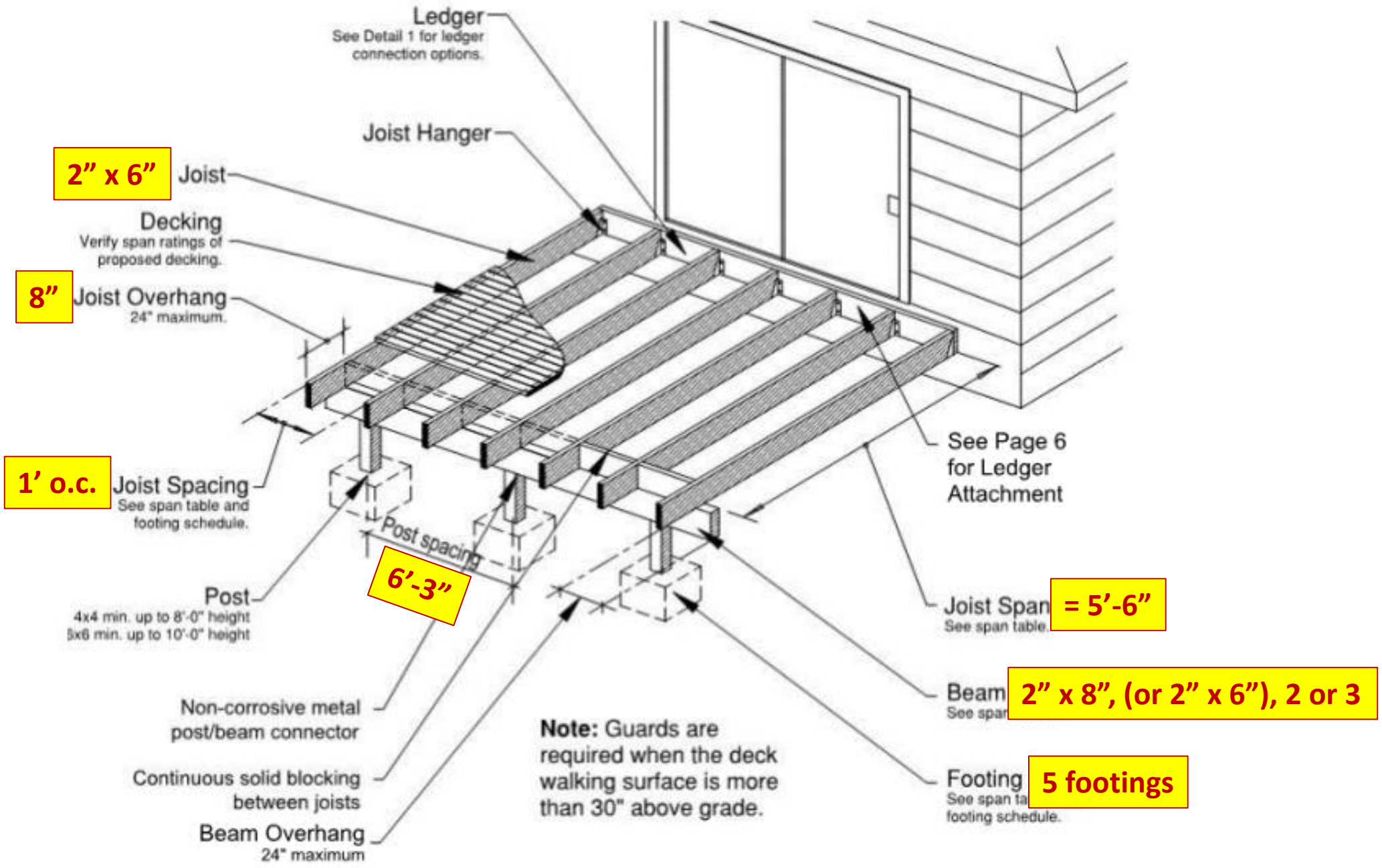
GIVEN: Typical Deck



PROPERTIES OF STRUCTURAL LUMBER- Sectional

Properties of Standard Dressed (S4S) Lumber Sizes

Nominal Size (b x d), inches	Standard Dressed Size (b x d), inches	Area of Section, A (sq. inches)	Moment of Inertia, I (inch^4)	Section Modulus, S (inch^3)
2x4	1.5x3.5	5.25	5.359	3.063
2x6	1.5x5.5	8.25	20.797	7.563
2x8	1.5x7.25	10.875	47.635	13.141
2x10	1.5x9.25	13.875	98.932	21.391
2x12	1.5x11.25	16.875	177.979	31.641
2x14	1.5x13.25	19.875	290.775	43.891

