WDY Structural • Civil Engineers

STRUCTURAL CALCULATIONS

FOR

WESTMORELAND CAMPUS MU
1717 CITY VIEW STREET
EUGENE, OREGON 97402

November 6, 2020

DESIGN PARAMETERS: **2019 Oregon Structural Specialty Code**

WIND
- BASIC WIND SPEED ..... 98 mph (Ult)
- EXPOSURE ..... B

SEISMIC
- MAPPED RESPONSE ..... $S_S = 0.721$, $S_1 = 0.411$
- SITE CLASS ..... D
- IMPORTANCE ..... $I_E = 1.00$

CONTENTS:

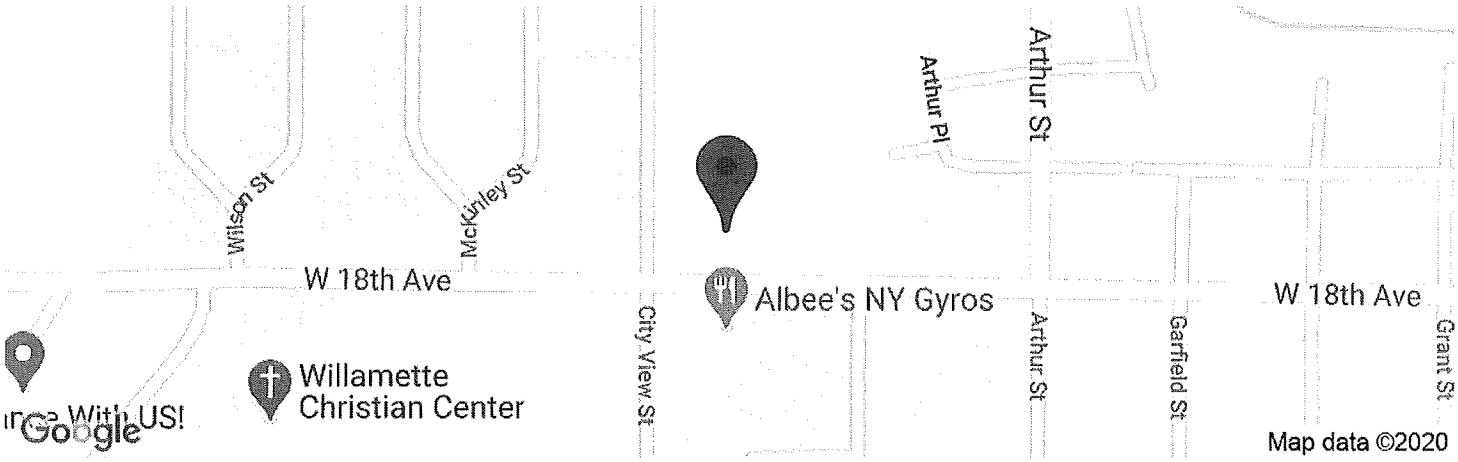
6443 SW Beaverton-Hillsdale Hwy, suite 210 • Portland, OR 97221 • ph: 503.203.8111 • fx: 503.203.8122 • www.wdyi.com

OSHPD

20179 - Westmoreland Campus MU

1717 City View St, Eugene, OR 97402, USA

Latitude, Longitude: 44.04088, -123.1271349



Date	10/7/2020, 10:27:27 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	0.721	MCE_R ground motion. (for 0.2 second period)
S_1	0.411	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.882	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.588	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.223	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.343	MCE_G peak ground acceleration
F_{PGA}	1.257	Site amplification factor at PGA
PGA_M	0.431	Site modified peak ground acceleration
T_L	16	Long-period transition period in seconds
SsRT	0.721	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.827	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.411	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.478	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.68	Factored deterministic acceleration value. (1.0 second)
PGAd	0.564	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.871	Mapped value of the risk coefficient at short periods

10/21/2020

WESTMORELAND SCHOOL RTU WEIGHTS

Unit Tag	Base Weight of unit & accessories (lbs)	+ Standard unit Curb (lbs)	xAdaptor Curb (lbs) Safety Factor of 1.5	xAdaptor Curb (lbs) Safety Factor of 2	=	Range of Unit TOTAL WEIGHT plus adaptor curb S.F (lbs)	
HV-2	1634	180	270	360		1904	1994
HV-3	686	115	172.5	230		859	916
HV-4	1312	143	214.5	286		1527	1598
HV-5	1085	143	214.5	286		1300	1371
HV-6	604	115	172.5	230		777	834
HV-7	1312	143	214.5	286		1527	1598
HV-8	1312	143	214.5	286		1527	1598
HV-9	604	115	172.5	230		777	834
HV-10	1612	180	270	360		1882	1972

