CONSULTING ENGINEERS

JVA JOB NO. 15100

STRUCTURAL CALCULATIONS

910 28th Street

Boulder, CO

07-26-2011

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JOB NUMBER: 15100	
PROJECT NAME: 910 28th Street	
CLIENT: Shears Adkins Rockmore	
PRINCIPAL-IN-CHARGE: TSS	PROJECT ENGINEER: JMT/BTM
HEAD DRAFTER: DJM	DATE: 07/26/11

STRUCTURAL CALCULATIONS
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CONSULTING ENGINEERS

910 28TH STREET

GENERAL CODE, LOAD, AND MATERIALS INFORMATION

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GENERAL CODE, LOAD, SYSTEMS, AND MATERIALS INFORMATION

JOB NUMBER: 15100

PROJECT NAME: 910 28th Street

PROJECT LOCATION: Boulder, Colorado

CODE	GOVERNING CODE: 2006 IBC	
	CODE AMENDMENTS: City of Boulder	
	BUILDING DEPT:	City of Boulder
	BLDG. DEPT. CONTACT:	
	PHONE: ( ) -	FAX: ( ) -
	DATE/TIME OF BLDG. DEPT. CODE REQUIREMENTS CONFIRMATION:	
	COMMENTS:	

DESIGN LIVE LOADS (Check all that apply)

GRAVITY	ROOF:	☒ MINIMUM (NON-SNOW) = 20 PSF ☒ BASIC SNOW = 30 PSF ☐ Drifted snow analysis not required ☒ Drifted snow analysis required Pg (Basic Ground Snow) = 25 psf I(Importance factor) = 1.0 Ce(Snow exposure factor) = 1.0 ☐ Snow load reduction for roof slope: ☐code ☐other ☒ Load duration factor for wood elements = 1.15 ☒ Mechanical Units on roof ☐ Special Loadings on roof: _____

	FLOOR:	☒ Residential = 40 psf; Level/Location: _____ ☐ Classroom = 40 psf; Level/Location: _____ ☐ Hospital wards & rooms = 40 psf; Level/Location: _____ ☐ Assembly areas ☐ Fixed seating = 50 psf; Level/Location: _____ ☐ Moveable seating = 100 psf; Level/Location: _____ ☐ Stage areas = 125 psf; Level/Location: _____ ☒ Garage ☐ Storage & Repair = 100 psf; Level/Location: _____ ☒ Motor vehicle storage = ~~50~~ 40 psf; Level/Location: _____ ☐ Library ☐ Reading Room = 60 psf; Level/Location: _____ ☐ Stacks = ☐ 125 psf; Level/Location: _____ ☐ 150 psf; Level/Location: _____ ☐ Manufacturing ☐ Light = 75 psf; Level/Location: _____ ☐ Heavy = 125 psf; Level/Location: _____ ☐ Office = 50 psf; Level/Location: _____ ☐ Partition (Dead Load) = 20 psf ☐ Partition (Dead Load) = _____ psf ☐ Exterior balcony = _____ psf; Level/Location: _____ ☐ Restrooms = 50 psf; Level/Location: _____ ☐ Storage ☐ Light = 125 psf; Level/Location: _____ ☐ Heavy = 250 psf; Level/Location: _____ ☐ Retail = ☐ 75 psf; Level/Location: _____ ☐ 100 psf; Level/Location: _____ ☐ Mechanical = 125; Level/Location: _____ ☐ Gymnasium, PE Areas = 100 psf; Level/Location: _____ ☐ Kitchen/Food Prep = 100 psf; Level/Location: _____ ☐ Laboratory = 60 psf; Level/Location: _____ ☒ Entrance Vestibules, Corridors, Stairways = 100 psf ☐ Special areas: _____ = _____ psf; Level/Location: _____ ☒ Live load reduction permitted
WIND	Basic Wind Speed = 120 mph Exposure = B Importance Factor (I_w) = 1.0 ☐ Air Density Coefficient = _____ ☐ Allowable stress increase = _____%	

SEISMIC	Importance Factor = 1.0 Soils Site Class = C Seismic Design Category = B Basic Force Resisting Structural System: ~~Steel System not specifically detailed for seismic~~ Light-Framed walls/Ordinary Reinforced Conc Response Modification Coefficient: R = 6.5/2.0/5.0 See Calcs Analysis Procedure: ____Equivalent Lateral Force _____ Spectral Response Acceleration Coefficient: Ss = 0.236 S1 = 0.058

FOUNDATION SYSTEM (Check all that apply)

SOILS ENGINEER: Kumar + Associates, Inc.

REPORT NUMBER: 11-1-240 | REPORT DATE: 5/3/11

FINISH FLOOR ELEVATION = USGS 5326.5

FROST DEPTH (below grade) = 3'-0

☐ Spread Footings	Maximum allowable bearing pressure = _____ psf ☐ Minimum dead load pressure = _____ psf ☐ Minimum bearing depth (below grade) = _____ feet ☐ Minimum continuous footing width = _____ inches Minimum isolated spread footing width = _____ feet ☐ Footing bearing on compacted fill ☐ Imported ☐ Existing ☐ Footing bearing on undisturbed natural soils
☒ Drilled Piers	Maximum end bearing pressure = 35 ksf Allowable side shear for downward loads = 3.5 ksf Allowable side shear for upward loads = 2.625 ksf Portion of pier in B.R. to be discounted for side shear = 0 ft Portion to be discounted for uplift side shear = 0 ft Minimum dead load pressure = 15 ksf or Force = _____ k Minimum pier length = 25 feet Minimum penetration into B.R. = 10 feet Minimum pier diameter = 16 inches

☐ Piles	Maximum axial capacity (at refusal) = _____ tons Minimum total embedment below grade = _____ feet Pile type: ☐ Steel ☐ Concrete ☐ Concrete filled Steel ☐ Wood Pile size: ☐ Minimum round pile diameter = _____ inches ☐ Minimum square pile side dimension = _____ inches ☐ Steel Shape = _____ Modulus of subgrade reaction = _____ tons/cubic foot
☒ Retaining	Lateral Earth Pressures (Equivalent Fluid Pressure): ▪ Active (no lateral restraint at top) = 40 pcf ▪ Passive = _____ pcf ▪ At-rest (lateral restraint at top) = 50 pcf Coefficient of sliding friction = _____ ☐ Surcharge = _____ psf
MATERIALS (Check all that apply)	
☒ Structural Steel	☒ Wide Flange Shapes: ASTM A992, 50 ksi ☐ Tube Sections: ASTM A500, Grade B, 46 ksi ☒ Pipes: ASTM A53, Grade B ☐ Other Shapes (Angles, channels, plates): ASTM A36, 36 ksi ☐ Bolts: ASTM A325 ☐ Anchor Bolts: ASTM A36, 36 ksi ☐ High Strength Anchor Bolts: ASTM A449, 92 ksi Bolted Connections: Bearing-type w/ ¾" diameter A325-N bolts Welded Connections: E70-xx electrodes Design Code: AISC 360-05
☐ Cee Studs	16 gage & heavier: ASTM A570, 50 ksi yield 18 gage & lighter: ASTM A611, Grade C, 33 ksi yield
☒ Timber – Sawn	2x framing: ☐ Douglas Fir-Larch S4S No. 2 ☒ Hem-Fir S4S No. 2 Studs: ☐ Douglas Fir-Larch ☐ Construction Grade ☒ Hem-Fir ☐ Stud Grade ☒ No. 2 Plates: ~~Douglas Fir-Larch No. 2~~ LSL Solid Timbers & Posts: Douglas Fir-Larch No. 1 Design Code: 2005 NDS

☒ Timber – Plant Fabricated/ Pre-Engineered	Laminated Veneer Lumber: (Microlam) Fb = 2800 psi, Fc_{11} = 2700 psi, $Fc_{(brg)}$ = 500 psi, Fu = 285 psi, E = 2,000,000 psi ☒ Plywood, Panel Grade: C-D ☒ Floor: 3/4" thick (min.), APA 48/24 ☒ Roof: ☒ 1/2" thick (min.), APA 32/16 ☐ 5/8" thick (min.), APA 40/20 ☐ Walls: 7/16" thick (min.), APA 32/16 ☒ Oriented Strand Board, Panel Grade: ☐ Floor: 3/4" thick (min.), APA 48/24 ☐ Roof: 5/8" thick (min.), APA 40/20 ☒ Walls: 7/16" thick (min.), APA 32/16 Design Code: _____
Timber – Glue-Lam	Simple Span: Combination Symbol 24F-V4 ☐ No camber ☐ Camber = _____ feet radius Continuous/Cantilever: combination symbol 24F-V8, no camber Columns: Combination symbol #2, no camber Minimum allowable stresses: $Fb_{(tens)}$ = 2400 psi, Fc_{11} = 1600 psi, $Fc_{(brg)}$ = 650 psi, Fv = 165 psi, E = 1,800,000 psi Design Code: _____
☒ Masonry	Block Units: ASTM C90, Grade N1 Minimum compressive strength = 2000 psi Mortar: ASTM C270, Type S Grout: ASTM C476, Min. compressive strength = _____ psi Prism assembly min. compressive strength (f'm) = 1500 psi ☐ No special inspection required ☒ Special inspection required; Locations: _____ Design Code: ACI 530-05

☒ Concrete	Minimum compressive strengths (f'c): ☐ Footings = 3000 psi, max W/C = _____ ☒ Stemwalls, Foundation walls, Pilasters, Pedestals: ☐ 3,000 psi, max W/C = _____; ☒ 4,000 psi, max W/C = 0.45 ☒ Grade beams ☐ 3,000 psi, max W/C = _____ ☒ 4,000 psi, max W/C = 0.45 ☐ _____ psi, max W/C = _____ ☒ Drilled Piers = 3,000 psi, max W/C = 0.55 ☐ Driven Pile fill = 4,000 psi ☐ Pile caps = 3,000 psi, max W/C = _____ ☐ Tilt-up walls and columns = 4,000 psi, max W/C = _____ ☐ Precast beams, DT's, columns, walls = 5,000 psi 5,000 ☒ Post-tensioned slabs & beams = 4,000 psi, max W/C = 0.45 ☐ Slab-on-grade = 3500 psi, max W/C = _____ ☐ Fiber reinforced ☐ WWF reinforced ☒ Interior slab ~~on formdeck~~ = ~~3,000~~ 4,000 psi, max W/C = .45 ☐ Interior slab on composite deck = 3,000 psi, max W/C = _____ ☐ Topping for precast elements = 3,500 psi, max W/C = _____ Design Code: _____
☒ Concrete & Masonry Reinforcing	Primary reinforcing: ASTM A615, Grade 60 Column ties & field bent bars: Grade 40 Welded bars: ASTM A706, Grade 60 Design Code: _____

CONSULTING ENGINEERS

910 28TH STREET

FOUNDATION ELEMENTS

CONSULTING ENGINEERS

Project: 910 28th Street | Date: 6/24/2011 | Job No.: 15100

Client: SA+R | By: JMT | Sheet of

DRILLED PIER CAPACITY TABLE

SOILS REPORT			
Soils Engineer	Kumar & Associates, Inc.		
Report Number	11-1-240		
Report Date	5/3/2011		
Bedrock Data			
Maximum End Bearing Pressure		35.0	ksf
Side Shear: Gravity		3.50	ksf
Side Shear: Uplift for Applied Loads		2.63	ksf
Side Shear: Minimum Dead Load		1.75	ksf
Minimum Dead Load End Bearing Pressure		15.0	ksf
Minimum Penetration into Bedrock		10.0	ft
Top Bedrock Penetration to be Ignored			ft
Unfactored Net Tensile Force		55.0	k
Uplift Side Shear Length		N/A	ft
Specified Minimum Total Pier Length		25.0	ft
Concrete Strength	f'_c =	3.0	ksi

Comments

55k for 1ft diameter pier, may reduce by amt that dead load exceeds min dead load

DRILLED PIER PROPERTIES

Diameter	**in**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**36**	**42**	**48**
End Area (A)	ft^2	0.55	0.79	1.07	1.40	1.77	2.18	3.14	4.91	7.07	9.62	12.57
Surface Area	ft^2/ft	2.62	3.14	3.67	4.19	4.71	5.24	6.28	7.85	9.42	11.00	12.57
$0.3xAxf'_c$ (ACI)	kips	71	102	139	181	229	283	407	636	916	1,247	1,629
.005*A	in^2	0.39	0.57	0.77	1.01	1.27	1.57	2.26	3.53	5.09	6.93	9.05
Pier Tension	kips	73	88	103	117	132	147	176	220	264	308	352
Tension Reinforcement	in^2	1.36	1.63	1.90	2.17	2.44	2.72	3.26	4.07	4.89	5.70	6.52
Bar Size #8	**# req'd**	**2**	**3**	**3**	**3**	**4**	**4**	**5**	**6**	**7**	**9**	**12**

DRILLED PIER CAPACITIES (kips)

Pier Diameter (in)		**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**36**	**42**	**48**
Bedrock Penetration (ft)	**10**	111	137	166	195	227	260	330	447	577	722	880
	11	120	148	179	210	243	278	352	474	610	760	924
	12	129	159	191	225	260	296	374	502	643	799	968
	13	138	170	204	239	276	315	396	529	676	837	1012
	15	157	192	230	269	309	351	440	584	742	914	1100
	17	175	214	255	298	342	388	484	639	808	991	1188
	19	193	236	281	327	375	425	528	694	874	1068	1275
	21	212	258	307	357	408	461	572	749	940	1145	1363
	23	230	280	332	386	441	498	616	804	1006	1222	1451
	25	248	302	358	415	474	535	660	859	1072	1299	1539
												>.3f'cA
Side Shear (kip/ft of depth in bedrock)		9.2	11.0	12.8	14.7	16.5	18.3	22.0	27.5	33.0	38.5	44.0
Min Dead Load Force (kips)		8.2	11.8	16.0	20.9	26.5	32.7	47.1	73.6	106.0	144.3	188.5
Pier Submerged Dead Load		1.1	1.6	2.2	2.9	3.6	4.5	6.5	10.1	14.6	19.9	25.9
Net min DL - Pier DL		7.1	10.2	13.8	18.1	22.9	28.2	40.6	63.5	91.4	124.4	162.5
Side Shear for Min Dead Load (kip/ft of depth in bedrock)		4.6	5.5	6.4	7.3	8.2	9.2	11.0	13.7	16.5	19.2	22.0
Addl Penn with no Applied DL		1.5	1.8	2.2	2.5	2.8	3.1	3.7	4.6	5.5	6.5	7.4
Uplift Resisting Shear in Bedrock (kip/ft of depth in bedrock)		6.9	8.2	9.6	11.0	12.4	13.7	16.5	20.6	24.7	28.9	33.0

CONSULTING ENGINEERS

Project: 910 28th Street Date: 6/24/2011 Job No.: 15100

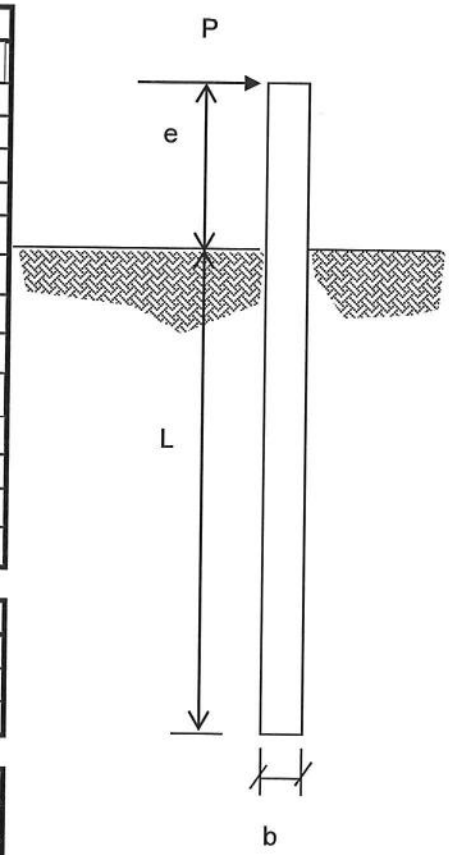
Client: SA+R By: JMT Sheet of

LATERAL LOADING OF PIERS - Broms Method (ACI 336.3R-93)

Soil Parameters			
Soil Type		Cohesive	
Undrained Shear Strength	c = qu/2	4	ksf
Vertical Subgrade Reaction	ks1	800	kcf
		27.5	
		0.11	
		35.0	

Description
16" diameter pier

Pier Definition			
Pier Type		Fixed-Head	
Maximum Allowable Deflection		0.50	in
P applied		39.00	k
Height of Pier above Ground	e	0	ft
Length of Pier below Ground	L	25	ft
Pier Diameter	b	1.3	ft
Moment of Inertia	I	3,467	in^4
Concrete Strength	f'_c	3,000	psi
Modulus of Elasticity	E_c	3,122	ksi
Reinforcement #/size		4	#8
Steel Strength	f_y	60	ksi
Cover		3.38	in
Moment Yield Strength of Pier	M_y	**83.66**	k-ft
Shear Strength	ϕV_c	16.83	k



Intermediate Values			
Depth of Max. Moment		10.5	ft
Depth of Max. Moment-1.5b	f	8.5	ft
L-1.5b-f	g	14.5	ft

Calculated Capacity			
Ultimate Lateral Load	P_u	**62.99**	**k**
Load Factor		1.6	
Allowable Lateral Load	P_a	**39.37**	**k**
'Long' Pier	**Plastic Hinge @ Depth of Mmax**		

Capacity Controls

Deflection			
Cohesive Deflection Coeff.	β	0.21	1/in
	βL	61.57	
Cohesionless Deflection Coeff.	η		
	ηL		
Allowable Lateral Load for Δ < 0.50 in		**74.71**	k

CONSULTING ENGINEERS

Project: 910 28th Street Date: 6/24/2011 Job No.: 15100

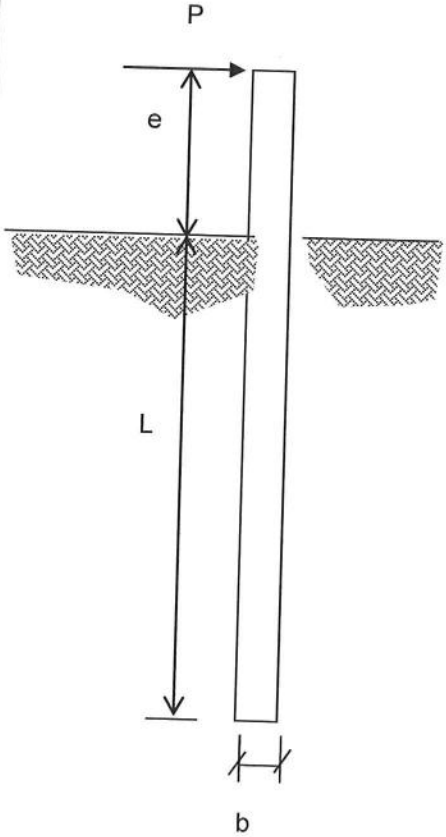
Client: SA+R By: JMT Sheet of

LATERAL LOADING OF PIERS - Broms Method (ACI 336.3R-93)

Soil Parameters			
Soil Type		Cohesive	
Undrained Shear Strength	c = qu/2	4	ksf
Vertical Subgrade Reaction	ks1	800	kcf
		27.5	
		0.11	
		35.0	

Description
18" diameter pier

Pier Definition			
Pier Type		Fixed-Head	
Maximum Allowable Deflection		0.50	in
P applied		49.00	k
Height of Pier above Ground	e	0	ft
Length of Pier below Ground	L	25	ft
Pier Diameter	b	1.5	ft
Moment of Inertia	I	5,538	in^4
Concrete Strength	f'_c	3,000	psi
Modulus of Elasticity	E_c	3,122	ksi
Reinforcement #/size		4	#8
Steel Strength	f_y	60	ksi
Cover		3.38	in
Moment Yield Strength of Pier	M_y	**118.46**	k-ft
Shear Strength	ϕV_c	**21.30**	k



Intermediate Values		
Depth of Max. Moment		10.5 ft
Depth of Max. Moment-1.5b	f	8.2 ft
L-1.5b-f	g	14.5 ft

Calculated Capacity		
Ultimate Lateral Load	P_u	**79.37 k**
Load Factor		1.6
Allowable Lateral Load	P_a	**49.61 k**
'Long' Pier	**Plastic Hinge @ Depth of Mmax**	

Capacity Controls

Deflection			
Cohesive Deflection Coeff.	β	0.18	1/in
	βL	54.76	
Cohesionless Deflection Coeff.	η		
	ηL		
Allowable Lateral Load for $\Delta <$ 0.50 in		**84.00**	k

Project: 910 28th Street Date: 6/24/2011 Job No.: 15100

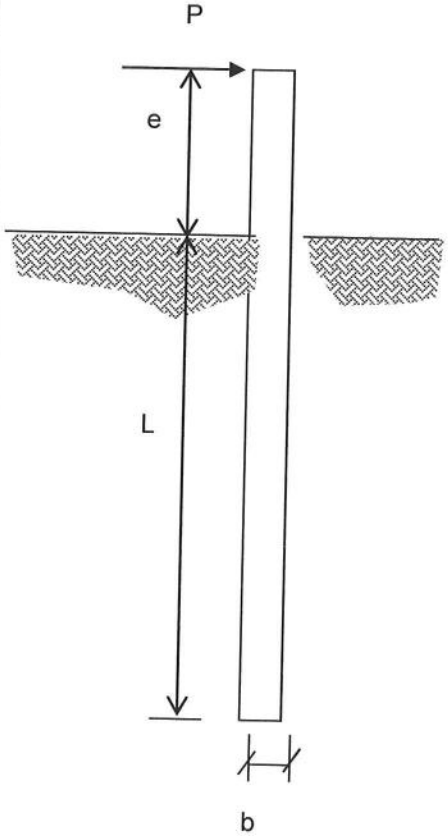
Client: SA+R By: JMT Sheet of

LATERAL LOADING OF PIERS - Broms Method (ACI 336.3R-93)

Soil Parameters			
Soil Type		Cohesive	
Undrained Shear Strength	c = qu/2	4	ksf
Vertical Subgrade Reaction	ks1	800	kcf
		27.5	
		0.11	
		35.0	

Description
24" diameter pier

Pier Definition			
Pier Type		Fixed-Head	
Maximum Allowable Deflection		0.50	in
P applied		91.00	k
Height of Pier above Ground	e	0	ft
Length of Pier below Ground	L	25	ft
Pier Diameter	b	2.0	ft
Moment of Inertia	I	17,739	in^4
Concrete Strength	f'_c	3,000	psi
Modulus of Elasticity	E_c	3,122	ksi
Reinforcement #/size		6	#8
Steel Strength	f_y	60	ksi
Cover		3.38	in
Moment Yield Strength of Pier	M_y	**295.47**	k-ft
Shear Strength	ϕV_c	**37.86**	k



Intermediate Values			
Depth of Max. Moment		10.6	ft
Depth of Max. Moment-1.5b	f	7.6	ft
L-1.5b-f	g	14.4	ft

Calculated Capacity			
Ultimate Lateral Load	P_u	**146.97**	**k**
Load Factor		1.6	
Allowable Lateral Load	P_a	**91.86**	**k**
'Long' Pier	**Plastic Hinge @ Depth of Mmax**		

Capacity Controls

Deflection			
Cohesive Deflection Coeff.	β	0.14	1/in
	βL	40.94	
Cohesionless Deflection Coeff.	η		
	ηL		
Allowable Lateral Load for $\Delta <$ 0.50 in		**112.37**	k

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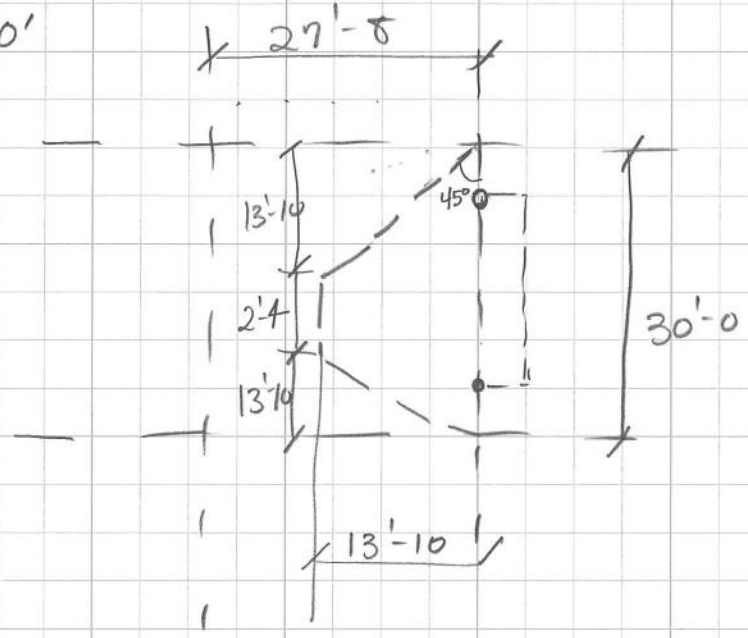
Date: _____ Page: ____ of ____
By: JMT Chkd By: _____
Job No: 15100
Project: 910 28th St
Client: SA+R
☐ Preliminary ☐ Final

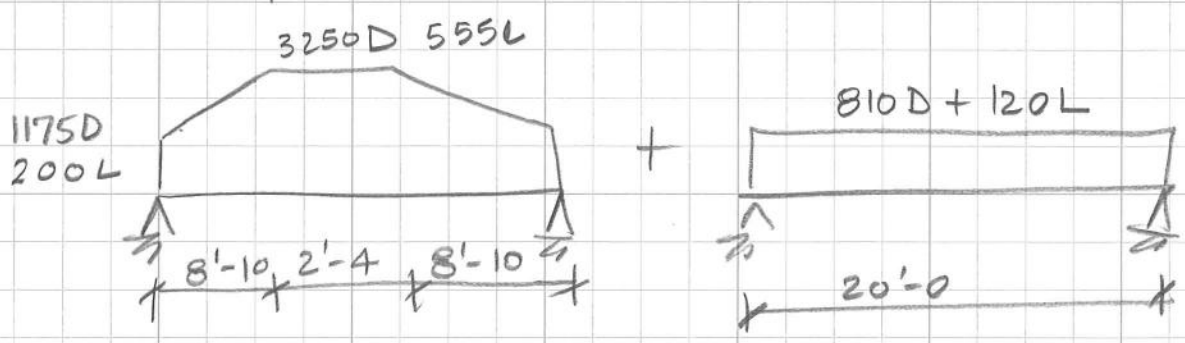
GARAGE ENTRY GB

40psf L
2 35psf D avg topping = 7"

t_w = 13'-8 inside t_w = 3' outside avg topping = 10 3/8 270psf D
40psf L

L = 20'





ends behave as fixed because full-height wall beyond

10"×2'-6 GB f'c = 4,000psi

$M_u^- = 179.5$ k·ft $M_u^+ = 96.5$ k·ft
$V_u = 49.6^k$

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Date: _____ Page: ____ of ____
By: JMT Chkd By: _____
Job No: 15100
Project: 910 28th St
Client: SAIR
☐ Preliminary ☐ Final

Angle support for patio slab

$w_u = 490$ plf $\quad w = 370$ plf

Need bearing width $f'_c = 4{,}000$ psi

of .02" ok

Use 4" horiz leg need $t \geq$ '8" ok

Titen HD shear

1/2" ø x 6 1/2 → 5 3/4 embed 3,225 allowable shear

edge distance = 1 3/4" reduction = .17 → 548#

Spacing no reduction = 8"

tension 3,910#

1 3/4" edge distance reduction = .73 → 2854#

Spacing no reduction = 8"

L 4x4 arm = 2" V = T

$$\left(\frac{V}{V_a}\right)^{5/3} + \left(\frac{T}{T_a}\right)^{5/3} \leq 1.0$$

$$\left(\frac{V}{548}\right)^{5/3} + \left(\frac{V}{2{,}854}\right)^{5/3} \leq 1.0$$

$$\left(\frac{1}{548}\right)^{5/3} V^{5/3} + \left(\frac{1}{2{,}854}\right)^{5/3} V^{5/3} \leq 1.0$$

$V \leq 528\#$ → 16" spacing

Two Way Slab Design

Cap Size		5 ft
	d	9.75 in
Slab Thickness	t	12 in
Ave Add Topp	t	3 in
Superimp Dead	D	5 psf
Live Load	L	40 psf
Factored Load	q_u	287 psf

q_c 150 pcf

Column Strip	Span	ft l_1	ft l_2	I or E	ft l_n	k*in Mo	ACI 318 Mom Dist Pos	Neg	A_s/ft Pos	Pos Col	Neg	in^2 Col A_s
B	1	16.5	28.3	E	14.0	2390	0.63	0.75	0.11	0.19	0.05	3.78
	2	11.7	28.3	I	6.7	542	0.35	0.65	0.01	0.02	0.01	0.56
	3	16.7	28.3	E	14.2	2449	0.63	0.75	0.11	0.19	0.05	3.88
C	1	16.5	28.3	E	14.0	2390	0.63	0.75	0.11	0.19	0.05	3.78
	2	30.0	28.3	I	25.0	7623	0.35	0.65	0.20	0.33	0.15	7.84
	3	16.5	28.3	E	14.0	2390	0.63	0.75	0.11	0.19	0.05	3.78
D	1	16.5	26.8	E	14.0	2264	0.63	0.75	0.11	0.19	0.05	3.58
	2	30.0	26.8	I	25.0	7220	0.35	0.65	0.20	0.33	0.15	7.43
	3	16.5	26.8	E	14.0	2264	0.63	0.75	0.11	0.19	0.05	3.58
E	1	16.5	26.0	E	14.0	2194	0.63	0.75	0.11	0.19	0.05	3.47
	2	30.0	26.0	I	25.0	6996	0.35	0.65	0.20	0.33	0.15	7.20
	3	16.5	26.0	E	14.0	2194	0.63	0.75	0.11	0.19	0.05	3.47
F	1	16.5	26.2	E	14.0	2211	0.63	0.75	0.11	0.19	0.05	3.50
	2	30.0	26.2	I	25.0	7049	0.35	0.65	0.20	0.33	0.15	7.25
	3	16.5	26.2	E	14.0	2211	0.63	0.75	0.11	0.19	0.05	3.50
2	1	23.0	23.5	E	20.5	4252	0.63	0.75	0.24	0.40	0.11	6.73
	2	27.0	23.5	I	22.0	4897	0.35	0.65	0.15	0.26	0.11	5.04
	3	26.7	23.5	I	21.7	4749	0.35	0.65	0.15	0.25	0.11	4.89
	4	25.3	23.5	I	20.3	4181	0.35	0.65	0.13	0.22	0.10	4.30
	5	27.1	23.5	E	24.6	6114	0.63	0.75	0.35	0.58	0.16	9.68
3	1	21.0	23.5	E	18.5	3462	0.63	0.75	0.20	0.33	0.09	5.48
	2	29.7	23.5	I	24.7	6156	0.35	0.65	0.19	0.32	0.14	6.33
	3	27.0	23.5	I	22.0	4897	0.35	0.65	0.15	0.26	0.11	5.04
	4	26.7	23.5	I	21.7	4749	0.35	0.65	0.15	0.25	0.11	4.89
	5	25.3	23.5	I	20.3	4181	0.35	0.65	0.13	0.22	0.10	4.30
	6	27.1	23.5	E	24.6	6114	0.63	0.75	0.35	0.58	0.16	9.68

CONSULTING ENGINEERS
www.jvajva.com

☐ Boulder, CO Ph 303.444.1951 Fax 303.444.1957
☐ Fort Collins, CO Ph 970.225.9099 Fax 970.225.6923
☐ Winter Park, CO Ph 970.722.7677 Fax 970.722.7679

Date: _____ Page: ____ of ____
By: BTW Chkd By: _____
Job No: 15100
Project: _____
Client: _____
☐ Preliminary ☐ Final

Typ. Bottom Reinf.:

$q_u = 290$ psf $\quad d = 9.75$

$l_n = 30' - 5 = 25' \quad l_2 = 26'$ Ave.

$$M = \frac{290(26)(25)^2}{8} = 589.0 \rightarrow 1069^{k\cdot in}$$

Int Pos $M_b = .35(1069) = 374^{k\cdot in}$

$$A_s = \frac{374}{.9^2(60)9.75} = 5.22^{in^2}$$

$$A_s^{1ft} = 5.22/26' = .200$$

#5@15" → $.206^{in^2}$

CONSULTING ENGINEERS

910 28TH STREET

FLOOR FRAMING

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Column

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : First Floor 2x4 Stud @ 12"

General Information

Calculations per 2005 NDS, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
End Fixities Top & Bottom Pinned
Overall Column Height 10.0 ft
(Used for non-slender calculations)

Wood Species Hem Fir
Wood Grade No.2

Fb - Tension	850 psi	Fv	150 psi
Fb - Compr	850 psi	Ft	525 psi
Fc - Prll	1300 psi	Density	27.7 pcf
Fc - Perp	405 psi		

E : Modulus of Elasticity . . .

	x-x Bending	y-y Bending	Axial
Basic	1300	1300	1300 ksi
Minimum	470	470	

Load Combination 2006 IBC & ASCE 7-05

Wood Section Name **2x4**
Wood Grading/Manuf. Graded Lumber
Wood Member Type Sawn

Exact Width	**1.50**	in
Exact Depth	**3.50**	in
Area	5.250	in^2
Ix	5.359	in^4
Iy	0.9844	in^4

Allowable Stress Modification Factors

Cf or Cv for Bending	1.50	
Cf or Cv for Compression	1.150	
Cf or Cv for Tension	1.50	
Cm : Wet Use Factor	1.0	
Ct : Temperature Factor	1.0	
Cfu : Flat Use Factor	1.0	
Kf : Built-up columns	1.0	NDS 15.3.2
Use Cr : Repetitive ?	No	(non-glb only)

Brace condition for deflection (buckling) along columns :
X-X (width) axis : Unbraced Length for X-X Axis buckling = .667 ft, K = 1.0
Y-Y (depth) axis :Unbraced Length for Y-Y Axis buckling = 9.33 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

AXIAL LOADS . . .
Axial Load at 10.0 ft, D = 0.720, L = 0.960 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.8918 : 1**

Load Combination	+D+L+H
Governing NDS Formla	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are . . .	
Applied Axial	1.680 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	358.83 psi

PASS Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+D+0.750L+0.750S+0.5250E+H
Location of max.above base	10.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	150.0 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y 0.0 in at ft above base
for load combination :
Along X-X in at ft above base
for load combination :

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension
Cf or Cv : Size based factors	1.500	1.150	

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio	Status	Location

Maximum Reactions - Unfactored

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		Y-Y Axis Reaction		Axial Reaction
	@ Base	@ Top	@ Base	@ Top	@ Base

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Column

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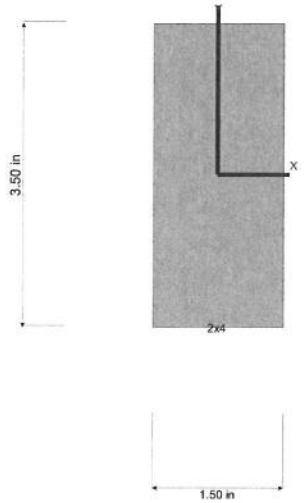
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : First Floor 2x4 Stud @ 12"

Sketches



Loads are total entered value. Arrows do not reflect absolute direction.

