BY G. OHANIAN
DATE 10-20-2021
SUBJECT

RACK DESIGN & ENGINEERING CO.
412 WEST BROADWAY, SUITE #204
GLENDALE, CA. 91204
E-MAIL: rackdesign1@gmail.com

SHEET NO. 1
JOB NO. RD-20711

Received
Development Services
November 17, 2021
CITY OF PUYALLUP

APPROVED

# STRUCTURAL CALCULATIONS OF STORAGE RACKS FOR:

CODEL ENTRY SYSTEMS CORPORATION

901 NORTH LEVEE ROAD

PUYALLUP, WA 98371


Digitally signed by
Garnik Ohanian
Date: 2021.11.04
11:44:51 -07'00'

EXPIRES 12-26-21

PER IBC 2018, ASCE 7-16

RMI/ANSI/MH16.1:2012

STORAGE RACKS CAPACITY:

3500 #/ LEVEL

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

CALCS. 1 THRU 4

DRAWINGS: RD-20711

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SHEET NO. 2
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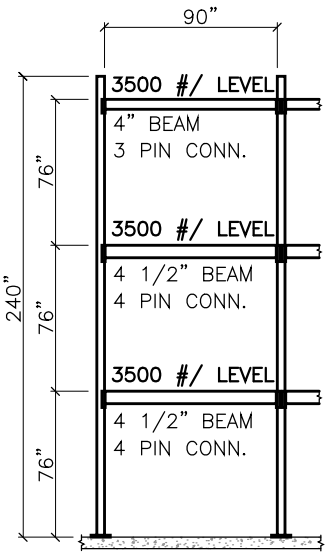


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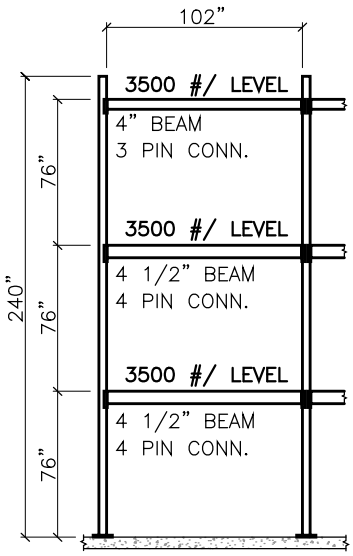


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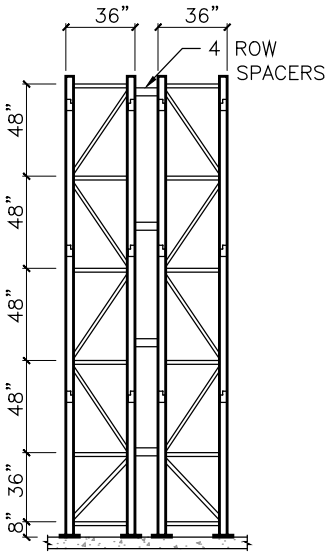
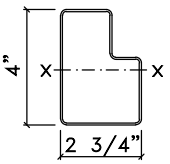



SIDE VIEW

## BEAM DESIGN




$I_x = 1.63$

$S_x = .77$

$F_Y = 55^{KSI.}$

t=.06" (16 GA.)

LOAD PER BEAM + 25% IMPACT LOAD

$(3.5^K \times .88) + (1.8^K \times .25) = \frac{3.5}{2_{BEAMS}} = 1.8^K$

$M = \frac{wL^2}{8} = 22\,"K$

$S_R = .68 < .77$

$\Delta = \frac{5 \times w L^4}{384.I^X.E} = .51" < \frac{L}{180} = .57"$

## SEISMIC DESIGN

$V = \frac{S_{DS} \times I}{R \times 1.4} \times W$ IBC 2018, ASCE 7-16
RMI/ANSI/MH16.1:2012

$S_{DS} = 1.00$ SITE CLASS D

I=1 NO PUBLIC ACCESS

R=6 MOM. CONN. RMI 2.6 AND 2.6.3

R=4 BRACED CONN.