SOUTHERN FOREST PRODUCTS ASSOCIATION

6660 Riverside Drive, Suite 212 Metairie, LA 70003 mail@sfpa.org SouthernPine.com SouthernPineDecks.com

NEW DESIGN VALUES

Treated Southern Pine Span Tables

Tables 1 through 3 are abbreviated span tables for pressure-treated Southern Pine visual grades No.1 and No.2, intended for use under wet-service conditions (floor/deck joists) where moisture content (MC) exceeds 19%. For other grades, loading conditions and on-center spacings, refer to *Maximum Spans for Southern Pine Joists & Rafters* published by the Southern Forest Products Association. Spans are given in feet and inches and are the maximum allowable horizontal span of the member from inside to inside of bearings.

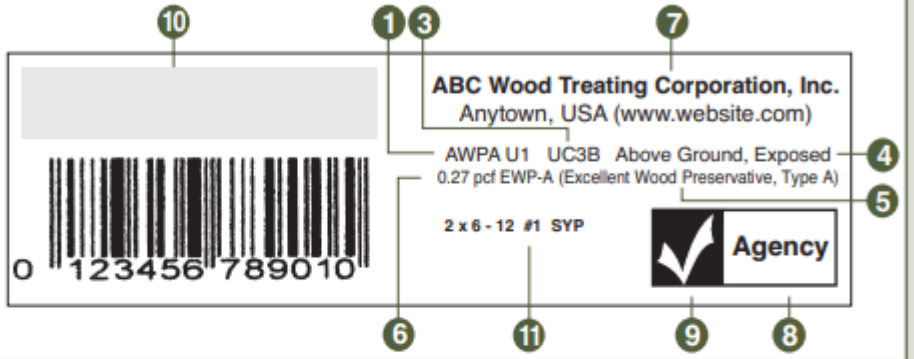
Standard engineering design formulas for simple span beams with uniformly distributed gravity loads were used. The calculated spans assume fully supported members, properly sheathed and nailed on the top edge of the joist. Maximum spans were calculated using design values effective June 1, 2013.

Each piece of lumber should be identified by the grade mark of an agency certified by the Board of Review of the American Lumber Standard Committee, and manufactured in accordance with *Product Standard PS 20* published by the U.S. Department of Commerce. In addition, all Southern Pine lumber treated with preservatives standardized by the American Wood Protection Association (AWPA) or evaluated by the International Code Council (ICC-ES) must be identified with a treated quality mark, either plastic end tag or ink stamp.

The conditions under which lumber is used in construction may vary widely, as does the quality of workmanship. Neither SFPA, nor its members, have knowledge of the quality of materials, workmanship or construction methods used on any construction project, and accordingly, do not warrant the technical data, design or performance of the lumber in completed structures.

Typical Treated Lumber Quality Marks – plastic end tag or ink stamp

AWPA Standardized Preservative



1 AWPA Standard Reference for AWPA Standardized Preservative System
2 ICC-ES Evaluation Report (ESR) Number for ICC-ES Evaluated Preservative System
3 AWPA Use Category
4 Exposure Category or End-use Condition
5 Preservative System
6 Preservative Retention in pounds per cubic foot (pcf) – optional for ICC-ES preservatives
7 Treating Company & Location
8 Accredited Inspection Agency
9 Checkmark of Quality (AWPA) or ICC-ES Logo (ESR)
10 (optional) Trade Name or Company Logo
11 (optional) Size, Length, Grade, Species

ICC-ES Evaluated Preservative

1 Treated Floor/Deck Joists

40 psf Live Load, 10 psf Dead Load, 360 Deflection

Size inches (actual)	Spacing inches on center	Visually Graded No.1 No.1 Prime	Visually Graded No.2 No.2 Prime
2x6 (1.5x5.5)	12.0	10-4	9-11
	16.0	9-5	9-0
	24.0	8-2	7-7
2x8 (1.5x7.25)	12.0	13-8	13-1
	16.0	12-5	11-10
	24.0	10-4	9-8
2x10 (1.5x9.25)	12.0	17-5	16-2
	16.0	15-10	14-0
	24.0	13-1	11-5
2x12 (1.5x11.25)	12.0	21-2	19-1
	16.0	19-1	16-6
	24.0	15-7	13-6