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Garden Terrace Door Header

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

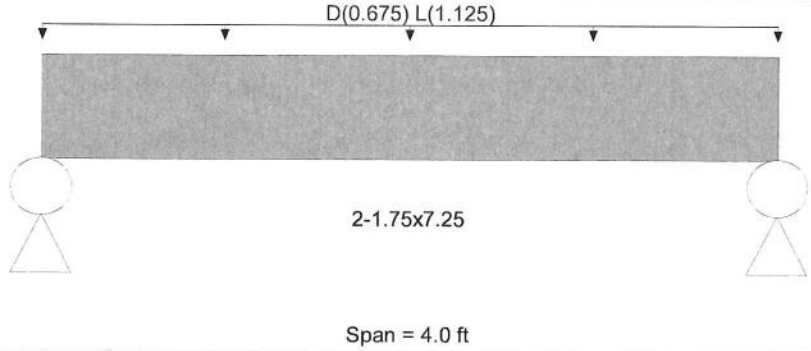
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0750, L = 0.1250 ksf, Tributary Width = 9.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.542 : 1	Maximum Shear Stress Ratio	=	0.523 : 1
Section used for this span		**2-1.75x7.25**	Section used for this span		**2-1.75x7.25**
fb : Actual	=	1,408.93 psi	fv : Actual	=	148.97 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	2.000 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.031 in	Ratio =	1551
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.049 in	Ratio =	969
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 4.0 ft	1	0.203	0.196	1.000	1.000	1.000	1.000	1.000	1.35	528.35	2,600.00	0.95	55.86	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.542	0.523	1.000	1.000	1.000	1.000	1.000	3.60	1,408.93	2,600.00	2.52	148.97	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.457	0.441	1.000	1.000	1.000	1.000	1.000	3.04	1,188.79	2,600.00	2.13	125.69	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.457	0.441	1.000	1.000	1.000	1.000	1.000	3.04	1,188.79	2,600.00	2.13	125.69	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.457	0.441	1.000	1.000	1.000	1.000	1.000	3.04	1,188.79	2,600.00	2.13	125.69	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.457	0.441	1.000	1.000	1.000	1.000	1.000	3.04	1,188.79	2,600.00	2.13	125.69	285.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.457	0.441	1.000	1.000	1.000	1.000	1.000	3.04	1,188.79	2,600.00	2.13	125.69	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.457	0.441	1.000	1.000	1.000	1.000	1.000	3.04	1,188.79	2,600.00	2.13	125.69	285.00

Wood Beam

Description : Garden Terrace Door Header

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.0495	2.020		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.600	3.600
D Only	1.350	1.350
L Only	2.250	2.250
D+L	3.600	3.600

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Garden Terrace GB 1

Material Properties

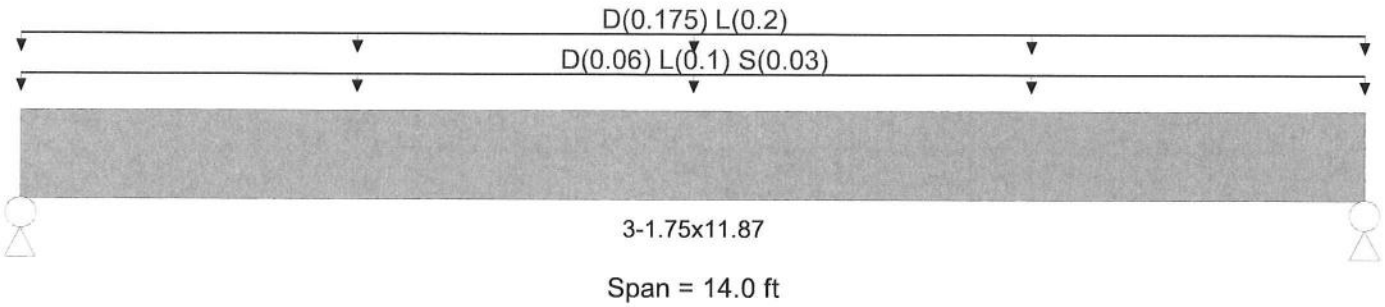
Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi	*E : Modulus of Elasticity*	
Fb - Compr	2,600.0 psi	Ebend- xx	1,900.0 ksi
Fc - Prll	2,510.0 psi	Eminbend - xx	965.71 ksi
Fc - Perp	750.0 psi		
Fv	285.0 psi		
Ft	1,555.0 psi	Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.060, L = 0.10, S = 0.030 ksf, Tributary Width = 1.0 ft
Uniform Load : D = 0.0350, L = 0.040 ksf, Tributary Width = 5.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.503 : 1	Maximum Shear Stress Ratio	=	0.279 : 1
Section used for this span		**3-1.75x11.87**	Section used for this span		**3-1.75x11.87**
fb : Actual	=	1,307.98 psi	fv : Actual	=	79.51 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	7.000 ft	Location of maximum on span	=	13.020 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.207 in	Ratio =	813
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.362 in	Ratio =	463
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 14.0 ft	1	0.228	0.127	1.000	1.000	1.000	1.000	1.000	6.10	593.17	2,600.00	1.50	36.06	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 14.0 ft	1	0.503	0.279	1.000	1.000	1.000	1.000	1.000	13.45	1,307.98	2,600.00	3.30	79.51	285.00
+D+S+H					1.000	1.000	1.000	1.000						
Length = 14.0 ft	1	0.256	0.142	1.000	1.000	1.000	1.000	1.000	6.83	664.65	2,600.00	1.68	40.40	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 14.0 ft	1	0.434	0.241	1.000	1.000	1.000	1.000	1.000	11.61	1,129.28	2,600.00	2.85	68.65	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 14.0 ft	1	0.455	0.252	1.000	1.000	1.000	1.000	1.000	12.16	1,182.89	2,600.00	2.99	71.91	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 14.0 ft	1	0.434	0.241	1.000	1.000	1.000	1.000	1.000	11.61	1,129.28	2,600.00	2.85	68.65	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 14.0 ft	1	0.455	0.252	1.000	1.000	1.000	1.000	1.000	12.16	1,182.89	2,600.00	2.99	71.91	285.00

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Garden Terrace GB 1

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 14.0 ft	1	0.434	0.241	1.000	1.000	1.000	1.000	1.000	11.61	1,129.28	2,600.00	2.85	68.65	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 14.0 ft	1	0.455	0.252	1.000	1.000	1.000	1.000	1.000	12.16	1,182.89	2,600.00	2.99	71.91	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L+S	1	0.3624	7.070		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.053	4.053
D Only	1.743	1.743
L Only	2.100	2.100
S Only	0.210	0.210
L+S	2.310	2.310
D+L	3.843	3.843
D+S	1.953	1.953
D+L+S	4.053	4.053

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 **Licensee : jva**

Description : Garden Terrace GB 2

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

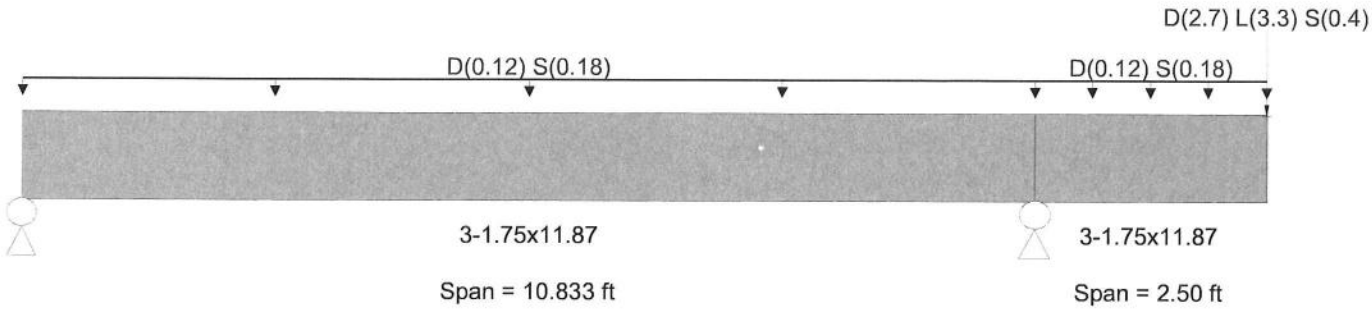
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 6.0 ft
Load for Span Number 2
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 6.0 ft
Point Load : D = 2.70, L = 3.30, S = 0.40 k @ 2.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.577 : 1	Maximum Shear Stress Ratio	=	0.524 : 1
Section used for this span		**3-1.75x11.87**	Section used for this span		**3-1.75x11.87**
fb : Actual	=	1,499.51 psi	fv : Actual	=	149.26 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	10.833 ft	Location of maximum on span	=	10.833 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.114 in	Ratio =	526
Max Upward L+Lr+S Deflection	-0.078 in	Ratio =	1669
Max Downward Total Deflection	0.190 in	Ratio =	314
Max Upward Total Deflection	-0.116 in	Ratio =	1116

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 10.833 ft	1	0.268	0.245	1.000	1.000	1.000	1.000	1.000	-7.17	697.17	2,600.00	2.90	69.86	285.00
Length = 2.50 ft	2	0.268	0.245	1.000	1.000	1.000	1.000	1.000	-7.17	697.17	2,600.00	2.90	69.86	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 10.833 ft	1	0.577	0.524	1.000	1.000	1.000	1.000	1.000	-15.42	1,499.51	2,600.00	6.20	149.26	285.00
Length = 2.50 ft	2	0.577	0.524	1.000	1.000	1.000	1.000	1.000	-15.42	1,499.51	2,600.00	6.20	149.26	285.00
+D+S+H					1.000	1.000	1.000	1.000						
Length = 10.833 ft	1	0.327	0.302	1.000	1.000	1.000	1.000	1.000	-8.73	849.13	2,600.00	3.58	86.06	285.00
Length = 2.50 ft	2	0.327	0.302	1.000	1.000	1.000	1.000	1.000	-8.73	849.13	2,600.00	3.58	86.06	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 **Licensee : jva**

Description : Garden Terrace GB 2

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
Length = 10.833 ft	1	0.500	0.454	1.000	1.000	1.000	1.000	1.000	-13.36	1,298.93	2,600.00	5.38	129.41	285.00
Length = 2.50 ft	2	0.500	0.454	1.000	1.000	1.000	1.000	1.000	-13.36	1,298.93	2,600.00	5.38	129.41	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 10.833 ft	1	0.543	0.497	1.000	1.000	1.000	1.000	1.000	-14.53	1,412.90	2,600.00	5.88	141.56	285.00
Length = 2.50 ft	2	0.543	0.497	1.000	1.000	1.000	1.000	1.000	-14.53	1,412.90	2,600.00	5.88	141.56	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 10.833 ft	1	0.500	0.454	1.000	1.000	1.000	1.000	1.000	-13.36	1,298.93	2,600.00	5.38	129.41	285.00
Length = 2.50 ft	2	0.500	0.454	1.000	1.000	1.000	1.000	1.000	-13.36	1,298.93	2,600.00	5.38	129.41	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 10.833 ft	1	0.543	0.497	1.000	1.000	1.000	1.000	1.000	-14.53	1,412.90	2,600.00	5.88	141.56	285.00
Length = 2.50 ft	2	0.543	0.497	1.000	1.000	1.000	1.000	1.000	-14.53	1,412.90	2,600.00	5.88	141.56	285.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 10.833 ft	1	0.500	0.454	1.000	1.000	1.000	1.000	1.000	-13.36	1,298.93	2,600.00	5.38	129.41	285.00
Length = 2.50 ft	2	0.500	0.454	1.000	1.000	1.000	1.000	1.000	-13.36	1,298.93	2,600.00	5.38	129.41	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 10.833 ft	1	0.543	0.497	1.000	1.000	1.000	1.000	1.000	-14.53	1,412.90	2,600.00	5.88	141.56	285.00
Length = 2.50 ft	2	0.543	0.497	1.000	1.000	1.000	1.000	1.000	-14.53	1,412.90	2,600.00	5.88	141.56	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	D+L	-0.1164	6.500
D+L	2	0.1901	2.500		0.0000	6.500

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	0.895	10.453	
D Only	0.064	4.422	
L Only	-0.762	4.062	
S Only	0.831	1.969	
L+S	0.069	6.031	
D+L	-0.698	8.484	
D+S	0.895	6.391	
D+L+S	0.133	10.453	

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Garden Terrace GB 3

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

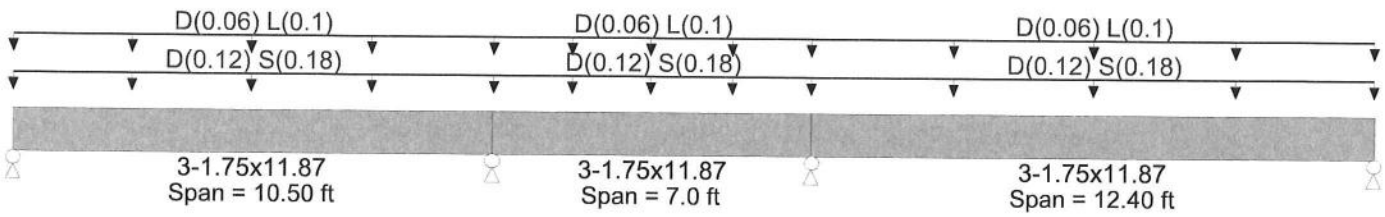
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads

Load for Span Number 1
- Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 6.0 ft
- Uniform Load : D = 0.060, L = 0.10 ksf, Tributary Width = 1.0 ft

Load for Span Number 2
- Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 6.0 ft
- Uniform Load : D = 0.060, L = 0.10 ksf, Tributary Width = 1.0 ft

Load for Span Number 3
- Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 6.0 ft
- Uniform Load : D = 0.060, L = 0.10 ksf, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.200 : 1	Maximum Shear Stress Ratio	=	0.215 : 1
Section used for this span		**3-1.75x11.87**	Section used for this span		**3-1.75x11.87**
fb : Actual	=	520.77 psi	fv : Actual	=	61.32 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+0.750L+0.750S+H	Load Combination		+D+0.750L+0.750S+H
Location of maximum on span	=	7.220 ft	Location of maximum on span	=	7.000 ft
Span # where maximum occurs	=	Span # 3	Span # where maximum occurs	=	Span # 2

Maximum Deflection

Max Downward L+Lr+S Deflection	0.065 in	Ratio =	2296
Max Upward L+Lr+S Deflection	-0.012 in	Ratio =	6985
Max Downward Total Deflection	0.110 in	Ratio =	1356
Max Upward Total Deflection	-0.020 in	Ratio =	4126

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 10.50 ft	1	0.073	0.083	1.000	1.000	1.000	1.000	1.000	1.94	189.05	2,600.00	0.99	23.76	285.00
Length = 7.0 ft	2	0.095	0.103	1.000	1.000	1.000	1.000	1.000	-2.53	245.80	2,600.00	1.22	29.44	285.00
Length = 12.40 ft	3	0.096	0.103	1.000	1.000	1.000	1.000	1.000	2.57	250.03	2,600.00	1.22	29.44	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.110	0.126	1.000	1.000	1.000	1.000	1.000	2.95	286.52	2,600.00	1.50	36.01	285.00

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8
Lic. # : KW-06003165
Licensee : jva

Description : Garden Terrace GB 3

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_r	C_m	C_t	Summary of Moment Values Mactual	fb-design	Fb-allow	Summary of Shear Values Vactual	fv-design	Fv-allow
Length = 7.0 ft	2	0.143	0.157	1.000	1.000	1.000	1.000	1.000	-3.83	372.53	2,600.00	1.85	44.62	285.00
Length = 12.40 ft	3	0.146	0.157	1.000	1.000	1.000	1.000	1.000	3.90	378.95	2,600.00	1.85	44.62	285.00
+D+S+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.140	0.161	1.000	1.000	1.000	1.000	1.000	3.75	364.50	2,600.00	1.90	45.82	285.00
Length = 7.0 ft	2	0.182	0.199	1.000	1.000	1.000	1.000	1.000	-4.87	473.92	2,600.00	2.36	56.76	285.00
Length = 12.40 ft	3	0.185	0.199	1.000	1.000	1.000	1.000	1.000	4.96	482.09	2,600.00	2.36	56.76	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.101	0.116	1.000	1.000	1.000	1.000	1.000	2.70	262.15	2,600.00	1.37	32.95	285.00
Length = 7.0 ft	2	0.131	0.143	1.000	1.000	1.000	1.000	1.000	-3.50	340.85	2,600.00	1.70	40.83	285.00
Length = 12.40 ft	3	0.133	0.143	1.000	1.000	1.000	1.000	1.000	3.57	346.72	2,600.00	1.70	40.83	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.151	0.174	1.000	1.000	1.000	1.000	1.000	4.05	393.74	2,600.00	2.06	49.49	285.00
Length = 7.0 ft	2	0.197	0.215	1.000	1.000	1.000	1.000	1.000	-5.26	511.94	2,600.00	2.55	61.32	285.00
Length = 12.40 ft	3	0.200	0.215	1.000	1.000	1.000	1.000	1.000	5.35	520.77	2,600.00	2.55	61.32	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.101	0.116	1.000	1.000	1.000	1.000	1.000	2.70	262.15	2,600.00	1.37	32.95	285.00
Length = 7.0 ft	2	0.131	0.143	1.000	1.000	1.000	1.000	1.000	-3.50	340.85	2,600.00	1.70	40.83	285.00
Length = 12.40 ft	3	0.133	0.143	1.000	1.000	1.000	1.000	1.000	3.57	346.72	2,600.00	1.70	40.83	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.151	0.174	1.000	1.000	1.000	1.000	1.000	4.05	393.74	2,600.00	2.06	49.49	285.00
Length = 7.0 ft	2	0.197	0.215	1.000	1.000	1.000	1.000	1.000	-5.26	511.94	2,600.00	2.55	61.32	285.00
Length = 12.40 ft	3	0.200	0.215	1.000	1.000	1.000	1.000	1.000	5.35	520.77	2,600.00	2.55	61.32	285.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.101	0.116	1.000	1.000	1.000	1.000	1.000	2.70	262.15	2,600.00	1.37	32.95	285.00
Length = 7.0 ft	2	0.131	0.143	1.000	1.000	1.000	1.000	1.000	-3.50	340.85	2,600.00	1.70	40.83	285.00
Length = 12.40 ft	3	0.133	0.143	1.000	1.000	1.000	1.000	1.000	3.57	346.72	2,600.00	1.70	40.83	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.151	0.174	1.000	1.000	1.000	1.000	1.000	4.05	393.74	2,600.00	2.06	49.49	285.00
Length = 7.0 ft	2	0.197	0.215	1.000	1.000	1.000	1.000	1.000	-5.26	511.94	2,600.00	2.55	61.32	285.00
Length = 12.40 ft	3	0.200	0.215	1.000	1.000	1.000	1.000	1.000	5.35	520.77	2,600.00	2.55	61.32	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L+S	1	0.0619	4.918		0.0000	0.000
	2	0.0000	4.918	D+L+S	-0.0204	3.899
D+L+S	3	0.1097	6.749		0.0000	3.899

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	2.122	4.180	5.428	2.440
D Only	0.868	1.711	2.221	0.999
L Only	0.448	0.882	1.145	0.515
S Only	0.806	1.588	2.062	0.927
L+S	1.254	2.470	3.207	1.442
D+L	1.316	2.593	3.367	1.514
D+S	1.674	3.298	4.283	1.925
D+L+S	2.122	4.180	5.428	2.440

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 Licensee : jva

Description : Garden Terrace GB 4

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

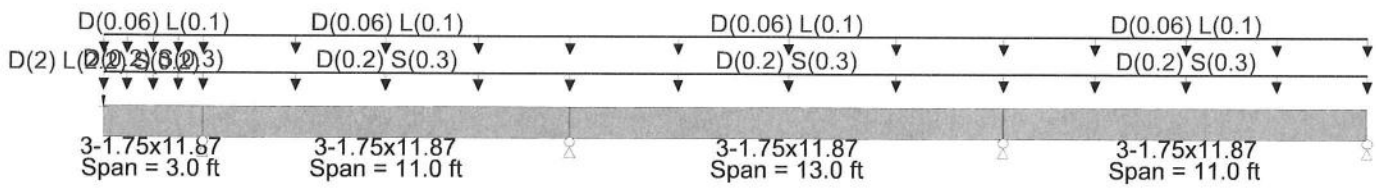
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 10.0 ft
Uniform Load : D = 0.060, L = 0.10 ksf, Tributary Width = 1.0 ft
Point Load : D = 2.0, L = 2.20, S = 0.20 k @ 0.0 ft
Load for Span Number 2
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 10.0 ft
Uniform Load : D = 0.060, L = 0.10 ksf, Tributary Width = 1.0 ft
Load for Span Number 3
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 10.0 ft
Uniform Load : D = 0.060, L = 0.10 ksf, Tributary Width = 1.0 ft
Load for Span Number 4
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 10.0 ft
Uniform Load : D = 0.060, L = 0.10 ksf, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.534 : 1	Maximum Shear Stress Ratio	=	0.419 : 1
Section used for this span		**3-1.75x11.87**	Section used for this span		**3-1.75x11.87**
fb : Actual	=	1,389.05 psi	fv : Actual	=	119.33 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+L+H	Load Combination		+D+0.750L+0.750S+H
Location of maximum on span	=	3.000 ft	Location of maximum on span	=	2.020 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.100 in	Ratio =	720
Max Upward L+Lr+S Deflection	-0.046 in	Ratio =	2888
Max Downward Total Deflection	0.183 in	Ratio =	392
Max Upward Total Deflection	-0.075 in	Ratio =	1771

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 3.0 ft	1	0.271	0.216	1.000	1.000	1.000	1.000	1.000	-7.23	703.41	2,600.00	2.55	61.44	285.00

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Job # 15100

Project Notes :

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 **Licensee : jva**

Description : Garden Terrace GB 4

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_r	C_m	C_t	Summary of Moment Values Mactual	fb-design	Fb-allow	Summary of Shear Values Vactual	fv-design	Fv-allow
Length = 11.0 ft	2	0.271	0.216	1.000	1.000	1.000	1.000	1.000	-7.23	703.41	2,600.00	1.72	61.44	285.00
Length = 13.0 ft	3	0.166	0.216	1.000	1.000	1.000	1.000	1.000	-4.45	432.33	2,600.00	1.74	61.44	285.00
Length = 11.0 ft	4	0.166	0.216	1.000	1.000	1.000	1.000	1.000	-4.45	432.33	2,600.00	1.66	61.44	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 3.0 ft	1	0.534	0.418	1.000	1.000	1.000	1.000	1.000	-14.28	1,389.05	2,600.00	4.96	119.23	285.00
Length = 11.0 ft	2	0.534	0.418	1.000	1.000	1.000	1.000	1.000	-14.28	1,389.05	2,600.00	2.85	119.23	285.00
Length = 13.0 ft	3	0.238	0.418	1.000	1.000	1.000	1.000	1.000	-6.36	618.88	2,600.00	2.48	119.23	285.00
Length = 11.0 ft	4	0.238	0.418	1.000	1.000	1.000	1.000	1.000	-6.36	618.88	2,600.00	2.30	119.23	285.00
+D+S+H					1.000	1.000	1.000	1.000						
Length = 3.0 ft	1	0.343	0.284	1.000	1.000	1.000	1.000	1.000	-9.18	893.06	2,600.00	3.36	80.83	285.00
Length = 11.0 ft	2	0.343	0.284	1.000	1.000	1.000	1.000	1.000	-9.18	893.06	2,600.00	3.05	80.83	285.00
Length = 13.0 ft	3	0.333	0.295	1.000	1.000	1.000	1.000	1.000	-8.91	866.89	2,600.00	3.50	84.11	285.00
Length = 11.0 ft	4	0.333	0.295	1.000	1.000	1.000	1.000	1.000	-8.91	866.89	2,600.00	3.45	84.11	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 3.0 ft	1	0.468	0.368	1.000	1.000	1.000	1.000	1.000	-12.52	1,217.64	2,600.00	4.36	104.78	285.00
Length = 11.0 ft	2	0.468	0.368	1.000	1.000	1.000	1.000	1.000	-12.52	1,217.64	2,600.00	2.57	104.78	285.00
Length = 13.0 ft	3	0.220	0.368	1.000	1.000	1.000	1.000	1.000	-5.88	572.24	2,600.00	2.29	104.78	285.00
Length = 11.0 ft	4	0.220	0.368	1.000	1.000	1.000	1.000	1.000	-5.88	572.24	2,600.00	2.14	104.78	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 3.0 ft	1	0.523	0.419	1.000	1.000	1.000	1.000	1.000	-13.98	1,359.87	2,600.00	4.96	119.33	285.00
Length = 11.0 ft	2	0.523	0.419	1.000	1.000	1.000	1.000	1.000	-13.98	1,359.87	2,600.00	3.47	119.33	285.00
Length = 13.0 ft	3	0.345	0.419	1.000	1.000	1.000	1.000	1.000	-9.24	898.16	2,600.00	3.61	119.33	285.00
Length = 11.0 ft	4	0.345	0.419	1.000	1.000	1.000	1.000	1.000	-9.24	898.16	2,600.00	3.48	119.33	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 3.0 ft	1	0.468	0.368	1.000	1.000	1.000	1.000	1.000	-12.52	1,217.64	2,600.00	4.36	104.78	285.00
Length = 11.0 ft	2	0.468	0.368	1.000	1.000	1.000	1.000	1.000	-12.52	1,217.64	2,600.00	2.57	104.78	285.00
Length = 13.0 ft	3	0.220	0.368	1.000	1.000	1.000	1.000	1.000	-5.88	572.24	2,600.00	2.29	104.78	285.00
Length = 11.0 ft	4	0.220	0.368	1.000	1.000	1.000	1.000	1.000	-5.88	572.24	2,600.00	2.14	104.78	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 3.0 ft	1	0.523	0.419	1.000	1.000	1.000	1.000	1.000	-13.98	1,359.87	2,600.00	4.96	119.33	285.00
Length = 11.0 ft	2	0.523	0.419	1.000	1.000	1.000	1.000	1.000	-13.98	1,359.87	2,600.00	3.47	119.33	285.00
Length = 13.0 ft	3	0.345	0.419	1.000	1.000	1.000	1.000	1.000	-9.24	898.16	2,600.00	3.61	119.33	285.00
Length = 11.0 ft	4	0.345	0.419	1.000	1.000	1.000	1.000	1.000	-9.24	898.16	2,600.00	3.48	119.33	285.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 3.0 ft	1	0.468	0.368	1.000	1.000	1.000	1.000	1.000	-12.52	1,217.64	2,600.00	4.36	104.78	285.00
Length = 11.0 ft	2	0.468	0.368	1.000	1.000	1.000	1.000	1.000	-12.52	1,217.64	2,600.00	2.57	104.78	285.00
Length = 13.0 ft	3	0.220	0.368	1.000	1.000	1.000	1.000	1.000	-5.88	572.24	2,600.00	2.29	104.78	285.00
Length = 11.0 ft	4	0.220	0.368	1.000	1.000	1.000	1.000	1.000	-5.88	572.24	2,600.00	2.14	104.78	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 3.0 ft	1	0.523	0.419	1.000	1.000	1.000	1.000	1.000	-13.98	1,359.87	2,600.00	4.96	119.33	285.00
Length = 11.0 ft	2	0.523	0.419	1.000	1.000	1.000	1.000	1.000	-13.98	1,359.87	2,600.00	3.47	119.33	285.00
Length = 13.0 ft	3	0.345	0.419	1.000	1.000	1.000	1.000	1.000	-9.24	898.16	2,600.00	3.61	119.33	285.00
Length = 11.0 ft	4	0.345	0.419	1.000	1.000	1.000	1.000	1.000	-9.24	898.16	2,600.00	3.48	119.33	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.1830	0.000		0.0000	0.000
	2	0.0000	0.000	D+L	-0.0745	4.041
D+L+S	3	0.0970	6.102		0.0000	4.041
D+L+S	4	0.0605	6.510	D+L	-0.0011	0.449

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4	Support 5
Overall MAXimum		11.083	6.740	9.464	2.722
D Only		4.789	2.652	3.866	1.103
L Only		3.718	0.362	1.545	0.376
S Only		2.577	3.726	4.053	1.244
L+S		6.295	4.088	5.598	1.619
D+L		8.507	3.014	5.411	1.478
D+S		7.365	6.379	7.920	2.346

Wood Beam

Description : Garden Terrace GB 4

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4	Support 5
D+L+S		11.083	6.740	9.464	2.722

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Typical Flush Floor Header

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

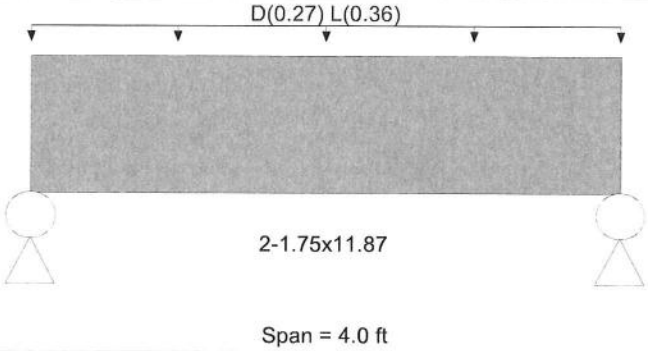
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.030, L = 0.040 ksf, Tributary Width = 9.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.072 : 1	Maximum Shear Stress Ratio	=	0.083 : 1
Section used for this span		**2-1.75x11.87**	Section used for this span		**2-1.75x11.87**
fb : Actual	=	186.52 psi	fv : Actual	=	23.53 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	2.000 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.002 in	Ratio =	21310
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.004 in	Ratio =	12000
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 4.0 ft	1	0.031	0.036	1.000	1.000	1.000	1.000	1.000	0.56	81.49	2,600.00	0.28	10.28	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.072	0.083	1.000	1.000	1.000	1.000	1.000	1.28	186.52	2,600.00	0.65	23.53	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.062	0.071	1.000	1.000	1.000	1.000	1.000	1.10	160.26	2,600.00	0.56	20.22	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.062	0.071	1.000	1.000	1.000	1.000	1.000	1.10	160.26	2,600.00	0.56	20.22	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.062	0.071	1.000	1.000	1.000	1.000	1.000	1.10	160.26	2,600.00	0.56	20.22	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.062	0.071	1.000	1.000	1.000	1.000	1.000	1.10	160.26	2,600.00	0.56	20.22	285.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 4.0 ft	1	0.062	0.071	1.000	1.000	1.000	1.000	1.000	1.10	160.26	2,600.00	0.56	20.22	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Typical Flush Floor Header

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
Length = 4.0 ft	1	0.062	0.071	1.000	1.000	1.000	1.000	1.000	1.10	160.26	2,600.00	0.56	20.22	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.0040	2.020		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.279	1.279
D Only	0.559	0.559
L Only	0.720	0.720
D+L	1.279	1.279

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Job # 15100

Project Notes :

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Typical Header Supporting Flush Header

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

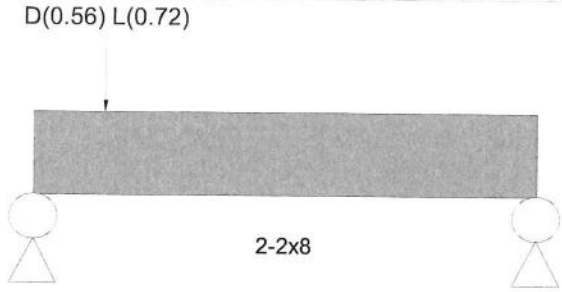
Wood Species : Douglas Fir - Larch
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	900.0 psi
Fb - Compr	900.0 psi
Fc - Prll	1,350.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	575.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	32.210 pcf



Span = 3.50 ft

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Point Load : D = 0.560, L = 0.720 k @ 0.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.233 : 1	Maximum Shear Stress Ratio	=	0.072 : 1
Section used for this span		**2-2x8**	Section used for this span		**2-2x8**
fb : Actual	=	251.54 psi	fv : Actual	=	13.00 psi
FB : Allowable	=	1,080.00 psi	Fv : Allowable	=	180.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	0.508 ft	Location of maximum on span	=	2.905 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.003 in	Ratio =	13363
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.006 in	Ratio =	7377
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 3.50 ft	1	0.103	0.033	1.000	1.200	1.000	1.000	1.000	0.24	111.00	1,080.00	0.09	5.90	180.00
+D+L+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.233	0.072	1.000	1.200	1.000	1.000	1.000	0.55	251.54	1,080.00	0.19	13.00	180.00
+D+0.750Lr+0.750L+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.200	0.062	1.000	1.200	1.000	1.000	1.000	0.47	216.40	1,080.00	0.16	11.22	180.00
+D+0.750L+0.750S+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.200	0.062	1.000	1.200	1.000	1.000	1.000	0.47	216.40	1,080.00	0.16	11.22	180.00
+D+0.750Lr+0.750L+0.750W+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.200	0.062	1.000	1.200	1.000	1.000	1.000	0.47	216.40	1,080.00	0.16	11.22	180.00
+D+0.750L+0.750S+0.750W+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.200	0.062	1.000	1.200	1.000	1.000	1.000	0.47	216.40	1,080.00	0.16	11.22	180.00
+D+0.750Lr+0.750L+0.5250E+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.200	0.062	1.000	1.200	1.000	1.000	1.000	0.47	216.40	1,080.00	0.16	11.22	180.00
+D+0.750L+0.750S+0.5250E+H					1.200	1.000	1.000	1.000						

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Job # 15100

Project Notes :

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Typical Header Supporting Flush Header

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
Length = 3.50 ft	1	0.200	0.062	1.000	1.200	1.000	1.000	1.000	0.47	216.40	1,080.00	0.16	11.22	180.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.0057	1.523		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.106	0.191
D Only	0.489	0.089
L Only	0.617	0.103
D+L	1.106	0.191

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Hallway Beam

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

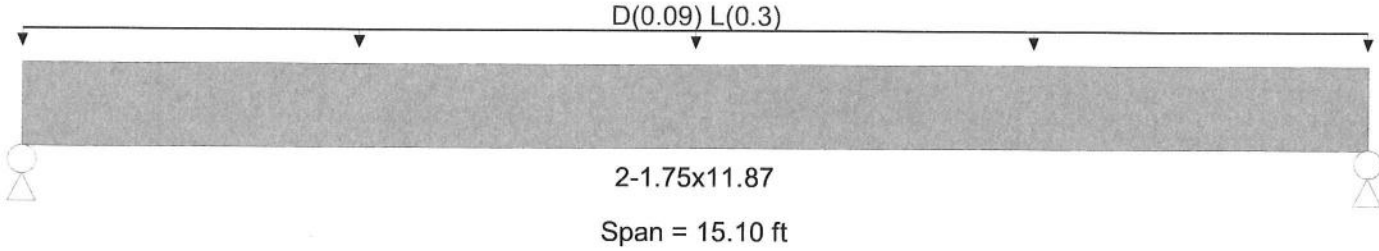
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.030, L = 0.10 ksf, Tributary Width = 3.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.624 : 1	Maximum Shear Stress Ratio	=	0.324 : 1
Section used for this span		2-1.75x11.87	Section used for this span		2-1.75x11.87
fb : Actual	=	1,621.53 psi	fv : Actual	=	92.45 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	7.550 ft	Location of maximum on span	=	14.119 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.381 in	Ratio =	475
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.496 in	Ratio =	365
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 15.10 ft	1	0.144	0.075	1.000	1.000	1.000	1.000	1.000	2.57	374.20	2,600.00	0.59	21.34	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 15.10 ft	1	0.624	0.324	1.000	1.000	1.000	1.000	1.000	11.12	1,621.53	2,600.00	2.56	92.45	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 15.10 ft	1	0.504	0.262	1.000	1.000	1.000	1.000	1.000	8.98	1,309.70	2,600.00	2.07	74.67	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 15.10 ft	1	0.504	0.262	1.000	1.000	1.000	1.000	1.000	8.98	1,309.70	2,600.00	2.07	74.67	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 15.10 ft	1	0.504	0.262	1.000	1.000	1.000	1.000	1.000	8.98	1,309.70	2,600.00	2.07	74.67	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 15.10 ft	1	0.504	0.262	1.000	1.000	1.000	1.000	1.000	8.98	1,309.70	2,600.00	2.07	74.67	285.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 15.10 ft	1	0.504	0.262	1.000	1.000	1.000	1.000	1.000	8.98	1,309.70	2,600.00	2.07	74.67	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 15.10 ft	1	0.504	0.262	1.000	1.000	1.000	1.000	1.000	8.98	1,309.70	2,600.00	2.07	74.67	285.00

Wood Beam

Description : Hallway Beam

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.4955	7.626		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.945	2.945
D Only	0.680	0.680
L Only	2.265	2.265
D+L	2.945	2.945

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Job # 15100

Project Notes :

Steel Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

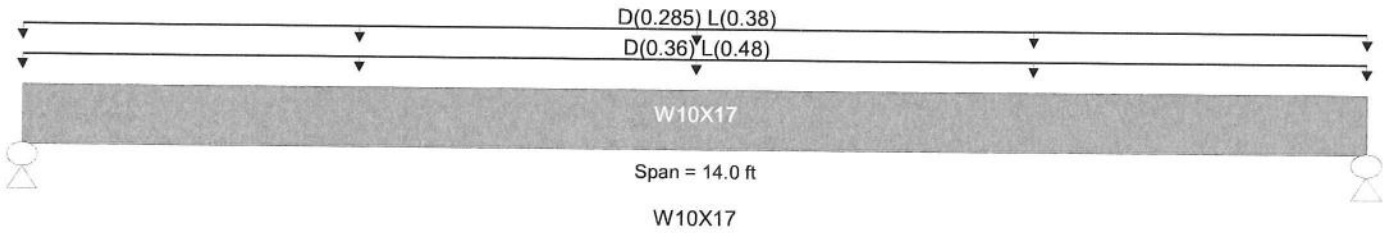
Description : 2nd Floor Transfer Beam

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



W10X17

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.030, L = 0.040 ksf, Tributary Width = 12.0 ft
Uniform Load : D = 0.030, L = 0.040 ksf, Tributary Width = 9.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.790 : 1	Maximum Shear Stress Ratio =	0.217 : 1
Section used for this span	W10X17	Section used for this span	W10X17
Mu : Applied	36.873 k-ft	Vu : Applied	10.535 k
Mn / Omega : Allowable	46.657 k-ft	Vn/Omega : Allowable	48.480 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	7.000ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.315 in	Ratio =	532
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.552 in	Ratio =	304
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope													
Dsgn. L = 14.00 ft +D	1	0.790	0.217	36.87		36.87	77.92	46.66	1.00	1.00	10.54	72.72	48.48
Dsgn. L = 14.00 ft +D+L+H	1	0.339	0.093	15.80		15.80	77.92	46.66	1.00	1.00	4.52	72.72	48.48
Dsgn. L = 14.00 ft +D+0.750Lr+0.750L+H	1	0.790	0.217	36.87		36.87	77.92	46.66	1.00	1.00	10.54	72.72	48.48
Dsgn. L = 14.00 ft +D+0.750L+0.750S+H	1	0.677	0.186	31.61		31.61	77.92	46.66	1.00	1.00	9.03	72.72	48.48
Dsgn. L = 14.00 ft +D+0.750Lr+0.750L+0.750W+H	1	0.677	0.186	31.61		31.61	77.92	46.66	1.00	1.00	9.03	72.72	48.48
Dsgn. L = 14.00 ft +D+0.750L+0.750S+0.750W+H	1	0.677	0.186	31.61		31.61	77.92	46.66	1.00	1.00	9.03	72.72	48.48
Dsgn. L = 14.00 ft +D+0.750Lr+0.750L+0.5250E+H	1	0.677	0.186	31.61		31.61	77.92	46.66	1.00	1.00	9.03	72.72	48.48
Dsgn. L = 14.00 ft +D+0.750L+0.750S+0.5250E+H	1	0.677	0.186	31.61		31.61	77.92	46.66	1.00	1.00	9.03	72.72	48.48
Dsgn. L = 14.00 ft	1	0.677	0.186	31.61		31.61	77.92	46.66	1.00	1.00	9.03	72.72	48.48

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.5521	7.070		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	10.535	10.535
D Only	4.515	4.515
L Only	6.020	6.020

Steel Beam

Description : 2nd Floor Transfer Beam

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
D+L	10.535	10.535

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Steel Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

