FPP Structural Checksheet Response

Permit #: 12-172563-000-00-FA **Date:** _____

Customer name and phone number: _____

Note: *Please number each change in the '#' column. Use as many lines as necessary to describe your changes. Indicate which reviewer's checksheet you are responding to and the item your change addresses. If the item is not in response to a checksheet, write* **customer** *in the last column.*

#	**Description of changes, revisions, additions, etc.**	Checksheet and item #
1	Please address the adequacy of the roof structure to support the new condensing units located on top of the roof. - *Stamped Structural engineering calcs from Norm Faris at KPFF attached confirming ability of roof to support new condensing units*	
2	The detail for the attachment between the rooftop condensing unit sleeper and the roof structure is indicated to be by others. Please provide the detail for that connection. - *Structural detail from Norm Faris at KPFF attached showing requirements for connection between CU sleeper and roof structure*	

kpff Consulting Engineers

September 27, 2012

Mr. Sean Murray
Alliant Systems
1600 NW 167th Place, Suite 330
Beaverton, Oregon 97006

RE: HVAC Work for KEEN 3rd Floor Server Room; Cooling Units, Roof Top Condensing Units & Piping
Application 12-172563-000-00-FA
Structural Plan Check Response

Dear Sean:

Below is our response to the structural plan check sheets that we received from the City of Portland Bureau of Development Services dated September 27, 2012. This response is intended to be reviewed in conjunction with the attached structural calculations and drawing SK1, dated September 27, 2012.

Item 1
Please address the adequacy of the roof structure to support the new condensing units located on top of the roof.

KPFF: Please reference attached structural calculations verifying the adequacy of the roof structure to support the new condensing units located on top of the roof.

Item 2
The detail for the attachment between the rooftop condensing unit sleeper and the roof structure is indicated to be by others. Please provide the detail for that connection.

KPFF: Please reference sheet SK1 for the connection detail.

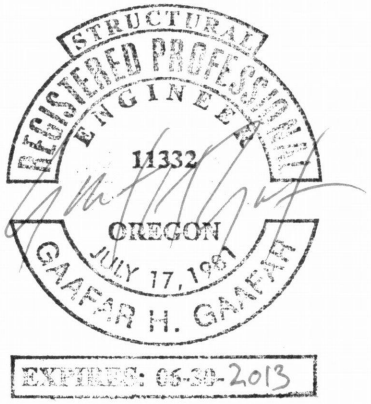
If you have any questions or need further information, please call me.

Sincerely,

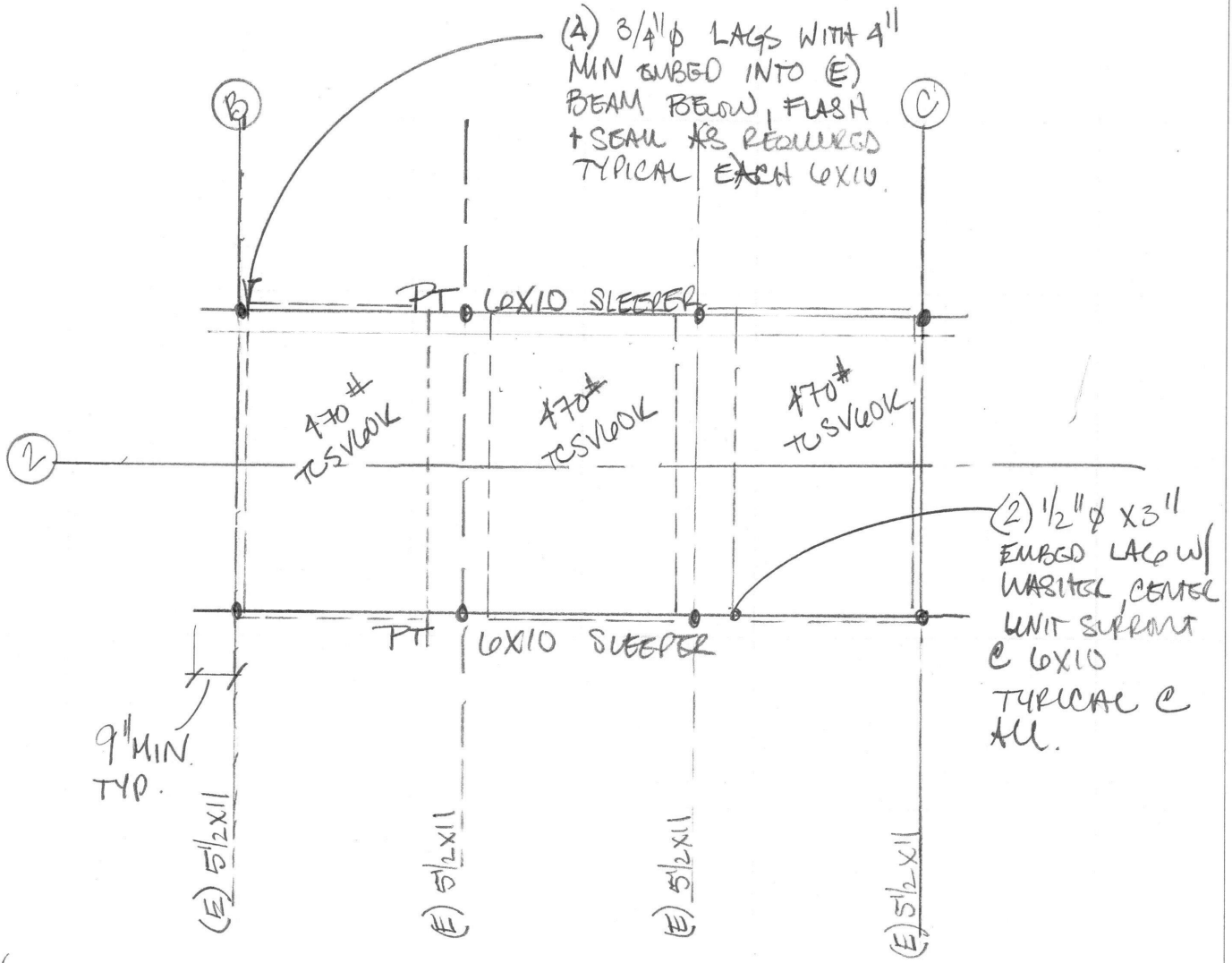
Jose Machuca

Jose H. Machuca

JHM/jkd
212221\10 - pes – hvac – 9-27-12.doc



kpff Consulting Engineers Portland, Oregon	Project PEARL	By	Sheet No.
	Location 1313 LOUISAN	Date 9/4	SK1
	Client ALLIANT.	Revised	Job No.
	LOUVRE TOWER.	Date	



NOTE

1. LUMBER SHALL BE DFL No 1, PRESSURE TREATED.
2. ALL LAGS SHALL BE GALVANIZED
3. SEAL + FLASH SLEEPER TO EXISTING ROOF STRUCTURE AS REQUIRED
4. NOTIFY ENGINEER IF FIELD CONDITIONS VARY FROM THOSE SHOWN

SK1 CONNECTION BETWEEN ROOFTOP & SLEEPER

kpff Consulting Engineers
Portland, Oregon

Project PEARL	By	Sheet No. 1
Location	Date 9/27/12	
Client	Revised	Job No.
SERVER COOLING TOWER.	Date	

CHECK STRUCTURE FOR ADDITIONAL 3 UNITS @ 470# EACH DISTRIBUTED TO 2 POSTS

TOTAL ADDITIONAL PER POST
$= 3 \cdot 470\#/2 = 705\#$.

TOTAL ADD PER COLUMN % INCREASE

$147.2 + 0.705 / 147.2$

$= < 0.5\%$ OK.

CHECK TOTAL ADDITIONAL ON ROOF ALONE AS UNIFORM ASSUMING 20 PSF BASE

$705\# \times 2 / 6' \times 20'$ (INFLUENCE AREA BETWEEN)

11.8 PSF.

ASSUME 1/2 TOTAL LOAD UNIFORM DIST ON (E) 5½x11 BEAM.
CHECK BEAM FOR LOAD.

20 + = 20 DL.
25 LL.
45.0 TL.

$M = \left(45.0 \times 5.25' + 705\#/20'\right)(16')^2/8$

$= 8688\#\cdot ft$

$S = 110.in^3$ $A = 60.5.in^2$.

$f_b = 8688 \times 12 / 110 = 948$ PSI OK

$f_v = 2172(3/2)/60.5 = 54$ PSI OK

$F_b' = 1503$ $F_v' = 195$

BEAM OK TO SUPPORT ADDL LOADING BY UNIT.