SouthernPine.com

2 Treated Floor/Deck Joists

60 psf Live Load, 10 psf Dead Load, 360 Deflection

Size inches (actual)	Spacing inches on center	Visually Graded No.1 No.1 Prime	Visually Graded No.2 No.2 Prime
2x6 (1.5x5.5)	12.0	9-1	8-8
	16.0	8-3	7-10
	24.0	6-11	6-5
2x8 (1.5x7.25)	12.0	11-11	11-5
	16.0	10-9	10-0
	24.0	8-9	8-2
2x10 (1.5x9.25)	12.0	15-2	13-8
	16.0	13-7	11-10
	24.0	11-1	9-8
2x12 (1.5x11.25)	12.0	18-6	16-1
	16.0	16-1	14-0
	24.0	13-2	11-5

SouthernPineDecks.com

3 Treated Floor/Deck Joists

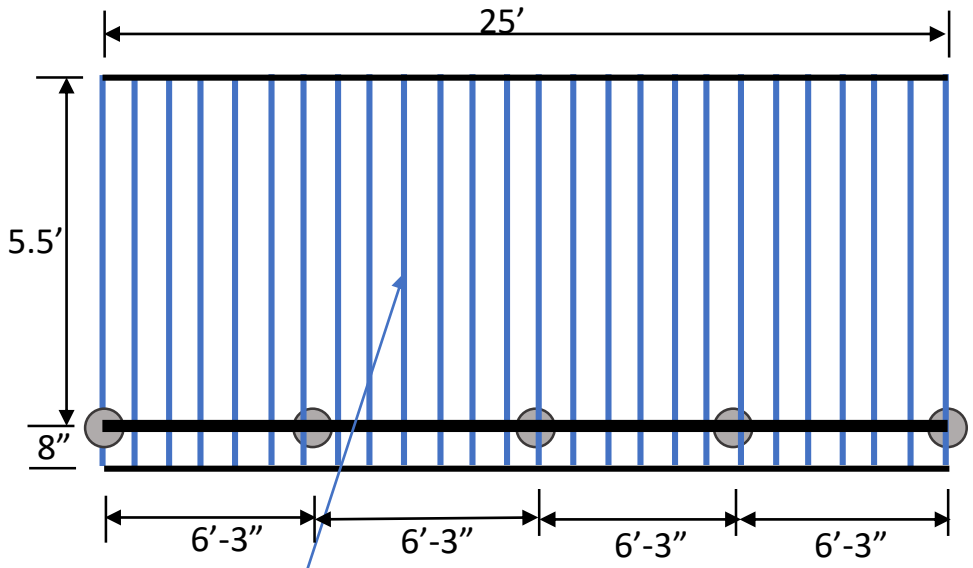
100 psf Live Load, 10 psf Dead Load, 360 Deflection

Size inches (actual)	Spacing inches on center	Visually Graded No.1 No.1 Prime	Visually Graded No.2 No.2 Prime
2x6 (1.5x5.5)	12.0	7-8	7-3
	16.0	6-9	6-3
	24.0	5-6	5-2
2x8 (1.5x7.25)	12.0	9-10	9-2
	16.0	8-7	8-0
	24.0	7-0	6-6
2x10 (1.5x9.25)	12.0	12-6	10-11
	16.0	10-10	9-5
	24.0	8-10	7-9
2x12 (1.5x11.25)	12.0	14-10	12-10
	16.0	12-10	11-2
	24.0	10-4	9-1

Spans were determined on the same basis as the code-recognized *Span Tables for Joists & Rafters* and *Wood Structural Design Data*, published by the American Wood Council; concentrated loads and uplift loads caused by wind were not considered. Applied loads are in pounds per square foot (psf). Deflection is limited to the span in inches divided by 360, and is based on live load only. The load duration factor, C_D, is 1.0.

Listed spans are for wet-service conditions, pressure-treated Southern Pine floor/deck joists, MC > 19%. Check sources of supply for available grades and sizes. Maximum spans were calculated using design values effective June 1, 2013. SFPA does not grade or test lumber. Neither SFPA, nor its members, warrant that the design values on which the span tables are based are correct, and disclaim responsibility for injury or damage resulting from the use of these tables.

