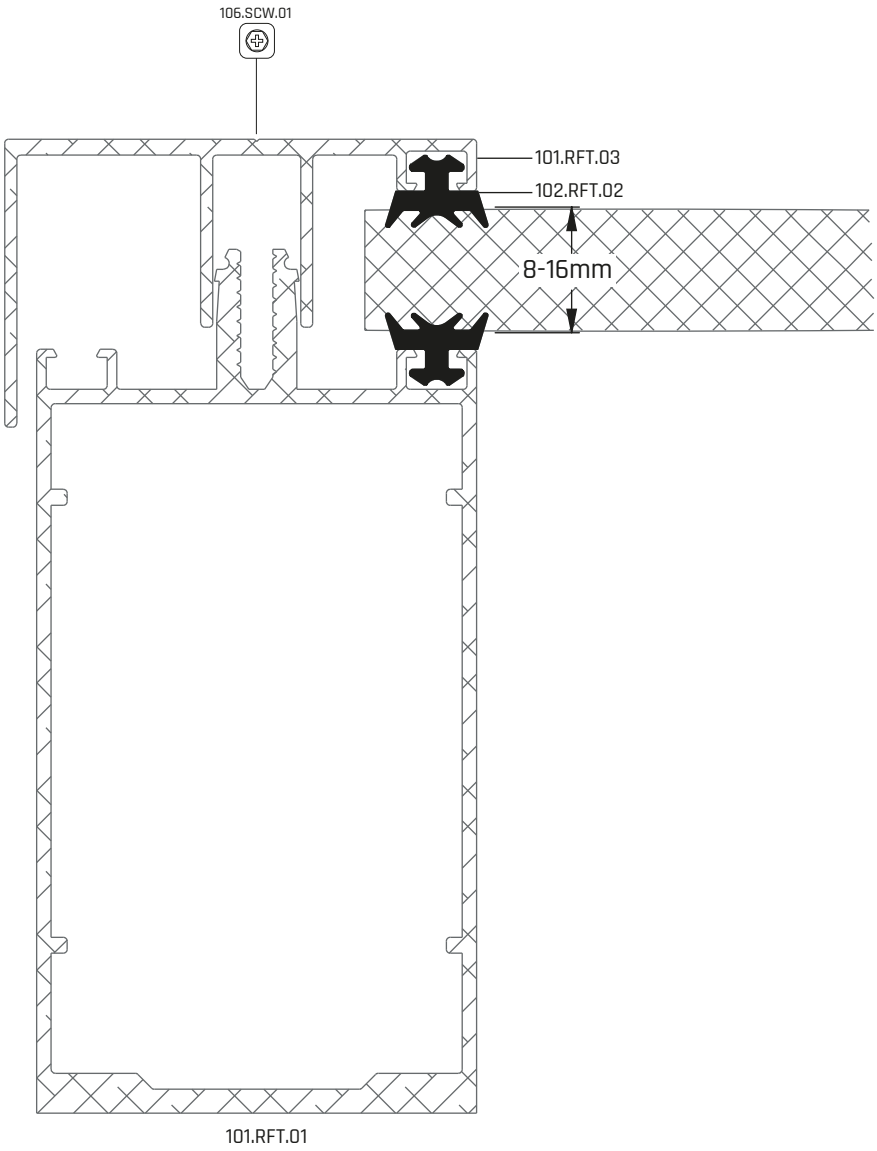


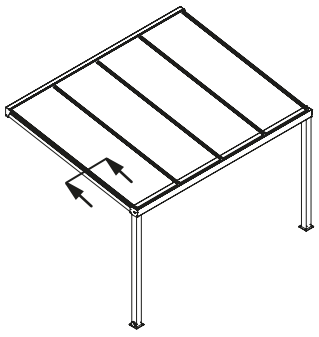
Screw Port



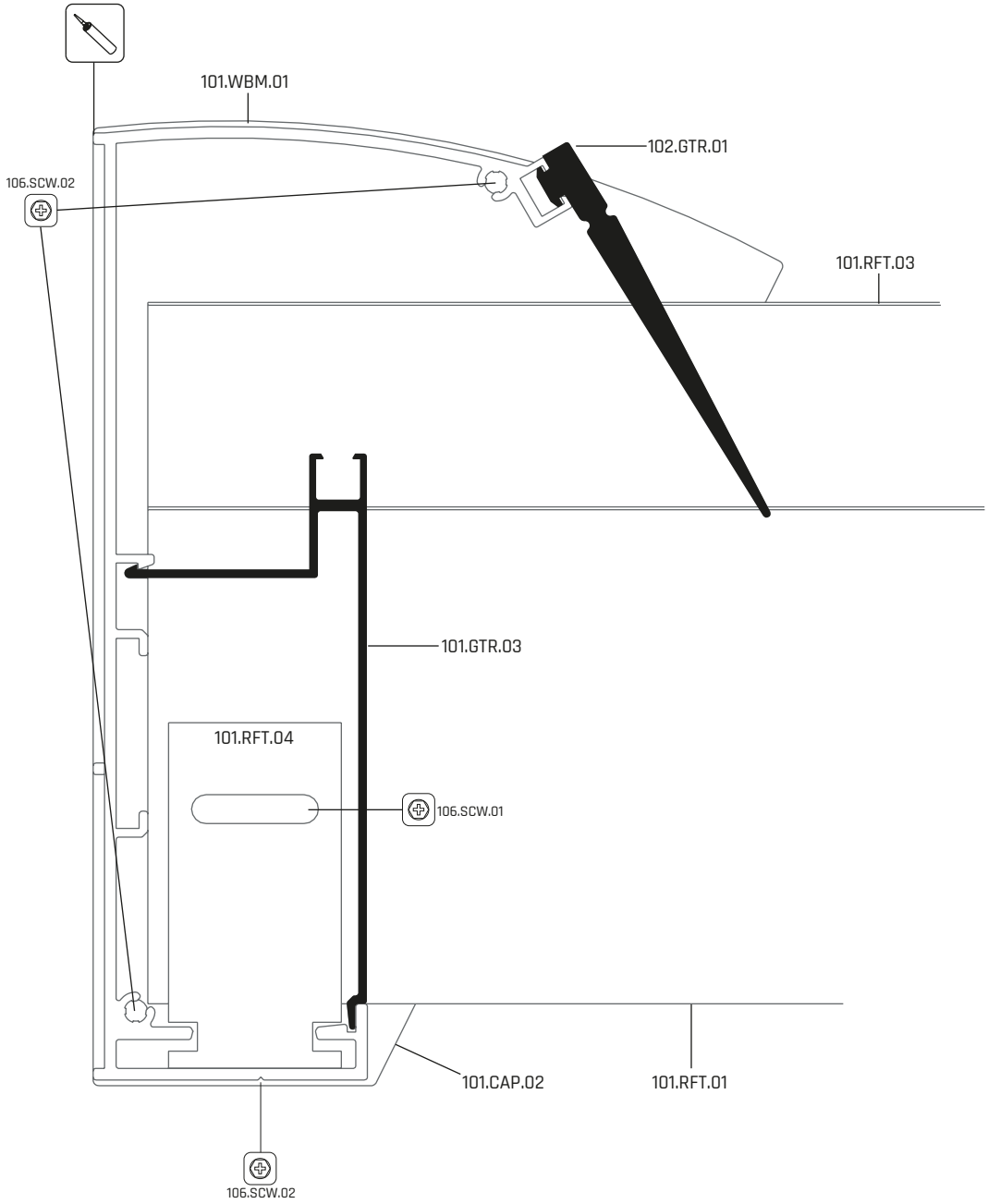


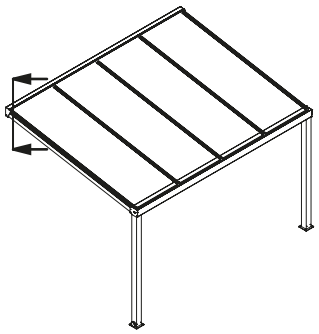
Screw Port





Screw Port





Screw Port

Silicone

CONNECTION DETAILS

Please refer to ANNEX A: “EVER PATIO COVER USER MANUAL AND INSTALLATION GUIDE” for assembly connection details.

LOAD CASES

DEAD LOAD (D)

Polycarbonate Sheet (PS) density: 1250 kg/m3
Mostly used PS combination (8+8mm) weight: D = 16mm*1250 kg/m3=20 kg/m2
or Glass combination (4+4 mm) weight: D = 8mm*2500 kg/m3=20 kg/m2
(Profile weights are calculated as “dead load” in the structural software.)

WIND LOAD (W)

Wind load suction / pressure is based on: W = 85 kg/m2

SNOW LOAD (S)

Snow load is taken as S = 85 kg/m2

LIVE LOAD (L)

Service load is estimated as a cleaner & equipment max. L = 100 kg

LOAD COMBINATIONS

COMB 1 (D)
COMB 2 (D + S)
COMB 3 (D + 0,75*S +0,75*L)
