AAI afghan associates, inc.
ENGINEERING

STRUCTURAL CALCULATIONS

PROJECT: Ainsworth Elementary School
Portland, Oregon
New Rooftop Units Calculations

PROJECT No.: A18142

DATE: September 28, 2018

PERMIT SUBMITTAL

Contents:

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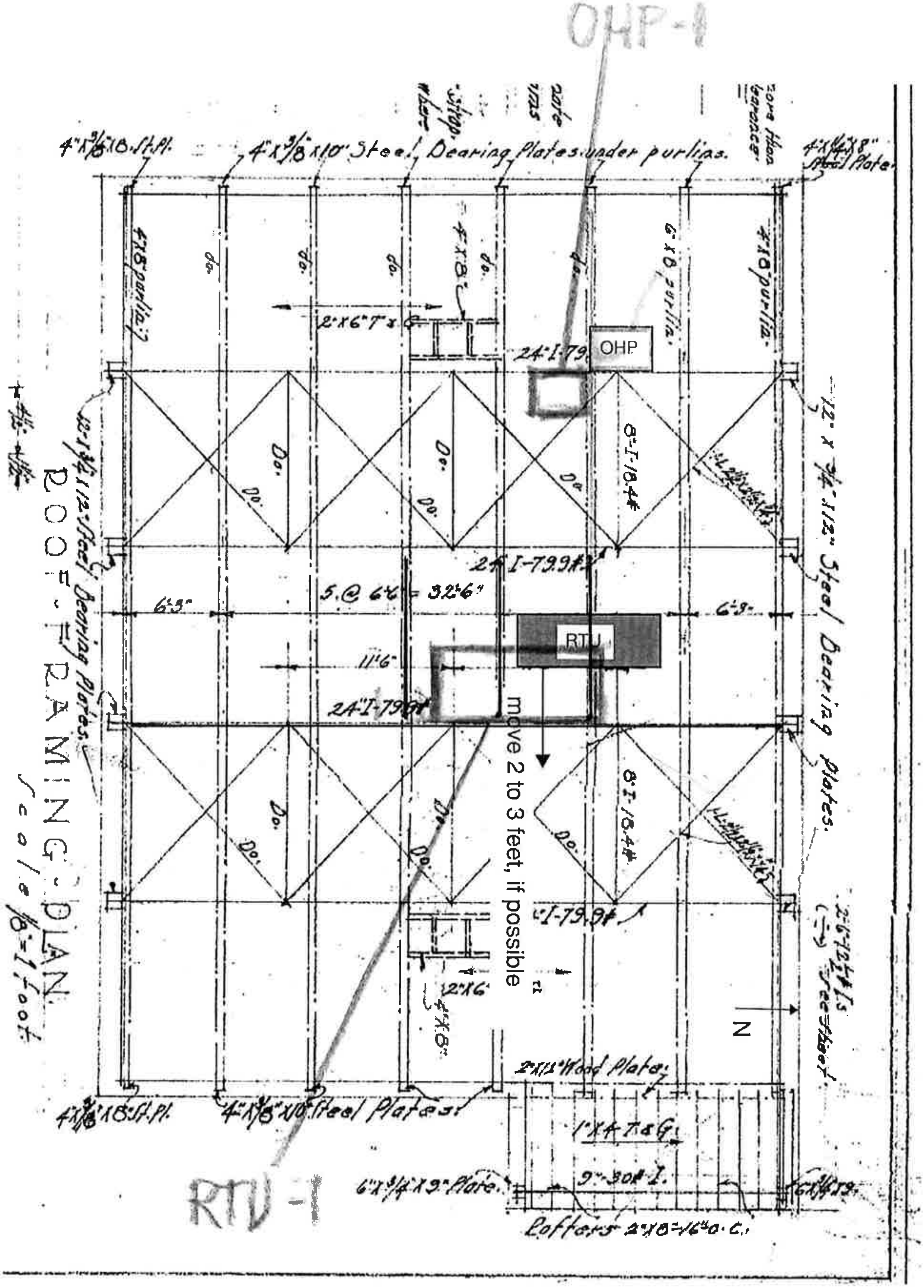
OHP-1
OHP
RTU
RTU-1
move 2 to 3 feet, if possible
ROOF FRAMING PLAN
Scale 1/8"=1 foot
4"x3/8"x10" Steel Bearing Plates under purlins.
4"x3/8"x10" Steel Plates
4"x3/8"x18" St. Pl.
4"x18" purlin
6"x8" purlin
4"x8"
Do.
24" I-79.9#
8" I-18.4#
12"x3/4"x12" Steel Bearing Plates.
5 @ 6'-6" = 32'-6"
6'-3"
11'-6"
2"x6"
2"x12" Wood Plate
1"x4" T&G
9"-30# I.
6"x3/4"x9" Plate.
Rafters 2"x8"-16" o.c.
N

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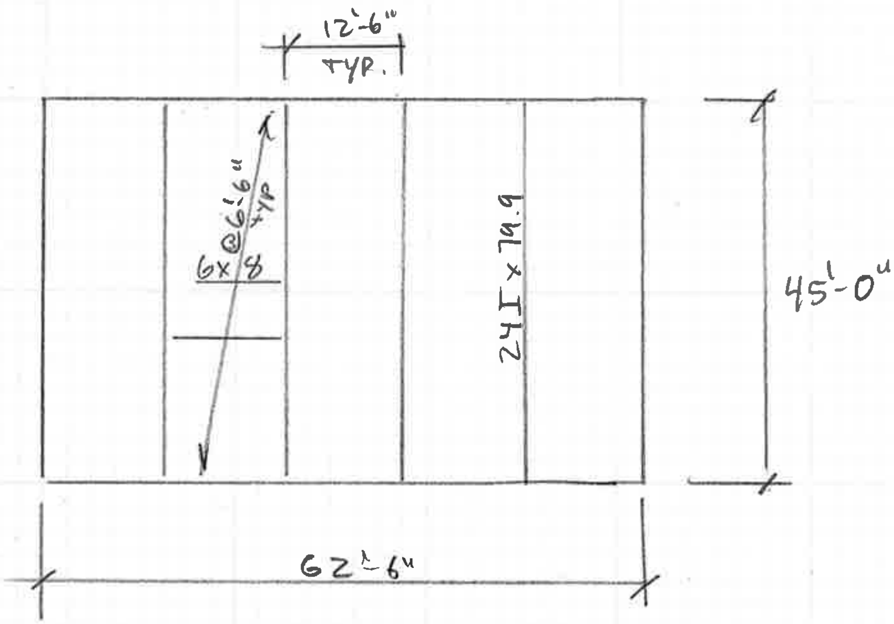
ROOF	Description	
Roof LL	standard min.	**20** psf
Roof SL	(not incl. drift)	**25** psf
Roof DL		
Roofing:	composition	**3.0** psf
Plywood:	2x6 flat	**1.5** psf
Joists:	6x8 @ 6.5'	**2.0** psf
Insulation:	Foam	**2.0** psf
Beams/Girders:	24l x 80 @ 12'	**6.7** psf
Columns:	na	**0.0** psf
Ceiling:	n/a	**0.0** psf
Fire Sprinkler:		**2.0** psf
MEP:		**1.5** psf
Other (specify):		**0.0** psf
Misc:		**1.0** psf
DL Joists		**13.0** psf
DL Beams		**20.0** psf
DL Columns		**20** psf

Mechanical Units	
Concrete Pad	**0** psf
RTU 1	**1700** lb
OHP 1	**300** lb
	0 lb

ROOF CHECKS FOR NEW UNITS



DL = 20 psf.
SL = 25 psf.

RTU = 1700 lb
OHP = 294 lb

CHECK 24I (AISC Ed. 1 1928)

W/O NEW UNITS

$W_D = 20\,psf \times 12.5' = 250\,plf.$
$W_S = 25 \times 12.5' = 313\,plf.$
$563\,plf.$

SECTION PROP:

$A = 23.33\,in^3$
$I_x = 2087.2\,in^4$
$S_x = 173.93\,in^3$
$b_f = 7.0"$
$t_f = 0.6"$
$t_w = 0.5"$

$M = .563\,klf \times 45'^2 / 8 \times 12"/' = 1710\,k"$

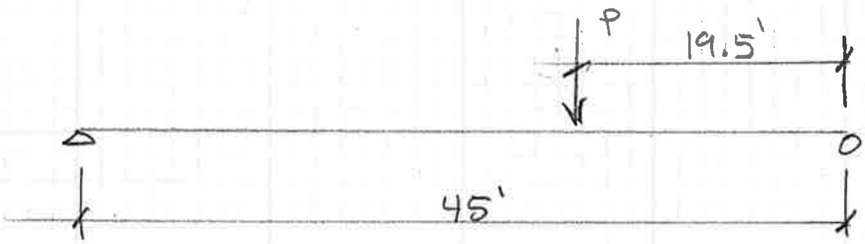
$M/S = 1710/173.93 = 9.83\,ksi$

LOW STRESS

1924
$F_U = 55\,ksi$
$F_y = \frac{1}{2} F_U \cong 25\,ksi$

ADD RTU-1 LOADS TO 24I

RESOLVE TO A SINGLE POINT LOAD.



P = 1700 lb.

$$M = \frac{1.7^{k} \times 19.5 \times 25.5'}{45'} \times 12''/1 = 19^{k''}$$

$$M/S = 19/173.93 = 0.11\ ksi$$

TOTAL STRESS ≅ 10 ksi

$$M_{TL} = M_a = (19^{k''} + 1710^{k''})\,1/12 = 144^{k'}$$

$$M_n/\Omega_b = 241^{k'} >> M_a \quad @\ F_y = 25\ ksi$$

W24×76

ASSUMING $L_u = 45/4\ BAY = 11.25'$ (HORIZ. BRACE BAYS)

∴ EXISTING 24I OK

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Beam Calculator based on AISC Manual 13th edition

Try :	**W24X76**	Member
unbraced length	**11.25**	ft.