Calculations



$$Live\ Load = 60psf$$
$$Dead\ Load = 10psf$$

***Check* 2" x 6" Joists @ 1′–0" O.C.**

$$M_{max} = \frac{wl^2}{8} = \frac{70psf(1'o.c.)(5.5)^2}{8} = 265\ ft - lb$$

$$Stress\ \sigma = \frac{Mc}{I} = \frac{265ft - lb(\frac{12in}{ft})(\frac{5.5"}{2})}{\frac{(1.5")5.5^3}{12}} = 421\ psi < 1{,}000psi\ for\ No.2\ Prime\ Pine, \text{so } \textbf{Okay for Stress}$$

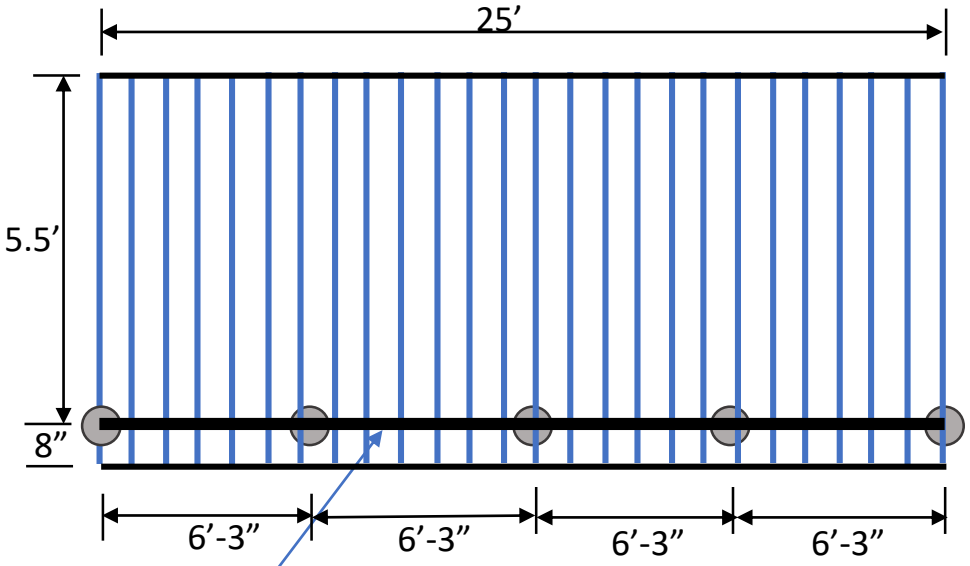
Check the Deflection and compare to L/360 for Live Load only:

$$\Delta = \frac{5wL^4}{384EI} = \frac{5(60psf)(1'o.c.)5.5^4(1728)}{384(1.2E6\ psi)\frac{(1.5")5.5^3}{12}} = .050“$$

Allowable Deflection = $\frac{L}{360} = \frac{5.5(12)}{360} = .183" \gg .050"\ actual\ \ so\ \boldsymbol{Okay\ for\ Deflection}$

Conclusion: Use 2” x 6” Joists @ 1’-0” O.C.
Could also Use 2” x 6” Joists @ 16” O.C.

Calculations



$$Live\ Load = 60psf$$
$$Dead\ Load = 10psf$$
$$\textbf{\textit{Check}}\ \textbf{2" x 8" Header Beam}$$
$$\text{w=70psf}\left(\frac{6'2"}{2}\right) = \mathbf{216lb/ft}$$

$$M_{max} = \frac{wl^2}{8} = \frac{216lb/ft(6.25)^2}{8} = 1{,}055\ ft - lb$$

$$Stress\ \sigma = \frac{Mc}{I} = \frac{1{,}055ft - lb(\frac{12in}{ft})(\frac{7.25"}{2})}{\frac{(1.5")7.25^3}{12}} = 963\ psi < 1{,}000psi\ for\ No.2\ Prime\ Pine,$$ **but really should**

have *more of a safety factor so let's try* (2) − 2" *x* 8“

***For* (2) − 2" x 8" beams,** $Stress\ \sigma = \frac{Mc}{I} = \frac{1{,}055ft-lb\left(\frac{12in}{ft}\right)\left(\frac{7.25"}{2}\right)}{\frac{(3")7.25^3}{12}} = 481\ psi << 1{,}000psi\ for\ No.2\ Prime\ Pine,$ **Okay for Stress!**

