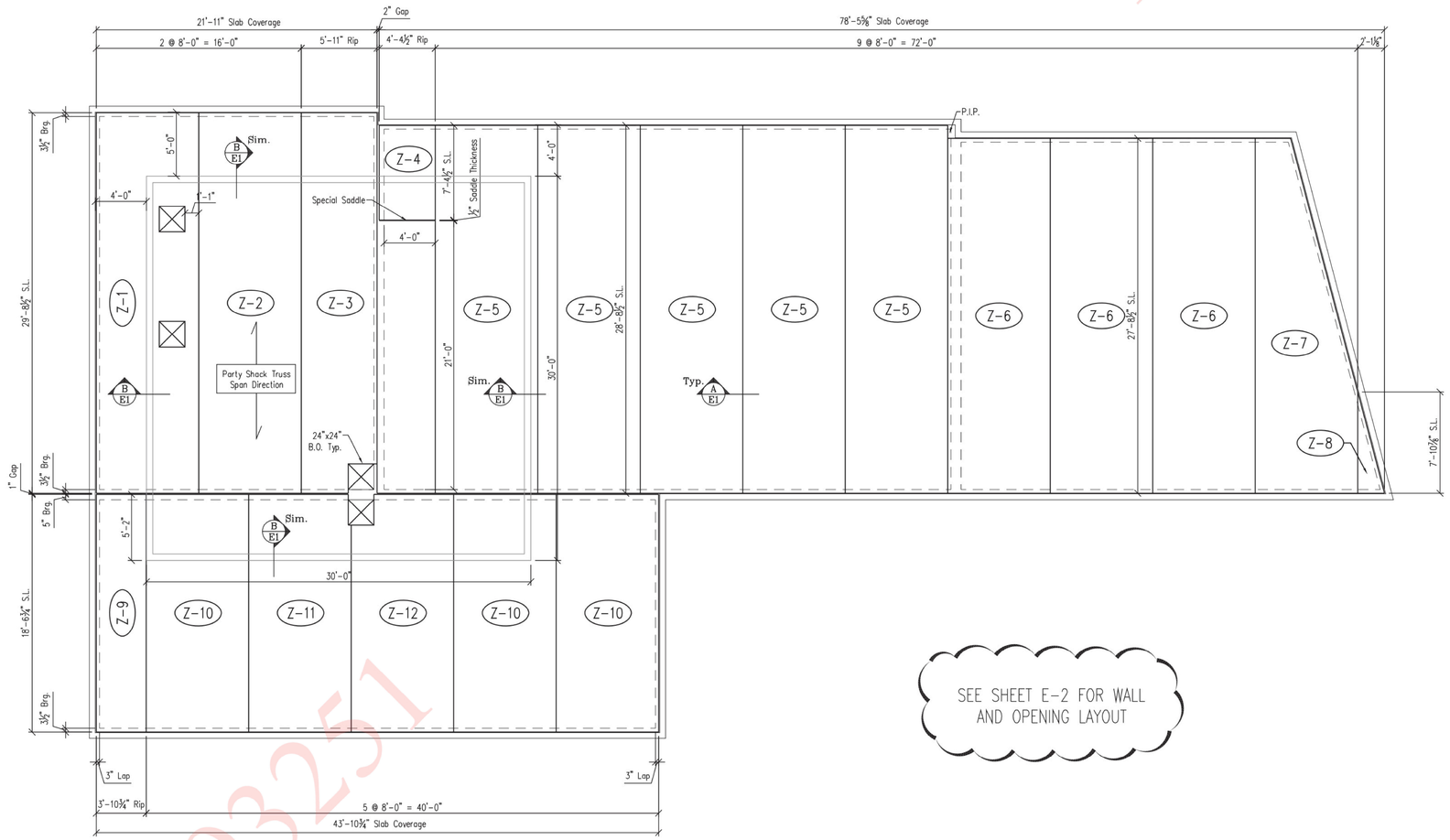


HOLLOW CORE PLAN

3/16" = 1'-0"

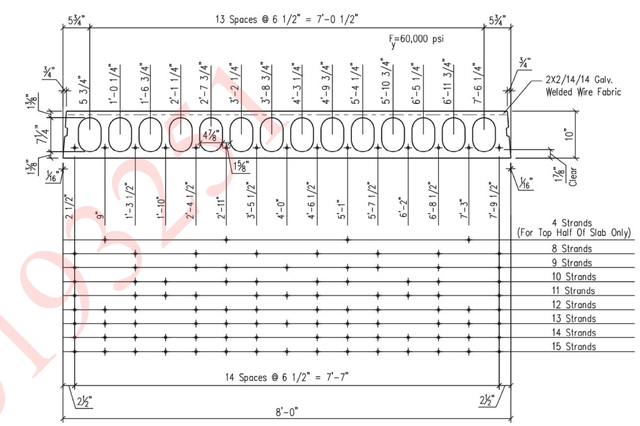
PLAN NORTH

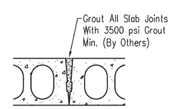
SEE SHEET E-2 FOR WALL AND OPENING LAYOUT

HOLLOW CORE SLAB SCHEDULE

MARK	QTY.	WIDTH and LENGTH	# of STRANDS per 8' WIDTH
Z-1	1	8'-0" x 29'-8½"	(15) ½"ø
Z-2	1	8'-0" x 29'-8½"	(15) ½"ø
Z-3	1	5'-11" x 29'-8½"	(15) ½"ø
Z-4	1	4'-4½" x 7'-4½"	(8) ½"ø
Z-5	5	8'-0" x 28'-8½"	(12) ½"ø
Z-6	3	8'-0" x 27'-8½"	(12) ½"ø
Z-7	1	8'-0" x 27'-8½"	(12) ½"ø
Z-8	1	8'-0" x 7'-10⅞"	(8) ½"ø
Z-9	1	3'-10¾" x 18'-6¾"	
Z-10	3	8'-0" x 18'-6¾"	
Z-11	1	8'-0" x 18'-6¾"	
Z-12	1	8'-0" x 18'-6¾"	(8) ½"ø

8'-0" x 10" HOLLOW-CORE SLAB SECTION AND PROPERTIES

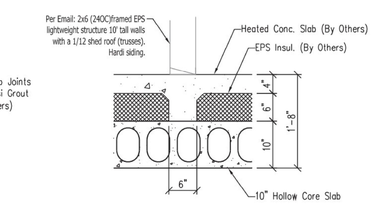




Detail A

3/4" = 1'-0"

(TYP. SLAB JOINT)



Detail B

3/4" = 1'-0"

HOLLOW-CORE SLAB ONLY

A = 595.5 in² Wt. = 75 psf
I = 6422 in⁴ b = 27.21 in
Y_t = 5.04 in³ Y_b = 4.96 in
Z_t = 1274 in³ Z_b = 1295 in³
Volume of grout = 159 in³/LF of joint
Wt. of grouted slab in place = 76.7 psf
f'c slab = 5500 psi f'c grout = 3500 psi

HOLLOW-CORE SLAB W/ 2" TOPPING

I – 11637 in⁴
Y_b = 6.56 in
Z_t = 2139 in³ Z_b = 1773 in³

Wt. of topped slab in place = 101.7 psf
f'c topping = 3500 psi

GENERAL NOTES:

SPECIAL MATERIAL REQUIREMENTS;
Prestressing strands are Grade 270-Low-Lax.
A 1/8"x2 1/2" continuous bearing pad shall be provided, by Stress-Cast, where slabs bear on concrete or masonry.
Stress-Cast is not responsible for adequacy of the support structure nor for deviation from support structure conditions as shown by the contract drawings.
The specific tentative date for the delivery and the erection of the product is desired TEN DAYS in advance, and reconfirmation is expected FOUR DAYS in advance. These advance notices are essential in efficiently scheduling delivery of equipment.
The general contractor's approval of these shop drawings indicates that all as-built building conditions at the time of erection will be in accordance with the approved shop drawings and within recognized industry tolerances. Approval indicates that the general contractor has completely checked all design building dimensions such as slab locations, slab sizes and shapes and that all requirements by other trades such as mechanical, heating, ventilating, and electrical have been properly interpreted.

CONTRACT NOTES:

Prestressed Hollow-Core slabs with lifting loops only are furnished F.O.B. jobsite by Stress-Cast. No loose erection hardware will be provided nor is any field work included.
Holes 10" in diameter or less shall be field cut by the trades requiring them after location is approved by architect/engineer.
If suitable roadways and approaches are not provided and maintained by the purchaser...Stress-Cast reserves the right to stop delivery until the condition is remedied.
Unloading shall be by the Buyer at his expense. Buyer will be allowed one hour free time per truck for unloading, and shall be charged for unloading time in excess of one hour.

SPECIAL NOTE:

The general contractor and/or any other trades shall provide holes or other means to allow the hollow cells to drain any water accumulation that may occur during the process of construction.

ERECTION NOTES:

The erector shall notify Stress-Cast of shipping damage upon delivery. Lack of notification at unloading shall indicate acceptance of an undamaged slab by the erector.
Hollow-Core slabs shall be leveled by jacking or loading as recommended by Stress-Cast prior to grouting.
Slabs shall be erected from center to center of edge joints. All joint gaps are 1/8" wide unless otherwise noted.
Slabs are delivered with integrated lifting loops located at 20-25% of the slab span length from each bearing end.
Chokers used for lifting must be equal to or longer than 60% of slab span length unless the erector opts to use a spreader beam. The angle between slab and choker shall, under no circumstances, be less than 60 degrees.

STRESS-CAST, INC. (785)667-3905 ASSARIA, KS. 67416
Shane Veritasi (816-838-0100)

PROJECT NO. 2210-Z
DATE: 11/9/22
DRAWN BY: M.J.M.
SUBMITTAL 1
REVISIONS

Customer: VERITASI DESIGN + BUILD
Project: 222 LAKEVIEW / PRRES20193251
Location: 206 SW LAKEVIEW BLVD
LEE'S SUMMIT, MO 64063

DATE	DESCRIPTION	REVISION PER

E1

SHEET 1 OF 1

2210-Z

Stress-cast Inc.

