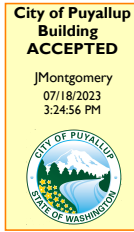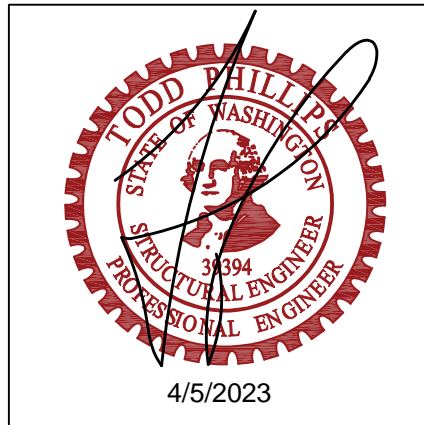# ENGINEERING ANALYSIS FOR:
# HC HOMES
# SITE:

# 409 43RD AVE SW
# PUYALLUP, WA

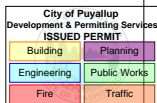**REPORT** REQUIRED TO BE PROVIDED BY THE PERMITTEE ON SITE FOR ALL INSPECTIONS

ORIGINAL STAMP
MUST BE RED
TO BE VALID



TODD PHILLIPS
STATE OF WASHINGTON
38394
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

4/5/2023

| DATE: | PLAN NUMBER: | | PHILLIPS STRUCTURAL ENGINEERING, PLLC | |
|---|---|---|---|---|
| APR. 5, 2023 | 43rd AVE DUPLEX | | P.O. BOX 108, MILTON, WA 98354<br>Phone (253) 344-1666 | |

| STRUCTURAL ENGINEERING CALCULATIONS | PHILLIPS STRUCTURAL ENGINEERING |
|---|---|

The enclosed documents are to be used in conjunction with the plans referenced on the cover page. It is imperative that the contractor study and understand the engineering requirements and any required changes to the architectural plan prior to start of work. Modifications may include additional foundations or footings, beam and framing size, sheathing, etc.

Scope of Engineering:  Engineering analysis and design to resist lateral and gravity loads in accordance with the 2018 IBC have been performed and incorporated into stamped "S" sheets. All analyses and calculations are included in this engineering report (see 8½x11 pages). Engineering assumptions are listed below. If the conditions listed below are not present at the site, all calculations and stamped drawings are void and *Phillips Structural Engineering* must be contacted immediately for further consultation.

STRUCTURAL DESIGN  CRITERIA AND LOADING:
Building Code                                2018 International Building Code (IBC)

EARTHQUAKE DESIGN DATA:
-Risk Category = II
- Seismic Importance Factor (Ie) = 1.0
- Mapped Spectral Response Acceleration Parameters
    - $S_s$ = 1.26
    - $S_1$ =  0.44
- Seismic Design Category (SDC) = "D"
- Basic Seismic Force-Resisting System = Light-frame (wood) walls sheathed with wood
   structural panel rated for shear resistance
- Response Modification Factor (R) = 6.5
- Analysis Procedure Used = Equivalent Lateral Force

WIND DESIGN DATA:
- Basic Design Wind Speed (V) = 110 MPH
- Allowable Stress Design Wind Speed (Vasd) = 85 MPH
- Risk Category = II
- Wind Importance Factor (Iw) = 1.0
- Wind Exposure = "B"
- Topographical Effect (Kzt) = 1.00

ROOF LOADING:
- Dead Load = 15 PSF (No tile weight included)
- Roof Live Load (Lr) =  20PSF
- Typical Flat Roof Snow Load (Pf) = 25PSF
- Snow Exposure Factor (Ce) = 1.0
- Snow Load Importance Factor (Is) = 1.0
**Typical roof snow load shall not be less than 25PSF

FLOOR LOADING:
- Dead Load = 12 PSF (Standard wood framing without heavy finish)
- Typical Residential Occupancy Live Loading (L) = 40PSF
- Deck Live Load (L) =  60PSF (1.5x for area served)

SOILS CRITERIA
| | |
|---|---|
| Soils Consultant | None (U.N.O.) |
| Soils Report # | None (U.N.O.) |
| Minimum Allowable Pressure Required | 1500 PSF (Verify w/ Site Conditions) |
| Frost Bearing Depth | 18" |

* See plans/detailing for other soils considerations
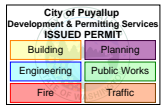
⚠ This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

## △TC Hazards by Location

## Search Information

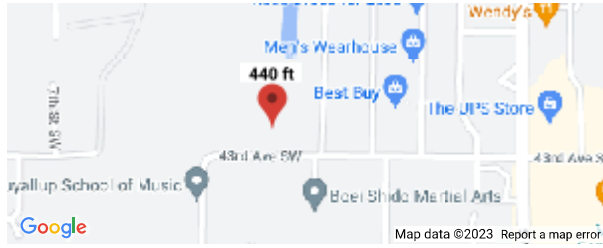| | |
|---|---|
| **Address:** | 409 43rd Ave SW, Puyallup, WA 98373, USA |
| **Coordinates:** | 47.15146399999999, -122.297448 |
| **Elevation:** | 440 ft |
| **Timestamp:** | 2023-03-29T19:35:50.651Z |
| **Hazard Type:** | Seismic |
| **Reference Document:** | ASCE7-16 |
| **Risk Category:** | II |
| **Site Class:** | D-default |

## Basic Parameters

| Name | Value | Description |
|---|---|---|
| $S_S$ | 1.262 | $MCE_R$ ground motion (period=0.2s) |
| $S_1$ | 0.436 | $MCE_R$ ground motion (period=1.0s) |
| $S_{MS}$ | 1.515 | Site-modified spectral acceleration value |
| $S_{M1}$ | * null | Site-modified spectral acceleration value |
| $S_{DS}$ | 1.01 | Numeric seismic design value at 0.2s SA |
| $S_{D1}$ | * null | Numeric seismic design value at 1.0s SA |

* See Section 11.4.8

## ▼Additional Information

| Name | Value | Description |
|---|---|---|
| SDC | * null | Seismic design category |
| $F_a$ | 1.2 | Site amplification factor at 0.2s |
| $F_v$ | * null | Site amplification factor at 1.0s |
| $CR_S$ | 0.914 | Coefficient of risk (0.2s) |
| $CR_1$ | 0.898 | Coefficient of risk (1.0s) |
| PGA | 0.5 | $MCE_G$ peak ground acceleration |
| $F_{PGA}$ | 1.2 | Site amplification factor at PGA |
| $PGA_M$ | 0.6 | Site modified peak ground acceleration |
| $T_L$ | 6 | Long-period transition period (s) |
| SsRT | 1.262 | Probabilistic risk-targeted ground motion (0.2s) |
| SsUH | 1.381 | Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years) |
| SsD | 1.5 | Factored deterministic acceleration value (0.2s) |
| S1RT | 0.436 | Probabilistic risk-targeted ground motion (1.0s) |
| S1UH | 0.485 | Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years) |
| S1D | 0.6 | Factored deterministic acceleration value (1.0s) |
| PGAd | 0.5 | Factored deterministic acceleration value (PGA) |

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

## Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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# WoodWorks® Shearwalls

## SOFTWARE FOR WOOD DESIGN

WoodWorks® Shearwalls 2019 (Update 3)

Mar. 29, 2023  13:31:36

PRRNSF20230918

**City of Puyallup**
Development & Permitting Services
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| Building | Planning |
| Engineering | Public Works |
| Fire | Traffic |



| Segmented | Perforated | Force-transfer | Non-shearwall | Aspect factor | Orange = Selected wall(s) |

# WoodWorks® Shearwalls

**SOFTWARE FOR WOOD DESIGN**

**43rd Ave Duplex - SHEAR.wsw**          **WoodWorks® Shearwalls 2019 (Update 3)**          **Mar. 29, 2023  13:31:36**

Level 2 of 2



Segmented   Perforated   Force-transfer   Non-shearwall   Aspect factor   Orange = Selected wall(s)

# WoodWorks® Shearwalls

**SOFTWARE FOR WOOD DESIGN**

**WoodWorks® Shearwalls 2019 (Update 3)**

**43rd Ave Duplex - SHEAR.wsw**                                   **Mar. 29, 2023 14:14:48**

## Project Information

### COMPANY AND PROJECT INFORMATION

| Company | Project |
|---|---|
| Phillips Structural Engineering<br>PO Box 108<br>Milton, WA 98354 | |

### DESIGN SETTINGS

| Design Code | Wind Standard | Seismic Standard |
|---|---|---|
| IBC 2018/AWC SDPWS 2015 | ASCE 7-16 Directional (All heights) | ASCE 7-16 |

| Load Combinations | | Building Code Capacity Modification | |
|---|---|---|---|
| **For Design (ASD)** | **For Deflection (Strength)** | **Wind** | **Seismic** |
| 0.70 Seismic | 1.00 Seismic | 1.00 | 1.00 |
| 0.60 Wind | 1.00 Wind | | |

| Service Conditions and Load Duration | | | | Max Shearwall Offset [ft] | |
|---|---|---|---|---|---|
| **Duration** | **Temperature** | **Moisture Content** | | **Plan** | **Elevation** |
| **Factor** | **Range** | **Fabrication** | **Service** | **(within story)** | **(between stories)** |
| – | – | – | – | 4.00 | 3.75 |

| Maximum Height-to-width Ratio | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Wood panels** | | **Fiberboard** | **Lumber** | | | **Gypsum** | |
| **Wind** | **Seismic** | | **Wind** | **Seismic** | | **Blocked** | **Unblocked** |
| 3.5 | 3.5 | – | – | – | | – | – |

| Ignore non-wood-panel shear resistance contribution... | | Forces based on... | |
|---|---|---|---|
| **Wind** | **Seismic** | **Hold-downs** | Applied loads |
| Never | Always | **Drag struts** | Applied loads |

| | |
|---|---|
| **Shearwall relative rigidity:** | Wall capacity |
| **Perforated shearwall Co factor:** | SDPWS Equation 4.3-5 |
| **Non-identical materials and construction on the shearline:** | Not allowed |
| **Deflection Equation:** | No deflection analysis |
| **Drift limit for wind design:** | 1 / 500 story height |
| **Force-transfer strap:** | Continuous at top of highest opening and bottom of lowest |

### SITE INFORMATION

| Wind | | | Seismic | | |
|---|---|---|---|---|---|
| ASCE 7-16 Directional (All heights) | | | ASCE 7-16 12.8 Equivalent Lateral Force Procedure | | |
| **Design Wind Speed** | 110 mph | | **Risk Category** | Category II - All others | |
| **Serviceability Wind Speed** | 100 mph | | **Structure Type** | Regular | |
| **Exposure** | Exposure B | | **Building System** | Bearing Wall | |
| **Enclosure** | Partially enclosed | | **Design Category** | D | |
| **Min Wind Loads: Walls** | 16 psf | | **Site Class** | D | |
| **Roofs** | 8 psf | | **Spectral Response Acceleration** | | |
| **Topographic Information [ft]** | | | **S1:** 0.440g | **Ss:** 1.260g | |
| **Shape** | **Height** | **Length** | **Fundamental Period** | **E-W** | **N-S** |
| – | – | – | **T Used** | 0.202s | 0.202s |
| **Site Location:** – | | | **Approximate Ta** | 0.202s | 0.202s |
| Elev: 0ft | | | **Maximum T** | 0.283s | 0.283s |
| Rigid building – Static analysis | | | **Response Factor R** | 6.50 | 6.50 |
| **Case 2** | **E-W loads** | **N-S loads** | **Fa:** 1.20 | **Fv:** 1.86 | |
| **Eccentricity (%)** | 15 | 15 | | | |
| **Loaded at** | 75% | | | | |

PRRNSF20230918

City of Puyallup
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**WoodWorks® Shearwalls**    **43rd Ave Duplex - SHEAR.wsw**    **Mar. 29, 2023**
14:14:48

## Structural Data

**STORY INFORMATION**

| | Story Elev [ft] | Floor/Ceiling Depth [in] | Wall Height [ft] |
|---|---|---|---|
| **Ceiling** | 21.44 | 0.0 | |
| **Level 2** | 13.44 | 1'-6.0 | 8.00 |
| **Level 1** | 2.94 | 11.3 | 9.00 |
| **Foundation** | 2.00 | | |

**BLOCK and ROOF INFORMATION**

| Block Dimensions [ft] | | | Roof Panels Face | Type | Slope | Overhang [ft] |
|---|---|---|---|---|---|---|
| **Block 1** | 2 Story | E-W Ridge | | | | |
| Location X,Y = | 0.00 | 2.00 | **North** | Side | 23.0 | 1.00 |
| Extent X,Y = | 30.00 | 32.00 | **South** | Side | 23.0 | 1.00 |
| Ridge Y Location, Offset | 18.00 | 0.00 | **East** | Gable | 90.0 | 1.00 |
| Ridge Elevation, Height | 28.23 | 6.79 | **West** | Gable | 90.0 | 1.00 |
| **Block 2** | 2 Story | N-S Ridge | | | | |
| Location X,Y = | 18.00 | 0.00 | **North** | Joined | 157.0 | 1.00 |
| Extent X,Y = | 12.00 | 2.00 | **South** | Gable | 90.0 | 1.00 |
| Ridge X Location, Offset | 18.00 | -6.00 | **East** | Side | 23.0 | 1.00 |
| Ridge Elevation, Height | 26.53 | 5.09 | **West** | Side | 90.0 | 1.00 |
| **Block 3** | 1 Story | E-W Ridge | | | | |
| Location X,Y = | 30.00 | 7.00 | **North** | Side | 27.0 | 1.00 |
| Extent X,Y = | 20.00 | 27.00 | **South** | Side | 27.0 | 1.00 |
| Ridge Y Location, Offset | 20.50 | 0.00 | **East** | Gable | 90.0 | 1.00 |
| Ridge Elevation, Height | 20.32 | 6.88 | **West** | Gable | 90.0 | 1.00 |
| **Block 4** | 1 Story | E-W Ridge | | | | |
| Location X,Y = | 0.00 | -2.75 | **North** | Side | 90.0 | 1.00 |
| Extent X,Y = | 17.75 | 4.75 | **South** | Side | 23.0 | 1.00 |
| Ridge Y Location, Offset | 2.00 | 2.38 | **East** | Gable | 90.0 | 1.00 |
| Ridge Elevation, Height | 15.45 | 2.02 | **West** | Gable | 90.0 | 1.00 |

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City of Puyallup
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**WoodWorks® Shearwalls**   **43rd Ave Duplex - SHEAR.wsw   Mar. 29, 2023**
**14:14:48**
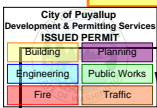
### SHEATHING MATERIALS by WALL GROUP

| Grp | Surf | Material | Ratng | Sheathing Thick in | GU in | Ply | Or | Gvtv lbs/in | Size | Type | Df | Eg in | Fd in | Bk | Apply Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ext | Struct Sh OSB | 24/16 | 7/16 | - | - | Vert | 83500 | 8d | Nail | N | 6 | 12 | Y | 1,3 |
| 2 | Ext | Struct Sh OSB | 24/16 | 7/16 | - | - | Vert | 83500 | 8d | Nail | N | 4 | 12 | Y | 1,2,3 |

*Legend:*
*Grp – Wall Design Group number, used to reference wall in other tables (created by program)*
*Surf – Exterior or interior surface when applied to exterior wall*
*Ratng – Span rating, see SDPWS Table C4.2.2.2C*
*Thick – Nominal panel thickness*
*GU - Gypsum underlay thickness*
*Ply – Number of plies (or layers) in construction of plywood sheets*
*Or – Orientation of longer dimension of sheathing panels*
*Gvtv – Shear stiffness in lb/in. of depth from SDPWS Tables C4.2.2A-B*
*Type – Fastener type from SDPWS Tables 4.3A-D: Nail – common wire nail for structural panels and lumber, cooler or gypsum wallboard nail for GWB, plasterboard nail for gypsum lath, galvanised nail for gypsum sheathing;  Box - box nail; Casing – casing nail; Roof – roofing nail; Screw – drywall screw*
*Size - Common, box, and casing nails: refer to SDPWS Table A1 (casing sizes = box sizes).*
*    Gauges: 11 ga = 0.120" x 1-3/4" (gypsum sheathing, 25/32" fiberboard ), 1-1/2" (lath & plaster, 1/2" fiberboard); 13 ga plasterboard = 0.92" x 1-1/8".*
*    Cooler or gypsum wallboard nail: 5d = .086" x 1-5/8"; 6d = .092" x 1-7/8"; 8d = .113" x 2-3/8"; 6/8d = 6d base ply, 8d face ply for 2-ply GWB.*
*    Drywall screws: No. 6, 1-1/4" long.*
*    5/8" gypsum sheathing can also use 6d cooler or GWB nail*
*Df – Deformed nails ( threaded or spiral), with increased withdrawal capacity*
*Eg –  Panel edge fastener spacing*
*Fd –  Field spacing interior to panels*
*Bk – Sheathing is nailed to blocking at all panel edges; Y(es) or N(o)*
*Apply Notes – Notes below table legend which apply to sheathing side*

Notes:
1.Capacity has been reduced for framing specific gravity according to SDPWS T4.3A Note 3.
2. Framing at adjoining panel edges must be 3" nominal or wider with staggered nailing according to SDPWS 4.3.7.1.4
3. Shear capacity for current design has been increased to the value for 15/32" sheathing with same nailing because stud spacing is 16" max. or panel orientation is horizontal. See SDPWS T4.3A Note 2.

### FRAMING MATERIALS and STANDARD WALL by WALL GROUP

| Wall Grp | Species | Grade | b in | d in | Spcg in | SG | E psi^6 | Standard Wall |
|---|---|---|---|---|---|---|---|---|
| 1 | Hem-Fir | No.2 | 1.50 | 5.50 | 16 | 0.43 | 1.30 | |
| 2 | Hem-Fir | No.2 | 1.50 | 5.50 | 16 | 0.43 | 1.30 | |

*Legend:*
*Wall Grp – Wall Design Group*
*b – Stud breadth (thickness)*
*d – Stud depth (width)*
*Spcg – Maximum on-centre spacing of studs for design, actual spacing may be less.*
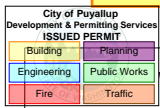*SG – Specific gravity*
*E – Modulus of elasticity*
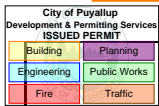*Standard Wall - Standard wall designed as group.*

Notes:
Check manufacture requirements for stud size, grade and specific gravity (G) for all shearwall hold-downs.

PRRNSF20230918

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**WoodWorks® Shearwalls**   **43rd Ave Duplex - SHEAR.wsw**   **Mar. 29, 2023**
**14:14:48**

**SHEARLINE, WALL and OPENING DIMENSIONS**

| North-south Shearlines | Type | Wall Group | Location X [ft] | Extent [ft] Start | End | Length [ft] | FHS [ft] | Aspect Ratio | Height [ft] |
|---|---|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | | | |
| **Level 2** | | | | | | | | | |
| Line 1 | | 1 | 0.00 | 2.00 | 34.00 | 32.00 | 14.50 | – | 8.00 |
| Wall 1-1 | Seg | 1 | 0.00 | 2.00 | 34.00 | 32.00 | 14.50 | – | – |
| Segment 1 | | – | – | 2.00 | 3.00 | 1.00 | – | 8.00 | – |
| Opening 1 | | – | – | 3.00 | 12.50 | 9.50 | – | – | 4.00 |
| Segment 2 | | – | – | 12.50 | 27.00 | 14.50 | – | 0.55 | – |
| Opening 2 | | – | – | 27.00 | 33.00 | 6.00 | – | – | 4.00 |
| Segment 3 | | – | – | 33.00 | 34.00 | 1.00 | – | 8.00 | – |
| **Level 1** | | | | | | | | | |
| Line 1 | | 1 | 0.00 | 2.00 | 34.00 | 32.00 | 16.50 | – | 9.00 |
| Wall 1-1 | Seg | 1 | 0.00 | 2.00 | 34.00 | 32.00 | 16.50 | – | – |
| Segment 1 | | – | – | 2.00 | 3.00 | 1.00 | – | 9.00 | – |
| Opening 1 | | – | – | 3.00 | 17.50 | 14.50 | – | – | 4.00 |
| Segment 2 | | – | – | 17.50 | 34.00 | 16.50 | – | 0.55 | – |
| **Line 2** | | | | | | | | | |
| **Level 2** | | | | | | | | | |
| Line 2 | NSW | | 18.00 | 0.00 | 35.75 | 35.75 | 0.00 | – | 8.00 |
| Wall 2-1 | NSW | | 18.00 | 0.00 | 2.00 | 2.00 | 0.00 | 1.00 | – |
| **Level 1** | | | | | | | | | |
| Line 2 | | | 18.00 | 0.00 | 35.75 | 35.75 | 0.00 | – | 9.00 |
| Wall 2-1 | NSW | | 18.00 | 0.00 | 2.00 | 2.00 | 0.00 | 1.00 | – |
| Wall 2-2 | NSW | | 18.25 | 34.00 | 35.75 | 1.75 | 0.00 | 1.00 | – |
| **Line 3** | | | | | | | | | |
| **Level 1** | | | | | | | | | |
| Line 3 | NSW | | 23.25 | 34.00 | 35.75 | 1.75 | 0.00 | – | 9.00 |
| Wall 3-1 | NSW | | 23.25 | 34.00 | 35.75 | 1.75 | 0.00 | 1.00 | – |
| **Line 4** | | | | | | | | | |
| **Level 2** | | | | | | | | | |
| Line 4 | Seg | 1 | 30.00 | 0.00 | 34.00 | 34.00 | 34.00 | – | 8.00 |
| Wall 4-1 | Seg | 1 | 30.00 | 0.00 | 34.00 | 34.00 | 34.00 | 0.24 | – |
| **Level 1** | | | | | | | | | |
| Line 4 | | 1 | 30.00 | 0.00 | 28.00 | 28.00 | 18.50 | – | 9.00 |
| Wall 4-1 | Seg | 1 | 30.00 | 0.00 | 7.00 | 7.00 | 7.00 | 1.29 | – |
| Wall 4-2 | Seg | 1 | 30.00 | 13.50 | 25.00 | 11.50 | 11.50 | 0.78 | – |
| Wall 4-3 | NSW | | 30.00 | 28.00 | 34.00 | 6.00 | 0.00 | 1.00 | – |
| **Line 5** | | | | | | | | | |
| **Level 1** | | | | | | | | | |
| Line 5 | | 1 | 50.00 | 7.00 | 28.00 | 21.00 | 13.00 | – | 9.00 |
| Wall 5-1 | NSW | | 50.00 | 7.00 | 15.00 | 8.00 | 0.00 | 1.00 | – |
| Wall 5-2 | Seg | 1 | 50.00 | 15.00 | 28.00 | 13.00 | 13.00 | 0.69 | – |