ASD Design

$M_n / \Omega_b =$	241.89	k-ft.

Limiting Width Thickness Ratios for Compression Elements
(See section 16.1-16 AISC TABLE B4.1)

Case			λ_p	λ_r		
1	$b/t =$	6.61	12.9	34.06	Compact	*flanges*
9	h/t_w	49.00	128.1	194.1	Compact	*webs*

Noncompact or Slender Flange (See section F3. AISC 16.1-47)

$M_n / \Omega_b =$	NA	k-ft.

Member Properties

F_y	25	ksi
$E=$	29000	ksi
$A =$	22.4	in.^{2}
Z_x	200	in.^{3}
$S_x =$	176	in.^{3}
$S_y =$	18.4	in.^{3}
$I_x =$	2100	in.^{4}
$I_y =$	82.5	in.^{4}
L_p	9.59	ft.
L_r	30.49	ft.
F_{cr}	92.42	ksi
$r_y =$	1.92	in.
$b_f =$	8.99	in.
$t_w =$	0.44	in.
$t_f =$	0.68	in.
$J =$	2.68	in.4
$Cw =$	11100	in.^{6}
$r_{at} =$	2.33	in.
$h_o =$	23.2	in.
$h/t_w =$	49.0	in.
k_c	0.6	
c	1.0	in.

in.

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Historical Listing of Selected Structural Steels

CSA Standards

Designation	Date Published	Yield Strength		Tensile Strength (F_u)	
		ksi	MPa	ksi	MPa
A16	1924	½ F_u	½ F_u	55 - 65	380 - 450
S39	1935	30	210	55 - 65	380 - 450
S40	1935	33	230	60 - 72	410 - 500
G40.4	1950	33	230	60 - 72	410 - 500
G40.5	1950	33	230	60 - 72	410 - 500
G40.6	1950	45 [1]	310	80 - 95	550 - 650
G40.8	1960	40 [3]	280	65 - 85	450 - 590
G40.12	1964 *	44 [2]	300	65	450
G40.21	1973 **	Replaced all previous Standards, see CISC Handbook			

* Introduced in May 1962 by the Algoma Steel Corporation as "Algoma 44"
** In May 1997, grade 350W became the only grade for W and HP shapes produced by Algoma Steel Inc.
[1] Silicon steel
[2] Yield reduces when thickness exceeds 1½ inches (40 mm).
[3] Yield reduces when thickness exceeds ⅝ inches (16 mm).

Rivet Steel

Designation	Date Published	Yield Strength		Tensile Strength (F_u)	
		ksi	MPa	ksi	MPa
G40.2	1950	28	190	52 - 62	360 - 430

ASTM Specifications

Designation	Date Published	Yield Strength		Tensile Strength (F_u)	
		ksi	MPa	ksi	MPa
A7 (bridges) A9 (buildings)	1914*	½ F_u	½ F_u	55 - 65	380 - 450
	1924	½ $F_u \geq 30$	½ $F_u \geq 210$	55 - 65	380 - 450
	1934	½ $F_u \geq 33$	½ $F_u \geq 230$	60 - 72	410 - 500
A373	1954	32	220	58 - 75	400 - 520
A242	1955	50 [1]	350	70 [1]	480
A36	1960	36	250	60 - 80	410 - 550
A440	1959	50 [1]	350	70 [1]	480
A441	1960	50 [1]	350	70 [1]	480
A572 grade 50	1966	50	345	65	450
A588	1968	50 [1]	345	70 [1]	485
A992	1998	50 min. to 65 max.	345 min. to 450 max.	65	450

[1] Reduces with increasing thickness
* Between 1900 and 1909, medium steel in A7 and A9 had a tensile strength 5 ksi higher than that adopted in 1914.

Reference: Handbook of Steel Construction, 8th Edition, CISC, 2004.

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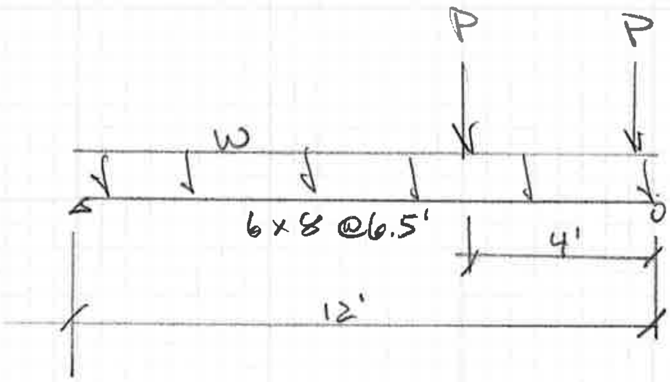
CHECK 6x8 PURLIN w/ 1700 lb RTU-1



• 6x8 DFL NO. 2

$A = 5.5 \times 7.5 = 41.3\ in^2$

$S = 5.5 \times 7.5^2/6 = 51.7\ in^3$

$F_b = 875\ psi$

$F_v = 170\ psi$

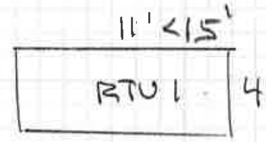
$W_D = 20\ psf \times 6.5' = 130\ plf.$

$W_S = 25\ psf \times 6.5' = 163\ plf.$

$\Sigma_{TL} = 293\ plf.$

$P = (1700/2)/2 = 425\ lb$

11' < 15'



NEGLECT DRIFT.

FOR D+S+RTU

$M_{D+S} = 293 \times 12^2/8 \times 12''/1 = 63288\ lb.in.$

$M_{RTU} = 425 \times 4' \times 8'/12' \times 12''/1 = 13600\ lb.in.$

$M_{TL} = 76888\ lb.in.$

$V_{TL} = 293\ plf \times 6' + 425\ lb \times 2 = 2608\ lb$

$C_D = 1.15$ $\qquad F'_b = 875 \times 1.15 \times 1.29 = 1298\ psi$

$C_F = 1.29\ (F_b\ only).$ $\qquad F'_v = 170 \times 1.15 = 196\ psi$

$f_b = M/S = 76888/51.7 = 1487\ psi > F'_b$

$f_v = 3 \times 2608 / 2 \times 41.3 = 95\ psi < F'_v$

FOR D + RTU

$C_D = 0.9$

$M_D = 130\,plf \times 12^2/8 \times 12"/' = 28080$ lb in.

$M_{RTU} =$ 13600 lb in.

41680 lb in.

M_{TL}

$V_{TL} = 130 \times 6' + 425\,lb \times 2 = 1630$ lb.

$f_b = M/S = 806\,psi < F'_b = 875 \times .9 \times 1.29 = 1016\,psi$

$f_v = 3 \times 1630 / 2 \times 41.3 = 59.2\,psi < F'_v = 170 \times .9 = 153\,psi$

∴ OK FOR D + UNIT

SUMMARY

D + S + RTU	DFL No. 2	FLEXURE	NG
		SHEAR	ok.
D + RTU	DFL No. 2	FLEXURE	ok.
		SHEAR	ok.

WOULD BE OK w/ DFL No. 1
NEED TO CONFIRM GRADE

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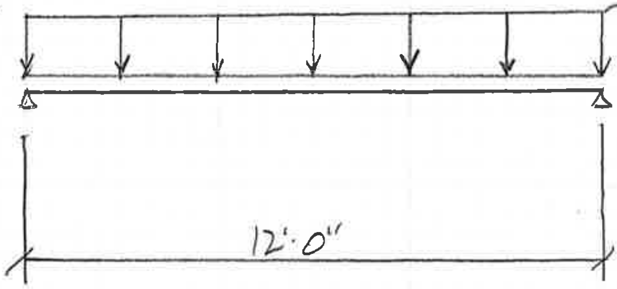
MORE PRECISE CHECK ON 6x8 PURLINS

BASE LOAD



6.5' × (13 + 25) = 85 + 163
= 248 plf

RTU DEAD LOAD

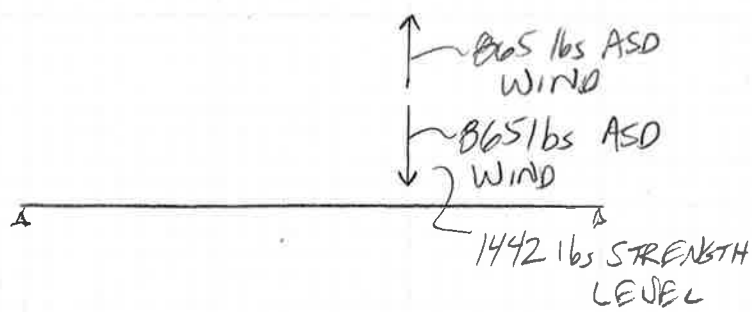
(1700 lbs / 2) / 11'-0" = 77 plf

× 6.5' = 503 lbs

× 1.15 = 578 lbs

INCREASE TO ACCOUNT FOR CURBS AND ANY UNBALANCED ASPECT TO LOAD.

