Reviewed 2/15/2022 DLSubject to field inspectors approvals.

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Seismic /97 MPH Wind Load Design Calculations for a

LG LUU369HV (CU-1,5,6) on a

Thybar Retromate
at 1201 39th Ave SW, Puyallup WA 98373

Costco 660 - Puyallup, WA
Thybar Order # 215746

October 27, 2021

THE APPROVED CONSTRUCTION PLANS AND ALL DOCUMENTS DOCUMENTS MUST BE POSTED ON THE JOB AT ALL INSPECTIONS IN A VISIBLE AND READILY ACCESSIBLE LOCATION.

B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA
Location: 1201 39th Ave SW, Puyallup WA 98373

Applicable Building Code: IBC2018
Seismic Design Category: D

Summary

Assumptions

Review all pages prior to installing

1. These calculations begin with the assumption that the Thybar Retromates is supported around its full perimeter by the existing curb.
2. The Thybar Retromate must be attached to the existing curb using welds or bolts at the Retromate base flanges. The existing curb is assumed to be of sufficient structural integrity to withstand all seismic and wind load forces transmitted to it by the Retromate. Thybar Corporation is not responsible for verification of existing curb structural integrity and verification of building structure supporting the existing and new adapter curb is not the responsibility of Thybar Corporation.
3. As curb manufacturers, Thybar Corporation cannot be expected to provide appropriate attachment hardware for every possible type of roof structure. Thybar provides seismic/wind load calculations that are based on the material provided; typically sheet metal curbs. It is the responsibility of others (project engineer, architect, SEOR, etc.) to know enough about the load carrying capability of the building structure to design a method of attachment to that structure. Thybar does not design the structure and therefore should not recommend an attachment method that may create difficulties with existing field conditions outside of the curb manufacturer's control.

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA
Location: 1201 39th Ave SW, Puyallup WA 98373
Applicable Building Code: IBC2018
Seismic Design Category: D

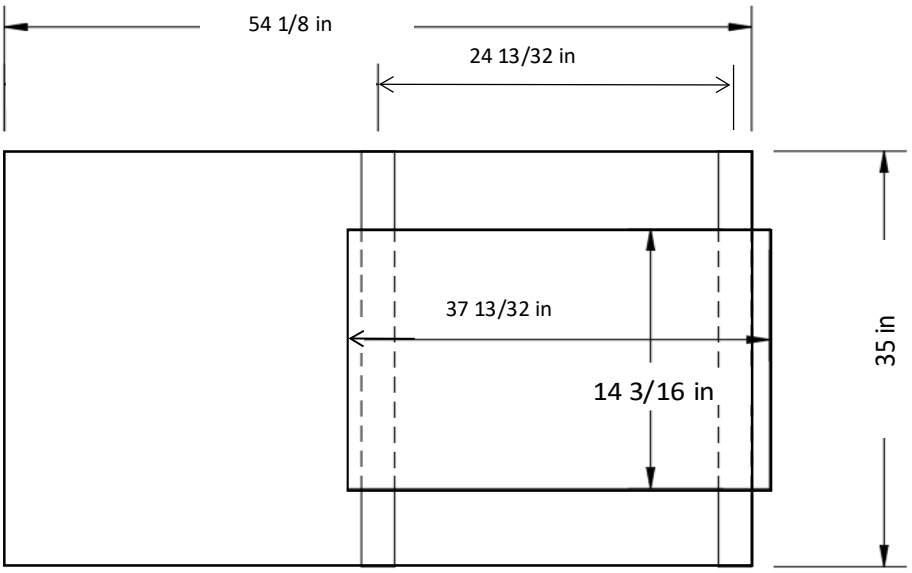
Equipment

Manufacturer LG
Unit Model LUU369HV (CU-1,5,6)

Base Length	24 3/8 in	**CG_{x1}**	14.64 in
Base Width	14 3/16 in	**CG_{y1}**	8.51 in
Height	54 3/8 in	**Top Area A_t**	3.7 ft²
Unit Weight	199 lbs.	**Long Side Area**	14.1 ft²
Total Operating Weight	199 lbs.	**Short Side Area**	5.4 ft²

Thybar Product

Product	TEMS3 Short Side					**TEMS Qty.**	2
TEMS Length	35 in	**TEMS Offset**	24 7/16 in	**Min. Height**	3.00 in	**Max. Height**	3.00 in
Material	14 Ga. Prime Galv Steel		**Thickness**	0.0713 in		**Est. Weight**	50 lbs.
	Poisson's Ratio v	0.297		**Yield Strength F_y**	33,000 psi	**Flat height of**	
	Tensile Strength F_u	45,000 psi		**Young's Modulus E**	29,000,000 psi	**curb wall h**	2.71 in



Wind Load Factors		Seismic Load Factors			
Exposure Category	B			Site Soil Classification	D
Height for Wind Calculations	30.0 ft.			Occupancy/Risk Category	II
Wind Speed V	97 MPH			S_S (% of g)	126.70%
				S_1 (% of g)	43.70%
Velocity Pressure coefficient Kz	0.70			S_{DS}	1.014
Topography factor Kzt	1.00	a_p	2.50	S_{D1}	0.000
Directionality factor K_d	0.85	I_P	1.00	F_a	1.20
qh	14.14	R_P	6.00	F_v	0.00
Importance factor Iw	N/A	**Snow Load**			
GCr	1.90			C_t	1.1
GC (Uplift)	1.50			C_E	1
Ke	0.99			Snow Importance, I	1.0
				Unit Roof Snow Load	11.6 lb/ft²

B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

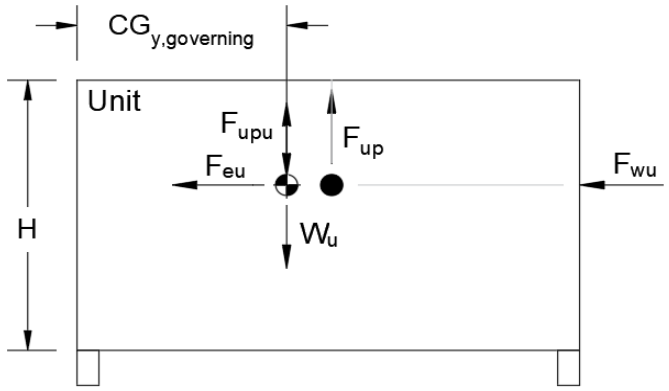
Seismic Design Category: D

Curb Type: Retromate

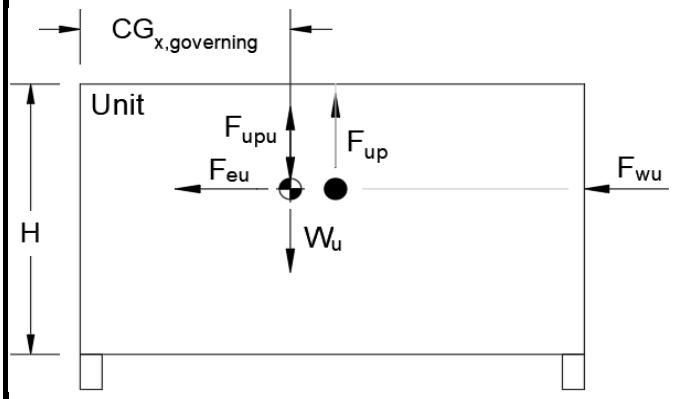
Unit Manufacturer / Model: LG LUU369HV (CU-1,5,6)

Unit Forces		
Unit Height	H	54.34 in
Unit COG	CG_y	8.51 in
Unit COG	CG_x	14.64 in
Unit COG	CG_z	27.19 in
Total Operating Weight	W_u	199 lbs.
Weight Long Side	W_{ul}	199 lbs.
Weight Short Side	W_{us}	199 lbs.
Snow Load	SL	42 lbs.
Snow Long Side	SL_l	42 lbs.
Snow Short Side	SL_s	42 lbs.
Wind Load (97 mph) Long Side	F_{wu}	379 lbs.
Wind Load (97 mph) Short Side	F_{wu}	144 lbs.
Wind Upward Force	F_{up}	78 lbs.
Seismic Force	F_{eu}	101 lbs.
	$F_{eu\ Max}$	323 lbs.
	$F_{eu\ Min}$	61 lbs.
Seismic Vertical ± Force	F_{upu}	40 lbs.
	z / h	1.0

Long Side Loading



Short Side Loading



B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: TEMS3 Short Side

Unit Manufacturer / Model: LG LUU369HV (CU-1,5,6)

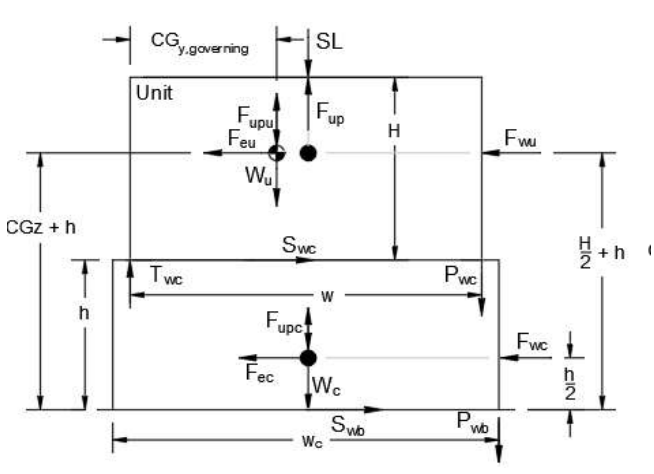
TEMS Forces		
TEMS Max Height	h	3.00 in
Centerline Width	w	14.19 in
TEMS Weight	W_c	50 lbs.
Wind Load (97 mph) Long Side	F_{wc}	2 lbs.
Wind Load (97 mph) Short Side	F_{wc}	20 lbs.
Seismic Force	F_{ec}	25 lbs.
	$F_{ec\ Max}$	81 lbs.
	$F_{ec\ Min}$	15 lbs.
TEMS Seismic Vertical ± Force	F_{upc}	10 lbs.

Maximum Total Loading on Screw			
Uplift Long Side	0.6D+0.6W	Pw	411 lbs.
Shear Long Side	0.6D+0.6W	Sw	227 lbs.
Uplift Short Side	0.6D+0.6W	Ps	70 lbs.
Shear Short Side	0.6D+0.6W	Ss	86 lbs.