| East-west Shearlines | Type | Wall Group | Location Y [ft] | Extent [ft] Start | End | Length [ft] | FHS [ft] | Aspect Ratio | Height [ft] |
|---|---|---|---|---|---|---|---|---|---|
| **Line A** | | | | | | | | | |
| **Level 2** | | | | | | | | | |
| Line A | | 1 | 1.20 | 0.00 | 30.00 | 30.00 | 18.00 | – | 8.00 |
| Wall A-1 | Seg | 1 | 2.00 | 0.00 | 18.00 | 18.00 | 6.00 | – | – |
| Segment 1 | | – | – | 0.00 | 3.25 | 3.25 | – | 2.46 | – |
| Opening 1 | | – | – | 3.25 | 15.25 | 12.00 | – | – | 4.00 |
| Segment 2 | | – | – | 15.25 | 18.00 | 2.75 | – | 2.91 | – |
| Wall A-2 | FT | 1 | 0.00 | 18.00 | 30.00 | 12.00 | 12.00 | – | – |
| Segment 1 | | – | – | 18.00 | 21.00 | 3.00 | – | 1.33 | – |
| Opening 1 | | – | – | 21.00 | 27.00 | 6.00 | – | – | 4.00 |
| Segment 2 | | – | – | 27.00 | 30.00 | 3.00 | – | 1.33 | – |
| **Level 1** | | | | | | | | | |
| Line A | | 1 | 1.20 | 0.00 | 30.00 | 30.00 | 18.50 | – | 9.00 |
| Wall A-1 | Seg | 1 | 2.00 | 0.00 | 18.00 | 18.00 | 12.50 | – | – |
| Segment 1 | | – | – | 0.00 | 12.50 | 12.50 | – | 0.72 | – |
| Opening 1 | | – | – | 12.50 | 17.00 | 4.50 | – | – | 4.00 |
| Segment 2 | | – | – | 17.00 | 18.00 | 1.00 | – | 9.00 | – |
| Wall A-2 | Seg | 1 | 0.00 | 18.00 | 30.00 | 12.00 | 6.00 | – | – |
| Segment 1 | | – | – | 18.00 | 21.00 | 3.00 | – | 3.00 | – |
| Opening 1 | | – | – | 21.00 | 27.00 | 6.00 | – | – | 5.00 |
| Segment 2 | | – | – | 27.00 | 30.00 | 3.00 | – | 3.00 | – |
| **Line B** | | | | | | | | | |
| **Level 1** | | | | | | | | | |
| Line B | NSW | | 7.00 | 30.00 | 50.00 | 20.00 | 0.00 | – | 9.00 |
| Wall B-1 | NSW | | 7.00 | 30.00 | 50.00 | 20.00 | 0.00 | 1.00 | – |
| **Line C** | | | | | | | | | |

PRRNSF20230918

**City of Puyallup**
Development & Permitting Services
**ISSUED PERMIT**

| Building | Planning |
| Engineering | Public Works |
| Fire | Traffic |

**SHEARLINE, WALL and OPENING DIMENSIONS (continued)**

| Label | Type | # | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Level 1** | | | | | | | | | |
| Line C | NSW | | 28.00 | 30.00 | 50.00 | 20.00 | 0.00 | – | 9.00 |
| Wall C-1 | NSW | | 28.00 | 30.00 | 50.00 | 20.00 | 0.00 | 1.00 | – |
| **Line D** | | | | | | | | | |
| **Level 2** | | | | | | | | | |
| Line D | | 1 | 34.00 | 0.00 | 30.00 | 30.00 | 16.00 | – | 8.00 |
| Wall D-1 | Seg | 1 | 34.00 | 0.00 | 30.00 | 30.00 | 16.00 | – | – |
| Segment 1 | | – | – | 0.00 | 1.00 | 1.00 | – | 8.00 | – |
| Opening 1 | | – | – | 1.00 | 4.00 | 3.00 | – | – | 4.00 |
| Segment 2 | | – | – | 4.00 | 15.75 | 11.75 | – | 0.68 | – |
| Opening 2 | | – | – | 15.75 | 25.75 | 10.00 | – | – | 4.00 |
| Segment 3 | | – | – | 25.75 | 30.00 | 4.25 | – | 1.88 | – |
| **Level 1** | | | | | | | | | |
| Line D | | 2 | 34.29 | 0.00 | 30.00 | 30.00 | 30.00 | – | 9.00 |
| Wall D-1 | FT | 2 | 34.00 | 0.00 | 18.25 | 18.25 | 18.25 | – | – |
| Segment 1 | | – | – | 0.00 | 4.25 | 4.25 | – | 1.18 | – |
| Opening 1 | | – | – | 4.25 | 10.25 | 6.00 | – | – | 5.00 |
| Segment 2 | | – | – | 10.25 | 13.50 | 3.25 | – | 1.54 | – |
| Opening 2 | | – | – | 13.50 | 16.50 | 3.00 | – | – | 5.00 |
| Segment 3 | | – | – | 16.50 | 18.25 | 1.75 | – | 2.86 | – |
| Wall D-2 | Seg | 2 | 35.75 | 18.25 | 23.25 | 5.00 | 5.00 | 1.80 | – |
| Wall D-3 | FT | 2 | 34.00 | 23.25 | 30.00 | 6.75 | 6.75 | – | – |
| Segment 1 | | – | – | 23.25 | 25.00 | 1.75 | – | 2.86 | – |
| Opening 1 | | – | – | 25.00 | 28.00 | 3.00 | – | – | 5.00 |
| Segment 2 | | – | – | 28.00 | 30.00 | 2.00 | – | 2.50 | – |

*Legend:*
*Type - Seg = segmented, Prf = perforated, FT = force-transfer, NSW = non-shearwall*
*Location - Dimension perpendicular to wall*
*FHS - Length of full-height sheathing used to resist shear force. For perforated walls, it is based on the factored segments Li defined in SDPWS 4.3.4.3*
*Aspect Ratio – Ratio of wall height to segment length (h/bs), for force-transfer walls, the aspect ratio of the central pier*
*Wall Group - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall*
     *If two wall group numbers listed, they are for rigid diaphragm and flexible diaphragm design.*

**City of Puyallup**
**Development & Permitting Services**
**ISSUED PERMIT**

| Building | Planning |
|---|---|
| Engineering | Public Works |
| Fire | Traffic |

# WoodWorks® Shearwalls
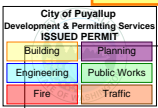
## Loads

**WIND SHEAR LOADS (as entered or generated)**

**Level 2**

| Block | F | Element | Load Case | Wnd Dir | Surf Dir | Prof | Location [ft] Start | Location [ft] End | Magnitude [lbs,plf,psf] Start | Magnitude [lbs,plf,psf] End | Trib Ht [ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Block 1 | W | Wall | 1 | W->E | Wind | Line | 0.00 | 2.00 | 44.3 | | |
| Block 1 | W | Wall | Min | W->E | Wind | Line | 0.00 | 2.00 | 32.0 | | |
| Block 1 | W | L Gable | Min | W->E | Wind | Line | 2.00 | 18.00 | 0.0 | 54.3 | |
| Block 1 | W | Wall | 1 | W->E | Wind | Line | 2.00 | 34.00 | 44.3 | | |
| Block 1 | W | Wall | Min | W->E | Wind | Line | 2.00 | 34.00 | 32.0 | | |
| Block 1 | W | L Gable | 1 | W->E | Wind | Line | 2.00 | 18.00 | 0.0 | 79.6 | |
| Block 1 | W | R Gable | 1 | W->E | Wind | Line | 18.00 | 34.00 | 79.6 | 0.0 | |
| Block 1 | W | R Gable | Min | W->E | Wind | Line | 18.00 | 34.00 | 54.3 | 0.0 | |
| Block 1 | E | Wall | 1 | W->E | Lee | Line | 0.00 | 34.00 | 29.7 | | |
| Block 1 | E | Wall | Min | W->E | Lee | Line | 0.00 | 34.00 | 32.0 | | |
| Block 1 | E | L Gable | 1 | W->E | Lee | Line | 2.00 | 18.00 | 0.0 | 50.4 | |
| Block 1 | E | L Gable | Min | W->E | Lee | Line | 2.00 | 18.00 | 0.0 | 54.3 | |
| Block 1 | E | R Gable | Min | W->E | Lee | Line | 18.00 | 34.00 | 54.3 | 0.0 | |
| Block 1 | E | R Gable | 1 | W->E | Lee | Line | 18.00 | 34.00 | 50.4 | 0.0 | |
| Block 1 | W | Wall | 1 | E->W | Lee | Line | 0.00 | 2.00 | 29.7 | | |
| Block 1 | W | Wall | Min | E->W | Lee | Line | 0.00 | 2.00 | 32.0 | | |
| Block 1 | W | L Gable | Min | E->W | Lee | Line | 2.00 | 18.00 | 0.0 | 54.3 | |
| Block 1 | W | L Gable | 1 | E->W | Lee | Line | 2.00 | 18.00 | 0.0 | 50.4 | |
| Block 1 | W | Wall | Min | E->W | Lee | Line | 2.00 | 34.00 | 32.0 | | |
| Block 1 | W | Wall | 1 | E->W | Lee | Line | 2.00 | 34.00 | 29.7 | | |
| Block 1 | W | R Gable | 1 | E->W | Lee | Line | 18.00 | 34.00 | 50.4 | 0.0 | |
| Block 1 | W | R Gable | Min | E->W | Lee | Line | 18.00 | 34.00 | 54.3 | 0.0 | |
| Block 1 | E | Wall | 1 | E->W | Wind | Line | 0.00 | 34.00 | 44.3 | | |
| Block 1 | E | Wall | Min | E->W | Wind | Line | 0.00 | 34.00 | 32.0 | | |
| Block 1 | E | L Gable | Min | E->W | Wind | Line | 2.00 | 18.00 | 0.0 | 54.3 | |
| Block 1 | E | L Gable | 1 | E->W | Wind | Line | 2.00 | 18.00 | 0.0 | 79.6 | |
| Block 1 | E | R Gable | Min | E->W | Wind | Line | 18.00 | 34.00 | 54.3 | 0.0 | |
| Block 1 | E | R Gable | 1 | E->W | Wind | Line | 18.00 | 34.00 | 79.6 | 0.0 | |
| Block 1 | S | Roof | 1 | S->N | Wind | Line | -1.00 | 31.00 | 1.5 | | |
| Block 1 | S | Roof | Min | S->N | Wind | Line | -1.00 | 31.00 | 28.9 | | |
| Block 1 | S | Wall | Min | S->N | Wind | Line | 0.00 | 18.00 | 32.0 | | |
| Block 1 | S | Wall | 1 | S->N | Wind | Line | 0.00 | 18.00 | 44.3 | | |
| Block 1 | S | Wall | Min | S->N | Wind | Line | 18.00 | 30.00 | 32.0 | | |
| Block 1 | S | Wall | 1 | S->N | Wind | Line | 18.00 | 30.00 | 44.3 | | |
| Block 1 | N | Roof | Min | S->N | Lee | Line | -1.00 | 31.00 | 28.9 | | |
| Block 1 | N | Roof | 1 | S->N | Lee | Line | -1.00 | 31.00 | 64.3 | | |
| Block 1 | N | Wall | Min | S->N | Lee | Line | 0.00 | 30.00 | 32.0 | | |
| Block 1 | N | Wall | 1 | S->N | Lee | Line | 0.00 | 30.00 | 28.9 | | |
| Block 1 | S | Roof | 1 | N->S | Lee | Line | -1.00 | 31.00 | 64.3 | | |
| Block 1 | S | Roof | Min | N->S | Lee | Line | -1.00 | 31.00 | 28.9 | | |
| Block 1 | S | Wall | Min | N->S | Lee | Line | 0.00 | 18.00 | 32.0 | | |
| Block 1 | S | Wall | 1 | N->S | Lee | Line | 0.00 | 18.00 | 28.9 | | |
| Block 1 | S | Wall | Min | N->S | Lee | Line | 18.00 | 30.00 | 32.0 | | |
| Block 1 | S | Wall | 1 | N->S | Lee | Line | 18.00 | 30.00 | 28.9 | | |
| Block 1 | N | Roof | 1 | N->S | Wind | Line | -1.00 | 31.00 | 1.5 | | |
| Block 1 | N | Roof | Min | N->S | Wind | Line | -1.00 | 31.00 | 28.9 | | |
| Block 1 | N | Wall | 1 | N->S | Wind | Line | 0.00 | 30.00 | 44.3 | | |
| Block 1 | N | Wall | Min | N->S | Wind | Line | 0.00 | 30.00 | 32.0 | | |
| | | | | | | | | | | | |
| Block 2 | W | Ctr Roof | Min | W->E | Wind | Line | -1.00 | 2.00 | 8.0 | | |
| Block 2 | W | Ctr Roof | 1 | W->E | Wind | Line | -1.00 | 2.00 | 59.9 | | |
| Block 2 | W | R Roof | Min | W->E | Wind | Line | 2.00 | 14.00 | 8.0 | 0.0 | |
| Block 2 | W | R Roof | 1 | W->E | Wind | Line | 2.00 | 14.00 | 59.9 | 0.0 | |
| Block 2 | E | Ctr Roof | Min | W->E | Lee | Line | -1.00 | 1.00 | 22.1 | | |
| Block 2 | E | R Roof | Min | W->E | Lee | Line | 1.00 | 14.00 | 22.1 | 0.0 | |
| Block 2 | W | Ctr Roof | Min | E->W | Lee | Line | -1.00 | 2.00 | 8.0 | | |
| Block 2 | W | Ctr Roof | 1 | E->W | Lee | Line | -1.00 | 2.00 | 45.0 | | |
| Block 2 | W | R Roof | Min | E->W | Lee | Line | 2.00 | 14.00 | 8.0 | 0.0 | |
| Block 2 | W | R Roof | 1 | E->W | Lee | Line | 2.00 | 14.00 | 45.0 | 0.0 | |
| Block 2 | E | Ctr Roof | Min | E->W | Wind | Line | -1.00 | 1.00 | 22.1 | | |
| Block 2 | E | R Roof | Min | E->W | Wind | Line | 1.00 | 14.00 | 22.1 | 0.0 | |
| Block 2 | S | R Gable | 1 | S->N | Wind | Line | 18.00 | 30.00 | 59.3 | 0.0 | |
| Block 2 | S | R Gable | Min | S->N | Wind | Line | 18.00 | 30.00 | 40.7 | 0.0 | |
| Block 2 | S | R Gable | 1 | N->S | Lee | Line | 18.00 | 30.00 | 37.5 | 0.0 | |
| Block 2 | S | R Gable | Min | N->S | Lee | Line | 18.00 | 30.00 | 40.7 | 0.0 | |

**Level 1**

| Block | F | Element | Load Case | Wnd Dir | Surf Dir | Prof | Location [ft] Start | Location [ft] End | Magnitude [lbs,plf,psf] Start | Magnitude [lbs,plf,psf] End | Trib Ht [ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|

**6**
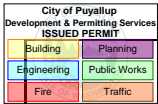
**WIND SHEAR LOADS (as entered or generated) (continued)**

```
Block 1        W    Wall           Min   W->E   Wind    Line     0.00     2.00    32.0
Block 1        W    Wall            1    W->E   Wind    Line     0.00     2.00    41.7
Block 1        W    Wall            1    W->E   Wind    Line     0.00     2.00    61.7
Block 1        W    Wall           Min   W->E   Wind    Line     0.00     2.00    48.0
Block 1        W    Wall           Min   W->E   Wind    Line     2.00    34.00    48.0
Block 1        W    Wall           Min   W->E   Wind    Line     2.00    34.00    32.0
Block 1        W    Wall            1    W->E   Wind    Line     2.00    34.00    41.7
Block 1        W    Wall            1    W->E   Wind    Line     2.00    34.00    61.7
Block 1        W    Wall           Min   W->E   Wind    Line    34.00    35.75    48.0
Block 1        W    Wall            1    W->E   Wind    Line    34.00    35.75    61.7
Block 1        E    Wall           Min   W->E   Lee     Line     0.00    34.00    32.0
Block 1        E    Wall            1    W->E   Lee     Line     0.00     7.00    44.6
Block 1        E    Wall            1    W->E   Lee     Line     0.00    34.00    29.7
Block 1        E    Wall           Min   W->E   Lee     Line     0.00     7.00    48.0
Block 1        E    Wall           Min   W->E   Lee     Line     7.00    28.00    48.0
Block 1        E    Wall            1    W->E   Lee     Line     7.00    28.00    44.6
Block 1        E    Wall            1    W->E   Lee     Line    28.00    34.00    44.6
Block 1        E    Wall           Min   W->E   Lee     Line    28.00    34.00    48.0
Block 1        E    Wall            1    W->E   Lee     Line    34.00    35.75    44.6
Block 1        E    Wall           Min   W->E   Lee     Line    34.00    35.75    48.0
Block 1        W    Wall            1    E->W   Lee     Line     0.00     2.00    29.7
Block 1        W    Wall           Min   E->W   Lee     Line     0.00     2.00    48.0
Block 1        W    Wall           Min   E->W   Lee     Line     0.00     2.00    32.0
Block 1        W    Wall            1    E->W   Lee     Line     0.00     2.00    44.6
Block 1        W    Wall            1    E->W   Lee     Line     2.00    34.00    29.7
Block 1        W    Wall           Min   E->W   Lee     Line     2.00    34.00    32.0
Block 1        W    Wall            1    E->W   Lee     Line     2.00    34.00    44.6
Block 1        W    Wall           Min   E->W   Lee     Line     2.00    34.00    48.0
Block 1        W    Wall           Min   E->W   Lee     Line    34.00    35.75    48.0
Block 1        W    Wall            1    E->W   Lee     Line    34.00    35.75    44.6
Block 1        E    Wall            1    E->W   Wind    Line     0.00     7.00    61.7
Block 1        E    Wall           Min   E->W   Wind    Line     0.00    34.00    32.0
Block 1        E    Wall            1    E->W   Wind    Line     0.00    34.00    41.7
Block 1        E    Wall           Min   E->W   Wind    Line     0.00     7.00    48.0
Block 1        E    Wall           Min   E->W   Wind    Line     7.00    28.00    48.0
Block 1        E    Wall            1    E->W   Wind    Line     7.00    28.00    61.7
Block 1        E    Wall            1    E->W   Wind    Line    28.00    34.00    61.7
Block 1        E    Wall           Min   E->W   Wind    Line    28.00    34.00    48.0
Block 1        E    Wall            1    E->W   Wind    Line    34.00    35.75    61.7
Block 1        E    Wall           Min   E->W   Wind    Line    34.00    35.75    48.0
Block 1        S    Wall           Min   S->N   Wind    Line     0.00    18.00    32.0
Block 1        S    Wall            1    S->N   Wind    Line     0.00    18.00    61.7
Block 1        S    Wall            1    S->N   Wind    Line     0.00    18.00    41.7
Block 1        S    Wall           Min   S->N   Wind    Line     0.00    18.00    48.0
Block 1        S    Wall            1    S->N   Wind    Line    18.00    30.00    61.7
Block 1        S    Wall           Min   S->N   Wind    Line    18.00    30.00    32.0
Block 1        S    Wall            1    S->N   Wind    Line    18.00    30.00    41.7
Block 1        S    Wall           Min   S->N   Wind    Line    18.00    30.00    48.0
Block 1        S    Wall           Min   S->N   Wind    Line    30.00    50.00    48.0
Block 1        S    Wall            1    S->N   Wind    Line    30.00    50.00    61.7
Block 1        N    Wall            1    S->N   Lee     Line     0.00    18.25    43.4
Block 1        N    Wall           Min   S->N   Lee     Line     0.00    30.00    32.0
Block 1        N    Wall            1    S->N   Lee     Line     0.00    30.00    28.9
Block 1        N    Wall           Min   S->N   Lee     Line     0.00    18.25    48.0
Block 1        N    Wall           Min   S->N   Lee     Line    18.25    23.25    48.0
Block 1        N    Wall            1    S->N   Lee     Line    18.25    23.25    43.4
Block 1        N    Wall           Min   S->N   Lee     Line    23.25    30.00    48.0
Block 1        N    Wall            1    S->N   Lee     Line    23.25    30.00    43.4
Block 1        N    Wall            1    S->N   Lee     Line    30.00    50.00    43.4
Block 1        N    Wall           Min   S->N   Lee     Line    30.00    50.00    48.0
Block 1        S    Wall           Min   N->S   Lee     Line     0.00    18.00    48.0
Block 1        S    Wall            1    N->S   Lee     Line     0.00    18.00    43.4
Block 1        S    Wall           Min   N->S   Lee     Line     0.00    18.00    32.0
Block 1        S    Wall            1    N->S   Lee     Line     0.00    18.00    28.9
Block 1        S    Wall            1    N->S   Lee     Line    18.00    30.00    28.9
Block 1        S    Wall           Min   N->S   Lee     Line    18.00    30.00    32.0
Block 1        S    Wall           Min   N->S   Lee     Line    18.00    30.00    48.0
Block 1        S    Wall            1    N->S   Lee     Line    18.00    30.00    43.4
Block 1        S    Wall            1    N->S   Lee     Line    30.00    50.00    43.4
Block 1        S    Wall           Min   N->S   Lee     Line    30.00    50.00    48.0
Block 1        N    Wall           Min   N->S   Wind    Line     0.00    30.00    32.0
Block 1        N    Wall            1    N->S   Wind    Line     0.00    18.25    61.7
```