RTU WIND LOAD



O.T.
73103 in-lbs / 50 in

= 1463 lbs / 11'

133 plf × 6.5' =
865 lbs

SEE ATTACHED ENERCALC PRINTOUT

ASSUMING DF-L #2, THE PROPOSED INSTALLATION IS 34% OVERSTRESSED

ASSUMING DF-L #1, THE PROPOSED INSTALLATION IS ACCEPTABLE WITH SR = 0.866

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Project Title:
Engineer:
Project Descr:

Project ID:

Printed: 24 SEP 2018, 1:39PM

Wood Beam

File = F:\2018\A18142.00 - Ainsworth School RTU and Foundation Repair\structural\Ainsworth RTUs.ec6
ENERCALC, INC. 1983-2018, Build:10.18.1.31, Ver:10.18.1.31

Lic. # : KW-06009892 **Licensee : AAI Engineering**

Description : Ainsworth Elementary School - 6x8 Purlins with RTU's - Proposed Load

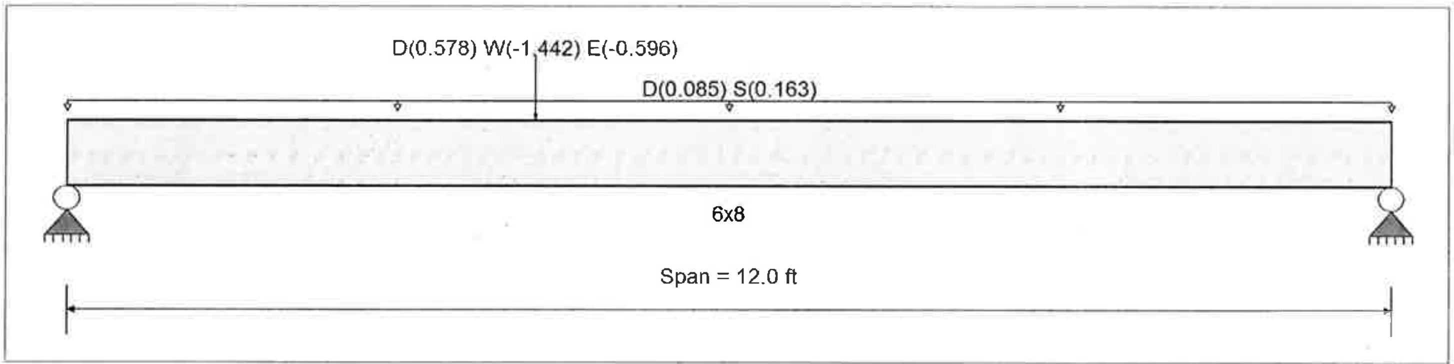
CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	1,350.0 psi	*E : Modulus of Elasticity*	
Load Combination	ASCE 7-10	Fb -	1,350.0 psi	Ebend- xx	1,600.0 ksi
		Fc - Prll	925.0 psi	Eminbend - xx	580.0 ksi
Wood Species	: Douglas Fir - Larch	Fc - Perp	625.0 psi		
Wood Grade	: No.1	Fv	170.0 psi		
		Ft	675.0 psi	Density	31.20 pcf

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0850, S = 0.1630 , Tributary Width = 1.0 ft

Point Load : D = 0.5780, W = -1.442, E = -0.5960 k @ 4.250 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	**0.866: 1**	Maximum Shear Stress Ratio	=	**0.318 : 1**
Section used for this span		**6x8**	Section used for this span		**6x8**
fb : Actual	=	1,344.40 psi	fv : Actual	=	62.15 psi
FB : Allowable	=	1,552.50 psi	Fv : Allowable	=	195.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	5.168 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.247 in	Ratio =	582 >=360
Max Upward Transient Deflection	-0.109 in	Ratio =	1317 >=360
Max Downward Total Deflection	0.480 in	Ratio =	300 >=180
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.4798	5.912		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.861	1.693
Overall MINimum	1.198	1.218
+D+H	0.883	0.715
+D+L+H	0.883	0.715
+D+Lr+H	0.883	0.715

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Wood Beam

Description : Ainsworth Elementary School - 6x8 Purlins with RTU's - Proposed Load

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+S+H	1.861	1.693
+D+0.750Lr+0.750L+H	0.883	0.715
+D+0.750L+0.750S+H	1.617	1.448
+D+0.60W+H	0.325	0.408
+D+0.70E+H	0.614	0.567
+D+0.750Lr+0.750L+0.450W+H	0.464	0.485
+D+0.750L+0.750S+0.450W+H	1.198	1.218
+D+0.750L+0.750S+0.5250E+H	1.415	1.337
+0.60D+0.60W+0.60H	-0.029	0.122
+0.60D+0.70E+0.60H	0.261	0.281
D Only	0.883	0.715
Lr Only		
L Only		
S Only	0.978	0.978
W Only	-0.931	-0.511
E Only	-0.385	-0.211
H Only		
+D+H	0.883	0.715
+D+L+H	0.883	0.715
+D+Lr+H	0.883	0.715
+D+S+H	1.861	1.693
+D+0.750Lr+0.750L+H	0.883	0.715
+D+0.750L+0.750S+H	1.617	1.448
+D+0.60W+H	0.325	0.408
+D+0.70E+H	0.614	0.567
+D+0.750Lr+0.750L+0.450W+H	0.464	0.485
+D+0.750L+0.750S+0.450W+H	1.198	1.218

Wood Beam

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ENERCALC, INC. 1983-2018, Build:10.18.1.31, Ver:10.18.1.31

Lic. # : KW-06009892 **Licensee : AAI Engineering**

Description : Ainsworth Elementary School - 6x8 Purlins with RTU's - Proposed Load

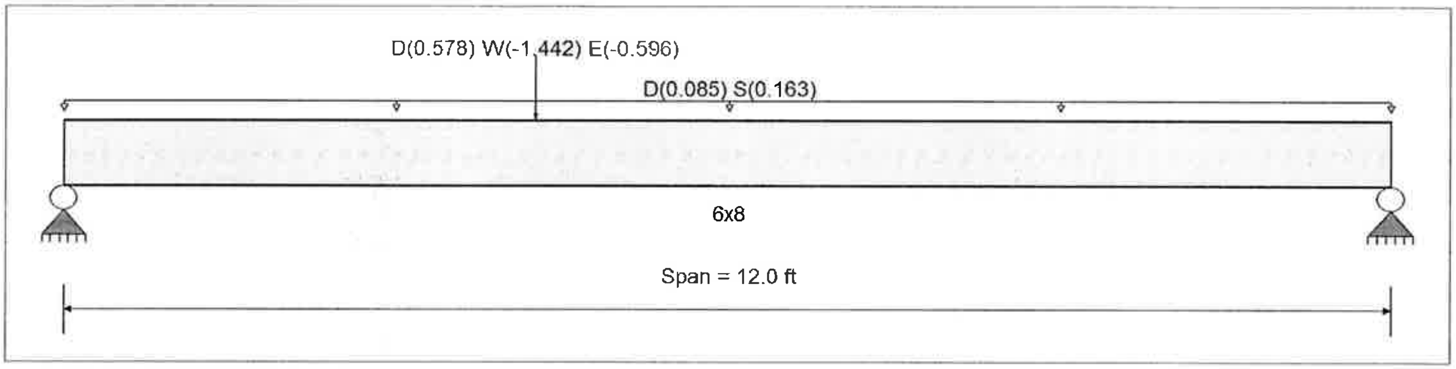
CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	875 psi	*E : Modulus of Elasticity*	
Load Combination	ASCE 7-10	Fb -	875 psi	Ebend- xx	1300 ksi
		Fc - Prll	600 psi	Eminbend - xx	470 ksi
Wood Species	: Douglas Fir - Larch	Fc - Perp	625 psi		
Wood Grade	: No.2	Fv	170 psi		
		Ft	425 psi	Density	31.2 pcf

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0850, S = 0.1630 , Tributary Width = 1.0 ft

Point Load : D = 0.5780, W = -1.442, E = -0.5960 k @ 4.250 ft

DESIGN SUMMARY

Design N.G.

Maximum Bending Stress Ratio	=	**1.336: 1**	Maximum Shear Stress Ratio	=	**0.318 : 1**
Section used for this span		**6x8**	Section used for this span		**6x8**
fb : Actual	=	1,344.40 psi	fv : Actual	=	62.15 psi
FB : Allowable	=	1,006.25 psi	Fv : Allowable	=	195.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	5.168 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.304 in	Ratio =	473 >=360
Max Upward Transient Deflection	-0.135 in	Ratio =	1070 >=360
Max Downward Total Deflection	0.591 in	Ratio =	243 >=180
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.5906	5.912		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.861	1.693
Overall MINimum	1.198	1.218
+D+H	0.883	0.715
+D+L+H	0.883	0.715
+D+Lr+H	0.883	0.715

Wood Beam

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Description : Ainsworth Elementary School - 6x8 Purlins with RTU's - Proposed Load

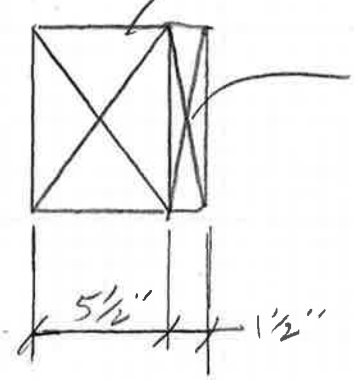
Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
+D+S+H	1.861	1.693
+D+0.750Lr+0.750L+H	0.883	0.715
+D+0.750L+0.750S+H	1.617	1.448
+D+0.60W+H	0.325	0.408
+D+0.70E+H	0.614	0.567
+D+0.750Lr+0.750L+0.450W+H	0.464	0.485
+D+0.750L+0.750S+0.450W+H	1.198	1.218
+D+0.750L+0.750S+0.5250E+H	1.415	1.337
+0.60D+0.60W+0.60H	-0.029	0.122
+0.60D+0.70E+0.60H	0.261	0.281
D Only	0.883	0.715
Lr Only		
L Only		
S Only	0.978	0.978
W Only	-0.931	-0.511
E Only	-0.385	-0.211
H Only		
+D+H	0.883	0.715
+D+L+H	0.883	0.715
+D+Lr+H	0.883	0.715
+D+S+H	1.861	1.693
+D+0.750Lr+0.750L+H	0.883	0.715
+D+0.750L+0.750S+H	1.617	1.448
+D+0.60W+H	0.325	0.408
+D+0.70E+H	0.614	0.567
+D+0.750Lr+0.750L+0.450W+H	0.464	0.485
+D+0.750L+0.750S+0.450W+H	1.198	1.218