Maximum Load at TEMS			
Axial Load Long	D+0.6W	Tw	531 lbs.
Shear Long	D+0.6W	Sw	227 lbs.
Axial Load Short	D+0.7E	Ts	270 lbs.
Shear Short	D+0.6W	Ss	86 lbs.

Maximum Load at TEMS Base			
Uplift Long Side	0.6D+0.6W	Pw	135 lbs.
Shear Long Side	0.6D+0.6W	Sw	230 lbs.
Uplift Short Side	0.6D+0.6W	Ps	45 lbs.
Shear Short Side	0.6D+0.6W	Ss	110 lbs.

Long Side Loading



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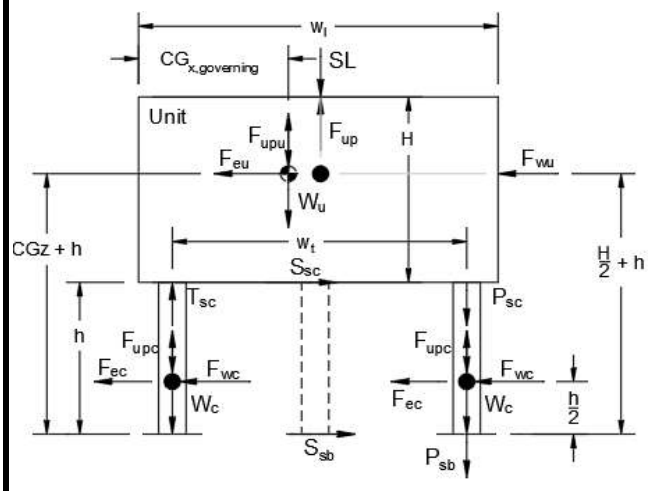


B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: TEMS3 Short Side

Unit Manufacturer / Model: LG LUU369HV (CU-1,5,6)

Unit to TEMS Screw Design

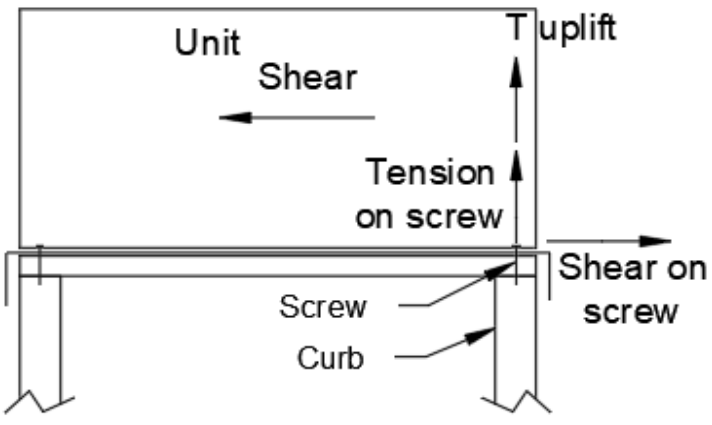
Unit and TEMS

	Long	Short
Unit Shear	227 lbs.	86 lbs.
Unit Uplift	411 lbs.	70 lbs.
TEMS Length and Offset	35.00 in	24.44 in

Screw Capacity

Screw size/type (#)	1/4 304 SS
Hole size	0.25 in
Allowable pullout/screw	1400 lbs.
Allowable shear/screw	746 lbs.

	Long
Tension on Screws	411 lbs.
Shear on Screws	114 lbs.
# Screws for pullout/side	2
# Screws for Shear/side	2
Combined loading check If < 1 Ok	0.223



Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: TEMS3 Short Side

Unit Manufacturer / Model: LG LUU369HV (CU-1,5,6)

TEMS Base Hole

Material Properties		
	F_y	33,000 psi
	F_U	45,000 psi

Base Hole Dimensions		
Hole Size		0.6250 in
Fastener Diameter		1/2 in
Material thickness		14 Ga.
TEMS flange thickness	t_f	0.1426 in
Cut out area		0.31 in²
Base flange width		2.0000 in
Edge distance		0.6875 in
Base shear area	A_n	0.20 in²

Bearing strength w/o bolt hole deformation AISI Section J3.3.1		
	P_n	7,219 lbs.
Allowable Bearing	P_{all}	2,888 lbs.

TEMS Base Hole Forces Short Side Loading		
Shear	V_S	55 lbs.
Uplift	T_S	58 lbs.
$R=\sqrt{T^2+V^2}$	R_S	80 lbs.
Min. Holes per TEMS side R/Pall		2

TEMS Base Hole Forces Long Side Loading		
Shear	V_L	29 lbs.
Uplift	T_L	23 lbs.
$R=\sqrt{T^2+V^2}$	R_L	37 lbs.
if R/Pall is < 1 number of holes OK		0.01

Shear Strength AISI Section J6.1			
	V_n	5,294	
Allowable Shear	V_{all}	2,385	
		LS Loading	SS Loading
Min. Holes per TEMS side	R/V_{all}	1	1

Base Holes	
Min. Holes per TEMS Long Side	2
Shear per Hole	14 lbs.
Uplift per Hole	11 lbs.

Use screws at 18" min.:
Long Side = 4
Short Side = 3

The screws must be drilled into the existing curb steel at the attachment of the retromate to the existing curb.

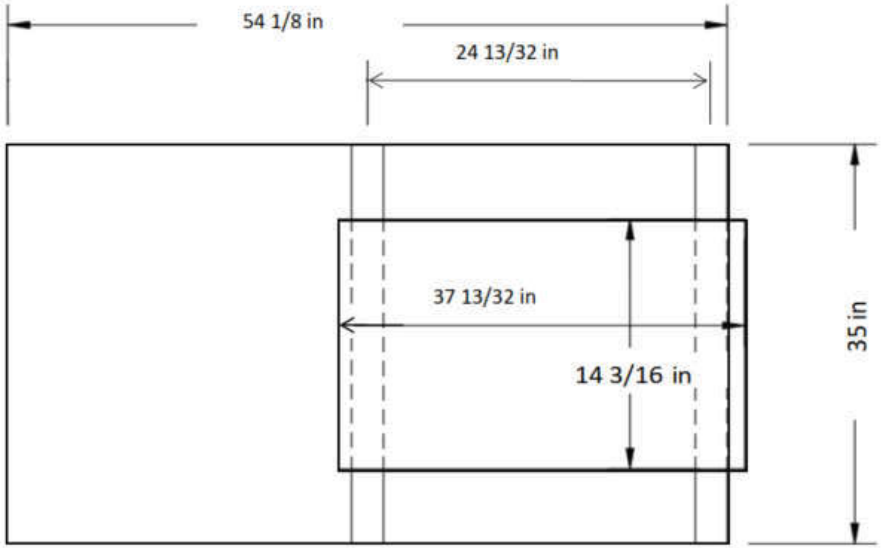
As curb manufacturers, Thybar Corporation cannot specify the appropriate attachment hardware for every possible type of roof structure. Thybar provides seismic/wind load calculations that are based on the material provided; typically sheet metal curbs. It is the responsibility of others (project engineer, architect, SEOR, etc) to design a method of the TEMS attachment to that structure. Thybar does not design the structure and therefore cannot recommend an attachment method that may create difficulties with existing field conditions outside of the curb manufacturer's control.

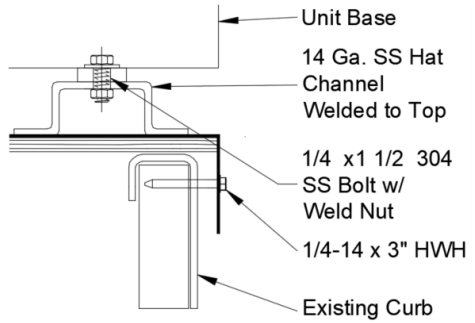
B-21-0421

Unit to Curb Screw Installation Instructions

1. Uniy directly connected to the top of Tems at specified unit location

Thybar Model Restraints	Bolt Qty. Per Unit	Attachment Screws	Product
N/A	4	(4) 1/4" Dia. 304 SS Bolts with Nuts	





DETAIL

Min Base Hole Quantity per side	4	3	0.25

VERIFY ALL ELECTRICAL WIRES ARE CLEAR OF BASE RAIL INTERIOR BEFORE INSTALLING RESTRAINT

(Holes start 6 in. from base OD)	Long	Short	Hole Size

Meets Requirements for: IBC2018 Seismic Design Category: D
Max. Wind Speed: 97 MPH Building Height: 30 ft.
Exposure Category: B Risk Category: II

Seismic & Wind load Restraints are designed & calculated for use in Seismic & Wind load applications when provided as part of a Seismic & Wind load rated Thybar curb. Attachment of calculated Restraint to any other curb does not constitute a Seismic & Wind load rated assembly. Thybar Corporation has a policy of continuous product improvement and reserves the right to change the product design without notice

(DO NOT SCALE DRAWING) Unless otherwise specified dimensions are in inches tolerances are ± 1/16 ± 0.0625 ± 1°

Date 10/27/2021

Seismic / Wind load Restraint for
LG LUU369HV
On a Thybar Retromate with Equipment Bases
Costco 660 - Puyallup, WA
1201 39th Ave SW, Puyallup WA 98373

Qty: 1 Job# 215746

Tag: (CU-1,5,6)

Drawing is conceptual, not to scale

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Seismic /97 MPH Wind Load Design Calculations for a

Aaon RN-006 (AC-4) on a

Thybar Retromate
at 1201 39th Ave SW, Puyallup WA 98373

Costco 660 - Puyallup, WA
Thybar Order # 215746

October 27, 2021

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA
Location: 1201 39th Ave SW, Puyallup WA 98373

Applicable Building Code: IBC2018
Seismic Design Category: D

Summary

Assumptions

Review all pages prior to installing

1. These calculations begin with the assumption that the Thybar Retromates is supported around its full perimeter by the existing curb.
2. The Thybar Retromate must be attached to the existing curb using welds or bolts at the Retromate base flanges. The existing curb is assumed to be of sufficient structural integrity to withstand all seismic and wind load forces transmitted to it by the Retromate. Thybar Corporation is not responsible for verification of existing curb structural integrity and verification of building structure supporting the existing and new adapter curb is not the responsibility of Thybar Corporation.
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Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA
Location: 1201 39th Ave SW, Puyallup WA 98373
Applicable Building Code: IBC2018
Seismic Design Category: D