7

**WIND SHEAR LOADS (as entered or generated) (continued)**

| Block | F | Element | Load Case | Wind Dir | Surf Dir | Prof | Loc Start | Loc End | Mag Start | Mag End |
|---|---|---|---|---|---|---|---|---|---|---|
| Block 1 | N | Wall | Min | N->S | Wind | Line | 0.00 | 18.25 | 48.0 | |
| Block 1 | N | Wall | 1 | N->S | Wind | Line | 0.00 | 30.00 | 41.7 | |
| Block 1 | N | Wall | 1 | N->S | Wind | Line | 18.25 | 23.25 | 61.7 | |
| Block 1 | N | Wall | Min | N->S | Wind | Line | 18.25 | 23.25 | 48.0 | |
| Block 1 | N | Wall | Min | N->S | Wind | Line | 23.25 | 30.00 | 48.0 | |
| Block 1 | N | Wall | 1 | N->S | Wind | Line | 23.25 | 30.00 | 61.7 | |
| Block 1 | N | Wall | 1 | N->S | Wind | Line | 30.00 | 50.00 | 61.7 | |
| Block 1 | N | Wall | Min | N->S | Wind | Line | 30.00 | 50.00 | 48.0 | |
| | | | | | | | | | | |
| Block 3 | W | L Gable | 1 | W->E | Wind | Line | 7.00 | 20.50 | 0.0 | 72.1 |
| Block 3 | W | L Gable | Min | W->E | Wind | Line | 7.00 | 20.50 | 0.0 | 55.0 |
| Block 3 | W | R Gable | 1 | W->E | Wind | Line | 20.50 | 34.00 | 72.1 | 0.0 |
| Block 3 | W | R Gable | Min | W->E | Wind | Line | 20.50 | 34.00 | 55.0 | 0.0 |
| Block 3 | E | L Gable | Min | W->E | Lee | Line | 7.00 | 20.50 | 0.0 | 55.0 |
| Block 3 | E | L Gable | 1 | W->E | Lee | Line | 7.00 | 20.50 | 0.0 | 45.8 |
| Block 3 | E | R Gable | 1 | W->E | Lee | Line | 20.50 | 34.00 | 45.8 | 0.0 |
| Block 3 | E | R Gable | Min | W->E | Lee | Line | 20.50 | 34.00 | 55.0 | 0.0 |
| Block 3 | W | L Gable | Min | E->W | Lee | Line | 7.00 | 20.50 | 0.0 | 55.0 |
| Block 3 | W | L Gable | 1 | E->W | Lee | Line | 7.00 | 20.50 | 0.0 | 45.8 |
| Block 3 | W | R Gable | Min | E->W | Lee | Line | 20.50 | 34.00 | 55.0 | 0.0 |
| Block 3 | W | R Gable | 1 | E->W | Lee | Line | 20.50 | 34.00 | 45.8 | 0.0 |
| Block 3 | E | L Gable | Min | E->W | Wind | Line | 7.00 | 20.50 | 0.0 | 55.0 |
| Block 3 | E | L Gable | 1 | E->W | Wind | Line | 7.00 | 20.50 | 0.0 | 72.1 |
| Block 3 | E | R Gable | Min | E->W | Wind | Line | 20.50 | 34.00 | 55.0 | 0.0 |
| Block 3 | E | R Gable | 1 | E->W | Wind | Line | 20.50 | 34.00 | 72.1 | 0.0 |
| Block 3 | S | Roof | Min | S->N | Wind | Line | 29.00 | 51.00 | 29.6 | |
| Block 3 | S | Roof | 1 | S->N | Wind | Line | 29.00 | 51.00 | 16.7 | |
| Block 3 | N | Roof | Min | S->N | Lee | Line | 29.00 | 51.00 | 29.6 | |
| Block 3 | N | Roof | 1 | S->N | Lee | Line | 29.00 | 51.00 | 59.0 | |
| Block 3 | S | Roof | 1 | N->S | Lee | Line | 29.00 | 51.00 | 59.0 | |
| Block 3 | S | Roof | Min | N->S | Lee | Line | 29.00 | 51.00 | 29.6 | |
| Block 3 | N | Roof | Min | N->S | Wind | Line | 29.00 | 51.00 | 29.6 | |
| Block 3 | N | Roof | 1 | N->S | Wind | Line | 29.00 | 51.00 | 16.7 | |
| | | | | | | | | | | |
| Block 4 | W | L Gable | Min | W->E | Wind | Line | -2.75 | 2.00 | 0.0 | 16.1 |
| Block 4 | W | L Gable | 1 | W->E | Wind | Line | -2.75 | 2.00 | 0.0 | 20.7 |
| Block 4 | E | L Gable | Min | W->E | Lee | Line | -2.75 | 2.00 | 0.0 | 16.1 |
| Block 4 | E | L Gable | 1 | W->E | Lee | Line | -2.75 | 2.00 | 0.0 | 5.5 |
| Block 4 | W | L Gable | 1 | E->W | Lee | Line | -2.75 | 2.00 | 0.0 | 5.5 |
| Block 4 | W | L Gable | Min | E->W | Lee | Line | -2.75 | 2.00 | 0.0 | 16.1 |
| Block 4 | E | L Gable | 1 | E->W | Wind | Line | -2.75 | 2.00 | 0.0 | 20.7 |
| Block 4 | E | L Gable | Min | E->W | Wind | Line | -2.75 | 2.00 | 0.0 | 16.1 |
| Block 4 | S | Roof | Min | S->N | Wind | Line | -1.00 | 18.75 | 50.0 | |
| Block 4 | N | Roof | Min | S->N | Lee | Line | -1.00 | 18.75 | 8.1 | |
| Block 4 | N | Roof | 1 | S->N | Lee | Line | -1.00 | 18.75 | 15.6 | |
| Block 4 | S | Roof | Min | N->S | Lee | Line | -1.00 | 18.75 | 50.0 | |
| Block 4 | N | Roof | 1 | N->S | Wind | Line | -1.00 | 18.75 | 20.7 | |
| Block 4 | N | Roof | Min | N->S | Wind | Line | -1.00 | 18.75 | 8.1 | |

*Legend:*

*Block - Block used in load generation*

    *Accum. = loads from one block combined with another*

    *Manual = user-entered loads (so no block)*

*F - Building face (north, south, east or west)*

*Element - Building surface on which loads generated or entered*

*Load Case - One of the following:*

    *ASCE 7 All Heights: Case 1 or 2 from Fig 27.3-8 or minimum loads from 27.1.5*

    *ASCE 7 Low-rise: Reference corner and Case A or B from Fig 28.3-1 or minimum loads from 28.3.4*

*Wind Dir - Direction of wind for loads with positive magnitude, also direction of MWFRS.*

*Surf Dir - Windward or leeward side of the building for loads in given direction*

*Prof - Profile (distribution)*

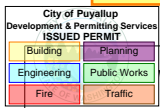*Location - Start and end points on building element*

*Magnitude - Start = intensity of uniform and point loads or leftmost intensity of trapezoidal load, End = right intensity of trap load*

*Trib Ht - Tributary height of area loads only*

Notes:

Windward load on the monoslope roof was not generated, to comply with ASCE 7 Figure 27.3-1, Note 7.

All loads entered by the user or generated by program are specified (unfactored) loads. The program applies a load factor of 0.60 to wind loads before distributing them to the shearlines.

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**43rd Ave Duplex - SHEAR.wsw**     **Mar. 29, 2023**
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**BUILDING MASSES**

| Level 2 Force Dir | Building Element | Block | Wall Line | Profile | Location [ft] Start | End | Magnitude [lbs,plf,psf] Start | End | Trib Width [ft] |
|---|---|---|---|---|---|---|---|---|---|
| E-W | Roof | Block 1 | 1 | Line | 1.00 | 35.00 | 240.0 | 240.0 | |
| E-W | Roof | Block 1 | 4 | Line | 1.00 | 35.00 | 240.0 | 240.0 | |
| E-W | Roof | Block 2 | 2 | Line | -1.00 | 2.00 | 105.0 | 105.0 | |
| E-W | Roof | Block 2 | 4 | Line | -1.00 | 2.00 | 105.0 | 105.0 | |
| E-W | R Gable | Block 1 | 1 | Line | 2.00 | 18.00 | 67.9 | 0.0 | |
| E-W | L Gable | Block 1 | 1 | Line | 18.00 | 34.00 | 0.0 | 67.9 | |
| E-W | L Gable | Block 1 | 4 | Line | 2.00 | 18.00 | 67.9 | 0.0 | |
| E-W | R Gable | Block 1 | 4 | Line | 18.00 | 34.00 | 0.0 | 67.9 | |
| | | | | | | | | | |
| N-S | Roof | Block 1 | | Line | -1.00 | 31.00 | 255.0 | 255.0 | |
| N-S | Roof | Block 1 | D | Line | -1.00 | 31.00 | 255.0 | 255.0 | |
| N-S | Roof | Block 2 | A | Line | 17.00 | 31.00 | 30.0 | 30.0 | |
| N-S | Roof | Block 2 | | Line | 17.00 | 31.00 | 15.0 | 15.0 | |
| N-S | R Gable | Block 2 | A | Line | 18.00 | 30.00 | 0.0 | 50.9 | |
| N-S | L Gable | Block 2 | A | Line | 18.00 | 18.00 | 50.9 | 0.0 | |
| | | | | | | | | | |
| Both | Wall 1-1 | n/a | 1 | Line | 2.00 | 34.00 | 40.0 | 40.0 | |
| Both | Wall 2-1 | n/a | 2 | Line | 0.00 | 2.00 | 40.0 | 40.0 | |
| Both | Wall 4-1 | n/a | 4 | Line | 0.00 | 34.00 | 40.0 | 40.0 | |
| Both | Wall A-2 | n/a | A | Line | 18.00 | 30.00 | 40.0 | 40.0 | |
| Both | Wall A-1 | n/a | | Line | 0.00 | 18.00 | 40.0 | 40.0 | |
| Both | Wall D-1 | n/a | D | Line | 0.00 | 30.00 | 40.0 | 40.0 | |

| Level 1 Force Dir | Building Element | Block | Wall Line | Profile | Location [ft] Start | End | Magnitude [lbs,plf,psf] Start | End | Trib Width [ft] |
|---|---|---|---|---|---|---|---|---|---|
| E-W | Roof | Block 3 | 4 | Line | 6.00 | 35.00 | 165.0 | 165.0 | |
| E-W | Roof | Block 3 | 5 | Line | 6.00 | 35.00 | 165.0 | 165.0 | |
| E-W | Roof | Block 4 | 1 | Line | -3.75 | 3.00 | 148.1 | 148.1 | |
| E-W | Roof | Block 4 | | Line | -3.75 | 3.00 | 148.1 | 148.1 | |
| E-W | R Gable | Block 3 | 4 | Line | 7.00 | 20.50 | 68.8 | 0.0 | |
| E-W | L Gable | Block 3 | 4 | Line | 20.50 | 34.00 | 0.0 | 68.8 | |
| E-W | L Gable | Block 3 | 5 | Line | 7.00 | 20.50 | 68.8 | 0.0 | |
| E-W | R Gable | Block 3 | 5 | Line | 20.50 | 34.00 | 0.0 | 68.8 | |
| E-W | R Gable | Block 4 | 1 | Line | -2.75 | 2.00 | 20.2 | 0.0 | |
| E-W | L Gable | Block 4 | 1 | Line | 2.00 | 2.00 | 0.0 | 20.2 | |
| E-W | L Gable | Block 4 | | Line | -2.75 | 2.00 | 20.2 | 0.0 | |
| E-W | R Gable | Block 4 | | Line | 2.00 | 2.00 | 0.0 | 20.2 | |
| E-W | Floor F2 | n/a | 1 | Line | 2.00 | 7.00 | 180.0 | 180.0 | |
| | | | | | | | | | |
| Both | Wall 1-1 | n/a | 1 | Line | 2.00 | 34.00 | 40.0 | 40.0 | |
| | | | | | | | | | |
| E-W | Floor F3 | n/a | 1 | Line | 7.00 | 28.00 | 300.0 | 300.0 | |
| E-W | Floor F4 | n/a | 1 | Line | 28.00 | 34.00 | 180.0 | 180.0 | |
| E-W | Floor F1 | n/a | 2 | Line | 0.00 | 2.00 | 72.0 | 72.0 | |
| | | | | | | | | | |
| Both | Wall 2-1 | n/a | 2 | Line | 0.00 | 2.00 | 40.0 | 40.0 | |
| | | | | | | | | | |
| E-W | Floor F5 | n/a | | Line | 34.00 | 35.75 | 30.0 | 30.0 | |
| E-W | Floor F5 | n/a | 3 | Line | 34.00 | 35.75 | 30.0 | 30.0 | |
| | | | | | | | | | |
| Both | Wall 4-1 | n/a | 4 | Line | 0.00 | 34.00 | 40.0 | 40.0 | |
| | | | | | | | | | |
| E-W | Floor F1 | n/a | 4 | Line | 0.00 | 2.00 | 72.0 | 72.0 | |
| E-W | Floor F2 | n/a | 4 | Line | 2.00 | 7.00 | 180.0 | 180.0 | |
| E-W | Floor F4 | n/a | 4 | Line | 28.00 | 34.00 | 180.0 | 180.0 | |
| E-W | Floor F3 | n/a | 5 | Line | 7.00 | 28.00 | 300.0 | 300.0 | |
| | | | | | | | | | |
| N-S | Roof | Block 3 | B | Line | 29.00 | 51.00 | 217.5 | 217.5 | |
| N-S | Roof | Block 3 | D | Line | 29.00 | 51.00 | 217.5 | 217.5 | |
| N-S | Roof | Block 4 | | Line | -1.00 | 18.75 | 50.6 | 50.6 | |
| N-S | Roof | Block 4 | | Line | -1.00 | 18.75 | 50.6 | 50.6 | |
| N-S | Floor F2 | n/a | A | Line | 18.00 | 18.25 | 204.0 | 204.0 | |
| | | | | | | | | | |
| Both | Wall A-2 | n/a | A | Line | 18.00 | 30.00 | 40.0 | 40.0 | |
| | | | | | | | | | |
| N-S | Floor F3 | n/a | A | Line | 18.25 | 23.25 | 214.5 | 214.5 | |
| N-S | Floor F4 | n/a | A | Line | 23.25 | 30.00 | 204.0 | 204.0 | |

**9**

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**BUILDING MASSES (continued)**

| Force Dir | Building element | Trib Width | Wall line | | Location | | | |
|---|---|---|---|---|---|---|---|---|
| N-S | Floor F1 | n/a | | Line | 0.00 | 18.00 | 192.0 | 192.0 |
| Both | Wall A-1 | n/a | | Line | 0.00 | 18.00 | 40.0 | 40.0 |
| N-S | Floor F5 | n/a | B | Line | 30.00 | 50.00 | 126.0 | 126.0 |
| N-S | Floor F5 | n/a | C | Line | 30.00 | 50.00 | 126.0 | 126.0 |
| N-S | Floor F1 | n/a | D | Line | 0.00 | 18.00 | 192.0 | 192.0 |
| Both | Wall D-1 | n/a | D | Line | 0.00 | 30.00 | 40.0 | 40.0 |
| N-S | Floor F2 | n/a | D | Line | 18.00 | 18.25 | 204.0 | 204.0 |
| N-S | Floor F4 | n/a | D | Line | 23.25 | 30.00 | 204.0 | 204.0 |
| N-S | Floor F3 | n/a | | Line | 18.25 | 23.25 | 214.5 | 214.5 |
| Both | Wall 1-1 | n/a | 1 | Line | 2.00 | 34.00 | 45.0 | 45.0 |
| Both | Wall 2-1 | n/a | 2 | Line | 0.00 | 2.00 | 45.0 | 45.0 |
| Both | Wall 2-2 | n/a | | Line | 34.00 | 35.75 | 45.0 | 45.0 |
| Both | Wall 3-1 | n/a | 3 | Line | 34.00 | 35.75 | 45.0 | 45.0 |
| Both | Wall 4-1 | n/a | 4 | Line | 0.00 | 7.00 | 45.0 | 45.0 |
| Both | Wall 4-2 | n/a | 4 | Line | 13.50 | 25.00 | 27.0 | 27.0 |
| Both | Wall 4-3 | n/a | 4 | Line | 28.00 | 34.00 | 45.0 | 45.0 |
| Both | Wall 5-1 | n/a | 5 | Line | 7.00 | 15.00 | 45.0 | 45.0 |
| Both | Wall 5-2 | n/a | 5 | Line | 15.00 | 28.00 | 45.0 | 45.0 |
| Both | Wall A-2 | n/a | A | Line | 18.00 | 30.00 | 45.0 | 45.0 |
| Both | Wall A-1 | n/a | | Line | 0.00 | 18.00 | 45.0 | 45.0 |
| Both | Wall B-1 | n/a | B | Line | 30.00 | 50.00 | 45.0 | 45.0 |
| Both | Wall C-1 | n/a | C | Line | 30.00 | 50.00 | 45.0 | 45.0 |
| Both | Wall D-1 | n/a | D | Line | 0.00 | 18.25 | 45.0 | 45.0 |
| Both | Wall D-3 | n/a | D | Line | 23.25 | 30.00 | 45.0 | 45.0 |
| Both | Wall D-2 | n/a | D | Line | 18.25 | 23.25 | 45.0 | 45.0 |

*Legend:*
*Force Dir - Direction in which the mass is used for seismic load generation, E-W, N-S, or Both*
*Building element - Roof, gable end, wall or floor area used to generate mass, wall line for user-applied masses, Floor F# - refer to Plan View for floor area number*
*Wall line - Shearline that equivalent line load is assigned to*
*Location - Start and end points of equivalent line load on wall line*
*Trib Width. - Tributary width; for user applied area loads only*

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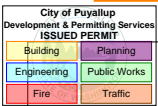
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**SEISMIC LOADS**

| Level 2 Force Dir | Profile | Location [ft] Start | End | Mag [lbs,plf,psf] Start | End |
|---|---|---|---|---|---|
| E-W | Line | -1.00 | 0.00 | 44.7 | 44.7 |
| E-W | Point | 0.00 | 0.00 | 167 | 167 |
| E-W | Line | 0.00 | 1.00 | 61.7 | 61.7 |
| E-W | Line | 1.00 | 2.00 | 163.8 | 163.8 |
| E-W | Point | 2.00 | 2.00 | 153 | 153 |
| E-W | Line | 2.00 | 18.00 | 119.1 | 148.0 |
| E-W | Line | 18.00 | 34.00 | 148.0 | 119.1 |
| E-W | Point | 34.00 | 34.00 | 255 | 255 |
| E-W | Line | 34.00 | 35.00 | 102.1 | 102.1 |
| | | | | | |
| N-S | Line | -1.00 | 0.00 | 108.5 | 108.5 |
| N-S | Point | 0.00 | 0.00 | 503 | 503 |
| N-S | Line | 0.00 | 17.00 | 125.5 | 125.5 |
| N-S | Line | 17.00 | 18.00 | 135.1 | 135.1 |
| N-S | Point | 18.00 | 18.00 | 17 | 17 |
| N-S | Line | 18.00 | 30.00 | 145.9 | 135.1 |
| N-S | Point | 30.00 | 30.00 | 520 | 520 |
| N-S | Line | 30.00 | 31.00 | 118.1 | 118.1 |

| Level 1 Force Dir | Profile | Location [ft] Start | End | Mag [lbs,plf,psf] Start | End |
|---|---|---|---|---|---|
| E-W | Line | -3.75 | -2.75 | 35.8 | 35.8 |
| E-W | Line | -2.75 | 0.00 | 35.8 | 38.6 |
| E-W | Point | 0.00 | 0.00 | 123 | 123 |
| E-W | Line | 0.00 | 2.00 | 76.5 | 78.5 |
| E-W | Point | 2.00 | 2.00 | 185 | 185 |
| E-W | Line | 2.00 | 3.00 | 104.6 | 99.7 |
| E-W | Line | 3.00 | 6.00 | 64.0 | 64.0 |
| E-W | Line | 6.00 | 7.00 | 103.8 | 103.8 |
| E-W | Point | 7.00 | 7.00 | 109 | 109 |
| E-W | Line | 7.00 | 13.50 | 132.8 | 140.8 |
| E-W | Line | 13.50 | 15.00 | 144.1 | 145.9 |
| E-W | Line | 15.00 | 20.50 | 145.9 | 152.7 |
| E-W | Line | 20.50 | 25.00 | 152.7 | 147.1 |
| E-W | Line | 25.00 | 28.00 | 143.9 | 140.2 |
| E-W | Point | 28.00 | 28.00 | 109 | 109 |
| E-W | Line | 28.00 | 34.00 | 111.2 | 103.8 |
| E-W | Point | 34.00 | 34.00 | 281 | 281 |
| E-W | Line | 34.00 | 35.00 | 57.9 | 57.9 |
| E-W | Line | 35.00 | 35.75 | 18.1 | 18.1 |
| E-W | Point | 35.75 | 35.75 | 27 | 27 |
| | | | | | |
| N-S | Line | -1.00 | 0.00 | 12.2 | 12.2 |
| N-S | Point | 0.00 | 0.00 | 334 | 334 |
| N-S | Line | 0.00 | 18.00 | 79.1 | 79.1 |
| N-S | Point | 17.75 | 17.75 | 6 | 6 |
| N-S | Point | 18.00 | 18.00 | 21 | 21 |
| N-S | Line | 18.00 | 18.25 | 82.0 | 82.0 |
| N-S | Point | 18.25 | 18.25 | 10 | 10 |
| N-S | Line | 18.25 | 18.75 | 84.5 | 84.5 |
| N-S | Line | 18.75 | 23.25 | 72.3 | 72.3 |
| N-S | Point | 23.25 | 23.25 | 10 | 10 |
| N-S | Line | 23.25 | 29.00 | 69.8 | 69.8 |
| N-S | Line | 29.00 | 30.00 | 122.3 | 122.3 |
| N-S | Point | 30.00 | 30.00 | 384 | 384 |
| N-S | Line | 30.00 | 50.00 | 93.8 | 93.8 |
| N-S | Point | 50.00 | 50.00 | 226 | 226 |
| N-S | Line | 50.00 | 51.00 | 52.5 | 52.5 |

Legend:
*Loads in table can be accumulation of loads from several building masses, so they do not correspond with a particular building element.*
*Location - Start and end of load in direction perpendicular to seismic force direction*

Notes:
All loads entered by the user or generated by program are specified (unfactored) loads.The program applies a load factor of 0.70 and redundancy factor to seismic loads before distributing them to the shearlines.