REINFORCE OF 6x8 → ADD A 2x8 TO SIDE OF 6x8

6x8 DF-L #2
MOMENT CAPACITY = 4324 ft-lbs
$\left(1006.25\text{ psi} \times \frac{5.5(7.5)^2}{6}\left(\frac{1}{12}\right)\right)$



2x8 DF-L #1
Moment CAPACITY = 1511 ft-lbs
5835 ft-lbs

APPLIED MOMENT FROM ENERCALC
5.777 k-ft

SR = 0.99
DL + SL w/ MECH. UNIT

MOMENT WITH WIND — M_{MAX} = 6.78 k ft

$M_{cap} = 5835 \times \frac{1.6}{1.15} =$

SR = 83.5% M_{cap} = 8118 k-ft

CONNECT 2 JOISTS TOGETHER SO THEY BEHAVE AS ONE

TOTAL SHEAR = 1.71 kips D+S $\rightarrow \times \frac{1.5}{7} =$ 366 lbs
1.91 kips D+0.75S+0.45W = 410 lbs

USE SDS SCREWS: ¼"ϕ x 3½" SDS SCREWS
CAPACITY = 340 lbs x 1.15 = 391 lbs
TRY (4) SCREWS EA. END.
1564 lbs OK EASILY
SR = 0.234

AAI ENGINEERING DESIGN AID
WOOD MEMBER CAPACITIES

2X TO 4X DIMENSIONAL LUMBER

DF-L #1

		MODIFICATION FACTORS	C_D	C_M	C_t	C_L	C_{fu}	C_i	C_r
F_b	1000 psi		1.15	1.00	1.00	1.00	1.00	1.00	1.00
F_v	180 psi		1.15	1.00	1.00	---	---	1.00	---
F_b'	1150 psi								
F_v'	207 psi								

NOMINAL SIZE	b (in)	d (in)	AREA, A (in^2)	S_{xx} (in^3)	I_{xx} (in^4)	C_F	F_b' (psi)	**M (ft-lbs)**	**V (lbs)**	**I_{xx} (in^4)**
2 x 3	1.5	2.5	3.75	1.56	2.0	1.5	1725	**225**	**518**	**1.95**
2 x 4	1.5	3.5	5.25	3.06	5.4	1.5	1725	**440**	**725**	**5.36**
2 x 5	1.5	4.5	6.75	5.06	11.4	1.4	1610	**679**	**932**	**11.4**
2 x 6	1.5	5.5	8.25	7.56	20.8	1.3	1495	**942**	**1,139**	**20.8**
2 x 8	1.5	7.25	10.88	13.14	47.6	1.2	1380	**1,511**	**1,501**	**47.6**
2 x 10	1.5	9.25	13.88	21.39	98.9	1.1	1265	**2,255**	**1,915**	**98.9**
2 x 12	1.5	11.25	16.88	31.64	178.0	1	1150	**3,032**	**2,329**	**178.0**
2 x 14	1.5	13.25	19.88	43.89	290.8	0.9	1035	**3,786**	**2,743**	**290.8**
3 x 4	2.5	3.5	8.75	5.10	8.9	1.5	1725	**734**	**1,208**	**8.9**
3 x 5	2.5	4.5	11.25	8.44	19.0	1.4	1610	**1,132**	**1,553**	**19.0**
3 x 6	2.5	5.5	13.75	12.60	34.7	1.3	1495	**1,570**	**1,898**	**34.7**
3 x 8	2.5	7.25	18.13	21.90	79.4	1.2	1380	**2,519**	**2,501**	**79.4**
3 x 10	2.5	9.25	23.13	35.65	164.9	1.1	1265	**3,758**	**3,191**	**164.9**
3 x 12	2.5	11.25	28.13	52.73	296.6	1	1150	**5,054**	**3,881**	**296.6**
3 x 14	2.5	13.25	33.13	73.15	484.6	0.9	1035	**6,309**	**4,571**	**484.6**
3 x 16	2.5	15.25	38.13	96.90	738.9	0.9	1035	**8,358**	**5,261**	**738.9**
4 x 4	3.5	3.5	12.25	7.15	12.5	1.5	1725	**1,027**	**1,691**	**12.5**
4 x 5	3.5	4.5	15.75	11.81	26.6	1.4	1610	**1,585**	**2,174**	**26.6**
4 x 6	3.5	5.5	19.25	17.65	48.5	1.3	1495	**2,198**	**2,657**	**48.5**
4 x 8	3.5	7.25	25.38	30.66	111.1	1.3	1495	**3,820**	**3,502**	**111.1**
4 x 10	3.5	9.25	32.38	49.91	230.8	1.2	1380	**5,740**	**4,468**	**230.8**
4 x 12	3.5	11.25	39.38	73.83	415.3	1.1	1265	**7,783**	**5,434**	**415.3**
4 x 14	3.5	13.25	46.38	102.41	678.5	1.0	1150	**9,814**	**6,400**	**678.5**
4 x 16	3.5	15.25	53.38	135.66	1034.4	1.0	1150	**13,001**	**7,366**	**1034.4**
(2) 2 x 4	---	---	10.50	6.13	10.7	---	1725	**880**	**1,449**	**10.7**
(2) 2 x 6	---	---	16.5	15.13	41.6	---	1495	**1,884**	**2,277**	**41.6**
(2) 2 x 8	---	---	21.75	26.28	95.3	---	1380	**3,022**	**3,002**	**95.3**
(2) 2 x 10	---	---	27.75	42.78	197.9	---	1265	**4,510**	**3,830**	**197.9**
(2) 2 x 12	---	---	33.75	63.28	356.0	---	1150	**6,064**	**4,658**	**356.0**
(3) 2 x 4	---	---	15.75	9.19	16.1	---	1725	**1,321**	**2,174**	**16.1**
(3) 2 x 6	---	---	24.75	22.69	62.4	---	1495	**2,826**	**3,416**	**62.4**
(3) 2 x 8	---	---	32.63	39.42	142.9	---	1380	**4,534**	**4,502**	**142.9**
(3) 2 x 10	---	---	41.63	64.17	296.8	---	1265	**6,765**	**5,744**	**296.8**
(3) 2 x 12	---	---	50.63	94.92	533.9	---	1150	**9,097**	**6,986**	**533.9**

Project: **AINSWORTH ELEMENTARY RTU'S**
Location: **RTU 1 - GYMNASIUM ROOF**
Subject: **Roof Top Unit Anchorage**

Unit Information:

Weight		1700 lbs				
New Weight		1955 lbs	(weight increased by 15% to account for Curb and Misc. weights)			
Dimensions:	(inches)					
width		50 in	length	132 in	Height	52 in
Curb Height		14 in				

Lateral Loads:

Wind Loads on other Structures and Building Appurtenances ASCE 7-10 Chapter 29

Input Parameters

V	130	Wind Speed (Ultimate), MPH			
k_d	0.85	Wind directionality factor			
k_{zt}	1	Topographic factor			
Exp. Cat.	B	Exposure Category			
h	25	height above ground (ft)			
k_h	0.66	Velocity pressure exposure coefficient, Table 29.3.1			
q_h	24.27	Velocity pressure, Eq. 29.3-1, (PSF)			
GCr	1.9				
Af Long.	47.7	ft²	Af short.	18.1	ft²
Af Long. w/curb	60.5	ft²	Af short. w/curl	22.9	ft²

	Lateral Wind Force (Unit Only):	*Lateral Wind Force (Unit + Curb):*		
Fh Long.	2198 lb (ult)	2790 lb (ult)	q_h(GCr)Af	Eq. 29.5-2
Fh Long.	1319 lb (ASD)	1674 lb (ASD)		
Fh short.	833 lb (ult)	1057 lb (ult)	q_h(GCr)Af	Eq. 29.5-2
Fh short.	500 lb (ASD)	634 lb (ASD)		

Vertical Uplift Force

Gcr	1.5	Fv	1669 lb (ult)	qh(GCr)Ar	Eq. 29.5-3
Ar	45.8 ft^2	Fv	1001 lb (ASD)		
qh	24.27 PSF				

Seismic Anchorage Non-Structural Components ASCE 7-10 Chapter 13

Input Parameters

S_{DS}	0.731	Design Spectral Acceleration	
I_p	1	Component Importance Factor	
z	25	Component height	
h	25	Total Structure Height	
Component Type			
R_p	2.5	Component Response Modification Factor	ASCE 7-10 Table 13.6-1
a_p	2.5	Component Amplification Factor	ASCE 7-10 Table 13.6-1

Component Acceleration Factor

F_p	0.877 Wp	F_{pmax}	1.17 Wp	F_{pmin}	0.219 Wp
Use F_p	0.877 Wp	*Component Horizontal Acceleration*			
Fp Long.	1714.9 lbs (ult)	Fp short	1714.9 lbs (ult)		
Fp Long.	1224.9 lbs (ASD)	Fp short	1224.9 lbs (ASD)		

Component Vertical Acceration

$F_{p,v}$	0.15 Wp	$0.2S_{DS}W_p$	$F_{p,v}$	0.10234 Wp	ASD

Anchorage Design:
Check Overturning:
Load Combinations: Seismic - (0.6 -Ev)D+0.7E (ASD)
Wind - 0.6D+0.6W (ASD)

Load Parallel to Short Direction:

WIND AT TOP OF CURB		WIND AT BASE OF CURB	
Mot:	62750 lbs-in	Mot:	85795 lbs-in
Mresisting:	25500 lbs-in	Mresisting:	25500 lbs-in
Uplift:	745 lbs (ASD)	Uplift:	1206 lbs (ASD)
Shear:	1319 lbs (ASD)	Shear:	1674 lbs (ASD)

SEISMIC AT TOP OF CURB		SEISMIC AT BASE OF CURB	
Mot:	35033 lbs-in	Mot:	52183 lbs-in
Mresisting:	21151 lbs-in	Mresisting:	21151 lbs-in
Uplift:	277.6587657 lbs (ASD)	Uplift:	620.64397 lbs (ASD)
Shear:	1225 lbs (ASD)	Shear:	1225 lbs (ASD)

