VC ENGINEERING, LLC
Structural Engineering Consulting

Engineering Report and Calculation Package

Prepared by: VC Engineering, LLC
Email: vcinfio@vceng.biz
Phone: 312-206-2896

REI – Rooftop Unit Replacement Project

Store No. 017
2962 El Camino Real
Tustin, CA 92782

Date: March 14, 2022

Table of Contents

VC ENGINEERING, LLC
Structural Engineering Consulting

Cameron Young, P.E.
Wittler Young Co. Inc. (WYHVAC)
2400 Forney Street
Los Angeles, CA 90031

RE: REI Store #017
Structural Analysis of Roof Structure for Replacement Mechanical Equipment
VC Engineering Project #22036

Dear Mr. Young,

VC Engineering is pleased to present this report of our structural analysis of the existing roof structure to support new replacement mechanical rooftop units on the at the store address indicated on the cover page. This report includes a summary of the services we have provided, a discussion of relevant data gathered, calculations and our conclusions regarding the structural capacity of the existing roof structure.

BACKGROUND

WYHVAC indicated to VC Engineering that they intend to remove and replace (13) existing mechanical rooftop units. VC Engineering was contacted to perform a structural analysis of the existing roof structural members to support the new loads imposed from the removal and replacement of the rooftop units.

OBSERVATIONS AND DISCUSSION

VC Engineering performed a site visit to the building to observe the existing structural framing and observed a total of (13) mechanical units on the roof. Based on email correspondence from WYHVAC, VC Engineering understands that all RTU's are intended to be replaced with new units installed at the same location as the existing units. VC Engineering will rely on the accuracy of our field measurements and structural data collected in order to perform our structural analysis. All units are screened by the existing parapet walls in every direction.

The existing roof construction appeared to be panelized and consisted of ¾" plywood deck spanning to 2x4 sub purlins spaced at 24" on center. The sub purlins are supported by glulam beams and girders that span to HSS8x8 steel columns. Supplemental 4x4 beams are located at the edges of the RTU's for additional support. Refer to the existing framing plan on the structural drawings for additional information. The local governing 2019 California Building Code with local amendments is used to determine the code prescribed loads on the roof structure.

Existing Unit Information		New Unit Information				
RTU	Total Operating Weight (lbs)	Lennox Model #	Operating Weight (lbs)	Curb Adapter Weight (lbs)	Total Operating Weight (lbs)	Total Weight Difference (lbs)
1	1200	KHB122H4E	1401	235	1636	436
2	1200	KHB122H4E	1401	235	1636	436
3	1200	KHB122H4E	1401	235	1636	436
4	1200	KHB122H4E	1401	235	1636	436
5	1200	KHB122H4E	1401	235	1636	436
6	1200	KHB122H4E	1401	235	1636	436
7	1200	KHB122H4E	1401	235	1636	436
8	1200	KHB122H4E	1401	235	1636	436
9	1200	KHB122H4E	1401	235	1636	436
10	1200	KHB122H4E	1401	235	1636	436
11	1200	KHB122H4E	1401	235	1636	436
12	535	KHB060H4E	867	215	1082	547
13	750	KHB074S4T	890	0	890	140

Reference the table above for new unit information. New Lennox units are proposed to be installed at the same location as the existing units indicated above. The operating weights indicated above include all accessories and operating weights of the unit as provided to VC Engineering in an email correspondence from WYHVAC.

CONCLUSION

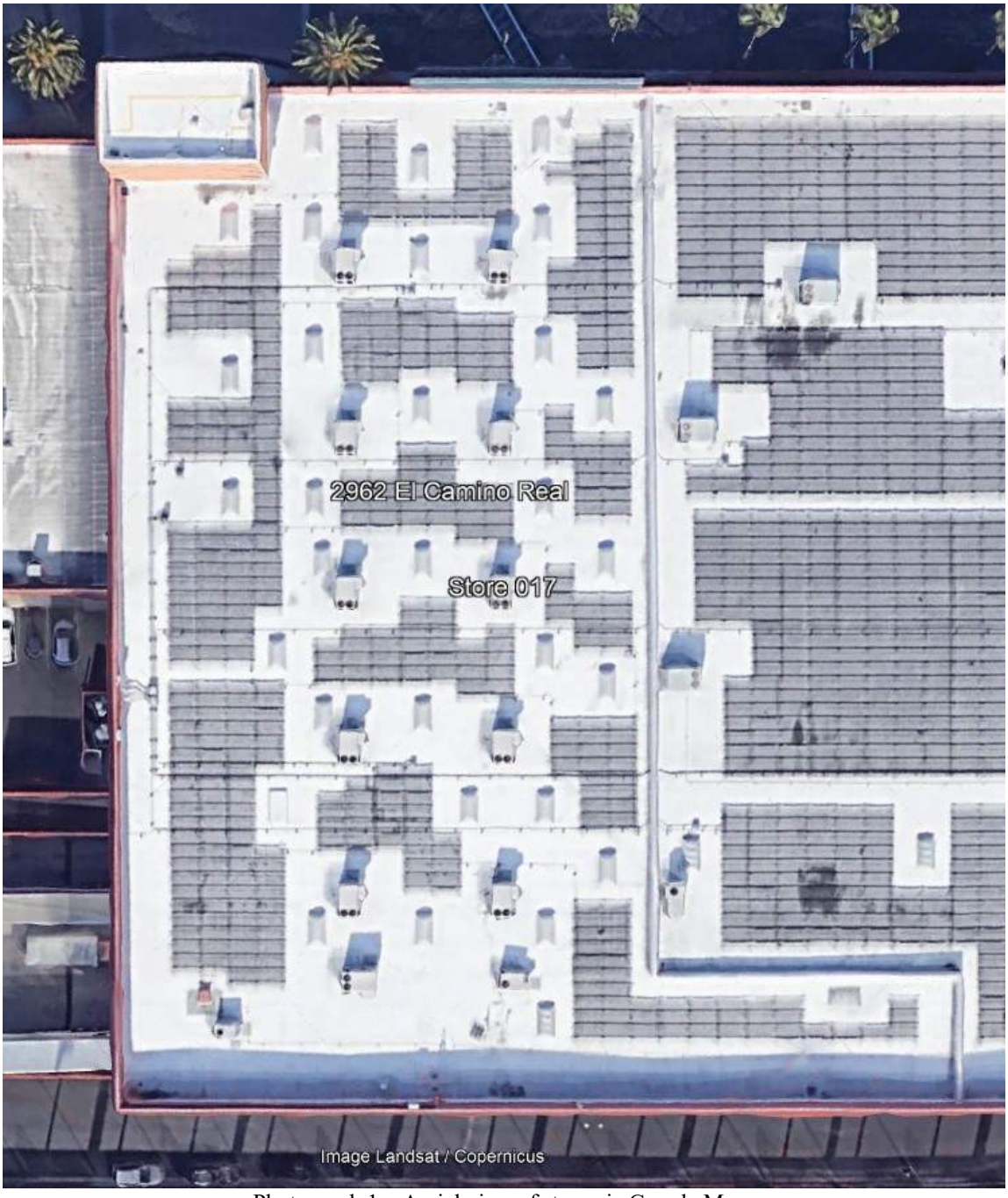
VC Engineering performed a structural analysis of the existing framing to support the code prescribed loads as well as the loads imposed by the new mechanical units and determined that the existing structural framing is adequate. See attached gravity and anchorage calculations in this report for additional information. This analysis is based on the new units located in the same location as the existing units to be removed.

Please feel free to contact me with any questions.

Sincerely,

Kali Dickerson

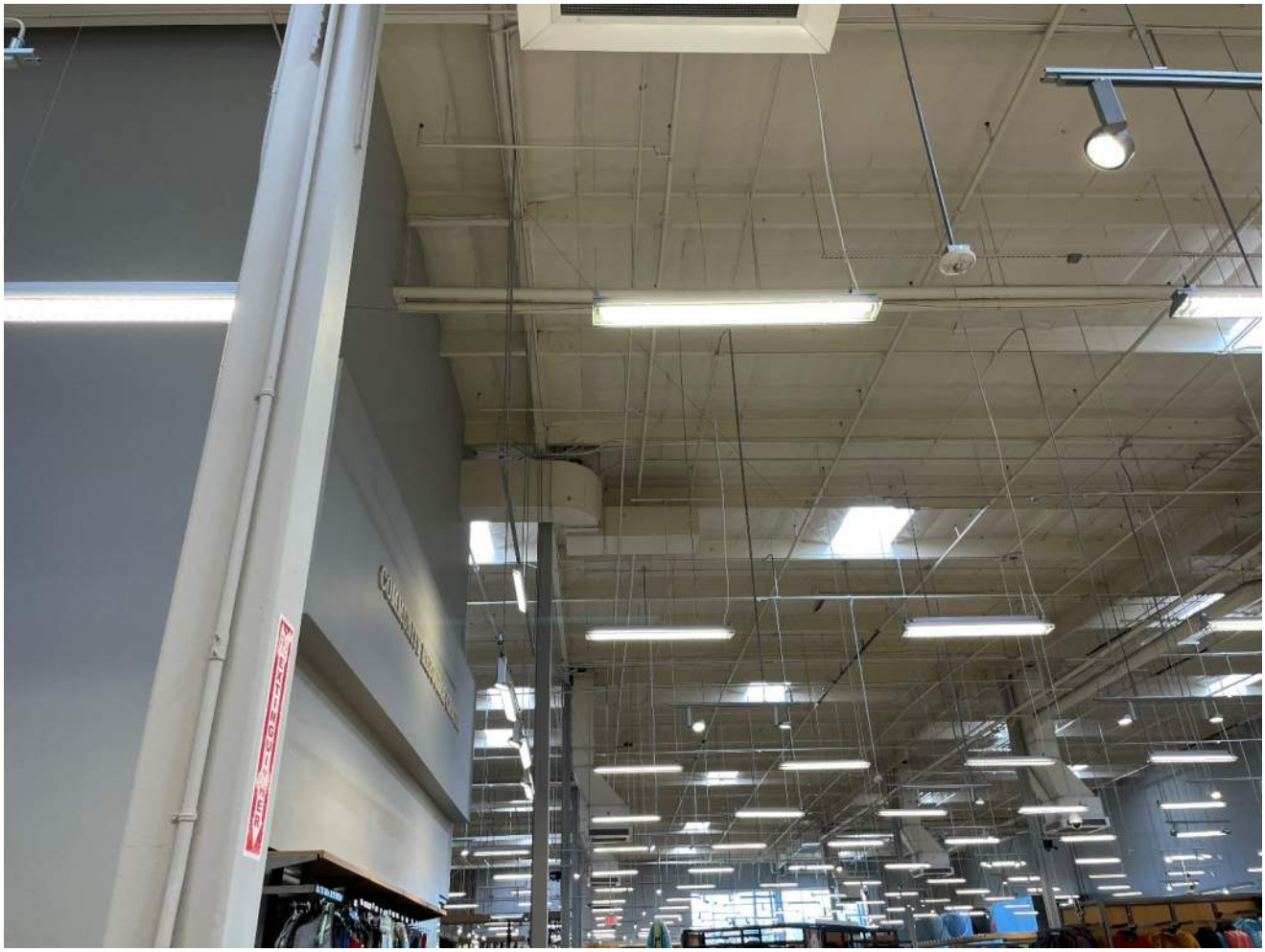
Kali Dickerson P.E.
VC Engineering, LLC



Photograph 1 – Aerial view of store via Google Maps

Photograph 2 – Overall view of store from parking lot

Photograph 3 – Overall view typical exposed structural framing



Photograph 4 – Overall view typical exposed structural framing

Photograph 5 – Overall view at underside of typical RTU

Photograph 6 – Overall view of units on roof. Screened in all directions by existing parapet walls

Photograph 7 – Overall photo of existing parapet wall

Photograph 8 – RTU #1-11

Photograph 9 – RTU #12. (RTU 13 Not Pictured)

Structural Drawings

STORE 017
RTU REPLACEMENT PROJECT
2962 EL CAMINO REAL
TUSTIN, CA 92782

SHEET INDEX
T001 - TITLE SHEET
S001 - EXISTING FRAMING PLAN
S002 - DETAILS

SCOPE OF WORK:
REMOVE AND REPLACE (13) ROOFTOP UNITS

EXISTING EQUIPMENT
RTU 1-11 – LENNOX LHA120H2BN1G
RTU 12 – LENNOX CHP20-060-5G
RTU 13 – LENNOX KHA072S4BN1G

NEW EQUIPMENT
RTU 1-11 – LENNOX KHB122H4E
RTU 12 – LENNOX KHB060H4E
RTU 13 – LENNOX KHB074S4T

PRE-INSTALLATION:
1. PERMITTING: ORGANIZE PROJECT DOCUMENTS FOR CITY PLAN CHECK TO REVIEW AND ACCEPT PROJECT.
2. PERMITTING: PROVIDE EXISTING EQUIPMENT PICTURES, PROVIDE ROOF PLAN SKETCH OF UNIT REPLACEMENT.
3. PERMITTING: PROVIDE OLD AND NEW EQUIPMENT SPECS FOR WEIGHT DIFFERENCES.

INSTALLATION:
1. ORDER AND PICK UP ALL MATERIALS FOR NEW INSTALL.
2. CAUTION TAPE AND CONE OFF LOT FOR CRANE SECTION & SCRAP TRUCK. CRANE UP AND SET NEW CURBS AND NEW EQUIPMENT.
3. INSTALL HIGH VOLTAGE DISCONNECT. ADD NEW CONDUIT WITH 8AWG WIRE, MISC. FITTINGS TO ADAPT TO NEW CONFIGURATION.
4. INSTALL AND LAYOUT NEW CONDENSATION DRAIN LINES TO NEW UNIT CONNECTION POINTS.
5. START UP NEW EQUIPMENT, COMMISSION EMS SYSTEM TO CONFIRM OPERATIONS
6. PROVIDE NEW INSTALLATION EQUIPMENT PICTURES TO CUSTOMER.
7. FILL OUT NEW ASSET FORMS FOR EACH UNIT.
8. CLEAN ALL ROOF DEBRIS FROM JOBSITE.
9. REMOVE ALL EXISTING ROOFTOP EQUIPMENT THAT WILL NOT BE REUSED, INCLUDING BUT NOT LIMITED TO PLATFORMS AND CURBS, VENTS, PIPES, AND SUPPORTS. FRAMING AND ROOF ASSEMBLY REMOVED TO INSTALL EXISTING ROOFTOP EQUIPMENT TO BE REPLACED WITH PATCH OR TIE-IN DETAILS TO CONFORM TO LANDLORD STANDARD ROOF DETAILS.
10. ALL NEW AND REPLACEMENT ROOFTOP UNITS TO BE LABELED WITH THE SPACE NUMBER AND UNIT NUMBER, STENCILED IN BLACK 3" HIGH NUMBERS (MINIMUM) ON THE SERVICE SIDE OF THE UNIT."

BUILDING PROPERTIES
CONSTRUCTION TYPE - TYPE V-B
OCCUPANCY GROUP - GROUP M - MERCANTILE
NUMBER OF STORIES - SINGLE STORY (1)
COUNTY - ORANGE COUNTY
PARCEL ID - 500-291-04
FULLY SPRINKELED - YES

GOVERNING CODES
WORK PERFORMED UNDER THIS CONTRACT SHALL, AT A MINIMUM, BE IN CONFORMANCE WITH APPLICABLE NATIONAL, STATE AND LOCAL CODES HAVING JURISDICTION. EQUIPMENT FURNISHED AND ASSOCIATED INSTALLATION WORK PERFORMED UNDER THIS CONTRACT SHALL BE IN STRICT COMPLIANCE WITH CURRENT APPLICABLE CODES ADOPTED BY THE LOCAL AHJ, INCLUDING ANY AMENDMENTS AND STANDARDS AS SET FORTH BY THE FOLLOWING:

2019 THE CALIFORNIA BUILDING CODE (CBC), VOLUMES 1 & 2
2019 THE CALIFORNIA ELECTRICAL CODE (CEC)
2019 THE CALIFORNIA PLUMBING CODE (CPC), AND APPENDIX H
2019 THE CALIFORNIA MECHANICAL CODE (CMC)
2019 THE CALIFORNIA ENERGY CODE
2019 THE CALIFORNIA ADMINISTRATIVE CODE
2019 THE CALIFORNIA REFERENCE STANDARDS
2019 THE CALIFORNIA EXISTING BUILDING CODE (CEBC)
2019 THE CALIFORNIA GREEN BUILDINGS STANDARD CODE (CGBSC)

WHERE THE CONTRACT DOCUMENTS EXCEED THE REQUIREMENTS OF THE REFERENCED CODES, STANDARDS, ETC., THE CONTRACT DOCUMENTS SHALL TAKE PRECEDENCE. WHERE CONFLICTS BETWEEN VARIOUS CODES, ORDINANCES, RULES, AND REGULATIONS EXIST, COMPLY WITH THE MOST STRINGENT. PROMPTLY BRING ALL CONFLICTS OBSERVED BETWEEN CODES, ORDINANCES, RULES, REGULATIONS, REFERENCED STANDARDS, AND THESE DOCUMENTS TO THE ATTENTION OF THE ENGINEER FOR FINAL RESOLUTION. CONTRACTOR WILL BE HELD RESPONSIBLE FOR ANY VIOLATION OF THE LAW.

LANDLORD VENDORS AND CONSULTANTS

INTERFACE SYSTEMS
CONTACT: EMMA BARLOW
PHONE: (949) 279-2084

FIRE PROTECTION/SPRINKLERS (BID TWO, SELECT ONE)
D.C FIRE PROTECTION; CONTACT: DANIEL CORPUZ; PHONE: (714) 309-0144
PACIFIC FIRE; PHONE: TOM MCMILLAN; PHONE: (805) 300-2651

ROOFING CONSULTANT/INSPECTION:
INDEPENDENT ROOFING CONSULTANTS; CONTACT: JEFF STAR, PHONE: (949) 476-8626

ROOFING CONTRACTOR (BID TWO, SELECT ONE):
SAN MARINO ROOFING; CONTACT: MARTHA RICHTER; PHONE: (714) 974-3070
SCHOLTEN ROOFING; CONTACT: DALE SCHOLTEN; PHONE: (949) 951-8844
TSP ROOFING; CONTACT: MIKE LINDSTROM; PHONE: (714) 974-3070

SOILS INSPECTIONS (COMPACTION DEPUTY INSPECTIONS)
GMU GEOTECHNICAL, INC.; PHONE: (949) 888-6513

DEPUTY INSPECTIONS, STRUCTURAL STEEL WELDING AND OTHER INSPECTIONS
RELIANT TESTING ENGINEERS; ROBERT JONES; PHONE: (714) 556-5867; EMAIL: RJONES@RELIANTTESTING.COM

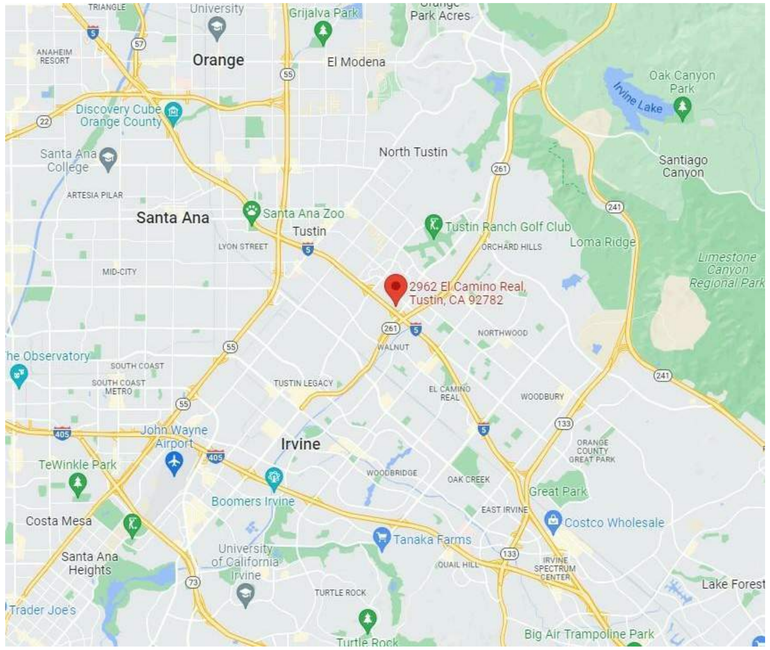
EXTERIOR PLASTERING:
DCS PLASTERING; DAVID HASSON; PHONE: (714) 483-1125; EMAIL: DAVID@DCSPLASTERING.COM

EXTERIOR PAINTING (BID TWO, SELECT ONE)
SOUTHERN PAINTING; ROBERT FLEMING; PHONE: (949) 631-6600
QUAD COUNTY PAINTING; TIM TYLER; PHONE: (714) 293-2444; QUADCOUNTYPAINTING@YAHOO.COM

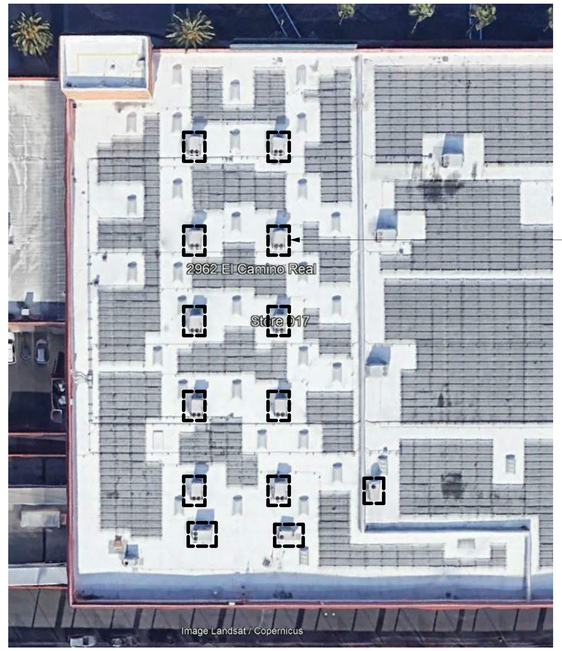
BARRICADES
TROY'S PAINTING; TROY BROWNING; (714) 412-7986 EMAIL: TROY@TROYSPAINTING.COM

DUMPSTER
CR&R; CHRISTINA OCHOA; 714-372-8272 OR 714-300-3941 (CELL); CHRISTINAO@CRRMAIL.COM

STRUCTURAL PEER REVIEW
FICCADENTI WAGGONER & CASTLE; MARK SCHROEDER OR JAMIE HIPP; PHONE: (949) 474-0502; EMAIL JHIPP@FWCSE.COM



1 PROJECT VICINITY MAP
3" = 1'-0"



REMOVE AND REPLACE (13) ROOFTOP UNITS

2 PROJECT AERIAL VIEW
3" = 1'-0"

STIPULATION FOR REUSE

CONTEMPORANEOUSLY WITH ITS ISSUE DATE ON 03/26/2022 AND IT IS NOT SUITABLE FOR USE ON A DIFFERENT PROJECT SITE OR AT A LATER TIME. USE OF THIS DRAWING FOR REFERENCE OR EXAMPLE ON ANOTHER PROJECT REQUIRES THE SERVICES OF PROPERLY LICENSED ARCHITECTS AND ENGINEERS. REPRODUCTION OF THIS DRAWING FOR REUSE ON ANOTHER PROJECT IS NOT AUTHORIZED AND MAY BE CONTRARY TO THE LAW.

