



CBWC Series SUN3672

Form No: CBWC - 112

Prepared For:

PROVENT

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Prepared By:

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Job No.: PRO1103
Effective Date: 2014.09.30



LYONS WARREN

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For wood, concrete and steel attachments see **Roof Anchorage Detail, Form No. CB24A.**

STRUCTURALLY CALCULATED WELDED ROOF CURBS FOR YORK UNITS

ZR 036-060, XP 036-060, ZF 036-072

| ProVent P/N | A | WEIGHT |
|---------------|-----|---------|
| CBWCSUN367208 | 8" | 80 Lbs |
| CBWCSUN367211 | 11" | 95 Lbs |
| CBWCSUN367214 | 14" | 109 Lbs |
| CBWCSUN367224 | 24" | 189" |

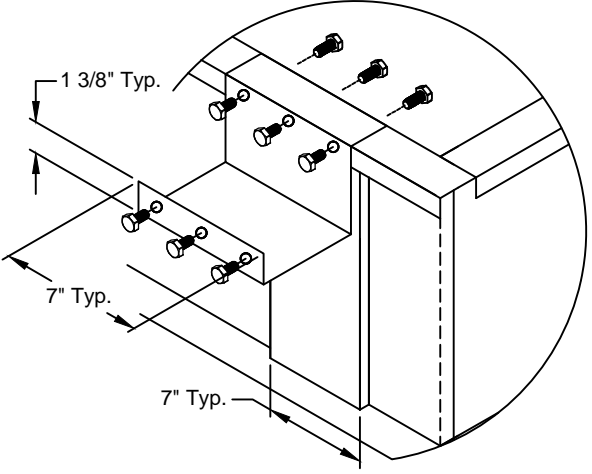
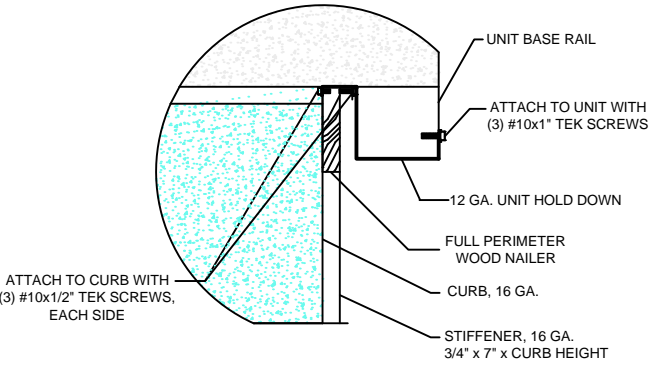
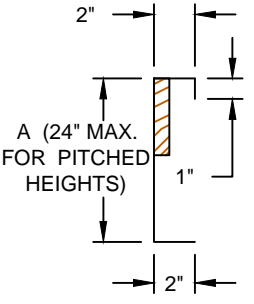
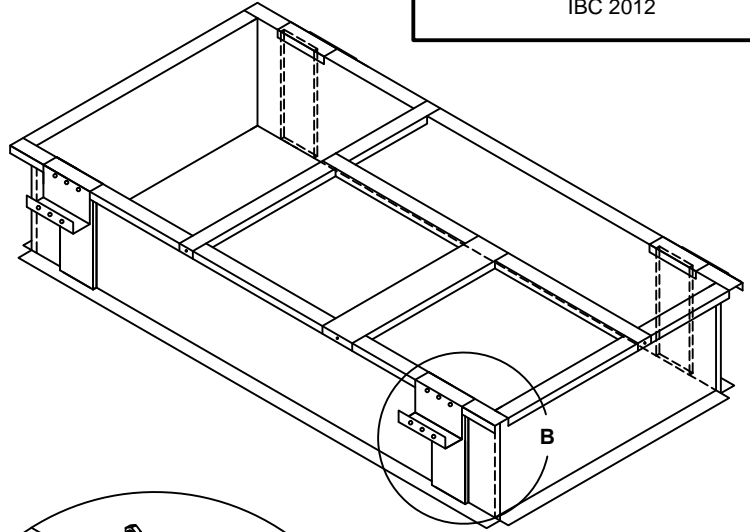
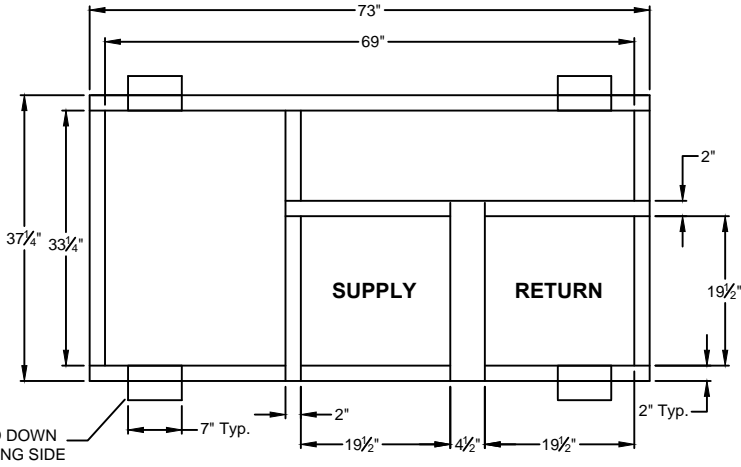
Meets seismic requirements for the following codes:
 CBC 2013
 IBC 2012