Load Parallel to Long Direction :

WIND AT TOP OF CURB		WIND AT BASE OF CURB	
Mot:	80366 lbs-in	Mot:	89095 lbs-in
Mresisting:	67320 lbs-in	Mresisting:	67320 lbs-in
Uplift:	99 lbs (ASD)	Uplift:	165 lbs (ASD)
Shear:	500 lbs (ASD)	Shear:	634 lbs (ASD)

SEISMIC AT TOP OF CURB		SEISMIC AT BASE OF CURB	
Mot:	35033 lbs-in	Mot:	52183 lbs-in
Mresisting:	55837 lbs-in	Mresisting:	55837 lbs-in
Uplift:	0 lbs (ASD)	Uplift:	0 lbs (ASD)
Shear:	1225 lbs (ASD)	Shear:	1225 lbs (ASD)

Check Global Uplift due to wind:
Uplift Force: 1001 lbs

Weight of Unit resisiting: 1020 lbs

Net uplift:	0 lbs (ASD)

Project: **AINSWORTH ELEMENTARY RTU'S**
Location: **OHA 1 - GYMNASIUM ROOF**
Subject: **Roof Top Unit Anchorage**

Unit Information:

Weight	300 lbs				
New Weight	345 lbs	(weight increased by 15% to account for Curb and Misc. weights)			
Dimensions: (inches)					
width	34.25 in	length	37.25 in	Height	46 in
Curb Height	14 in				

Lateral Loads:

Wind Loads on other Structures and Building Appurtenances ASCE 7-10 Chapter 29

Input Parameters

V	130	Wind Speed (Ultimate), MPH			
k_d	0.85	Wind directionality factor			
k_{zt}	1	Topographic factor			
Exp. Cat.	B	Exposure Category			
h	25	height above ground (ft)			
k_h	0.66	Velocity pressure exposure coefficient, Table 29.3.1			
q_h	24.27	Velocity pressure, Eq. 29.3-1, (PSF)			
GCr	1.9				
Af Long.	11.9	ft²	Af short.	10.9	ft²
Af Long. w/curb	15.5	ft²	Af short. w/curl	14.3	ft²

Lateral Wind Force (Unit Only):		*Lateral Wind Force (Unit + Curb):*	
Fh Long.	549 lb (ult)	716 lb (ult)	q_h(GCr)Af Eq. 29.5-2
Fh Long.	329 lb (ASD)	429 lb (ASD)	
Fh short.	505 lb (ult)	658 lb (ult)	q_h(GCr)Af Eq. 29.5-2
Fh short.	303 lb (ASD)	395 lb (ASD)	

Vertical Uplift Force

Gcr	1.5	Fv	323 lb (ult)	qh(GCr)Ar Eq. 29.5-3
Ar	8.9 ft^2	Fv	194 lb (ASD)	
qh	24.27 PSF			

Seismic Anchorage Non-Structural Components ASCE 7-10 Chapter 13

Input Parameters

S_{DS}	0.731	Design Spectral Acceleration	
I_p	1	Component Importance Factor	
z	25	Component height	
h	25	Total Structure Height	
Component Type			
R_p	2.5	Component Response Modification Factor	ASCE 7-10 Table 13.6-1
a_p	1	Component Amplification Factor	ASCE 7-10 Table 13.6-1

Component Acceleration Factor

F_p	0.351 Wp	F_{pmax}	1.17 Wp	F_{pmin}	0.219 Wp
Use F_p	0.351 Wp	*Component Horizontal Acceleration*			
Fp Long.	121.1 lbs (ult)	Fp short	121.1 lbs (ult)		
Fp Long.	86.5 lbs (ASD)	Fp short	86.5 lbs (ASD)		

Component Vertical Acceration

$F_{p,v}$	0.15 Wp	$0.2S_{DS}W_p$	$F_{p,v}$	0.10234 Wp	ASD

4875 SW Griffith Drive, Suite 300
Beaverton, OR 97005
tel: (503)-620-330
fax: (503)-620-5539
www.aaieng.com

Anchorage Design:
Check Overturning:
Load Combinations: Seismic - (0.6 -Ev)D+0.7E (ASD)
Wind - 0.6D+0.6W (ASD)

Load Parallel to Short Direction:

WIND AT TOP OF CURB		**WIND AT BASE OF CURB**	
Mot:	11644 lbs-in	Mot:	17486 lbs-in
Mresisting:	3083 lbs-in	Mresisting:	3083 lbs-in
Uplift:	250 lbs (ASD)	Uplift:	421 lbs (ASD)
Shear:	329 lbs (ASD)	Shear:	429 lbs (ASD)

SEISMIC AT TOP OF CURB		**SEISMIC AT BASE OF CURB**	
Mot:	2188 lbs-in	Mot:	3398 lbs-in
Mresisting:	2557 lbs-in	Mresisting:	2557 lbs-in
Uplift:	0 lbs (ASD)	Uplift:	24.566985 lbs (ASD)
Shear:	86 lbs (ASD)	Shear:	86 lbs (ASD)

Load Parallel to Long Direction :

WIND AT TOP OF CURB		**WIND AT BASE OF CURB**	
Mot:	11264 lbs-in	Mot:	16635 lbs-in
Mresisting:	3353 lbs-in	Mresisting:	3353 lbs-in
Uplift:	212 lbs (ASD)	Uplift:	357 lbs (ASD)
Shear:	303 lbs (ASD)	Shear:	395 lbs (ASD)

SEISMIC AT TOP OF CURB		**SEISMIC AT BASE OF CURB**	
Mot:	2188 lbs-in	Mot:	3398 lbs-in
Mresisting:	2781 lbs-in	Mresisting:	2781 lbs-in
Uplift:	0 lbs (ASD)	Uplift:	13.423309 lbs (ASD)
Shear:	86 lbs (ASD)	Shear:	86 lbs (ASD)

Check Global Uplift due to wind:
Uplift Force: 194 lbs

Weight of Unit resisiting: 180 lbs

Net uplift:	14 lbs (ASD)

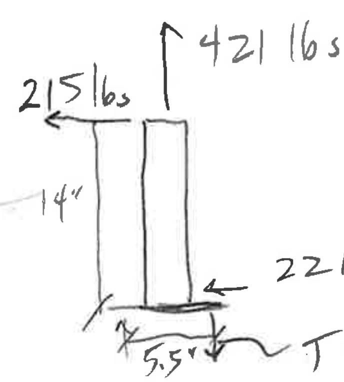
#12 SCREW
TENSION CAPACITY

T = 154 lbs × 1.6 × 1"
= 246 lbs

V = 116 lbs × 1.6 = 186 lbs

SR = 22/186 + 152/246 = 0.74 OK

EQTN 11.4-1 → Z' = 244.5
SR = 0.63 OK



T = 760 lbs
÷ 5 SCREWS
152 lbs TENSION

REFERENCE DETAIL

14" CURB TO TOP OF WOOD FRAMING

#12 SCREWS w/ 2½" LENGTH

$W = 154\ lbs/in \times 1.75" = 270\ lbs \cdot \overset{1.6}{C_D} \times \overset{0.7}{C_M}$

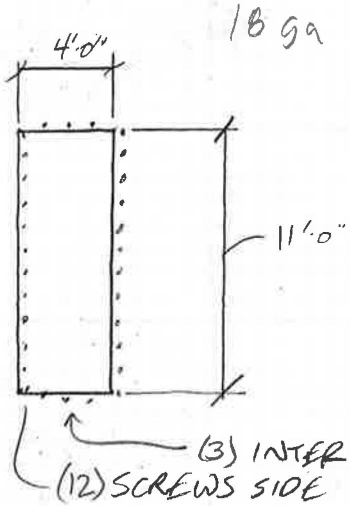
$= 302.\ lbs$ TENSION

SHEAR CAPACITY

14ga STEEL = 147 lbs × 1.6 × 0.7 = 165 lbs

16ga STEEL = 116 lbs ~~130~~ ← ASSUME FOR CALCULATION PURP.

18 ga STEEL = 90 lbs - 100



SHEAR = 1674 lbs / 30 = 56

TENSION = 1206 lbs / 12 = 100

$Z = 115\ lbs$

~~ANGLE~~ $= \frac{100}{56}$

$\alpha = 60.8°$

$Z' = \frac{302(130)}{302\cos^2 59 + 130\sin^2 59}$

$Z' = 230\ lbs$

$SR = \frac{115}{223} = 0.50$

OK

30 SCREWS TOTAL IN SHEAR

12 SCREWS IN TENSION

SIMPSON SDWS SCREWS ~~W~~ PENETRATION INFO

WOOD FRAMING → SHEAR LOADS = 395 lbs × 1.6 × 0.7

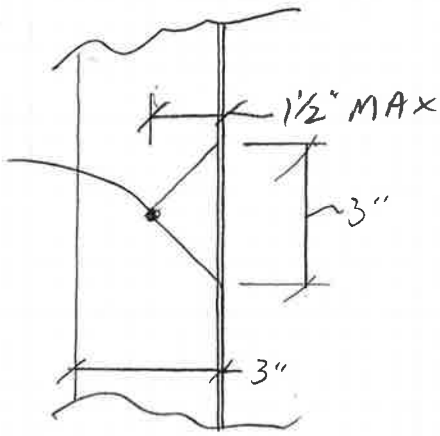
TENSION = 214 lbs × 1.6 × 0.7

SHEAR = 442 lbs
TENSION = 240 lbs } OK BY INSPECTION

CHECK CAPACITY OF LIGHT GAGE FLAT PLATE BENDING

ASSUME 16ga 50ksi MATERIAL

1½" DISTANCE FROM ℄ OF SCREW TO BACK WALL OF CURB



$$Z_{PL} = \frac{3"(0.0566)^2}{4} = 0.0024 in^3$$

$$M_n = Z_{PL} F_y = 50ksi(0.0024 in^3)$$

$$M_n = 120 in\text{-}lbs$$

$$\frac{M_n}{\Omega} = \frac{120 in\text{-}lbs}{1.67} = 72 in\text{-}lbs$$

$$\div 1.5" = 48 lbs$$

TRY 14 ga MATERIAL

$$Z_{PL} = 3(0.073)^2/4 = 0.0038 in^3$$

$$\frac{M_n}{\Omega} = 50ksi(0.0038 in^3)/1.67$$

$$\frac{M_n}{\Omega} = 114 in\text{-}lbs \div 1.5 in$$

$$= 76 lbs$$

ADD ACTUAL HOLDOWNS TO CURB

$$\frac{952 lbs}{2} = 480 lbs$$

USE SIMPSON LSTA9 STRAP w/ (4) #10 SCREWS TO LIGHT GA. CURB & (4) 10d NAILS TO WOOD CURB

Gas Fired Packaged Heating & Ventilating Unit Schedule

Line No.	Qty	Unit Tags	Reznor Model-Size	Type	MBH Output	EAT °F	LAT °F	Fuel Type	CFM	Mtr HP	Fan RPM	Ext. SP "WC	Total SP "WC	Voltage & Phase	Unit Notes
1	1	RTU-1	RDH-250	Outdoor					3500	2	901	0.5	0.812	208/3/60	