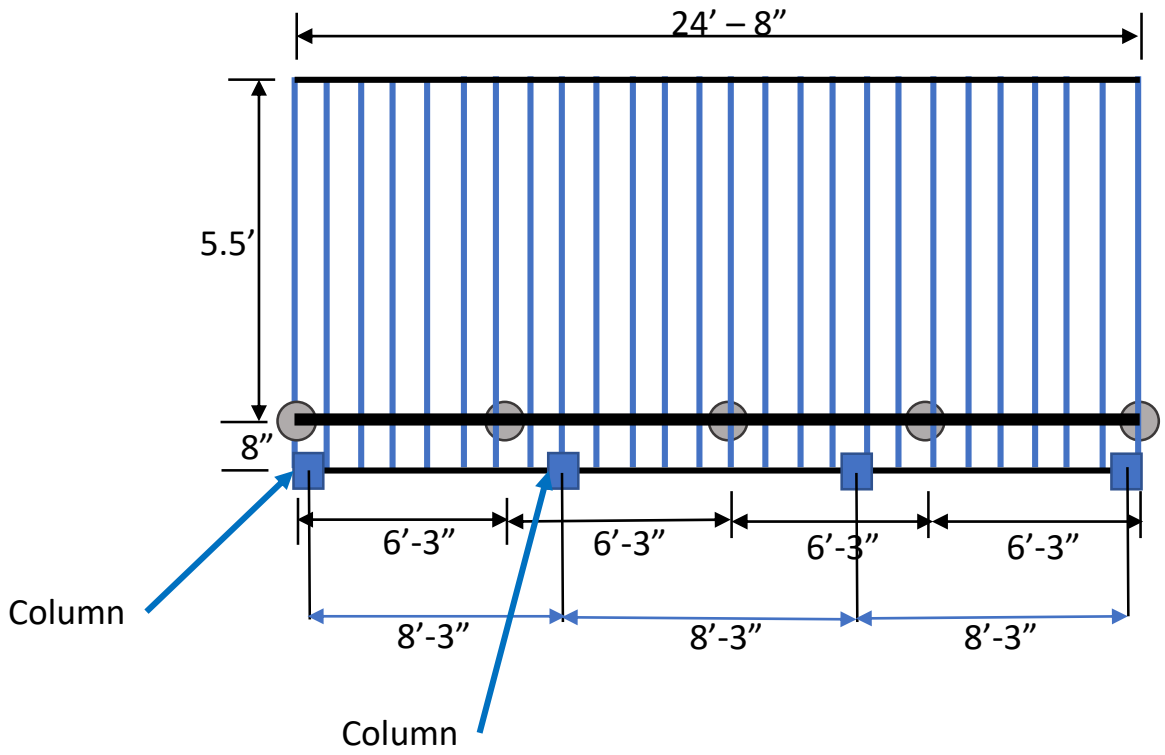
Check the Deflection and compare to L/360 for Live Load only:

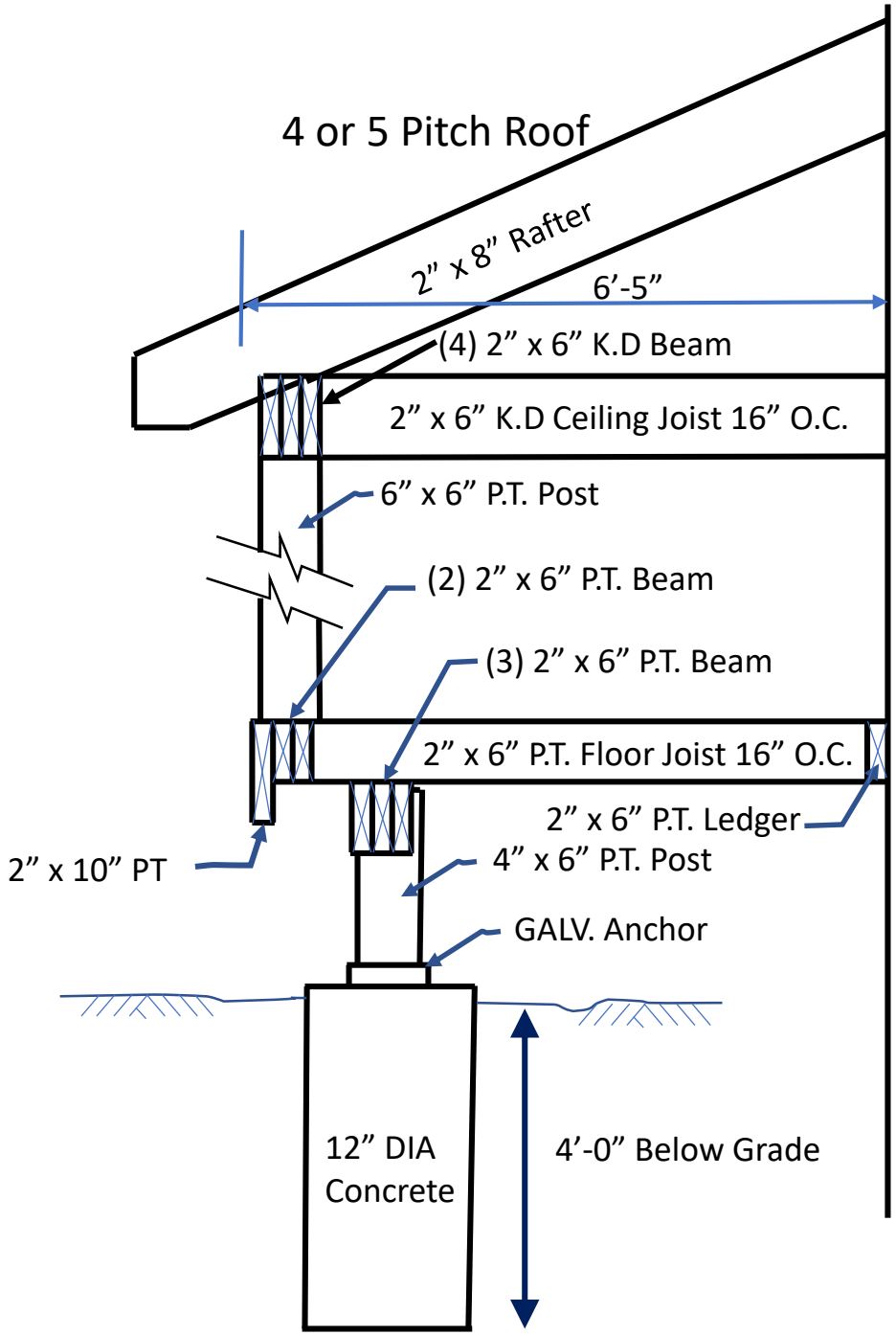
$$\Delta = \frac{5wL^4}{384EI} = \frac{5(60psfx3.08')6.25^4(1728)}{384(1.2E6\ psi)\frac{(3.0")7.25^3}{12}} = .056“$$