BY: jdc SHEET 1 OF .
DATE: 11/14/2022

Lee's Summit,MO - Slab Z5

(Z6, Z7 sim.)

DESIGN DATA

Left Cant. = 0.00 ft Simple Span = 28.71 ft Right Cant. = 0.00 ft
Beam Length = 28.71 ft Lift @ Left = 5.94 ft Lift @ Right= 5.94 ft
Design Bearing Lengths: @ Left = 0.29 ft @ Right= 0.29 ft

Top width = 96.000 in Flange thick= 1.375 in Tpg. thick = 0.000 in
Web width = 26.250 in Stem Height = 7.250 in Haunch thick= 0.000 in
Bot. width = 96.000 in Bot. thick = 1.375 in Section Type=GENERAL
Note: Section is HOLLOW

Non-Composite : (Assigned by the user) Height = 10.000 in
Area = 595.500 in^2 St = 1274.00 in^3 Yt = 5.041 in
I = 6422.00 in^4 Sb = 1295.00 in^3 Yb = 4.959 in
Vol/Surf = 2.810 in

Miscellaneous : (Governing code is ACI 318-14 w/ mod. load factors)
Beam f'ci = 3.500 ksi Rel. humid. = 60.00 % Stress Block=RECTANGULAR
Beam f'c = 5.500 ksi Beam weight = 150.00 pcf NORMAL WT.
Cu = 2.350 eds = 0 E-06 eshu = 650 E-06
Eci modifier= 1.000 Ec modifier = 1.000 Camber Mult.= 1.000
Shear Options : Depth used = NON-COMP f'c used = BEAM
Allow. Concrete Stress: At Release =0.600f'ci At Final =12.0sqrt f'c
phi : Tension-controlled Flexure = 0.900 Strand Developmt = 0.750
Factors : Compression-controlled Flexure = 0.650 Shear & Torsion = 0.750
Load Cases:
1) U = 1.40 DL
2) U = 1.20 DL + 1.60 LL
3) U = 1.20 DL + 1.60 LL + 0.50 (S or R) + 1.00 (W or E)
4) U = 0.90 DL + 0.50 LL + 1.60 (S or R) + 1.00 (W or E)
NOTE: User-modified load factors

Prestressing Strands (Strand Type: LOW RELAXATION Strain Curve: PCI Handbk)

Eff. Pull = 0.700Xfpu Strand diam.= 0.5000 in Estrand = 28500 ksi
Strand fpu =270.00 ksi Area ea.str.= 0.1530 in^2 LtMult = 1.000
Str. lev. = 1 # of Strand = 12.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:

Description	X(ft) From Left End	Hstr (in)	Eccent. (in)	Area of P/S (in^2)
Left End of Beam----------	0.00	2.13	2.83	1.8360
Right End of Beam----------	28.71	2.13	2.83	1.8360

Mild Steel

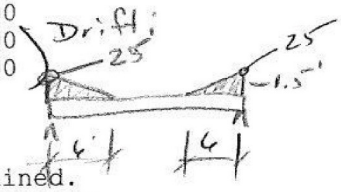
Shear : fyv = 60.00 ksi fyh = 60.00 ksi fyl = 60.00 ksi
Emild = 29000 ksi LdMult = 1.000

SDL = (15+50) = 65psf x 8' = .52 klf
SLL = 60psf x 8' = .48 klf
Base Snw: 20psf x 8' = .16 klf

Distributed Loads (non-factored)

Drift: 1.5' x 16/6 = 25psf x 8' = .20 klf

Load Type	Magnitude of Load Beginning (k/ft)	Ending (k/ft)	Distance From Left Beginning (ft)	Ending (ft)	Eccent. (in)
P/C Self Weight	0.600	0.600	0.00	28.71	0.000
Non-comp. Dead Load	0.520	0.520	0.00	28.71	0.000
Live Load	0.480	0.480	0.00	28.71	0.000
Rain or Snow Load	0.160	0.160	0.00	28.70	0.000
Rain or Snow Load	0.200	0.000	0.00	6.00	0.000
Rain or Snow Load	0.000	0.200	22.70	28.70	0.000



At Release Only: Suction = 0.000 k/ft Core Material = 0.000 k/ft

NOTE: 0.00% of all distributed and concentrated live loads are sustained.
NOTE: Shear calculations are based on loads being applied to top of member.

Bearing Plates

Nu = 0.20*Pu Height= 0.00 in Bearing Pad Thickness = 0.250 in
Eff. Brg. Surface: Width = 0.00 in Length = 0.000 in
Plate Rebar: Angle = 10.00 deg fy = 60.00 ksi
Confinement for non-debonded prestressing strand assumed -> NO

********** OUTPUT **********

INITIAL STRESSES (psi, at release)

A) DL beam + core material (if any) + suction (if any)
Beam is supported at 5.94 ft from LEFT end and 5.94 ft from RIGHT end

X(ft) From Left End	Initial P/S Top	Initial P/S Bot.	Init.P/S + BM Top	Init.P/S + BM Bot.	Aux. steel area (ACI 24.5.3.2.1)	
2.08	-179	1277	-191	1289	0.00	
5.94	-179	1274	-278	1372	0.73	TOP<---
7.62	-179	1276	-206	1303	0.45	TOP<---
9.31	-179	1278	-151	1250	0.00	
10.99	-179	1279	-111	1212	0.00	
12.67	-179	1280	-87	1189	0.00	
14.35	-179	1280	-79	1181	0.00	

NOTE: Required f'ci = 3500 psi based on assigned minimum.

STRAND STRESSES (Based on f'ci=3.500 ksi, f'c=5.500 ksi, by PCI Committee)

X(ft) from Left End	at Tensioning ksi	at Release ksi	DL and Sust. LL ksi	Final* ksi	P/S Loss ksi	P/S Loss %
0.00	189.0	180.0	0.0	0.0	189.00	100.00
2.87	189.0	180.9	161.4	162.3	26.74	14.15
5.74	189.0	181.6	163.8	165.2	23.76	12.57
8.61	189.0	182.1	165.5	167.4	21.65	11.45
11.48	189.0	182.4	166.5	168.6	20.38	10.78
14.35	189.0	182.5	166.8	169.0	19.95	10.56

*NOTE: Final strand stresses include elastic regain for Live Load.

FINAL STRESSES (psi)

X(ft) From Left End	FP + BM Top	FP + BM Bot	FP + DL + Sustained LL Tpg	FP + DL + Sustained LL Top	FP + DL + Sustained LL Bot	FP + DL + All LL Tpg	FP + DL + All LL Top	FP + DL + All LL Bot
0.00	0	0	---	0	0	---	0	0
1.44	1	677	---	96	582	---	220	463
2.87	49	939	---	231	760	---	463	537
4.31	135	862	---	393	609	---	719	295
5.74	210	795	---	533	478	---	940	86
7.18	273	739	---	652	366	---	1127	-91
8.61	325	693	---	749	276	---	1280	-235
10.05	365	657	---	824	205	---	1399	-348
11.48	394	631	---	878	154	---	1483	-428
12.92	411	616	---	910	124	---	1534	-476
14.35	417	610	---	921	114	---	1551	-492

NOTE: Allowable precast tensile stress = 12.0*sqrt(f'c) = -890 psi OK

ULTIMATE MOMENT: (k-in)

Required Mu by	Required Mu by	Provided phi*Mn by	Provided phi*Mn by Other	Flex. phi	N.A.

X(ft) From Left End	Fact'd Loads	1.2*Mcr (ACI 9.6.2.1)	Strain-compat.	Limits (see notes)	Factor (ACI Tab 21.2.1)	c(in)
0.00	0			0 (3)	0.00	0.00
1.44	519 {3}			1146 (1)	0.75	2.75
2.87	982 {3}			2109 (1)	0.78	1.05
4.31	1389 {3}			2678 (1)	0.83	1.26
5.74	1742 {3}			3103 (1)	0.88	1.39
7.18	2040 {3}		3229		0.90	1.41
8.61	2284 {3}		3229		0.90	1.41
10.05	2473 {3}		3229		0.90	1.41
11.48	2609 {3}		3229		0.90	1.41
12.92	2690 {3}		3229		0.90	1.41
14.35	2717 {3}	2703 <	3229		0.90	1.41

OK

{n}: Load Case {n} controls.
(1): Development length controlled by strand.
(3): Development length controlled by both strand and rebar.
Betal for depth of Whitney block: 0.78

VERTICAL SHEAR REINFORCING

OK

X(ft) From Left End	d in.	Vu kips	Tu k-in	Vci kips	Vcw kips	-- Required Reinforcing -- for Avci in^2/ft	for Avcw in^2/ft	for Avmin in^2/ft
0.56	8.00	30.5	0.0	151.0	63.0	0.000	0.000	0.292 (A2)
1.44	8.00	28.5	0.0	96.9	76.1	0.000	0.000	0.086 (C1)
2.87	8.00	25.3	0.0	62.4	86.0	0.000	0.000	0.086 (C2)
4.31	8.00	22.1	0.0	42.3	86.3	0.000	0.000	0.086 (C2)
5.74	8.00	18.9	0.0	32.0	86.6	0.000	0.000	0.086 (C2)
7.18	8.00	15.7	0.0	26.5	86.8	0.000	0.000	0.086 (C2)
8.61	8.00	12.6	0.0	26.5	87.0	0.000	0.000	0.086 (C2)
10.05	8.00	9.4	0.0	26.5	87.2	0.000	0.000	0.086 (C1)
11.48	8.00	6.3	0.0	26.5	87.3	0.000	0.000	0.086 (C1)
12.92	8.00	3.1	0.0	26.5	87.3	0.000	0.000	0.086 (C1)
14.35	8.00	0.0	0.0	26.5	87.3	0.000	0.000	0.086 (C1)

x.75 = 47.3 k > Vn

(A): Minimum based on ACI Tab 9.6.3.3a. (prestress < 40% tensile strength)
(C): Minimum based on ACI Tab 9.6.3.3e. (prestress > 40% tensile strength)
(1): Avmin not required, Vu < phi*Vc/2 (ACI 9.6.3.1).
(2): Avmin not required, phi*Vc > Vu > phi*Vc/2 (ACI 7.6.3.1 H.C.).
NOTE: Reqd. reinf. does not include suspension steel for ledges & pockets.
NOTE: Reqd. reinf. is based on a total web width = 26.250 in.
NOTE: No significant torsion was found (ACI 9.5.4.1).
NOTE: Design assumes web reinforcing is carried as close to compression and tension surfaces as possible per ACI 25.7.1.1.
NOTE: Shear calculations based on loads applied to top of member.

