

MRR

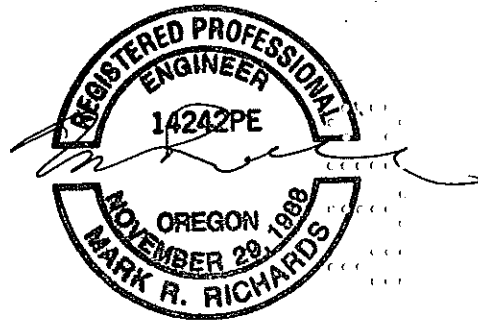
M. R. RICHARDS ENGINEERING INC

100 WEST 13th AVENUE SUITE 210 EUGENE OR 97401
541-687-0129 WWW.MRRICHARDS.COM

STRUCTURAL CALCULATIONS AND BACKGROUND INFORMATION

Pacific Hall PV
University of Oregon

Prepared For:
University of Oregon
9-10-2012



RENEWAL DATE: 12-31-2012

12-04681-01



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WIND LOADS FOR CONTAINER & RACKING SYSTEM

HT @ ROOF = 67' 5TH LEVEL
4x14 + 11 = 67'
AVE HT OF CONTAINER 71'
AVE HT OF PV 75'

WIND SPEED 75 MPH

I = 1.15

EXP. B

K_z = .89

TBL G-3 @ 70'

K_{zF} = 1

G = .85

DEFAULT

ENCLOSED STRUCTURE

$$q_z = .00256 K_z K_{zF} V^2 I = .00256 \times .89 \times 1.0 \times 95^2 \times 1.15$$
$$= 23.6 \text{ PSF}$$

MWERS

WINDWARD WALL

$$L/B = 20/8 = 2.5$$

C_p = .8

LEEWARD WALL

C_p = -.3

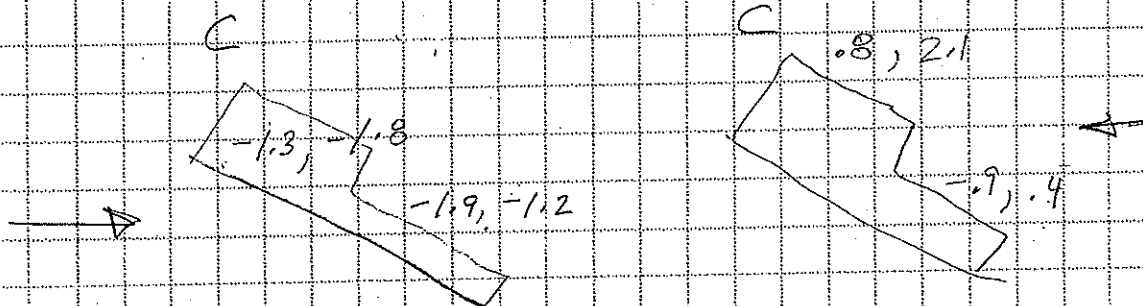
$$p = (23.6 \times .85 \times (.8 + .3)) = 22 \text{ PSF}$$

PANELS

FIG G-18A

$$Q = \frac{450}{10} (44)$$

OBSTRUCTED FLOW





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PANEL LOAD CONTD

$$1. C = \frac{-1.3 + -1.9}{2} = -1.6$$

$$2. C = \frac{-1.8 + -1.2}{2} = -1.5$$

$$3. C = \frac{.8 - .9}{2} = .05$$

$$4. C = \frac{2.1 + .4}{2} = +1.25$$

DESIGN UPLIFT = $\frac{9}{2} \phi C = 23.6 \times .85 \times 1.6 = 32 \text{ PSF}$

DESIGN DOWN WIND = $23.6 \times .85 \times 1.25 = 25 \text{ PSF}$

DL 3 PSF

$$TL_{UP} = 32 - 6 \times 3 = 30 \text{ PSF}$$

$$TL_{DN} = .75(20 + 25) + 3 = 37 \text{ PSF}$$

REVIEW OF STRUT SYSTEM

1) HANDRAILS

50 PCF 7'-6" SPAN
1530 STRUT

$$M_u = \frac{.05 \times 7.5^2}{8} = 3.5' = 4.2" K$$

$$S = \frac{I}{c} = \frac{1.8}{1.5} = 1.2$$

$$M_u = \frac{S \times F_b}{1.67} = \frac{1.2 \times 35}{1.67} = 25" K$$

2) HANDRAIL POSTS

TOP @ 42"
@ STAIR EDGE 45" HANDRAIL
P = .05 x 3.75 = .2 (MIN)

$$M_u = .2 \times 42 = 8.4" K$$

1530 OR

3) POST CONN.

4302 E.S. 1530
X 1/4 x 1/2 x 1/2 x 1/16
4" B.C.

$$T = M_u = \frac{8.4}{4} = 2.1 K$$

5/16" BOLT CONN

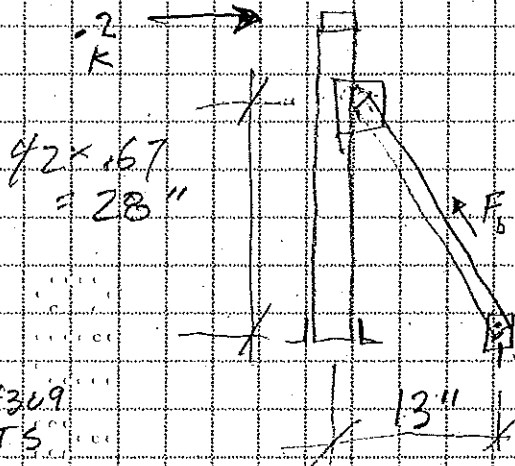
$$OK FOR 20ksi x 11" $\frac{5/16^3}{4} = .48 K$$$

⇒ ADD BRACE

START SYSTEM CONT

3) CONT'D

REQ'D B.C.



$T = M/d$

$d = M/T = \frac{8.4}{4 \times .12 \times 1.33} = 13''$

USE
4308/4309
BRACKETS

(8) #12 SCREWS
IN 43 mil steel
OR FOR .12 K TENS,
.20 K SHEAR

$F_b = \frac{.2 \times 42}{13} \frac{\sqrt{13^2 + 28^2}}{28} = .712 K$

$F_H = .2 K$

$F_V = .65 K$

$\frac{.65}{8 \times .12} + \frac{.2}{8 \times .28} = .68 + .089 = .77 OK$

4) PANEL STRINGERS

1515 30" SPACING
5'-6" SPAN
37 PSF TL

$M = \frac{wL^2}{8} = \frac{2.5 (10.5)^2}{8} = .35 K = 4.2'' K$

1515 $I = .25$ $S = \frac{I}{c} = \frac{.25}{.5} = .50''^3$

$M_{19} = \frac{SF_b}{1.67} = \frac{.5 \times 35}{1.67} = 10.5''^3$

OK

STRUTS (CONT'D)

5. PANEL FRAME

1530 SPAN 7'0" , 4'-3" TRIB

$$M = \frac{4.25(-.037)}{8} 7^2 = .96 K = 1.16 K$$

1530 OR FOR $M_d = 25 K$ OK

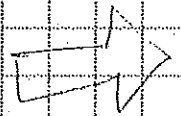
6. PANEL FRAME SUPPORT POSTS

92" HT = 7'-8"

$$P = .037 \times 7 \times 4.25 = 1.11 K$$

1530 STRUT $A = 2''$ $I_y = .482$

$$P_e = \frac{\pi^2 EI}{L^2} = \frac{3.14 \times 10,000 \times .482}{92^2} = 1.79 K$$



BRACE TO MID-HT STRUT REQ'D

THEN

$$P_e = \frac{3.14 \times 10,000 \times .482}{48^2} = 6.57 K \text{ OK}$$

7. POST CONN.

$$\text{UPLIFT} = 30 \text{ PSF} \times 7 \times 4.5 = .95 K$$

(2) $\frac{5''}{16}$ LAGS INTO 6x6 , 3 1/2" E

$$\text{OR FOR } 16 \times .22 \times 3 \times 2 = 2.11 K \text{ OK}$$



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STRUTS CONTD

8. PANEL HORIZ WIND

$$\frac{32 \text{ PSF}}{1.4} = 23 \text{ PSF HORIZ}$$

$$10.4'' \text{ PANEL} = 8'-8''$$

$$23 \times 8.67 = 200 \text{ PLF HORIZ.}$$

MID-LENGTH SUPPORTS

$$F = T \times .2 = 1.4 \text{ K}$$

ADD HORIZ STRUT TO CONTAINER

$$1515 \quad R = 48'' \quad A = 1.15''$$

$$P_e = 6.57 \text{ K OK}$$

$$T_a = 1.4 / 1.15 = \text{OK}$$

CONNECTION : (2) CORNER BRACKETS
 EN END

$$2 \times .575 \times 1.33 = 1.53 \text{ K OK}$$

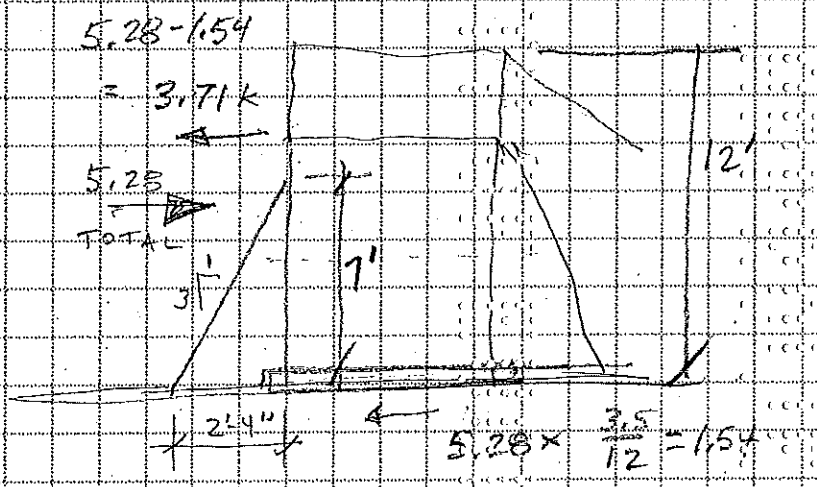
CONTAINER ANCHORAGE

USE FULL EXPOSURE TO
TOP OF RAILS

$$F = .022 \text{ KSF} \times 20' \times (8.5 + 35)$$

$$= 5.28 \text{ K}$$

CABLE ANCHOR @ 2 LOCATIONS



CABLE TENSION

$$\frac{3.71}{2} \sqrt{1+3^2} = 5.87 \text{ K}$$

FRICIONAL RESISTANCE

$$f = .30 W$$

$$= .3 \times (9000 \times .6)$$

$$= 1.62 \text{ K}$$

USE F.S. 2
11.74 K MIN BREAK STRENGTH

3/8" 7x19 OK FOR 14.4K

3/4" TURNBUCKLE 5200 WORK LOAD x 1.33 = 6.9

3/4" ROD EMBEDDED W SIMPSON ADHESIVE
SET ADHESIVES, 2000 PSI CONC,
5/16" EMB OK FOR 7.2K



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CONTAINER ANCHORAGE CONTD

LONGITUDINAL WIND

$$F = .022 \times 8 \times 12 = 2.11 \text{ K}$$

FRictionAL FORCE TO RESIST
MAJORITY OF LOAD. INCLINED
WIRE ROPES TO RESIST BALANCE

SEISMIC CONSIDERATIONS

$$F_{sp} = \frac{.4 \times S_D S W_p}{(R_p / I)} \left(1 + 2 \frac{z}{h} \right)$$

$$= \frac{.4 \times 1.0 \times .57}{(2.5 / 1.25)} \frac{9,000 \text{ LBS} \times 3}{1}$$

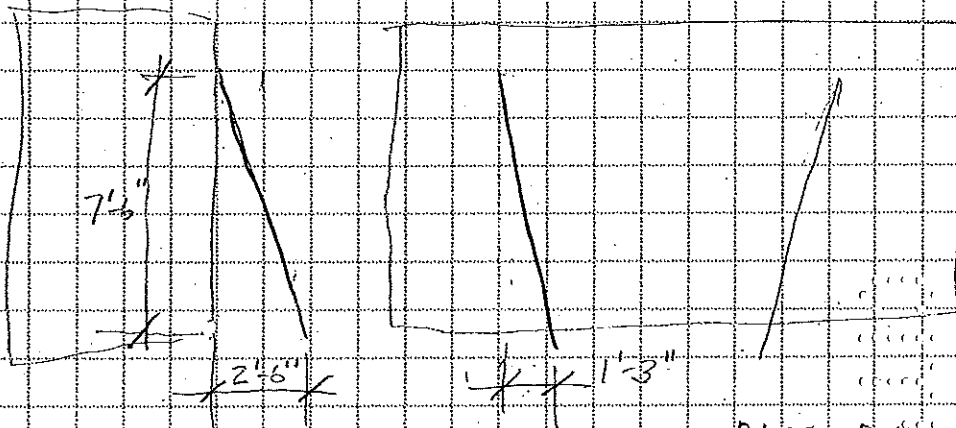
$$= 3.08 \text{ K}$$

REDUCING TO ASD VALUES

$$F_{ASD} = 3.08 / 1.4 = 2.2 \text{ K}$$

CONTAINER ANCHORAGE

WIRE ROPE IN 3 DIMENSIONS



BASE DIA = $\sqrt{2.5^2 + 1.25^2}$
= 2.79

1) WIND

$$T = \frac{3.71}{2} \sqrt{\frac{7.5^2 + 2.79^2}{2.5}} = 5.93 \text{ K}$$

2) SEISMIC

$$T = \frac{2.2}{2} \sqrt{\frac{7.5^2 + 2.79^2}{1.25}} = 7.04 \text{ K}$$

OK

ATTACH TO CONTAINER TOP RAIL

W #12 SMS
1/8 MATERIAL S.S. $f = .125$

USE SCREW VALUES FOR 48 MILL
805 * SHEAR

$$N = 7.04 / (.805 \times 1.33) = 6.57$$

USE 8 SCREWS



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STAIR CONNECTIONS

100 PSF LL
15 PSF DL

$$P_{STRAND \#R} = .115 \times \frac{8.75}{2} \times \frac{2.75}{2} = .692K$$

a) TOP CONN

(6) 5/16" BOLTS
DE FOR (6) $\times \pi \frac{.313^2}{4} \times 10 \text{ ksi} = 4.6 K$

b) BOTT CONN

PLACE STEEL PLATE ON ROOF



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Roof top Platform

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Existing Dead Loads:

roof membrane 2.0 psf

lightweight concrete fill

(5 in)(110 pcf) = 4.6 psf

separation membrane 1.0 psf

concrete slab

(5 in)(145 pcf) = 60.4 psf

m & e, misc 1.0 psf

suspended ceiling 1.8 psf

112 psf

beams add (14 in)(28 in - 5 in)(145 pcf) = 325 plf

+ 10.33

37.5

TOTAL 144 PSF



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Rooftop Platform

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Slab Check:

$$1.2 \overset{DL}{(112 \text{ psf})} + 1.6 \overset{SNO}{(25 \text{ psf})} = 174 \text{ psf controls}$$

$$1.4(112 \text{ psf}) = 157 \text{ psf}$$

$$M_u (+) = (174 \text{ psf})(10.33 \text{ ft})^2 / 14 = 1.33 \text{ kip-ft/ft}$$

MRS1 slab

$$= (174 \text{ psf})(10.33 \text{ ft})^2 / 16 = 1.16 \text{ kip-ft/ft}$$

MRS2 slab

$$M_u (-) = (174 \text{ psf})(10.33 \text{ ft})^2 / 10 = 1.86 \text{ kip-ft/ft}$$

between MRS1 & MRS2 slabs

MRS1 slab, positive bending

#4 @ 11" oc

$$d = 4.25 \text{ in}$$

$$T = (40 \text{ ksi})(0.20 \text{ in}^2) / (11 \text{ in}) = 8.7 \text{ kip/ft}$$

$$C = T = 0.85(2500 \text{ psi})a \quad a = 0.34 \text{ in}$$

$$\phi M_n = \phi T(d - a/2) = (0.9)(8.7 \text{ kip/ft})(4.25 \text{ in} - 0.34 \text{ in}/2)$$
$$= 2.66 \text{ kip-ft/ft} > 1.33 \text{ kip-ft/ft} \checkmark$$

OK



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Slab check, cont:

MRSZ slab, positive bending

4 @ 13" oc $d = 4.25$ in

$$T = (40 \text{ psf})(0.20 \text{ in}^2)/(13 \text{ in}) = 7.4 \text{ kip/ft}$$

$$C = T = 0.85(2500 \text{ psi})a \quad a = 0.29 \text{ in}$$

$$\phi M_n = \phi T(d - a/2) = 0.9(7.4 \text{ kip/ft})(4.25 \text{ in} - 0.29 \text{ in}/2) \\ = 2.28 \text{ kip-ft/ft} > 1.16 \text{ kip-ft/ft} \checkmark$$

MRS1 & MRS2, negative bending

$$\text{MRS2 controls } \phi M_n = 2.2 \text{ kip-ft/ft} \\ > 1.86 \text{ kip-ft/ft}$$

$$V_u = 1.15(200 \text{ psf})(8.33 \text{ ft})/2 = 1.0 \text{ kip/ft}$$

$$\phi V_c = 0.75 \left[\frac{4}{3} \sqrt{2500 \text{ psi}} (5 \text{ in}) \right] = 3.0 \text{ kip/ft} \checkmark$$

SURPLUS SLAB L.L. CAPACITY

NEGATIVE BENDING CONTROLS

$$M_u = 2.2 - 1.86 = .34 \text{ k}$$

$$w_u = 10 \text{ M}/l^2 = .032 \text{ kSF}$$

$$w_{\text{ASD}} = .032 / 1.6 = 20 \text{ PSF}$$

ADDITIONAL CAPACITY AVAIL IF MOM. DIST. CONSIDERED



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Beam Checks:

$$1.2[(142 \text{ psf})(10.33 \text{ ft}) + (325 \text{ plf})] + 1.6(25 \text{ psf})(10.33 \text{ ft})$$

$$= 1.2(1489 \text{ plf}) + 1.6(258 \text{ plf}) = 2189 \text{ plf}$$

$$1.4(1.48 \text{ klf}) = 2075 \text{ plf} \text{ controls } \uparrow$$

$$M R B1 \quad L = 21 \text{ ft}$$

$$M_u = (2189 \text{ plf})(21 \text{ ft})^2 / 8 = 199 \text{ kip-ft}$$

$$(4) 1\frac{1}{4} \text{ square bars} \quad d = 26 \text{ in}$$

$$A_s = 4(1.25 \text{ in})^2 = 6.25 \text{ in}^2$$

$$T = (40 \text{ ksi})(6.25 \text{ in}^2) = 250 \text{ kip}$$

$$M_n = 2.5 A_s d$$

$$= 2.5 \times 6.25 \times 26$$

$$= 406 \text{ k} \checkmark$$

$$c = T = 0.85(2500 \text{ psi})a(14 \text{ in})$$

$$a = 8.40 \text{ in} = 0.85c \rightarrow c = 9.89 \text{ in}$$

$$\epsilon_s = (0.003)(26 \text{ in} - 9.89 \text{ in}) / (9.89 \text{ in}) = 0.00489$$

$$\phi = 0.48 + 83(0.00489) = 0.886$$

$$\phi M_n = \phi T(d - a/2) = (0.886)(250 \text{ kip})(26 \text{ in} - 8.40 \text{ in}/2)$$

$$= 402 \text{ kip-ft} > 199 \text{ OK}$$

SURPLUS MOM CAPACITY

$$M_u = 402 - 199 = 203 \text{ k}$$

EQUIV PT LOAD

$$P = 4M/e = 30 \text{ k}$$

$$P_{\text{reqd}} = 30 \text{ k} / 1.6 = 18.8 \text{ k}$$



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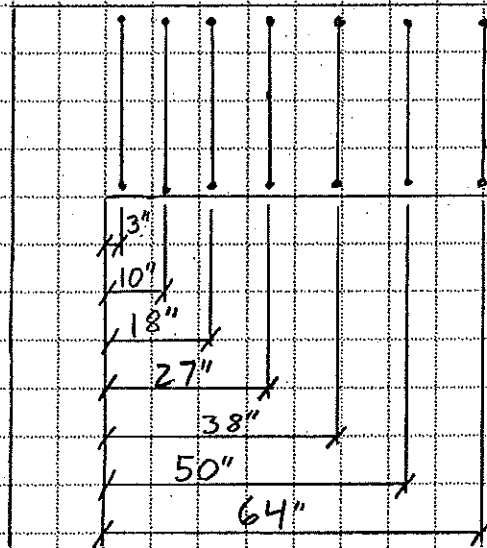
Beam Checks, cont:

MIRBI, cont

$$V_u = (2139 \text{ plf})(27 \text{ ft}/2) = 29.6 \text{ kip}$$

$$V_c = 2\sqrt{2500 \text{ psi}}(14 \text{ in})(26 \text{ in}) = 36 \text{ kip}$$

#4 U-stirrups:



current concrete code requires stirrup spacing

$$\leq \frac{1}{2}(26 \text{ in}) = 13 \text{ in} \rightarrow \text{stirrup @ } 64'' \text{ ineffective}$$

$$\phi V_c = 0.75(36 \text{ kip}) = 27 \text{ kip} > 22 \text{ kip}$$

$$\rightarrow \text{ok to } 50'' + 13'' = 5'-3''$$

$$\text{at } 5'-3'' \quad V_u = (2088 \text{ plf})(21 \text{ ft}/2 - 5.25 \text{ ft}) = 11 \text{ kip}$$

$$\frac{1}{2}\phi V_c = \frac{1}{2}(0.75)(36 \text{ kip}) = 14 \text{ kip} \checkmark$$



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Beam Checks, cont:

MRBZ $L = 16 \text{ ft}$

$$M_u = (2189 \text{ plf})(16 \text{ ft})^2 / 8 = 70 \text{ kip-ft}$$

(2) #8 & (2) 1" square bars $d = 22 \text{ in}$

$$A_s = 2(0.79 \text{ in}^2 + 1.00 \text{ in}^2) = 3.6 \text{ in}^2$$

$$T = (40 \text{ ksi})(3.6 \text{ in}^2) = 143 \text{ kip}$$

$$C = T = 0.85(2500 \text{ psi})a(14 \text{ in})$$

$$a = 4.81 \text{ in} = 0.85c \rightarrow c = 5.65 \text{ in}$$

$$\epsilon_s = 0.003(22 \text{ in} - 5.65 \text{ in}) / (5.65 \text{ in}) = 0.009$$

$> 0.005 \rightarrow \phi = 0.9$

$$\phi M_n = \phi T(d - a/2) = (0.9)(143 \text{ kip})(22 \text{ in} - 4.81 \text{ in}/2)$$
$$= 210 \text{ kip-ft} > 70 \text{ ok}$$

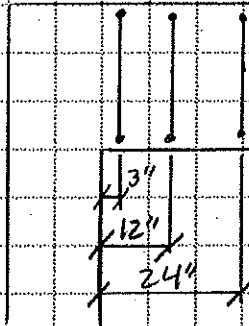
Beam Checks, cont:

M RBZ, cont

$$V_u = (2489 \text{ plf})(16 \text{ ft}/2) = 17.5 \text{ kip}$$

$$V_c = 2\sqrt{2500 \text{ psi}}(14 \text{ in})(22 \text{ in}) = 30.8 \text{ kip} \quad \underline{\text{OK}}$$

(3) #4 U-stirrups:



current concrete code requires stirrup spacing

$$\leq \frac{1}{2}(22 \text{ in}) = 11 \text{ in} \rightarrow \text{stirrup @ } 24'' \text{ ineffective}$$

$$\phi V_c = (0.75)(30.8 \text{ kip}) = 23.1 \text{ kip} > 12.5 \text{ kip}$$

$$\rightarrow \text{ok to } 12'' + 11'' = 1'-11''$$

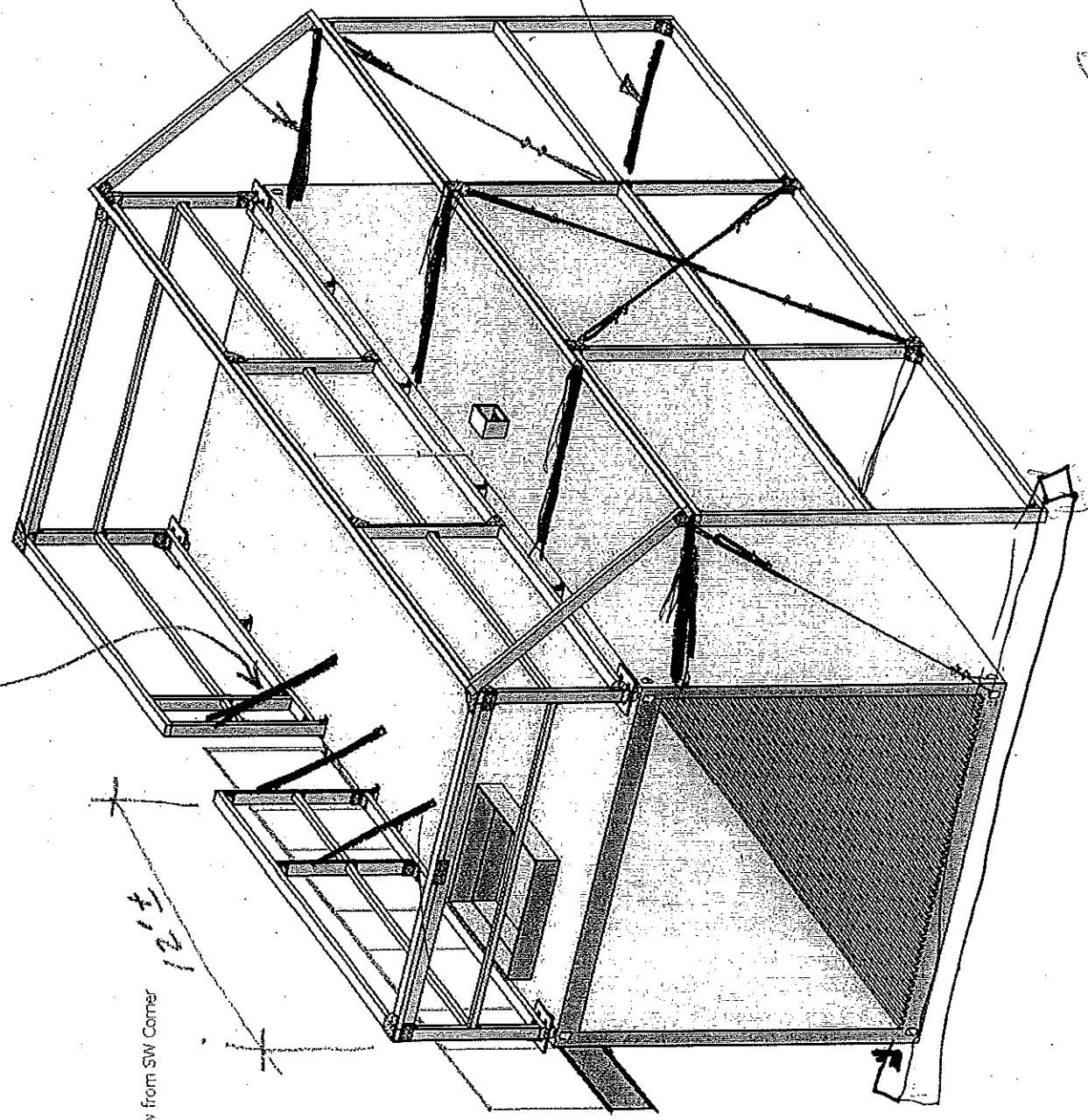
$$\text{at } 1'-11'' \quad V_u = (2088 \text{ plf})(12 \text{ ft}/2 - 1.92 \text{ ft}) = 8.5 \text{ kip}$$

$$\frac{1}{2} \phi V_c = \frac{1}{2}(0.75)(30.8 \text{ kip}) = 11.6 \text{ kip} \quad \checkmark$$

ADD HANDRAIL BRACES, (3) LOCATIONS

ADD HORIZONTAL STRUTS

ADD DIAGONAL STRUT

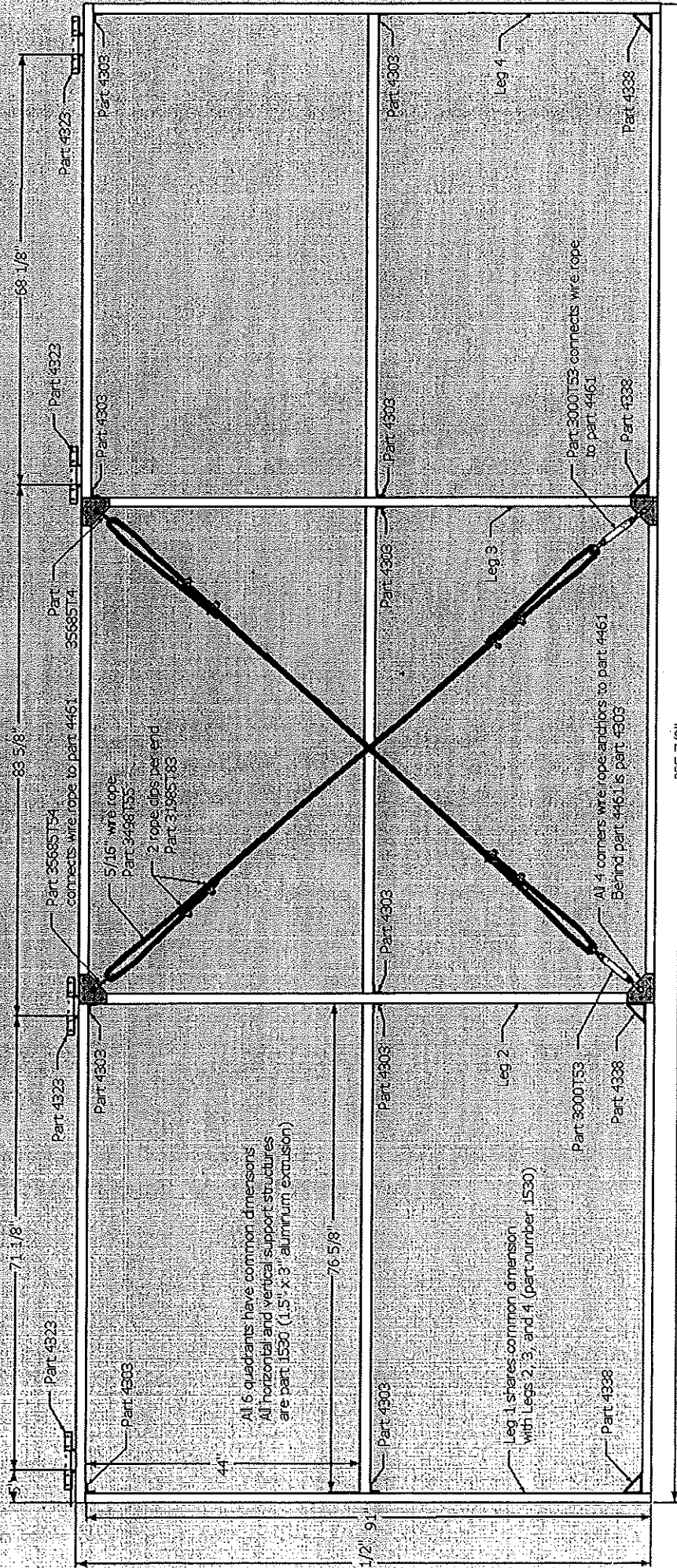


View from SW Corner

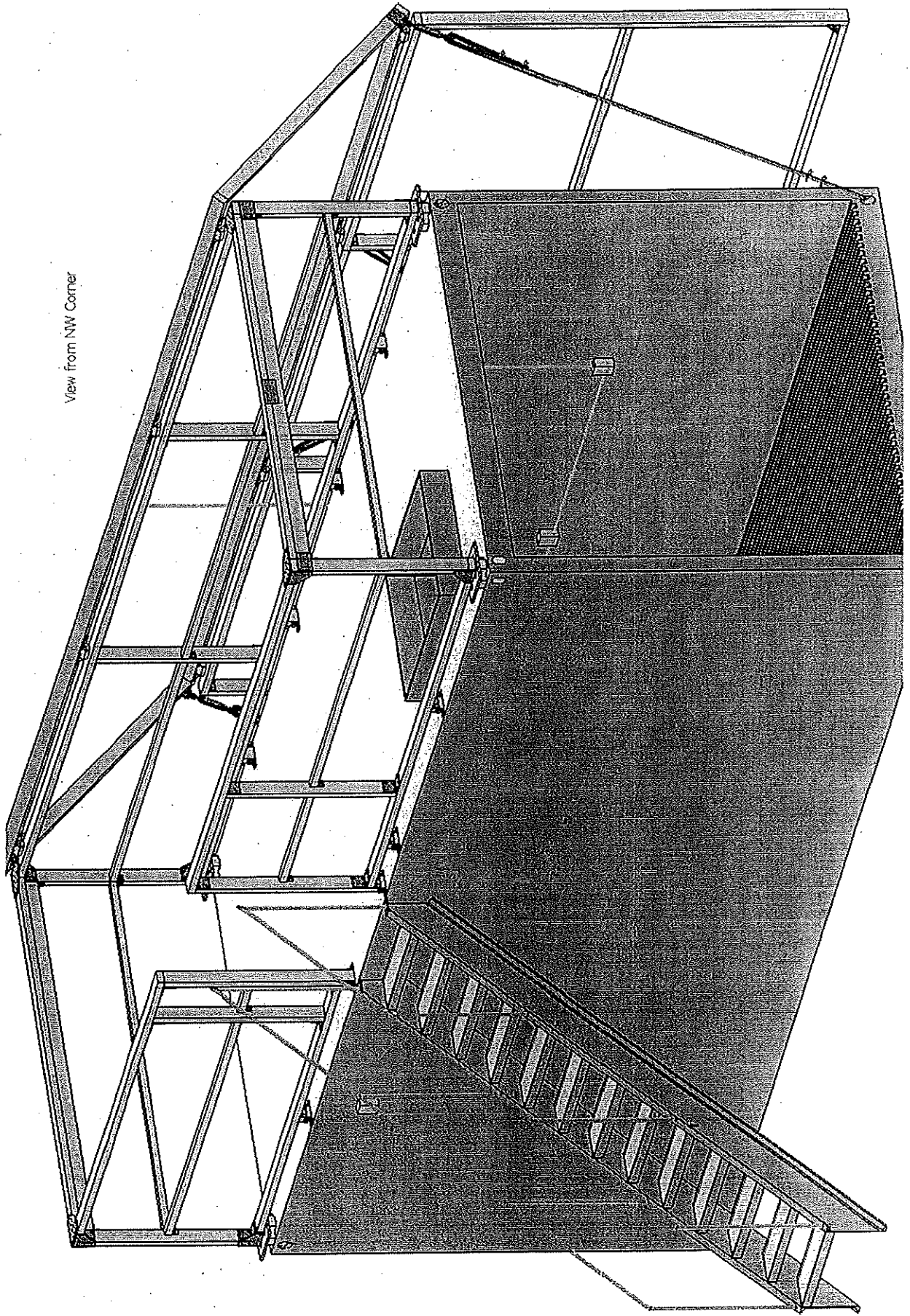
12'±

MPR
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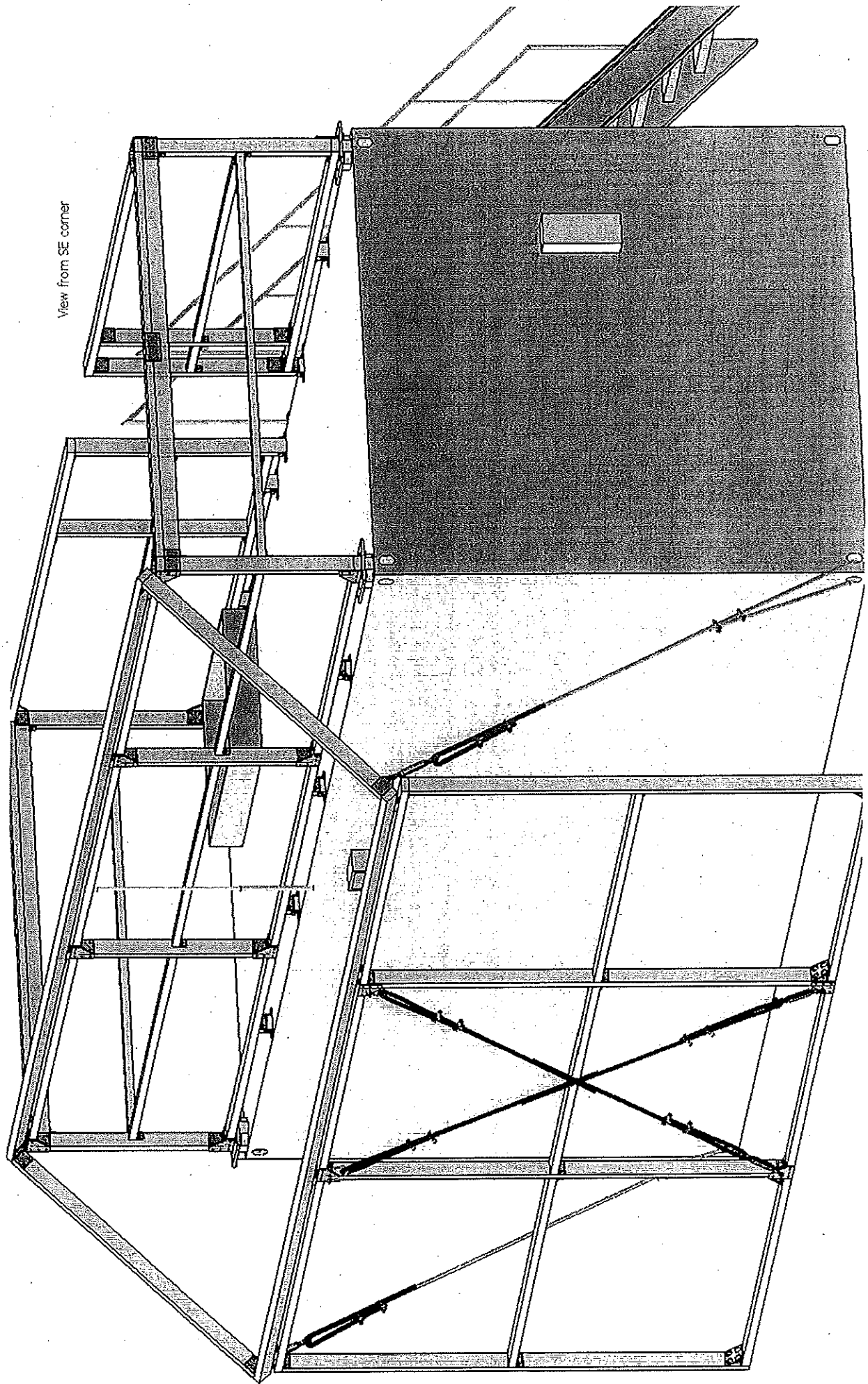
Module Rear Leg Structure (Front View)