## Design Summary

### SHEARWALL DESIGN

**Wind Shear Loads, Flexible Diaphragm**
All shearwalls have sufficient design capacity.

**Seismic Loads, Flexible Diaphragm**
All shearwalls have sufficient design capacity.
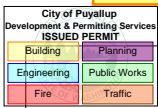
### HOLDDOWN DESIGN

**Wind Loads, Flexible Diaphragm**
All hold-downs have sufficient design capacity.

**Seismic Loads, Flexible Diaphragm**
All hold-downs have sufficient design capacity.

*This Design Summary does not include failures that occur due to excessive story drift from ASCE 7 CC.2.2 (wind) or 12.12 (seismic).*
*Refer to Story Drift table in this report to verify this design criterion.*
*Refer to the Deflection table for possible issues regarding fastener slippage (SDPWS Table C4.2.2D).*

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## Flexible Diaphragm Wind Design
## ASCE 7 Directional (All Heights) Loads

**SHEAR RESULTS**

| N-S Shearlines | W Gp | For Dir | ASD Shear Force [plf] v | vmax/vft | V [lbs] | Asp-Cub Int | Ext | Int | Allowable Shear [plf] Ext | Co | C | Cmb | V [lbs] | Resp. Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | | | | | | | | |
| **Level 2** | | | | | | | | | | | | | | |
| Ln1, Lev2 | – | S->N | – | – | 1348 | – | – | – | 339 | – | – | – | 4909 | – |
| | – | N->S | – | – | 1327 | – | – | – | 339 | – | – | – | 4909 | – |
| Wall 1-1 | 1 | S->N | – | – | 1348 | – | 1.0 | – | 339 | – | – | – | 4909 | – |
| | 1 | N->S | – | – | 1327 | – | 1.0 | – | 339 | – | – | – | 4909 | – |
| Seg. 1 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 339 | – | – | 339 | – | – |
| Seg. 2 | – | S->N | 93.0 | 0.0 | 1348 | – | 1.0 | – | 339 | – | – | 339 | 4909 | 0.27 |
| | – | N->S | 91.5 | 0.0 | 1327 | – | 1.0 | – | 339 | – | – | 339 | 4909 | 0.27 |
| Seg. 3 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 339 | – | – | 339 | – | – |
| **Level 1** | | | | | | | | | | | | | | |
| Ln1, Lev1 | – | Both | – | – | 3094 | – | – | – | 339 | – | – | – | 5586 | – |
| Wall 1-1 | 1 | Both | – | – | 3094 | – | 1.0 | – | 339 | – | – | – | 5586 | – |
| Seg. 1 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 339 | – | – | 339 | – | – |
| Seg. 2 | – | Both | 187.5 | 0.0 | 3094 | – | 1.0 | – | 339 | – | – | 339 | 5586 | 0.55 |
| **Line 4** | | | | | | | | | | | | | | |
| **Level 2** | | | | | | | | | | | | | | |
| Ln4, Lev2 | 1 | S->N | 42.6 | – | 1447 | – | 1.0 | – | 339 | – | – | 339 | 11510 | 0.13 |
| | 1 | N->S | 40.9 | – | 1390 | – | 1.0 | – | 339 | – | – | 339 | 11510 | 0.12 |
| **Level 1** | | | | | | | | | | | | | | |
| Ln4, Lev1 | – | S->N | – | – | 4213 | – | – | – | 339 | – | – | – | 6263 | – |
| | – | N->S | – | – | 4174 | – | – | – | 339 | – | – | – | 6263 | – |
| Wall 4-1 | 1 | S->N | 227.7 | – | 1594 | – | 1.0 | – | 339 | – | – | 339 | 2370 | 0.67 |
| | 1 | N->S | 225.6 | – | 1579 | – | 1.0 | – | 339 | – | – | 339 | 2370 | 0.67 |
| Wall 4-2 | 1 | S->N | 227.7 | – | 2619 | – | 1.0 | – | 339 | – | – | 339 | 3893 | 0.67 |
| | 1 | N->S | 225.6 | – | 2595 | – | 1.0 | – | 339 | – | – | 339 | 3893 | 0.67 |
| **Line 5** | | | | | | | | | | | | | | |
| Ln5, Lev1 | – | Both | – | – | 1130 | – | – | – | 339 | – | – | – | 4401 | – |
| Wall 5-2 | 1 | Both | 86.9 | – | 1130 | – | 1.0 | – | 339 | – | – | 339 | 4401 | 0.26 |

| E-W Shearlines | W Gp | For Dir | ASD Shear Force [plf] v | vmax/vft | V [lbs] | Asp-Cub Int | Ext | Int | Allowable Shear [plf] Ext | Co | C | Cmb | V [lbs] | Resp. Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Line A** | | | | | | | | | | | | | | |
| **Level 2** | | | | | | | | | | | | | | |
| LnA, Lev2 | – | W->E | – | – | 1682 | – | – | – | 339 | – | – | – | 5596 | – |
| | – | E->W | – | – | 1609 | – | – | – | 339 | – | – | – | 5596 | – |
| Wall A-1 | 1 | W->E | – | – | 461 | – | 1.0 | – | 339 | – | – | – | 1534 | – |
| | 1 | E->W | – | – | 441 | – | 1.0 | – | 339 | – | – | – | 1534 | – |
| Seg. 1 | – | W->E | 82.7 | 0.0 | 269 | – | .81 | – | 275 | – | – | 275 | 894 | 0.30 |
| | – | E->W | 79.1 | 0.0 | 257 | – | .81 | – | 275 | – | – | 275 | 894 | 0.29 |
| Seg. 2 | – | W->E | 70.0 | 0.0 | 192 | – | .69 | – | 233 | – | – | 233 | 640 | 0.30 |
| | – | E->W | 66.9 | 0.0 | 184 | – | .69 | – | 233 | – | – | 233 | 640 | 0.29 |
| Wall A-2 | 1 | W->E | – | – | 1221 | – | 1.0 | – | 339 | – | – | – | 4062 | – |
| | 1 | E->W | – | – | 1168 | – | 1.0 | – | 339 | – | – | – | 4062 | – |
| Seg. 1 | – | W->E | 203.5 | 0.0 | 611 | – | 1.0 | – | 339 | – | – | 339 | 1016 | 0.60 |
| | – | E->W | 194.7 | 0.0 | 584 | – | 1.0 | – | 339 | – | – | 339 | 1016 | 0.58 |
| Open. 1 | – | W->E | – | 203.5 | 1221 | – | – | – | 339 | – | – | 339 | 2031 | 0.60 |
| | – | E->W | – | 194.7 | 1168 | – | – | – | 339 | – | – | 339 | 2031 | 0.58 |
| Seg. 2 | – | W->E | 203.5 | 0.0 | 611 | – | 1.0 | – | 339 | – | – | 339 | 1016 | 0.60 |
| | – | E->W | 194.7 | 0.0 | 584 | – | 1.0 | – | 339 | – | – | 339 | 1016 | 0.58 |
| **Level 1** | | | | | | | | | | | | | | |
| LnA, Lev1 | – | W->E | – | – | 4010 | – | – | – | 339 | – | – | – | 5586 | – |
| | – | E->W | – | – | 3937 | – | – | – | 339 | – | – | – | 5586 | – |
| Wall A-1 | 1 | W->E | – | – | 3038 | – | 1.0 | – | 339 | – | – | – | 4232 | – |
| | 1 | E->W | – | – | 2983 | – | 1.0 | – | 339 | – | – | – | 4232 | – |
| Seg. 1 | – | W->E | 243.0 | 0.0 | 3038 | – | 1.0 | – | 339 | – | – | 339 | 4232 | 0.72 |
| | – | E->W | 238.6 | 0.0 | 2983 | – | 1.0 | – | 339 | – | – | 339 | 4232 | 0.70 |
| Seg. 2 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 339 | – | – | 339 | – | – |
| Wall A-2 | 1 | W->E | – | – | 972 | – | 1.0 | – | 339 | – | – | – | 1354 | – |
| | 1 | E->W | – | – | 954 | – | 1.0 | – | 339 | – | – | – | 1354 | – |
| Seg. 1 | – | W->E | 162.0 | 0.0 | 486 | – | .67 | – | 226 | – | – | 226 | 677 | 0.72 |
| | – | E->W | 159.1 | 0.0 | 477 | – | .67 | – | 226 | – | – | 226 | 677 | 0.70 |
| Seg. 2 | – | W->E | 162.0 | 0.0 | 486 | – | .67 | – | 226 | – | – | 226 | 677 | 0.72 |
| | – | E->W | 159.1 | 0.0 | 477 | – | .67 | – | 226 | – | – | 226 | 677 | 0.70 |
| **Line D** | | | | | | | | | | | | | | |
| **Level 2** | | | | | | | | | | | | | | |

**13**

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PRRNSF20230918

## SHEAR RESULTS (flexible wind design, continued)

| | W Gp | For Dir | v | vmax/vft | V | C | Asp/Cub | Int | Ext | Co | Cmb | V | Crit Resp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LnD, Lev2 | – | W->E | – | – | 1400 | – | – | – | 339 | – | – | 5416 | – |
| | – | E->W | – | – | 1392 | – | – | – | 339 | – | – | 5416 | – |
| Wall D-1 | 1 | W->E | – | – | 1400 | – | 1.0 | – | 339 | – | – | 5416 | – |
| | 1 | E->W | – | – | 1392 | – | 1.0 | – | 339 | – | – | 5416 | – |
| Seg. 1 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 339 | – | 339 | – | – |
| Seg. 2 | – | W->E | 87.5 | 0.0 | 1028 | – | 1.0 | – | 339 | – | 339 | 3978 | 0.26 |
| | – | E->W | 87.0 | 0.0 | 1022 | – | 1.0 | – | 339 | – | 339 | 3978 | 0.26 |
| Seg. 3 | – | W->E | 87.5 | 0.0 | 372 | – | 1.0 | – | 339 | – | 339 | 1439 | 0.26 |
| | – | E->W | 87.0 | 0.0 | 370 | – | 1.0 | – | 339 | – | 339 | 1439 | 0.26 |
| **Level 1** | | | | | | | | | | | | | |
| LnD, Lev1 | – | W->E | – | – | 3802 | – | – | – | 495 | – | – | 14125 | – |
| | – | E->W | – | – | 3794 | – | – | – | 495 | – | – | 14125 | – |
| Wall D-1 | 2 | W->E | – | – | 2480 | – | 1.0 | – | 495 | – | – | 8770 | – |
| | 2 | E->W | – | – | 2475 | – | 1.0 | – | 495 | – | – | 8770 | – |
| Seg. 1 | – | W->E | 244.6 | 0.0 | 1040 | – | 1.0 | – | 495 | – | 495 | 2103 | 0.49 |
| | – | E->W | 244.1 | 0.0 | 1037 | – | 1.0 | – | 495 | – | 495 | 2103 | 0.49 |
| Open. 1 | – | W->E | – | 305.8 | 1835 | – | – | – | 495 | – | 495 | 2969 | 0.62 |
| | – | E->W | – | 305.1 | 1831 | – | – | – | 495 | – | 495 | 2969 | 0.62 |
| Seg. 2 | – | W->E | 326.2 | -101.9 | 1060 | – | 1.0 | – | 495 | – | 495 | 1608 | 0.66 |
| | – | E->W | 325.5 | -101.7 | 1058 | – | 1.0 | – | 495 | – | 495 | 1608 | 0.66 |
| Open. 2 | – | W->E | – | 305.8 | 917 | – | – | – | 495 | – | 495 | 1484 | 0.62 |
| | – | E->W | – | 305.1 | 915 | – | – | – | 495 | – | 495 | 1484 | 0.62 |
| Seg. 3 | – | W->E | 217.4 | 34.0 | 381 | – | .70 | – | 346 | – | 346 | 606 | 0.63 |
| | – | E->W | 217.0 | 33.9 | 380 | – | .70 | – | 346 | – | 346 | 606 | 0.63 |
| Wall D-2 | 2 | W->E | 135.9 | – | 679 | – | 1.0 | – | 495 | – | 495 | 2474 | 0.27 |
| | 2 | E->W | 135.6 | – | 678 | – | 1.0 | – | 495 | – | 495 | 2474 | 0.27 |
| Wall D-3 | 2 | W->E | – | – | 642 | – | 1.0 | – | 495 | – | – | 2882 | – |
| | 2 | E->W | – | – | 641 | – | 1.0 | – | 495 | – | – | 2882 | – |
| Seg. 1 | – | W->E | 171.2 | 0.0 | 300 | – | .70 | – | 346 | – | 346 | 606 | 0.49 |
| | – | E->W | 170.9 | 0.0 | 299 | – | .70 | – | 346 | – | 346 | 606 | 0.49 |
| Open. 1 | – | W->E | – | 214.0 | 642 | – | – | – | 495 | – | 495 | 1484 | 0.43 |
| | – | E->W | – | 213.6 | 641 | – | – | – | 495 | – | 495 | 1484 | 0.43 |
| Seg. 2 | – | Both | 170.9 | 0.0 | 342 | – | .80 | – | 396 | – | 396 | 792 | 0.43 |

*Legend:*

*W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall. "^" means that this wall is critical for all walls in the Standard Wall group.*

*For Dir - Direction of wind force along shearline.*

*v - Design shear force on segment = ASD-factored shear force per unit length of full-height sheathing (FHS)*

*vmax/vft - Perforated walls: Collector and in-plane anchorage force as per SDPWS eqn. 4.3-9 = V/FHS/Co. FHS is factored for narrow segments as per 4.3.4.3*

*Force-transfer walls: Shear force in piers above and below either openings or piers beside opening(s). Aspect ratio factor does not apply to these piers.*

*V - ASD factored shear force. For shearline: total shearline force. For wall: total of all segments on wall. For segment: force on segment*

*Asp/Cub – For wall: Unblocked structural wood panel factor Cub from SDPWS 4.3.3.2. For segment or force-transfer pier: Aspect ratio adjustment from SDPWS 4.3.3.4.1*

*Int - Unit shear capacity of interior sheathing; Ext - Unit shear capacity of exterior sheathing. For wall: Unfactored. For segment: Include Cub factor and aspect ratio adjustments.*

*Co - Adjustment factor for perforated walls from SDPWS Equation 4.3-5.*

*C - Sheathing combination rule, A = Add capacities, S = Strongest side or twice weakest, G = Stiffness-based using SDPWS 4.3-3.*

*Cmb - Combined interior and exterior unit shear capacity including perforated wall factor Co.*

*V – Total factored shear capacity of shearline, wall or segment.*

*Crit Resp – Response ratio = v/Cmb = design shear force/unit shear capacity. "S" indicates that the wind design criterion was critical in selecting wall.*

Notes:

Refer to Elevation View diagrams for individual level for uplift anchorage force t for perforated walls given by SDPWS 4.3.6.4.2,4.

## HOLD-DOWN DESIGN (flexible wind design)

| Level 1 Line-Wall | Posit'n | Location [ft] X | Y | Load Case | Tensile ASD Holddown Force [lbs] Shear | Dead | Uplift | Cmb'd | Hold-down | Cap [lbs] | Crit Resp. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | | | | | |
| | V Elem | 0.00 | 2.88 | 1 | 419 | | | 419 | Refer to upper level | | |
| 1-1 | R Op 1 | 0.00 | 17.63 | 1 | 2541 | | | 2541 | STHD14 (8" | 3815 | 0.67 |
| | V Elem | 0.00 | 26.88 | 1 | 1228 | | | 1228 | Refer to upper level | | |
| 1-1 | R End | 0.00 | 33.87 | 1 | 1713 | | | 1713 | STHD14 (8" | 3815 | 0.45 |
| **Line 4** | | | | | | | | | | | |
| 4-1 | L End | 30.00 | 0.12 | 1 | 2607 | | | 2607 | STHD14 (8" | 3815 | 0.68 |
| 4-1 | R End | 30.00 | 6.88 | 1 | 2106 | | | 2106 | STHD14 (8" | 3815 | 0.55 |
| 4-2 | L End | 30.00 | 13.63 | 1 | 2095 | | | 2095 | STHD14 (8" | 3815 | 0.55 |
| 4-2 | R End | 30.00 | 24.88 | 1 | 2076 | | | 2076 | STHD14 (8" | 3815 | 0.54 |
| | V Elem | 30.00 | 33.87 | 1 | 462 | | | 462 | Refer to upper level | | |
| **Line 5** | | | | | | | | | | | |
| 5-2 | L End | 50.00 | 15.13 | 1 | 1393 | | | 1393 | LIMIT w/o | 1500 | 0.93 |
| 5-2 | R End | 50.00 | 27.88 | 1 | 1393 | | | 1393 | LIMIT w/o | 1500 | 0.93 |
| **Line A** | | | | | | | | | | | |
| A-1 | L End | 0.12 | 2.00 | 1 | 2948 | | | 2948 | STHD14 (8" | 3815 | 0.77 |
| | V Elem | 3.13 | 0.00 | 1 | 686 | | | 686 | Refer to upper level | | |
| A-1 | L Op 1 | 12.38 | 2.00 | 1 | 1979 | | | 1979 | STHD14 (8" | 3815 | 0.52 |
| | V Elem | 17.13 | 0.00 | 1 | 393 | | | 393 | Refer to upper level | | |
| | V Elem | 17.87 | 0.00 | 1 | 589 | | | 589 | Refer to upper level | | |
| A-2 | L End | 18.13 | 0.00 | 1 | 2687 | | | 2687 | STHD14 (8" | 3815 | 0.70 |
| A-2 | L Op 1 | 20.88 | 0.00 | 1 | 1562 | | | 1562 | STHD14 (8" | 3815 | 0.41 |
| A-2 | R Op 1 | 27.13 | 0.00 | 1 | 1591 | | | 1591 | STHD14 (8" | 3815 | 0.42 |
| A-2 | R End | 29.88 | 0.00 | 1 | 2610 | | | 2610 | STHD14 (8" | 3815 | 0.68 |
| **Line D** | | | | | | | | | | | |
| D-1 | L End | 0.12 | 34.00 | 1 | 1240 | | | 1240 | LIMIT w/o | 1500 | 0.83 |
| | V Elem | 4.13 | 34.00 | 1 | 715 | | | 715 | Refer to upper level | | |
| | V Elem | 13.38 | 34.00 | 1 | 207 | | | 207 | Refer to upper level | | |
| | V Elem | 16.62 | 34.00 | 1 | 504 | | | 504 | Refer to upper level | | |
| D-1 | R End | 18.13 | 34.00 | 1 | 1237 | | | 1237 | LIMIT w/o | 1500 | 0.82 |
| D-2 | L End | 18.38 | 35.75 | 1 | 1287 | | | 1287 | LIMIT w/o | 1500 | 0.86 |
| D-2 | R End | 23.13 | 35.75 | 1 | 1285 | | | 1285 | LIMIT w/o | 1500 | 0.86 |
| D-3 | L End | 23.38 | 34.00 | 1 | 889 | | | 889 | LIMIT w/o | 1500 | 0.59 |
| | V Elem | 24.88 | 34.00 | 1 | 527 | | | 527 | Refer to upper level | | |
| | V Elem | 28.13 | 34.00 | 1 | 217 | | | 217 | Refer to upper level | | |
| D-3 | R End | 29.88 | 34.00 | 1 | 1627 | | | 1627 | STHD14 (8" | 3815 | 0.43 |

| Level 2 Line-Wall | Posit'n | Location [ft] X | Y | Load Case | Tensile ASD Holddown Force [lbs] Shear | Dead | Uplift | Cmb'd | Hold-down | Cap [lbs] | Crit Resp. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | | | | | |
| 1-1 | R Op 1 | 0.00 | 12.63 | 1 | 1247 | | | 1247 | MSTC48B3 | 3315 | 0.38 |
| 1-1 | L Op 2 | 0.00 | 26.88 | 1 | 1228 | | | 1228 | MST48 | 3640 | 0.34 |
| **Line 4** | | | | | | | | | | | |
| 4-1 | L End | 30.00 | 0.12 | 1 | 481 | | | 481 | LIMIT w/o | 1500 | 0.32 |
| 4-1 | R End | 30.00 | 33.87 | 1 | 462 | | | 462 | LIMIT w/o | 1500 | 0.31 |
| **Line A** | | | | | | | | | | | |
| A-1 | L End | 0.12 | 2.00 | 1 | 717 | | | 717 | LIMIT w/o | 1500 | 0.48 |
| A-1 | L Op 1 | 3.13 | 2.00 | 1 | 686 | | | 686 | LIMIT w/o | 1500 | 0.46 |
| A-1 | R Op 1 | 15.38 | 2.00 | 1 | 616 | | | 616 | LIMIT w/o | 1500 | 0.41 |
| A-1 | R End | 17.87 | 2.00 | 1 | 589 | | | 589 | LIMIT w/o | 1500 | 0.39 |
| A-2 | L End | 18.13 | 0.00 | 1 | 1096 | | | 1096 | LIMIT w/o | 1500 | 0.73 |
| A-2 | R End | 29.88 | 0.00 | 1 | 1049 | | | 1049 | LIMIT w/o | 1500 | 0.70 |
| **Line D** | | | | | | | | | | | |
| D-1 | R Op 1 | 4.13 | 34.00 | 1 | 715 | | | 715 | LIMIT w/o | 1500 | 0.48 |
| D-1 | L Op 2 | 15.63 | 34.00 | 1 | 711 | | | 711 | LIMIT w/o | 1500 | 0.47 |
| D-1 | R Op 2 | 25.88 | 34.00 | 1 | 744 | | | 744 | LIMIT w/o | 1500 | 0.50 |
| D-1 | R End | 29.88 | 34.00 | 1 | 739 | | | 739 | LIMIT w/o | 1500 | 0.49 |

*Legend:*
*Line-Wall:*
  *At wall or opening – Shearline and wall number  At vertical element - Shearline*
*Posit'n - Position of stud that hold-down is attached to:*
  *V Elem - Vertical element: column or strengthened studs required where not at wall end or opening*
  *L or R End - At left or right wall end*
  *L or R Op n -  At left or right side of opening n*
  *t @ Op n -  Uplift force t at opening n from offset opening in perforated wall above, from SDPWS 4.3.6.2.1*
*Location - Co-ordinates in Plan View*
*Load Case - Results are for critical load case:*

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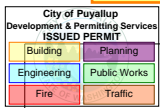
*ASCE 7 All Heights: Case 1 or 2 from Fig. 27.3-8*
*ASCE 7 Low-rise: Windward corner(s) and Case A or B from Fig. 28.3-1*
*ASCE 7 Minimum loads (27.1.5 / 28.3.4)*
*Hold-down Forces:*
   *Shear – Wind shear overturning component, based on shearline force, factored for ASD by 0.60. For perforated walls, T from SDPWS 4.3-8 is used.*
   *Dead – Dead load resisting component, factored for ASD by 0.60*
   *Uplift - Uplift wind load component, factored for ASD by 0.60. For perforated walls, T from SDPWS 4.3-8 is used.*
   *Cmb'd - Sum of ASD-factored overturning, dead and uplift forces. May also include the uplift force t from perforated walls from SDPWS 4.3.6.2.1 when openings are staggered.*
*Hold-down – Device used from hold-down database*
*Cap – Allowable ASD tension load*
*Crit. Resp. - Critical Response = Combined ASD force / Allowable ASD tension load*

Notes:
Refer to Shear Results table for factor Co, and shearline dimensions table for the sum of Li, used to calculate tension force T for perforated walls from SDPWS Eqn. 4.3-8.
Designer is responsible for design of connection from wall to floor or foundation for shear force shown in Shear Results table. Refer to SDPWS 4.3.6.4.3 for foundation anchor bolt requirements.