SUMMARY OF MINIMUM VERTICAL AND LONGITUDINAL WEB REINFORCEMENT REQUIREMENTS

NOTE: Ledge and hanger steel design not available for General sections.
For Vertical Reinf, select from columns (1), (2), (3) or (4)
For Longitudinal Reinf, select from columns (A) or (B)

X From Left End ft	Ph in	(1) Ash in^2/ft	(2) Av/2+At in^2/ft	(3) Av/2+Ash in^2/ft	(4) Av/2+Awv in^2/ft	(A) Al/2 in^2	(B) Awl in^2
0.56		<3>	0.000	<3>	0.000	0.000	0.000
1.44		<3>	0.000	<3>		0.000	
2.87		<3>	0.000	<3>		0.000	
4.31		<3>	0.000	<3>		0.000	
5.74		<3>	0.000	<3>		0.000	
7.18		<3>	0.000	<3>		0.000	

8.61	<3>	0.000	<3>	0.000
10.05	<3>	0.000	<3>	0.000
11.48	<3>	0.000	<3>	0.000
12.92	<3>	0.000	<3>	0.000
14.35	<3>	0.000	<3>	0.000

Awv = Awl = 0.000(left), 0.000(right) = Vertical and long. web reinf.
for bending due to torsional equil. reactions (ledge face, in^2),
based on: Tu = 0.0 k-in at Left End, = 0.0 k-in at Right End
ds = 24.250 in Hs = 8.000 in
Ash = Hanger reinforcement (ledge face only).
NOTE: The above values for steel are for one face only. Columns (2) & (A) should be applied to both faces. All other columns need only be applied to the ledge face.
<3>NOTE: Section does not have a ledge, or is defined as a General Section.

PREDICTED DEFLECTIONS

Based on : Rational approach and PCI Committee Recommendations for losses.
f'ci = 3.500 ksi, f'c = 5.500 ksi and ACI-209
Eci = 3587 ksi, Ec = 4496 ksi, Camber Mult.= 1.000
Modified : Cu = 1.697 eshu = 445 E-06

Position:	Midspan (in)
Release : PS+BM DL	-0.21
Creep Before Erection	-0.12
Erection: PS+BM DL @ 30 days	-0.33
Change Due to Non-Comp.DL	0.27
30 days : PS+BM DL+Non-Comp.DL	-0.05
Change Due to Comp.DL+SustLL	0.00
60 days : PS+All DL+Sust.LL	-0.05
Long Term Creep	0.26
Final : PS+All DL+Sust.LL	0.20
: PS+All DL+LL	0.54

NOTE: Negative values indicate camber.

MISC. PRODUCTION INFORMATION

Initial prestress force = 347 kips Final prestress force = 310 kips
Concrete strengths used in design:
Release strength f'ci= 3500 psi Final strength f'c= 5500 psi
Beam is NORMAL WEIGHT concrete. Piece weight = 17.23 kips.

Estimated shortening between supports at erection time :

	at C.G.	Curvature Effect	Total	
Top	0.14	-0.05	0.09	<<<Length correction not to exceed this value
C.G	0.14	0.00	0.14	
Bot	0.14	0.05	0.19	

DESIGN DATA

Left Cant. = 0.00 ft Simple Span = 28.71 ft Right Cant. = 0.00 ft
Beam Length = 28.71 ft ~~Lift @ Left = 5.94 ft~~ Lift @ Right= 5.94 ft
Design Bearing Lengths: @ Left = 0.29 ft @ Right= 0.29 ft

Top width = 96.000 in Flange thick= 1.375 in Tpg. thick = 0.000 in
Web width = 26.250 in Stem Height = 7.250 in Haunch thick= 0.000 in
Bot. width = 96.000 in Bot. thick = 1.375 in Section Type=GENERAL
Note: Section is HOLLOW

Non-Composite : (Assigned by the user) Height = 10.000 in
Area = 595.500 in^2 St = 1274.00 in^3 Yt = 5.041 in
I = 6422.00 in^4 Sb = 1295.00 in^3 Yb = 4.959 in
Vol/Surf = 2.810 in

Miscellaneous : (Governing code is ACI 318-14 w/ mod. load factors)
Beam f'ci = 3.500 ksi Rel. humid. = 60.00 % Stress Block=RECTANGULAR
Beam f'c = 5.500 ksi Beam weight = 150.00 pcf NORMAL WT.
Cu = 2.350 eds = 0 E-06 eshu = 650 E-06
Eci modifier= 1.000 Ec modifier = 1.000 Camber Mult.= 1.000
Shear Options : Depth used = NON-COMP f'c used = BEAM
Allow. Concrete Stress: At Release =0.600f'ci At Final =12.0sqrt f'c
phi : Tension-controlled Flexure = 0.900 Strand Developmt = 0.750
Factors : Compression-controlled Flexure = 0.650 Shear & Torsion = 0.750
Load Cases:
1) U = 1.40 DL
2) U = 1.20 DL + 1.60 LL
3) U = 1.20 DL + 1.60 LL + 0.50 (S or R) + 1.00 (W or E)
4) U = 0.90 DL + 0.50 LL + 1.60 (S or R) + 1.00 (W or E)
NOTE: User-modified load factors

Prestressing Strands (Strand Type: LOW RELAXATION Strain Curve: PCI Handbk)

Eff. Pull = 0.700Xfpu Strand diam.= 0.5000 in Estrand = 28500 ksi
Strand fpu =270.00 ksi Area ea.str.= 0.1530 in^2 LtMult = 1.000
Str. lev. = 1 # of Strand = 12.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:

Description	X(ft) From Left End	Hstr (in)	Eccent. (in)	Area of P/S (in^2)
Left End of Beam----------	0.00	2.13	2.83	1.8360
Right End of Beam----------	28.71	2.13	2.83	1.8360

Mild Steel

Shear : fyv = 60.00 ksi fyh = 60.00 ksi fyl = 60.00 ksi
Emild = 29000 ksi LdMult = 1.000

SLL = (15+50) = 65 psf x 8' = .52 Kl f
SLL = 60psf x 8' = .48 Kl f

Distributed Loads (non-factored)

Load Type	Magnitude of Load Beginning (k/ft)	Ending (k/ft)	Distance From Left Beginning (ft)	Ending (ft)	Eccent. (in)
P/C Self Weight	0.600	0.600	0.00	28.71	0.000
Non-comp. Dead Load	0.520	0.520	0.00	28.71	0.000
Live Load	0.480	0.480	0.00	28.71	0.000
Rain or Snow Load	0.200	0.200	24.70	28.70	0.000
Non-comp. Dead Load	0.170	0.170	0.00	24.71	0.000

— Drift @ walkway 25psf x 8' = .20 Kl f
Non Brg Wall (cont.)

At Release Only: Suction = 0.000 k/ft Core Material = 0.000 k/ft

Concentrated Loads (non-factored)

Magnitude Distance From Eccent.

Load Type	of Load (k)	Left End (ft)	(in)
Non-comp. Dead Load	3.76	24.71	0.000
Live Load	2.40	24.71	0.000

endwall brg.
D = (300+170) = 470 #/1x8' = 3.76K
L = 300 plf x 8' = 2.40 klf

NOTE: 0.00% of all distributed and concentrated live loads are sustained.
NOTE: Shear calculations are based on loads being applied to top of member.

Bearing Plates

Nu = 0.20*Pu Height= 0.00 in Bearing Pad Thickness = 0.250 in
Eff. Brg. Surface: Width = 0.00 in Length = 0.000 in
Plate Rebar: Angle = 10.00 deg fy = 60.00 ksi
Confinement for non-debonded prestressing strand assumed -> NO

********** OUTPUT **********

INITIAL STRESSES (psi, at release)

A) DL beam + core material (if any) + suction (if any)
Beam is supported at 5.94 ft from LEFT end and 5.94 ft from RIGHT end

X(ft) From Left End	Initial P/S Top	Initial P/S Bot.	Init.P/S + BM Top	Init.P/S + BM Bot.	Aux. steel area (ACI 24.5.3.2.1)	
2.08	-179	1277	-191	1289	0.00	
5.94	-179	1274	-278	1372	0.73	TOP<---
7.62	-179	1276	-206	1303	0.45	TOP<---
9.31	-179	1278	-151	1250	0.00	
10.99	-179	1279	-111	1212	0.00	
12.67	-179	1280	-87	1189	0.00	
14.35	-179	1280	-79	1181	0.00	

NOTE: Required f'ci = 3500 psi based on assigned minimum.

STRAND STRESSES (Based on f'ci=3.500 ksi, f'c=5.500 ksi, by PCI Committee)

X(ft) from Left End	at Tensioning ksi	at Release ksi	DL and Sust. LL ksi	Final* ksi	P/S Loss ksi	P/S Loss %
0.00	189.0	180.0	0.0	0.0	189.00	100.00
2.87	189.0	180.9	161.9	162.6	26.44	13.99
5.74	189.0	181.6	164.7	165.8	23.19	12.27
8.61	189.0	182.1	166.7	168.2	20.84	11.03
11.48	189.0	182.4	167.9	169.6	19.38	10.25
14.35	189.0	182.5	168.3	170.2	18.81	9.95

*NOTE: Final strand stresses include elastic regain for Live Load.