Mech Unit =	HV-2
Unit Weight =	1634 lbs
Unit Height =	4.50 ft
Length =	5.92 ft
Width =	4.33 ft
Curb Weight =	270 lbs
Curb Height =	1.17 ft

WIND DESIGN PER ASCE 7-16, SECTION 26 - 31

Design Wind Loads on Other Structures: 29.5.1

A_f =	33.1 ft^2	*MU dimension normal wind direction*
A_f =	40.0 ft^3	*MU+curb dimension normal wind direction*
GCr =	1.9	*Gust Effect Factor*
V =	98 mph	*Basic Wind Speed (per Figure 26.5 or local code)*
Kd =	0.9	*Wind Directionality Factor per Table 26.6*
K_z =	0.66	*Table 29.3-1 (exposure B)*
K_{zt} =	1.00	*Topographic Factor per 26.8-2:*
qz =	**14.6** psf	*Velocity Pressure* $qz = 0.00256 K z K_{zt} K_d V^2$

Design wind force EQ. (29.5-2)

F_{ult} =	**919 lbs**	*Force on MU*
F_{asd} =	**551 lbs**	
F_{ult} =	**1111 lbs**	*Force on MU+curb*
F_{asd} =	**666 lbs**	

SEISMIC DESIGN PER ASCE 7-16, SECTION 13.0

Seismic Design Force: 13.3.1

S_{DS} =	0.588 g	*NEHRP Seismic Design Provisions*
a_p =	2.5	*Component Amplification Factor perTable 13.5.1 or 13.6.1*
I_p =	1	*Importance Factor per section13.1.3*
W_p =	1904 lbs	*Component Operating Weight*
R_p =	6	*Component Response Mod. Factor per Table 13.5.1 or 13.6.1*
z/h =	1.00	*Height of attachement with respect to base*
$F_{p\ ult}$ =	**560 lbs**	*Design Seismic force EQ. (6-13-1)*
$F_{p\ asd}$ =	**392 lbs**	
F_{pMIN}=	240 lbs	*Design Seismic force EQ. (6-13-3)*

WDY **Structural . Civil Engineers**

Job Name:	Westmoreland Campus MU	Job No:	20179	Sheet No:	4/7
Client:	R&W Engineering	Date:	Nov 2020	By:	MS

Finding Center of Gravity of Total Weight

		Anchor Center to Center (IN)	52.0
	WEIGHTS (LB)	DISTANCE TO CENTER OF WEIGHT (IN)	
HV-2	1634	27.00	
Curb	270	7.00	
Total	1904		
	y BAR	34.0	
	X BAR	26.0	

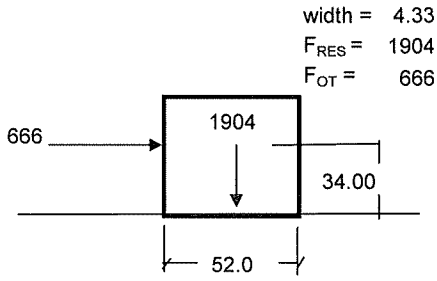
Finding Seismic Force, F_p (Per ASCE 7 - 13.3)

latidude	44.04088
longitude	-123.1271349
I (Importance Factor)	1
ap (	2.5
Rp (	6
S_s	0.721
S_1	0.411
F_a	1.2
S_{DS}	0.588
z	1
h	1

Seismic Weight, W_p	1904

Fp (lb) =	391.8	ASCE 7 (EQ.13.3-1)
Fp min (lb) =	239.9	ASCE 7 (EQ.13.3-3)
Fp max (lb) =	1,279.5	ASCE 7 (EQ.13.3-2)
Design Fp (lb)	391.8	

WIND



M_{RES} = 2475.2 lbs-ft *ASD
M_{OT} = 1888.2 lbs-ft *ASD

T_{wind} = -135.47 lbs
V_{wind} = 666 lbs

NO OVERTURNING

Anchor Force Seismic

M_{RESIST} (LB*FT) Strength Design	2475.2
$M_{O.T}$ (LB*FT) Strength Design	1110.2

T (lb)	-314.99	**No Overturning**	At Back Side
T (lb)	-314.99	**No Overturning**	At Front Side