GIRDERS OK BY INSPECTION W/ ADDITIONAL
$705\#/2 = 353\#$ SHEAR.

kpff Consulting Engineers
Portland, Oregon

Project		By NJF	Sheet No. 2
Location		Date 9/27/12	
Client		Revised	Job No.
		Date	

COOLING TOWER SEISMIC DESIGN AND BASE CHECK.

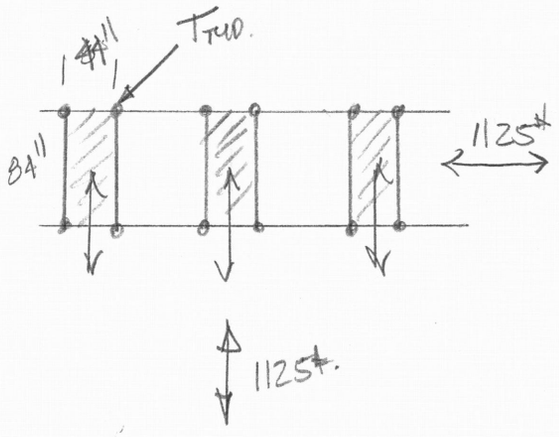
$W_p = 470^{\#} \times 3 = 1410^{\#}$

$F_{ph} = 0.7 \cdot 1.14 \cdot 1410^{\#} = \underline{1125^{\#}}$

$F_{pv} = 0.7 \cdot 0.2 \cdot S_{ds} \cdot 1410^{\#} = \underline{100^{\#}}$

$S_{ds} = 0.506$

DESIGN SLEEPER TO RESIST O.T + SHEAR BY (3) UNITS



$T_{E/W} = \frac{0.6 \cdot 470^{\#}}{4} - \frac{1125^{\#}(27.5")}{3} / 44" \cdot 2 - 33^{\#}/4.$

$= 70.5^{\#} - (118^{\#} + 8^{\#})$

$= \underline{55^{\#}}$ ↑ MAX. ↔

$T_{N/S} = \frac{0.6 \cdot 470^{\#}}{4} - \frac{1125^{\#}(27.5")}{3} / 84" \cdot 2 - 33/4$

$= 70.5^{\#} - (61.4 + 8^{\#})$

$= \phi$ NO NET T.

$V_{BOLT} = 1125^{\#}/4 \cdot 3 \text{ UNITS} = \underline{94^{\#}}$

$T_{BOLT} = \underline{55^{\#}}$

(2) 9/16 HOLES PROVIDED PER LEG. ✓
USE 1/2"ϕ LAG INTO SLEEPER.

$V_{ALL} = 1.6 \cdot 320^{\#} = \underline{512^{\#}}$

$T_{ALL} = 1.6 \cdot (267^{\#}/\text{IN} \cdot 3") = \underline{1761^{\#}}$

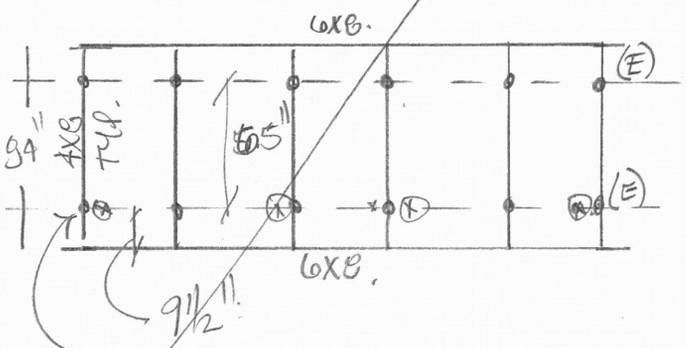
$\frac{94}{2 \cdot 512^{\#}} + \frac{55^{\#}}{2 \cdot 1761^{\#}} =$ ✓

$0.09 + 0.016 = \underline{0.106} << 1.$

USE (2) 1/2"ϕ GALV LAG SCREWS W/ MIN 3" PENETRATION

DESIGN SLEEPER ATTACHMENT TO STRUCTURE.

USE 6X8 LONG SLEEPER + 4X8. PERPENDICULAR SLEEPERS TO SUPPORT + ACCOMMODATE FEET.



$T_{SLEEPER} = \frac{94}{605} \cdot 55^{\#} = 7^{\#}$ PER BOLT.

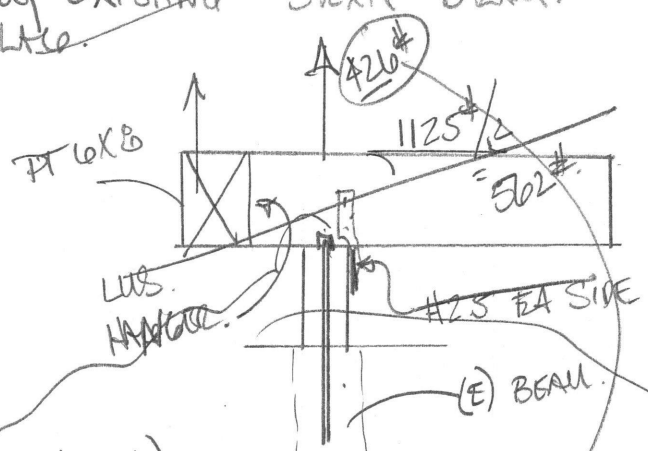
OR $142^{\#}$/UNIT

OR $426^{\#}$ TOTAL

kpff Consulting Engineers
Portland, Oregon

Project		By NJF	Sheet No. (3)
Location		Date 9/27/12	
Client		Revised	Job No.
		Date	

USE PT 4X8 SLEEPER ALONG W/ EXISTING 5½X11 BEAM. LAG.



MIN (4) LAGS PER SIDE.

T = 426/4 = 106#

V = 562/4 = 140#.

(4) 5/8"ϕ LAG W/ 4" PENETRATION OK. INTO (E) BEAM.

BY INSPECTION ALL LUMBER OK.

MAX V ON 4X8.

470# + 426# + 175#
2 (2)

= 244# MAX SHEAR

244 / 3.25 · 7.5 = 15 psi OK

4X8. PT OK

BENDING OK -

PT 4X8 TO SLEEPER

USE SIMPSON H2.5A (MIN).

V = 562#/6 = 94#

130# OK.

UPLIFT.

426#/6 = 71#

535# OK.

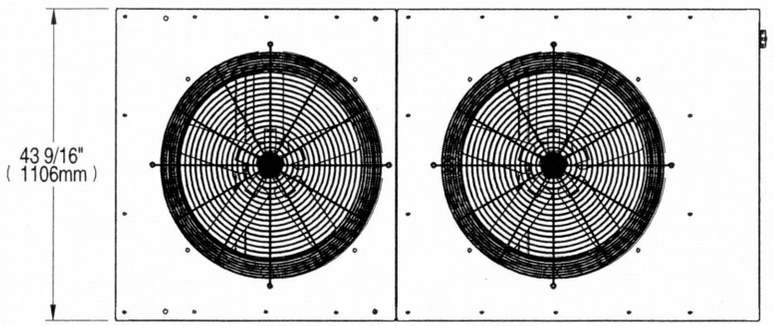
HANGER. TO 6X8.

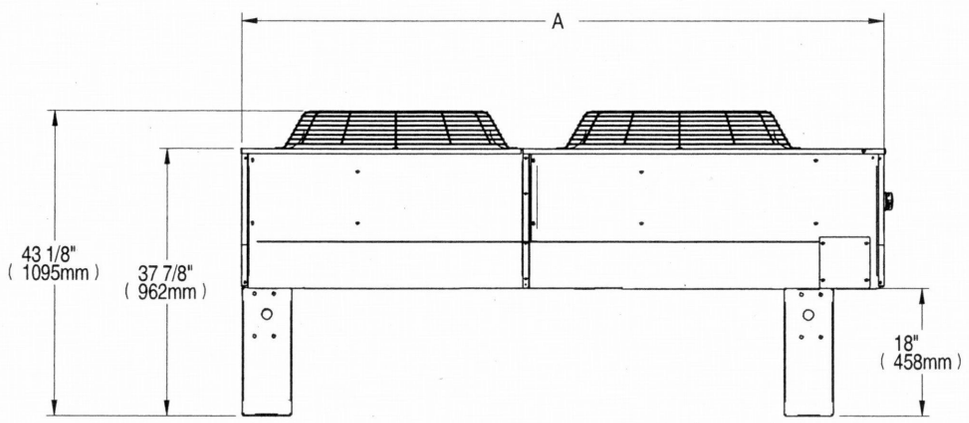
LUS46 T = 1000#

OK.