FINAL STRESSES (psi)

X(ft) From Left End	FP + BM Top	FP + BM Bot	FP + DL + Sustained LL Tpg	FP + DL + Sustained LL Top	FP + DL + Sustained LL Bot	FP + DL + All LL Tpg	FP + DL + All LL Top	FP + DL + All LL Bot
0.00	0	0	---	0	0	---	0	0
1.44	0	678	---	134	547	---	227	457
2.87	49	942	---	303	693	---	480	522
4.31	135	867	---	495	512	---	748	269
5.74	209	802	---	663	355	---	981	49
7.18	272	746	---	806	220	---	1181	-140
8.61	323	701	---	925	110	---	1346	-296
10.05	364	666	---	1018	22	---	1477	-420
11.48	392	641	---	1087	-42	---	1574	-511
12.92	409	626	---	1130	-83	---	1637	-571
14.35	415	621	---	1149	-101	---	1666	-598

NOTE: Allowable precast tensile stress = 12.0*sqrt(f'c) = -890 psi -598

ULTIMATE MOMENT: (k-in)

X(ft) From Left End	Required Mu by Fact'd Loads	Required Mu by 1.2*Mcr (ACI 9.6.2.1)	Provided phi*Mn by Strain-compat.	Provided phi*Mn by Other Limits (see notes)	Flex. phi Factor (ACI Tab 21.2.1)	N.A. c(in)
0.00	0			0 (3)	0.00	0.00
1.44	564 {3}			1154 (1)	0.75	2.76
2.87	1070 {3}			2119 (1)	0.78	1.05
4.31	1519 {3}			2687 (1)	0.83	1.27
5.74	1911 {3}			3110 (1)	0.88	1.39
7.18	2245 {3}		3229		0.90	1.41
8.61	2523 {3}		3229		0.90	1.41
10.05	2743 {3}		3229		0.90	1.41
11.48	2905 {3}		3230		0.90	1.41
12.92	3011 {3}		3230		0.90	1.41
14.35	3059 {3}	2720	3230		0.90	1.41

OK

{n}: Load Case {n} controls.
(1): Development length controlled by strand.
(3): Development length controlled by both strand and rebar.
Beta1 for depth of Whitney block: 0.78

OK

VERTICAL SHEAR REINFORCING

X(ft) From Left End	d in.	Vu kips	Tu k-in	Vci kips	Vcw kips	Required Reinforcing for Avci in^2/ft	for Avcw in^2/ft	for Avmin in^2/ft
0.56	8.00	33.1	0.0	151.4	63.0	0.000	0.000	0.292 (A2)
1.44	8.00	31.1	0.0	97.5	76.1	0.000	0.000	0.086 (C2)
2.87	8.00	27.7	0.0	63.0	86.1	0.000	0.000	0.086 (C2)
4.31	8.00	24.4	0.0	42.9	86.4	0.000	0.000	0.086 (C2)
5.74	8.00	21.1	0.0	32.5	86.7	0.000	0.000	0.086 (C2)
7.18	8.00	17.8	0.0	26.5	87.0	0.000	0.000	0.086 (C2)
8.61	8.00	14.4	0.0	26.5	87.2	0.000	0.000	0.086 (C2)
10.05	8.00	11.1	0.0	26.5	87.3	0.000	0.000	0.086 (C2)
11.48	8.00	7.8	0.0	26.5	87.5	0.000	0.000	0.086 (C1)
12.92	8.00	4.5	0.0	26.5	87.5	0.000	0.000	0.086 (C1)
14.35	8.00	1.1	0.0	26.5	87.6	0.000	0.000	0.086 (C1)

x.75 = 47.3 k, ϕV_n

(A): Minimum based on ACI Tab 9.6.3.3a. (prestress < 40% tensile strength)
(C): Minimum based on ACI Tab 9.6.3.3e. (prestress > 40% tensile strength)
(1): Avmin not required, Vu < phi*Vc/2 (ACI 9.6.3.1).
(2): Avmin not required, phi*Vc > Vu > phi*Vc/2 (ACI 7.6.3.1 H.C.).
NOTE: Reqd. reinf. does not include suspension steel for ledges & pockets.
NOTE: Reqd. reinf. is based on a total web width = 26.250 in.
NOTE: No significant torsion was found (ACI 9.5.4.1).
NOTE: Design assumes web reinforcing is carried as close to compression and tension surfaces as possible per ACI 25.7.1.1.
NOTE: Shear calculations based on loads applied to top of member.

SUMMARY OF MINIMUM VERTICAL AND LONGITUDINAL WEB REINFORCEMENT REQUIREMENTS

NOTE: Ledge and hanger steel design not available for General sections.
For Vertical Reinf, select from columns (1), (2), (3) or (4)
For Longitudinal Reinf, select from columns (A) or (B)

X From Left End ft	Ph in	(1) Ash in^2/ft	(2) Av/2+At in^2/ft	(3) Av/2+Ash in^2/ft	(4) Av/2+Awv in^2/ft	(A) Al/2 in^2	(B) Awl in^2

0.56	<3>	0.000	<3>	0.000	0.000	0.000
1.44	<3>	0.000	<3>		0.000	
2.87	<3>	0.000	<3>		0.000	
4.31	<3>	0.000	<3>		0.000	
5.74	<3>	0.000	<3>		0.000	
7.18	<3>	0.000	<3>		0.000	
8.61	<3>	0.000	<3>		0.000	
10.05	<3>	0.000	<3>		0.000	
11.48	<3>	0.000	<3>		0.000	
12.92	<3>	0.000	<3>		0.000	
14.35	<3>	0.000	<3>		0.000	

```
Awv = Awl =  0.000(left),  0.000(right) = Vertical and long. web reinf.
        for bending due to torsional equil. reactions (ledge face, in^2),
        based on: Tu =    0.0 k-in at Left End, =    0.0 k-in at Right End
                  ds = 24.250 in              Hs =  8.000 in
  Ash = Hanger reinforcement (ledge face only).
  NOTE: The above values for steel are for one face only. Columns (2) & (A)
        should be applied to both faces. All other columns need only be
        applied to the ledge face.
<3>NOTE: Section does not have a ledge, or is defined as a General Section.
```

PREDICTED DEFLECTIONS

```
Based on : Rational approach and PCI Committee Recommendations for losses.
           f'ci = 3.500 ksi, f'c  = 5.500 ksi and ACI-209
           Eci  =  3587 ksi, Ec   =  4496 ksi, Camber Mult.= 1.000
Modified : Cu   = 1.697      eshu =   445 E-06
```

Position:	Midspan (in)
Release : PS+BM DL	-0.21
Creep Before Erection	-0.12
Erection: PS+BM DL @ 30 days	-0.33
Change Due to Non-Comp.DL	0.40
30 days : PS+BM DL+Non-Comp.DL	0.08
Change Due to Comp.DL+SustLL	0.00
60 days : PS+All DL+Sust.LL	0.08
Long Term Creep	0.43
Final : PS+All DL+Sust.LL	0.51
: PS+All DL+LL	0.85

```
  NOTE: Negative values indicate camber.
  NOTE: Beam has cracked under positive moment; deflections are based
        on a bilinear moment-deflection relationship using simple Icr.
```

MISC. PRODUCTION INFORMATION

```
Initial prestress force  =  347 kips  Final prestress force  =  312 kips
Concrete strengths used in design:
  Release strength f'ci= 3500 psi    Final strength f'c= 5500 psi
Beam is NORMAL WEIGHT concrete. Piece weight = 17.23 kips.
```

Estimated shortening between supports at erection time :

	at C.G.	Curvature Effect	Total	
Top	0.14	-0.05	0.09	<<<Length correction not to exceed this value
C.G	0.14	0.00	0.14	
Bot	0.14	0.05	0.19	

Lee's Summit, Mo - Slab Z2

DESIGN DATA (Z3 sim.)

Left Cant. = 0.00 ft Simple Span = 29.71 ft Right Cant. = 0.00 ft
Beam Length = 29.71 ft Lift @ Left = 6.15 ft Lift @ Right= 6.15 ft
Design Bearing Lengths: @ Left = 0.29 ft @ Right= 0.29 ft

Top width = 96.000 in Flange thick= 1.375 in Tpg. thick = 0.000 in
Web width = 26.250 in Stem Height = 7.250 in Haunch thick= 0.000 in
Bot. width = 96.000 in Bot. thick = 1.375 in Section Type=GENERAL
Note: Section is HOLLOW

Non-Composite : (Assigned by the user) Height = 10.000 in
Area = 595.500 in^2 St = 1274.00 in^3 Yt = 5.041 in
I = 6422.00 in^4 Sb = 1295.00 in^3 Yb = 4.959 in
Vol/Surf = 2.810 in

Miscellaneous : (Governing code is ACI 318-14 w/ mod. load factors)
Beam f'ci = 3.500 ksi Rel. humid. = 60.00 % Stress Block=RECTANGULAR
Beam f'c = 5.500 ksi Beam weight = 150.00 pcf NORMAL WT.
Cu = 2.350 eds = 0 E-06 eshu = 650 E-06
Eci modifier= 1.000 Ec modifier = 1.000 Camber Mult.= 1.000
Shear Options : Depth used = NON-COMP f'c used = BEAM
Allow. Concrete Stress: At Release =0.600f'ci At Final =12.0sqrt f'c
phi : Tension-controlled Flexure = 0.900 Strand Developmt = 0.750
Factors : Compression-controlled Flexure = 0.650 Shear & Torsion = 0.750
Load Cases:
1) U = 1.40 DL
2) U = 1.20 DL + 1.60 LL
3) U = 1.20 DL + 1.60 LL + 0.50 (S or R) + 1.00 (W or E)
4) U = 0.90 DL + 0.50 LL + 1.60 (S or R) + 1.00 (W or E)
NOTE: User-modified load factors

Prestressing Strands (Strand Type: LOW RELAXATION Strain Curve: PCI Handbk)