COMB 4 (D + L)
COMB 5 (D + W)
COMB 6 (D - W)

STANDARDS AND SOURCES

EN 1991-1-4 Wind Actions
EN 1991-1-3 Snow Loads
EN 13830 Curtain Walling - Product Standard
CWTC (Center for Window & Cladding Technology) Standard for Curtain Walling

LOAD ANALYZES

Calculation is made in the case of purlins the distance for every 1 meter.

DEAD LOAD (D) CASE:

Dead Load:
Fd = Ay1*20 kg/m2 = 1m * 20 kg/m2 = 20 kg/m
Fd = Ay1*20 kg/m2 = 0,5m * 20 kg/m2 = 10 kg/m

WIND LOAD (W) CASE:

Wind Load:
Fd = Ay1*85 kg/m2 = 1m * 85kg/m2 = 85 kg/m
Fd = Ay1*85 kg/m2 = 0,5m * 85kg/m2 = 55 kg/m

SNOW LOAD (S) CASE:

Snow Load:
Fd = Ay1*85 kg/m2 = 1m * 85 kg/m2 = 85 kg/m
Fd = Ay1*85 kg/m2 = 0,5m * 85 kg/m2 = 85 kg/m

LIVE LOAD (L) CASE:

Live Load:
Fd = 100 kg (as a point load.)
Due to different purlin lengths point loads are converted to distributed load.
Fd = 100 kg / 3m = 33,3 kg/m

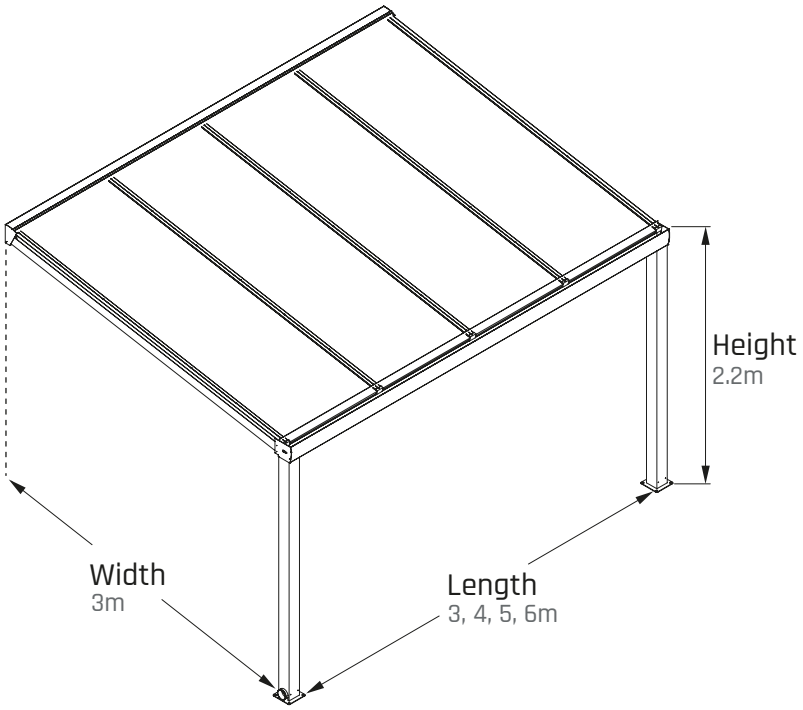
DEFLECTION DESIGN CRITERIA:

According to EN 1380:

Span L (mm)	Allowable Deflection (mm)
L < 4500 mm	L/200
L > 4500 mm	L/300

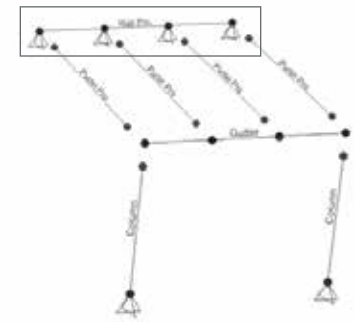
CASE STUDIES

Height is constant 2,2 meter and slope is %15. Length and width are variable in the cases below.
3x3 m, 4x3 m, 5x3m and 6x3m dimension cases will be checked.



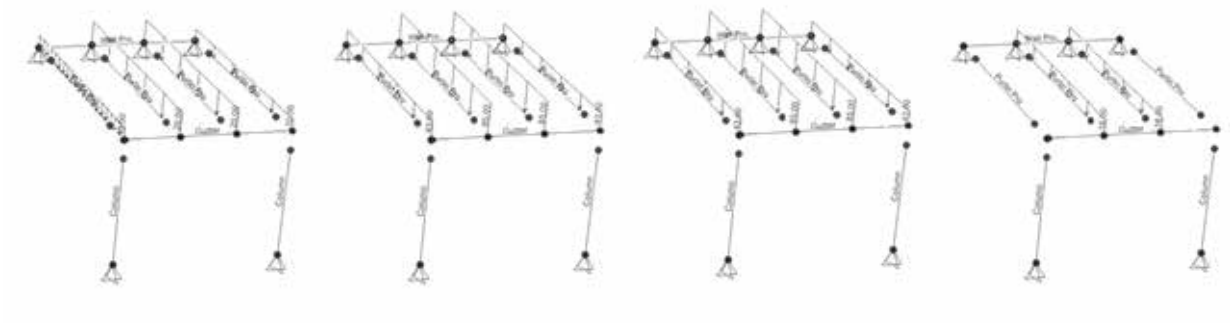
CASE 1

Width 3m, Length 3m
System is modelled shown below. As seen the highlighted wall profile must be fixed on the wall by anchors on every purlin line. Purlin profiles are used every 1 meter distance.



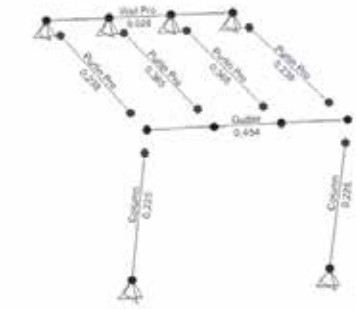
LOADINGS

Distributed design loads are assigned as Dead, Snow, Wind(kg/m) and Live unfavorable cases.



DESIGN

After the system is checked on software aluminium design ratios are shown below.



Units: Tonf, cm, C

AA-LRFD 2000 ALUMINUM SECTION CHECK Units: Tonf, cm, C

Frame ID: 100 Station Loc: 200,000 Section ID: Gutter
Element Type: Moment Resisting Classification: Slender

Lateral Factor:1,000 Use Lateral Factor: No Near-Weld Section: No

Resistance Factors:
Phiy=0,950 Phib=0,850 Phic=0,850 Phiu=0,850
Phicc=0,780 Phicp=0,800 PHIV=0,800 Phivp=0,900
kt=1,000

L=300,000
A=13,711 i22=510,326 i33=152,215
s22=68,043 s33=35,399 r22=6,101 r33=3,332

Designation: 6063-T6 Wrought Alloy
E=710,000 Fcy=1,758 Fty=1,758 Fsy=1,015 Fy=1,758 Ftu=2,109 Fsu=1,336

Buckling Constants
Bc =1,943 Dc =0,010 Cc =78,376 Bp =2,209 Dp =0,012 Cp =73,513
Bt =2,142 Dt =0,069 Ct =N/C Bbr=3,239 Dbr=0,027 Cbr=80,585
Btb=3,213 Dtb=0,197 Ctb=69,946 Bs =1,280 Ds =0,005 Cs =96,545
K1c=0,350 K2c=2,270 K1b=0,500 K2b=2,040

P-M33-M22 Demand/Capacity Ratio is 0,454 = 0,000 + 0,356 + 0,098

STRESS CHECK FORCES & MOMENTS

		P	M33	M22	V2	V3
Combo	COMB5	0,000	-13,496	10,532	-0,141	0,107

AXIAL FORCE & BIAXIAL MOMENT DESIGN (4.1.1-3)

		fa	Fa	Ft
		Stress	Allowable	Allowable
Axial		0,000	0,555	1,434

	Fc(flange) Compression	Fc(web) Compression	Fac0 Allowable	Fec Buckling	Fcr Buckling	Frc Allowable
Axial	0,688	1,575	1,178	0,864	0,568	0,555

	fb Stress	Fb Allowable	Fe Allowable	Cm Factor	K Factor	L Factor
Major Bending	0,381	1,071	0,674	0,850	1,000	1,000
Minor Bending	0,155	1,575	20,334	0,850	1,000	0,333

	Fb Tension	Fb(Flange) Compression	Fb(Web) Compression	Feb(Local) Buckling	Fcr(Local) Buckling	Frb(Local) Allowable
Major Bending	1,670	0,638	2,171	0,000	0,000	0,000
Minor Bending	1,670	1,694	1,575	0,000	0,000	0,000

σw < σR (Critical Ratio= 0,454) for Gutter Profile OK.
All sections are OK as per the capacity.