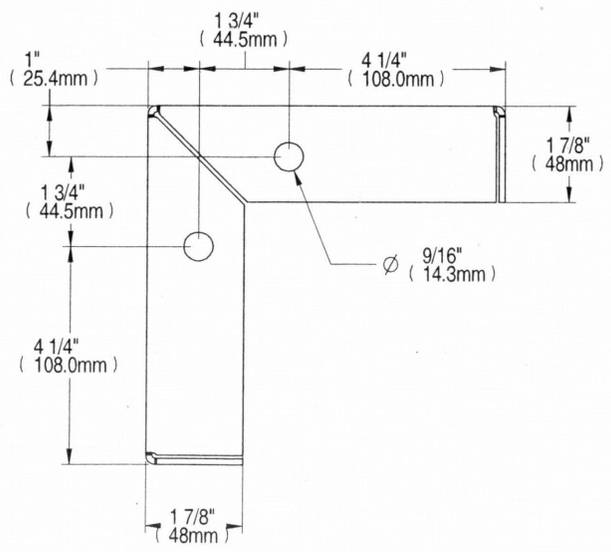
CABINET & ANCHOR DIMENSIONAL DATA

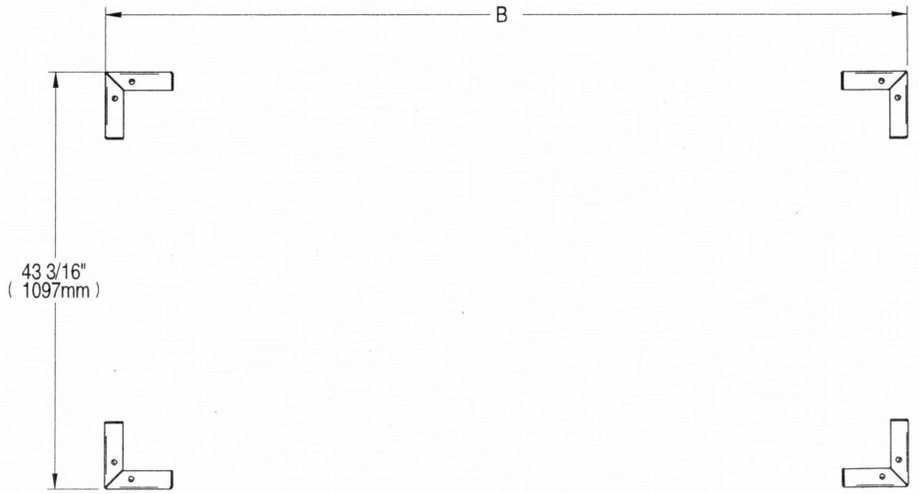
R-410A VFD CONTROL SINGLE CIRCUIT CONDENSERS 60 Hz



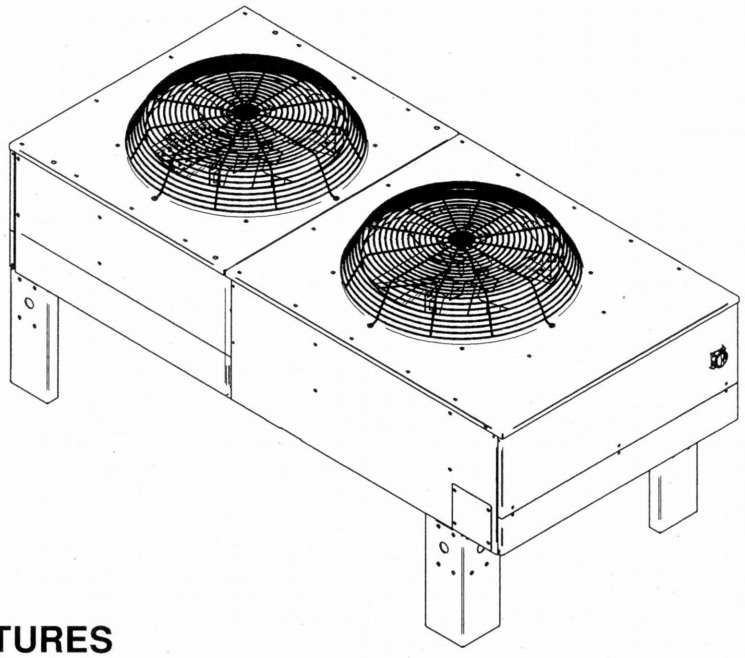


LIEBERT MODEL NO.	NO. FANS	A		B		NET WEIGHT	
		IN.	MM	IN.	MM	LBS.	KG
~~TCSV28K~~	~~1~~	~~51 1/2~~	~~1308~~	~~44~~	~~1118~~	~~325~~	~~148~~
TCSV60K	2	91 1/2	2324	84	2134	470	213
TCSV90K	3	131 1/2	3340	124	3150	670	304





LIEBERT AIR COOLED R-410A VFD CONTROL CONDENSERS (5)



STANDARD FEATURES

COIL The coil is constructed of copper tubes in a staggered tube pattern. Tubes are expanded into continuous, rippled or enhanced aluminum type fins. The fins have full depth fin collars completely covering the copper tubes which are connected to heavy wall type L headers. Inlet coil connector tubes pass through relieved holes in the tube sheet for maximum resistance to piping strain and vibration. Coils are factory leak tested at a minimum of 475 PSIG, dehydrated, then filled and sealed with a nitrogen holding charge for shipment.

FANS Blades are constructed of zinc plated steel or aluminum with a diameter of 26 inches and secured to the fan shaft by a heavy duty hub with set screw. Fan guards are heavy gauge, close meshed, steel wire with corrosion resistant finish. Fans are factory balanced and tested before shipment.

FAN MOTORS The variable speed fan motor is a specifically designed inverter duty motor with permanently lubricated ceramic bearings. The Liebert variable frequency drive (VFD) control system provides overload protection for the variable speed motor. Each ambient-temperature-controlled fan motor has built-in overload protection. All motors have rain slingers, permanently lubricated bearings and are rigidly mounted on die-formed galvanized steel supports.

HEAD PRESSURE CONTROL The Liebert VFD Condenser control system is complete with variable frequency drive (VFD), inverter duty fan motor operating from 0% to 100% motor RPM based on head pressure, refrigerant pressure transducers, ambient-temperature thermostat(s), motor overload protection, and electrical control circuit factory wired in the control panel. VFD control is always furnished on the fan adjacent to the connection end of the condenser which runs continuously with the compressors. Other condenser fans are controlled by ambient thermostats and are either "on" or "off". This system allows for operation at ambient conditions as low as -20°F (-28.9°C).

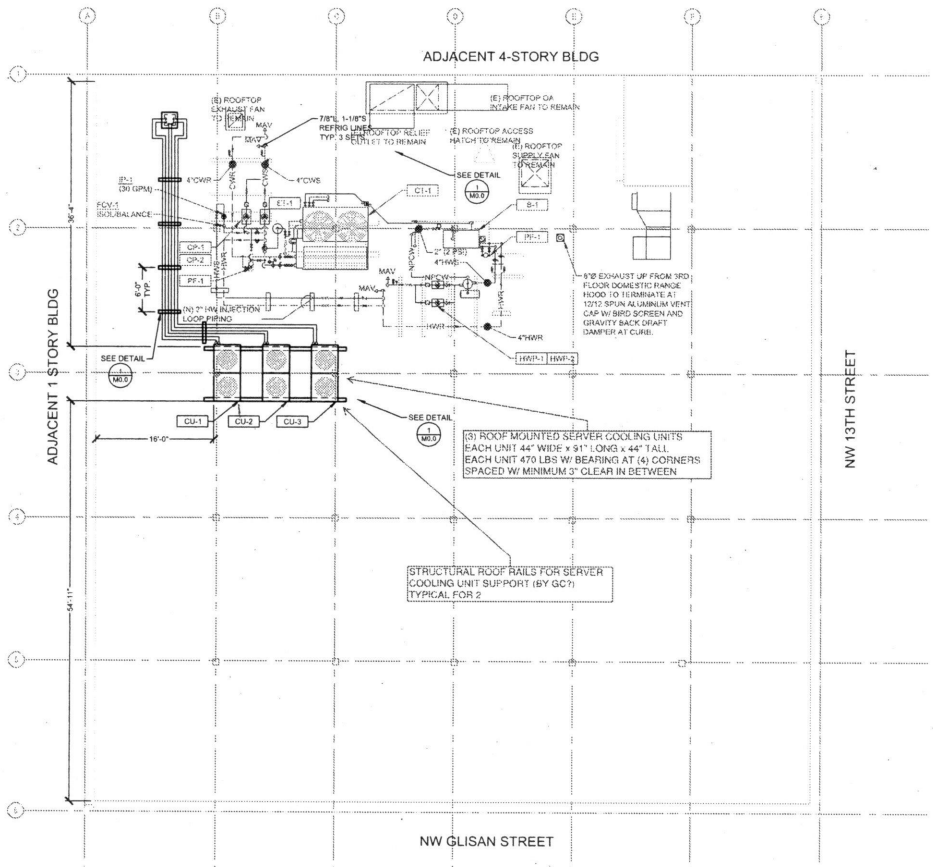
HOUSING The condenser housing is constructed of bright aluminum sheet and divided into individual fan sections by full width baffles. Structural support members, including coil support frame, motor, and drive support, are galvanized steel for strength and corrosion resistance. Aluminum legs are provided with rigging holes for hoisting the unit into position.