Eff. Pull = 0.700Xfpu Strand diam.= 0.5000 in Estrand = 28500 ksi
Strand fpu =270.00 ksi Area ea.str.= 0.1530 in^2 LtMult = 1.000
Str. lev. = 1 # of Strand = 15.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:

Description	X(ft) From Left End	Hstr (in)	Eccent. (in)	Area of P/S (in^2)
Left End of Beam----------	0.00	2.13	2.83	2.2950
Right End of Beam----------	29.71	2.13	2.83	2.2950

Mild Steel

Shear : fyv = 60.00 ksi fyh = 60.00 ksi fyl = 60.00 ksi
Emild = 29000 ksi LdMult = 1.000

SDL = (15+50) = 65 psf x 8' = .52 klf
SLL = 60 psf x 8' = .48 klf
Base Snow + Drift = 25 psf x 8' = .20 klf

Distributed Loads (non-factored)

Load Type	Magnitude of Load Beginning (k/ft)	Ending (k/ft)	Distance From Left Beginning (ft)	Ending (ft)	Eccent. (in)
P/C Self Weight	0.600	0.600	0.00	29.71	0.000
Non-comp. Dead Load	0.520	0.520	0.00	29.71	0.000
Live Load	0.480	0.480	0.00	29.71	0.000
Rain or Snow Load	0.200	0.200	24.71	29.71	0.000
Non-comp. Dead Load	0.170	0.170	0.00	24.71	0.000

Non-Bry wall @ Z1 = 8.5' x 15 psf = .17 klf

At Release Only: Suction = 0.000 k/ft Core Material = 0.000 k/ft

Concentrated Loads (non-factored)

Magnitude Distance From Eccent.

Load Type	of Load (k)	Left End (ft)	(in)
Non-comp. Dead Load	2.40	24.71	0.000
Live Load	2.40	24.71	0.000

$D = \frac{30}{2} \times 20 = .30^{klf} \times 8' = 2.4^{k}$
$L = \frac{30}{2} \times 20 = .3^{klf} \times 8' = 2.4^{k}$

NOTE: 0.00% of all distributed and concentrated live loads are sustained.
NOTE: Shear calculations are based on loads being applied to top of member.

Bearing Plates

Nu = 0.20*Pu Height= 0.00 in Bearing Pad Thickness = 0.250 in
Eff. Brg. Surface: Width = 0.00 in Length = 0.000 in
Plate Rebar: Angle = 10.00 deg fy = 60.00 ksi
Confinement for non-debonded prestressing strand assumed -> NO

********** OUTPUT **********

INITIAL STRESSES (psi, at release)

A)DL beam + core material (if any) + suction (if any)
Beam is supported at 6.15 ft from LEFT end and 6.15 ft from RIGHT end

X(ft) From Left End	Initial P/S Top	Initial P/S Bot.	Init.P/S + BM Top	Init.P/S + BM Bot.	Aux. steel area (ACI 24.5.3.2.1)	
2.08	-221	1580	-234	1592	0.00	
6.15	-221	1576	-328	1681	0.84	TOP<---
7.89	-221	1579	-251	1608	0.54	TOP<---
9.63	-222	1581	-191	1551	0.34	TOP<---
11.37	-222	1583	-149	1511	0.00	
13.11	-222	1584	-123	1487	0.00	
14.85	-222	1584	-115	1479	0.00	

NOTE: Required f'ci = 3500 psi based on assigned minimum.

STRAND STRESSES (Based on f'ci=3.500 ksi, f'c=5.500 ksi, by PCI Committee)

X(ft) from Left End	at Tensioning ksi	at Release ksi	DL and Sust. LL ksi	Final* ksi	P/S Loss ksi	P/S Loss %
0.00	189.0	178.2	0.0	0.0	189.00	100.00
2.97	189.0	179.1	158.5	159.2	29.83	15.78
5.94	189.0	179.9	161.4	162.6	26.39	13.96
8.91	189.0	180.4	163.5	165.1	23.90	12.64
11.88	189.0	180.7	164.7	166.6	22.36	11.83
14.85	189.0	180.8	165.2	167.2	21.77	11.52

*NOTE: Final strand stresses include elastic regain for Live Load.

FINAL STRESSES (psi)

X(ft) From Left End	FP + BM Top	FP + BM Bot	FP + DL + Sustained LL Tpg	FP + DL + Sustained LL Top	FP + DL + Sustained LL Bot	FP + DL + All LL Tpg	FP + DL + All LL Top	FP + DL + All LL Bot
0.00	0	0	---	0	0	---	0	0
1.49	-21	879	---	120	740	---	221	644
2.97	28	1184	---	295	921	---	487	737
4.46	119	1106	---	499	733	---	773	471
5.94	199	1038	---	676	569	---	1021	239
7.43	266	981	---	827	429	---	1233	40
8.91	321	934	---	951	314	---	1409	-124
10.40	363	898	---	1049	224	---	1548	-254
11.88	394	872	---	1120	158	---	1651	-350
13.37	412	857	---	1164	117	---	1717	-412
14.85	418	852	---	1182	100	---	1747	-440

NOTE: Allowable precast tensile stress = 12.0*sqrt(f'c) = -890 psi OK -440

ULTIMATE MOMENT: (k-in)

X(ft) From Left End	Required Mu by Fact'd Loads	Required Mu by 1.2*Mcr (ACI 9.6.2.1)	Provided phi*Mn by Strain-compat.	Provided phi*Mn by Other Limits (see notes)	Flex. phi Factor (ACI Tab 21.2.1)	N.A. c(in)
0.00	0			0 (3)	0.00	0.00
1.49	602 {3}			1454 (1)	0.75	3.12
2.97	1143 {3}			2633 (1)	0.78	1.32
4.46	1622 {3}			3338 (1)	0.83	1.59
5.94	2040 {3}			3845 (1)	0.88	1.74
7.43	2397 {3}		3946		0.90	1.75
8.91	2692 {3}		3946		0.90	1.75
10.40	2926 {3}		3946		0.90	1.75
11.88	3099 {3}		3946		0.90	1.75
13.37	3210 {3}		3946		0.90	1.75
14.85	3260 {3}	3141	3946		0.90	1.75

OK

{n}: Load Case {n} controls.
(1): Development length controlled by strand.
(3): Development length controlled by both strand and rebar.
Beta1 for depth of Whitney block: 0.78

VERTICAL SHEAR REINFORCING OK

X(ft) From Left End	d in.	Vu kips	Tu k-in	Vci kips	Vcw kips	Required Reinforcing for Avci in^2/ft	for Avcw in^2/ft	for Avmin in^2/ft
0.56	8.00	34.2	0.0	164.5	64.8	0.000	0.000	0.292 (A2)
1.49	8.00	32.1	0.0	108.9	81.9	0.000	0.000	0.107 (C2)
2.97	8.00	28.6	0.0	69.6	93.2	0.000	0.000	0.107 (C2)
4.46	8.00	25.2	0.0	47.0	93.6	0.000	0.000	0.107 (C2)
5.94	8.00	21.7	0.0	35.4	94.0	0.000	0.000	0.107 (C2)
7.43	8.00	18.3	0.0	28.1	94.3	0.000	0.000	0.107 (C2)
8.91	8.00	14.8	0.0	26.5	94.6	0.000	0.000	0.107 (C2)
10.40	8.00	11.4	0.0	26.5	94.8	0.000	0.000	0.107 (C2)
11.88	8.00	8.0	0.0	26.5	95.0	0.000	0.000	0.107 (C1)
13.37	8.00	4.5	0.0	26.5	95.1	0.000	0.000	0.107 (C1)
14.85	8.00	1.1	0.0	26.5	95.1	0.000	0.000	0.107 (C1)

x.75 = 48.6K > φV_1

(A): Minimum based on ACI Tab 9.6.3.3a. (prestress < 40% tensile strength)
(C): Minimum based on ACI Tab 9.6.3.3e. (prestress > 40% tensile strength)
(1): Avmin not required, Vu < phi*Vc/2 (ACI 9.6.3.1).
(2): Avmin not required, phi*Vc > Vu > phi*Vc/2 (ACI 7.6.3.1 H.C.).
NOTE: Reqd. reinf. does not include suspension steel for ledges & pockets.
NOTE: Reqd. reinf. is based on a total web width = 26.250 in.
NOTE: No significant torsion was found (ACI 9.5.4.1).
NOTE: Design assumes web reinforcing is carried as close to compression and tension surfaces as possible per ACI 25.7.1.1.
NOTE: Shear calculations based on loads applied to top of member.

SUMMARY OF MINIMUM VERTICAL AND LONGITUDINAL WEB REINFORCEMENT REQUIREMENTS

NOTE: Ledge and hanger steel design not available for General sections.
For Vertical Reinf, select from columns (1), (2), (3) or (4)
For Longitudinal Reinf, select from columns (A) or (B)

X From Left End ft	Ph in	(1) Ash in^2/ft	(2) Av/2+At in^2/ft	(3) Av/2+Ash in^2/ft	(4) Av/2+Awv in^2/ft	(A) Al/2 in^2	(B) Awl in^2

0.56	<3>	0.000	<3>	0.000	0.000	0.000
1.49	<3>	0.000	<3>		0.000	
2.97	<3>	0.000	<3>		0.000	
4.46	<3>	0.000	<3>		0.000	
5.94	<3>	0.000	<3>		0.000	
7.43	<3>	0.000	<3>		0.000	
8.91	<3>	0.000	<3>		0.000	
10.40	<3>	0.000	<3>		0.000	
11.88	<3>	0.000	<3>		0.000	
13.37	<3>	0.000	<3>		0.000	
14.85	<3>	0.000	<3>		0.000	

Awv = Awl = 0.000(left), 0.000(right) = Vertical and long. web reinf.
for bending due to torsional equil. reactions (ledge face, in^2),
based on: Tu = 0.0 k-in at Left End, = 0.0 k-in at Right End
ds = 24.250 in Hs = 8.000 in
Ash = Hanger reinforcement (ledge face only).
NOTE: The above values for steel are for one face only. Columns (2) & (A) should be applied to both faces. All other columns need only be applied to the ledge face.
<3>NOTE: Section does not have a ledge, or is defined as a General Section.