RTU-1

1700 lb

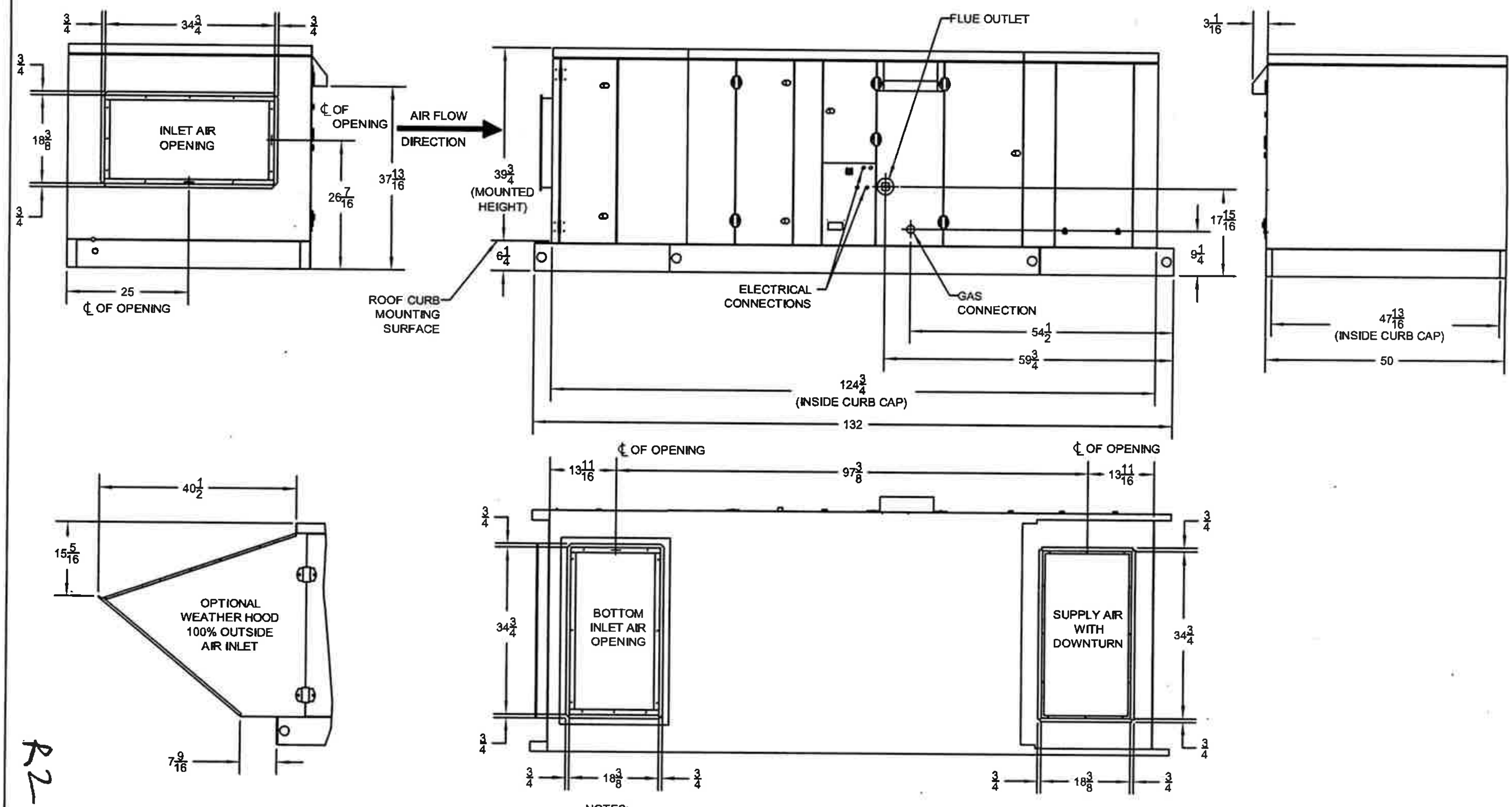
Unit Notes:
1)
2)
3)
4)
5)

R1

RDH_D_DT_MX

MODEL(S)

- RDH 250
- RDH 300



NOTES:

1) UNITS ARE SHOWN WITH LEFT HAND CONTROLS (AJ1).
2) UNITS WITH OPTION AJ2 HAVE GAS AND ELECTRICAL CONNECTIONS/SERVICING ON THE OPPOSITE SIDE.
3) COIL CONNECTIONS ON THE LEFT HAND SIDE (AU5L OR AU6L).
4) UNITS WITH OPTION AU5R OR AU6R HAVE COIL CONNECTIONS ON THE OPPOSITE SIDE.

ALL DIMENSIONS ARE IN INCHES

R2

REZNOR® AIR INTAKE DAMPERS & AIR OPTIONS (cont'd)

Applies to All Models unless otherwise noted.

INLET DAMPERS (Indoor Units)

CABINET MOUNTED OPT. ON/OFF DAMPER OPTION AR8

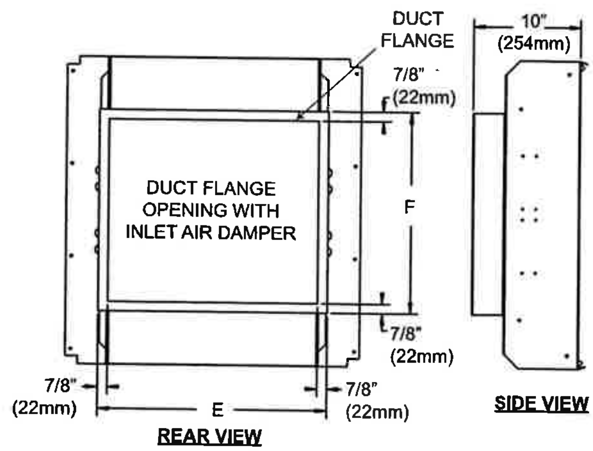
Option AR8 is factory-mounted to the air inlet side of the cabinet. It can be mounted on the blower cabinet or the cooling coil module. See table below for dimensions and weights to be added to base unit. (not available with Evaporative Cooling Module. See Mixing Box Option MXB1 for additional air inlet arrangements.)

Dimensions - Inches (±1/8")

PDH or SDH	PEH	PXH	SHH	E	F	Weight - lbs.
75, 100	10A, 20A, 40A	000A	- -	19 3/8	16 3/4	34
125, 150	15B, 30B, 60B	000B	- -	24 7/8	16 3/4	45
175, 200, 225	- -	000C	130, 180	21 1/4	25 3/4	56
250, 300	30D, 60D, 90D, 120D	000D	260	34 1/4	18 1/4	73
350, 400A	40E, 80E, 120E	000E	350	38 5/8	21 1/4	85

Dimensions - mm (±3)

PDH or SDH	PEH	PXH	SHH	E	F	Weight - (kg)
75, 100	10A, 20A, 40A	000A	N/A	(492)	(425)	(15)
125, 150	15B, 30B, 60B	000B	N/A	(632)	(425)	(20)
175, 200, 225	- -	000C	130, 180	(540)	(654)	(25)
250, 300	30D, 60D, 90D, 120D	000D	260	(870)	(464)	(33)
350, 400A	40E, 80E, 120E	000E	350	(981)	(540)	(39)

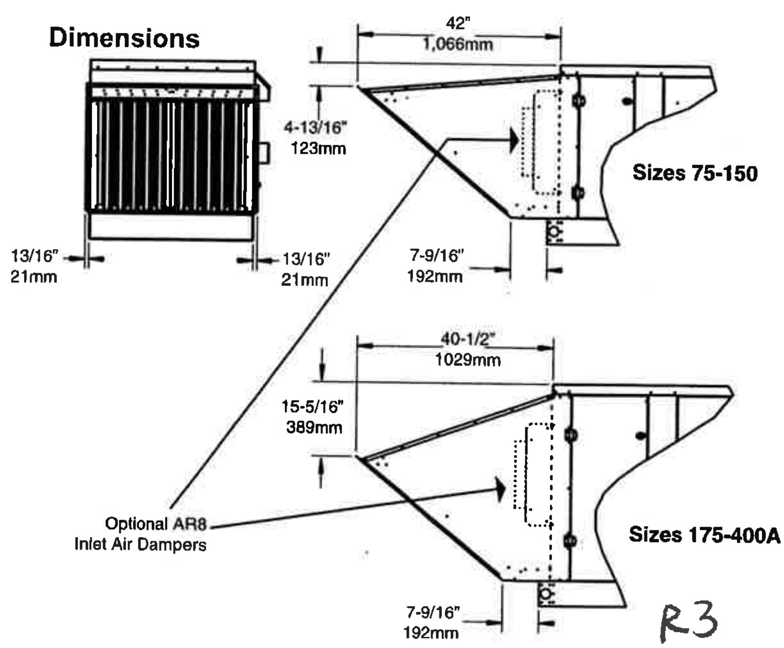


OPTIONAL WEATHER HOOD OPTION AS2

100% Outside Air Screened Intake Hood w/Rain Baffles.