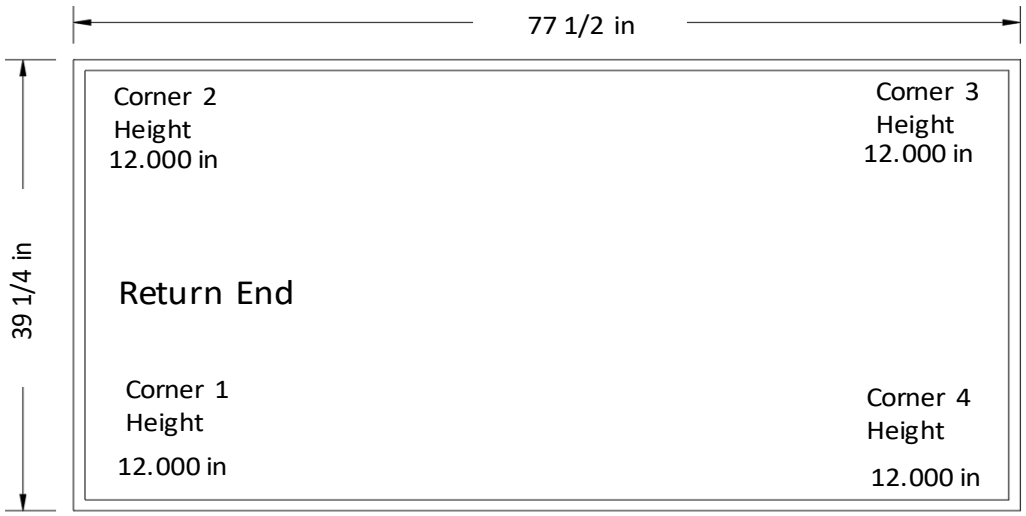
Equipment

Manufacturer Aaon
Unit Model RN-006 (AC-4)

Base Length	82 in	**CG_{x1}**	44.00 in
Base Width	43 3/4 in	**CG_{y1}**	15.35 in
Height	44 in	**Top Area A_t**	50.2 ft²
Unit Weight	1,247 lbs.	**Long Side Area**	26.4 ft²
Total Operating Weight	1,247 lbs.	**Short Side Area**	18.7 ft²

Thybar Product

Product	**Insulated Roof Curb No Top Nailer**						1
Length OD	77 1/2 in	**Width OD**	39 1/4 in	**Min. Height**	12.00 in	**Max. Height**	12.00 in
Material	14 Ga. Prime Galv Steel		**Thickness**	0.0713 in		**Est. Weight**	127 lbs.
	Poisson's Ratio v	0.297		**Yield Strength F_y**	33,000 psi	**Flat height of**	
	Tensile Strength F_u	45,000 psi		**Young's Modulus E**	29,000,000 psi	**curb wall h**	11.71 in



Wind Load Factors		Seismic Load Factors			
Exposure Category	B			Site Soil Classification	D
Height for Wind Calculations	30.0 ft.			Occupancy/Risk Category	II
Wind Speed V	97 MPH			S_S (% of g)	126.70%
				S_1 (% of g)	43.70%
Velocity Pressure coefficient Kz	0.70			S_{DS}	1.014
Topography factor Kzt	1.00	a_p	2.50	S_{D1}	0.000
Directionality factor K_d	0.85	I_P	1.00	F_a	1.20
qh	14.14	R_P	6.00	F_v	0.00
Importance factor Iw	N/A	**Snow Load**			
GCr	1.90			C_t	1.1
GC (Uplift)	1.50			C_E	1
Ke	0.99			Snow Importance, I	1.0
				Unit Roof Snow Load	11.6 lb/ft²

B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

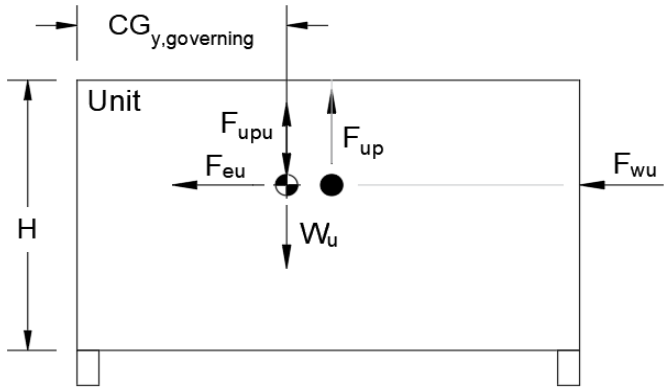
Seismic Design Category: D

Curb Type: Retromate

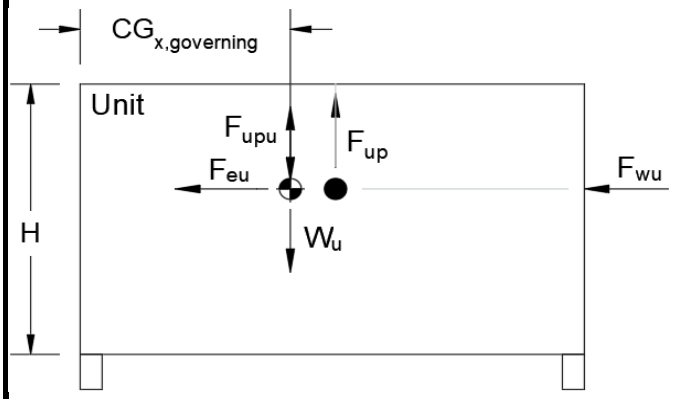
Unit Manufacturer / Model: Aaon RN-006 (AC-4)

Unit Forces		
Unit Height	H	44.00 in
Unit COG	CG_y	15.35 in
Unit COG	CG_x	44.00 in
Unit COG	CG_z	22.00 in
Total Operating Weight	W_u	1,247 lbs.
Weight Long Side	W_{ul}	828 lbs.
Weight Short Side	W_{us}	419 lbs.
Snow Load	SL	580 lbs.
Snow Long Side	SL_l	385 lbs.
Snow Short Side	SL_s	195 lbs.
Wind Load (97 mph) Long Side	F_{wu}	709 lbs.
Wind Load (97 mph) Short Side	F_{wu}	502 lbs.
Wind Upward Force	F_{up}	1,064 lbs.
Seismic Force	F_{eu}	632 lbs.
	$F_{eu\ Max}$	2,024 lbs.
	$F_{eu\ Min}$	379 lbs.
Seismic Vertical ± Force	F_{upu}	253 lbs.
	z / h	1.0

Long Side Loading



Short Side Loading



B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: Retromate

Unit Manufacturer / Model: Aaon RN-006 (AC-4)

Curb Forces		
Curb Max Height	h	12.00 in
Centerline Width	w	41.25 in
Curb Weight	W_c	127 lbs.
Wind Load (97 mph) Long Side	F_{wc}	173 lbs.
Wind Load (97 mph) Short Side	F_{wc}	88 lbs.
Seismic Force	F_{ec}	64 lbs.
	$F_{ec\ Max}$	205 lbs.
	$F_{ec\ Min}$	39 lbs.
Curb Seismic Vertical ± Force	F_{upc}	26 lbs.

Maximum Total Loading on Bracket			
Uplift Long Side	0.6D+0.6W	Pw	307 lbs.
Shear Long Side	0.6D+0.6W	Sw	213 lbs.
Uplift Short Side	0.6D+0.6W	Ps	62 lbs.
Shear Short Side	0.6D+0.6W	Ss	151 lbs.

Maximum Load at Curb			
Axial Load Long	D+0.75(0.7E)+0.75S	Twc	1,459 lbs.
Shear Long	D+0.7E	Swc	221 lbs.
Axial Load Short	D+0.75(0.7E)+0.75S	Tsc	1,154 lbs.
Shear Short	D+0.7E	Ssc	221 lbs.

Maximum Load at Curb Base			
Uplift Long Side	0.6D+0.6W	Pwb	391 lbs.
Shear Long Side	0.6D+0.6W	Swb	265 lbs.
Uplift Short Side	0.6D+0.7E	Psb	0 lbs.
Shear Short Side	0.6D+0.7E	Ssb	244 lbs.

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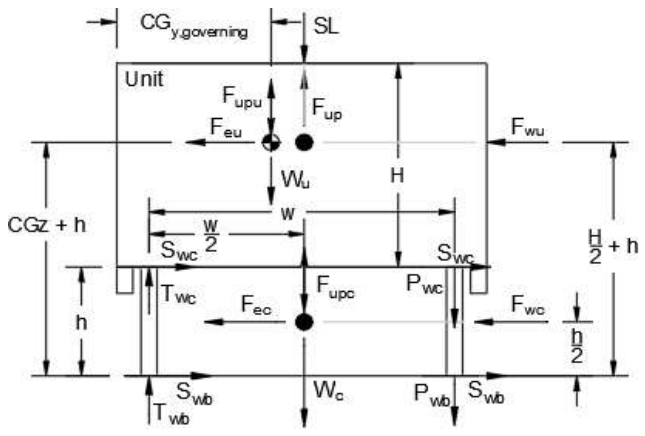

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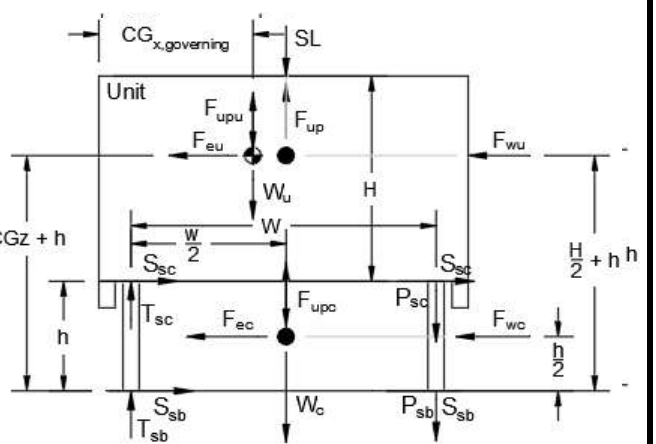

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Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: Retromate

Unit Manufacturer / Model: Aaon RN-006 (AC-4)

Unit to Curb Bracket Design

Unit and Curb

	Long	Short
Unit Shear	213 lbs.	151 lbs.
Unit Uplift	307 lbs.	62 lbs.
Curb Length/Width	77.50 in	39.25 in

Bracket Dimensions

Length	L	8.00 in
Max bending arm	BA	1.88 in
Gauge		10 Ga
thickness	t	0.1220 in
Yield Strength	F_y	50,000 psi
Cross Sectional Area		0.98 in²

Bracket Flexure Capacity

	F_y	50,000 psi
Allowable Uplift	T_a	475 lbs.

