PV LETTERS

STRUCTURAL CALCULATIONS
FOR

HELIODYNE COLLECTORS RAILS AND MOUNTS

Pitched Shingle and Metal Roofing
Honolulu, Hawaii

November 18, 2025

518 Lake Cleveland Street • Burley, ID 83318 • ph: 208-994-1680 • www.pvletters.com

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SCOPE OF WORK

This report applies to the Heliodyne solar collector system installed on flush-mount shingle and metal roofs. The purpose of this analysis is to verify that the proprietary mounting rails and attachment configurations meet the structural load-resistance requirements of the applicable code for installation in a high-wind region of Honolulu, Hawaii. The evaluation includes:

- Determination of gravity and wind pressures on the solar collector assembly
- Structural modeling of the rail
- Computation of forces and reactions at attachment points
- Verification of rail and mounting capacities
- Comparison of analysis results to manufacturer-provided or calculated capacities

The respective acceptable design criteria are outlined in this report.

CONCLUSION

After analysis, the Heliodyne rail and mounting system has been determined to be adequate to support imposed loads in conditions outlined below. Typical residential building in Honolulu, Hawaii areas should be covered by the tabulated conditions. All racking and collector parts shall be designed and installed per manufacturer's approved installation specifications.

Table 1: Design criteria for pitched roof with shingles

Heliodyne Collectors: Dual collector system

Codes: 2021 Hawaii Building Code, ASCE 7-16
Risk Category: II

Condition 1: (Mounting: 6 total attachment - 3 on the bottom rail and 3 top on the top rail)

Basic wind speed V, mph:	140
Exposure Category:	B
Dead Load, psf:	3.3
Roof Angle, degrees:	20

Condition 2: (Mounting: 6 total attachment - 3 on the bottom rail and 3 top on the top rail)

Basic wind speed V, mph:	140
Exposure Category:	C
Dead Load, psf:	3.3
Roof Angle, degrees:	20

Condition 3: (Mounting: 6 total attachment - 3 on the bottom rail and 3 top on the top rail)

Basic wind speed V, mph:	140
Exposure Category:	D
Dead Load, psf:	3.3
Roof Angle, degrees:	20

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Table 2: Design criteria for pitched roof with metal roofing

Heliodyne Collectors: Dual collector system

Codes: 2021 Hawaii Building Code, ASCE 7-16
Risk Category: II

Condition 4: (Mounting: 8 total attachment - 4 on the bottom rail and 4 top on the top rail)

Basic wind speed V, mph:	140
Exposure Category:	B
Dead Load, psf:	3.3
Roof Angle, degrees:	20

Condition 5: (Mounting: 10 total attachment - 5 on the bottom rail and 5 top on the top rail)

Basic wind speed V, mph:	140
Exposure Category:	C
Dead Load, psf:	3.3
Roof Angle, degrees:	20

Condition 6: (Mounting: 12 total attachment - 6 on the bottom rail and 6 top on the top rail)

Basic wind speed V, mph:	140
Exposure Category:	D
Dead Load, psf:	3.3
Roof Angle, degrees:	20

REFERENCES

ASCE Minimum Design Loads for Buildings and Other Structures (ASCE7-16)
2018 National Design Specification for Wood Construction (NDS)
2015 Aluminum Design Manual (ADM)

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NOTES AND LIMITS OF SCOPE OF WORK

1. Racks are installed on both shorts sides of the collectors (portrait orientation)
2. The strength of the collectors is not part of the scope of this report
3. Engineer of Record for each specific site shall be responsible for its analysis and design forces
4. This report can be used for reference only for sites meeting Table 1 and 2
5. For Table 1&2, maximum building height considered is 40 feet
6. For Tables 1&2, the governing load case occurs at a roof pitch of 20 degrees
7. Heliodyne solar mounting system installed on shingle roofing can be placed in all roof zones 1, 2, and 3.
8. Heliodyne solar mounting system installed for metal roofing shall be placed exclusively within designated Zone 1 (interior) roof areas. No components may encroach into Zone 2 or Zone 3 (edge or corner zones).

BACKGROUND

This report summarizes the structural engineering methodology and findings for the Heliodyne solar collector mounting system evaluated in a high-wind region of Honolulu, Hawaii. The analysis addresses the adequacy of the rail members, attachment hardware, and overall mounting configuration under different wind load conditions.

Determination of Wind Pressures

Wind pressures acting on the Heliodyne collector were calculated in accordance with ASCE 7-16 Chapter 29. The collector is analyzed as a rigid, flush-mounted solar panel with minimal standoff height relative to roof surface. Resulting design uplift pressures were converted into line loads and applied to the rail system as distributed loads for structural analysis.

Rail Modeling and Analysis

The proprietary rail profile used for the collector assembly does not match any standard shape listed in Aluminum Design Manual tables; therefore, the rail geometry was modeled in SkyCiv Section Builder to determine section properties. Extracted section properties are shown in Table 3:

Table 3: Mounting Rail Section Properties

Rail Section Properties	
Area of Section	1.35764 in^2
X-coordinate centroid	1.07661 in
Y-coordinate centroid	0.869911 in
Moment of inertia about principal X-axis	0.428955 in^4
Moment of inertia about principal Y-axis	0.758509 in^4
Torsion constant	0.257576 in^4
Moment capacity about principal X-axis	2295 lb-ft
Moment capacity about principal Y-axis	2101.2 lb-ft

RISA 3D Structural Analysis

A structural model of the collector rails was created in RISA 3D to evaluate member forces. The analysis considers:

- Rail spans between discrete attachment points
- Gravity load from collector weight
- ASCE 7 wind loads applied as distributed loads under different conditions

RISA 3D calculated internal forces are used as the governing design demands. Then, demand-to-capacity ratios were computed.

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Load Calculation for Shingle Roofing

Solar Collector Dead Load	3.3	psf
Solar Collector Wind Load (Exposure B)	48.9	psf
Solar Collector Wind Load (Exposure C)	71.1	psf
Solar Collector Wind Load (Exposure D)	83.3	psf
Tributary length	4.33	ft

Applied Loading (to RISA)

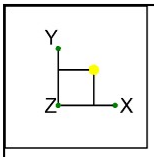
Solar Collector Dead Load	**14.30**	plf
Solar Collector Wind Load (Exposure B)	**211.90**	plf
Solar Collector Wind Load (Exposure C)	**308.10**	plf
Solar Collector Wind Load (Exposure D)	**360.97**	plf

Load Calculation for Metal Roofing

Solar Collector Dead Load	3.3	psf
Solar Collector Wind Load (Exposure B)	48.9	psf
Solar Collector Wind Load (Exposure C)	99.3	psf
Solar Collector Wind Load (Exposure D)	116.3	psf
Tributary length	4.33	ft

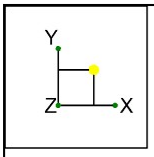
Applied Loading (to RISA)

Dead Load	**0.00**	plf
Solar Collector Dead Load	**14.30**	plf
Solar Collector Wind Load (Exposure B)	**211.90**	plf
Solar Collector Wind Load (Exposure C)	**430.30**	plf
Solar Collector Wind Load (Exposure D)	**503.97**	plf



2D Lock ON

FOR SHINGLE ROOFING



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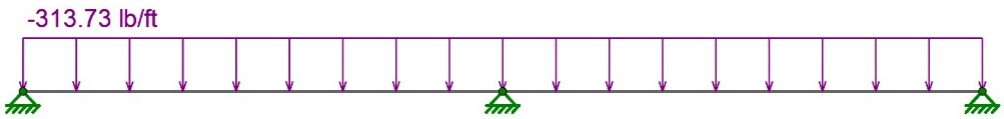

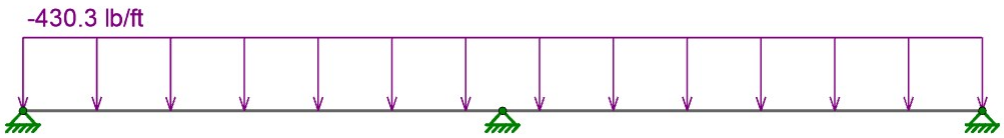

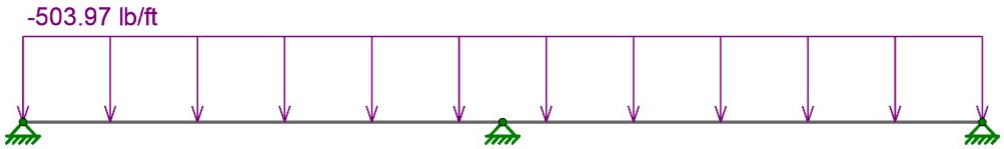

Loads: BLC 3, WL

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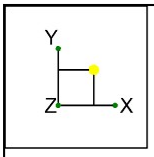
	JA		Member Check.r3d
	COM - 085		



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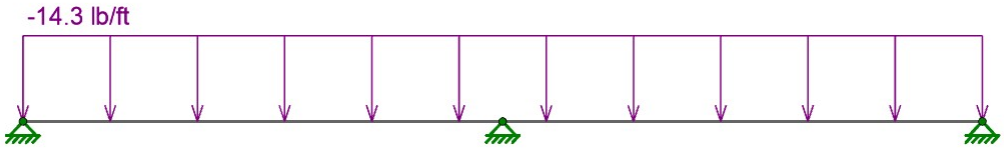

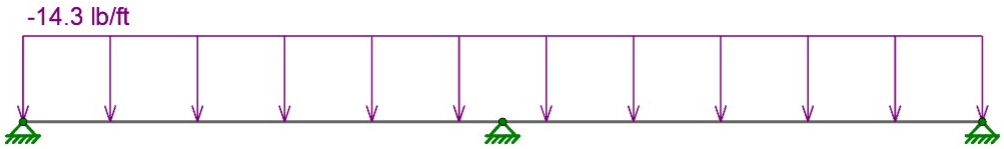

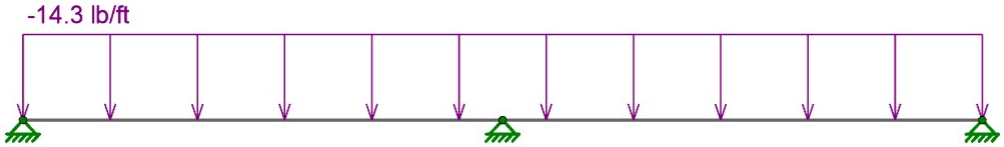

Loads: BLC 2, DL-Solar

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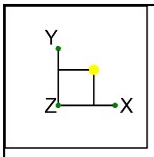
	JA		Member Check.r3d
	COM - 085		



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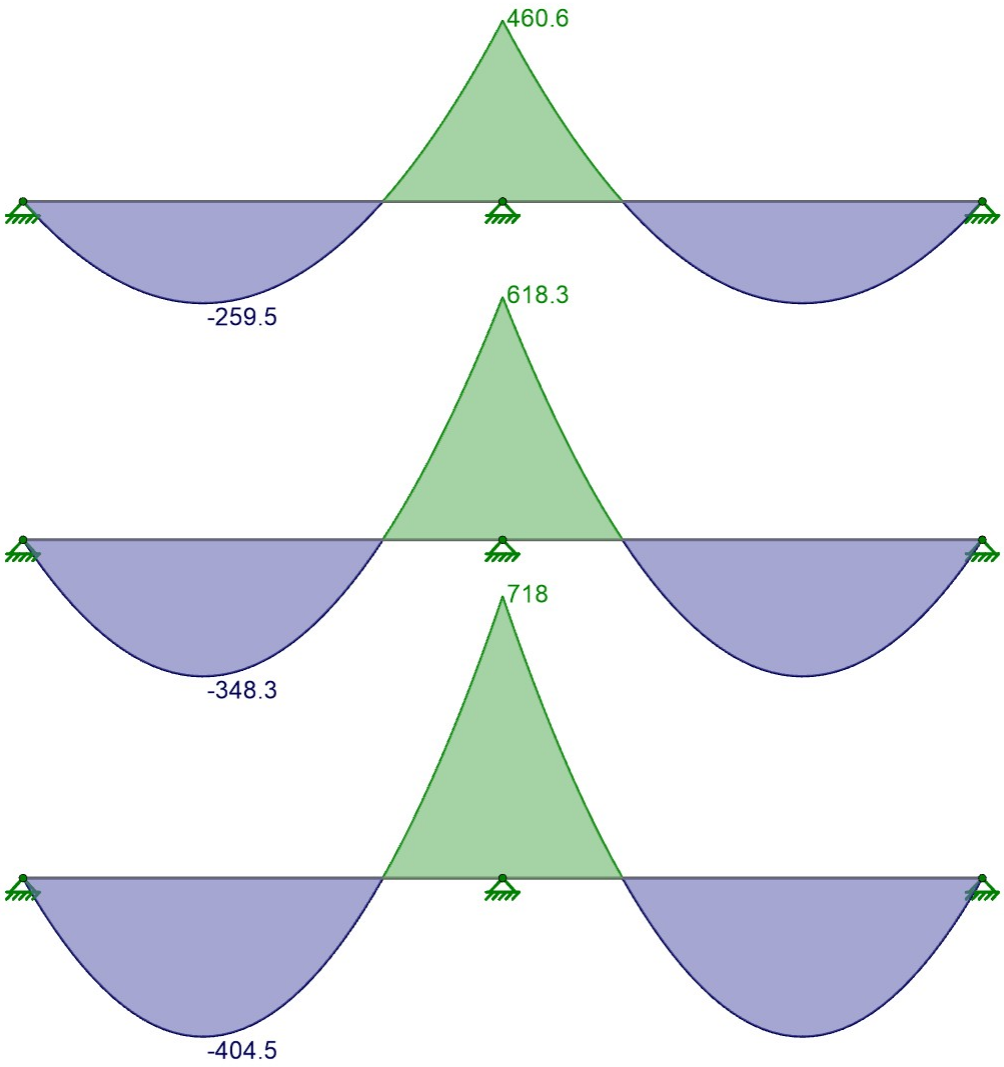
FOR SHINGLE ROOFING



Results for LC 1, IBC 21/ASCE ASD 5 (a)
Member z Bending Moments (lb-ft)

FOR SHINGLE ROOFING

General Materials Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Plate Methodology
1	gen_Alum	10100	4077	0.3	1.29	0.173	Isotropic

General Section Sets

	Label	Shape	Type	Material	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	Rail_Exposure B	HELIODYNERAIL	Beam	gen_Alum	1.358	0.751	0.437	0.258
2	Rail_Exposure C	HELIODYNERAIL	Beam	gen_Alum	1.358	0.751	0.437	0.258
3	Rail_Exposure D	HELIODYNERAIL	Beam	gen_Alum	1.358	0.751	0.437	0.258

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N4	N6	Rail_Exposure D	Beam	None	gen_Alum	Typical
2	M2	N5	N7	Rail_Exposure C	Beam	None	gen_Alum	Typical
3	M3	N9	N10	Rail_Exposure B	Beam	None	gen_Alum	Typical

Member Distributed Loads (BLC 2 : DL-Solar)

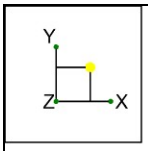
	Member Label	Direction	Start Magnitude [lb/ft, F, psf, k-ft/ft]	End Magnitude [lb/ft, F, psf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Y	-14.3	-14.3	0	%100
2	M2	Y	-14.3	-14.3	0	%100
3	M3	Y	-14.3	-14.3	0	%100

Member Distributed Loads (BLC 3 : WL)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, k-ft/ft]	End Magnitude [lb/ft, F, psf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Y	-503.97	-503.97	0	%100
2	M2	Y	-430.3	-430.3	0	%100
3	M3	Y	-313.73	-313.73	0	%100

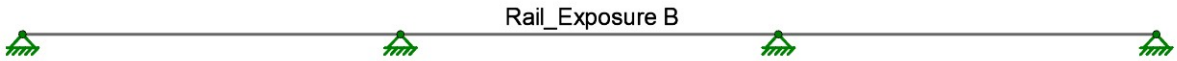
Load Combinations

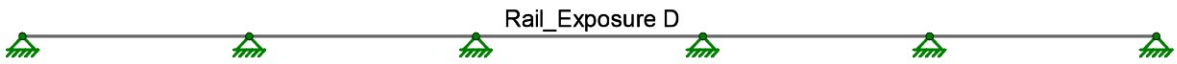
	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor
1	IBC 21/ASCE ASD 5 (a)	Yes	Y	DL	1	WL	0.6		
2	IBC 21/ASCE ASD 6 (a)	Yes	Y	DL	1	WL	0.45		
3	IBC 21/ASCE ASD 6 (b)	Yes	Y	DL	1	WL	0.45	SL	0.75
4	IBC 21/ASCE ASD 7	Yes	Y	DL	0.6	WL	0.6		

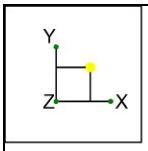


2D Lock ON

FOR METAL ROOFING







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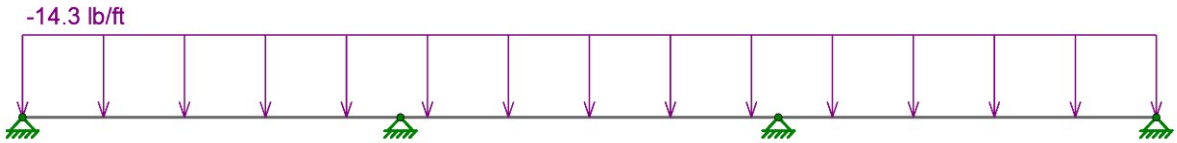
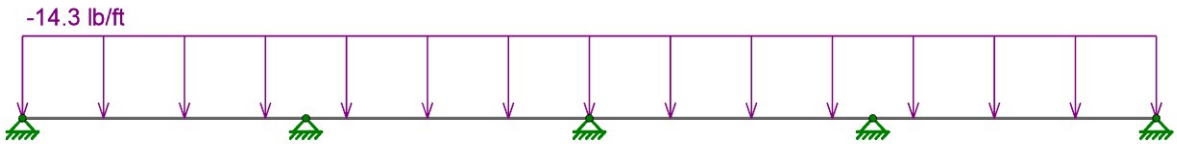
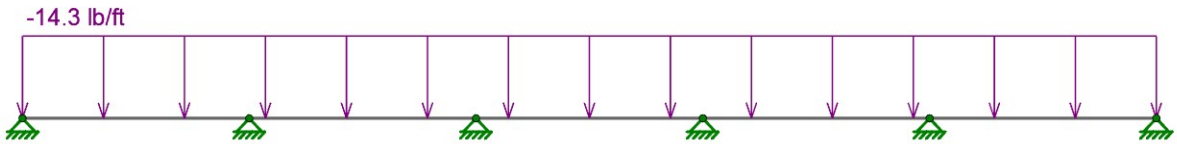
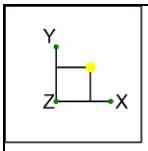






Loads: BLC 2, DL-Solar



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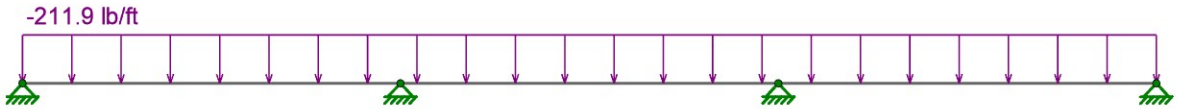
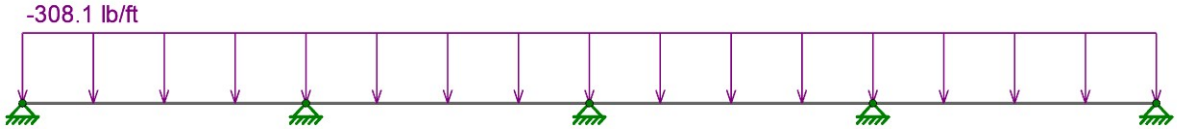
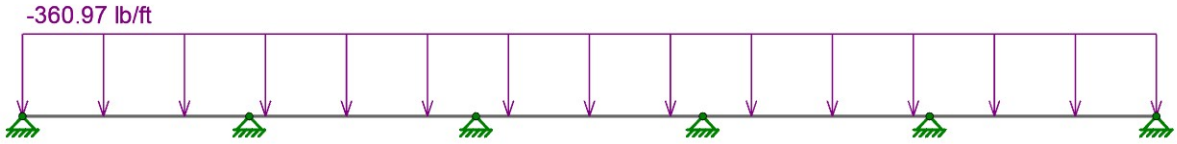
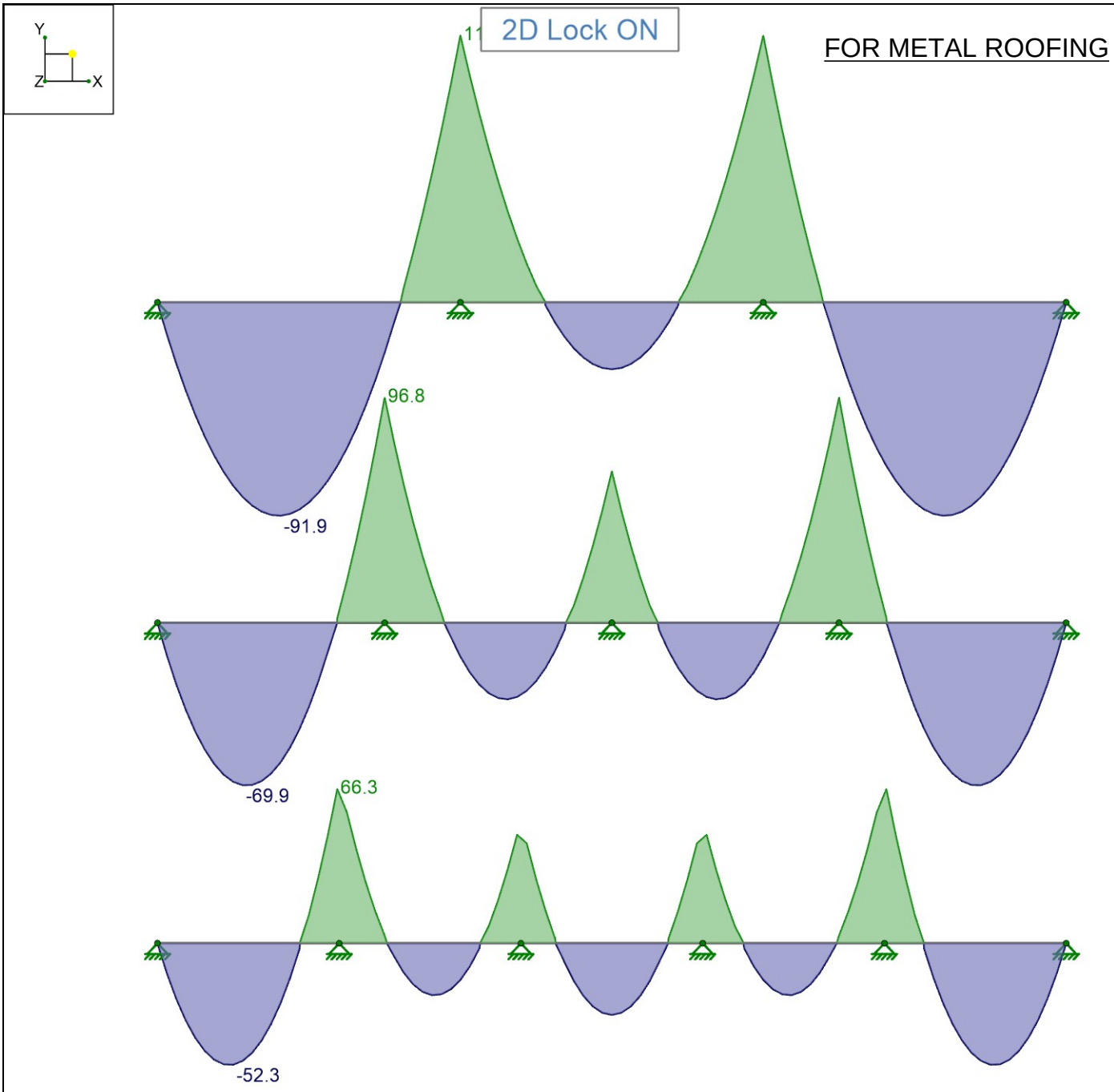






