DESIGN CALCULATIONS

FOR

12.5" HOLLOW CORE SLABS

FOR

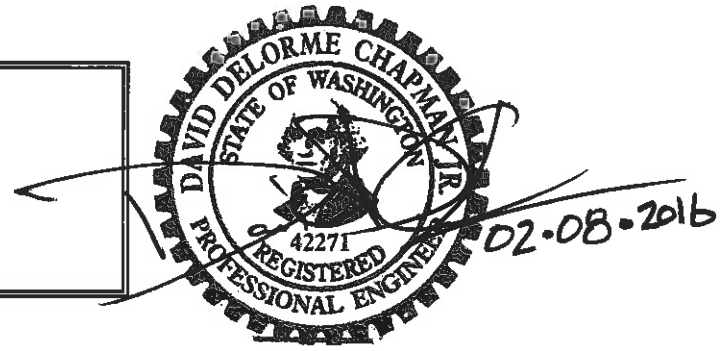
JUANITA FARMHOUSE COTTAGES DV

KIRKLAND

WASHINGTON

BY: CONCRETE TECHNOLOGY CORPORATION
AUSTIN D. MAUE
JOB #: 16004A-H
DATE: 2/1/2016

I HEREBY CERTIFY THAT THE PRECAST CONCRETE COMPONENTS DESCRIBED HEREIN HAVE BEEN DESIGNED TO CARRY THE LOADS SPECIFIED BY THE ENGINEER OF RECORD. THESE CALCULATIONS ARE HEREBY SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW AND APPROVAL.



ENGINEER OF RECORD
DESIGN LOAD APPROVAL

SIGNATURE: Ben McCa

DATE: 02/25/2016

BY SIGNING THE ABOVE, THE ENGINEER OF RECORD INDICATES THAT THE DESIGN LOADS SHOWN IN THESE CALCULATIONS CONFORM TO PROJECT SPECIFICATIONS.

[X] CONFORMS TO DESIGN CONCEPT

[ ] CONFORMS TO DESIGN CONCEPT WITH REVISIONS AS SHOWN

[ ] NON-CONFORMING – REVISE AND RESUBMIT

THIS SHOP DRAWING HAS BEEN REVIEWED FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT ONLY AND DOES NOT RELIEVE THE FABRICATOR/VENDOR OF RESPONSIBILITY FOR CONFORMANCE WITH THE DESIGN DRAWINGS AND SPECIFICATIONS ALL OF WHICH HAVE PRIORITY OVER THIS SHOP DRAWING.

By: BJM Date 02/25/2016

CT ENGINEERING INC

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 1 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:**	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

MATERIAL PROPERTIES

✓ JDL

Concrete:

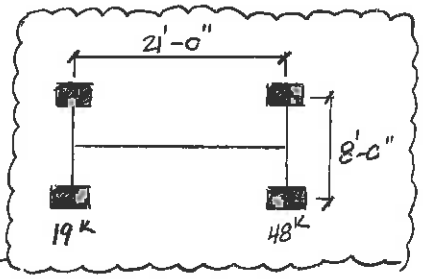
f'_c =	8,000	psi
w_c =	154	pcf
E_c =	5,641	ksi

Strand: 1/2" Diameter, 7 wire, 270 ksi, Low Relaxation

f_{si} =	189.00	ksi	Interior	f_{si} =	124.00	ksi	Exterior
f_{se} =	154.00	ksi	Web	f_{se} =	100.00	ksi	Web

SECTION PROPERTIES

	Bare Ultraspan	
Depth =	12.50	in
A =	313	in^2
I =	6,136	in^4
S_t =	1,019	in^3
S_b =	947	in^3
y_t =	6.02	in
y_b =	6.48	in
b_w =	10.00	in
b =	48.00	in
e =	4.53	in
d =	10.55	in
A_e =	187	in^2



LOADS*

a)	Live Loads	=	HS20-44 or Fire Truck or 45k Outrigger on 18" sq. pad or 250 psf
b)	Superimposed Dead Loads	=	4" Concrete @ 160 pcf on Compacted Fill @ 135 pcf
c)	Dead Load (Precast)	=	84 psf
d)	Snow Load	=	25 psf

* SEE SHEET 3 FOR ADDITIONAL LOADS

REFERENCES

Building Code Requirements for Structural Concrete: ACI 318-11
Analysis of Wheel Loads on Hollowcore Planks w/ Soil Cover, 1988

ASSUMPTIONS

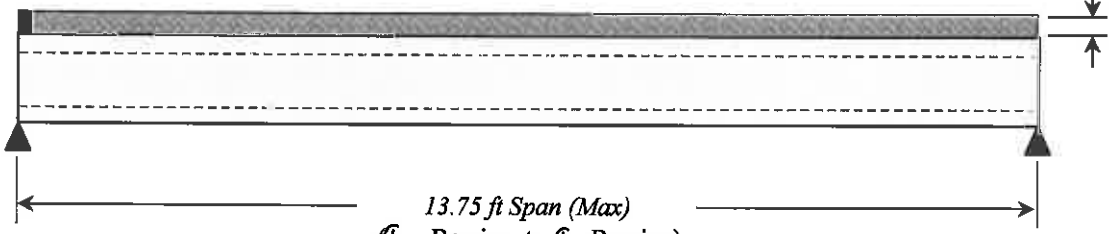
a) Structure is simple span for all loads
b) Maximum allowable tension stress = $7.5\sqrt{f'_c}$
c) Maximum allowable compressive stress = $0.45f'_c$

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 2 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:**	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

DESIGN CONFIGURATION

DDC

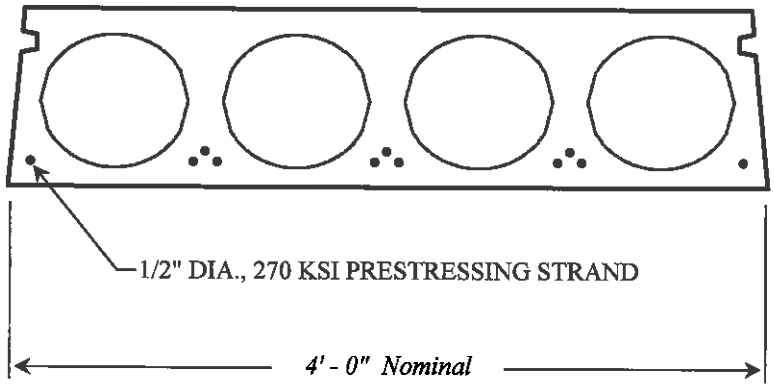
4" Concrete @ 160 pcf on 5" Fill @ 135 pcf [9" MINIMUM Cover @ 146 pcf]
4" Concrete @ 160 pcf on 35" Fill @ 135 pcf [39" MAXIMUM Cover @ 138 pcf]



13.75 ft Span (Max)
(℄ Bearing to ℄ Bearing)

TYPICAL HOLLOW CORE ELEVATION

MINIMUM STRAND REQUIREMENTS



(11) Strands MK 01

TYPICAL HOLLOW CORE SECTION

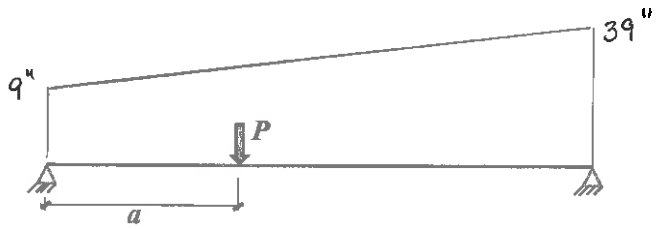
CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 3 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:**	**BY:** ADM **DATE:** 2/1/2016 **REV:** 0