**16**

**COLLECTOR FORCES (flexible wind design)**

| Level 1 Line-Wall | Position on Wall or Opening | Location [ft] X | Y | Load Case | Drag Strut Force [lbs] ---> | <--- | Strap/Blocking Force [lbs] ---> | <--- |
|---|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | | |
| 1-1 | Right Opening 1 | 0.00 | 17.50 | 1 | -1498 | 1498 | | |
| **Line 4** | | | | | | | | |
| 4-1 | Right Wall End | 30.00 | 7.00 | 1 | 541 | -536 | | |
| 4-2 | Left Wall End | 30.00 | 13.50 | 1 | -437 | 433 | | |
| 4-2 | Right Wall End | 30.00 | 25.00 | 1 | 451 | -447 | | |
| **Line 5** | | | | | | | | |
| 5-2 | Left Wall End | 50.00 | 15.00 | 1 | -431 | 431 | | |
| **Line A** | | | | | | | | |
| A-1 | Left Opening 1 | 12.50 | 2.00 | 1 | 1367 | -1342 | | |
| A-2 | Left Opening 1 | 21.00 | 0.00 | 1 | 717 | -704 | | |
| A-2 | Right Opening 1 | 27.00 | 0.00 | 1 | -85 | 84 | | |
| **Line D** | | | | | | | | |
| D-1 | Left Opening 1 | 4.25 | 34.00 | 1 | -539 | 537 | | |
| D-1 | Right Opening 1 | 10.25 | 34.00 | 1 | 536 | -535 | | |
| D-1 | Left Opening 2 | 13.50 | 34.00 | 1 | -207 | 207 | | |
| D-1 | Right Opening 2 | 16.50 | 34.00 | 1 | 330 | -329 | | |
| D-3 | Left Opening 1 | 25.00 | 34.00 | 1 | -8 | 8 | | |
| D-3 | Right Opening 1 | 28.00 | 34.00 | 1 | 253 | -253 | | |
| D-1 | Left Opening 1 | 4.25 | 34.00 | | | | 1040 | 1037 |
| D-1 | Right Opening 1 | 10.25 | 34.00 | | | | 795 | 793 |
| D-1 | Left Opening 2 | 13.50 | 34.00 | | | | 596 | 595 |
| D-1 | Right Opening 2 | 16.50 | 34.00 | | | | 321 | 320 |
| D-3 | Left Opening 1 | 25.00 | 34.00 | | | | 300 | 299 |
| D-3 | Right Opening 1 | 28.00 | 34.00 | | | | 342 | 342 |
| **Level 2 Line-Wall** | **Position on Wall or Opening** | **Location [ft] X** | **Y** | **Load Case** | **Drag Strut Force [lbs] --->** | **<---** | **Strap/Blocking Force [lbs] --->** | **<---** |
| **Line 1** | | | | | | | | |
| 1-1 | Right Opening 1 | 0.00 | 12.50 | 1 | -442 | 435 | | |
| 1-1 | Left Opening 2 | 0.00 | 27.00 | 1 | 295 | -290 | | |
| **Line A** | | | | | | | | |
| A-1 | Left Opening 1 | 3.25 | 2.00 | 1 | 86 | -83 | | |
| A-1 | Right Opening 1 | 15.25 | 2.00 | 1 | -586 | 561 | | |
| A-2 | Left Opening 1 | 21.00 | 0.00 | 1 | -716 | 685 | | |
| A-2 | Right Opening 1 | 27.00 | 0.00 | 1 | 168 | -161 | | |
| A-2 | Left Opening 1 | 21.00 | 0.00 | | | | 611 | 584 |
| A-2 | Right Opening 1 | 27.00 | 0.00 | | | | 611 | 584 |
| **Line D** | | | | | | | | |
| D-1 | Right Opening 1 | 4.00 | 34.00 | 1 | -187 | 186 | | |
| D-1 | Left Opening 2 | 15.75 | 34.00 | 1 | 293 | -291 | | |
| D-1 | Right Opening 2 | 25.75 | 34.00 | 1 | -173 | 173 | | |

*Legend:*

*Line-Wall - Shearline and wall number*

*Position…- Side of opening or wall end that drag strut is attached to*

*Location - Co-ordinates in Plan View*

*Load Case - Results are for critical load case:*

  *ASCE 7 All heights Case 1 or 2*

  *ASCE 7 Low-rise corner; Case A or B*

*Drag strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression.*
  *Based on ASD-factored shearline force (vmax from 4.3.6.4.1.1 for perforated walls)*

*Strap/Blocking Force – For force-transfer walls, force transferred from above and below opening to shearwall pier.*

*-> Due to shearline force in the west-to-east or south-to-north direction*

*<- Due to shearline force in the east-to-west or north-to-south direction*
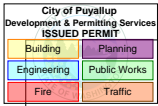
## Flexible Diaphragm Seismic Design

**SEISMIC INFORMATION**

| Level | Mass [lbs] | Area [sq.ft] | Story Shear [lbs] | | Diaphragm Force [lbs] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | E-W | N-S | E-W: | Fpx | Design | N-S: | Fpx | Design | |
| **2** | 24549 | 984.0 | 5222 | 5222 | | 3655 | 3655 | | 3655 | 3655 | |
| **1** | 43624 | 1412.8 | 5266 | 5266 | | 6156 | 6156 | | 6156 | 6156 | |
| **All** | **68173** | – | **10488** | **10488** | | – | – | | – | – | |

*Legend:*

*Mass – Sum of all generated and input building masses on level = wx in ASCE 7 equation 12.8-12.*

*Story Shear – Total unfactored (strength-level) shear force induced at level x, = Fx in ASCE 7 equation 12.8-11.*

*Diaphragm Force – Minimum ASD-factored force for diaphragm design, used by Shearwalls only for drag strut forces, as per Exception to 12.10.2.1. Fpx is from Eqns. 12.10-1, -2, and -3. Design = The greater of the story shear and Fpx + transfer forces from discontinuous shearlines, factored by overstrength (omega) as per 12.10.1.1. Omega = 2.5 as per 12.2-1.*

**Redundancy Factor p (rho):**

E-W 1.00, N-S 1.00
Automatically calculated according to ASCE 7 12.3.4.2.

**Vertical Earthquake Load Ev**

Ev = 0.2 Sds D; Sds = 1.00; Ev = 0.200 D unfactored; 0.140 D factored; total dead load factor: 0.6 - 0.140 = 0.460 tension, 1.0 + 0.140 = 1.140 compression.

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**City of Puyallup**
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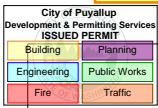
**WoodWorks® Shearwalls**  **43rd Ave Duplex - SHEAR.wsw**  **Mar. 29, 2023**
**14:14:48**

## SHEAR RESULTS (flexible seismic design)

| N-S Shearlines | W Gp | For Dir | ASD Shear Force [plf] v | vmax/vft | V [lbs] | Asp-Cub Int | Ext | Int | Allowable Shear [plf] Ext | Co | C | Cmb | V [lbs] | Resp. Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | | | | | | | | |
| **Level 2** | | | | | | | | | | | | | | |
| Ln1, Lev2 | – | Both | – | – | 1782 | – | – | – | 242 | – | | – | 3506 | – |
| Wall 1-1 | 1 | Both | – | – | 1782 | – | 1.0 | – | 242 | – | | – | 3506 | – |
| Seg. 1 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 242 | – | | 242 | – | – |
| Seg. 2 | – | Both | 122.9 | 0.0 | 1782 | – | 1.0 | – | 242 | – | | 242 | 3506 | 0.51 |
| Seg. 3 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 242 | – | | 242 | – | – |
| **Level 1** | | | | | | | | | | | | | | |
| Ln1, Lev1 | – | Both | – | – | 2857 | – | – | – | 242 | – | | – | 3990 | – |
| Wall 1-1 | 1 | Both | – | – | 2857 | – | 1.0 | – | 242 | – | | – | 3990 | – |
| Seg. 1 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 242 | – | | 242 | – | – |
| Seg. 2 | – | Both | 173.1 | 0.0 | 2857 | – | 1.0 | – | 242 | – | | 242 | 3990 | 0.72 |
| **Line 4** | | | | | | | | | | | | | | |
| **Level 2** | | | | | | | | | | | | | | |
| Ln4, Lev2 | 1 | Both | 55.1 | – | 1873 | – | 1.0 | – | 242 | – | | 242 | 8221 | 0.23 |
| **Level 1** | | | | | | | | | | | | | | |
| Ln4, Lev1 | – | Both | – | – | 3633 | – | – | – | 242 | – | | – | 4473 | – |
| Wall 4-1 | 1 | Both | 196.4 | – | 1375 | – | 1.0 | – | 242 | – | | 242 | 1693 | 0.81 |
| Wall 4-2 | 1 | Both | 196.4 | – | 2259 | – | 1.0 | – | 242 | – | | 242 | 2781 | 0.81 |
| **Line 5** | | | | | | | | | | | | | | |
| Ln5, Lev1 | – | Both | – | – | 852 | – | – | – | 242 | – | | – | 3143 | – |
| Wall 5-2 | 1 | Both | 65.5 | – | 852 | – | 1.0 | – | 242 | – | | 242 | 3143 | 0.27 |

| E-W Shearlines | W Gp | For Dir | ASD Shear Force [plf] v | vmax/vft | V [lbs] | Asp-Cub Int | Ext | Int | Allowable Shear [plf] Ext | Co | C | Cmb | V [lbs] | Resp. Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Line A** | | | | | | | | | | | | | | |
| **Level 2** | | | | | | | | | | | | | | |
| LnA, Lev2 | – | Both | – | – | 1869 | – | – | – | 242 | – | | – | 3997 | – |
| Wall A-1 | 1 | Both | – | – | 512 | – | 1.0 | – | 242 | – | | – | 1096 | – |
| Seg. 1 | – | Both | 91.9 | 0.0 | 299 | – | .81 | – | 196 | – | | 196 | 639 | 0.47 |
| Seg. 2 | – | Both | 77.7 | 0.0 | 214 | – | .69 | – | 166 | – | | 166 | 457 | 0.47 |
| Wall A-2 | 1 | Both | – | – | 1357 | – | 1.0 | – | 242 | – | | – | 2902 | – |
| Seg. 1 | – | Both | 226.1 | 0.0 | 678 | – | 1.0 | – | 242 | – | | 242 | 725 | 0.94 |
| Open. 1 | – | Both | – | 226.1 | 1357 | – | – | – | 242 | – | | 242 | 1451 | 0.94 |
| Seg. 2 | – | Both | 226.1 | 0.0 | 678 | – | 1.0 | – | 242 | – | | 242 | 725 | 0.94 |
| **Level 1** | | | | | | | | | | | | | | |
| LnA, Lev1 | – | Both | – | – | 3727 | – | – | – | 242 | – | | – | 3990 | – |
| Wall A-1 | 1^ | Both | – | – | 2823 | – | 1.0 | – | 242 | – | | – | 3023 | – |
| Seg. 1 | – | Both | 225.9 | 0.0 | 2823 | – | 1.0 | – | 242 | – | | 242 | 3023 | 0.93 |
| Seg. 2 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 242 | – | | 242 | – | – |
| Wall A-2 | 1^ | Both | – | – | 903 | – | 1.0 | – | 242 | – | | – | 967 | – |
| Seg. 1 | – | Both | 150.6 | 0.0 | 452 | – | .67 | – | 161 | – | | 161 | 484 | 0.93 |
| Seg. 2 | – | Both | 150.6 | 0.0 | 452 | – | .67 | – | 161 | – | | 161 | 484 | 0.93 |
| **Line D** | | | | | | | | | | | | | | |
| **Level 2** | | | | | | | | | | | | | | |
| LnD, Lev2 | – | Both | – | – | 1786 | – | – | – | 242 | – | | – | 3869 | – |
| Wall D-1 | 1 | Both | – | – | 1786 | – | 1.0 | – | 242 | – | | – | 3869 | – |
| Seg. 1 | – | Both | 0.0 | 0.0 | 0 | – | 1.0 | – | 242 | – | | 242 | – | – |
| Seg. 2 | – | Both | 111.6 | 0.0 | 1312 | – | 1.0 | – | 242 | – | | 242 | 2841 | 0.46 |
| Seg. 3 | – | Both | 111.6 | 0.0 | 474 | – | 1.0 | – | 242 | – | | 242 | 1028 | 0.46 |
| **Level 1** | | | | | | | | | | | | | | |
| LnD, Lev1 | – | Both | – | – | 3617 | – | – | – | 353 | – | | – | 10090 | – |
| Wall D-1 | 2^ | Both | – | – | 2359 | – | 1.0 | – | 353 | – | | – | 6264 | – |
| Seg. 1 | – | Both | 232.7 | 0.0 | 989 | – | 1.0 | – | 353 | – | | 353 | 1502 | 0.66 |
| Open. 1 | – | Both | – | 290.9 | 1745 | – | – | – | 353 | – | | 353 | 2120 | 0.82 |
| Seg. 2 | – | Both | 310.3 | -97.0 | 1008 | – | 1.0 | – | 353 | – | | 353 | 1149 | 0.88 |
| Open. 2 | – | Both | – | 290.9 | 873 | – | – | – | 353 | – | | 353 | 1060 | 0.82 |
| Seg. 3 | – | Both | 206.8 | 32.3 | 362 | – | .70 | – | 247 | – | | 247 | 433 | 0.84 |
| Wall D-2 | 2 | Both | 129.3 | – | 646 | – | 1.0 | – | 353 | – | | 353 | 1767 | 0.37 |
| Wall D-3 | 2 | Both | – | – | 611 | – | 1.0 | – | 353 | – | | – | 2059 | – |
| Seg. 1 | – | Both | 162.9 | 0.0 | 285 | – | .70 | – | 247 | – | | 247 | 433 | 0.66 |
| Open. 1 | – | Both | – | 203.6 | 611 | – | – | – | 353 | – | | 353 | 1060 | 0.58 |
| Seg. 2 | – | Both | 162.9 | 0.0 | 326 | – | .80 | – | 283 | – | | 283 | 565 | 0.58 |

*Legend:*
*W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall. "^" means that this wall is critical for all walls in the Standard Wall group.*
*For Dir – Direction of seismic force along shearline.*
*v - Design shear force on segment = ASD-factored shear force per unit length of full-height sheathing (FHS)*

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PRRNSF20230918

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*43rd Ave Duplex - SHEAR.wsw*     **Mar. 29, 2023**
*14:14:48*

*vmax/vft - Perforated walls: Collector and in-plane anchorage force as per SDPWS eqn. 4.3-9 = V/FHS/Co. FHS is factored for narrow segments as per 4.3.4.3*

*Force-transfer walls: Shear force in piers above and below either openings or piers beside opening(s). Aspect ratio factor does not apply to these piers.*

*V - ASD factored shear force. For shearline: total shearline force. For wall: total of all segments on wall. For segment: force on segment*

*Asp/Cub – For wall: Unblocked structural wood panel factor Cub from SDPWS 4.3.3.2.  For segment or force-transfer pier: Aspect ratio adjustment from SDPWS 4.3.3.4.1*

*Int - Unit shear capacity of interior sheathing; Ext - Unit shear capacity of exterior sheathing.  For wall: Unfactored. For segment: Include Cub factor and aspect ratio adjustments.*

*Co - Adjustment factor for perforated walls from SDPWS Equation 4.3-5.*

*C - Sheathing combination rule, A = Add capacities, S = Strongest side or twice weakest, G = Stiffness-based using SDPWS 4.3-3.*

*Cmb - Combined interior and exterior unit shear capacity including perforated wall factor Co.*

*V – Total factored shear capacity of shearline, wall or segment.*

*Crit Resp – Response ratio = v/Cmb = design shear force/unit shear capacity.  "W" indicates that the wind design criterion was critical in selecting wall.*

Notes:
Refer to Elevation View diagrams for individual level for uplift anchorage force t for perforated walls given by SDPWS 4.3.6.4.2,4.

**HOLD-DOWN DESIGN (flexible seismic design)**

| Level 1 Line-Wall | Posit'n | Location [ft] X | Y | Shear | Tensile ASD Holddown Force [lbs] Dead | Ev | Cmb'd | Hold-down | Cap [lbs] | Crit Resp. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | | | | |
| | V Elem | 0.00 | 2.88 | 554 | | | 554 | Refer to upper level | | |
| 1-1 | R Op 1 | 0.00 | 17.63 | 2677 | | | 2677 | STHD14 (8" | 3815 | 0.70 |
| | V Elem | 0.00 | 26.88 | 1649 | | | 1649 | Refer to upper level | | |
| 1-1 | R End | 0.00 | 33.87 | 1582 | | | 1582 | STHD14 (8" | 3815 | 0.41 |
| **Line 4** | | | | | | | | | | |
| 4-1 | L End | 30.00 | 0.12 | 2456 | | | 2456 | STHD14 (8" | 3815 | 0.64 |
| 4-1 | R End | 30.00 | 6.88 | 1833 | | | 1833 | STHD14 (8" | 3815 | 0.48 |
| 4-2 | L End | 30.00 | 13.63 | 1807 | | | 1807 | STHD14 (8" | 3815 | 0.47 |
| 4-2 | R End | 30.00 | 24.88 | 1807 | | | 1807 | STHD14 (8" | 3815 | 0.47 |
| | V Elem | 30.00 | 33.87 | 623 | | | 623 | Refer to upper level | | |
| **Line 5** | | | | | | | | | | |
| 5-2 | L End | 50.00 | 15.13 | 1050 | | | 1050 | LIMIT w/o | 1500 | 0.70 |
| 5-2 | R End | 50.00 | 27.88 | 1050 | | | 1050 | LIMIT w/o | 1500 | 0.70 |
| **Line A** | | | | | | | | | | |
| A-1 | L End | 0.12 | 2.00 | 2870 | | | 2870 | STHD14 (8" | 3815 | 0.75 |
| | V Elem | 3.13 | 0.00 | 796 | | | 796 | Refer to upper level | | |
| A-1 | L Op 1 | 12.38 | 2.00 | 1827 | | | 1827 | STHD14 (8" | 3815 | 0.48 |
| | V Elem | 17.13 | 0.00 | 437 | | | 437 | Refer to upper level | | |
| | V Elem | 17.87 | 0.00 | 684 | | | 684 | Refer to upper level | | |
| A-2 | L End | 18.13 | 0.00 | 2696 | | | 2696 | STHD14 (8" | 3815 | 0.71 |
| A-2 | L Op 1 | 20.88 | 0.00 | 1478 | | | 1478 | STHD14 (8" | 3815 | 0.39 |
| A-2 | R Op 1 | 27.13 | 0.00 | 1478 | | | 1478 | STHD14 (8" | 3815 | 0.39 |
| A-2 | R End | 29.88 | 0.00 | 2696 | | | 2696 | STHD14 (8" | 3815 | 0.71 |
| **Line D** | | | | | | | | | | |
| D-1 | L End | 0.12 | 34.00 | 1180 | | | 1180 | LIMIT w/o | 1500 | 0.79 |
| | V Elem | 4.13 | 34.00 | 913 | | | 913 | Refer to upper level | | |
| | V Elem | 13.38 | 34.00 | 266 | | | 266 | Refer to upper level | | |
| | V Elem | 16.62 | 34.00 | 646 | | | 646 | Refer to upper level | | |
| D-1 | R End | 18.13 | 34.00 | 1180 | | | 1180 | LIMIT w/o | 1500 | 0.79 |
| D-2 | L End | 18.38 | 35.75 | 1225 | | | 1225 | LIMIT w/o | 1500 | 0.82 |
| D-2 | R End | 23.13 | 35.75 | 1225 | | | 1225 | LIMIT w/o | 1500 | 0.82 |
| D-3 | L End | 23.38 | 34.00 | 846 | | | 846 | LIMIT w/o | 1500 | 0.56 |
| | V Elem | 24.88 | 34.00 | 672 | | | 672 | Refer to upper level | | |
| | V Elem | 28.13 | 34.00 | 277 | | | 277 | Refer to upper level | | |
| D-3 | R End | 29.88 | 34.00 | 1795 | | | 1795 | STHD14 (8" | 3815 | 0.47 |

| Level 2 Line-Wall | Posit'n | Location [ft] X | Y | Shear | Tensile ASD Holddown Force [lbs] Dead | Ev | Cmb'd | Hold-down | Cap [lbs] | Crit Resp. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | | | | |
| 1-1 | R Op 1 | 0.00 | 12.63 | 1649 | | | 1649 | MSTC48B3 | 3315 | 0.50 |
| 1-1 | L Op 2 | 0.00 | 26.88 | 1649 | | | 1649 | MST48 | 3640 | 0.45 |
| **Line 4** | | | | | | | | | | |
| 4-1 | L End | 30.00 | 0.12 | 623 | | | 623 | LIMIT w/o | 1500 | 0.42 |
| 4-1 | R End | 30.00 | 33.87 | 623 | | | 623 | LIMIT w/o | 1500 | 0.42 |
| **Line A** | | | | | | | | | | |
| A-1 | L End | 0.12 | 2.00 | 796 | | | 796 | LIMIT w/o | 1500 | 0.53 |
| A-1 | L Op 1 | 3.13 | 2.00 | 796 | | | 796 | LIMIT w/o | 1500 | 0.53 |
| A-1 | R Op 1 | 15.38 | 2.00 | 684 | | | 684 | LIMIT w/o | 1500 | 0.46 |
| A-1 | R End | 17.87 | 2.00 | 684 | | | 684 | LIMIT w/o | 1500 | 0.46 |
| A-2 | L End | 18.13 | 0.00 | 1218 | | | 1218 | LIMIT w/o | 1500 | 0.81 |
| A-2 | R End | 29.88 | 0.00 | 1218 | | | 1218 | LIMIT w/o | 1500 | 0.81 |
| **Line D** | | | | | | | | | | |
| D-1 | R Op 1 | 4.13 | 34.00 | 913 | | | 913 | LIMIT w/o | 1500 | 0.61 |
| D-1 | L Op 2 | 15.63 | 34.00 | 913 | | | 913 | LIMIT w/o | 1500 | 0.61 |
| D-1 | R Op 2 | 25.88 | 34.00 | 949 | | | 949 | LIMIT w/o | 1500 | 0.63 |
| D-1 | R End | 29.88 | 34.00 | 949 | | | 949 | LIMIT w/o | 1500 | 0.63 |