Anchor Design Seismic*

(2) Back Anchors	Force Per Anchor	(2) Front Anchors	Force Per Anchor	
T/Anchor	0.00	T/Anchor	0.00	LB
V/Anchor	97.96	V/anchor	97.96	LB

Anchor Design Wind*

(2) Back Anchors	Force Per Anchor	(2) Front Anchors	Force Per Anchor	
T/Anchor	0.00	T/Anchor	0.00	LB
V/Anchor	166.60	V/anchor	166.60	LB

WIND CONTROLS

*USE SIMPSON 1/4" DIA x 2 1/2 SDS SCREW IN EACH CORNER

WoodWorks® SOFTWARE FOR WOOD DESIGN

COMPANY
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Porland, OR 97221
Nov. 5, 2020 16:25

PROJECT
20179
Westmoreland Campus MU
(E) 2x10 @ 24 O.C.wwb

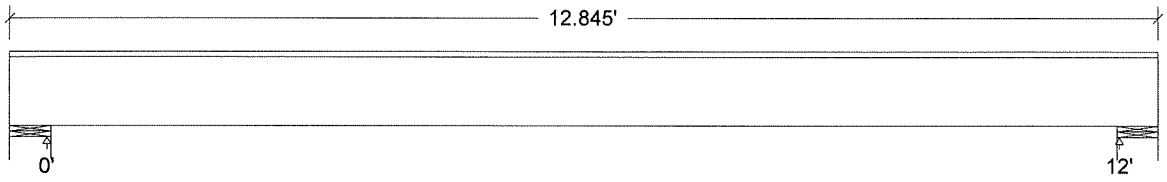
Design Check Calculation Sheet

WoodWorks Sizer 2019 (Update 1)

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
DL	Dead	Full Area				8.00(24.0")		psf
SL	Snow	Full Area				25.00(24.0")		psf
HV-4/7/8	Dead	Partial UDL		0.00	6.00	127.0	127.0	plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:			
Dead	699		268
Snow	321		322
Factored:			
Total	1020		590
Bearing:			
Capacity			
Joist	5156		5156
Support	6445		6445
Des ratio			
Joist	0.20		0.11
Support	0.16		0.09
Load comb	#2		#2
Length	5.50		5.50
Min req'd	1.09		0.63
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fcp sup	625		625

Bearing for wall supports is perpendicular-to-grain bearing on top plate. No stud design included.

Lumber-soft, D.Fir-L, No.2, 2x10 (1-1/2"x9-1/4")

Supports: All - Lumber Stud Wall, D.Fir-L Stud

Roof joist spaced at 24.0" c/c; Total length: 12.85'; Clear span: 11.928'; Volume = 1.2 cu.ft.

Lateral support: top = continuous, bottom = at supports; Repetitive factor: applied where permitted (refer to online help);

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 85	Fv' = 207	psi	fv/Fv' = 0.41
Bending(+)	fb = 1285	Fb' = 1309	psi	fb/Fb' = 0.98
Dead Defl'n	0.21 = L/672			
Live Defl'n	0.15 = L/977	0.60 = L/240	in	0.25
Total Defl'n	0.36 = L/398	0.80 = L/180	in	0.45

WoodWorks® SOFTWARE FOR WOOD DESIGN

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PROJECT
20179
Westmoreland Campus MU
(E) 2x12 @ 24 O.C.wwb

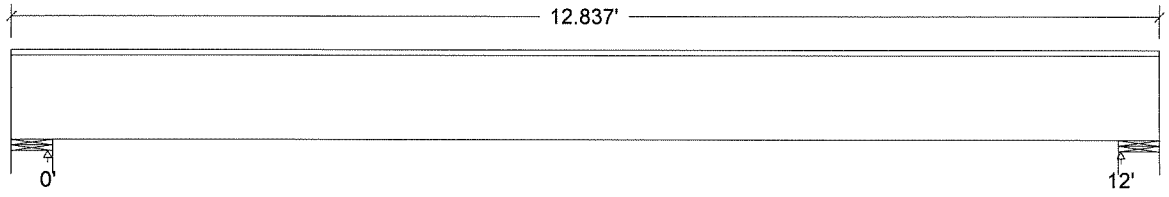
Design Check Calculation Sheet

WoodWorks Sizer 2019 (Update 1)

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
DL	Dead	Full Area				8.00(24.0")		psf
SL	Snow	Full Area				25.00(24.0")		psf
HV-2/10	Dead	Partial UDL		0.00	6.00	158.6	158.6	plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:			
Dead	847		310
Snow	320		322
Factored:			
Total	1168		631
Bearing:			
Capacity			
Joist	5156		5156
Support	6445		6445
Des ratio			
Joist	0.23		0.12
Support	0.18		0.10
Load comb	#2		#2
Length	5.50		5.50
Min req'd	1.25		0.67
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fcp sup	625		625

Bearing for wall supports is perpendicular-to-grain bearing on top plate. No stud design included.