Loads: BLC 3, WL



Results for LC 1, IBC 21/ASCE ASD 5 (a)
Member z Bending Moments (lb-ft)

IRISA A NEMETSCHEK COMPANY	PV Letters	Heliodyne collectors rack structures (HI)	SK-6
	JA		Member Check.r3d
	COM - 085		

FOR METAL ROOFING

General Materials Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Plate Methodology
1	gen_Alum	10100	4077	0.3	1.29	0.173	Isotropic

General Section Sets

	Label	Shape	Type	Material	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	Rail_Exposure B	HELIODYNERAIL	Beam	gen_Alum	1.358	0.751	0.437	0.258
2	Rail_Exposure C	HELIODYNERAIL	Beam	gen_Alum	1.358	0.751	0.437	0.258
3	Rail_Exposure D	HELIODYNERAIL	Beam	gen_Alum	1.358	0.751	0.437	0.258

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N4	N6	Rail_Exposure D	Beam	None	gen_Alum	Typical
2	M2	N5	N7	Rail_Exposure C	Beam	None	gen_Alum	Typical
3	M3	N9	N10	Rail_Exposure B	Beam	None	gen_Alum	Typical

Member Distributed Loads (BLC 2 : DL-Solar)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/ft]	End Magnitude [lb/ft, F, psf, lb-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Y	-14.3	-14.3	0	%100
2	M2	Y	-14.3	-14.3	0	%100
3	M3	Y	-14.3	-14.3	0	%100

Member Distributed Loads (BLC 3 : WL)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/ft]	End Magnitude [lb/ft, F, psf, lb-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Y	-360.97	-360.97	0	%100
2	M2	Y	-308.1	-308.1	0	%100
3	M3	Y	-211.9	-211.9	0	%100

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor
1	IBC 21/ASCE ASD 5 (a)	Yes	Y	DL	1	WL	0.6		
2	IBC 21/ASCE ASD 6 (a)	Yes	Y	DL	1	WL	0.45		
3	IBC 21/ASCE ASD 6 (b)	Yes	Y	DL	1	WL	0.45	SL	0.75
4	IBC 21/ASCE ASD 7	Yes	Y	DL	0.6	WL	0.6		

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Rail Capacity Check				
Shingle Roofing Conditions	Demand (lb-ft)	Capacity (lb-ft)	Ratio	Remarks
Condition 1	460.6	2101.2	0.219	OK
Condition 2	618.3	2101.2	0.294	OK
Condition 3	718	2101.2	0.342	OK

Rail Capacity Check				
Metal Roofing Conditions	Demand (lb-ft)	Capacity (lb-ft)	Ratio	Remarks
Condition 4	114.8	2101.2	0.055	OK
Condition 5	96.8	2101.2	0.046	OK
Condition 6	66.3	2101.2	0.032	OK

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Connection Calculation (Exposure B) - Shingle Roofing

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	52
Roof Angle, degrees	20
Roof Layout	Gable
Wind Speed, mph	140
Exposure Coefficient, K_z	0.76
Topographic Factor, K_{zt}	1.00
Directionality Factor, K_d	0.85
Elevation Factor, K_e	1.00
Velocity Pressure q_z, psf	32.4
Prying Coefficient	1

Zones:	1	2n, 2r, 2e	3r, 3e
Spacing parallel to rail, in	48	48	48
GC_p (max)	2.00	2.66	3.17
Exposed Panels? (γ_E = 1.5)	No	No	No
Effective Wind Area on each con., ft^2	17.3	17.3	17.3
Pressure Equalization Factor, γ_a	0.70	0.70	0.70
Uplift Force, psf	45.7	60.7	72.4
Max. Uplift Force / Connection (0.6 WL), lbs	474.9	631.2	752.7
Solar Dead Load (0.6 DL). Lbs	31.2	31.2	31.2
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**443.7**	**600.0**	**721.5**

Connection Capacity

Connection Type	ProSolar FastJack E-Series
Ultimate Capacity, lbs	3600
Factor of Safety	2.50
Total Capacity, lbs	**1440.0**

Compare ASD Factored Demand to Capacity

Demand, lbs	721.5
Capacity, lbs	1440.0
Result	**Capacity exceeds demands. Therefore, connection passes.**

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Connection Calculation (Exposure C) - Shingle Roofing

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	52
Roof Angle, degrees	20
Roof Layout	Gable
Wind Speed, mph	140
Exposure Coefficient, K_z	1.04
Topographic Factor, K_{zt}	1.00
Directionality Factor, K_d	0.85
Elevation Factor, K_e	1.00
Velocity Pressure q_z, psf	44.5
Prying Coefficient	1

Zones:	1	2n, 2r, 2e	3r, 3e
Spacing parallel to rail, in	48	48	48
GC_p (max)	2.00	2.66	3.17
Exposed Panels? (γ_E = 1.5)	No	No	No
Effective Wind Area on each con., ft^2	17.3	17.3	17.3
Pressure Equalization Factor, γ_a	0.70	0.70	0.70
Uplift Force, psf	62.6	83.3	99.3
Max. Uplift Force / Connection (0.6 WL), lbs	651.5	866.0	1032.7
Solar Dead Load (0.6 DL). Lbs	31.2	31.2	31.2
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**620.3**	**834.8**	**1001.5**

Connection Capacity

Connection Type	ProSolar FastJack E-Series
Ultimate Capacity, lbs	3600
Factor of Safety	2.50
Total Capacity, lbs	**1440.0**

Compare ASD Factored Demand to Capacity

Demand, lbs	1001.5
Capacity, lbs	1440.0
Result	**Capacity exceeds demands. Therefore, connection passes.**

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Connection Calculation (Exposure D) - Shingle Roofing

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	52
Roof Angle, degrees	20
Roof Layout	Gable
Wind Speed, mph	140
Exposure Coefficient, K_z	1.22
Topographic Factor, K_{zt}	1.00
Directionality Factor, K_d	0.85
Elevation Factor, K_e	1.00
Velocity Pressure q_z, psf	52.1
Prying Coefficient	1

Zones:	1	2n, 2r, 2e	3r, 3e
Spacing parallel to rail, in	48	48	48
GC_p (max)	2.00	2.66	3.17
Exposed Panels? (γ_E = 1.5)	No	No	No
Effective Wind Area on each con., ft^2	17.3	17.3	17.3
Pressure Equalization Factor, γ_a	0.70	0.70	0.70
Uplift Force, psf	73.3	97.5	116.3
Max. Uplift Force / Connection (0.6 WL), lbs	762.8	1013.9	1209.1
Solar Dead Load (0.6 DL). Lbs	31.2	31.2	31.2
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**731.6**	**982.7**	**1177.9**

Connection Capacity

Connection Type	ProSolar FastJack E-Series
Ultimate Capacity, lbs	3600
Factor of Safety	2.50
Total Capacity, lbs	**1440.0**

Compare ASD Factored Demand to Capacity

Demand, lbs	1177.9
Capacity, lbs	1440.0
Result	**Capacity exceeds demands. Therefore, connection passes.**

PV LETTERS

Bracket Connection Calculation (Exposure B) - Metal Roofing

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	52
Roof Angle, degrees	20
Roof Layout	Gable
Wind Speed, mph	140
Exposure Coefficient, K_z	0.76
Topographic Factor, K_{zt}	1.00
Directionality Factor, K_d	0.85
Elevation Factor, K_e	1.00
Velocity Pressure q_z, psf	32.4
Prying Coefficient	1

Zones:	1	2n, 2r, 2e	3r, 3e
Spacing parallel to rail, in	36	Not Affected	Not Affected
GC_p (max)	2.00	N/A	N/A
Exposed Panels? (γ_E = 1.5)	No	N/A	N/A
Effective Wind Area on each con., ft^2	13.0	N/A	N/A
Pressure Equalization Factor, γ_a	0.75	N/A	N/A
Uplift Force, psf	48.9	N/A	N/A
Max. Uplift Force / Connection (0.6 WL), lbs	381.4	N/A	N/A
Solar Dead Load (0.6 DL). Lbs	23.4	N/A	N/A
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**358.0**	N/A	N/A

Connection Capacity

Connection Type	S-5! RibBracket
Ultimate Capacity, lbs	904
Factor of Safety	2.50
Total Capacity, lbs	**361.6**

Compare ASD Factored Demand to Capacity

Demand, lbs	358.0
Capacity, lbs	361.6
Result	**Capacity exceeds demands. Therefore, connection passes.**

PV LETTERS

Bracket Connection Calculation (Exposure C) - Metal Roofing

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	52
Roof Angle, degrees	20
Roof Layout	Gable
Wind Speed, mph	140
Exposure Coefficient, K_z	1.04
Topographic Factor, K_{zt}	1.00
Directionality Factor, K_d	0.85
Elevation Factor, K_e	1.00
Velocity Pressure q_z, psf	44.5
Prying Coefficient	1

Zones:	1	2n, 2r, 2e	3r, 3e
Spacing parallel to rail, in	24	Not Affected	Not Affected
GC_p (max)	2.00	N/A	N/A
Exposed Panels? (γ_E = 1.5)	No	N/A	N/A
Effective Wind Area on each con., ft^2	8.7	N/A	N/A
Pressure Equalization Factor, γ_a	0.80	N/A	N/A
Uplift Force, psf	71.1	N/A	N/A
Max. Uplift Force / Connection (0.6 WL), lbs	369.9	N/A	N/A
Solar Dead Load (0.6 DL). Lbs	15.6	N/A	N/A
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**354.3**	N/A	N/A

Connection Capacity

Connection Type	S-5! RibBracket
Ultimate Capacity, lbs	904
Factor of Safety	2.50
Total Capacity, lbs	**361.6**

Compare ASD Factored Demand to Capacity

Demand, lbs	354.3
Capacity, lbs	361.6
Result	**Capacity exceeds demands. Therefore, connection passes.**

PV LETTERS

Bracket Connection Calculation (Exposure D) - Metal Roofing

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	52
Roof Angle, degrees	20
Roof Layout	Gable
Wind Speed, mph	140
Exposure Coefficient, K_z	1.22
Topographic Factor, K_{zt}	1.00
Directionality Factor, K_d	0.85
Elevation Factor, K_e	1.00
Velocity Pressure q_z, psf	52.1
Prying Coefficient	1

Zones:	1	2n, 2r, 2e	3r, 3e
Spacing parallel to rail, in	20	Not Affected	Not Affected
GC_p (max)	2.00	N/A	N/A
Exposed Panels? (γ_E = 1.5)	No	N/A	N/A
Effective Wind Area on each con., ft^2	7.2	N/A	N/A
Pressure Equalization Factor, γ_a	0.80	N/A	N/A
Uplift Force, psf	83.3	N/A	N/A
Max. Uplift Force / Connection (0.6 WL), lbs	361.0	N/A	N/A
Solar Dead Load (0.6 DL). Lbs	13.0	N/A	N/A
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**348.0**	N/A	N/A

Connection Capacity

Connection Type	S-5! RibBracket
Ultimate Capacity, lbs	904
Factor of Safety	2.50
Total Capacity, lbs	**361.6**

Compare ASD Factored Demand to Capacity

Demand, lbs	348.0
Capacity, lbs	361.6
Result	**Capacity exceeds demands. Therefore, connection passes.**

Appendices

Section Property Report

Geometric Properties

Area		1.35764	in^2
C_z		1.07661	in
C_y		0.869911	in

Moment of Inertia

I_z		0.436865	in^4
I_y		0.750598	in^4
I_{zy}		-50.4414×10^{-3}	in^4
I_{zp}		0.428955	in^4
I_{yp}		0.758509	in^4
α		8.91275	°
r_z		0.567259	in
r_y		0.743552	in
r_{zp}		0.562099	in
r_{yp}		0.747459	in

Elastic Section Moduli

S_{zt}		0.371456	in^3
S_{zb}		0.502195	in^3
S_{yt}		0.635354	in^3
S_{yb}		0.697184	in^3
S_{zpt}		0.272926	in^3
S_{zpb}		0.300121	in^3
S_{ypt}		0.550813	in^3
S_{ypb}		0.559707	in^3

Torsion and Warping Properties

J		0.257576	in^4
r		1.43339	in
I_w		91.1682×10^{-3}	in^6
$\beta_{z,\,pos}$		-0.210559	in
$\beta_{y,\,pos}$		-0.371751	in
$\beta_{zp,\,pos}$		-0.263762	in
$\beta_{yp,\,pos}$		-0.339718	in

Section Capacity

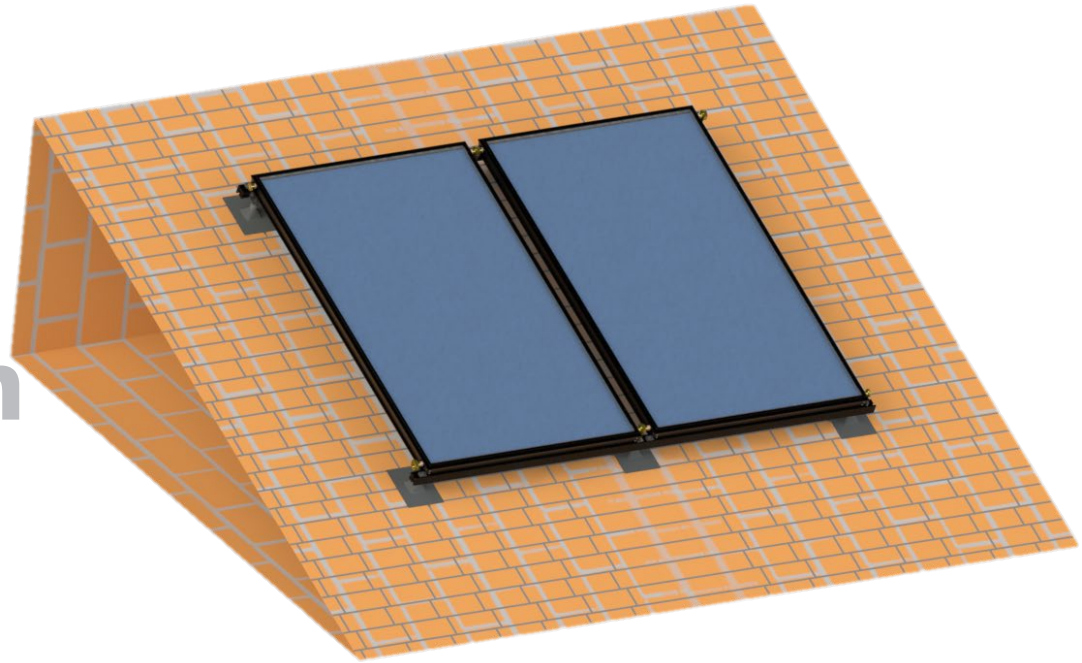
$R_{y,base}$		36	ksi
$M_{pl,zp}$		2.295	kip-ft
$M_{pl,yp}$		2.1012	kip-ft
$M_{pl,z}$		2.0826	kip-ft
$M_{pl,y}$		2.6586	kip-ft
$N_{pl,x}$		48.8751	kip

heliodyne
SOLAR HOT WATER

INSTALLATION GUIDE

Two Collector Flush Mounting Using Rails with Fast Jack

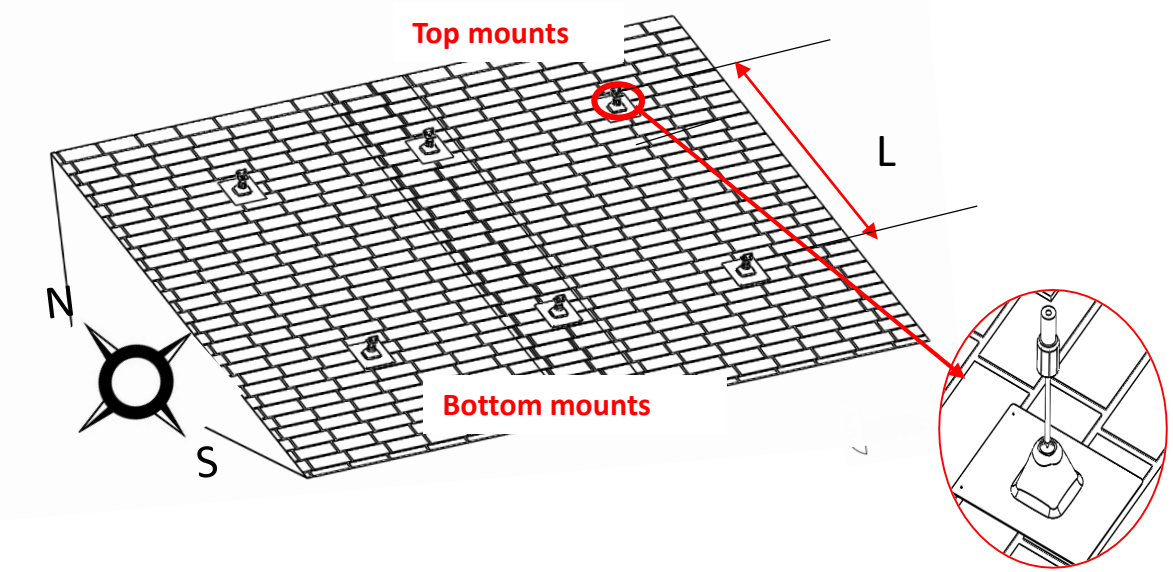
FLSH 001 013 & RAIL 002 00B



EXCELLENCE BY DESIGN

Step 1 -Mark the point where the fast jack will be mounted on the roof *

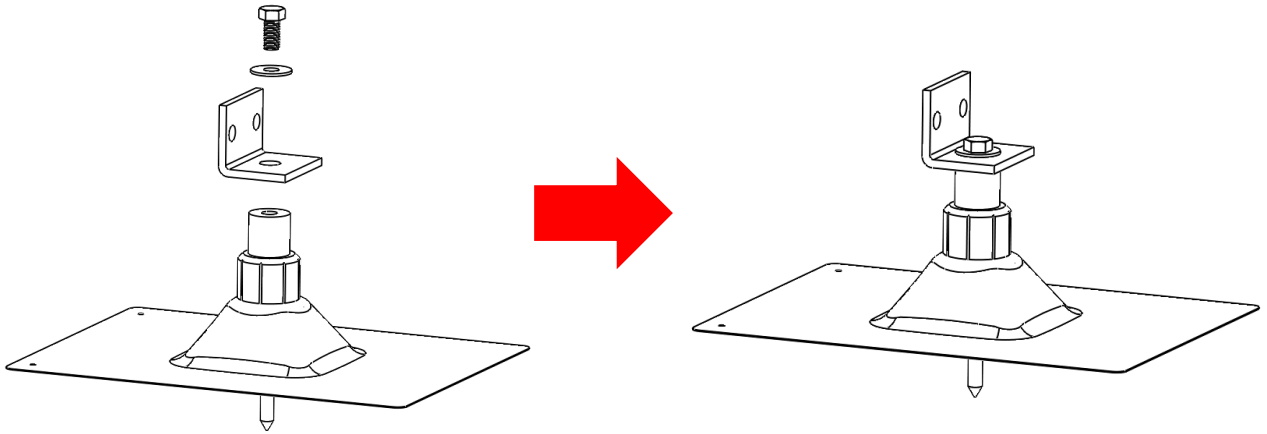
GOBI MODEL	L (INCHES)
406 00X	64”
408 00X	80”
410 00X	104”



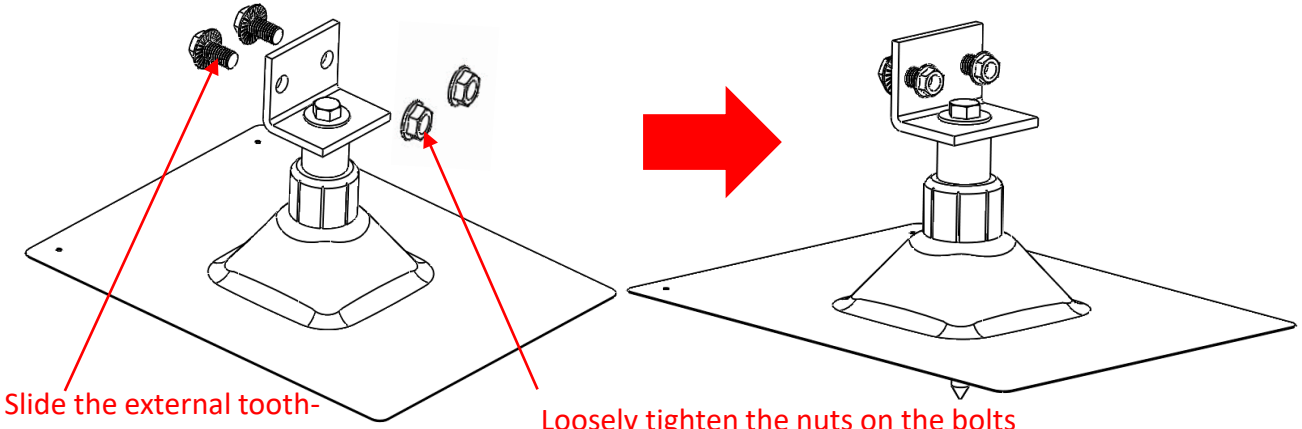
*Ensure the placement of the fast jack on the roof secures them to the roof rafters/ structure or as per the PE recommendation to maintain structural integrity.