PREDICTED DEFLECTIONS

Based on : Rational approach and PCI Committee Recommendations for losses.
f'ci = 3.500 ksi, f'c = 5.500 ksi and ACI-209
Eci = 3587 ksi, Ec = 4496 ksi, Camber Mult.= 1.000
Modified : Cu = 1.697 eshu = 445 E-06

Position:	Midspan (in)
Release : PS+BM DL	-0.35
Creep Before Erection	-0.21
Erection: PS+BM DL @ 30 days	-0.56
Change Due to Non-Comp.DL	0.45
30 days : PS+BM DL+Non-Comp.DL	-0.11
Change Due to Comp.DL+SustLL	0.00
60 days : PS+All DL+Sust.LL	-0.11
Long Term Creep	0.39
Final : PS+All DL+Sust.LL	0.28
: PS+All DL+LL	0.61

NOTE: Negative values indicate camber.

MISC. PRODUCTION INFORMATION

Initial prestress force = 434 kips Final prestress force = 384 kips
Concrete strengths used in design:
Release strength f'ci= 3500 psi Final strength f'c= 5500 psi
Beam is NORMAL WEIGHT concrete. Piece weight = 17.83 kips.

Estimated shortening between supports at erection time :

	at C.G.	Curvature Effect	Total	
Top	0.17	-0.07	0.09	<<<Length correction not to exceed this value
C.G	0.17	0.00	0.17	
Bot	0.17	0.07	0.24	

DESIGN DATA

Left Cant. = 0.00 ft Simple Span = 29.71 ft Right Cant. = 0.00 ft
Beam Length = 29.71 ft Lift @ Left = 6.15 ft Lift @ Right= 6.15 ft
Design Bearing Lengths: @ Left = 0.29 ft @ Right= 0.29 ft

Top width = 96.000 in Flange thick= 1.375 in Tpg. thick = 0.000 in
Web width = 26.250 in Stem Height = 7.250 in Haunch thick= 0.000 in
Bot. width = 96.000 in Bot. thick = 1.375 in Section Type=GENERAL
Note: Section is HOLLOW

Non-Composite : (Assigned by the user) Height = 10.000 in
Area = 595.500 in^2 St = 1274.00 in^3 Yt = 5.041 in
I = 6422.00 in^4 Sb = 1295.00 in^3 Yb = 4.959 in
Vol/Surf = 2.810 in

Miscellaneous : (Governing code is ACI 318-14 w/ mod. load factors)
Beam f'ci = 3.500 ksi Rel. humid. = 60.00 % Stress Block=RECTANGULAR
Beam f'c = 5.500 ksi Beam weight = 150.00 pcf NORMAL WT.
Cu = 2.350 eds = 0 E-06 eshu = 650 E-06
Eci modifier= 1.000 Ec modifier = 1.000 Camber Mult.= 1.000
Shear Options : Depth used = NON-COMP f'c used = BEAM
Allow. Concrete Stress: At Release =0.600f'ci At Final =12.0sqrt f'c
phi : Tension-controlled Flexure = 0.900 Strand Developmt = 0.750
Factors : Compression-controlled Flexure = 0.650 Shear & Torsion = 0.750
Load Cases:
1) U = 1.40 DL
2) U = 1.20 DL + 1.60 LL
3) U = 1.20 DL + 1.60 LL + 0.50 (S or R) + 1.00 (W or E)
4) U = 1.20 DL + 0.50 LL + 1.60 (S or R) + 1.00 (W or E)
NOTE: User-modified load factors

Prestressing Strands (Strand Type: LOW RELAXATION Strain Curve: PCI Handbk)

Eff. Pull = 0.700Xfpu Strand diam.= 0.5000 in Estrand = 28500 ksi
Strand fpu =270.00 ksi Area ea.str.= 0.1530 in^2 LtMult = 1.000
Str. lev. = 1 # of Strand = 15.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:

Description	X(ft) From Left End	Hstr (in)	Eccent. (in)	Area of P/S (in^2)
Left End of Beam----------	0.00	2.13	2.83	2.2950
Right End of Beam----------	29.71	2.13	2.83	2.2950

Strand Debonding :

Strand Level	Debonding Location	Dist. from Left End Start (ft)	Stop (ft)	Length of Debonding (ft)	# of Strands Debonded
1	MID-SPAN	11.50	22.71	11.210	3.00) slip strand @ holes

NOTE: A factor of 2.000 is applied to Lt and Ld for debonded strand.
NOTE: Strand debonded mid-span are assumed to be cut at the debond.

Mild Steel

Shear : fyv = 60.00 ksi fyh = 60.00 ksi fyl = 60.00 ksi
Emild = 29000 ksi LdMult = 1.000

SDL = (15+50) 65 psf × 8' = .052 klf

Distributed Loads (non-factored)

Load Type	Magnitude of Load Beginning (k/ft)	Ending (k/ft)	Distance From Left Beginning (ft)	Ending (ft)	Eccent. (in)
P/C Self Weight	0.600	0.600	0.00	29.71	0.000
Non-comp. Dead Load	0.520	0.520	0.00	29.71	0.000

SLL=60psf×8'=.48 KIF
Drift: 16.5psf×4'=.066 KIF
Wall DL=8.5'×20#=.17 KIF

Live Load	0.480	0.480	0.00	29.71	0.000
Rain or Snow Load	0.066	0.066	0.00	29.71	0.000
Non-comp. Dead Load	0.170	0.170	0.00	24.71	0.000

At Release Only: Suction = 0.000 k/ft Core Material = 0.000 k/ft

Concentrated Loads (non-factored)

$D = \frac{30'}{2} \times 20 = 300\#/'$

Load Type	Magnitude of Load (k)	Distance From Left End (ft)	Eccent. (in)
Non-comp. Dead Load	1.20	24.71	0.000
Live Load	1.20	24.71	0.000

300plf×4' = 1.2K
300plf×4' = 1.2K

NOTE: 0.00% of all distributed and concentrated live loads are sustained.
NOTE: Shear calculations are based on loads being applied to top of member.

Bearing Plates

Nu = 0.20*Pu Height= 0.00 in Bearing Pad Thickness = 0.250 in
Eff. Brg. Surface: Width = 0.00 in Length = 0.000 in
Plate Rebar: Angle = 10.00 deg fy = 60.00 ksi
Confinement for non-debonded prestressing strand assumed -> NO

********** OUTPUT **********

INITIAL STRESSES (psi, at release)

A)DL beam + core material (if any) + suction (if any)
Beam is supported at 6.15 ft from LEFT end and 6.15 ft from RIGHT end

X(ft) From Left End	Initial P/S Top	Initial P/S Bot.	Init.P/S + BM Top	Init.P/S + BM Bot.	Aux. steel area (ACI 24.5.3.2.1)	
2.08	-221	1580	-234	1592	0.00	
6.15	-221	1576	-328	1681	0.84	TOP<---
7.89	-215	1537	-245	1566	0.53	TOP<---
9.63	-197	1407	-167	1377	0.00	
11.37	-179	1276	-106	1204	0.00	
13.11	-179	1280	-81	1183	0.00	
14.85	-179	1280	-72	1175	0.00	

NOTE: Required f'ci = 3500 psi based on assigned minimum.

STRAND STRESSES (Based on f'ci=3.500 ksi, f'c=5.500 ksi, by PCI Committee)

X(ft) from Left End	at Tensioning ksi	at Release ksi	DL and Sust. LL ksi	Final* ksi	P/S Loss ksi	P/S Loss %
0.00	189.0	178.2	0.0	0.0	189.00	100.00
2.97	189.0	179.1	158.4	159.2	29.81	15.77
5.94	189.0	179.9	161.3	162.6	26.36	13.95
8.91	189.0	180.4	164.7	166.5	22.50	11.91
11.88	189.0	182.6	168.3	170.3	18.70	9.90
14.85	189.0	182.7	168.7	170.8	18.17	9.62

*NOTE: Final strand stresses include elastic regain for Live Load.

FINAL STRESSES (psi)

X(ft) From Left End	FP + BM Top	FP + BM Bot	FP + DL + Sustained LL Tpg	FP + DL + Sustained LL Top	FP + DL + Sustained LL Bot	FP + DL + All LL Tpg	FP + DL + All LL Top	FP + DL + All LL Bot
0.00	0	0	---	0	0	---	0	0
1.49	-21	879	---	117	743	---	227	638
2.97	28	1184	---	289	927	---	498	727

4.46	119	1106	---	490	741	---	787	457
5.94	199	1038	---	665	579	---	1038	223
7.43	267	974	---	814	436	---	1251	18
8.91	335	835	---	948	231	---	1440	-240
10.40	391	703	---	1056	49	---	1590	-464
11.88	431	605	---	1134	-87	---	1700	-631
13.37	450	589	---	1176	-126	---	1761	-689
14.85	456	583	---	1191	-140	---	1785	-711

NOTE: Allowable precast tensile stress = 12.0*sqrt(f'c) = -890 psi OK

ULTIMATE MOMENT: (k-in)

X(ft) From Left End	Required Mu by Fact'd Loads	Required Mu by 1.2*Mcr (ACI 9.6.2.1)	Provided phi*Mn by Strain-compat.	Provided phi*Mn by Other Limits (see notes)	Flex. phi Factor (ACI Tab 21.2.1)	N.A. c(in)
0.00	0			0 (3)	0.00	0.00
1.49	599 {3}			1484 (4)	0.75	3.15
2.97	1137 {3}			2668 (4)	0.78	1.34
4.46	1612 {3}			3241 (4)	0.82	1.57
5.94	2025 {3}			3589 (4)	0.86	1.65
7.43	2375 {3}			3595 (1)	0.88	1.62
8.91	2664 {3}			3459 (1)	0.89	1.54
10.40	2890 {3}			3320 (1)	0.89	1.46
11.88	3054 {3}		3230		0.90	1.41
13.37	3156 {3}		3230		0.90	1.41
14.85	3196 {3}	2724	< 3230		0.90	1.41