SPD & UNIT DISCONNECT SWITCH Surge Suppression Device and locking disconnect factory installed and wired in enclosed condenser control section.

ALARM CONTACTS Normally open dry contacts provided for indication of VFD and SPD alarm condition.

OPTIONAL FEATURES

FUSIBLE PLUG SERVICE KIT Provides compliance for local codes requiring fusible-plug-type pressure relief devices. Shipped loose for field installation on each liquid line.



1 M2.6 MECHANICAL ROOF LEVEL HVAC PLAN
1/8"=1'-0"

4' 2' 0' 4' 8'

ALLIANT SYSTEMS, LLC
1600 NW 167th PL, STE 330
BEAVERTON, OR 97006
PHONE: 503/619-4000
FAX: 503/230-9238
WWW.ALLIANT-SYSTEMS.COM
CCB# 153420

REGISTERED PROFESSIONAL ENGINEER 64563PE OREGON 01/25/2000 SEAN C. MURRAY
PRELIMINARY
EXPIRES 12-31-12

REVISIONS: DATE

KEEN
SERVER ROOM

1313 NW GLISAN ST.
PORTLAND, OR

DRAWING REVIEW

DEPT	INITIALS	DATE
CAD		
DESIGNER		
P.M.		
ENGINEER		
FIELD		

MECHANICAL
ROOF LEVEL
HVAC PLAN

ENGINEER: S. MURRAY
CAD: E. STOYAN
LAST RE-ISSUED:
ISSUE DATE:

DRAWING NUMBER: C-0330-22074

PRELIMINARY

SHEET NUMBER: **M2.5**

#1

STRUCTURAL CALCULATIONS

FOR:

Alliant Systems

REGARDING:

HVAC Seismic Connections

LOCATION:

Keen Server Room
1313 NW Glisan St., Portland, OR

AE1242

September 21, 2012

Expires 12/31/13

ARCHER ENGINEERING, LLC 2345 NE 37TH AVE PORTLAND, OR 97212
P 503.281.6441 F 503.281.6441 C 503.730.3357 E archereng@comcast.net

Project:	HVAC Seismic Connections - Keen Server Room	*Page:* 1 of 3
Location:	1313 NW Glisan St., Portland, OR	*Job #:* AE1242
Client:	Alliant Systems	*Date:* Sept. 21, 2012

IBC2006 (1613), ASCE 7-05 CHAPTER 11, 12, 13 SEISMIC DESIGN CRITERIA

Soil Site Class D	Table 20-3-1, Default = D	
Response Spectral Acc. (0.2 sec) S_s =98.30%g	= 0.983g	Figure 22-1 through 22-14
Response Spectral Acc.(1.0 sec) S_1 =34.60%g	= 0.346g	Figure 22-1 through 22-14
Site Coefficient F_a = 1.107		Table 11.4-1
Site Coefficient F_v = 1.708		Table 11.4-2
Max Considered Earthquake Acc. $S_{MS} = F_a \cdot S_s$	= 1.088	(11.4-1)
Max Considered Earthquake Acc. $S_{M1} = F_v \cdot S_1$	= 0.591	(11.4-2)
@ 5% Damped Design S_{DS} = 2/3(S_{MS})	= 0.725	(11.4-3)
S_{D1} = 2/3(S_{M1})	= 0.394	(11.4-4)

13.3 Seismic Demands on Nonstructural Components

$$F_p = \frac{0.4 a_p S_{DS} W_p (1+2z/h)}{(R_p/I_p)}$$ (13.3-1) S_{DS} = 0.725

a_p = 2.5 R_p = 6 T-13.5-1 or 13.6-1

I_p = 1.0 13.1.3

z = 20 ft h = 20 ft F_p = 0.363 Wp

Max $F_p = 1.6 S_{DS} I_p W_p$ = 1.161Wp (13.3-2)

Min $F_p = 0.3 S_{DS} I_p W_p$ = 0.218Wp (13.3-3)

F_p = 0.363 Wp x.7 = .254 Wp. /ASD

2005 ASCE 7 Standard
Latitude = 45.526594
Longitude = -122.684688
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.05 deg grid spacing

Period (sec)	Sa (g)
0.2	0.983 (Ss, Site Class B)
1.0	0.346 (S1, Site Class B)

Design of the connection of a HVAC unit to wood floor system

2010 OSSC /ASCE 7-05 Sec. 13.6 - Mechanical and Electrical Component Seismic Design Requirements

IRC-1,2,3

Loading :

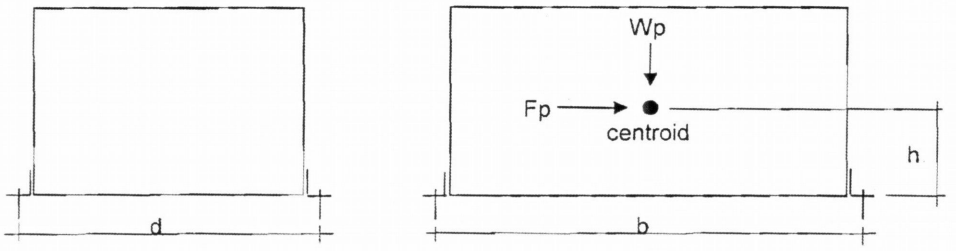
Unit Weight =	850	lbs. (Wp)	maximum
Centroid Height =	3.5	ft (h)	
Floor Height =	20.00	ft. (hr)	maximum

Design Forces :

Use Loads For: ASD (ASD or USD)

Equipment Element :

Fp = 0.254 (see page 1) 850 lbs x Fp = 215.90 lbs.



Connection Design :

Tension Load: Overturning Moment 10579 in. lbs. (Fp x h)
Resisting Moment 18742.5 in. lbs. (Wp/2 x d x .9)
Mr > Mo - No Tension Force

Shear connections:

Unit to Floor:

# of anchor attachments (n): 2 per side of unit
Base Material: I-joists w/ 3/4 ply & 4x4 blocking

d= 49 in.
b= 89 in.
h= 49 in.
Perimeter = 276 in.

Shear force per fastener = 108 lbs (Fp / n)

Use (4) L2x4x12 gage angles w/(2) Simp SDS screws at subfloor (3x6) and (3) #10 sheet metal screws at unit base flange
Allowable Shear per angel connection = 840 lbs

Design of the connection of a rooftop HVAC unit to 6x10 wood sleepers

2010 OSSC /ASCE 7-05 Sec. 13.6 - Mechanical and Electrical Component Seismic Design Requirements

Loading : **CU-1,2,3**

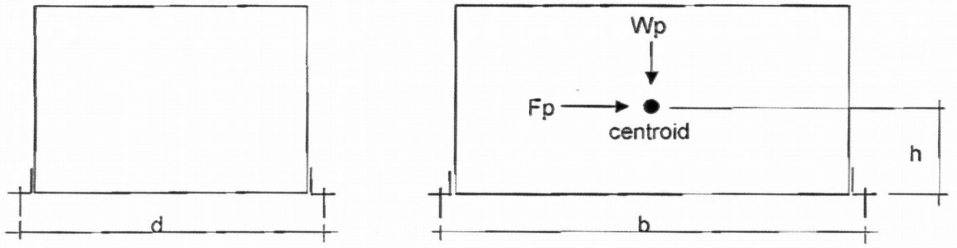
Unit Weight =	500	lbs. (Wp)	maximum
Centroid Height =	2.5	ft (h)	
Floor Height =	40.00	ft. (hr)	maximum

Design Forces :

Use Loads For: ASD (ASD or USD)

Equipment Element :

Fp = 0.2·S_I (see page 1) 500 lbs x Fp = 123.50 lbs.



Connection Design :

Tension Load: Overturning Moment 3705 in. lbs. (Fp x h)
Resisting Moment 9900 in. lbs. (Wp/2 x d x .9)
Mr > Mo - No Tension Force

Shear connections:

Unit to roof sleepers:

# of anchor attachments (n): 4 per side of unit d= 44 in.
Base Material: 6x10 PT sleeper (sleper design by others) b= 84 in.
h= 30 in.
Perimeter = 256 in.