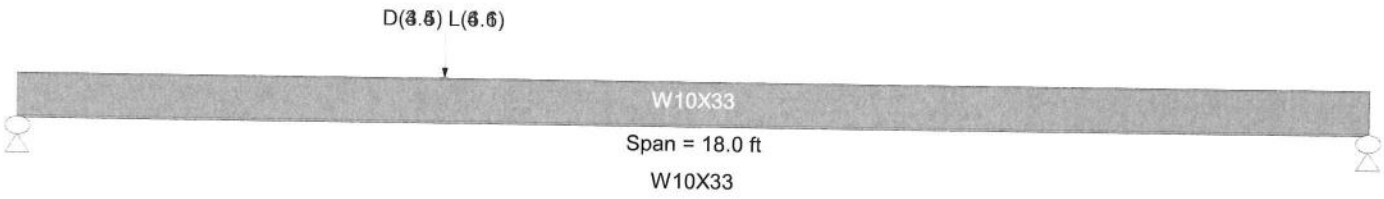
Description : 2nd Floor Transfer Beam #2

Material Properties

Calculations per AISC 360-05, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Beam Bracing : Beam is Fully Braced against lateral-torsion buckling
Bending Axis : Major Axis Bending
Load Combination 2006 IBC & ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Load(s) for Span Number 1
Point Load : D = 4.50, L = 6.10 k @ 5.667 ft
Point Load : D = 3.40, L = 4.60 k @ 5.667 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.746 : 1	Maximum Shear Stress Ratio =	0.226 : 1
Section used for this span	W10X33	Section used for this span	W10X33
Mu : Applied	72.203 k-ft	Vu : Applied	12.744 k
Mn / Omega : Allowable	96.806 k-ft	Vn/Omega : Allowable	56.434 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	5.670ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.379 in	Ratio =	570
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.659 in	Ratio =	328
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma - Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Overall MAXimum Envelope													
Dsgn. L = 18.00 ft +D	1	0.746	0.226	72.20		72.20	161.67	96.81	1.00	1.00	12.74	84.65	56.43
Dsgn. L = 18.00 ft +D+L+H	1	0.317	0.096	30.67		30.67	161.67	96.81	1.00	1.00	5.41	84.65	56.43
Dsgn. L = 18.00 ft +D+0.750Lr+0.750L+H	1	0.746	0.226	72.20		72.20	161.67	96.81	1.00	1.00	12.74	84.65	56.43
Dsgn. L = 18.00 ft +D+0.750L+0.750S+H	1	0.639	0.193	61.82		61.82	161.67	96.81	1.00	1.00	10.91	84.65	56.43
Dsgn. L = 18.00 ft +D+0.750Lr+0.750L+0.750W+H	1	0.639	0.193	61.82		61.82	161.67	96.81	1.00	1.00	10.91	84.65	56.43
Dsgn. L = 18.00 ft +D+0.750L+0.750S+0.750W+H	1	0.639	0.193	61.82		61.82	161.67	96.81	1.00	1.00	10.91	84.65	56.43
Dsgn. L = 18.00 ft +D+0.750Lr+0.750L+0.5250E+H	1	0.639	0.193	61.82		61.82	161.67	96.81	1.00	1.00	10.91	84.65	56.43
Dsgn. L = 18.00 ft +D+0.750L+0.750S+0.5250E+H	1	0.639	0.193	61.82		61.82	161.67	96.81	1.00	1.00	10.91	84.65	56.43
Dsgn. L = 18.00 ft	1	0.639	0.193	61.82		61.82	161.67	96.81	1.00	1.00	10.91	84.65	56.43

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.6585	8.190		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	12.744	5.856
D Only	5.413	2.487

Steel Beam

Description : 2nd Floor Transfer Beam #2

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
L Only	7.331	3.369
D+L	12.744	5.856

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

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ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 **Licensee : jva**

Description : GL 1 Offset B1

Material Properties

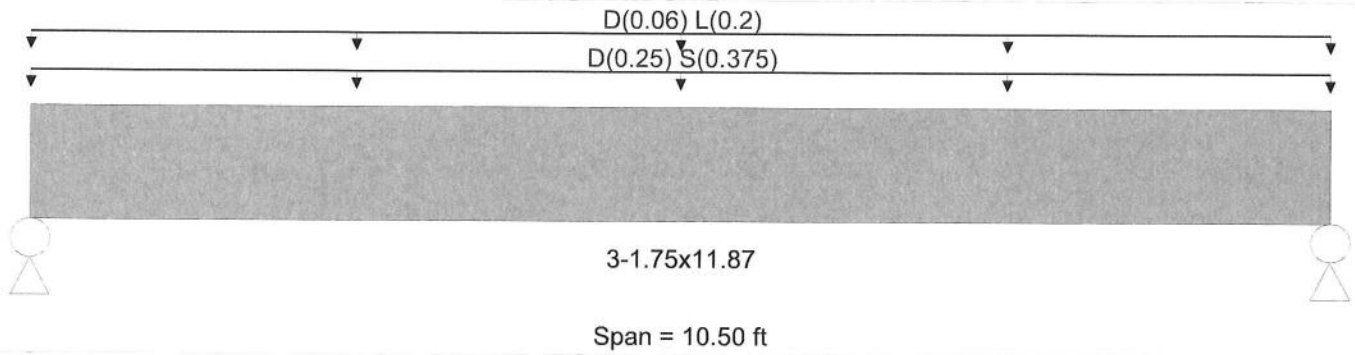
Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi	*E : Modulus of Elasticity*	
Fb - Compr	2,600.0 psi	Ebend- xx	1,900.0 ksi
Fc - Prll	2,510.0 psi	Eminbend - xx	965.71 ksi
Fc - Perp	750.0 psi		
Fv	285.0 psi		
Ft	1,555.0 psi	Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 12.50 ft
Uniform Load : D = 0.030, L = 0.10 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.389 : 1	Maximum Shear Stress Ratio	=	0.274 : 1
Section used for this span		**3-1.75x11.87**	Section used for this span		**3-1.75x11.87**
fb : Actual	=	1,012.17 psi	fv : Actual	=	78.22 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+0.750L+0.750S+H	Load Combination		+D+0.750L+0.750S+H
Location of maximum on span	=	5.250 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.114 in	Ratio =	1106
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.178 in	Ratio =	707
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 10.50 ft	1	0.167	0.118	1.000	1.000	1.000	1.000	1.000	4.46	434.18	2,600.00	1.39	33.55	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.270	0.190	1.000	1.000	1.000	1.000	1.000	7.22	702.23	2,600.00	2.26	54.27	285.00
+D+S+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.360	0.254	1.000	1.000	1.000	1.000	1.000	9.63	936.78	2,600.00	3.01	72.40	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.244	0.172	1.000	1.000	1.000	1.000	1.000	6.53	635.22	2,600.00	2.04	49.09	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.389	0.274	1.000	1.000	1.000	1.000	1.000	10.41	1,012.17	2,600.00	3.25	78.22	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.244	0.172	1.000	1.000	1.000	1.000	1.000	6.53	635.22	2,600.00	2.04	49.09	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.389	0.274	1.000	1.000	1.000	1.000	1.000	10.41	1,012.17	2,600.00	3.25	78.22	285.00

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 **Licensee : jva**

Description : GL 1 Offset B1

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.244	0.172	1.000	1.000	1.000	1.000	1.000	6.53	635.22	2,600.00	2.04	49.09	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 10.50 ft	1	0.389	0.274	1.000	1.000	1.000	1.000	1.000	10.41	1,012.17	2,600.00	3.25	78.22	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L+S	1	0.1780	5.303		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.719	4.719
D Only	1.701	1.701
L Only	1.050	1.050
S Only	1.969	1.969
L+S	3.019	3.019
D+L	2.751	2.751
D+S	3.669	3.669
D+L+S	4.719	4.719

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1319 Spruce St
Boulder, CO

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Project Notes :

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Wood Beam

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ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : GL 1 Offset 7.25 B2

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

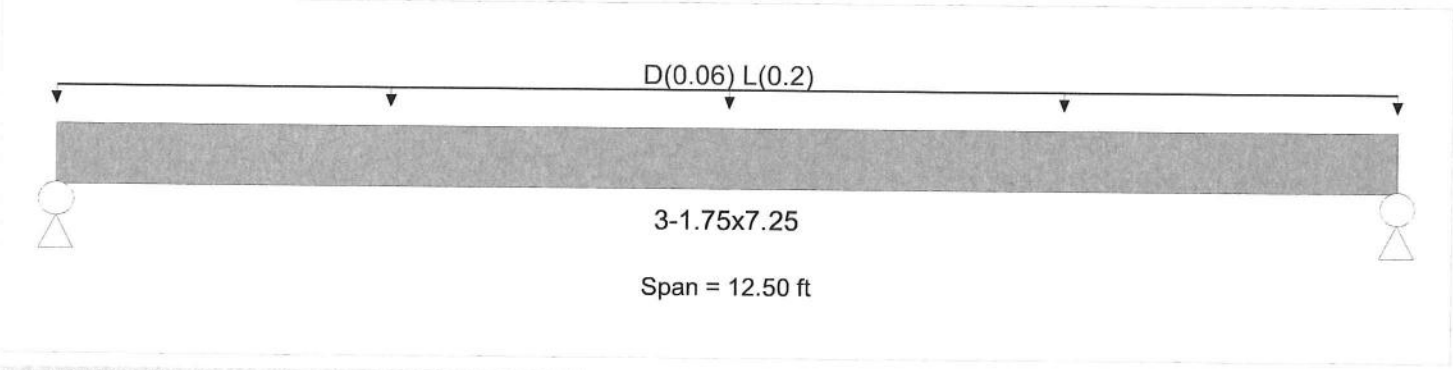
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.030, L = 0.10 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.526 : 1	Maximum Shear Stress Ratio	=	0.211 : 1
Section used for this span		3-1.75x7.25	Section used for this span		3-1.75x7.25
fb : Actual	=	1,368.34 psi	fv : Actual	=	60.18 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	6.250 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.350 in	Ratio =	429
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.469 in	Ratio =	319
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 12.50 ft	1	0.134	0.054	1.000	1.000	1.000	1.000	1.000	1.34	349.14	2,600.00	0.39	15.36	285.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 12.50 ft	1	0.526	0.211	1.000	1.000	1.000	1.000	1.000	5.24	1,368.34	2,600.00	1.53	60.18	285.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 12.50 ft	1	0.428	0.172	1.000	1.000	1.000	1.000	1.000	4.27	1,113.54	2,600.00	1.24	48.98	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 12.50 ft	1	0.428	0.172	1.000	1.000	1.000	1.000	1.000	4.27	1,113.54	2,600.00	1.24	48.98	285.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 12.50 ft	1	0.428	0.172	1.000	1.000	1.000	1.000	1.000	4.27	1,113.54	2,600.00	1.24	48.98	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 12.50 ft	1	0.428	0.172	1.000	1.000	1.000	1.000	1.000	4.27	1,113.54	2,600.00	1.24	48.98	285.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 12.50 ft	1	0.428	0.172	1.000	1.000	1.000	1.000	1.000	4.27	1,113.54	2,600.00	1.24	48.98	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

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ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : GL 1 Offset 7.25 B2

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
Length = 12.50 ft	1	0.428	0.172	1.000	1.000	1.000	1.000	1.000	4.27	1,113.54	2,600.00	1.24	48.98	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.4694	6.313		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.678	1.678
D Only	0.428	0.428
L Only	1.250	1.250
D+L	1.678	1.678

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

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ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : EXTERIOR DECK BEAM

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

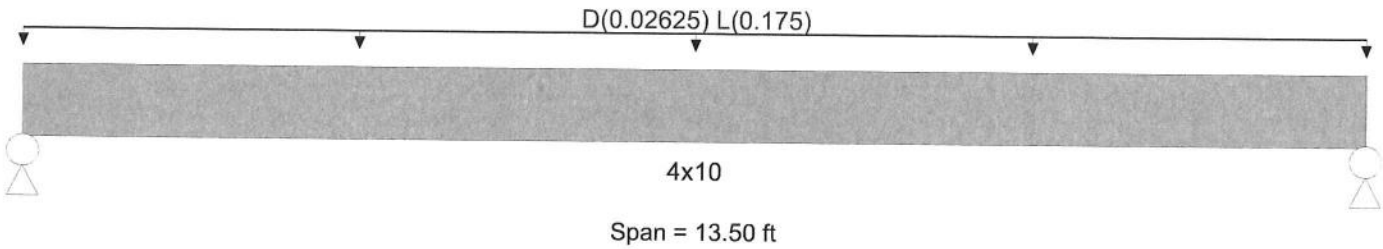
Wood Species : Douglas Fir - Larch
Wood Grade : No.1

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	1,000.0 psi
Fb - Compr	1,000.0 psi
Fc - Prll	1,500.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	675.0 psi

E : Modulus of Elasticity

Ebend- xx	1,700.0 ksi
Eminbend - xx	620.0 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0150, L = 0.10 ksf, Tributary Width = 1.750 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.919 : 1	Maximum Shear Stress Ratio	=	0.311 : 1
Section used for this span		**4x10**	Section used for this span		**4x10**
fb : Actual	=	1,102.29 psi	fv : Actual	=	56.02 psi
FB : Allowable	=	1,200.00 psi	Fv : Allowable	=	180.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	6.750 ft	Location of maximum on span	=	12.758 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.336 in	Ratio =	482
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.386 in	Ratio =	419
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 13.50 ft	1	0.120	0.041	1.000	1.200	1.000	1.000	1.000	0.60	143.78	1,200.00	0.16	7.31	180.00
+D+L+H					1.200	1.000	1.000	1.000						
Length = 13.50 ft	1	0.919	0.311	1.000	1.200	1.000	1.000	1.000	4.58	1,102.29	1,200.00	1.21	56.02	180.00
+D+0.750Lr+0.750L+H					1.200	1.000	1.000	1.000						
Length = 13.50 ft	1	0.719	0.244	1.000	1.200	1.000	1.000	1.000	3.59	862.66	1,200.00	0.95	43.84	180.00
+D+0.750L+0.750S+H					1.200	1.000	1.000	1.000						
Length = 13.50 ft	1	0.719	0.244	1.000	1.200	1.000	1.000	1.000	3.59	862.66	1,200.00	0.95	43.84	180.00
+D+0.750Lr+0.750L+0.750W+H					1.200	1.000	1.000	1.000						
Length = 13.50 ft	1	0.719	0.244	1.000	1.200	1.000	1.000	1.000	3.59	862.66	1,200.00	0.95	43.84	180.00
+D+0.750L+0.750S+0.750W+H					1.200	1.000	1.000	1.000						
Length = 13.50 ft	1	0.719	0.244	1.000	1.200	1.000	1.000	1.000	3.59	862.66	1,200.00	0.95	43.84	180.00
+D+0.750Lr+0.750L+0.5250E+H					1.200	1.000	1.000	1.000						
Length = 13.50 ft	1	0.719	0.244	1.000	1.200	1.000	1.000	1.000	3.59	862.66	1,200.00	0.95	43.84	180.00
+D+0.750L+0.750S+0.5250E+H					1.200	1.000	1.000	1.000						
Length = 13.50 ft	1	0.719	0.244	1.000	1.200	1.000	1.000	1.000	3.59	862.66	1,200.00	0.95	43.84	180.00

Wood Beam

Description : EXTERIOR DECK BEAM

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.3863	6.818		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.358	1.358
D Only	0.177	0.177
L Only	1.181	1.181
D+L	1.358	1.358

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 **Licensee : jva**

Description : EXTERIOR DECK BEAM

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

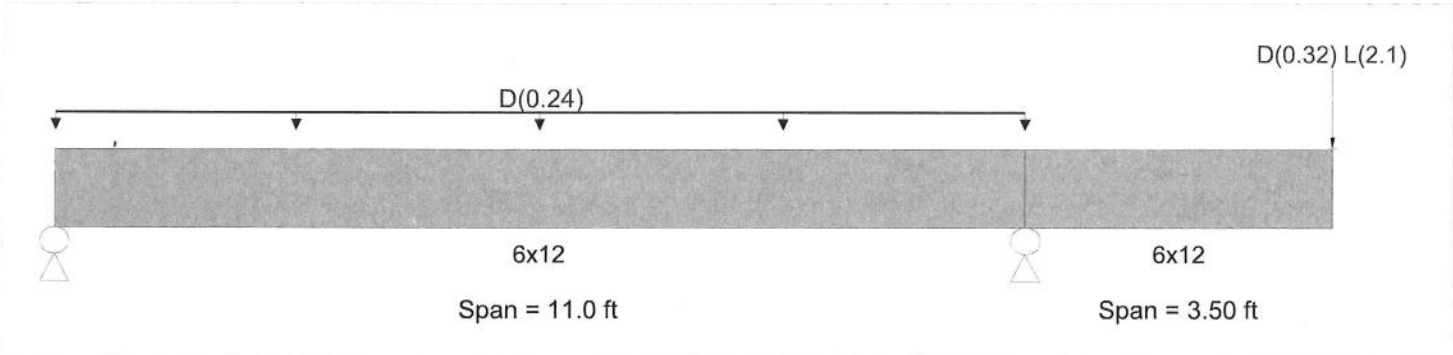
Wood Species : Douglas Fir - Larch
Wood Grade : No.1

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	1,000.0 psi
Fb - Compr	1,000.0 psi
Fc - Prll	1,500.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	675.0 psi

E : Modulus of Elasticity

Ebend- xx	1,700.0 ksi
Eminbend - xx	620.0 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.020 ksf, Tributary Width = 12.0 ft
Load for Span Number 2
Point Load : D = 0.320, L = 2.10 k @ 3.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.847: 1	Maximum Shear Stress Ratio	=	0.324 : 1
Section used for this span		**6x12**	Section used for this span		**6x12**
fb : Actual	=	846.99 psi	fv : Actual	=	58.25 psi
FB : Allowable	=	1,000.00 psi	Fv : Allowable	=	180.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	11.000 ft	Location of maximum on span	=	11.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.181 in	Ratio =	462
Max Upward L+Lr+S Deflection	-0.084 in	Ratio =	1571
Max Downward Total Deflection	0.181 in	Ratio =	462
Max Upward Total Deflection	-0.084 in	Ratio =	1571

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 11.0 ft	1	0.323	0.167	1.000	1.000	1.000	1.000	1.000	3.26	323.12	1,000.00	1.27	30.14	180.00
Length = 3.50 ft	2	0.119	0.167	1.000	1.000	1.000	1.000	1.000	-1.21	119.44	1,000.00	0.36	30.14	180.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.847	0.324	1.000	1.000	1.000	1.000	1.000	-8.56	846.99	1,000.00	2.46	58.25	180.00
Length = 3.50 ft	2	0.847	0.324	1.000	1.000	1.000	1.000	1.000	-8.56	846.99	1,000.00	2.46	58.25	180.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
Length = 3.50 ft	2	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : EXTERIOR DECK BEAM

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
Length = 3.50 ft	2	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
Length = 3.50 ft	2	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
Length = 3.50 ft	2	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
Length = 3.50 ft	2	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00
Length = 3.50 ft	2	0.665	0.254	1.000	1.000	1.000	1.000	1.000	-6.72	665.10	1,000.00	1.93	45.80	180.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	L Only	-0.0840	6.431
L Only	2	0.1811	3.500		0.0000	6.431

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	1.288	4.645	
D Only	1.288	1.877	
L Only	-0.668	2.768	
D+L	0.620	4.645	

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

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ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 — Licensee : jva

Description : EXTERIOR DECK BEAM

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

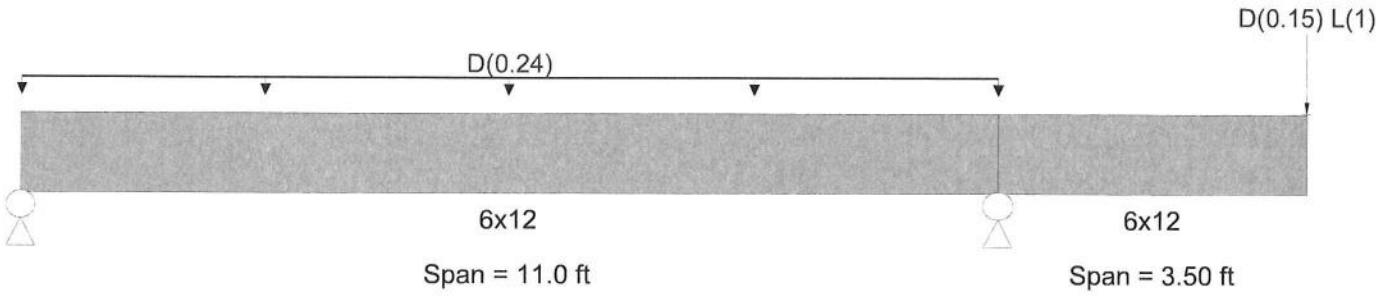
Wood Species : Douglas Fir - Larch
Wood Grade : No.1

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	1,000.0 psi
Fb - Compr	1,000.0 psi
Fc - Prll	1,500.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	675.0 psi

E : Modulus of Elasticity

Ebend- xx	1,700.0 ksi
Eminbend - xx	620.0 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.020 ksf, Tributary Width = 12.0 ft
Load for Span Number 2
Point Load : D = 0.150, L = 1.0 k @ 3.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.407 : 1	Maximum Shear Stress Ratio	=	0.233 : 1
Section used for this span		6x12	Section used for this span		6x12
fb : Actual	=	407.00 psi	fv : Actual	=	42.01 psi
FB : Allowable	=	1,000.00 psi	Fv : Allowable	=	180.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	11.000 ft	Location of maximum on span	=	11.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.086 in	Ratio =	974
Max Upward L+Lr+S Deflection	-0.040 in	Ratio =	3299
Max Downward Total Deflection	0.086 in	Ratio =	974
Max Upward Total Deflection	-0.057 in	Ratio =	1472

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 11.0 ft	1	0.351	0.191	1.000	1.000	1.000	1.000	1.000	3.54	350.82	1,000.00	1.45	34.47	180.00
Length = 3.50 ft	2	0.061	0.191	1.000	1.000	1.000	1.000	1.000	-0.61	60.55	1,000.00	0.19	34.47	180.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.407	0.233	1.000	1.000	1.000	1.000	1.000	-4.11	407.00	1,000.00	1.77	42.01	180.00
Length = 3.50 ft	2	0.407	0.233	1.000	1.000	1.000	1.000	1.000	-4.11	407.00	1,000.00	1.19	42.01	180.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	1.69	40.13	180.00
Length = 3.50 ft	2	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	0.94	40.13	180.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	1.69	40.13	180.00

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 **Licensee : jva**

Description : EXTERIOR DECK BEAM

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Summary of Moment Values Mactual	fb-design	Fb-allow	Summary of Shear Values Vactual	fv-design	Fv-allow
Length = 3.50 ft	2	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	0.94	40.13	180.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	1.69	40.13	180.00
Length = 3.50 ft	2	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	0.94	40.13	180.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	1.69	40.13	180.00
Length = 3.50 ft	2	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	0.94	40.13	180.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	1.69	40.13	180.00
Length = 3.50 ft	2	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	0.94	40.13	180.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 11.0 ft	1	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	1.69	40.13	180.00
Length = 3.50 ft	2	0.320	0.223	1.000	1.000	1.000	1.000	1.000	-3.24	320.38	1,000.00	0.94	40.13	180.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D Only	1	0.0647	5.500		0.0000	0.000
L Only	2	0.0862	3.500		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	1.342	2.971	
D Only	1.342	1.653	
L Only	-0.318	1.318	
D+L	1.024	2.971	

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

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ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 Licensee : jva

Description : EXTERIOR DECK BEAM

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

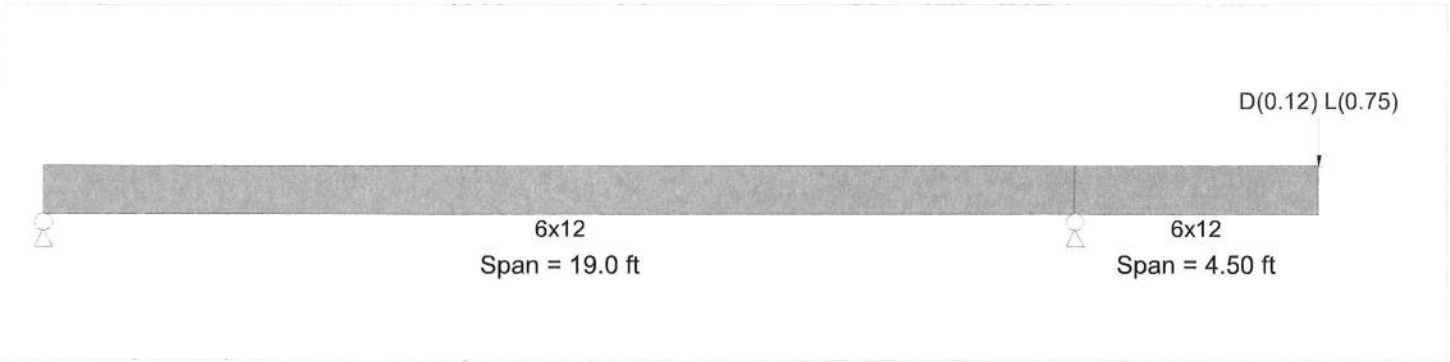
Wood Species : Douglas Fir - Larch
Wood Grade : No.1

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	1,000.0 psi
Fb - Compr	1,000.0 psi
Fc - Prll	1,500.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	675.0 psi

E : Modulus of Elasticity

Ebend- xx	1,700.0 ksi
Eminbend - xx	620.0 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load for Span Number 2
Point Load : D = 0.120, L = 0.750 k @ 4.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.402 : 1	Maximum Shear Stress Ratio	=	0.121 : 1
Section used for this span		**6x12**	Section used for this span		**6x12**
fb : Actual	=	401.71 psi	fv : Actual	=	21.83 psi
FB : Allowable	=	1,000.00 psi	Fv : Allowable	=	180.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	19.000 ft	Location of maximum on span	=	19.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.173 in	Ratio =	622
Max Upward L+Lr+S Deflection	-0.115 in	Ratio =	1980
Max Downward Total Deflection	0.181 in	Ratio =	594
Max Upward Total Deflection	-0.115 in	Ratio =	1980

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 19.0 ft	1	0.068	0.022	1.000	1.000	1.000	1.000	1.000	-0.68	67.63	1,000.00	0.17	4.04	180.00
Length = 4.50 ft	2	0.068	0.022	1.000	1.000	1.000	1.000	1.000	-0.68	67.63	1,000.00	0.17	4.04	180.00
+D+L+H					1.000	1.000	1.000	1.000						
Length = 19.0 ft	1	0.402	0.121	1.000	1.000	1.000	1.000	1.000	-4.06	401.71	1,000.00	0.92	21.83	180.00
Length = 4.50 ft	2	0.402	0.121	1.000	1.000	1.000	1.000	1.000	-4.06	401.71	1,000.00	0.92	21.83	180.00
+D+0.750Lr+0.750L+H					1.000	1.000	1.000	1.000						
Length = 19.0 ft	1	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
Length = 4.50 ft	2	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 19.0 ft	1	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
Length = 4.50 ft	2	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
+D+0.750Lr+0.750L+0.750W+H					1.000	1.000	1.000	1.000						

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8
Lic. # : KW-06003165
Licensee : jva

Description : EXTERIOR DECK BEAM

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
Length = 19.0 ft	1	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
Length = 4.50 ft	2	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 19.0 ft	1	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
Length = 4.50 ft	2	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
+D+0.750Lr+0.750L+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 19.0 ft	1	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
Length = 4.50 ft	2	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 19.0 ft	1	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00
Length = 4.50 ft	2	0.318	0.097	1.000	1.000	1.000	1.000	1.000	-3.21	318.19	1,000.00	0.73	17.38	180.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	L Only	-0.1151	11.108
D+L	2	0.1815	4.500		0.0000	11.108

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	-0.178	1.282	
D Only	0.098	0.354	
L Only	-0.178	0.928	
D+L	-0.079	1.282	

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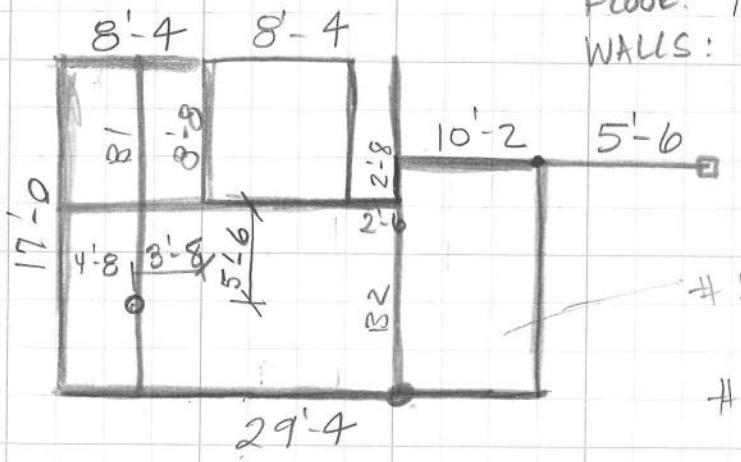
Date: 6/5/11 Page: ___ of ___
By: JMT Chkd By: ___
Job No: 15100
Client: SATR
☐ Preliminary ☐ Final

CANTERNA

design for possible future enclosure

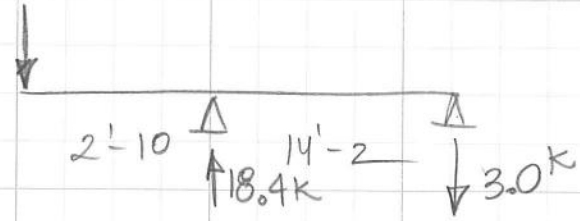
ROOF: 20 PSF D 30 PSF S
FLOOR: 90 PSF D 100 PSF L
WALLS: 20 PSF D × 12'-8 = 255 plf



#5 @ 12" bot strength
shrinkage
#5 @ 18"

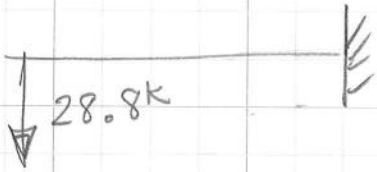
6" slab #5 @ 18" → L ≤ 10'
#5 @ 12" → L ≤ 12'

B1 a



M = 48.6 k·ft
17' unbraced
W12x26 strength

B2



M = 240 k·ft
8'-4 unbraced
W18x55 strength
Δ_{TL} = .37" = L/538

to limit Δ of floor below
need to make stiffer

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Date: _____ Page: ____of____
By: _____ Chkd By: _____
Job No: 15100
Client: SA+R
☐ Preliminary ☐ Final

Roof beam

max span = 13'-6 w/ 4'-2 trib 20D 30S

Verts t_w = 11.83' x 20psf wind

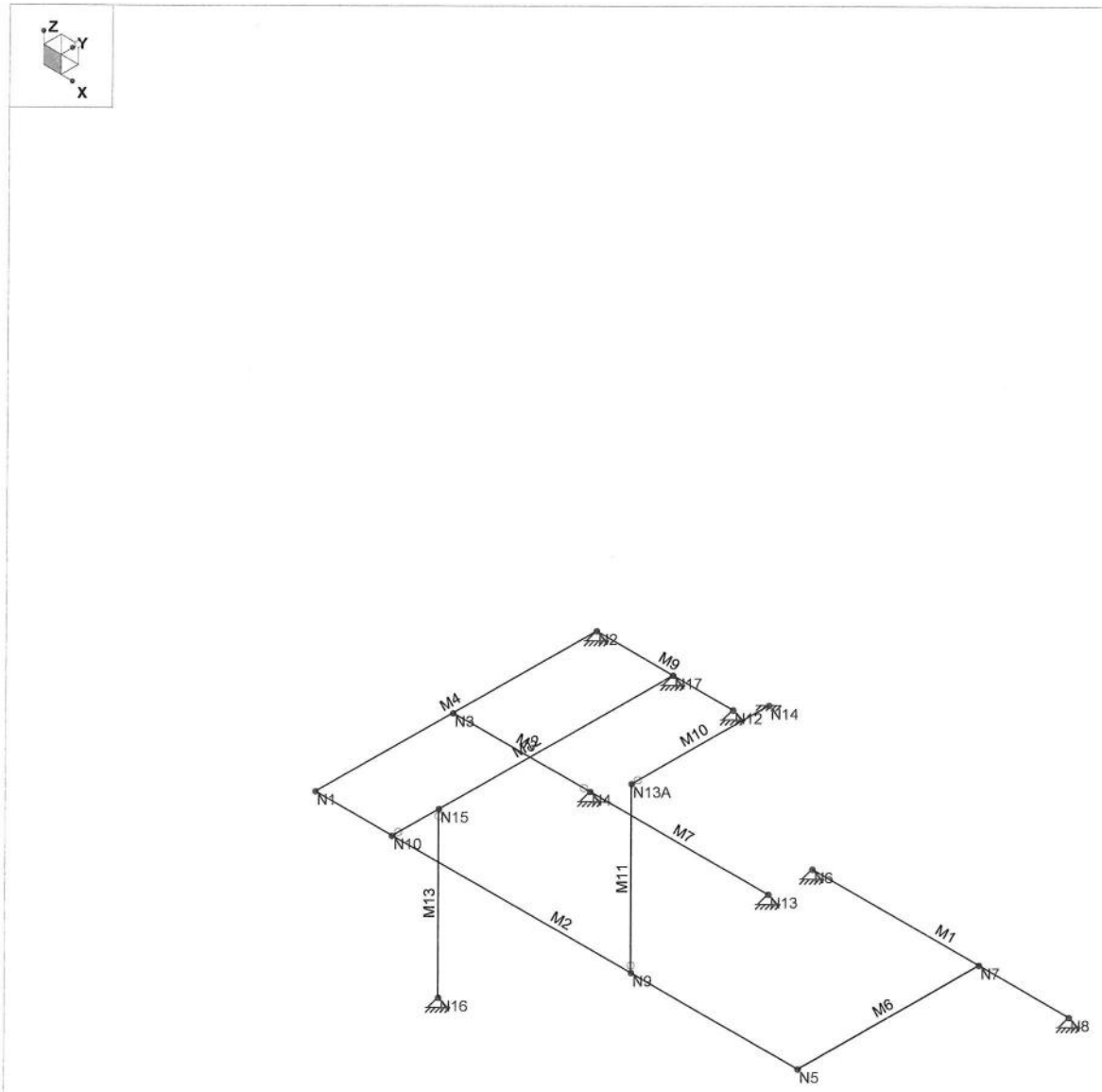
10' high M = 3.0k·ft

limit $.7\Delta_w$ to L/360 = .33"

HSS4x2x¼

Girts max span = 13'-6 t_w = 4'-6

M = 2.0k·ft



Results for LC 1, D+L

JVA, Inc.	Lantern Framing	SK - 1
JMT		July 26, 2011 at 8:50 AM
15100		15100 Lantern Framing.r3d

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	0	0	0	0	
2	N2	0	17	0	0	
3	N3	0	8.33	0	0	
4	N4	8.33	8.33	0	0	
5	N5	29.33	0	0	0	
6	N6	19.17	11	0	0	
7	N7	29.33	11	0	0	
8	N8	34.83	11	0	0	
9	N9	19.17	0	0	0	
10	N10	4.67	0	0	0	
11	N12	8.33	17	0	0	
12	N13	19.17	8.33	0	0	
13	N13A	19.17	0	10	0	
14	N14	19.17	8.33	10	0	
15	N15	4.67	2.83	0	0	
16	N16	4.67	2.83	-10	0	
17	N17	4.67	17	0	0	

Hot Rolled Steel Design Parameters

	Label	Shape	Lengt...	Lbyy[ft]	Lbzz[ft]	Lcomp t...	Lcomp ...	Kyy	Kzz	Cm-...	Cm-...	Cb	y sw...	z sw..	Function
1	M1	Back Beam	15.66	5.5	5.5	0									Lateral
2	M2	Front Beam	29.33	10.17	10.17	0									Lateral
3	M3	W8X10	8.33	0	0	0									Lateral
4	M4	Edge Beams	17	0	0	0									Lateral
5	M6	Edge Beams	11												Lateral
6	M7	W8X10	10.84												Lateral
7	M8	W8X10	2.67												Lateral
8	M9	W8X10	8.33												Lateral
9	M9A	W8X10	8.67												Lateral
10	M10	W24X55	8.33												Lateral
11	M11	HSS4X4X4	10												Lateral
12	M12	W16X26	17												Lateral
13	M13	PIPE_5.0	10												Lateral

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Front Beam	W16X45	Beam	Wide Flan...	A572 Gr.50	Front Beam	13.3	32.8	586	1.11
2	Back Beam	W12X14	Beam	Wide Flan...	A572 Gr.50	Typical	4.16	2.36	88.6	.07
3	Edge Beams	W12X19	Beam	Wide Flan...	A572 Gr.50	Typical	5.57	3.76	130	.18

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N6	N8		90	Back Beam	Beam	Wide Flange	A572 Gr.50	Typical
2	M2	N1	N5		90	Front Beam	Beam	Wide Flange	A572 Gr.50	Front Beam
3	M3	N3	N4		90	W8X10	Beam	Wide Flange	A572 Gr.50	Typical
4	M4	N1	N2		90	Edge Beams	Beam	Wide Flange	A572 Gr.50	Typical
5	M6	N5	N7		90	Edge Beams	Beam	Wide Flange	A572 Gr.50	Typical
6	M7	N4	N13		90	W8X10	Beam	Wide Flange	A572 Gr.50	Typical
7	M8	N13	N6		90	W8X10	Beam	Wide Flange	A572 Gr.50	Typical
8	M9	N2	N12		90	W8X10	Beam	Wide Flange	A572 Gr.50	Typical
9	M9A	N12	N4		90	W8X10	Beam	Wide Flange	A572 Gr.50	Typical
10	M10	N13A	N14		90	W24X55	Beam	Wide Flange	A572 Gr.50	Front Beam
11	M11	N13A	N9			HSS4X4X4	Column	Tube	A500 Gr.46	Front Beam
12	M12	N10	N17		90	W16X26	Beam	Wide Flange	A572 Gr.50	Front Beam
13	M13	N15	N16			PIPE_5.0	Column	Pipe	A36 Gr.36	Front Beam

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	TOM	Inactive	Seismic Design ...
1	M1						Yes			None
2	M2						Yes			None
3	M3		BenPIN				Yes			None
4	M4						Yes			None
5	M6						Yes			None
6	M7						Yes		Exclude	None
7	M8						Yes		Inactive	None
8	M9						Yes		Exclude	None
9	M9A						Yes		Inactive	None
10	M10	BenPIN					Yes			None
11	M11		AllPIN				Yes			None
12	M12	BenPIN					Yes			None
13	M13	BenPIN					Yes			None