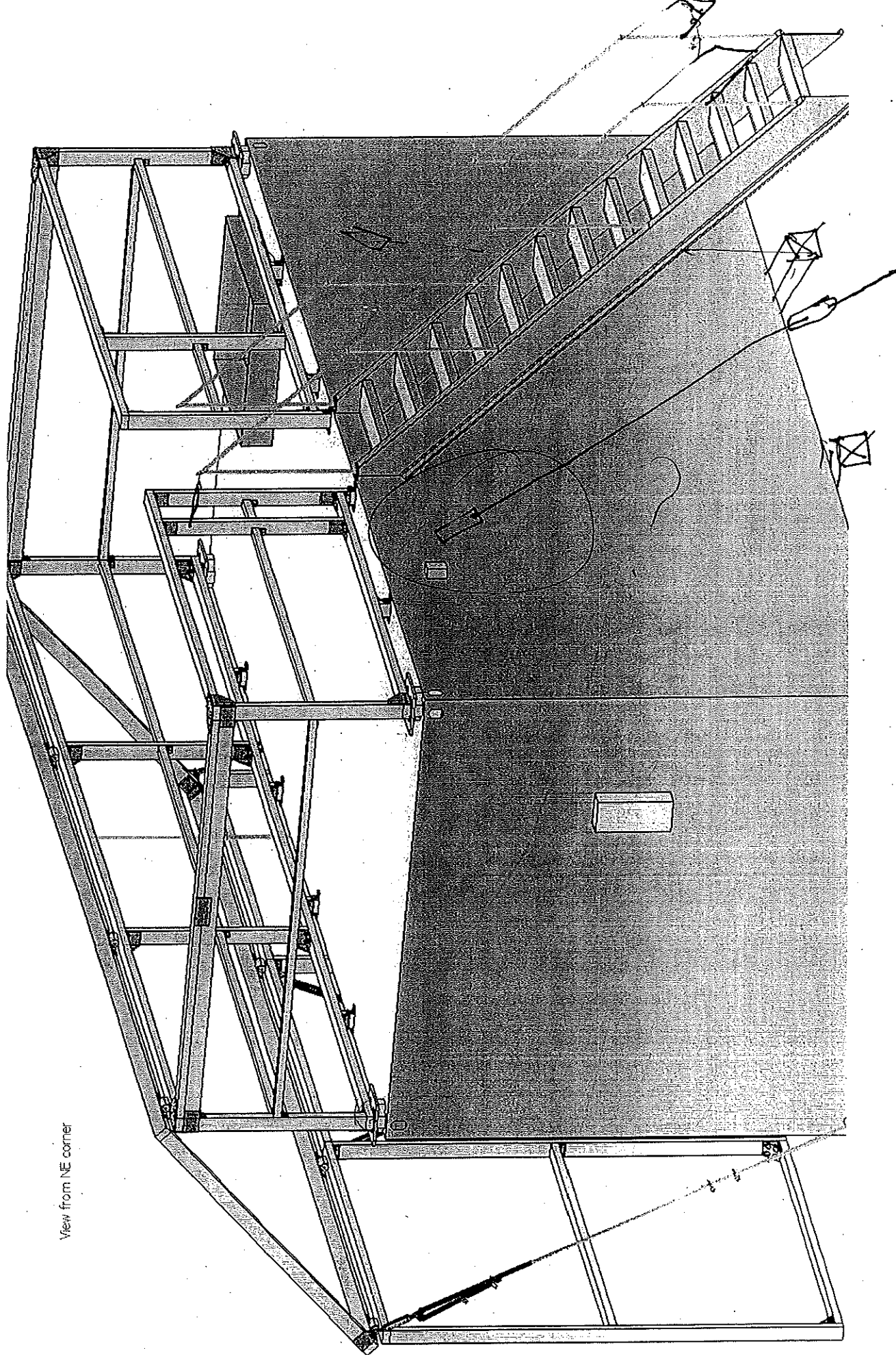


View from NW Corner



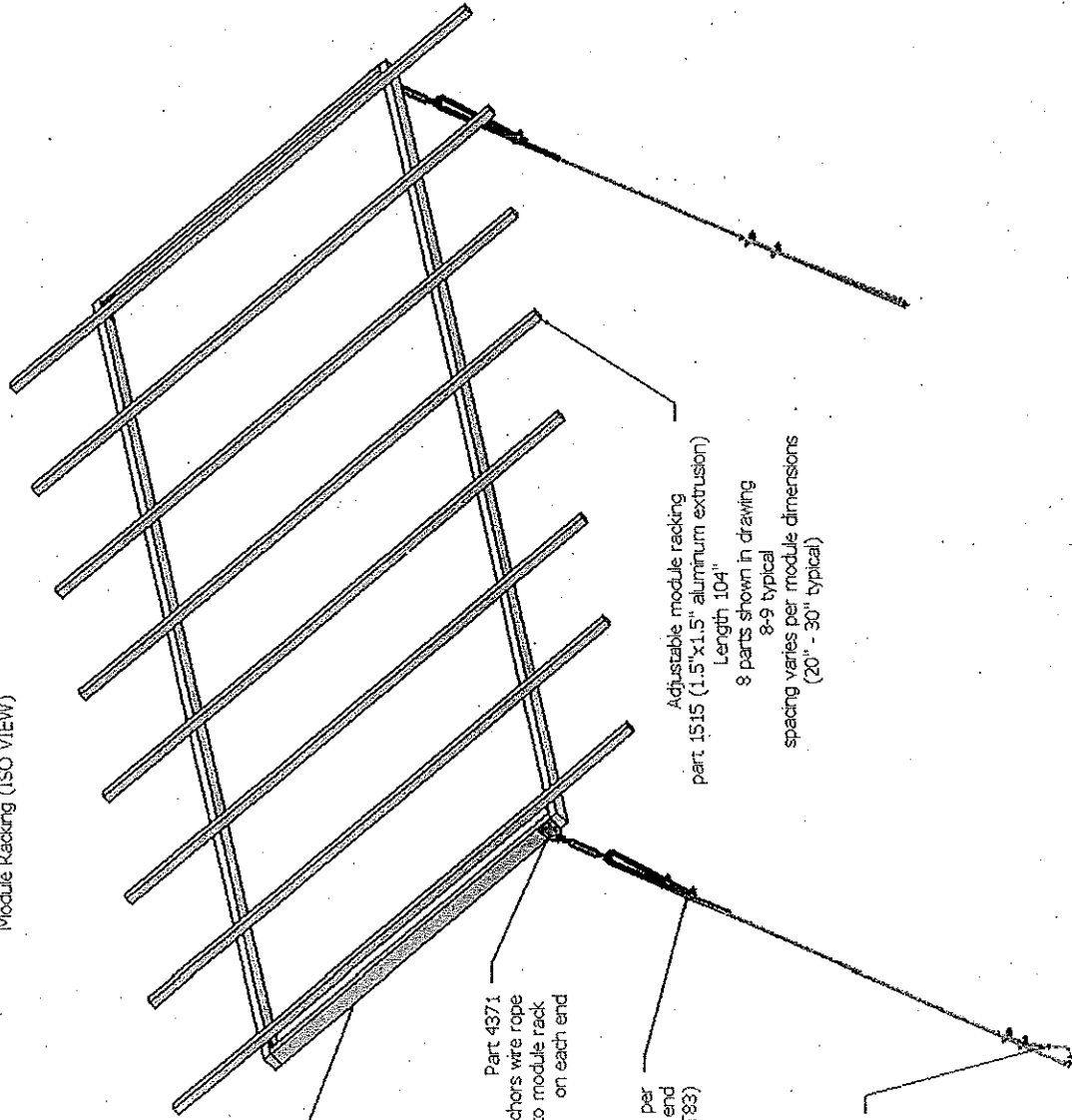
View from SE corner





View from NE corner

Module Racking (ISO VIEW)



East

West

Module Racking Support
Part 1530 (1.5" x 3")

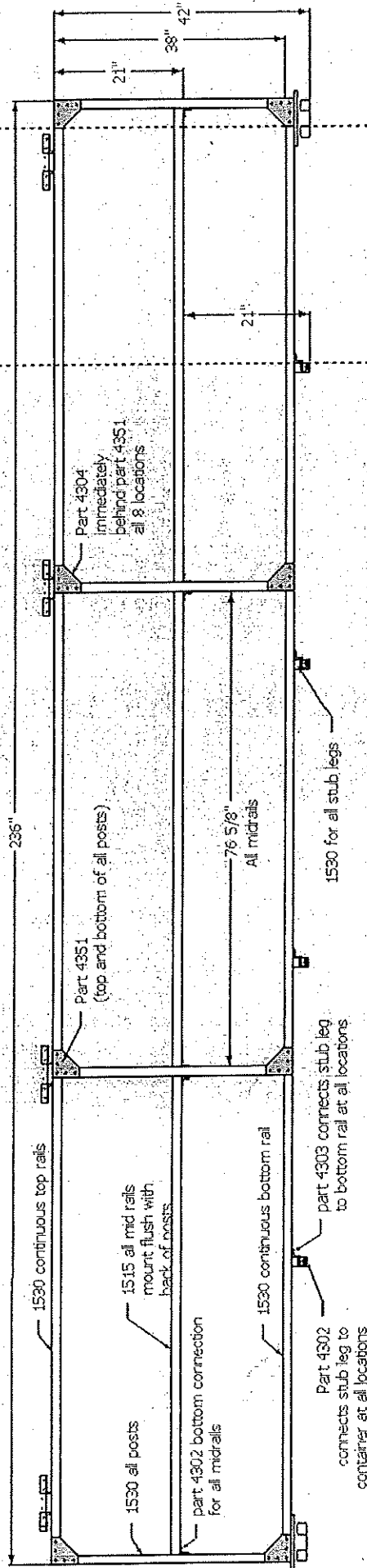
Part 4371
anchors wire rope
to module rack
on each end

2 Wire rope clips per
termination end
of rope (part 31985T83)

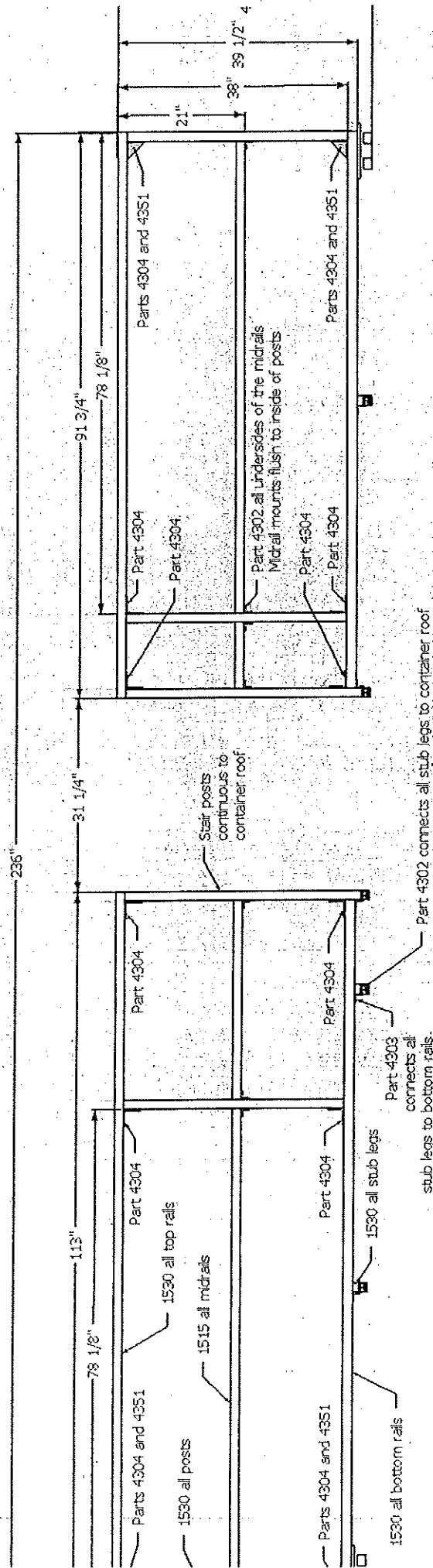
Adjustable module racking
part 1515 (1.5"x1.5" aluminum extrusion)
Length 104"
8 parts shown in drawing
8-9 typical
spacing varies per module dimensions
(20" - 30" typical)

Wire rope anchors
to corner of 20'
ISO container
on each end

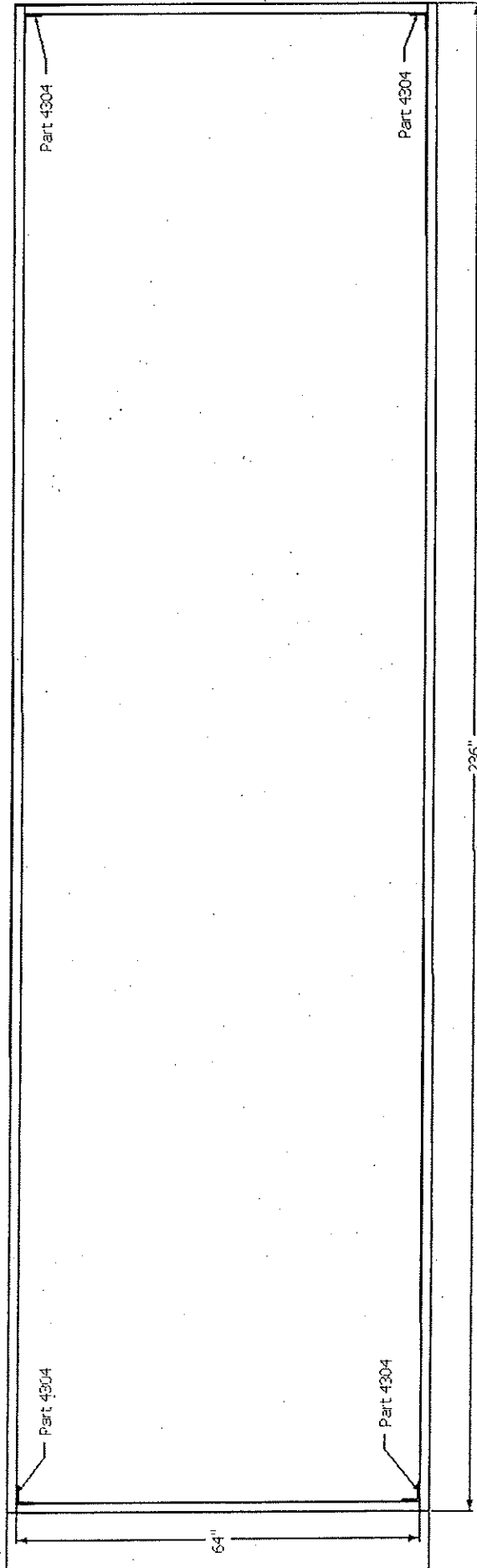
Railing on south side of container (front view)



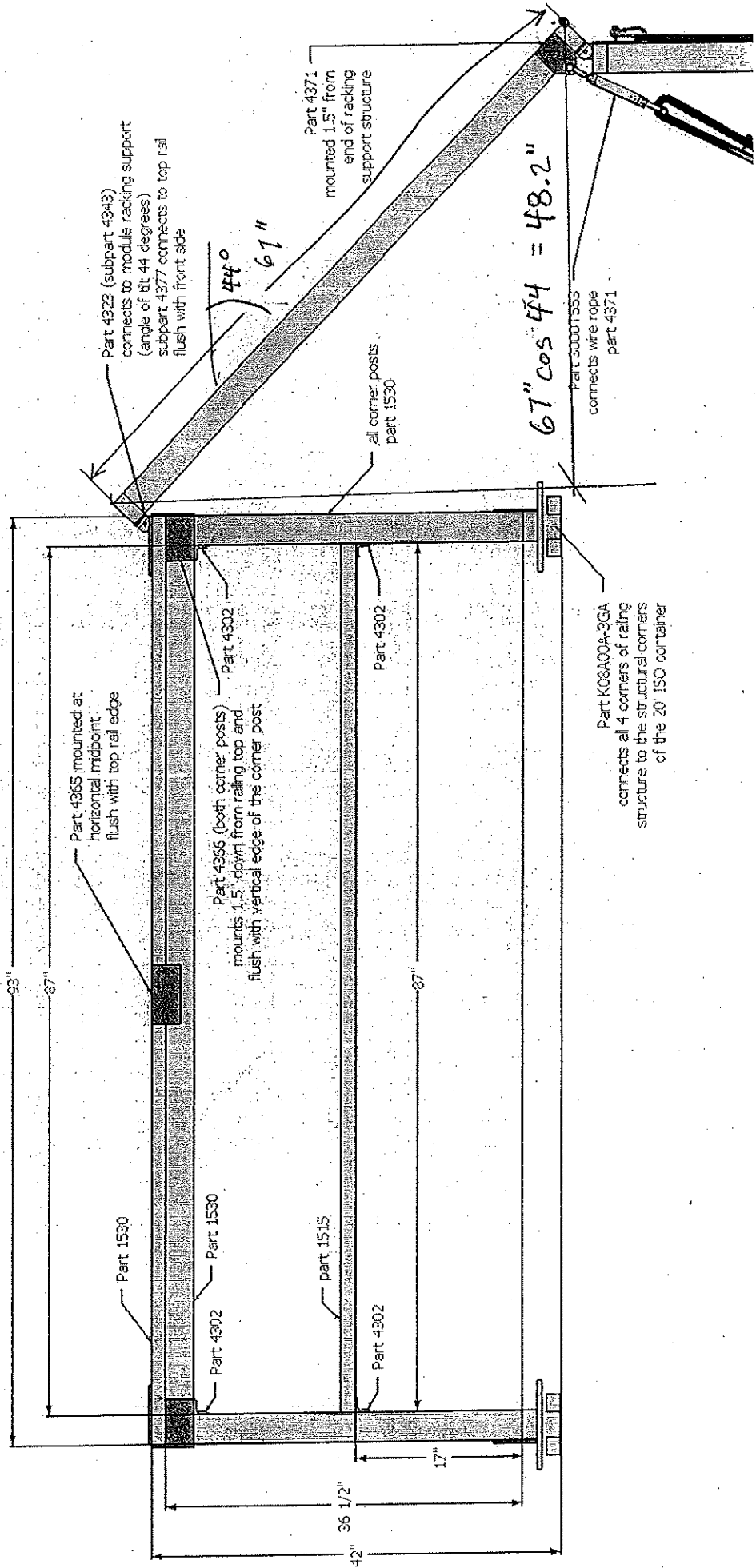
North railing (front view)



Module Racking Support (top normal view)

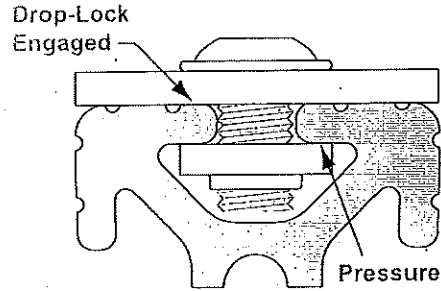


Railing and Racking Support Structure (west end view)
 (east end is identical yet mirrored)



Torque Specifications

- See table below for the amount of torque in foot-lbs. required to activate the 2° drop-lock feature for T-slotted profiles
- Nut and bolt combination is pre-loaded when tightened to the minimum torque rating
- When properly tightened, fasteners will not loosen even under heavy vibration