CONCRETE LOAD MOMENTS AND SHEARS

DAV

	P (kips)	a (ft)	Type	R_L (kips)	R_R (kips)	
Load 1	2.40	12.13	LL	0.28	2.12	← 0.6 KLF LINE LOAD
Load 2	1.60	12.13	LL	0.19	1.41	← 0.4 KLF LINE LOAD
Load 3	4.80	12.13	DL	0.57	4.23	← 1.2 KLF LINE LOAD
Load 4			LL	0.00	0.00	

x (ft)	M_1 (in-k)	V_1 (kips)	M_2 (in-k)	V_2 (kips)	M_3 (in-k)	V_3 (kips)	M_4 (in-k)	V_4 (kips)
0.13	0	0.28	0	0.19	1	0.57	0	0.00
0.50	2	0.28	1	0.19	3	0.57	0	0.00
1.00	3	0.28	2	0.19	7	0.57	0	0.00
1.50	5	0.28	3	0.19	10	0.57	0	0.00
2.00	7	0.28	5	0.19	14	0.57	0	0.00
2.50	9	0.28	6	0.19	17	0.57	0	0.00
3.00	10	0.28	7	0.19	20	0.57	0	0.00
3.50	12	0.28	8	0.19	24	0.57	0	0.00
4.00	14	0.28	9	0.19	27	0.57	0	0.00
4.50	15	0.28	10	0.19	31	0.57	0	0.00
5.00	17	0.28	11	0.19	34	0.57	0	0.00
5.50	19	0.28	12	0.19	37	0.57	0	0.00
6.00	20	0.28	14	0.19	41	0.57	0	0.00
6.50	22	0.28	15	0.19	44	0.57	0	0.00
7.00	24	0.28	16	0.19	48	0.57	0	0.00



CONCRETE TECHNOLOGY CORPORATION
DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS

JOB NAME: JUANITA FARMHOUSE COTTAGES
JOB NO.: 16004A-H
CASE NO.: HS20-44 ON 9"- 39" SLOPING COVER

BY: ADM
DATE: 1-Feb-16
REV: 0

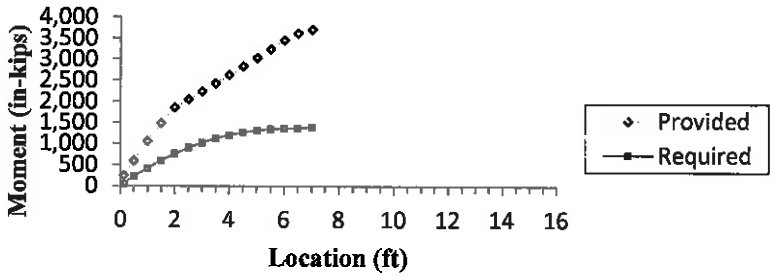
REVIEW OF FLEXURE

Slab Geometry
Span = 13.75 ft
Length = 14.00 ft

Strand Information
9 *Interior Strands*
2 *Exterior Strands*

P = 242.7 kips
f_{ps} = 256.95 ksi

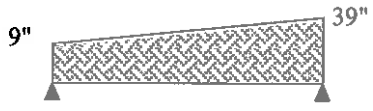
x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	17	36	101	-0.095	0.604	0.151	-0.162	0.056	0.442	225	593
1.00	32	70	189	-0.170	1.088	0.287	-0.309	0.116	0.779	426	1,057
1.50	47	103	267	-0.240	1.530	0.410	-0.441	0.170	1.088	608	1,488
2.00	61	134	334	-0.301	1.925	0.519	-0.559	0.218	1.366	769	1,882
2.50	74	164	389	-0.303	1.936	0.615	-0.662	0.312	1.274	908	2,071
3.00	85	191	437	-0.303	1.936	0.699	-0.753	0.396	1.184	1,030	2,258
3.50	96	216	473	-0.303	1.936	0.770	-0.828	0.466	1.108	1,130	2,449
4.00	106	239	500	-0.303	1.936	0.828	-0.891	0.525	1.045	1,213	2,644
4.50	114	259	518	-0.303	1.936	0.874	-0.940	0.570	0.996	1,275	2,843
5.00	122	276	528	-0.303	1.936	0.908	-0.978	0.605	0.958	1,322	3,047
5.50	129	291	531	-0.303	1.936	0.932	-1.003	0.629	0.933	1,352	3,254
6.00	134	303	527	-0.303	1.936	0.945	-1.018	0.642	0.919	1,367	3,465
6.50	139	311	522	-0.303	1.936	0.953	-1.026	0.650	0.910	1,375	3,627
7.00	143	317	531	-0.303	1.936	0.971	-1.045	0.668	0.891	1,400	3,711



Allowable Compression
$0.45f'_c$ = 3.600 > 0.668

Allowable Tension
$7.5\sqrt{f'_c}$ = 0.671 > N/A

Note: This case assumes a sloping cover profile for SDL & minimum cover depth for wheel load distribution



Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 5 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** HS20-44 ON 9"- 39" SLOPING COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

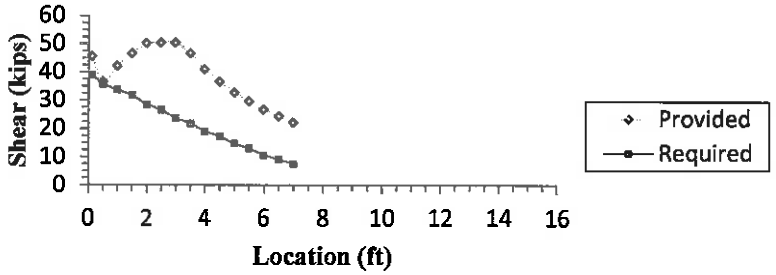
w_{dl} = 84 psf

w_{sdl} = Sloping Cover - See Sketch Below

w_{ll} = HS20-44

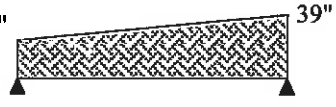
w_{snow} = 25 psf

x	Applied Shear (kips)			Req'd Strength	M_{cre}	Shear Strength (kips)			# of Filled Voids
(ft)	V_{dl}	V_{sdl}	V_{ll}	V_u	(in-kips)	V_{cw}	V_{ci}	ϕV_n	Req'd
0.50	2.7	5.9	15.9	35.8	1,028	48.9	189.4	36.7	0
1.00	2.5	5.6	15.0	33.8	1,435	56.2	137.0	42.2	0
1.50	2.4	5.3	14.1	31.8	1,806	62.2	117.0	46.6	0
2.00	2.2	5.0	12.5	28.6	2,136	67.0	104.9	50.3	0
2.50	2.0	4.7	11.6	26.7	2,104	67.2	85.4	50.4	0
3.00	1.9	4.4	10.1	23.7	2,065	67.2	71.9	50.4	0
3.50	1.7	4.0	9.4	21.9	2,030	67.2	62.2	46.7	0
4.00	1.5	3.6	8.1	19.1	1,997	67.2	54.7	41.0	0
4.50	1.4	3.1	7.5	17.3	1,969	67.2	48.8	36.6	0
5.00	1.2	2.7	6.3	14.7	1,943	67.2	43.7	32.8	0
5.50	1.0	2.2	5.7	13.1	1,922	67.2	39.6	29.7	0
6.00	0.9	1.7	4.8	10.7	1,905	67.2	35.7	26.8	0
6.50	0.7	1.2	4.3	9.1	1,891	67.2	32.5	24.4	0
7.00	0.5	0.6	3.9	7.6	1,882	67.2	29.5	22.1	0



Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. (f'c = 4000 psi)

Note: This case assumes a sloping cover profile for SDL & minimum cover depth for wheel load distribution



CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 6 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** HS20-44 ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF FLEXURE