*Legend:*
*Line-Wall:*
  At wall or opening – Shearline and wall number
  At vertical element - Shearline
*Posit'n -  Position of stud that hold-down is attached to:*
  V Elem -  Vertical element: column or strengthened studs required where not at wall end or opening
  L or R End - At left or right wall end
  L or R Op n -  At left or right side of opening n
  t @ Op n -  Uplift force t at opening n from offset opening in perforated wall above, from SDPWS 4.3.6.2.1
*Location - Co-ordinates in Plan View*

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*43rd Ave Duplex - SHEAR.wsw*     **Mar. 29, 2023**
*14:14:48*
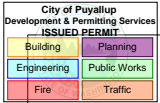
*Hold-down Forces:*

*Shear – Seismic shear overturning component, factored for ASD by 0.7. For perforated walls, T from SDPWS 4.3-8 is used*

*Dead – Dead load resisting component, factored for ASD by 0.60*

*Ev – Vertical seismic load effect from ASCE 7 12.4.2.2 = -0.2Sds x ASD seismic factor x unfactored D = 0.233 x factored D. Refer to Seismic Information table for more details.*

*Cmb'd - Sum of ASD-factored overturning, dead and vertical seismic forces. May also include the uplift force t from perforated walls from SDPWS 4.3.6.2.1 when openings are staggered.*

*Hold-down – Device used from hold-down database*

*Cap – Allowable ASD tension load*

*Crit. Resp. – Critical Response = Combined ASD force/Allowable ASD tension load*

Notes:

Combined force from ASCE 7 2.4.1 load combination 10 = - (0.6D - 0.7Ev + 0.7Eh); Eh (from 12.4.2.1) = - shear overturning force

Refer to Shear Results table for factor Co, and shearline dimensions table for the sum of Li, used to calculate tension force T for perforated walls from SDPWS Eqn. 4.3-8.

Designer is responsible for design of connection from wall to floor or foundation for shear force shown in Shear Results table. Refer to SDPWS 4.3.6.4.3 for foundation anchor bolt requirements.
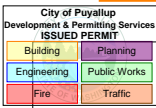
**COLLECTOR FORCES (flexible seismic design)**

| Level 1 Line-Wall | Position on Wall or Opening | Location [ft] X | Location [ft] Y | Drag Strut Force [lbs] ---> | Drag Strut Force [lbs] <--- | Strap/Blocking Force [lbs] ---> | Strap/Blocking Force [lbs] <--- |
|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | |
| | Shearline force | | | 3577 | 3577 | | |
| 1-1 | Right Opening 1 | 0.00 | 17.50 | -1732 | 1732 | | |
| **Line 4** | | | | | | | |
| | Shearline force | | | 4813 | 4813 | | |
| 4-1 | Right Wall End | 30.00 | 7.00 | 618 | -618 | | |
| 4-2 | Left Wall End | 30.00 | 13.50 | -499 | 499 | | |
| 4-2 | Right Wall End | 30.00 | 25.00 | 516 | -516 | | |
| **Line 5** | | | | | | | |
| | Shearline force | | | 1422 | 1422 | | |
| 5-2 | Left Wall End | 50.00 | 15.00 | -542 | 542 | | |
| **Line A** | | | | | | | |
| | Shearline force | | | 4970 | 4970 | | |
| A-1 | Left Opening 1 | 12.50 | 2.00 | 1694 | -1694 | | |
| A-2 | Left Opening 1 | 21.00 | 0.00 | 889 | -889 | | |
| A-2 | Right Opening 1 | 27.00 | 0.00 | -105 | 105 | | |
| **Line D** | | | | | | | |
| | Shearline force | | | 4841 | 4841 | | |
| D-1 | Left Opening 1 | 4.25 | 34.00 | -686 | 686 | | |
| D-1 | Right Opening 1 | 10.25 | 34.00 | 682 | -682 | | |
| D-1 | Left Opening 2 | 13.50 | 34.00 | -264 | 264 | | |
| D-1 | Right Opening 2 | 16.50 | 34.00 | 420 | -420 | | |
| D-3 | Left Opening 1 | 25.00 | 34.00 | -11 | 11 | | |
| D-3 | Right Opening 1 | 28.00 | 34.00 | 323 | -323 | | |
| D-1 | Left Opening 1 | 4.25 | 34.00 | | | 989 | 989 |
| D-1 | Right Opening 1 | 10.25 | 34.00 | | | 756 | 756 |
| D-1 | Left Opening 2 | 13.50 | 34.00 | | | 567 | 567 |
| D-1 | Right Opening 2 | 16.50 | 34.00 | | | 305 | 305 |
| D-3 | Left Opening 1 | 25.00 | 34.00 | | | 285 | 285 |
| D-3 | Right Opening 1 | 28.00 | 34.00 | | | 326 | 326 |

| Level 2 Line-Wall | Position on Wall or Opening | Location [ft] X | Location [ft] Y | Drag Strut Force [lbs] ---> | Drag Strut Force [lbs] <--- | Strap/Blocking Force [lbs] ---> | Strap/Blocking Force [lbs] <--- |
|---|---|---|---|---|---|---|---|
| **Line 1** | | | | | | | |
| | Shearline force | | | 1782 | 1782 | | |
| 1-1 | Right Opening 1 | 0.00 | 12.50 | -585 | 585 | | |
| 1-1 | Left Opening 2 | 0.00 | 27.00 | 390 | -390 | | |
| **Line A** | | | | | | | |
| | Shearline force | | | 1869 | 1869 | | |
| A-1 | Left Opening 1 | 3.25 | 2.00 | 96 | -96 | | |
| A-1 | Right Opening 1 | 15.25 | 2.00 | -652 | 652 | | |
| A-2 | Left Opening 1 | 21.00 | 0.00 | -796 | 796 | | |
| A-2 | Right Opening 1 | 27.00 | 0.00 | 187 | -187 | | |
| A-2 | Left Opening 1 | 21.00 | 0.00 | | | 678 | 678 |
| A-2 | Right Opening 1 | 27.00 | 0.00 | | | 678 | 678 |
| **Line D** | | | | | | | |
| | Shearline force | | | 1786 | 1786 | | |
| D-1 | Right Opening 1 | 4.00 | 34.00 | -238 | 238 | | |
| D-1 | Left Opening 2 | 15.75 | 34.00 | 374 | -374 | | |
| D-1 | Right Opening 2 | 25.75 | 34.00 | -221 | 221 | | |

*Legend:*

*Line-Wall - Shearline and wall number*

*Position…- Side of opening or wall end that drag strut is attached to*

*Location - Co-ordinates in Plan View*

*Drag strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression.*
   *Based on ASD-factored shearline force shown. For SDC C-F, it is the greater of the design shearline force and the diaphragm force Fpx, added to shearline force from story above and to forces transferred from discontinuous shearlines factored by overstrength (omega) as per 12.10.1.1. Refer to Seismic Information table for diaphragm forces and omega factor.*
   *For SDC D-F, if horizontal torsional irregularities 2, 3, or 4 are input, or vertical irregularity 4 detected or input, 25% increase from 12.3.3.4 applied.*
   *For perforated walls, this force is converted to vmax using 4.3.6.4.1.1.*

*Strap/Blocking Force – For force-transfer walls, force transferred from above and below opening to shearwall pier.*

*-> Due to shearline force in the west-to-east or south-to-north direction*

*<- Due to shearline force in the east-to-west or north-to-south direction*

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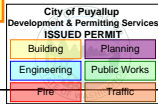
R1
Apr. 4, 2023  16:44

## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start End | Magnitude Start End | Unit |
|---|---|---|---|---|---|---|
| Load1 | Dead | Full Area | | | 15.00(17.50') | psf |
| Load2 | Snow | Full Area | | | 25.00(17.50') | psf |
| Self-weight | Dead | Full UDL | | | 8.5 | plf |

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

10.266'

0'    10.133'
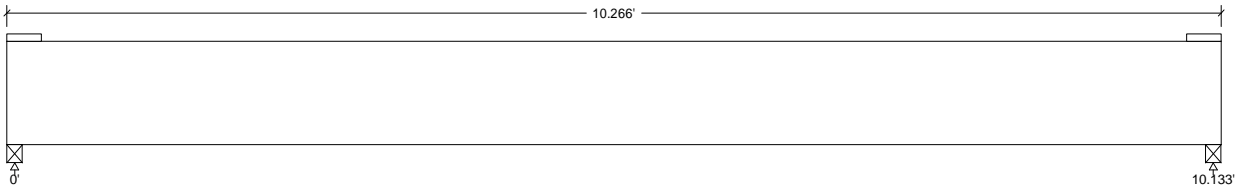
| Unfactored: | | | |
|---|---|---|---|
| Dead | 1390 | | 1390 |
| Snow | 2246 | | 2246 |
| Factored: | | | |
| Total | 3636 | | 3636 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 3636 | | 3636 |
| Support | 3871 | | 3871 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.94 | | 0.94 |
| Load comb | #2 | | #2 |
| Length | 1.60 | | 1.60 |
| Min req'd | 1.60 | | 1.60 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

### R1
**Glulam-Unbal., West Species, 24F-V4 DF, 3-1/2"x10-1/2"**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 10.25'; Clear span: 10'; Volume = 2.6 cu.ft.; 7 laminations, 3-1/2" maximum width,
Lateral support: top = at supports, bottom = at supports;
**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 = 119 | Fv' = 305 | psi | fv/Fv' = 0.39 |
| Bending(+) | fb = 1697 | Fb' = 2625 | psi | fb/Fb' = 0.65 |
| Live Defl'n | 0.17 = L/711 | 0.34 = L/360 | in | 0.51 |
| Total Defl'n | 0.33 = L/369 | 0.51 = L/240 | in | 0.65 |

### Additional Data:
FACTORS: F/E(psi) CD    CM    Ct    CL    CV    Cfu   Cr    Cfrt  Notes Cvr   LC#

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.15 | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.15 | 1.00 | 1.00 | 0.951 | 1.000 | – | – | 1.00 | 1.00 | – | 2 |
| Fcp' | 650 | – | 1.00 | 1.00 | – | – | – | – | 1.00 | – | – | – |
| E' | 1.8 million | 1.00 | 1.00 | – | – | – | – | 1.00 | – | – | 2 |
| Eminy' | 0.85 million | 1.00 | 1.00 | – | – | – | – | 1.00 | – | – | 2 |

CRITICAL LOAD COMBINATIONS:
Shear      : LC #2  = D + S
Bending(+) : LC #2  = D + S
Deflection: LC #2  = D + S  (live)
            LC #2  = D + S  (total)
Bearing   : Support 1 – LC #2 = D + S
            Support 2 – LC #2 = D + S
D=dead S=snow
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
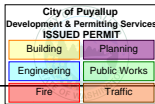V max = 3590, V design = 2922 (NDS 3.4.3.1(a)) lbs; M(+) = 9094 lbs-ft
EI = 607.74e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 10.13'  Le = 19.13'  RB = 14.0

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2015 and manufactured in accordance with ANSI A190.1-2012
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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SF1
Apr. 4, 2023  16:45

## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start End | Magnitude Start End | Unit |
|------|------|--------------|----------|-------------------------|---------------------|------|
| Load1 | Dead | Full Area | | | 15.00(4.50') | psf |
| Load2 | Snow | Full Area | | | 25.00(4.50') | psf |
| Self-weight | Dead | Full UDL | | | 13.3 | plf |

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

19.756'

0'                                                                              19.711'
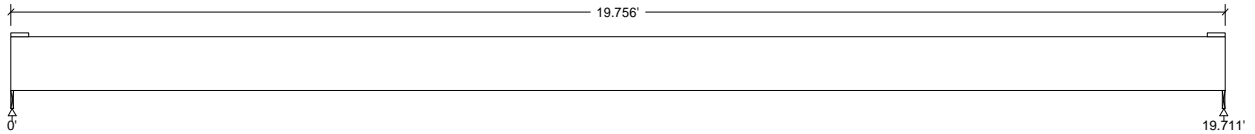
| Unfactored: | | | |
|------|------|------|------|
| Dead | 798 | | 798 |
| Snow | 1111 | | 1111 |
| Factored: | | | |
| Total | 1909 | | 1909 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 1909 | | 1909 |
| Support | 1961 | | 1961 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.97 | | 0.97 |
| Load comb | #2 | | #2 |
| Length | 0.53 | | 0.53 |
| Min req'd | 0.53 | | 0.53 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.07 | | 1.07 |
| Fcp sup | 625 | | 625 |

### SF1
### Glulam-Unbal., West Species, 24F-V4 DF, 5-1/2"x10-1/2"
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 19.75'; Clear span: 19.688'; Volume = 7.9 cu.ft.; 7 laminations, 5-1/2" maximum width,
Lateral support: top = at supports, bottom = at supports;
**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 = 45 | Fv' = 305 | psi | fv/Fv' = 0.15 |
| Bending(+) | fb = 1115 | Fb' = 2672 | psi | fb/Fb' = 0.42 |
| Live Defl'n | 0.40 = L/591 | 0.66 = L/360 | in | 0.61 |
| Total Defl'n | 0.83 = L/284 | 0.99 = L/240 | in | 0.84 |

### Additional Data:
```
FACTORS:  F/E(psi) CD    CM    Ct    CL    CV    Cfu   Cr    Cfrt  Notes Cvr   LC#
Fv'       265      1.15  1.00  1.00  –     –     –     –     1.00  1.00  1.00  2
Fb'+      2400     1.15  1.00  1.00  0.968 1.000 –     –     1.00  1.00  –     2
Fcp'      650      –     1.00  1.00  –     –     –     –     1.00  –     –     –
E'        1.8 million    1.00  1.00  –     –     –     –     1.00  –     –     2
Eminy'    0.85 million   1.00  1.00  –     –     –     –     1.00  –     –     2
```
CRITICAL LOAD COMBINATIONS:
```
Shear     : LC #2  = D + S
Bending(+): LC #2  = D + S
Deflection: LC #2  = D + S  (live)
            LC #2  = D + S  (total)
Bearing   : Support 1 – LC #2 = D + S
            Support 2 – LC #2 = D + S
D=dead S=snow
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
```
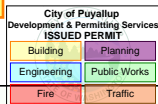CALCULATIONS:
```
V max = 1905, V design = 1732 (NDS 3.4.3.1(a)) lbs; M(+) = 9388 lbs-ft
EI = 955.03e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 19.69'  Le = 36.25'  RB = 12.3
```

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2015 and manufactured in accordance with ANSI A190.1-2012
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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SF2
Apr. 4, 2023  16:46

## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|------|------|-------------|----------|------|-----|------|-----|------|
| Load1 | Dead | Full UDL | | | | 80.0 | | plf |
| Load2 | Dead | Full Area | | | | 12.00(7.25') | | psf |
| Load3 | Live | Full Area | | | | 40.00(7.25') | | psf |
| Load4 | Dead | Partial Area | | 1.00 | 3.13 | 15.00(17.08') | | psf |
| Load5 | Snow | Partial Area | | 1.00 | 3.13 | 25.00(17.08') | | psf |
| Load6 | Dead | Point | | 1.01 | | 1390 | | lbs |
| Load7 | Snow | Point | | 1.01 | | 2246 | | lbs |
| Self-weight | Dead | Full UDL | | | | 6.0 | | plf |

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

3.216'

0'          3.108'
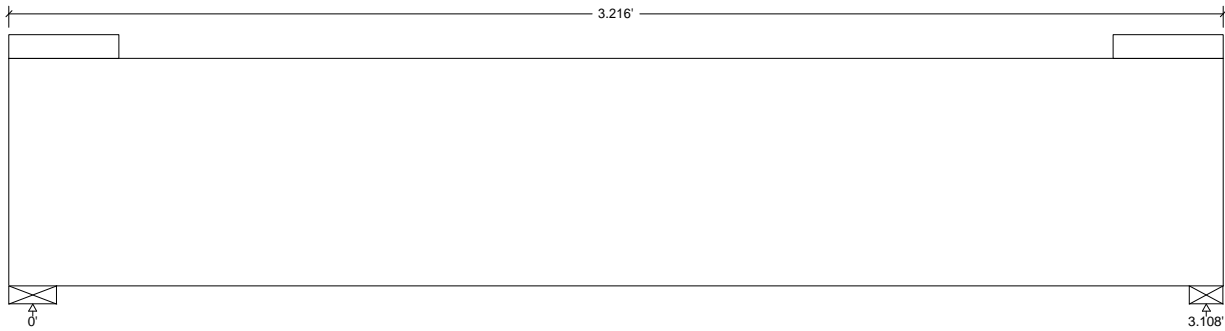
| Unfactored: | | | |
|------|------|------|------|
| Dead | 1442 | | 1049 |
| Live | 469 | | 464 |
| Snow | 1887 | | 1266 |
| Factored: | | | |
| Total | 3329 | | 2346 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 3329 | | 2346 |
| Support | 3686 | | 2597 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.90 | | 0.90 |
| Load comb | #4 | | #3 |
| Length | 1.52 | | 1.07 |
| Min req'd | 1.52 | | 1.07 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

### SF2
**Lumber-soft, D.Fir-L, No.2, 4x8 (3-1/2"x7-1/4")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 3.19'; Clear span: 3.0'; Volume = 0.6 cu.ft.
Lateral support: top = at supports, bottom = at supports;
**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 = 188 | Fv' = 207 | psi | fv/Fv' = 0.91 |
| Bending(+) | fb = 1195 | Fb' = 1339 | psi | fb/Fb' = 0.89 |
| Live Defl'n | 0.01 = < L/999 | 0.10 = L/360 | in | 0.14 |
| Total Defl'n | 0.03 = < L/999 | 0.16 = L/240 | in | 0.20 |

### Additional Data:
FACTORS:

| | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | LC# |
|---|---------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|
| Fv' | 180 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 4 |
| Fb'+ | 900 | 1.15 | 1.00 | 1.00 | 0.995 | 1.300 | - | 1.00 | 1.00 | 1.00 | 4 |
| Fcp' | 625 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | - |
| E' | 1.6 million | 1.00 | 1.00 | - | - | - | - | - | 1.00 | 1.00 | 4 |
| Emin' | 0.58 million | 1.00 | 1.00 | - | - | - | - | - | 1.00 | 1.00 | 4 |

CRITICAL LOAD COMBINATIONS:
Shear      : LC #4 = D + S
Bending(+) : LC #4 = D + S
Deflection : LC #4 = D + S  (live)
             LC #4 = D + S  (total)
Bearing    : Support 1 - LC #4 = D + S
             Support 2 - LC #3 = D + 0.75(L + S)
D=dead L=live S=snow
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 3184, V design = 3184 (NDS 3.4.3.1(a)) lbs; M(+) = 3054 lbs-ft
EI = 177.83e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 3.13'  Le = 6.38'  RB = 6.7

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
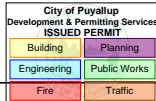
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SF3
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## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|------|------|-------------|----------|-------|-----|--------|-----|------|
| Load1 | Dead | Full UDL | | | | 80.0 | | plf |
| Load2 | Dead | Full Area | | | | 12.00(7.25') | | psf |
| Load3 | Live | Full Area | | | | 40.00(7.25') | | psf |
| Load4 | Dead | Full Area | | | | 15.00(1.00') | | psf |
| Load5 | Snow | Full Area | | | | 25.00(1.00') | | psf |
| Load6 | Dead | Partial Area | | 0.00 | 2.12 | 15.00(17.00') | | psf |
| Load7 | Snow | Partial Area | | 0.00 | 2.12 | 25.00(17.00') | | psf |
| Load8 | Dead | Point | | 2.13 | | 1390 | | lbs |
| Load9 | Snow | Point | | 2.13 | | 2246 | | lbs |
| Self-weight | Dead | Full UDL | | | | 6.0 | | plf |

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



3.22'