OK

{n}: Load Case {n} controls.
(1): Development length controlled by strand.
(3): Development length controlled by both strand and rebar.
(4): Development lengths overlap. Strength may be reduced.
Beta1 for depth of Whitney block: 0.78

VERTICAL SHEAR REINFORCING

X(ft) From Left End	d in.	Vu kips	Tu k-in	Vci kips	Vcw kips	Required Reinforcing for Avci in^2/ft	Required Reinforcing for Avcw in^2/ft	Required Reinforcing for Avmin in^2/ft
0.56	8.00	34.1	0.0	164.4	64.8	0.000	0.000	0.292 (A2)
1.49	8.00	31.9	0.0	108.8	81.9	0.000	0.000	0.107 (C2)
2.97	8.00	28.4	0.0	69.4	93.2	0.000	0.000	0.107 (C2)
4.46	8.00	24.9	0.0	46.8	93.6	0.000	0.000	0.107 (C2)
5.94	8.00	21.4	0.0	35.2	94.0	0.000	0.000	0.107 (C2)
7.43	8.00	17.9	0.0	27.9	94.3	0.000	0.000	0.107 (C2)
8.91	8.00	14.4	0.0	26.5	94.9	0.000	0.000	0.107 (C2)
10.40	8.00	10.9	0.0	26.5	91.6	0.000	0.000	0.097 (C2)
11.88	8.00	7.5	0.0	26.5	87.6	0.000	0.000	0.086 (C1)
13.37	8.00	4.0	0.0	26.5	87.7	0.000	0.000	0.086 (C1)
14.85	8.00	0.5	0.0	26.5	87.7	0.000	0.000	0.086 (C1)

OK

x.75 = 48.6k = ϕV_n

(A): Minimum based on ACI Tab 9.6.3.3a. (prestress < 40% tensile strength)
(C): Minimum based on ACI Tab 9.6.3.3e. (prestress > 40% tensile strength)
(1): Avmin not required, Vu < phi*Vc/2 (ACI 9.6.3.1).
(2): Avmin not required, phi*Vc > Vu > phi*Vc/2 (ACI 7.6.3.1 H.C.).
NOTE: Reqd. reinf. does not include suspension steel for ledges & pockets.
NOTE: Reqd. reinf. is based on a total web width = 26.250 in.
NOTE: No significant torsion was found (ACI 9.5.4.1).
NOTE: Design assumes web reinforcing is carried as close to compression and tension surfaces as possible per ACI 25.7.1.1.
NOTE: Shear calculations based on loads applied to top of member.

SUMMARY OF MINIMUM VERTICAL AND LONGITUDINAL WEB REINFORCEMENT REQUIREMENTS

NOTE: Ledge and hanger steel design not available for General sections.
For Vertical Reinf, select from columns (1), (2), (3) or (4)
For Longitudinal Reinf, select from columns (A) or (B)

X From Left End ft	Ph in	(1) Ash in^2/ft	(2) Av/2+At in^2/ft	(3) Av/2+Ash in^2/ft	(4) Av/2+Awv in^2/ft	(A) Al/2 in^2	(B) Awl in^2
0.56		<3>	0.000	<3>	0.000	0.000	0.000
1.49		<3>	0.000	<3>		0.000	
2.97		<3>	0.000	<3>		0.000	
4.46		<3>	0.000	<3>		0.000	
5.94		<3>	0.000	<3>		0.000	
7.43		<3>	0.000	<3>		0.000	
8.91		<3>	0.000	<3>		0.000	
10.40		<3>	0.000	<3>		0.000	
11.88		<3>	0.000	<3>		0.000	
13.37		<3>	0.000	<3>		0.000	
14.85		<3>	0.000	<3>		0.000	

Awv = Awl = 0.000(left), 0.000(right) = Vertical and long. web reinf.
for bending due to torsional equil. reactions (ledge face, in^2),
based on: Tu = 0.0 k-in at Left End, = 0.0 k-in at Right End
ds = 24.250 in Hs = 8.000 in
Ash = Hanger reinforcement (ledge face only).
NOTE: The above values for steel are for one face only. Columns (2) & (A) should be applied to both faces. All other columns need only be applied to the ledge face.
<3>NOTE: Section does not have a ledge, or is defined as a General Section.

PREDICTED DEFLECTIONS

Based on : Rational approach and PCI Committee Recommendations for losses.
f'ci = 3.500 ksi, f'c = 5.500 ksi and ACI-209
Eci = 3587 ksi, Ec = 4496 ksi, Camber Mult.= 1.000
Modified : Cu = 1.697 eshu = 445 E-06

Position:	Midspan (in)
Release : PS+BM DL	-0.23
Creep Before Erection	-0.13
Erection: PS+BM DL @ 30 days	-0.36
Change Due to Non-Comp.DL	0.43
30 days : PS+BM DL+Non-Comp.DL	0.06
Change Due to Comp.DL+SustLL	0.00
60 days : PS+All DL+Sust.LL	0.06
Long Term Creep	0.45
Final : PS+All DL+Sust.LL	0.52
: PS+All DL+LL	1.23

NOTE: Negative values indicate camber.
NOTE: Beam has cracked under positive moment; deflections are based on a bilinear moment-deflection relationship using simple Icr.

MISC. PRODUCTION INFORMATION

Initial prestress force = 434 kips Final prestress force = 314 kips
Concrete strengths used in design:
Release strength f'ci= 3500 psi Final strength f'c= 5500 psi
Beam is NORMAL WEIGHT concrete. Piece weight = 17.83 kips.

Estimated shortening between supports at erection time :

	at C.G.	Curvature Effect	Total	
Top	0.16	-0.06	0.09	<<<Length correction not to exceed this value
C.G	0.16	0.00	0.16	
Bot	0.16	0.06	0.22	

DESIGN DATA (Z9, Z11, Z12, Z4, Z8 sim.)

Left Cant.	= 0.00 ft	Simple Span	= 18.56 ft	Right Cant.	= 0.00 ft
Beam Length	= 18.56 ft	Lift @ Left	= 3.84 ft	Lift @ Right	= 3.84 ft
Design Bearing Lengths:		@ Left	= 0.29 ft	@ Right	= 0.29 ft
Top width	= 96.000 in	Flange thick	= 1.375 in	Tpg. thick	= 0.000 in
Web width	= 26.250 in	Stem Height	= 7.250 in	Haunch thick	= 0.000 in
Bot. width	= 96.000 in	Bot. thick	= 1.375 in	Section Type	=GENERAL

Note: Section is HOLLOW

Non-Composite : (Assigned by the user)

Area =	595.500 in^2	St	= 1274.00 in^3	Height	= 10.000 in
I =	6422.00 in^4	Sb	= 1295.00 in^3	Yt	= 5.041 in
Vol/Surf =	2.810 in			Yb	= 4.959 in

Miscellaneous : (Governing code is ACI 318-14 w/ mod. load factors)

Beam f'ci	= 3.500 ksi	Rel. humid.	= 60.00 %	Stress Block	=RECTANGULAR
Beam f'c	= 5.500 ksi	Beam weight	= 150.00 pcf	NORMAL WT.	
Cu	= 2.350	eds	= 0 E-06	eshu	= 650 E-06
Eci modifier	= 1.000	Ec modifier	= 1.000	Camber Mult.	= 1.000
Shear Options	:	Depth used	= NON-COMP	f'c used	= BEAM
Allow. Concrete Stress:		At Release	=0.600f'ci	At Final	=12.0sqrt f'c
phi	: Tension-controlled Flexure		= 0.900	Strand Developmt	= 0.750
Factors	: Compression-controlled Flexure		= 0.650	Shear & Torsion	= 0.750

Load Cases:
1) U = 1.40 DL
2) U = 1.20 DL + 1.60 LL
3) U = 1.20 DL + 1.60 LL + 0.50 (S or R) + 1.00 (W or E)
4) U = 1.20 DL + 0.50 LL + 1.60 (S or R) + 1.00 (W or E)

NOTE: User-modified load factors

Prestressing Strands (Strand Type: LOW RELAXATION Strain Curve: PCI Handbk)

Eff. Pull	= 0.700Xfpu	Strand diam.	= 0.5000 in	Estrand	= 28500 ksi
Strand fpu	=270.00 ksi	Area ea.str.	= 0.1530 in^2	LtMult	= 1.000
# Str. lev.	= 1	# of Strand	= 8.00	LdMult	= 1.000

Losses: PCI Comm. Report ~~(RATIONAL)~~ Strand Transformed -> NO

Harping Profile:

Description	X(ft) From Left End	Hstr (in)	Eccent. (in)	Area of P/S (in^2)
Left End of Beam----------	0.00	2.13	2.83	1.2240
Right End of Beam----------	18.56	2.13	2.83	1.2240

Mild Steel

Shear :	fyv = 60.00 ksi	fyh = 60.00 ksi	fyl = 60.00 ksi
Emild	= 29000 ksi	LdMult = 1.000	

SDL = (15+50) 65 psf x 8' = .52 Klf
SLL = 60 psf x 8' = .48 Klf
Snow = 20 Bldg + 25 drift = 45 psf x 4' = .18 Klf

Distributed Loads (non-factored)

Load Type	Magnitude of Load Beginning (k/ft)	Ending (k/ft)	Distance From Left Beginning (ft)	Ending (ft)	Eccent. (in)
P/C Self Weight	0.600	0.600	0.00	18.56	0.000
Non-comp. Dead Load	0.520	0.520	0.00	18.56	0.000
Live Load	0.480	0.480	0.00	18.56	0.000
Rain or Snow Load	0.200	0.200	0.00	13.40	0.000
Non-comp. Dead Load	0.170	0.170	13.40	18.56	0.000

Non Big wall : 8.5' x 20 psf = .170 Klf

At Release Only: Suction = 0.000 k/ft Core Material = 0.000 k/ft

Concentrated Loads (non-factored)

Magnitude Distance From Eccent.

