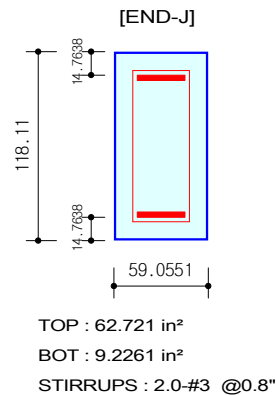
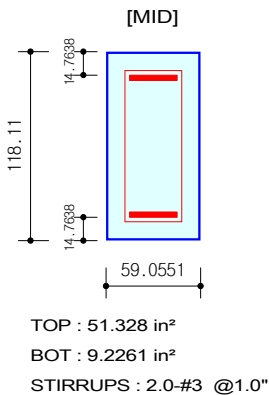
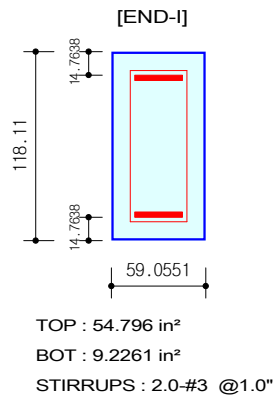
	Company		Project Title	
	Author		File Name	C:\...\Pier_Example.mcb

1. Design Information

Design Code : AASHTO-LRFD12
 Unit System : kips, in
 Material Data : $f_c = 5$, $f_y = 60$, $f_{ys} = 60$ ksi
 Beam Span : 70.8661 in
 Section Property : Cap Mid (No : 2)

2. Section Diagram




3. Bending Moment Capacity

	END-I	MID	END-J
Negative Moment (Mu)	277653.54	261614.08	315657.91
(-) Load Combination No.	1	1	1
Factored Strength (Mr)	285303.74	269268.61	323812.72
Check Ratio (Mu/Mr)	0.9732	0.9716	0.9748
Positive Moment (Mu)	0.00	0.00	0.00
(+) Load Combination No.	3	3	3
Factored Strength (Mr)	50817.15	50817.15	50817.15
Check Ratio (Mu/Mr)	0.0000	0.0000	0.0000
Required Top As	54.7957	51.3285	62.7209
Required Bot As	9.2261	9.2261	9.2261

4. Shear Capacity


	END-I	MID	END-J
Load Combination No.	1	1	1
Factored Shear Force (Vu)	1959.00	1959.00	1959.00
Shear Strength by Conc.(ϕV)	557.78	566.22	451.44
Shear Strength by Rebar.(ϕV_s)	1401.22	1392.78	1507.56
Required Shear Reinf. (Av)	2.5583	2.5171	3.1061
Required Stirrups Spacing	2.0-#3 @ 1.0"	2.0-#3 @ 1.0"	2.0-#3 @ 0.8"
Check Ratio	1.0000	1.0000	1.0000

	Company		Project Title	
	Author		File Name	C:\...\Pier_Example.mcb

5. Torsion Capacity

	END-I	MID	END-J
Load Combination No.	3	3	3
Factored Torsion (Tu)	0.00	0.00	0.00
Torsion Resistance (Tn)	0.00	0.00	0.00
Required Stirrups Spacing	0.00	0.00	0.00
Check Ratio	0.0000	0.0000	0.0000

PROJECT TITLE :

	Company		Client	
	Author		File Name	Pier Cap Detail Report 1


MIDAS/Civil - RC-Beam Design [AASHTO-LRFD12] Civil 2016

MIDAS(Modeling, Integrated Design & Analysis Software)
MIDAS/Civil - Design & checking system for windows
RC-Member(Beam or Column) Analysis and Design
Based On AASHTO-LRFD12, AASHTO-LRFD07, AASHTO-LRFD02,
AASHTO-LFD96, ACI318-02, CSA-S6-00,
Eurocode2-2:05, SNiP 2.05.03-84*,
SP 35.13330.2011, SNiP 2.05.03-84*(MKS),
SP 35.13330.2011(MKS), JTJ023-85,
IRC:21-2000, IRC:112-2011, KCI-USD12,
KCI-USD07, KSCE-USD05, KCI-USD99, KSCE-USD96,
(c)SINCE 1989
MIDAS Information Technology Co.,Ltd. (MIDAS IT)
MIDAS IT Design Development Team
HomePage : www.MidasUser.com
MIDAS/Civil Version 8.5.1

*.DEFINITION OF LOAD COMBINATIONS WITH SCALING UP FACTORS.