Part Number	Fastener Description	Tested Profile	Minimum Ft.-lbs. Torque	Maximum Ft.-lbs. Torque
3320	5/16-18 x 11/16 Flanged BHSCS & Economy T-Nut	1515	10.00	15.00
3325	5/16-18 x 3/4 Economy T-Slot Stud, Washer & Hex Nut	1515	25.00	30.00
3360	15 Series Anchor Fastener Assembly	1515-Lite	10.00	20.00
3380	15 Series End Fastener Assembly	1515-Lite	10.00	22.00
3321	1/4-20 x 1/2 Flanged BHSCS & Economy T-Nut	1010	4.00	6.00
3395	10 Series Anchor Fastener Assembly	1010	3.00	17.00
3381	10 Series End Fastener Assembly	1010	4.00	17.00

Fastener Application Tests

1: Single Anchor 2: Double Anchor 3: End Fastener 4: Joining Plate 5: 90° Joining Plate 6: Corner Bracket

7: Corner Gusset

8: Inside-Inside Hidden Corner 9: Inside-Outside Hidden Corner

Horizontal Profile Dimension

A: Direct Force
B: Cantilevered Force
C: Torsional Force

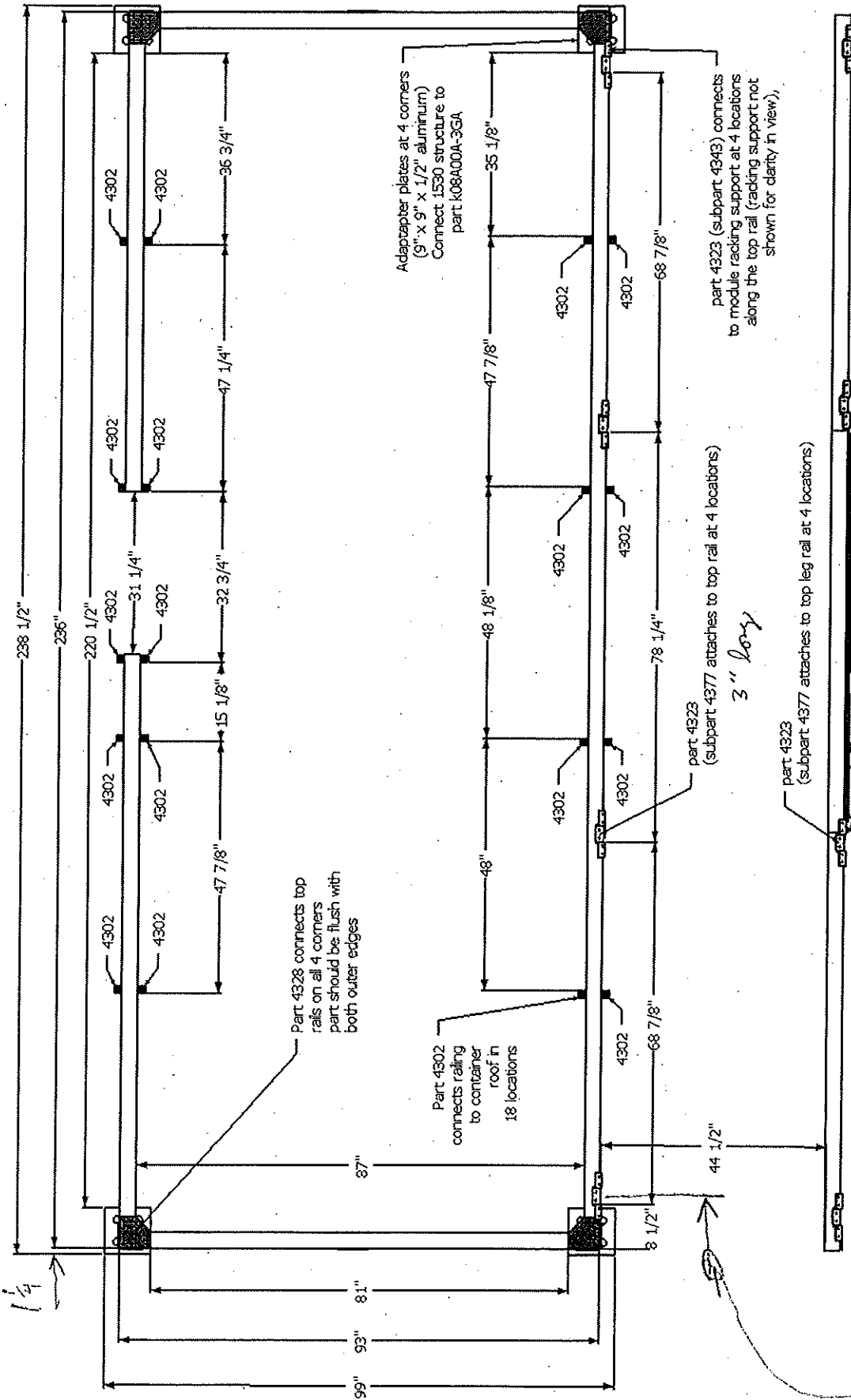
10 Series = 5.000"
15 Series = 6.000"

Fastener	1010 Profile			1515-Lite Profile			1515 Profile		
	A (lbs.)	B (lbs.)	C (Inch.-lbs.)	A (lbs.)	B (lbs.)	C (Inch.-lbs.)	A (lbs.)	B (lbs.)	C (Inch.-lbs.)
1	500	250	180	950	625	540	950	1,000	700
2	900	250	260	1,200	700	1,150	1,200	1,200	2,000
3	450	200	325	1,000	500	680	1,000	820	1,150
4	175	50	400	225	200	1,000	225	200	1,100
5	175	50	500	250	200	1,120	250	200	1,260
6	325	75	180	375	225	500	575	225	500
7	325	220	260	375	750	500	575	750	500
8	N/A	N/A	N/A	50	50	50	N/A	N/A	N/A
9	N/A	N/A	N/A	240	220	240	N/A	N/A	N/A

Note: Plates, brackets and gussets were attached with 80/20® recommended bolt kits. Fasteners were tightened according to 80/20 torque specifications found at the top of the page.

Test results reflect the connection failure point. Loads at or above these points are not recommended.

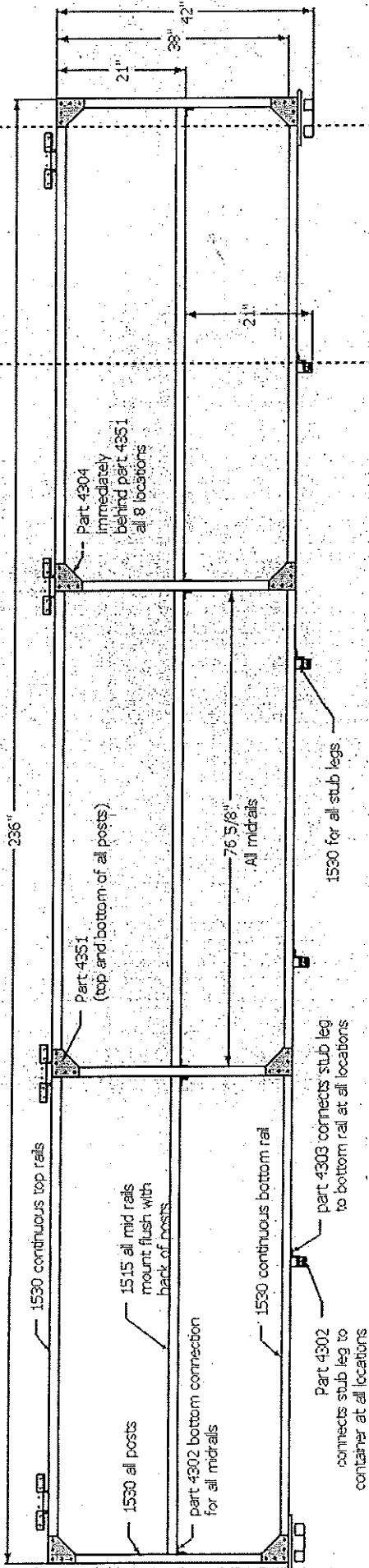
Container Railing and Module Rack Leg Structure (top view)



Handwritten calculation:

$$4'-0'' + 8\frac{1}{2} + \frac{1}{4} + 1\frac{1}{2} + 1\frac{1}{4} = 4'-11\frac{1}{2}''$$

Railing on south side of container (front view)



MPERT racking and railing bill of materials

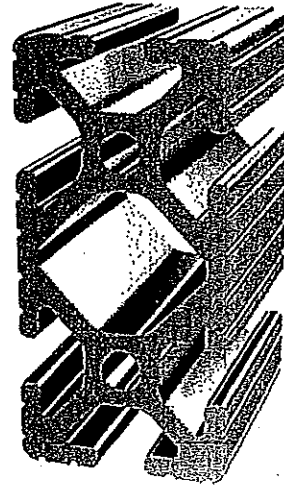
Part #	Count	Length	Description
80/20 #s			
1530	4	236"	S. top and bottom rail and east/west rack frame
1530	8	36.5"	railing posts
1530	4	87"	side top railing, one vertical one horizontal
1530	2	64"	north/south rack frame
1530	4	91"	rack legs
1530	7	76.625"	horizontal between rack legs
1530	2	79.625"	top horizontal connector for rack legs
1530	7	3"	fence support stubs (2.5" in model)
1530	2	40.5"	posts at top of steps
1530	1	113"	top rail east /west NW corner
1530	1	111.5"	bottom rail east/west NW corner
1530	1	91.75"	top rail east /west NE corner
1530	1	90.25"	bottom rail east/west NE corner
1515	9	104"	rack module support
1515	5	76.625"	mid rails east/west sides
1515	2	87"	mid rails north/south sides
1515	1	31.875"	mid rail immediately west of stairs
1515	1	10.625"	mid rail immediately east of stairs
4323	8		living hinge (comprised of parts 4343 and 4377)
4338	4		8 hole gusset 90
4304	24		8 hole 90
4303	19		4 hole 90
4302	46		2 hole 90
4328	4		12 hole corner plate
4461	4		6 hole corner plate
4351	12		5 hole corner plate
4365	2		8 hole rectangular plate
4366	4		6 hole rectangular plate
4371	2		5 hole pivot plate
3600	300		Stainless drop in Tnut
3678	300		Stainless economy trnut
3111	600	5/8"	Stainless button head socket cap screws, 5/16-18 thread
McMaster #s			
35685T54	2		stainless 5/16" elongated D shackle
3498T55	1	100 feet	5/16" galvanized 1x7 strand wire rope split in 4 pieces
3000T53	4	6"	galvanized jaw and eye turnbuckle
31985T83	16	5/16"	stainless wire rope clips
8234T27	1	8 feet	Steel adjustable height stairway
Tandemloc #			
K08A00A-3GA	4		vertical clamp connector for 20' ISO shipping container corners

Fractional

T-Slotted Aluminum Profiles

1530 T-Slotted Profile - 15 Series

- Compatible with all 15 Series fasteners
- Six open T-slots for mounting accessories
- The center cavity can be pressurized up to 150 psi; refer to pages 451-453
- Ideal for machine guards, sound enclosures, work benches, displays and panel mount racks
- Compatibility Code*: 8-15



**VIBRATION
PROOF™**

1

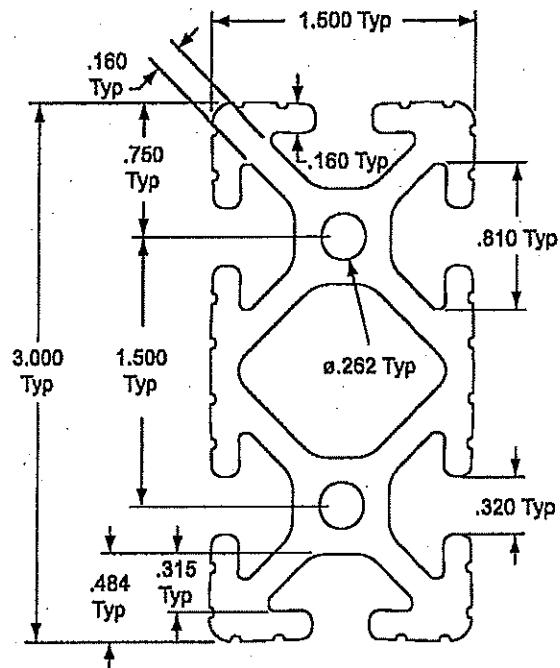
Part No.	1530
Material	6105-T5
Finish	Clear Anodized
Weight Per Foot	2.4209 Lbs.
Stock Length (+/- .125")	97" - Part No. 1530-97 145" - Part No. 1530-145 242" - Part No. 1530-242
Moment of Inertia	IX=1.8042 ⁱⁿ ⁴ IY=.4824 ⁱⁿ ⁴
Estimated Area	2.0798 Sq. In.

Quick Machining Reference

Machining Service	Service Number
Cut to Length	7020 (see page 563)
.295" Access Hole	7050 (see page 565)
Anchor Counterbore	7040 (see page 567)
Tap Profile End	7045 (see page 564)

* See Compatibility Code information on page 152.

** See 2° Drop-Lock information on page 150.



Pre-Cut Lengths

48" - Part No. 1530-48	72" - Part No. 1530-72
------------------------	------------------------

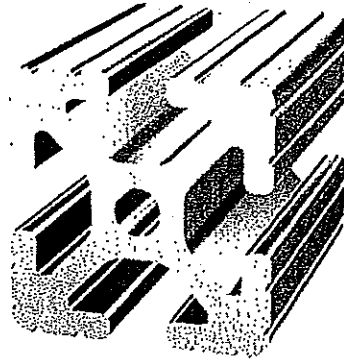
- Pre-cut, ready to ship
- Cut to our standard tolerance of +/- .015"
- One part number, one price (Includes cut charge)

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1515 T-Slotted Profile - 15 Series



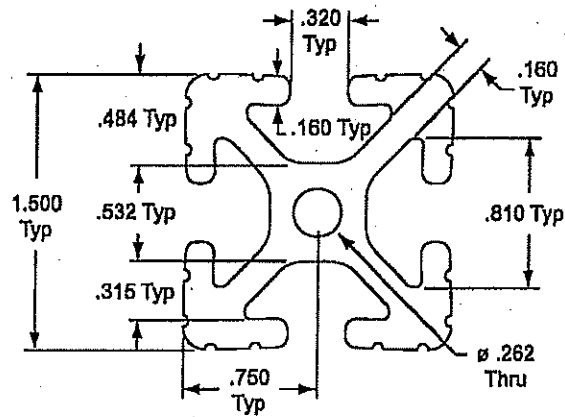
- Compatible with all 15 Series fasteners
- Four open T-slots for mounting accessories
- 1515 is ideal for machine guards, sound enclosures, work benches, displays and panel mount racks
- Compatibility Code*: 8-15



VIBRATION
 PROOF™**



Part No.	1515
Material	6105-T5
Finish	Clear Anodized
Weight Per Foot	1.3433 Lbs.
Stock Length (6'-125")	97" - Part No. 1515-97 145" - Part No. 1515-145 242" - Part No. 1515-242
Moment Of Inertia	IX=.2524" ⁴ IY=.2524" ⁴
Estimated Area	1.1540 Sq. In.



Quick Machining Reference

Machining Service	Service Number
Cut to Length	7010 (see page 563)
.295" Access Hole	7050 (see page 565)
Anchor Counterbore	7040 (see page 567)
Tap Profile End	7060 (see page 564)

Pre-Cut Lengths

48" - Part No. 1515-48	72" - Part No. 1515-72
------------------------	------------------------

- Pre-cut, ready to ship
- Cut to our standard tolerance of +/- .015"
- One part number, one price (includes cut charge)

* See Compatibility Code information on page 152.

** See 2° Drop-Lock information on page 150.

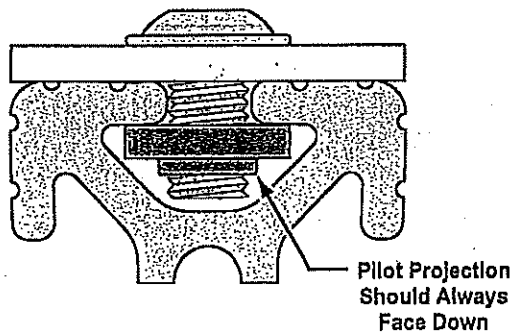
Fractional

Fastener Standards

Assembling T-slotted profiles with 80/20®'s selection of fasteners is a simple and quick process. To ensure a secure connection, there are a few key points to keep in mind when placing fasteners into the T-slot:

Threaded Pilot Projection

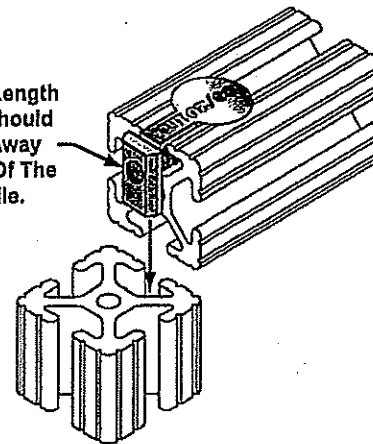
The threaded pilot projection on T-nuts exists to provide more thread, adding strength to the fastener. Always aim the projection down in the T-slot to avoid crashing and an uneven connection.



Offset Tap Hole Location

The offset threaded hole on 80/20® T-nuts allows for a flush surface when mating two profiles at a 90° connection. This is most common when using anchor fasteners, as shown in the example below.

The Extended Length Of The T-Nut Should Always Aim Away From The Top Of The Mating Profile.



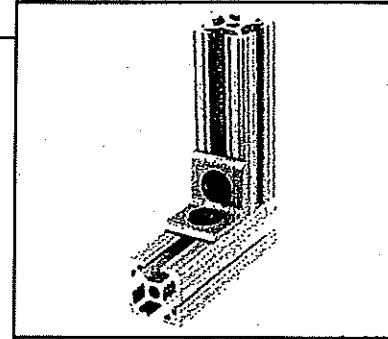
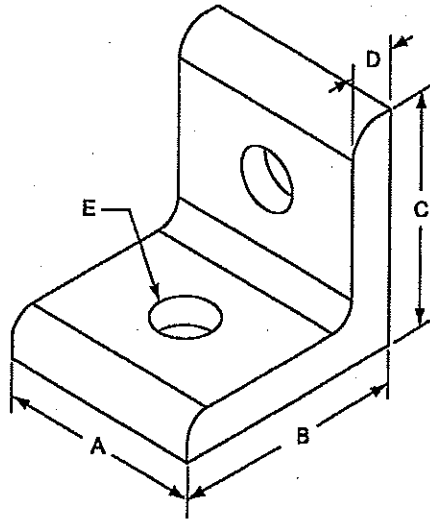
Fastener Hex Tool Size Reference

This chart is a quick reference when looking for the correct size of hex wrench to use with 80/20® fasteners. See pages 549-558 for power bits, T- or L-handle wrenches, and Bondhus® tools.

Thread Size	Fastener Head			
	SHCS	BHSCS	FBHSCS	FHSCS
1/8-32	N/A	3/32"	N/A	N/A
10-32	5/32"	1/8"	N/A	N/A
1/4-20	3/16"	5/32"	5/32"	5/32"
5/16-18	1/4"	3/16"	3/16"	3/16"
3/8-16	5/16"	N/A	N/A	7/32"
M5	4mm	3mm	N/A	3mm
M6	5mm	4mm	N/A	4mm
M8	6mm	5mm	N/A	5mm
M10	8mm	6mm	N/A	6mm

Fractional

2 Hole 1/8" Inside Corner Bracket



10 Series Recommended Mounting Hardware:

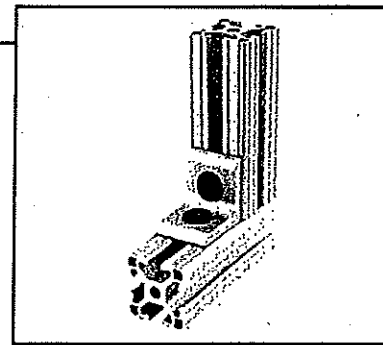
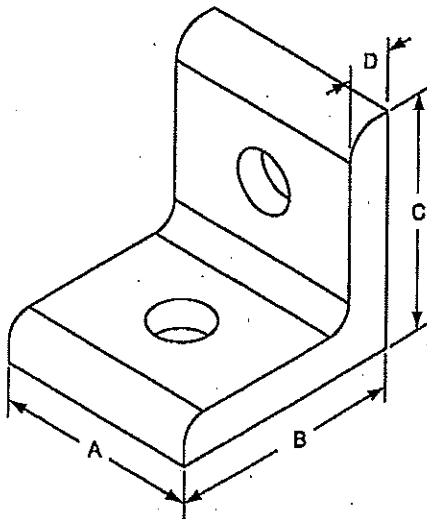
Part No.	Qty	Description
3386 ✂	2	1/4-20 x 3/8" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table L on page 165.