Units: Tonf, cm, C

AA-LRFD 2000 ALUMINUM SECTION CHECK Units: Tonf, cm, C

Frame ID: 97 Station Loc: 154,738 Section ID: Purlin Pro
Element Type: Moment Resisting Classification: Compact

Lateral Factor:1,000 Use Lateral Factor: No Near-Weld Section: No

Resistance Factors:
Phiy=0,950 Phib=0,850 Phic=0,850 Phiu=0,850
Phicc=0,920 Phicp=0,800 PHIV=0,800 Phivp=0,900
kt=1,000

L=309,477
A=8,881 i22=32,927 i33=112,371
s22=12,425 s33=24,166 r22=2,819 r33=3,729

Designation: 6063-T6 Wrought Alloy
E=710,000 Fcy=1,758 Fty=1,758 Fsy=1,015 Fy=1,758 Ftu=2,109 Fsu=1,336

Buckling Constants
Bc =1,943 Dc =0,010 Cc =78,376 Bp =2,209 Dp =0,012 Cp =73,513
Bt =2,142 Dt =0,069 Ct =N/C Bbr=3,239 Dbr=0,027 Cbr=80,585
Btb=3,213 Dtb=0,197 Ctb=69,946 Bs =1,280 Ds =0,005 Cs =96,545
K1c=0,350 K2c=2,270 K1b=0,500 K2b=2,040

P-M33-M22 Demand/Capacity Ratio is 0,365 = 0,000 + 0,365 + 0,000

STRESS CHECK FORCES & MOMENTS

		P	M33	M22	V2	V3
Combo	COMB5	0,111	12,448	0,000	0,000	0,000

AXIAL FORCE & BIAXIAL MOMENT DESIGN (BENDING)

		fa	Fa	Ft
		Stress	Allowable	Allowable
Axial		0,014	0,274	1,434

	Fc(Flange) Compression	Fc(web) Compression	Fac0 Allowable	Fec Buckling	Fcr Buckling	Frc Allowable
Axial	1,670	1,136	1,434	0,298	1,548	0,000

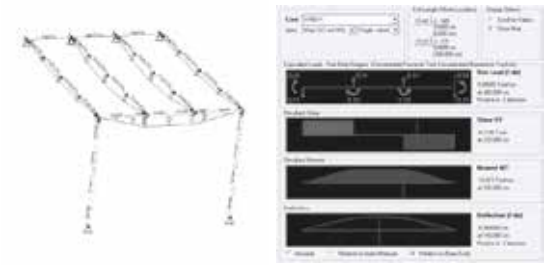
	fb Stress	Fb Allowable	Fe Allowable	Cm Factor	K Factor	L Factor
Major Bending	0,515	1,410	0,936	1,000	1,000	1,000
Minor Bending	0,000	1,173	0,274	1,000	1,000	1,000

	Fb Tension	Fb(Flange) Compression	Fb(Web) Compression	Feb(Local) Buckling	Fcr(Local) Buckling	Frb(Local) Allowable
Major Bending	1,670	1,670	2,112	0,000	0,000	0,000
Minor Bending	1,670	2,171	1,173	0,000	0,000	0,000

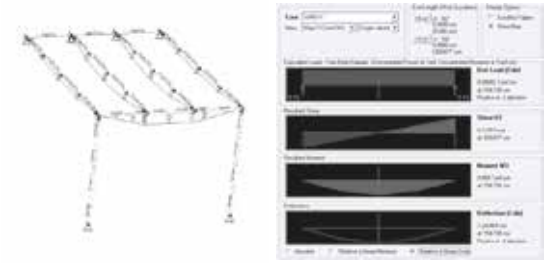
σw < σR (Ratio= 0,365) for Purlin Profile OK.
All sections are OK as per the capacity.

DEFLECTION

Max deflection is on Gutter Profile 300cm/200= 1,5 cm > 0,90 cm OK.



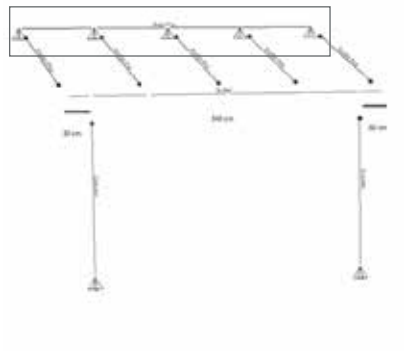
Max deflection is on Purlin Profile 300cm/200= 1,5 cm > 1,24 cm OK.



CASE 1 is OK.

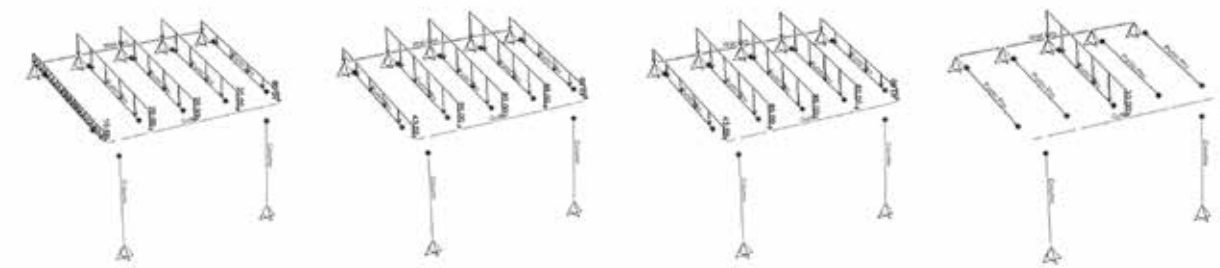
CASE 2

Width 3m, Length 4m
System is modelled shown below. As seen the highlighted wall profile must be fixed on the wall by anchors on every purlin line. 4 m gutter span is covered, purlins are still 3 m length. 30 cm distances are left from the edges.