Shear force per fastener = 31 lbs (Fp / n)

Use (2) 3/8" X 4" lag bolts at each 'foot' of fan unit.
Allowable Shear per lag bolt = 120 lbs OK.

STRUCTURAL NOTES

GENERAL

THE CONTRACTOR IS RESPONSIBLE FOR CHECKING THE PLANS PRIOR TO THE START OF CONSTRUCTION AND SHALL NOTIFY THE ENGINEER OF ANY ERRORS OR INCONSISTANCY WITH THE MECHANICAL OR SUPPLIER DRAWINGS. SHOULD QUESTIONS ARISE REGARDING THE INFORMATION SHOWN ON THESE DRAWINGS THE CONTRACTOR SHALL CONTACT THE ENGINEER BEFORE PROCEEDING. THE ENGINEER IS NOT RESPONSIBLE FOR IMPROPER CONSTRUCTION PRACTICES DUE TO MISUNDERSTANDING OR MISUSE OF THE INFORMATION ON THESE DRAWINGS.

THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE DURING THE CONSTRUCTION PERIOD FOR ALL CONDITIONS AT THE CONSTRUCTION SITE, INCLUDING SAFETY OF PROPERTY AND PERSONS. THE ENGINEER'S VISITS TO THE SITE AREA ARE NOT INTENDED, NOR SHALL THEY BE CONSTRUED TO INCLUDE A REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STRENGTH AND STABILITY OF ALL SHORING, BRACING, SCAFFOLDING AND TEMPORARY SUPPORTS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE WATERPROOFING AND FLASHING DETAILS OF ALL STRUCTURAL ELEMENTS INDICATED ON THESE DRAWINGS.

WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALE DIMENSIONS. DO NOT SCALE DRAWINGS. ALL STRUCTURAL DIMENSIONS ARE TO FACE OF FRAMING, UNLESS NOTED OTHERWISE.

CONTRACTOR SHALL REVIEW DRAWINGS WITH RESPECT TO MATERIALS, LAYOUT, ELEVATIONS, AND DIMENSIONS BEFORE STARTING WORK. ANY APPARENT DISCREPANCY, AMBIGUITY, OR CONFLICT IN THESE DRAWINGS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION. ANY REVISION TO THESE DRAWINGS SHALL BE COMPLETED BEFORE PROCEEDING WITH THE WORK AFFECTED.

CODES AND STANDARDS

2010 OREGON STRUCTURAL SPECIALTY CODE

DESIGN LOADS

DEAD LOAD – ALL COMPONENT WEIGHTS

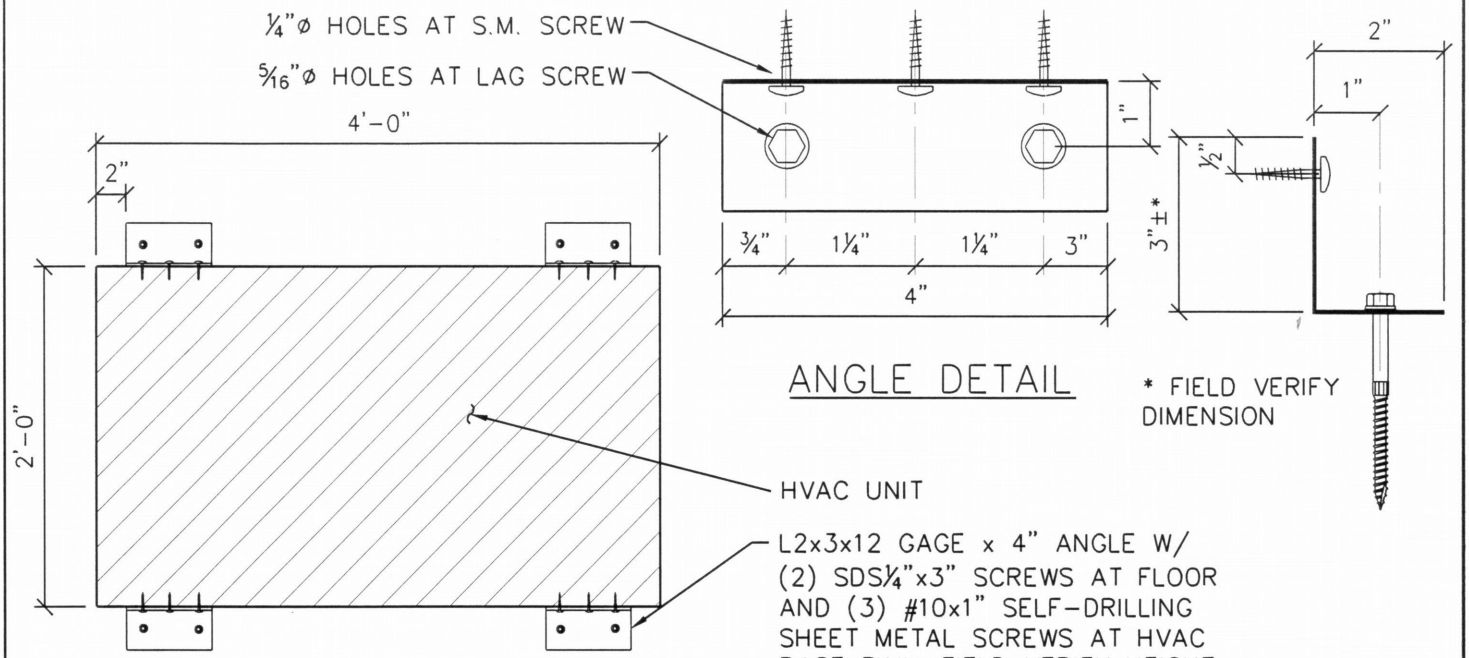
SEISMIC LOAD – Ss = .983; S1 = .346g; Fp = .254 Wp (ASD)

SCOPE OF WORK

THESE DRAWINGS AND CALCULALTIONS ONLY PERTAIN TO THE SEISMEC CONNECTIONS BETWEEN THE INDICATED UNITS TO THEIR IMMEDIATE SUPPORTING STRUCTURAL ELEMENT (FLOOR SYSTEM, ROOF-TOP SLEEPERS, ETC). THE VERTICAL LOAD ANALYSIS OF THE STRUCTURE ITSELF IS NOT PART OF THIS WORK AND ARE BY OTHERS.

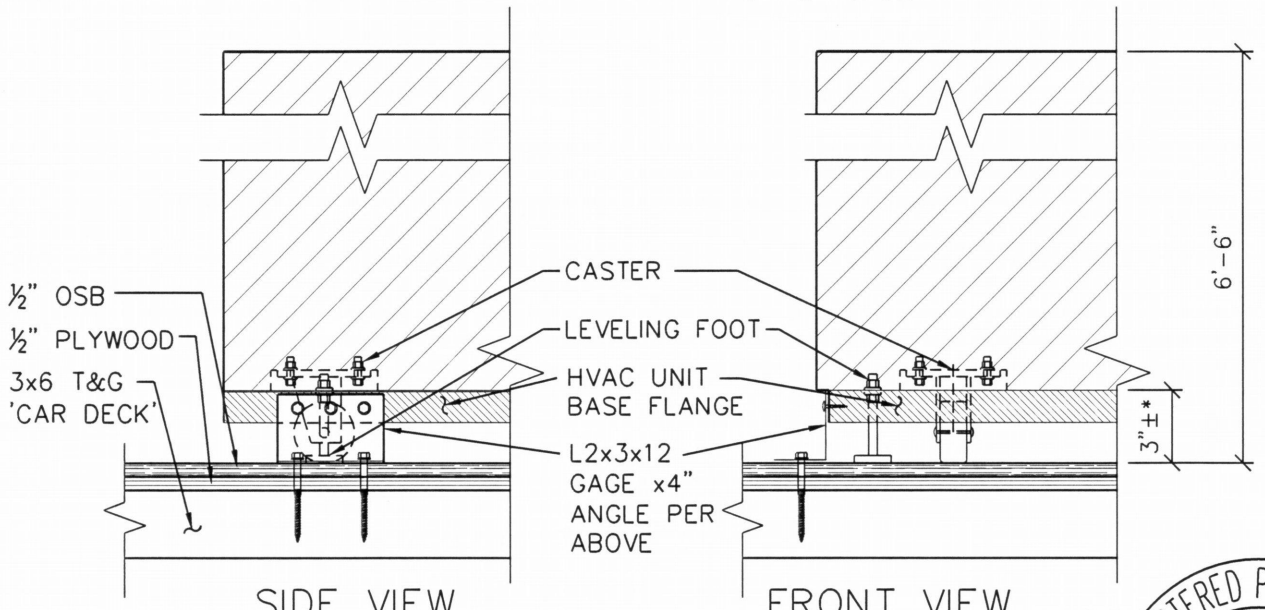
EXP. 12/31/13

HVAC UNITS - SEISMIC CONNECTIONS **KEEN SERVER ROOM** **1313 NW GLISAN ST., PORTLAND, OR**	STRUCTURAL NOTES
ARCHER ENGINEERING L.L.C. 2345 NE 37th Ave., Portland, OR 97212 P 503.281.6441 F 503.281.6441 C 503.730.3357 E archereng@comcast.net	ALLIANT SYSTEMS 1600 NW 167TH PL BEAVERTON, OR 97006 BY: MDA
	DATE: 9/21/12 PROJECT: **AE1242** DETAIL **1/S1**