✂ = 10 Series Compatible Part

Part No.	A	B	C	D	E	Lbs.
4108 ✂	1.000	1.000	1.000	.125	ø.257	.020

2 Hole Inside Corner Bracket



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3393 ✂	2	1/4-20 x 1/2" BHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table M on page 165.

15 Series Recommended Mounting Hardware:

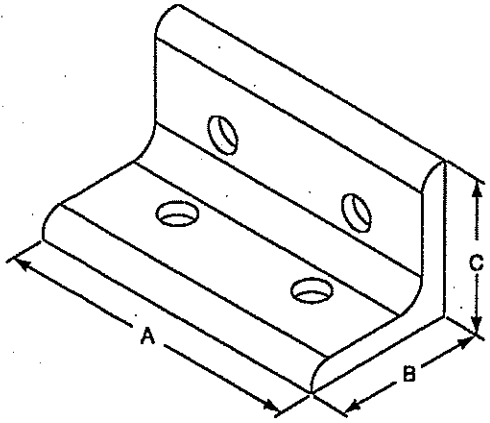
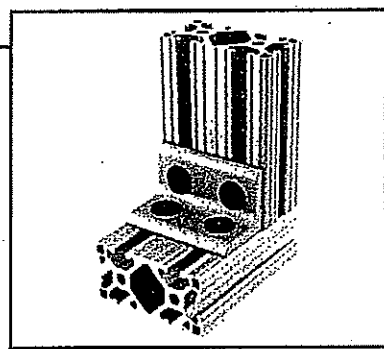
Part No.	Qty	Description
3320	2	5/16-18 x 1/4" FBHSCS & Econ T-Nut

For more 15 Series mounting hardware options, see Table N on page 166.

✂ = 10 Series Compatible Part

Part No.	A	B	C	D	Lbs.
4119 ✂	.875	1.000	1.000	.188	.025
4302	1.310	1.500	1.500	.250	.085

4 Hole Inside Corner Bracket



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3393 ☼	4	1/4-20 x 1/2" BHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table M on page 165.

15 Series Recommended Mounting Hardware:

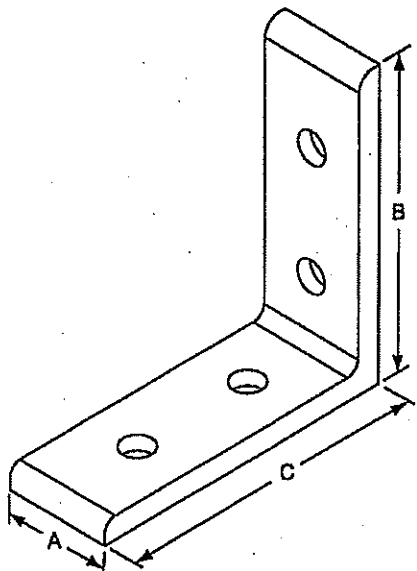
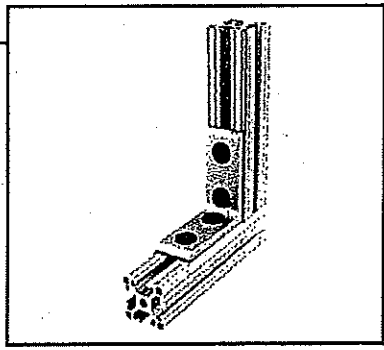
Part No.	Qty	Description
3320	4	5/16-18 x 1/16" FBHSCS & Econ T-Nut

For more 15 Series mounting hardware options, see Table N on page 166.

☼ = 10 Series Compatible Part

Part No.	A	B	C	Lbs.
4113 ☼	1.875	1.000	1.000	.055
4303	2.810	1.500	1.500	.175

4 Hole Inside Corner Bracket



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3393 ☼	4	1/4-20 x 1/2" BHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table M on page 165.

15 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3320	4	5/16-18 x 1/16" FBHSCS & Econ T-Nut

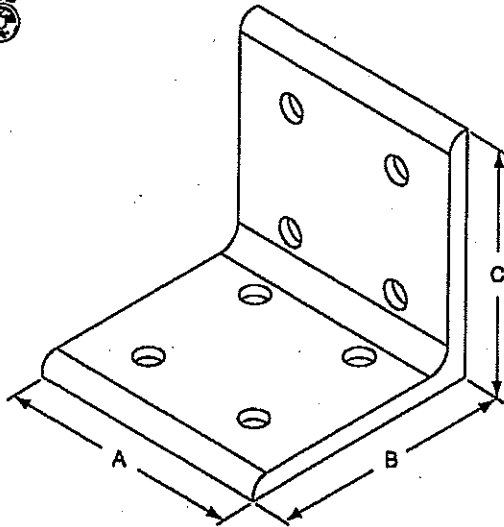
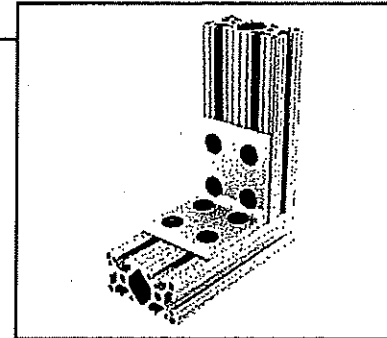
For more 15 Series mounting hardware options, see Table N on page 166.

☼ = 10 Series Compatible Part

Part No.	A	B	C	Lbs.
4115 ☼	.875	2.000	2.000	.055
4301	1.310	3.000	3.000	.170

Fractional

8 Hole Inside Corner Bracket



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3393 ⌘	8	1/4-20 x 1/2" BHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table M on page 165.

15 Series Recommended Mounting Hardware:

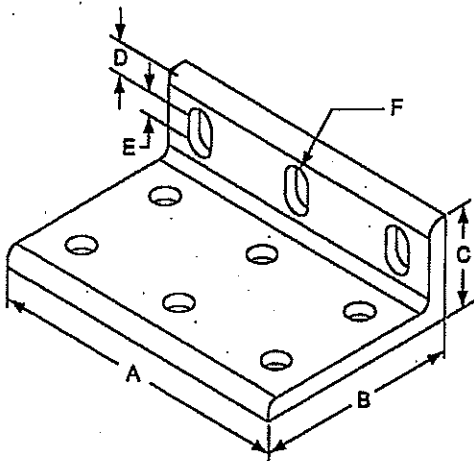
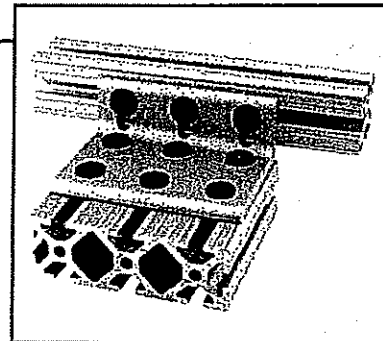
Part No.	Qty	Description
3320	8	5/16-18 x 1/16" FBHSCS & Econ T-Nut

For more 15 Series mounting hardware options, see Table N on page 166.

⌘ = 10 Series Compatible Part

Part No.	A	B	C	Lbs.
4114 ⌘	1.875	2.000	2.000	.120
4304	2.810	3.000	3.000	.385

9 Hole Slotted Inside Corner Bracket



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3321 ⌘	9	1/4-20 x 1/2" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table M on page 165.

15 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3320	9	5/16-18 x 1/16" FBHSCS & Econ T-Nut

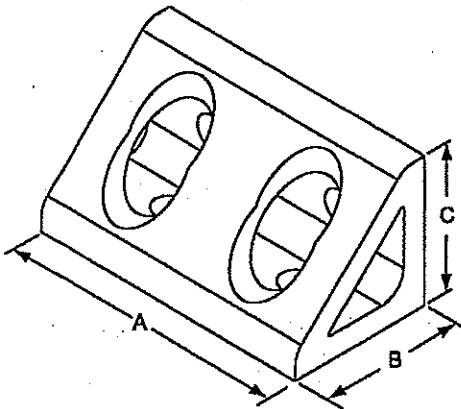
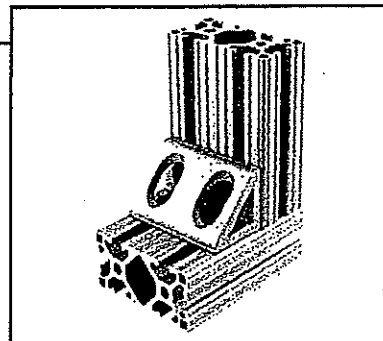
For more 15 Series mounting hardware options, see Table N on page 166.

⌘ = 10 Series Compatible Part

Part No.	A	B	C	D	E	F	Lbs.
4251 ⌘	2.875	2.000	1.000	.312	.188	ø.281	.130
4281	4.310	3.000	1.500	.500	.500	ø.328	.405

Fractional

4 Hole Inside Gusset Corner Bracket



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3393 ☒	4	1/4-20 x 1/2" BHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table M on page 165.

15 Series Recommended Mounting Hardware:

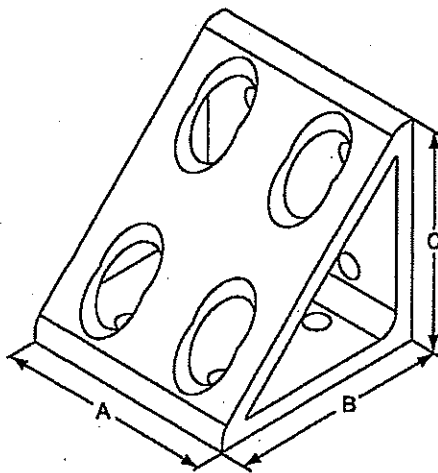
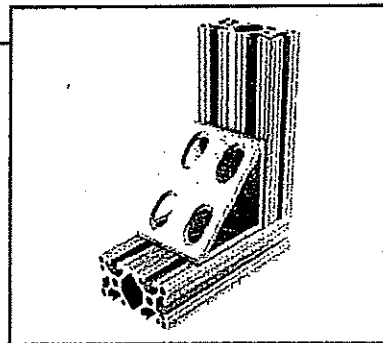
Part No.	Qty	Description
3320	4	5/16-18 x 1/16" FBHSCS & Econ T-Nut

For more 15 Series mounting hardware options, see Table N on page 166.

☒ = 10 Series Compatible Part

Part No.	A	B	C	Lbs.
4134 ☒	1.875	1.000	1.000	.081
4334	2.810	1.500	1.500	.246

8 Hole Inside Gusset Corner Bracket



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3393 ☒	8	1/4-20 x 1/2" BHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table M on page 165.

15 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3320	8	5/16-18 x 1/16" FBHSCS & Econ T-Nut

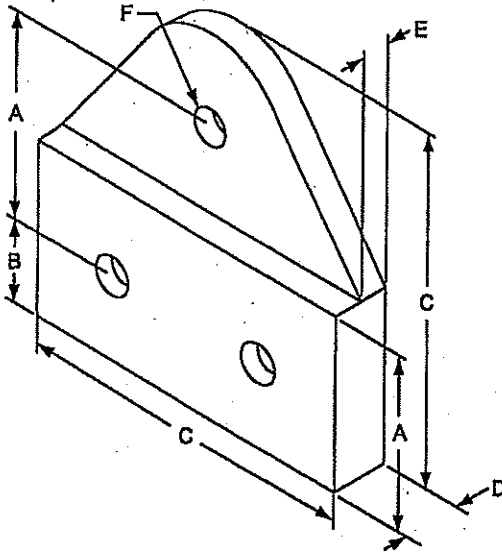
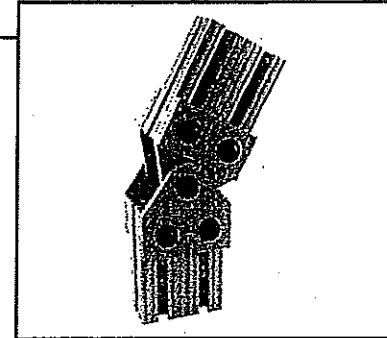
For more 15 Series mounting hardware options, see Table N on page 166.

☒ = 10 Series Compatible Part

Part No.	A	B	C	Lbs.
4138 ☒	1.875	2.000	2.000	.184
4338	2.810	3.000	3.000	.551

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THE STANDARD

3 Hole Pivot Plate



Recommended Mounting Hardware to Mount to Profile:

Part No.	Qty	Description
3443	2	5/16-18 x 1" BHSCS, Washer & Econ T-Nut

Recommended Mounting Hardware for Pivot:

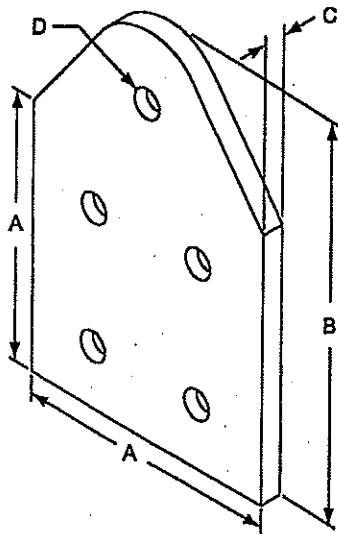
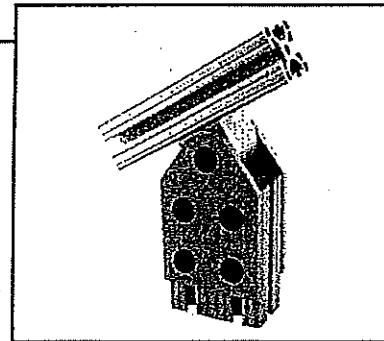
Part No.	Qty	Description
3446	1	5/16-18 x 7/8" SHCS, Washer & Hex Nut

For more mounting hardware options, see Table D on page 164.

Part No.	A	B	C	D	E	F	Lbs.
4392	1.500	.750	3.000	.500	.250	ø.328	.276

4

5 Hole Pivot Plate



Recommended Mounting Hardware: (to Pivot Nub)

Part No.	Qty	Description
3330	1	5/16-18 x 1 1/16" FBHSCS

Recommended Mounting Hardware: (to Profile)

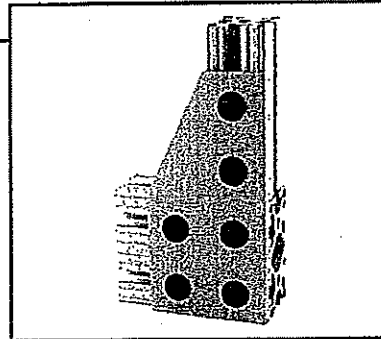
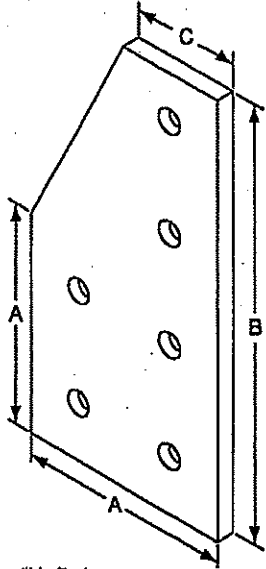
Part No.	Qty	Description
3320	4	5/16-18 x 1 1/16" FBHSCS & Econ T-Nut

For more 15 Series mounting hardware options, see Table C on page 163.

Part No.	A	B	C	D	Lbs.
4371	3.000	4.500	.250	ø.328	.280

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6 Hole 90° Joining Plate



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3321 ☒	6	1/4-20 x 1/2" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table G on page 164.

15 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3320	6	5/16-18 x 1 1/16" FBHSCS & Econ T-Nut
OR		
3325	6	5/16-18 x 3/4" Econ. T-Slot Stud, Washer, Hex Nut

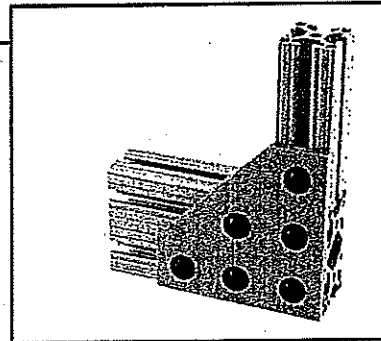
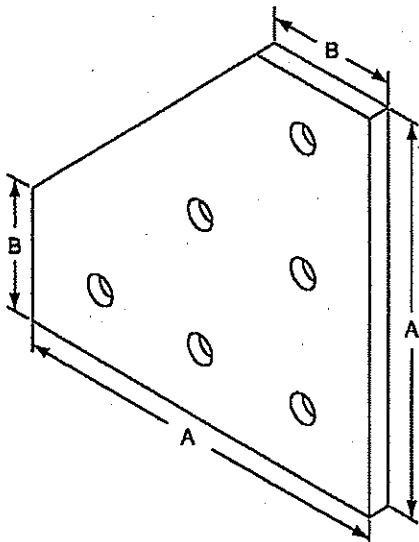
For more 15 Series mounting hardware options, see Table C on page 163.

☒ = 10 Series Compatible Part

Part No.	A	B	C	Lbs.
4120 ☒	2.000	4.000	1.000	.120
4320	3.000	6.000	1.500	.370

4

6 Hole 90° Joining Plate



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3321 ☒	6	1/4-20 x 1/2" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table G on page 164.

15 Series Recommended Mounting Hardware:

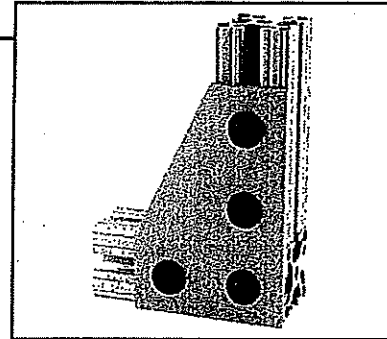
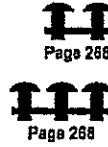
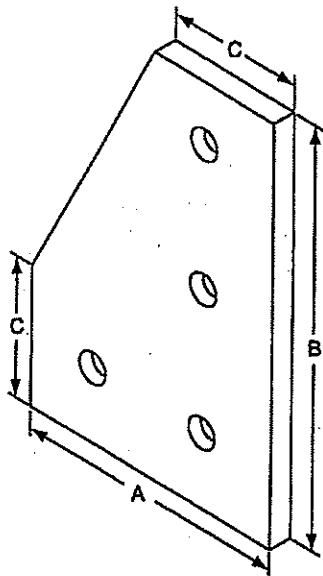
Part No.	Qty	Description
3320	6	5/16-18 x 1 1/16" FBHSCS & Econ T-Nut
OR		
3325	6	5/16-18 x 3/4" Econ. T-Slot Stud, Washer, Hex Nut

For more 15 Series mounting hardware options, see Table C on page 163.

☒ = 10 Series Compatible Part

Part No.	A	B	Lbs.
4061 ☒	3.000	1.000	.125
4461	4.500	1.500	.370

4 Hole 90° Joining Plate



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3321 ☒	4	1/4-20 x 1/2" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table G on page 164.