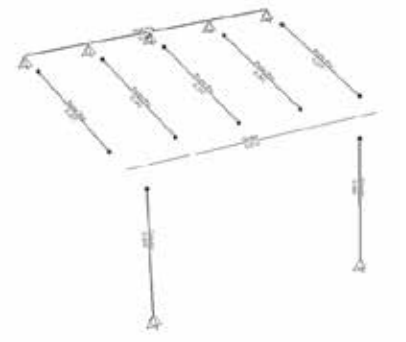
LOADINGS

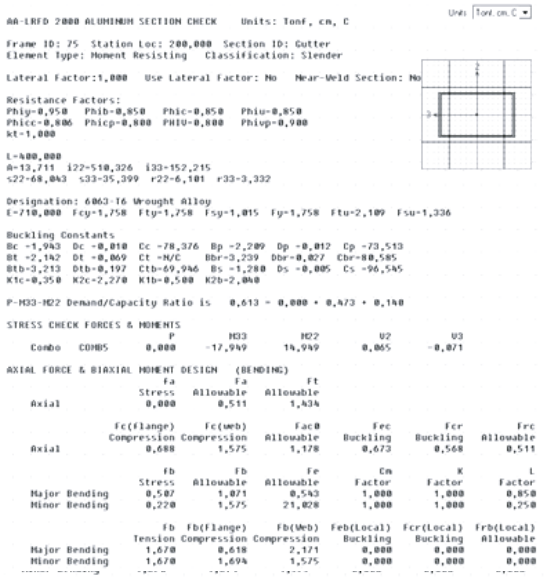
Distributed design loads are assigned as Dead, Snow, Wind and Live (kg/m) unfavorable cases.



DESIGN

After the system is checked on software aluminium design ratios are shown below.





AA-LRFD 2000 ALUMINUM SECTION CHECK Units: Tonf, cm, C

Frame ID: 75 Station Loc: 200,000 Section ID: Gutter
Element Type: Moment Resisting Classification: Slender

Lateral Factor:1,000 Use Lateral Factor: No Near-Weld Section: No

Resistance Factors:
Phiy=0,950 Phib=0,850 Phic=0,850 Phiu=0,850
Phicc=0,806 Phicp=0,800 PHIV=0,800 Phivp=0,900
kt=1,000

L=400,000
A=13,711 i22=510,326 i33=152,215
s22=68,043 s33=35,399 r22=6,101 r33=3,332

Designation: 6063-T6 Wrought Alloy
E=710,000 Fcy=1,758 Fty=1,758 Fsy=1,015 Fy=1,758 Ftu=2,109 Fsu=1,336

Buckling Constants
Bc =1,943 Dc =0,010 Cc =78,376 Bp =2,289 Dp =0,012 Cp =73,513
Bt =2,142 Dt =0,069 Ct =N/C Bbr=3,239 Dbr=0,027 Cbr=80,585
Btb=3,213 Dtb=0,197 Ctb=69,946 Bs =1,280 Ds =0,005 Cs =96,545
K1c=0,350 K2c=2,270 K1b=0,500 K2b=2,040

P-M33-M22 Demand/Capacity Ratio is 0,613 = 0,000 + 0,473 + 0,140

STRESS CHECK FORCES & MOMENTS

		P	M33	M22	V2	V3
Combo	COMB5	0,000	-17,949	14,949	0,065	-0,071

AXIAL FORCE & BIAXIAL MOMENT DESIGN (BENDING)

	Fa Stress	Fa Allowable	Ft Allowable
Axial	0,000	0,511	1,434

	Fc(flange) Compression	Fc(web) Compression	Fac0 Allowable	Fec Buckling	Fcr Buckling	Frc Allowable
Axial	0,688	1,575	1,178	0,673	0,568	0,511

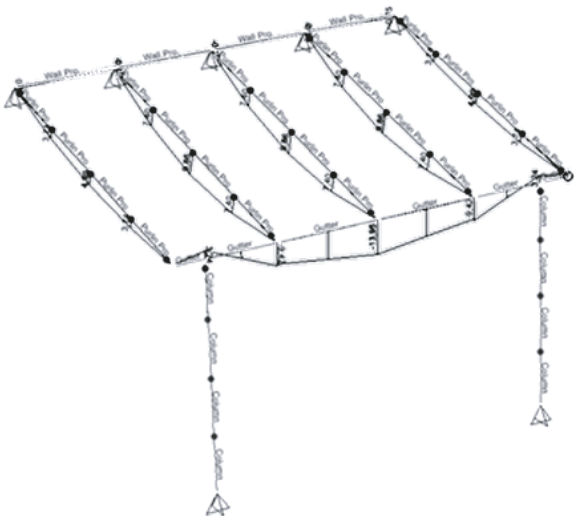
	fb Stress	Fb Allowable	Fe Allowable	Cm Factor	K Factor	L Factor
Major Bending	0,507	1,071	0,543	1,000	1,000	0,850
Minor Bending	0,220	1,575	21,028	1,000	1,000	0,250

