

PRE-FABRICATED BUILDING DESIGN - FOUNDATION CALCULATIONS				IBC-2018, ASCE 7-16& WSBC		
CLIENT	bcra	Owner	Puyallup SD			
DATE:	3-Apr-22	Est.#	E22061	LOCATION:	South Hill, 6312 Waller Rd E, Tacoma, WA 98443	
PROJECT#	220100	01.1.4-1		STATE:	WA	98443

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<u>LOCATION</u>		<u>WIDTH:</u>	<u>LENGTH:</u>	<u>TYPE:</u>
Puyallup SD South Hill, 6312 Waller Rd E, Tacoma, WA 98443	01.1.4-1	28	32	MODULAR Style Building-Classroom, W/MID-SPAN FLOOR SUPPORT, 1500 psf Soil Bearing

**PRE-MANUFACTURED BUILDING PAD & PIER FOUNDATION CALCULATIONS**

IBC-2018, ASCE 7-16&amp; WSBC

**CLIENT** bcra**DEALER:** Puyallup SD**Criteria** 25,40,100C,D,1.253,1500**Date:** 3-Apr-22**PO#** E22061**Location:** South Hill, 6312 Waller Rd E, Tacoma, WA 98443**Project #:** 220100 01.1.4-1**MODULAR Style Building-Classroom, W/MID-SPAN****State(s):** WA 98443**FLOOR SUPPORT, 1500 psf Soil Bearing****I. DESIGN CRITERIA:**

Building Risk Category, BRC:

II

ASCE 7 Table 1-1

Dead Load: Roof, RDL =

15 psf

Ceiling CDL =

1 psf

Ceiling CLL =

1 psf

E&amp;M =

2 psf

Floor, FDL =

10 psf

Wall, WDL =

9 psf

Roof Live Load: General Roof Minimum Live Load, RML

20 psf

Ground Snow Load

18 psf

Snow Load, RSL =  $0.7 \cdot C_e \cdot C_t \cdot I_s \cdot AGSL$ 

14 psf

Jurisdictional Snow Load

25 psf

Design Roof Live Load, RLL

25 psf

Load Duration Factor, Cd =

1.15 %

Floor Load: Uniform Floor Load, FLL =

Classroom

40 psf

IBC Table 1607.1

Concentrated Live Load, p =

1000 lbs.

IBC Table 1607.1

Partion, PDL =

0 psf

Wind Load: Basic Wind Speed, V =

98

100 mph

ASCE 7 Figure 6-1

"a" Edge Pressure Distance =

3.00 ft

2 Roof Slope = 2:12 =

9.46 Degrees

Ave. Lateral Edge Wind Pressure, Wep = (A&amp;B)

16 psf

ASCE 7 Figure 6.2

Ave. Lateral Interior Wind Pressure, Wip = (C&amp;D)

16 psf

ASCE 7 Figure 6.2

Average Lateral Wind Pressure, Wp =

16 psf

ASCE 7 Figure 6-2

Ave. Uplift Edge Wind Pressure, Wep = (E&amp;F)

-17.61 psf

ASCE 7 Figure 6.2

Ave. Uplift Interior Wind Pressure, Wip = (G&amp;H)

-12.43 psf

ASCE 7 Figure 6.2

Average Uplift Wind Pressure, Wp =

-13.40 psf

ASCE 7 Figure 6-2

Exposure Category = C Exposure Factor,  $\lambda$  =

1.29

ASCE 7 Section 6.5.6.1

Wind Topographic Factor, Kz =

1.00

ASCE 7 Section 6.5

Design Wind Pressure, Dwp =  $W_p \cdot \lambda \cdot I_w \cdot K_z$  =

20.64 psf

IBC Section 1605.3.1

Average Uplift Pressure, Dwulp (OTM) =

-17.29 psf

Seismic: **98443** ASCE 7-10 Section 12.14 - Simplified Alt. Struc. Design Criteria for Simple Bearing Wall or Frame Systems

Upper Module Weight = 0.00 psf

Lower Module Weight = 26.54 psf

Required Partion Weight = 0.00 psf

Total Seismic Design Weight, Wtot = 26.54 psf

ASCE 7, Section 3.1

Snow Load % Used in Seismic Design =

0%

Soil Site Class

D

81 Mapped Spectral Accelerations, short periods, Ss =

1.253

IBC Figure 1615

47.180817 Site Coefficient, Fa =

1.200

ASCE 7, Section 12.14.8.1

-122.256265 Max. Spectral Response, SMS =  $F_a \cdot S_s$  =

1.504

IBC Equation 16-16

'D' Design Spectral Response, SDS =  $2/3 \cdot SMS$  =

1.002

IBC Equation 16-18

Seismic Design Category =

D

ASCE 7, T.11.6-1

Response Modification Coefficient, R =

4.00

ASCE 7, T.12.2-1

Overstrength Factor

2.50

ASCE 7, T.12.2-1

Lateral Load Factor, F = (1, Single Story; 1.1, 2-story; 1.2, 3-story)