Bracket Quantity

	Long	Short
Brackets Required, # per side	2	0
Total Brackets Required	**4**	

Screw Capacity @ Side of Bracket

Screw size/type (#)	1/4
Hole size	0.25 in
Allowable pullout/screw	191 lbs.
Allowable shear/screw	463 lbs.

	Long	Short
Tension on Screws	213 lbs.	75 lbs.
Shear on Screws	307 lbs.	62 lbs.
# Screws for pullout/Bracket	4	
# Screws for Shear/Bracket	4	
Combined loading check If < 1 Ok	0.026	

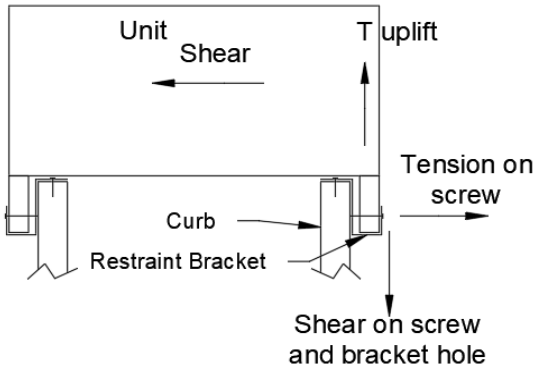
Screw Capacity @ Top of Bracket

Screw size/type (#)	10
Hole size	0.25 in
Allowable pullout/screw	145 lbs.
Allowable shear/screw	404 lbs.

	Long	Short
Tension on Screws T_c	307 lbs.	
Shear on Screws	213 lbs.	
# Screws for pullout/Bracket	4	
# Screws for Shear/Bracket	4	
Combined loading check If < 1 Ok	0.074	

Bracket Shear Capacity at Holes

Max Shear / Bracket		153 lbs.
hole edge to bracket edge	e	0.375 in
Allowable shear stress	F_v	30,000 lbs.
Allowable shear / Bracket	P_s	5,490 lbs.



B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: Retromate

Unit Manufacturer / Model: Aaon RN-006 (AC-4)

Curb Wall Design

Compression of Curb Wall		
	K	4
	f_{cr}	528 psi
	F_a	264 psi
Material thickness	t	0.071 in
	P	729 lbs.
stiffeners Required	b	31.74
OK	f_a	264 psi
OK	Lc/ts	164

Shear on Short Side of Curb Wall		
	α	3.35
	K_s	5.70
	f_{cr}	5,520 psi
	F_v	2,760 psi
	f_v	40 psi

stiffeners Design		
stiffeners Width	ws	1.00 in
stiffeners Thickness	ts	0.071 in
stiffeners Length	Lc	11.715 in
	ws/ts	14.03
$0.42\sqrt{(E/Fy)}$		12.45
	weff	0.888 in

Bearing Stiffener Capacity per AISI F5.1 (a)	
As	0.06 in²
Ac	0.15 in²
Pn	5,108 lbs.
Pall	2,554 lbs.

Bearing Stiffener Capacity per AISI F5.1 (b)	
Ab	0.19 in²
Fe	136,965 psi
Fn	29,834 psi
Pn	5,680 lbs.
Pall	2,840 lbs.

stiffeners capacity	2,554
Max. stiffeners Spacing	**31.741 in**

Curb is to be continuously supported along the perimeter of curb base and any unit section splits
ref. : AISI S100-2016

B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: Retromate

Unit Manufacturer / Model: Aaon RN-006 (AC-4)

Curb Base Hole

Material Properties		
F_y	33,000 psi	
F_U	45,000 psi	
Base Hole Dimensions		
Hole Size	0.2500 in	
Fastener Diameter	1/4 in	
Material thickness	14 Ga.	
Curb flange thickness t_f	0.0713 in	
Cut out area	0.05 in²	
Base flange width	2.0000 in	
Edge distance	0.8750 in	
Base shear area A_n	0.12 in²	
Allowable Screw Capacity		
Allowable Shear	406 lbs.	
ullout	153 lbs.	
Base Hole Forces Short Side Loading		
Shear	V_S	244 lbs.
Curb Uplift	T_S	0 lbs.
$R = \sqrt{T^2 + V^2}$	R_S	244 lbs.
Min. Hole R/P_{all}		2
Base Hole Forces Long Side Loading		
Shear	V_L	265 lbs.
Uplift	T_L	391 lbs.
$R = \sqrt{T^2 + V^2}$	R_L	472 lbs.
Min. Hole R/P_{all}		4

Shear Strength AISI Section J6.1			
	V_n	3,369	
Allowable Shear	V_{all}	1,518	
		Long	Short
Min. Hole	R/V_{all}	1	1

Base Holes		
	Long	Short
Min Holes required per side	4	2
Shear per Hole	66 lbs.	122 lbs.
Uplift per Hole	98 lbs.	0 lbs.

The screws must be drilled into the existing curb steel at the attachment of the retromate to the existing curb.

As curb manufacturers, Thybar Corporation cannot specify the appropriate attachment hardware for every possible type of roof structure. Thybar provides seismic/wind load calculations that are based on the material provided; typically sheet metal curbs. It is the responsibility of others (project engineer, architect, SEOR, etc) to design a method of the curb attachment to that structure. Thybar does not design the structure and therefore cannot recommend an attachment method that may create difficulties with existing field conditions outside of the curb manufacturer's control.

B-21-0421

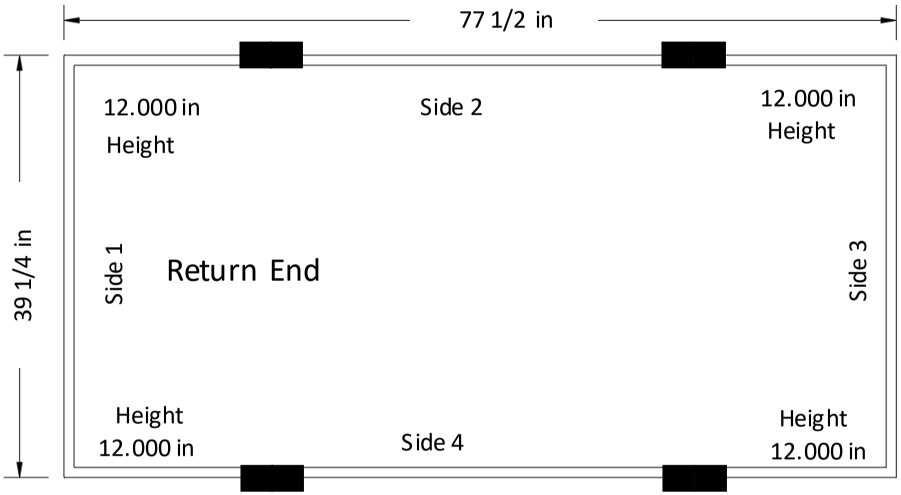
Unit to Curb Bracket Installation Instructions

Bracket must be field installed to roof curb before setting unit.

1. Start Bracket 4 inches from end of curb. Then equally distribute Brackets as much as possible while avoiding interferences with lifting lugs, condensate drain lines, unit base screws, Etc.
2. Screw brackets or Weld at all notches 1 in. long 1/16 in. fillet weld (not for curbs with wood on top) to top of curb.
3. Gasket top perimeter of curb and brackets before setting unit.

Thybar Model Restraints	Bracket Qty. Per Unit	Attachment Screws Per Bracket	Product
ACSWRANB0009RC	4	(4) 1/4-14x3 HWH (4) #10-16x1 HWH	for Curb

Total Screws: (16) 1/4-14x3 HWH #1157000
(16) #10-16x1 HWH #1129000



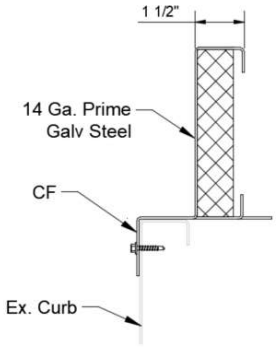
Requires 1/2 in. Thick Gasket

Bracket Quantity per side 2

Max. stiffeners Spacing Curb 31.74 in

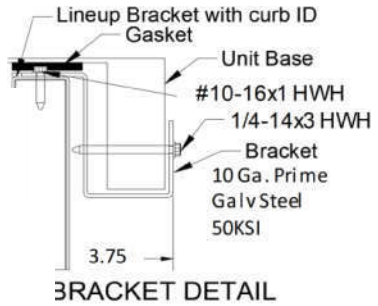
Min Base Hole Quantity per side 4 2 0.25

(Holes start 6 in. from base OD)



RETROMATE BASE DETAIL

HARDWARE: (QTY. PER CALCULATION) $\frac{1}{4}$" TEK SCREWS OR EQUIVALENT AS PROVIDED BY CONTRACTOR (CONTRACTOR TO VERIFY LENGTH REQUIRED)



BRACKET DETAIL

Meets Requirements for: IBC2018 Seismic Design Category: D
Max. Wind Speed: 97 MPH Building Height: 30 ft.
Exposure Category: B Risk Category: II

913 S. Kay Avenue
Addison, IL 60101
800-666-CURB (2872)
Fax: 630-543-5309
www.thybar.com
Member of
VISCMA

Seismic /97 MPH Wind Load Design Calculations for a

Aaon RN-050 (AC-7,8,9,10,11) on a

Thybar Retromate
at 1201 39th Ave SW, Puyallup WA 98373

Costco 660 - Puyallup, WA
Thybar Order # 215746

October 27, 2021

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA
Location: 1201 39th Ave SW, Puyallup WA 98373

Applicable Building Code: IBC2018
Seismic Design Category: D

Summary

Assumptions

Review all pages prior to installing

1. These calculations begin with the assumption that the Thybar Retromates is supported around its full perimeter by the existing curb.
2. The Thybar Retromate must be attached to the existing curb using welds or bolts at the Retromate base flanges. The existing curb is assumed to be of sufficient structural integrity to withstand all seismic and wind load forces transmitted to it by the Retromate. Thybar Corporation is not responsible for verification of existing curb structural integrity and verification of building structure supporting the existing and new adapter curb is not the responsibility of Thybar Corporation.
3. As curb manufacturers, Thybar Corporation cannot be expected to provide appropriate attachment hardware for every possible type of roof structure. Thybar provides seismic/wind load calculations that are based on the material provided; typically sheet metal curbs. It is the responsibility of others (project engineer, architect, SEOR, etc.) to know enough about the load carrying capability of the building structure to design a method of attachment to that structure. Thybar does not design the structure and therefore should not recommend an attachment method that may create difficulties with existing field conditions outside of the curb manufacturer's control.