CONSULTANTS

STORE 017
2962 EL CAMINO REAL
TUSTIN, CA 92782
JOB NUMBER: 22036

ISSUE BLOCK

CHECKED BY:	KED
DRAWN BY:	VFC
DOCUMENT DATE:	03/26/2022

REGISTERED PROFESSIONAL ENGINEER
KEVIN DICKERSON
C 85904
exp. 9/30/24
CIVIL
STATE OF CALIFORNIA

TITLE SHEET

SHEET: T001

GENERAL NOTES

1. STRUCTURAL DRAWINGS ARE TO BE COORDINATED AND USED IN CONJUNCTION WITH THE ARCHITECTURAL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS. SEE MECHANICAL DRAWINGS FOR EQUIPMENT PADS, BASES, SUPPORTS, AND DUCT PENETRATIONS.

2. VC ENGINEERING, LLC. SHALL NOT BE RESPONSIBLE FOR, NOR HAVE CONTROL OR CHARGE OF CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES FOR THE SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THIS PROJECT, AND SHALL NOT BE RESPONSIBLE FOR CONTRACTOR'S FAILURE TO CARRY OUT HIS WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

3. VC ENGINEERING, LLC. SHALL NOT BE RESPONSIBLE FOR, NOR HAVE CONTROL OVER, THE ACTS OR OMISSIONS OF THE CONTRACTOR, SUBCONTRACTORS, ANY OF THEIR AGENTS, OR EMPLOYEES, OR ANY OTHER PERSONS PERFORMING ANY OF THE WORK, OR FOR THE FAILURE OF ANY OF THEM TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

4. THE CONTRACTOR SHALL PROVIDE AND BE RESPONSIBLE FOR ALL TEMPORARY SHORING AND BRACING REQUIRED FOR THE CONSTRUCTION OF THIS PROJECT. ALL SHORING AND BRACING MEMBERS AND CONNECTIONS SHALL BE OF SUFFICIENT STRENGTH TO SUPPORT THE IMPOSED LOADS. TEMPORARY MEMBERS AND CONNECTIONS SHALL NOT BE REMOVED UNTIL PERMANENT MEMBERS ARE IN PLACE AND FINAL CONNECTIONS ARE MADE.

5. CONTRACTOR SHALL VERIFY IN FIELD ALL DIMENSIONS, ELEVATIONS AND MEMBER SIZES AS SHOWN ON THE CONTRACT DRAWINGS FOR THE EXISTING CONSTRUCTION, PRIOR TO THE DETAILING OR FABRICATION OF ANY NEW STRUCTURAL ELEMENT. CONTRACTOR SHALL DOCUMENT ANY CONSTRUCTION-RELATED DISCREPANCIES. CONTRACTOR SHALL FURNISH THE ABOVE INFORMATION IN THE FORM OF DETAILED SKETCHES TO THE STRUCTURAL ENGINEER FOR REVIEW (28) CALENDAR DAYS PRIOR TO THE SCHEDULED START OF ANY DETAILING OR FABRICATION.

6. THE CONTRACTOR SHALL PROVIDE ALL MEASURES AND PRECAUTIONS NECESSARY TO PREVENT DAMAGE AND SETTLEMENT OF EXISTING OR NEW CONSTRUCTION INSIDE OR OUTSIDE THE PROJECT LIMITS DURING EXCAVATION AND FOUNDATION CONSTRUCTION. ANY DAMAGE TO NEW OR EXISTING CONSTRUCTION INSIDE OR OUTSIDE OF THE PROJECT LIMITS, CAUSED BY CONSTRUCTION TECHNIQUES IS THE RESPONSIBILITY OF THE CONTRACTOR.

7. NO FIELD MODIFICATIONS TO ANY STRUCTURAL COMPONENTS SHALL BE MADE WITHOUT PRIOR APPROVAL BY THE STRUCTURAL ENGINEER. THIS INCLUDES, BUT IS NOT LIMITED TO REVISIONS DUE TO MISLOCATION, MISFIT, OR ANY OTHER CONSTRUCTION ERRORS.

8. NO OPENING SHALL BE PLACED IN ANY STRUCTURAL MEMBER (OTHER THAN AS INDICATED ON APPROVED SHOP DRAWINGS) UNTIL THE LOCATION HAS BEEN APPROVED BY THE STRUCTURAL ENGINEER.

9. PROVIDE SLEEVE LAYOUTS FOR ALL PENETRATIONS THROUGH STRUCTURAL MEMBERS (ALL TRADES ARE INCLUDED). LAYOUTS ARE TO BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW PRIOR TO CONSTRUCTION.

10. SUPPORT ALL ROOF MOUNTED EQUIPMENT OR EQUIPMENT SUSPENDED FROM FLOORS OR THE ROOF ONLY ON/FROM BEAMS DESIGNATED FOR SUCH PURPOSE. IF NO SUPPORT HAS BEEN DESIGNATED, OR IF A QUESTION ARISES, NOTIFY STRUCTURAL ENGINEER PRIOR TO ERECTION OF EQUIPMENT.

11. ALL DETAILS, SECTIONS, AND NOTES ON THE DRAWINGS ARE INTENDED TO BE TYPICAL FOR SIMILAR SITUATIONS ELSEWHERE, UNLESS OTHERWISE NOTED. FOR DETAILS AND DIMENSIONS NOT INDICATED ON THE STRUCTURAL DRAWINGS, SEE THE ARCHITECTURAL DRAWINGS.

12. MATERIALS AND EQUIPMENT SHALL BE STORED AND TRANSPORTED IN A MANNER SO AS NOT TO EXCEED THE ALLOWABLE FLOOR OR ROOF LOADING INDICATED IN THE "SCHEDULE OF BUILDING DESIGN LOADS" ON THE CONSTRUCTION DOCUMENTS OR THE ALLOWABLE CAPACITY OF THE CONSTRUCTED MEMBER, WHICHEVER IS SMALLER.

SPECIAL INSPECTIONS

1. ALL SPECIAL INSPECTIONS AND TESTS, STATEMENTS OF SPECIAL INSPECTIONS, RESPONSIBILITIES OF CONTRACTORS, SUBMITTALS TO THE BUILDING OFFICIAL AND STRUCTURAL OBSERVATIONS SHALL MEET THE APPLICABLE REQUIREMENTS OF THE LOCAL GOVERNING CURRENT CALIFORNIA BUILDING CODE, SECTION 1704

2. THE OWNER OR THE OWNER'S AUTHORIZED AGENT, OTHER THAN THE CONTRACTOR, SHALL EMPLOY ONE OR MORE APPROVED AGENCIES TO PROVIDE SPECIAL INSPECTIONS AND TESTS DURING CONSTRUCTION ON THE TYPES OF WORK SPECIFIED IN SECTION 1705 OF THE GOVERNING CALIFORNIA BUILDING CODE AND IDENTIFY THE APPROVED AGENCIES TO THE BUILDING OFFICIAL.

3. PRIOR TO THE START OF THE CONSTRUCTION, THE APPROVED AGENCIES SHALL PROVIDE WRITTEN DOCUMENTATION TO THE BUILDING OFFICIAL DEMONSTRATING THE COMPETENCE AND RELEVANT EXPERIENCE OR TRAINING OF THE SPECIAL INSPECTORS WHO WILL PERFORM THE SPECIAL INSPECTIONS AND TESTS DURING CONSTRUCTION.

CODE	SECTION	REQUIRED	NOT REQUIRED
CBC 1704.6.1	STRUCTURAL OBSERVATIONS FOR SEISMIC RESISTANCE		X
CBC 1705.2	STEEL CONSTRUCTION		X
CBC 1705.3	CONCRETE CONSTRUCTION		X
CBC 1705.4	MASONRY CONSTRUCTION		X
CBC 1705.5	WOOD CONSTRUCTION		X
CBC 1705.6	SOILS		X
CBC 1705.10	FABRICATED ITEMS		X
CBC 1705.11	WIND RESISTANCE		X
CBC 1705.12	SEISMIC RESISTANCE		X

STRUCTURAL LOADING

1. STRUCTURAL BUILDING CODES
   1. 2019 CALIFORNIA BUILDING CODE
   2. 2018 INTERNATIONAL EXISTING BUILDING CODE

2. GRAVITY LOADS
   A. DEAD LOAD = 10 PSF
   B. ROOF LIVE LOAD = 20 PSF

3. WIND LOADS
   A. RISK CATEGORY = II
   B. EXPOSURE CATEGORY = C
   C. DESIGN WIND SPEED = 95 MPH

4. SNOW LOADS
   A. NONE

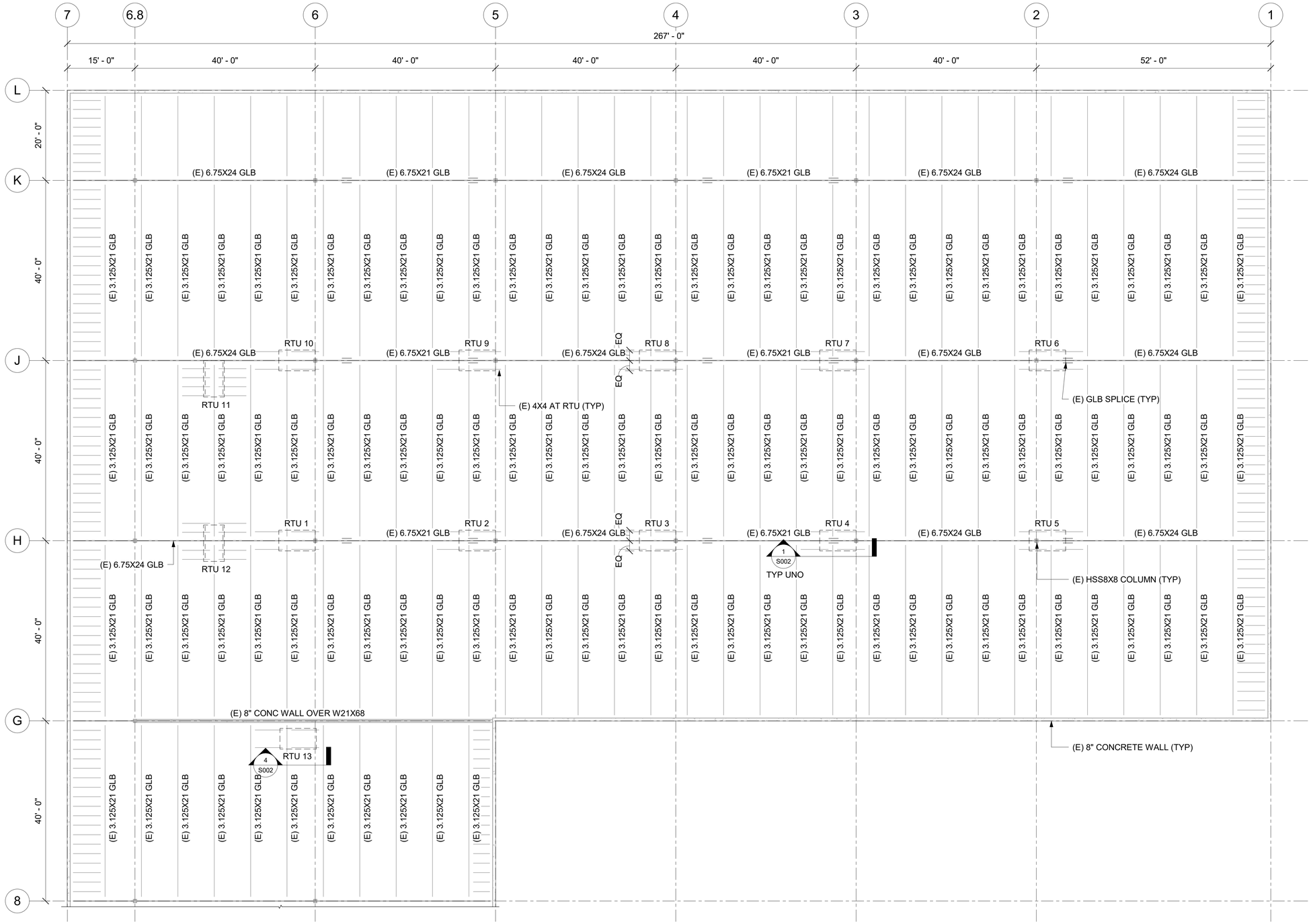
5. SEISMIC LOADS
   A. DESIGN CODE REFERENCE = ASCE 07-16
   B. RISK CATEGORY = II
   C. SITE CLASS = D
   D. Ss = 1.275
   E. S1 = 0.456
   F. Sms = 1.530
   G. Sds = 1.020
   H. Fa = 1.20
   I. ap = 2.5
   J. Rp = 6.0

HVAC WEIGHT REPLACEMENT SCHEDULE

1-11. RTU EXISTING/NEW = 1,200 / 1,636 LB
12. RTU EXISTING/NEW = 535 / 1,082 LB
13. RTU EXISTING/NEW = 750 / 890 LB

HVAC EXISTING DIMENSION SCHEDULE (L x W x H)

1-11. RTU EXISTING = 99-1/4" x 58" x 50"
12. RTU EXISTING = 72-1/2" x 52" x 29"
13. RTU EXISTING = 96-1/4" x 45" x 46-7/8"



1 EXISTING ROOF FRAMING PLAN

3/32" = 1'-0"

NOTES:
1. CONTRACTOR SHALL VERIFY EXISTING FRAMING IN FIELD AND NOTIFY ENGINEER IF FRAMING DEPICTED ON EXISTING FRAMING PLAN VARIES FROM IN FIELD CONDITIONS.
2. EXISTING FRAMING DEPICTED ABOVE IS FOR INFORMATION PURPOSES ONLY AS IT RELATES TO THE PROJECT MECHANICAL ROOFTOP REPLACEMENT AND NOT MEANT TO IDENTIFY ALL STRUCTURAL ROOF MEMBERS.
3. NEW ROOFTOP EQUIPMENT SHALL BE FULLY SUPPORTED BY CURBS ON ALL SIDES AND MAY NOT OVERHANG THE CURB AND/OR BE SUPPORTED BY OTHER SUPPORT POINTS ON THE ROOF.
4. ROOF WORK IS TO BE REVIEWED IN ADVANCE OF WORK PERFORMED, THEN APPROVED FOLLOWING COMPLETION BY LANDLORD'S ROOFING CONSULTANT. ANY ROOFING OR WATERPROOFING WORK ARE EXCLUDED FROM THESE DRAWINGS OR SCOPE OF WORK

CONSULTANTS

REI
STORE 017
2962 EL CAMINO REAL
TUSTIN, CA 92782
JOB NUMBER: 22036

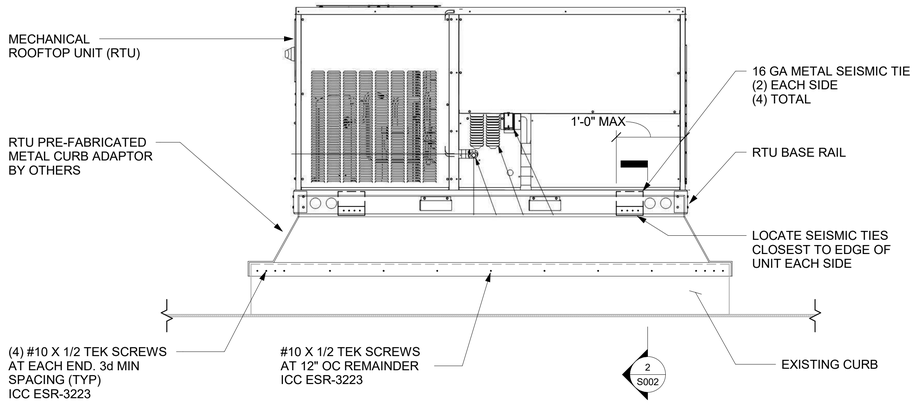
ISSUE BLOCK

CHECKED BY:	KED
DRAWN BY:	VFC
DOCUMENT DATE:	03/26/2022

REGISTERED PROFESSIONAL ENGINEER
KEVIN DICKERSON
C 85904
exp. 9/30/24
CIVIL
STATE OF CALIFORNIA

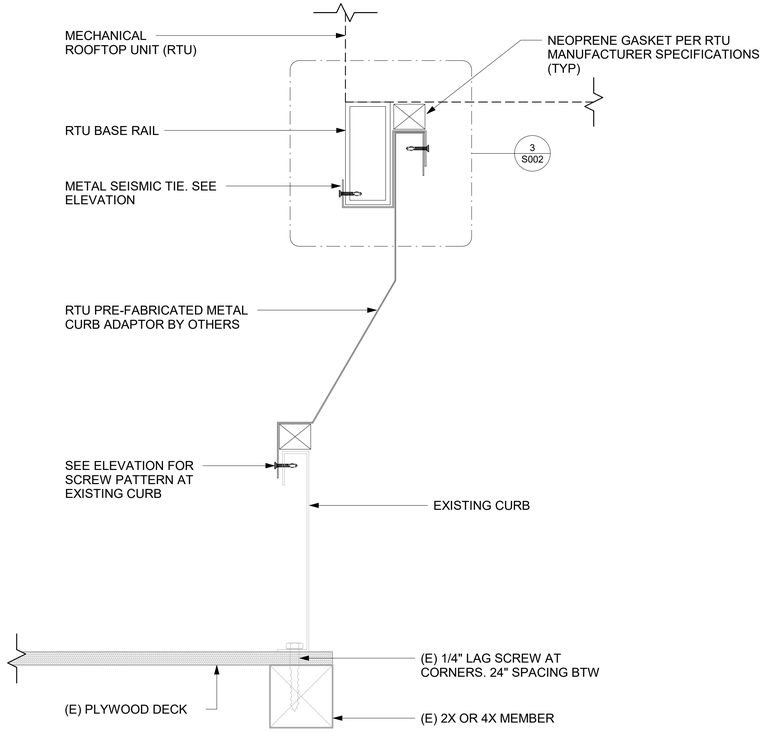
EXISTING FRAMING PLAN

SHEET:
S001



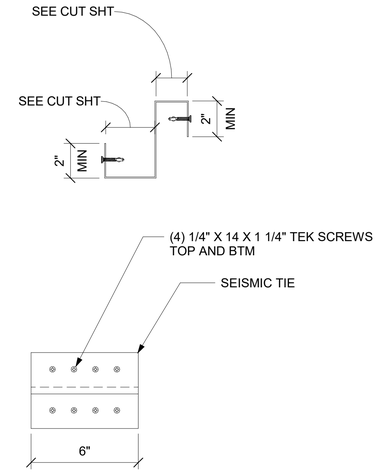
1 ELEVATION - NEW UNIT W/CURB ADAPTOR TO EXISTING CURB

3/4" = 1'-0"



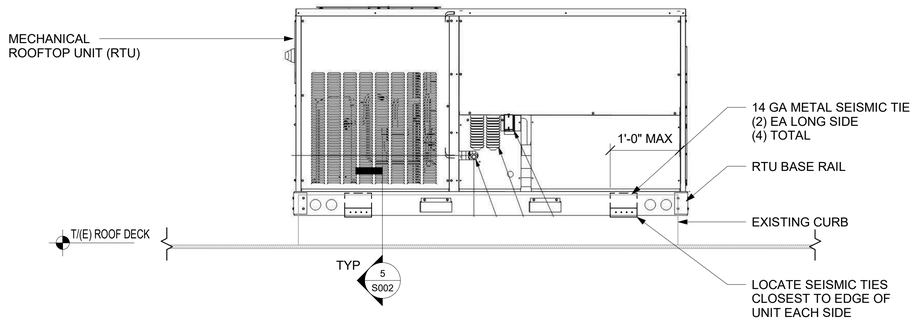
2 SECTION - NEW UNIT W/CURB ADAPTOR TO EXISTING CURB

3" = 1'-0"



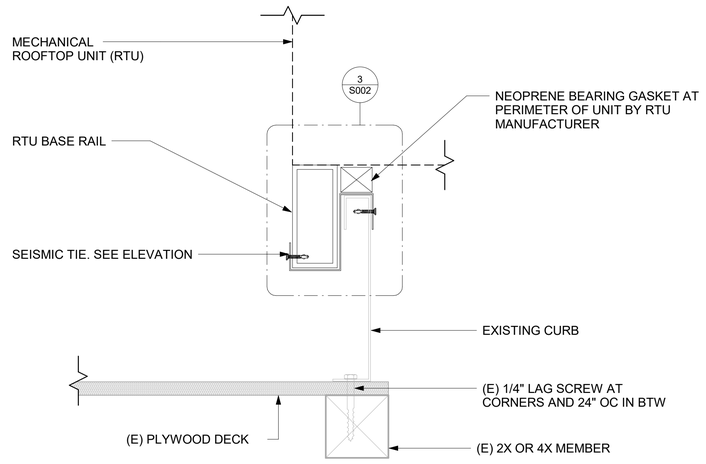
3 DETAIL

3" = 1'-0"



4 ELEVATION - NEW UNIT TO EXISTING CURB

3/4" = 1'-0"



5 SECTION - NEW UNIT TO (E) CURB - WOOD FRAMED

3" = 1'-0"

STIPULATION FOR REUSE

CONTEMPORANEOUSLY WITH ITS ISSUE DATE ON 03/25/2022 AND IT IS NOT SUITABLE FOR USE ON A DIFFERENT PROJECT SITE OR AT A LATER TIME. USE OF THIS DRAWING FOR REFERENCE OR EXAMPLE ON ANOTHER PROJECT REQUIRES THE SERVICES OF PROPERLY LICENSED ARCHITECTS AND ENGINEERS. REPRODUCTION OF THIS DRAWING FOR REUSE ON ANOTHER PROJECT IS NOT AUTHORIZED AND MAY BE CONTRARY TO THE LAW.

