



Nolen Frisa Associates

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File name: C:\Users\steve\OneDrive - Nolen Frisa Associates\NFA 20426 Kent\Calcs\Ram\40-Ft GeoBarn\40ft 4-Bay Frames 2020-11-25 Modify.retx

Wood Design

Design code: ANSI/AF&PA NDS-2005 ASD

Report: Comprehensive

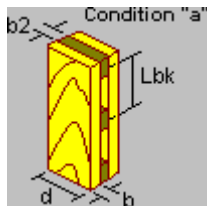
Member : 137 (Porch Box Rafter)
Design status : N.G.

PROPERTIES

Section information

Section name: SP 2-4x12 2-2x12 (US)

Dimensions



b	=	5.000	[in]	Thickness
b2	=	5.500	[in]	Spacing
d	=	11.250	[in]	Height
Lbk	=	18.000	[in]	Dist. between blocks

Properties

Section properties	Unit	Major axis	Minor axis
Gross area of the section. (Ag)	[in2]	112.500	
Moment of Inertia (principal axes) (I')	[in4]	1186.523	3335.156
Top elastic section modulus of the section (local axis) (Ssup)	[in3]	210.938	430.343

Material : DFir-L_No1

Properties	Value
Type:	Lumber
Species:	Douglas Fir-Larch
Grade:	No.1
Coefficient of variation:	0.25

DESIGN CRITERIA

Description	Unit	Value
Temperature:	--	T<=100F
Moisture conditions:	--	Dry
Wood:	--	Unincised
Repetitive member:	--	Yes
Type:	--	Beam
End notches at top:	--	Top
Notch length:	[in]	0.00
Notch depth:	[in]	0.00

Description	Unit	Major axis	Minor axis
Physical length	[in]	222.60	
Effective length for bending (Le)	[in]	0.00	
Unbraced length for bending (Lu)	[in]	24.00	
Unbraced compression length (Lx, Ly)	[in]	72.42	24.00
Effective length factor (K)	--	1.00	1.00
Lateral bracing	--	No	No
Bearing length (Lb)	[in]	0.50	
Length between inflection points (Li)	[in]	222.60	

DESIGN CHECKS

DESIGN FOR TENSION



Ratio	:	0.09	Reference	:	(Sec. 3.8)
Capacity	:	1.08 [Kip/in2]	Ctrl Eq.	:	D6 at 100.00%
Demand	:	0.10 [Kip/in2]			

Intermediate results	Unit	Value	Reference
<u>Axial design value for tension (Ft)</u>	[Kip/in2]	0.68	
Duration factor (CD)	--	1.60	(Table 2.3.2)
Wet service factor (CM)	--	1.00	(Sec. 4.3.3)
Temperature factor (Ct)	--	1.00	(Sec. 2.3.3)
Size factor (CFt)	--	1.00	(Sec. 4.3.6)
Incising factor (CiFt)	--	1.00	(Sec. 4.3.8)
<u>Tension axial force (P+)</u>	[Lb]	10755.68	

DESIGN FOR COMPRESSION



Ratio	:	0.03	Reference	:	(Sec. 3.6.3)
Capacity	:	2.29 [Kip/in2]	Ctrl Eq.	:	D28 at 68.75%
Demand	:	-0.07 [Kip/in2]			

Intermediate results	Unit	Value	Reference
<u>Axial design value for compression (Fc)</u>	[Kip/in2]	1.50	
Duration factor (CD)	--	1.60	(Table 2.3.2)
Wet service factor (CM)	--	1.00	(Sec. 4.3.3)
Temperature factor (Ct)	--	1.00	(Sec. 2.3.3)
Size factor (CF)	--	1.00	(Sec. 4.3.6)
Incising factor (Ci)	--	1.00	(Sec. 4.3.8)
Column stability factor (CP)	--	0.96	(Eq. 3.7-1)
<u>Compression axial force (P-)</u>	[Lb]	-8401.04	
<u>Modulus of elasticity for stability (Emin)</u>	[Kip/in2]	620.00	
<u>Adjusted modulus of elasticity for stability (Emin')</u>	[Kip/in2]	620.00	

Wet service factor (CM)	--	1.00	(Sec. 4.3.3)
Temperature factor (Ct)	--	1.00	(Sec. 2.3.3)
Incising factor (Ci)	--	1.00	(Sec. 4.3.8)
Buckling stiffness factor (CT)	--	1.00	(Sec. 4.4.2)
<u>Critical buckling design value (FcE1)</u>	[Kip/in2]	12.30	(Sec. 3.9.2)
<u>Critical buckling design value (FcE2)</u>	[Kip/in2]	55.30	(Sec. 3.9.2)

DESIGN FOR FLEXURE



Bending about major axis, M33

Ratio	:	1.19		
Capacity	:	1.60 [Kip/in2]	Reference	: (Sec. 3.3)
Demand	:	1.90 [Kip/in2]	Ctrl Eq.	: D11 at 65.63%