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA
Location: 1201 39th Ave SW, Puyallup WA 98373
Applicable Building Code: IBC2018
Seismic Design Category: D

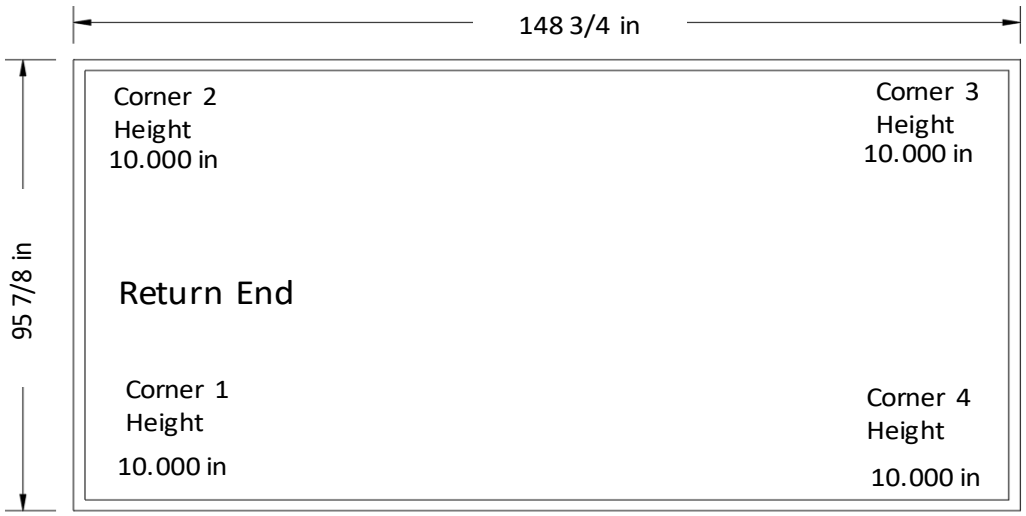
Equipment

Manufacturer Aaon
Unit Model RN-050 (AC-7,8,9,10,11)

Base Length	153 in	**CG_{x1}**	88.10 in
Base Width	99 3/4 in	**CG_{y1}**	50.75 in
Height	101 3/4 in	**Top Area A_t**	126.9 ft²
Unit Weight	6,419 lbs.	**Long Side Area**	111.3 ft²
Total Operating Weight	6,419 lbs.	**Short Side Area**	70.5 ft²

Thybar Product

Product	**Insulated Roof Curb No Top Nailer**						1
Length OD	148 3/4 in	**Width OD**	95 7/8 in	**Min. Height**	10.00 in	**Max. Height**	10.00 in
Material	12 Ga. Prime Galv Steel		**Thickness**	0.1017 in		**Est. Weight**	392 lbs.
	Poisson's Ratio v	0.297		**Yield Strength F_y**	33,000 psi	**Flat height of**	
	Tensile Strength F_u	45,000 psi		**Young's Modulus E**	29,000,000 psi	**curb wall h**	9.59 in



Wind Load Factors		Seismic Load Factors			
Exposure Category	B			Site Soil Classification	D
Height for Wind Calculations	30.0 ft.			Occupancy/Risk Category	II
Wind Speed V	97 MPH			S_S (% of g)	126.70%
				S_1 (% of g)	43.70%
Velocity Pressure coefficient Kz	0.70			S_{DS}	1.014
Topography factor Kzt	1.00	a_p	2.50	S_{D1}	0.000
Directionality factor K_d	0.85	I_P	1.00	F_a	1.20
qh	14.14	R_P	6.00	F_v	0.00
Importance factor Iw	N/A	**Snow Load**			
GCr	1.90			C_t	1.1
GC (Uplift)	1.50			C_E	1
Ke	0.99			Snow Importance, I	1.0
				Unit Roof Snow Load	11.6 lb/ft²

B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

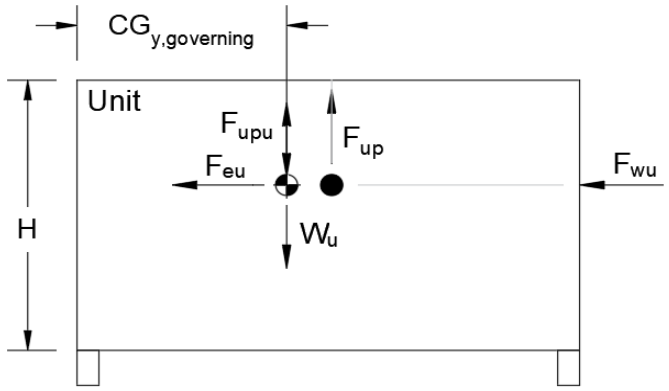
Seismic Design Category: D

Curb Type: Retromate

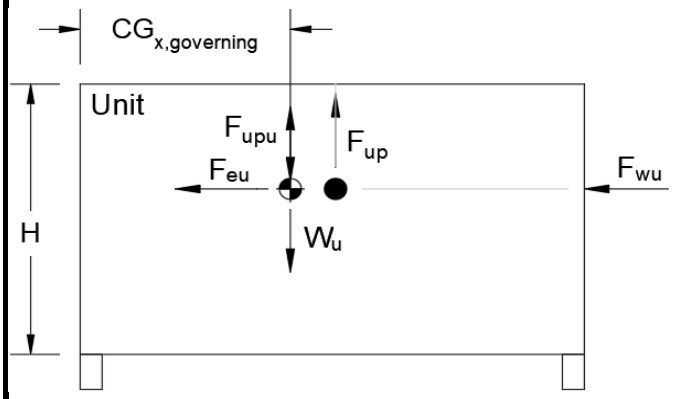
Unit Manufacturer / Model: Aaon RN-050 (AC-7,8,9,10,11)

Unit Forces		
Unit Height	H	101.75 in
Unit COG	CG_y	50.75 in
Unit COG	CG_x	88.10 in
Unit COG	CG_z	50.88 in
Total Operating Weight	W_u	6,419 lbs.
Weight Long Side	W_{ul}	3,903 lbs.
Weight Short Side	W_{us}	2,516 lbs.
Snow Load	SL	1,466 lbs.
Snow Long Side	SL_l	892 lbs.
Snow Short Side	SL_s	575 lbs.
Wind Load (97 mph) Long Side	F_{wu}	2,988 lbs.
Wind Load (97 mph) Short Side	F_{wu}	1,893 lbs.
Wind Upward Force	F_{up}	2,692 lbs.
Seismic Force	F_{eu}	3,254 lbs.
	$F_{eu\ Max}$	10,414 lbs.
	$F_{eu\ Min}$	1,953 lbs.
Seismic Vertical ± Force	F_{upu}	1,302 lbs.
	z / h	1.0

Long Side Loading



Short Side Loading



B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: Retromate

Unit Manufacturer / Model: Aaon RN-050 (AC-7,8,9,10,11)

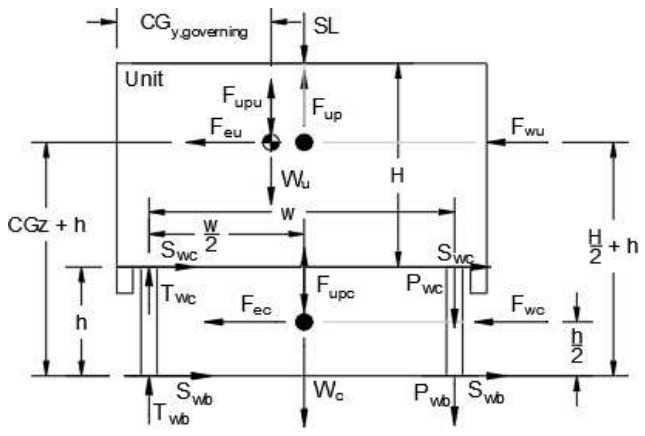
Curb Forces		
Curb Max Height	h	10.00 in
Centerline Width	w	97.88 in
Curb Weight	W_c	392 lbs.
Wind Load (97 mph) Long Side	F_{wc}	277 lbs.
Wind Load (97 mph) Short Side	F_{wc}	179 lbs.
Seismic Force	F_{ec}	199 lbs.
	$F_{ec\ Max}$	635 lbs.
	$F_{ec\ Min}$	119 lbs.
Curb Seismic Vertical ± Force	F_{upc}	79 lbs.

Maximum Total Loading on Bracket			
Uplift Long Side	0.6D+0.7E	Pw	232 lbs.
Shear Long Side	0.6D+0.7E	Sw	1,139 lbs.
Uplift Short Side	0.6D+0.7E	Ps	-67 lbs.
Shear Short Side	0.6D+0.7E	Ss	1,139 lbs.

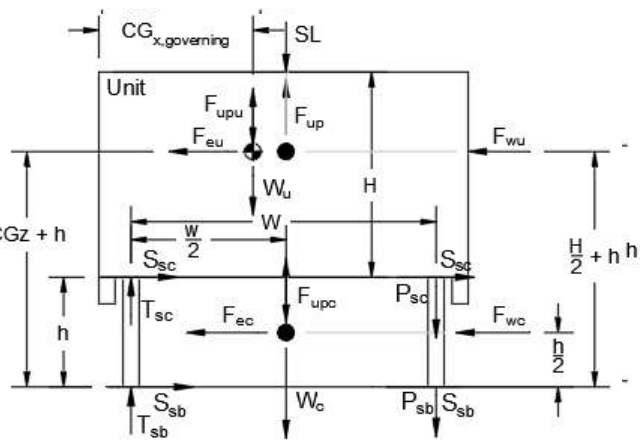
Maximum Load at Curb			
Axial Load Long	D+0.75(0.7E)+0.75S	Twc	5,552 lbs.
Shear Long	D+0.7E	Swc	1,139 lbs.
Axial Load Short	D+0.75(0.7E)+0.75S	Tsc	5,778 lbs.
Shear Short	D+0.7E	Ssc	1,139 lbs.