CONSULTANTS

REI

STORE 017
2962 EL CAMINO REAL
TUSTIN, CA 92782

JOB NUMBER: 22036

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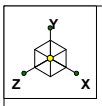
DRAWN BY:	VFC
DOCUMENT DATE:	03/26/2022

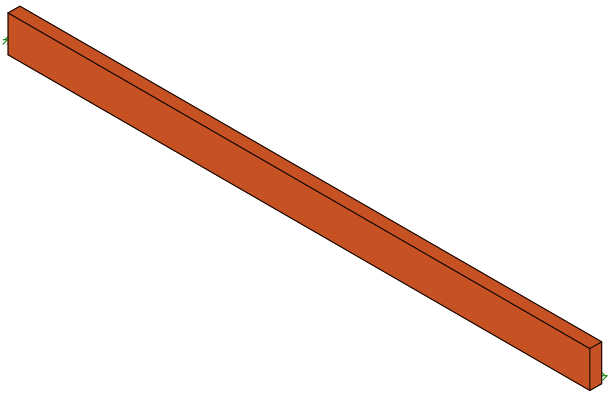
REGISTERED PROFESSIONAL ENGINEER
KEVIN EDWARD DOWNEY
C 85904
exp. 9/30/24
CIVIL
STATE OF CALIFORNIA

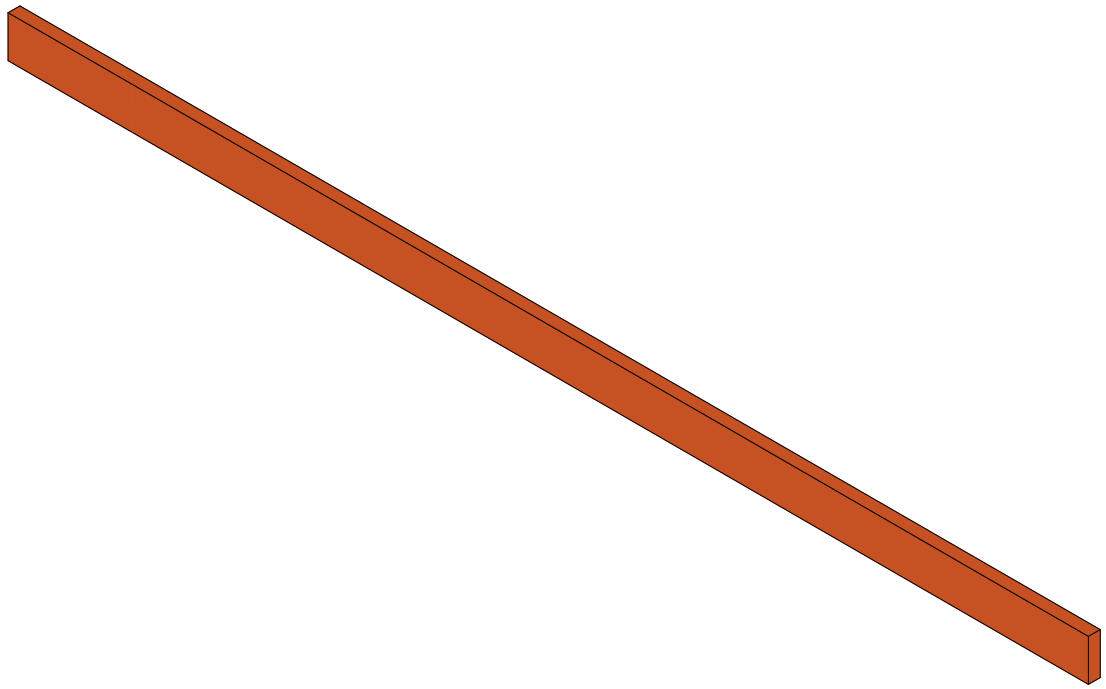
DETAILS

SHEET:
S002

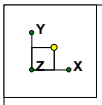
Gravity Calculations

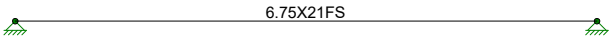


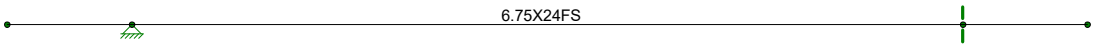




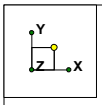
		Mar 14, 2022 at 12:35 PM
	Typical 6.75x21 GLB and 6.75x24 GLB	untitled.r2d



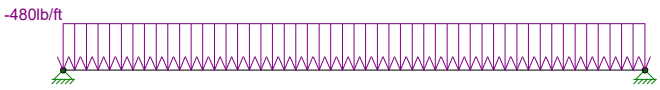


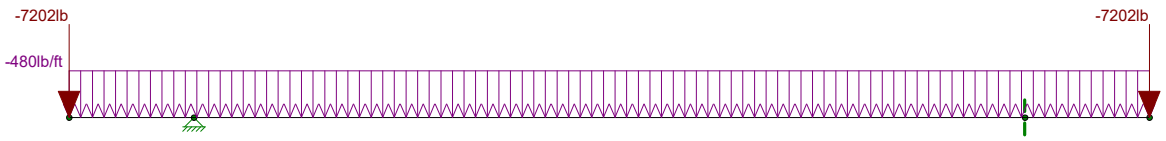


		Mar 14, 2022 at 12:34 PM
	Member Shapes	untitled.r2d



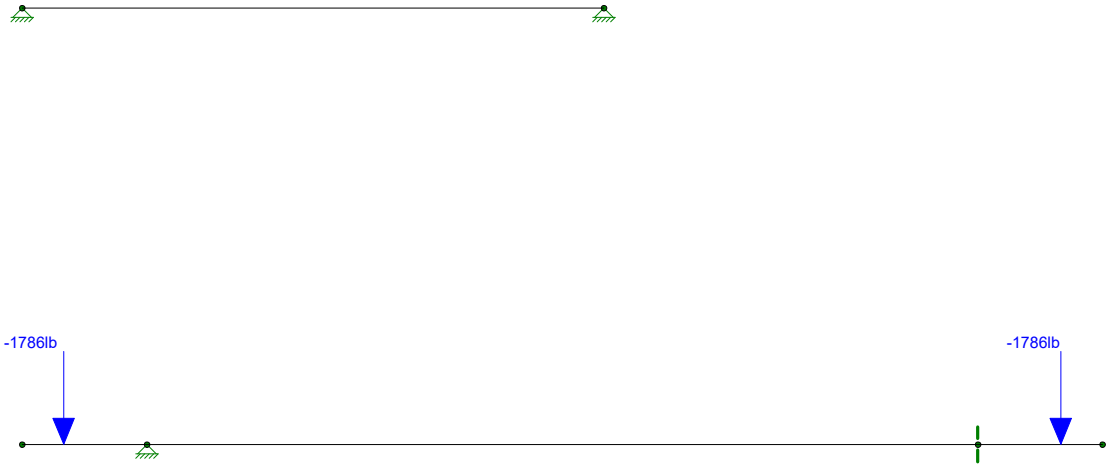
		Mar 14, 2022 at 12:35 PM
	Material	untitled.r2d





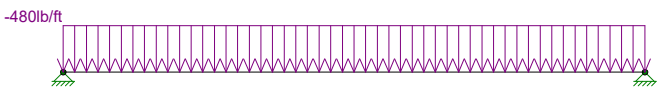
Loads: BLC 2, DLsu

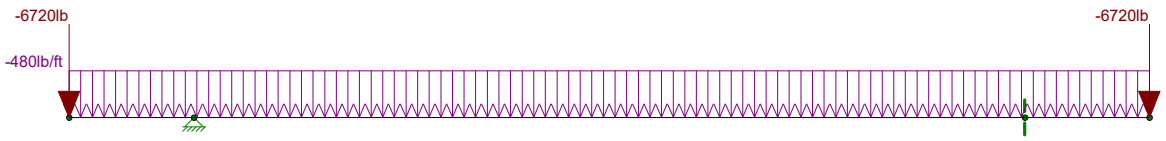
		Mar 14, 2022 at 12:32 PM
	Dead Load Superimposed = 12 psf x 40 ft = 480 plf	untitled.r2d



Loads: BLC 3, DLrtu

		Mar 14, 2022 at 12:37 PM
	Dead Load RTU & Curb = 1636 + 150 = 1786 lb	untitled.r2d



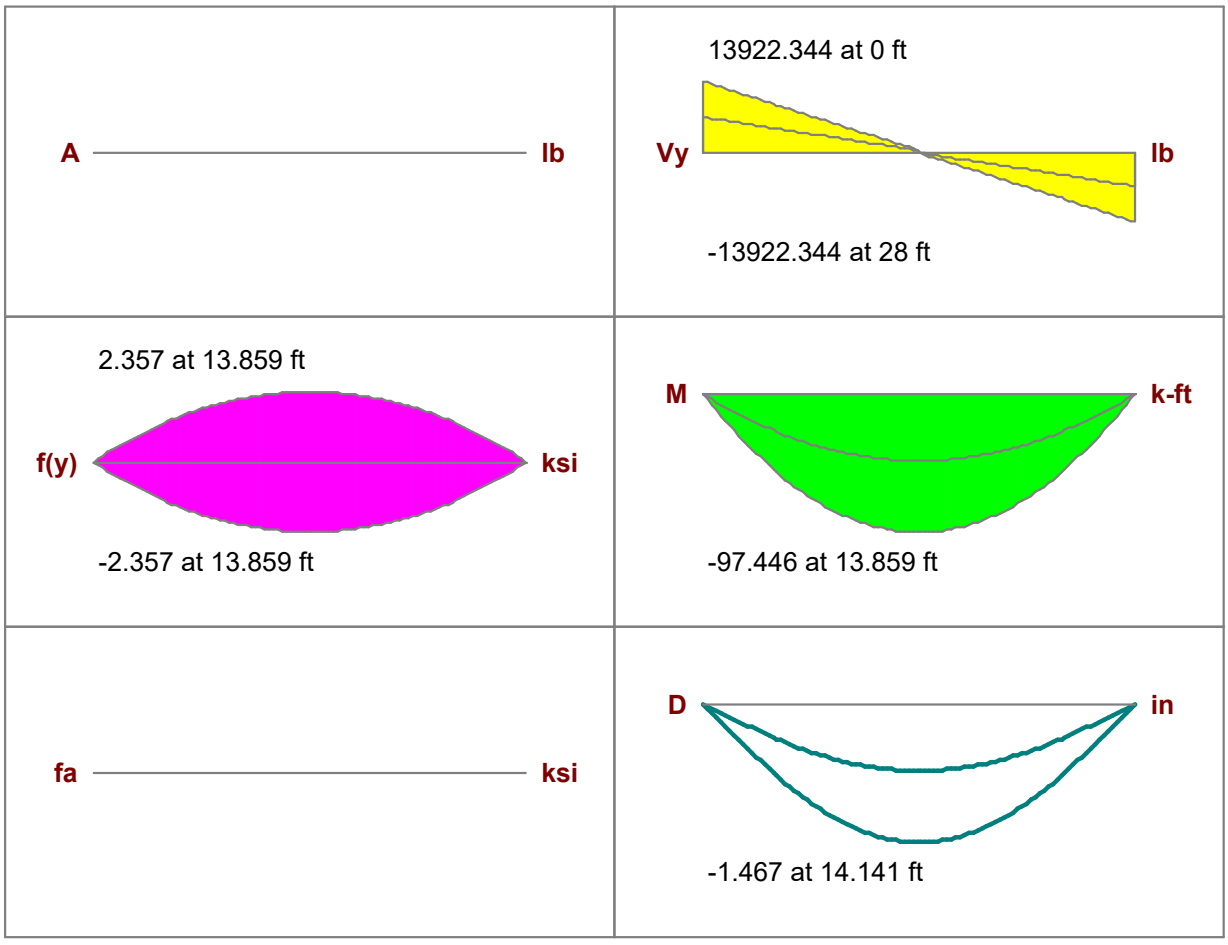


Loads: BLC 4, RLL

		Mar 14, 2022 at 12:34 PM
	Roof Live Load = 12 psf x 40 ft = 480 plf	untitled.r2d

Beam: ***M2***

Shape: **6.75X21FS**
Material: **24F-1.8E DF Balanced**
Length: **28 ft**
I Joint: **N5**
J Joint: **N6**
Envelope
Code Check: **0.879 (LC 2)**
Report Based On 100 Sections



AWC NDS-12: ASD Code Check

Max Bending Check	**0.879 (LC 2)**	Max Shear Check	**0.445 (LC 2)**	Max Defl Ratio	**L/229**
Location	**14.141 ft**	Location	**28 ft**	Location	**14.141 ft**
Equation	**3.9-3**			Span	**1**

CD	**1.25**	RB	**12.444**	CL	**0.962**	CV	**0.894**
Cr	**1**	Cfu	**1.07**	CP	**0.138**		

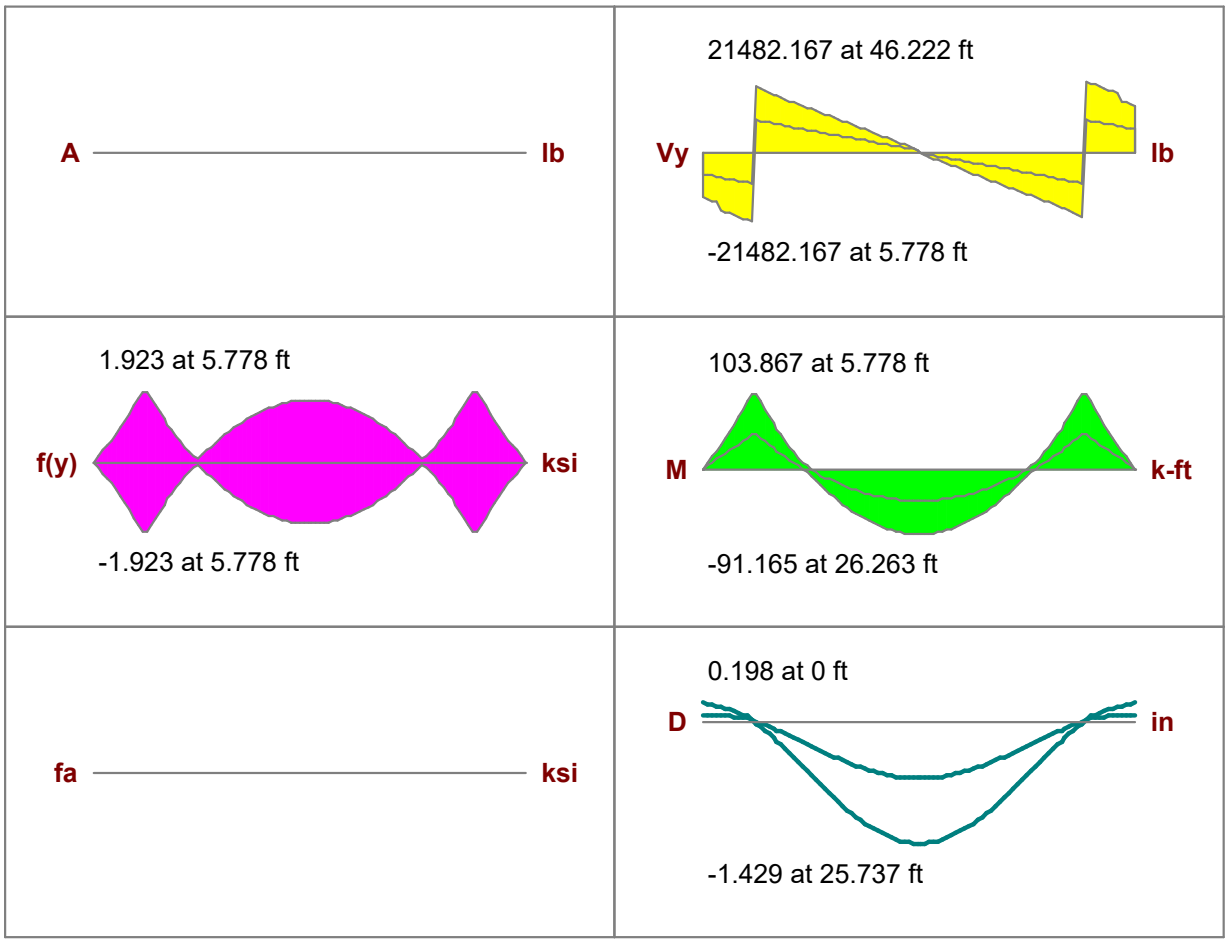
	(ksi)	Cm	Ct	CF
Fc'	**0.276**	**1**	**1**	**1**
Ft'	**1.375**	**1**	**1**	**1**
Fb'	**2.681**	**1**	**1**	**1**
Fv'	**0.331**	**1**	**1**	
E'	**1800**	**1**	**1**	

	Out	In
Lb	**28 ft**	**28 ft**
le/d	**49.778**	**16**
Sway	**No**	**No**

Le-Bending Top **28 ft**
Le-Bending Bot **28 ft**

Beam: ***M1***

Shape: **6.75X24FS**
Material: **24F-1.8E DF Balanced**
Length: **52 ft**
I Joint: **N1**
J Joint: **N4**
Envelope
Code Check: **0.773 (LC 2)**
Report Based On 100 Sections



AWC NDS-12: ASD Code Check

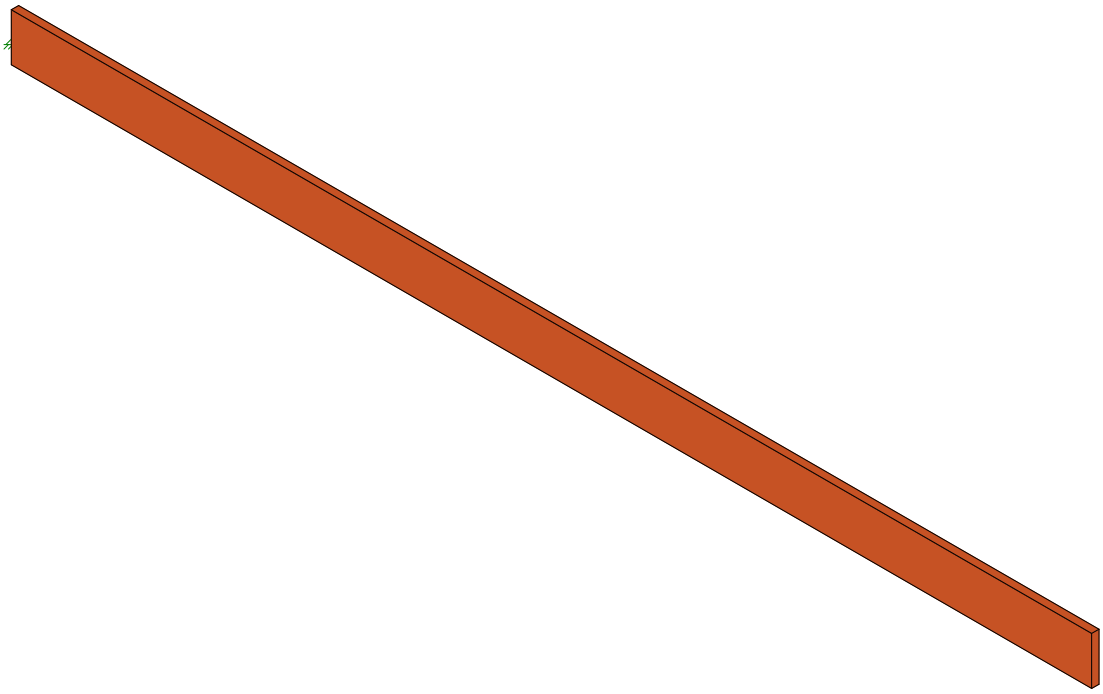
Max Bending Check	**0.773 (LC 2)**	Max Shear Check	**0.600 (LC 2)**	Max Defl Ratio	**L/335**
Location	**46.222 ft**	Location	**46.222 ft**	Location	**25.737 ft**
Equation	**3.9-3**			Span	**2**

CD	**1.25**	RB	**2.514**	CL	**0.999**	CV	**0.829**
Cr	**1**	Cfu	**1.07**	CP	**0.999**		

	(ksi)	Cm	Ct	CF
Fc'	**1.998**	**1**	**1**	**1**
Ft'	**1.375**	**1**	**1**	**1**
Fb'	**2.487**	**1**	**1**	**1**
Fv'	**0.331**	**1**	**1**	
E'	**1800**	**1**	**1**	

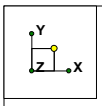
	Out	In
Lb	**1 ft**	**1 ft**
le/d	**1.778**	**0.5**
Sway	**No**	**No**

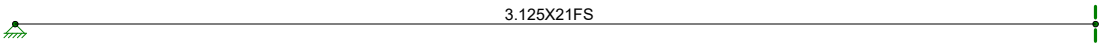
Le-Bending Top **1 ft**
Le-Bending Bot **1 ft**



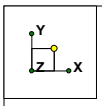
Loads: BLC 1, DLsw

		Mar 14, 2022 at 12:56 PM
	Typical 3.125x21 GLB	Typical GLB Beam.r2d

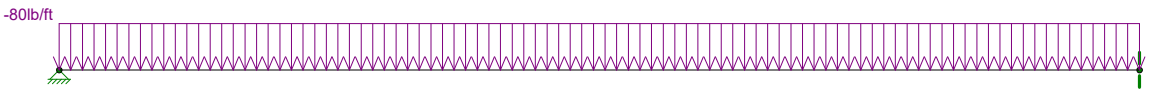




		Mar 14, 2022 at 1:02 PM
	Member Shape	Typical GLB Beam.r2d



		Mar 14, 2022 at 1:03 PM
	Material	Typical GLB Beam.r2d



Loads: BLC 2, DLsu

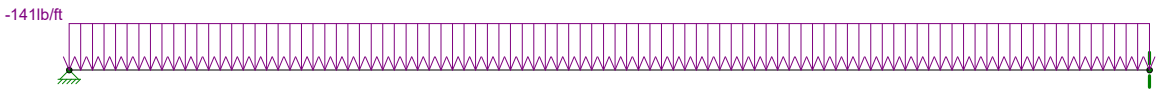
		Mar 14, 2022 at 12:59 PM
	Dead Load Superimposed = 10 psf x 8 ft = 80 plf	Typical GLB Beam.r2d

Dead Load RTU 11
RTU = 1,636 lb
Curb = 150 lb
Total = 1,786 lb
Length = 10 ft
Load = 1786 / 2 / 10 ft = 178 plf

Dead Load RTU 12
RTU = 1,082 lb
Curb = 150 lb
Total = 1,232 lb
Tributary to GLB 3.125x21 = 1/3 Weight
Load = 1232 / 3 = 407 lb

Loads: BLC 3, DLrtu

		Mar 17, 2022 at 3:28 PM
	Dead Load RTU 11 = 178 plf Dead Load RTU 12 = 407 lb	Typical GLB Beam.r2d