GOC

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Strand Information

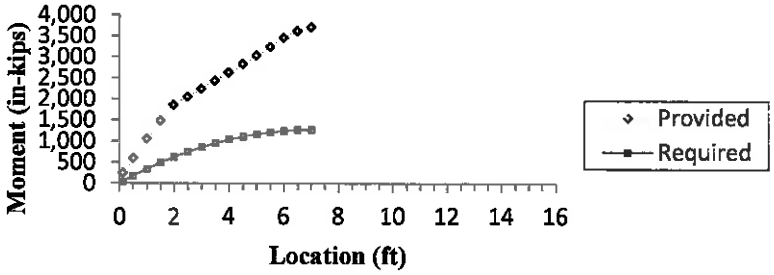
9 *Interior Strands*

2 *Exterior Strands*

P = 242.7 kips

f_{ps} = 256.95 ksi

x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	17	71	45	-0.095	0.604	0.130	-0.140	0.035	0.465	177	593
1.00	32	137	86	-0.170	1.088	0.250	-0.269	0.080	0.818	340	1,057
1.50	47	197	123	-0.240	1.530	0.360	-0.387	0.120	1.142	489	1,488
2.00	61	252	156	-0.301	1.925	0.460	-0.495	0.159	1.430	625	1,882
2.50	74	302	187	-0.303	1.936	0.551	-0.593	0.248	1.343	749	2,071
3.00	85	346	214	-0.303	1.936	0.633	-0.681	0.330	1.255	860	2,258
3.50	96	385	237	-0.303	1.936	0.704	-0.758	0.401	1.178	956	2,449
4.00	106	418	257	-0.303	1.936	0.766	-0.825	0.463	1.111	1,040	2,644
4.50	114	447	274	-0.303	1.936	0.819	-0.882	0.516	1.054	1,112	2,843
5.00	122	469	288	-0.303	1.936	0.863	-0.929	0.560	1.007	1,171	3,047
5.50	129	487	298	-0.303	1.936	0.897	-0.965	0.593	0.971	1,216	3,254
6.00	134	499	306	-0.303	1.936	0.921	-0.992	0.618	0.944	1,249	3,465
6.50	139	506	310	-0.303	1.936	0.937	-1.008	0.634	0.928	1,270	3,627
7.00	143	507	312	-0.303	1.936	0.943	-1.015	0.640	0.921	1,279	3,711



Allowable Compression

$0.45f'_c$ = 3.600 > 0.640

Allowable Tension

$7.5\sqrt{f'_c}$ = 0.671 > 0.004

Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 7 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** HS20-44 ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

DOC

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

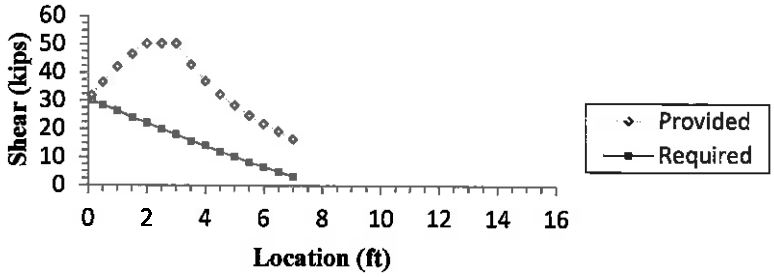
w_{dl} = 84 psf

w_{sdl} = 447 psf

w_{ll} = HS20-44

w_{snow} = 25 psf

x (ft)	Applied Shear (kips) V_{dl}	V_{sdl}	V_{ll}	Req'd Strength V_u	M_{cre} (in-kips)	Shear Strength (kips) V_{cw}	V_{ci}	ϕV_n	# of Filled Voids Req'd
0.50	2.7	11.4	7.3	28.6	993	48.9	187.9	36.7	0
1.00	2.5	10.5	6.9	26.6	1,369	56.2	131.7	42.2	0
1.50	2.4	9.6	6.1	24.2	1,712	62.2	113.8	46.6	0
2.00	2.2	8.7	5.7	22.3	2,018	67.0	100.9	50.3	0
2.50	2.0	7.8	5.1	20.0	1,966	67.2	81.0	50.4	0
3.00	1.9	6.9	4.7	18.1	1,910	67.2	67.3	50.4	0
3.50	1.7	6.0	4.2	15.9	1,861	67.2	57.2	42.9	0
4.00	1.5	5.1	3.9	14.2	1,817	67.2	49.5	37.1	0
4.50	1.4	4.2	3.3	12.1	1,781	67.2	43.0	32.3	0
5.00	1.2	3.4	3.1	10.3	1,750	67.2	37.9	28.4	0
5.50	1.0	2.5	2.6	8.3	1,726	67.2	33.2	24.9	0
6.00	0.9	1.6	2.4	6.7	1,708	67.2	29.3	22.0	0
6.50	0.7	0.7	2.1	5.1	1,697	67.2	25.8	19.3	0
7.00	0.5	-0.2	1.8	3.2	1,692	67.2	22.1	16.6	0



Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. (f'c = 4000 psi)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 8 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** Fire Truck ON 9"- 39" SLOPING COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF FLEXURE

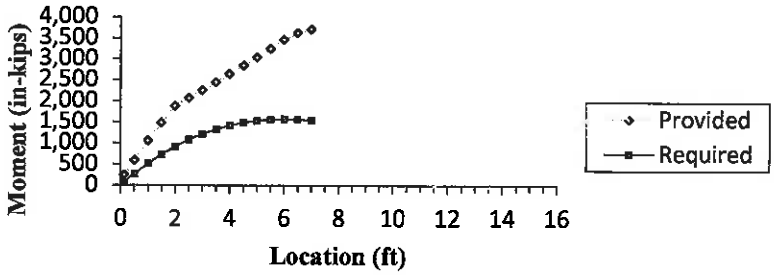
LOL

Slab Geometry
Span = 13.75 ft
Length = 14.00 ft

Strand Information
9 *Interior Strands*
2 *Exterior Strands*

P = 242.7 kips
f_{ps} = 256.95 ksi

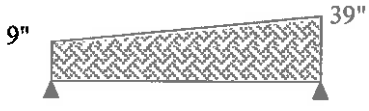
x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	17	36	132	-0.095	0.604	0.181	-0.195	0.086	0.410	274	593
1.00	32	70	245	-0.170	1.088	0.341	-0.367	0.171	0.721	515	1,057
1.50	47	103	345	-0.240	1.530	0.486	-0.523	0.246	1.007	732	1,488
2.00	61	134	429	-0.301	1.925	0.613	-0.660	0.311	1.265	921	1,882
2.50	74	164	500	-0.303	1.936	0.723	-0.778	0.420	1.158	1,084	2,071
3.00	85	191	557	-0.303	1.936	0.817	-0.879	0.514	1.057	1,222	2,258
3.50	96	216	601	-0.303	1.936	0.895	-0.963	0.592	0.973	1,335	2,449
4.00	106	239	633	-0.303	1.936	0.958	-1.032	0.655	0.905	1,425	2,644
4.50	114	259	653	-0.303	1.936	1.006	-1.083	0.703	0.853	1,492	2,843
5.00	122	276	664	-0.303	1.936	1.042	-1.121	0.738	0.815	1,539	3,047
5.50	129	291	665	-0.303	1.936	1.064	-1.145	0.761	0.791	1,567	3,254
6.00	134	303	659	-0.303	1.936	1.075	-1.157	0.772	0.779	1,578	3,465
6.50	139	311	644	-0.303	1.936	1.074	-1.156	0.770	0.781	1,571	3,627
7.00	143	317	624	-0.303	1.936	1.063	-1.144	0.760	0.792	1,550	3,711



Allowable Compression
$0.45f'_c$ = 3.600 > 0.772

Allowable Tension
$7.5\sqrt{f'_c}$ = 0.671 > N/A

Note: This case assumes a sloping cover profile for SDL & minimum cover depth for wheel load distribution



Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 9 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** Fire Truck ON 9"- 39" SLOPING COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