Maximum Load at Curb Base			
Uplift Long Side	0.6D+0.7E	Pwb	407 lbs.
Shear Long Side	0.6D+0.7E	Swb	1,208 lbs.
Uplift Short Side	0.6D+0.7E	Psb	31 lbs.
Shear Short Side	0.6D+0.7E	Ssb	1,208 lbs.

Long Side Loading



Short Side Loading



B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: Retromate

Unit Manufacturer / Model: Aaon RN-050 (AC-7,8,9,10,11)

Unit to Curb Bracket Design

Unit and Curb

	Long	Short
Unit Shear	1,139 lbs.	1,139 lbs.
Unit Uplift	232 lbs.	0 lbs.
Curb Length/Width	148.75 in	95.88 in

Bracket Dimensions

Length	L	8.00 in
Max bending arm	BA	1.72 in
Gauge		10 Ga
thickness	t	0.1220 in
Yield Strength	F_y	50,000 psi
Cross Sectional Area		0.98 in²

Bracket Flexure Capacity

	F_y	50,000 psi
Allowable Uplift	T_a	519 lbs.

Bracket Quantity

	Long	Short
Brackets Required, # per side	2	0
Total Brackets Required	**4**	

Screw Capacity @ Side of Bracket

Screw size/type (#)	1/4
Hole size	0.25 in
Allowable pullout/screw	239 lbs.
Allowable shear/screw	463 lbs.

	Long	Short
Tension on Screws	1,139 lbs.	569 lbs.
Shear on Screws	232 lbs.	0 lbs.
# Screws for pullout/Bracket	4	
# Screws for Shear/Bracket	4	
Combined loading check If < 1 Ok	0.359	

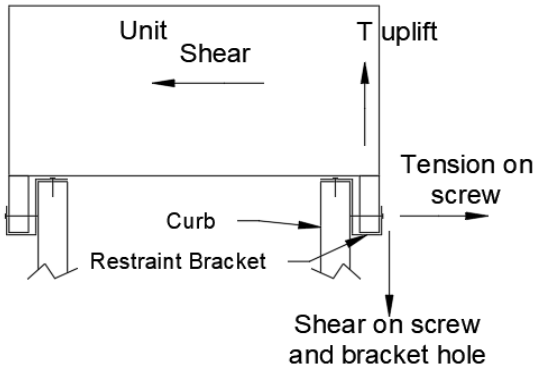
Screw Capacity @ Top of Bracket

Screw size/type (#)	10
Hole size	0.25 in
Allowable pullout/screw	182 lbs.
Allowable shear/screw	404 lbs.

	Long	Short
Tension on Screws T_c	232 lbs.	
Shear on Screws	1,139 lbs.	
# Screws for pullout/Bracket	4	
# Screws for Shear/Bracket	4	
Combined loading check If < 1 Ok	0.150	

Bracket Shear Capacity at Holes

Max Shear / Bracket		116 lbs.
hole edge to bracket edge	e	0.375 in
Allowable shear stress	F_v	30,000 lbs.
Allowable shear / Bracket	P_s	5,490 lbs.



B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: Retromate

Unit Manufacturer / Model: Aaon RN-050 (AC-7,8,9,10,11)

Curb Wall Design

Compression of Curb Wall		
	K	4
	f_{cr}	764 psi
	F_a	382 psi
Material thickness	t	0.102 in
	P	1,926 lbs.
stiffeners Required	b	37.64
OK	f_a	382 psi
OK	Lc/ts	94

Shear on Short Side of Curb Wall		
	α	9.99
	K_s	5.38
	f_{cr}	15,817 psi
	F_v	7,908 psi
	f_v	58 psi

stiffeners Design		
stiffeners Width	ws	1.00 in
stiffeners Thickness	ts	0.102 in
stiffeners Length	Lc	9.593 in
	ws/ts	9.83
$0.42\sqrt{(E/Fy)}$		12.45
	weff	1.000 in

Bearing Stiffener Capacity per AISI F5.1 (a)		
	As	0.10 in²
	Ac	0.29 in²
	Pn	9,500 lbs.
	Pall	4,750 lbs.

Bearing Stiffener Capacity per AISI F5.1 (b)		
	Ab	0.35 in²
	Fe	259,173 psi
	Fn	31,287 psi
	Pn	10,838 lbs.
	Pall	5,419 lbs.

stiffeners capacity	4,750
Max. stiffeners Spacing	**37.640 in**

Curb is to be continuously supported along the perimeter of curb base and any unit section splits
ref. : AISI S100-2016

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: Retromate

Unit Manufacturer / Model: Aaon RN-050 (AC-7,8,9,10,11)

Curb Base Hole

Material Properties		
F_y	33,000 psi	
F_U	45,000 psi	

Base Hole Dimensions		
Hole Size	0.2500 in	
Fastener Diameter	1/4 in	
Material thickness	12 Ga	
Curb flange thickness t_f	0.1017 in	
Cut out area	0.05 in²	
Base flange width	2.0000 in	
Edge distance	0.8750 in	
Base shear area A_n	0.18 in²	

Allowable Screw Capacity	
Allowable Shear	406 lbs.
ullout	153 lbs.

Base Hole Forces Short Side Loading		
Shear	V_S	1,208 lbs.
Curb Uplift	T_S	31 lbs.
$R = \sqrt{T^2 + V^2}$	R_S	1,209 lbs.
Min. Hole R/P_{all}		8

Base Hole Forces Long Side Loading		
Shear	V_L	1,208 lbs.
Uplift	T_L	407 lbs.
$R = \sqrt{T^2 + V^2}$	R_L	1,275 lbs.
Min. Hole R/P_{all}		9

Shear Strength AISI Section J6.1			
	V_n	4,805	
Allowable Shear	V_{all}	2,165	
		Long	Short
Min. Hole R/V_{all}		1	1

Base Holes		
	Long	Short
Min Holes required per side	9	8
Shear per Hole	134 lbs.	151 lbs.
Uplift per Hole	45 lbs.	4 lbs.

The screws must be drilled into the existing curb steel at the attachment of the retromate to the existing curb.

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B-21-0421

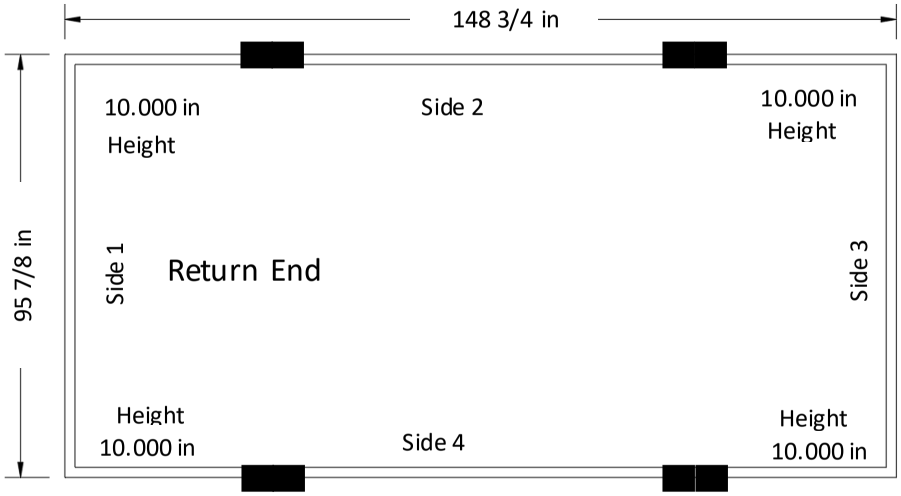
Unit to Curb Bracket Installation Instructions

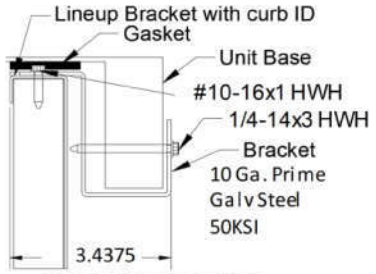
Bracket must be field installed to roof curb before setting unit.

1. Start Bracket 4 inches from end of curb. Then equally distribute Brackets as much as possible while avoiding interferences with lifting lugs, condensate drain lines, unit base screws, Etc.
2. Screw brackets or Weld at all notches 1 in. long 1/16 in. fillet weld (not for curbs with wood on top) to top of curb.
3. Gasket top perimeter of curb and brackets before setting unit.

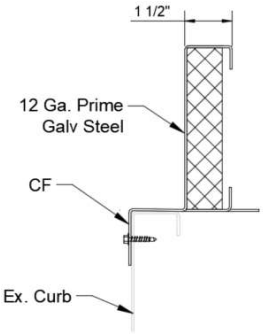
Thybar Model Restraints	Bracket Qty. Per Unit	Attachment Screws Per Bracket	Product
ACSWRANB0027RC	4	(4) 1/4-14x3 HWH (4) #10-16x1 HWH	for Curb

Total Screws: (16) 1/4-14x3 HWH #1157000
(16) #10-16x1 HWH #1129000





BRACKET DETAIL



RETROMATE BASE DETAIL

HARDWARE: (QTY. PER CALCULATION) $\frac{1}{4}$" TEK SCREWS OR EQUIVALENT AS PROVIDED BY CONTRACTOR (CONTRACTOR TO VERIFY LENGTH REQUIRED)

Bracket Quantity per side 2

Max. stiffeners Spacing Curb 37.64 in

(Holes start 6 in. from base OD)	Long	Short	Hole Size
Min Base Hole Quantity per side	9	8	0.25

VERIFY ALL ELECTRICAL WIRES ARE CLEAR OF BASE RAIL INTERIOR BEFORE INSTALLING RESTRAINT

Requires 1/2 in. Thick Gasket

Meets Requirements for: IBC2018 Seismic Design Category: D
Max. Wind Speed: 97 MPH Building Height: 30 ft.
Exposure Category: B Risk Category: II