Weather hood shipped separately, knocked down, for field installation.

RDH Size	REH Cabinet	RHH Size	RXH Size	lbs	(kg)
75/100	10A, 20A, 40A	- -	000A	70	(32)
125/150	15B, 30B, 60B	- -	000B	76	(34)
175/200/225	- -	130, 180	000C	76	(34)
250/300	30D, 60D, 90D, 120D	260	000D	87	(39)
350/400A	40E, 80E, 120E	350	000E	96	(44)



INLET DAMPERS (Outdoor Units)

CABINET MOUNTED OPT. ON/OFF DAMPER OPTION AR8

Option AR8 is factory-mounted to the air inlet side of the cabinet. It can be mounted on the blower cabinet or the cooling coil module (not available with Evaporative Cooling Module or Mixing Box. See Mixing Box Option MXB1 for additional air inlet arrangements.)

Option AR8 for outdoor models is similar to the inlet damper option for indoor units, except the outdoor units do not included duct flanges.

R3

REZNOR®

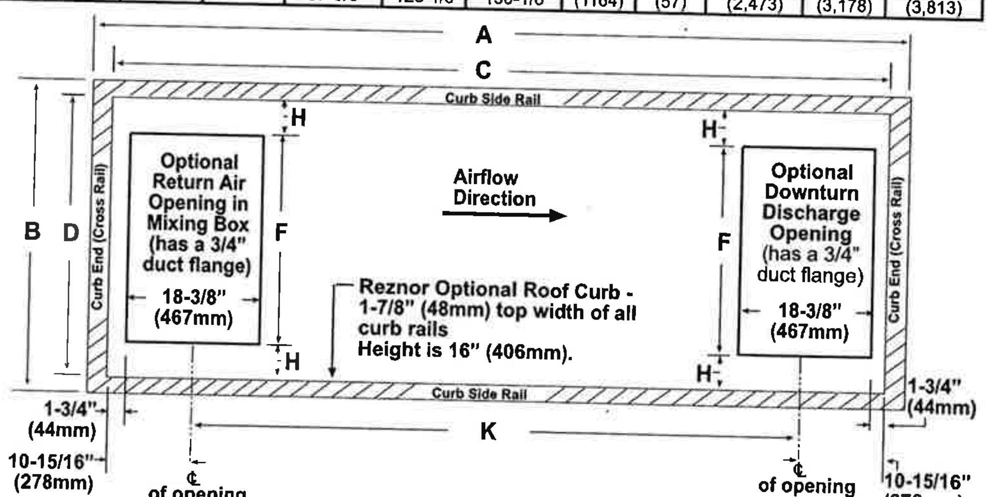
Curb is 16" (406mm) high

ROOF CURB DIMENSIONS MODEL RDH, REH and RXH

Configuration	Option Code	RDH Size	REH Size	RXH Size	Inches (±1/8) A	B	C	D	mm (±3) A	B	C	D	Weight lbs	kg
Basic Unit ONLY (blower and heat section) with horizontal discharge	CJ8A	75/100	10A/20A/40A	000A	51-13/16	29-13/16	48-1/16	26-1/16	1,316	757	1,221	662	90	41
		125/150	15B/30B/60B	000B	51-13/16	39-13/16	48-1/16	36-1/16	1,316	1,011	1,221	916	101	46
		175/200/225	N/A	000C	67-1/2	29-13/16	63-3/4	26-1/16	1,715	757	1,619	662	107	49
		250/300	30D/60D/90D/120D	000D	67-1/2	46-1/16	63-3/4	42-5/16	1,715	1,170	1,619	1,075	125	57
		350/400A	40E/80E/120E	000E	67-1/2	54-1/16	63-3/4	50-5/16	1,715	1,373	1,619	1,278	134	61
Basic unit PLUS 1 either - Downturn Discharge Plenum (AQ5 or AQ8); OR Mixing Box (MXB1) with horizontal discharge; OR Cooling Coil Cabinet without Reheat (AU5 or AU6) with horizontal discharge	CJ8B	75/100	10A/20A/40A	000A	79-9/16	29-13/16	75-13/16	26-1/16	2,021	757	1,926	662	120	54
		125/150	15B/30B/60B	000B	79-9/16	39-13/16	75-13/16	36-1/16	2,021	1,011	1,926	916	131	59
		175/200/225	N/A	000C	95-1/4	29-13/16	91-1/2	26-1/16	2,419	757	2,324	662	138	63
		250/300	30D/60D/90D/120D	000D	95-1/4	46-1/16	91-1/2	42-5/16	2,419	1,170	2,324	1,075	155	70
		350/400A	40E/80E/120E	000E	95-1/4	54-1/16	91-1/2	50-5/16	2,419	1,373	2,324	1,278	164	74
Basic unit PLUS 2 - Down Discharge (AQ 5 or 8) AND Mixing Box OR Cooling Coil Cabinet without Reheat (AU 5 or 6); OR Mixing Box AND Cooling Coil Cabinet without Reheat (AU 5 or 6) with horizontal discharge	CJ8C	75/100	10A/20A/40A	000A	107-5/16	29-13/16	103-9/16	26-1/16	2726	757	2631	662	151	68
		125/150	15B/30B/60B	000B	107-5/16	39-13/16	103-9/16	36-1/16	2726	1011	2631	916	162	73
		175/200/225	N/A	000C	123	29-13/16	119-1/4	26-1/16	3124	757	3029	662	168	76
		250/300	30D/60D/90D/120D	000D	123	46-1/16	119-1/4	42-5/16	3124	1170	3029	1075	186	84
		350/400A	40E/80E/120E	000E	123	54-1/16	119-1/4	50-5/16	3124	1373	3029	1278	195	88
Basic unit PLUS 3 - Down Discharge Plenum (AQ5 or AQ8) AND Mixing Box (MXB1) AND Cooling Coil Cabinet without Reheat (AU5 or AU6)	CJ8D	75/100	10A/20A/40A	000A	135-1/16	29-13/16	131-5/16	26-1/16	3431	757	3335	662	181	82
		125/150	15B/30B/60B	000B	135-1/16	39-13/16	131-5/16	36-1/16	3431	1011	3335	916	192	87
		175/200/225	N/A	000C	150-3/4	29-13/16	147	26-1/16	3829	757	3734	662	199	90
		250/300	30D/60D/90D/120D	000D	150-3/4	46-1/16	147	42-5/16	3829	1170	3734	1075	216	98
		350/400A	40E/80E/120E	000E	150-3/4	54-1/16	147	50-5/16	3829	1373	3734	1278	225	102
Basic unit PLUS 1 - Cooling Coil Cabinet with Reheat (AU7) with horizontal discharge	CJ8E	75/100	10A/20A/40A	000A	104-9/16	29-13/16	100-13/16	26-1/16	2656	757	2561	662	149	68
		125/150	15B/30B/60B	000B	104-9/16	39-13/16	100-13/16	36-1/16	2656	1011	2561	916	160	73
		175/200/225	N/A	000C	120-1/4	29-13/16	116-1/2	26-1/16	3054	757	2959	662	167	76
		250/300	30D/60D/90D/120D	000D	120-1/4	46-1/16	116-1/2	42-5/16	3054	1170	2959	1075	184	83
		350/400A	40E/80E/120E	000E	120-1/4	54-1/16	116-1/2	50-5/16	3054	1373	2959	1278	193	88
Basic unit PLUS 2 - Cooling Coil Cabinet with Reheat (AU7) AND Down Discharge Plenum (AQ5 or AQ8) OR Mixing Box (MXB1) with horizontal discharge	CJ8F	75/100	10A/20A/40A	000A	132-5/16	29-13/16	128-9/16	26-1/16	3361	757	3266	662	180	82
		125/150	15B/30B/60B	000B	132-5/16	39-13/16	128-9/16	36-1/16	3361	1011	3266	916	191	87
		175/200/225	N/A	000C	148	29-13/16	144-1/4	26-1/16	3759	757	3664	662	197	89
		250/300	30D/60D/90D/120D	000D	148	46-1/16	144-1/4	42-5/16	3759	1170	3664	1075	215	98
		350/400A	40E/80E/120E	000E	148	54-1/16	144-1/4	50-5/16	3759	1373	3664	1278	224	102
Basic unit PLUS 3 - Cooling Coil Cabinet with Reheat (AU7) AND Down Discharge Plenum (AQ5 or AQ8) AND Mixing Box (MXB1)	CJ8G	75/100	10A/20A/40A	000A	160-1/16	29-13/16	156-5/16	26-1/16	4066	757	3970	662	210	95
		125/150	15B/30B/60B	000B	160-1/16	39-13/16	156-5/16	36-1/16	4066	1011	3970	916	221	100
		175/200/225	N/A	000C	175-3/4	29-13/16	172	26-1/16	4464	757	4369	662	228	103
		250/300	30D/60D/90D/120D	000D	175-3/4	46-1/16	172	42-5/16	4464	1170	4369	1075	245	111
		350/400A	40E/80E/120E	000E	175-3/4	54-1/16	172	50-5/16	4464	1373	4369	1278	254	115