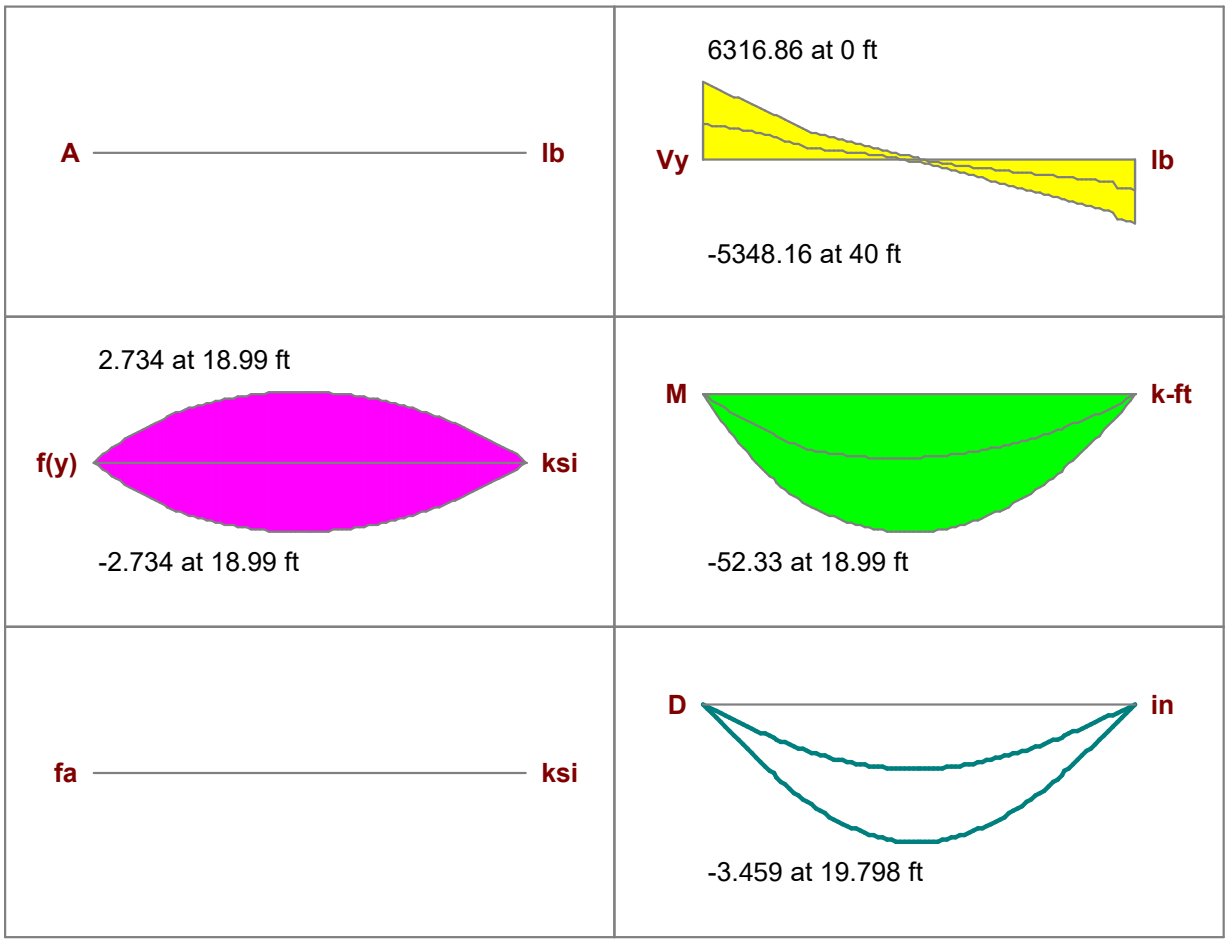


Loads: BLC 4, RLL

		Mar 14, 2022 at 1:01 PM
	Roof Live Load = 17.6 psf x 8 ft = 141 plf	Typical GLB Beam.r2d

Beam: ***M1***

Shape: **3.125X21FS**
Material: **24F-1.8E DF Balanced**
Length: **40 ft**
I Joint: **N2**
J Joint: **N3**
Envelope
Code Check: **0.978 (LC 2)**
Report Based On 100 Sections



AWC NDS-12: ASD Code Check

Max Bending Check	**0.978 (LC 2)**	Max Shear Check	**0.436 (LC 2)**	Max Defl Ratio	**L/139**
Location	**18.99 ft**	Location	**0 ft**	Location	**19.798 ft**
Equation	**3.9-3**			Span	**1**

CD	**1.25**	RB	**5.08**	CL	**0.996**	CV	**0.932**
Cr	**1**	Cfu	**1.16**	CP	**0.996**		

	(ksi)	Cm	Ct	CF
Fc'	**1.991**	**1**	**1**	**1**
Ft'	**1.375**	**1**	**1**	**1**
Fb'	**2.795**	**1**	**1**	**1**
Fv'	**0.331**	**1**	**1**	
E'	**1800**	**1**	**1**	

	Out	In
Lb	**1 ft**	**1 ft**
le/d	**3.84**	**0.571**
Sway	**No**	**No**

Le-Bending Top	**1 ft**
Le-Bending Bot	**1 ft**

Deflection Calculation

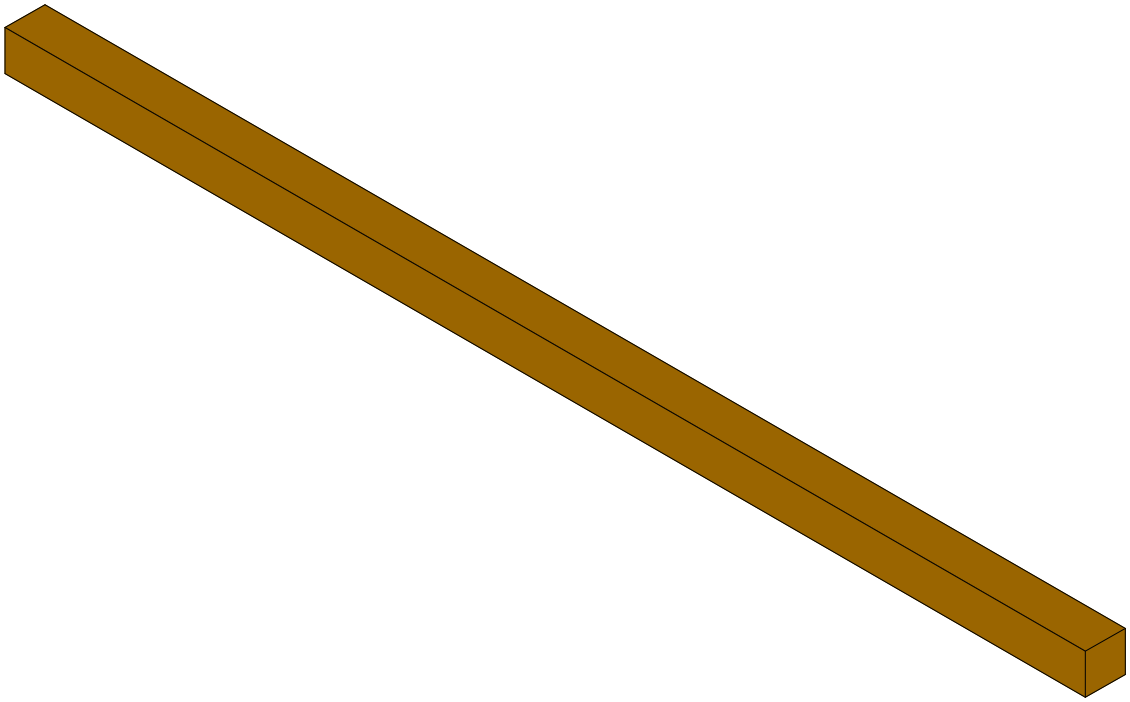
Code: CBC Table 1604.3 Serviceability

Date: 3/16/2022

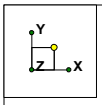
Project: REI 017

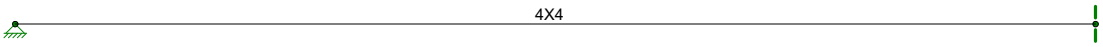
Member			
Size	3.125x21		
Span	40.00	ft	
L/240	2.000	in	RLL Limit
L/180	2.667	in	DL+RLL Limit

Load Case	Deflection		
DL	1.616	in	Dead Load Deflection
0.5 x DL	0.808	in	Dead Load Deflection due to Creep per CBC Table 1604.3 Note D
RLL	1.843	in	Short Term Live Load Deflection
0.5DL+RLL	2.651	in	
L/180	2.667	in	
Check	Ok	2.651 in < 2.667 in	
RLL	1.843	in	
L/240	2.000	in	
Check	Ok	1.843 in < 2.000 in	

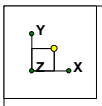


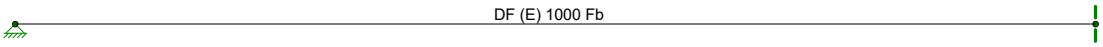
		Mar 14, 2022 at 1:11 PM
	Typical 4x4 Joist	Typical 4x4 Joist.r2d



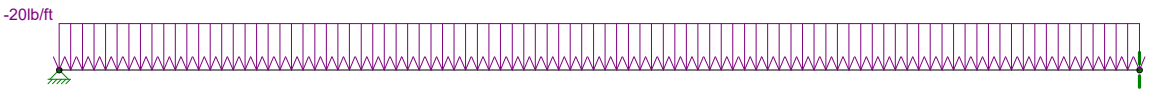


		Mar 14, 2022 at 1:12 PM
	Member Shape	Typical 4x4 Joist.r2d



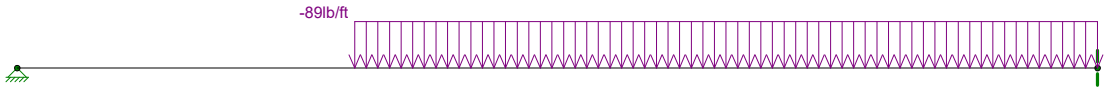


		Mar 14, 2022 at 1:12 PM
	Material	Typical 4x4 Joist.r2d



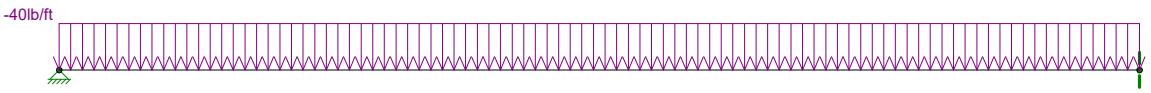
Loads: BLC 2, DLsu

		Mar 14, 2022 at 1:11 PM
	Dead Load Superimposed = 10 psf x 2 ft = 20 plf	Typical 4x4 Joist.r2d



Loads: BLC 3, DLrtu

		Mar 14, 2022 at 1:10 PM
	Dead Load RTU & Curb = 1636 + 150 / 2 Sides / 10 ft =...	Typical 4x4 Joist.r2d

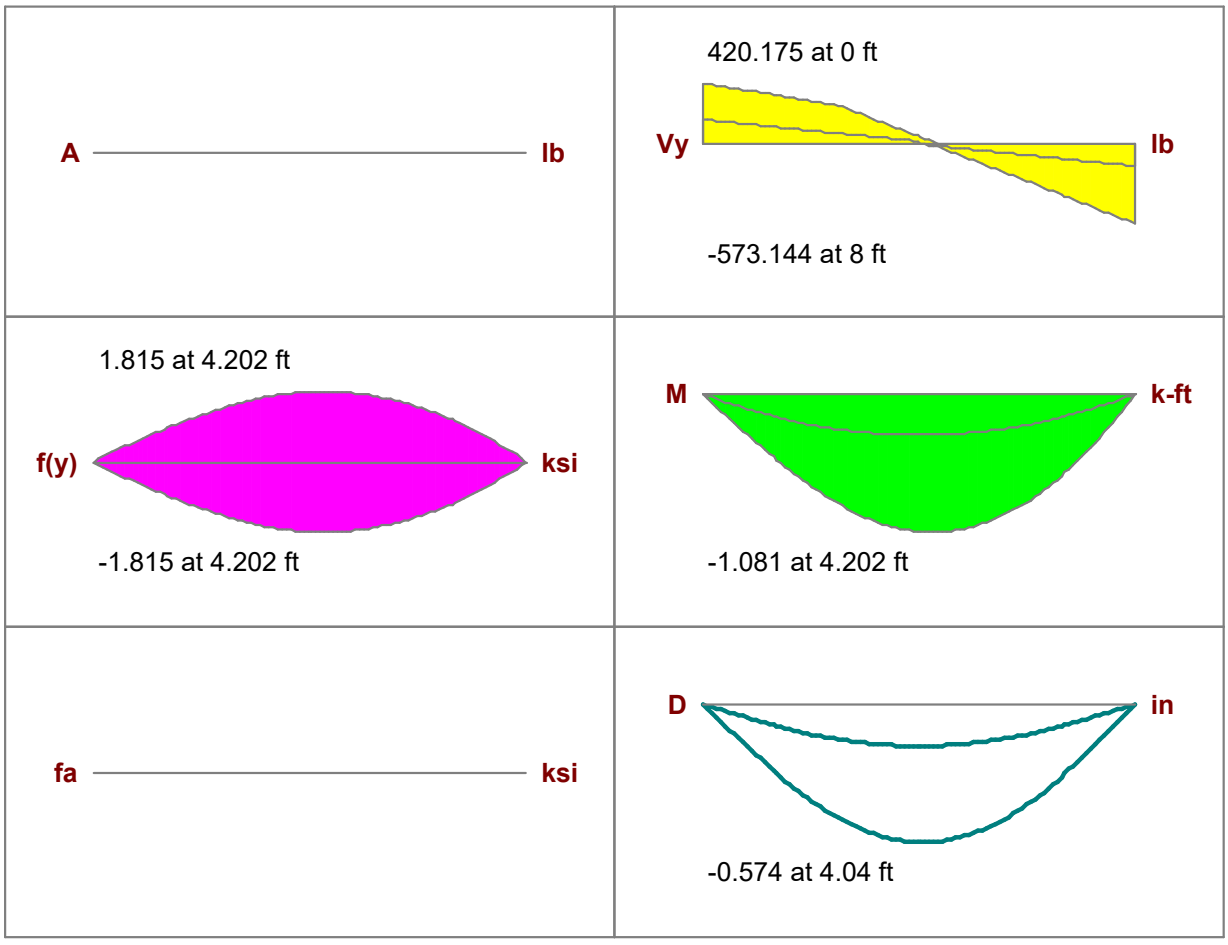


Loads: BLC 4, RLL

		Mar 14, 2022 at 1:10 PM
	Roof Live Load = 20 psf x 2 ft = 40 plf	Typical 4x4 Joist.r2d

Beam: ***M1***

Shape: **4X4**
Material: **DF (E) 1000 Fb**
Length: **8 ft**
I Joint: **N2**
J Joint: **N3**
Envelope
Code Check: **0.842 (LC 2)**
Report Based On 100 Sections



AWC NDS-12: ASD Code Check

Max Bending Check	**0.842 (LC 2)**	Max Shear Check	**0.312 (LC 1)**	Max Defl Ratio	**L/167**
Location	**4.202 ft**	Location	**8 ft**	Location	**4.04 ft**
Equation	**3.9-3**			Span	**1**

CD	**1.25**	RB	**1.852**	CL	**1**
Cr	**1.15**	Cfu	**1**	CP	**0.99**

	(ksi)	Cm	Ct	CF
Fc'	**2.134**	**1**	**1**	**1.15**
Ft'	**1.266**	**1**	**1**	**1.5**
Fb'	**2.156**	**1**	**1**	**1.5**
Fv'	**0.162**	**1**	**1**	
E'	**1700**	**1**	**1**	

	Out	In
Lb	**1 ft**	**1 ft**
le/d	**3.429**	**3.429**
Sway	**No**	**No**

Le-Bending Top **1 ft**
Le-Bending Bot **1 ft**

Deflection Calculation

Code: CBC Table 1604.3 Serviceability

Date: 3/16/2022

Project: REI 017

Member			
Size	4x4		
Span	8.00	ft	
L/240	0.400	in	RLL Limit
L/180	0.533	in	DL+RLL Limit

Load Case	Deflection		
DL	0.401	in	Dead Load Deflection
0.5 x DL	0.201	in	Dead Load Deflection due to Creep per CBC Table 1604.3 Note D
RLL	0.173	in	Short Term Live Load Deflection
0.5DL+RLL	0.374	in	
L/180	0.533	in	
Check	Ok	0.374 in < 0.533 in	
RLL	0.173	in	
L/240	0.400	in	
Check	Ok	0.73 in < 0.400 in	

Anchorage Calculations

Hazards by Location

Search Information

Address: El Camino Real, Tustin, CA, USA

Coordinates: 33.7251061, -117.8034263

Elevation: 81 ft

Timestamp: 2022-03-13T23:00:32.031Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default

Basic Parameters

Name	Value	Description
S_S	1.275	MCE_R ground motion (period=0.2s)
S_1	0.456	MCE_R ground motion (period=1.0s)
S_{MS}	1.53	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.02	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.938	Coefficient of risk (0.2s)
CR_1	0.93	Coefficient of risk (1.0s)
PGA	0.532	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.639	Site modified peak ground acceleration

T_L	8	Long-period transition period (s)
SsRT	1.275	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.36	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.505	Factored deterministic acceleration value (0.2s)
S1RT	0.456	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.49	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.615	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Hazards by Location

Search Information

Address: El Camino Real, Tustin, CA, USA

Coordinates: 33.7251061, -117.8034263

Elevation: 81 ft

Timestamp: 2022-03-13T23:00:04.855Z

Hazard Type: Wind

ASCE 7-16

MRI 10-Year	66 mph
MRI 25-Year	71 mph
MRI 50-Year	77 mph
MRI 100-Year	81 mph
Risk Category I	89 mph
Risk Category II	95 mph
Risk Category III	102 mph
Risk Category IV	106 mph

ASCE 7-10

MRI 10-Year	72 mph
MRI 25-Year	79 mph
MRI 50-Year	85 mph
MRI 100-Year	91 mph
Risk Category I	100 mph
Risk Category II	110 mph
Risk Category III-IV	115 mph

ASCE 7-05

ASCE 7-05 Wind Speed	85 mph

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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Seismic Force Minimum Anchorage Calculation

New Mechanical Unit Input

Lennox			Brand
KHB122H4E			Model Number
Wp	1176	lb	Wp - Operating Weight (Includes all accessories)
Lx	124	in	Long Dimension of New Unit
Ly	60	in	Short Dimension of New Unit
H	47	in	Height of New Unit

New Mechanical Unit Curb Adapter Input

Lx_ca	97	in	Long Dimension of Curb Adapter
Ly_ca	56	in	Short Dimension of Curb Adapter
Weight	235	lb	Weight of Curb Adapter

Seismic Parameters

Sds	1.020	g	Short Period Spectral Acceleration
ap	2.5		Air-Side HVAC - Component Amplification Factor
Rp	6.0		Air-Side HVAC - Component Response Modification Factor
Wp	1176	lb	Component Operating Weight
Ip	1.0		Component Importance Factor
z/h	1.0		Height of Structure/Unit Ratio

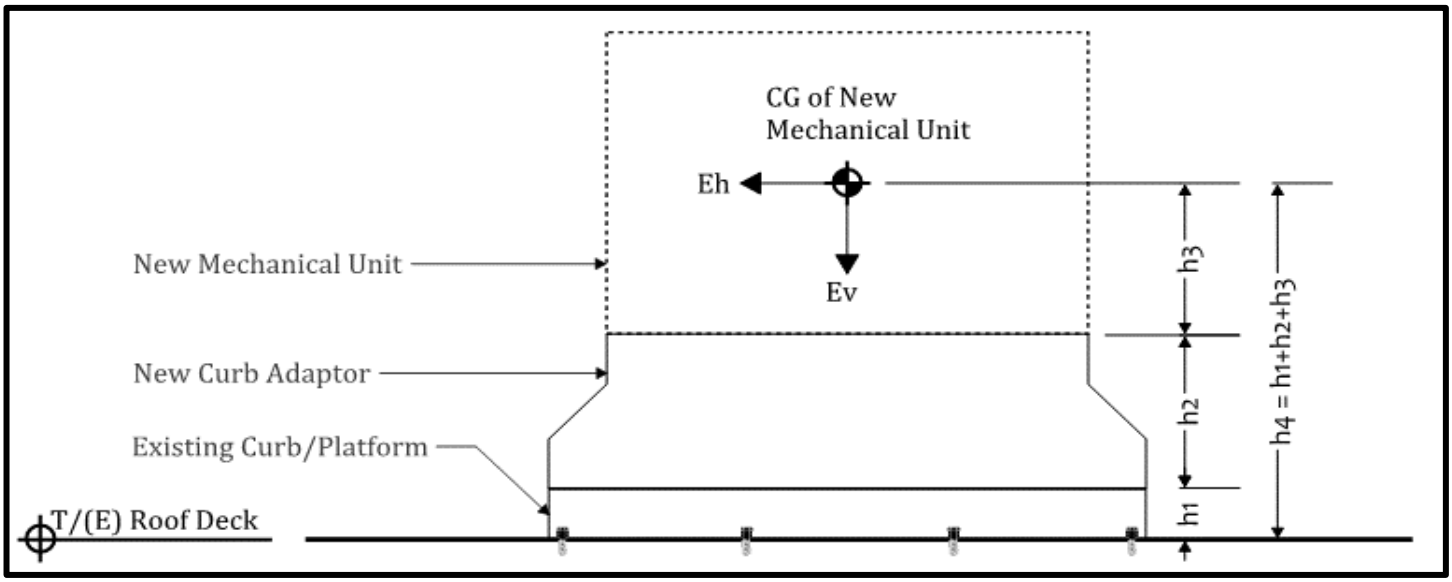
Seismic Force Calculation

Fpmin	360	lb
Fp	600	lb
Fpmax	1919	lb

Existing Curb and Adaptor Curb Information

h1	12	in
h2	17	in
h3	23.5	in
h4	52.5	in

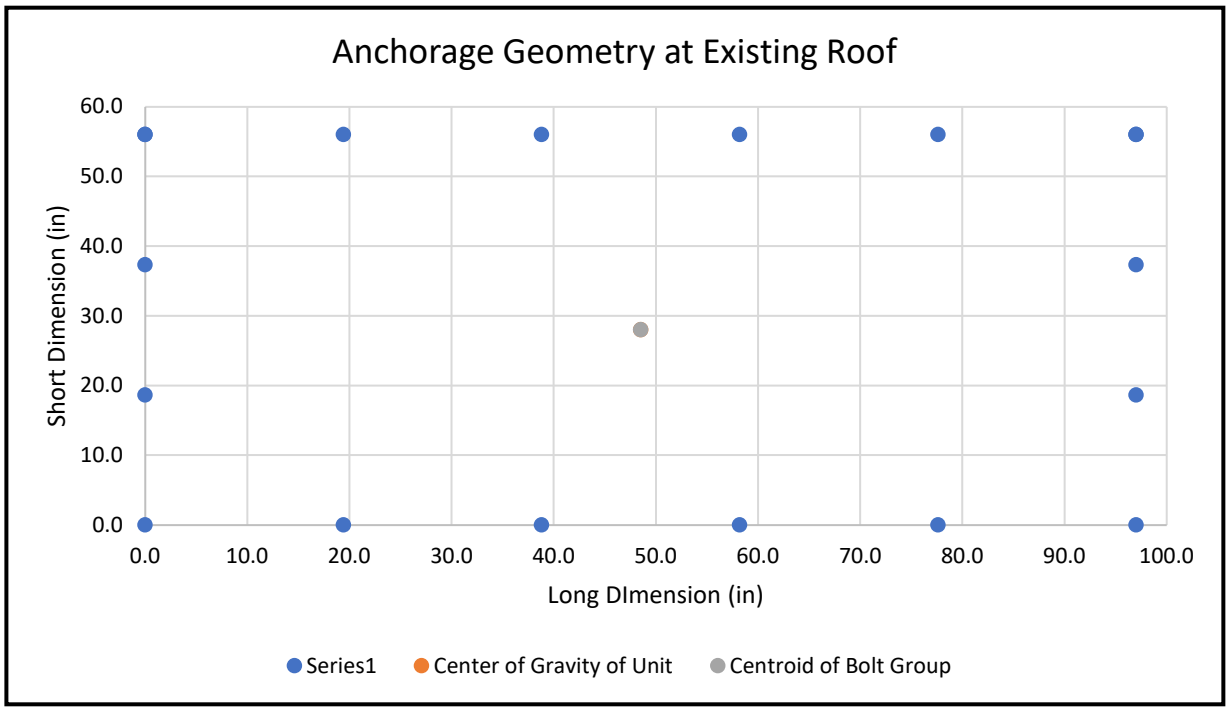
Seismic Force, Fp	**600**	**lb**



Seismic Force Minimum Anchorage Calculation

New Mechanical Equipment Anchorage

Axy	1	ea	Anchors at Each Corner
Ax	4	ea	Add'l Anchors Long Dimension
Ay	2	ea	Add'l Anchors Short Dimension
At	16	ea	Total Anchors