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribut...	Area(Member)	Surface(...
1	Dead	DL			-1	1		5	3	
2	Live	None							3	
3	BLC 1 Transient Ar...	None						7		
4	BLC 2 Transient Ar...	None						7		

Member Distributed Loads (BLC 1 : Dead)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft,%]	End Location[ft,%]
1	M2	Z	-.255	-.255	0	0
2	M6	Z	-.255	-.255	0	0
3	M4	Z	-.255	-.255	0	0
4	M2	Z	-.085	-.085	19.17	0
5	M2	Z	-.11	-.11	19.17	29.33

Member Distributed Loads (BLC 3 : BLC 1 Transient Area Loads)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft,%]	End Location[ft,%]
1	M3	Z	-.39	-.39	0	8.33
2	M9	Z	-.39	-.39	0	8.33
3	M2	Z	-.375	-.375	0	19.17
4	M3	Z	-.375	-.375	0	7.987
5	M7	Z	-.387	-.387	0	10.84

Member Distributed Loads (BLC 3 : BLC 1 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft,%]	End Location[ft,%]
6	M1	Z	-.495	-.495	0	10.16
7	M2	Z	-.495	-.495	19.17	29.33

Member Distributed Loads (BLC 4 : BLC 2 Transient Area Loads)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft,%]	End Location[ft,%]
1	M3	Z	-.434	-.434	0	8.33
2	M9	Z	-.434	-.434	0	8.33
3	M2	Z	-.416	-.416	0	19.17
4	M3	Z	-.416	-.416	0	7.987
5	M7	Z	-.43	-.43	0	10.84
6	M1	Z	-.55	-.55	0	10.16
7	M2	Z	-.55	-.55	19.17	29.33

Member Area Loads (BLC 1 : Dead)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]
1	N2	N12	N4	N3	Z	B-C	-.09
2	N3	N13	N9	N1	Z	B-C	-.09
3	N6	N7	N5	N9	Z	B-C	-.09

Member Area Loads (BLC 2 : Live)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]
1	N2	N12	N4	N3	Z	B-C	-.1
2	N3	N13	N9	N1	Z	B-C	-.1
3	N6	N7	N5	N9	Z	B-C	-.1

Joint Loads and Enforced Displacements (BLC 1 : Dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k...
1	N3	L	Z	-.71

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	D+L	Yes	Y		1	1	2	1												
2	L	Yes	Y		2	1														

Member AISC 13th(360-05): ASD Steel Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Dir	Pnc/om [k]	Pnt/om [k]	Mnyy/om...	Mnzz/om...	Cb	Eqn
1	1	M1	W12X14	.664	7.341	.183	0	y	68.589	124.551	4.741	43.413	1	H1-1b
2	1	M2	W16X45	.996	19.248	.168	19.248	y	256.055	398.204	36.178	93.936	1.659	H1-1b
3	1	M3	W8X10	.643	4.165	.252	0	y	83.115	88.623	4.071	21.87	1	H1-1b
4	1	M4	W12X19	.675	8.323	.107	0	y	149.752	166.766	7.435	61.627	1	H1-1b
5	1	M6	W12X19	.147	4.927	.037	8.135	y	32.436	166.766	7.435	28.715	1.135	H1-1b
6	1	M10	W24X55	.726	8.33	.176	8.33	y	302.677	485.03	33.167	334.331	1.67	H1-1b
7	1	M11	HSS4X4X4	.312	0	.000	0	y	60.987	92.677	10.752	10.752	1	H1-1a
8	1	M12	W16X26	.879	2.833	.225	2.656	y	34.637	229.94	13.673	49.775	1.491	H1-1b
9	1	M13	PIPE_5.0	.269	10	.000	0		70.163	86.874	12.269	12.269	1	H1-1a

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N14	0	0	29.371	-242.747	0	0

Joint Reactions (Continued)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
2	1	N8	0	0	4.539	0	0	0
3	1	N6	0	0	7.812	0	0	0
4	1	N4	0	0	10.981	0	0	0
5	1	N2	0	0	7.555	0	0	0
6	1	N12	0	0	1.04	0	0	0
7	1	N13	0	0	4.479	0	0	0
8	1	N16	0	0	18.907	0	0	0
9	1	N17	0	0	1.434	0	0	0
10	1	Totals:	0	0	86.119			
11	1	COG (ft):	NC	NC	NC			

Joint Deflections

	LC	Joint Label	X [in]	Y [in]	Z [in]	X Rotation [rad]	Y Rotation [rad]	Z Rotation [rad]
1	1	N1	0	0	-.371	-7.324e-3	-2.912e-3	0
2	1	N2	0	0	0	1.088e-2	4.606e-4	0
3	1	N3	0	0	-.813	1.565e-3	-1.455e-4	0
4	1	N4	0	0	0	1.565e-3	8.839e-3	0
5	1	N5	0	0	-1.393	5.744e-3	9.112e-3	0
6	1	N6	0	0	0	7.211e-3	1.049e-2	0
7	1	N7	0	0	-.538	7.211e-3	-4.788e-3	0
8	1	N8	0	0	0	7.211e-3	-9.57e-3	0
9	1	N9	0	0	-.383	1.217e-3	5.444e-3	0
10	1	N10	0	0	-.215	-5.243e-3	-2.007e-3	0
11	1	N12	0	0	0	-1.848e-3	-1.589e-4	0
12	1	N13	0	0	0	1.565e-3	-8.839e-3	0
13	1	N13A	0	0	-.338	0	0	0
14	1	N14	0	0	0	0	0	0
15	1	N15	0	0	-.024	4.411e-3	-1.694e-3	0
16	1	N16	0	0	0	0	0	0
17	1	N17	0	0	0	-1.848e-3	-1.285e-4	0

Member Section Deflections

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
1	1	M1	1	0	0	0	7.211e-3	NC	NC
2			2	0	-.44	0	7.211e-3	426.793	NC
3			3	0	-.609	0	7.211e-3	308.803	NC
4			4	0	-.42	0	7.211e-3	447.647	NC
5			5	0	0	0	7.211e-3	NC	NC
6	1	M2	1	0	-.371	0	-7.324e-3	NC	NC
7			2	0	-.166	0	-4.057e-3	1718.576	NC
8			3	0	-.194	0	-7.903e-4	1988.193	NC
9			4	0	-.613	0	2.477e-3	1451.65	NC
10			5	0	-1.393	0	5.744e-3	344.269	NC
11	1	M3	1	0	-.813	0	1.565e-3	NC	NC
12			2	0	-.785	0	1.565e-3	570.612	NC
13			3	0	-.652	0	1.565e-3	406.634	NC
14			4	0	-.378	0	1.565e-3	570.953	NC
15			5	0	0	0	1.565e-3	NC	NC
16	1	M4	1	0	-.371	0	-2.912e-3	NC	NC
17			2	0	-.71	0	-1.5e-3	472.112	NC
18			3	0	-.809	0	-1.336e-4	326.969	NC
19			4	0	-.521	0	1.635e-4	476.006	NC
20			5	0	0	0	4.606e-4	NC	NC
21	1	M6	1	0	-1.393	0	9.112e-3	NC	NC
22			2	0	-1.201	0	5.637e-3	6123.754	NC

Member Section Deflections (Continued)

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate[rad]	(n) L/y Ratio	(n) L/z Ratio
23			3	0	-.996	0	2.162e-3	4372.049	NC
24			4	0	-.773	0	-1.313e-3	6142.936	NC
25			5	0	-.538	0	-4.788e-3	NC	NC
26	1	M10	1	0	-.338	0	0	295.411	NC
27			2	0	-.218	0	0	459.34	NC
28			3	0	-.111	0	0	898.144	NC
29			4	0	-.034	0	0	2948.008	NC
30			5	0	0	0	0	NC	NC
31	1	M11	1	.338	0	0	0	NC	NC
32			2	.349	0	0	0	NC	NC
33			3	.361	0	0	0	NC	NC
34			4	.372	0	0	0	NC	NC
35			5	.383	0	0	0	NC	NC
36	1	M12	1	0	-.215	0	-2.007e-3	NC	NC
37			2	0	.039	0	-1.537e-3	1016.553	NC
38			3	0	.121	0	-1.068e-3	891.077	NC
39			4	0	.089	0	-5.98e-4	1430.552	NC
40			5	0	0	0	-1.285e-4	NC	NC
41	1	M13	1	.024	0	0	0	NC	NC
42			2	.018	0	0	0	NC	NC
43			3	.012	0	0	0	NC	NC
44			4	.006	0	0	0	NC	NC
45			5	0	0	0	0	NC	NC

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
1	1	M1	1	0	7.812	0	0	0	0
2			2	0	3.666	0	0	0	-22.468
3			3	0	-.481	0	0	0	-28.702
4			4	0	-4.484	0	0	0	-17.662
5			5	0	-4.539	0	0	0	0
6	1	M2	1	0	-6.142	0	-.062	0	-.008
7			2	0	1.275	0	-.062	0	33.316
8			3	0	-6.729	0	-.062	0	53.313
9			4	0	12.795	0	-.062	0	52.371
10			5	0	1.501	0	-.062	0	-.044
11	1	M3	1	0	6.764	0	0	0	.006
12			2	0	3.379	0	0	0	-10.555
13			3	0	-.005	0	0	0	-14.069
14			4	0	-3.389	0	0	0	-10.535
15			5	0	-6.502	0	0	0	0
16	1	M4	1	0	6.142	0	-.008	0	.062
17			2	0	4.978	0	-.008	0	-23.567
18			3	0	-3.66	0	-.002	0	-40.978
19			4	0	-4.825	0	-.002	0	-22.948
20			5	0	-5.989	0	-.002	0	.03
21	1	M6	1	0	1.501	0	.044	0	-.062
22			2	0	.748	0	.044	0	-3.154
23			3	0	-.006	0	.044	0	-4.175
24			4	0	-.759	0	.044	0	-3.123
25			5	0	-1.512	0	.044	0	0
26	1	M10	1	0	-28.912	0	0	0	0
27			2	0	-29.026	0	0	0	60.328
28			3	0	-29.141	0	0	0	120.895
29			4	0	-29.256	0	0	0	181.702
30			5	0	-29.371	0	0	0	242.747

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
31	1	M11	1	-28.912	0	0	0	0	0
32			2	-28.883	0	0	0	0	0
33			3	-28.854	0	0	0	0	0
34			4	-28.826	0	0	0	0	0
35			5	-28.797	0	0	0	0	0
36	1	M12	1	0	-15.421	0	-.002	0	0
37			2	0	3.237	0	-.002	0	39.123
38			3	0	3.126	0	-.002	0	25.6
39			4	0	3.015	0	-.002	0	12.549
40			5	0	2.904	0	-.002	0	-.03
41	1	M13	1	18.77	0	0	0	0	0
42			2	18.804	0	0	0	0	0
43			3	18.838	0	0	0	0	0
44			4	18.872	0	0	0	0	0
45			5	18.907	0	0	0	0	0

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Date: _____ Page: ____ of ____
By: JMT Chkd By: _____
Job No: 15100
Project: 910 28th St.
Client: SA+R
☐ Preliminary ☐ Final

LOUVER HEAD

Deck + Self-weight $L = 12'-6$

3'-5	2'-0
40L	40L
15D	235D

$V_u = 6.1k$ No shear stl req'd

$M_u = 19.0 k\cdot ft$ 2-#5

Support is only 10" wide

Torsion: 6.8k·in/ft

$T_u = 42.5 k\cdot in$ if $< \underbrace{\phi\sqrt{f'_c}\left(\frac{A_{cp}^2}{P_{cp}}\right) \text{ can neglect}}_{\phi = .75 \rightarrow 107.7 k\cdot in}$ ok

$\phi T_n = \phi 4\sqrt{f'_c}\,\frac{A_{cp}^2}{P_{cp}} =$

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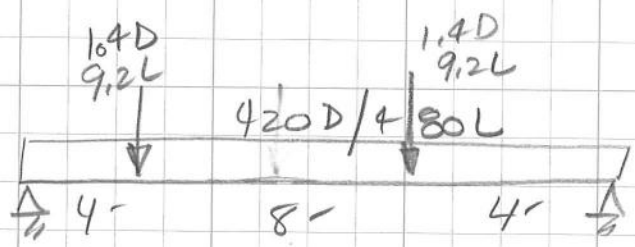
Date: _____ Page: ____ of ____
By: JMT Chkd By: _____
Job No: 15100
Project: 910 28th St
Client: SA+R
☐ Preliminary ☐ Final

Beam at Garage

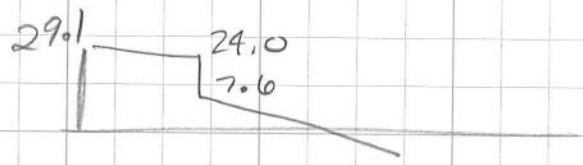
100 L + 15 D
Stair Cols 46ft²
x 3-2
2-1

tw level 3 = 6'
level 2 = 6'

35 D
40 L



5.6D
14.0L



Vu = 29.1k

Mu = 121k-ft

10" wide beam x 2d works w/ 3-#7

does that work for garage?

If not, need PT beam

ceiling is 2'-0 below floor allows for 15" deep beam

No, need PT

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Job No: 15100
Project: 910 28th St.
Client: SA+R
☐ Preliminary ☐ Final

Shear Transfer Entry Slab to Beam

$V_u = 2.2$ kef

$V_n = A_{vf} f_y \mu$ $\mu = 0.6$ $f_y = 60$ ksi

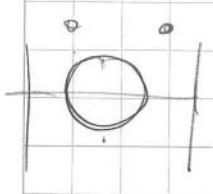
$\phi = .75$

Need $0.08 \text{ in}^2/\text{ft}$ = #4 @ 29"

development length on hook for #4 = 7.1" if side cover ≥ 2½"
end cover 2" 10.1" if end cover < 2"

Development length #4 = 12.2"

Use 2'-0 long bar



CONSULTING STRUCTURAL ENGINEERS

Project: 910 28th St. | Date: 6/2/2011 | Job No.: 15100

Client: SA+R | By: JMT | Sheet of

ACI 318-08 CONCRETE BEAM AND SLAB REINFORCEMENT DESIGN

MATERIAL PROPERTIES

Concrete Weight	150	pcf	E concrete	4,287	ksi	f_y bending	60	ksi	f_r	0.53	ksi	normalweight				
f'_c	5	ksi	n	6.8		f_y shear	40	ksi	β_1	0.80						

Mark	SS Slab		Beam		Entry Slab 13		B12		B30		B8a		B8b		Ramp	
Slab or Beam	Slab		Beam		Slab		Beam		Beam		Beam		Beam		Slab	
B (in)	12		48		12		12		30		12		8		12	
h (in)	10		16		7.625		24		24		20		18		7	
D (in)	8.9375		13.5		5.625		20.875		21.375		17.375		15.375		4.875	
dt (in)	9.25		14		6.125		21.6875		22		17.375		16		5.5	
Mu (k-ft)	2.28		94.9		7.1		153.3735		175.284		49.05		50.8		2.624	
Ma (wkg) (k-ft)	1.6		68.5		4.7		102.2		116.9		32.7		33.9		1.7	
MD+MsustainedL (k-ft)	1.6		68.5		4.7		102.2		116.9		32.7		33.9		1.7	
Vu (kips)	1.4		40.7		2.2		30.789099		19.476		13.27		12.7		0.5	
As required	0.09		2.11		0.29		1.73		1.90		0.70		0.86		0.12	
As min (ACI 10.5.1)	0.12		2.16		0.23		0.84		2.14		0.70		0.41		0.16	
Bar Size	#5		#8		#5		#5		#5		#5		#6		#5	
#/Spacing Required	**@**	**18.0**	**EA**	**2.7**	**@**	**12.9**	**EA**	**5.6**	**EA**	**6.9**	**EA**	**2.3**	**EA**	**1.9**	**@**	**18.0**
#/Spacing Supplied	@	18.0	EA	4.0	@	12.0	EA	6.0	EA	7.0	EA	3.0	EA	2.0	@	18.0
As supplied	0.21		3.16		0.31		1.86		2.17		0.93		0.88		0.21	
a	0.02		0.07		0.36		1.51		0.75		0.42		0.11		0.24	
Cc	1		13		19		77		96		21		4		12	
x	0.02		0.08		0.46		1.89		0.94		0.52		0.14		0.30	
ε_t	1.286		0.507		0.037		0.031		0.067		0.097		0.346		0.051	
ϕ	0.90		0.90		0.90		0.90		0.90		0.90		0.90		0.90	
Mn	8		177		8		183		222		74		58		5	
ϕMn	**7.1**	k-ft/ft	**158.9**	k-ft	**7.6**	k-ft/ft	**164.4**	k-ft	**200.0**	k-ft	**66.4**	k-ft	**52.4**	k-ft	**4.4**	k-ft/ft
As'	0.21		3.16		0		0.62		0.62		0.62		0.88		0	
ρ'	0.0019		0.0049		0.0000		0.0025		0.0010		0.0030		0.0072		0.0000	
d'	1.375		2.5		2.5		2.3125		2.3125		2.3125		2.3125		2.3125	
Cs	12		176		0		35		35		35		49		0	
M(-)redistribution	20.0 %		20.0 %		20.0 %		20.0 %		20.0 %		20.0 %		20.0 %		20.0 %	
Mcr	8.8		90.5		5.1		50.9		127.3		35.4		19.1		4.3	
Mcr/Ma	5.42		1.32		1.09		0.50		1.09		1.08		0.56		2.48	
I_g	1,000		16,384		443		13,824		34,560		8,000		3,888		343	
r	0.85		0.85		0.00		0.28		0.24		0.57		0.85		0.00	
kd	1.33		3.00		1.24		5.51		4.06		3.68		3.89		0.96	
I_{cr}	90		2,793		48		3,676		5,081		1,386		955		25	
I_e	1,000		16,384		443		4,929		34,560		8,000		1,480		343	

LONG-TERM DEFLECTION, $\lambda\Delta$ in inches (ACI 9.5.2.5), for simply supported beams

Mark	1		2		3		4		5		6		7		8	
>=5 years	0.19	####	0.35	####	1.09	L/384	1.90	L/221	0.33	#####	0.37	####	1.73	L/242	0.52	L/801
1 year	0.13	####	0.24	####	0.76	L/549	1.33	L/316	0.23	#####	0.26	####	1.21	L/346	0.37	#####
6 months	0.11	####	0.21	####	0.66	L/641	1.14	L/369	0.20	#####	0.22	####	1.04	L/404	0.31	#####
3 months	0.09	####	0.17	####	0.55	L/769	0.95	L/442	0.17	#####	0.18	####	0.87	L/485	0.26	#####
Length of Beam (ft)	39.00		35.00		35.00		35.00		35.00		35.00		35.00		35.00	

SHEAR

Mark	1		2		3		4		5		6		7		8	
Av Size	#3		#4		#5		#4		#4		#4		#4		None	
# verts	2		2		2		2		2		2		1		2	
s required	**NONE**		**6.8**	in	**NONE**		**10.4**	in	**NONE**		**8.7**	in	**7.7**	in	**NONE**	
s supplied (in)	8	>D/2	6	in	6	>D/2	10	in	16	>D/2	8	in	6	in	1	in
Av min	NONE		0.38		NONE		0.16		NONE		0.13		0.06		NONE	
Av	N/A		0.4		N/A		0.4		0.4		0.4		0.2		N/A	
Vc	14.93		94.96		9.84		38.30		91.58		30.34		18.73		8.34	
Vs	0.00		36.00		0.00		33.40		21.38		34.75		20.50		0.00	
Vc + Vs	14.93		130.96		9.84		71.70		112.95		65.09		39.23		8.34	
ϕVn	N/A	OK	**98.2**	OK	N/A	OK	**53.8**	OK	**84.7**	OK	**48.8**	OK	**29.4**	OK	N/A	OK

CONSULTING STRUCTURAL ENGINEERS

Project: 910 28th Street | Date: 7/26/2011 | Job No.: 15100

Client: SA+R | By: JMT | Sheet of

ACI 318-08 CONCRETE BEAM AND SLAB REINFORCEMENT DESIGN

MATERIAL PROPERTIES

Concrete Weight	150 pcf	E concrete	3,834 ksi	f_y bending	60 ksi	f_r	0.47 ksi	normalweight
f'_c	4 ksi	n	7.6	f_y shear	40 ksi	β_1	0.85	

Mark	Terrace Slab	Garage Bea	GB2	Patio Slab				
Slab or Beam	Slab	Beam	Beam	Slab	Beam	Slab	Slab	Slab
B (in)	12	10	24	12	18	12	12	12
h (in)	6	30	16	7.25	36	6	6	6
D (in)	4.1875	27.5625	13.6875	5.4375	33.5	3.5	3.5	3.5
dt (in)	4.5	28	14	5.75	33.5	3.5	3.5	3.5
L (ft)	11	20	20	5.67				
Mu (k-ft)	4.280375	179.5	179.5	0.7	542.7	4.5	6	10
Ma (wkg) (k-ft)	2.9	142.5	142.5	0.5	361.8	3.0	4.0	6.7
MD+MsustainedL (k-ft)	2.9	122.1	122.1	0.5	361.8	3.0	4.0	6.7
Vu (kips)	1.5565	49.6	49.6	0.5	67.8	0.5	0.5	0.5
As required	0.24	1.60	3.21	0.03	3.81	0.31	0.42	0.86
As min (ACI 10.5.1)	0.17	0.92	1.10	0.04	2.01	0.14	0.14	0.14
Bar Size	#5	#7	#7	#5	#9	#5	#5	#6
#/Spacing Required	@ 15.7	EA 2.7	EA 5.3	@ 18.0	EA 3.8	@ 12.2	@ 8.9	@ 6.1
#/Spacing Supplied	@ 12.0	EA 3.0	EA 4.0	@ 18.0	EA 4.0	@ 12.0	@ 8.0	@ 6.0
As supplied	0.31	1.80	2.40	0.21	4.00	0.31	0.47	0.88
a	0.46	0.18	1.33	0.30	3.92	0.46	0.68	1.29
Cc	19	6	109	12	240	19	28	53
x	0.54	0.21	1.57	0.36	4.61	0.54	0.80	1.52
ε_t	0.022	0.394	0.024	0.045	0.019	0.017	0.010	0.004
ϕ	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.81
Mn	6	227	151	5	631	5	7	13
ϕMn	**5.5** k-ft/ft	**204.6** k-ft	135.8 k-ft	**4.9** k-ft/ft	**567.7** k-ft	**4.6** k-ft/ft	**6.6** k-ft/ft	**10.1** k-ft/ft
As'		1.80	0.62	0	0	0	0	0
ρ'	0.0000	0.0065	0.0019	0.0000	0.0000	0.0000	0.0000	0.0000
d'	1.8125	2.4375	2.5	2.5	2.5	2.5	2.5	2.5
Cs	0	102	35	0	0	0	0	0
M(-)redistribution	20.0 %	20.0 %	20.0 %	20.0 %	18.8 %	16.6 %	10.1 %	0.0 %
Mcr	2.8	59.3	40.5	4.2	153.7	2.8	2.8	2.8
Mcr/Ma	0.99	0.42	0.28	8.90	0.42	0.95	0.71	0.43
I_g	216	22,500	8,192	381	69,984	216	216	216
r	0.00	0.87	0.22	0.00	0.00	0.00	0.00	0.00
kd	1.10	6.80	3.81	1.07	9.06	0.99	1.17	1.49
I_{cr}	28	7,142	2,220	35	22,533	19	25	40
I_e	211	8,249	2,357	381	26,170	187	94	54

LONG-TERM DEFLECTION, $\lambda\Delta$ in inches (ACI 9.5.2.5), for simply supported beams

Mark	1		2		3		4		5		6		7		8	
>=5 years	1.95	L/240	1.28	L/327	5.44	L/77	0.14	####	1.59	L/264	1.84	L/228	4.89	L/86	14.25	L/29
1 year	1.36	L/343	0.90	L/467	3.81	L/110	0.10	####	1.11	L/377	1.29	L/325	3.42	L/123	9.98	L/42
6 months	1.17	L/400	0.77	L/545	3.27	L/129	0.08	####	0.95	L/440	1.11	L/380	2.93	L/143	8.55	L/49
3 months	0.97	L/480	0.64	L/654	2.72	L/154	0.07	####	0.80	L/528	0.92	L/456	2.44	L/172	7.13	L/59
Length of Beam (ft)	39.00		35.00		35.00		35.00		35.00		35.00		35.00		35.00	

SHEAR

Mark	1		2		3		4		5		6		7		8	
Av Size	#3		#4		#4		None		#3		None		None		None	
# verts	2		2		2		2		1		2		2		2	
s required	**NONE**		**13.8** in		**6.8** in		**NONE**		**16.8** in		**NONE**		**NONE**		**NONE**	
s supplied (in)	8	>D/2	12	in	6	in	33	>D/2	16	in	35	>D/2	36	>D/2	1	in
Av min	NONE		0.15		0.18		NONE		0.36		NONE		NONE		NONE	
Av	N/A		0.4		0.4		N/A		0.11		N/A		N/A		N/A	
Vc	6.81		37.62		45.47		8.36		82.46		5.35		5.39		5.43	
Vs	0.00		36.75		36.50		0.00		9.21		0.00		0.00		0.00	
Vc + Vs	6.81		74.37		81.97		8.36		91.67		5.35		5.39		5.43	
ϕVn	N/A	OK	**55.8**	OK	**61.5**	OK	N/A	OK	**68.8**	OK	N/A	OK	N/A	OK	N/A	OK

CONSULTING STRUCTURAL ENGINEERS

Project: 910 28th St. | Date: 6/2/2011 | Job No.: 15100

Client: SA+R | By: JMT | Sheet of

ACI 318-08 CONCRETE BEAM AND SLAB REINFORCEMENT DESIGN

MATERIAL PROPERTIES

Concrete Weight	150	pcf	E concrete	3,834	ksi	f_y bending	60	ksi	f_r	0.47	ksi	normalweight				
f'_c	4	ksi	n	7.6		f_y shear	40	ksi	β_1	0.85						

Mark	Garage Head		Louver Head		LH2											
Slab or Beam	Beam	2	Beam		Beam		Beam		Beam		Beam		Beam		Slab	
B (in)	10		24		10		10		30		12		8		12	
h (in)	21		18.25		18.25		24		24		20		18		7	
D (in)	18.5625		15.9375		15.9375		20.875		21.375		17.375		15.375		4.875	
dt (in)	19		16.25		16.25		21.6875		22		17.375		16		5.5	
Mu (k-ft)	134.125		19		19.0		153.3735		175.284		49.05		50.8		2.624	
Ma (wkg) (k-ft)	1.6		17.5		12.7		102.2		116.9		32.7		33.9		1.7	
MD+MsustainedL (k-ft)	1.6		17.5		12.7		102.2		116.9		32.7		33.9		1.7	
Vu (kips)	29.1		6.1		6.1		30.789099		19.476		13.27		12.7		0.5	
As required	1.74		0.35		0.56		1.76		1.91		0.71		0.86		0.12	
As min (ACI 10.5.1)	0.62		0.47		0.53		0.70		2.14		0.70		0.41		0.16	
Bar Size	#7		#5		#5		#7		#5		#5		#6		#5	
#/Spacing Required	**EA**	**2.9**	**EA**	**1.5**	**EA**	**1.8**	**EA**	**2.9**	**EA**	**6.9**	**EA**	**2.3**	**EA**	**2.0**	**@**	**18.0**
#/Spacing Supplied	EA	3.0	EA	2.0	EA	2.0	EA	4.0	EA	7.0	EA	3.0	EA	2.0	@	18.0
As supplied	1.80		0.62		0.62		2.40		2.17		0.93		0.88		0.21	
a	2.14		0.03		-0.90		3.20		0.93		0.51		0.11		0.30	
Cc	73		2		-31		109		95		21		3		12	
x	2.52		0.03		-1.06		3.77		1.10		0.60		0.13		0.36	
ε_t	0.020		1.601		####		0.014		0.057		0.084		0.368		0.043	
ϕ	0.90		0.90		0.65		0.90		0.90		0.90		0.90		0.90	
Mn	154		43		34		229		221		74		58		5	
ϕMn	**138.4**	k-ft	**38.4**	k-ft	**22.4**	k-ft	**206.3**	k-ft	**199.3**	k-ft	**66.2**	k-ft	**52.2**	k-ft	**4.4**	k-ft/ft
As'	0.62		0.62		1.2		0.62		0.62		0.62		0.88		0	
ρ'	0.0033		0.0016		0.0075		0.0030		0.0010		0.0030		0.0072		0.0000	
d'	2.3125		2.3125		2.4375		2.3125		2.3125		2.3125		2.3125		2.3125	
Cs	35		35		68		35		35		35		50		0	
M(-)redistribution	19.6 %		20.0 %		0.0 %		14.3 %		20.0 %		20.0 %		20.0 %		20.0 %	
Mcr	29.1		52.7		21.9		37.9		113.8		31.6		17.1		3.9	
Mcr/Ma	17.82		3.01		1.73		0.37		0.97		0.97		0.50		2.21	
I_g	7,718		12,157		5,065		11,520		34,560		8,000		3,888		343	
r	0.30		0.87		1.68		0.22		0.25		0.58		0.87		0.00	
kd	5.68		2.31		3.26		6.87		4.27		3.85		4.04		1.00	
I_{cr}	2,916		969		874		4,726		5,596		1,525		1,048		27	
I_e	7,718		12,157		5,065		5,073		32,376		7,381		1,412		343	

LONG-TERM DEFLECTION, $\lambda\Delta$ in inches (ACI 9.5.2.5), for simply supported beams

Mark	1		2		3		4		5		6		7		8	
>=5 years	0.01	L/35309	0.15	####	0.21	####	2.02	L/208	0.40	#####	0.44	L/947	2.03	L/207	0.59	L/716
1 year	0.00	L/50442	0.11	####	0.15	####	1.41	L/297	0.28	#####	0.31	####	1.42	L/295	0.41	#####
6 months	0.00	L/58849	0.09	####	0.13	####	1.21	L/347	0.24	#####	0.27	####	1.22	L/345	0.35	#####
3 months	0.00	L/70619	0.08	####	0.10	####	1.01	L/416	0.20	#####	0.22	####	1.02	L/414	0.29	#####
Length of Beam (ft)	20.00		35.00		35.00		35.00		35.00		35.00		35.00		35.00	

SHEAR

Mark	1		2		3		4		5		6		7		8	
Av Size	#3	2	#4		#3		#3		#4		#4		#4		None	
# verts	2		2		2		2		2		2		1		2	
s required	**9.3**	in	**NONE**		**NONE**		**10.4**	in	**NONE**		**8.7**	in	**7.7**	in	**NONE**	
s supplied (in)	9	in	6	in	6	in	10	in	16	>D/2	8	in	6	in	1	in
Av min	0.11		NONE		NONE		0.13		NONE		0.12		0.06		NONE	
Av	0.22		0.4		0.22		0.22		0.4		0.4		0.2		N/A	
Vc	26.81		47.51		20.70		31.08		82.48		27.38		16.98		7.51	
Vs	18.15		42.50		23.38		18.37		21.38		34.75		20.50		0.00	
Vc + Vs	44.96		90.01		44.08		49.45		103.86		62.13		37.48		7.51	
ϕVn	**33.7**	OK	**67.5**	OK	**33.1**	OK	**37.1**	OK	**77.9**	OK	**46.6**	OK	**28.1**	OK	N/A	OK

CONSULTING STRUCTURAL ENGINEERS

Project: 910 28th St. Date: 6/2/2011 Job No.: 15100

Client: SA+R By: JMT Sheet of

ACI 318-08 CONCRETE BEAM AND SLAB REINFORCEMENT DESIGN

MATERIAL PROPERTIES

Concrete Weight	150 pcf	E concrete	4,287 ksi	f_y bending	60 ksi	f_r	0.53 ksi	normalweight
f'_c	5 ksi	n	6.8	f_y shear	40 ksi	β_1	0.80	

Mark	16RB48							
Slab or Beam	Beam		Slab	Beam	Beam	Beam	Beam	Slab
B (in)	48	48	12	12	30	12	8	12
h (in)	16	16	7.625	24	24	20	18	7
D (in)	13.5	13.5	5.625	20.875	21.375	17.375	15.375	4.875
dt (in)	14	14	6.125	21.6875	22	17.375	16	5.5
Mu (k-ft)	144.43	94.9	7.1	153.3735	175.284	49.05	50.8	2.624
Ma (wkg) (k-ft)	1.6	68.5	4.7	102.2	116.9	32.7	33.9	1.7
MD+MsustainedL (k-ft)	1.6	68.5	4.7	102.2	116.9	32.7	33.9	1.7
Vu (kips)	57.75	40.7	2.2	30.789099	19.476	13.27	12.7	0.5
As required	2.92	1.97	0.29	1.73	1.90	0.70	0.86	0.12
As min (ACI 10.5.1)	2.16	2.16	0.23	0.84	2.14	0.70	0.41	0.16
Bar Size	#8	#8	#5	#5	#5	#5	#6	#5
#/Spacing Required	**EA 3.7**	**ERR 2.7**	**@ 12.9**	**EA 5.6**	**EA 6.9**	**EA 2.3**	**EA 1.9**	**@ 18.0**
#/Spacing Supplied	EA 4.0	ERR 4.0	@ 12.0	EA 6.0	EA 7.0	EA 3.0	EA 2.0	@ 18.0
As supplied	3.16	2.37	0.31	1.86	2.17	0.93	0.88	0.21
a	0.07	0.05	0.36	1.51	0.75	0.42	0.11	0.24
Cc	13	10	19	77	96	21	4	12
x	0.08	0.06	0.46	1.89	0.94	0.52	0.14	0.30
ε_t	0.507	0.678	0.037	0.031	0.067	0.097	0.346	0.051
ϕ	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Mn	177	132	8	183	222	74	58	5
ϕMn	**158.9** k-ft	**119.2** k-ft	**7.6** k-ft/ft	**164.4** k-ft	**200.0** k-ft	**66.4** k-ft	**52.4** k-ft	**4.4** k-ft/ft
As'	3.16	2.37	0	0.62	0.62	0.62	0.88	0
ρ'	0.0049	0.0037	0.0000	0.0025	0.0010	0.0030	0.0072	0.0000
d'	2.5	2.5	2.5	2.3125	2.3125	2.3125	2.3125	2.3125
Cs	176	132	0	35	35	35	49	0
M(-)redistribution	20.0 %	20.0 %	20.0 %	20.0 %	20.0 %	20.0 %	20.0 %	20.0 %
Mcr	90.5	90.5	5.1	50.9	127.3	35.4	19.1	4.3
Mcr/Ma	55.53	1.32	1.09	0.50	1.09	1.08	0.56	2.48
I_g	16,384	16,384	443	13,824	34,560	8,000	3,888	343
r	0.85	0.85	0.00	0.28	0.24	0.57	0.85	0.00
kd	3.00	2.67	1.24	5.51	4.06	3.68	3.89	0.96
I_{cr}	2,793	2,185	48	3,676	5,081	1,386	955	25
I_e	16,384	16,384	443	4,929	34,560	8,000	1,480	343

LONG-TERM DEFLECTION, $\lambda\Delta$ in inches (ACI 9.5.2.5), for simply supported beams

Mark	1		2		3		4		5		6		7		8	
>=5 years	0.01	####	0.36	####	1.09	L/384	1.90	L/221	0.33	#####	0.37	####	1.73	L/242	0.52	L/801
1 year	0.01	####	0.25	####	0.76	L/549	1.33	L/316	0.23	#####	0.26	####	1.21	L/346	0.37	#####
6 months	0.01	####	0.22	####	0.66	L/641	1.14	L/369	0.20	#####	0.22	####	1.04	L/404	0.31	#####
3 months	0.01	####	0.18	####	0.55	L/769	0.95	L/442	0.17	#####	0.18	####	0.87	L/485	0.26	#####
Length of Beam (ft)	39.00		35.00		35.00		35.00		35.00		35.00		35.00		35.00	

SHEAR

Mark	1		2		3		4		5		6		7		8	
Av Size	#3		#4		#5		#4		#4		#4		#4		None	
# verts	2		2		2		2		2		2		1		2	
s required	**6.8**	in	**6.8**	in	**NONE**		**10.4**	in	**NONE**		**8.7**	in	**7.7**	in	**NONE**	
s supplied (in)	6	in	6	in	6	>D/2	10	in	16	>D/2	8	in	6	in	1	in
Av min	0.38		0.38		NONE		0.16		NONE		0.13		0.06		NONE	
Av	0.22		0.4		N/A		0.4		0.4		0.4		0.2		N/A	
Vc	94.96		92.98		9.84		38.30		91.58		30.34		18.73		8.34	
Vs	19.80		0.00		0.00		33.40		21.38		34.75		20.50		0.00	
Vc + Vs	114.76		92.98		9.84		71.70		112.95		65.09		39.23		8.34	
ϕVn	**86.1**	OK	N/A	OK	N/A	OK	**53.8**	OK	**84.7**	OK	**48.8**	OK	**29.4**	OK	N/A	OK