Step 2 – Install the fast jack on the roof. Refer to **Appendix A** for roof attachments and **Appendix B** for fast jack installation

Step 3 – Connect the L- Bracket to the fast jack



Step 4 - Prepare the mounts for the rail installation



Step 1 -Mark the point where the fast jack will be mounted on the roof *

GOBI MODEL	L (INCHES)
406 00X	64”
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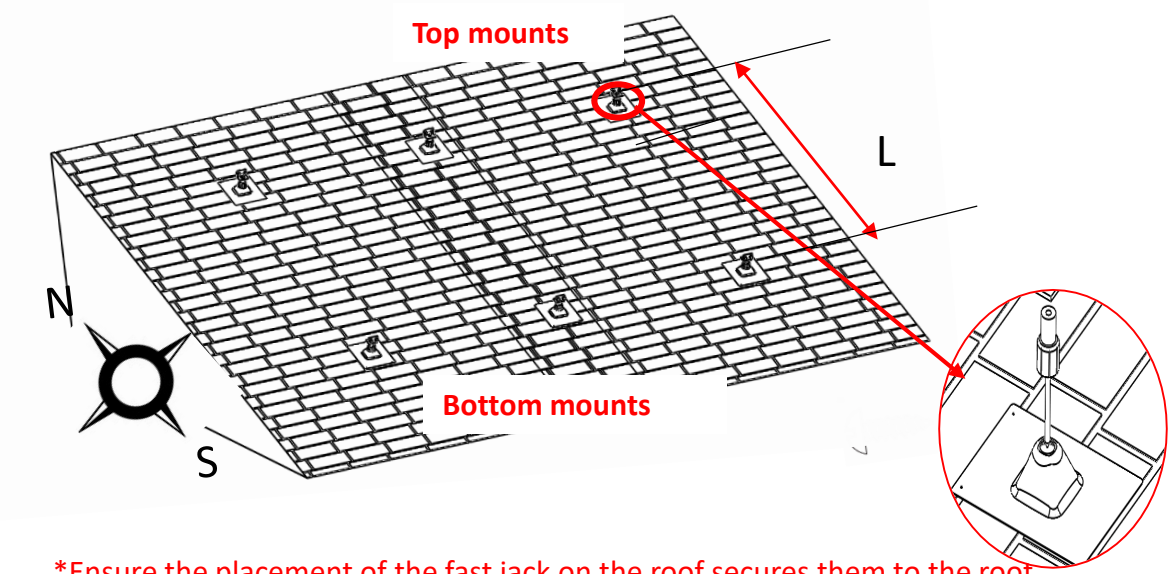
410 00X	104”



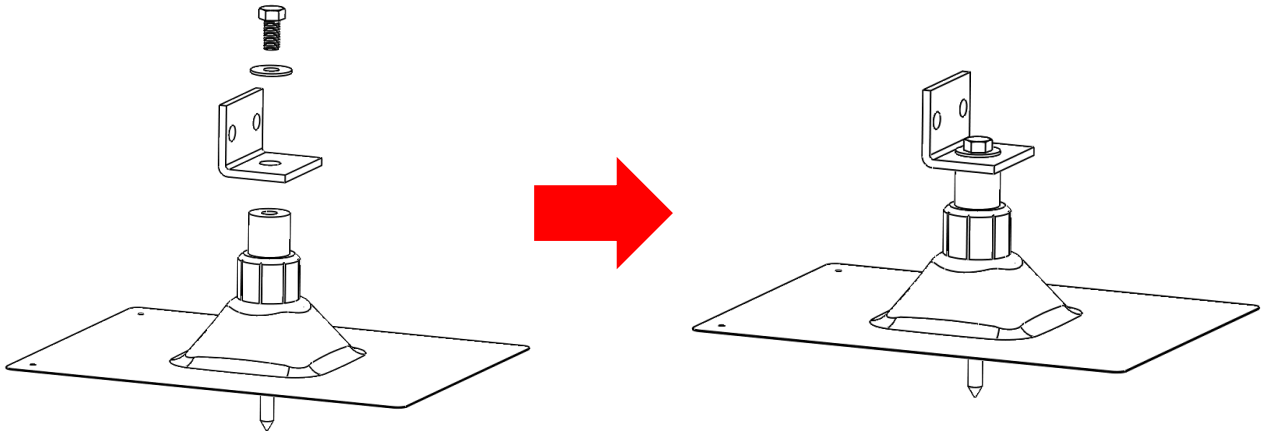
*Ensure the placement of the fast jack on the roof secures them to the roof rafters/ structure or as per the PE recommendation** to maintain structural integrity.

***As per the Design Basis – Provided by Honolulu Plumbing Department, calculations by the PE recommend the following attachment configuration:*

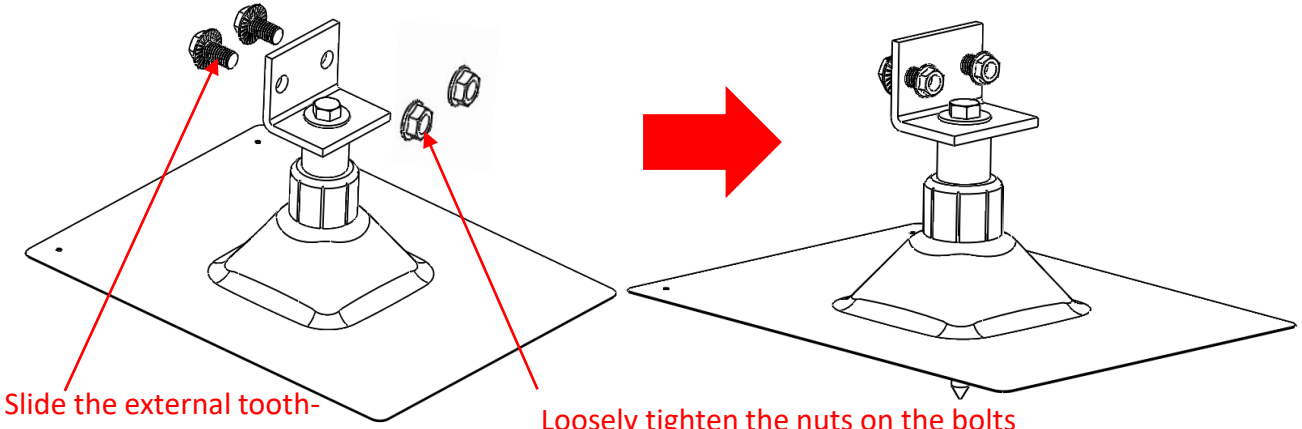
EXPOSURE CATEGORY	TOTAL NUMBER OF ATTACHMENTS
EXPOSURE B, C & D	6

Step 2 – Install the fast jack on the roof. Refer to **Appendix A** for roof attachments and **Appendix B** for fast jack installation

Step 3 – Connect the L- Bracket to the fast jack

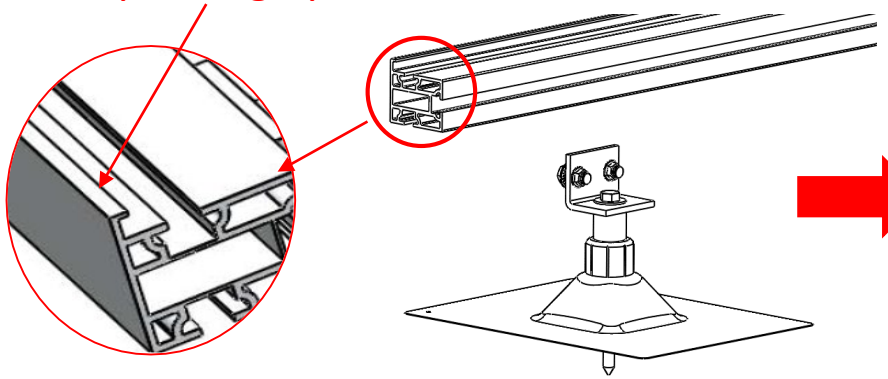


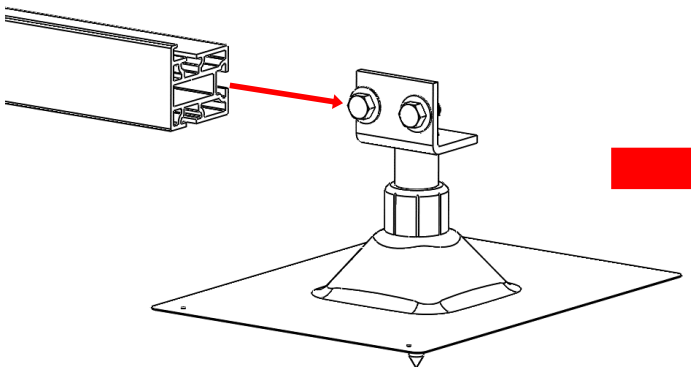
Step 4 - Prepare the mounts for the rail installation



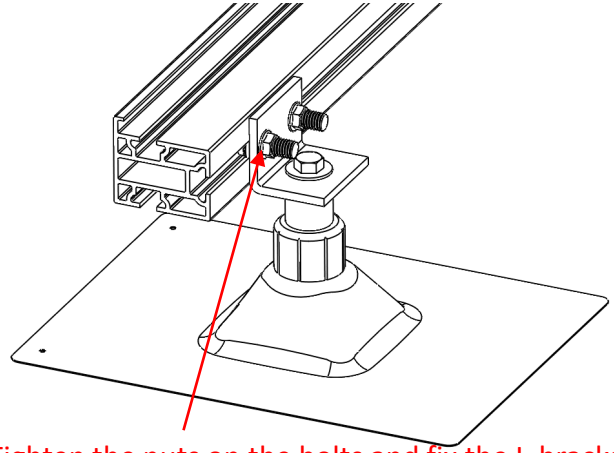
Step 5 – Bottom rail orientation for front mount and installing the bottom rail on the front mounts

Rail lip facing up



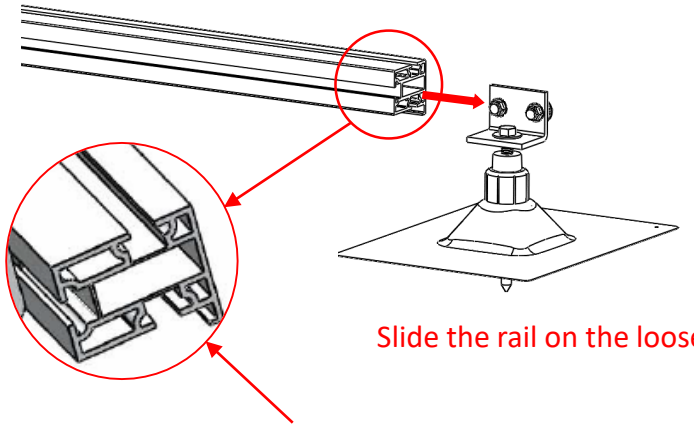


Slide the rail on the loosely tightened bolts



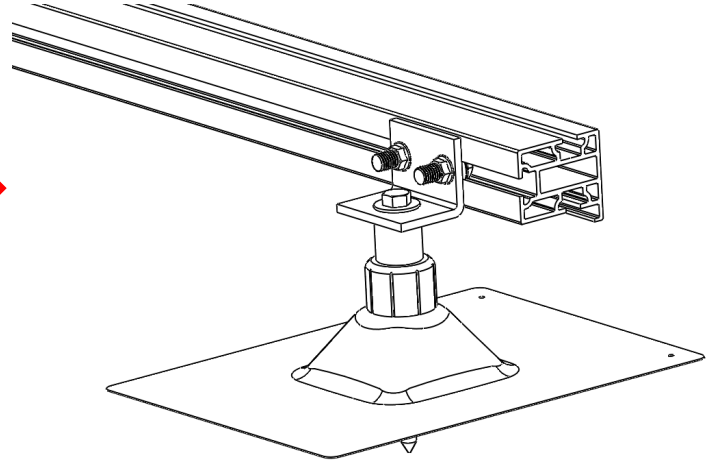
Tighten the nuts on the bolts and fix the L-bracket to the bottom rail

Step 6 – Top rail orientation for back mounts and installing the L- bracket with the top rail



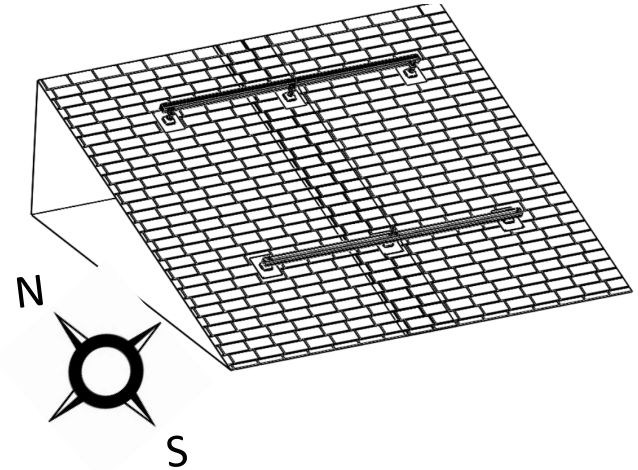
Slide the rail on the loosely tightened bolts

Rail lip facing down



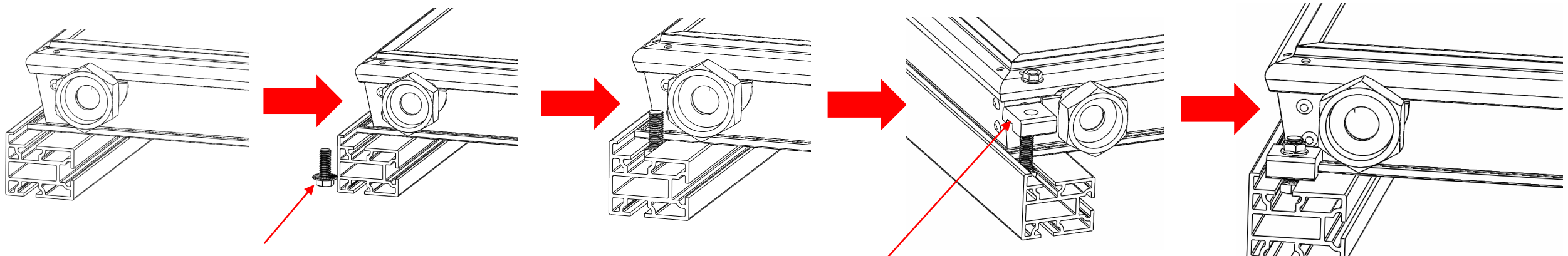
Tighten the nuts on the bolts and fix the L-bracket to the top rail

Step 7 – Install all mounts

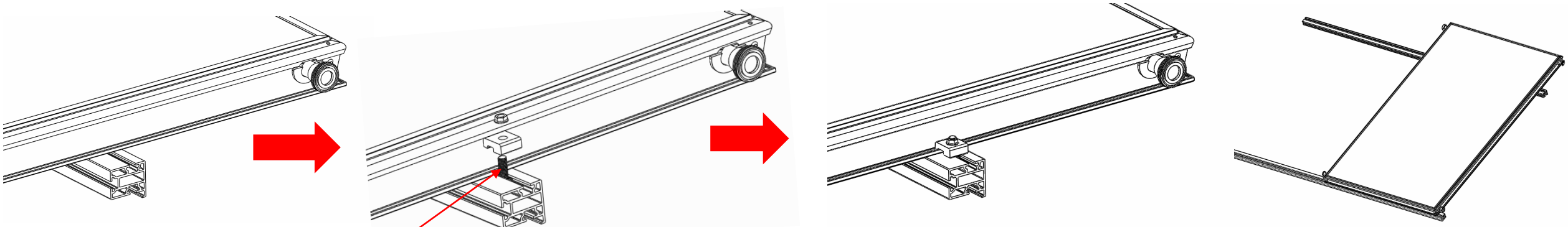


Note : To add more rails/ legs you need to install a splice kit please refer to the splice kit installation manual

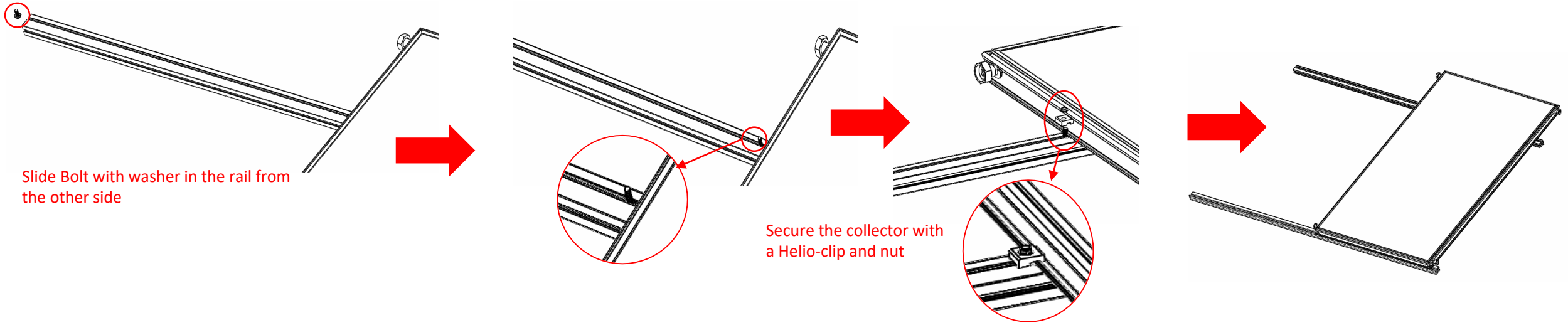
Step 8 –Slide the 1st Gobi collector on the bottom rail and secure the collector with the bottom rail using the helio-clip



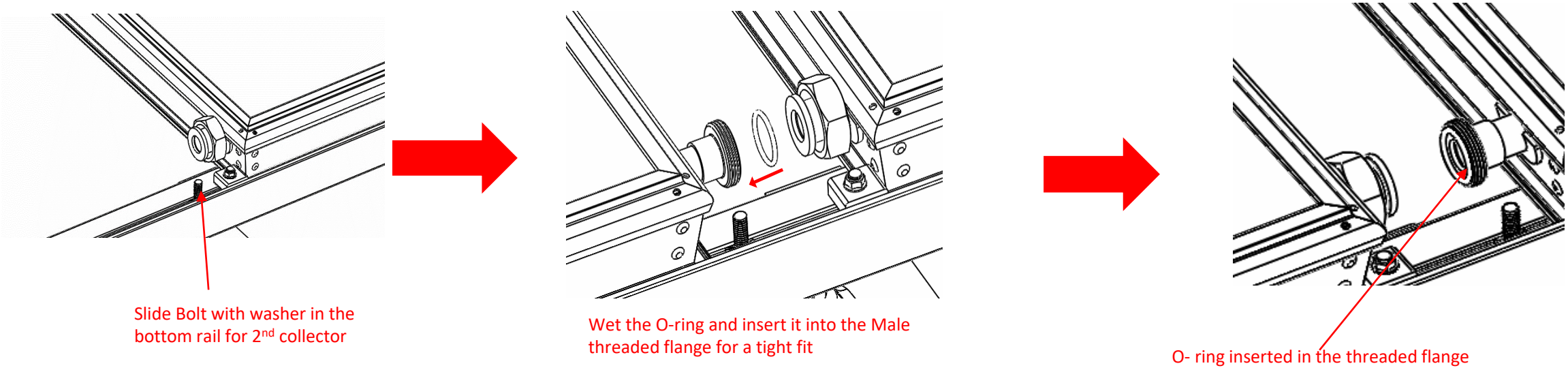
Step 9 – The 1st Gobi collector rests on the top rail and secure the collector with the top rail using the helio-clip



Step 10 –Fixing the other side of the collector

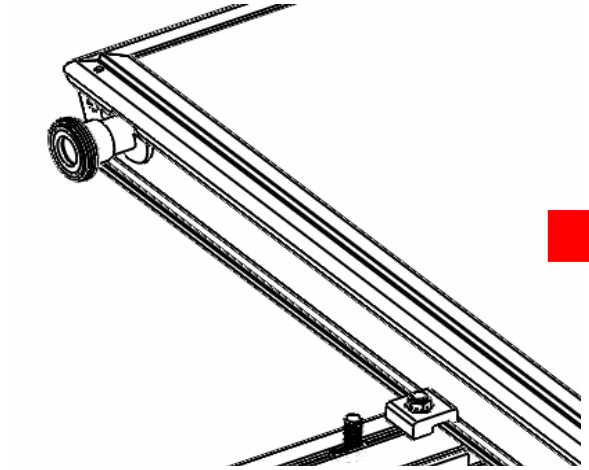


Step 11 – Slide the 2nd collector on the bottom rail and add O-rings* between the two collectors

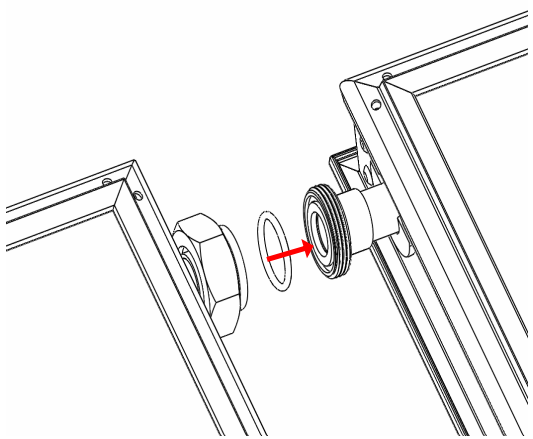


**Do not over-tighten or use Teflon tape to tighten the DOS unions. If the O-rings are correctly placed and tightened, they will ensure a watertight seal.*

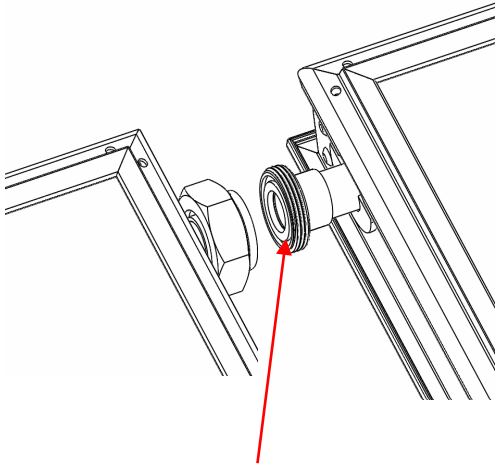
Step 12 – Rest the 2nd collector on the top rail and add O-ring* between the two collectors



Slide Bolt with washer in the top rail for 2nd collector and rest the 2n collector on the top rail



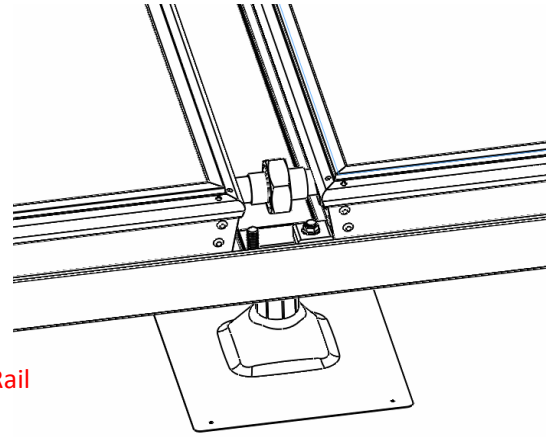
Wet the O-ring and insert it into the Male threaded flange for a tight fit