0'    3.11'
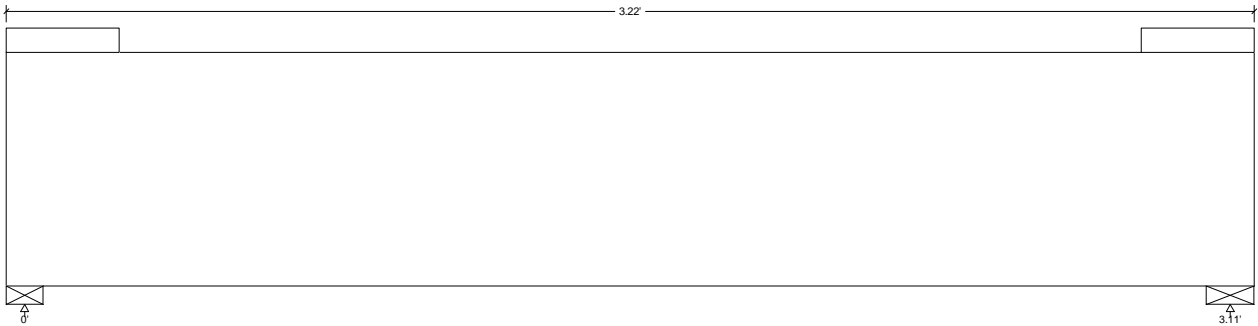
| Unfactored: | | | |
|------|------|---|------|
| Dead | 1126 | | 1411 |
| Live | 465 | | 469 |
| Snow | 1391 | | 1838 |
| Factored: | | | |
| Total | 2518 | | 3249 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 2518 | | 3249 |
| Support | 2788 | | 3597 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.90 | | 0.90 |
| Load comb | #3 | | #4 |
| Length | 1.15 | | 1.49 |
| Min req'd | 1.15 | | 1.49 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

### SF3
**Lumber-soft, D.Fir-L, No.2, 4x8 (3-1/2"x7-1/4")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 3.25'; Clear span: 3.0'; Volume = 0.6 cu.ft.
Lateral support: top = at supports, bottom = at supports;
**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 = 182 | Fv' = 207 | psi | fv/Fv' = 0.88 |
| Bending(+) | fb = 1258 | Fb' = 1339 | psi | fb/Fb' = 0.94 |
| Live Defl'n | 0.02 = < L/999 | 0.10 = L/360 | in | 0.15 |
| Total Defl'n | 0.03 = < L/999 | 0.16 = L/240 | in | 0.21 |

### Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | LC# |
|----------|----------|-----|------|------|-------|-------|-----|------|------|------|-----|
| Fv' | 180 | 1.15 | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 4 |
| Fb'+ | 900 | 1.15 | 1.00 | 1.00 | 0.995 | 1.300 | – | 1.00 | 1.00 | 1.00 | 4 |
| Fcp' | 625 | – | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | – |
| E' | 1.6 million | | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 4 |
| Emin' | 0.58 million | | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 4 |

CRITICAL LOAD COMBINATIONS:
Shear      : LC #4  = D + S
Bending(+): LC #4  = D + S
Deflection: LC #4  = D + S  (live)
           LC #4  = D + S  (total)
Bearing   : Support 1 - LC #3 = D + 0.75(L + S)
            Support 2 - LC #4 = D + S
D=dead L=live S=snow
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
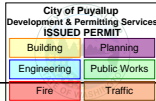V max = 3072, V design = 3072 (NDS 3.4.3.1(a)) lbs; M(+) = 3215 lbs-ft
EI = 177.83e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+): Lu = 3.13'  Le = 6.44'  RB = 6.7

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

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SF4
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## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pattern | Location [ft] Start End | Magnitude Start End | Unit |
|---|---|---|---|---|---|---|
| Load1 | Dead | Full UDL | | | 80.0 | plf |
| Load2 | Dead | Full Area | | | 12.00(7.08') | psf |
| Load3 | Live | Full Area | | | 40.00(7.08') | psf |
| Load4 | Dead | Full Area | | | 15.00(17.25') | psf |
| Load5 | Snow | Full Area | | | 25.00(17.25') | psf |
| Self-weight | Dead | Full UDL | | | 7.7 | plf |

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

6.23'

0'                                                                  6.115'
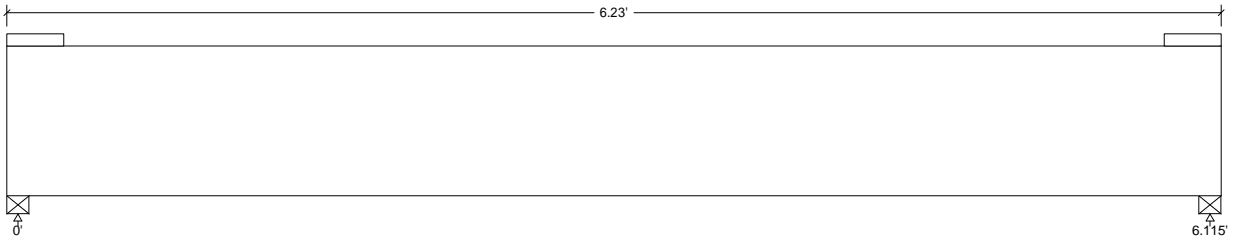
| Unfactored: | | | |
|---|---|---|---|
| Dead | 1343 | | 1343 |
| Live | 882 | | 882 |
| Snow | 1343 | | 1343 |
| **Factored:** | | | |
| Total | 3012 | | 3012 |
| **Bearing:** | | | |
| Capacity | | | |
| Beam | 3012 | | 3012 |
| Support | 3335 | | 3335 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.90 | | 0.90 |
| Load comb | #3 | | #3 |
| Length | 1.38 | | 1.38 |
| Min req'd | 1.38 | | 1.38 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

### SF4
**Lumber-soft, D.Fir-L, No.2, 4x10 (3-1/2"x9-1/4")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 6.25'; Clear span: 6.0'; Volume = 1.4 cu.ft.
Lateral support: top = at supports, bottom = at supports;
**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 = 100 | Fv' = 207 | psi | fv/Fv' = 0.48 |
| Bending(+) | fb = 1087 | Fb' = 1227 | psi | fb/Fb' = 0.89 |
| Live Defl'n | 0.05 = < L/999 | 0.20 = L/360 | in | 0.22 |
| Total Defl'n | 0.10 = L/728 | 0.31 = L/240 | in | 0.33 |

### Additional Data:
FACTORS:  F/E(psi)  CD    CM    Ct    CL    CF    Cfu   Cr    Cfrt  Ci    LC#

| | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 180 | 1.15 | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 3 |
| Fb'+ | 900 | 1.15 | 1.00 | 1.00 | 0.988 | 1.200 | – | 1.00 | 1.00 | 1.00 | 3 |
| Fcp' | 625 | – | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | – |
| E' | 1.6 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 3 |
| Emin' | 0.58 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 3 |

CRITICAL LOAD COMBINATIONS:
Shear      : LC #3  = D + 0.75(L + S)
Bending(+): LC #3  = D + 0.75(L + S)
Deflection: LC #3  = D + 0.75(L + S)  (live)
            LC #3  = D + 0.75(L + S)  (total)
Bearing   : Support 1 – LC #3 = D + 0.75(L + S)
            Support 2 – LC #3 = D + 0.75(L + S)
D=dead L=live S=snow
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 2957, V design = 2156 (NDS 3.4.3.1(a)) lbs; M(+) = 4521 lbs-ft
EI = 369.34e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+): Lu = 6.13'  Le = 12.25'  RB = 10.5

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

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SF5
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## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pattern | Location [ft] Start End | Magnitude Start End | Unit |
|---|---|---|---|---|---|---|
| Load1 | Dead | Full UDL | | | 80.0 | plf |
| Load2 | Dead | Full Area | | | 12.00(1.00') | psf |
| Load3 | Live | Full Area | | | 40.00(1.00') | psf |
| Load4 | Dead | Full Area | | | 15.00(2.00') | psf |
| Load5 | Snow | Full Area | | | 25.00(2.00') | psf |
| Load6 | Earthquake | Point | | 1.35 | 4123 | lbs |
| Self-weight | Dead | Full UDL | | | 9.4 | plf |

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

6.143'

0'          6.072'
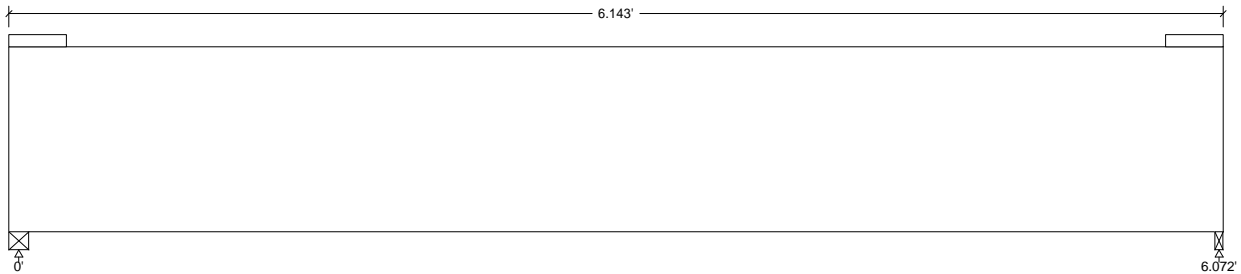
| Unfactored: | | | |
|---|---|---|---|
| Dead | 405 | | 401 |
| Live | 123 | | 122 |
| Snow | 154 | | 153 |
| Earthquake | 3240 | | 883 |
| **Factored:** | | | |
| Total | 2673 | | 1071 |
| **Bearing:** | | | |
| Capacity | | | |
| Beam | 2673 | | 1094 |
| Support | 2959 | | 1211 |
| Des ratio | | | |
| Beam | 1.00 | | 0.98 |
| Support | 0.90 | | 0.88 |
| Load comb | #8 | | #5 |
| Length | 1.22 | | 0.50* |
| Min req'd | 1.22 | | 0.50* |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

*Minimum bearing length setting used: 1/2" for end supports

### SF5
**Lumber-soft, D.Fir-L, No.2, 4x12 (3-1/2"x11-1/4")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 6.13'; Clear span: 6.0'; Volume = 1.7 cu.ft.
Lateral support: top = at supports, bottom = at supports;
**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 = 97 | Fv' = 288 | psi | fv/Fv' = 0.34 |
| Bending(+) | fb = 546 | Fb' = 1550 | psi | fb/Fb' = 0.35 |
| Live Defl'n | 0.02 = < L/999 | 0.20 = L/360 | in | 0.11 |
| Total Defl'n | 0.03 = < L/999 | 0.30 = L/240 | in | 0.10 |

### Additional Data:
FACTORS:  F/E(psi)  CD    CM    Ct    CL     CF     Cfu   Cr    Cfrt   Ci    LC#
Fv'        180      1.60  1.00  1.00   -      -      -     -     1.00   1.00   8
Fb'+       900      1.60  1.00  1.00  0.978  1.100   -    1.00   1.00   1.00   8
Fcp'       625       -    1.00  1.00   -      -      -     -     1.00   1.00   -
E'       1.6 million 1.00 1.00   -      -      -      -     -     1.00   1.00   8
Emin'   0.58 million 1.00 1.00   -      -      -      -     -     1.00   1.00   8

CRITICAL LOAD COMBINATIONS:
Shear     : LC #8  = D + 0.7E
Bending(+): LC #8  = D + 0.7E
Deflection: LC #8  = D + 0.7E  (live)
            LC #8  = D + 0.7E  (total)
Bearing   : Support 1 - LC #8 = D + 0.7E
            Support 2 - LC #5 = D + 0.75(L + S + 0.7E)
D=dead L=live S=snow E=earthquake
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 2667, V design = 2537 (NDS 3.4.3.1(a)) lbs; M(+) = 3358 lbs-ft
EI = 664.44e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 6.06'  Le = 12.50'  RB = 11.7

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

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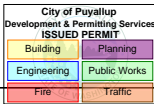
SF6
Apr. 4, 2023  16:48

## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start  End | Magnitude Start  End | Unit |
|------|------|-------------|----------|------|-----------|------|
| Load1 | Dead | Full Area | | | 12.00(11.75') | psf |
| Load2 | Live | Full Area | | | 40.00(11.75') | psf |
| Self-weight | Dead | Full UDL | | | 15.0 | plf |

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

9.139'

0'                                                                           9.069'
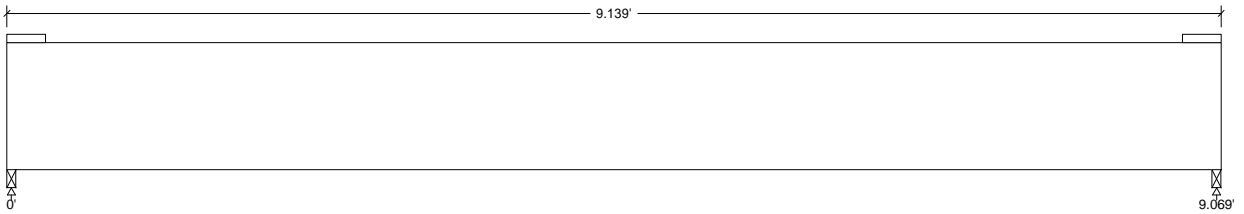
| | | |
|---|---|---|
| **Unfactored:** | | |
| Dead | 712 | 712 |
| Live | 2148 | 2148 |
| **Factored:** | | |
| Total | 2860 | 2860 |
| **Bearing:** | | |
| Capacity | | |
| Beam | 2860 | 2860 |
| Support | 3055 | 3055 |
| Des ratio | | |
| Beam | 1.00 | 1.00 |
| Support | 0.94 | 0.94 |
| Load comb | #2 | #2 |
| Length | 0.83 | 0.83 |
| Min req'd | 0.83 | 0.83 |
| Cb | 1.00 | 1.00 |
| Cb min | 1.00 | 1.00 |
| Cb support | 1.07 | 1.07 |
| Fcp sup | 625 | 625 |

### SF6
**Timber-soft, D.Fir-L, No.2, 6x12 (5-1/2"x11-1/2")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 9.13'; Clear span: 9.0'; Volume = 4.0 cu.ft.; Beam or stringer
Lateral support: top = at supports, bottom = at supports;
**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 = 53 | Fv' = 170 | psi | fv/Fv' = 0.31 |
| Bending(+) | fb = 637 | Fb' = 869 | psi | fb/Fb' = 0.73 |
| Live Defl'n | 0.08 = < L/999 | 0.30 = L/360 | in | 0.26 |
| Total Defl'n | 0.12 = L/920 | 0.45 = L/240 | in | 0.26 |

### Additional Data:

FACTORS:
| | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | LC# |
|---|---------|-----|-----|-----|------|------|-----|------|------|-----|-----|
| Fv' | 170 | 1.00 | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 2 |
| Fb'+ | 875 | 1.00 | 1.00 | 1.00 | 0.993 | 1.000 | – | 1.00 | 1.00 | 1.00 | 2 |
| Fcp' | 625 | – | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | – |
| E' | 1.3 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 2 |
| Emin' | 0.47 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 2 |

CRITICAL LOAD COMBINATIONS:
Shear       : LC #2 = D + L
Bending(+): LC #2 = D + L
Deflection: LC #2 = D + L  (live)
            LC #2 = D + L  (total)
Bearing   : Support 1 – LC #2 = D + L
            Support 2 – LC #2 = D + L
D=dead L=live
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 2839, V design = 2217 (NDS 3.4.3.1(a)) lbs; M(+) = 6437 lbs-ft
EI = 906.17e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+): Lu = 9.06'  Le = 17.69'  RB = 9.0

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

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SF7
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## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start End | Magnitude Start End | Unit |
|---|---|---|---|---|---|---|
| Load1 | Dead | Partial Area | | 0.00  4.67 | 12.00(4.25') | psf |
| Load2 | Live | Partial Area | | 0.00  4.67 | 40.00(4.25') | psf |
| Load3 | Dead | Partial Area | | 4.67  11.25 | 12.00(8.25') | psf |
| Load4 | Live | Partial Area | | 4.67  11.25 | 40.00(8.25') | psf |
| Load5 | Dead | Point | | 4.67 | 113 | lbs |
| Load6 | Live | Point | | 4.67 | 264 | lbs |
| Self-weight | Dead | Full UDL | | | 18.2 | plf |

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

— 11.319' —

0'                                                                          11.243'
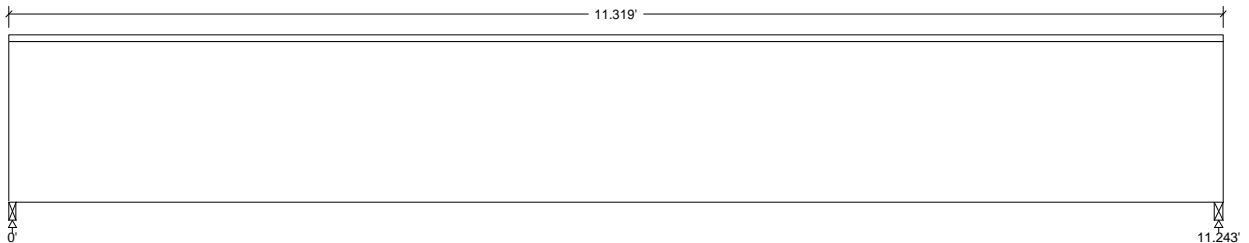
| Unfactored: | | | |
|---|---|---|---|
| Dead | 550 | | 656 |
| Live | 1428 | | 1801 |
| Factored: | | | |
| Total | 1978 | | 2458 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 2144 | | 2664 |
| Support | 1978 | | 2458 |
| Des ratio | | | |
| Beam | 0.92 | | 0.92 |
| Support | 1.00 | | 1.00 |
| Load comb | #2 | | #2 |
| Length | 0.82 | | 1.01 |
| Min req'd | 0.82** | | 1.01** |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

**Minimum bearing length governed by the required width of the supporting member.

### SF7
**LVL n-ply, 1.8E, 2600Fb, 1-3/4"x18", 2-ply (3-1/2"x18")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 11.31'; Clear span: 11.188'; Volume = 5.0 cu.ft.
Lateral support: top = continuous, bottom = at supports;
**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 =   43 | Fv' =  285 | psi | fv/Fv' =  0.15 |
| Bending(+) | fb =  433 | Fb' = 2460 | psi | fb/Fb' =  0.18 |
| Live Defl'n | 0.04 = < L/999 | 0.37 = L/360 | in | 0.12 |
| Total Defl'n | 0.07 = < L/999 | 0.56 = L/240 | in | 0.12 |

### Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Ci | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 285 | 1.00 | - | 1.00 | - | - | - | - | 1.00 | - | 2 |
| Fb'+ | 2600 | 1.00 | - | 1.00 | 1.000 | 0.946 | - | 1.00 | 1.00 | - | 2 |
| Fcp' | 750 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| E' | 1.9 million | - | 1.00 | - | - | - | - | - | 1.00 | - | 2 |
| Eminy' | 0.95 million | - | 1.00 | - | - | - | - | - | 1.00 | - | 2 |

CRITICAL LOAD COMBINATIONS:
Shear      : LC #2  = D + L
Bending(+): LC #2  = D + L
Deflection: LC #2  = D + L  (live)
            LC #2  = D + L  (total)
Bearing   : Support 1 - LC #2 = D + L
            Support 2 - LC #2 = D + L
D=dead L=live
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 2458, V design = 1803 (NDS 3.4.3.1(a)) lbs; M(+) = 6824 lbs-ft
EI = 1607.44e06 lb-in^2/ply   GA = 7.44e06 lb
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.
4. SCL: Structural composite lumber design has assumed: - dry service conditions - no preservative or fire-retardant treatment - no notches
5. BUILT-UP SCL: Contact manufacturer for connection details when side-loaded or when loads are not applied equally to all plies.
6. SCL: Shear deflection is calculated using true modulus of elasticity E and shear modulus G = E/16.