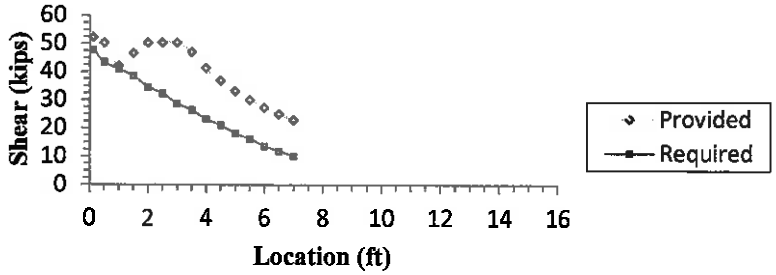
w_{dl} = 84 psf

w_{sdl} = Sloping Cover - See Sketch Below

w_{ll} = Fire Truck

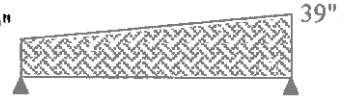
w_{snow} = 25 psf

x	Applied Shear (kips)			Req'd Strength	M_{cre}	Shear Strength (kips)			# of Filled Voids
(ft)	V_{dl}	V_{sdl}	V_{ll}	V_u	(in-kips)	V_{cw}	V_{ci}	ϕV_n	Req'd
0.50	2.7	5.9	20.7	43.5	1,028	48.9	189.5	50.3	2
1.00	2.5	5.6	19.5	41.0	1,435	56.2	137.2	42.2	0
1.50	2.4	5.3	18.4	38.6	1,806	62.2	117.3	46.6	0
2.00	2.2	5.0	16.2	34.6	2,136	67.0	105.2	50.3	0
2.50	2.0	4.7	15.2	32.4	2,104	67.2	85.7	50.4	0
3.00	1.9	4.4	13.2	28.6	2,065	67.2	72.3	50.4	0
3.50	1.7	4.0	12.3	26.5	2,030	67.2	62.6	47.0	0
4.00	1.5	3.6	10.7	23.2	1,997	67.2	55.1	41.3	0
4.50	1.4	3.1	9.9	21.2	1,969	67.2	49.2	36.9	0
5.00	1.2	2.7	8.5	18.2	1,943	67.2	44.3	33.2	0
5.50	1.0	2.2	7.8	16.3	1,922	67.2	40.2	30.2	0
6.00	0.9	1.7	6.6	13.7	1,905	67.2	36.5	27.4	0
6.50	0.7	1.2	6.0	11.9	1,891	67.2	33.4	25.0	0
7.00	0.5	0.6	5.5	10.1	1,882	67.2	30.5	22.9	0



Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. ($f'c$ = 4000 psi)

Note: This case assumes a sloping cover profile for SDL & minimum cover depth for wheel load distribution



CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 10 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** Fire Truck ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF FLEXURE

SDC

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Strand Information

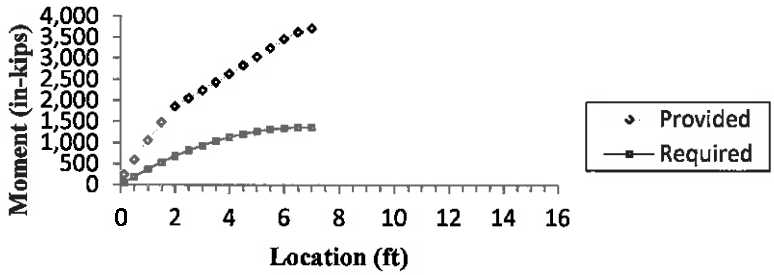
9 *Interior Strands*

2 *Exterior Strands*

P = 242.7 kips

f_{ps} = 256.95 ksi

x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	17	71	56	-0.095	0.604	0.141	-0.152	0.047	0.452	196	593
1.00	32	137	108	-0.170	1.088	0.272	-0.292	0.101	0.795	375	1,057
1.50	47	197	154	-0.240	1.530	0.391	-0.421	0.151	1.109	539	1,488
2.00	61	252	196	-0.301	1.925	0.499	-0.537	0.198	1.388	689	1,882
2.50	74	302	233	-0.303	1.936	0.597	-0.643	0.294	1.293	824	2,071
3.00	85	346	266	-0.303	1.936	0.684	-0.736	0.381	1.200	943	2,258
3.50	96	385	294	-0.303	1.936	0.760	-0.818	0.457	1.118	1,047	2,449
4.00	106	418	318	-0.303	1.936	0.826	-0.889	0.523	1.047	1,138	2,644
4.50	114	447	338	-0.303	1.936	0.882	-0.949	0.579	0.987	1,214	2,843
5.00	122	469	353	-0.303	1.936	0.927	-0.997	0.623	0.939	1,275	3,047
5.50	129	487	364	-0.303	1.936	0.961	-1.035	0.658	0.901	1,322	3,254
6.00	134	499	371	-0.303	1.936	0.985	-1.061	0.682	0.875	1,354	3,465
6.50	139	506	374	-0.303	1.936	1.000	-1.076	0.697	0.860	1,373	3,627
7.00	143	507	374	-0.303	1.936	1.004	-1.081	0.701	0.855	1,378	3,711



Allowable Compression

$0.45f'_c$ = 3.600 > 0.701

Allowable Tension

$7.5\sqrt{f'_c}$ = 0.671 > 0.001

Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 11 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** Fire Truck ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

ADM

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

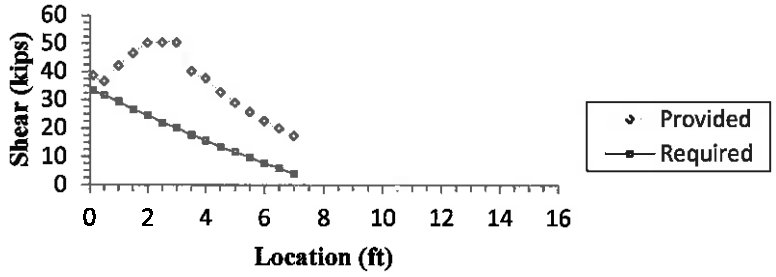
w_{dl} = 84 psf

w_{sdl} = 447 psf

w_{ll} = Fire Truck

w_{snow} = 25 psf

x	Applied Shear (kips)			Req'd Strength	M_{cre}	Shear Strength (kips)			# of Filled Voids
(ft)	V_{dl}	V_{sdl}	V_{ll}	V_u	(in-kips)	V_{cw}	V_{ci}	ϕV_n	Req'd
0.50	2.7	11.4	9.2	31.6	993	48.9	188.2	36.7	0
1.00	2.5	10.5	8.7	29.5	1,369	56.2	135.2	42.2	0
1.50	2.4	9.6	7.7	26.7	1,712	62.2	114.4	46.6	0
2.00	2.2	8.7	7.3	24.7	2,018	67.0	101.6	50.3	0
2.50	2.0	7.8	6.4	22.1	1,966	67.2	81.7	50.4	0
3.00	1.9	6.9	6.0	20.1	1,910	67.2	68.1	50.4	0
3.50	1.7	6.0	5.3	17.7	1,861	67.2	53.7	40.3	0
4.00	1.5	5.1	4.9	15.8	1,817	67.2	50.3	37.7	0
4.50	1.4	4.2	4.2	13.4	1,781	67.2	43.9	32.9	0
5.00	1.2	3.4	3.9	11.6	1,750	67.2	38.8	29.1	0
5.50	1.0	2.5	3.5	9.8	1,726	67.2	34.4	25.8	0
6.00	0.9	1.6	3.0	7.7	1,708	67.2	30.3	22.7	0
6.50	0.7	0.7	2.7	6.0	1,697	67.2	26.8	20.1	0
7.00	0.5	-0.2	2.2	3.9	1,692	67.2	23.2	17.4	0



Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. (f'c = 4000 psi)

JOB NAME: JUANITA FARMHOUSE COTTAGES
JOB NO.: 16004A-H
CASE NO.: 45k OUTRIGGER ON 18"x18" SQ. PAD ON 9"- 39" SLOPING COVER