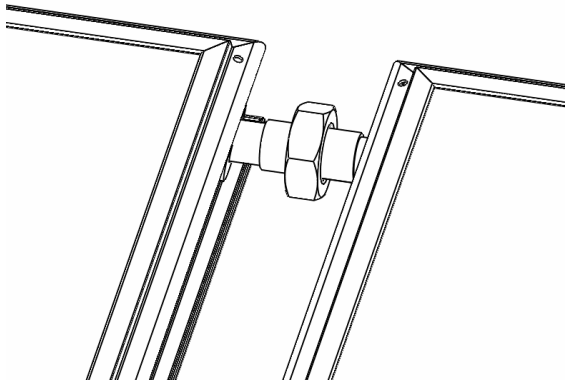
O- ring inserted in the threaded flange

**Do not over-tighten or use Teflon tape to tighten the DOS unions. If the O-rings are correctly placed and tightened, they will ensure a watertight seal.*

Step 13 – Secure the both the DOS nut on the bottom and on the top

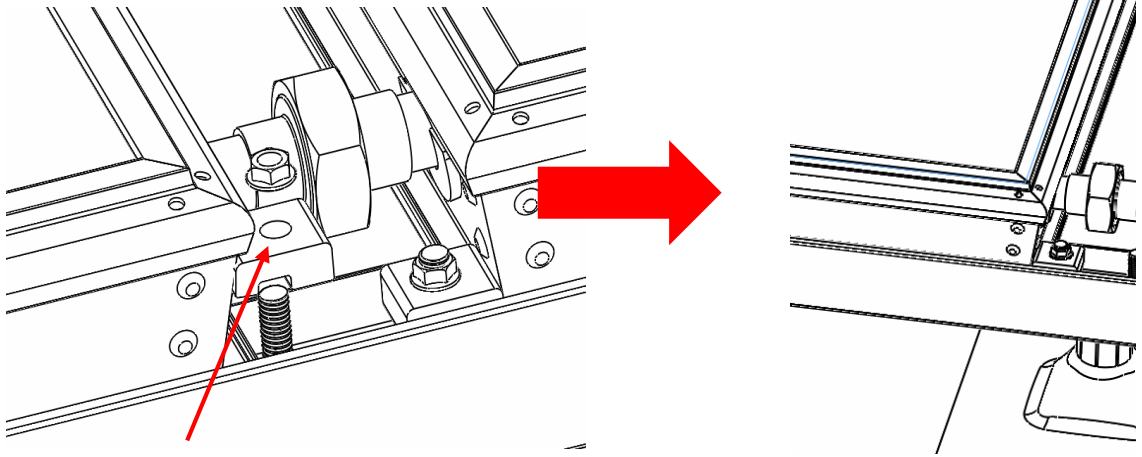


Bottom Rail

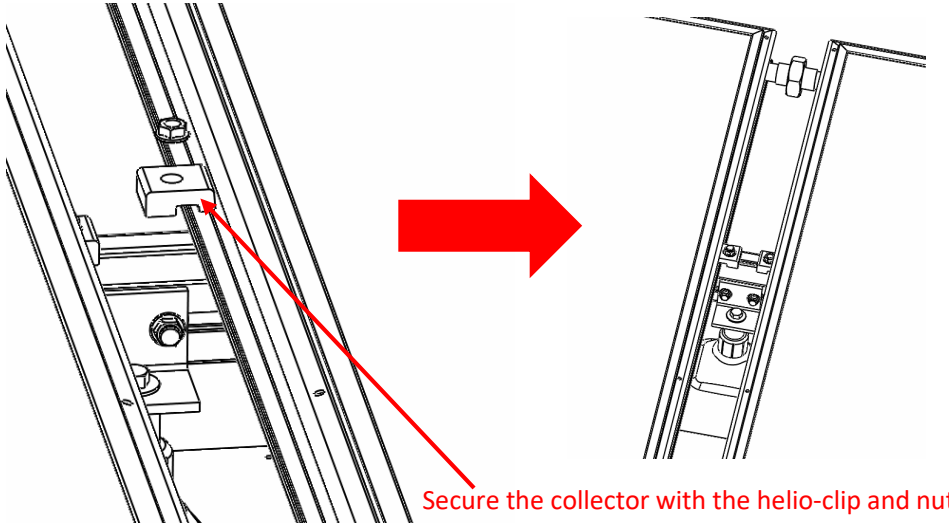


Top Rail

Step 14 – Secure the 2nd collector with the helio–clip

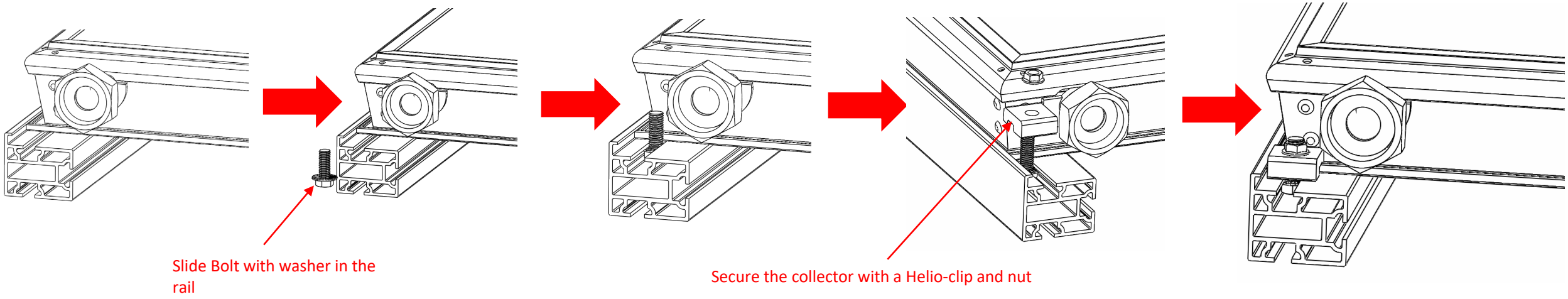


Bottom rail

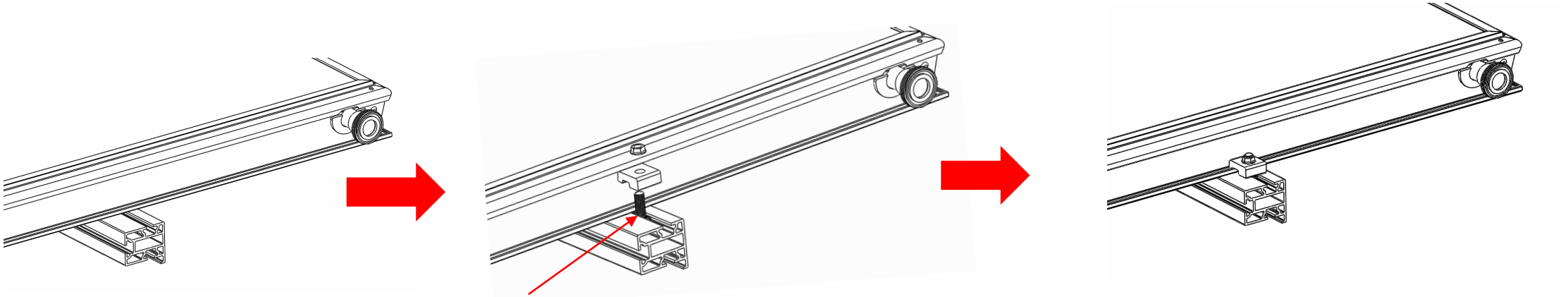


Top rail

Step 15 – Secure the other side of the 2nd collector with the helio–clip on the bottom rail

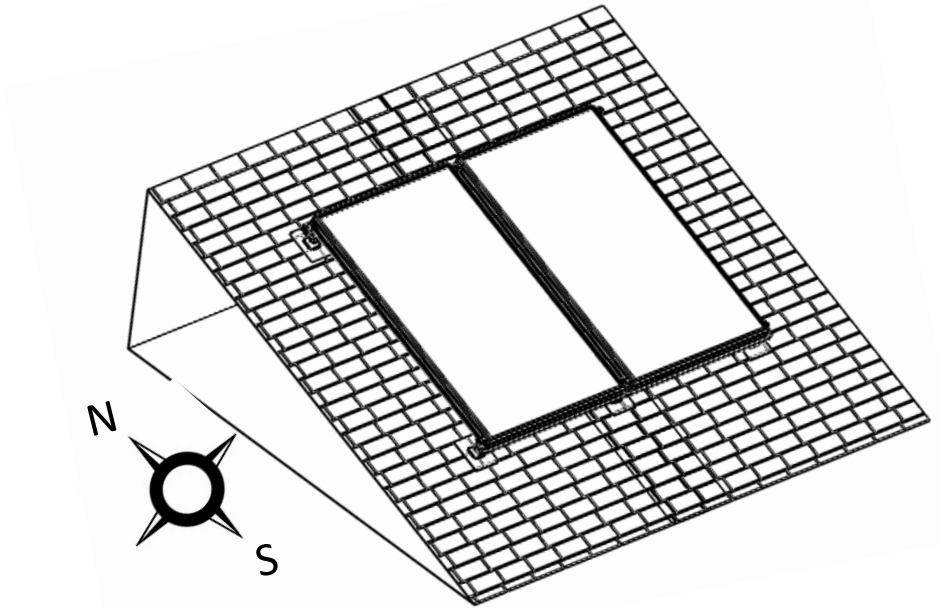


Step 16 – Secure the other side of the 2nd collector with the helio–-clip on the top rail



Slide Bolt with washer in the rail

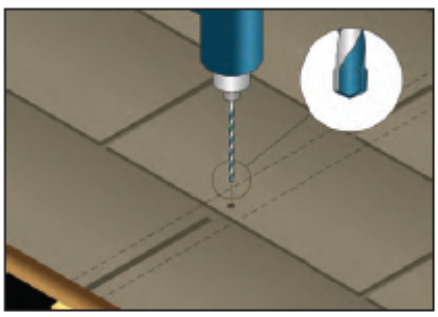
Secure the collector with a Helio-clip and nut



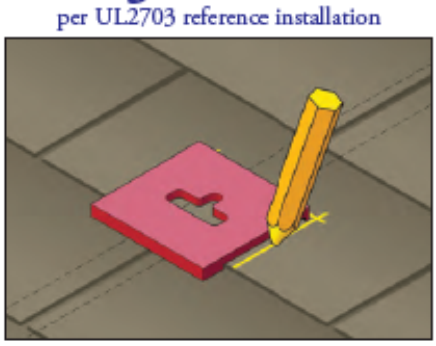
JOB DONE

Installation steps for FastJack® and FastJack® Flashing

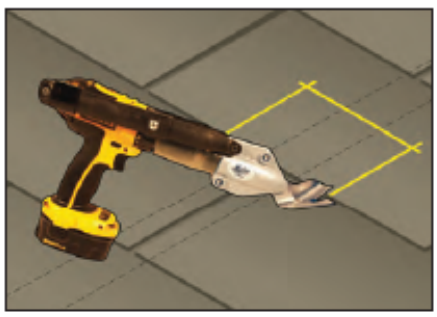
per UL2703 reference installation



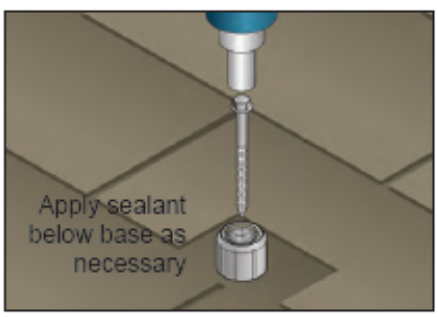
Step 1: Drill rafter pilot hole with 3/16" carbide bit



Step 2: Mark trim lines using template and lumber crayon



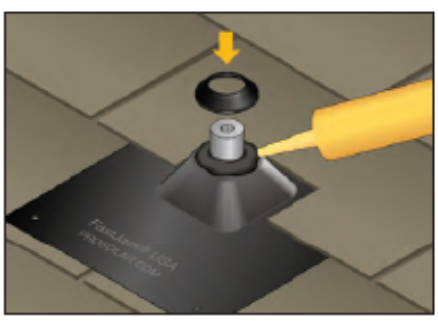
Step 3: Trim and remove shingle.
For high volume use Malco TurboShear Asphalt shingle cutter



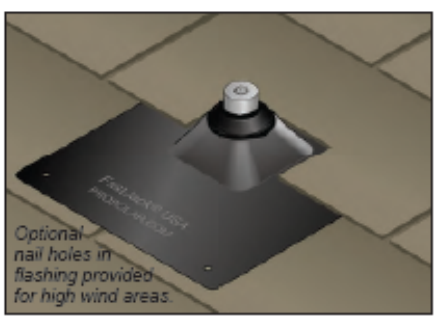
Step 4. Drive lag screw through Fast-Jack® base with cordless impact gun until seated.

Step 5: Slide FastJack® flashing under shingle

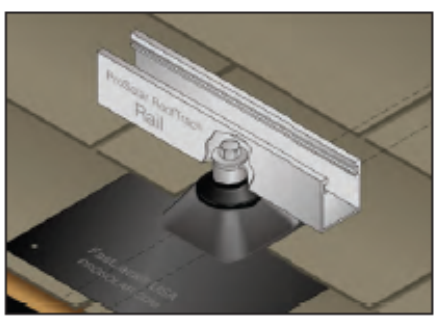
Step 6: Tighten FastJack® post into base



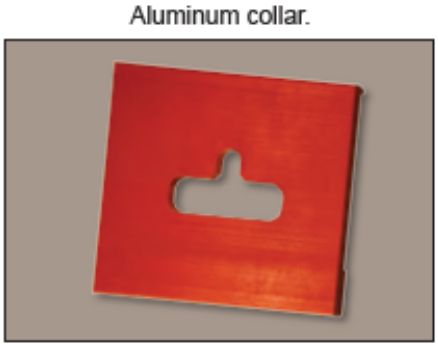
Step 7: Apply 1/4" bead of sealant (Geocel 4500) and compress with Aluminum collar.



Step 8: Done



Step 9: Attach ProSolar RoofTrac® rail and clamps



Shingle cutting template.
Part #TEMP-FJE

Malco TurboShear drill accessory.
Part #A-Malco *drill shown*

For use with 1 inch post diameter ProSolar FastJack® E-Series

FastJack® E-Series and parts packaged separately

See online installation guide for further details

FastJack® patent #6,360,491

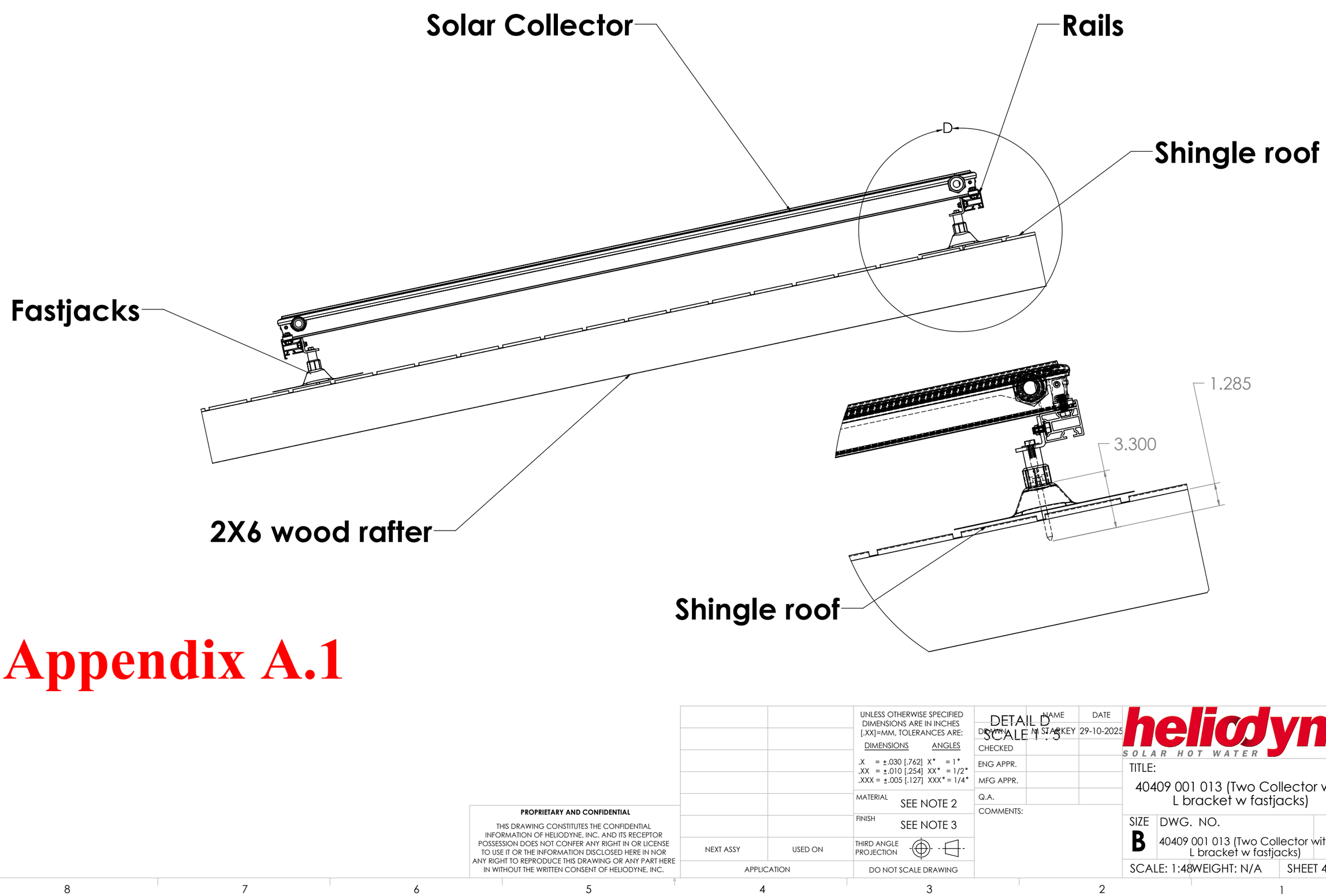
www.prosolar.com

FLSH 001 013 x 6

S.no	PN	Description	Qty
1	21149 	3/8-16 SERRATED FLANGE NUT SS	2
2	23669 	3/8 EXTERNAL TOOTH Lock Washer 18-8SS	2
3	25058 	FastJack E-Series 2" Standoff	1
4	25059 	FastJack E-Series Flashing,Aluminum,Black	1
5	25339 	3/8-16 x 3/4" Hex Head Bolt, 18-8 SS	3
6	25340 	3/8 x 1" OD X .062" Thick, 18-8 SS Flat Washer	1
7	21385-E 	Rail0608 L-Bracket	1

RAIL 002 000B

S.no	PN	Description	Qty
1	21725 	Collector Mounting Rail 1109 - 102"	2
1	21149 	3/8-16 SERRATED FLANGE NUT SS	8
2	21728 	Helio Clip 1209 Black	8
3	23669 	3/8 EXTERNAL TOOTH Lock Washer 18-8SS	8
4	25337 	3/8-16 x 1-1/4" Hex head bolt, SS	8



Appendix A.1

DETAIL D
SCALE 1 : 5

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		
COMMENTS:		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS ANGLES

.X = ±.030 [.762] X° = 1°
.XX = ±.010 [.254] XX° = 1/2°
.XXX = ±.005 [.127] XXX° = 1/4°

MATERIAL SEE NOTE 2

FINISH SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

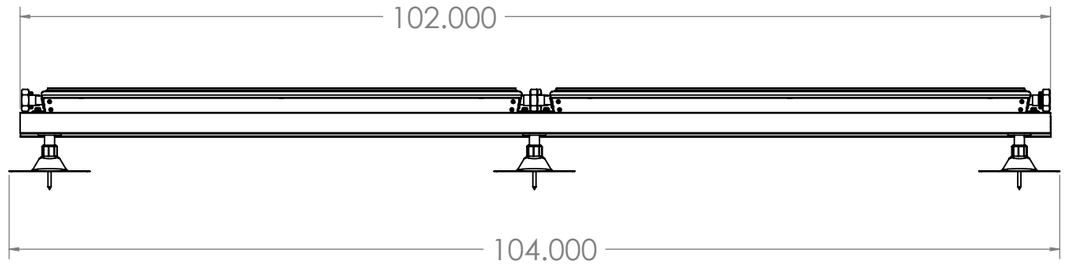
NEXT ASSY	USED ON
APPLICATION	

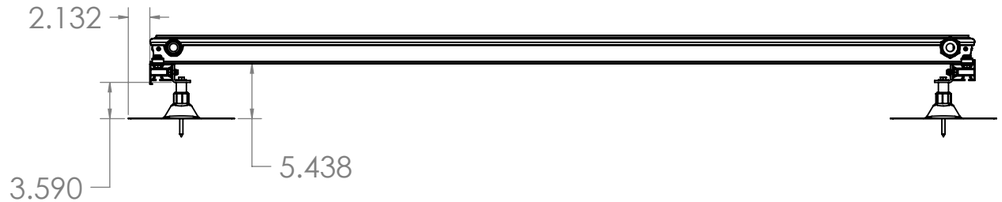
heliodyne
SOLAR HOT WATER

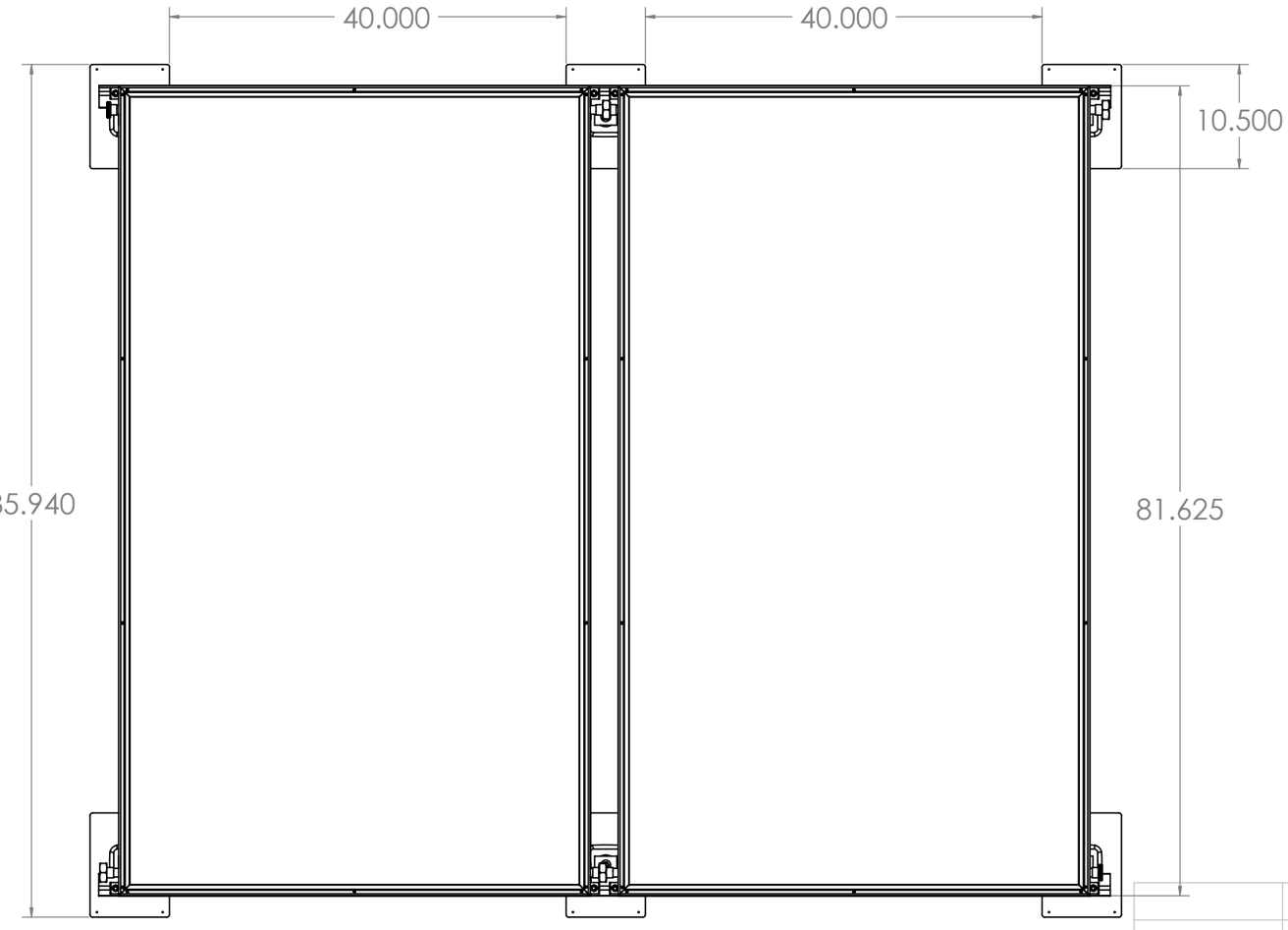
TITLE:
40409 001 013 (Two Collector with L bracket w fastjacks)