Seismic & Wind load Restraints are designed & calculated for use in Seismic & Wind load applications when provided as part of a Seismic & Wind load rated Thybar curb. Attachment of calculated Restraint to any other curb does not constitute a Seismic & Wind load rated assembly. Thybar Corporation has a policy of continuous product improvement and reserves the right to change the product design without notice

(DO NOT SCALE DRAWING) Unless otherwise specified dimensions are in inches tolerances are ± 1/16 ± 0.0625 ± 1°

Date 10/27/2021

Seismic / Wind load Restraint for
Aaon RN-050
On a Thybar Retromate with Top Duct Supports
Costco 660 - Puyallup, WA
1201 39th Ave SW, Puyallup WA 98373

Qty: 1 Job# 215746

Tag: (AC-7,8,9,10,11)

Drawing is conceptual, not to scale

Page 9 of 9 215746-3

thybar CORPORATION
Thybar makes it right the first time, every time

City of Puyallup Development & Permitting Services ISSUED PERMIT
Fire Engineering Building
Traffic Public Works Planning

913 S. Kay Avenue
Addison, IL 60101
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Member of
VISCMA

Seismic /97 MPH Wind Load Design Calculations for a

LG LUU369HV (CU-2) on a

Thybar Retromate
at 1201 39th Ave SW, Puyallup WA 98373

Costco 660 - Puyallup, WA
Thybar Order # 215746

October 28, 2021

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA
Location: 1201 39th Ave SW, Puyallup WA 98373

Applicable Building Code: IBC2018
Seismic Design Category: D

Summary

Assumptions

Review all pages prior to installing

1. These calculations begin with the assumption that the Thybar Retromates is supported around its full perimeter by the existing curb.
2. The Thybar Retromate must be attached to the existing curb using welds or bolts at the Retromate base flanges. The existing curb is assumed to be of sufficient structural integrity to withstand all seismic and wind load forces transmitted to it by the Retromate. Thybar Corporation is not responsible for verification of existing curb structural integrity and verification of building structure supporting the existing and new adapter curb is not the responsibility of Thybar Corporation.
3. As curb manufacturers, Thybar Corporation cannot be expected to provide appropriate attachment hardware for every possible type of roof structure. Thybar provides seismic/wind load calculations that are based on the material provided; typically sheet metal curbs. It is the responsibility of others (project engineer, architect, SEOR, etc.) to know enough about the load carrying capability of the building structure to design a method of attachment to that structure. Thybar does not design the structure and therefore should not recommend an attachment method that may create difficulties with existing field conditions outside of the curb manufacturer's control.

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA
Location: 1201 39th Ave SW, Puyallup WA 98373
Applicable Building Code: IBC2018
Seismic Design Category: D

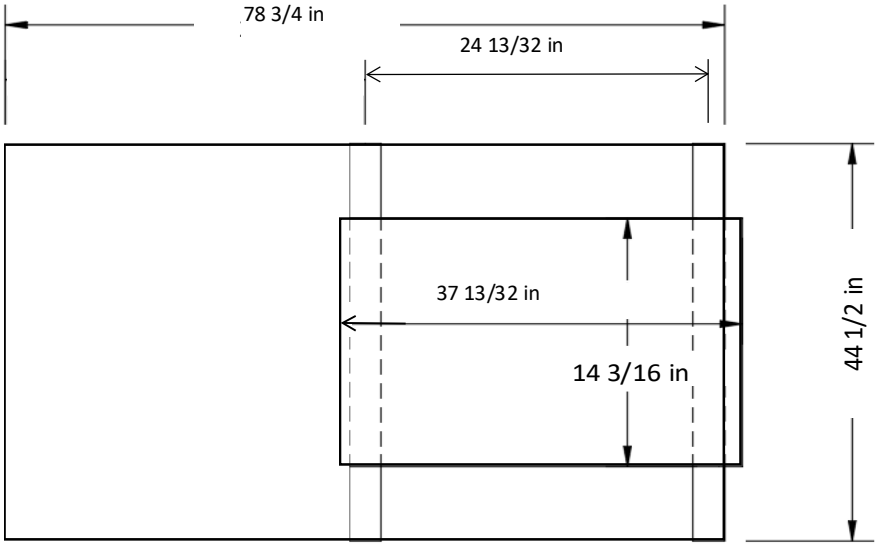
Equipment

Manufacturer LG
Unit Model LUU369HV (CU-2)

Base Length	24 3/8 in	**CG_{x1}**	14.64 in
Base Width	14 3/16 in	**CG_{y1}**	8.51 in
Height	54 3/8 in	**Top Area A_t**	3.7 ft²
Unit Weight	199 lbs.	**Long Side Area**	14.1 ft²
Total Operating Weight	199 lbs.	**Short Side Area**	5.4 ft²

Thybar Product

Product	TEMS3 Short Side					**TEMS Qty.**	2
TEMS Length	44 1/2 in	**TEMS Offset**	24 7/16 in	**Min. Height**	3.00 in	**Max. Height**	3.00 in
Material	14 Ga. Prime Galv Steel			**Thickness**	0.0713 in	**Est. Weight**	62 lbs.
Poisson's Ratio v	0.297			**Yield Strength F_y**	33,000 psi	**Flat height of curb wall h**	2.71 in
Tensile Strength F_u	45,000 psi			**Young's Modulus E**	29,000,000 psi		



Wind Load Factors		Seismic Load Factors			
Exposure Category	B	Site Soil Classification			D
Height for Wind Calculations	30.0 ft.	Occupancy/Risk Category			II
Wind Speed V	97 MPH	S_S (% of g)			126.70%
		S_1 (% of g)			43.70%
Velocity Pressure coefficient Kz	0.70	S_{DS}			1.014
Topography factor Kzt	1.00	a_p	2.50	S_{D1}	0.000
Directionality factor K_d	0.85	I_P	1.00	F_a	1.20
qh	14.14	R_P	6.00	F_v	0.00
Importance factor Iw	N/A	**Snow Load**			
GCr	1.90	C_t			1.1
GC (Uplift)	1.50	C_E			1
Ke	0.99	Snow Importance, I			1.0
		Unit Roof Snow Load			11.6 lb/ft²

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

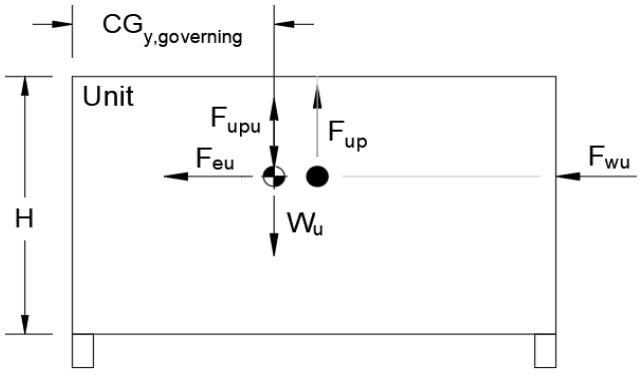
Job Name: Costco 660 - Puyallup, WA **Applicable Building Code:** IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373 **Seismic Design Category:** D

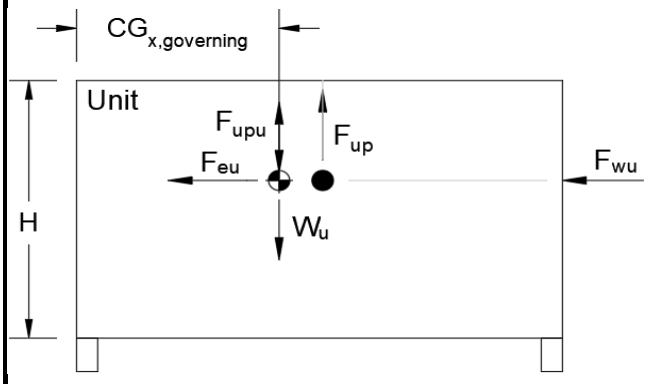
Curb Type: Retromate **Unit Manufacturer / Model:** LG LUU369HV (CU-2)

Unit Forces		
Unit Height	H	54.34 in
Unit COG	CG_y	8.51 in
Unit COG	CG_x	14.64 in
Unit COG	CG_z	27.19 in
Total Operating Weight	W_u	199 lbs.
Weight Long Side	W_{ul}	199 lbs.
Weight Short Side	W_{us}	199 lbs.
Snow Load	SL	42 lbs.
Snow Long Side	SL_l	42 lbs.
Snow Short Side	SL_s	42 lbs.
Wind Load (97 mph) Long Side	F_{wu}	379 lbs.
Wind Load (97 mph) Short Side	F_{wu}	144 lbs.
Wind Upward Force	F_{up}	78 lbs.
Seismic Force	F_{eu}	101 lbs.
	$F_{eu\ Max}$	323 lbs.
	$F_{eu\ Min}$	61 lbs.
Seismic Vertical ± Force	F_{upu}	40 lbs.
	z / h	1.0

Long Side Loading



Short Side Loading



B-21-0421

Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA **Applicable Building Code:** IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373 **Seismic Design Category:** D

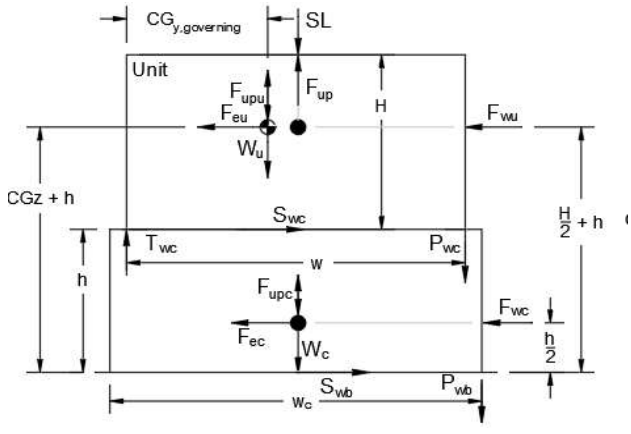
Curb Type: TEMS3 Short Side **Unit Manufacturer / Model:** LG LUU369HV (CU-2)

TEMS Forces		
TEMS Max Height	h	3.00 in
Centerline Width	w	14.19 in
TEMS Weight	W_c	62 lbs.
Wind Load (97 mph) Long Side	F_{wc}	2 lbs.
Wind Load (97 mph) Short Side	F_{wc}	25 lbs.
Seismic Force	F_{ec}	31 lbs.
	$F_{ec\ Max}$	101 lbs.
	$F_{ec\ Min}$	19 lbs.
TEMS Seismic Vertical ± Force	F_{upc}	13 lbs.