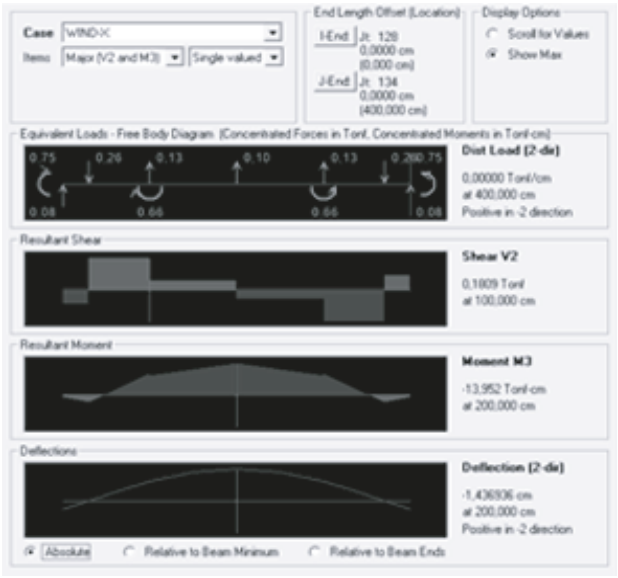
	fb Tension	Fb(Flange) Compression	Fb(Web) Compression	Feb(Local) Buckling	Fcr(Local) Buckling	Frb(Local) Allowable
Major Bending	1,670	0,618	2,171	0,000	0,000	0,000
Minor Bending	1,670	1,694	1,575	0,000	0,000	0,000

σw < σR (Critical Ratio= 0,613) for Gutter Profile OK.
All sections are OK as per the capacity.

DEFLECTION

Max deflection is on Gutter Profile 360cm/200= 1,8 cm > 1,43 cm OK.

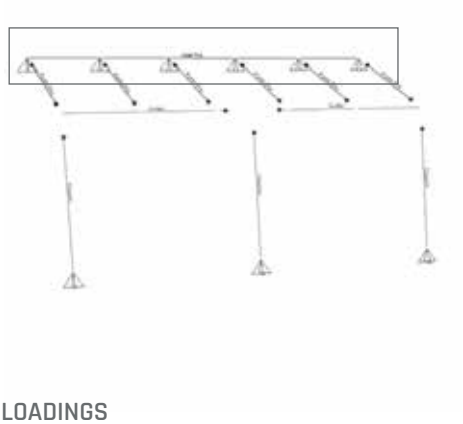




CASE 2 is OK.

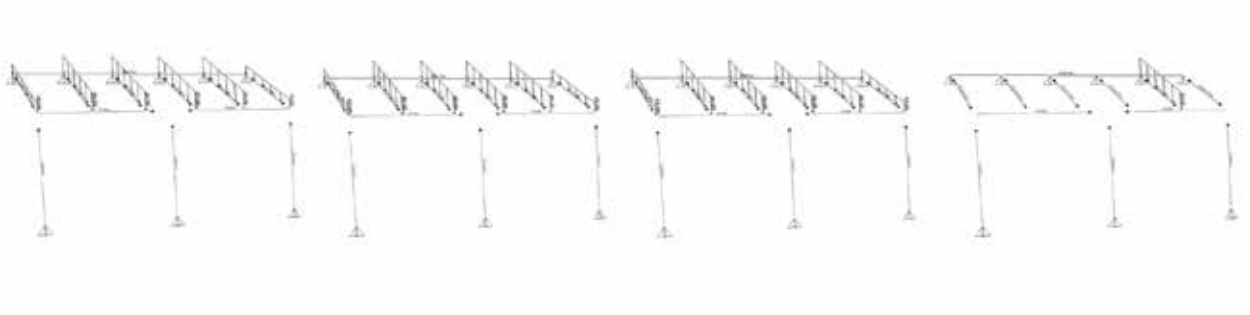
CASE 3

Width 3m, Length 5m
System is modelled shown below. As seen the highlighted wall profile must be fixed on the wall by anchors on every purlin line. 5 meters long gutter profile is supported by three columns.



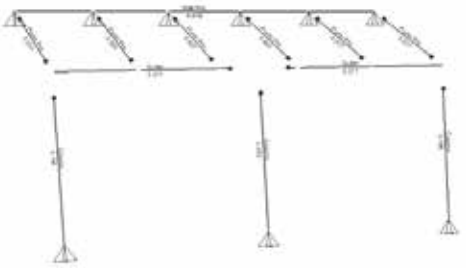
LOADINGS

Distributed design loads are assigned as Dead, Snow, Wind and Live (kg/m) unfavorable cases.



DESIGN

After the system is checked on software critical design ratios are shown below. Purlin(rafter) profile is critical than the gutter as seen below.



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AA-LRFD 2000 ALUMINUM SECTION CHECK    Units: Tonf, cm, C

Frame ID: 13  Station Loc: 154,738  Section ID: Purlin Pro
Element Type: Moment Resisting   Classification: Compact

Lateral Factor:1,000   Use Lateral Factor: No   Near-Weld Section: No

Resistance Factors:
Phiy=0,950   Phib=0,850   Phic=0,850   Phiu=0,850
Phicc=0,920  Phicp=0,800  PHIU=0,800   Phiup=0,900
kt=1,000

L=309,477
A=8,081  i22=32,927  i33=112,371
s22=12,425  s33=24,166  r22=2,019  r33=3,729

Designation: 6063-T6 Wrought Alloy
E=710,000  Fcy=1,758  Fty=1,758  Fsy=1,055  Fy=1,758  Ftu=2,109  Fsu=1,336

Buckling Constants
Bc =1,943  Dc =0,010  Cc =78,376  Bp =2,209  Dp =0,012  Cp =73,513
Bt =2,142  Dt =0,069  Ct =N/C    Bbr=3,239  Dbr=0,027  Cbr=80,585
Btb=3,213  Dtb=0,197  Ctb=69,946  Bs =1,280  Ds =0,005  Cs =96,545
K1c=0,350  K2c=2,270  K1b=0,500  K2b=2,040

