

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)
Area = 595.500 in² St = 1274.00 in³ Yt = 5.041 in
I = 6422.00 in⁴ Sb = 1295.00 in³ 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 = 0.600 f'ci At Final = 12.0 sqrt 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 = 0.700 X fpu Strand diam. = 0.5000 in Estrand = 28500 ksi
Strand fpu = 270.00 ksi Area ea. str. = 0.1530 in² LtMult = 1.000
Str. lev. = 1 # of Strand = 12.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:	X(ft) From	Hstr	Eccent.	Area of
Description	Left End	(in)	(in)	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

Distributed Loads (non-factored)

Load Type	Magnitude of Load		Distance From Left		Eccent.
	Beginning (k/ft)	Ending (k/ft)	Beginning (ft)	Ending (ft)	
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 = $12.0 \times \sqrt{f'c}$ = -890 psi

ULTIMATE MOMENT: (k-in)

Required Mu		Provided phi*Mn		
by	by	by	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}				0.90	1.41
8.61	2284 {3}				0.90	1.41
10.05	2473 {3}				0.90	1.41
11.48	2609 {3}				0.90	1.41
12.92	2690 {3}				0.90	1.41
14.35	2717 {3}	2703	< 3229		0.90	1.41

{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

X(ft) From Left End	d in.	Vu kips	Tu k-in	Vci kips	Vcw kips	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)

(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, $V_u < \phi V_c / 2$ (ACI 9.6.3.1).

(2): Avmin not required, $\phi V_c > V_u > \phi V_c / 2$ (ACI 7.6.3.1 H.C.).

NOTE: Req'd. reinf. does not include suspension steel for ledges & pockets.

NOTE: Req'd. 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 :

	Curvature			
	at C.G.	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)
Area = 595.500 in² St = 1274.00 in³ Yt = 5.041 in
I = 6422.00 in⁴ Sb = 1295.00 in³ 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 = 0.600 f'ci At Final = 12.0 sqrt 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 = 0.700 X fpu Strand diam. = 0.5000 in Estrand = 28500 ksi
Strand fpu = 270.00 ksi Area ea. str. = 0.1530 in² LtMult = 1.000
Str. lev. = 1 # of Strand = 12.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:	X(ft) From	Hstr	Eccent.	Area of
Description	Left End	(in)	(in)	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

Distributed Loads (non-factored)

Load Type	Magnitude of Load		Distance From Left		Eccent.
	Beginning (k/ft)	Ending (k/ft)	Beginning (ft)	Ending (ft)	
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

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

Concentrated Loads (non-factored)

Magnitude	Distance From	Eccent.
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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

*end wall brg. #
D = (300+170) = 470' x 8' = 3.76k
L = 300 pft 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	Bot.	Init.P/S + BM Top	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	Bot	FP + DL + Sustained LL Tpg	Top	Bot	FP + DL + All LL Tpg	Top	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 = $12.0 \times \sqrt{f'c} = -890$ psi

ULTIMATE MOMENT: (k-in)

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

{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

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

(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: Req'd. reinf. does not include suspension steel for ledges & pockets.

NOTE: Req'd. 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
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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, in²),
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 :

	Curvature			
	at C.G.	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

(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)
Area = 595.500 in² St = 1274.00 in³ Height = 10.000 in
I = 6422.00 in⁴ Sb = 1295.00 in³ 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 = 0.600 f'ci At Final = 12.0 sqrt 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 = 0.700 X fpu Strand diam. = 0.5000 in Estrand = 28500 ksi
Strand fpu = 270.00 ksi Area ea.str. = 0.1530 in² LtMult = 1.000
Str. lev. = 1 # of Strand = 15.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:	X(ft) From	Hstr	Eccent.	Area of
Description	Left End	(in)	(in)	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

Distributed Loads (non-factored)

SDC = (15+50) = 65 psf x 8' = .62 klf
SLL = 60 psf x 8' = .48 klf
Base Snow + Drift = 25 psf x 8' = .20 klf

Load Type	Magnitude of Load		Distance From Left		Eccent.
	Beginning (k/ft)	Ending (k/ft)	Beginning (ft)	Ending (ft)	
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

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	$D = \frac{30}{2} \times 20 = 30 \text{ klf} \times 8' = 2.4 \text{ k}$
Live Load	2.40	24.71	0.000	$L = \frac{30}{2} \times 20 = 30 \text{ klf} \times 8' = 2.4 \text{ k}$

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	Bot.	Init.P/S + BM Top	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	Bot	FP + DL + Sustained LL Tpg	Top	Bot	FP + DL + All LL Tpg	Top	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 = $12.0 \cdot \sqrt{f'c} = -890$ psi

ULTIMATE MOMENT: (k-in)

X(ft) From Left End	Required Mu		Provided phi*Mn		Flex. phi Factor (ACI Tab 21.2.1)	N.A. c(in)
	by Fact'd Loads	by 1.2*Mcr (ACI 9.6.2.1)	by Strain-compat.	by Other Limits (see notes)		
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

{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

X(ft) From Left End	d in.	Vu		T _u k-in	V _{ci} kips	V _{cw} kips	-- Required Reinforcing --		
		kips					for A _{vc}	for A _{vcw}	for A _{vmin}
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)

(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): A_{vmin} not required, Vu < phi*Vc/2 (ACI 9.6.3.1).

