

| | | | | | | |
|---|--------------------------|--------------|-------------|--|---------------|-------------------------|
| → | Length of nail | 3.25 inches | | Load Duration Factor | 1.6 | |
| | Nail diameter | 0.135 inches | 12d sinker | | | |
| | Top of nail height | 1.50 inches | See diagram | Wood species | Southern Pine | |
| | Thickness valley truss | 1.50 inches | | Reference withdrawal unit strength | 42 lbs/inch | |
| | Main truss slope | | | Penetration for Lateral Strength | | |
| | Vertical component | 5.50 | | Minimum penetration (6D) | 0.81 inches | |
| | Horizontal component | 12 | | | | |
| | Slope angle, main truss | 24.6 degrees | | <u>Combined Withdrawal and Lateral Load (per NDS-2005)</u> | | |
| | Tan slope angle | 0.458 | | | | |
| → | Nail installation angle | 40 degrees | | Alpha | 50 degrees | |
| | Tangent | 0.839 | | Sine | 0.766 | |
| | Cosine | 0.766 | | Cosine | 0.643 | |
| | Sine | 0.643 | | | | |
| | Gap vertical | 0.69 inches | | Adjusted withdrawal capacity, W'p | 76 lbs | |
| | Nail in upper truss, A | 1.96 inches | Ts | | | |
| | Wedge horizontal, B | 1.26 inches | | Reference lateral capacity | 89 lbs | per Technical Report 12 |
| | C | 1.70 inches | | | | |
| | G2 | 0.57 inches | | | | |
| | Nail in gap, X | 0.16 inches | X | Adjusted lateral capacity, Z' | 143 lbs | |
| | Nail penetration | 1.14 inches | Tm | | | |
| | | | | Allowable inclined force, Z' alpha | 69 lbs | |
| | Angle; nail & main truss | 15.4 degrees | | | | |

Uplift Capacity As Toenail (Without Gap)

Nail penetration (without gap) 1.29 inches

Toenail withdrawal capacity 58 lbs

Toenail Factor 0.67

Calculation as toenail intended only as indirect "check" for upper part of nail in valley truss, assuming main truss in level position. However, there is no code basis for such "check".

Shaded cells are required inputs

| | | | | |
|--|---------------------------------------|-------------------------|---|--------------------------------|
| Nail Size: 12d | Nail Diameter, D | 0.135 inches | Load is considered applied by side member to nail | |
| Nail Type: Sinker | Bending yield strength of nail | 100,000 psi | Kd | 2.2 |
| Top of nail height | Nail Length | 3.25 inches | Re | 1.0000 |
| Nail installation angle | | | Rt | 0.58 |
| Gap | Thickness (inches) | 1.96 3.50 | Thetamax | 0 |
| | Dowel Bearing Length | 1.96 1.14 | Ktheta | 1.00 |
| | Theta (degrees) | 0 0 | Theta = Angle between direction of load and direction of grain (long axis), for any member of connection | |
| Input thickness (side) & nail in gap into Nail Shear Strength program | Theta (radians) | 0.000 0.000 | | |
| | Sine Theta | 0.00 0.00 | | |
| | Cosine Theta | 1.00 1.00 | | |
| | Species | SP SP | | |
| | Specific Gravity | 0.55 0.55 | Total available length | 5.61 inches |
| | Dowel Bearing Strength, parallel | 5,526 5,526 | Penetration, p | 1.14 inches OK |
| | Dowel Bearing Strength, perpendicular | 5,526 5,526 | Minimum penetration | 0.81 inches |
| | Dowel Bearing Strength | 5,526 5,526 | Based on nominal diameter, D | |
| | | | k1 | 0.347 |
| | | | k2 | 1.124 |
| | | | k3 | 1.043 |
| | | | Penetration factor | 1.00 Either 1 or 0 |
| | | | Load Duration Factor | 1.00 |
| | | | Wet Service Factor | 1.00 |
| | | | Temperature Factor | 1.00 |
| | | | Group Action Factor | 1.00 |
| | | | Geometry Factor | 1.00 |
| | | | End Grain Factor | 1.00 |
| | | | Diaphragm Factor | 1.00 |
| | | | Toenail Factor | 1.00 |
| | | | Unit withdrawal value | 42 lbs per inch of penetration |
| | | | Net Factor, Withdrawal | 1.00 |

Tech Report 12

Bending yield strength of nail; Fb,5% **100,000** psi

NDS-2005

| A | B | C | Technical Report 12 Z (lbs) | Least Z Value |
|----------|-------|------|-----------------------------|---------------|
| | | | 385 | |
| | | | 664 | 385 |
| 0.000670 | 1.703 | -956 | 215 | 215 |
| 0.001005 | 0.724 | -282 | 127 | 127 |
| 0.001005 | 1.135 | -756 | 214 | 127 |
| 0.001341 | 0.156 | -82 | 89 | 89 |

| Yield Mode | Rd | Z (lbs) | Least Z Value | Ratio of Z Values |
|------------|------|---------|---------------|-------------------|
| 1m | 2.20 | 385 | | 1.00 |
| 1s | 2.20 | 664 | 385 | 1.00 |
| 2 | 2.20 | 230 | 230 | 0.93 |
| 3m | 2.20 | 144 | 144 | 0.88 |
| 3s | 2.20 | 231 | 144 | 0.93 |
| 4 | 2.20 | 112 | 112 | 0.79 |

Adjusted Lateral Design Value **89** lbs
With gap

Reference Lateral Design Value 112 lbs
Net Factor, Lateral 1.00

Adjusted Lateral Design Value **112** lbs
For zero gap only

Adjusted Withdrawal Design Value **47** lbs

F2

Wind Uplift Forces

Exposure Category **B**

Adjustment Factor **1.00**

Tributary Area **8.00 sf**

Dead Load **3.00 psf**

Main truss slope
Vertical component **6**
Horizontal component **12**

Slope angle, main truss 26.57 degrees
Tan slope angle 0.500
Cosine 0.894

| Zone | 1 | 2 |
|----------------------|-------------|-------------|
| Wind uplift pressure | 27.8 | 48.4 |

| | | |
|-------------------------------|------|------|
| Vertical wind uplift pressure | 24.9 | 43.3 |
| Net wind uplift pressure | 21.9 | 40.3 |
| Net wind uplift force | 175 | 322 |

Adjustment Factor **1.00**

Tributary Area **8.00 sf**

Dead Load **3.00 psf**

Main truss slope
Vertical component **7**
Horizontal component **12**

Slope angle, main truss 30.26 degrees
Tan slope angle 0.583
Cosine 0.864

| Zone | 1 | 2 |
|----------------------|-------------|-------------|
| Wind uplift pressure | 30.4 | 35.6 |

| | | |
|-------------------------------|------|------|
| Vertical wind uplift pressure | 26.3 | 30.8 |
| Net wind uplift pressure | 23.3 | 27.8 |
| Net wind uplift force | 186 | 222 |

Wind uplift pressures per ASCE 7-05, components & cladding (Figure 6-3)
Wind uplift pressure is applied perpendicular ("normal") to roof surface