BY: ADM
DATE: 1-Feb-16
REV: 0

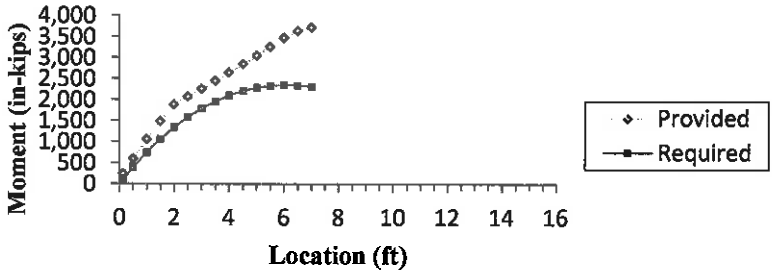
REVIEW OF FLEXURE

Slab Geometry
Span = 13.75 ft
Length = 14.00 ft

Strand Information
9 *Interior Strands*
2 *Exterior Strands*

P = 242.7 kips
f_{ps} = 256.95 ksi

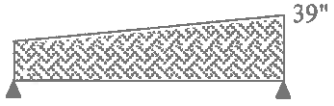
x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	17	36	208	-0.095	0.604	0.256	-0.275	0.161	0.329	396	593
1.00	32	70	390	-0.170	1.088	0.484	-0.521	0.313	0.567	748	1,057
1.50	47	103	553	-0.240	1.530	0.690	-0.742	0.450	0.787	1,065	1,488
2.00	61	134	692	-0.301	1.925	0.871	-0.937	0.569	0.988	1,342	1,882
2.50	74	164	812	-0.303	1.936	1.029	-1.108	0.726	0.828	1,584	2,071
3.00	85	191	912	-0.303	1.936	1.166	-1.255	0.863	0.681	1,791	2,258
3.50	96	216	992	-0.303	1.936	1.280	-1.377	0.976	0.559	1,962	2,449
4.00	106	239	1,056	-0.303	1.936	1.374	-1.479	1.070	0.458	2,103	2,644
4.50	114	259	1,100	-0.303	1.936	1.445	-1.556	1.142	0.381	2,208	2,843
5.00	122	276	1,130	-0.303	1.936	1.499	-1.614	1.196	0.323	2,285	3,047
5.50	129	291	1,142	-0.303	1.936	1.532	-1.649	1.229	0.287	2,330	3,254
6.00	134	303	1,141	-0.303	1.936	1.548	-1.666	1.244	0.270	2,349	3,465
6.50	139	311	1,125	-0.303	1.936	1.545	-1.663	1.242	0.273	2,340	3,627
7.00	143	317	1,097	-0.303	1.936	1.526	-1.643	1.223	0.293	2,306	3,711



Allowable Compression
$0.45f'_c$ = 3.600 > 1.244

Allowable Tension
$7.5\sqrt{f'_c}$ = 0.671 > N/A

Note: This case assumes a sloping cover profile for SDL & minimum cover depth for wheel load distribution



Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 13 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** 45k OUTRIGGER ON 18"x18" SQ. PAD ON 9"- 39" SLOPING COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

SOC

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

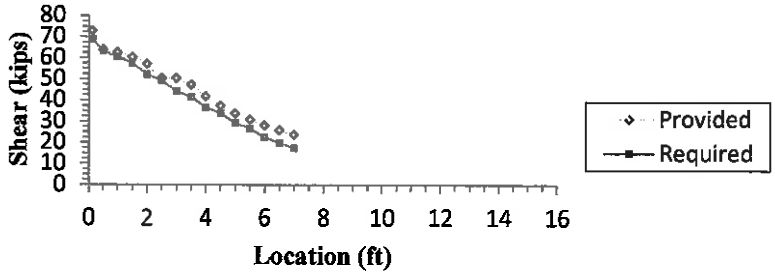
w_{dl} = 84 psf

w_{sdl} = Sloping Cover - See Sketch Below

w_{ll} = 45k OUTRIGGER ON 18"x18" SQ. PAD

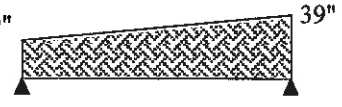
w_{snow} = 25 psf

x (ft)	Applied Shear (kips) V_{dl}	V_{sdl}	V_{ll}	Req'd Strength V_u	M_{cre} (in-kips)	Shear Strength (kips) V_{cw}	V_{ci}	ϕV_n	# of Filled Voids Req'd
0.50	2.7	5.9	33.2	63.4	1,028	48.9	189.6	63.9	4
1.00	2.5	5.6	31.7	60.4	1,435	56.2	137.4	62.6	3
1.50	2.4	5.3	30.1	57.5	1,806	62.2	117.6	60.2	2
2.00	2.2	5.0	27.2	52.2	2,136	67.0	105.6	57.1	1
2.50	2.0	4.7	25.8	49.3	2,104	67.2	86.2	50.4	0
3.00	1.9	4.4	23.0	44.3	2,065	67.2	72.8	50.4	0
3.50	1.7	4.0	21.7	41.5	2,030	67.2	63.2	47.4	0
4.00	1.5	3.6	19.1	36.7	1,997	67.2	55.8	41.9	0
4.50	1.4	3.1	17.8	33.9	1,969	67.2	50.0	37.5	0
5.00	1.2	2.7	15.5	29.4	1,943	67.2	45.1	33.9	0
5.50	1.0	2.2	14.3	26.8	1,922	67.2	41.1	30.9	0
6.00	0.9	1.7	12.1	22.5	1,905	67.2	37.6	28.2	0
6.50	0.7	1.2	11.1	20.0	1,891	67.2	34.5	25.9	0
7.00	0.5	0.6	10.1	17.5	1,882	67.2	31.8	23.9	0



Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. (f'c = 4000 psi)

Note: This case assumes a sloping cover profile for SDL & minimum cover depth for wheel load distribution



CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 14 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** 45k OUTRIGGER ON 18"x18" SQ. PAD ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF FLEXURE

SDC

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Strand Information

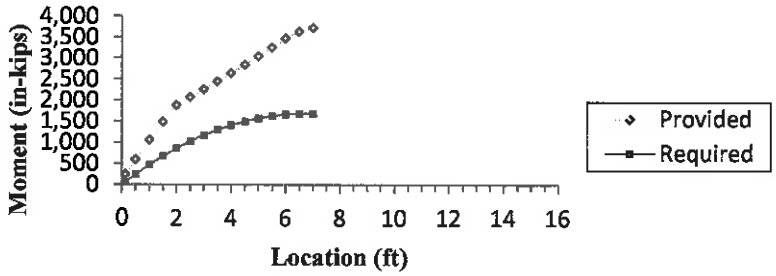
9 *Interior Strands*

2 *Exterior Strands*

P = 242.7 kips

f_{ps} = 256.95 ksi

x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	17	71	87	-0.095	0.604	0.172	-0.185	0.077	0.419	245	593
1.00	32	137	167	-0.170	1.088	0.330	-0.355	0.159	0.733	470	1,057
1.50	47	197	239	-0.240	1.530	0.474	-0.511	0.235	1.019	676	1,488
2.00	61	252	303	-0.301	1.925	0.605	-0.651	0.303	1.274	861	1,882
2.50	74	302	361	-0.303	1.936	0.723	-0.778	0.419	1.158	1,028	2,071
3.00	85	346	411	-0.303	1.936	0.826	-0.889	0.523	1.047	1,175	2,258
3.50	96	385	453	-0.303	1.936	0.917	-0.987	0.613	0.949	1,303	2,449
4.00	106	418	490	-0.303	1.936	0.995	-1.071	0.692	0.865	1,413	2,644
4.50	114	447	519	-0.303	1.936	1.059	-1.140	0.756	0.796	1,503	2,843
5.00	122	469	542	-0.303	1.936	1.112	-1.197	0.808	0.740	1,576	3,047
5.50	129	487	557	-0.303	1.936	1.150	-1.238	0.847	0.698	1,630	3,254
6.00	134	499	567	-0.303	1.936	1.178	-1.268	0.874	0.669	1,667	3,465
6.50	139	506	570	-0.303	1.936	1.192	-1.283	0.889	0.653	1,686	3,627
7.00	143	507	567	-0.303	1.936	1.194	-1.285	0.891	0.651	1,687	3,711



Allowable Compression

$0.45f'_c$ = 3.600 > 0.891

Allowable Tension

$7.5\sqrt{f'_c}$ = 0.671 > N/A

Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 15 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** 45k OUTRIGGER ON 18"x18" SQ. PAD ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