Anchor Coordinates		
Location	**x (in)**	**y (in)**
1	0.0	0.0
2	19.4	0.0
3	38.8	0.0
4	58.2	0.0
5	77.6	0.0
6	97.0	0.0
7	0.0	56.0
8	19.4	56.0
9	38.8	56.0
10	58.2	56.0
11	77.6	56.0
12	97.0	56.0
13	0.0	18.7
14	0.0	37.3
15	0.0	56.0
16	97.0	18.7
17	97.0	37.3
18	97.0	56.0

Unit COG	
x (in)	**y (in)**
48.5	28.0

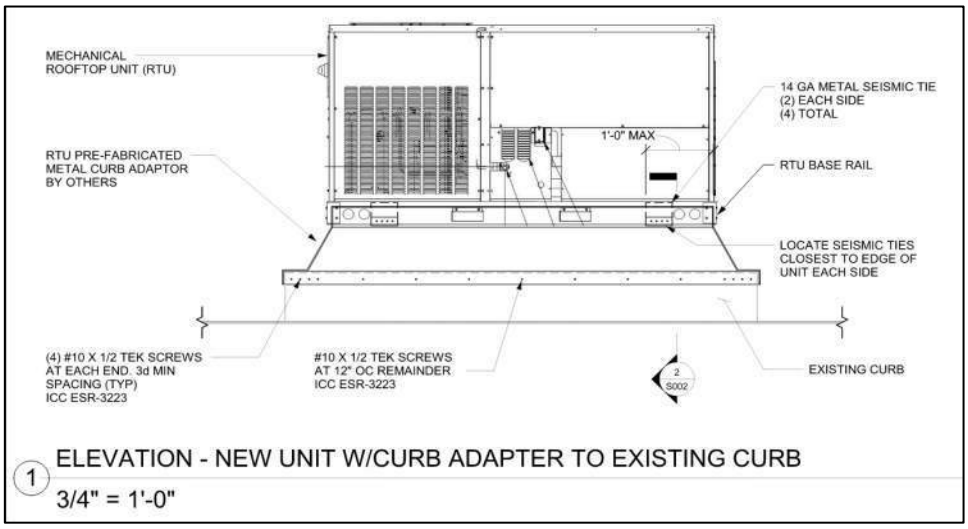
Anchor COG	
x (in)	**y (in)**
48.5	28.0

Structural Forces Acting at Unit COG

Eh	600	lb	Eh = Qe
Ev	240	lb	Ev = (0.2 x Sds x D)

Load Combination - 0.6D+0.7E = 0.6D+0.7(Eh-Ev)
Produces maximum uplift and shear

Seismic Force Minimum Anchorage Calculation



1. New Unit to Curb Adapter Check

Anchorage Selection

Select Clip	14 GA Metal Seismic Z Clip		
Select Screw	1/4" x 14 x 1 1/4"		
Select Quantity of Screws	4		
Top Sheet Thickness	0.048 (18ga)	in	Design for 18ga
Bottom Sheet Thickness	0.048 (18ga)	in	Design for 18ga
Allowable Shear per screw	331	lb	(Note: Pullover does not govern capacity)
Total Allowable Shear per Clip	1324	lb	(2) Each Long Side - (4) Total

Resolve Horizontal Forces

Note: Horizontal shear forces are resisted by bearing of the metal base rail at the perimeter of the RTU on the existing curb or curb adapter. The metal base rail is rigidly attached to the unit and overhangs the curb around the perimeter. Refer to details for additional information. Seismic ties are used solely to resist uplift forces generated and resolved by the overturning moment.

Resolve Vertical Forces

Vertical CG of Force	23.5	in	h3 - See Diagram on Page 1	
Service Level EQ Force	420	lb	Force = 0.7 x Eh	
Moment	9,866	lb-in	Moment = Eh x h3	
Clips Each Side	2	total	(2) Each Long Side - (4) Total	
Lever Arm btw Clips - Long Dir.	100	in	Lever Arm = Lx - 12 in - 12 in	
Lever Arm btw Clips - Short Dir.	60	in	Lever Arm = Ly	
Upward Force from Moment	-82	lb	Moment/Lever Arm	A
Upward Force from Ev	-42	lb	0.7*Ev/# of Clips	B
Downward Force from Self Weight	176	lb	0.6*D	C
Net Tension Force	0	lb	Force/4 Screws per Clip	D = A+B+C

Ratio	**0%**	**OK**	**Force/Allowable Shear Force**

No net tension on unit to curb adapter connection. Provide positively fastened connection per ASCE 13.4

Seismic Force Minimum Anchorage Calculation

2. Curb Adapter to Existing Curb Check

Anchorage Selection

Select Screw	#10-16 HWH		
Spacing	8	in	
Screws Long Side (Interior)	11	total	
Screws Short Side (Interior)	6	total	
Screws at Edge Group	4	each corner, each side	
Top Sheet Thickness	0.048 (18ga)	in	Design for 18ga
Bottom Sheet Thickness	0.048 (18ga)	in	Design for 18ga
Allowable Shear per screw	331	lb	(Note: Pullover does not govern capacity)

Resolve Horizontal and Vertical Forces

Eh	600	lb	Strength Level Seismic Force
V_a	420	lb	Service Level Seismic Force
Force Each Side	210	lb	Va/2
Screws Each Side	14	total	Refer to structural drawings
Horiz Force per Screw	31	lb	

Resolve Vertical Forces

Vertical CG of Force	40.5	in	(h2+h3) - See Diagram on Page 1
Service Level EQ Force	420	lb	Service Level Seismic Force, Va
Moment	17,003	lb-in	Moment = Va x (h2+h3)
Lever Arm btw Edge Groups	44	in	Lever Arm = Ly_ca - 6in - 6in
Vertical Force from Moment per Edge Group	386	lb	Moment/Lever Arm
Vertical Force from Moment per Screw	97	lb	

Total Force	**101**	**lb**	**$\sqrt{H^2 + V^2} + Ev$**
Ratio	**31%**	**Passes**	

Seismic Force Minimum Anchorage Calculation

3. Existing Curb to Base Structure

T_Ω	62	lb	Strength Level Tension
T_a	43	lb	Service Level Tension = T_Ω x 0.7
V_Ω	38	lb	Strength Level Shear
V_a	27	lb	Service Level Shear = V_Ω x 0.7

Analysis of Existing Anchors

Select Anchor Type	1/4"		Lag Screw at Corners and Middle
Select Depth of Embed	2	in	Assume 8d Minimum Embed
Select Side Member Thickness	> 3 1/2	in	
Select Species	DF		
Specific Gravity, G	0.50		
Withdrawl Capacity per inch	225	lb/in	NDS Table 11.2A
Shear Capacity	120	lb	NDS Table 11J

W	450	lb	Nominal Withdrawl (Tension) Capacity
Cd	1.6		Load Duration for EQ Load
W'=W x Cd	720	lb	Allowable Tension for Single Anchor
$Z_\perp$	120	lb	Nominal Shear Capacity
Cd	1.6		Load Duration for EQ Load
$Z'=Z_\perp$ x Cd	192	lb	Allowable Shear for Single Anchor
T_a/W'	6%		Tension Ratio
V_a/Z'	14%		Shear Ratio

Ta/W' + Va/Z'	**20%**	**<**	**70%**	**Passes**
Combined Tension and Shear Ratio				

Bolt Pattern Force Distribution

Results Summary

A summary of the results is shown below.

Bolt Force Summary

The resultant axial and shear forces on each bolted joint are given below:

Bolt #	Ptrn #	Ptrn Type	Axial Force	Shear Force
1	1	Rectangle	-119.5 lbf	37.5 lbf
2	1	Rectangle	-59.3 lbf	37.5 lbf
3	1	Rectangle	1.0 lbf	37.5 lbf
4	1	Rectangle	61.3 lbf	37.5 lbf
5	1	Rectangle	-119.5 lbf	37.5 lbf
6	1	Rectangle	61.3 lbf	37.5 lbf
7	1	Rectangle	-119.5 lbf	37.5 lbf
8	1	Rectangle	61.3 lbf	37.5 lbf
9	1	Rectangle	-119.5 lbf	37.5 lbf
10	1	Rectangle	61.3 lbf	37.5 lbf
11	1	Rectangle	-119.5 lbf	37.5 lbf
12	1	Rectangle	61.3 lbf	37.5 lbf
13	1	Rectangle	-119.5 lbf	37.5 lbf
14	1	Rectangle	-59.3 lbf	37.5 lbf
15	1	Rectangle	1.0 lbf	37.5 lbf
16	1	Rectangle	61.3 lbf	37.5 lbf

Forces and Moments at Pattern Centroid

The applied forces and moments are translated to the centroid of the pattern.

The forces at the centroid are simply the sum of the applied forces:

$F_{c.x}$ = 0 lbf — sum of the forces in the X-direction

$F_{c.y}$ = 600 lbf — sum of the forces in the Y-direction

$F_{c.z}$ = -466 lbf — sum of the forces in the Z-direction

The moments at the centroid are:

$M_{c.x}$ = -31,500 in*lbf — moments at centroid about X-axis

$M_{c.y}$ = 0 in*lbf — moments at centroid about Y-axis

$M_{c.z}$ = 0 in*lbf — moments at centroid about Z-axis

Pattern Properties Summary

The properties of the pattern are detailed below:

A_{cmb} = 1.24 in^2 — combined area of bolts in the pattern

x_c = 48.5 in — X-coordinate of the pattern centroid

y_c = 28.0 in — Y-coordinate of the pattern centroid

$I_{c.x}$ = 756.022 in^4 — centroidal moment of inertia about X-axis

$I_{c.y}$ = 1,749.838 in^4 — centroidal moment of inertia about Y-axis

$I_{c.p}$ = 2,505.86 in^4 — centroidal polar moment of inertia

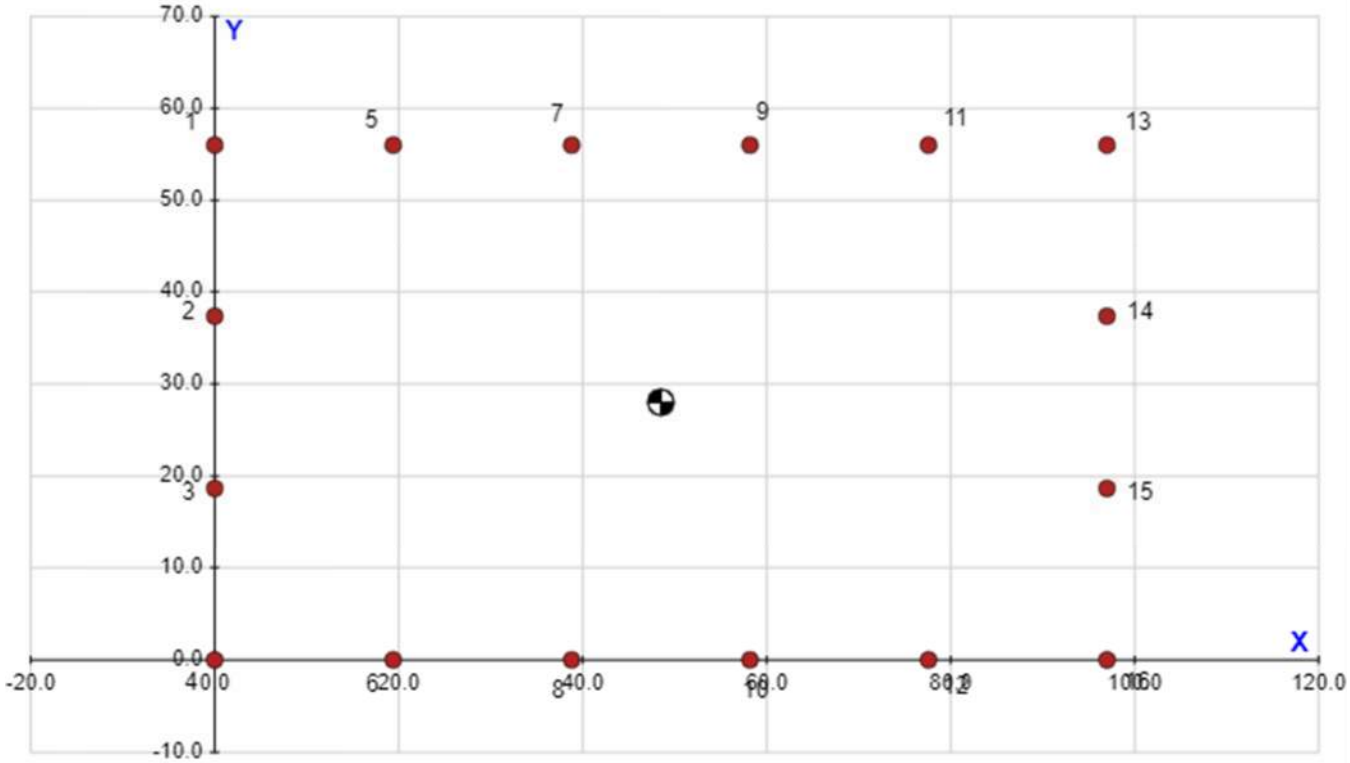
Pattern Properties

This section details the properties of the bolt pattern. These pattern properties determine how the applied forces distribute among the individual bolts.

Bolt Pattern Geometry

The pattern properties are determined based on the pattern geometry. The specified bolt sizes and locations are shown in the table below, as well the distances of the bolts from the pattern centroid:

Bolt #	Thread	Area [in^2]	x [in]	y [in]	r.x [in]	r.y [in]	r.xy [in]
1	3/8-16	0.0775	0.0	56.0	-48.5	28.0	56.002
2	3/8-16	0.0775	0.0	37.333	-48.5	9.333	49.39
3	3/8-16	0.0775	0.0	18.667	-48.5	-9.333	49.39
4	3/8-16	0.0775	0.0	0.0	-48.5	-28.0	56.002
5	3/8-16	0.0775	19.4	56.0	-29.1	28.0	40.383
6	3/8-16	0.0775	19.4	0.0	-29.1	-28.0	40.383
7	3/8-16	0.0775	38.8	56.0	-9.7	28.0	29.633
8	3/8-16	0.0775	38.8	0.0	-9.7	-28.0	29.633
9	3/8-16	0.0775	58.2	56.0	9.7	28.0	29.633
10	3/8-16	0.0775	58.2	0.0	9.7	-28.0	29.633
11	3/8-16	0.0775	77.6	56.0	29.1	28.0	40.383
12	3/8-16	0.0775	77.6	0.0	29.1	-28.0	40.383
13	3/8-16	0.0775	97.0	56.0	48.5	28.0	56.002
14	3/8-16	0.0775	97.0	37.333	48.5	9.333	49.39
15	3/8-16	0.0775	97.0	18.667	48.5	-9.333	49.39
16	3/8-16	0.0775	97.0	0.0	48.5	-28.0	56.002



Pattern Properties Summary

The properties of the pattern were calculated based on the areas and locations of the bolts:

A_{cmb} = 1.24 in^2	combined area of bolts in the pattern
x_c = 48.5 in	X-coordinate of the pattern centroid
y_c = 28.0 in	Y-coordinate of the pattern centroid
$I_{c.x}$ = 756.022 in^4	centroidal moment of inertia about X-axis
$I_{c.y}$ = 1,749.838 in^4	centroidal moment of inertia about Y-axis
$I_{c.p}$ = 2,505.86 in^4	centroidal polar moment of inertia

Bolt Pattern Centroid

Applied forces and moments are translated to the pattern centroid before distributing forces among individual bolts. The bolt pattern is treated as if it were a beam, where the centroid of the pattern is like the neutral axis of the beam.

The pattern centroid is calculated as:

$$x_c = \frac{\sum_i x_i A_i}{\sum_i A_i} = 48.5 \text{ in} \qquad y_c = \frac{\sum_i y_i A_i}{\sum_i A_i} = 28.0 \text{ in}$$

where A.i is the bolt area and x.i and y.i are the x- and y- bolt locations, respectively.

Bolt Pattern Moment of Inertia

The moments of inertia of the pattern about the x- and y- axes are calculated as:

$$I_{c.x} = \sum_i r_{c.y,i}^2 A_i = \quad 756.022 \text{ in}^4 \qquad I_{c.y} = \sum_i r_{c.x,i}^2 A_i = \quad 1{,}749.838 \text{ in}^4$$

where A.i is the bolt area and r.c.x,i and r.c.y,i are the x- and y- distances of the bolt from the centroid, respectively.

The polar moment of inertia of the pattern about the centroid is calculated as:

$$I_{c.p} = \sum_i r_{c.xy,i}^2 A_i = \sum_i (r_{c.x,i}^2 + r_{c.y,i}^2) A_i = I_{c.x} + I_{c.y} = \quad 2{,}505.86 \text{ in}^4$$

It should be noted that these calculations are directly analogous to the calculation of the centroid of a cross section, moment of inertia of a cross section, and polar moment of inertia of a cross section.

Forces and Moments at Centroid

The applied forces and moments are translated to the centroid of the bolt pattern. Once forces and moments at the centroid are calculated, they can be used to calculate the forces acting on individual bolted joints.

Applied Forces and Moments

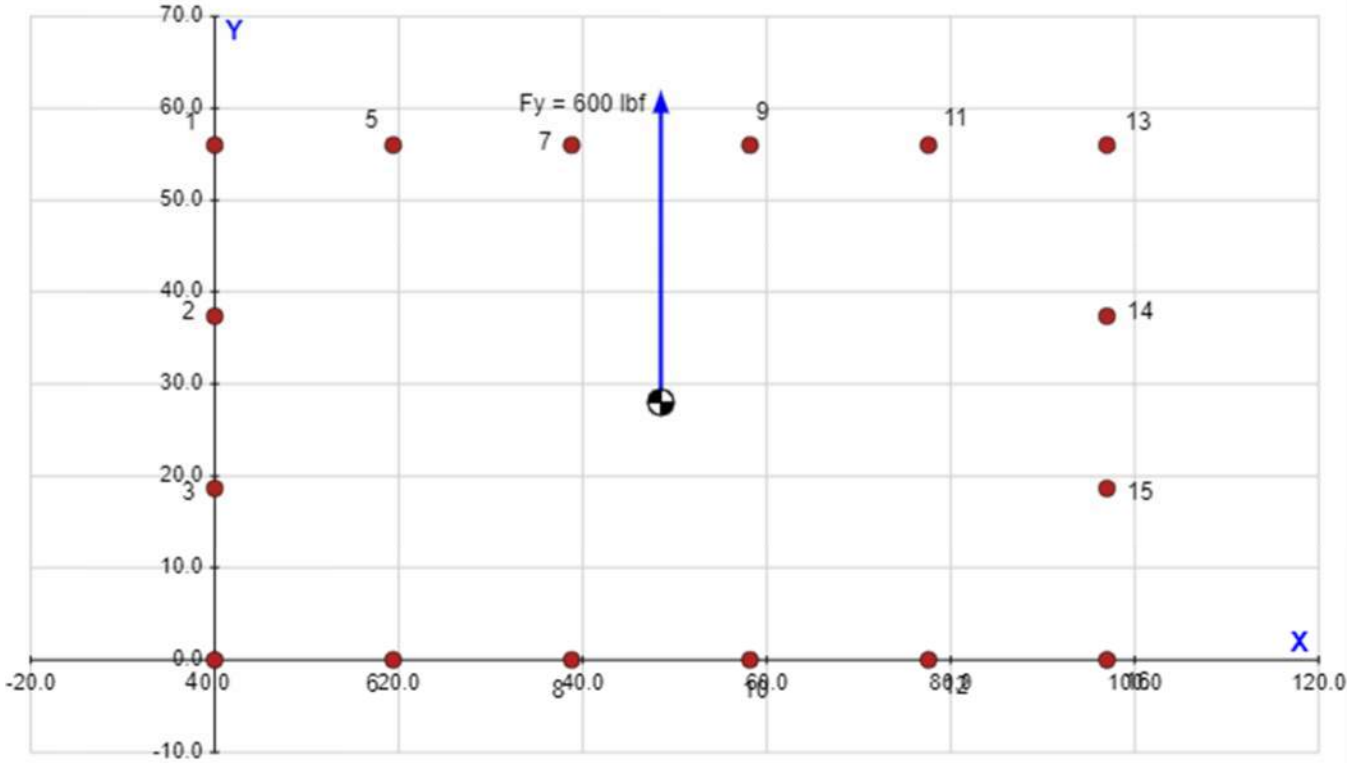
The applied forces are listed below:

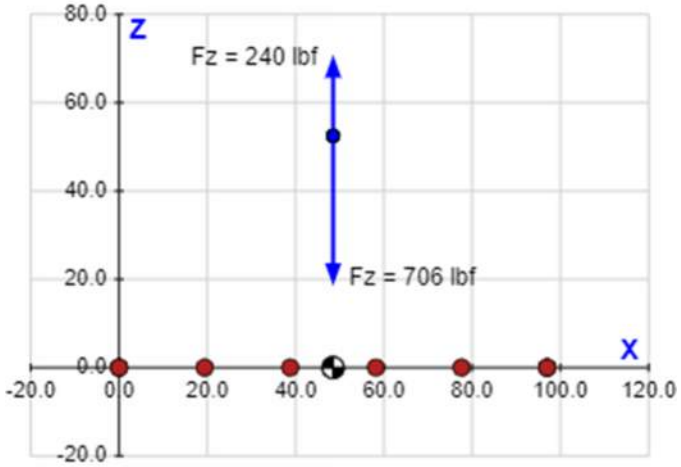
Force #	Fx	Fy	Fz	Lx	Ly	Lz
1	0.0 lbf	600.0 lbf	0.0 lbf	48.5 in	28.0 in	52.5 in
2	0.0 lbf	0.0 lbf	-706.0 lbf	48.5 in	28.0 in	52.5 in
3	0.0 lbf	0.0 lbf	240.0 lbf	48.5 in	28.0 in	52.5 in

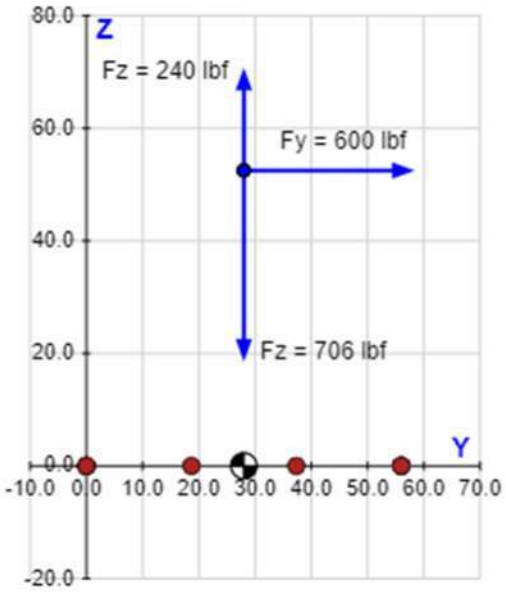
The applied moments are listed below:

Moment #	Mx	My	Mz

The applied forces and moments are plotted on the next page.