HVAC UNIT BASE PLAN

ANGLE DETAIL



SIDE VIEW

FRONT VIEW

* FIELD VERIFY DIMENSION

REGISTERED PROFESSIONAL ENGINEER
67734PE
OREGON
MAR. 14, 2000
MICHAEL D. ARCHER

EXP. 12/31/13

1 / S2 **HVAC CONNECTION DETAIL**

NTS

CURB6

HVAC UNITS - SEISMIC CONNECTIONS

KEEN SERVER ROOM
1313 NW GLISAN ST., PORTLAND, OR

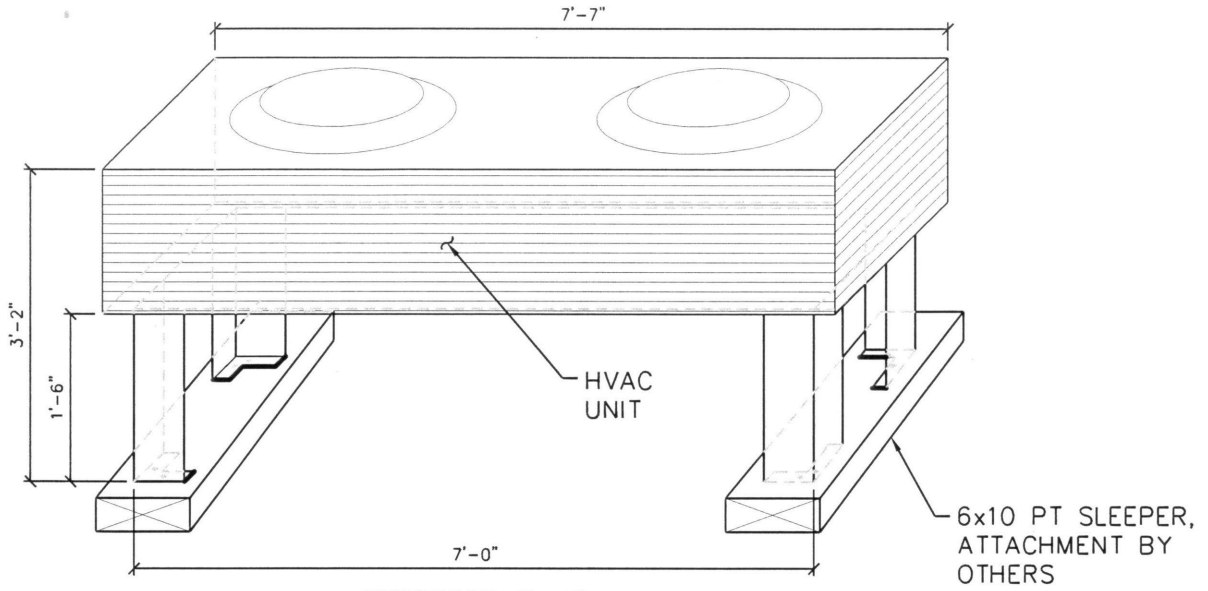
ROW COOLER UNITS IRC-1,2,3
MAXIMUM OPERATING WEIGHT 850 LBS.

ARCHER ENGINEERING L.L.C.
2345 NE 37th Ave., Portland, OR 97212 P 503.281.6441 F 503.281.6441 C 503.730.3357 E archereng@comcast.net

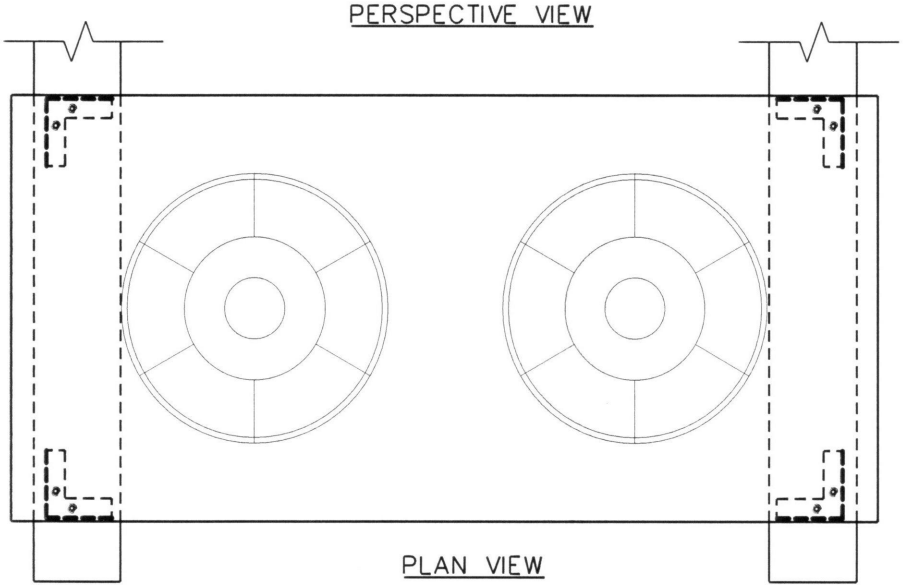
ALLIANT SYSTEMS
1600 NW 167TH PL
BEAVERTON, OR 97006

BY: MDA

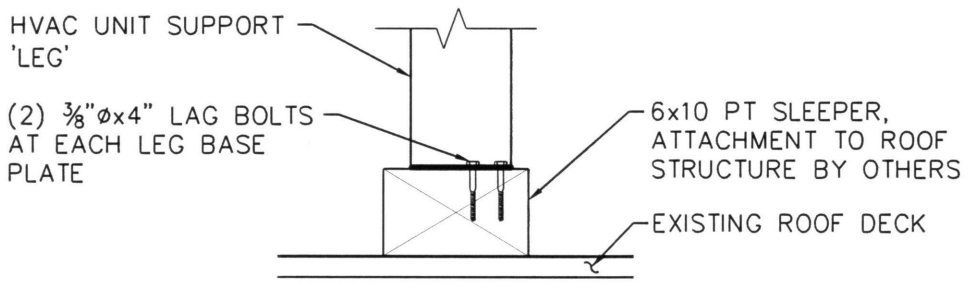
DATE: 9/21/12
PROJECT: AE1242
DETAIL S2



PERSPECTIVE VIEW



PLAN VIEW



SECTION VIEW

REGISTERED PROFESSIONAL ENGINEER
63134PE
OREGON
MAR. 14, 2000
MICHAEL D. ARCHER

EXP. 12/31/13

1/S3 **HVAC CONNECTION DETAIL**
NTS

HVAC-ROOF FAN

HVAC UNITS - SEISMIC CONNECTIONS

KEEN SERVER ROOM
1313 NW GLISAN ST., PORTLAND, OR

ROOF-TOP COOLING UNITS CU-1,2,3
MAXIMUM OPERATING WEIGHT 500 LBS.

ARCHER ENGINEERING L.L.C.
2345 NE 37th Ave., Portland, OR 97212 P 503.281.6441 F 503.281.6441 C 503.730.3357 E archereng@comcast.net

ALLIANT SYSTEMS
1600 NW 167TH PL
BEAVERTON, OR 97006

BY: MDA

DATE: 9/20/12
PROJECT: AE1238
DETAIL S3

#1

kpff Consulting Engineers

September 21, 2012

Mr. Kevin Grant
C2K Architecture Inc.
107 SE Washington St. Suite 740
Portland, Oregon 97214

RE: Pearl Building – KEEN
3rd Floor HVAC

Dear Kevin,

Attached please find calculations, sheets C1 through C2, dated September 20, 2012, which verify the structural adequacy of the existing wood framing system to support the new HVAC units being installed, as shown on drawing M2.3 dated August 14, 2012. Design is based on the requirements of the 2010 Oregon Structural Specialty Code, based on the 2009 International Building Code.