KDC

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

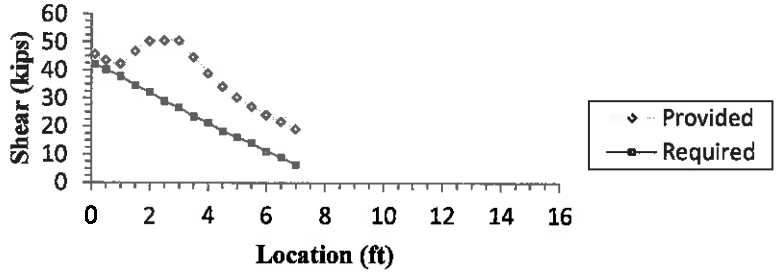
w_{dl} = 84 psf

w_{sdl} = 447 psf

w_{ll} = 45k OUTRIGGER ON 18"x18" SQ. PAD

w_{snow} = 25 psf

x	Applied Shear (kips)			Req'd Strength	M_{cre}	Shear Strength (kips)			# of Filled Voids
(ft)	V_{dl}	V_{sdl}	V_{ll}	V_u	(in-kips)	V_{cw}	V_{ci}	ϕV_n	Req'd
0.50	2.7	11.4	14.5	40.1	993	48.9	188.6	43.5	1
1.00	2.5	10.5	13.8	37.8	1,369	56.2	135.8	42.2	0
1.50	2.4	9.6	12.6	34.5	1,712	62.2	115.3	46.6	0
2.00	2.2	8.7	11.9	32.2	2,018	67.0	102.8	50.3	0
2.50	2.0	7.8	10.7	29.0	1,966	67.2	83.0	50.4	0
3.00	1.9	6.9	10.1	26.7	1,910	67.2	69.4	50.4	0
3.50	1.7	6.0	8.9	23.6	1,861	67.2	59.4	44.5	0
4.00	1.5	5.1	8.4	21.4	1,817	67.2	51.8	38.8	0
4.50	1.4	4.2	7.3	18.4	1,781	67.2	45.5	34.2	0
5.00	1.2	3.4	6.7	16.2	1,750	67.2	40.5	30.4	0
5.50	1.0	2.5	6.2	14.1	1,726	67.2	36.2	27.2	0
6.00	0.9	1.6	5.2	11.2	1,708	67.2	32.3	24.2	0
6.50	0.7	0.7	4.7	9.2	1,697	67.2	28.9	21.7	0
7.00	0.5	-0.2	3.8	6.5	1,692	67.2	25.5	19.1	0



Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. (f'c = 4000 psi)

JOB NAME: JUANITA FARMHOUSE COTTAGES
JOB NO.: 16004A-H
CASE NO.: 250 PSF LIVE LOAD ON 39" UNIFORM COVER

BY: ADM
DATE: 1-Feb-16
REV: 0

REVIEW OF FLEXURE

KDV

Slab Geometry

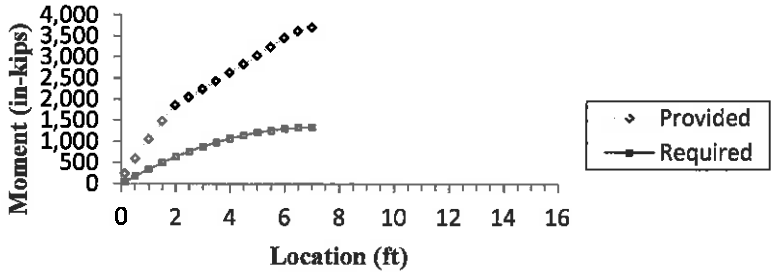
Span = 13.75 ft
Length = 14.00 ft

Strand Information

9 *Interior Strands*
2 *Exterior Strands*

P = 242.7 kips
f_{ps} = 256.95 ksi

x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	17	71	47	-0.095	0.604	0.132	-0.142	0.037	0.462	180	593
1.00	32	137	90	-0.170	1.088	0.254	-0.274	0.084	0.814	347	1,057
1.50	47	197	130	-0.240	1.530	0.367	-0.395	0.127	1.135	501	1,488
2.00	61	252	166	-0.301	1.925	0.470	-0.506	0.169	1.419	642	1,882
2.50	74	302	200	-0.303	1.936	0.564	-0.607	0.261	1.329	770	2,071
3.00	85	346	230	-0.303	1.936	0.649	-0.698	0.345	1.238	885	2,258
3.50	96	385	257	-0.303	1.936	0.724	-0.779	0.420	1.157	988	2,449
4.00	106	418	280	-0.303	1.936	0.789	-0.849	0.486	1.087	1,077	2,644
4.50	114	447	300	-0.303	1.936	0.845	-0.909	0.542	1.027	1,153	2,843
5.00	122	469	317	-0.303	1.936	0.891	-0.959	0.588	0.977	1,217	3,047
5.50	129	487	331	-0.303	1.936	0.928	-0.999	0.625	0.937	1,268	3,254
6.00	134	499	341	-0.303	1.936	0.956	-1.029	0.653	0.907	1,305	3,465
6.50	139	506	348	-0.303	1.936	0.974	-1.048	0.670	0.888	1,330	3,627
7.00	143	507	352	-0.303	1.936	0.982	-1.057	0.679	0.879	1,342	3,711



Allowable Compression

$0.45f'_c$ = 3.600 > 0.679

Allowable Tension

$7.5\sqrt{f'_c}$ = 0.671 > N/A

Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 17 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** 250 PSF LIVE LOAD ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

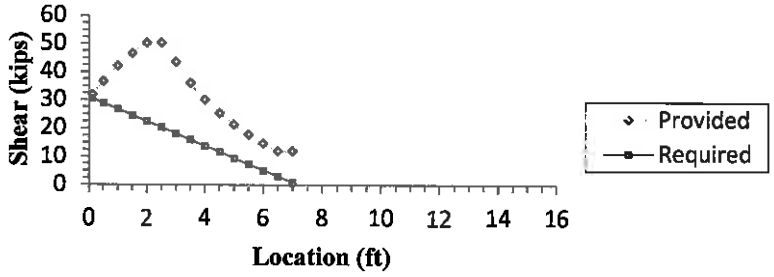
w_{dl} = 84 psf

w_{sdl} = 447 psf

w_{ll} = 250 psf

w_{snow} = 25 psf

x	Applied Shear (kips)			Req'd Strength	M_{cre}	Shear Strength (kips)			# of Filled Voids
(ft)	V_{dl}	V_{sdl}	V_{ll}	V_u	(in-kips)	V_{cw}	V_{ci}	ϕV_n	Req'd
0.50	2.7	11.4	7.5	28.9	993	48.9	183.7	36.7	0
1.00	2.5	10.5	6.9	26.7	1,369	56.2	128.7	42.2	0
1.50	2.4	9.6	6.4	24.6	1,712	62.2	106.2	46.6	0
2.00	2.2	8.7	5.8	22.4	2,018	67.0	91.6	50.3	0
2.50	2.0	7.8	5.3	20.3	1,966	67.2	71.8	50.4	0
3.00	1.9	6.9	4.7	18.1	1,910	67.2	58.1	43.6	0
3.50	1.7	6.0	4.2	16.0	1,861	67.2	48.0	36.0	0
4.00	1.5	5.1	3.6	13.8	1,817	67.2	40.2	30.2	0
4.50	1.4	4.2	3.1	11.7	1,781	67.2	33.8	25.4	0
5.00	1.2	3.4	2.5	9.5	1,750	67.2	28.5	21.4	0
5.50	1.0	2.5	2.0	7.4	1,726	67.2	23.8	17.8	0
6.00	0.9	1.6	1.4	5.2	1,708	67.2	19.5	14.6	0
6.50	0.7	0.7	0.9	3.1	1,697	67.2	16.0	12.0	0
7.00	0.5	-0.2	0.3	0.9	1,692	67.2	16.0	12.0	0

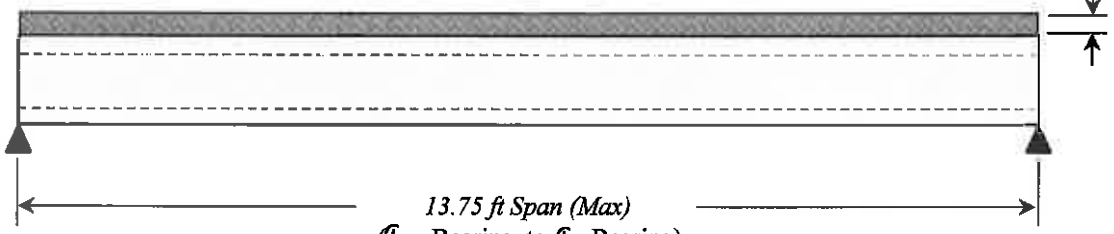


Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. (f'c = 4000 psi)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 18 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:**	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