Y
X
Fy = 600 lbf
1
2
3
5
7
9
11
13
14
15
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
120.0


Z
X
Fz = 240 lbf
Fz = 706 lbf
80.0
60.0
40.0
20.0
0.0
-20.0
120.0


Z
Y
Fz = 240 lbf
Fy = 600 lbf
Fz = 706 lbf
80.0
60.0
40.0
20.0
0.0
-20.0
70.0

Forces and Moments at Pattern Centroid

The applied forces and moments are translated to the centroid of the pattern. Once forces and moments at the centroid are calculated, they can be used to calculate the forces acting on individual bolted joints.

The forces at the centroid are simply the sum of the applied forces:

$F_{c.x}$ = 0 lbf	sum of the forces in the X-direction
$F_{c.y}$ = 600 lbf	sum of the forces in the Y-direction
$F_{c.z}$ = -466 lbf	sum of the forces in the Z-direction

The moments at the centroid are:

$M_{c.x}$ = -31,500 in*lbf	moments at centroid about X-axis
$M_{c.y}$ = 0 in*lbf	moments at centroid about Y-axis
$M_{c.z}$ = 0 in*lbf	moments at centroid about Z-axis

The forces at the centroid are calculated as the sum of all applied forces:

$$\overline{F}_c = \sum_i \overline{F}_i$$

The moments at the centroid are calculated as the sum of all applied moments, plus the sum of the cross product of each applied force with the vector from the centroid to the location of that applied force:

$$\overline{M}_c = \sum_i \overline{M}_i + \sum_i \left(\overline{R}_{c,i} \times \overline{F}_i \right)$$

Individual Bolt Forces

This section details the axial and shear forces acting on each individual bolt in the pattern.

Bolt Force Summary

The resultant axial and shear forces on each bolted joint are given below:

Bolt #	Ptrn #	Ptrn Type	Axial Force	Shear Force
1	1	Rectangle	-119.5 lbf	37.5 lbf
2	1	Rectangle	-59.3 lbf	37.5 lbf
3	1	Rectangle	1.0 lbf	37.5 lbf
4	1	Rectangle	61.3 lbf	37.5 lbf
5	1	Rectangle	-119.5 lbf	37.5 lbf
6	1	Rectangle	61.3 lbf	37.5 lbf
7	1	Rectangle	-119.5 lbf	37.5 lbf
8	1	Rectangle	61.3 lbf	37.5 lbf
9	1	Rectangle	-119.5 lbf	37.5 lbf
10	1	Rectangle	61.3 lbf	37.5 lbf
11	1	Rectangle	-119.5 lbf	37.5 lbf
12	1	Rectangle	61.3 lbf	37.5 lbf
13	1	Rectangle	-119.5 lbf	37.5 lbf
14	1	Rectangle	-59.3 lbf	37.5 lbf
15	1	Rectangle	1.0 lbf	37.5 lbf
16	1	Rectangle	61.3 lbf	37.5 lbf

Axial Force Calculation

The axial forces on each bolted joint are shown in the table below:

Bolt #	Area	P_ax total	P_z_FZ	P_z_MX	P_z_MY
1	0.0775 in^2	-119.527 lbf	-29.125 lbf	-90.402 lbf	0.0 lbf
2	0.0775 in^2	-59.259 lbf	-29.125 lbf	-30.134 lbf	0.0 lbf
3	0.0775 in^2	1.009 lbf	-29.125 lbf	30.134 lbf	0.0 lbf
4	0.0775 in^2	61.277 lbf	-29.125 lbf	90.402 lbf	0.0 lbf
5	0.0775 in^2	-119.527 lbf	-29.125 lbf	-90.402 lbf	0.0 lbf
6	0.0775 in^2	61.277 lbf	-29.125 lbf	90.402 lbf	0.0 lbf
7	0.0775 in^2	-119.527 lbf	-29.125 lbf	-90.402 lbf	0.0 lbf
8	0.0775 in^2	61.277 lbf	-29.125 lbf	90.402 lbf	0.0 lbf
9	0.0775 in^2	-119.527 lbf	-29.125 lbf	-90.402 lbf	0.0 lbf
10	0.0775 in^2	61.277 lbf	-29.125 lbf	90.402 lbf	0.0 lbf
11	0.0775 in^2	-119.527 lbf	-29.125 lbf	-90.402 lbf	0.0 lbf
12	0.0775 in^2	61.277 lbf	-29.125 lbf	90.402 lbf	0.0 lbf
13	0.0775 in^2	-119.527 lbf	-29.125 lbf	-90.402 lbf	0.0 lbf
14	0.0775 in^2	-59.259 lbf	-29.125 lbf	-30.134 lbf	0.0 lbf
15	0.0775 in^2	1.009 lbf	-29.125 lbf	30.134 lbf	0.0 lbf
16	0.0775 in^2	61.277 lbf	-29.125 lbf	90.402 lbf	0.0 lbf

The equations used to calculate each axial force component are:

$$P_{z.FZ} = \frac{F_{c.z} A}{\sum_i A_i}$$ Z-force on bolt due to direct force in Z

$$P_{z.MX} = \frac{M_{c.x} r_{c.y}}{I_{c.x}} \cdot A$$ Z-force on bolt due to MX about centroid

$$P_{z.MY} = \frac{-M_{c.y} r_{c.x}}{I_{c.y}} \cdot A$$ Z-force on bolt due to MY about centroid

The total axial force on an individual bolted joint is the sum of the axial force components:

$$P_{axial} = P_{z.FZ} + P_{z.MX} + P_{z.MY}$$

Shear Force Calculation

The shear forces on each bolted joint are shown in the table below:

Bolt #	Area	P_shr total	P_x_FX	P_y_FY	P_x_MZ	P_y_MZ
1	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
2	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
3	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
4	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
5	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
6	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
7	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
8	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
9	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
10	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
11	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
12	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
13	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
14	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
15	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf
16	0.0775 in^2	37.5 lbf	0.0 lbf	-37.5 lbf	0.0 lbf	0.0 lbf

The equations used to calculate each shear force component are:

$$P_{x.FX} = \frac{-F_{c.x}A}{\sum_i A_i}$$ X-force on bolt due to direct force in X

$$P_{y.FY} = \frac{-F_{c.y}A}{\sum_i A_i}$$ Y-force on bolt due to direct force in Y

$$P_{xy.MZ} = \frac{M_{c.z}r_{c.xy}}{I_{c.p}} \cdot A$$ XY-force on bolt due to MZ about centroid

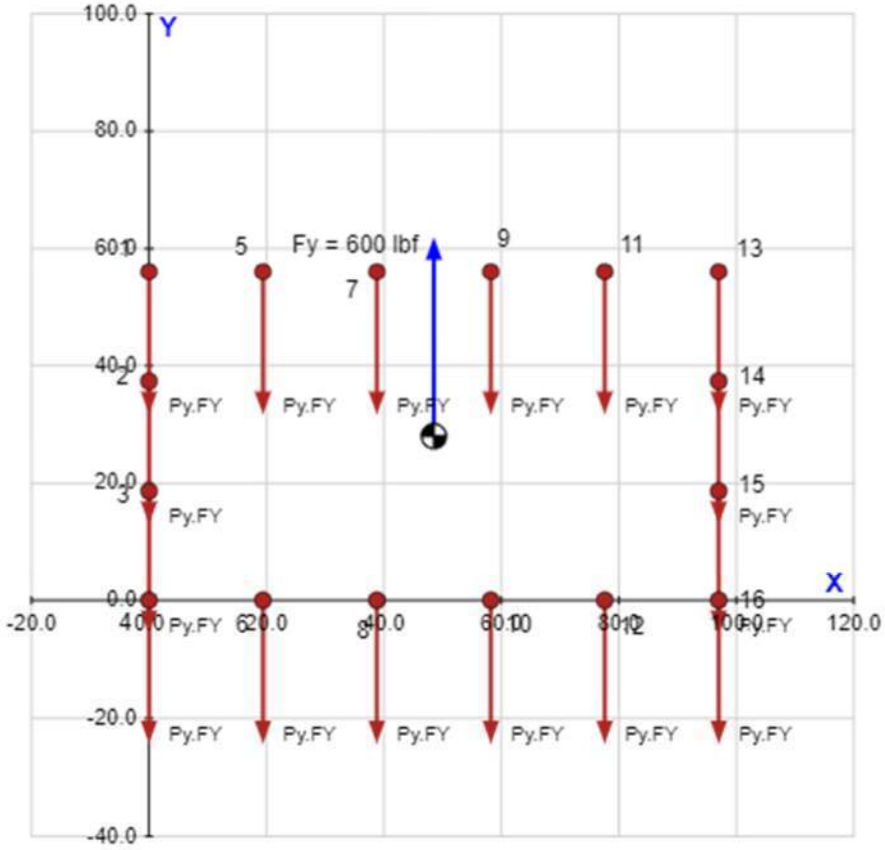
$$P_{x.MZ} = P_{xy.MZ} \cdot \sin\theta$$ X-force on bolt due to MZ about centroid

$$P_{x.MZ} = -P_{xy.MZ} \cdot \cos\theta$$ Y-force on bolt due to MZ about centroid

The total shear force on an individual bolted joint is calculated as the vector sum of the X- components plus the Y- components:

$$P_{shear} = \sqrt{(P_{x.FX} + P_{x.MZ})^2 + (P_{y.FY} + P_{y.MZ})^2}$$

Bolt shear forces are displayed below. Applied forces and moments are shown in blue, and resultant shear forces on the individual bolts are shown in red.


Y
X
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-20.0
120.0
Fy = 600 lbf
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Py.FY

New Unit Specifications

Project Submittal

Project Name: REI 17 Tustin CA
Project Number: 272071
Project Altitude: 138
Project Location:
2962 El Camino Real
Tustin, California US

Customer: Recreational Equipment Inc
Engineer: Pending Engineer
National Account: Rei

Date: 2/11/2022
Quote: 201431A
Roof Top Units: 13
Split Systems: 0

Table of Contents

Revit® Building Information Modeling (BIM) - Click here

AutoCAD® Templates - Click here

Project Submittal

Tag: RTU 1-11
Model: KHB122H4E - KHB122H4E-G 10T CONF E=12.3

UNIT OVERVIEW

Voltage	IEER EER	IPLV	HSPF	MCA/MOCP (amp)	Gross Cooling Ttl/Sens (MBH)	Net Cooling Ttl/Sens (MBH)	Supply Air Flow (cfm)	ESP/TSP (in.WC)	EAT DB/WB (°F)	LAT DB/WB (°F)
460V 3Ph 60Hz	14.8 12.3			28 / 35	130.1 / 95.0	121.2 / 86.0	4,000	1.00 / 1.34	80.0 / 67.0	57.3 / 56.2

COOLING

Cooling Performance		Temperatures (DB/WB °F)		
Gross Cooling (Ttl/Sens)	130.1 / 95.0 MBH	Ambient	95.0	
Net Cooling (Ttl/Sens)	121.2 / 86.0 MBH	Entering	80.0	67.0
Coil Moisture Removal	33.11 lb/hr	Leaving – (Coil)	57.3	56.2
System Moisture Removal	33.11 lb/hr	Leaving – (Unit)	59.5	57.0

ARI Performance		Compressors		Refrigerant		Condensate Drain	
ARI Cooling	121.0 / 118.0 MBH	Cooling Stages	2	Type	R-410A	Qty	1
ARI Power	9,600 W	Compressor Qty	2	Charge	30 LBS. 0 OZ.	Size	1 in.
		Compressor RLA	15.6 amp			Pipe Thread	npt

HEATING

Heating Performance		Temperatures (DB/WB °F)	
HP Output @ Design	70.8 MBH	HP Design	17.0
COP (High/Low)	3.6 / 2.4	HP Heat Rise @ Design	0.0
HP Power (High/Low)	9.5 / 8.6 kW	Leaving	16.4

VENTILATION

Air Flow (cfm)		Supply Fan		Air Resistance (in.WC)	
Supply	4,000	Nominal Power	3.75 hp	Total	1.34
	0	Required Power	3.75 hp	Ext Supply	1.00
		Drive Type	MSAV Direct Drive		
		Speed	0		
		Motor Torque			

AIR RESISTANCE - OPTIONS/ACCESSORIES (in.WC)

Wet Coil	Humiditrol	Heat	Economizer	Filters	Diffuser	Exhaust	ERW
0.15			0.19				

ELECTRICAL

Voltage	460V 3Ph / 60Hz	Compressor RLA	15.6 amp
MCA	28 amp	Cooling FLA Total	24.1 amp
MOCP	35 amp	Condenser FLA	4.2 amp
Condenser Power	806 W	Supply Fan FLA	4.3 amp
Oper Range-Nom Volt	+/- 10%		

ADDITIONAL DATA

Cabinet	124.38 in. x 60.12 in. x 46.88 in.	Total Weight	1,401 lb
Downflow Supply	20.0 in. x 28.0 in.	Base Unit Net Weight	1,301 lb
Downflow Return	24.0 in. x 27.0 in.	OAS/Econ Weight	83 lb
Filters	**(4)** 20.0 in. x 25.0 in. x 2.0 in.		
Sound Rating	85 dBA		

Tag: RTU 1-11

Factory Installed Options

High Performance Economizer Upgrade Factory Installed
Single Enthalpy Economizer
Standard Cap, Std Packaging
Unit Orientation Downflow
MSAV Direct Drive
440V/460V/480V 3Phase
175 Amp Terminal Block Factory Installed
Supply Motor - 3.75 Hp - DirectPlus w/MSAV
Barometric Relief Damper (Fac)
GFCI Factory Installed/Field Wired
BACnet Module (Fac)
Tube and Fin Coil System Factory Installed
2" MERV4 - Std. Filter Factory Installed

Field Installed Accessories

Catalog Number	Qty	Description
53W45	11	Power Exhaust Fan Field Installed
13T06	11	Combination Coil/Hail Guards Field Installed
97W23	11	Bacnet Sensor With Display Field installed
50W61	44	2" MERV8 - Filter Field Installed
87N53	11	CO2 Sensors - Wall-mount, off-white plastic cover, no display Field Installed

Product Features

Cabinet

Durable Outdoor Enamel Paint Finish
Totally Enclosed Outdoor Fan Motor
PVC Coated Fan Guard
Corrosion-Resistant Removable, Reversible Drain Pan
Isolated Compressor Compartment

Cooling System

Scroll Compressor
Expansion Valves
High Capacity Driers
High Pressure Switch (Manual Reset)
Crankcase Heater
System can operate from 30°F to 125°F without any additional controls
Pre-charged Refrigeration System
Internal Pressure Relief Valve
Thermostat Control – 2 Stages of Cooling

Control System

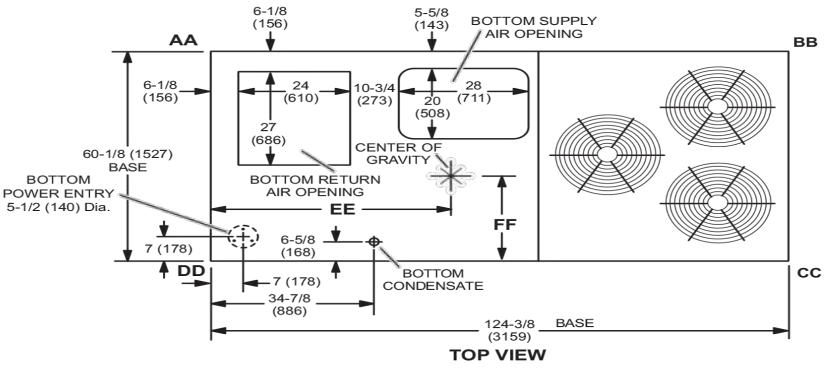
Fan and Limit Controls
Overload Protection

Warranty

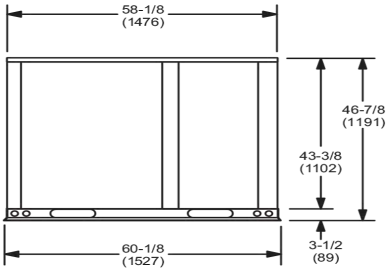
Limited warranty on compressor of 5 years
Limited warranty on High Performance Economizer of 5 years
Limited warranty on all other components of 1 year
See Limited Warranty Certificate included with unit for details

Project Submittal

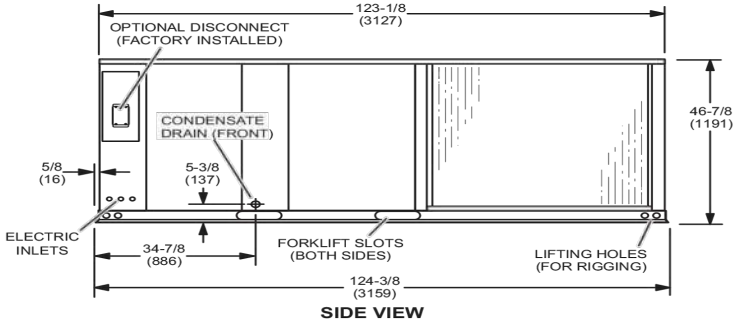
Corner Weights (lb)								Center of Gravity (in.)			
AA		BB		CC		DD		EE		FF	
Base	Max	Base	Max	Base	Max	Base	Max	Base	Max	Base	Max
316	365	273	316	288	333	339	392	56.50	55.50	25.50	26.50



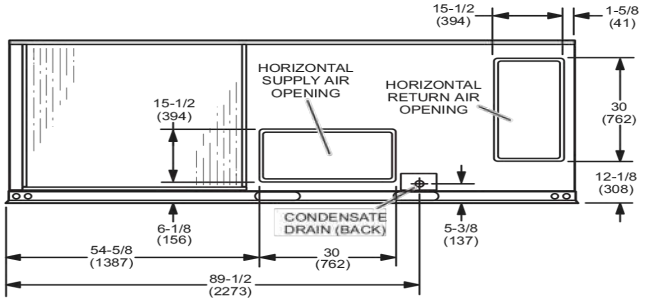
TOP VIEW



END VIEW

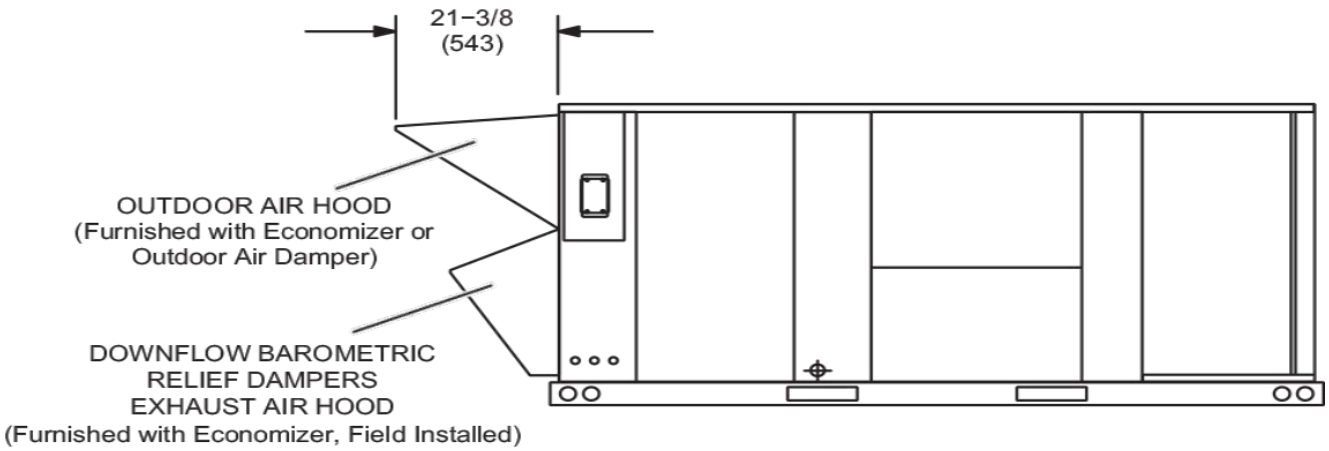


SIDE VIEW

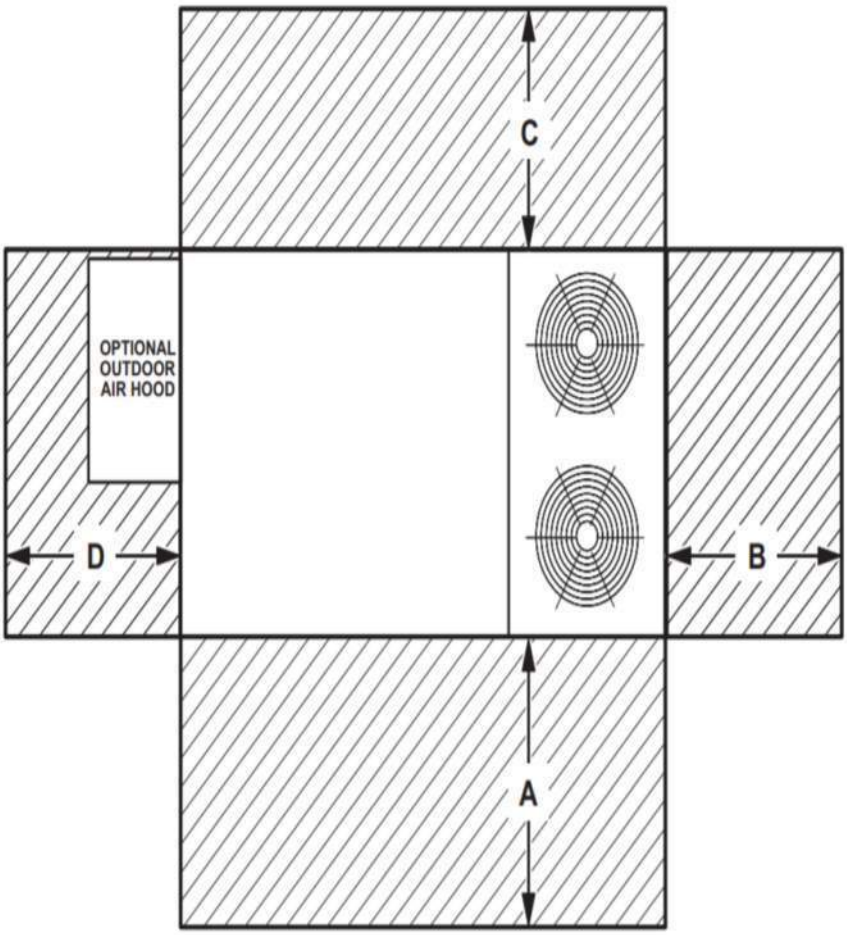


SIDE VIEW
(Horizontal Openings)

OUTDOOR AIR HOOD DETAIL



UNIT CLEARANCES



[1] Unit Clearance	A		B		C		D		Top Clearance
	in.	mm	in.	mm	in.	mm	in.	mm	
Service Clearance	60	1524	36	914	36	914	60	1524	Unobstructed
Minimum Operation Clearance	36	914	36	914	36	914	36	914	

NOTE - Entire perimeter of unit base requires support when elevated above the mounting surface.