W= D.L.+(.67xPRODUCT LOAD)

LOAD PER COL. $= \frac{3 \times 3.5^K}{2_{COL.}} = 5.2^K$

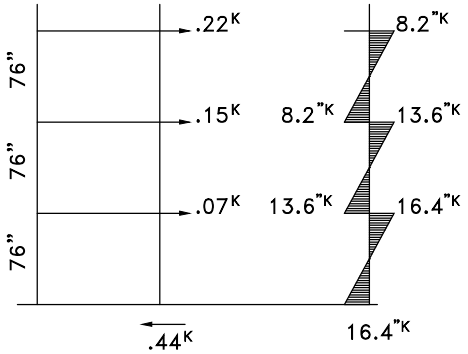
$P = .2_{DL} + (5.2^K \times 0.75) = 4.1^K$

$W = .2_{DL} + (5.2^K_{PL} \times 0.67) = 3.7^K$

$V_{LONGIT.} = .44^K$

$V_{TRANS.} = .66^K$

LONGIT. SEISMIC



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SHEET NO. 3
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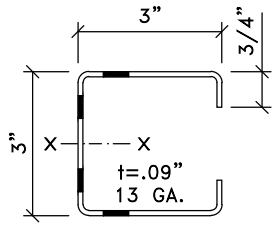
## COLUMN DESIGN




$F_Y = 55$ KSI
$A_e = .78$
$I_x = 1.19$
$S_e = .8$
$r_x = 1.2$
$r_y = 1.1$

$\frac{KL}{r_x} = \frac{76 \times 1.0}{1.2} = 62$

$\frac{KL}{r_y} = \frac{36}{1.1} = 33$

$M_n = S_e . F_y = 44$

$Fe = \frac{\pi^2 x E}{(\frac{KL}{r_x})^2} = 76$

$F_n = F_y(.658^{\lambda_c^2}) = 41$ KSI

$P_n = F_n . A_e = 32.0$ K

$\lambda_c = \sqrt{F_y / Fe} = 0.85$

$\lambda_c < 1.5$

## COMBINED STRESS RATIO

$Pex = \frac{\pi^2 E . Ix}{(KL)^2} = 60.0$

$ax = 1 - \frac{\Omega c P}{Pex} = .88$

$\Omega c = 1.8$
$\Omega b = 1.67$
$Cmx = .85$

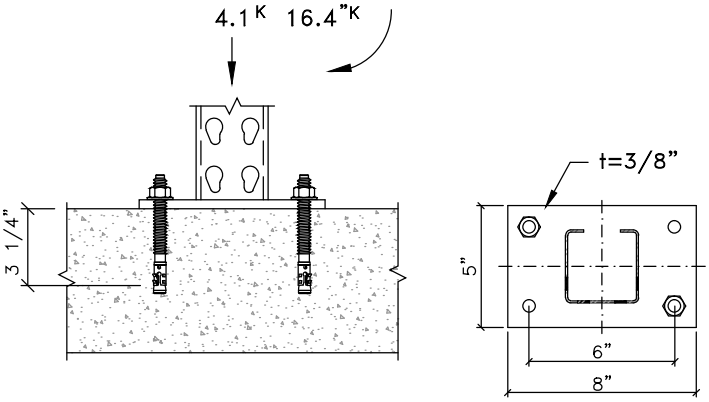
$\frac{\Omega c . P}{P_n} + \frac{\Omega b . Cmx . M}{M_n . ax} = .84 < 1$