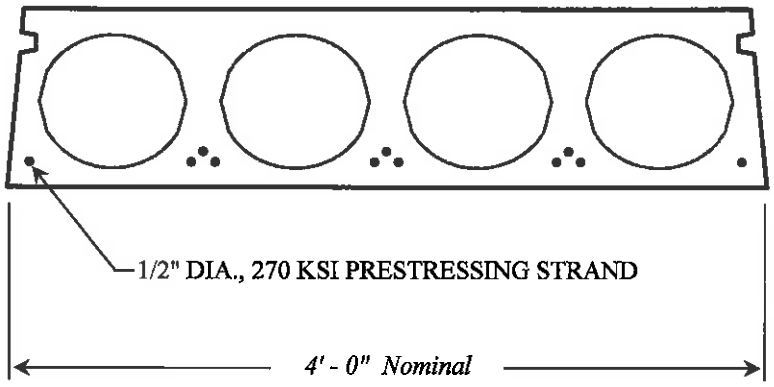
DESIGN CONFIGURATION

4" Concrete @ 160 pcf on 28" Fill @ 135 pcf [32" MINIMUM Cover @ 138 pcf]
4" Concrete @ 160 pcf on 35" Fill @ 135 pcf [39" MAXIMUM Cover @ 138 pcf]



TYPICAL HOLLOW CORE ELEVATION

MINIMUM STRAND REQUIREMENTS



(11) Strands MK 01

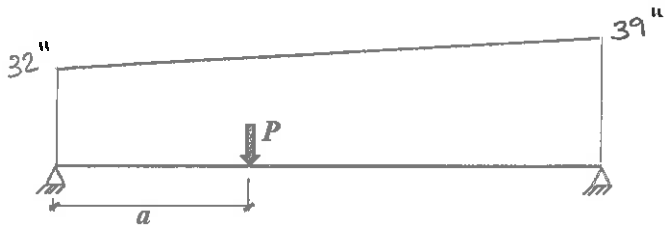
TYPICAL HOLLOW CORE SECTION

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 19 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:**	**BY:** ADM **DATE:** 2/1/2016 **REV:** 0

CONCENTRATED LOAD MOMENTS AND SHEARS

	P (kips)	a (ft)	Type	R_L (kips)	R_R (kips)
Load 1	2.40	1.63	LL	2.12	0.28 ← 0.6KLF LINE LOAD
Load 2	1.60	1.63	LL	1.41	0.19 ← 0.4 KLF LINE LOAD
Load 3	4.80	1.63	DL	4.23	0.57 ← 1.2KLF LINE LOAD
Load 4			LL	0.00	0.00

x (ft)	M_1 (in-k)	V_1 (kips)	M_2 (in-k)	V_2 (kips)	M_3 (in-k)	V_3 (kips)	M_4 (in-k)	V_4 (kips)
0.13	3	2.12	2	1.41	6	4.23	0	0.00
0.50	13	2.12	8	1.41	25	4.23	0	0.00
1.00	25	2.12	17	1.41	51	4.23	0	0.00
1.50	38	2.12	25	1.41	76	4.23	0	0.00
2.00	40	-0.28	27	-0.19	80	-0.57	0	0.00
2.50	38	-0.28	26	-0.19	77	-0.57	0	0.00
3.00	37	-0.28	24	-0.19	73	-0.57	0	0.00
3.50	35	-0.28	23	-0.19	70	-0.57	0	0.00
4.00	33	-0.28	22	-0.19	66	-0.57	0	0.00
4.50	31	-0.28	21	-0.19	63	-0.57	0	0.00
5.00	30	-0.28	20	-0.19	60	-0.57	0	0.00
5.50	28	-0.28	19	-0.19	56	-0.57	0	0.00
6.00	26	-0.28	18	-0.19	53	-0.57	0	0.00
6.50	25	-0.28	16	-0.19	49	-0.57	0	0.00
7.00	23	-0.28	15	-0.19	46	-0.57	0	0.00



CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 20 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** 45k OUTRIGGER ON 18"x18" SQ. PAD ON 32"- 39" SLOPING COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF FLEXURE

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Strand Information

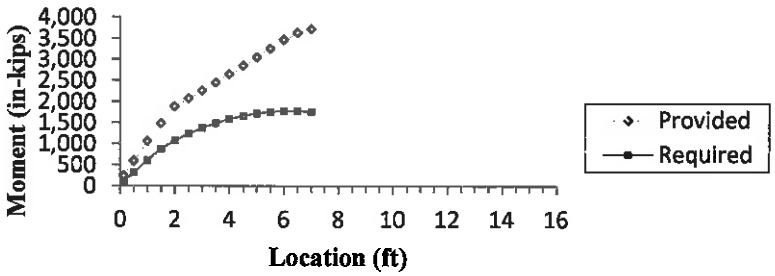
9 *Interior Strands*

2 *Exterior Strands*

P = 242.7 kips

f_{ps} = 256.95 ksi

x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	39	63	121	-0.095	0.604	0.219	-0.235	0.124	0.369	316	593
1.00	76	121	234	-0.170	1.088	0.423	-0.455	0.253	0.632	611	1,057
1.50	113	175	336	-0.240	1.530	0.613	-0.660	0.373	0.870	884	1,488
2.00	127	225	412	-0.301	1.925	0.749	-0.807	0.448	1.119	1,081	1,882
2.50	133	270	472	-0.303	1.936	0.859	-0.924	0.555	1.012	1,239	2,071
3.00	138	310	524	-0.303	1.936	0.954	-1.027	0.651	0.909	1,376	2,258
3.50	142	345	567	-0.303	1.936	1.035	-1.114	0.732	0.822	1,493	2,449
4.00	145	376	602	-0.303	1.936	1.102	-1.186	0.799	0.750	1,589	2,644
4.50	147	403	628	-0.303	1.936	1.155	-1.244	0.852	0.692	1,665	2,843
5.00	147	424	647	-0.303	1.936	1.196	-1.287	0.893	0.649	1,721	3,047
5.50	147	441	658	-0.303	1.936	1.223	-1.317	0.920	0.619	1,760	3,254
6.00	146	453	662	-0.303	1.936	1.238	-1.332	0.935	0.604	1,779	3,465
6.50	144	460	659	-0.303	1.936	1.240	-1.335	0.937	0.601	1,780	3,627
7.00	141	463	648	-0.303	1.936	1.228	-1.322	0.925	0.614	1,761	3,711



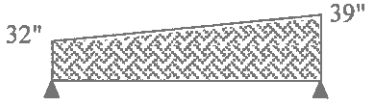
Allowable Compression

$0.45f'_c$ = 3.600 > 0.937

Allowable Tension

$7.5\sqrt{f'_c}$ = 0.671 > N/A

Note: This case assumes a sloping cover profile for SDL & minimum cover depth for wheel load distribution



Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 21 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** 45k OUTRIGGER ON 18"x18" SQ. PAD ON 32"- 39" SLOPING COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