Allowable Deflection = $\frac{L}{360} = \frac{(6.25')(12)}{360} = .21" \gg .056"$ *so* ***Okay for Deflection***

Conclusion: Use (2) - 2” x 8” Header, or (3) 2” x 6” Header

Calculations





Let's check the 2"x8" Rafter first

Leicester Snow Load = 50 psf

Dead Load = 10 psf

Total Load = 60 psf

$$Uniform\ Load = 60psf\left(\frac{16"}{12}\right) = 80\ lb/ft$$

$$M_{max} = \frac{wl^2}{8} = \frac{60psf(16"o.c./12)(6.417)^2}{8} = 412\ ft-lb$$

$$Stress\ \sigma = \frac{Mc}{I} = \frac{412ft-lb(\frac{12in}{ft})(\frac{7.25"}{2})}{\frac{(1.5")7.25^3}{12}} = 376\ psi$$

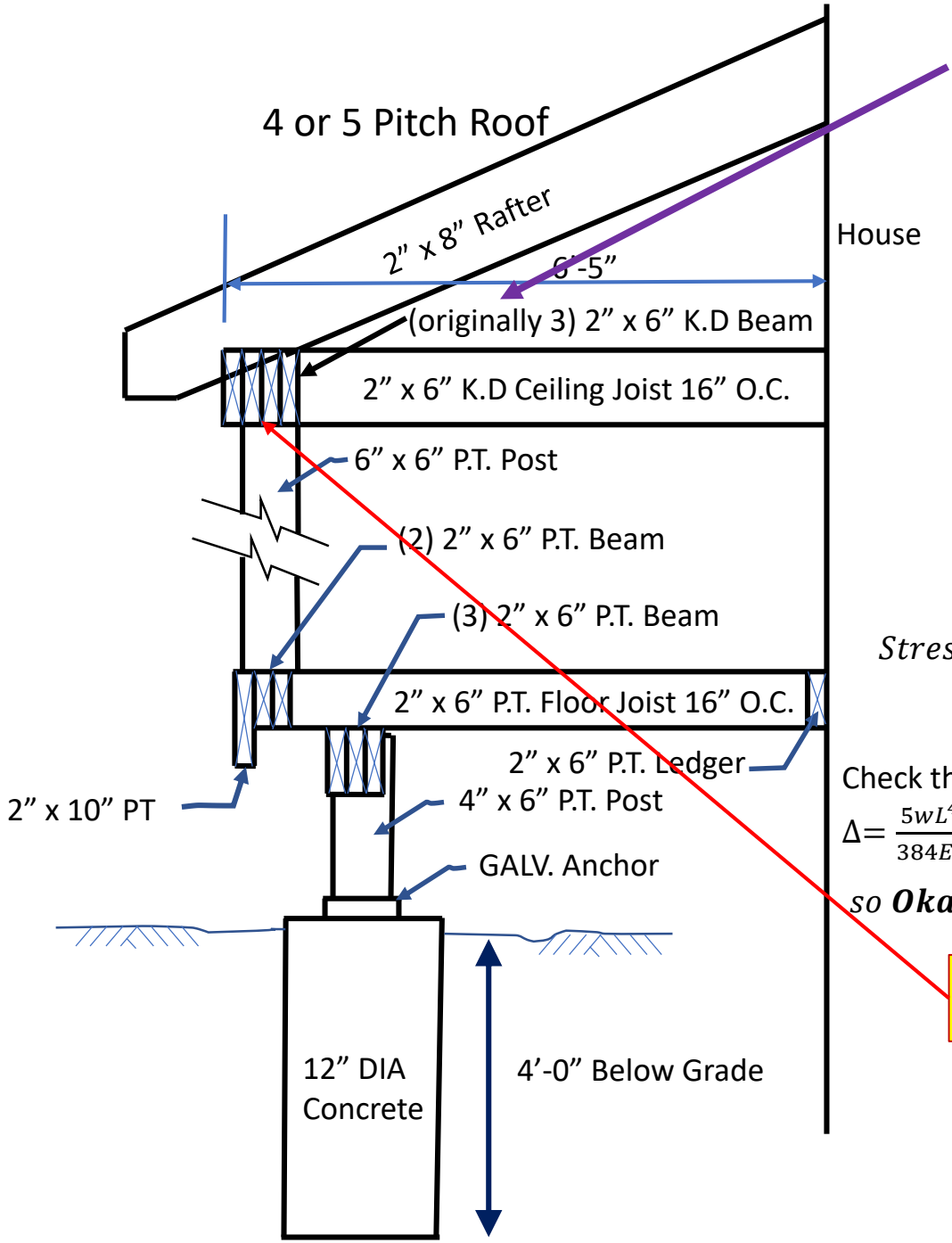
$< 1{,}000psi\ for\ No.2\ Prime\ Pine$, so **Okay for Stress**