[1] **Service Clearance** - Required for removal of serviceable parts.
Minimum Operation Clearance - Required clearance for proper unit operation.

Project Submittal

Tag: RTU 12
Model: KHB060H4E - KHB060H4E-G 5T CONF H=16.0

UNIT OVERVIEW

Voltage	SEER EER	IPLV	HSPF	MCA/MOCP (amp)	Gross Cooling Ttl/Sens (MBH)	Net Cooling Ttl/Sens (MBH)	Supply Air Flow (cfm)	ESP/TSP (in.WC)	EAT DB/WB (°F)	LAT DB/WB (°F)
460V 3Ph 60Hz	16 12.5		8.5	15 / 20	62.5 / 48.5	60.1 / 46.1	2,092	0.75 / 0.85	80.0 / 67.0	57.9 / 57.2

COOLING

Cooling Performance		Temperatures (DB/WB °F)		
Gross Cooling (Ttl/Sens)	62.5 / 48.5 MBH	Ambient	95.0	
Net Cooling (Ttl/Sens)	60.1 / 46.1 MBH	Entering	80.0	67.0
Coil Moisture Removal	13.18 lb/hr	Leaving – (Coil)	57.9	57.2
System Moisture Removal	13.18 lb/hr	Leaving – (Unit)	59.0	57.6

ARI Performance		Compressors		Refrigerant		Condensate Drain	
ARI Cooling	59.4 / 58.0 MBH	Cooling Stages	2	Type	R-410A	Qty	1
ARI Power	4,700 W	Compressor Qty	1	Charge	20 LBS. 0 OZ.	Size	1 in.
		Compressor RLA	7.2 amp			Pipe Thread	npt

HEATING

Heating Performance		Temperatures (DB/WB °F)	
HP Output @ Design	33.2 MBH	HP Design	17.0
COP (High/Low)	3.7 / 2.5	HP Heat Rise @ Design	0.0
HP Power (High/Low)	4.7 / 4.0 kW	Leaving	14.7

VENTILATION

Air Flow (cfm)		Supply Fan		Air Resistance (in.WC)	
Supply	2,092	Nominal Power	1.00 hp	Total	0.85
	0	Required Power	1.00 hp	Ext Supply	0.75
		Drive Type	MSAV Direct Drive		
		Speed	5		
		Motor Torque			

AIR RESISTANCE - OPTIONS/ACCESSORIES (in.WC)

Wet Coil	Humiditrol	Heat	Economizer	Filters	Diffuser	Exhaust	ERW
0.05			0.05				

ELECTRICAL

Voltage	460V 3Ph / 60Hz	Compressor RLA	7.2 amp
MCA	15 amp	Cooling FLA Total	12.3 amp
MOCP	20 amp	Condenser FLA	1.4 amp
Condenser Power	280 W	Supply Fan FLA	3.7 amp
Oper Range-Nom Volt	+/- 10%		

ADDITIONAL DATA

Cabinet	98.25 in. x 47.00 in. x 46.88 in.	Total Weight	867 lb
Downflow Supply	20.0 in. x 18.0 in.	Base Unit Net Weight	727 lb
Downflow Return	29.0 in. x 11.0 in.	OAS/Econ Weight	131 lb
Filters	**(4)** 20.0 in. x 20.0 in. x 2.0 in.		
Sound Rating	77 dBA		

Tag: RTU 12

Factory Installed Options

High Performance Economizer Upgrade Factory Installed
Single Enthalpy Economizer
Standard Cap, Std Packaging
Unit Orientation Downflow
MSAV Direct Drive
440V/460V/480V 3Phase
Supply Motor - 1.0 Hp ECM - w/ MSAV
Barometric Relief Damper (Fac)
GFCI Factory Installed/Field Wired
BACnet Module (Fac)
Tube and Fin Coil System Factory Installed
2" MERV4 - Std. Filter Factory Installed

Field Installed Accessories

Catalog Number	Qty	Description
13T17	1	Combination Coil/Hail Guards Field Installed
97W23	1	Bacnet Sensor With Display Field installed
54W21	4	2" MERV8 - Filter Field Installed
87N53	1	CO2 Sensors - Wall-mount, off-white plastic cover, no display Field Installed

Product Features

Cabinet

Durable Outdoor Enamel Paint Finish
Totally Enclosed Outdoor Fan Motor
PVC Coated Fan Guard
Corrosion-Resistant Removable, Reversible Drain Pan
Isolated Compressor Compartment

Cooling System

Scroll Compressor
Expansion Valves
High Capacity Driers
High Pressure Switch (Manual Reset)
Crankcase Heater
System can operate from 30°F to 125°F without any additional controls
Pre-charged Refrigeration System
Internal Pressure Relief Valve
Thermostat Control – 2 Stages of Cooling

Control System

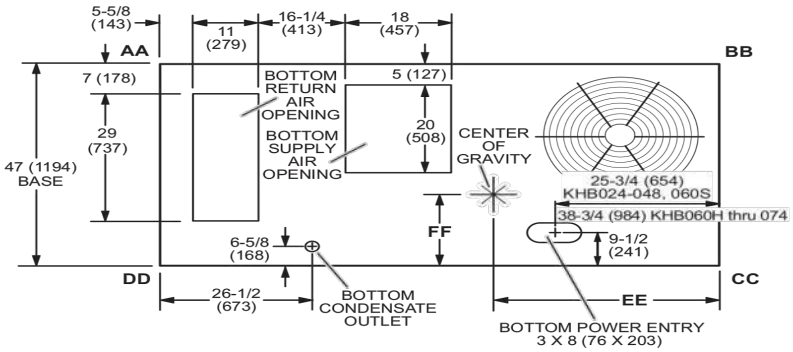
Fan and Limit Controls
Overload Protection

Warranty

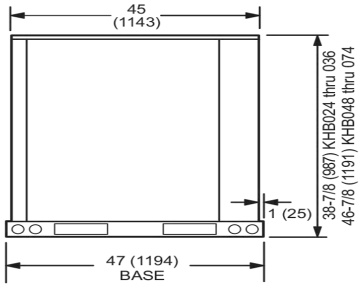
Limited warranty on compressor of 5 years
Limited warranty on High Performance Economizer of 5 years
Limited warranty on all other components of 1 year
See Limited Warranty Certificate included with unit for details

Project Submittal

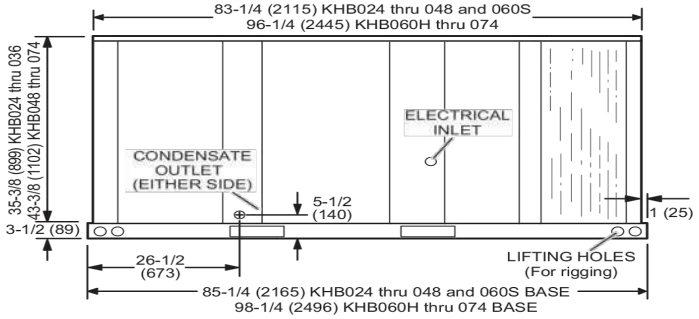
Corner Weights (lb)								Center of Gravity (in.)			
AA		BB		CC		DD		EE		FF	
Base	Max	Base	Max	Base	Max	Base	Max	Base	Max	Base	Max
162	217	192	201	218	229	184	247	45.00	51.00	22.00	22.00



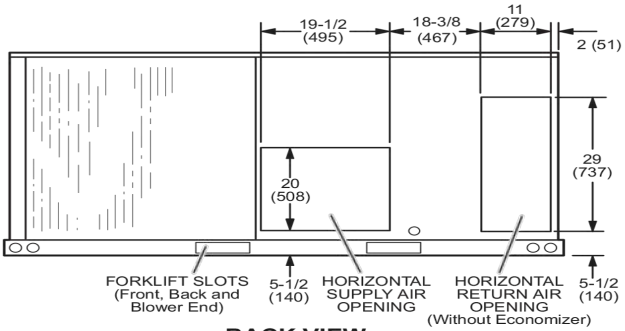
TOP VIEW (Base)



END VIEW

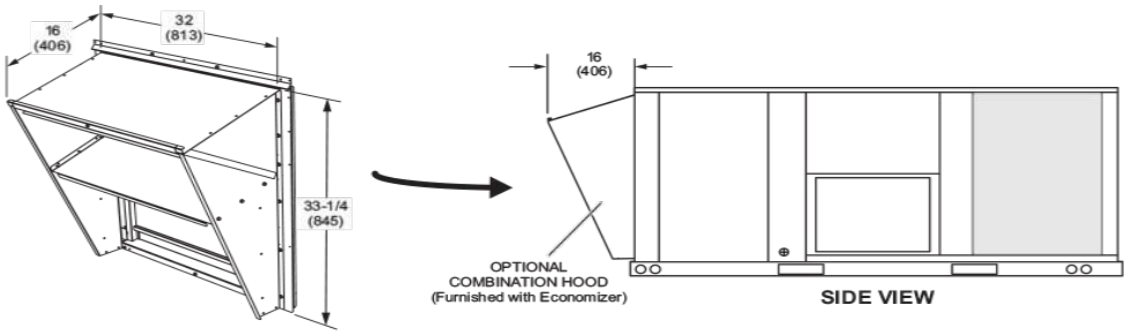


SIDE VIEW

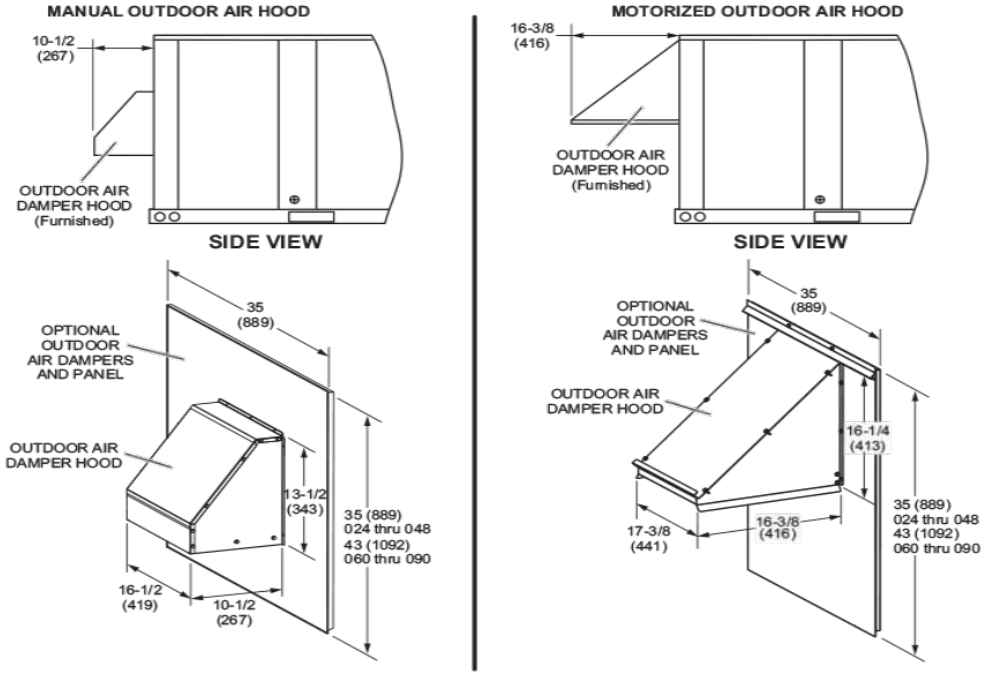


BACK VIEW

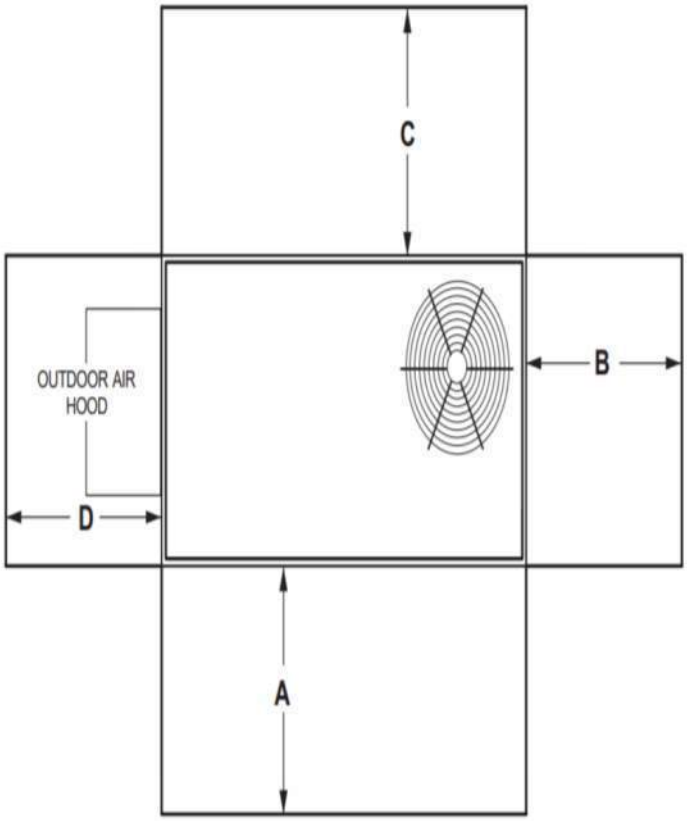
COMBINATION OUTDOOR AIR HOOD DETAIL FOR OPTIONAL ECONOMIZER AND BAROMETRIC RELIEF DAMPERS
(Furnished With Economizer for Downflow Applications)



OUTDOOR AIR DAMPER HOOD DETAIL (Downflow or Horizontal Applications)



UNIT CLEARANCES



[1] Unit Clearance	A		B		C		D		Top Clearance
	in.	mm	in.	mm	in.	mm	in.	mm	
Service Clearance	36	914	36	914	36	914	36	914	Unobstructed
Minimum Operation Clearance	36	914	36	914	36	914	36	914	

NOTE - Entire perimeter of unit base requires support when elevated above the mounting surface.

[1] Service Clearance - Required for removal of serviceable parts.
Minimum Operation Clearance - Required clearance for proper unit operation.

Project Submittal

Tag: RTU 13
Model: KHB074S4T - KHB074S4T-G 6T CONF E=11.0

UNIT OVERVIEW

Voltage	IEER EER	IPLV	HSPF	MCA/MOCP (amp)	Gross Cooling Ttl/Sens (MBH)	Net Cooling Ttl/Sens (MBH)	Supply Air Flow (cfm)	ESP/TSP (in.WC)	EAT DB/WB (°F)	LAT DB/WB (°F)
460V 3Ph 60Hz	14 11			17 / 25	70.5 / 56.4	66.5 / 52.4	2,400	1.00 / 1.12	80.0 / 67.0	57.6 / 57.3

COOLING

Cooling Performance		Temperatures (DB/WB °F)		
Gross Cooling (Ttl/Sens)	70.5 / 56.4 MBH	Ambient	95.0	
Net Cooling (Ttl/Sens)	66.5 / 52.4 MBH	Entering	80.0	67.0
Coil Moisture Removal	13.29 lb/hr	Leaving – (Coil)	57.6	57.3
System Moisture Removal	13.29 lb/hr	Leaving – (Unit)	59.2	57.9

ARI Performance		Compressors		Refrigerant		Condensate Drain	
ARI Cooling	71.0 / 68.0 MBH	Cooling Stages	2	Type	R-410A	Qty	1
ARI Power	6,200 W	Compressor Qty	1	Charge	24 LBS. 0 OZ.	Size	1 in.
		Compressor RLA	8.5 amp			Pipe Thread	npt

HEATING

Heating Performance		Temperatures (DB/WB °F)	
HP Output @ Design	40.7 MBH	HP Design	17.0
COP (High/Low)	3.3 / 2.3	HP Heat Rise @ Design	0.0
HP Power (High/Low)	6.1 / 5.6 kW	Leaving	15.7

VENTILATION

Air Flow (cfm)		Supply Fan		Air Resistance (in.WC)	
Supply	2,400	Nominal Power	2.00 hp	Total	1.12
		Required Power	1.25 hp	Ext Supply	1.00
		Drive Type	MSAV Belt Drive		
		RPM Range	968 - 1,340 rpm		
		Required RPM	1,288 rpm		

AIR RESISTANCE - OPTIONS/ACCESSORIES (in.WC)

Wet Coil	Humiditrol	Heat	Economizer	Filters	Diffuser	Exhaust	ERW
0.07			0.05				

ELECTRICAL

Voltage	460V 3Ph / 60Hz	Compressor RLA	8.5 amp
MCA	17 amp	Cooling FLA Total	13.4 amp
MOCP	25 amp	Condenser FLA	1.5 amp
Condenser Power	505 W	Supply Fan FLA	3.4 amp
Oper Range-Nom Volt	+/- 10%		

ADDITIONAL DATA

Cabinet	98.25 in. x 47.00 in. x 46.88 in.	Total Weight	890 lb
Downflow Supply	20.0 in. x 18.0 in.	Base Unit Net Weight	750 lb
Downflow Return	29.0 in. x 11.0 in.	OAS/Econ Weight	131 lb
Filters	**(4)** 20.0 in. x 20.0 in. x 2.0 in.		
Sound Rating	83 dBA		

Tag: RTU 13

Factory Installed Options

High Performance Economizer Upgrade Factory Installed
Single Enthalpy Economizer
Standard Cap, Std Packaging
Unit Orientation Downflow
MSAV Belt Drive 2-Speed
440V/460V/480V 3Phase
Supply Motor - 2.0 Hp - w/ MSAV
Supply Drive Kit 4 (968-1340 RPM)
Barometric Relief Damper (Fac)
GFCI Factory Installed/Field Wired
BACnet Module (Fac)
Tube and Fin Coil System Factory Installed
2" MERV4 - Std. Filter Factory Installed

Field Installed Accessories

Catalog Number	Qty	Description
13T17	1	Combination Coil/Hail Guards Field Installed
97W23	1	Bacnet Sensor With Display Field installed
54W21	4	2" MERV8 - Filter Field Installed
87N53	1	CO2 Sensors - Wall-mount, off-white plastic cover, no display Field Installed

Product Features

Cabinet

Durable Outdoor Enamel Paint Finish
Totally Enclosed Outdoor Fan Motor
PVC Coated Fan Guard
Corrosion-Resistant Removable, Reversible Drain Pan
Isolated Compressor Compartment

Cooling System

Scroll Compressor
Expansion Valves
High Capacity Driers
High Pressure Switch (Manual Reset)
Crankcase Heater
System can operate from 30°F to 125°F without any additional controls
Pre-charged Refrigeration System
Internal Pressure Relief Valve
Thermostat Control – 2 Stages of Cooling

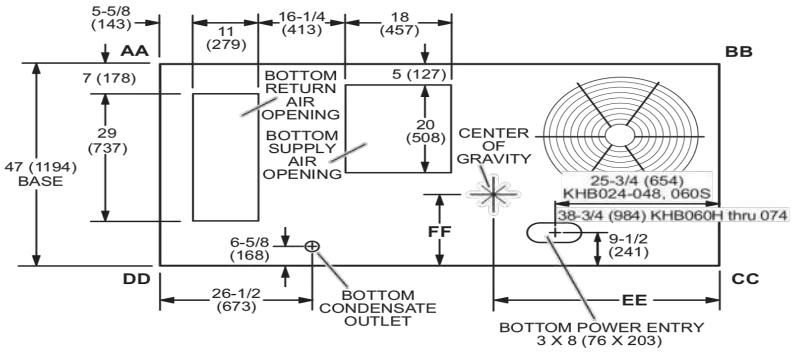
Control System

Fan and Limit Controls
Overload Protection

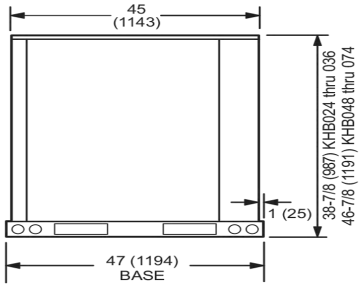
Warranty

Limited warranty on compressor of 5 years
Limited warranty on High Performance Economizer of 5 years
Limited warranty on all other components of 1 year
See Limited Warranty Certificate included with unit for details

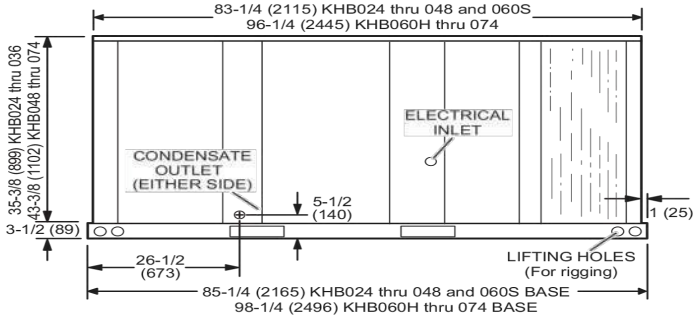
Corner Weights (lb)								Center of Gravity (in.)			
AA		BB		CC		DD		EE		FF	
Base	Max	Base	Max	Base	Max	Base	Max	Base	Max	Base	Max
160	185	180	208	233	269	207	239	46.25	46.25	20.50	20.50



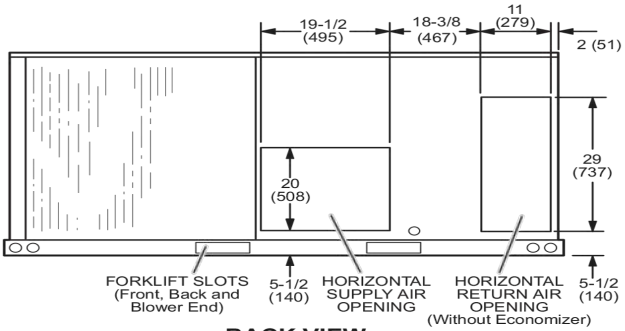
TOP VIEW (Base)