RDH Size	REH Size	RXH Size	Dimensions (inches ±1/8) F (with mixing box and/or down discharge)	H (with mixing box and/or down discharge)	K (with mixing box and down discharge) no cooling coil module	K with a cooling coil module, no reheat	K with a cooling coil module, with reheat	Dimensions (mm ±3) F (with mixing box and/or down discharge)	H (with mixing box and/or down discharge)	K (with mixing box and down discharge) no cooling coil module	K with a cooling coil module, no reheat	K with a cooling coil module, with reheat
75/100	10A/20A/40A	000A	22-7/8	1-9/16	81-5/8	109-3/8	134-3/8	(581)	(40)	(2,073)	(2,778)	(3,413)
125/150	15B/30B/60B	000B	26-1/2	4-3/4	81-5/8	109-3/8	134-3/8	673)	(121)	(2,073)	(2,778)	(3,413)
175/200/ 225	N/A	000C	22-7/8	1-9/16	97-3/8	125-1/8	150-1/8	(581)	(40)	(2,473)	(3,178)	(3,813)
250/300	30D/60D/90D/ 120D	000D	34-3/4	3-3/4	97-3/8	125-1/8	150-1/8	(883)	(96)	(2,473)	(3,178)	(3,813)
350/400A	40E/80E/120E	000E	45-13/16	2-1/4	97-3/8	125-1/8	150-1/8	(1164)	(57)	(2,473)	(3,178)	(3,813)

***NOTE:** If there is an evaporative cooling module, the base of the unit under the evaporative cooling module extends beyond the end of the roof curb. An evaporative cooling module does not affect the length of the roof curb.*



R4

OHP-1

TRANE®

General Data

Product Specifications

Model No. ①	4TWR5042G1	4TWR5049E1	4TWR5061E1
Electrical Data V/Ph/Hz ②	208/230/1/60	208/230/1/60	208/230/1/60
Min Cir Ampacity	23	28	36
Max Fuse Size (Amps)	40	50	60
Compressors	CLIMATUFF® - SCROLL	CLIMATUFF® - SCROL	CLIMATUFF® - SCROL
RL AMPS - LR AMPS	16.7 - 112	21.8 - 117	26.4 - 134
Outdoor Fan FL Amps	0.74	1.00	2.80
Fan HP	1/8	1/5	1/3
Fan Dia (inches)	26.6	27.6	227.6
Coil	Spine Fin™	Spine Fin™	Spine Fin™
Refrigerant R-410A	9/14-LB/OZ	13/10-LB/OZ	13/12-LB/OZ
Line Size - (in.) O.D. Gas ③	3/4	7/8	1-1/8
Line Size - (in.) O.D. Liquid ③	3/8	3/8	3/8
Dimensions H x W x D (Crated)	42 x 35.1 x 38.7	51 x 35.1 x 38.7	51 x 35.1 x 38.7
Weight - Shipping	277	331	332
Weight - Net	243	294	295
Start Components	NO	NO	YES
Sound Enclosure	YES	NO	NO
Compressor Sump Heat	YES	YES	YES
Optional Accessories: ④			
Anti-short Cycle Timer	TAYASCT501A	TAYASCT501A	TAYASCT501A
Evaporator Defrost Control A/C	AY28X084	AY28X084	AY28X084
Rubber Isolator Kit	BAYISLT101	BAYISLT101	BAYISLT101
Hard Start Kit Scroll	BAYKSKT260	BAYKSKT260	
Extreme Condition Mounting Kit	BAYECMT004	BAYECMT004	BAYECMT004
Snow Leg - Base & Cap 4" High	BAYLEGS002	BAYLEGS002	BAYLEGS002
Snow Leg - 4" Extension	BAYLEGS003	BAYLEGS003	BAYLEGS003
Seacoast Kit	BAYSEAC001	BAYSEAC001	BAYSEAC001
Refrigerant Lineset ⑤	TAYREFLN7*	TAYREFLN3*	TAYREFLN3*

① Certified in accordance with the Air-Source Unitary Heat Pump Equipment certification program which is based on AHRI Standard 210/240.
② Calculated in accordance with N.E.C. Only use HACR circuit breakers or fuses.
③ Standard line lengths - 60'. Standard lift - 60' Suction and Liquid line.
For Greater lengths and lifts refer to refrigerant piping software Pub# 32-3312-0†. (†denotes latest revision)
④ For accessory description and usage, see page 5.
⑤ * = 15, 20, 25, 30, 40 and 50 foot lineset available.

R5

0HP-1

Dimensions

4TWR5 Outline Drawing

Note: All dimensions are in MM (Inches).

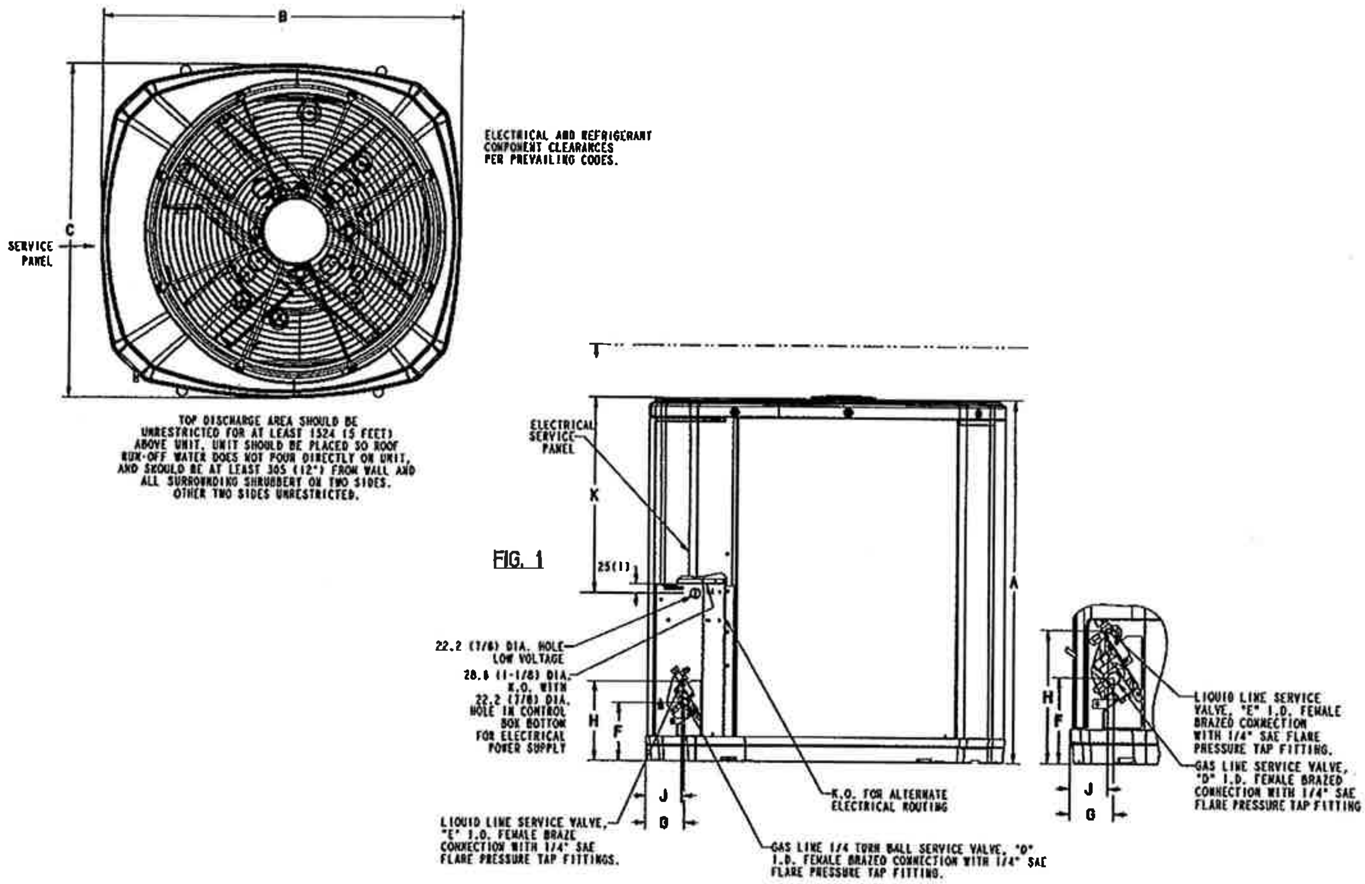


FIG. 1

MODELS	BASE	A	B	C	D	E	F	G	H	J	K
4TWR5018G	4	730 (28-3/4)	829 (32-5/8)	756 (29-3/4)	5/8	3/8	143 (5-5/8)	92 (3-5/8)	210 (8-1/4)	79 (3-1/8)	508 (20)
4TWR5024G	3	832 (32-3/4)	829 (32-5/8)	756 (29-3/4)	5/8	3/8	143 (5-5/8)	92 (3-5/8)	210 (8-1/4)	79 (3-1/8)	508 (20)
4TWR5030G	4	841 (33-1/8)	946 (37-1/4)	870 (34-1/4)	3/4	3/8	152 (6)	98 (3-7/8)	219 (8-5/8)	86 (3-3/8)	508 (20)
4TWR5036G	4	841 (33-1/8)	946 (37-1/4)	870 (34-1/4)	3/4	3/8	152 (6)	98 (3-7/8)	219 (8-5/8)	86 (3-3/8)	508 (20)
4TWR5042G	4	943 (37 1/8)	946 (37-1/4)	870 (34-1/4)	3/4	3/8	143 (5-5/8)	98 (3-7/8)	219 (8-5/8)	86 (3-3/8)	508 (20)
4TWR5049E	4	1147 (45 1/8)	946 (37-1/4)	870 (34-1/4)	7/8	3/8	152 (6)	98 (3-7/8)	219 (8-5/8)	86 (3-3/8)	508 (20)
4TWR5061E	4	1147 (45 1/8)	946 (37-1/4)	870 (34-1/4)	1-1/8	3/8	152 (6)	98 (3-7/8)	219 (8-5/8)	86 (3-3/8)	508 (20)

From Dwg. D152898 R6