15 Series Recommended Mounting Hardware:

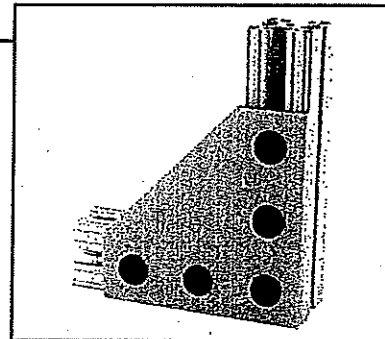
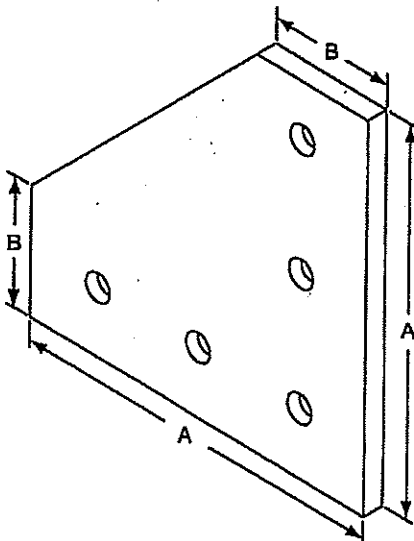
Part No.	Qty	Description
3320	4	3/16-18 x 1/16" FBHSCS & Econ T-Nut
OR		
3325	4	3/16-18 x 3/4" Econ. T-Slot Stud, Washer, Hex Nut

For more 15 Series mounting hardware options, see Table C on page 163.

☒ = 10 Series Compatible Part

Part No.	A	B	C	Lbs.
4150 ☒	2.000	3.000	1.000	.090
4350	3.000	4.500	1.500	.260

5 Hole 90° Joining Plate



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3321 ☒	5	1/4-20 x 1/2" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table G on page 164.

15 Series Recommended Mounting Hardware:

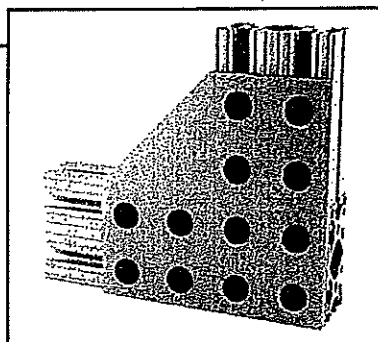
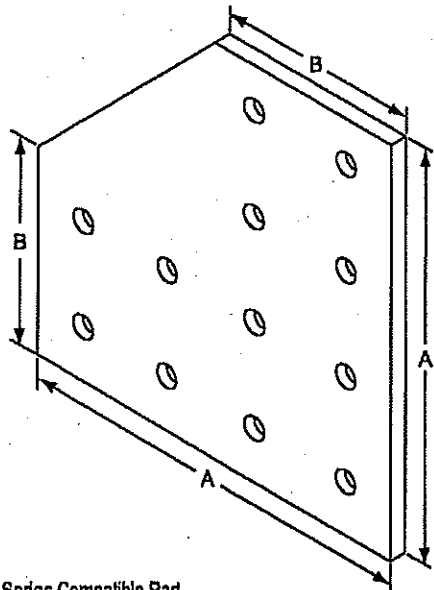
Part No.	Qty	Description
3320	5	3/16-18 x 1/16" FBHSCS & Econ T-Nut
OR		
3325	5	3/16-18 x 3/4" Econ. T-Slot Stud, Washer, Hex Nut

For more 15 Series mounting hardware options, see Table C on page 163.

☒ = 10 Series Compatible Part

Part No.	A	B	Lbs.
4151 ☒	3.000	1.000	.125
4351	4.500	1.500	.370

12 Hole 90° Joining Plate



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3321 ✖	12	1/4-20 x 1/2" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table G on page 164.

15 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3320	12	3/16-18 x 1/16" FBHSCS & Econ T-Nut
OR		
3325	12	3/16-18 x 3/4" Econ. T-Slot Stud, Washer, Hex Nut

For more 15 Series mounting hardware options, see Table C on page 163.

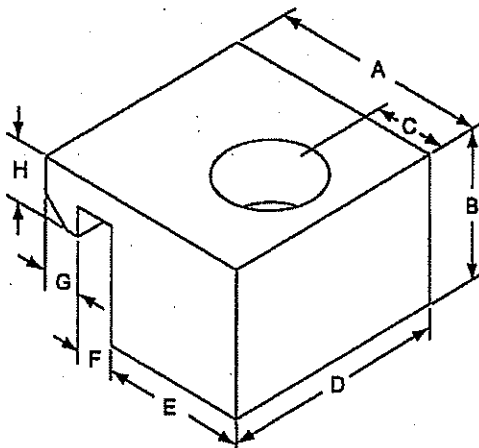
✖ = 10 Series Compatible Part

Part No.	A	B	Lbs.
4128 ✖	4.000	2.000	.240
4328	6.000	3.000	.730

Clamp Block



NO MACHINING REQUIRED!



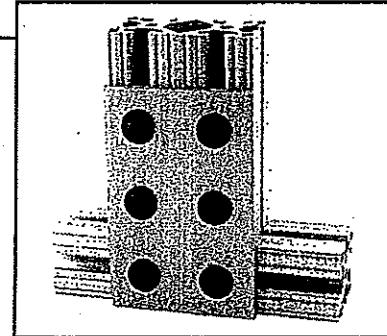
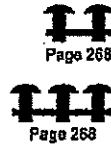
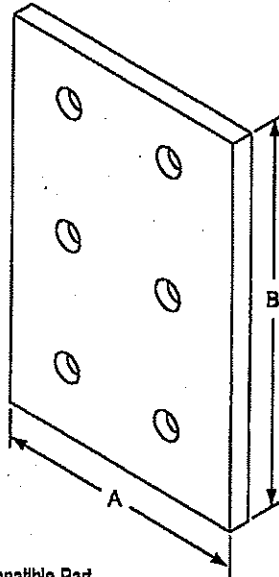
- 10 or 15 Series compatible
- Secures profiles at various angles
- Made from 6105-T5 aluminum
- Sold in pairs
- Mounting hardware included

✖ = 10 Series Compatible Part

Part No.	A	B	C	D	E	F	G	H	Lbs.
4174 ✖	.710	.500	.250	.710	.500	.110	.100	.215	.044
4458	1.142	.750	.375	1.142	.750	.196	.196	.304	.109

80/20® Inc.
The Industrial Erector Set®
THE STANDARD

6 Hole Joining Plate



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3321 ✘	6	1/4-20 x 1/2" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table G on page 164.

15 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3320	6	3/16-18 x 1/16" FBHSCS & Econ T-Nut
OR		
3325	6	3/16-18 x 3/4" Econ. T-Slot Stud, Washer, Hex Nut

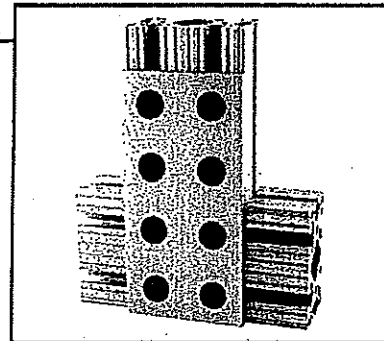
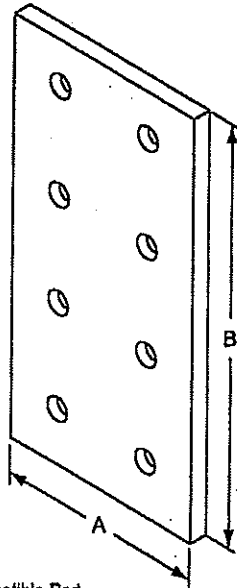
For more 15 Series mounting hardware options, see Table C on page 163.

✘ = 10 Series Compatible Part

Part No.	A	B	Lbs.
4166 ✘	2.000	3.000	.105
4366	3.000	4.500	.320

4

8 Hole Joining Plate



10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3321 ✘	8	1/4-20 x 1/2" FBHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table G on page 164.

15 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3320	8	3/16-18 x 1/16" FBHSCS & Econ T-Nut
OR		
3325	8	3/16-18 x 3/4" Econ. T-Slot Stud, Washer, Hex Nut

For more 15 Series mounting hardware options, see Table C on page 163.

✘ = 10 Series Compatible Part

Part No.	A	B	Lbs.
4165 ✘	2.000	4.000	.140
4365	3.000	6.000	.425

80/20[®] Inc.
The Industrial Erector Set[®]
THE STANDARD

Living Hinge Assemblies – 15 Series



- Permanently lubricated bronze bushings act as high strength pivot points
- Nylon thrust washers protect the pivot arms
- Offers a high load capacity while ensuring a long cycle life
- Provides a full 180° axial motion



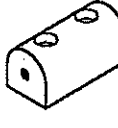











15 Series Mounting Hardware Included

Nub to Profile:
 Part # 3422 – 5/16-18 x 1 1/2" SHCS & Econ T-Nut

Nub to Arms:
 Part # 3500 – (2) 3/8 x 3/8 Stripper Bolt & (4) Thrust Washers

Arm to Profile:
 Part # 3355 – (2) 5/16-18 x 5/8" FBHSCS & Dbl Econ T-Nut
 Part # 3412 – (2) 5/16-18 x 5/8" FHSCS & Econ T-Nut

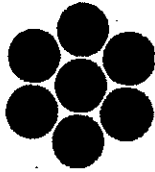
Individual Part No.

		4381	4384	4377	4385	4343
		 0° Nub Page 337	 90° Nub Page 337	 Universal Nub Page 338	 4.5" Arm Page 338	 "L" Arm Page 339
Complete Assembly Part No.	4380 .685 Lbs. 	1			2	
	4383 .685 Lbs. 		1		2	
	4379 .995 Lbs. 			1	2	
	4321 .675 Lbs. 	1				2
	4322 .675 Lbs. 		1			2
	4323 .985 Lbs. 			1		2
	4363 .680 Lbs. 	1			1	1
	4364 .680 Lbs. 		1		1	1
	4313 .990 Lbs. 			1	1	1

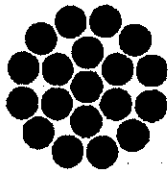
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Need help finding a product?
E-mail or call (630) 600-3600.

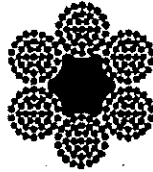
Galvanized Steel Wire Rope



1 x 7 Strand



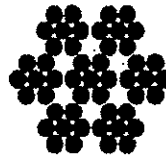
1 x 19 Strand



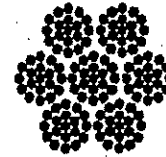
6 x 37 Class
Fiber Core



6 x 37 Class
IWRC



7 x 7 Strand Core



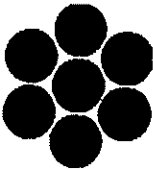
7 x 19 Strand
Core

A zinc coating on this galvanized rope provides corrosion protection. All are preformed and unlubricated (unless noted). Galvanized rope is generally not as strong as plain steel rope.

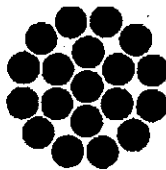
View additional information about selecting wire rope.

Warning! Breaking strength should never be considered the rope's working load.

Multipurpose Strand Rope



1 x 7 Strand



1 x 19 Strand

Constructed of a single strand, rope has low flexibility. 1 x 19 construction is more flexible than 1 x 7.

To Order: Please specify length from those listed; continuous lengths greater than the longest length listed are also available.

Dia.	Meets Spec.	Breaking Strength, lbs.	Available Lengths, ft.	Per Ft.
1 x 7 Strand				
1/4"	ASTM A475	6,650	25, 50, 100, 300, 500	3498T54 \$0.50
5/16"	ASTM A475	11,200	10, 25, 50, 100, 300	3498T55 .70

Catalog Page | Bookmark

Galvanized Steel Multipurpose Strand Rope 1 X 7, 5/16"
Dia, 11200 lb Break Strength

Wire Rope Selection Criteria

100 ft. were forwarded 11/16/10.

Ft.

In stock

3/8"	ASTM A475	15,400	10, 25, 50, 100, 300	3498T56 .96
------	-----------	--------	----------------------	-------------

1 x 19 Strand				
1/4"	—	8,200	10, 25, 50, 100, 300	3498T66* 1.16

* Lubricated.

Multipurpose Rope

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Need help finding a product?
E-mail or call (630) 600-3600.

High-Strength Corrosion-Resistant Turnbuckles

Suited to your toughest applications, these turnbuckles offer strong, seamless, forged construction (unless noted) and are ideal for outdoor and wet environments. Replacement components sold separately.


Jaw end fittings include one removable pin and one cotter pin.

Galvanized steel turnbuckles have a hot-dipped finish and offer good corrosion resistance. Meet ASTM F1145-05 Type 1, Grade 1.

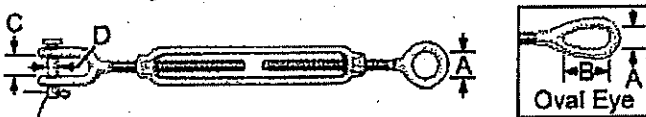
Type 316 stainless steel turnbuckles provide maximum corrosion resistance. Meet ASTM F1145-92 Type 1.

Warning! Never exceed work load limits.

Also Available: Jam nuts. Select 30045T555 and specify thread size and right- or left-hand thread.

 For technical drawings and 3-D models, click on a part number.

Jaw and Eye



Work Load Limit, lbs.	Closed Length	Max. Adjustment (A)	(B)	(C)	(D)	Thread Size		Each
Galvanized Steel with Round Eye								
1,200	11 1/2"	6"	3/4"	—	1/2"	5/16"	3/8"-16	3000T53 \$21.89

[CAD](#) | [Catalog Page](#) | [Bookmark](#)

Galvanized Steel Jaw and Eye Turnbuckle 3/8"-16 Thread, 6" Maximum Adjustment, 1200# Wll

4 each were forwarded 11/16/10.

Each

In stock

2,200	13 1/4"	6"	1"	—	5/8"	7/16"	1/2"-13	3000T54	23.19
3,500	14 5/8"	6"	1 1/4"	—	7/8"	1/2"	5/8"-11	3000T57	32.04
5,200	15 5/8"	6"	1 1/2"	—	15/16"	5/8"	3/4"-10	3000T61	48.18
7,200	19"	6"	1 3/4"	—	1 1/8"	3/4"	7/8"-9	3000T32	80.14
10,000	19 1/8"	6"	2"	—	1 3/16"	7/8"	1"-8	3000T67	91.48

Type 316 Stainless Steel with Oval Eye									
1,200	11"	6"	1/2"	1 1/8"	9/16"	5/16"	3/8"-16	3022T43	60.90
2,200	12 1/2"	6"	3/4"	1 7/16"	5/8"	3/8"	1/2"-13	3022T44	86.89
3,500	14"	6"	7/8"	1 3/4"	3/4"	1/2"	5/8"-11	3022T45	130.00
5,200	15 5/8"	6"	1"	2 1/16"	1"	5/8"	3/4"-10	3022T46	194.81

Corrosion-Resistant Turnbuckles

Made of cast Type 316 stainless steel (unless noted), these turnbuckles are the economical choice when you need corrosion resistance.

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Cast Wire Rope Clips—Not for Lifting



The choice when the extra strength of forged clips is not required. All are single saddle.

Malleable Iron

Clips are good for applications where corrosion is not a factor. All except 1/16" and 3/32" rope dia. sizes meet Fed. Spec. FF-C-450. Zinc-plated clips provide good corrosion resistance. Hot-dipped galvanized clips offer better corrosion resistance than zinc-plated clips.

Warning! Do not use with coated wire rope unless coating is removed.

For Rope Dia.	Min. Clips Req'd.	Rope Turnback	Torque, ft-lbs.	Plain Finish Each		Zinc Plated Each		Hot-Dipped Galvanized Each				
				1-9	10-Up	1-9	10-Up	1-9	10-Up			
1/16"	3	4 3/4"	2			30325T13	\$0.34	\$0.31				
3/32"	3	4 3/4"	2	30325T14	\$0.47	\$0.44	30325T15	.55	.50			
1/8"	3	4 3/4"	3	30325T61	.58	.51	30325T26	.58	.53			
3/16"	3	5 1/2"	4.5	30325T62	.62	.56	30325T27	.64	.58			
1/4"	3	7"	15	30325T63	.74	.67	30325T28	.79	.68	30325T83	\$0.98	\$0.88
5/16"	3	7 3/4"	15	30325T64	.84	.74	30325T29	.86	.77	30325T84	1.15	1.02
3/8"	3	9 1/2"	30	30325T65	1.14	1.04	30325T31	1.26	1.12	30325T85	1.57	1.39
7/16"	3	10 1/4"	40	30325T66	1.29	1.19	30325T32	1.46	1.34	30325T86	1.94	1.71
1/2"	4	15 1/4"	45	30325T67	1.44	1.33	30325T33	1.63	1.44	30325T87	2.25	1.99
9/16"	4	16"	50	30325T48	1.72	1.59	30325T49	1.97	1.84	30325T55	2.55	2.28
5/8"	4	16"	75	30325T39	1.80	1.67	30325T45	2.10	1.88	30325T46	2.75	2.56
3/4"	5	22 1/4"	75	30325T69	2.58	2.40	30325T35	2.89	2.58	30325T89	3.81	3.40
7/8"	5	23 1/2"	130	30325T71	3.95	3.66	30325T36	4.25	3.81	30325T9	5.48	4.91
1"	6	31"	130	30325T72	4.66	4.28	30325T37	5.31	4.73	30325T91	6.99	6.28

Type 304 Stainless Steel

Clips are mildly magnetic and provide better corrosion resistance than all of the malleable iron clips.

Warning! Do not use with coated wire rope unless coating is removed.

For Rope Dia.	Min Clips Req'd.	Rope Turnback	Torque, ft-lbs.	Each		
				1-9	10-Up	
1/16"	2			31985T19	\$1.08	\$0.95
1/8"	2	3 1/4"		31985T71	1.50	1.32
5/32"	2	3 3/4"		31985T81	1.73	1.53
3/16"	2	3 3/4"		31985T72	1.81	1.59
1/4"	2	4 3/4"	8	31985T73	2.29	2.05
5/16"	2	5 1/4"	15	31985T83	3.54	3.12

Catalog Page | Bookmark

Cast Wire Rope Clip Type 304
Stainless Steel, for 5/16" Rope
Diameter

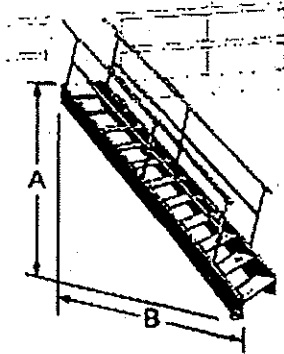
16 each were forwarded
11/16/10.

Each

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Steel Adjustable-Height Stairways



Adjustable mounting brackets allow these stairways to accommodate slight differences in landing heights. Mounting angle varies from 36° to 42°.

Stairways are galvanized steel with 33 1/2" high steel handrails. Handrails have a safety-yellow finish. Steps are 8 3/4" deep and perforated for slip resistance. Stairways include two floor mounting brackets, each with two 1/2" dia. holes. They also include two landing mounting brackets, each with four 11/32" dia. holes, two 11/32" x 3/4" slots, and two 11/32" x 1/2" slots (fasteners not included).

Shipped unassembled. Meet OSHA requirements for fixed stairways.

Note: Before erecting stairways, check federal, state, and local codes.