END VIEW

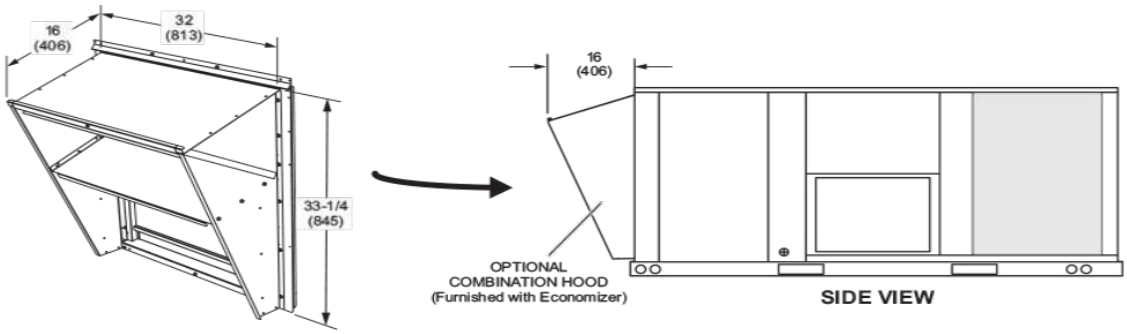


SIDE VIEW

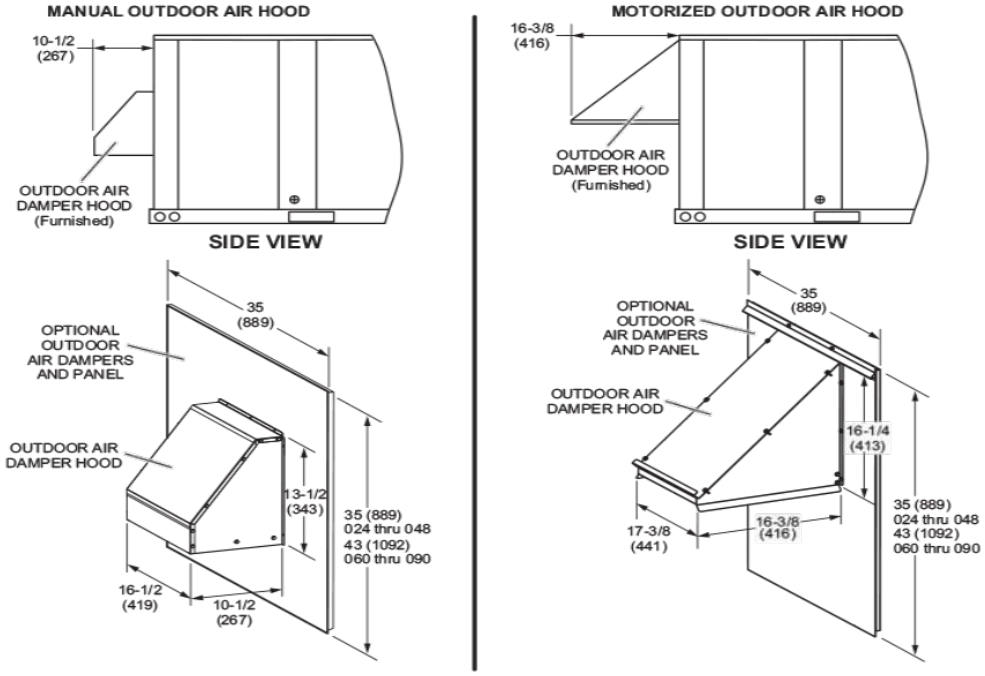


BACK VIEW

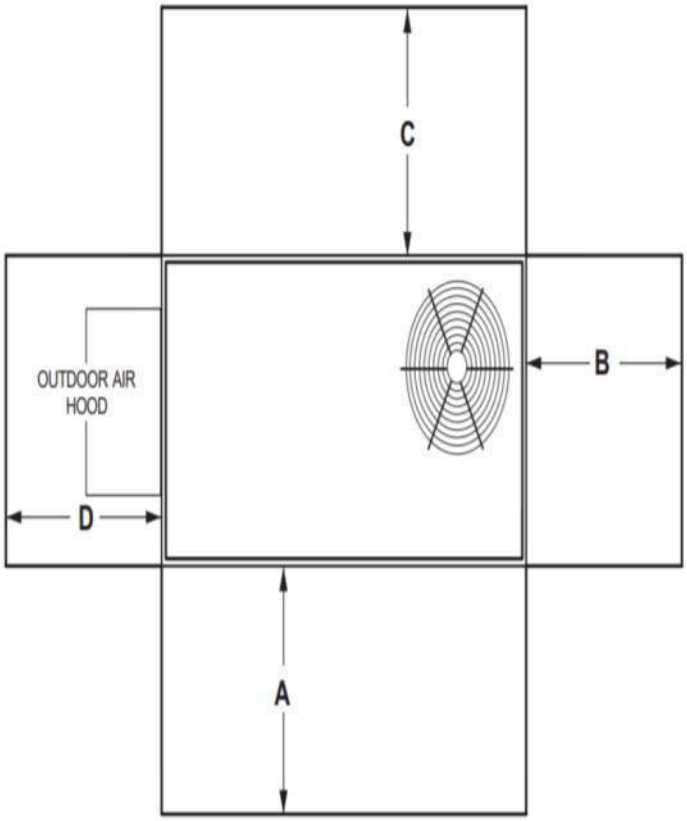
COMBINATION OUTDOOR AIR HOOD DETAIL FOR OPTIONAL ECONOMIZER AND BAROMETRIC RELIEF DAMPERS
(Furnished With Economizer for Downflow Applications)



OUTDOOR AIR DAMPER HOOD DETAIL (Downflow or Horizontal Applications)



UNIT CLEARANCES



[1] Unit Clearance	A		B		C		D		Top Clearance
	in.	mm	in.	mm	in.	mm	in.	mm	
Service Clearance	36	914	36	914	36	914	36	914	Unobstructed
Minimum Operation Clearance	36	914	36	914	36	914	36	914	

NOTE - Entire perimeter of unit base requires support when elevated above the mounting surface.

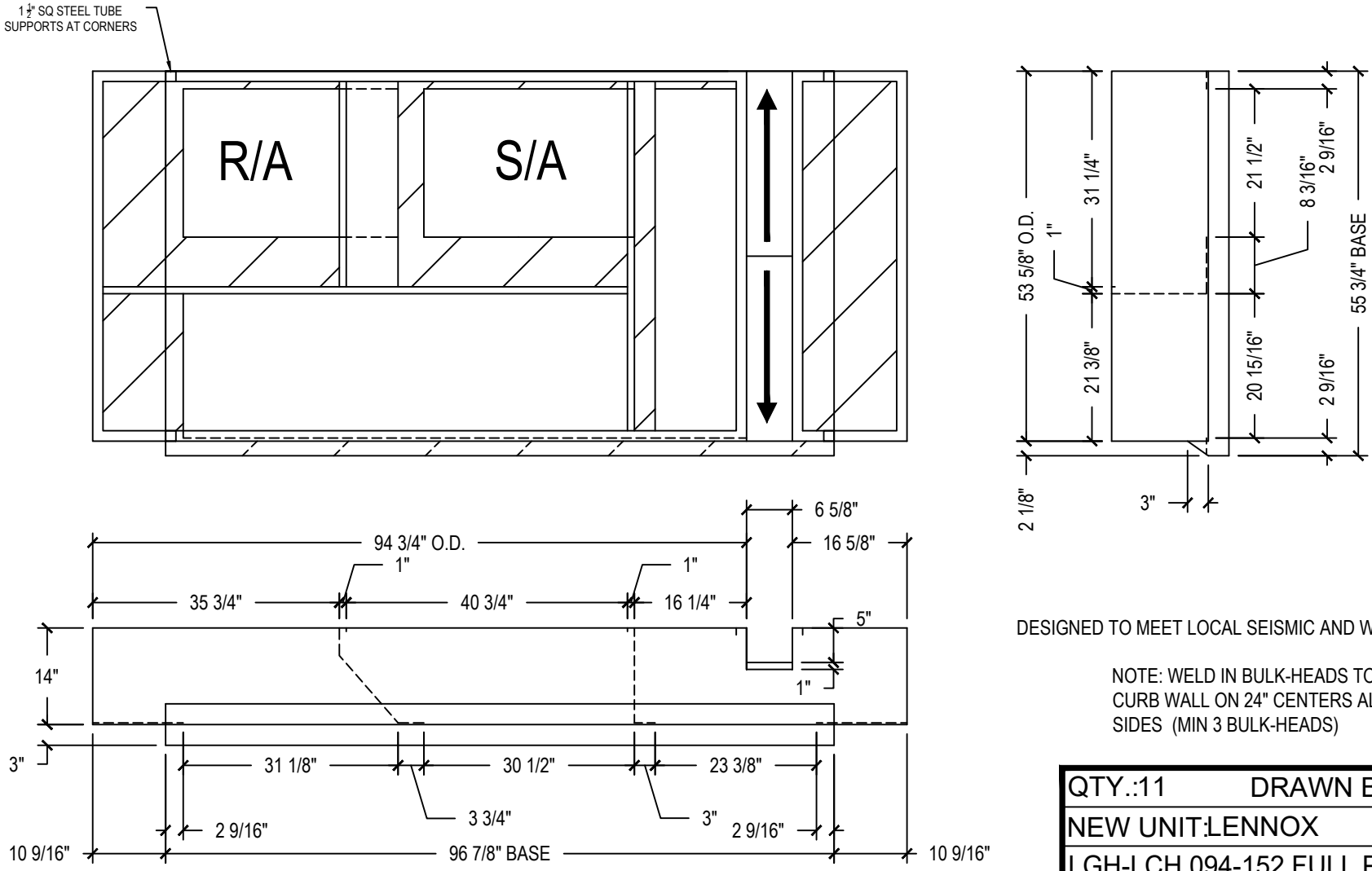
[1] Service Clearance - Required for removal of serviceable parts.
Minimum Operation Clearance - Required clearance for proper unit operation.

Tag: Miscellaneous Items

Miscellaneous Items

Tag	Catalog Number	Qty	Description
(12) CPT-1 High Efficiency Curb Adapters			
	COMSD	1	(12) CPT-1 High Efficiency Curb Adapters

Drawing Date: 5-9-18		REV: 001	Approved By:	Approved Date:
SHELL: 16 GA	PANS: 18 GA	CHANNELS: 16 GA	CLOSURES: 16 GA	TOP FLANGE DIM: 1 1/2"



DESIGNED TO MEET LOCAL SEISMIC AND WIND CRITERIA

NOTE: WELD IN BULK-HEADS TO CURB WALL ON 24" CENTERS ALL SIDES (MIN 3 BULK-HEADS)

QTY.:11	DRAWN BY.:SLR
NEW UNIT:LENNOX	
LGH-LCH 094-152 FULL PERIMETER	
OLD UNIT:LENNOX	
L/T-SERIES 090-150	
ROLLS OF GASKET:2	
TAG:	

CURBS PLUS, INC.
8767 Alabama Hwy
Ringgold, GA 30736
Phone:(706) 858-1188 / Fax: (706) 866-2339
website: www.curbs-plus.com

TRANSITION-CURB SYSTEM

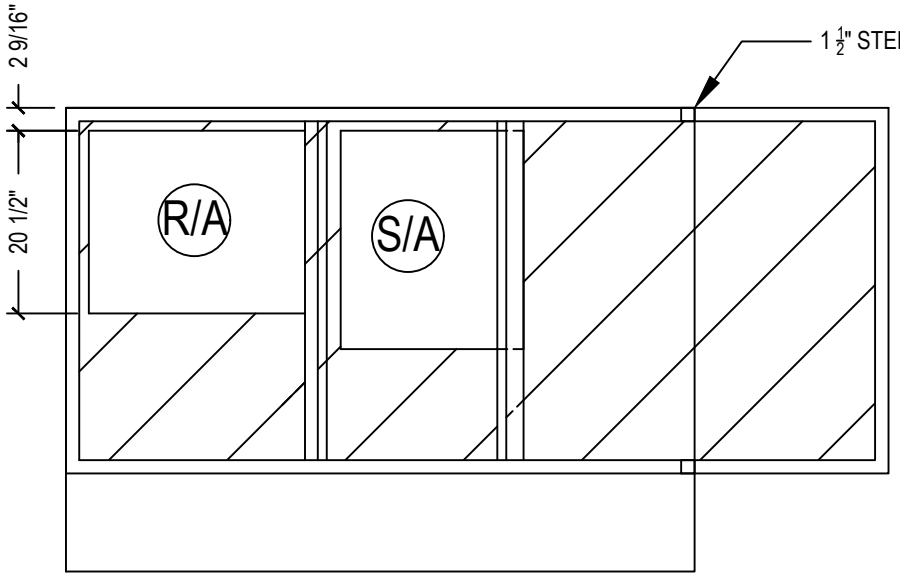
TAG PLATE:LX466LX9-SEISMIC

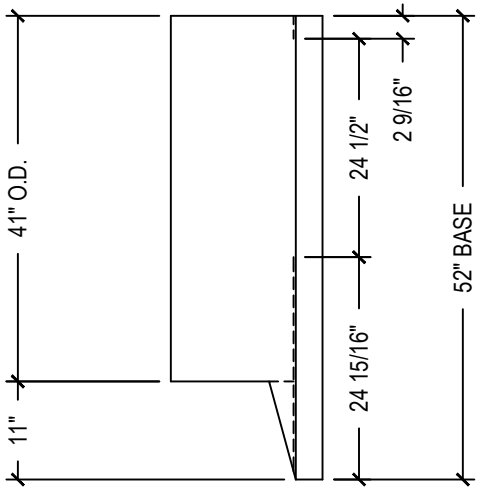
APPROXIMATE WEIGHT:235 LBS.

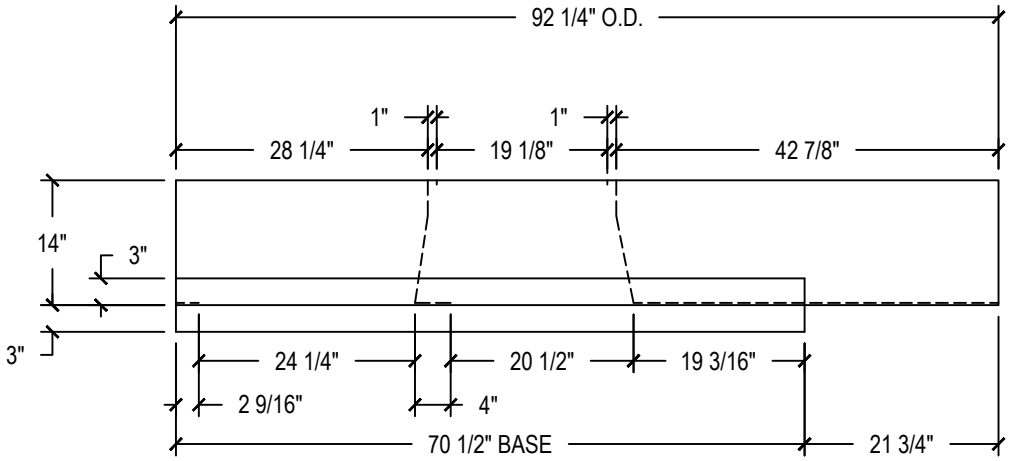
Note: Design subject to change without notice.

File Name: LX466LX9-SEISMIC NEW LENNOX LGH-LCH 094-152 FULL PERIMETER EXISTING LENNOX L/T-SERIES 090-150

Drawing Date: 8-20-10	REV: 001	Approved By:	Approved Date:
SHELL: 16 GA	PANS: 18 GA	CHANNELS: 18 GA	CLOSURES: 16 GA	TOP FLANGE DIM: 1 1/2"







DESIGNED TO MEET LOCAL SEISMIC AND WIND CRITERIA

NOTE: WELD IN BULK-HEADS TO CURB WALL ON 24" CENTERS ALL SIDES (MIN 3 BULK-HEADS)

EXISTING LENNOX UNIT
GCS/CHA/CHP16 511 / 653 / 16W- 413-653
GCS/CHA/CHP20 411 / 653
GCS16/20 048-060

QTY.:1	DRAWN BY.: SLR
NEW UNIT: LENNOX	
K-SERIES 090,KHA072,KHB060-074 FULL PERIMETER	
OLD UNIT: LENNOX	
SEE ABOVE	
ROLLS OF GASKET: 2	
TAG:	

CURBS PLUS, INC.
8767 Alabama Hwy
Ringgold, GA 30736
Phone:(706) 858-1188 / Fax: (706) 866-2339
website: www.curbs-plus.com

TRANSITION-CURB SYSTEM

TAG PLATE: LX297LX86-SEISMIC

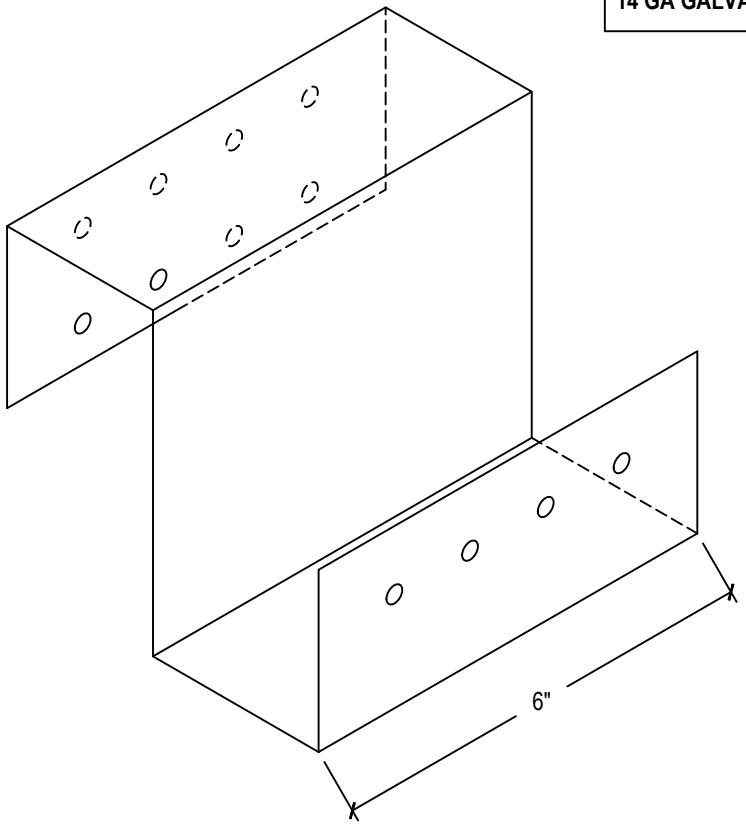
APPROXIMATE WEIGHT: 215 LBS.

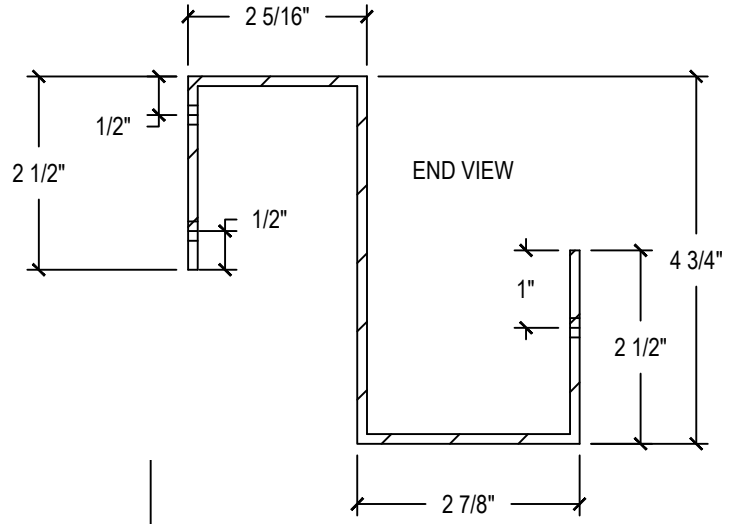
Note: Design subject to change without notice.

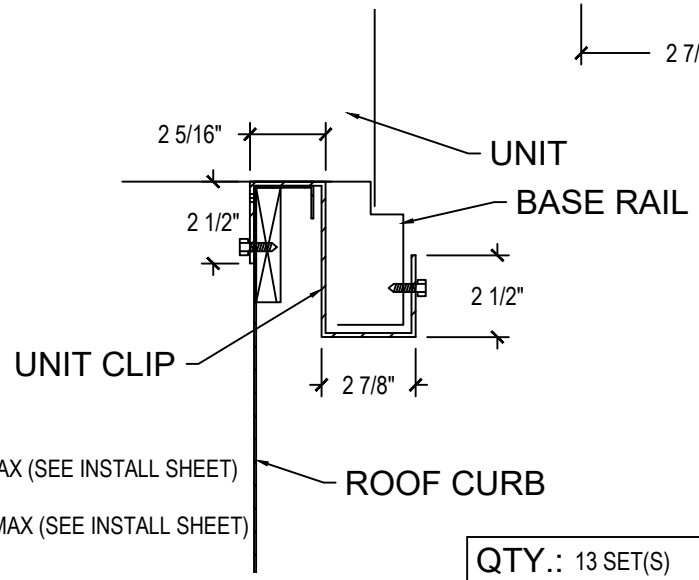
File Name: LX297LX86--SEISMIC NEW LENNOX K-SERIES 090 A BOX EXISTING LENNOX GCS CHA 14" TO 24" BOX

Drawing Date:	REV: 2-21-17	Approved By:

14 GA GALVANIZED CONSTRUCTION







LENNOX: L/T/K-SERIES/LGH-LCH/LC,LGM 024-150 UNITS USE UP TO (8) CLIPS PER CURB MAX (SEE INSTALL SHEET)

LENNOX: L/T/K-SERIES/LGH-LCH,LC,LGM 156-360 UNITS USE UP TO (10) CLIPS PER CURB MAX (SEE INSTALL SHEET)

ATTACH VIA (8) $\frac{1}{4}$"X14X1 $\frac{1}{4}$" TEK SCREWS

QTY.: 13 SET(S)	(10 CLIPS PER SET)
PROJECT NAME:	
CITY, STATE:	
CUSTOMER:	
JOB NUMBER:	
TAG:	

CURBS PLUS, INC.

8767 Alabama Hwy
Ringgold, GA 30736

205 Metcalf Rd.
El Dorado,KS 67042

Phone: (706) 858-1188 / FAX (706) 866-2339
website: www.curbs-plus.com

LENNOX UNIT CLIPS
MODEL# L/T/K/S-SERIES/LGH-LCH 024-360

LENNOX PART# X6523