



COMPANY

PROJECT

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Column\_Stability\_Assignment1.wvcc

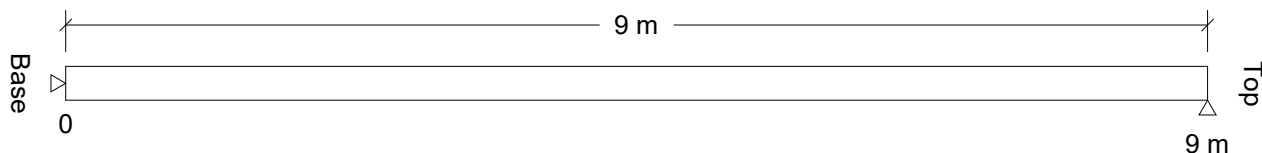
## Design Check Calculation Sheet

WoodWorks Sizer 11.5

### Loads:

| Load  | Type | Distribution | Location [m ]<br>Start End | Magnitude<br>Start End | Unit |
|-------|------|--------------|----------------------------|------------------------|------|
| Load1 | Dead | Axial        | (Ecc. = 44 mm)             | 50.00                  | kN   |
| Load2 | Live | Axial        | (Ecc. = 44 mm)             | 75.00                  | kN   |

### Reactions (kN):



|             |       |  |       |
|-------------|-------|--|-------|
| Unfactored: |       |  |       |
| Lateral:    |       |  |       |
| Dead        | 0.25  |  | -0.25 |
| Live        | 0.37  |  | -0.37 |
| Axial:      |       |  |       |
| Dead        | 50.00 |  | 50.00 |
| Live        | 75.00 |  | 75.00 |
| Factored:   |       |  |       |
| R->L        |       |  | 0.86  |
| Load comb   |       |  | #2    |
| L->R        | 0.86  |  |       |
| Load comb   | #2    |  | #1    |

### Glulam-c, Spruce-Pine, 12c-E, 175x266 mm

Support: Non-wood

Total length: 9.0 m; Volume = 0.419 m<sup>3</sup>; 175 mm max lam width

Pinned base; Load face = width(b); Ke x Lb: 1.0 x 3.0 = 3.0 m ; Ke x Ld: 1.0 x 4.5 = 4.5 m ;

**This section PASSES the design code check.**

### Force vs. Resistance and Deflection using CSA O86-14:

| Criterion      | Analysis Value | Design Value                          | Unit | Analysis/Design |
|----------------|----------------|---------------------------------------|------|-----------------|
| Shear 7.5.7.2b | Vf = 0.86      | Vr = 31.77                            | kN   | Vf/Vr = 0.03    |
| Moment (+)     | Mf = 7.77      | Mr = 18.20                            | kN-m | Mf/Mr = 0.43    |
| Axial b        | Pf = 175.00    | Pr = 538.36                           | kN   | Pf/Pr = 0.33    |
| Axial d        | Pf = 175.00    | Pr = 543.59                           | kN   |                 |
| Combined       |                | (Pf/Pr) ^2 + (Mf/Mr) *1 / (1-Pf/Pe) = |      | 0.61            |
| Perm. Defl'n   | 4.3 = < L/999  | 25.0 = L/360                          | mm   | 0.17            |
| Live Defl'n    | 6.5 = < L/999  | 50.0 = L/180                          | mm   | 0.13            |
| Total Defl'n   | 10.8 = L/830   | 50.0 = L/180                          | mm   | 0.22            |

### Additional Data:

| FACTORS:  | f/E (MPa) | KD   | KH   | KZ    | Kc    | KL    | KT   | KS   | Cv | LC# |
|-----------|-----------|------|------|-------|-------|-------|------|------|----|-----|
| Fb+       | 9.8       | 1.00 | 1.00 | 1.056 | -     | 1.000 | 1.00 | 1.00 | -  | #2  |
| Es        | 9700      | -    | -    | -     | -     | -     | 1.00 | 1.00 | -  | #2  |
| E05       | 8439      | -    | -    | -     | -     | -     | 1.00 | 1.00 | -  | #2  |
| Fcb       | 25.2      | 1.00 | 1.00 | 0.761 | 0.753 | -     | 1.00 | 1.00 | -  | #2  |
| Fcd       | 25.2      | 1.00 | 1.00 | 0.761 | 0.761 | -     | 1.00 | 1.00 | -  | #2  |
| Comb'd Fc | 25.2      | 1.00 | 1.00 | 0.761 | 0.753 | -     | 1.00 | 1.00 | -  | #2  |
| Comb'd Fb | 9.8       | 1.00 | 1.00 | 1.056 | -     | 1.000 | 1.00 | 1.00 | -  | #2  |

### CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = 1.25D + 1.5L  
 Moment (+) : LC #2 = 1.25D + 1.5L  
 Deflection: LC #1 = 1.0D (permanent)  
               LC #2 = 1.0D + 1.0L (live)  
               LC #2 = 1.0D + 1.0L (total)  
 Axial : LC #2 = 1.25D + 1.5L  
 Combined : LC #2 = 1.25D + 1.5L  
 Load Types: D=dead L=live(use,occupancy)  
 Load combinations from NBC 2015; code references and LC's listed in the Analysis report

### CALCULATIONS:

Shear Vr: 086 7.5.7.2(b) used  
 $EI = 2662e06 \text{ kN-mm}^2$   
 "Live" deflection is due to all non-dead loads (live, wind, snow...)  
 Axial b used; CCB = 17.1; CCd = 16.9  
 $1/(1-Pf/Pe) = 1.18$

### Design Notes:

1. WoodWorks analysis and design are in accordance with the 2015 National Building Code of Canada (NBC), Division B, Part 4, and the CSA O86-14 Engineering Design in Wood standard, Update No. 2 (June 2017).
2. Please verify that the default deflection limits are appropriate for your application.
3. Axial load eccentricity applied in direction of load face only. It is the designers responsibility to check for effect of eccentricity in the other direction.