ASD Wood Member Design v7.2.1 (2-24-14)

Sample Beam

Member Dimensions	Beam ☉	Joist ☐		_Member Material Properties_		_Loads_		
	Cantilever	Span	Cantilever	Total Length	Lumber type = Engineered	Roof DL =	25	psf
Span =		21.00		21.00	Type = LVL	Roof Lr =	20	psf
Unbraced length =	2.00	ft			Grade = 1.9E	Snow, S =	15	psf
Number of plys =	2				Member unit weight = 42 pcf	Rain, R =	5	psf
Member width, b =	1.75	in	☐ Custom width	Bearing length @ support A = 5.00 in ≥ 4.62 in	Floor DL =	15	psf
Member depth, d =	18	in	☐ Custom depth	Bearing length @ support B = 3.00 in ≥ 2.34 in	Floor LL =	40	psf
Orientation =	Strong							

**TL deflection controls member design (98%)**

Unfactored Load Reactions

Load type	R_A	R_B	
D =	5891	3020	lbs
L =	0	0	lbs
Lr =	4211	2089	lbs
S =	0	0	lbs
R =	0	0	lbs
W =	0	0	lbs
E =	0	0	lbs

**Point Loads**

	P_L	P_D	P_T	a	LL Type	Load Description
P_1 =	1500	2025	3525	5.00	Roof	
P_2 =			0			
P_3 =			0			
P_4 =			0			
P_5 =			0			
P_6 =			0			

**Uniform Loads** Roof slope = 5.00 :12   Member slope = :12

Live, psf	Dead, psf	Trib. Width		W_L	W_D	W_T	Start @	End @	LL Type	Load Description
20	25	17.00	W_1 =	340	460	800	0.00	12.00	Roof	
20	25	4.00	W_2 =	80	108	188	12.00	21.00	Roof	
			W_3 =			0				
			W_4 =			0				
			W_5 =			0				
			W_6 =			0				

**Triangular Loads (Starting or ending load must be 0)**

	Start W_L	Start W_D	End W_L	End W_D	Start W_T	End W_T	Start @	End @	LL Type	Load Description
T_1 =					0	0				
T_2 =					0	0				
T_3 =					0	0				
T_4 =					0	0				

**Member Shear Design** Member design controlled by D+(Lr or S or R)

Fv =	285	psi
Fv' = Fv*($C_D C_M C_t C_i$) =	356	psi
Max V =	10103	lbs
Design V =	8704	lbs
A = b*d =	63.00	in²
fv = 1.5*V/A =	241	psi
	OK	

**Adjustment Factors**

C_D =	1.25	For roof live load
C_M =	1.00	For MC < 19%
C_t =	1.00	Insulated against 100+ F
C_F =		No size increase
C_V =	0.95	Volume Factor
C_{fu} =		Narrow face loaded
C_i =		No incising
C_r =	1.00	Not a repetitive member
C_f =		Rectangular shaped
C_T =		Buckling stiffness factor
C_b =	1.00	Bearing area factor

**Member Bending Design** Member design controlled by D+(Lr or S or R)

	F_b^+	F_b^-	
Fb =	2600	2600	psi
Fb* = Fb*($C_D C_M C_t C_F C_i C_r C_f$) =	3250	3250	psi
Emin =	965710	965710	psi
Emin' = Emin*(CMCtCiCT) =	965710	965710	psi
unbraced length, lu =	2.00	2.00	ft
lu/d =	1.33	1.33	
le =	49	49	in
R_B = $(le*d/b^2)^{1/2}$ =	8.52	8.52	≤ 50, OK
F_{bE} = 1.20*E'min/$(R_B)^2$ =	15952	15952	psi
C_L =	0.988	0.988	
Fb' = Fb*($C_D C_M C_t C_L C_F C_V C_{fu} C_i C_r C_f$) =	3076	3076	psi

	+ Moment	- Moment	
Max moment, M =	44045		lb-ft
S = bd²/6 =	189.00	189.00	in³
fb = M/S =	2797	0	psi
	OK	**OK**	

Shear Diagram — Shear, lbs vs Member Span, ft

Moment diagram — Moment, ft-lbs vs Member Span, ft
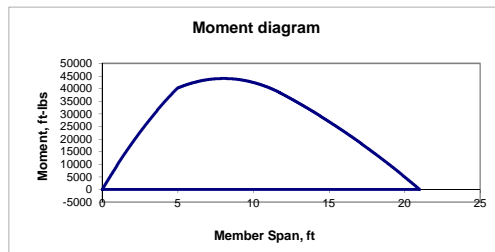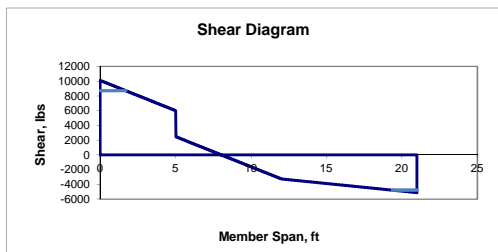
**Member Bearing** Member design controlled by D+(Lr or S or R)

				C_b	P, lbs	A, in²	$fc_\perp = P/A$		
$Fc_\perp$ =	625	psi	Support @ A =	1.00	10103	17.50	577	psi	OK
$F'c_\perp$ = $Fc_\perp$*($C_M C_t C_i C_b$) =	625	psi	Support @ B =	1.00	5108	10.50	487	psi	OK

**Member Deflection**

Moment of Inertia, I = bd³/12 =	1701.000	in⁴
E =	1900000	psi
E' = E*($C_M C_t C_i$) =	1900000	psi

Mid Span Deflection

Loading	Ratio_allow	$\Delta_{allowed}$	Δ_{actual}	Ratio_actual	Check
Δ_{LL}	360	0.700	0.428	L/588	OK
Δ_{TL}	240	1.050	1.032	L/244	OK

Cantilever Deflection

Loading	Ratio_allow	$\Delta_{allowed}$	Δ_{actual}	Ratio_actual	Check
Δ_{LL}	180	0.000	0.000	N/A	OK
Δ_{TL}	120	0.000	0.000	N/A	OK

Deflection — Deflection, in vs Member Span, ft (LL, TL)
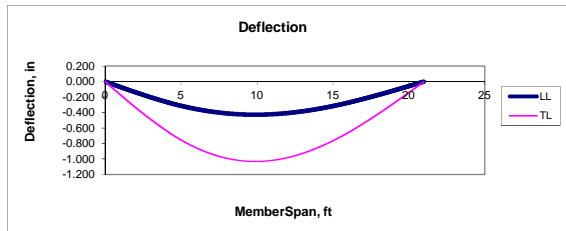
(2) 1.75" x 18" LVL 1.9E

Date: 3/22/14 11:08 AM