1

ASCE 7, 12.14.8.1

Total Shear, pst =  $F \cdot SDS \cdot W_{tot} / R$  =

6.65 psf

ASCE 7, EQ. 12.14-11

**PRE-MANUFACTURED BUILDING PAD & PIER FOUNDATION CALCULATIONS**

IBC-2018, ASCE 7-16&amp; WSBC

<b>CLIENT</b>	bcra	<b>DEALER:</b>	Puyallup SD	<b>Criteria</b>	25,40,100C,D,1.253,1500
<b>Date:</b>	3-Apr-22	<b>PO#</b>	E22061	<b>Location:</b>	South Hill, 6312 Waller Rd E, Tacoma, WA 98443
<b>Project #:</b>	220100	01.1.4-1	<b>MODULAR Style Building-Classroom, W/MID-SPAN</b>	<b>State(s):</b>	WA 98443
<b>FLOOR SUPPORT, 1500 psf Soil Bearing</b>					

Dimensions:	Module Length, ML =		32	ft.
	Module Width, MW =		14.00	ft.
	Width, W =	# Units = 2	28.00	ft.
	Length, L =	# Units = 1	32.00	ft.
	1st Floor Wall Ht., Wht1 =		9.37	ft.
	Roof Height, Rht =	2 :12 Slope	W	2.33 ft.
	Ave FF above NG, Fht =	30	inches	2.50 ft
	Building Ht Coeff, Htc = Rht+Wht+Fht-10			2.00
	No. of floor spans per module, nfs =		2	
	Effective Width of Building Supported, L2a =		84.00	inches

**II. FOUNDATION DESIGN****A. Foundation Components**

Option A	Individual Bearing Pads - Bearing Pads		Int. Column	Ext Co. Pads
	Width, wbp =	16	inches	16
	Length, lbp =	16	inches	16
	Enhanced Subgrade Depth: Conc, Asph & Base	2	inches	
	Equivalent Bearing Area at Soil, BA =	324	Sq. Inches	324 324
IBC-T.18.4.2	Allowable Soil Bearing Pressure, Q =	1500	psf.	Assumed
Option B	Perimeter Support Width	0	inches	
	Allowable Load, Pbp = (BA)/144*Q =	3375	pounds	3375 pounds
	<b>Lateral Load Anchors</b> - 'Minuteman' Auger Anchors w/Stabilizer Cap			4a Soils-MMA-52 w/MMA-SD2A
	ASD Anchor Capacity, Anch_L =	3150	lbs. @ 45°	4b Soils-MMA-75 w/MMA-SD2A
	<b>Overturning Uplift Anchors</b> - 'Minuteman' Auger Anchor w/Stabilizer Cap			
	ASD Anchor Capacity, Anch_U =	3150	lbs. @ 90°	

**B1. Exterior Pads (Exterior Rails)**

<b>Floor and Roof Loads:</b>	Exterior Uniform Floor Load, ufl = (RLL+RDL+CDL+CLL+EM)*MW/2 + (FLL+FDL+PDL)*L2a/24 + (Wht+Wht1)*WDL =	506 lb/ft.
	Perimeter Support Bearing Pressure, (Skirting)	0 psf - OK!
OR	Max. Pad Spacing, Mps = Pfla/ufl =	6.00 ft.
	Max. span of Support Beams =	6.00 ft.
	<b>Use:</b> Perimeter Skirting W/ (7) 16-inch x 16-inch pad @ 6-ft o.c., max exterior supports.	

**C1. Interior Pads (Floor Loads Only)**

<b>Floor Loads:</b>	Interior Uniform Floor Load, ifll = (FDL+FLL+PDL)*L2a/12 =	350 lb/ft.
	Max. Pad Spacing, Mps = Pfla/ifll =	8.00 ft.
	Max. span of Support Beams =	8.00 ft.
	<b>Use:</b> (5) 16-inch x 16-inch Pads @ 8-ft o.c, max. interior supports.	

**D. Column Pads (Roof Loads Only)**

<b>Roof Loads:</b>	Column Pads Required, Cpr =	1	pads
	Allowable Load, Prla =	3375	lbs.
	ML Beams Load, mbrl = (RLL+RDL+EM+CDL+CLL)*MW+IF(Wht=0,0,(FLL+FDL+EM+CDL+CLL)*MW	616	lb/ft.
	Effective Mateline Beam Span, Mps = Pfla/mbrl =	5.48	ft.
	<b>Use:</b> (1) 16-inch x 16-inch pads for every 5.47-ft effective Mateline Beam Span.		