## BASE PLATE

ANCH. TENSION = .66 K

ANCHOR SHEAR = .22 K

(2)-1/2"ø ANCHORS PER BASE PL., 3 1/4" EMB.
HILTI KWIK BOLT-TZ ESR-1917
PERIODIC SPECIAL INSPECTION IS REQUIRED




## MOMENT AT BEAM CONNECTION

.5x.09x1x65=2.9 K BEARING CAPACITY OF COL. HOLE

7/16"ø RIVET

A = .1 Fy = 79 KSI

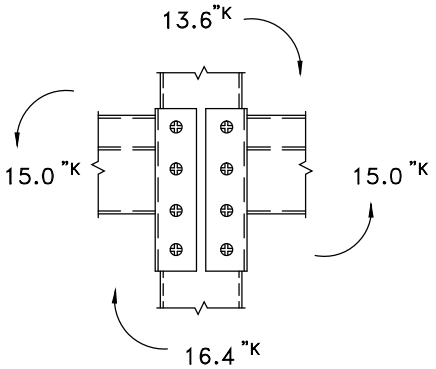
Pa = .1x79x.4 = 3 K

$Ma_{CONN.} = (2.9^K x 6") + (2.0^K x 4") = 25.4^{"K}$ 4 PIN CONN. 1st & 2nd LEVELS

$Ma_{CONN.} = (2.9^K x 4") + (1.5^K x 2") = 14.6^{"K}$ 3 PIN CONN. 3rd LEVEL

$M_{END} = .01 x w l^2 = 1.8^{"K}$

$M = 15.0^{"K}$ SEISMIC $M = 16.8^{"K}$ TOTAL



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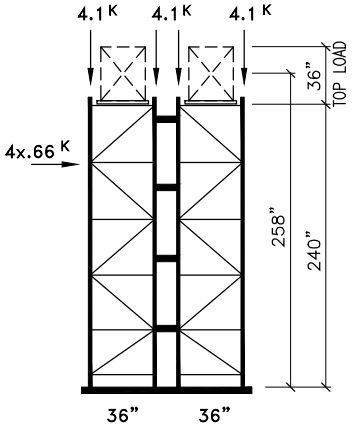
OVERTURNING

$M_{OT} = .66^{K} x 4_{COL.} x 246" x 0.66 = 428^{"K}$

$M_R = 4.1^{K} x 4 x 42" = 688^{"K}$

NO UPLIFT




TOP LEVEL 100% LOADING

$W = 0.2_{DL} + 1.8_{LL} = 2.0^{K}$ LOAD PER COL.

$V = .35^{K}$

$M_{OT} = .35^{K} x 4_{COL.} x 228" = 319^{"K}$

$M_R = 2.0^{K} x 4 x 42" = 336^{"K}$

NO UPLIFT

LOAD TO DIAGONAL

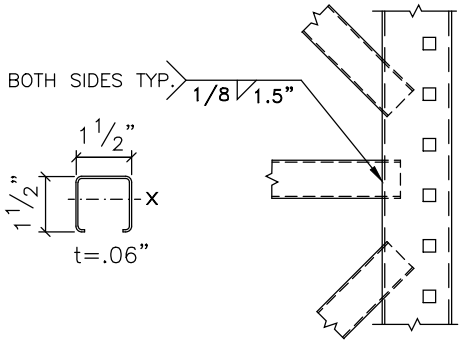
$P = .66^{K} x 2_{COL.} x \frac{46}{36} = 1.7^{K}$

$F_Y = 55^{KSI}$

$Ae = .26$

$r_x = .48$

$L = 46"$ $P_a = 4.1^{K}$




CHECK WELDS

$P_n = L.t.F_u = .06 x 1.5" x 65 = 5.9^{K}$

$\Omega = 2.35$

$\frac{P_n}{\Omega} = \frac{5.9^{K}}{2.35} = 2.5 x 2_{SIDES} = 5.0^{K}$

CHECK SLAB

$\frac{4100}{1000} = 4.1^{\square'}$ $4.1 x 144 = 590^{\square"}$

$\sqrt{590} = 24"$

$M = \left(\frac{7.5}{12}\right)^2 x 1000 x \frac{1}{2} x 12 = 2344^{"\#}$

$S = \frac{12 x 6^2}{6} = 72$

$\frac{2344}{72} = 33 < 1.6\sqrt{2500} = 80$