Landing Ht. (A)		Dp. (B)		O'all Wd.	No. of Steps		Each
Min.	Max.	Min.	Max.				
30" Wide Steps							
3'0"	3'5"	3'0"	3'4"	33"	4	8234T12	\$770.17
3'6"	4'0"	3'9"	4'2"	33"	5	8234T14	870.26
4'1"	4'8"	4'5"	5'0"	33"	6	8234T16	965.99
4'9"	5'4"	5'2"	5'9"	33"	7	8234T19	1,068.04
5'5"	5'11"	5'11"	6'6"	33"	8	8234T21	1,083.55
6'0"	6'6"	6'8"	7'4"	33"	9	8234T22	1,218.96
6'7"	7'3"	7'5"	8'1"	33"	10	8234T23	1,274.69
7'4"	8'2"	8'2"	8'9"	33"	11	8234T27	1,585.91

Catalog Page | Bookmark

Steel Adjustable-Height Stairway 30" W
Steps, 7'4"-8'2" H Landing, 33" W O'all,
11 Steps

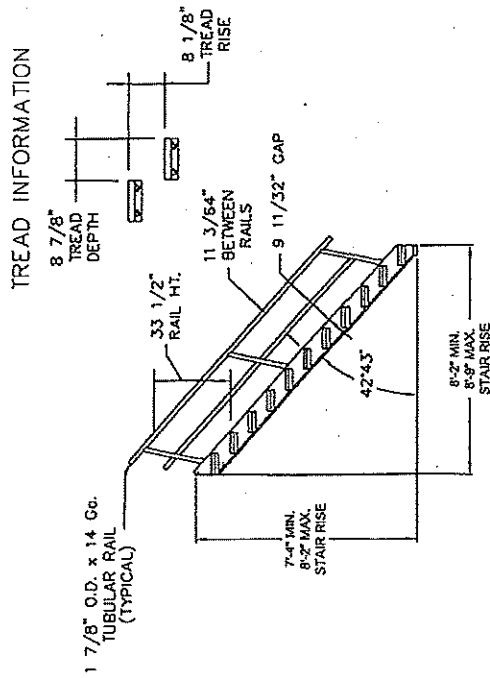
Each

In stock

12 RISERS

$$8.17 / 12 = 8.17" \text{ RISE}$$

8234T27



TREAD INFORMATION

OSHA STAIRWAY
F11 SERIES
SIDE ELEVATION
INSTRUCTION
DRAWING # 13ASY



Office Hours: Mon – Thur 8:30 AM to 5:00 PM EST | Fri 8:30 AM to 2:00 PM EST

Email this page

SALES CONTACT: 1-800-258-7324

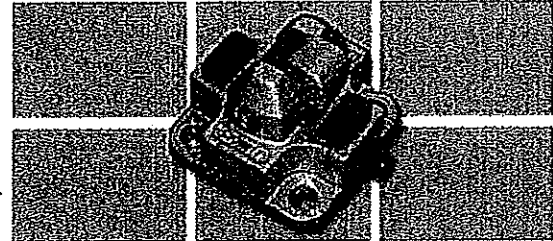
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HELP WANTED CAREER OPPORTUNITY AT TANDEMLOC: Mechanical Engineer, preferably with experience in the design of below the hook lifting devices. Please send resumes to Tandemloc, 824 Highway 101, Havelock, NC 28532, attention Sandy Allen or sandy@tandemloc.com.

VERTICAL CLAMP CONNECTOR (VI-SO) (K08A00A-1GA)

The VISO Connector has a bolt-on base or it may be welded to a suitable platform. The VISO fits ISO 1161 Corner Fitting large aperture and incorporates a clamping action that removes any slack between the corner fitting and the body of the connector. Use whenever a slack free connection is preferred. Hot Dipped galvanized for rugged use

Product Photo



- The grip and force exerted by the clamp arm (Piece 20) is variable by rotating the drive stud (Piece 30.) Max load on the hex drive is 60 ft/lb.
- STRENGTH RATINGS:**
 Ultimate load for one VI-SO (No Safety Factor)
 44,000 Lbs. - Restraint against upward force
 50,000 Lbs. - Traverse shear
 200,000 Lbs. - Compression
HIGHER STRENGTHS AVAILABLE
- Two grease fittings allow for easy lubrication.
- Dimensions without tolerance are subject to manufacturing tolerances.
- Use for a slack-free, clamp-down connection of ISO 668 type container or similar structure. Connector enters the large bottom aperture of the standard corner fitting (ISO 1161) & clamps down on the inside of the bottom wall.

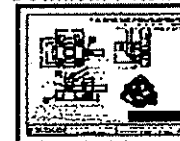
While this standard VI-SO is not designed for single wheels or lifting, products for these purposes are available.

Use to tightly secure containers to structures such as special pallets, ships' deck, overhead beams, foundations, chassis or other containers.

While this standard VI-SO is not designed for single wheels or lifting, products for these purposes are available.

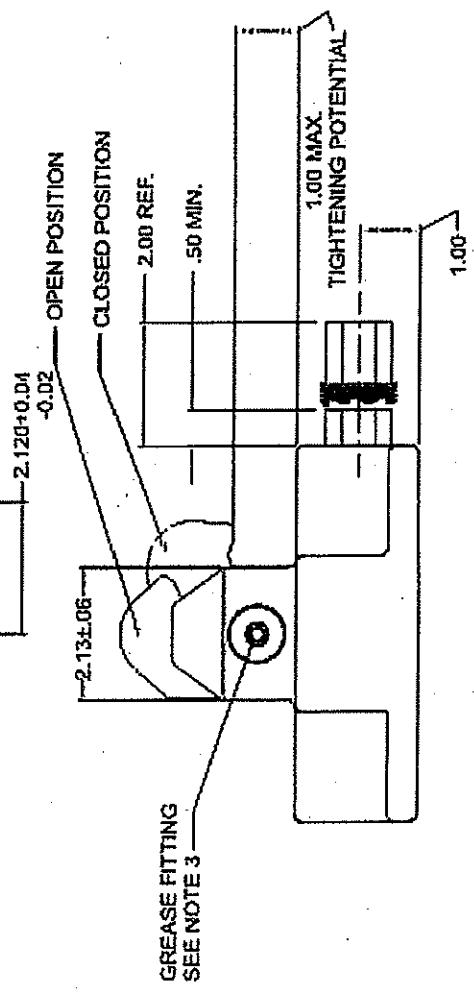
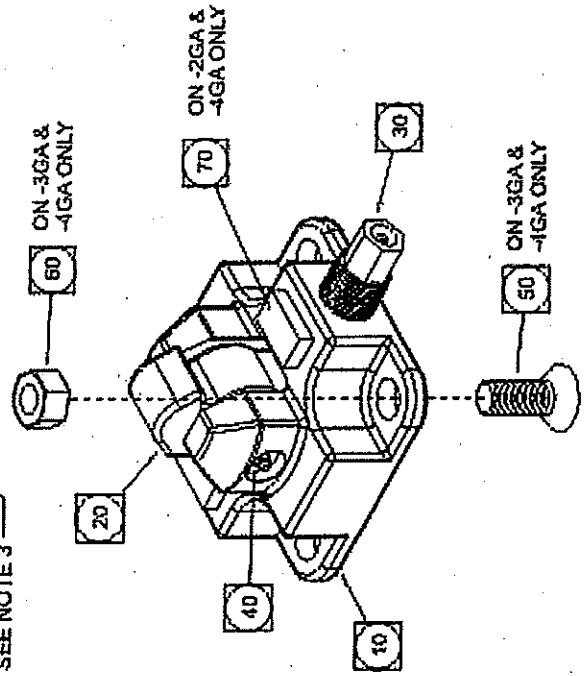
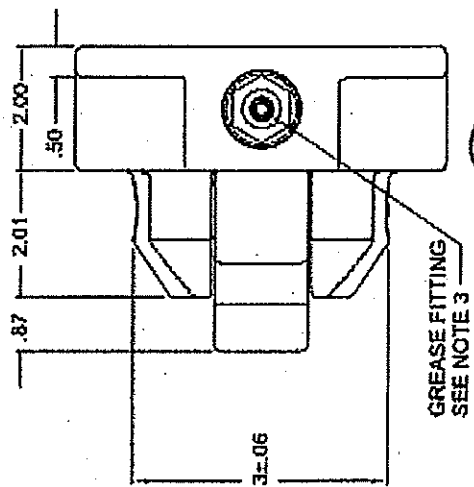
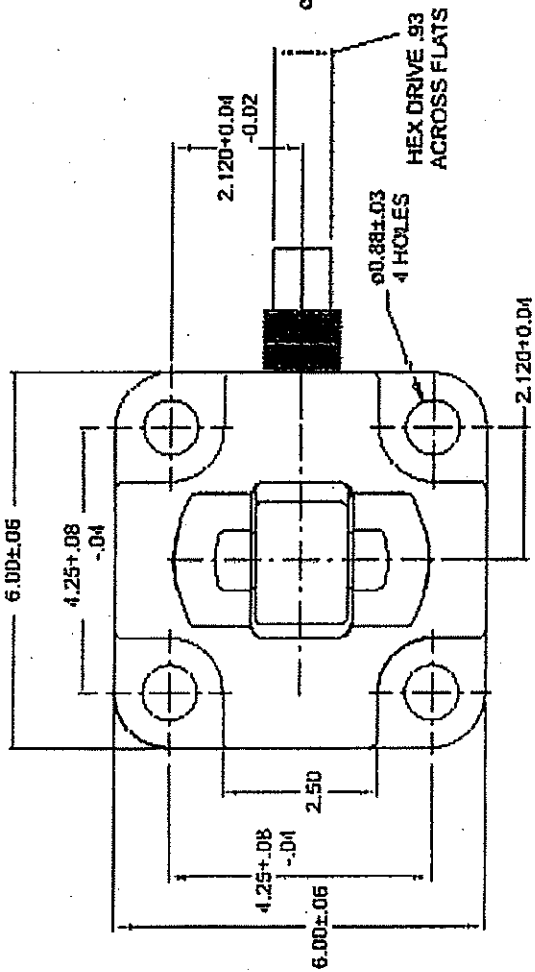
Order Numbers:	
K08A00A-1GA: VISO Connector	PRODUCT INQUIRY
K08A00A-2GA: With Rubber Pads, Weight: 15.6 LBS	PRODUCT INQUIRY
K08A00A-3GA: With Mounting Hardware, Weight: 17 LBS	PRODUCT INQUIRY
K08A00A-4GA: With Rubber Pads and Mounting Hardware, Weight: 17.1 LBS	PRODUCT INQUIRY

Download / view printer friendly data sheet(s)

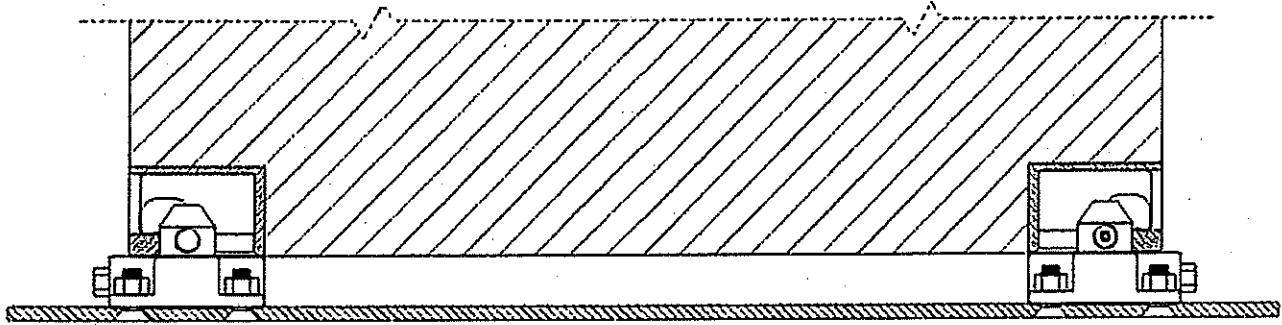


Login / register to activate:
 TANDEMLOC_K08A00A-1GA.pdf
 Type: Adobe Acrobat Document
 Size: 117 KB

Need Credit? Let us know.
 (Note: Credit Applications will only be processed with an accompanying purchase order.)



- A. Use - for a slack-free, clamp-down connection of each corner of an ISO 668 type container to a deck or other structure, lower the container so that the open connector enters the large bottom aperture of each ISO 1161 standard corner fitting. The clamp arm bears down on the inside of the bottom wall when the drive stud is screwed in.
- B. Use cap screws and lock nuts to assemble the connector to a suitable receiving structure. Locate connectors per "male fitting instructions" on Tandemloc Data Sheet DF-72047-16 (Sheet 2) for standard sized structures. For non-standard sizes use the principles implied on this sheet to determine your location.
- C. The VI-SO is to be bolted to the desired structure using four 3/4" SAE Grade 8 steel cap screws. Special flat head cap screws and locknuts are available with hex sockets on both ends. This permits the cap screw to be held from the threaded end while turning the lock nut (useful when the head end is not accessible).
- D. To secure an ISO container or similar structure first open the connector fully by turning the drive stud counterclockwise until it is within (Sheet 1) dimension. Lower container so that the upward projecting portions of the connector enter the large apertures in the bases of the corner fittings. Turn the drive stud clockwise to secure. 50 FT/LB. of torque in the drive stud when metal to metal contact is achieved is recommended. Excessive torque pre-loads the clamp arm, resulting in a reduction of its maximum strength.



AT LEAST TWO OPPOSING VERTICAL CLAMPS ARE REQUIRED TO SECURE

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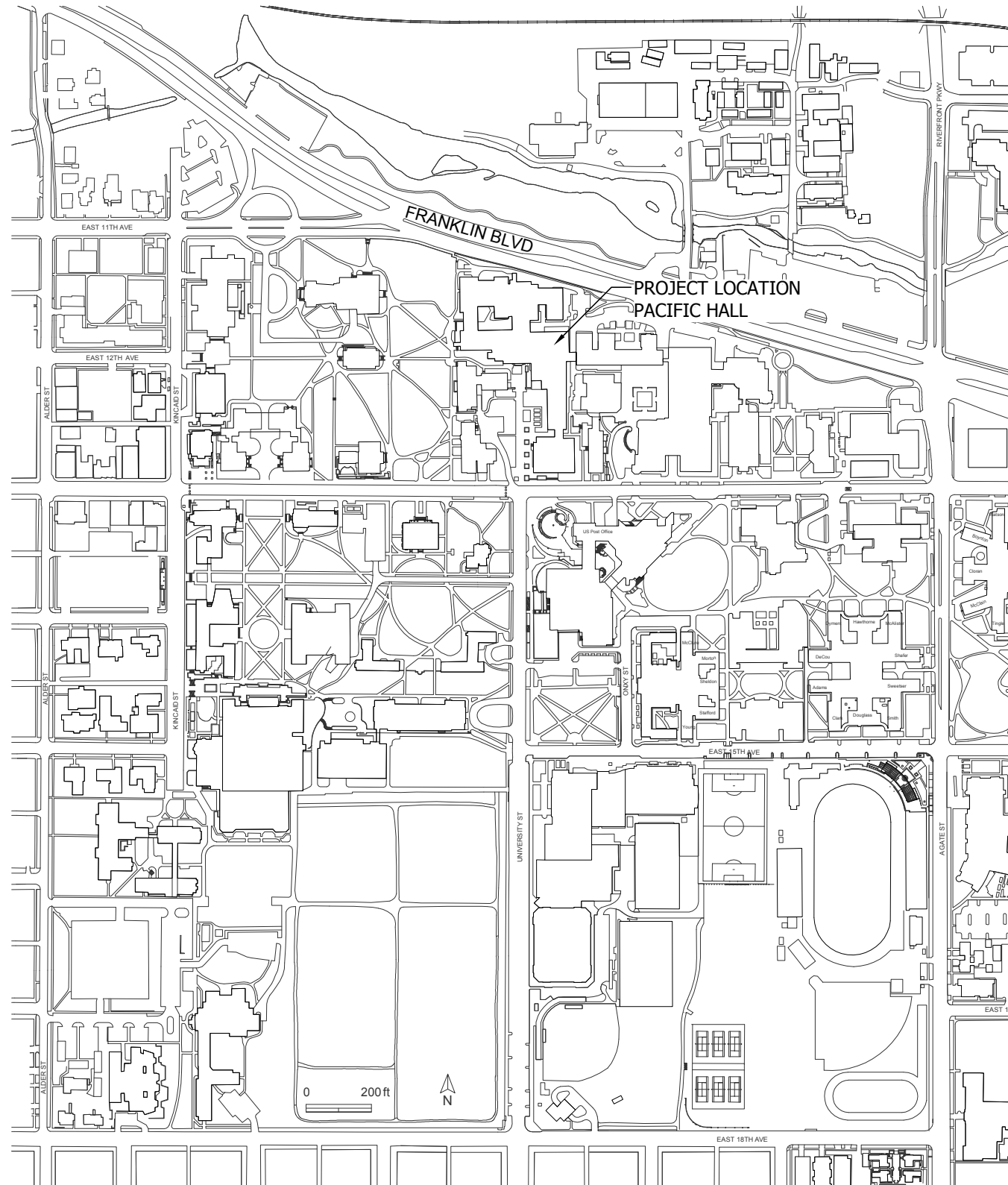
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Products include lifting, mobilizing and securing products for below the hook and ISO container handling. Tandemloc provides standard corner fittings, lift beams, spreader bars, pipe end caps, container lifting devices, lifting attachments, twistlocks, d-rings, heavy duty casters, container casters, container lifting dollies and more.

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KEY PLAN
UNIVERSITY OF OREGON CAMPUS



MRR
M. R. RICHARDS ENGINEERING INC
 100 WEST 13th AVENUE SUITE 210 EUGENE OR 97401
 541-687-0129 WWW.MRRICHARDS.COM

PROJECT DESCRIPTION:
 INSTALLATION OF SHIPPING
 CONTAINER ON ROOF OF
 PACIFIC HALL AND ERECTION
 OF PHOTOELECTRIC PANELS.

No.	Revisory/Issue	Date

DRAWING TITLE: **KEY PLAN**

UNIVERSITY OF OREGON

EUGENE, OREGON 97403-12176
 1276 UNIVERSITY OF OREGON
 FACILITIES SERVICES

PROJECT NAME:
PACIFIC HALL PV

PROJECT NO.:
519-202

DATE:
9/11/2012

SCALE:
AS SHOWN

DRAWING NO.:
G1



RENEWAL DATE: 12-31-2012

No.	Revisory/Issue	Date

STRUCTURAL GENERAL NOTES:

THE GENERAL CONTRACTOR IS RESPONSIBLE FOR VERIFICATION AND CORRELATION OF ALL DIMENSIONS, ELEVATIONS, AND OPENINGS ON THE STRUCTURAL DRAWINGS WITH EXISTING CONDITIONS. NOTIFY THE ENGINEER OF ANY DISCREPANCIES OR INCONSISTENCIES PRIOR TO STARTING CONSTRUCTION.

THE CONTRACT STRUCTURAL DOCUMENTS REPRESENT THE FINAL STRUCTURE AND UNLESS INDICATED OTHERWISE, THEY DO NOT SPECIFY THE METHOD OF CONSTRUCTION.

ALL TYPICAL DETAILS AND NOTES SHOWN ON DRAWINGS SHALL APPLY, UNLESS NOTED OTHERWISE. CONDITIONS NOT SPECIFICALLY DETAILED SHALL BE IN GENERAL CONFORMANCE WITH CONSTRUCTION DETAILS OF A SIMILAR NATURE ELSEWHERE ON THE PROJECT.