Intermediate results	Unit	Value	Reference
<u>Bending design value (Fb)</u>	[Kip/in2]	1.00	
Duration factor (CD)	--	1.60	(Table 2.3.2)
Wet service factor (CM)	--	1.00	(Sec. 4.3.3)
Temperature factor (Ct)	--	1.00	(Sec. 2.3.3)
Stability Factor (CL)	--	1.00	(Sec. 3.3.3)
Size factor (CF)	--	1.00	(Sec. 4.3.6)
Incising factor (Ci)	--	1.00	(Table 4.3.8)
Repetitive member factor (Cr)	--	1.00	(Sec. 4.3.9)
<u>Bending moment (Mxx)</u>	[Lb*ft]	33402.89	
<u>Slenderness Ratio (RB)</u>	--	4.72	(Eq. 3.3-5)
<u>Critical buckling design value (FbE)</u>	[Kip/in2]	33.44	(Sec. 3.3.3.8)

Bending about minor axis, M22

Ratio	:	0.00		
Capacity	:	0.67 [Kip/in2]	Reference	: (Sec. 3.3)
Demand	:	0.00 [Kip/in2]	Ctrl Eq.	: D1 at 0.00%

Intermediate results	Unit	Value	Reference
<u>Bending design value (Fbvy)</u>	[Kip/in2]	1.00	
Duration factor (CD)	--	0.90	(Table 2.3.2)
Wet service factor (CM)	--	1.00	(Sec. 4.3.3)
Temperature factor (Ct)	--	1.00	(Sec. 2.3.3)
Stability Factor (CL)	--	1.00	(Sec. 3.3.3)
Size factor (CF)	--	1.00	(Sec. 4.3.6)
Flat use factor (Cfu)	--	0.74	(Sec. 4.3.7)
Incising factor (Ci)	--	1.00	(Table 4.3.8)
Repetitive member factor (Cr)	--	1.00	(Sec. 4.3.9)
<u>Bending moment (Myy)</u>	[Lb*ft]	0.00	

DESIGN FOR SHEAR



Shear parallel to minor axis, V2

Ratio	:	0.28		
Capacity	:	0.29 [Kip/in2]	Reference	: (Sec. 3.4)
Demand	:	0.08 [Kip/in2]	Ctrl Eq.	: D11 at 100.00%

Intermediate results	Unit	Value	Reference
<u>Shear design value (Fv)</u>	[Kip/in2]	0.18	
Duration factor (CD)	--	1.60	(Table 2.3.2)
Wet service factor (CM)	--	1.00	(Sec. 4.3.3)
Temperature factor (Ct)	--	1.00	(Sec. 2.3.3)
Incising factor (Ci)	--	1.00	(Table 4.3.8)
<u>Shear Force (Vy)</u>	[Lb]	-6075.96	
<u>Notch factor (CN)</u>	--	1.00	(Sec. 3.4.3)

Shear parallel to major axis, V3

Ratio	:	0.00		
Capacity	:	0.16 [Kip/in2]	Reference	: (Sec. 3.4.2)
Demand	:	0.00 [Kip/in2]	Ctrl Eq.	: D1 at 0.00%

Intermediate results	Unit	Value	Reference
<u>Shear design value (Fv)</u>	[Kip/in2]	0.18	
Duration factor (CD)	--	0.90	(Table 2.3.2)
Wet service factor (CM)	--	1.00	(Sec. 4.3.3/5.3.3)
Temperature factor (Ct)	--	1.00	(Sec. 2.3.3)
Incising factor (Ci)	--	1.00	(Table 4.3.8)
<u>Shear Force (Vy)</u>	[Lb]	0.00	

DESIGN FOR TORSION

Ratio	:	0.00		
Capacity	:	0.11 [Kip/in2]	Reference	: (AITC-TCM)
Demand	:	0.00 [Kip/in2]	Ctrl Eq.	: D1 at 0.00%

Intermediate results	Unit	Value	Reference
<u>Torsion design value (Fvt)</u>	[Kip/in2]	0.12	
<u>Torsion moment (Mtor)</u>	[Lb*ft]	0.00	

DESIGN FOR BEARING (informative)

Intermediate results	Unit	Value	Reference
<u>Maximum reaction (Rmax)</u>	[Lb]	3375.00	(Sec. 3.10.3)
<u>Load angle (θ)</u>	--	0.00	
<u>Axial design value for compression (Fc*)</u>	[Kip/in2]	1.35	
<u>Comp. design value perpendicular to grain (Fcp)</u>	[Kip/in2]	0.63	
Wet service factor (CM)	--	1.00	(Sec. 4.3.3)
Temperature factor (Ct)	--	1.00	(Sec. 2.3.3)
Incising factor (Ci)	--	1.00	(Sec. 4.3.8)
Bearing area factor (Cb)	--	1.75	(Eq. 3.10-2)

INTERACTION

Combined axial and bending interaction value

Ratio : 1.19

Ctrl Eq. : D23 at 68.75%
Reference : (Eq. 3.9-1)

CRITICAL STRENGTH RATIO



Ratio : 1.19

Ctrl Eq. : D23 at 68.75%

Reference : (Eq. 3.9-1)