Maximum Total Loading on Screw			
Uplift Long Side	0.6D+0.6W	Pw	411 lbs.
Shear Long Side	0.6D+0.6W	Sw	227 lbs.
Uplift Short Side	0.6D+0.6W	Ps	70 lbs.
Shear Short Side	0.6D+0.6W	Ss	86 lbs.
Maximum Load at TEMS			
Axial Load Long	D+0.6W	Tw	531 lbs.
Shear Long	D+0.6W	Sw	227 lbs.
Axial Load Short	D+0.7E	Ts	270 lbs.
Shear Short	D+0.6W	Ss	86 lbs.

Maximum Load at TEMS Base			
Uplift Long Side	0.6D+0.6W	Pw	85 lbs.
Shear Long Side	0.6D+0.6W	Sw	230 lbs.
Uplift Short Side	0.6D+0.6W	Ps	38 lbs.
Shear Short Side	0.6D+0.6W	Ss	116 lbs.

Long Side Loading



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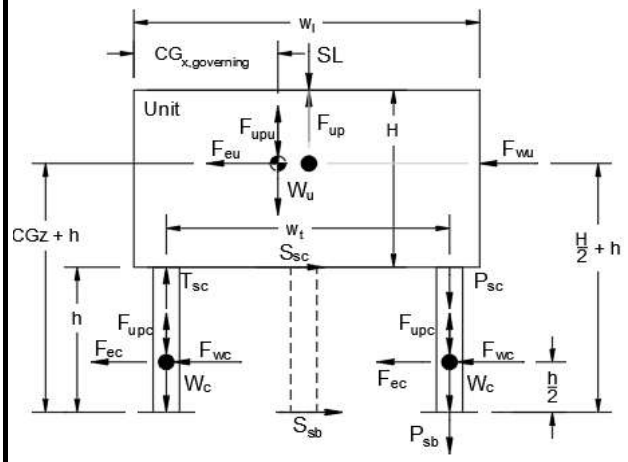

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Thybar Corporation Seismic /Wind Load Design Calculations for Order # 215746

Job Name: Costco 660 - Puyallup, WA

Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: TEMS3 Short Side

Unit Manufacturer / Model: LG LUU369HV (CU-2)

Unit to TEMS Screw Design

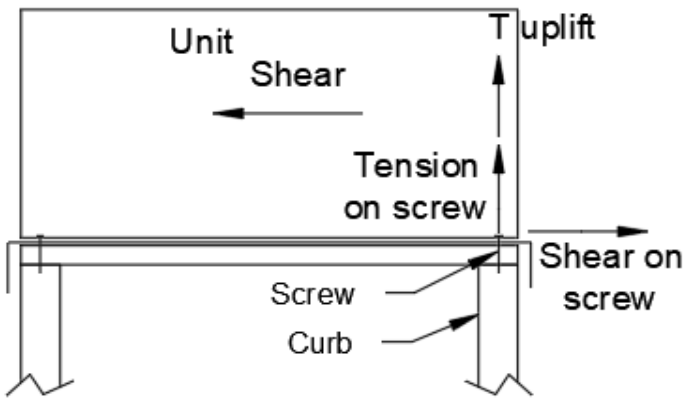
Unit and TEMS

	Long	Short
Unit Shear	227 lbs.	86 lbs.
Unit Uplift	411 lbs.	70 lbs.
TEMS Length and Offset	44.50 in	24.44 in

Screw Capacity

Screw size/type (#)	1/4 304 SS
Hole size	0.25 in
Allowable pullout/screw	1400 lbs.
Allowable shear/screw	746 lbs.

	Long
Tension on Screws	411 lbs.
Shear on Screws	114 lbs.
# Screws for pullout/Bracket	2
# Screws for Shear/Bracket	2
Combined loading check If < 1 Ok	0.223



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Applicable Building Code: IBC2018

Location: 1201 39th Ave SW
Puyallup, WA 98373

Seismic Design Category: D

Curb Type: TEMS3 Short Side

Unit Manufacturer / Model: LG LUU369HV (CU-2)

TEMS Base Hole

Material Properties		
F_y	33,000 psi	
F_U	45,000 psi	
Base Hole Dimensions		
Hole Size	0.6250 in	
Fastener Diameter	1/2 in	
Material thickness	14 Ga.	
TEMS flange thickness t_f	0.1426 in	
Cut out area	0.31 in²	
Base flange width	2.0000 in	
Edge distance	0.6875 in	
Base shear area A_n	0.20 in²	
Bearing strength w/o bolt hole deformation AISI Section J3.3.1		
P_n	7,219 lbs.	
Allowable Bearing P_{all}	2,888 lbs.	
TEMS Base Hole Forces Short Side Loading		
Shear V_S	58 lbs.	
Uplift T_S	58 lbs.	
$R = \sqrt{T^2 + V^2}$ R_S	82 lbs.	
Min. Holes per TEMS side R/Pall	2	
TEMS Base Hole Forces Long Side Loading		
Shear V_L	29 lbs.	
Uplift T_L	18 lbs.	
$R = \sqrt{T^2 + V^2}$ R_L	34 lbs.	
if R/Pall is < 1 number of holes OK	0.01	
Shear Strength AISI Section J6.1		
V_n	5,294	
Allowable Shear V_{all}	2,385	
	LS Loading	SS Loading
Min. Holes per TEMS side R/V_{all}	1	1
Base Holes		
Min. Holes per TEMS Long Side	2	
Shear per Hole	14 lbs.	
Uplift per Hole	9 lbs.	

Use screws at 18" min.:
Long Side = 6
Short Side = 4

The screws must be drilled into the existing curb steel at the attachment of the retromate to the existing curb.

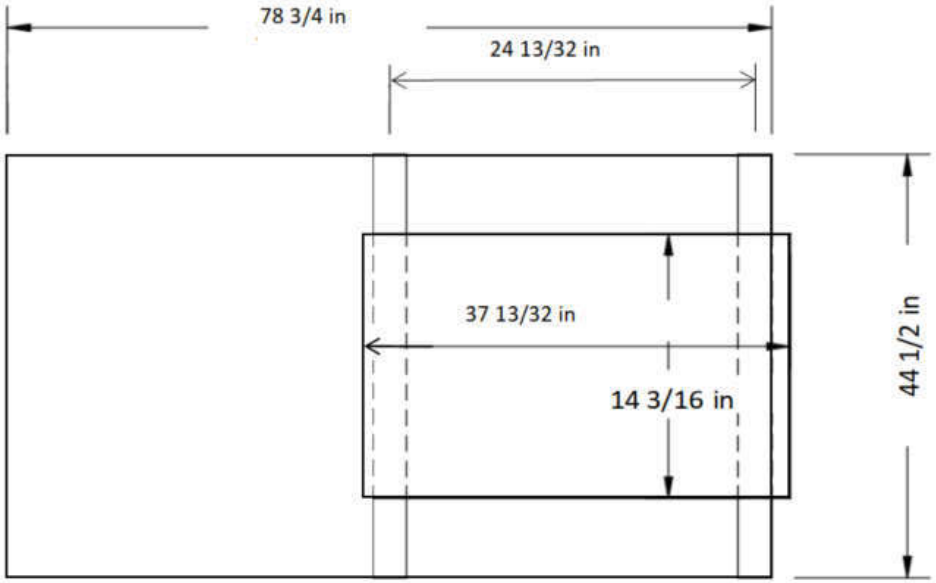
As curb manufacturers, Thybar Corporation cannot specify the appropriate attachment hardware for every possible type of roof structure. Thybar provides seismic/wind load calculations that are based on the material provided; typically sheet metal curbs. It is the responsibility of others (project engineer, architect, SEOR, etc) to design a method of the TEMS attachment to that structure. Thybar does not design the structure and therefore cannot recommend an attachment method that may create difficulties with existing field conditions outside of the curb manufacturer's control.

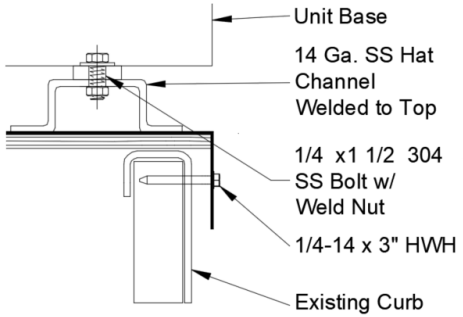
B-21-0421

Unit to Curb Screw Installation Instructions

1. Uniy directly connected to the top of Tems at specified unit location

Thybar Model Restraints	Bolt Qty. Per Unit	Attachment Screws	Product
N/A	4	(4) 1/4" Dia. 304 SS Bolts with Nuts	





DETAIL

Min Base Hole Quantity per side	6	4	0.25

VERIFY ALL ELECTRICAL WIRES ARE CLEAR OF BASE RAIL INTERIOR BEFORE INSTALLING RESTRAINT

(Holes start 6 in. from base OD)	Long	Short	Hole Size

Meets Requirements for: IBC2018 Seismic Design Category: D
Max. Wind Speed: 97 MPH Building Height: 30 ft.
Exposure Category: B Risk Category: II

Seismic & Wind load Restraints are designed & calculated for use in Seismic & Wind load applications when provided as part of a Seismic & Wind load rated Thybar curb. Attachment of calculated Restraint to any other curb does not constitute a Seismic & Wind load rated assembly. Thybar Corporation has a policy of continuous product improvement and reserves the right to change the product design without notice

(DO NOT SCALE DRAWING) Unless otherwise specified dimensions are in inches tolerances are ± 1/16 ± 0.0625 ± 1°

Date 10/28/2021

Seismic / Wind load Restraint for
LG LUU369HV
On a Thybar Retromate with Equipment Bases
Costco 660 - Puyallup, WA
1201 39th Ave SW, Puyallup WA 98373

Qty: 1 Job# 215746

Tag: (CU-2)

Drawing is conceptual, not to scale

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thybar CORPORATION
Thybar makes it right the first time, every time

City of Puyallup Development & Permitting Services ISSUED PERMIT
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