Load Type	of Load (k)	Left End (ft)	(in)
Non-comp. Dead Load	2.40	13.40	0.000
Live Load	2.40	13.40	0.000

$\frac{30}{2} \times 20^{psf} = .30^{klf} \times 8' = .24^{klf}$
D+L

NOTE: 0.00% of all distributed and concentrated live loads are sustained.
NOTE: Shear calculations are based on loads being applied to top of member.

Bearing Plates

Nu = 0.20*Pu Height= 0.00 in Bearing Pad Thickness = 0.250 in
Eff. Brg. Surface: Width = 0.00 in Length = 0.000 in
Plate Rebar: Angle = 10.00 deg fy = 60.00 ksi
Confinement for non-debonded prestressing strand assumed -> NO

********** OUTPUT **********

INITIAL STRESSES (psi, at release)

A)DL beam + core material (if any) + suction (if any)
Beam is supported at 3.84 ft from LEFT end and 3.84 ft from RIGHT end

X(ft) From Left End	Initial P/S Top	Initial P/S Bot.	Init.P/S + BM Top	Init.P/S + BM Bot.	Aux. steel area (ACI 24.5.3.2.1)
2.08	-121	863	-133	875	0.00
3.84	-121	862	-162	903	0.00
4.93	-121	863	-132	874	0.00
6.02	-121	863	-109	852	0.00
7.10	-121	864	-92	836	0.00
8.19	-121	864	-82	826	0.00
9.28	-121	864	-79	823	0.00

NOTE: Required f'ci = 3500 psi based on assigned minimum.

STRAND STRESSES (Based on f'ci=3.500 ksi, f'c=5.500 ksi, by PCI Committee)

X(ft) from Left End	at Tensioning ksi	at Release ksi	DL and Sust. LL ksi	Final* ksi	P/S Loss ksi	P/S Loss %
0.00	189.0	182.5	0.0	0.0	189.00	100.00
1.86	189.0	182.9	146.9	147.3	41.72	22.07
3.71	189.0	183.2	165.8	166.5	22.48	11.89
5.57	189.0	183.4	166.6	167.6	21.45	11.35
7.42	189.0	183.5	167.1	168.2	20.78	11.00
9.28	189.0	183.5	167.4	168.5	20.48	10.83

*NOTE: Final strand stresses include elastic regain for Live Load.

FINAL STRESSES (psi)

X(ft) From Left End	FP + BM Top	FP + BM Bot	FP + DL + Sustained LL Tpg	FP + DL + Sustained LL Top	FP + DL + Sustained LL Bot	FP + DL + All LL Tpg	FP + DL + All LL Top	FP + DL + All LL Bot
0.00	0	0	---	0	0	---	0	0
0.93	-2	302	---	45	256	---	101	201
1.86	-10	609	---	80	520	---	188	415
2.78	15	660	---	143	534	---	297	384
3.71	46	631	---	208	471	---	403	283
4.64	72	607	---	265	417	---	494	195
5.57	94	587	---	313	372	---	571	121
6.50	111	572	---	351	335	---	633	62
7.42	123	561	---	381	307	---	681	16
8.35	130	554	---	401	288	---	714	-16
9.28	132	552	---	412	277	---	733	-34

NOTE: Allowable precast tensile stress = 12.0*sqrt(f'c) = -890 psi

-34psi

ULTIMATE MOMENT: (k-in)

X(ft) From Left End	Required Mu by Fact'd Loads	Required Mu by 1.2*Mcr (ACI 9.6.2.1)	Provided phi*Mn by Strain-compat.	Provided phi*Mn by Other Limits (see notes)	Flex. phi Factor (ACI Tab 21.2.1)	N.A. c(in)
0.00	0			0 (3)	0.00	0.00
0.93	239 {3}			504 (1)	0.75	1.78
1.86	455 {3}			989 (1)	0.75	2.55
2.78	648 {3}			1402 (1)	0.77	0.68
3.71	818 {3}			1668 (1)	0.81	0.79
4.64	965 {3}			1901 (1)	0.84	0.87
5.57	1090 {3}			2090 (1)	0.87	0.92
6.50	1192 {3}		2216		0.90	0.94
7.42	1270 {3}		2216		0.90	0.94
8.35	1326 {3}		2216		0.90	0.94
9.28	1359 {3}		2216		0.90	0.94

OK

{n}: Load Case {n} controls.
(1): Development length controlled by strand.
(3): Development length controlled by both strand and rebar.
Beta1 for depth of Whitney block: 0.78

VERTICAL SHEAR REINFORCING

OK

X(ft) From Left End	d in.	Vu kips	Tu k-in	Vci kips	Vcw kips	Required Reinforcing for Avci in^2/ft	for Avcw in^2/ft	for Avmin in^2/ft
0.56	8.00	21.2	0.0	131.8	60.3	0.000	0.000	0.292 (A1)
0.93	8.00	20.4	0.0	97.2	64.0	0.000	0.000	0.292 (A1)
1.86	8.00	18.4	0.0	69.1	73.6	0.000	0.000	0.057 (C1)
2.78	8.00	16.3	0.0	49.5	76.0	0.000	0.000	0.057 (C1)
3.71	8.00	14.3	0.0	37.2	76.1	0.000	0.000	0.057 (C2)
4.64	8.00	12.2	0.0	29.6	76.1	0.000	0.000	0.057 (C2)
5.57	8.00	10.2	0.0	26.5	76.2	0.000	0.000	0.057 (C2)
6.50	8.00	8.1	0.0	26.5	76.3	0.000	0.000	0.057 (C1)
7.42	8.00	6.0	0.0	26.5	76.3	0.000	0.000	0.057 (C1)
8.35	8.00	4.0	0.0	26.5	76.3	0.000	0.000	0.057 (C1)
9.28	8.00	2.0	0.0	26.5	76.3	0.000	0.000	0.057 (C1)

x.75 = 45.2k 2φV1

(A): Minimum based on ACI Tab 9.6.3.3a. (prestress < 40% tensile strength)
(C): Minimum based on ACI Tab 9.6.3.3e. (prestress > 40% tensile strength)
(1): Avmin not required, Vu < phi*Vc/2 (ACI 9.6.3.1).
(2): Avmin not required, phi*Vc > Vu > phi*Vc/2 (ACI 7.6.3.1 H.C.).
NOTE: Reqd. reinf. does not include suspension steel for ledges & pockets.
NOTE: Reqd. reinf. is based on a total web width = 26.250 in.
NOTE: No significant torsion was found (ACI 9.5.4.1).
NOTE: Design assumes web reinforcing is carried as close to compression and tension surfaces as possible per ACI 25.7.1.1.
NOTE: Shear calculations based on loads applied to top of member.

SUMMARY OF MINIMUM VERTICAL AND LONGITUDINAL WEB REINFORCEMENT REQUIREMENTS

NOTE: Ledge and hanger steel design not available for General sections.
For Vertical Reinf, select from columns (1), (2), (3) or (4)
For Longitudinal Reinf, select from columns (A) or (B)

X From Left End ft	Ph in	(1) Ash in^2/ft	(2) Av/2+At in^2/ft	(3) Av/2+Ash in^2/ft	(4) Av/2+Awv in^2/ft	(A) Al/2 in^2	(B) Awl in^2

0.56	<3>	0.000	<3>	0.000	0.000	0.000
0.93	<3>	0.000	<3>		0.000	
1.86	<3>	0.000	<3>		0.000	
2.78	<3>	0.000	<3>		0.000	
3.71	<3>	0.000	<3>		0.000	
4.64	<3>	0.000	<3>		0.000	
5.57	<3>	0.000	<3>		0.000	
6.50	<3>	0.000	<3>		0.000	
7.42	<3>	0.000	<3>		0.000	
8.35	<3>	0.000	<3>		0.000	
9.28	<3>	0.000	<3>		0.000	

```
Awv = Awl =  0.000(left),  0.000(right) = Vertical and long. web reinf.
        for bending due to torsional equil. reactions (ledge face, in^2),
        based on: Tu =    0.0 k-in at Left End, =    0.0 k-in at Right End
                  ds = 24.250 in              Hs =  8.000 in
  Ash = Hanger reinforcement (ledge face only).
  NOTE: The above values for steel are for one face only. Columns (2) & (A)
        should be applied to both faces. All other columns need only be
        applied to the ledge face.
<3>NOTE: Section does not have a ledge, or is defined as a General Section.
```

PREDICTED DEFLECTIONS

```
Based on : Rational approach and PCI Committee Recommendations for losses.
           f'ci = 3.500 ksi, f'c  = 5.500 ksi and ACI-209
           Eci  =  3587 ksi, Ec   =  4496 ksi, Camber Mult.= 1.000
Modified : Cu   = 1.697      eshu =   445 E-06

Position:                                Midspan
                                          (in)
Release : PS+BM DL                       -0.10
  Creep Before Erection          -0.06
Erection: PS+BM DL @ 30 days             -0.16
  Change Due to Non-Comp.DL       0.06
30 days : PS+BM DL+Non-Comp.DL           -0.10
  Change Due to Comp.DL+SustLL    0.00
60 days : PS+All DL+Sust.LL              -0.10
  Long Term Creep                 0.02
Final   : PS+All DL+Sust.LL              -0.08
        : PS+All DL+LL                   -0.01

  NOTE: Negative values indicate camber.
```

MISC. PRODUCTION INFORMATION

```
Initial prestress force  =  231 kips  Final prestress force  =  206 kips
Concrete strengths used in design:
  Release strength f'ci= 3500 psi    Final strength f'c= 5500 psi
Beam is NORMAL WEIGHT concrete. Piece weight = 11.14 kips.

Estimated shortening between supports at erection time :
              Curvature
     at C.G.   Effect   Total
Top    0.07    -0.03     0.04 <<<Length correction not to exceed this value
C.G    0.07     0.00     0.07
Bot    0.07     0.03     0.10
```