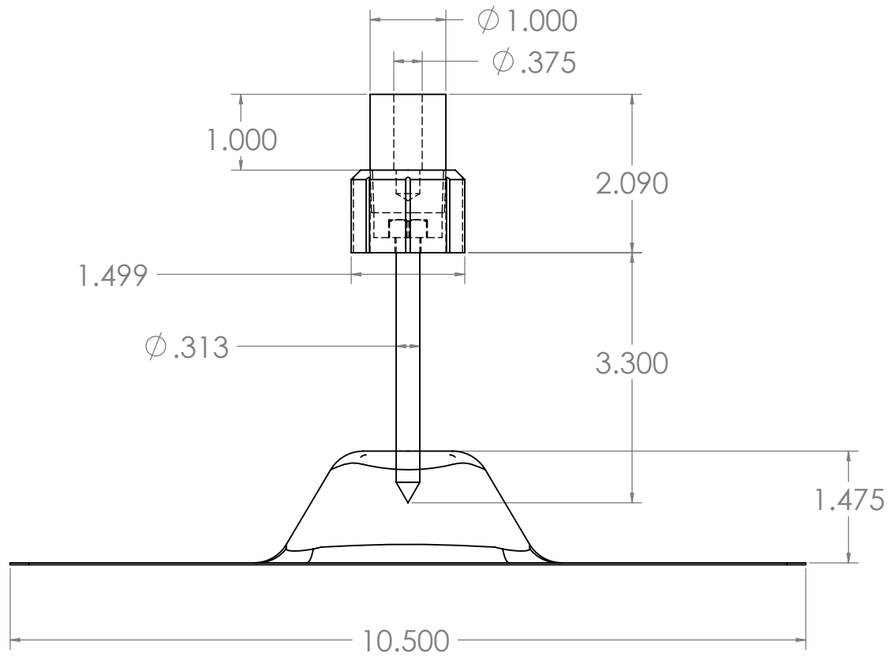
SIZE	DWG. NO.	REV
B	40409 001 013 (Two Collector with L bracket w fastjacks)	B

SCALE: 1:48 WEIGHT: N/A SHEET 4 OF 4









Appendix A.2

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS	ANGLES
.X = ±.030 [.762]	X° = 1°
.XX = ±.010 [.254]	XX° = 1/2°
.XXX = ±.005 [.127]	XXX° = 1/4°

MATERIAL: SEE NOTE 2

FINISH: SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

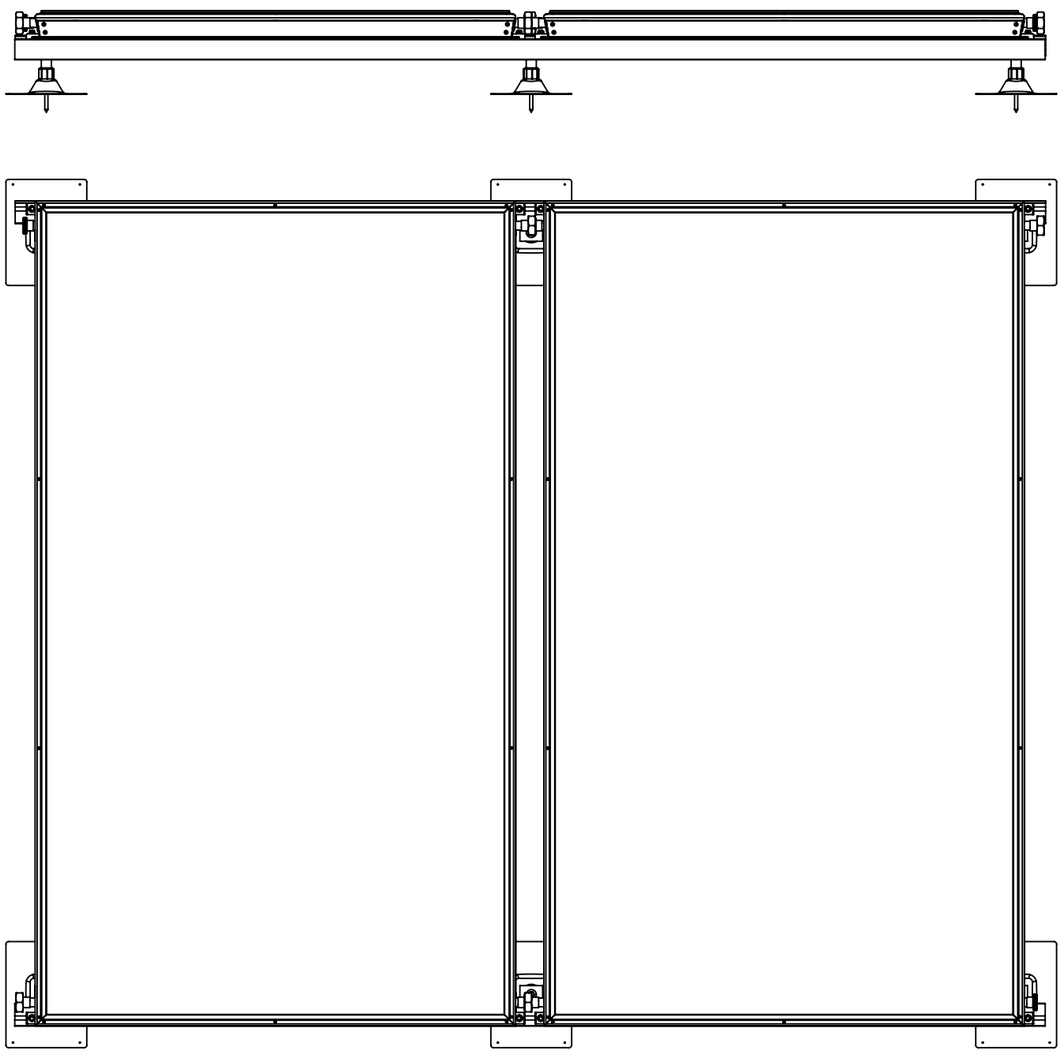
heliodyne SOLAR HOT WATER

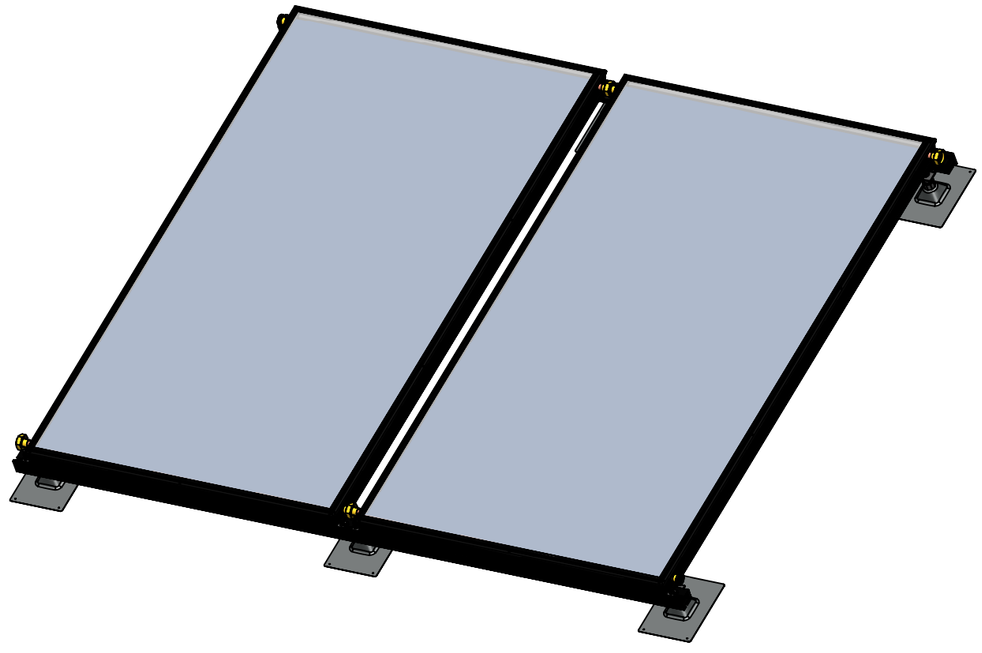
TITLE:

40409 001 013 (Two Collector with L bracket w fastjacks)

SIZE	DWG. NO.	REV
B	40409 001 013 (Two Collector with L bracket w fastjacks)	B

SCALE: 1:48 WEIGHT: N/A SHEET 2 OF 4





4 FINISH:

3. REMOVE ALL BURRS AND SHARP EDGES (R.076 MAX).

2 MATERIAL:

1. INTERPRET DRAWING PER ANSI/ASME Y14.5 & Y14.35M. DIMENSIONS AND TOLERANCES PER ANSI/ASME Y14.5M-1994.

NOTES: (unless otherwise specified)

Appendix A.3

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS	ANGLES
.X = ±.030 [.762]	X° = 1°
.XX = ±.010 [.254]	XX° = 1/2°
.XXX = ±.005 [.127]	XXX° = 1/4°

MATERIAL SEE NOTE 2

FINISH SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

heliodyne
SOLAR HOT WATER

TITLE:
40409 001 013 (Two Collector with L bracket w fastjacks)

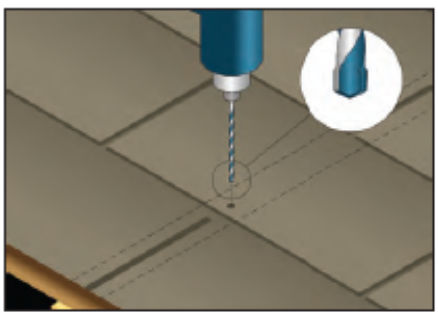
SIZE	DWG. NO.	REV
B	40409 001 013 (Two Collector with L bracket w fastjacks)	B

SCALE: 1:48 WEIGHT: N/A SHEET 1 OF 4

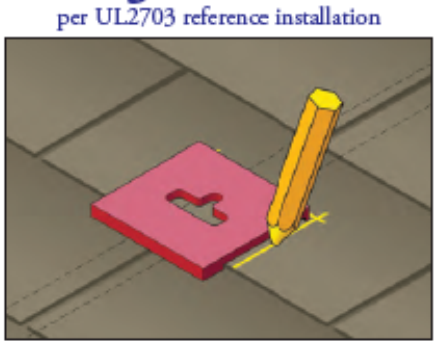
Appendix B

Installation steps for FastJack® and FastJack® Flashing

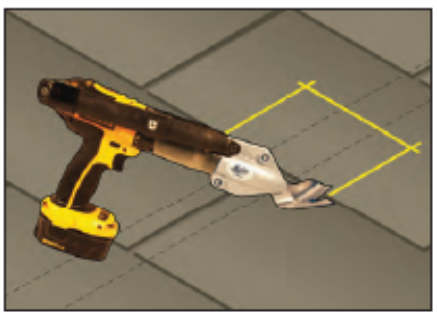
per UL2703 reference installation



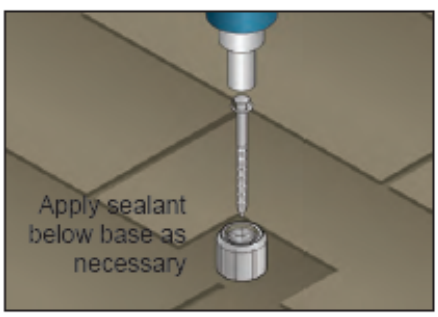
Step 1: Drill rafter pilot hole with 3/16" carbide bit



Step 2: Mark trim lines using template and lumber crayon



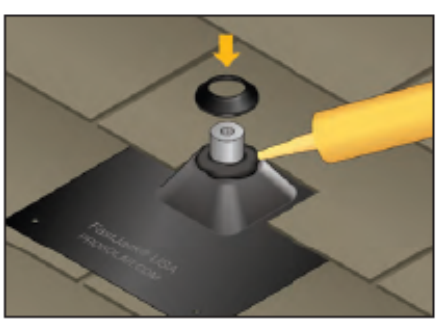
Step 3: Trim and remove shingle.
For high volume use Malco TurboShear Asphalt shingle cutter



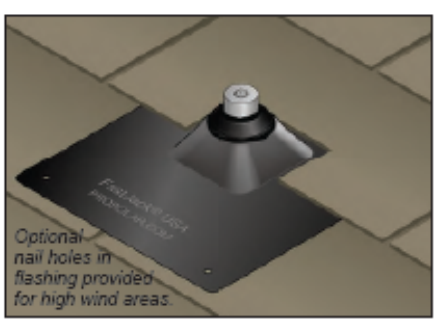
Step 4. Drive lag screw through Fast-Jack® base with cordless impact gun until seated.

Step 5: Slide FastJack® flashing under shingle

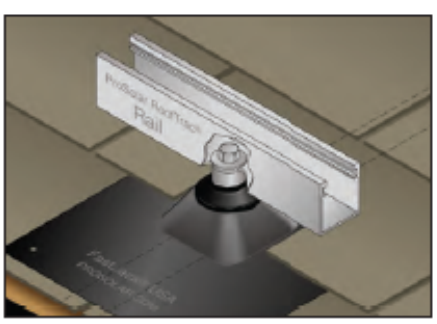
Step 6: Tighten FastJack® post into base



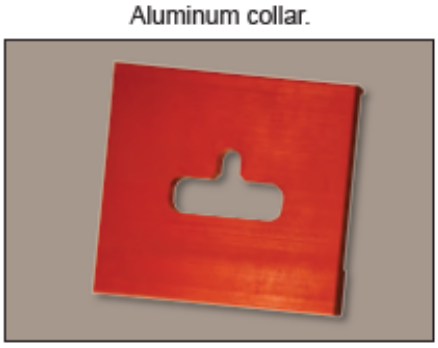
Step 7: Apply 1/4" bead of sealant (Geocel 4500) and compress with Aluminum collar.



Step 8: Done



Step 9: Attach ProSolar RoofTrac® rail and clamps



Shingle cutting template.
Part #TEMP-FJE

Malco TurboShear drill accessory.
Part #A-Malco *drill shown*

For use with 1 inch post diameter ProSolar FastJack® E-Series

FastJack® E-Series and parts packaged separately

See online installation guide for further details

FastJack® patent #6,360,491

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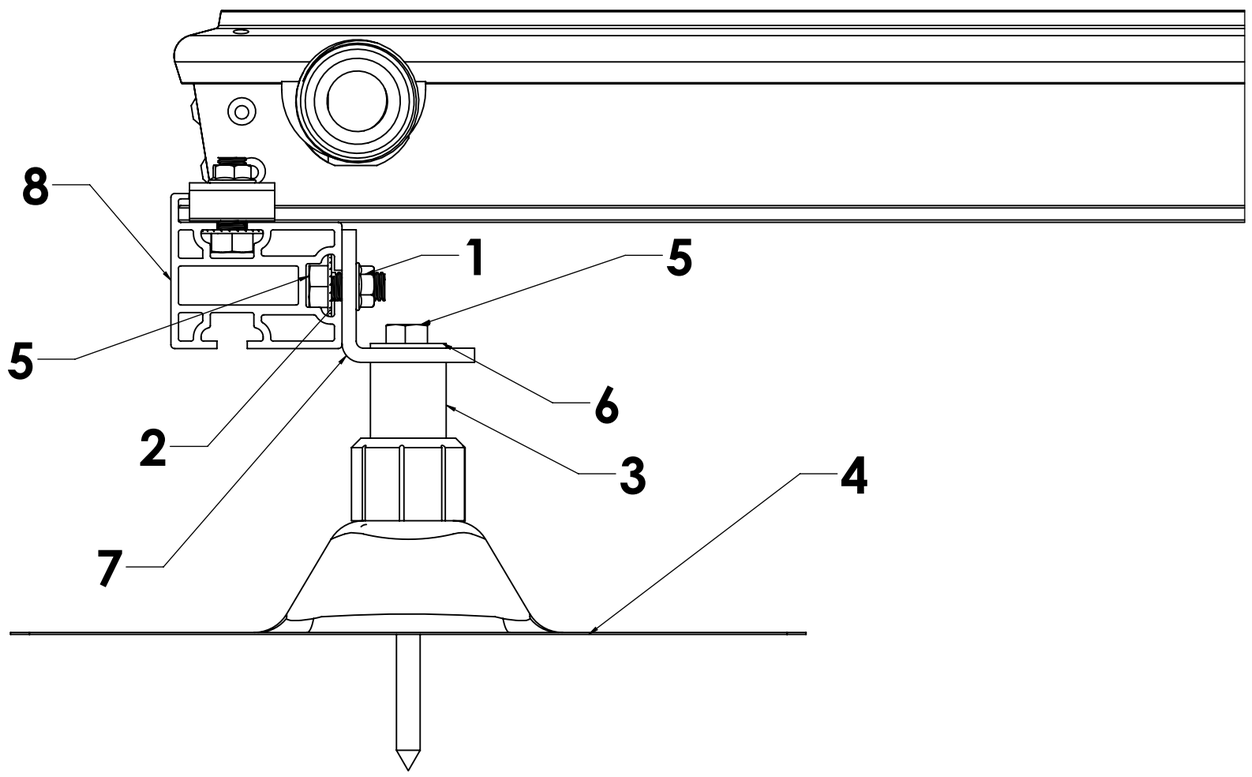


S.no	PN	Description	Qty
1	21149	3/8-16 SERRATED FLANGE NUT SS	2
2	23669	3/8 EXTERNAL TOOTH Lock Washer 18-8SS	2
3	25058	FastJack E-Series 2" Standoff	1
4	25059	FastJack E-Series Flashing,Aluminum,Black	1
5	25339	3/8-16 x 3/4" Hex Head Bolt, 18-8 SS	3
6	25340	3/8 x 1" OD X .062" Thick, 18-8 SS Flat Washer	1
7	21385-E	Rail0608 L-Bracket	1
8	21725	Collector Mounting Rail 1109 - 102"	2

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS	ANGLES
.X = ±.030 [.762]	X° = 1°
.XX = ±.010 [.254]	XX° = 1/2°
.XXX = ±.005 [.127]	XXX° = 1/4°

MATERIAL SEE NOTE 2

FINISH SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

helioDyne SOLAR HOT WATER

TITLE:

40409 001 013 (Two Collector with L bracket w fastjacks)

SIZE	DWG. NO.	REV
B	40409 001 013 (Two Collector with L bracket w fastjacks)	B

SCALE: 1:48 WEIGHT: N/A SHEET 3 OF 4

FLSH 001 013 x 6

S.no	PN	Description	Qty
1	21149 	3/8-16 SERRATED FLANGE NUT SS	2
2	23669 	3/8 EXTERNAL TOOTH Lock Washer 18-8SS	2
3	25058 	FastJack E-Series 2" Standoff	1
4	25059 	FastJack E-Series Flashing,Aluminum,Black	1
5	25339 	3/8-16 x 3/4" Hex Head Bolt, 18-8 SS	3
6	25340 	3/8 x 1" OD X .062" Thick, 18-8 SS Flat Washer	1
7	21385-E 	Rail0608 L-Bracket	1

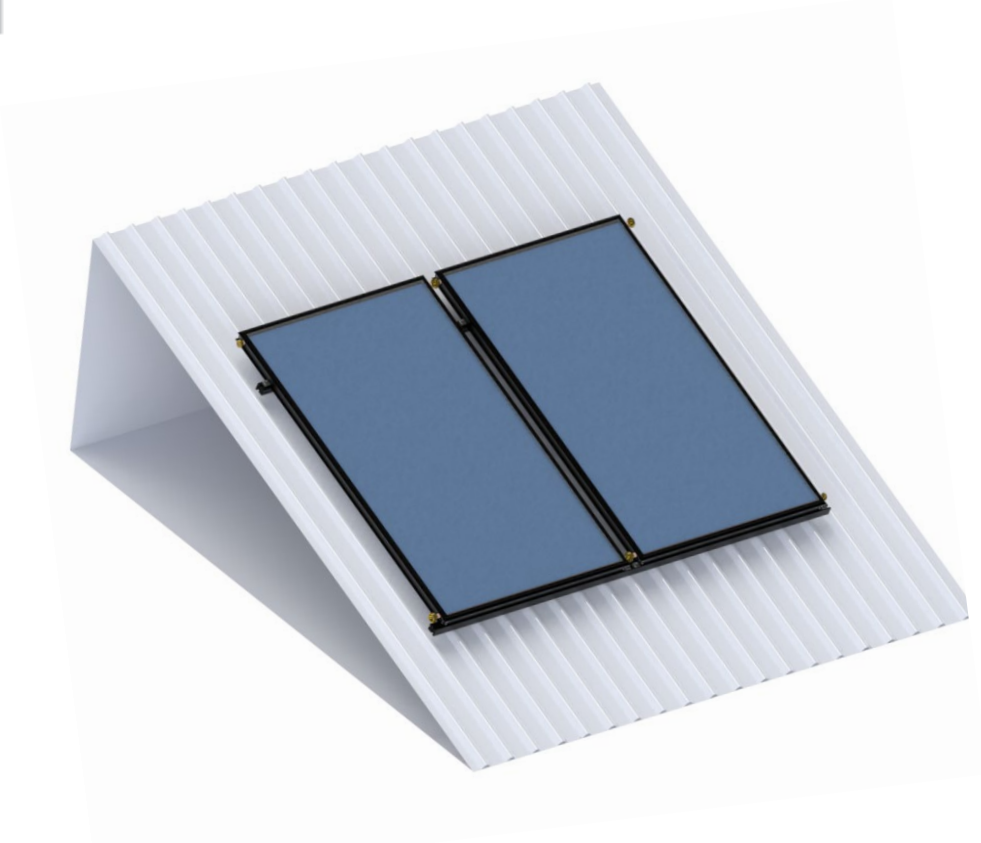
RAIL 002 000B

S.no	PN	Description	Qty
1	21725 	Collector Mounting Rail 1109 - 102"	2
1	21149 	3/8-16 SERRATED FLANGE NUT SS	8
2	21728 	Helio Clip 1209 Black	8
3	23669 	3/8 EXTERNAL TOOTH Lock Washer 18-8SS	8
4	25337 	3/8-16 x 1-1/4" Hex head bolt, SS	8