CONSULTING ENGINEERS

910 28TH STREET

ROOF FRAMING

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Roof 9' header

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

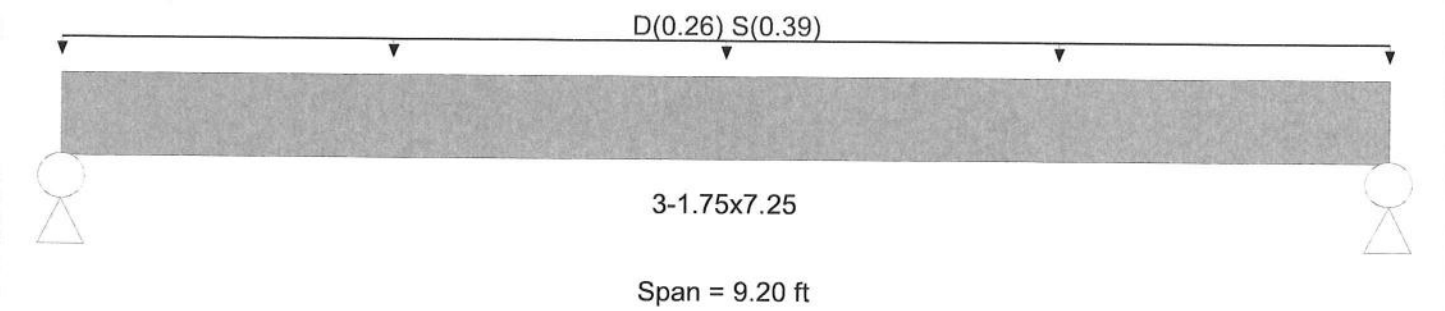
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 13.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.699 : 1	Maximum Shear Stress Ratio	=	0.364 : 1
Section used for this span		3-1.75x7.25	Section used for this span		3-1.75x7.25
fb : Actual	=	1,817.81 psi	fv : Actual	=	103.86 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	4.600 ft	Location of maximum on span	=	8.602 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.200 in	Ratio =	551
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.338 in	Ratio =	326
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 9.20 ft	1	0.285	0.149	1.000	1.000	1.000	1.000	1.000	2.84	741.22	2,600.00	1.07	42.35	285.00
+D+S+H					1.000	1.000	1.000	1.000						
Length = 9.20 ft	1	0.699	0.364	1.000	1.000	1.000	1.000	1.000	6.97	1,817.81	2,600.00	2.64	103.86	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 9.20 ft	1	0.596	0.310	1.000	1.000	1.000	1.000	1.000	5.94	1,548.66	2,600.00	2.25	88.48	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 9.20 ft	1	0.596	0.310	1.000	1.000	1.000	1.000	1.000	5.94	1,548.66	2,600.00	2.25	88.48	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 9.20 ft	1	0.596	0.310	1.000	1.000	1.000	1.000	1.000	5.94	1,548.66	2,600.00	2.25	88.48	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+S	1	0.3378	4.646		0.0000	0.000

Wood Beam

Description : Roof 9' header

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.029	3.029
D Only	1.235	1.235
S Only	1.794	1.794
D+S	3.029	3.029

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165 **Licensee : jva**

Description : Roof 13' header

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

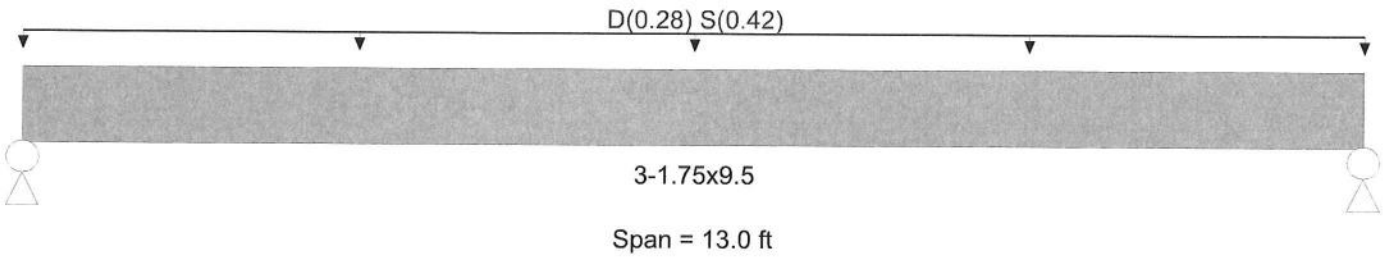
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	2,600.0 psi
Fb - Compr	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 14.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.878 : 1	Maximum Shear Stress Ratio	=	0.429 : 1
Section used for this span		**3-1.75x9.5**	Section used for this span		**3-1.75x9.5**
fb : Actual	=	2,282.90 psi	fv : Actual	=	122.34 psi
FB : Allowable	=	2,600.00 psi	Fv : Allowable	=	285.00 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	6.500 ft	Location of maximum on span	=	12.220 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.382 in	Ratio =	408
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.646 in	Ratio =	241
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 13.0 ft	1	0.359	0.176	1.000	1.000	1.000	1.000	1.000	6.15	934.65	2,600.00	1.67	50.09	285.00
+D+S+H					1.000	1.000	1.000	1.000						
Length = 13.0 ft	1	0.878	0.429	1.000	1.000	1.000	1.000	1.000	15.02	2,282.90	2,600.00	4.07	122.34	285.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 13.0 ft	1	0.748	0.366	1.000	1.000	1.000	1.000	1.000	12.81	1,945.84	2,600.00	3.47	104.28	285.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 13.0 ft	1	0.748	0.366	1.000	1.000	1.000	1.000	1.000	12.81	1,945.84	2,600.00	3.47	104.28	285.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 13.0 ft	1	0.748	0.366	1.000	1.000	1.000	1.000	1.000	12.81	1,945.84	2,600.00	3.47	104.28	285.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+S	1	0.6464	6.565		0.0000	0.000

Wood Beam

Description : Roof 13' header

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.623	4.623
D Only	1.893	1.893
S Only	2.730	2.730
D+S	4.623	4.623

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Roof 4'8 HEADER

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

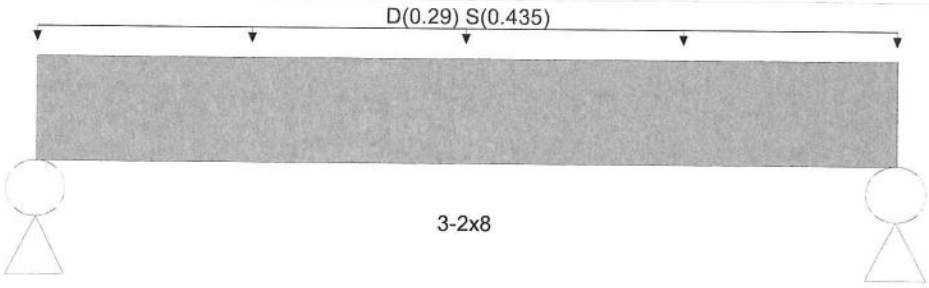
Wood Species : Douglas Fir - Larch
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	900.0 psi
Fb - Compr	900.0 psi
Fc - Prll	1,350.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	575.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	32.210 pcf



Span = 4.667 ft

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 14.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.562 : 1	Maximum Shear Stress Ratio	=	0.327 : 1
Section used for this span		**3-2x8**	Section used for this span		**3-2x8**
fb : Actual	=	606.90 psi	fv : Actual	=	58.92 psi
FB : Allowable	=	1,080.00 psi	Fv : Allowable	=	180.00 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	2.334 ft	Location of maximum on span	=	4.084 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.020 in	Ratio =	2735
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.034 in	Ratio =	1625
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 4.667 ft	1	0.228	0.133	1.000	1.200	1.000	1.000	1.000	0.81	246.39	1,080.00	0.52	23.92	180.00
+D+S+H					1.200	1.000	1.000	1.000						
Length = 4.667 ft	1	0.562	0.327	1.000	1.200	1.000	1.000	1.000	1.99	606.90	1,080.00	1.28	58.92	180.00
+D+0.750L+0.750S+H					1.200	1.000	1.000	1.000						
Length = 4.667 ft	1	0.478	0.279	1.000	1.200	1.000	1.000	1.000	1.70	516.77	1,080.00	1.09	50.17	180.00
+D+0.750L+0.750S+0.750W+H					1.200	1.000	1.000	1.000						
Length = 4.667 ft	1	0.478	0.279	1.000	1.200	1.000	1.000	1.000	1.70	516.77	1,080.00	1.09	50.17	180.00
+D+0.750L+0.750S+0.5250E+H					1.200	1.000	1.000	1.000						
Length = 4.667 ft	1	0.478	0.279	1.000	1.200	1.000	1.000	1.000	1.70	516.77	1,080.00	1.09	50.17	180.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+S	1	0.0345	2.357		0.0000	0.000

Wood Beam

Description : Roof 4'8 HEADER

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.709	1.709
D Only	0.694	0.694
S Only	1.015	1.015
D+S	1.709	1.709

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8

Lic. # : KW-06003165

Licensee : jva

Description : Roof Walkdoor header

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

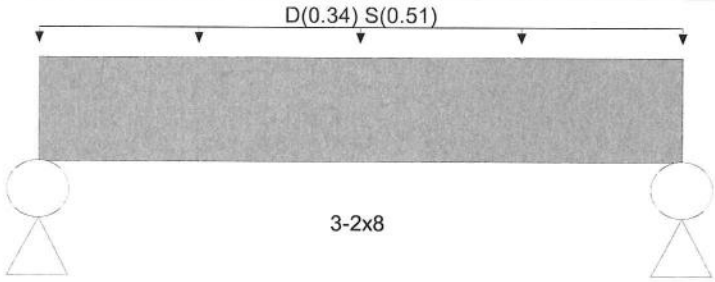
Wood Species : Douglas Fir - Larch
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	900.0 psi
Fb - Compr	900.0 psi
Fc - Prll	1,350.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	575.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	32.210 pcf



Span = 3.50 ft

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 17.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.370 : 1	Maximum Shear Stress Ratio	=	0.253 : 1
Section used for this span		**3-2x8**	Section used for this span		**3-2x8**
fb : Actual	=	399.60 psi	fv : Actual	=	45.53 psi
FB : Allowable	=	1,080.00 psi	Fv : Allowable	=	180.00 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	1.750 ft	Location of maximum on span	=	2.905 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.008 in	Ratio =	5532
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.013 in	Ratio =	3291
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios							Summary of Moment Values			Summary of Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_r	C_m	C_t	Mactual	fb-design	Fb-allow	Vactual	fv-design	Fv-allow
+D														
Length = 3.50 ft	1	0.150	0.102	1.000	1.200	1.000	1.000	1.000	0.53	161.88	1,080.00	0.40	18.44	180.00
+D+S+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.370	0.253	1.000	1.200	1.000	1.000	1.000	1.31	399.60	1,080.00	0.99	45.53	180.00
+D+0.750L+0.750S+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.315	0.215	1.000	1.200	1.000	1.000	1.000	1.12	340.17	1,080.00	0.84	38.75	180.00
+D+0.750L+0.750S+0.750W+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.315	0.215	1.000	1.200	1.000	1.000	1.000	1.12	340.17	1,080.00	0.84	38.75	180.00
+D+0.750L+0.750S+0.5250E+H					1.200	1.000	1.000	1.000						
Length = 3.50 ft	1	0.315	0.215	1.000	1.200	1.000	1.000	1.000	1.12	340.17	1,080.00	0.84	38.75	180.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+S	1	0.0128	1.768		0.0000	0.000

Wood Beam

Description : Roof Walkdoor header

Vertical Reactions - Unfactored

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.500	1.500
D Only	0.608	0.608
S Only	0.893	0.893
D+S	1.500	1.500

JVA Consulting Engineers
1319 Spruce St
Boulder, CO

Title : 910 28th Street
Dsgnr: JMT
Project Desc.:

Project Notes :

Job # 15100

Wood Beam

File: C:\Users\btm\Desktop\15100.ec6
ENERCALC, INC. 1983-2011, Build:6.11.4.8, Ver:6.11.4.8
Lic. # : KW-06003165
Licensee : jva

Description : Roof Beam

Material Properties

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-05

Analysis Method : Allowable Stress Design
Load Combination 2006 IBC & ASCE 7-05

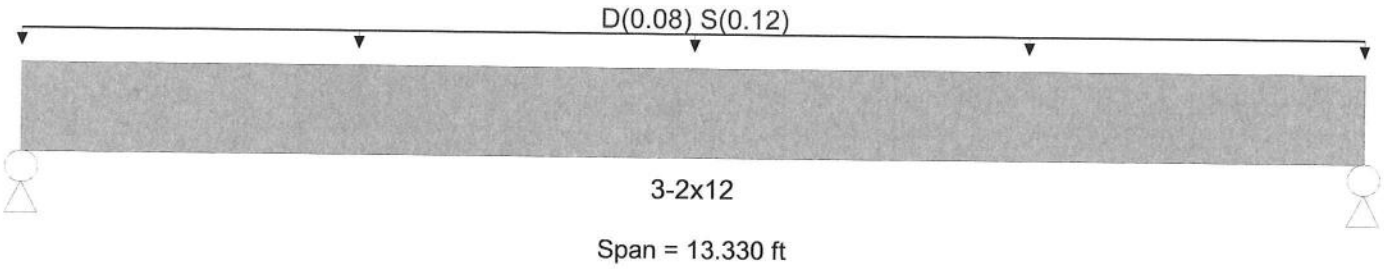
Wood Species : Douglas Fir - Larch
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsion buckling

Fb - Tension	900.0 psi
Fb - Compr	900.0 psi
Fc - Prll	1,350.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	575.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	32.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 4.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.659 : 1	Maximum Shear Stress Ratio	=	0.199 : 1
Section used for this span		**3-2x12**	Section used for this span		**3-2x12**
fb : Actual	=	593.38 psi	fv : Actual	=	35.89 psi
FB : Allowable	=	900.00 psi	Fv : Allowable	=	180.00 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	6.665 ft	Location of maximum on span	=	12.397 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.101 in	Ratio =	1590
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.177 in	Ratio =	903
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_r	C_m	C_t	Summary of Moment Values: Mactual	fb-design	Fb-allow	Summary of Shear Values: Vactual	fv-design	Fv-allow
+D														
Length = 13.330 ft	1	0.285	0.086	1.000	1.000	1.000	1.000	1.000	2.03	256.43	900.00	0.52	15.51	180.00
+D+S+H					1.000	1.000	1.000	1.000						
Length = 13.330 ft	1	0.659	0.199	1.000	1.000	1.000	1.000	1.000	4.69	593.38	900.00	1.21	35.89	180.00
+D+0.750L+0.750S+H					1.000	1.000	1.000	1.000						
Length = 13.330 ft	1	0.566	0.171	1.000	1.000	1.000	1.000	1.000	4.03	509.14	900.00	1.04	30.79	180.00
+D+0.750L+0.750S+0.750W+H					1.000	1.000	1.000	1.000						
Length = 13.330 ft	1	0.566	0.171	1.000	1.000	1.000	1.000	1.000	4.03	509.14	900.00	1.04	30.79	180.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.000	1.000	1.000						
Length = 13.330 ft	1	0.566	0.171	1.000	1.000	1.000	1.000	1.000	4.03	509.14	900.00	1.04	30.79	180.00

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+S	1	0.1771	6.732		0.0000	0.000

Wood Beam

Description : Roof Beam

Vertical Reactions - Unfactored

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.408	1.408
D Only	0.609	0.609
S Only	0.800	0.800
D+S	1.408	1.408

CONSULTING ENGINEERS

910 28TH STREET

LATERAL ELEMENTS

Wind Load Design

910 28th Street

Mean Roof Height, h	40	ft
Wind Speed	120	mph
Exposure	B	
Roof Slope	1.2	
Gust Factor	0.85	
Kd	0.85	
Kz	0.761	
I	1	
Kzt	1	

Method 1	λ	1.09
	Zones	
	A	C
Pressures	22.8	15.1
	24.85	16.46

Method 2	qz	23.8 psf
	WW	LW
Cp	0.8	-0.5
Gcpi	0	0
Pressure	16.21	-10.1 psf
Combined		26.3 psf

Floor Tribs	ft
Roof	8
Second	10.33
First Floor	10.33

Shear Wall Design

North-South Direction

GL	B.5	C.3/D.3		B.8/C.2/F.2/D.5/D.8		B.5/C.9/E.5	F.6	G
L, ft	21.5	5.833	9	9.5	11.5	21	9.2	10.5
Roof Shear Walls								
Trib, ft	20					40		19.5
h, ft	9					9		9
Dead, plf	0					0		0
Area, ft^2	160					320		156
V, lbs	2593					5186		2528
v, plf	121					247		241
T, lbs	0					1210		1778
3rd Floor Shear Wall								
Trib, ft	8	15	15	20	20	20	12	5.5
h, ft	9	9	9	9	9	9	9	9
Dead,plf	240	450	450	360	300	240	360	240
Area, ft2	82.64	154.95	154.95	206.6	206.6	206.6	123.96	56.815
V, lbs	3932	988	1524	1515	1834	8534	2009	3449
v, plf	183	169	169	159	159	406	218	328
T	25	643	73	169	99	3594	804	4223
2nd Floor Shear Walls								
Trib, ft	8	15	15	20	20	20	12	8
h, ft	9	9	9	9	9	9	9	9
Dead,plf	240	450	450	360	300	240	360	240
Area, ft2	82.64	154.95	154.95	206.6	206.6	206.6	123.96	82.64
V, lbs	5272	1975	3047	3029	3667	11883	4018	4788
v, plf	245	339	339	319	319	566	437	456
T	112	2979	1839	1933	1793	6942	3791	7628

Shear Wall Design

East-West Direction

GL	1.2	2.4*		2.6		4			
L, ft	13.75	28	12	12	12	4.75	6	3.75	14
Roof Shear Walls									
Trib, ft	12.5	17.5	17.5	16	16	15	15	15	15
h, ft	9	9	9	9	9	9	9	9	9
Dead, plf	250	250	250	250	170	300	300	300	280
Area, ft^2	100	140	140	128	128	120	120	120	120
V, lbs	1621	2581	1106	2074	2074	637	805	503	1945
v, plf	118	92	92	173	173	134	134	134	139
T, lbs	0	0	0	0	0	106	0	366	0
3rd Floor Shear Wall									
Trib, ft	16	17.5	17.5	16	16	15	15	15	15
h, ft	9	9	9	9	9	9	9	9	9
Dead,plf	0	105	0	0	0	0	0	0	0
Area, ft2	165.28	180.775	180.775	165.28	165.28	154.95	154.95	154.95	154.95
V, lbs	4299	5913	2534	4251	4251	1460	1844	1152	4456
v, plf	313	211	211	354	354	307	307	307	318
T	2335	0	1314	3551	3871	3654	3454	3814	2425
2nd Floor Shear Walls									
Trib, ft	16	17.5	17.5	16	16	15	15	15	15
h, ft	9	9	9	9	9	9	9	9	9
Dead,plf	0	105	0	0	0	0	0	0	0
Area, ft2	165.28	180.775	180.775	165.28	165.28	154.95	154.95	154.95	154.95
V, lbs	6978	9246	3963	6427	6427	2282	2883	1802	6967
v, plf	507	330	330	536	536	480	480	480	498
T	6997	0	4256	8547	8867	8317	8079	8507	6982

* Indicates Windard and Leeward combined

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☐ Fort Collins, CO Ph 970.225.9099 Fax 970.225.6923
☐ Winter Park, CO Ph 970.722.7677 Fax 970.722.7679

Date: _____ Page: ___ of ___
By: [illegible] Chkd By: _____
Job No: 5100
Project: _____
Client: _____
☐ Preliminary ☐ Final

910 28th St. WIND BASE SHEAR

P = 26.3 psf combined WW + LW → PER SPREADSHEET

V = 62'(30')(26.3) = 48.9" E-W WIND CONTROLS. ~~SEISMIC CONTROLS~~

V = 158(30)(26.3) = 124.7" N-S. WIND CONTROLS.

Project Name = 910 28th St
Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Latitude = 40.0
Longitude = -105.27000000000001
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.05 deg grid spacing

Period (sec)	Sa (g)	
0.2	0.238	(Ss, Site Class B)
1.0	0.059	(S1, Site Class B)

Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Latitude = 40.0
Longitude = -105.27000000000001
Spectral Response Accelerations SMs and SM1
SMs = Fa x Ss and SM1 = Fv x S1
Site Class D - Fa = 1.6 ,Fv = 2.4

Period (sec)	Sa (g)	
0.2	0.381	(SMs, Site Class D)
1.0	0.141	(SM1, Site Class D)

Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Latitude = 40.0
Longitude = -105.27000000000001
Design Spectral Response Accelerations SDs and SD1
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.6 ,Fv = 2.4

Period (sec)	Sa (g)	
0.2	0.254	(SDs, Site Class D)
1.0	0.094	(SD1, Site Class D)

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Date: _____ Page: ____ of ____
By: PKU Chkd By: _____
Job No: 15102
Project: _____
Client: _____
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Seismic BASE SHEAR

DEAD LOAD

	AREA	WEIGHT	
ROOF	7530	15	113k
3rd FLR	9000	32	288k
2nd FLR	9000	32	288k
			689k

$h_n = 40^{ft}$ $R = 2.0$ $I = 1.0$ $T_L = 4$ sec.

$S_{DS} = 0.254$ $S_{D1} = 0.094$

$C_s = \frac{.254}{(2/1)} = .127$ $T = .02(40)^{.75} = .318$

$C_{s\,max} = \frac{.094}{.318(2/1)} = .148$

$C_{s\,min} = .01$

$C_s = .127$

$V = .127(689^k) = 88^k$

LEFT RIGHT $R = 6.5$

$V = \left(\frac{.254}{6.5}\right)(689) = 26.9^k$

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Date: _____ Page: ____ of ____
By: BJL Chkd By: _____
Job No: 15100
Project: _____
Client: _____
☐ Preliminary ☐ Final

FLOOR DEAD LOADS.

ROOF

GYP	2.0
TRUSSES	3.5
PLYWOOD	2.0
ROFG	2.5
MISC	4.0
	14.9 → 15

FLOOR

GYP		2.0
JOISTS		4.0
PLYWOOD		2.3
LW CONC	1½"	18
MISC		4.0
		31.1 → 32

CONSULTING ENGINEERS

910 28TH STREET

GENERAL CODE AND LOADS

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910 28TH STREET

WOOD FRAMING LATERAL CALCULATIONS

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910 28TH STREET

WOOD FRAMING CALCULATIONS

910 28th STREET

Sesimic Base Shear ABOVE PODIUM

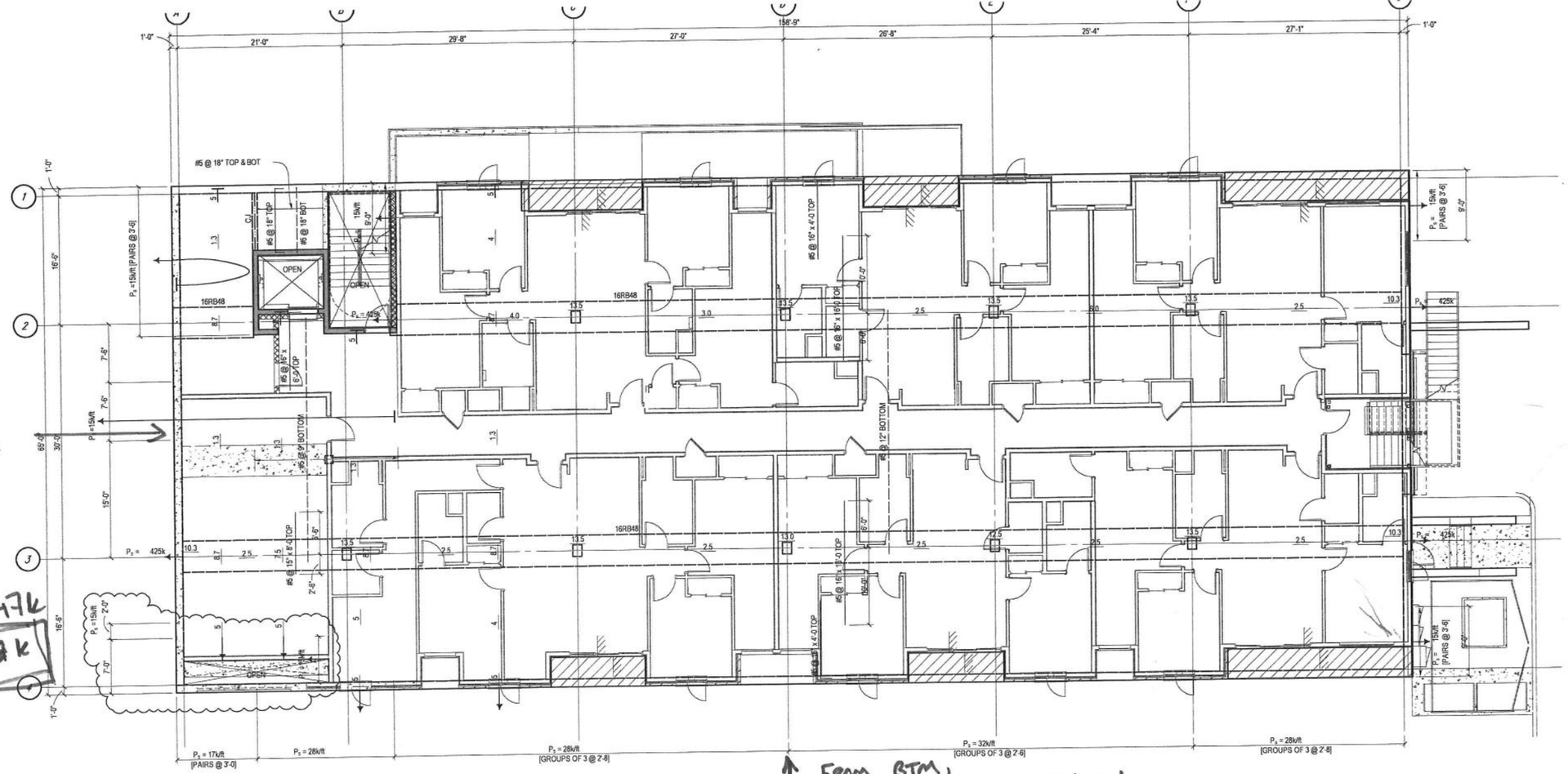
			Dead Load Area		Wieght
			Roof	7530	15
			3rd Floor	9000	32
hn	40	ft	2nd Floor	9000	32
R	6.5				
I	1		W		688.95 kips
TL	4	sec			
SDs	0.254				
SD1	0.094				
Ct	0.02				
x	0.75				
Ta	0.318108				
Cs	0.039077				
Csmax	0.045461				
Csmin	0.01				
Cs	0.039077				
V	26.92205				

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	-.005	2	2.958	2	.419	2	0	1	0	1	0	1
2		min	-.026	3	2.541	3	.217	3	0	1	0	1	0	1
3	N2	max	.016	3	2.815	4	.362	4	0	1	0	1	0	1
4		min	-.02	2	2.783	3	.345	3	0	1	0	1	0	1
5	N3	max	.028	2	2.864	2	.3	2	0	1	0	1	0	1
6		min	-.004	3	2.669	1	.224	1	0	1	0	1	0	1
7	N4	max	1.006	3	16.542	1	.929	2	0	1	0	1	0	1
8		min	-7.375	2	8.796	2	-.888	3	0	1	0	1	0	1
9	N5	max	.717	3	21.529	3	-.066	2	0	1	0	1	0	1
10		min	-13.383	2	20.877	2	-.181	3	0	1	0	1	0	1
11	N6	max	-.38	1	22.025	2	-.277	3	0	1	0	1	0	1
12		min	-14.222	2	21.84	1	-.386	2	0	1	0	1	0	1
13	N7	max	-.546	1	23.801	2	-.053	2	0	1	0	1	0	1
14		min	-17.974	2	23.046	3	-.196	3	0	1	0	1	0	1
15	N8	max	-.629	1	26.527	2	.319	4	0	1	0	1	0	1
16		min	-10.444	2	15.972	3	-.741	3	0	1	0	1	0	1
17	N9	max	-.289	3	16.79	2	-.386	4	0	1	0	1	0	1
18		min	-.822	2	14.824	3	-2.198	3	0	1	0	1	0	1
19	N10	max	.037	4	30.058	1	.792	2	0	1	0	1	0	1
20		min	.027	3	29.578	2	-4.364	3	0	1	0	1	0	1
21	N11	max	.021	1	17.523	2	-.007	4	0	1	0	1	0	1
22		min	.016	2	17.447	1	-.009	3	0	1	0	1	0	1
23	N12	max	-.021	1	16.457	1	.038	1	0	1	0	1	0	1
24		min	-.021	2	16.375	2	.037	2	0	1	0	1	0	1
25	N13	max	-1.047	3	30.04	2	.639	2	0	1	0	1	0	1
26		min	-1.455	2	29.437	3	-2.898	3	0	1	0	1	0	1
27	N14	max	.022	3	38.479	2	-.263	4	0	1	0	1	0	1
28		min	-.045	2	38.447	1	-6.528	3	0	1	0	1	0	1
29	N15	max	.039	1	30.68	2	.026	4	0	1	0	1	0	1
30		min	.037	2	30.579	1	.026	3	0	1	0	1	0	1
31	N16	max	-.037	3	33.951	3	.04	4	0	1	0	1	0	1
32		min	-.038	2	33.851	2	.039	2	0	1	0	1	0	1
33	N17	max	-.055	1	34.571	2	.365	2	0	1	0	1	0	1
34		min	-.098	2	34.457	3	-5.3	3	0	1	0	1	0	1
35	N18	max	.055	1	36.333	1	-.129	4	0	1	0	1	0	1
36		min	-.009	2	36.103	2	-6.027	3	0	1	0	1	0	1
37	N19	max	.038	1	30.273	2	-.029	4	0	1	0	1	0	1
38		min	.035	2	30.115	3	-.031	3	0	1	0	1	0	1
39	N20	max	-.037	3	31.673	1	-.044	2	0	1	0	1	0	1
40		min	-.04	2	31.541	2	-.046	3	0	1	0	1	0	1
41	N21	max	-.029	1	38.084	2	.112	2	0	1	0	1	0	1
42		min	-.116	2	37.895	3	-6.162	3	0	1	0	1	0	1
43	N22	max	.065	3	35.488	2	.09	4	0	1	0	1	0	1
44		min	-.07	2	35.357	3	-5.784	3	0	1	0	1	0	1
45	N23	max	.033	1	29.865	2	.031	4	0	1	0	1	0	1
46		min	.028	2	29.64	1	.03	3	0	1	0	1	0	1
47	N24	max	-.033	1	30.757	3	.044	4	0	1	0	1	0	1
48		min	-.038	2	30.528	2	.043	3	0	1	0	1	0	1
49	N25	max	.021	1	36.234	1	.248	2	0	1	0	1	0	1
50		min	-.096	2	36.198	2	-5.716	3	0	1	0	1	0	1
51	N26	max	.082	1	35.037	3	-.4	4	0	1	0	1	0	1
52		min	-.097	2	34.31	2	-5.941	3	0	1	0	1	0	1
53	N27	max	.051	3	33.404	2	-.027	4	0	1	0	1	0	1
54		min	.045	2	33.033	3	-.029	3	0	1	0	1	0	1
55	N28	max	-.051	1	29.108	1	-.045	2	0	1	0	1	0	1
56		min	-.058	2	28.771	2	-.049	3	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
57	N29	max	.058	1	36.951	2	.27	2	0	1	0	1	0	1
58		min	-.154	2	36.419	1	-6.182	3	0	1	0	1	0	1
59	N30	max	.432	1	25.357	3	-1.319	4	0	1	0	1	0	1
60		min	-10.908	2	6.402	2	-4.275	3	0	1	0	1	0	1
61	N31	max	1.091	1	19.43	2	-.236	3	0	1	0	1	0	1
62		min	-15.019	2	17.336	1	-.255	2	0	1	0	1	0	1
63	N32	max	-.252	3	23.175	2	-.09	2	0	1	0	1	0	1
64		min	-3.391	2	8.344	3	-.116	3	0	1	0	1	0	1
65	N33	max	.243	1	7.687	1	.131	1	0	1	0	1	0	1
66		min	-.383	2	-5.125	2	.122	2	0	1	0	1	0	1
67	N34	max	-1.011	3	25.245	3	-.113	4	0	1	0	1	0	1
68		min	-21.197	2	22.187	2	-.122	3	0	1	0	1	0	1
69	N35	max	-.641	3	43.362	2	-1.158	2	0	1	0	1	0	1
70		min	-15.577	2	29.79	1	-4.373	3	0	1	0	1	0	1
71	N71	max	-.111	1	11.428	2	.041	4	0	1	0	1	0	1
72		min	-.825	2	9.031	3	-.065	3	0	1	0	1	0	1
73	N72	max	-.168	3	14.473	3	-.757	4	0	1	0	1	0	1
74		min	-1.274	2	14.262	4	-.88	2	0	1	0	1	0	1
75	N73	max	.378	1	9.665	1	.735	2	0	1	0	1	0	1
76		min	-.298	2	8.157	2	.384	3	0	1	0	1	0	1
77	N74	max	.414	3	18.141	3	1.045	2	0	1	0	1	0	1
78		min	-.108	2	16.606	2	.356	3	0	1	0	1	0	1
79	N75	max	.597	3	22.286	3	-.182	2	0	1	0	1	0	1
80		min	.269	2	21.405	2	-.403	3	0	1	0	1	0	1
81	Totals:	max	0	1	941.529	1	0	2						
82		min	-135.07	2	941.529	2	-68.169	3						



FROM BTM, WIND BASE SHEAR = 124.7 k

POST TENSION FLOOR PLAN

1/8"=1'-0

NORTH

* TOP OF 10" THICK PT PODIUM SLAB ELEVATION = 110'-2 WITH DEPRESSED AREAS HATCHED
* SEE SHEET S3XX FOR TOPS OF CONCRETE WALL ELEVATIONS, EMBED PLATE LOCATIONS, AND PT SLAB PENETRATIONS
* SEE MECHANICAL AND PLUMBING FOR COORDINATION OF SLAB PENETRATIONS

PT BEAM SCHEDULE

MARK	DEPTH	WIDTH	FULL LENGTH MILD STEEL REINFORCING
16RB48	16"	48"	4-#8 TOP & BOTTOM

* SEE PLANS FOR REQUIRED ADDITIONAL REINFORCING
* SPLICE TOP BARS AT MID-SPAN. SPLICE BOTTOM BARS AT SUPPORTS
* TOP BARS AT ENDS REQUIRE A STD HOOK

INDICATES DEPRESSION IN TOP OF SLAB. SEE SECTIONS AND ARCHITECTURAL DRAWINGS

POST-TENSIONED PLAN NOTES

* SEE POST-TENSIONING GENERAL NOTES ON SHEET S-001
* BANDED AND UNIFORM FORCES, AFTER LOSSES, ARE SHOWN ON PLAN "k" INDICATES KIPS, "k/ft INDICATES KIPS PER LINEAR FOOT
* [#STR] INDICATES NUMBER/SPACING OF STRAND FOR FINAL FORCE NOTED
* HEIGHTS OF STRAND CENTERLINES AT HIGH POINTS, LOW POINTS, AND ANCHORS ARE NOTED ON PLAN THUS: 1.5
* STRESSING ENDS NOTED THUS: →
* DEAD ENDS (DE) NOTED THUS: —|
* CONTINUOUS MILD STEEL IS NOTED IN BEAM SCHEDULE
* PROVIDE STANDARD HOOKS ON BARS ENDING AT SLAB EDGES
* ADDITIONAL MILD STEEL IS NOTED ON PLAN
* CENTER BOTTOM MILD STEEL IN MIDDLE OF SPAN & TOP MILD STEEL OVER SUPPORTING BEAMS AND COLUMNS UNLESS NOTED OTHERWISE ON PLAN
* PROVIDE 1" COVER (TOP & BOTTOM) TO SLAB MILD STEEL REINFORCEMENT AND 2" COVER TO BEAM LONGITUDINAL MILD STEEL REINFORCEMENT
* POST-TENSIONING AND MILD REINFORCING FOR SLABS SHOWN IN EAST/WEST DIRECTION APPLIES ACROSS ENTIRE NORTH/SOUTH WIDTH OF EACH ZONE UNLESS NOTED OTHERWISE

FROM BTM: WIND BASE SHEAR = 48.9 k

LEVEL 0 WIND BASE SHEAR: 26.0 PSF × 66' × 10.167' = 17.447 k

TOTAL = 66.3[illegible] k

78.667'

10.167'

$V = \frac{78.667 \times 10.167}{2} \times 26.0$ PSF

= 10.397 k

TOTAL = 135.1 k

5psf wind D

FROM BTM: SEISMIC BASE SHEAR (ABOVE PODIUM) = 26.92 k

PODIUM & BELOW: WEIGHT: PODIUM: 10,500 S.F. × .833' × 145 pcf = 1268.243 k

FND. WALLS: 450 L.F. × 10.167' TALL × 1'-0 THK × 145 pcf = 663.397 k

1931.6 k

V = (.039072) 1931.6 k = 75.48 k

TOTAL = 102.4 k

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PHONE: 303 45

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910 28TH STREET

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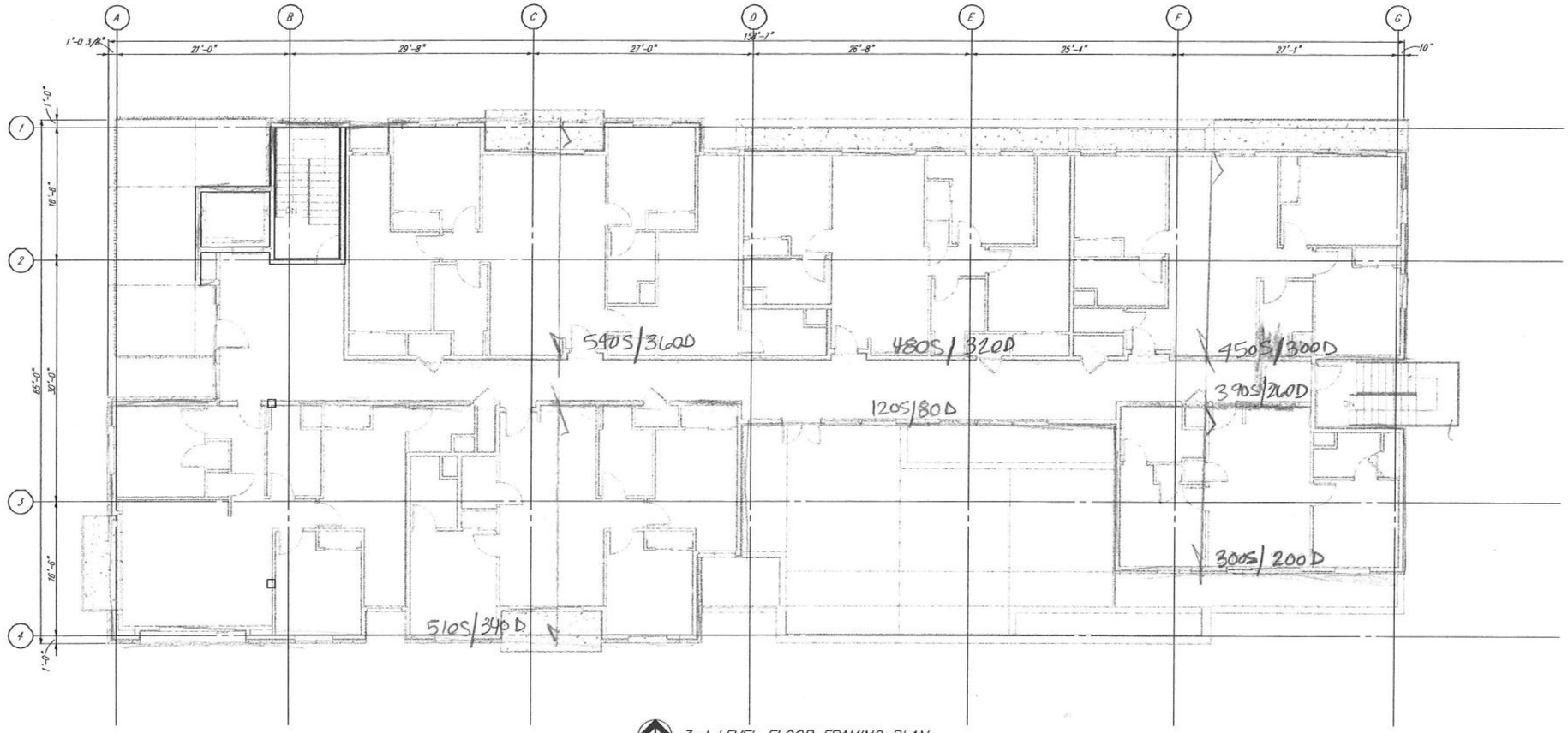
CONSULTING ENGINEERS