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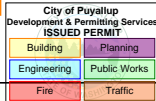
SF8
Apr. 4, 2023  16:49

## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start End | Magnitude Start End | Unit |
|------|------|--------------|----------|--------------------------|----------------------|------|
| Load1 | Dead | Full Area | | | 15.00(4.25') | psf |
| Load2 | Snow | Full Area | | | 25.00(4.25') | psf |
| Self-weight | Dead | Full UDL | | | 15.0 | plf |

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

17.25'

0'                                                                  17.208'
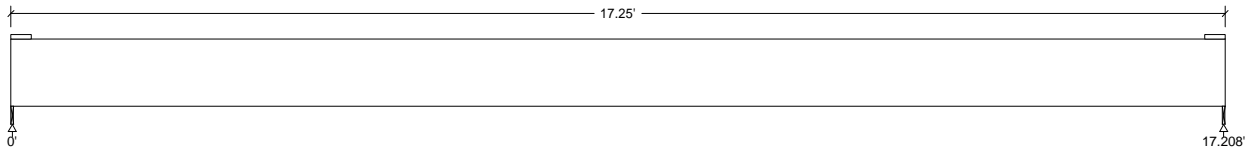
| | | | | |
|---|---|---|---|---|
| Unfactored: | | | | |
| Dead | 679 | | | 679 |
| Snow | 916 | | | 916 |
| Factored: | | | | |
| Total | 1596 | | | 1596 |
| Bearing: | | | | |
| Capacity | | | | |
| Beam | 1719 | | | 1719 |
| Support | 1836 | | | 1836 |
| Des ratio | | | | |
| Beam | 0.93 | | | 0.93 |
| Support | 0.87 | | | 0.87 |
| Load comb | #2 | | | #2 |
| Length | 0.50* | | | 0.50* |
| Min req'd | 0.50* | | | 0.50* |
| Cb | 1.00 | | | 1.00 |
| Cb min | 1.00 | | | 1.00 |
| Cb support | 1.07 | | | 1.07 |
| Fcp sup | 625 | | | 625 |

*Minimum bearing length setting used: 1/2" for end supports

### SF8
**Timber-soft, D.Fir-L, No.2, 6x12 (5-1/2"x11-1/2")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 17.25'; Clear span: 17.188'; Volume = 7.6 cu.ft.; Beam or stringer
Lateral support: top = at supports, bottom = at supports;
**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 = 33 | Fv' = 195 | psi | fv/Fv' = 0.17 |
| Bending(+) | fb = 678 | Fb' = 989 | psi | fb/Fb' = 0.69 |
| Live Defl'n | 0.23 = L/892 | 0.57 = L/360 | in | 0.40 |
| Total Defl'n | 0.49 = L/422 | 0.86 = L/240 | in | 0.57 |

### Additional Data:
FACTORS: F/E(psi) CD    CM    Ct    CL    CF    Cfu   Cr    Cfrt  Ci    LC#

| | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|
| Fv' | 170 | 1.15 | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 2 |
| Fb'+ | 875 | 1.15 | 1.00 | 1.00 | 0.983 | 1.000 | – | 1.00 | 1.00 | 1.00 | 2 |
| Fcp' | 625 | – | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | – |
| E' | 1.3 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 2 |
| Emin' | 0.47 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 2 |

CRITICAL LOAD COMBINATIONS:
Shear     : LC #2  = D + S
Bending(+): LC #2  = D + S
Deflection: LC #2  = D + S  (live)
            LC #2  = D + S  (total)
Bearing   : Support 1 – LC #2 = D + S
            Support 2 – LC #2 = D + S
D=dead S=snow
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 1592, V design = 1411 (NDS 3.4.3.1(a)) lbs; M(+) = 6849 lbs-ft
EI = 906.17e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+): Lu = 17.19'  Le = 31.69'  RB = 12.0

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

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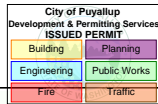
SF9
Apr. 5, 2023  09:25

## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start End | Magnitude Start End | Unit |
|---|---|---|---|---|---|---|
| Load1 | Dead | Full Area | | | 15.00(12.00') | psf |
| Load2 | Snow | Full Area | | | 25.00(12.00') | psf |
| Self-weight | Dead | Full UDL | | | 15.2 | plf |

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

16.187'

0'           16.093'
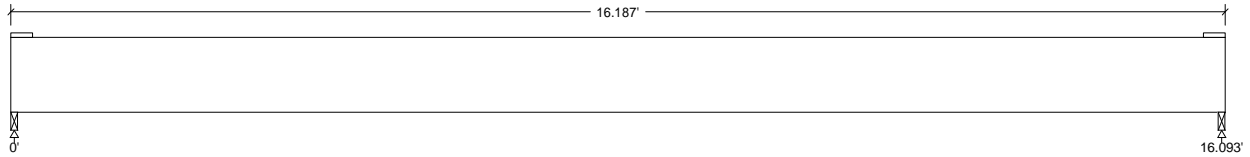
| Unfactored: | | | |
|---|---|---|---|
| Dead | 1579 | | 1579 |
| Snow | 2428 | | 2428 |
| **Factored:** | | | |
| Total | 4007 | | 4007 |
| **Bearing:** | | | |
| Capacity | | | |
| Beam | 4007 | | 4007 |
| Support | 4116 | | 4116 |
| Des ratio | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.97 | | 0.97 |
| Load comb | #2 | | #2 |
| Length | 1.12 | | 1.12 |
| Min req'd | 1.12 | | 1.12 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.07 | | 1.07 |
| Fcp sup | 625 | | 625 |

### SF9
**Glulam-Unbal., West Species, 24F-V4 DF, 5-1/2"x12"**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 16.19'; Clear span: 16'; Volume = 7.4 cu.ft.; 8 laminations, 5-1/2" maximum width,
Lateral support: top = at supports, bottom = at supports;
**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 = 79 | Fv' = 305 | psi | fv/Fv' = 0.26 |
| Bending(+) | fb = 1457 | Fb' = 2681 | psi | fb/Fb' = 0.54 |
| Live Defl'n | 0.32 = L/608 | 0.54 = L/360 | in | 0.59 |
| Total Defl'n | 0.63 = L/307 | 0.80 = L/240 | in | 0.78 |

### Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.15 | 1.00 | 1.00 | 0.971 | 1.000 | - | - | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:
Shear      : LC #2  = D + S
Bending(+): LC #2  = D + S
Deflection: LC #2  = D + S  (live)
           LC #2  = D + S  (total)
Bearing   : Support 1 – LC #2 = D + S
           Support 2 – LC #2 = D + S
D=dead S=snow
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 3985, V design = 3466 (NDS 3.4.3.1(a)) lbs; M(+) = 16032 lbs-ft
EI = 1425.58e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 16.06'  Le = 29.63'  RB = 11.9

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2015 and manufactured in accordance with ANSI A190.1-2012
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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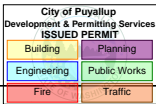
F1
Apr. 4, 2023  16:50

## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start End | Magnitude Start End | Unit |
|------|------|--------------|----------|-------------------------|---------------------|------|
| Load1 | Dead | Full Area | | | 12.00(24.0") | psf |
| Load2 | Live | Full Area | | | 40.00(24.0") | psf |
| Self-weight | Dead | Full UDL | | | 3.5 | plf |

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

9.473'

0'          9.403'
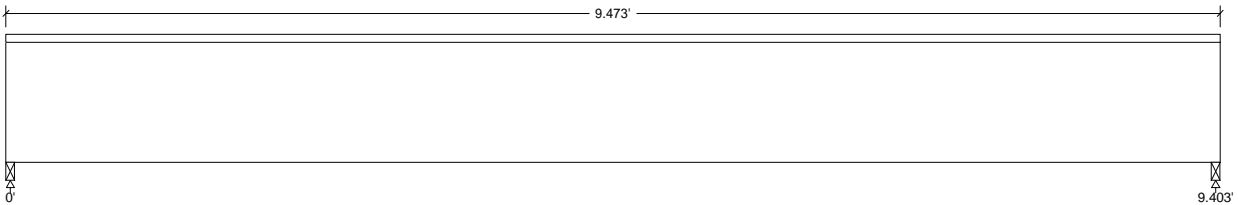
| Unfactored: | | | |
|-------------|-----|-----|-----|
| Dead | 130 | | 130 |
| Live | 379 | | 379 |
| Factored: | | | |
| Total | 509 | | 509 |
| Bearing: | | | |
| Capacity | | | |
| Joist | 509 | | 509 |
| Support | 982 | | 982 |
| Des ratio | | | |
| Joist | 1.00 | | 1.00 |
| Support | 0.52 | | 0.52 |
| Load comb | #2 | | #2 |
| Length | 0.84 | | 0.84 |
| Min req'd | 0.84 | | 0.84 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.25 | | 1.25 |
| Fcp sup | 625 | | 625 |

**F1**
**Lumber-soft, Hem-Fir, No.2, 2x12 (1-1/2"x11-1/4")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Floor joist spaced at 24.0" c/c; Total length: 9.5'; Clear span: 9.313'; Volume = 1.1 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 = 36 | Fv' = 150 | psi | fv/Fv' = 0.24 |
| Bending(+) | fb = 451 | Fb' = 977 | psi | fb/Fb' = 0.46 |
| Live Defl'n | 0.06 = < L/999 | 0.31 = L/360 | in | 0.19 |
| Total Defl'n | 0.09 = < L/999 | 0.47 = L/240 | in | 0.20 |

### Additional Data:
```
FACTORS:  F/E(psi) CD    CM    Ct    CL    CF    Cfu   Cr    Cfrt  Ci    LC#
Fv'       150     1.00  1.00  1.00  -     -     -     -     1.00  1.00  2
Fb'+      850     1.00  1.00  1.00  1.000 1.000 -     1.15  1.00  1.00  2
Fcp'      405      -    1.00  1.00  -     -     -     -     1.00  1.00  -
E'        1.3 million 1.00 1.00 -    -     -     -     -     1.00  1.00  2
Emin'     0.47 million 1.00 1.00 -   -     -     -     -     1.00  1.00  2
CRITICAL LOAD COMBINATIONS:
Shear     : LC #2  = D + L
Bending(+): LC #2  = D + L
Deflection: LC #2  = D + L  (live)
            LC #2  = D + L  (total)
Bearing   : Support 1 - LC #2 = D + L
            Support 2 - LC #2 = D + L
D=dead L=live
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 505, V design = 401 (NDS 3.4.3.1(a)) lbs; M(+) = 1188 lbs-ft
EI = 231.37e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
```

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

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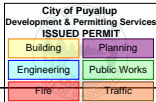
F2
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## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start  End | Magnitude Start  End | Unit |
|------|------|--------------|----------|--------------------------|----------------------|------|
| Load1 | Dead | Full Area | No | | 12.00(7.17') | psf |
| Load2 | Live | Full Area | Yes | | 40.00(7.17') | psf |
| Self-weight | Dead | Full UDL | No | | 6.0 | plf |

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

8.375'

0'                    4.167'                    8.333'
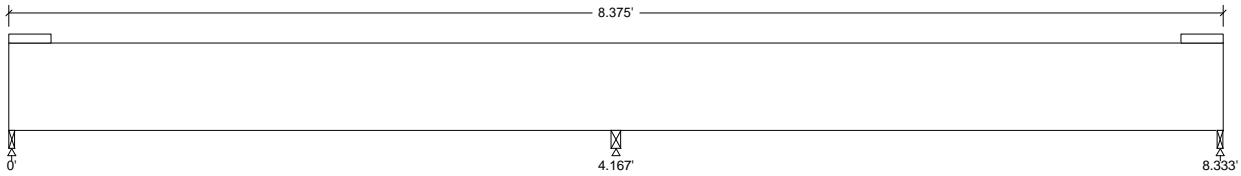
| Unfactored: | | | | |
|-------------|---|---|---|---|
| Dead | 146 | 479 | | 146 |
| Live | 529 | 1493 | | 529 |
| **Factored:** | | | | |
| Total | 674 | 1972 | | 674 |
| **Bearing:** | | | | |
| **Capacity** | | | | |
| Beam | 1094 | 2602 | | 1094 |
| Support | 1211 | 1972 | | 1211 |
| **Des ratio** | | | | |
| Beam | 0.62 | 0.76 | | 0.62 |
| Support | 0.56 | 1.00 | | 0.56 |
| Load comb | #3 | #2 | | #4 |
| Length | 0.50* | 0.81 | | 0.50* |
| Min req'd | 0.50* | 0.81** | | 0.50* |
| Cb | 1.00 | 1.46 | | 1.00 |
| Cb min | 1.00 | 1.46 | | 1.00 |
| Cb support | 1.11 | 1.11 | | 1.11 |
| Fcp sup | 625 | 625 | | 625 |

*Minimum bearing length setting used: 1/2" for end supports
**Minimum bearing length governed by the required width of the supporting member.

### F2
**Lumber-soft, D.Fir-L, No.2, 4x8 (3-1/2"x7-1/4")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 8.38'; Clear span: 4.125', 4.125'; Volume = 1.5 cu.ft.
Lateral support: top = at end supports, bottom = at end supports;
**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 =   44 | Fv' = 180 | psi | fv/Fv' =  0.24 |
| Bending(+) | fb =  229 | Fb' = 1157 | psi | fb/Fb' =  0.20 |
| Bending(-) | fb =  322 | Fb' = 1157 | psi | fb/Fb' =  0.28 |
| Live Defl'n | 0.01 = < L/999 | 0.14 = L/360 | in | 0.06 |
| Total Defl'n | 0.01 = < L/999 | 0.21 = L/240 | in | 0.05 |

### Additional Data:
| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | LC# |
|----------|----------|-----|-----|-----|-------|-------|-----|-----|------|-----|-----|
| Fv' | 180 | 1.00 | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 2 |
| Fb'+ | 900 | 1.00 | 1.00 | 1.00 | 0.989 | 1.300 | – | – | 1.00 | 1.00 | 3 |
| Fb'- | 900 | 1.00 | 1.00 | 1.00 | 0.989 | 1.300 | – | 1.00 | 1.00 | 1.00 | 2 |
| Fcp' | 625 | – | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | – |
| E' | 1.6 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 3 |
| Emin' | 0.58 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 3 |

CRITICAL LOAD COMBINATIONS:
Shear    : LC #2  = D + L
Bending(+): LC #3  = D + L (pattern: L_)
Bending(-): LC #2  = D + L
Deflection: LC #3  =  (live)
            LC #3  =  (total)
Bearing  : Support 1 - LC #3 = D + L (pattern: L_)
           Support 2 - LC #2 = D + L
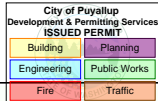           Support 3 - LC #4 = D + L (pattern: _L)
D=dead L=live
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 986, V design = 745 (NDS 3.4.3.1(a)) lbs; M(+) = 586 lbs-ft; M(-) = 822 lbs-ft
EI = 177.83e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 8.31'  Le = 15.38'  RB = 10.5; Lu based on full length
Lateral stability(-):  Lu = 8.31'  Le = 15.38'  RB = 10.5; Lu based on full length

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.
4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

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## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start End | Magnitude Start End | Unit |
|------|------|--------------|----------|------------------------|---------------------|------|
| Load1 | Dead | Full Area | No | | 12.00(8.08') | psf |
| Load2 | Live | Full Area | Yes | | 40.00(8.08') | psf |
| Load3 | Dead | Full Area | No | | 12.00(11.75') | psf |
| Load4 | Live | Full Area | Yes | | 40.00(11.75') | psf |
| Self-weight | Dead | Full UDL | No | | 6.0 | plf |

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

11.041'

0'      4.583'      9.167'      11'
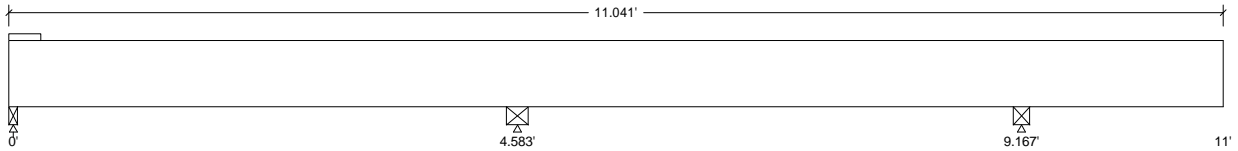
| | | | | |
|---|---|---|---|---|
| Unfactored: | | | | |
| Dead | 451 | 1264 | 978 | |
| Live | 1696 | 4544 | 3408 | |
| Factored: | | | | |
| Total | 2147 | 5808 | 4387 | |
| Bearing: | | | | |
| Capacity | | | | |
| Beam | 2147 | 6066 | 4783 | |
| Support | 2377 | 5808 | 4387 | |
| Des ratio | | | | |
| Beam | 1.00 | 0.96 | 0.92 | |
| Support | 0.90 | 1.00 | 1.00 | |
| Load comb | #7 | #5 | #8 | |
| Length | 0.98 | 2.40 | 1.81 | |
| Min req'd | 0.98 | 2.40** | 1.81** | |
| Cb | 1.00 | 1.16 | 1.21 | |
| Cb min | 1.00 | 1.16 | 1.21 | |
| Cb support | 1.11 | 1.16 | 1.11 | |
| Fcp sup | 625 | 625 | 625 | |

**Minimum bearing length governed by the required width of the supporting member.

### F3
**Lumber-soft, D.Fir-L, No.2, 4x8 (3-1/2"x7-1/4")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 11.06'; Clear span: 4.438', 4.438', 1.75'; Volume = 1.9 cu.ft.
Lateral support: top = at end supports, bottom = at end supports;
**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 = 132 | Fv' = 180 | psi | fv/Fv' = 0.73 |
| Bending(+) | fb = 836 | Fb' = 1155 | psi | fb/Fb' = 0.72 |
| Bending(-) | fb = 1026 | Fb' = 1155 | psi | fb/Fb' = 0.89 |
| Deflection: | | | | |
| Interior Live | 0.04 = < L/999 | 0.15 = L/360 | in | 0.23 |
| Total | 0.05 = < L/999 | 0.23 = L/240 | in | 0.20 |
| Cantil. Live | 0.06 = L/387 | 0.12 = L/180 | in | 0.46 |
| Total | 0.06 = L/347 | 0.18 = L/120 | in | 0.35 |

### Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | LC# |
|----------|----------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|
| Fv' | 180 | 1.00 | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 5 |
| Fb'+ | 900 | 1.00 | 1.00 | 1.00 | 0.987 | 1.300 | – | 1.00 | 1.00 | 1.00 | 7 |
| Fb'- | 900 | 1.00 | 1.00 | 1.00 | 0.987 | 1.300 | – | 1.00 | 1.00 | 1.00 | 5 |
| Fcp' | 625 | – | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | – |
| E' | 1.6 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 7 |
| Emin' | 0.58 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 7 |

CRITICAL LOAD COMBINATIONS:
Shear    : LC #5  = D + L (pattern: LL_)
Bending(+): LC #7  = D + L (pattern: L_L)
Bending(-): LC #5  = D + L (pattern: LL_)
Deflection: LC #7  =    (live)
           LC #7  =    (total)
Bearing  : Support 1 - LC #7 = D + L (pattern: L_L)
           Support 2 - LC #5 = D + L (pattern: LL_)
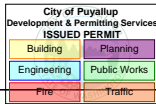           Support 3 - LC #8 = D + L (pattern: _LL)
D=dead L=live
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 2949, V design = 2227 (NDS 3.4.3.1(a)) lbs; M(+) = 2136 lbs-ft; M(-) = 2621 lbs-ft
EI = 177.83e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 11.00'  Le = 17.63'  RB = 11.2; Lu based on full length
Lateral stability(-):  Lu = 11.00'  Le = 17.63'  RB = 11.2; Lu based on full length

### Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.
4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
5. The critical deflection value has been determined using maximum back-span deflection. Cantilever deflections do not govern design.

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## Design Check Calculation Sheet
WoodWorks Sizer 2023

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start End | Magnitude Start End | Unit |
|------|------|--------------|----------|---------|-----------|------|
| Load1 | Dead | Full Area | No | | 12.00(9.17') | psf |
| Load2 | Live | Full Area | Yes | | 40.00(9.17') | psf |
| Load3 | Dead | Full Area | No | | 12.00(9.17') | psf |
| Load4 | Live | Full Area | Yes | | 40.00(9.17') | psf |
| Self-weight | Dead | Full UDL | No | | 6.0 | plf |

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

11.038'

0'      4.583'      9.167'      11'
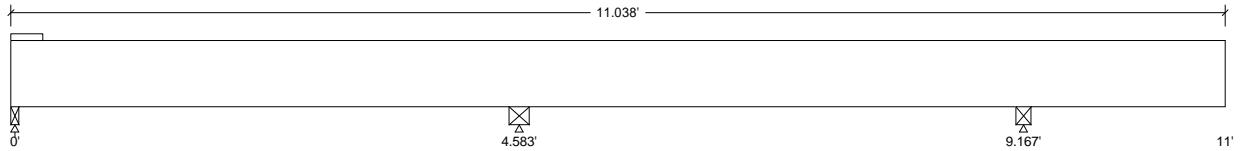
| | | | | |
|------|------|------|------|------|
| Unfactored: | | | | |
| Dead | 418 | 1171 | 907 | |
| Live | 1566 | 4202 | 3152 | |
| Factored: | | | | |
| Total | 1983 | 5373 | 4058 | |
| Bearing: | | | | |
| Capacity | | | | |
| Beam | 1983 | 5673 | 4486 | |
| Support | 2196 | 5373 | 4058 | |
| Des ratio | | | | |
| Beam | 1.00 | 0.95 | 0.90 | |
| Support | 0.90 | 1.00 | 1.00 | |
| Load comb | #7 | #5 | #8 | |
| Length | 0.91 | 2.22 | 1.68 | |
| Min req'd | 0.91 | 2.22** | 1.68** | |
| Cb | 1.00 | 1.17 | 1.22 | |
| Cb min | 1.00 | 1.17 | 1.22 | |
| Cb support | 1.11 | 1.11 | 1.11 | |
| Fcp sup | 625 | 625 | 625 | |

**Minimum bearing length governed by the required width of the supporting member.

**Lumber-soft, D.Fir-L, No.2, 4x8 (3-1/2"x7-1/4")**
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 11.06'; Clear span: 4.438', 4.438', 1.75'; Volume = 1.9 cu.ft.
Lateral support: top = at end supports, bottom = at end supports;
**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 = 122 | Fv' = 180 | psi | fv/Fv' = 0.68 |
| Bending(+) | fb = 773 | Fb' = 1155 | psi | fb/Fb' = 0.67 |
| Bending(-) | fb = 949 | Fb' = 1155 | psi | fb/Fb' = 0.82 |
| Deflection: | | | | |
| Interior Live | 0.03 = < L/999 | 0.15 = L/360 | in | 0.21 |
| Total | 0.04 = < L/999 | 0.23 = L/240 | in | 0.18 |
| Cantil. Live | 0.05 = L/418 | 0.12 = L/180 | in | 0.43 |
| Total | 0.06 = L/375 | 0.18 = L/120 | in | 0.32 |

### Additional Data:
FACTORS:

| | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | LC# |
|--|----------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|
| Fv' | 180 | 1.00 | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | 5 |
| Fb'+ | 900 | 1.00 | 1.00 | 1.00 | 0.987 | 1.300 | – | 1.00 | 1.00 | 1.00 | 7 |
| Fb'- | 900 | 1.00 | 1.00 | 1.00 | 0.987 | 1.300 | – | 1.00 | 1.00 | 1.00 | 5 |
| Fcp' | 625 | – | 1.00 | 1.00 | – | – | – | – | 1.00 | 1.00 | – |
| E' | 1.6 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 7 |
| Emin' | 0.58 million | 1.00 | 1.00 | – | – | – | – | – | 1.00 | 1.00 | 7 |

CRITICAL LOAD COMBINATIONS:
Shear     : LC #5  = D + L (pattern: LL_)
Bending(+): LC #7  = D + L (pattern: L_L)
Bending(-): LC #5  = D + L (pattern: LL_)
Deflection: LC #7  =   (live)
           LC #7  =   (total)
Bearing   : Support 1 - LC #7 = D + L (pattern: L_L)
            Support 2 - LC #5 = D + L (pattern: LL_)
            Support 3 - LC #8 = D + L (pattern: _LL)
D=dead L=live
All LC's are listed in the Analysis output
Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
Load combinations: ASD Basic from ASCE 7-16 2.4
CALCULATIONS:
V max = 2728, V design = 2067 (NDS 3.4.3.1(a)) lbs; M(+) = 1976 lbs-ft; M(-) = 2425 lbs-ft
EI = 177.83e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 11.00'  Le = 17.63'  RB = 11.2; Lu based on full length
Lateral stability(-):  Lu = 11.00'  Le = 17.63'  RB = 11.2; Lu based on full length

### Design Notes:
1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.
4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
5. The critical deflection value has been determined using maximum back-span deflection. Cantilever deflections do not govern design.