(2): A_{vmin} 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	Ph	(1)	(2)	(3)	(4)	(A)	(B)
ft	in	Ash	Av/2+At	Av/2+Ash	Av/2+Awv	Al/2	Awl
		in^2/ft	in^2/ft	in^2/ft	in^2/ft	in^2	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, in²),
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+Sust.LL	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 :

Curvature			
	at C.G.	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)
Area = 595.500 in² St = 1274.00 in³ Height = 10.000 in
I = 6422.00 in⁴ Sb = 1295.00 in³ 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 in² LtMult = 1.000
Str. lev. = 1 # of Strand = 15.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:	X(ft) From	Hstr	Eccent.	Area of
Description	Left End	(in)	(in)	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

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

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

Stress-cast Inc.

222 Lakeview Rd, Lee's Summit, MO - Slab Z1

BY: jdc

SHEET 10 OF .
DATE: 11/14/2022
$$SLL = 60 \text{ psf} \times 8' = .48 \text{ KIF}$$

$$\text{Drift: } 16.5 \text{ psf} \times 4' = .066 \text{ KIF}$$

$$\text{Wall DL} = 8.5' \times 20' = .17 \text{ KIF}$$

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)

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

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

$$300 \text{ pf} \times 4' = 1.2 \text{ K}$$

$$300 \text{ pf} \times 4' = 1.2 \text{ K}$$

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	Bot.	Init. P/S + BM Top	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	Bot	FP + DL + Sustained LL Tpg	Top	Bot	FP + DL + All LL Tpg	Top	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 = $12.0 \times \sqrt{f'c}$ = -890 psi

ULTIMATE MOMENT: (k-in)

X(ft) From Left End	Required Mu		Provided phi*Mn		Flex. phi Factor (ACI Tab 21.2.1)	N.A. c(in)
	by Fact'd Loads	by 1.2*Mcr (ACI 9.6.2.1)	by Strain- compat.	by Other Limits (see notes)		
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

{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.

Betal for depth of Whitney block: 0.78

VERTICAL SHEAR REINFORCING

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

(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, $V_u < \phi V_c/2$ (ACI 9.6.3.1).

(2): Avmin not required, $\phi V_c > V_u > \phi V_c/2$ (ACI 7.6.3.1 H.C.).

NOTE: Req'd. reinf. does not include suspension steel for ledges & pockets.

NOTE: Req'd. 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, in²),
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 :

Stress-cast Inc.
222 Lakeview Rd, Lee's Summit, MO - Slab Z1

BY: jdc SHEET 17 OF .
DATE: 11/14/2022

	Curvature		
	at C.G.	Effect	Total
Top	0.16	-0.06	0.09
C.G	0.16	0.00	0.16
Bot	0.16	0.06	0.22

<<<Length correction not to exceed this value

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 in² St = 1274.00 in³ Height = 10.000 in
I = 6422.00 in⁴ Sb = 1295.00 in³ 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 in² LtMult = 1.000
Str. lev. = 1 # of Strand = 8.00 LdMult = 1.000
Losses: PCI Comm. Report (RATIONAL) Strand Transformed -> NO

Harping Profile:	X(ft) From	Hstr	Eccent.	Area of
Description	Left End	(in)	(in)	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

Distributed Loads (non-factored)

Load Type	Magnitude of Load		Distance From Left		Eccent.
	Beginning (k/ft)	Ending (k/ft)	Beginning (ft)	Ending (ft)	
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

SDL = (15+50) 65 psf x 8' = .52 KIP
SLL = 60 psf x 8' = .48 KIP
Snow = 20 psf x 25' = .10 KIP
20 psf x 25' = .10 KIP

Non Brq Wall : 8.5' x 20 psf = .170 KIP

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

$$\frac{30}{2} \times 20 \text{ psf} = 30 \text{ klf} \times 8' = 24 \text{ klf}$$

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	Initial P/S	Init.P/S + BM	Aux. steel area
Left End	Top Bot.	Top Bot.	(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	at	at	DL and	Final*	P/S Loss	P/S Loss
Left End	Tensioning	Release	Sust. LL	ksi	ksi	%
	ksi	ksi	ksi			
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	FP + BM	FP + DL + Sustained LL	FP + DL + All LL
Left End	Top Bot	Top Bot	Top 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 = $12.0 \cdot \sqrt{f'c} = -890$ psi

ULTIMATE MOMENT: (k-in)

X(ft) From Left End	Required Mu		Provided phi*Mn		Flex. phi Factor (ACI Tab 21.2.1)	N.A. c(in)
	by Fact'd Loads	by 1.2*Mcr (ACI 9.6.2.1)	by Strain-compat.	by Other Limits (see notes)		
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

{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

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

(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	Ph	(1)	(2)	(3)	(4)	(A)	(B)
ft	in	Ash	Av/2+At	Av/2+Ash	Av/2+Awv	Al/2	Awl
		in^2/ft	in^2/ft	in^2/ft	in^2/ft	in^2	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
C.G	0.07	0.00	0.07
Bot	0.07	0.03	0.10

<<<Length correction not to exceed this value