Check the Deflection and compare to L/360 for Live Load only:

$\Delta = \frac{5wL^4}{384EI} = \frac{5(66.7lb/ft)6.417^4(1728)}{384(1.2E6\ psi)\frac{(1.5")7.25^3}{12}} = .042" <$ Allowable Deflection $= \frac{L}{360} = \frac{6.417(12)}{360} = .214"$

so ***Okay for Deflection***

Conclusion: 2" x 8" Rafters @ 16" O.C. is Okay



Now, Let's check the (3) – 2" x 6" Header Beam that supports the roof
Span L = 8'-3" with a tributary area distance = 3.75'

Leicester Snow Load = 50 psf
Dead Load = 10 psf
Total Load = 60 psf

$$Uniform\ Load = 60psf(3.75') = 225\ lb/ft$$

$$M_{max} = \frac{wl^2}{8} = \frac{225(8.25)^2}{8} = 1{,}914\ ft-lb$$

$$Stress\ \sigma = \frac{Mc}{I} = \frac{1{,}914ft-lb(\frac{12in}{ft})(\frac{5.5"}{2})}{\frac{3(1.5")5.5^3}{12}} = 1{,}012\ psi$$

$$> 1{,}000\ psi\ N.G.\ for\ Stress, so\ now\ lets\ try\ (4)\ 2"\ x\ 6"$$

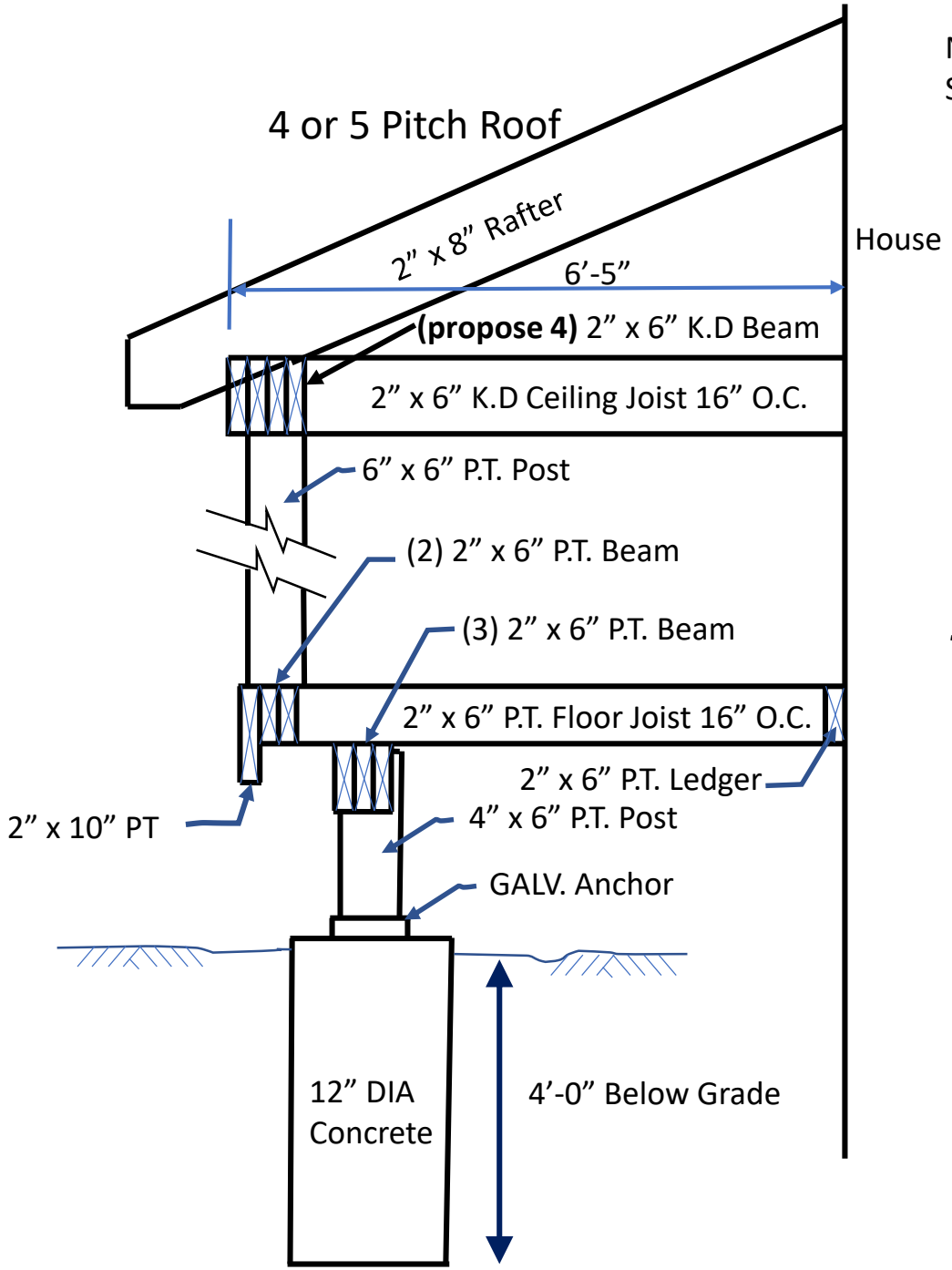
$$Stress\ \sigma = \frac{Mc}{I} = \frac{1{,}914ft-lb(\frac{12in}{ft})(\frac{5.5"}{2})}{\frac{\mathbf{4}(1.5")5.5^3}{12}} = 759\ psi < 1{,}000\ psi\ \boldsymbol{Okay\ for\ stress}$$