LCB	C	Loadcase Name(Factor) + Loadcase Name(Factor) + Loadcase Name(Factor)
1	1	DC1-1 Girder Selfwei(1.250) +DC2-1 Barrier, Scaff(1.250) +DW Wearing Surface(1.500)
		+ L HL-93(1.750)
2	1	DC1-1 Girder Selfwei(1.250) +DC2-1 Barrier, Scaff(1.250) +DW Wearing Surface(1.500)
		+ L HL-93(1.350)
3	1	DC1-1 Girder Selfwei(1.500) +DC2-1 Barrier, Scaff(1.500) +DW Wearing Surface(1.500)

PROJECT TITLE :

	Company		Client	
	Author		File Name	Pier Cap Detail Report 1

MIDAS/Civil - RC-Beam Design [AASHTO-LRFD12] Civil 2016

*.MIDAS/Civil - RC-BEAM Analysis/Design Program.

*.PROJECT :
 *.DESIGN CODE : AASHTO-LRFD12, *.UNIT SYSTEM : kips, in
 *.MEMBER : Member Type = BEAM, MEMB = 8

*.DESCRIPTION OF BEAM DATA (iSEC = 2) : Cap Mid
 Section Type : Rectangle (RECT)
 Beam Length (Span) = 70.866 in.
 Section Depth (Hc) = 118.110 in.
 Section Width (Bc) = 59.055 in.
 Concrete Strength (fc') = 5.000 kips/in^2.
 Main Rebar Strength (fy) = 60.000 kips/in^2.
 Stirrups Strength (fys) = 60.000 kips/in^2.
 Modulus of Elasticity (Es) = 29000.000 kips/in^2.

*.FORCES AND MOMENTS AT CHECK POINT <I> :
 Positive Bending Moment P-Mu = 0.00 kips-in., LCB = 3
 Negative Bending Moment N-Mu = 277653.54 kips-in., LCB = 1
 Shear Force Vu = 1959.00 kips., LCB = 1

*.REINFORCEMENT PATTERN :

Location	i	di (in.)	Rebar	Asi (in^2.)
Top	1	14.764	-	54.79574
Bottom	2	14.764	-	9.22610

Stirrups : 2.0-#3 @2"

[[[*]]] ANALYZE NEGATIVE BENDING MOMENT CAPACITY.


(). Compute parameter.

- phi = 0.90
 - Alpha = 0.85
 - Beta = 0.80
 - d = 103.3465 in.
 - ecu = 0.0030

(). Compute maximum and minimum reinforcement.

- Rhomin1 = $(1.2) * M_{cr} / [\phi * f_y * b * d * (d - a/2)]$ = 0.0026
 - Rhomin2 = $1.33 * M_u / [\phi * f_y * b * d * (d - a/2)]$ = 0.0118
 - Rhomin = MIN[Rhomin1, Rhomin2] = 0.0026
 - As_min = Rhomin * Ag = 105.6289 in^2.

PROJECT TITLE :

	Company		Client	
	Author		File Name	Pier Cap Detail Report 1

MIDAS/Civil - RC-Beam Design [AASHTO-LRFD12] Civil 2016

(). Search for required reinforcement..... Unit : kips., in.

Trial	Assumed As	Mr	Ratio	Status
1	18.4522	50817.15	5.464	N.G
2	145.2547	370430.63	0.750	O.K
3	81.8534	217145.55	1.279	N.G
4	113.5540	295388.88	0.940	O.K
5	97.7037	257062.69	1.080	N.G
6	105.6289	275934.37	1.006	N.G
7	109.5915	285303.74	0.973	O.K

(). Check moment capacity.

- c = 16.2402 in.
 - Cc = 3260.82 kips.
 - Ts = 3287.74 kips.
 - Mr = 285303.74 kips-in.
 - Mu/Mr = 0.973 ---> O.K !

[[[*]]] ANALYZE POSITIVE BENDING MOMENT CAPACITY.

(). Compute parameter.

- phi = 0.90
 - Alpha = 0.85
 - Beta = 0.80
 - d = 103.3465 in.
 - ecu = 0.0030


(). Compute maximum and minimum reinforcement.