FEATURES

- Roof curb sides and ends are 16 ga. galvanized steel.
- Gasketing package provided.
- Heat treated wood nailer provided.
- Pitched curbs and taller curbs are available.

NOTES

- Attach ductwork to roof curb. Flanges of duct rest on top of curb. Support ductwork below the curb.



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SUBMITTED TO: _____
 COMPANY: _____
 JOB NAME: _____
 EQUIPMENT: _____
 NOTES: _____

FORM NO:
 CBWC-112
 DATE:
 7/23/14
 REV:
 2

PART NUMBER:
 CBWCSUN3672 SERIES
 DRAWN BY:
 JG

Curb Information

HVAC UNIT: Sunline 3-6 Welded Roof Curb 8-14"

Curb Number:

| | | |
|--------------------|-------|--|
| Hcurb | 24 | (Height from support structure to top of curb) |
| Lcurb | 69 | (Length of Curb - In to In) |
| Wcurb | 33.25 | (Width of Curb - In to In) |
| Lclip | 62 | (min Length in Long dir from end to clip) |
| # clips Long Side | 2 | (Shear + Uplift Clips) |
| # clips short side | 0 | (Shear Clips) |

Unit Information:

| | | |
|---------|----------|---|
| | 1175 lbs | (Max Weight) |
| Weight: | 1175 lbs | (Min Weight) |
| W c-max | 679 lbs | (Maximum corner weight) |
| W c-min | 219 lbs | (Minimum corner weight) |
| W mid | 223 lbs | |
| H unit | 32.63 | (Height of unit above curb) |
| H cm | 16.31 | (Height from top of curb to center of mass of unit) |
| L unit | 82.25 | (Length of unit) |
| w unit | 44.88 | (Width of unit) |

Seismic Loading

| | | |
|--------|---------|--|
| | CBC2012 | (DESIGN ALSO OK FOR IBC 2009/CBC2010) |
| Ss | 2.00 | |
| Fa | 1.00 | (worst case for site; Ss>1.25, Site Class D) |
| Sms | 2.00 | (=Fa*Ss) |
| Sds | 1.33 | (=2/3*Sms) |
| Ip | 1.5 | (=Worst case) |
| ap | 2.5 | |
| Rp | 6 | |
| Fp max | 1.0 Wp | (=0.4*ap*Sds*Wp*(1+2*z/h)/(Rp/Ip)) |
| Fp ASD | 853 lbs | (=0.7*Fpmax) |

Wind Loading (Ultimate)

| | | |
|----------------|---------|---|
| Code: | CBC2012 | (DESIGN ALSO OK FOR IBC 2009/CBC2010 - 90MPH) |
| Wind Exposure: | C | |
| V | 120 mph | (Ultimate Wind Speed) |
| Kzt | 1 | |
| Kd | 0.9 | |
| Kh | 1.13 | for 60 foot roof height |
| GCf | 1.9 | |

Wind Loading: Lateral

| | | | |
|---------------|----------|------------|-------------------|
| qh | 37 psf | | (ASD=0.6W) |
| F | 71 psf | (ultimate) | 43 psf (service) |
| A net/transv. | 19 sf | | |
| Fwind transv | 1327 lbs | (ultimate) | 796 lbs (service) |
| A net/long | 10 sf | | |
| Fwind long | 724 lbs | (ultimate) | 435 psf (service) |

Controlling Lateral Load (Seismic vs. Wind)

| | |
|------------|---------------|
| Transverse | 853 lbs (ASD) |
| Long | 853 lbs (ASD) |

Wind Loading: Uplift

| | | | |
|----------|----------|------------|------------------------|
| qh | 37.5 psf | | |
| GCr | 1.5 | | |
| Fv (psf) | 56.2 psf | (ultimate) | |
| Av | 26 sf | | |
| Fv | 1441 lbs | (ultimate) | Fv 865 lbs (ASD: 0.6W) |

Curb Loading:

Transverse direction:

| | | |
|---------------|----------------|--|
| OTM: | 1160 lb-ft | 0.6W: F max - transv * Hcm |
| M res. | 821 lb-ft | 0.6D: 2 * Wcrnmin * 0.6 * (width curb + 4.25") |
| Net OTM: | 339 lb-ft | 0.6D+0.6W: OTM-RM |
| Max Comp | 1291 lbs /side | 1.0D+0.6W: (2 x Wcrnmax + (Mot-Mres) / (width curb + 4.25")) |
| Max Tension | 541 lbs /side | 0.6D+0.6W: (Mot-Mres) / (width curb + 4.25") + Fv / (2 sides) |
| Max Tension | 270 lbs /clip | 0.6D+0.6W: Max tension / side / #clips |
| Max Corner: | 717 lbs | W c-max + (Mot-Mres) / ((w / curb + 4.25") / Lcurb * (N-corner) / 2 / 12 |
| Max Interior: | 298 lbs | W mid + (Mot-Mres) / (width curb + 4.25") / Lcurb * (N-mid) |

Longitudinal direction:

| | | |
|---------------|----------------|--|
| OTM: | 1160 lb-ft | 0.6W: F max long * Hcm |
| RM | 1610 lb-ft | 0.6D: 2 X Wcrnmin x (Lcurb + 4.25in) / 12 x 0.6 |
| Net OTM: | -450 lb-ft | 0.6D+0.6W: OTM-RM |
| Max Comp = | 1063 lbs /side | 1.0D+0.6W: (2 * Wcmax + (NetOTM) / Lclip) + Fv / (U.C) |
| Max Tens = | 345 lbs /side | 0.6D+0.6W: (Mot-Mres) / Lclip + Fv / (2 sides) |
| Max Tension = | 129 lbs /clip | 0.6D+0.6W: (Mot-Mres) / Lclip + Fv / (2 sides) / #clips / side |
| Max Corner: | 623 lbs | W c-max + (Mot-Mres) / Lcurb / Wcurb * (N-corner) / 2 |

Connection of Unit to Curb

Screws - metal ga

| | | |
|----------------------------|----------|---------------------|
| Screws in Uplift clips | #10-16ga | Vall= 582 lbs/screw |
| Screws in Short Side Clips | #10-16ga | Vall= 582 lbs/screw |

UPLIFT CLIPS:

| | | | |
|---------|----------------------|---------------|---------------|
| Shear: | 213 lbs/clip | UPLIFT CLIPS: | 2 #10-16ga |
| Uplift: | 270 lbs/clip | Fdiag/screw | 126 lbs/screw |
| F diag | 253 lbs/clip to curb | F/screw outs. | 68 lbs/screw |

SCREWS OK

SHORTSIDE CLIPS

| | | | |
|--------|---------|-----------------|-------------------|
| Shear: | #DIV/0! | SHORTSIDE CLIPS | 2 #10-16ga |
| | | F screw | #DIV/0! lbs/screw |
| | | | #DIV/0! |

Curb info

| | | |
|--------|--------|---------------------|
| H curb | 24 | in, curb height max |
| Fy | 50 | ksi |
| E | 29000 | ksi |
| Fu | 65 | ksi |
| gage: | 16 | |
| R | 0.0849 | |
| t | 0.0593 | |
| R/t | 1.43 | |
| h | 23.77 | in |

Interior Curb

| | | |
|------------------|--------|--|
| N | 48 | bearing length: 2*h |
| C | 20 | |
| C _R | 0.1 | |
| C _N | 0.08 | |
| C _h | 0.03 | |
| φ _w | 0.85 | |
| Ω _w | 1.75 | |
| P _n | 4.05 k | |
| P _{all} | 2.31 k | |
| φP _n | 3.44 k | |
| P _{max} | 0.30 k | P _{all} >P _{max} ,curb OK, |

Exterior Curb:

| | | |
|---------|----|---|
| N total | 48 | 2*curb height |
| N -BUS | 7 | bearing length with stiffener (built up section) |
| N - SWC | 41 | bearing length without stiffener (single web channel) |

| Exterior Curb SWC | |
|-------------------|---------|
| N | 41 |
| C | 7.5 |
| C _R | 0.08 |
| C _N | 0.12 |
| C _h | 0.05 |
| φ _w | 0.85 |
| Ω _w | 1.75 |
| P _n | -0.01 k |
| P _{all} | 0.00 k |
| φP _n | 0.00 k |

| Exterior Curb BUS | |
|-------------------|--------|
| N | 7 |
| C | 15.5 |
| C _R | 0.09 |
| C _N | 0.08 |
| C _h | 0.04 |
| φ _w | 0.75 |
| Ω _w | 2 |
| P _n | 1.81 k |
| P _{all} | 0.91 k |
| φP _n | 1.36 k |

| Corner: | |
|------------------|--------|
| P _{all} | 0.90 k |
| φP _n | 1.35 k |
| P _{max} | 0.72 k |