910 28TH STREET

POST-TENSIONED CONCRETE



3rd LEVEL FLOOR FRAMING PLAN

TRUE NORTH 1/8"=1'-0

0 2' 4' 8' 16'

* TOP OF FLOOR SHEATHING ELEVATION = 122'-10
* ⊘X INDICATES ATS HOLDOWN SYSTEM, SEE 6/S3.3:
  # INDICATES TOTAL NUMBER OF STUDS
  X INDICATES HOLDOWN SYSTEM TYPE, SEE 2/S3.3
* SEE SHEET S1.0 FOR STRUCTURAL GENERAL NOTES, ABBREVIATIONS KEY, AND FRAMING SYMBOLS LEGEND
* LAYOUT JOISTS TO AVOID PLUMBING PENETRATIONS

Roof 30S 20D

2ND LEVEL STRUCTURAL WALL SCHEDULE (MINIMUM REQUIREMENTS)

MARK	FRAMING (1)	TOP PLATE (1,2)	BOTTOM PLATE (1)	SHEATHING (6)	INSTALLATION & NAILING (3)
21	2-2x4 WOOD STUDS @ 16" (SHEAR WALL)	2-1 1/2"x3 1/2" LSL CONTINUOUS	1 1/2"x3 1/2" LSL CONTINUOUS (4)	7/16" WOOD SHEATHING (ONE FACE) (ALL EDGES BLOCKED)	8d COMMON @ 4" ON EDGES, 8d COMMON @ 12" ON INTERMEDIATE FRAMING
22	2-2x6 WOOD STUDS @ 16" (SHEAR WALL)	2-1 1/2"x5 1/2" LSL CONTINUOUS	1 1/2"x5 1/2" LSL CONTINUOUS (4)	7/16" WOOD SHEATHING (ONE FACE) (ALL EDGES BLOCKED)	8d GUN @ 6" ON EDGES, 8d GUN @ 12" ON INTERMEDIATE FRAMING
23	2x6 WOOD STUDS @ 16" (SHEAR WALL)	2-1 1/2"x5 1/2" LSL CONTINUOUS	1 1/2"x5 1/2" LSL CONTINUOUS (4)	7/16" WOOD SHEATHING (ONE FACE) (ALL EDGES BLOCKED)	8d COMMON @ 4" ON EDGES, 8d COMMON @ 12" ON INTERMEDIATE FRAMING
24	2x6 WOOD STUDS @ 16"	2-1 1/2"x5 1/2" LSL CONTINUOUS	1 1/2"x5 1/2" LSL CONTINUOUS (5)	5/8" GYPSUM SHEATHING (BOTH FACES)	6d COOLER @ 7"
25	2x6 WOOD STUDS @ 16"	2-1 1/2"x5 1/2" LSL CONTINUOUS	1 1/2"x5 1/2" LSL CONTINUOUS (5)	5/8" TYPE X GYPSUM SHEATHING (BOTH FACES)	6d COOLER @ 7"
26	2-2x6 WOOD STUDS @ 16"	2-1 1/2"x5 1/2" LSL CONTINUOUS	1 1/2"x5 1/2" LSL CONTINUOUS (5)	5/8" TYPE X GYPSUM SHEATHING (BOTH FACES)	6d COOLER @ 7"

NOTES:

1. HEM-FIR NO. 2 STUDS, U.N.O., LSL TOP & BOTTOM PLATES. BOTTOM PLATE TO BE PRESERVATIVE TREATED.
2. LAP END JOINTS 48" AND SPLICE WITH 8-12d GUN FACE NAILS EACH SIDE OF JOINT
3. NAIL ALL EDGES OF BLOCKED WALL SHEATHING
4. SEE SECTION 11/S3.1 FOR CONNECTION OF SOLE PLATE TO PT SLAB
5. SEE SECTION 14/S3.1 FOR CONNECTION OF SOLE PLATE TO PT SLAB
6. 7/16" SHEATHING TO BE APA RATED 24/16. 15/32" APA RATED 32/16 SHEATHING MAY BE SUBSTITUTED FOR 7/16" SHEATHING AT CONTRACTOR'S OPTION

TYPICAL FLOOR SHEATHING (UNO):
3/4" STURD-I-FLOOR, APA RATED 24" O.C. TONGUE & GROOVE SHEATHING GLUED AND NAILED WITH 8d COMMON NAILS (0.131"ø x 2 1/2") @ 6" ALONG PANEL EDGES AND @ 12" ALONG INTERMEDIATE FRAMING MEMBERS. LAY PANELS PERPENDICULAR TO FRAMING MEMBERS AND STAGGER PANEL JOINTS.

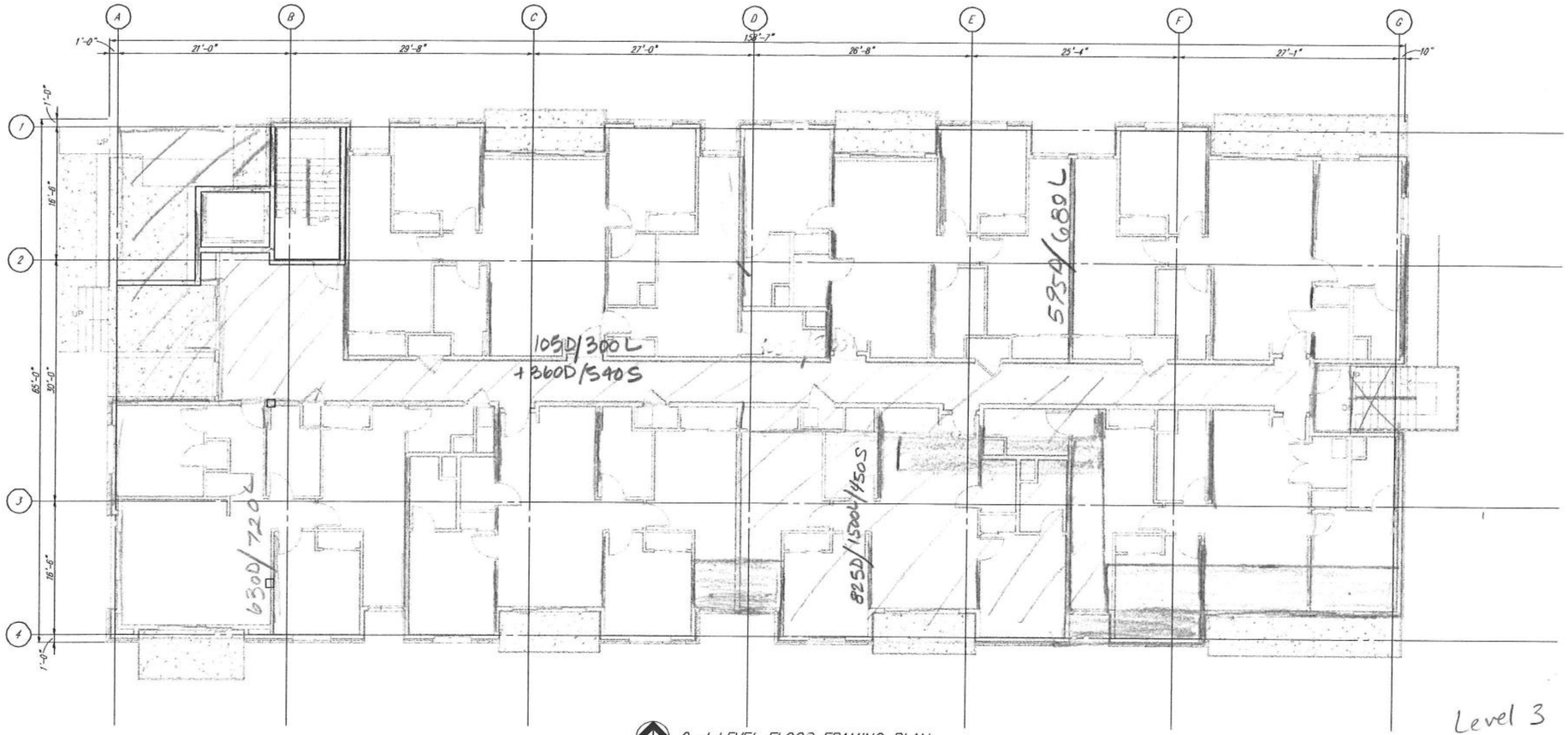
TYPICAL: SQUASH BLOCKING REQUIRED BELOW ALL WOOD COLUMNS, POSTS, & TRIMMERS. SQUASH BLOCKS SHALL BE SAME SIZE AS COLUMN ABOVE.

TYPICAL DROPPED (DASHED) HEADER TO BE 3-2x8 HEM FIR No.2, UNO. MINIMUM 2-KING & 1-TRIMMER STUD EA END UNO.

TYPICAL FLUSH (SOLID) BEAM TO BE 2-11 7/8" LVL UNO. SEE PLAN FOR NUMBER OF SUPPORT STUDS REQUIRED AT EACH END OF BEAM.

TYPICAL AT EACH BORED PLATE: WHERE WALL PLATES ARE BORED FOR PLUMBING, ELECTRICAL, ETC., THE BORED HOLE SHALL NOT BE GREATER THAN 2"ø (1 3/8"ø AT 2x4 PLATE). IN NO CASE SHALL THE EDGE OF THE BORED HOLE BE NEARER THAN 5/8" TO THE EDGE OF THE PLATE. WHERE LARGER HOLES ARE REQUIRED, NAIL A SIMPSON MSTA36 TO EACH SIDE OF EACH PLATE (CENTERED ON BORED HOLE) WITH 26-10d 1 1/2" NAILS (0.148" DIAMETER).

MAXIMUM OPENING IN SHEAR WALL SHEATHING SHALL BE 12" SQUARE. BLOCK ABOVE AND BELOW THE OPENING FOR THE FULL CLEAR WIDTH BETWEEN STUDS. ROUND HOLES LESS THAN 12"ø DO NOT REQUIRE BLOCKING



2nd LEVEL FLOOR FRAMING PLAN

TRUE NORTH ½"=1'-0

0 2' 4' 8' 16'

* TOP OF FLOOR SHEATHING ELEVATION = 122'-10
* ⌀Dx INDICATES AIS HOLDOWN SYSTEM, SEE 6/S3.3:
  ⌀ INDICATES TOTAL NUMBER OF STUDS
  X INDICATES HOLDOWN SYSTEM TYPE, SEE 2/S3.3
* SEE SHEET S1.0 FOR STRUCTURAL GENERAL NOTES, ABBREVIATIONS KEY, AND FRAMING SYMBOLS LEGEND
* LAYOUT JOISTS TO AVOID PLUMBING PENETRATIONS

PODIUM LEVEL STRUCTURAL WALL SCHEDULE (MINIMUM REQUIREMENTS)

MARK	FRAMING (1)	TOP PLATE (1,2)	BOTTOM PLATE (1)	SHEATHING (8)	INSTALLATION & NAILING (3)
21	2-2x4 WOOD STUDS @ 16" (SHEAR WALL)	2-1½"x3½" LSL CONTINUOUS	1½"x3½" LSL CONTINUOUS (4)	7/16" WOOD SHEATHING (ONE FACE) (ALL EDGES BLOCKED)	8d COMMON @ 4" ON EDGES, 8d COMMON @ 12" ON INTERMEDIATE FRAMING
22	2-2x6 WOOD STUDS @ 16" (SHEAR WALL)	2-1½"x5½" LSL CONTINUOUS	1½"x5½" LSL CONTINUOUS (4)	7/16" WOOD SHEATHING (ONE FACE) (ALL EDGES BLOCKED)	8d GUN @ 6" ON EDGES, 8d GUN @ 12" ON INTERMEDIATE FRAMING
23	2x6 WOOD STUDS @ 16" (SHEAR WALL)	2-1½"x5½" LSL CONTINUOUS	1½"x5½" LSL CONTINUOUS (4)	7/16" WOOD SHEATHING (ONE FACE) (ALL EDGES BLOCKED)	8d COMMON @ 4" ON EDGES, 8d COMMON @ 12" ON INTERMEDIATE FRAMING
24	2x6 WOOD STUDS @ 16"	2-1½"x5½" LSL CONTINUOUS	1½"x5½" LSL CONTINUOUS (5)	⅝" GYPSUM SHEATHING (BOTH FACES)	6d COOLER @ 7"
25	2x6 WOOD STUDS @ 16"	2-1½"x5½" LSL CONTINUOUS	1½"x5½" LSL CONTINUOUS (5)	⅝" TYPE X GYPSUM SHEATHING (BOTH FACES)	6d COOLER @ 7"
26	2-2x6 WOOD STUDS @ 16"	2-1½"x5½" LSL CONTINUOUS	1½"x5½" LSL CONTINUOUS (5)	⅝" TYPE X GYPSUM SHEATHING (BOTH FACES)	6d COOLER @ 7"

NOTES:

1. HEM-FIR NO. 2 STUDS, U.N.O., LSL TOP & BOTTOM PLATES. BOTTOM PLATE TO BE PRESERVATIVE TREATED.
2. LAP END JOINTS 48" AND SPLICE WITH 8-12d GUN FACE NAILS EACH SIDE OF JOINT
3. NAIL ALL EDGES OF BLOCKED WALL SHEATHING
4. SEE SECTION 11/S3.1 FOR CONNECTION OF SOLE PLATE TO PT SLAB
5. SEE SECTION 14/S3.1 FOR CONNECTION OF SOLE PLATE TO PT SLAB
6. 7/16" SHEATHING TO BE APA RATED 24/16. 15/32" APA RATED 32/16 SHEATHING MAY BE SUBSTITUTED FOR 7/16" SHEATHING AT CONTRACTOR'S OPTION

TYPICAL FLOOR SHEATHING (UNO):
¾" STURD-I-FLOOR, APA RATED 24" O.C. TONGUE & GROOVE SHEATHING GLUED AND NAILED WITH 8d COMMON NAILS (0.131"ø x 2½") @ 6" ALONG PANEL EDGES AND @ 12" ALONG INTERMEDIATE FRAMING MEMBERS. LAY PANELS PERPENDICULAR TO FRAMING MEMBERS AND STAGGER PANEL JOINTS.

TYPICAL: SQUASH BLOCKING REQUIRED BELOW ALL WOOD COLUMNS, POSTS, & TRIMMERS. SQUASH BLOCKS SHALL BE SAME SIZE AS COLUMN ABOVE.

TYPICAL DROPPED (DASHED) HEADER TO BE 3-2x8 HEM FIR No.2, UNO. MINIMUM 2-KING & 1-TRIMMER STUD EA END UNO.

TYPICAL FLUSH (SOLID) BEAM TO BE 2-11 7/8" LVL UNO. SEE PLAN FOR NUMBER OF SUPPORT STUDS REQUIRED AT EACH END OF BEAM.

TYPICAL AT EACH BORED PLATE: WHERE WALL PLATES ARE BORED FOR PLUMBING, ELECTRICAL, ETC., THE BORED HOLE SHALL NOT BE GREATER THAN 2"ø (1⅜"ø AT 2x4 PLATE). IN NO CASE SHALL THE EDGE OF THE BORED HOLE BE NEARER THAN ⅝" TO THE EDGE OF THE PLATE. WHERE LARGER HOLES ARE REQUIRED, NAIL A SIMPSON MSTA36 TO EACH SIDE OF EACH PLATE (CENTERED ON BORED HOLE) WITH 26-10d1½" NAILS (0.148" DIAMETER).

MAXIMUM OPENING IN SHEAR WALL SHEATHING SHALL BE 12" SQUARE. BLOCK ABOVE AND BELOW THE OPENING FOR THE FULL CLEAR WIDTH BETWEEN STUDS. ROUND HOLES LESS THAN 12"ø DO NOT REQUIRE BLOCKING

Level 3

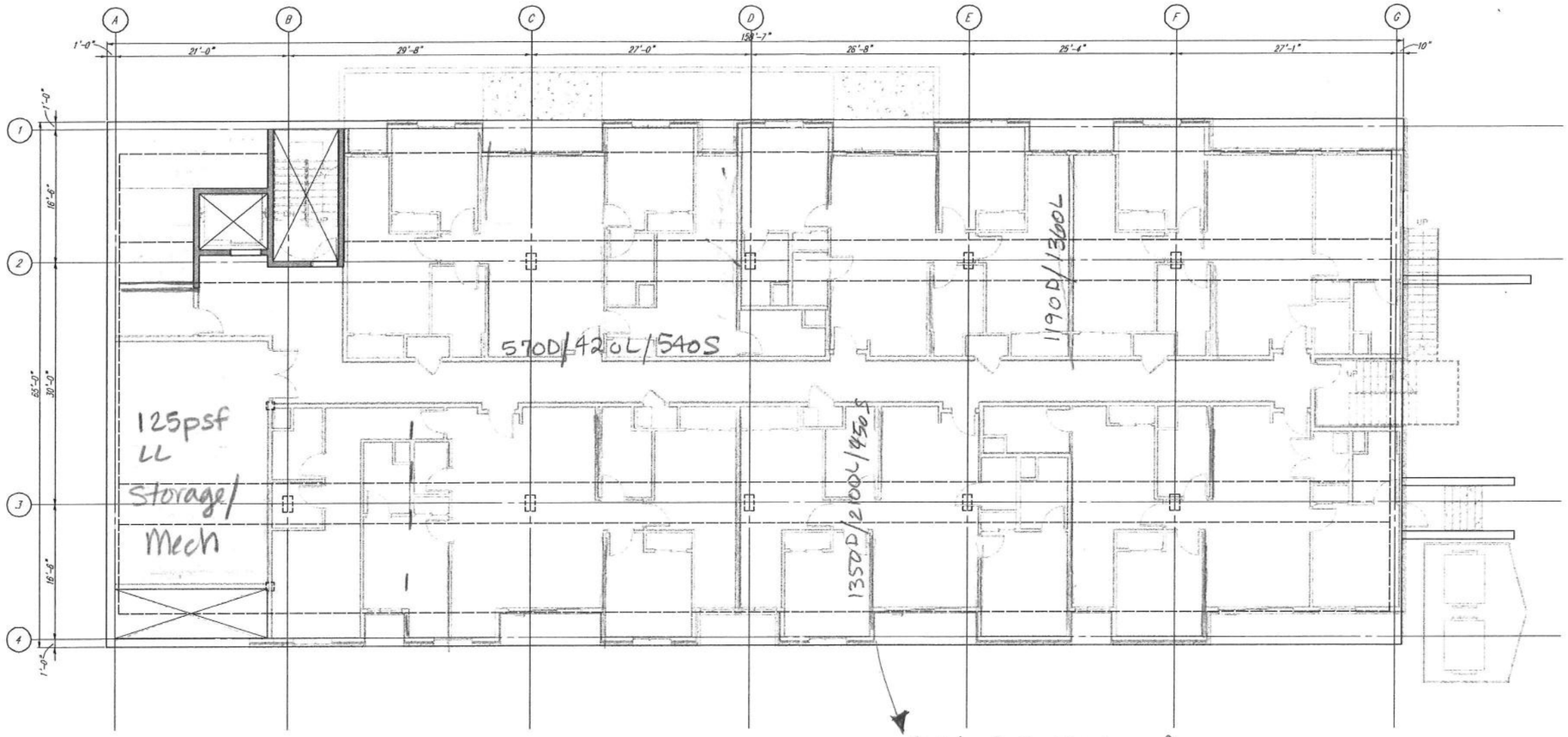
= Planters 220psf D
30psf S

= Public Deck 55psf D
100psf L
30psf S

= Private Deck 55psf D
40psf L
30psf S

= Public Hallway 35psf D
100psf L

35psf D
40psf L



D+L > D+.75(L+S)

D+L = 3.45kef < 3.6kef

∴ can distribute over 10' width

2nd Floor 35psf D
40psf L

PODIUM FLOOR – LEVEL 1 PLAN

TRUE NORTH 1/8"=1'-0

0 2' 4' 8' 16'

- TOP OF PT PODIUM SLAB ELEVATION = 1XX'-0
- TOP OF CONCRETE WALL ELEVATION NOTED THUS: ELEV
- SEE SHEET S-XXX FOR ADDITIONAL FLOOR FRAMING INFORMATION
- SEE SHEET S-102PT FOR BEAM DIMENSIONS AND CONC REINFORCING
- SEE MECHANICAL AND PLUMBING FOR COORDINATION OF SLAB PENETRATIONS
- INDICATES 12"x12"x0'-8" W/ 4-5/8"ø x6" HAS ø 4" CAGE AT LOCATIONS SHOWN W/ 5/8"ø x 3" THREADED ARC STUD
- INDICATES HOLDOWN EMBED PLATE, SEE X/SXXX
- ★ INDICATES EMBED ℄ ON CONC EDGE AND BOT AT BOTH EDGES OF ALL AWNINGS W/ HSS6x3 JAMB BELOW

TYPICAL STAIR LANDING SLAB CONSTRUCTION
4" NORMAL WEIGHT CONCRETE WITH FIBERMESH
ON 1.5VLI22 GALVANIZED COMPOSITE STEEL DECK.

Level 2

Worst Case 10' strip

SDL = 140psf (distribute over 10')

LL = 250psf (unreduced)

SL = 45psf

$A_T = 1{,}120 ft^2$ for 28' length of wall

$K_{LL} = \frac{A_I}{A_T} = \frac{1960}{1{,}120} = 1.75$ $L = 0.59L_o = 150psf$

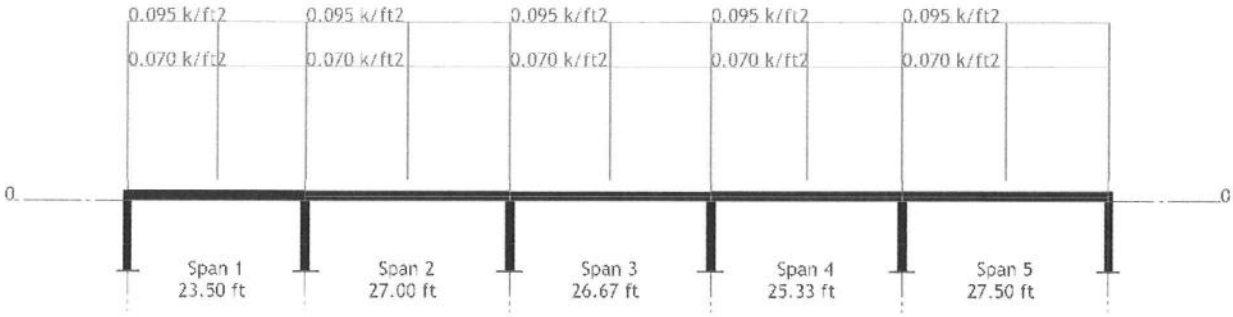
40psf L

D = self-weight slab/beams + 5psf misc

ADAPT

Your Partner in Concrete Design

15100 910 28th Street
Girder Grid 2



Tuesday, July 26, 2011

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- B.3 - Design Moments Envelope
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- B.5 - Stress check / Code check Envelope
- B.6 - Rebar Report
- B.7 - Punching Shear
- B.8 - Deflection
- B.9 - Quantities

A. Design Parameters and Load Combinations

A.1 Project Design Parameters

Parameter	Value	Parameter	Value
Concrete		Minimum Cover at BOTTOM	2.00 in
F'c for BEAMS/SLABS	5000.00 psi	Post-tensioning	
For COLUMNS/WALLS	4000.00 psi	SYSTEM	UNBONDED
Ec for BEAMS/SLABS	3605.00 ksi	Fpu	270.00 ksi
For COLUMNS/WALLS	3605.00 ksi	Fse	175.00 ksi
CREEP factor	2.00	Strand area	0.153 in 2
CONCRETE WEIGHT	NORMAL	Min CGS from TOP	2.50 in
UNIT WEIGHT	150.00 pcf	Min CGS from BOT for interior spans	2.50 in
Tension stress limits / (f'c)1/2		Min CGS from BOT for exterior spans	2.50 in
At Top	6.000	Min average precompression	125.00 psi
At Bottom	6.000	Max spacing / slab depth	8.00
Compression stress limits / f'c		Analysis and design options	
At all locations	0.450	Structural system	TWO-WAY
Reinforcement		Moment of Inertia over support is	INCREASED
Fy (Main bars)	60.00 ksi	Moments reduced to face of support	YES
Fy (Shear reinforcement)	60.00 ksi	Moment Redistribution	YES
Minimum Cover at TOP	2.00 in	DESIGN CODE SELECTED	ACI-318 (2005)

A.2 Load Combinations

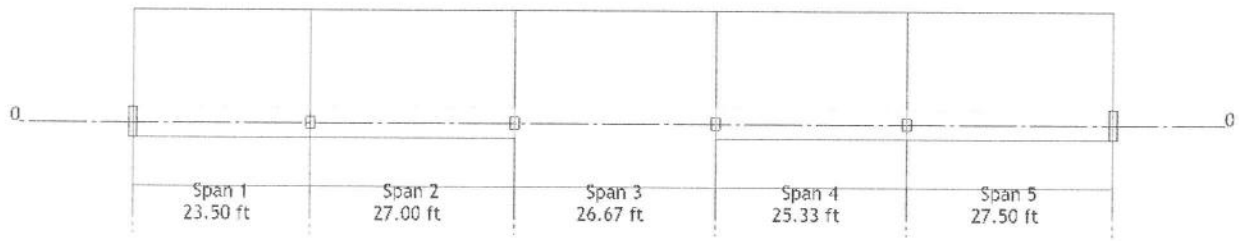
Strength load combinations
1. 1.2 SW + 1.6 LL + 1.2 SDL + 1.2 X + 1 HYP

Service load combinations
Sustained Load
1. 1 SW + 0.3 LL + 1 SDL + 1 X + 1 PT
Total Load
2. 1 SW + 1 LL + 1 SDL + 1 X + 1 PT

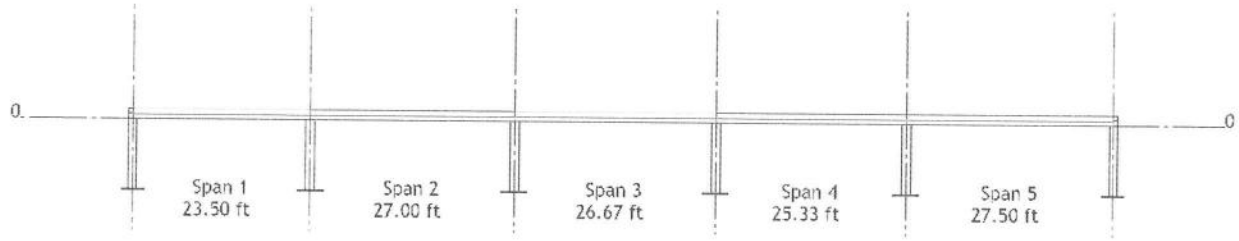
Initial load combinations
1 SW + 1.15 PT

B. Design Strip Report: Girder Grid 2
B.1 Geometry

- Plan

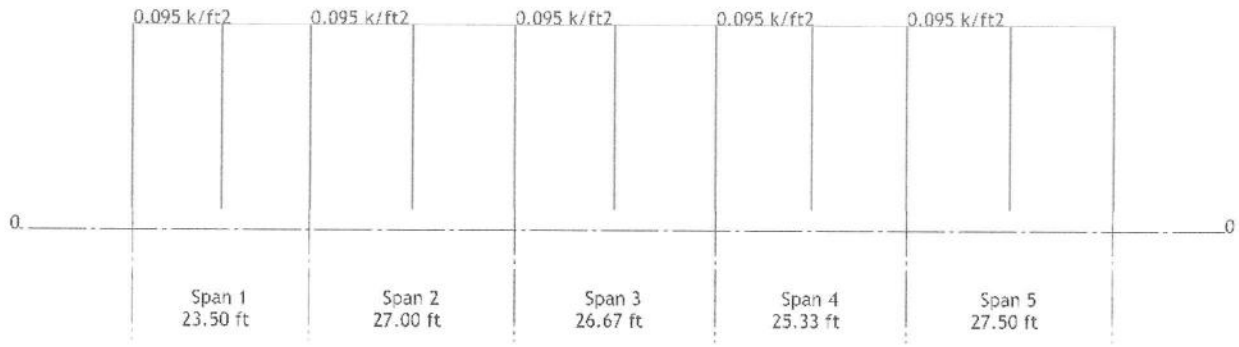


- Elevation

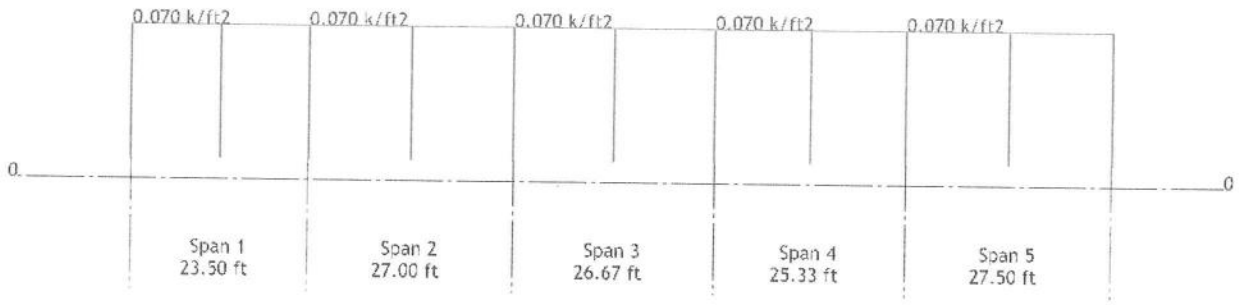

0.
0
Span 1
23.50 ft
Span 2
27.00 ft
Span 3
26.67 ft
Span 4
25.33 ft
Span 5
27.50 ft

B.2 Applied loads

- Superimposed Dead Load

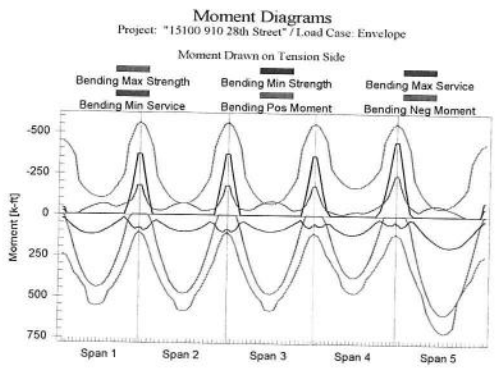


- Live Load


0.070 k/ft2
0.070 k/ft2
0.070 k/ft2
0.070 k/ft2
0.070 k/ft2
0.
0
Span 1
23.50 ft
Span 2
27.00 ft
Span 3
26.67 ft
Span 4
25.33 ft
Span 5
27.50 ft

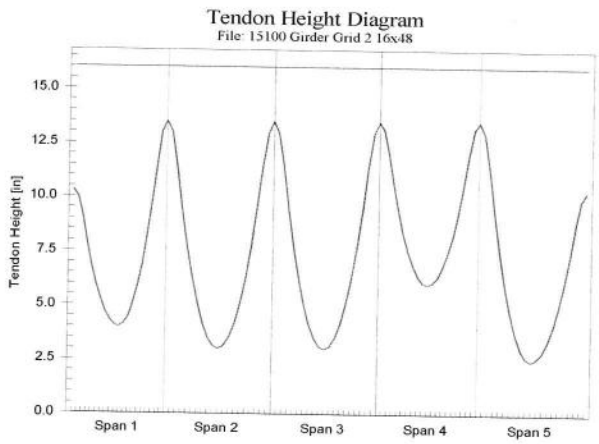
B.3 Design Moment

LOAD COMBINATION: Envelope



DESIGN MOMENT
(Moment is drawn on tension side)

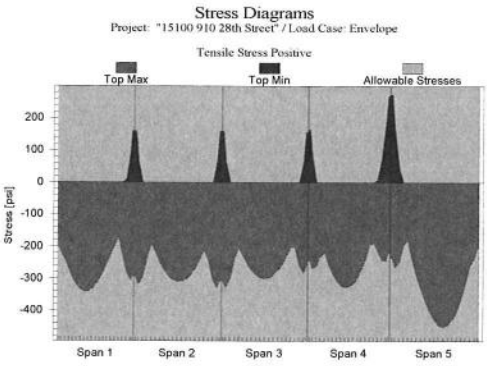
B.4 Tendon Profile

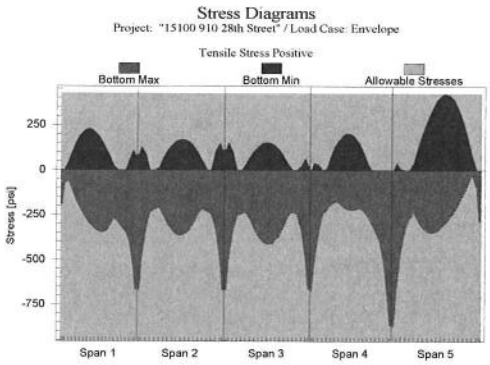


POST-TENSIONING
PROFILE

B.5 Stress check results / Code check

LOAD COMBINATION: Envelope





SERVICE COMBINATION STRESSES
(Tension stress positive)

B.6 Rebar Report

Total Strip Provided Rebar

Span	ID	Location	From	Quantity	Size	Length	Area
			ft			ft	in2
1	1	TOP	0.00	3	8	5.00	2.37
1	2	TOP	18.80	3	8	10.50	2.37
2	3	TOP	21.60	4	8	11.00	3.16
3	4	TOP	21.34	3	8	10.50	2.37
4	5	TOP	20.26	4	8	11.00	3.16
5	6	TOP	22.00	3	8	5.50	2.37
1	7	BOT	7.05	1	8	7.50	0.79
2	8	BOT	10.80	1	8	7.00	0.79
3	9	BOT	10.67	1	8	5.50	0.79
4	10	BOT	7.60	1	8	9.00	0.79
5	11	BOT	8.25	2	8	12.00	1.58
1	12	BOT	7.05	1	8	6.00	0.79
4	13	BOT	8.86	1	8	6.50	0.79
5	14	BOT	11.00	2	8	9.50	1.58

B.7 Punching Shear

Critical Section Stresses

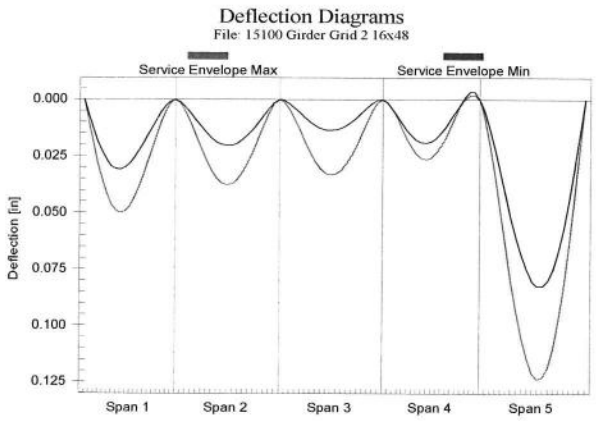
Label	Layer	Cond.	Factored shear	Factored moment	Stress due to shear	Stress due to moment	Total stress	Allowable stress	Stress ratio
			k	k-ft	ksi	ksi	ksi	ksi	
1	---	---	---	---	---	---	---	---	---
2	1	1	-254.26	+4.12	0.17	0.001	0.170	0.216	0.785
3	1	1	-256.33	+0.09	0.17	0.000	0.170	0.216	0.786
4	1	1	-245.53	-2.66	0.16	0.001	0.164	0.216	0.756
5	1	1	-268.50	+15.50	0.18	0.005	0.183	0.216	0.845
6	---	---	---	---	---	---	---	---	---

Punching Shear Reinforcement
Reinforcement option: Shear Studs
Stud diameter: 0.5
Number of rails per side: 2

Col.	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist
	in	in	in	in	in	in	in	in	in	in
1	---	---								
2										
3										
4										
5										
6	---	---								

Dist. = Distance measured from the face of support
Note: Columns with --- have not been checked for punching shear.
Note: Columns with *** have exceeded the maximum allowable shear stress.