If you have any questions or need further information, please call me.

Sincerely,

Jose Machuca

JM:kw
212316/3rd Floor HVAC Calcs.docx

STRUCTURAL
REGISTERED PROFESSIONAL ENGINEER
19608
OREGON
NOV. 14, 2000
CRAIG J. TOTTEN
EXPIRES: 06/30/14

111 SW Fifth Avenue, Suite 2500 Portland, Oregon 97204-3628 (503) 227-3251 Fax (503) 227-7980

Seattle Tacoma Portland Eugene San Francisco Sacramento Los Angeles Irvine San Diego Phoenix Denver St. Louis New York

kpff Consulting Engineers, Portland, Oregon	Project KEEN	By NWH	Sheet No. C1
	Location	Date 9/20	
	Client	Revised	Job No.
	3RD FLOOR MECH. UNITS	Date	

• MECH. UNIT

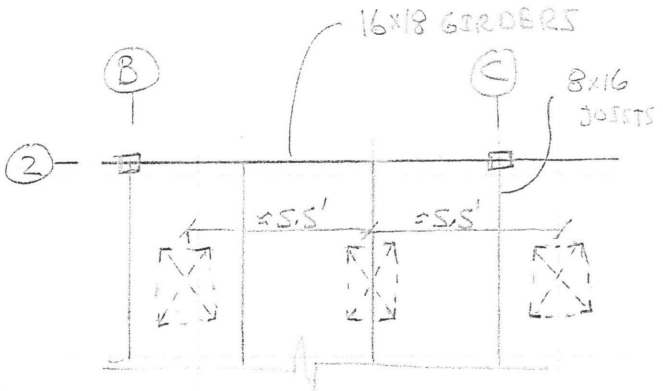
WT = 800#

AREA = 2' x 4' = 8#

LOAD = 800#/8# = 100 PSF

DL = 25 PSF

LL = 65 PSF



DF. L #2 : f_b = 900

DF. L #1 : f_b = 1000

C_D = 1

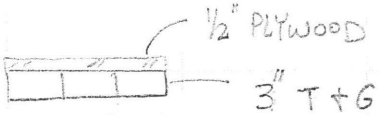
C_{FI} = 1.5

C_{fu} = 1

C_r = 1.15

#2 ⇒ F_b = 900(1)(1.5)(1)(1.15) = 1550 PSI

#1 ⇒ F_b = 1725 PSI



FLOORING

• 3" T+G

$S' = \frac{(12")(3")^2}{6}$ = 18 IN³/FT

FLOORING

FOR SIMPLICITY, CALCULATE AS LOAD OVER ENTIRE SPAN, T+G DECKING ONLY.

W = 25+65+100 = 190 PSF

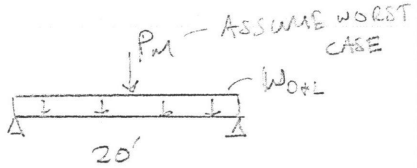
$M = \frac{(190)(4')^2}{8}$ = 4560 #-IN

M/S = 4560/18 = 253 PSI < 1550 PSI ✓

JOISTS

W_{D+L} = (25+65)(4') = 360 PLF

P_M ≈ 800#



$M_{D+L} = \frac{360(20)^2}{8}$ = 18,000 #-FT

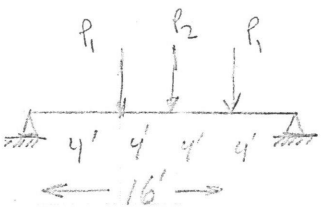
$M_{P_M} = \frac{800\#(20')}{4}$ = 4,000 #-FT

$S = \frac{(7.25)(15.25)^2}{6}$ = 280 IN³

$M_T/S = (18000+4000)(12)/280$ = 942 PSI < 1550 PSI ✓

kpff Consulting Engineers Portland, Oregon	Project KEEN	By NWH	Sheet No. C2
	Location	Date 9/20	
	Client	Revised	Job No.
	3RD FLOOR MECH. UNITS	Date	

GIRDERS



$P_1 = (25+65)(4')(20') + 800\# = 8{,}000\#$

$P_2 = (25+65)(4')(20') = 7200\#$

$M = \frac{(7200\#)(16')}{4} + 2\left[(800\#)(4')\right] = 1.11\times10^6\ \#\text{-IN}$ $\quad S_{GIRDER} = \frac{(15.75)(17.25")^2}{6} = 781\ IN^3$

$M/S = 1.11\times10^6\ \#\text{-IN}/781\ IN^3 = 1425\ PSI < 1550\ PSI$ ✓

COLUMNS

LOAD: $(25+65)(16'\times19')\times2 + (25)(16'\times19') = 62{,}320\#$

MECH. = 800# ADDITIONAL, MAX

$800\#/62{,}320\# = .012$

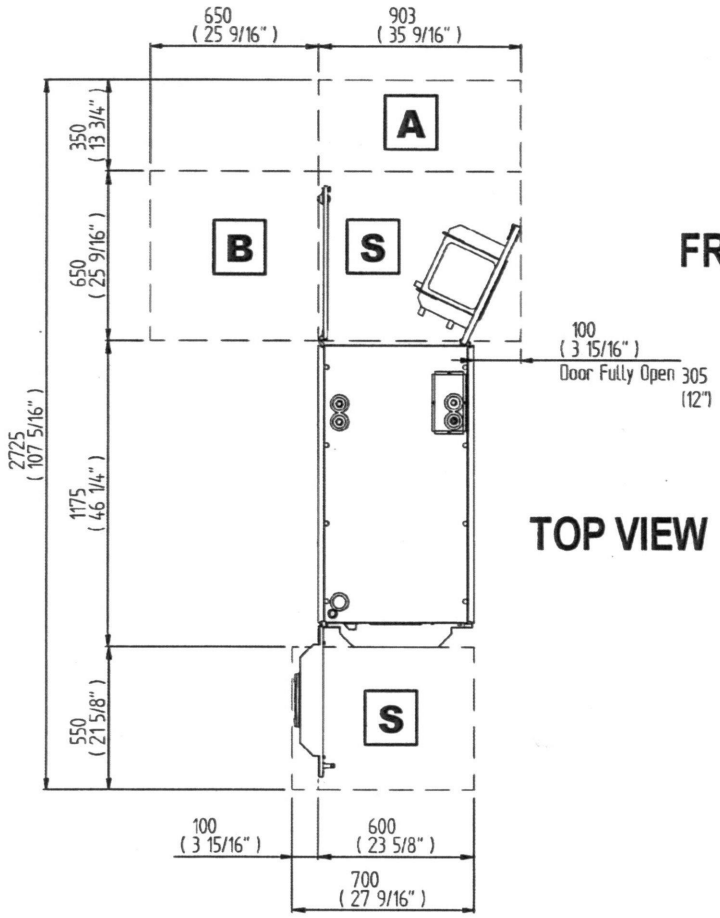
→ 1% ADDITIONAL LOAD, NEGLIGIBLE

CABINET AND FLOOR PLANNING DIMENSIONAL DATA

AIR COOLED (A) / WATER / GLYCOL COOLED (W) / CHILLED WATER (C)

ACCESS REQUIRED TO SERVICE WITHIN THE ROW

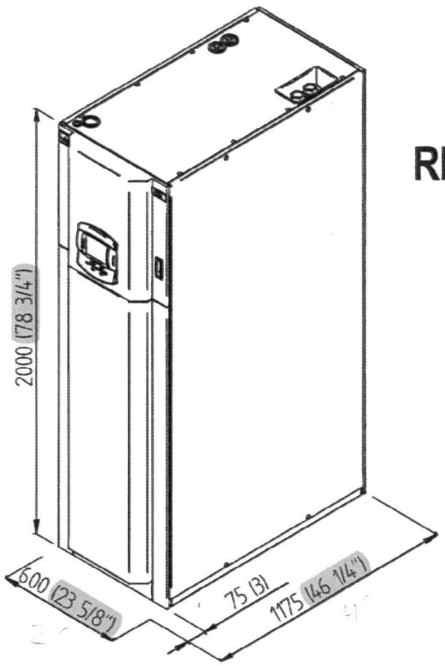
REAR SERVICE AREA IS S+B OR S+A WHEN B IS NOT AVAILABLE