Lumber-soft, D.Fir-L, No.2, 2x12 (1-1/2"x11-1/4")

Supports: All - Lumber Stud Wall, D.Fir-L Stud

Roof joist spaced at 24.0" c/c; Total length: 12.84'; Clear span: 11.92'; Volume = 1.5 cu.ft.

Lateral support: top = continuous, bottom = at supports; Repetitive factor: applied where permitted (refer to online help);

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 77	Fv' = 207	psi	fv/Fv' = 0.37
Bending(+)	fb = 978	Fb' = 1190	psi	fb/Fb' = 0.82
Dead Defl'n	0.14 = < L/999			
Live Defl'n	0.08 = < L/999	0.60 = L/240	in	0.14
Total Defl'n	0.22 = L/641	0.80 = L/180	in	0.28

WoodWorks® SOFTWARE FOR WOOD DESIGN

COMPANY
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Nov. 6, 2020 13:23

PROJECT
20179
Westmoreland Campus MU
HV-3,6 (N) LVL @ 24 O.C.wwb

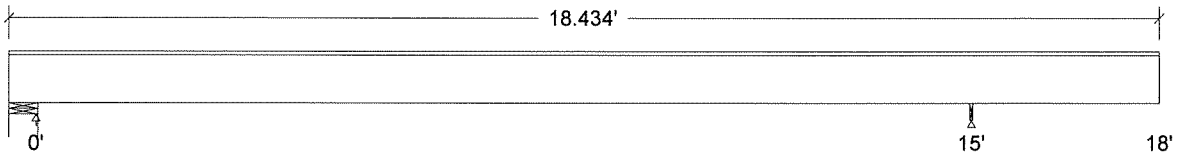
Design Check Calculation Sheet

WoodWorks Sizer 2019 (Update 1)

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
DL	Dead	Full Area	No			8.00(24.0")		psf
SL	Snow	Full Area	No			25.00(24.0")		psf
HV-3/9	Dead	Partial UDL	No	3.50	9.50	72.0	72.0	plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:						
Dead	379			347		
Snow	382			540		
Factored:						
Total	761			887		
Bearing:						
Capacity						
Joist	7219			1369		
Support	7305			887		
Des ratio						
Joist	0.11			0.65		
Support	0.10			1.00		
Load comb	#2			#2		
Length	5.50			0.67		
Min req'd	0.58			0.67**		
Cb	1.00			1.56		
Cb min	1.00			1.56		
Cb support	-			1.21		
Fcp sup	625			625		

**Minimum bearing length governed by the required width of the supporting member.
Bearing for wall supports is perpendicular-to-grain bearing on top plate. No stud design included.

(WORST CASE)
OK Y.

LVL n-ply, 2.0E, 2500Fb, 1-3/4"x9-1/4", 1-ply

Supports: 1 - Lumber Stud Wall, D.Fir-L Stud; 2 - Lumber n-ply Beam, D.Fir-L No.2;
Roof joist spaced at 24" c/c; Total length: 18.43'; Clear span: 14.948', 2.972'; Volume = 2.1 cu.ft.
Lateral support: top = continuous, bottom = at supports; Repetitive factor: applied where permitted (refer to online help);
This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 63	Fv' = 328	psi	fv/Fv' = 0.19
Bending(+)	fb = 1420	Fb' = 3098	psi	fb/Fb' = 0.46
Bending(-)	fb = 143	Fb' = 1380	psi	fb/Fb' = 0.10
Deflection:				
Interior Dead	0.27 = L/660			
Live	0.22 = L/807	0.75 = L/240	in	0.30
Total	0.50 = L/363	1.00 = L/180	in	0.50
Cantil. Dead	-0.16 = L/227			
Live	-0.13 = L/279	0.30 = L/120	in	0.43
Total	-0.29 = L/125	0.40 = L/90	in	0.72