INSTALLATION GUIDE

Flush mount for metal roofs using Helio Rail- Dual collector

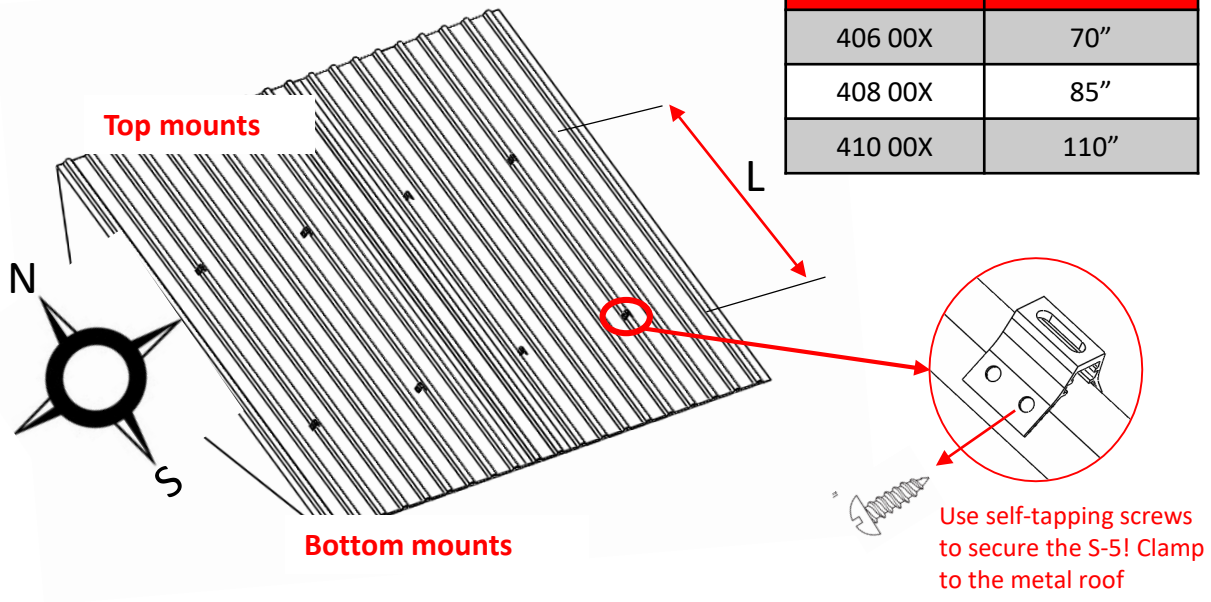
RAIL 002 000B & LBMR 000 000



EXCELLENCE BY DESIGN

Step 1 -Mark the point where the S-5! will be mounted on the roof *

GOBI MODEL	L (INCHES)
406 00X	70”
408 00X	85”
410 00X	110”



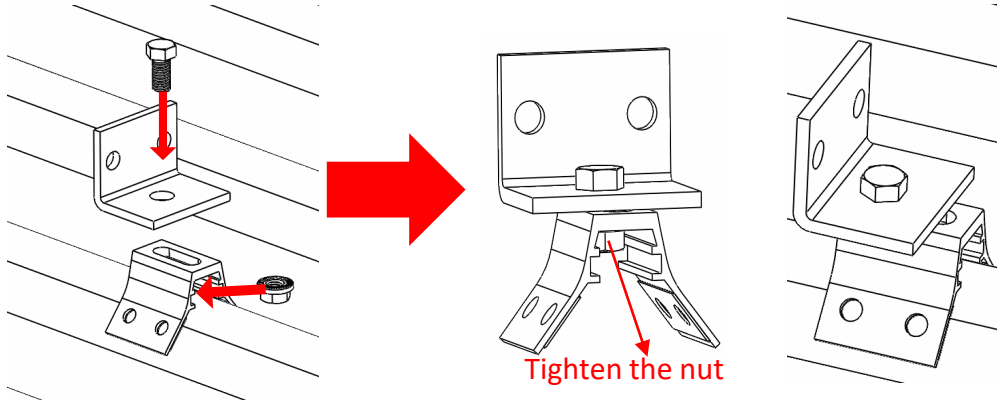
*Ensure the placement of the S-5! on the roof secures them to the roof rafters/ structure or as per the PE recommendation** to maintain structural integrity.

***As per the Design Basis – Provided by Honolulu Plumbing Department, calculations by the PE recommend the following attachment configurations:*

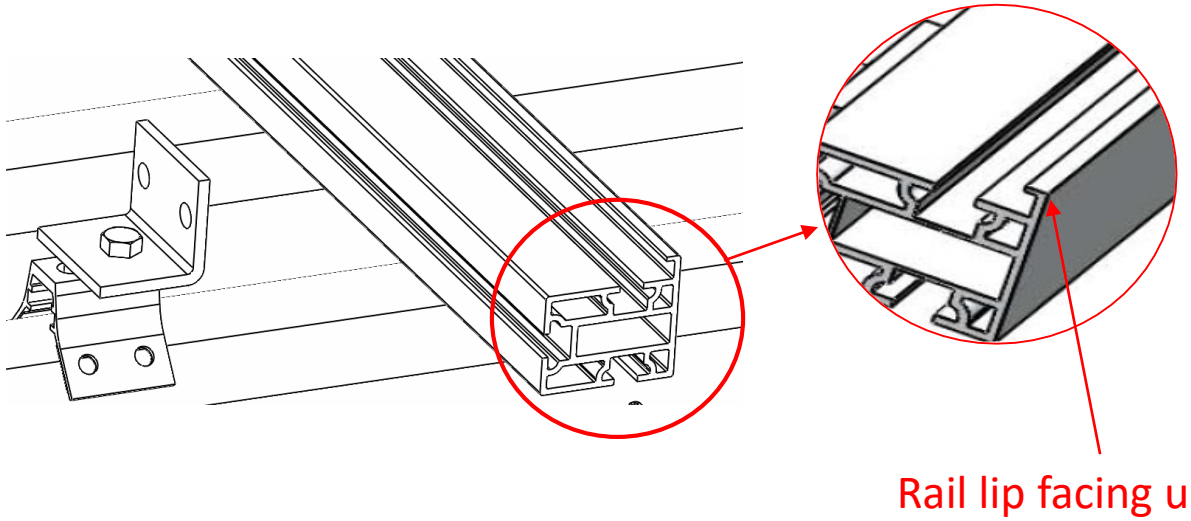
EXPOSURE CATEGORY	TOTAL NUMBER OF ATTACHMENTS
EXPOSURE B	8
EXPOSURE C	10
EXPOSURE D	12

Step 2 – Install the S-5! on the roof, refer to the S-5! Installation manual, for roof attachment detail refer to Appendix A

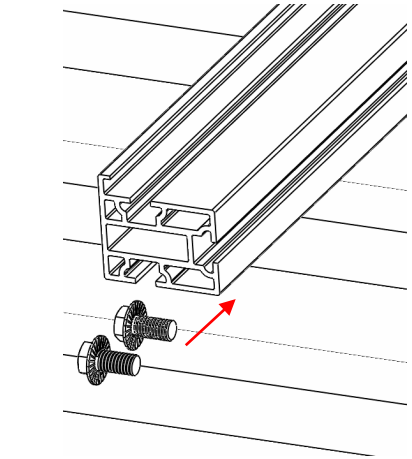
Step 3 – Connect the L- Bracket to the S-5! Clamps



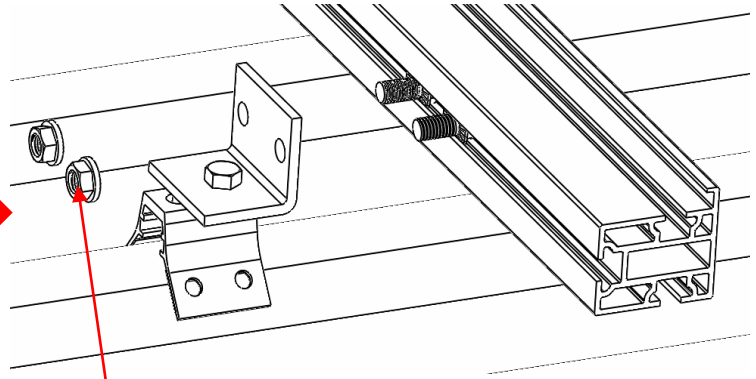
Step 4 –Rail set up for Bottom mounts



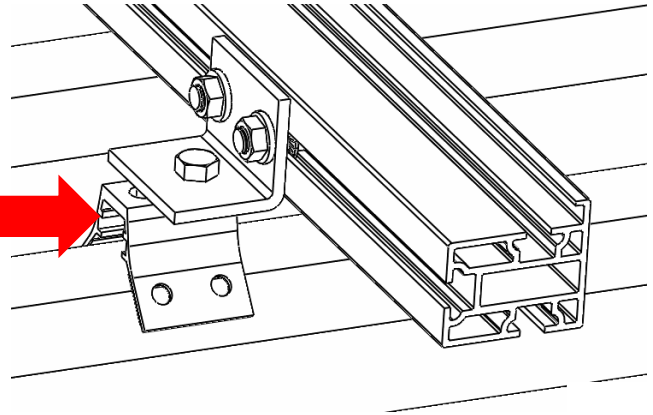
Step 5 – Installing the L bracket bottom rail



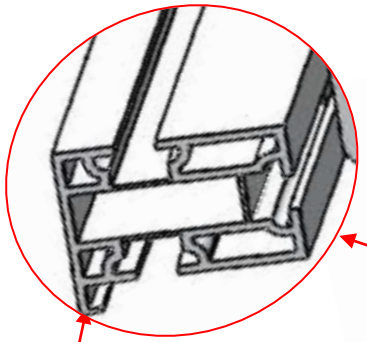
Slide Bolts with external tooth washer in the rail



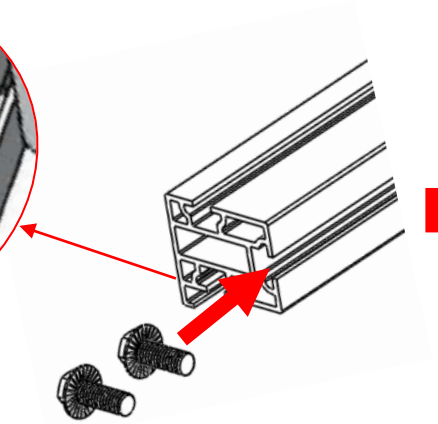
Tighten the nuts on the bolts and fix the L-bracket to the bottom rails



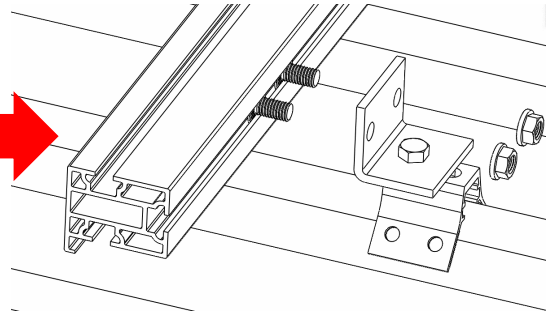
Step 6 – Rail set up for Top mounts and installing the L- bracket to the top rail



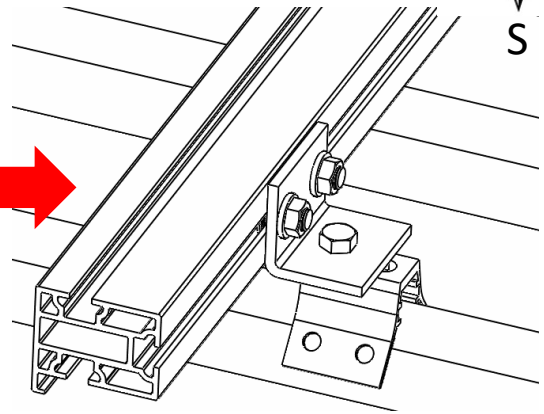
Rail lip facing down

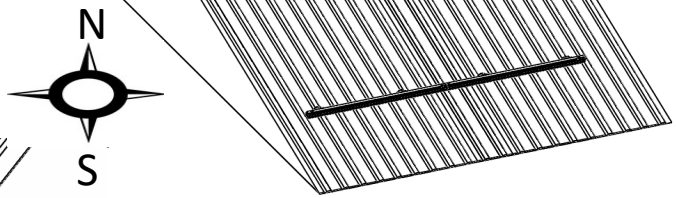


Slide Bolts with external tooth washer in the rail



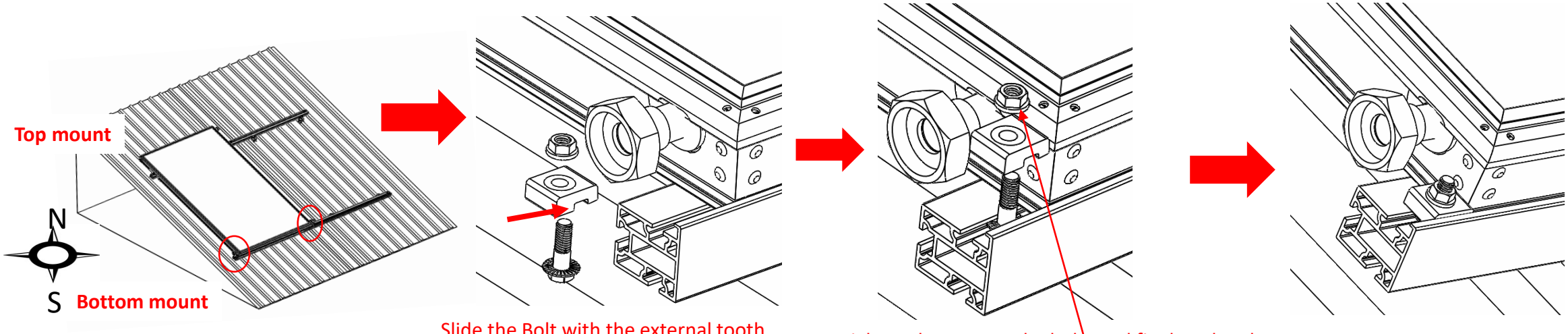
Tighten the nuts on the bolts and fix the L-bracket to the top rail





Mounting for South facing roof

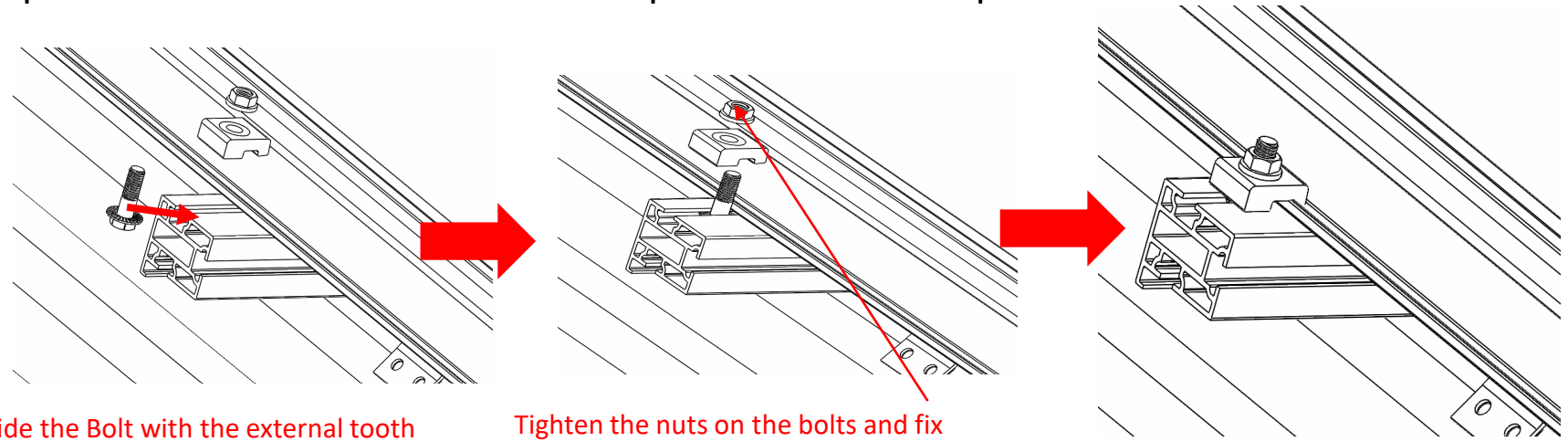
Step 5 – Slide in the 1st Gobi collector on the bottom rail and rest it on the top rail, secure the collector with the bottom rail using the helio-clip



Slide the Bolt with the external tooth washer in the rail slot.

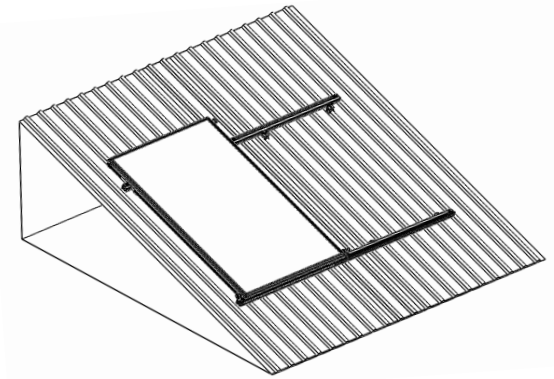
Tighten the nuts on the bolts and fix the L-bracket to the bottom rail

Step 6 – Secure the collector to the top rail with helio-clip



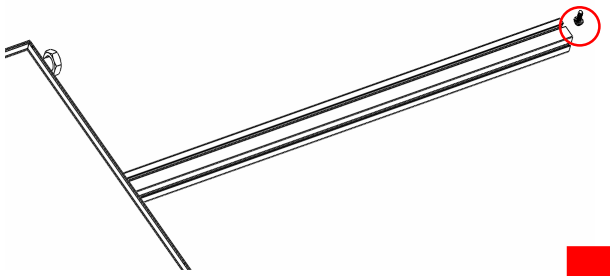
Slide the Bolt with the external tooth washer in the rail slot.

Tighten the nuts on the bolts and fix the shoe to the bottom rail

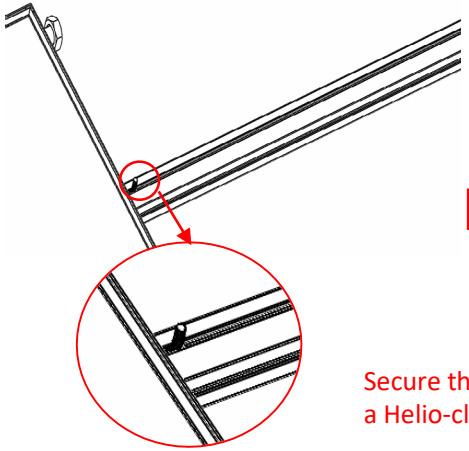


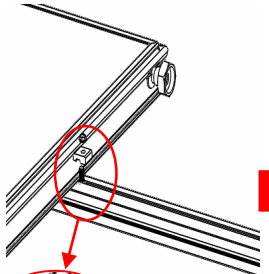
Mounting for South facing roof

Step 10 –Fixing the other side of the collector

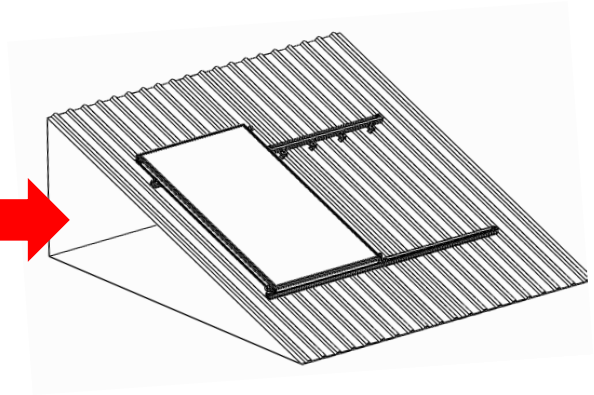


Slide Bolt with washer in the rail from the other side

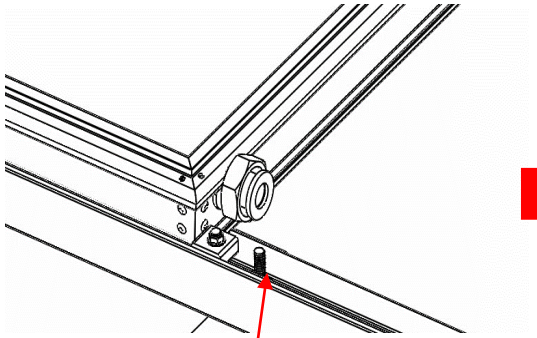




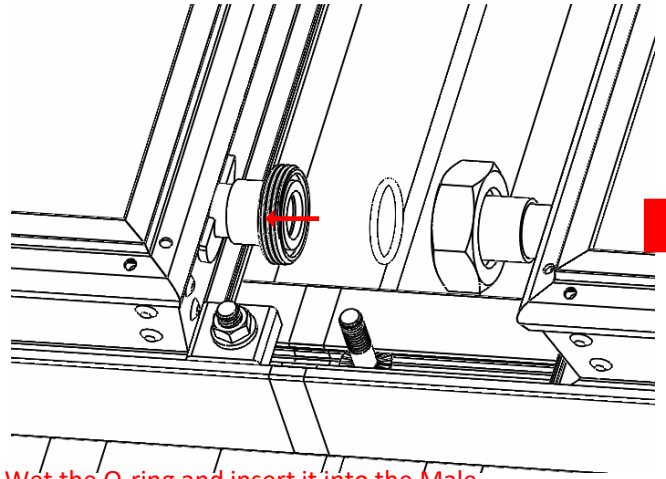
Secure the collector with a Helio-clip and nut