B.8 Deflection



DEFLECTION

B.9 Quantities

CONCRETE

Total volume of concrete = 2805.83ft3 (103.92 yd3)
Area covered = 3055.00 ft2

MILD STEEL

Total weight of rebar = 732.19 lbs
Average rebar usage = 0.24 psf, 0.26 pcf

PRESTRESSING MATERIAL

Total weight of tendon = 1072.9 lb
Average tendon usage = 0.35 psf, 0.38 pcf

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☐ Winter Park, CO Ph 970.722.7677 Fax 970.722.7679

Date: _____ Page: ____ of ____
By: _____ Chkd By: _____
Job No: 15100
Project: _____
Client: _____
☐ Preliminary ☐ Final

Girder Grid 3

$158' \times 23.5' = 3{,}713 ft^2 = A_T$

$K_{LL} = 2$

$L = .42 L_o$

Design for uniform load: too much load if wall only distributed 11.25' → need to use true trib's

		Dead
Level 3	48psf LL (accounts for 100psf in hall)	35
Level 2	48	35
Level 1	48	5
	143 x .42 = 60psf LL	75psf → 95
Terrace	100psf LL	55
	48	35
	48	5
	196 x .42 = 82psf LL use 85	95 psf → 115

Roof load is line load or 20psf D
30 psf S

use 70psf LL to account for .25(L+S)

ADAPT

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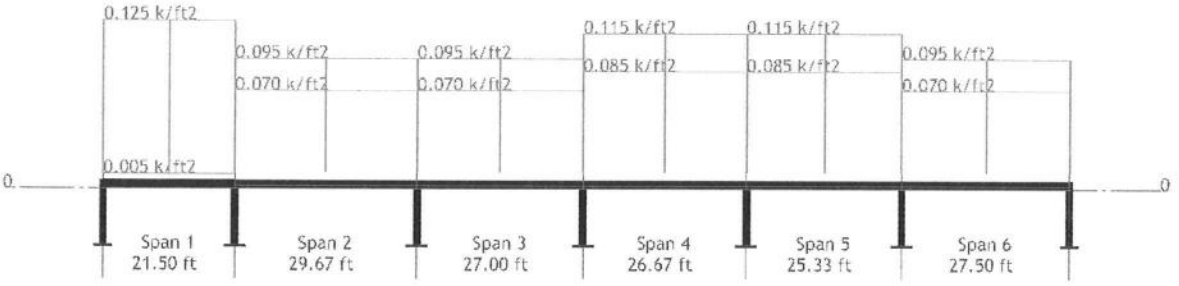
15100 910 28th Street
Girder Grid 3



Tuesday, July 26, 2011

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A. - Project Design Parameters and Load Combinations
- A.1 - Project Design Parameters
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B. - Design Strip Report Girder Grid 3
- B.1 - Geometry
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- B.3 - Design Moments Envelope
- B.4 - Tendon Profile
- B.5 - Stress check / Code check Envelope
- B.6 - Rebar Report
- B.7 - Punching Shear
- B.8 - Deflection
- B.9 - Quantities

A. Design Parameters and Load Combinations

A.1 Project Design Parameters

Parameter	Value	Parameter	Value
Concrete		Minimum Cover at BOTTOM	2.00 in
F'c for BEAMS/SLABS	5000.00 psi	Post-tensioning	
For COLUMNS/WALLS	4000.00 psi	SYSTEM	UNBONDED
Ec for BEAMS/SLABS	3605.00 ksi	Fpu	270.00 ksi
For COLUMNS/WALLS	3605.00 ksi	Fse	175.00 ksi
CREEP factor	2.00	Strand area	0.153 in 2
CONCRETE WEIGHT	NORMAL	Min CGS from TOP	2.50 in
UNIT WEIGHT	150.00 pcf	Min CGS from BOT for interior spans	2.50 in
Tension stress limits / (f'c)1/2		Min CGS from BOT for exterior spans	2.50 in
At Top	6.000	Min average precompression	125.00 psi
At Bottom	6.000	Max spacing / slab depth	8.00
Compression stress limits / f'c		Analysis and design options	
At all locations	0.450	Structural system	TWO-WAY
Reinforcement		Moment of Inertia over support is	INCREASED
Fy (Main bars)	60.00 ksi	Moments reduced to face of support	YES
Fy (Shear reinforcement)	60.00 ksi	Moment Redistribution	YES
Minimum Cover at TOP	2.00 in	DESIGN CODE SELECTED	ACI-318 (2005)

A.2 Load Combinations

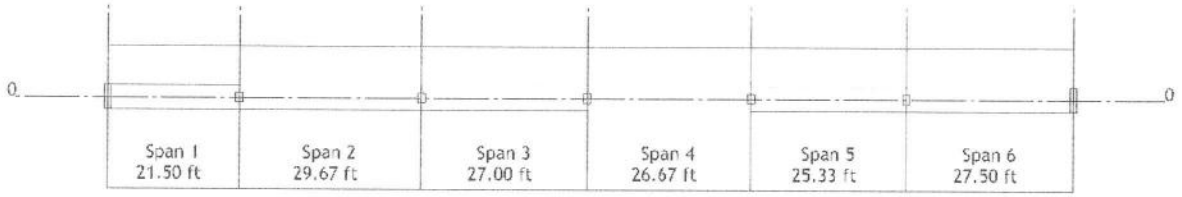
Strength load combinations
1. 1.2 SW + 1.6 LL + 1.2 SDL + 1.2 X + 1 HYP

Service load combinations
Sustained Load
1. 1 SW + 0.3 LL + 1 SDL + 1 X + 1 PT
Total Load
2. 1 SW + 1 LL + 1 SDL + 1 X + 1 PT

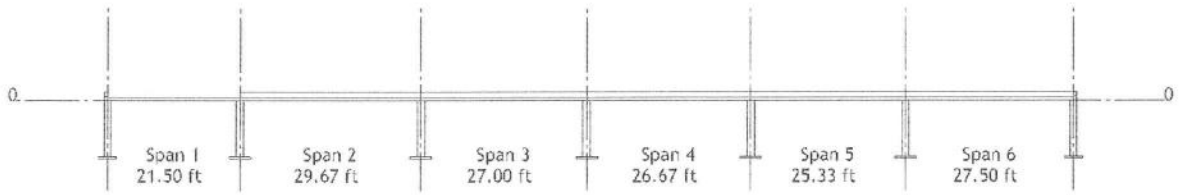
Initial load combinations
1 SW + 1.15 PT

B. Design Strip Report: Girder Grid 3
B.1 Geometry

- Plan

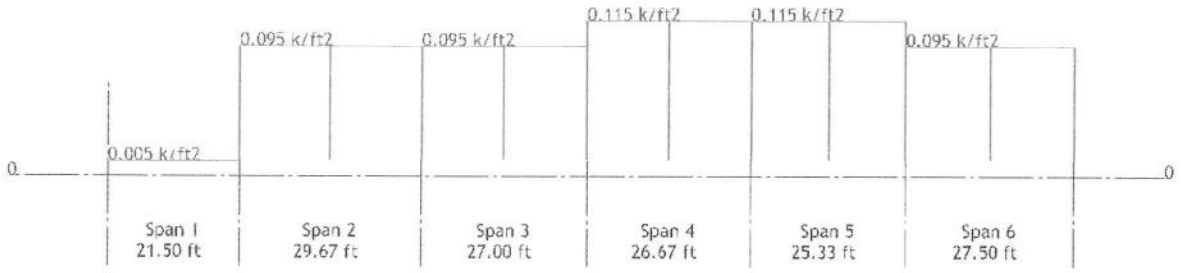


- Elevation

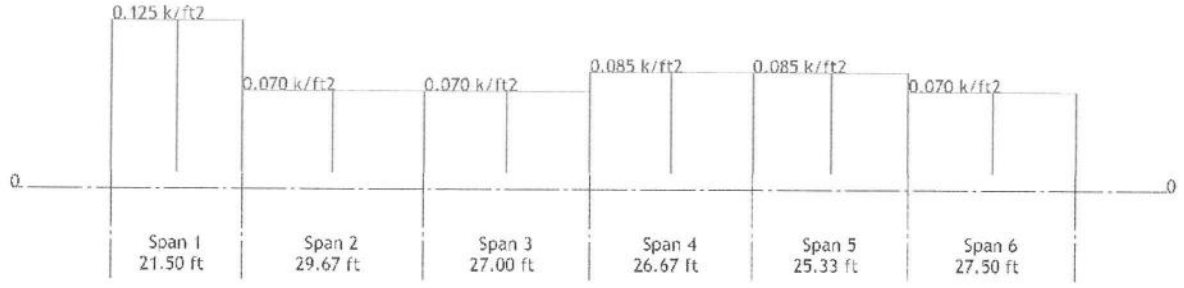

0
0
Span 1
21.50 ft
Span 2
29.67 ft
Span 3
27.00 ft
Span 4
26.67 ft
Span 5
25.33 ft
Span 6
27.50 ft

B.2 Applied loads

- Superimposed Dead Load

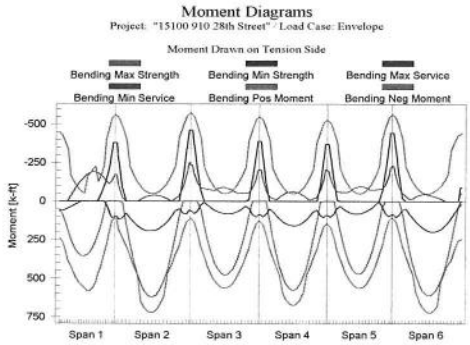


- Live Load


0.125 k/ft2
0.070 k/ft2
0.070 k/ft2
0.085 k/ft2
0.085 k/ft2
0.070 k/ft2
0
0
Span 1
21.50 ft
Span 2
29.67 ft
Span 3
27.00 ft
Span 4
26.67 ft
Span 5
25.33 ft
Span 6
27.50 ft

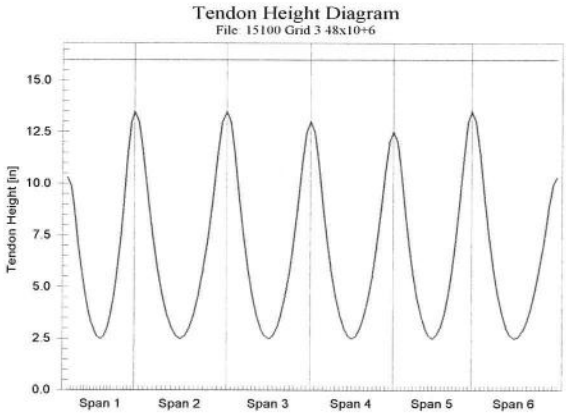
B.3 Design Moment

LOAD COMBINATION: Envelope



DESIGN MOMENT
(Moment is drawn on tension side)

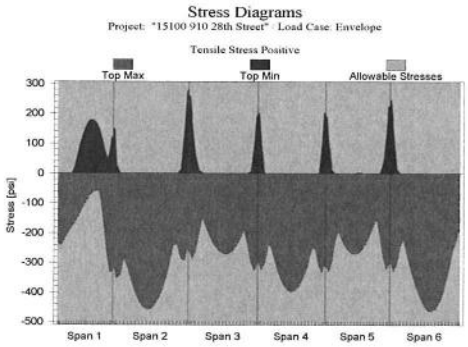
B.4 Tendon Profile

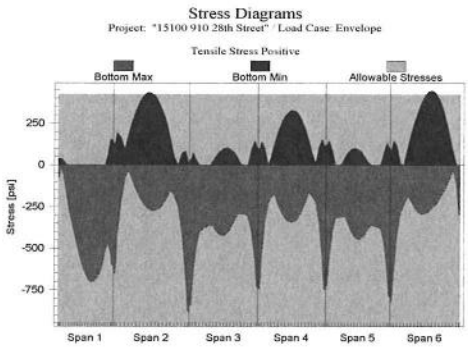


POST-TENSIONING PROFILE

B.5 Stress check results / Code check

LOAD COMBINATION: Envelope





SERVICE COMBINATION STRESSES

(Tension stress positive)

B.6 Rebar Report

Total Strip Provided Rebar

Span	ID	Location	From	Quantity	Size	Length	Area
			ft			ft	in2
1	1	TOP	0.00	3	8	4.50	2.37
1	2	TOP	9.68	4	8	5.50	3.16
1	3	TOP	17.20	3	8	10.50	2.37
2	4	TOP	23.74	4	8	11.50	3.16
3	5	TOP	21.60	4	8	11.00	3.16
4	6	TOP	21.34	3	8	10.50	2.37
5	7	TOP	20.26	4	8	11.00	3.16
6	8	TOP	22.00	3	8	5.50	2.37
2	9	BOT	0.58	1	8	4.00	0.79
2	10	BOT	8.90	4	8	12.00	3.16
4	11	BOT	8.00	2	8	11.00	1.58
6	12	BOT	8.25	2	8	13.50	1.58
2	13	BOT	0.58	1	8	2.50	0.79
4	14	BOT	9.33	1	8	8.00	0.79
6	15	BOT	9.63	2	8	11.00	1.58

B.7 Punching Shear

Critical Section Stresses

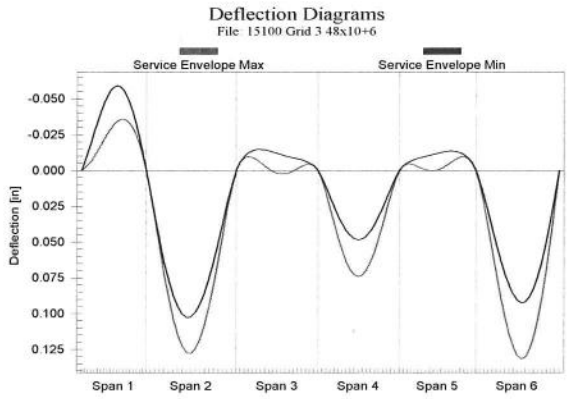
Label	Layer	Cond.	Factored shear	Factored moment	Stress due to shear	Stress due to moment	Total stress	Allowable stress	Stress ratio
			k	k-ft	ksi	ksi	ksi	ksi	
1	---	---	---	---	---	---	---	---	---
2	1	1	-253.02	+38.32	0.17	0.012	0.180	0.216	0.831
3	1	1	-276.40	-22.79	0.18	0.007	0.190	0.216	0.880
4	1	1	-272.15	+14.44	0.18	0.004	0.185	0.216	0.855
5	1	1	-276.15	-14.68	0.18	0.005	0.188	0.216	0.867
6	1	1	-282.34	+18.20	0.19	0.006	0.193	0.216	0.891
7	---	---	---	---	---	---	---	---	---

Punching Shear Reinforcement
Reinforcement option: Shear Studs
Stud diameter: 0.5
Number of rails per side: 2

Col.	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist
	in	in	in	in	in	in	in	in	in	in
1	---	---								
2										
3										
4										
5										
6										
7	---	---								

Dist. = Distance measured from the face of support
Note: Columns with --- have not been checked for punching shear.
Note: Columns with *** have exceeded the maximum allowable shear stress.

B.8 Deflection



DEFLECTION

B.9 Quantities

CONCRETE

Total volume of concrete = 3403.04ft3 (126.04 yd3)
Area covered = 3705.25 ft2

MILD STEEL

Total weight of rebar = 1056.56 lbs
Average rebar usage = 0.29 psf, 0.31 pcf

PRESTRESSING MATERIAL

Total weight of tendon = 1301.3 lb
Average tendon usage = 0.35 psf, 0.38 pcf

ADAPT

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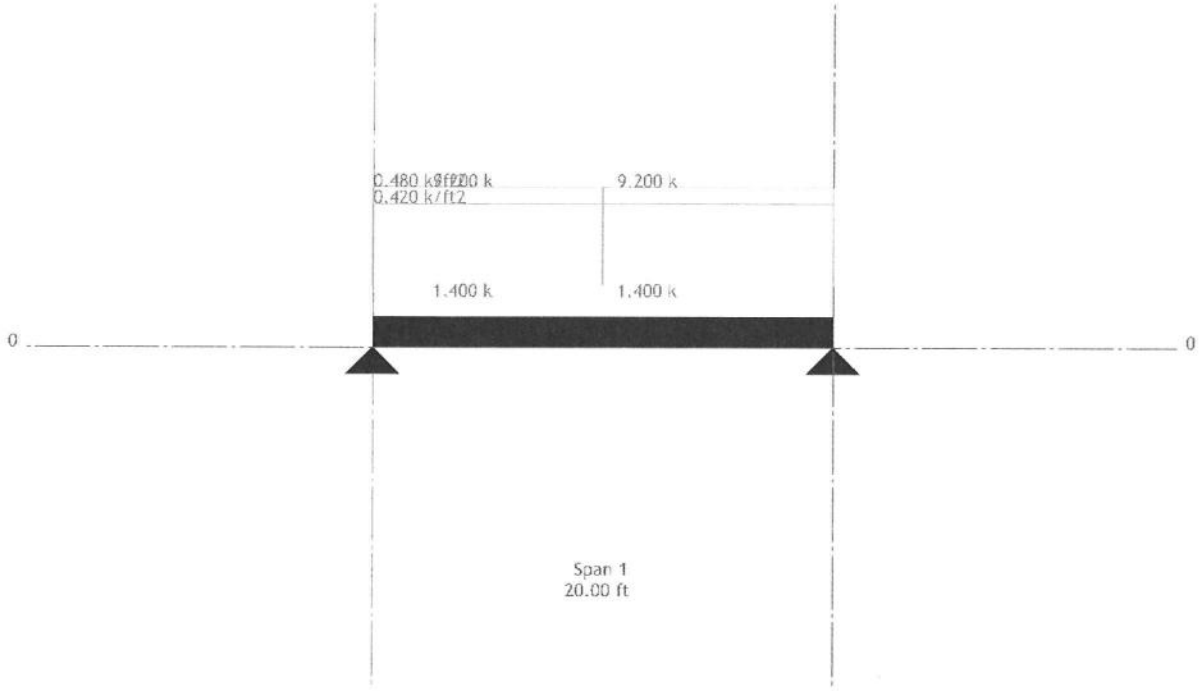
Grid G Beam



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- B.8 - Deflection
- B.9 - Quantities

A. Design Parameters and Load Combinations

A.1 Project Design Parameters

Parameter	Value	Parameter	Value
Concrete		SYSTEM	UNBONDED
F'c for BEAMS/SLABS	5000.00 psi	Fpu	270.00 ksi
Ec for BEAMS/SLABS	3605.00 ksi	Fse	175.00 ksi
CREEP factor	2.00	Strand area	0.153 in 2
CONCRETE WEIGHT	NORMAL	Min CGS from TOP	1.00 in
UNIT WEIGHT	150.00 pcf	Min CGS from BOT for interior spans	1.00 in
Tension stress limits / (f'c)1/2		Min CGS from BOT for exterior spans	1.75 in
At Top	6.000	Min average precompression	125.00 psi
At Bottom	6.000	Max spacing / slab depth	8.00
Compression stress limits / f'c		Analysis and design options	
At all locations	0.450	Structural system	BEAM
Reinforcement		Moment of Inertia over support is	NOT INCREASED
Fy (Main bars)	60.00 ksi	Moments reduced to face of support	YES
Fy (Shear reinforcement)	60.00 ksi	Moment Redistribution	NO
Minimum Cover at TOP	1.00 in	Effective flange width consideration	YES
Minimum Cover at BOTTOM	1.00 in	Effective flange width implementation method	ACI-318
Post-tensioning		DESIGN CODE SELECTED	ACI-318 (2005)

A.2 Load Combinations

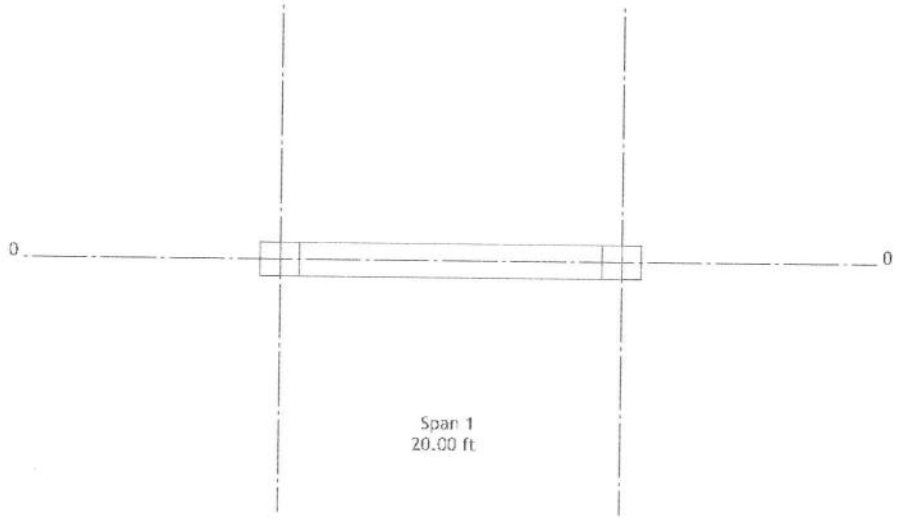
Strength load combinations
1. 1.2 SW + 1.6 LL + 1.2 SDL + 1.6 X + 1 HYP

Service load combinations
Sustained Load
1. 1 SW + 0.3 LL + 1 SDL + 0.3 X + 1 PT
Total Load
2. 1 SW + 1 LL + 1 SDL + 1 X + 1 PT

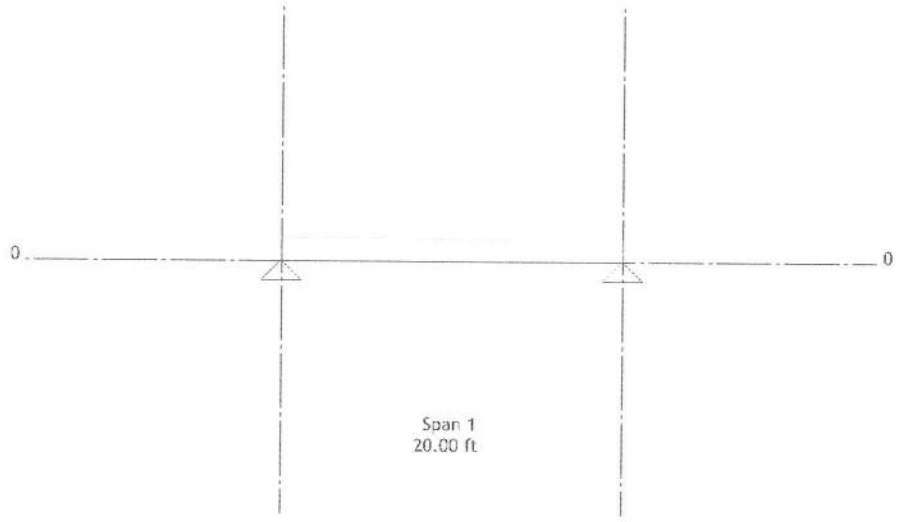
Initial load combinations
1 SW + 1.15 PT

B. Design Strip Report:
B.1 Geometry

- Plan

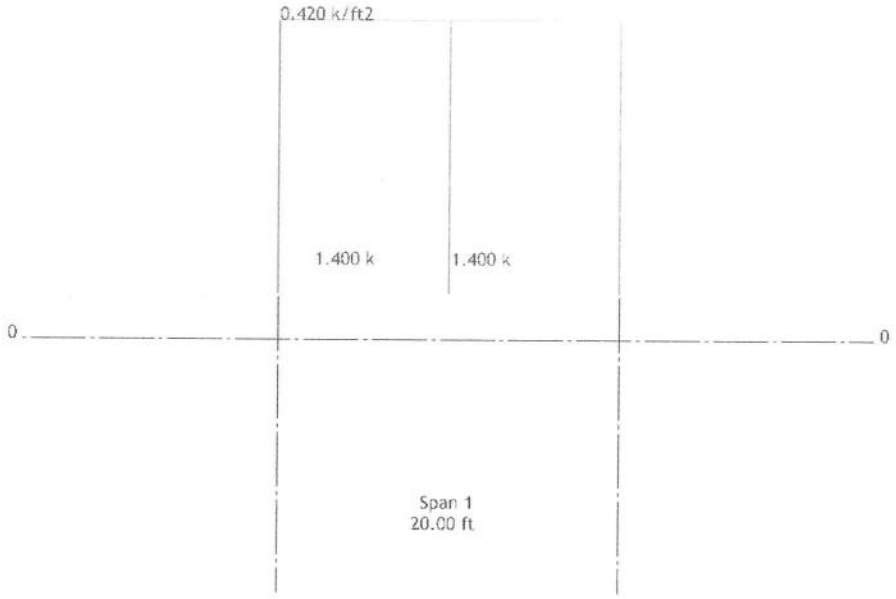


- Elevation

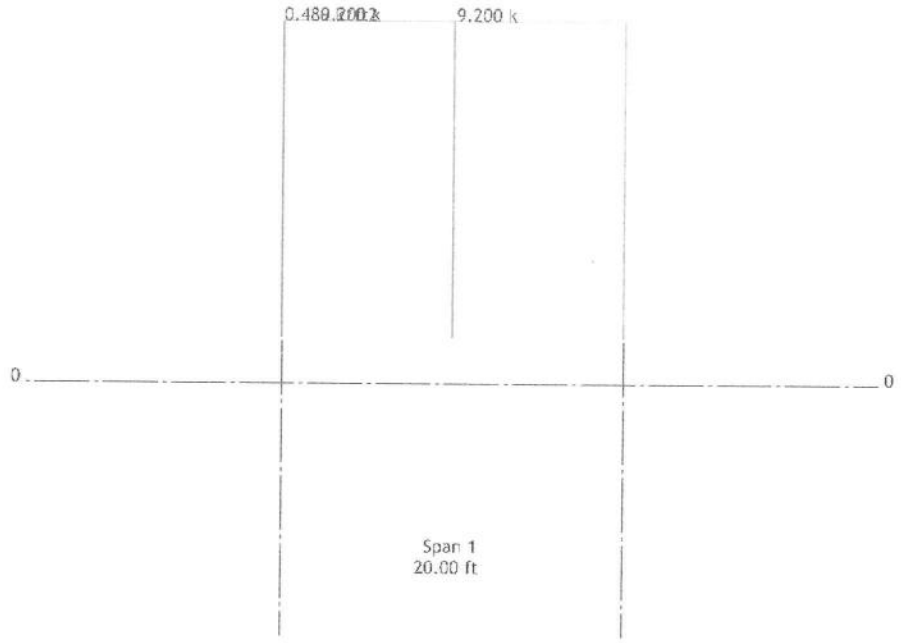

0
0
Span 1
20.00 ft

B.2 Applied loads

- Superimposed Dead Load

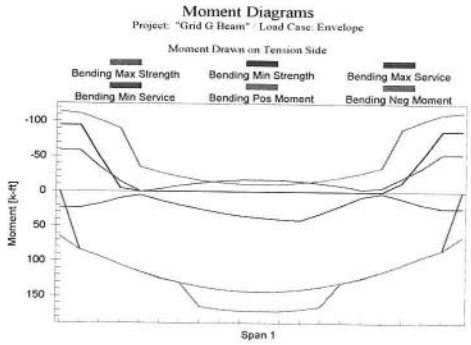


- Live Load


0.489,200 k
9.200 k
0
0
Span 1
20.00 ft

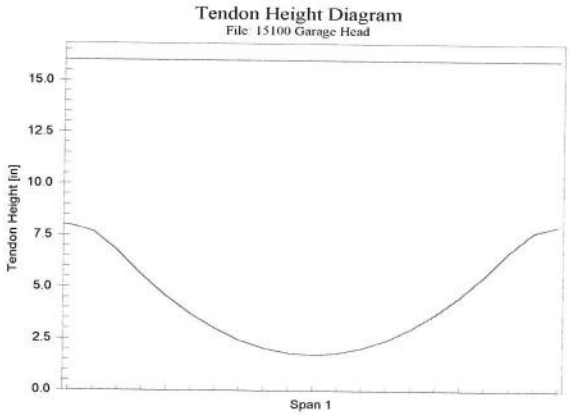
B.3 Design Moment

LOAD COMBINATION: Envelope



DESIGN MOMENT
(Moment is drawn on tension side)

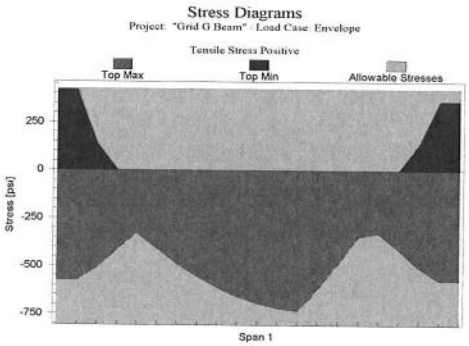
B.4 Tendon Profile

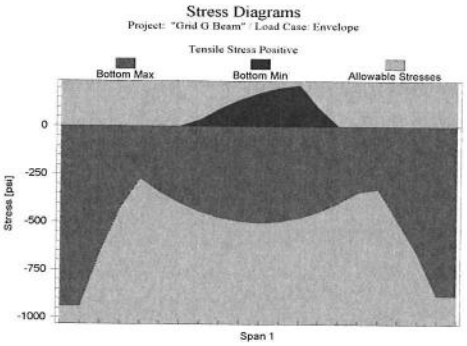


POST-TENSIONING PROFILE

B.5 Stress check results / Code check

LOAD COMBINATION: Envelope





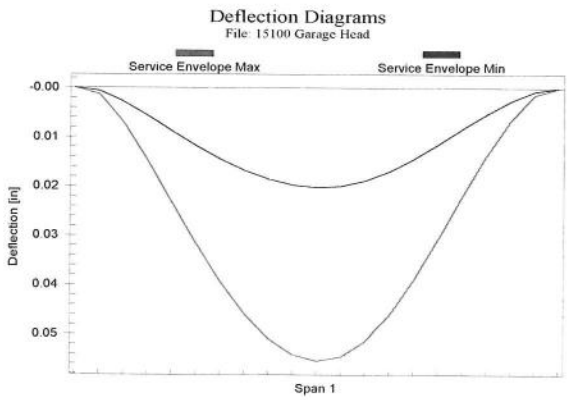
SERVICE COMBINATION STRESSES
(Tension stress positive)

B.6 Rebar Report

Total Strip Provided Rebar

Span	ID	Location	From	Quantity	Size	Length	Area
			ft			ft	in2
1	1	TOP	0.00	1	8	4.00	0.79
1	2	TOP	16.00	1	8	4.00	0.79
1	3	BOT	0.00	1	8	20.00	0.79

B.8 Deflection



DEFLECTION

B.9 Quantities

CONCRETE
Total volume of concrete = 53.33ft3 (1.98 yd3)
Area covered = 40.00 ft2

MILD STEEL
Total weight of rebar = 75.37 lbs
Average rebar usage = 1.88 psf, 1.41 pcf

PRESTRESSING MATERIAL
Total weight of tendon = 38.8 lb
Average tendon usage = 0.97 psf, 0.73 pcf

CONSULTING ENGINEERS
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☐ Fort Collins, CO Ph 970.225.9099 Fax 970.225.6923
☐ Winter Park, CO Ph 970.722.7677 Fax 970.722.7679

Date: _____ Page: ____of____
By: _____ Chkd By: _____
Job No: 15100
Project: _____
Client: _____
☐ Preliminary ☐ Final

Can we distribute load over 12 ft?

10" slab f_t allowable $= 3\sqrt{f'_c}$ $f'_c = 5{,}000$ psi
$= 212$ psi

125 psi prestress force

$\frac{M}{S} \leq 337$ psi

$S = 173 \text{ in}^3$

$M \leq 58{,}300$ lb·in

$P_{max} = 3.2^k$ for 12'

$P = 3.45^k$ can distribute 11.25'

SDL = 125 psf
LL = 135 psf
SL = 40 psf

Girder $A_T = 3{,}724$ ~~psf~~ ft^2 $K_{LL} = 2$ $L = .42 L_o$

Print everything at end of day tomorrow

8" slab can distribute 2.55k 11.25'

North wall

$\frac{1190 D}{11.25'} = 105$ psf + 5 psf misc = 110 psf D

26' length of wall A_T level 1

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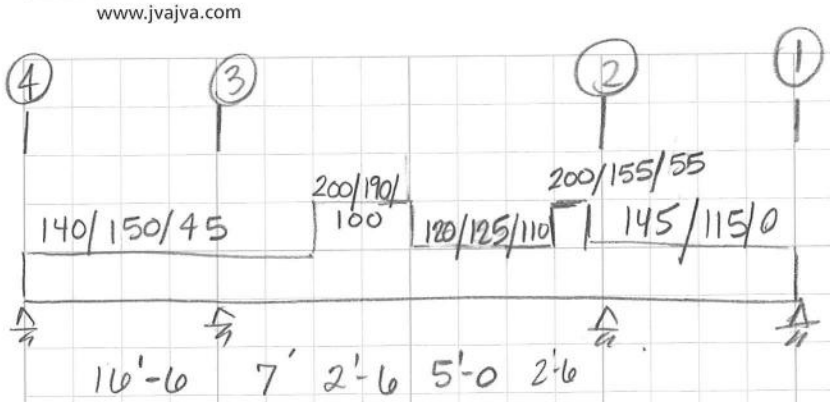
Date: 6/1/11 Page: ____ of ____
By: JMT Chkd By: ____
Job No: 15100
Project: 910 28th St.
Client: SA+R
☐ Preliminary ☐ Final



Psf on 10' strip
not counting self-weight
D/L/S

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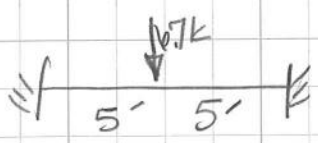
☐ Fort Collins, CO Ph 970.225.9099 Fax 970.225.6923
☐ Winter Park, CO Ph 970.722.7677 Fax 970.722.7679

Date: _____ Page: ____ of ____
By: _____ Chkd By: _____
Job No: 15100
Project: _____
Client: _____
☐ Preliminary ☐ Final

Need to add rebar below stair col to distribute load across 10' strip
1.4D
9.2L

can distribute 3.9k through pre-compression

Need rebar for 6.7k



$Mu = 3.5^k \times 5' = 17.5 k\cdot ft \times 1.6 = \cancel{28 k\cdot ft}$ 26.8

$d = 8.5''$

$Mu/4d = \cancel{.82}\ .79\ in^2$

⊥ direction 28k/ft → 233psi

can distribute 6.7k 7.7' → .1in²/ft = #5 @ 3'
use #5 @ 18" x 15'o

ADAPT

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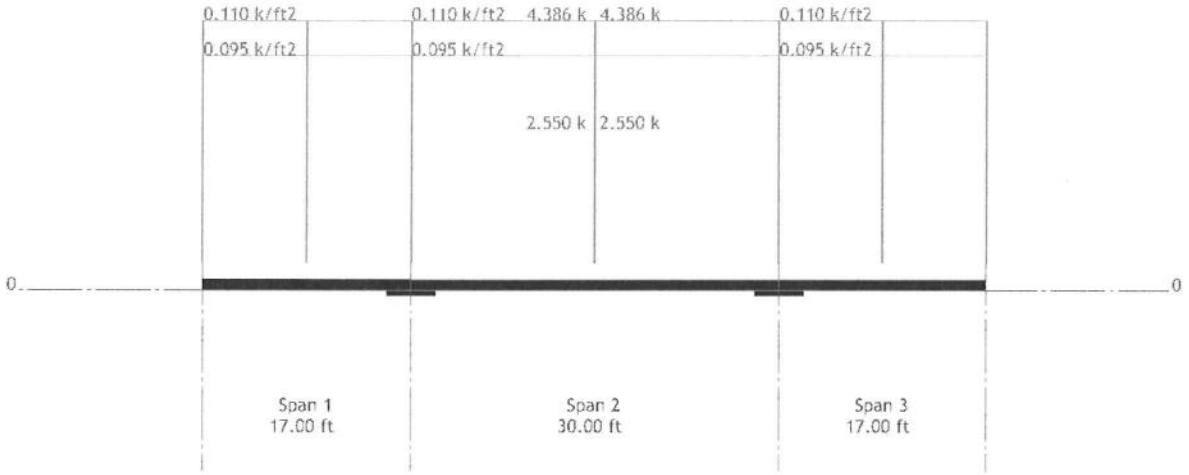
910 28th Street
Slab



Tuesday, July 26, 2011

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- A.1 - Project Design Parameters
- A.2 - Load Combinations

B. - Design Strip Report Slab
- B.1 - Geometry
- B.2 - Applied Loads
- B.3 - Design Moments Envelope
- B.4 - Tendon Profile
- B.5 - Stress check / Code check Envelope
- B.6 - Rebar Report
- B.7 - Punching Shear
- B.8 - Deflection
- B.9 - Quantities

A. Design Parameters and Load Combinations

A.1 Project Design Parameters

Parameter	Value	Parameter	Value
Concrete		Minimum Cover at BOTTOM	1.00 in
F'c for BEAMS/SLABS	5000.00 psi	Post-tensioning	
For COLUMNS/WALLS	4000.00 psi	SYSTEM	UNBONDED
Ec for BEAMS/SLABS	4031.00 ksi	Fpu	270.00 ksi
For COLUMNS/WALLS	3605.00 ksi	Fse	175.00 ksi
CREEP factor	2.00	Strand area	0.153 in 2
CONCRETE WEIGHT	NORMAL	Min CGS from TOP	1.30 in
UNIT WEIGHT	150.00 pcf	Min CGS from BOT for interior spans	1.30 in
Tension stress limits / (f'c)1/2		Min CGS from BOT for exterior spans	1.30 in
At Top	6.000	Min average precompression	125.00 psi
At Bottom	6.000	Max spacing / slab depth	8.00
Compression stress limits / f'c		Analysis and design options	
At all locations	0.450	Structural system	TWO-WAY
Reinforcement		Moment of Inertia over support is	INCREASED
Fy (Main bars)	60.00 ksi	Moments reduced to face of support	YES
Fy (Shear reinforcement)	60.00 ksi	Moment Redistribution	YES
Minimum Cover at TOP	1.00 in	DESIGN CODE SELECTED	ACI-318 (2005)