P-M33-M22 Demand/Capacity Ratio is   0,407 = 0,042 + 0,365 + 0,000

STRESS CHECK FORCES & MOMENTS
                  P          M33          M22          V2          V3
    Combo   COMB5     -0,094       12,448        0,000       0,000       0,000

AXIAL FORCE & BIAXIAL MOMENT DESIGN   (A.1.1-3)
                  fa           Fa           Ft
                Stress   Allowable   Allowable
    Axial        0,012       0,274       1,434

                Fc(flange)     Fc(web)        Fac0         Fec         Fcr         Frc
              Compression Compression   Allowable    Buckling    Buckling   Allowable
    Axial           1,670       1,136       1,434       0,298       1,548       0,000

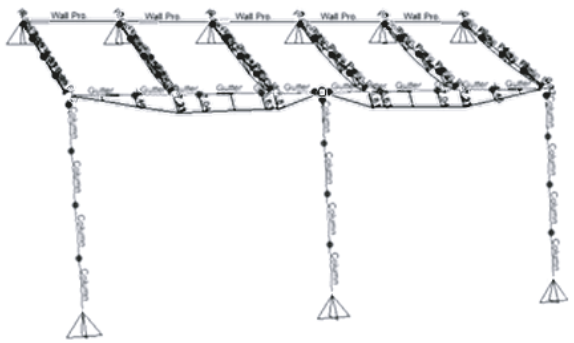
                  fb           Fb           Fe          Cm           K           L
                Stress   Allowable   Allowable      Factor      Factor      Factor
    Major Bending 0,515       1,410       0,936       0,850       1,000       1,000
    Minor Bending 0,000       1,173       0,274       0,850       1,000       1,000

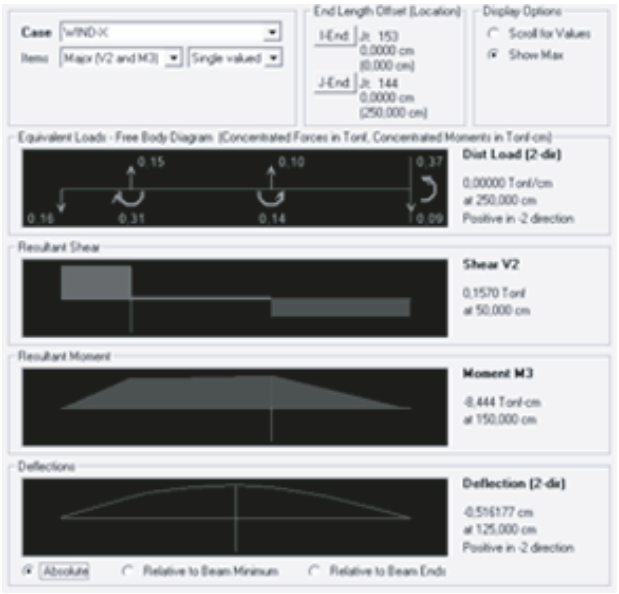
                  Fb  Fb(Flange)     Fb(Web)  Feb(Local)  Fcr(Local)  Frb(Local)
              Tension Compression Compression    Buckling    Buckling   Allowable
    Major Bending 1,670       1,670       2,112       0,000       0,000       0,000
    Minor Bending 1,670       2,171       1,173       0,000       0,000       0,000
```

σw < σR (Critical Ratio= 0,407) for Purlin Profile OK. All aluminium sections are OK as per the capacity.

DEFLECTION

Max deflection is on Gutter Profile 300cm/200= 1,50 cm > 0,52 cm OK.

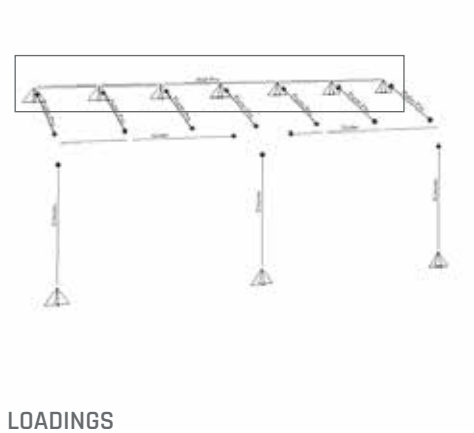




CASE 3 is OK.

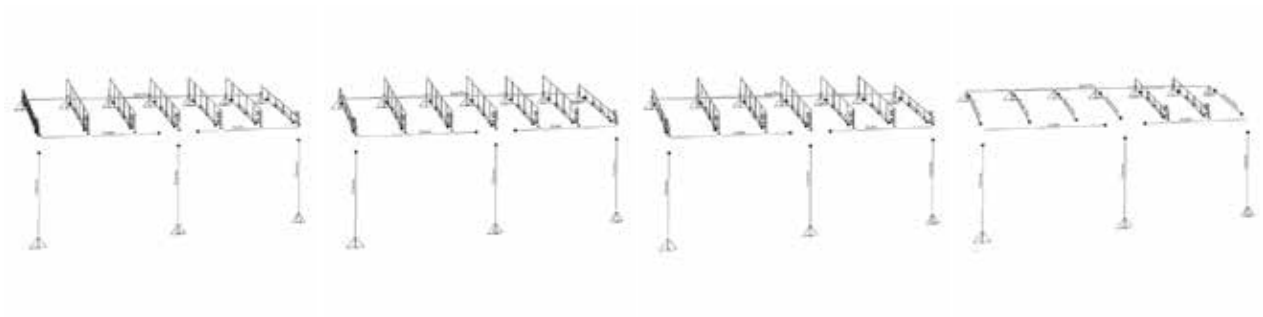
CASE 4

Width 3m, Length 6m
System is modelled shown below. As seen the highlighted wall profile must be fixed on the wall by anchors on every purlin line. 6 meters long gutter profile is supported by three columns.



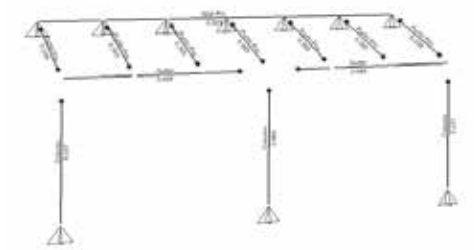
LOADINGS

Distributed design loads are assigned as Dead, Snow, Wind and Live (kg/m) in unfavorable cases.



DESIGN

After the system is checked on software critical design ratios are shown below.