APPLICABLE CODES AND STANDARDS

BUILDING CODE 2010 STATE OF OREGON STRUCTURAL SPECIALTY CODE

STRUCTURAL DESIGN DATA

GRAVITY LOADS:

CONTAINER WEIGHT 9000 LBS
 SNOW LOAD 25 PSF

WIND LOADS:

BASIC WIND SPEED= 95 MPH
 OCCUPANCY IMPORTANCE FACTOR I= 1.15
 SITE EXPOSURE CATEGORY= B

MATERIALS:

FRAMING LUMBER: HEM FIR #2, S4S, PRESERVATIVE TREATED

STEEL PLATES AND ANGLES: ASTM A36

WIRE ROPE FOR HOLDOWNS: 3/8" 7 x 19 GALV. 11,500 LB MIN. BREAKING STRENGTH

CABLE CLAMPS: FED SPEC FF-C-450 TYPE 1

TURNBUCKLES: 5,200 LB MIN. WORKING LOAD

THREADED RODS EMBEDDED IN CONCRETE WITH EPOXY ADHESIVE: ASTM A36 ROD WITH SIMPSON "SET" ADHESIVE

STRUCTURAL TESTS, INSPECTIONS AND OBSERVATIONS:

1. AN INDEPENDENT TESTING AGENCY AND SPECIAL INSPECTORS WILL BE RETAINED BY THE OWNER TO PERFORM STRUCTURAL TESTS AND INSPECTIONS. PROVIDE ACCESS AND FURNISH SAMPLES TO THE AGENCY AS REQUIRED BY THE CONTRACT DOCUMENTS.
2. IF INITIAL TESTS OR INSPECTIONS MADE BY THE OWNER'S TESTING AGENCY REVEAL THAT ANY PORTION OF THE WORK DOES NOT COMPLY WITH THE CONTRACT DOCUMENTS, ADDITIONAL TESTS, INSPECTIONS, AND NECESSARY REPAIRS WILL BE MADE AT THE CONTRACTOR'S EXPENSE.
3. INSPECTION REPORTS ARE TO BE SUBMITTED TO THE OWNER.
4. STRUCTURAL ITEMS REQUIRING INSPECTION ARE:
 THREADED RODS INSTALLED IN CONCRETE WITH EPOXY ADHESIVE

DRAWING INDEX:

- G1 KEY PLAN
- S1 STRUCTURAL GENERAL NOTES AND INSPECTIONS
- S2 PARTIAL ROOF PLAN
- S3 TOP OF CONTAINER PLAN
- S4 SECTION
- S5 CONNECTION DETAILS



RENEWAL DATE: 12-31-2012

DRAWING TITLE: STRUCTURAL GENERAL NOTES AND INSPECTIONS

UNIVERSITY OF OREGON

EUGENE, OREGON 97403-12176
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PROJECT NAME:
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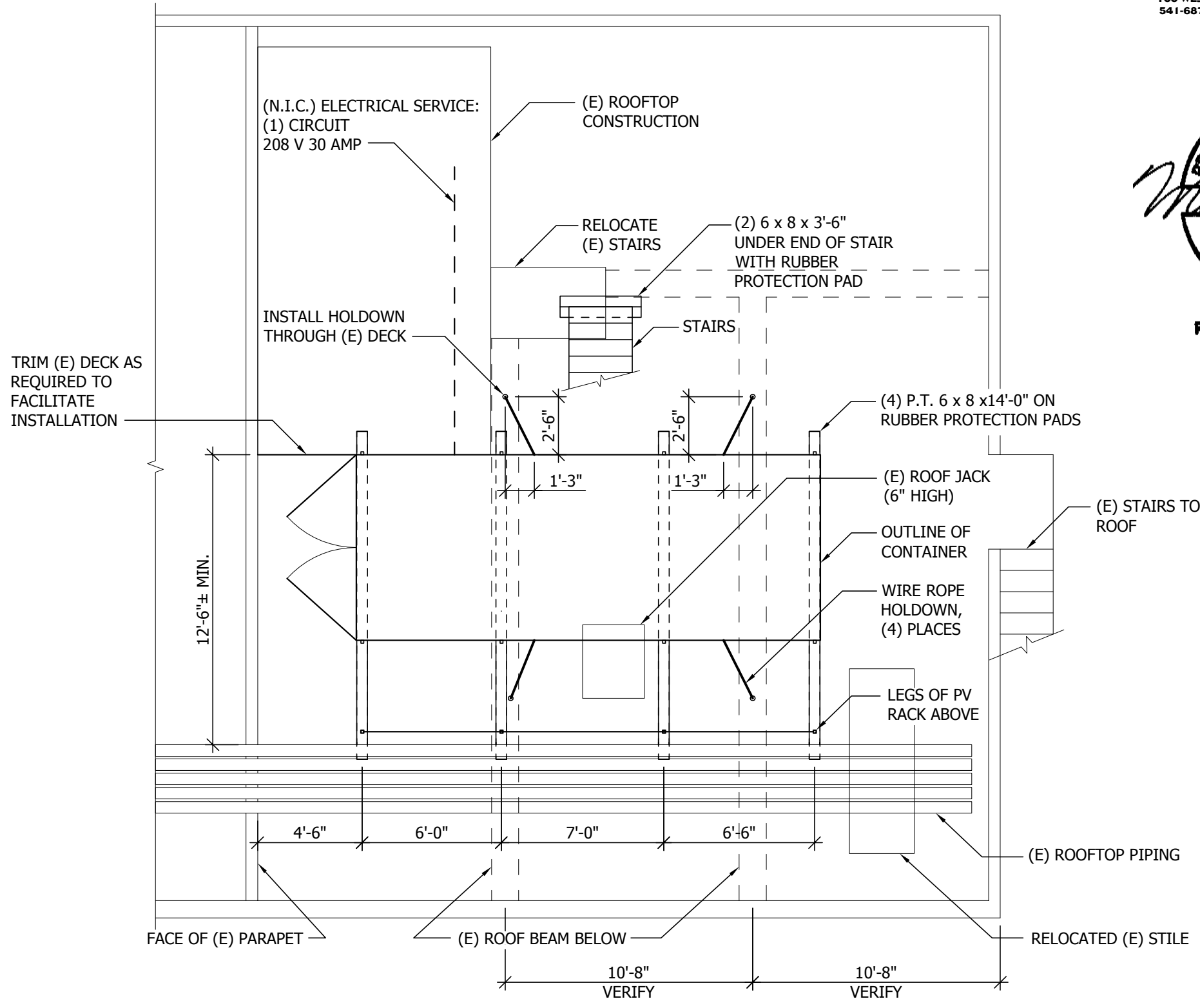
SCALE:
AS SHOWN

DRAWING NO.:
S1

No.	Revisory/Issue	Date



RENEWAL DATE: 12-31-2012



1
S2
PARTIAL ROOF PLAN
 SCALE: 3/16" = 1'-0"

NORTH

N.I.C. : NOT IN CONTRACT

DRAWING TITLE:
PARTIAL ROOF PLAN

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PROJECT NAME:
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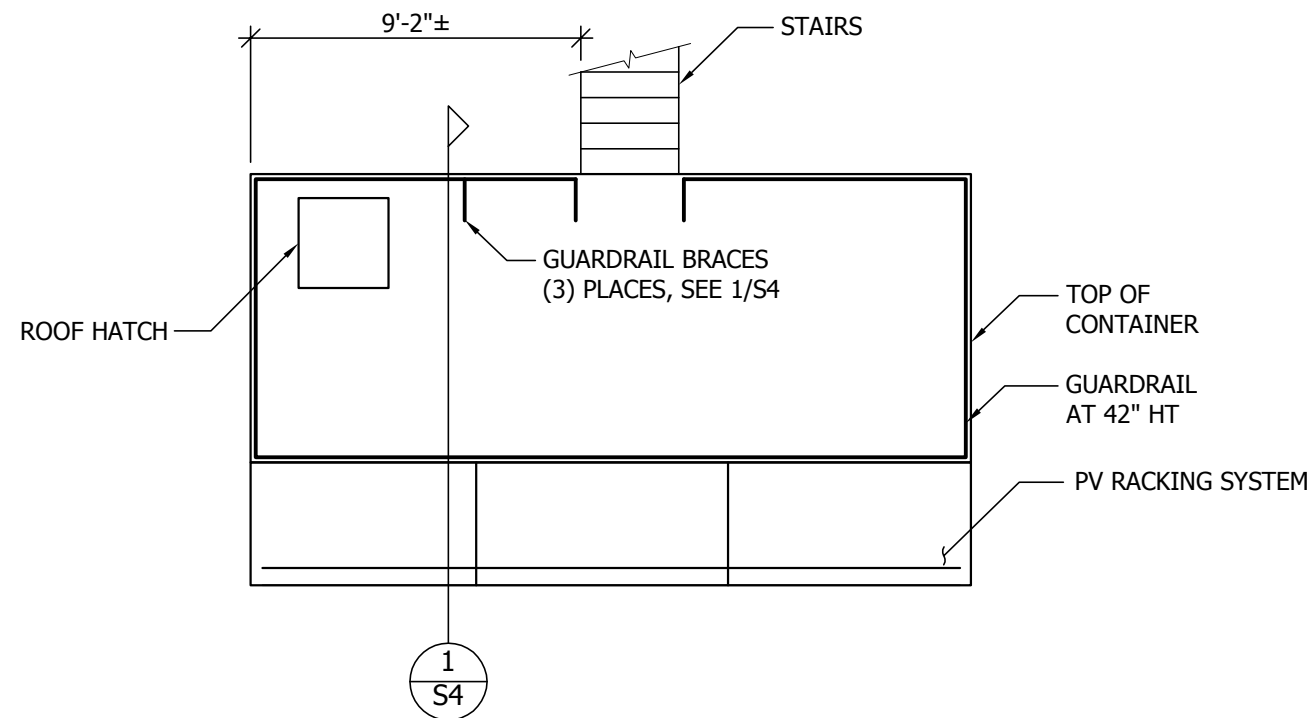
SCALE:
AS SHOWN

DRAWING NO.:
S2

No.	Revisory/Issue	Date



RENEWAL DATE: 12-31-2012



1
S3

TOP OF CONTAINER PLAN

SCALE: 3/16" = 1'-0"



NOTE:
 TOP OF CONTAINER TO BE ACCESSED
 BY RESEARCH TECHNICIANS ONLY

DRAWING TITLE:
TOP OF CONTAINER PLAN

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PROJECT NAME:
PACIFIC HALL PV

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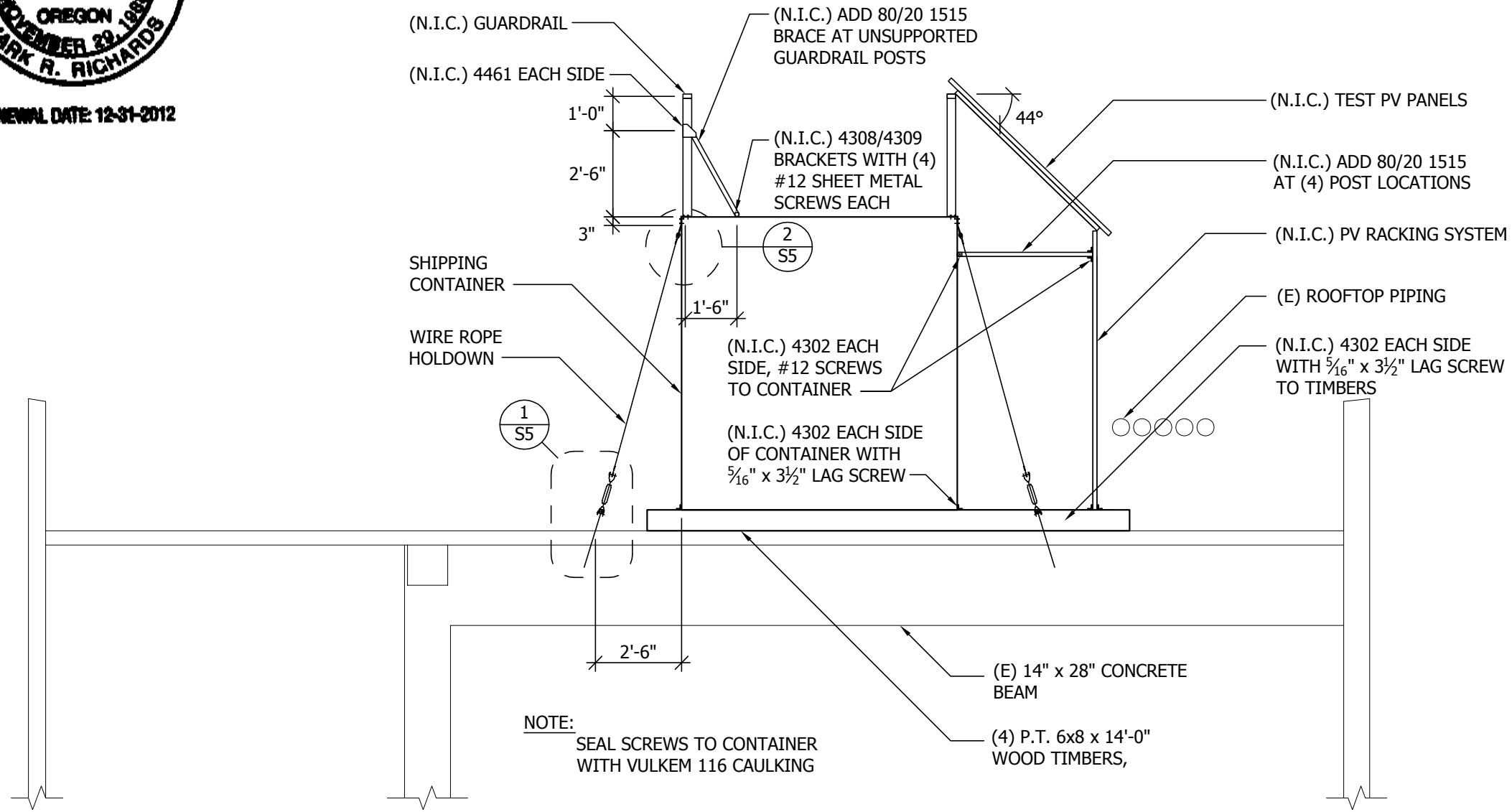
DATE:
9/11/2012

SCALE:
AS SHOWN

DRAWING NO.:
S3



RENEWAL DATE: 12-31-2012



NOTE:
 SEAL SCREWS TO CONTAINER
 WITH VULKEM 116 CAULKING

1
S4 SECTION
 SCALE: 1/4" = 1'-0"

N.I.C. : NOT IN CONTRACT

No.	Revisory/Issue	Date

DRAWING TITLE: SECTION

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PROJECT NAME:
PACIFIC HALL PV

PROJECT NO.:
519-202

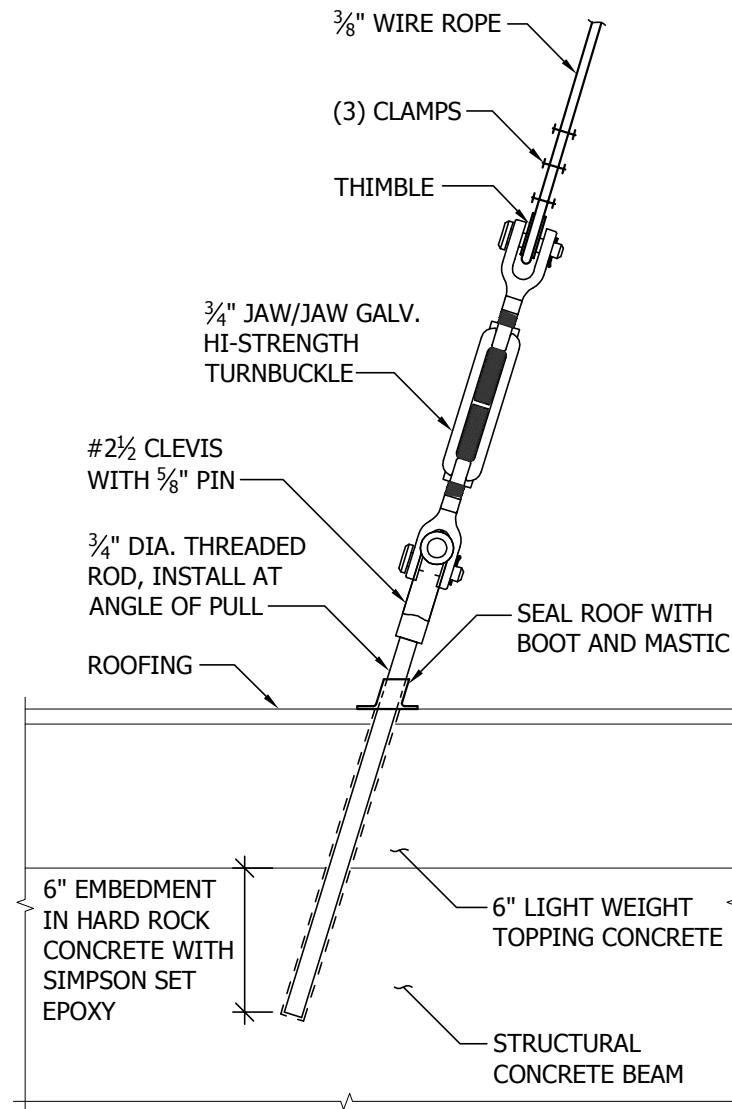
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9/11/2012

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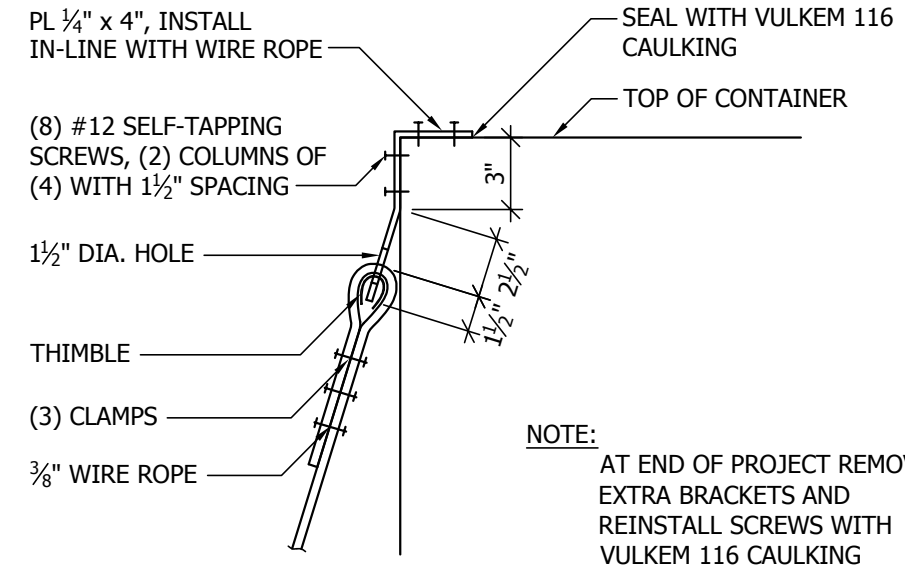
DRAWING NO.:
S4

No.	Revisory/Issue	Date

NOTE:
 AT NORTHWEST HOLDOWN
 LOCATION INSTALL THREADED
 ROD THROUGH ROOF NECK



1
S5 CONNECTION DETAIL
 SCALE: 1-1/2" = 1'-0"



NOTE:
 AT END OF PROJECT REMOVE
 EXTRA BRACKETS AND
 REINSTALL SCREWS WITH
 VULKEM 116 CAULKING

2
S5 CONNECTION DETAIL
 SCALE: 1-1/2" = 1'-0"



RENEWAL DATE: 12-31-2012

DRAWING TITLE:
CONNECTION DETAILS

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PROJECT NAME:
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DATE:
9/11/2012

SCALE:
AS SHOWN

DRAWING NO.:
S5