- Rhomin1 = $(1.2) \cdot M_{cr} / [\phi \cdot f_y \cdot b \cdot d \cdot (d - a/2)]$ = 0.0026
 - Rhomin2 = $1.33 \cdot M_u / [\phi \cdot f_y \cdot b \cdot d \cdot (d - a/2)]$ = 0.0000
 - Rhomin = MIN[Rhomin1, Rhomin2] = 0.0026
 - As_min = Rhomin * Ag = 18.4522 in².

(). Search for required reinforcement..... Unit : kips., in.

Trial	Assumed As	Mr	Ratio	Status
1	18.4522	50817.15	0.000	O.K

PROJECT TITLE :

	Company		Client	
	Author		File Name	Pier Cap Detail Report 1

MIDAS/Civil - RC-Beam Design [AASHTO-LRFD12] Civil 2016

(). Check moment capacity.

- . c = 2.7451 in.
 - . Cc = 551.19 kips.
 - . Ts = 553.57 kips.
 - . Mr = 50817.15 kips-in.
 - . Mu/Mr = 0.000 ---> 0.K !

[[[*]]] ANALYZE SHEAR CAPACITY.

(). Compute shear parameter.

- . phi = 0.90
 - . Av = 0.2200 in^2.
 - . bv = 59.06 in.
 - . dv = MAX[dv, 0.9*d, 0.72*Hc] = 1.00e+002 in.
 - . theta = 39.43 Deg. [Clause 5.8.3.4.2]
 - . beta = 1.48

(). Compute shear strength of concrete.

- . Vu = 1959.00 kips.
 - . Vc = 0.0316*beta*SQRT[fc']*bv*dv = 619.76 kips.
 - . phiVc = phi * Vc = 557.78 kips.
 - . Vn_lim = 0.25*fc'*bv*dv = 7387.11 kips.

(). Compute stirrup spacing.

- . Maximum spacing smax = MIN[0.8*dv, 24 in] = 24.000 in.
 - . Vu > phiVc ---> Required shear reinforcement.
 - . Calculate spacing s1 = (phi*Av*fys*dv*cot(theta)) / (Vu-phiVc) = 1.032 in.
 - . Applied spacing s = MIN[smax, s1] = 1.032 in.

(). Compute shear strength of reinforcement.


- . Vs = Av*fys*dv*cot(theta) / s = 1556.91 kips.
 - . Vs_lim = 0.25*fc'*bv*dv - Vc = 6767.35 kips.
 - . Vs = MIN[Vs, Vs_lim] = 1556.91 kips.
 - . phiVs = phi*Vs = 1401.22 kips.

- . phiVs > (Vu-phiVc) ---> 0.K !
 - . Av_req/s = Vs / (fys*dv*cot(theta)) = 2.5583 in^2/ft.

(). Check tension force in the longitudinal reinforcement caused by shear.

- . phib = 0.90
 - . phiv = 0.90
 - . Vs1 = MIN[Vs, Vu/phiv] = 1556.91 kips.
 - . As_req = [Mu/(phib*dv) + (Vu/phiv - 0.5*Vs1)*cot(theta)] / fy = 79.7251 in^2.
 - . As = 54.7957 in^2.
 - . As_req > As ---> Under-reinforced !

PROJECT TITLE :

	Company		Client	
	Author		File Name	Pier Cap Detail Report 1

=====

MIDAS/Civil - RC-Beam Design [AASHTO-LRFD12]

Civil 2016

=====

=====

[[[*]]] ANALYZE TORSION CAPACITY.

=====

(). Compute torsion parameter.

- . ϕ = 0.90
- . A_{cp} = 6975.01 in².
- . P_c = 354.33 in.
- . A_{oh} = 6452.52 in².
- . A_o = $0.85 \cdot A_{oh}$ = 5484.64 in².
- . ϕ = 342.33 in.
- . T_u = 0.00 kips-in.
- . T_{cr} = $0.125 \cdot \sqrt{f_c'} \cdot A_{cp}^2 / P_c$ = 38377.47 kips-in.
- . $T_u < 0.25 \cdot \phi \cdot T_{cr}$ = 8634.93 kips-in.
----> Torsion check is not required.