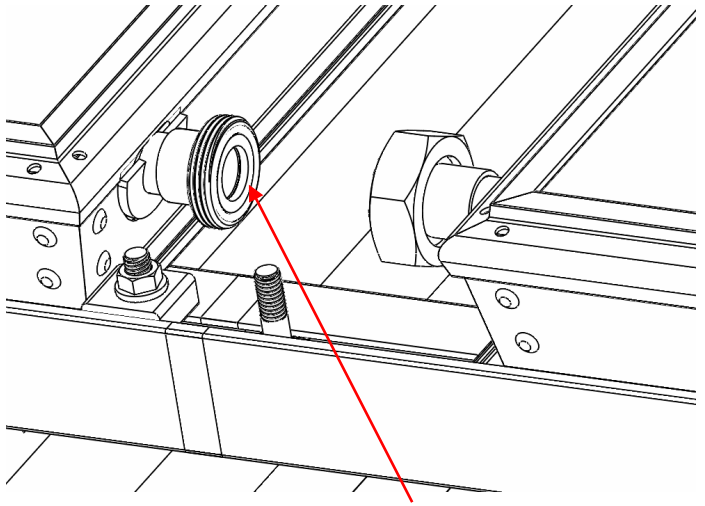
Step 11 – Slide the 2nd collector on the bottom rail and add O-rings* between the two collectors



Slide Bolt with washer in the bottom rail for 2nd collector



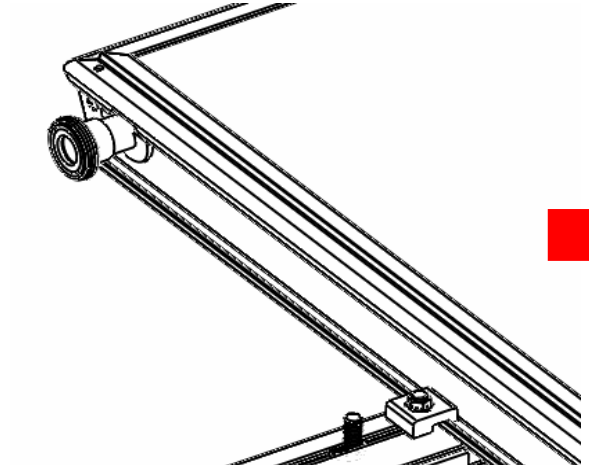
Wet the O-ring and insert it into the Male threaded flange for a tight fit



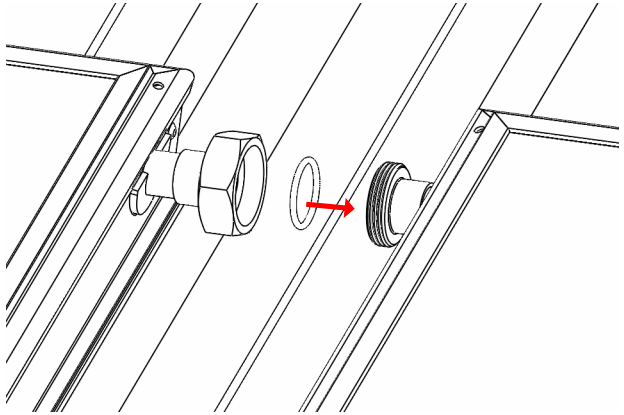
O- ring inserted in the threaded flange

**Do not over-tighten or use Teflon tape to tighten the DOS unions. If the O-rings are correctly placed and tightened, they will ensure a watertight seal.*

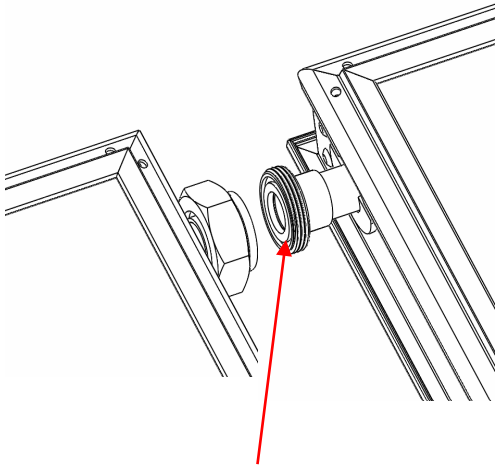
Step 12 – Rest the 2nd collector on the top rail and add O-ring* between the two collectors



Slide Bolt with washer in the top rail for 2nd collector and rest the 2n collector on the top rail



Wet the O-ring and insert it into the Male threaded flange for a tight fit

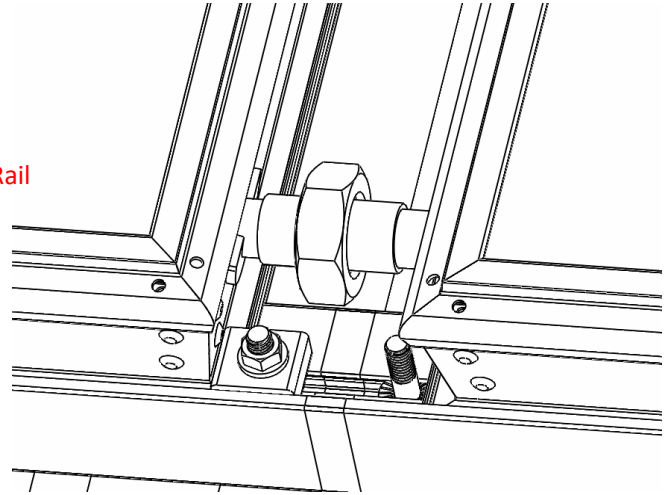


O- ring inserted in the threaded flange

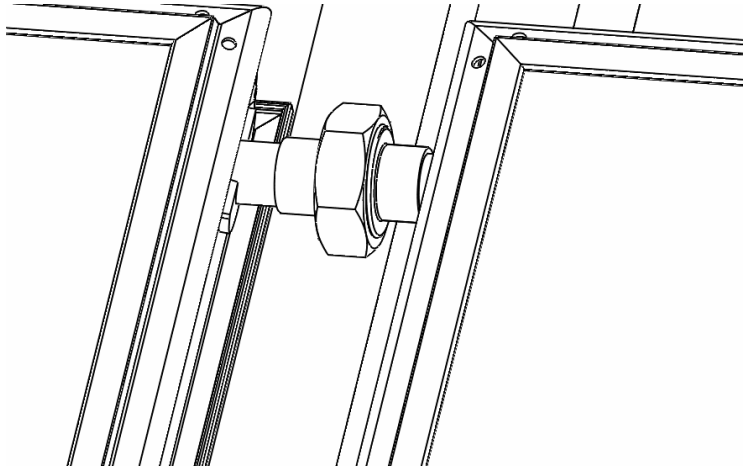
**Do not over-tighten or use Teflon tape to tighten the DOS unions. If the O-rings are correctly placed and tightened, they will ensure a watertight seal.*

Step 13 – Secure the both the DOS nut on the bottom and on the top

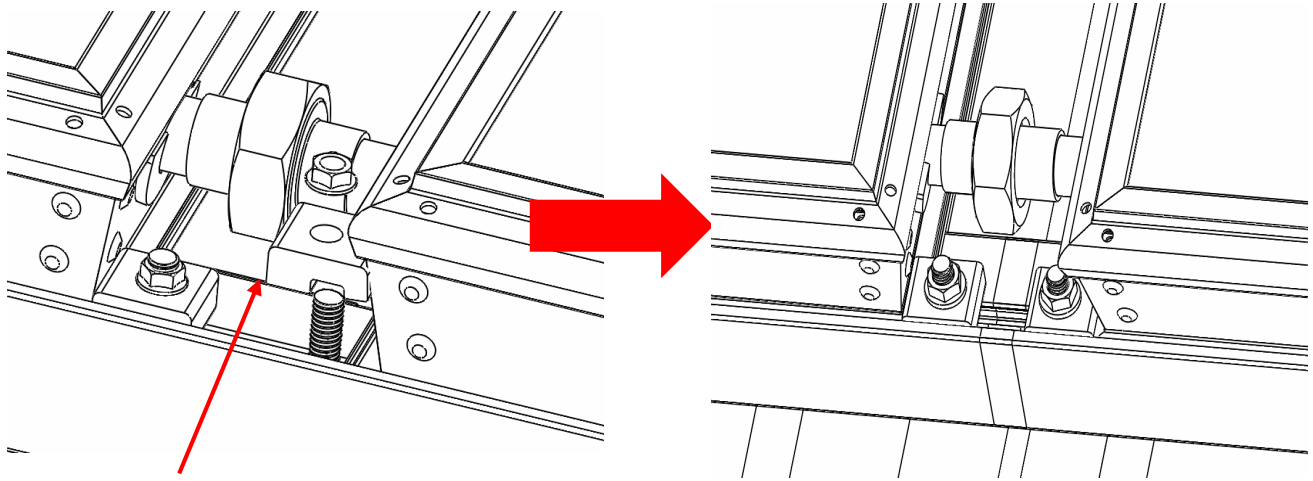
Bottom Rail



Top Rail

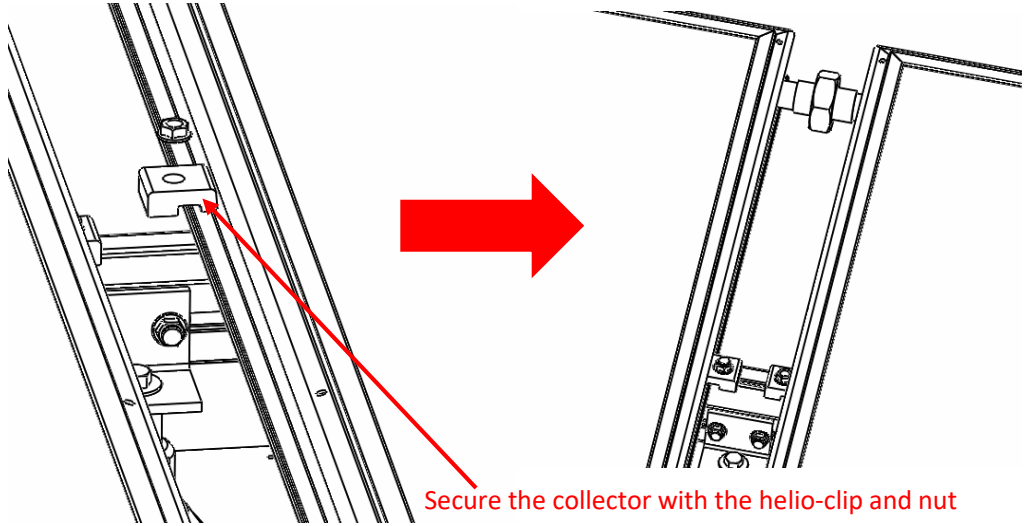


Step 14 – Secure the 2nd collector with the helio–clip



Secure the collector with the helio-clip and nut

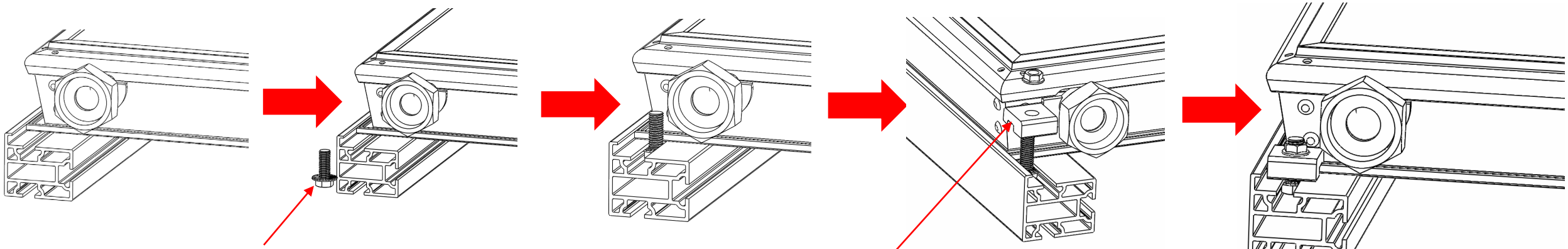
Bottom rail



Secure the collector with the helio-clip and nut

Top rail

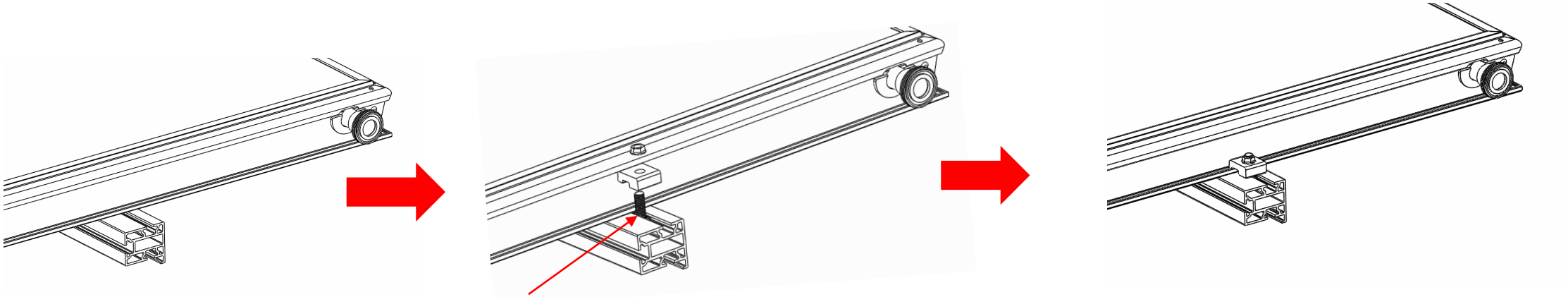
Step 15 – Secure the other side of the 2nd collector with the helio–clip on the bottom rail



Slide Bolt with washer in the rail

Secure the collector with a Helio-clip and nut

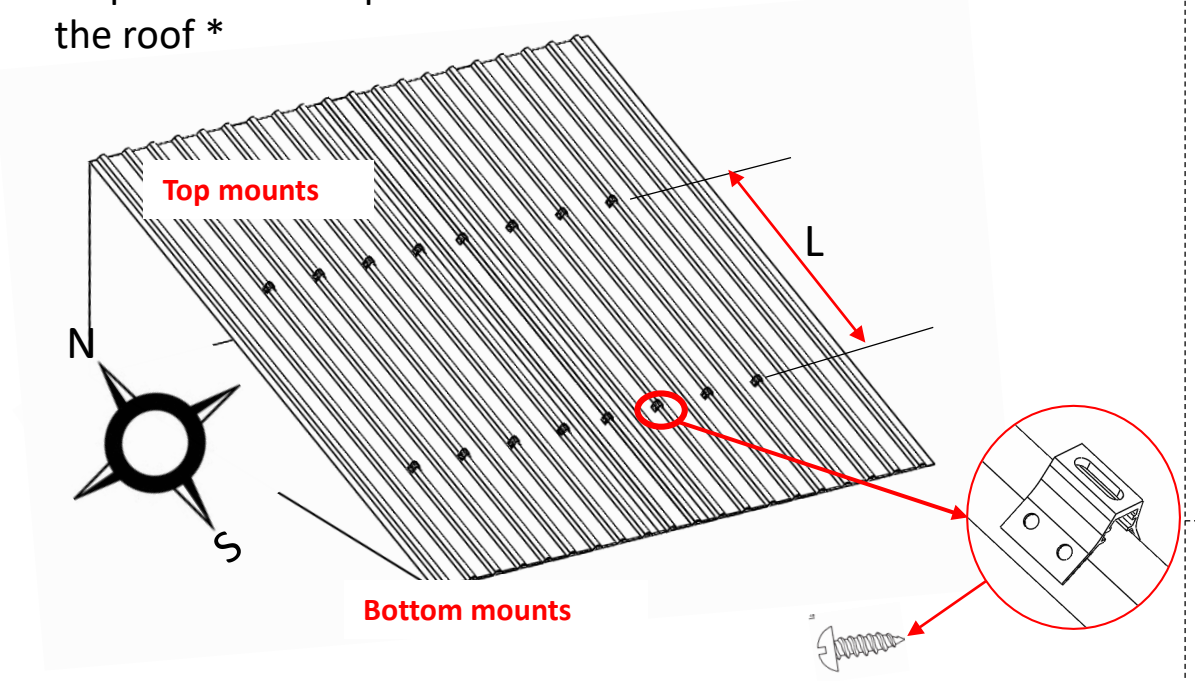
Step 16 – Secure the other side of the 2nd collector with the helio–-clip on the top rail



Slide Bolt with washer in the rail

Secure the collector with a Helio-clip and nut

Step 1 -Mark the point where the S-5! will be mounted on the roof *



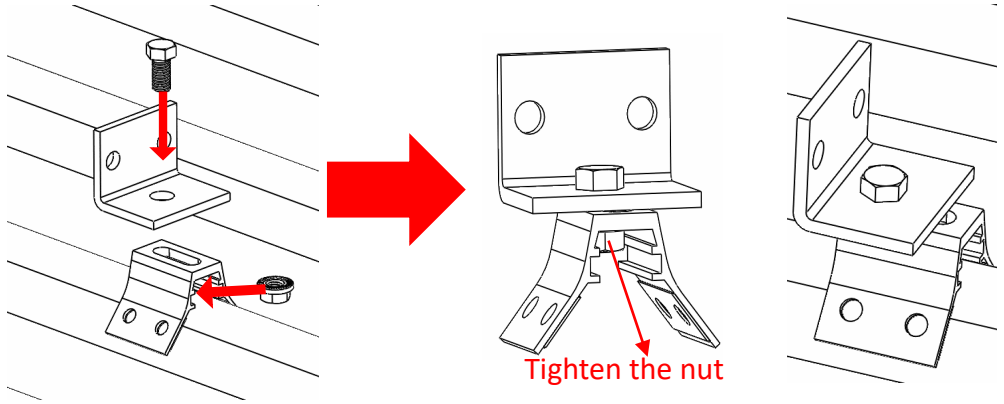
Use self tapping screws to secure the S-5! Clamp to the meatal roof

GOBI MODEL	L (INCHES)
406 00X	70”
408 00X	85”
410 00X	110”

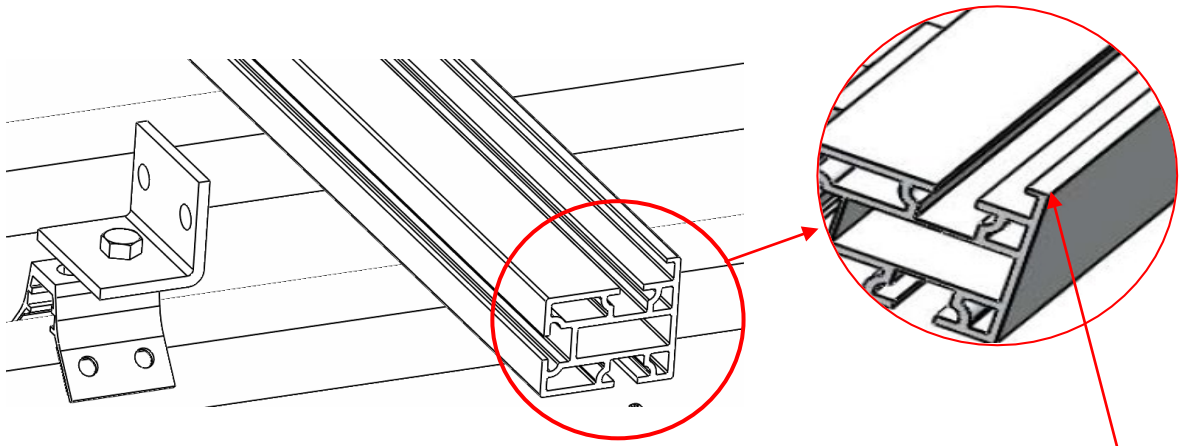
*Ensure the placement of the S-5! on the roof secures them to the roof rafters/ structure or as per the PE recommendation to maintain structural integrity.

Step 2 – Install the S-5! on the roof, refer to the S-5! Installation manual, for roof attachment detail refer to **Appendix A**

Step 3 – Connect the L- Bracket to the S-5! Clamps

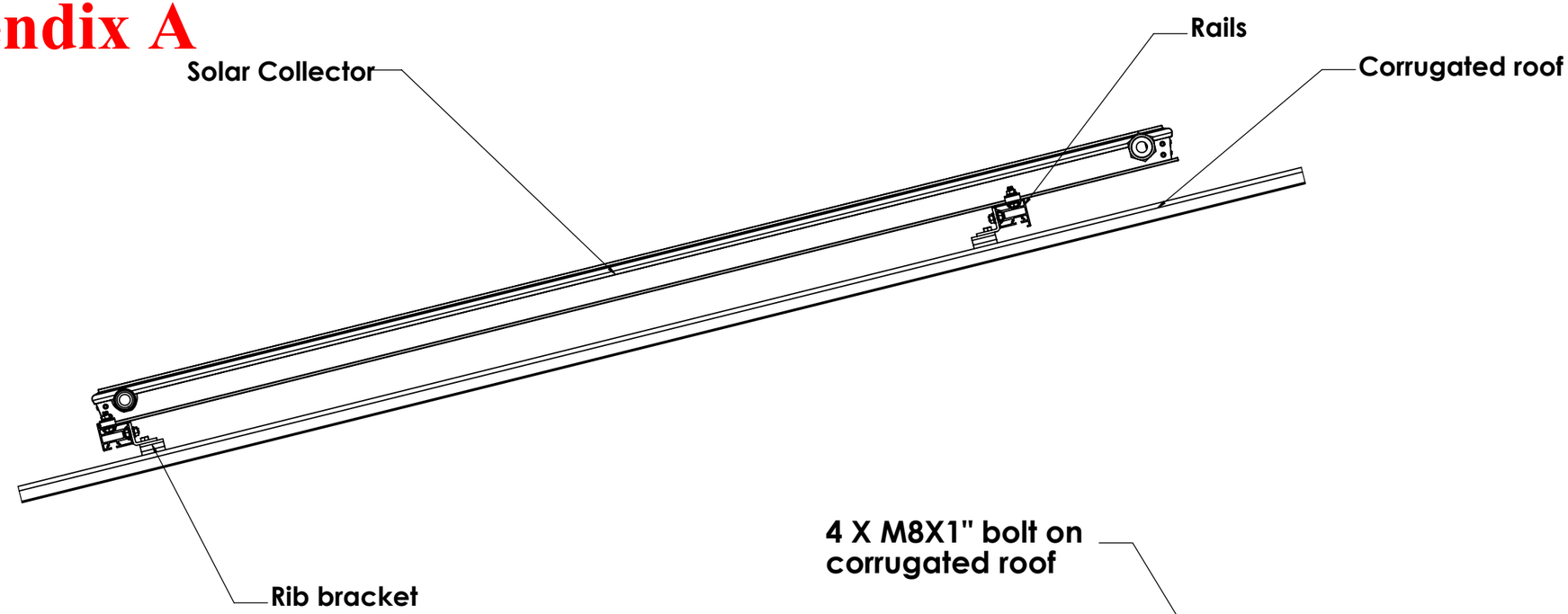


Step 4 –Rail set up for Bottom mounts



Rail lip facing up

Appendix A



4 FINISH:

3. REMOVE ALL BURRS AND SHARP EDGES (R.076 MAX).

2 MATERIAL:

1. INTERPRET DRAWING PER ANSI/ASME Y14.5 & Y14.35M. DIMENSIONS AND TOLERANCES PER ANSI/ASME Y14.5M-1994.

NOTES: (unless otherwise specified)