```
AA-LRFD 2000 ALUMINUM SECTION CHECK    Units: Tonf, cm, C

Frame ID: 69  Station Loc: 200,000  Section ID: Gutter
Element Type: Moment Resisting   Classification: Slender

Lateral Factor:1,000   Use Lateral Factor: No   Near-Weld Section: No

Resistance Factors:
Phiy=0,950   Phib=0,850   Phic=0,850   Phiu=0,850
Phicc=0,780  Phicp=0,800  PHIV=0,800   Phivp=0,900
kt=1,000

L=300,000
A=13,711  i22=510,326  i33=152,215
s22=68,043  s33=35,399  r22=6,101  r33=3,332

Designation: 6063-T6 Wrought Alloy
E=710,000  Fcy=1,758  Fty=1,758  Fsy=1,015  Fy=1,758  Ftu=2,109  Fsu=1,336

Buckling Constants
Bc =1,943  Dc =0,010  Cc =78,376  Bp =2,209  Dp =0,012  Cp =73,513
Bt =2,142  Dt =0,069  Ct =N/C    Bbr=3,239  Dbr=0,027  Cbr=80,585
Btb=3,213  Dtb=0,197  Ctb=69,946  Bs =1,280  Ds =0,005  Cs =96,545
K1c=0,350  K2c=2,270  K1b=0,500  K2b=2,040

P-M33-M22 Demand/Capacity Ratio is   0,468 = 0,000 + 0,368 + 0,100

STRESS CHECK FORCES & MOMENTS
                  P          M33          M22          V2          V3
    Combo   COMB5       0,000      -13,968       10,711      -0,138       0,107

AXIAL FORCE & BIAXIAL MOMENT DESIGN   (4.1.1-3)
                  fa          Fa          Ft
              Stress   Allowable   Allowable
    Axial      0,000       0,555       1,434

              Fc(flange)     Fc(web)       Fac0        Fec         Fcr         Frc
             Compression Compression   Allowable   Buckling   Buckling   Allowable
    Axial          0,688       1,575       1,178       0,864       0,568       0,555

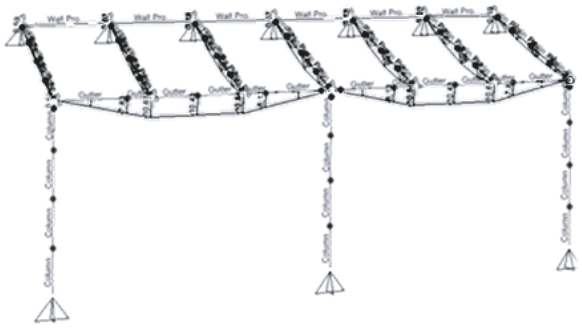
                  fb          Fb          Fe          Cm           K           L
              Stress   Allowable   Allowable      Factor      Factor      Factor
    Major Bending      0,395       1,071       0,674       0,850       1,000       1,000
    Minor Bending      0,157       1,575      20,334       0,850       1,000       0,333

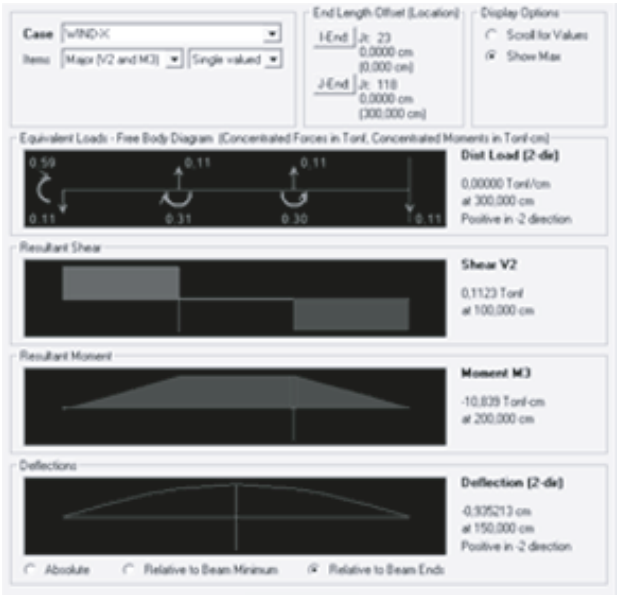
                  Fb  Fb(flange)     Fb(Web)  Feb(Local)  Fcr(Local)  Frb(Local)
             Tension Compression Compression   Buckling   Buckling   Allowable
    Major Bending      1,670       0,618       2,171       0,000       0,000       0,000
    Minor Bending      1,670       1,694       1,575       0,000       0,000       0,000
```

σw < σR (Critical Ratio= 0,468) for Column Profile OK.
All aluminium sections are OK as per the capacity.

DEFLECTION

Max deflection is on Purlin Profile 300cm/200= 1,5 cm > 0,94 cm OK.





CASE 4 is OK.

CONCLUSION

EVER SOUL PATIO COVER Profile System's maximum design dimension are defined with this report.

These dimensions :
3 m width x 3 m length system and
3 m width x 4 m length (3,6 m ablosute) system can be solved with one opening (two columns).
3m width x 5m length system and
4 m width x 6 m length system can be solved with two opening (three columns).