<b>Effective Interior Roof Beam Span =</b>	0 ft., (0)-SF	0	16x16 PADS REQ'D
<b>Effective Exterior Roof Beam Span =</b>	16 ft., (6.6)-SF	3	16x16 PADS REQ'D

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Required Design Factor of Safety =

1.5

ASD

Unit Wind Load,  $UWL = (Wht + Rht/2 + Fht/2) * Wp * L =$ 

7785 lbs

Governs

4671

Unit Seismic Load,  $USL = W * pst =$ 

5958 lbs

4171

Building Weight =

23776 lbs

% Building Weight Used for Lateral Sliding

0%

Transverse Foundation Friction Factor =

0.35

Gravity Resistance,  $GR = \text{Building WT} * \text{Friction Factor} =$ 

0 lbs.

 $OTM = \text{MAX}(UWL * wht/2 + \text{Uplift}, OTM, USL * wht/2)$ 

159173 Ft-lbs

 $RM = \text{Building Wt} * W/2$ 

332860 Ft-lbs

Factor of Safety =  $RM/OTM$ 

2.09

No Uplift Anchors Required

**Use: (3) Lateral Load Anchors, Min.****& No Uplift Anchors Required****2A. Lateral Walls (End, Short Walls) - Soil Anchor Option**Unit Wind Load,  $UWL = (Wht + Rht + Fht/2) * Wp =$ 

6089 lbs.

Governs

ASD

3654

Unit Seismic Lateral Load,  $USLL = L * pst =$ 

5958 lbs.

4171

Building Weight =

0 lbs

% Building Weight Used for Longitudinal Sliding

0%

Longitudinal Foundation Friction Factor =

0.35

Gravity Resistance,  $GR_L = \text{Building WT} * \text{Friction Factor} =$ 

0 lbs.

 $OTM = \text{MAX}(UWL * wht/2 + \text{Uplift OTM}, USL * wht/2)$ 

157933 Ft-lbs

 $RM = \text{Building Wt} * W/2$ 

380411 Ft-lbs

Factor of Safety =  $RM/OTM$ 

2.41

No Uplift Anchors Required

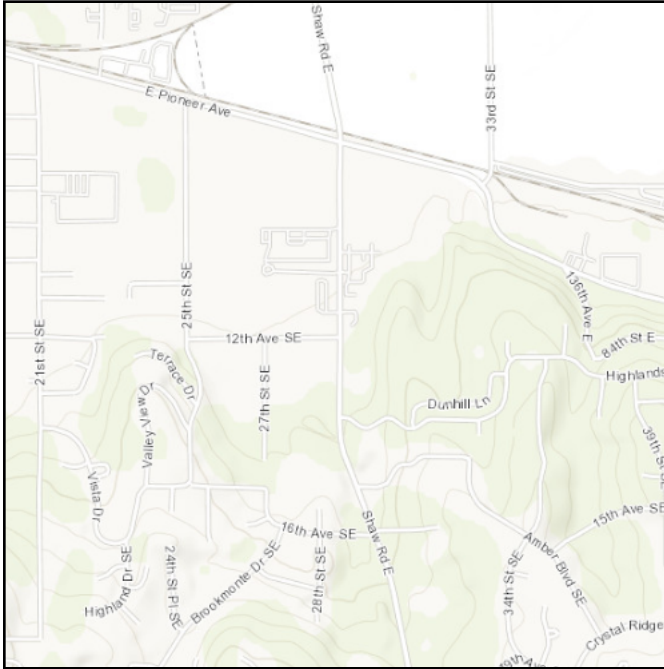
**Use: (2) Lateral Load Anchors, Min.****& No Uplift Anchors Required**

# ASCE 7 Hazards Report

**Address:**  
1106 Shaw Rd E  
Puyallup, Washington  
98372

<b>Standard:</b>	ASCE/SEI 7-16
<b>Risk Category:</b>	II
<b>Soil Class:</b>	D - Default (see Section 11.4.3)

**Elevation:** 81.29 ft (NAVD 88)  
**Latitude:** 47.180817  
**Longitude:** -122.256265



## Wind

### Results:

Wind Speed	98 Vmph
10-year MRI	67 Vmph
25-year MRI	74 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2  
Date Accessed: Mon Mar 28 2022

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

**Site Soil Class:** D - Default (see Section 11.4.3)

**Results:**

$S_S$ :	1.253	$S_{D1}$ :	N/A
$S_1$ :	0.431	$T_L$ :	6
$F_a$ :	1.2	PGA :	0.5
$F_v$ :	N/A	PGA <sub>M</sub> :	0.6
$S_{MS}$ :	1.504	$F_{PGA}$ :	1.2
$S_{M1}$ :	N/A	$I_e$ :	1
$S_{DS}$ :	1.002	$C_v$ :	1.351

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

**Data Accessed:** Mon Mar 28 2022

**Date Source:** [USGS Seismic Design Maps](#)

**Results:**

Ground Snow Load,  $p_g$  : 18 lb/ft<sup>2</sup>

Elevation: 81.3 ft

Data Source:

Date Accessed: Mon Mar 28 2022

Statutory requirements of the Authority Having Jurisdiction are not included.

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The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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