A.2 Load Combinations

Strength load combinations
1. 1.2 SW + 1.6 LL + 1.2 SDL + 1.2 X + 1 HYP

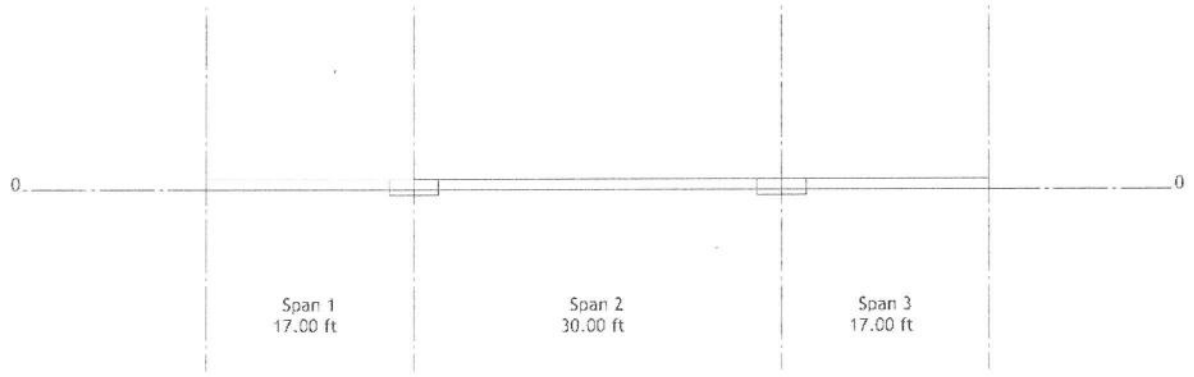
Service load combinations
Sustained Load
1. 1 SW + 0.3 LL + 1 SDL + 1 X + 1 PT
Total Load
2. 1 SW + 1 LL + 1 SDL + 1 X + 1 PT

Initial load combinations
1 SW + 1.15 PT

B. Design Strip Report: Slab
B.1 Geometry

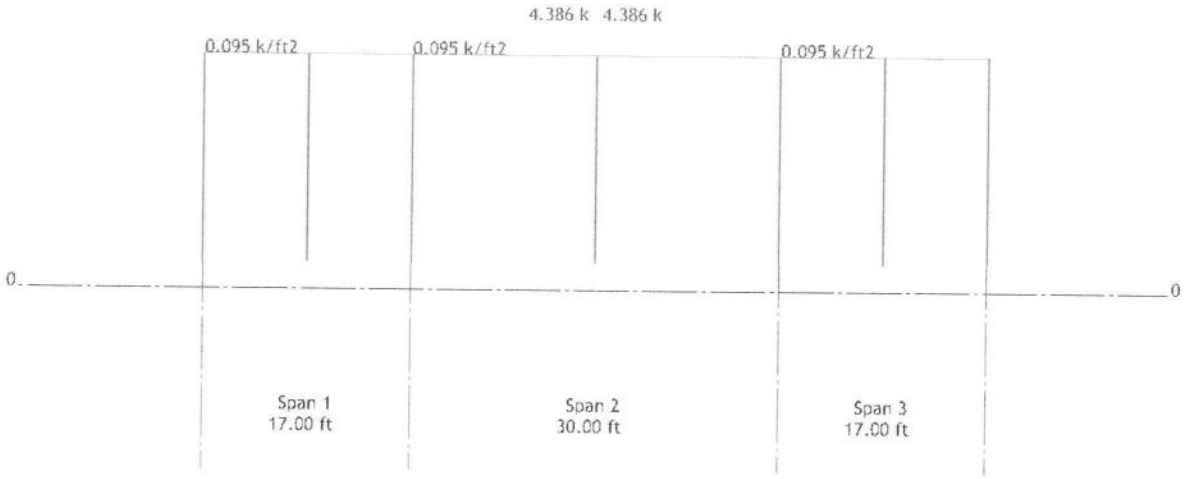
- Plan

- Elevation


0
0
Span 1
17.00 ft
Span 2
30.00 ft
Span 3
17.00 ft

B.2 Applied loads

- Live Load

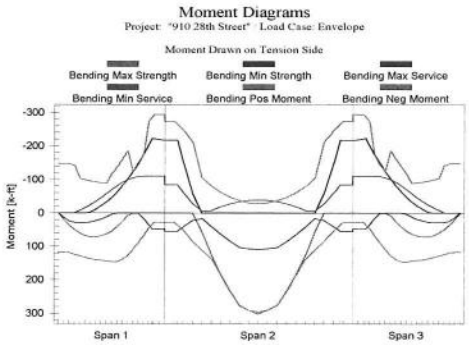


- X Load

0.110 k/ft2
0.110 k/ft2
0.110 k/ft2
2.550 k
2.550 k
0.
0
Span 1
17.00 ft
Span 2
30.00 ft
Span 3
17.00 ft

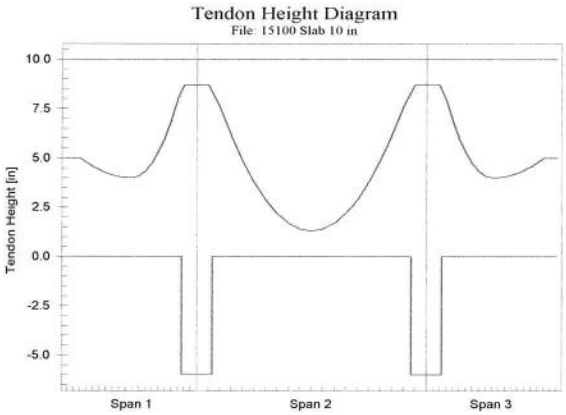
B.3 Design Moment

LOAD COMBINATION: Envelope



DESIGN MOMENT
(Moment is drawn on tension side)

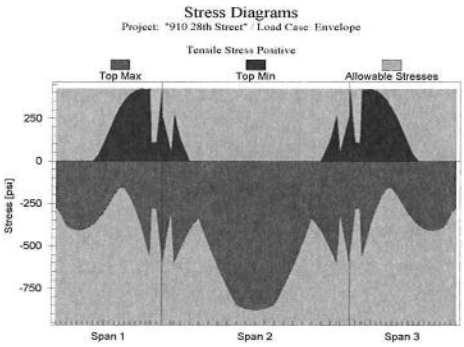
B.4 Tendon Profile

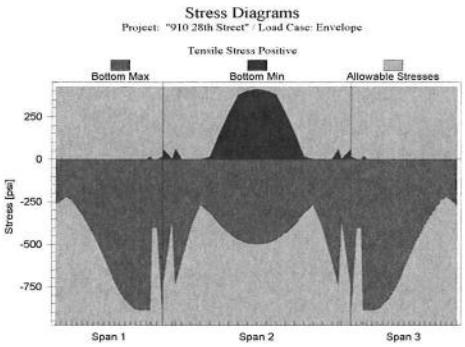


POST-TENSIONING PROFILE

B.5 Stress check results / Code check

LOAD COMBINATION: Envelope





SERVICE COMBINATION STRESSES
(Tension stress positive)

B.6 Rebar Report

Total Strip Provided Rebar

Span	ID	Location	From	Quantity	Size	Length	Area
			ft			ft	in2
1	1	TOP	0.00	3	5	3.50	0.93
1	2	TOP	7.65	4	5	15.50	1.24
2	3	TOP	24.00	4	5	15.50	1.24
3	4	TOP	13.60	3	5	3.50	0.93
1	5	TOP	8.35	3	5	15.00	0.93
2	6	TOP	24.00	3	5	14.50	0.93
2	7	BOT	8.00	5	5	14.00	1.55
2	8	BOT	9.50	4	5	11.00	1.24

B.7 Punching Shear

Critical Section Stresses

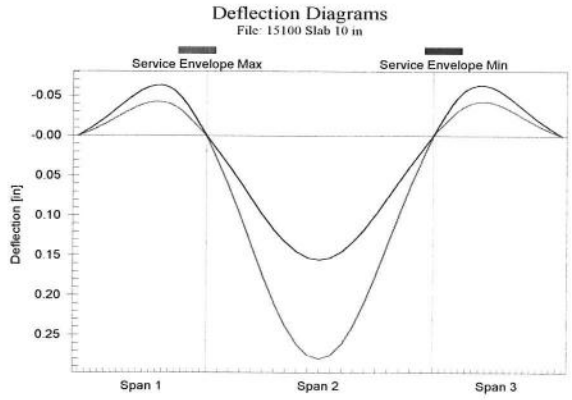
Label	Layer	Cond.	Factored shear	Factored moment	Stress due to shear	Stress due to moment	Total stress	Allowable stress	Stress ratio
			k	k-ft	ksi	ksi	ksi	ksi	
1	1	2	-23.38	-0.00	0.17	0.037	0.204	0.106	1.920
2	1	1	-138.95	+0.00	0.17	0.000	0.168	0.238	0.706
3	1	1	-138.95	+0.00	0.17	0.000	0.168	0.238	0.706
4	1	2	-23.38	+0.00	0.17	0.037	0.204	0.106	1.920

Punching Shear Reinforcement
Reinforcement option: Shear Studs
Stud diameter: 0.5
Number of rails per side: 2

Col.	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist
	in	in	in	in	in	in	in	in	in	in
1	4.2	8.4								
2										
3										
4	4.2	8.4								

Dist. = Distance measured from the face of support
Note: Columns with --- have not been checked for punching shear.
Note: Columns with *** have exceeded the maximum allowable shear stress.

B.8 Deflection



DEFLECTION

B.9 Quantities

CONCRETE

Total volume of concrete = 533.33ft3 (19.75 yd3)
Area covered = 640.00 ft2

MILD STEEL

Total weight of rebar = 408.79 lbs
Average rebar usage = 0.64 psf, 0.77 pcf

PRESTRESSING MATERIAL

Total weight of tendon = 348.0 lb
Average tendon usage = 0.54 psf, 0.65 pcf

ADAPT

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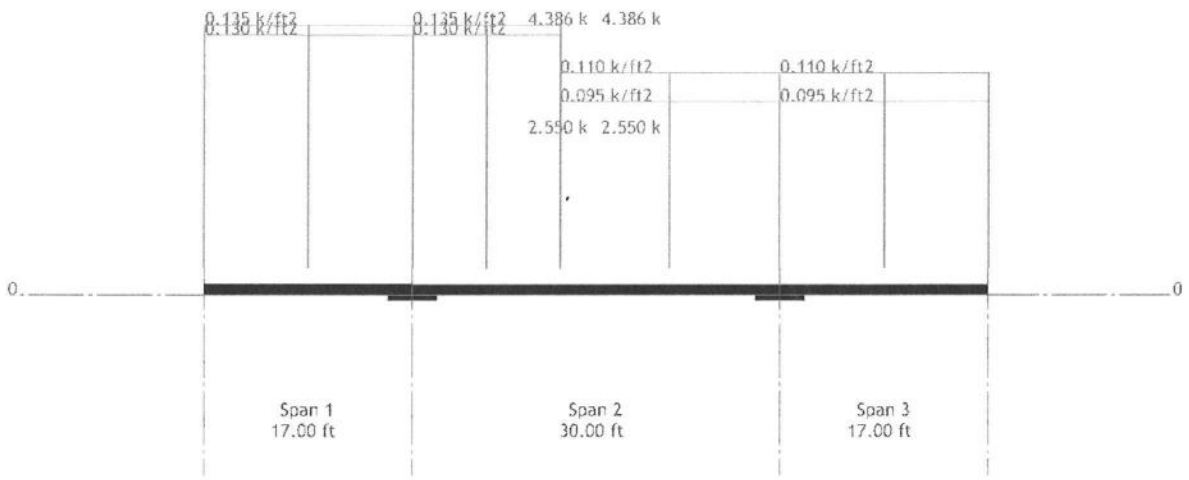
910 28th Street
Slab



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- B.6 - Rebar Report
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- B.8 - Deflection
- B.9 - Quantities

A. Design Parameters and Load Combinations

A.1 Project Design Parameters

Parameter	Value	Parameter	Value
Concrete		Post-tensioning	
F'c for BEAMS/SLABS	5000.00 psi	SYSTEM	UNBONDED
Ec for BEAMS/SLABS	4031.00 ksi	Fpu	270.00 ksi
CREEP factor	2.00	Fse	175.00 ksi
CONCRETE WEIGHT	NORMAL	Strand area	0.153 in 2
UNIT WEIGHT	150.00 pcf	Min CGS from TOP	1.30 in
Tension stress limits / (f'c)1/2		Min CGS from BOT for interior spans	1.30 in
At Top	6.000	Min CGS from BOT for exterior spans	1.30 in
At Bottom	6.000	Min average precompression	125.00 psi
Compression stress limits / f'c		Max spacing / slab depth	8.00
At all locations	0.450	Analysis and design options	
Reinforcement		Structural system	TWO-WAY
Fy (Main bars)	60.00 ksi	Moment of Inertia over support is	INCREASED
Fy (Shear reinforcement)	60.00 ksi	Moments reduced to face of support	YES
Minimum Cover at TOP	1.00 in	Moment Redistribution	YES
Minimum Cover at BOTTOM	1.00 in	DESIGN CODE SELECTED	ACI-318 (2005)

A.2 Load Combinations

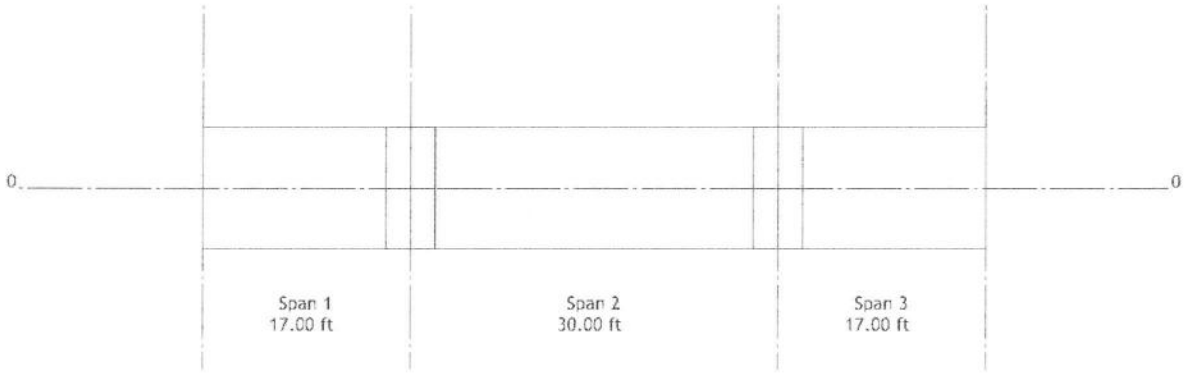
Strength load combinations
1. 1.2 SW + 1.6 LL + 1.2 SDL + 1.2 X + 1 HYP

Service load combinations
Sustained Load
1. 1 SW + 0.3 LL + 1 SDL + 1 X + 1 PT
Total Load
2. 1 SW + 1 LL + 1 SDL + 1 X + 1 PT

Initial load combinations
1 SW + 1.15 PT

B. Design Strip Report: Slab
B.1 Geometry

- Plan

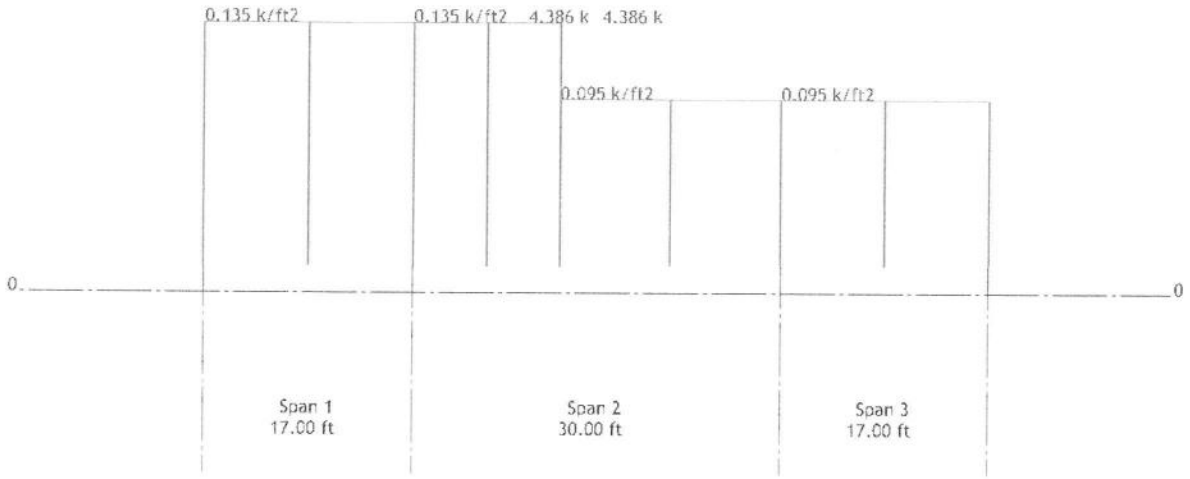


- Elevation

0
0
Span 1
17.00 ft
Span 2
30.00 ft
Span 3
17.00 ft

B.2 Applied loads

- Live Load

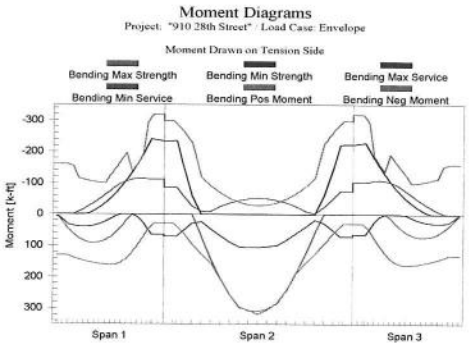


- X Load

0.130 k/ft2
0.130 k/ft2
0.110 k/ft2
0.110 k/ft2
2.550 k 2.550 k
0.
0
Span 1
17.00 ft
Span 2
30.00 ft
Span 3
17.00 ft

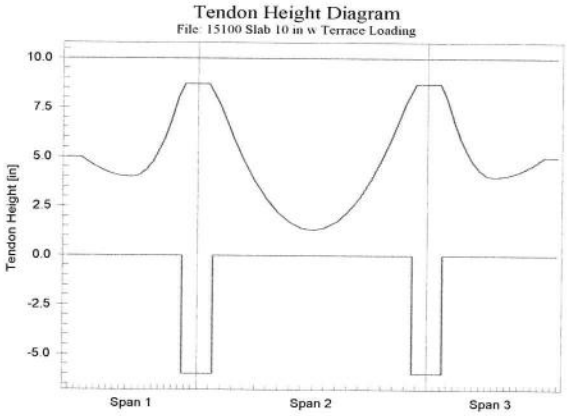
B.3 Design Moment

LOAD COMBINATION: Envelope



DESIGN MOMENT
(Moment is drawn on tension side)

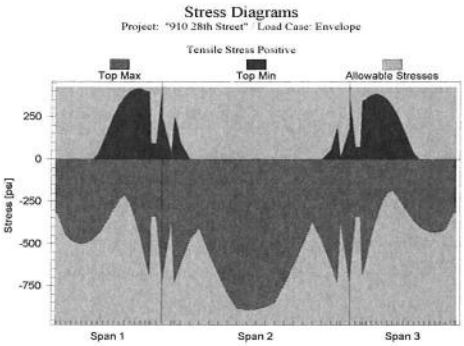
B.4 Tendon Profile

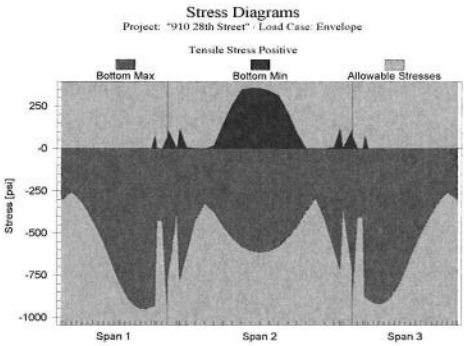


POST-TENSIONING
PROFILE

B.5 Stress check results / Code check

LOAD COMBINATION: Envelope





SERVICE COMBINATION STRESSES
(Tension stress positive)

B.6 Rebar Report

Total Strip Provided Rebar

Span	ID	Location	From	Quantity	Size	Length	Area
			ft			ft	in2
1	1	TOP	0.00	3	5	3.50	0.93
1	2	TOP	7.65	4	5	15.50	1.24
2	3	TOP	24.00	4	5	15.50	1.24
3	4	TOP	13.60	3	5	3.50	0.93
1	5	TOP	8.35	3	5	15.00	0.93
2	6	TOP	24.00	3	5	14.50	0.93
2	7	BOT	8.00	4	5	14.00	1.24
2	8	BOT	8.00	3	5	12.50	0.93

B.7 Punching Shear

Critical Section Stresses

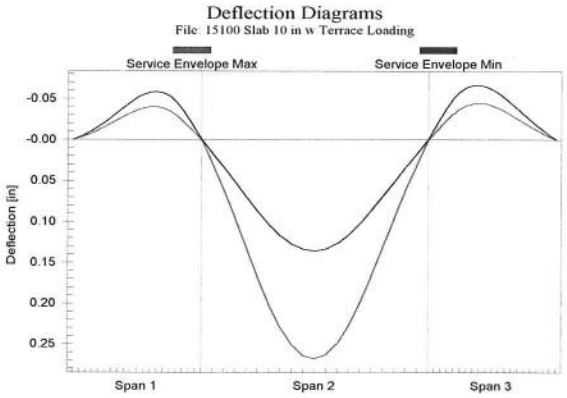
Label	Layer	Cond.	Factored shear	Factored moment	Stress due to shear	Stress due to moment	Total stress	Allowable stress	Stress ratio
			k	k-ft	ksi	ksi	ksi	ksi	
1	1	2	-29.64	+0.00	0.21	0.047	0.258	0.106	2.434
2	1	1	-158.33	-0.02	0.19	0.000	0.192	0.246	0.780
3	1	1	-141.00	+0.00	0.17	0.000	0.171	0.246	0.694
4	1	2	-23.60	+0.00	0.17	0.037	0.206	0.106	1.938

Punching Shear Reinforcement
Reinforcement option: Shear Studs
Stud diameter: 0.5
Number of rails per side: 2

Col.	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist
	in	in	in	in	in	in	in	in	in	in
1	4.2	8.4								
2										
3										
4	4.2	8.4								

Dist. = Distance measured from the face of support
Note: Columns with --- have not been checked for punching shear.
Note: Columns with *** have exceeded the maximum allowable shear stress.

B.8 Deflection



DEFLECTION

B.9 Quantities

CONCRETE

Total volume of concrete = 533.33ft3 (19.75 yd3)
Area covered = 640.00 ft2

MILD STEEL

Total weight of rebar = 387.66 lbs
Average rebar usage = 0.61 psf, 0.73 pcf

PRESTRESSING MATERIAL

Total weight of tendon = 397.7 lb
Average tendon usage = 0.62 psf, 0.75 pcf

ADAPT

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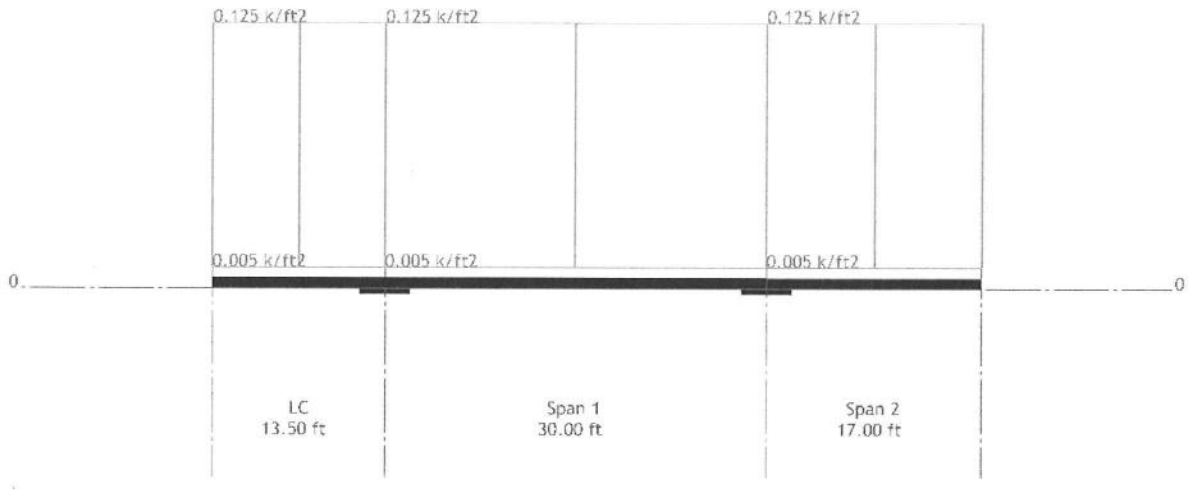
910 28th Street
Slab



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- B.8 - Deflection
- B.9 - Quantities

A. Design Parameters and Load Combinations

A.1 Project Design Parameters

Parameter	Value	Parameter	Value
Concrete		Post-tensioning	
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CREEP factor	2.00	Fse	175.00 ksi
CONCRETE WEIGHT	NORMAL	Strand area	0.153 in 2
UNIT WEIGHT	150.00 pcf	Min CGS from TOP	1.30 in
Tension stress limits / (f'c)1/2		Min CGS from BOT for interior spans	1.30 in
At Top	6.000	Min CGS from BOT for exterior spans	1.30 in
At Bottom	6.000	Min average precompression	125.00 psi
Compression stress limits / f'c		Max spacing / slab depth	8.00
At all locations	0.450	Analysis and design options	
Reinforcement		Structural system	TWO-WAY
Fy (Main bars)	60.00 ksi	Moment of Inertia over support is	INCREASED
Fy (Shear reinforcement)	60.00 ksi	Moments reduced to face of support	YES
Minimum Cover at TOP	1.00 in	Moment Redistribution	YES
Minimum Cover at BOTTOM	1.00 in	DESIGN CODE SELECTED	ACI-318 (2005)

A.2 Load Combinations

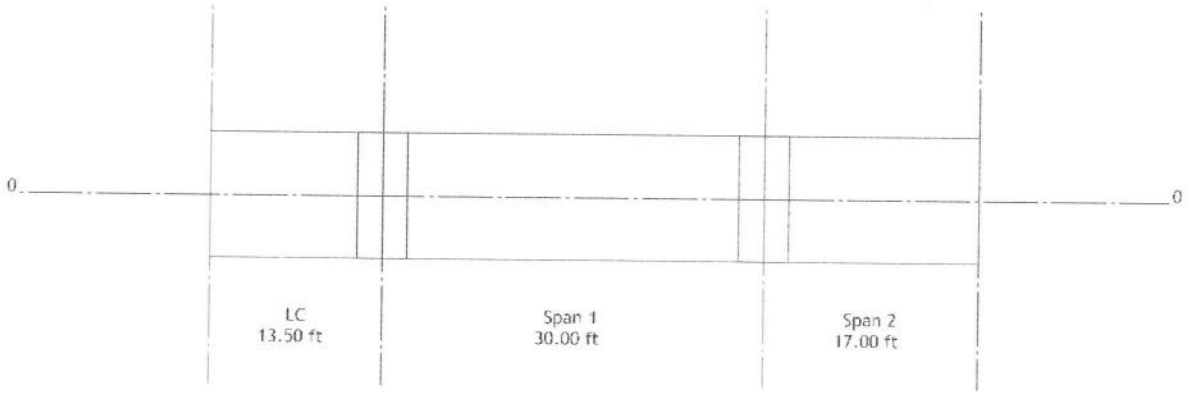
Strength load combinations
1. 1.2 SW + 1.6 LL + 1.2 SDL + 1.2 X + 1 HYP

Service load combinations
Sustained Load
1. 1 SW + 0.3 LL + 1 SDL + 1 X + 1 PT
Total Load
2. 1 SW + 1 LL + 1 SDL + 1 X + 1 PT

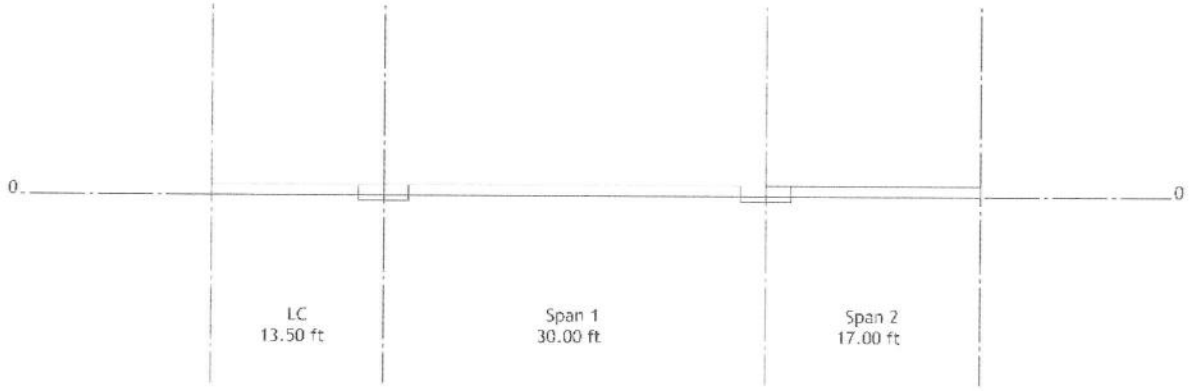
Initial load combinations
1 SW + 1.15 PT

B. Design Strip Report: Slab
B.1 Geometry

- Plan

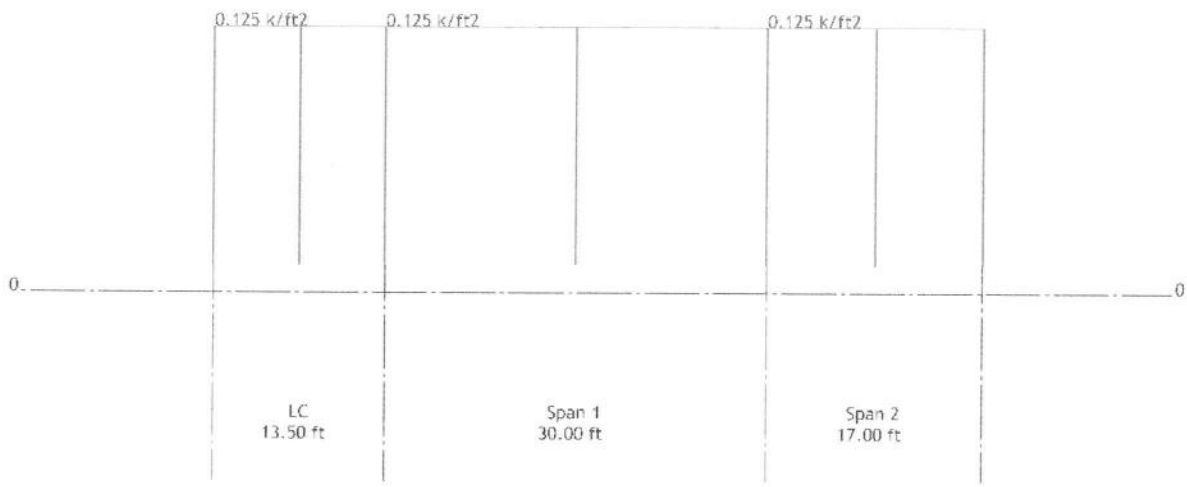


- Elevation

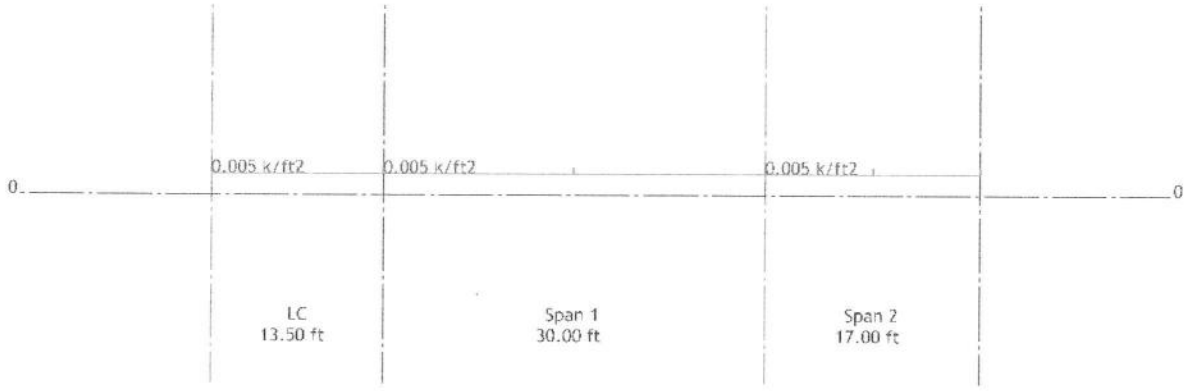

0
0
LC
13.50 ft
Span 1
30.00 ft
Span 2
17.00 ft

B.2 Applied loads

- Live Load

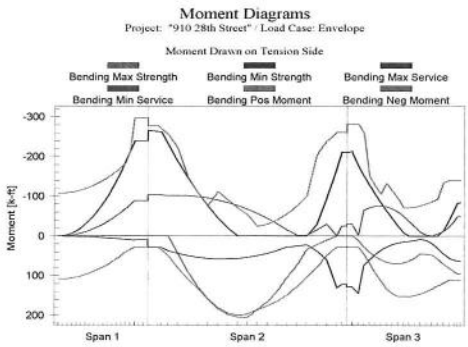


- X Load


0.005 k/ft2
0.005 k/ft2
0.005 k/ft2
0
0
LC
13.50 ft
Span 1
30.00 ft
Span 2
17.00 ft

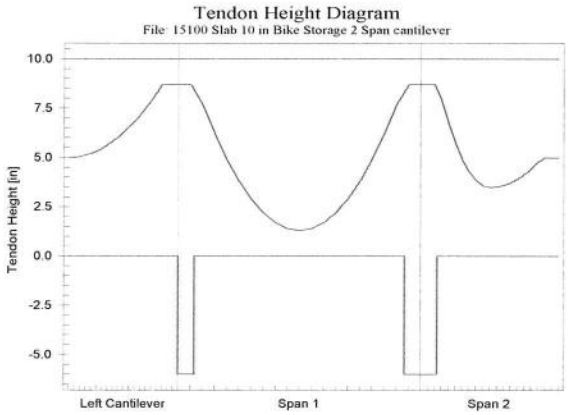
B.3 Design Moment

LOAD COMBINATION: Envelope



DESIGN MOMENT
(Moment is drawn on tension side)

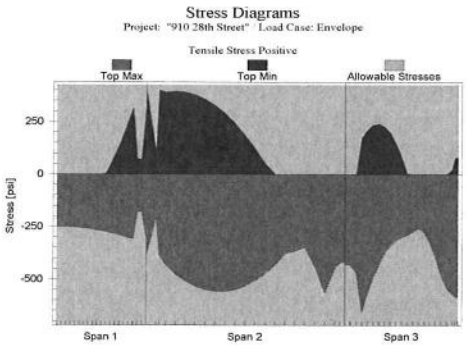
B.4 Tendon Profile

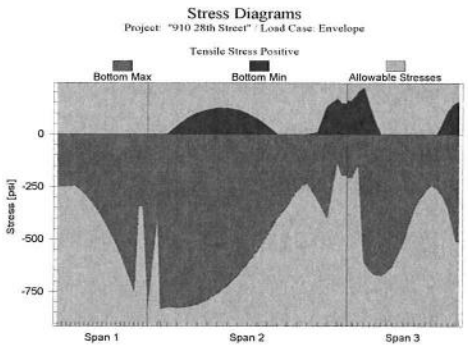


POST-TENSIONING
PROFILE

B.5 Stress check results / Code check

LOAD COMBINATION: Envelope





SERVICE COMBINATION STRESSES
(Tension stress positive)

B.6 Rebar Report

Total Strip Provided Rebar

Span	ID	Location	From	Quantity	Size	Length	Area
			ft			ft	in2
CL	1	TOP	9.12	5	5	21.00	1.55
1	2	TOP	24.00	4	5	14.50	1.24
2	3	TOP	13.60	3	5	3.50	0.93
CL	4	TOP	9.80	4	5	18.50	1.24
1	5	TOP	24.00	3	5	10.50	0.93
1	6	BOT	6.50	1	5	11.00	0.31
1	7	BOT	8.00	1	5	9.50	0.31

B.7 Punching Shear

Critical Section Stresses

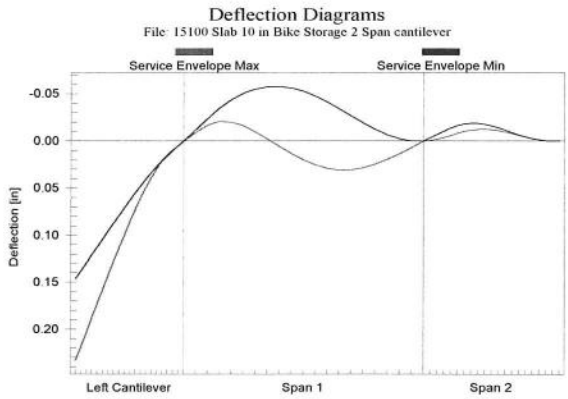
Label	Layer	Cond.	Factored shear	Factored moment	Stress due to shear	Stress due to moment	Total stress	Allowable stress	Stress ratio
			k	k-ft	ksi	ksi	ksi	ksi	
1	1	1	-109.19	+0.00	0.13	0.000	0.132	0.234	0.564
2	1	1	-111.51	+0.02	0.13	0.000	0.135	0.216	0.624
3	1	2	-34.40	-97.55	0.25	0.535	0.780	0.106	7.355

Punching Shear Reinforcement
Reinforcement option: Shear Studs
Stud diameter: 0.5
Number of rails per side: 2

Col.	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist	Dist
	in	in	in	in	in	in	in	in	in	in
1										
2										
3	***	***								

Dist. = Distance measured from the face of support
Note: Columns with --- have not been checked for punching shear.
Note: Columns with *** have exceeded the maximum allowable shear stress.

B.8 Deflection



DEFLECTION

B.9 Quantities

CONCRETE

Total volume of concrete = 504.17ft3 (18.67 yd3)
Area covered = 605.00 ft2

MILD STEEL

Total weight of rebar = 310.55 lbs
Average rebar usage = 0.51 psf, 0.62 pcf

PRESTRESSING MATERIAL

Total weight of tendon = 305.5 lb
Average tendon usage = 0.50 psf, 0.61 pcf