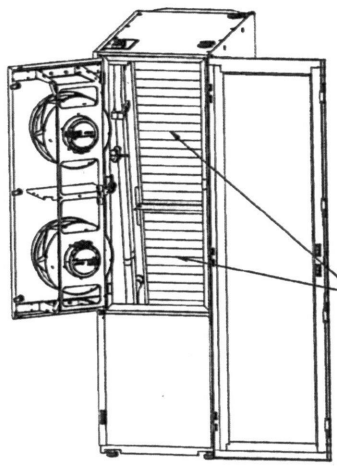


TOP VIEW

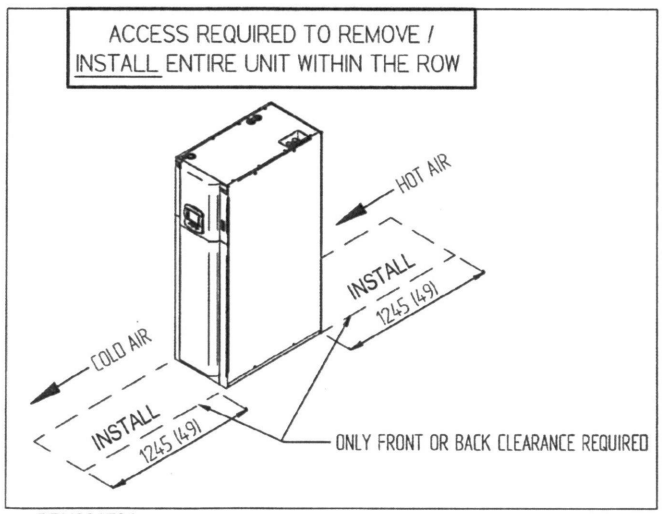
FRONT

REAR





REAR VIEW



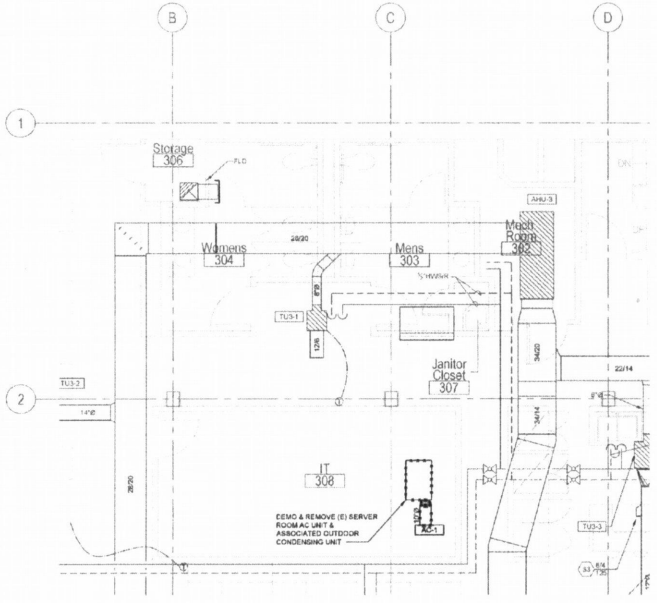
DRY WEIGHT ± 5% (lb / kg)		
Model No.	AIR COOLED	WATER/GLYCOL
CR020R	739 / 335	772 / 350
CR035R	805 / 365	849 / 385
	CHILLED WATER	
CR040R	728 /330	

Floor Plan

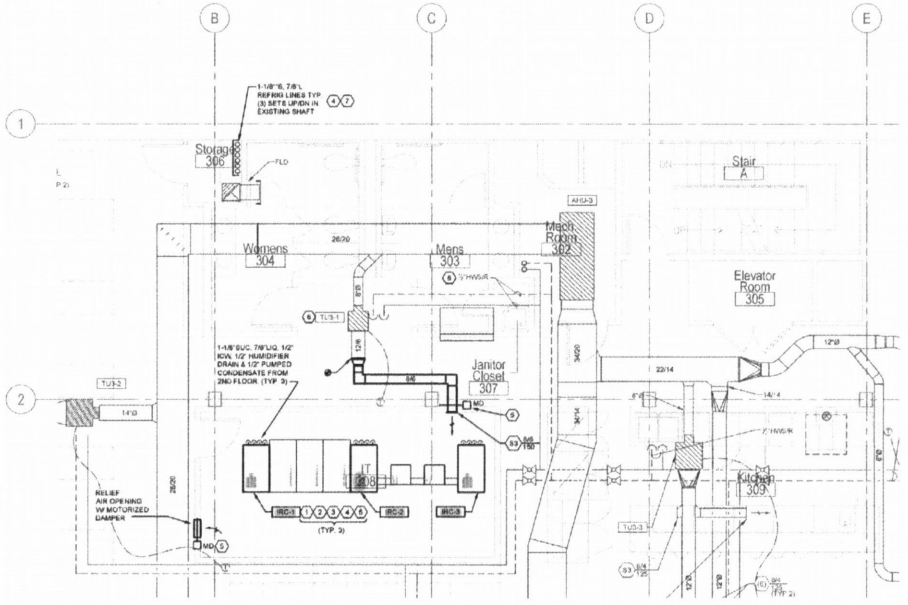
ECONOMIZER EXEMPTION
NEW COOLING EQUIPMENT (2) PRIMARY UNITS W/ 113 MBH COOLING AND (1) REDUNDANT UNIT W/ 116 MBH COOLING ARE PROVIDED FOR EXPANDED CAPACITY AT EXISTING SERVER ROOM. AS SUCH THEY DO NOT REQUIRE ECONOMIZER PER OESC EXEMPTION 503.4.1.6 WHICH ALLOWS INSTALLATION OF UP TO 600 MBH OF NEW NON-ECONOMIZER COOLING EQUIPMENT AT (E) SERVER ROOM

HVAC GENERAL NOTES	
A	NO ELECTROPLATED GALVANIZED MATERIALS TO BE USED WITHIN THE IT SERVER ROOM TO PREVENT ZINC WHISKER CONTAMINATION
B	CONTRACTOR SHALL VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH SITE CONDITIONS AND NOTIFY ENGINEER OF ANY CONFLICT OR DIFFERENCES.

HVAC NOTES BY SYMBOL (NOT ALL NOTES USED ON EACH SHEET)
(1) ALL ELECTRICAL & PIPING CONNECTIONS ARE MADE THROUGH THE TOP OF THE UNIT. INSTALLATION MADE PER MANUFACTURERS RECOMMENDATIONS.
(2) PROVIDE AN RPBP IN MECHANICAL ROOM FOR IN-ROW COOLERS HUMIDIFIER SUPPLY PIPE. RPBP TO BE SUPPLIED W/ DISCHARGE TO NEAREST SINK OR APPROVED DRAIN.
(3) 1/2" PUMPED CONDENSATE TO TO DISCHARGE W/ AIRGAP AT MOP SINK ON SECOND FLOOR
(4) PER MANUFACTURERS RECOMMENDATIONS, VERTICAL RISERS TO BE DOWNSIZED ONE TRADE SIZE (IE 1-1/8" TO 7/8" AND 7/8" TO 3/4")
(5) IRC & MD CONTROLS TO INTERLOCK W/ FIRE SUPPRESSION SYSTEM CONTROLS TO STOP AIRFLOW UPON ALARM. COORDINATE REQUIREMENTS W/ FIRE SYSTEM CONTRACTOR.
(6) NO REHEAT REQUIRED FOR EXISTING TERMINAL UNIT TU 3-1. HYDRONIC VALVES TO BE PERMANENTLY CLOSED.
(7) COORDINATE W/ GC TO REMOVE WALL AND PATCH / REPAIR TO ALLOW SHAFT ACCESS



1 M2.3 MECHANICAL THIRD FLOOR HVAC DEMO PLAN
1/8"=1'-0"



2 M2.3 MECHANICAL THIRD FLOOR HVAC PLAN
1/8"=1'-0"

ALLIANT SYSTEMS, LLC
1600 NW 167th PL, STE 330
BEAVERTON, OR 97006
PHONE: 503/619-4000
FAX: 503/230-9238
WWW.ALLIANT-SYSTEMS.COM
CCB# 153420

OREGON 64463PE 09/29/2006 BRIAN C. MURRAY
EXPIRES: 12-31-12

REVISIONS: DATE

KEEN
SERVER ROOM

1313 NW GLISAN ST.
PORTLAND, OR

DRAWING REVIEW

DEPT	INITIALS	DATE
CAD		
DESIGNER		
P.M.		
ENGINEER		
FIELD		

MECHANICAL
THIRD FLOOR
HVAC PLAN

ENGINEER: B. MURRAY
LAST REVISED:
CAD: E. STOYAN
ISSUE DATE:
DRAWING NUMBER: C-0330-22974

PERMIT ISSUE
08/14/12

SHEET NUMBER
M2.3

CAD FILENAME: 22974SEC1.dwg