P_{all}>P_{max},curb OK,

Connection of Curb to Supporting Structure (ASD)Transverse: **0.6D+0.6W**

**Uplift (wind)= 1136 lbs
 *Uplift (seismic) 648 lbs
 Uplift max= 1136 lbs/long side
 **Shear (wind) 1288 lbs
 *Shear (seis) 853 lbs
 Shear max= 1288 lbs/total curb

Longitudinal:

**Uplift (wind)= 427 lbs
 *Uplift (seismic) 243 lbs
 Uplift max= 427 lbs/long side
 **Shear (wind) 671 lbs
 *Shear (seis) 853 lbs
 Shear max= 853 lbs/total curb

T max

| |
|------|
| 1136 |
|------|

 lbs/long
 V max

| |
|------|
| 1288 |
|------|

 lbs/total

**Wood Attachment: (Use 1/4" ϕ x 3.5" SDS SCREWS)
(3.5" minimum embed into DF or SP wood)**

W'

| |
|-----|
| 616 |
|-----|

 lbs
 V'

| |
|-----|
| 256 |
|-----|

 lbs

total screws required=

| |
|---|
| 6 |
|---|

 # screws: LONG SIDE

| |
|---|
| 2 |
|---|

 # screws: SHORT SIDE

| |
|---|
| 1 |
|---|

 W/screw (uplift) 284 lbs
 V/Screw 215 lbs

WOOD SCREWS OK**Steel Deck Attach.: (Use 5/8" ϕ A307 Bolts attached to L5x5x1/4 below deck at each conn.point)**

Tall=

| |
|------|
| 6900 |
|------|

 lbs
 Vall=

| |
|------|
| 3680 |
|------|

 lbs

total bolts required=

| |
|---|
| 6 |
|---|

 # bolts: LONG SIDE

| |
|---|
| 2 |
|---|

 # bolts: SHORT SIDE

| |
|---|
| 1 |
|---|

 T/bolt (uplift) 568 lbs
 V/bolt 215 lbs
 fv 0.7 ksi
 ft 1.8 ksi
 Fnt' 55.9 ksi
 Fnv 24.0 ksi

OK
OK

BOLTS OK

Connection of Curb to Concrete Supporting Structure - STRENGTH DESIGN

Transverse: **0.9D +1.0(E or W)**

| | | |
|-------------------|---------------|---|
| **Uplift (wind)= | 1936 lbs | |
| *Uplift (seismic) | 6374 lbs | *Rp*1.3/1.5/0.7asd |
| Uplift max= | 6374 lbs/side | (Per long side curb) |
| **Shear (wind) | 2147 lbs | (Maximum Lateral Force) (seismic: Rp=1.5 max) |
| *Shear (seis) | 6338 lbs | *Rp*1.3/1.5/0.7asd |
| Shear max= | 6338 lbs | (Total Curb) |

Longitudinal:

| | | | |
|-------------------|---------------|----------------------|-----------------|
| **Uplift (wind)= | 764 lbs | | |
| *Uplift (seismic) | 3654 lbs | | Tu max 6374 lbs |
| Uplift max= | 3654 lbs/side | (Per long side curb) | Vu max 6338 lbs |
| **Shear (wind) | 1119 lbs | | |
| *Shear (seis) | 6338 lbs | | |
| Shear max= | 6338 lbs | (Total Curb) | |

Concrete Attach.: (Use 5/8" ϕ Simpson Strong Bolt 2)

| | |
|--------|----------|
| phi-Tn | 2600 lbs |
| phi-Vn | 1100 lbs |

(LRFD design)

| | |
|---|-----|
| Anchors Required for Uplift (long side only)= | 2.5 |
| Anchors Required for Shear (Total Curb)= | 5.8 |
| Anchors Required (long side only) = | 3.0 |

| Conc Anchors | |
|----------------------|---------|
| anchors (long side) | 4.0 OK |
| anchors (short side) | 1.0 |
| anchors (total) | 10 OK |
| Tu | 1594 OK |
| Vu | 634 OK |

Simpson Strong Bolt 2
 3 5/8" Embed
 (f'c=4000psi, 6" min total thickness - normal weight concrete, 12" E.D.)
 ESR Report - 3037
 Special Inspection Required

*Uplift and Shear seismic anchorage forces have been designed for an Rp of 1.5 max per ASCE 13.4.2

Anchorage design per ASCE 14.2.2.17/ACI D3.3 with strength reduction factors not required in combination with Rp=1.5

** For wind force, shear at base for anchorage design, accounts for add'l area from curb width and height