Check the Deflection and compare to L/360 for Live Load only:

$$\Delta = \frac{5wL^4}{384EI} = \frac{5(66.7lb/ft)8.25^4(1728)}{384(1.2E6\ psi)\frac{\mathbf{4}(1.5")5.5^3}{12}} = .069" <$$ Allowable Deflection $= \frac{L}{360} = \frac{6.417(12)}{360} = .214"$

$so\ \boldsymbol{Okay\ for\ Deflection}$

Conclusion: use (4) 2" x 6" for the Header



Now, Let's check the 8" overhang and see if its able to support the roof loading in Shear Span L =8" cantilever beam

Leicester Snow Load = 50 psf
Dead Load = 10 psf
Total Load = 60 psf

$$Uniform\ Load = 60psf(3.75') = 225\ lb/ft$$

$$Shear\ V = \frac{3V}{2A} = \frac{3\left(225lb/ft\left(\frac{8"}{12}\right)\right)}{2(1.5")(5.5")} = 27psi \ll 1{,}200psi\ allowable\ OKAY$$

$$M_{max} = \frac{wl^2}{2} = \frac{225(\frac{8}{12})^2}{2} = 50\ ft-lb$$

$$Stress\ \sigma = \frac{Mc}{I} = \frac{50ft-lb(\frac{12in}{ft})(\frac{5.5"}{2})}{\frac{(1.5")5.5^3}{12}} = 80\ psi < 1{,}000\ psi\ \boldsymbol{Okay\ for\ stress}$$

Conclusion: the 8" overhang on the Floor Joists easily handles the roof loading demonstrating structurally integrity