✓ADC

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

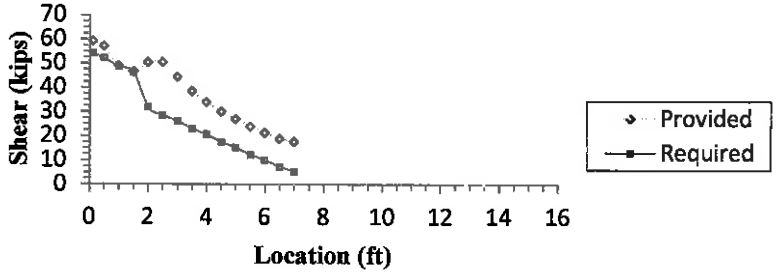
w_{dl} = 84 psf

w_{sdl} = Sloping Cover - See Sketch Below

w_{ll} = 45k OUTRIGGER ON 18"x18" SQ. PAD

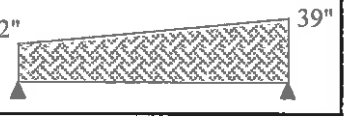
w_{snow} = 25 psf

x	Applied Shear (kips)			Req'd Strength	M_{cre}	Shear Strength (kips)			# of Filled Voids
(ft)	V_{dl}	V_{sdl}	V_{ll}	V_u	(in-kips)	V_{cw}	V_{ci}	ϕV_n	Req'd
0.50	6.4	10.1	20.2	52.1	979	48.9	189.0	57.1	3
1.00	6.2	9.4	18.7	48.6	1,340	56.2	136.4	49.0	1
1.50	6.0	8.6	18.0	46.3	1,668	62.2	116.2	46.6	0
2.00	1.1	7.9	13.2	31.8	1,979	67.0	83.2	50.3	0
2.50	0.9	7.1	11.8	28.5	1,939	67.2	69.1	50.4	0
3.00	0.7	6.3	11.1	26.2	1,894	67.2	59.2	44.4	0
3.50	0.6	5.6	9.7	22.9	1,854	67.2	51.2	38.4	0
4.00	0.4	4.8	9.1	20.7	1,820	67.2	45.3	34.0	0
4.50	0.2	4.0	7.8	17.5	1,792	67.2	40.0	30.0	0
5.00	0.1	3.2	7.1	15.3	1,770	67.2	35.8	26.9	0
5.50	-0.1	2.4	6.0	12.3	1,753	67.2	31.8	23.8	0
6.00	-0.3	1.6	5.4	10.2	1,742	67.2	28.5	21.4	0
6.50	-0.4	0.8	4.3	7.3	1,737	67.2	25.1	18.8	0
7.00	-0.6	0.0	3.8	5.3	1,738	67.2	23.5	17.6	0



Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. ($f'c$ = 4000 psi)

Note: This case assumes a sloping cover profile for SDL & minimum cover depth for wheel load distribution



CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 22 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** 45k OUTRIGGER ON 18"x18" SQ. PAD ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF FLEXURE

SDC

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Strand Information

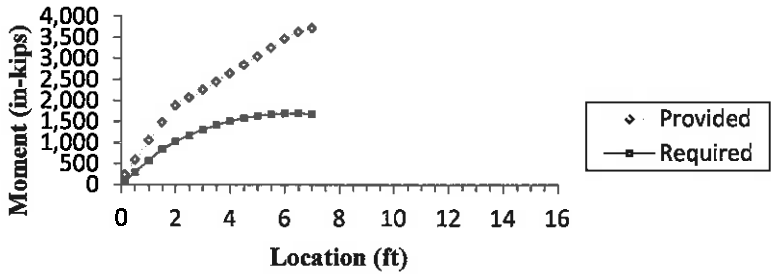
9 *Interior Strands*

2 *Exterior Strands*

P = 242.7 kips

f_{ps} = 256.95 ksi

x	Moments (in-kips)			*Service Stresses (ksi)*						Strength (in-kips)	
				Prestress		Applied		Net			
(ft)	M_{dl}	M_{sdl}	M_{ll}	Top	Bot	Top	Bot	Top	Bot	M_u	ϕM_n
0.50	39	71	106	-0.095	0.604	0.211	-0.228	0.117	0.377	301	593
1.00	76	137	203	-0.170	1.088	0.409	-0.440	0.238	0.648	581	1,057
1.50	113	197	294	-0.240	1.530	0.593	-0.638	0.353	0.891	843	1,488
2.00	127	252	359	-0.301	1.925	0.724	-0.779	0.423	1.146	1,029	1,882
2.50	133	302	411	-0.303	1.936	0.830	-0.893	0.527	1.043	1,179	2,071
3.00	138	346	455	-0.303	1.936	0.921	-0.991	0.618	0.945	1,308	2,258
3.50	142	385	492	-0.303	1.936	0.999	-1.076	0.696	0.861	1,419	2,449
4.00	145	418	523	-0.303	1.936	1.065	-1.147	0.762	0.790	1,512	2,644
4.50	147	447	546	-0.303	1.936	1.117	-1.203	0.814	0.734	1,585	2,843
5.00	147	469	563	-0.303	1.936	1.158	-1.246	0.854	0.690	1,641	3,047
5.50	147	487	573	-0.303	1.936	1.184	-1.275	0.881	0.662	1,677	3,254
6.00	146	499	577	-0.303	1.936	1.199	-1.291	0.896	0.645	1,697	3,465
6.50	144	506	575	-0.303	1.936	1.201	-1.293	0.898	0.643	1,699	3,627
7.00	141	507	566	-0.303	1.936	1.191	-1.282	0.888	0.654	1,683	3,711



Allowable Compression

$0.45f'_c$ = 3.600 > 0.898

Allowable Tension

$7.5\sqrt{f'_c}$ = 0.671 > N/A

Flexural strength is adequate. (Per ACI 318-11, Section 18.7)

CONCRETE TECHNOLOGY CORPORATION DESIGN CALCULATIONS FOR 12.5" HOLLOW CORE SLABS	SHEET 23 OF 23
JOB NAME: JUANITA FARMHOUSE COTTAGES **JOB NO.:** 16004A-H **CASE NO.:** 45k OUTRIGGER ON 18"x18" SQ. PAD ON 39" UNIFORM COVER	**BY:** ADM **DATE:** 1-Feb-16 **REV:** 0

REVIEW OF SHEAR STRENGTH (Per CTA Technical Bulletins 78B1 & 85B1)

Slab Geometry

Span = 13.75 ft

Length = 14.00 ft

Loading

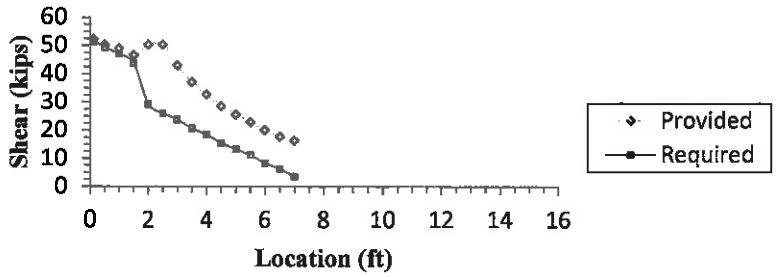
w_{dl} = 84 psf

w_{sdl} = 447 psf

w_{ll} = 45k OUTRIGGER ON 18"x18" SQ. PAD

w_{snow} = 25 psf

x	Applied Shear (kips)			Req'd Strength	M_{cre}	Shear Strength (kips)			# of Filled Voids
(ft)	V_{dl}	V_{sdl}	V_{ll}	V_u	(in-kips)	V_{cw}	V_{ci}	ϕV_n	Req'd
0.50	6.4	11.4	17.6	49.4	971	48.9	188.8	50.3	2
1.00	6.2	10.5	16.9	47.1	1,325	56.2	136.1	49.0	1
1.50	6.0	9.6	15.6	43.8	1,646	62.2	115.7	46.6	0
2.00	1.1	8.7	11.0	29.3	1,952	67.0	80.7	50.3	0
2.50	0.9	7.8	9.8	26.1	1,907	67.2	67.0	50.3	0
3.00	0.7	6.9	9.2	23.9	1,858	67.2	57.4	43.0	0
3.50	0.6	6.0	8.0	20.7	1,815	67.2	49.5	37.1	0
4.00	0.4	5.1	7.4	18.5	1,778	67.2	43.6	32.7	0
4.50	0.2	4.2	6.3	15.5	1,748	67.2	38.3	28.7	0
5.00	0.1	3.4	5.8	13.3	1,725	67.2	34.1	25.6	0
5.50	-0.1	2.5	5.2	11.2	1,707	67.2	30.5	22.9	0
6.00	-0.3	1.6	4.3	8.4	1,696	67.2	26.7	20.1	0
6.50	-0.4	0.7	3.8	6.3	1,692	67.2	23.7	17.8	0
7.00	-0.6	-0.2	2.9	3.6	1,694	67.2	21.8	16.4	0



Vertical shear strength of concrete is adequate.
Note: Fill voids as indicated. (f'c = 4000 psi)