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS	ANGLES
.X = ±.030 [.762]	X° = 1°
.XX = ±.010 [.254]	XX° = 1/2°
.XXX = ±.005 [.127]	XXX° = 1/4°

MATERIAL SEE NOTE 2

FINISH SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

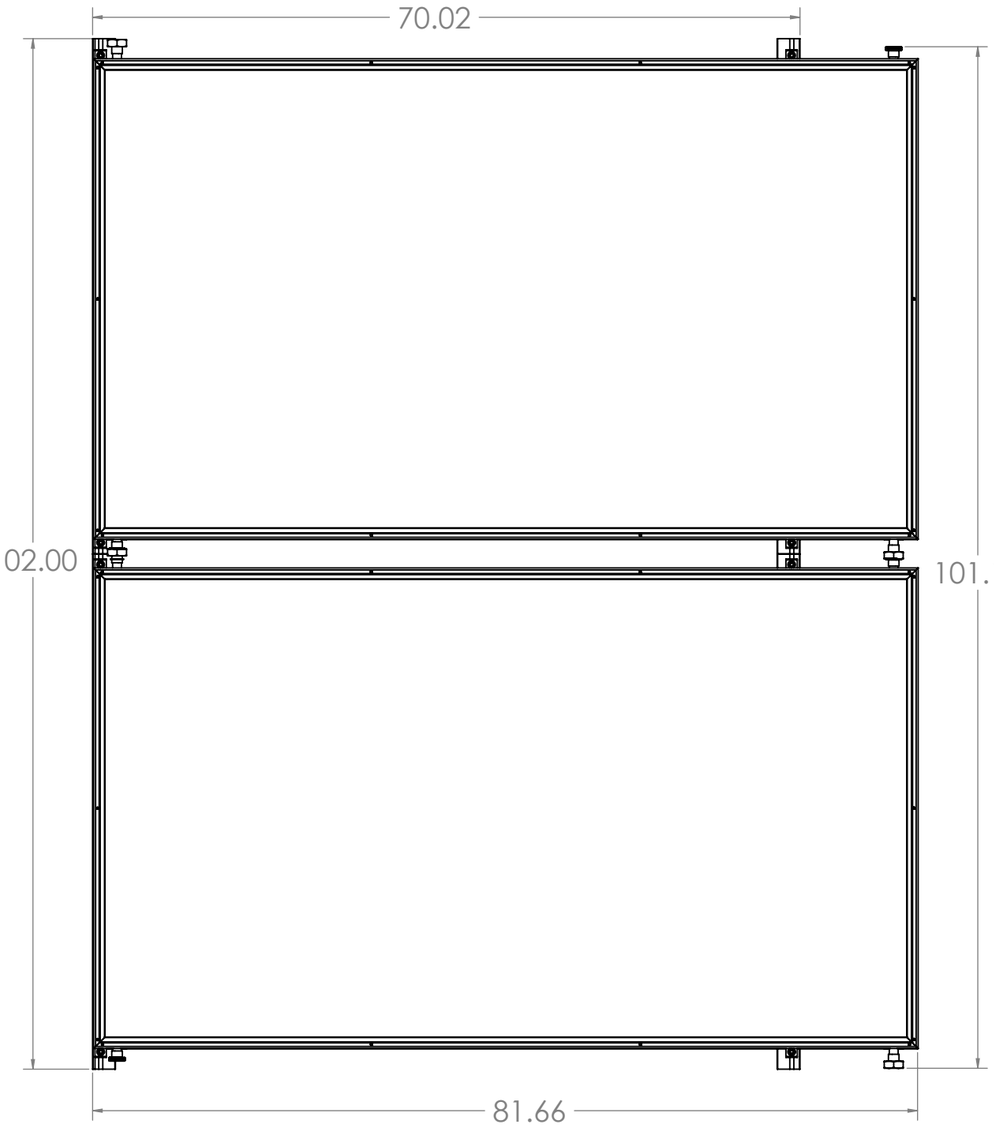
heliodyne SOLAR HOT WATER

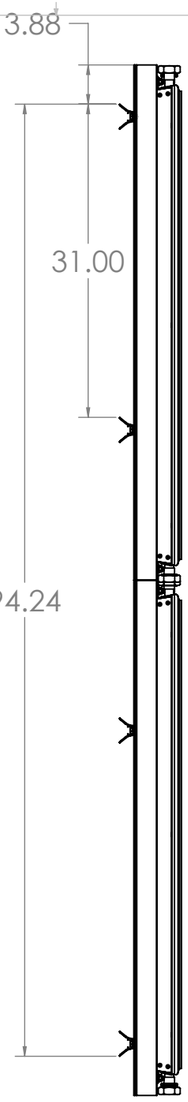
TITLE:
40090_FLSR 002 000B with collector rail and rib bracket for metal roof

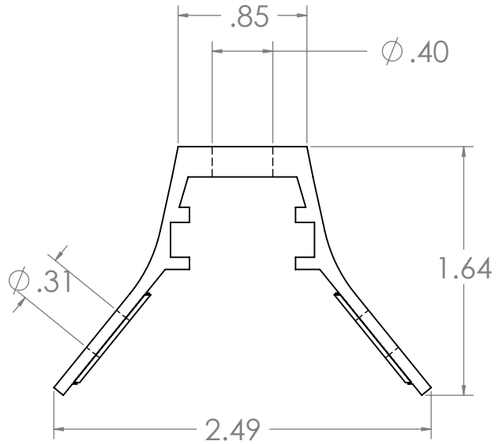
SIZE	DWG. NO.	REV
B	40090_FLSR 002 000B with collector rail and rib bracket for metal roof	B

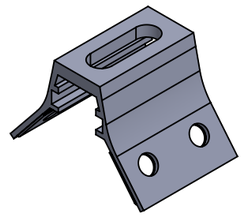
SCALE: 1:32 WEIGHT: N/A SHEET 4 OF 4

EXPOSURE B









NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS	ANGLES
.X = ±.030 [.762]	X° = 1°
.XX = ±.010 [.254]	XX° = 1/2°
.XXX = ±.005 [.127]	XXX° = 1/4°

MATERIAL: SEE NOTE 2

FINISH: SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

heliodyne SOLAR HOT WATER

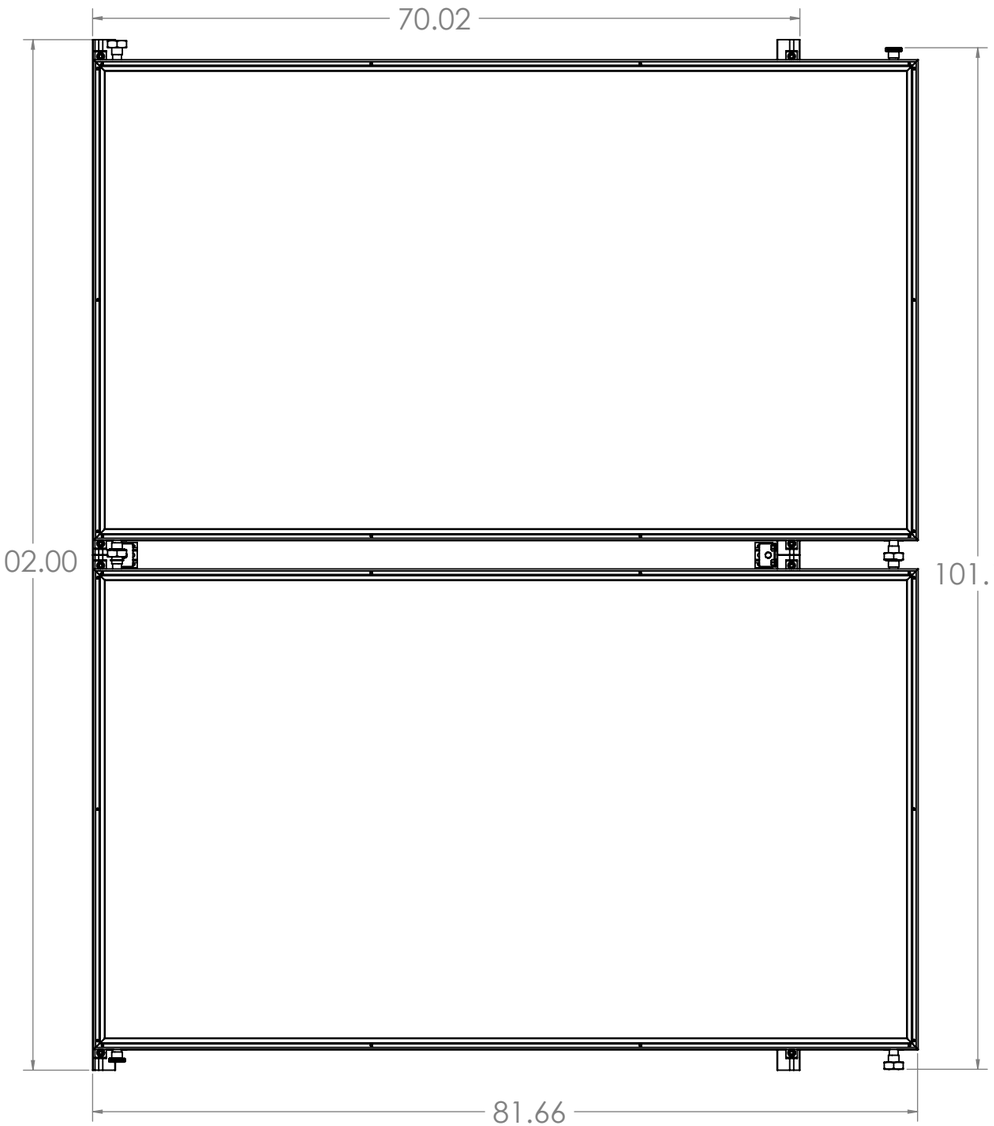
TITLE:

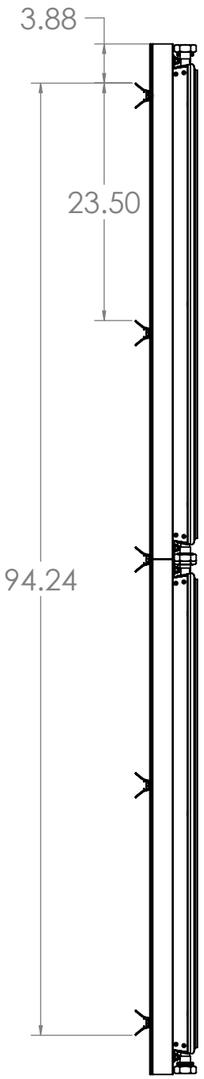
40090_FLSR 002 000B with collector rail and rib bracket for metal roof

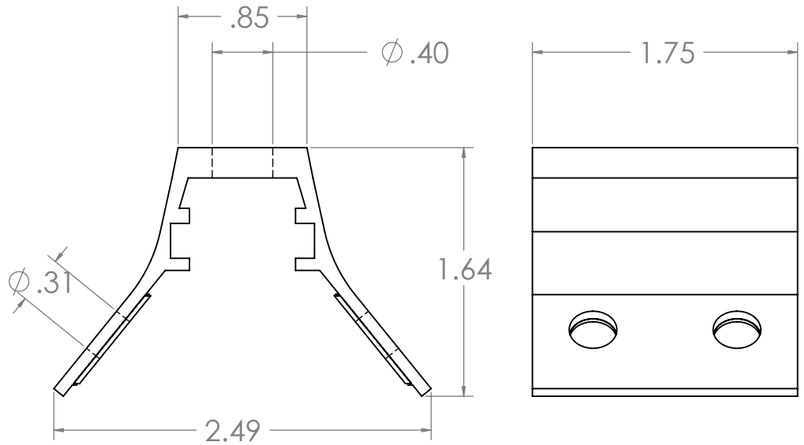
SIZE	DWG. NO.	REV
B	40090_FLSR 002 000B with collector rail and rib bracket for metal roof	B

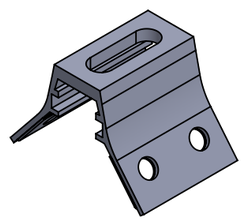
SCALE: 1:32 WEIGHT: N/A SHEET 2 OF 4

EXPOSURE C









NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS	ANGLES
.X = ±.030 [.762]	X° = 1°
.XX = ±.010 [.254]	XX° = 1/2°
.XXX = ±.005 [.127]	XXX° = 1/4°

MATERIAL SEE NOTE 2

FINISH SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

heliodyne SOLAR HOT WATER

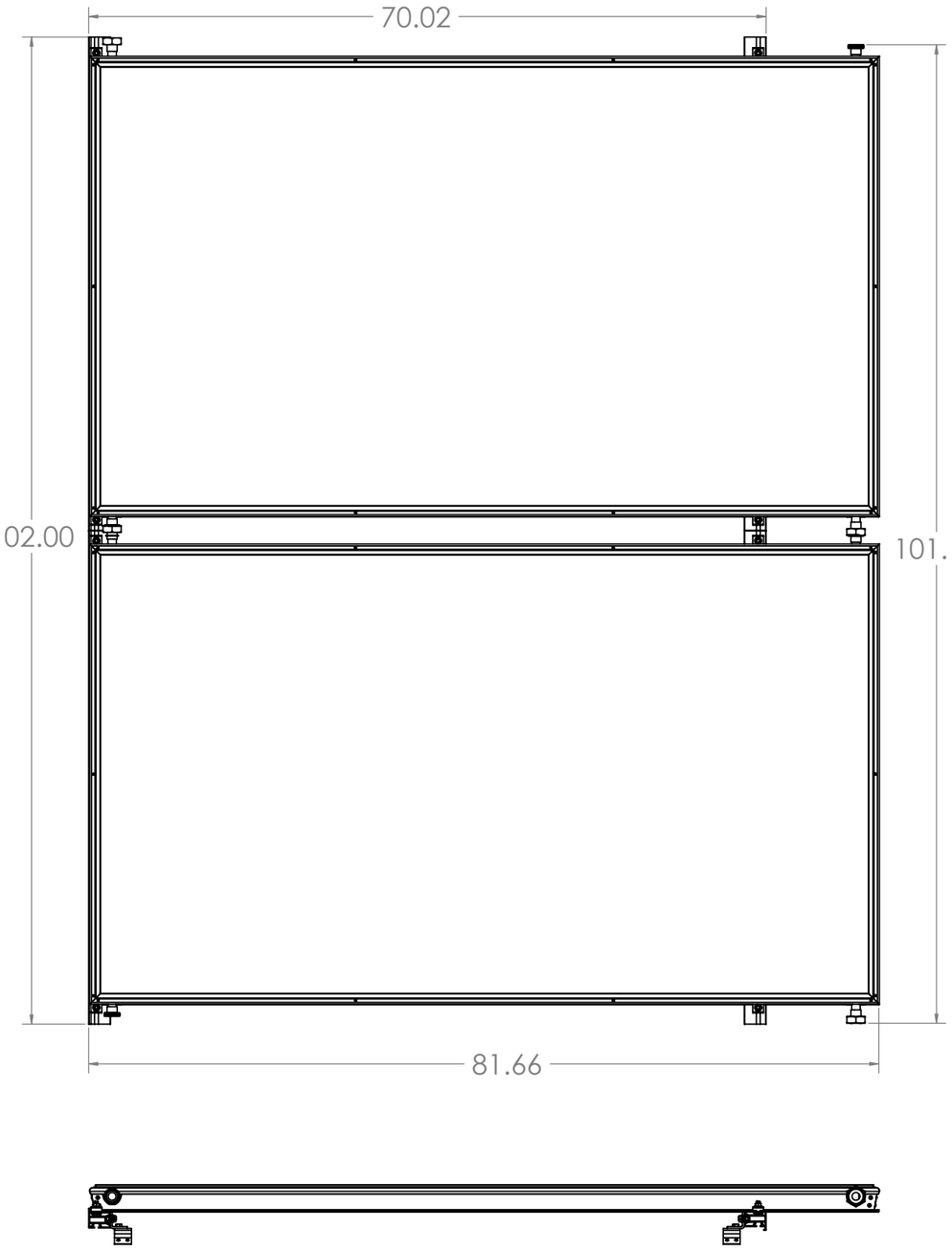
TITLE:

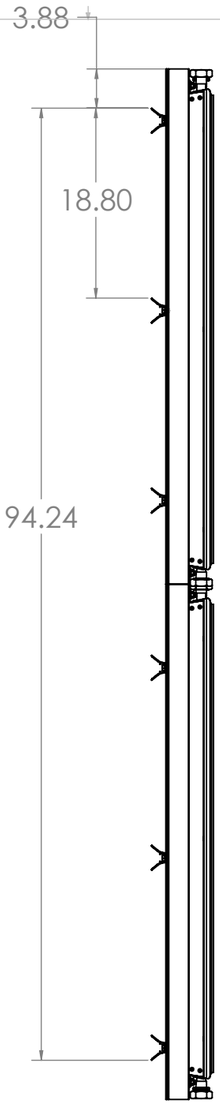
40090_FLSR 002 000B with collector rail and 10 rib bracket for metal roof

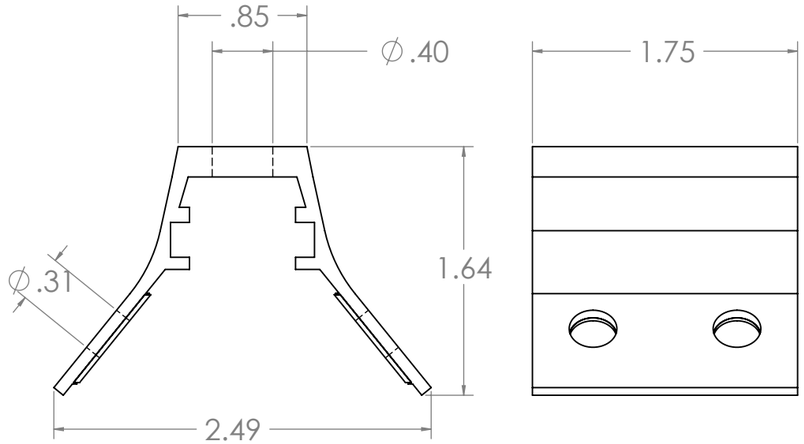
SIZE	DWG. NO.	REV
B	40090_FLSR 002 000B with collector rail and 10 rib bracket for metal roof	B

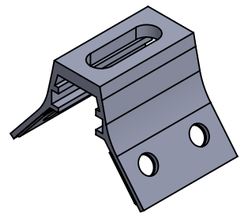
SCALE: 1:32 WEIGHT: N/A SHEET 2 OF 4

EXPOSURE D









NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS	ANGLES
.X = ±.030 [.762]	X° = 1°
.XX = ±.010 [.254]	XX° = 1/2°
.XXX = ±.005 [.127]	XXX° = 1/4°

MATERIAL: SEE NOTE 2

FINISH: SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

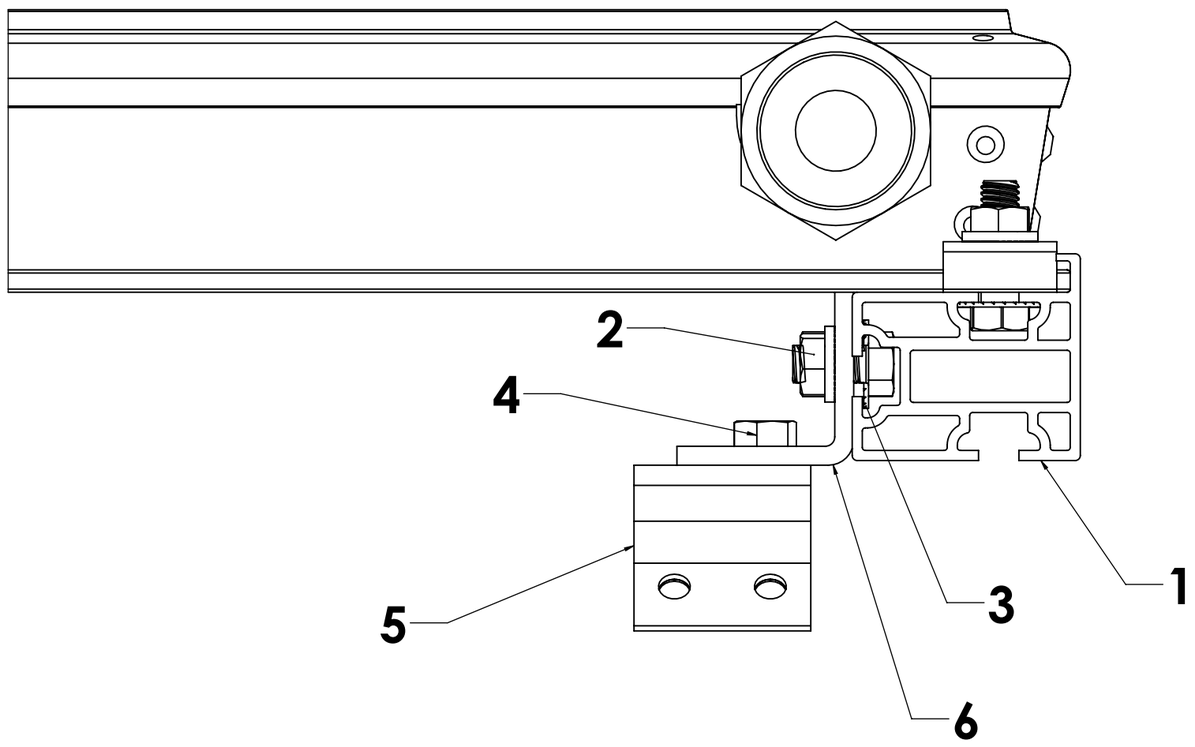
heliodyne SOLAR HOT WATER

TITLE:

40090_FLSR 002 000B with collector rail and 12 rib bracket for metal roof

SIZE	DWG. NO.	REV
B	40090_FLSR 002 000B with collector rail and 12 rib bracket for metal roof	B

SCALE: 1:32 WEIGHT: N/A SHEET 2 OF 4



Item no	PART NUMBER	DESCRIPTION	QTY.
1	21725	Mounting Rail-102	2
2	21149	Serrated Flg Nut 0.375-16 18-8 Blk	3
3	23669	3/8 EXTERNAL TOOTH Lock Washer 18-8SS	2
4	25339	3/8-16 x 3/4" Hex Head Bolt, 18-8 SS	2
5		Rib bracket	1
6	21382	L Bracket	1

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [.XX]=MM, TOLERANCES ARE:

DIMENSIONS	ANGLES
.X = ±.030 [.762]	X° = 1°
.XX = ±.010 [.254]	XX° = 1/2°
.XXX = ±.005 [.127]	XXX° = 1/4°

MATERIAL SEE NOTE 2

FINISH SEE NOTE 3

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	M STARKEY	29-10-2025
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

helioDyne SOLAR HOT WATER

TITLE:

40090_FLSR 002 000B with collector rail and 10 rib bracket for metal roof

SIZE	DWG. NO.	REV
B	40090_FLSR 002 000B with collector rail and 10 rib bracket for metal roof	B

SCALE: 1:32 WEIGHT: N/A SHEET 3 OF 4