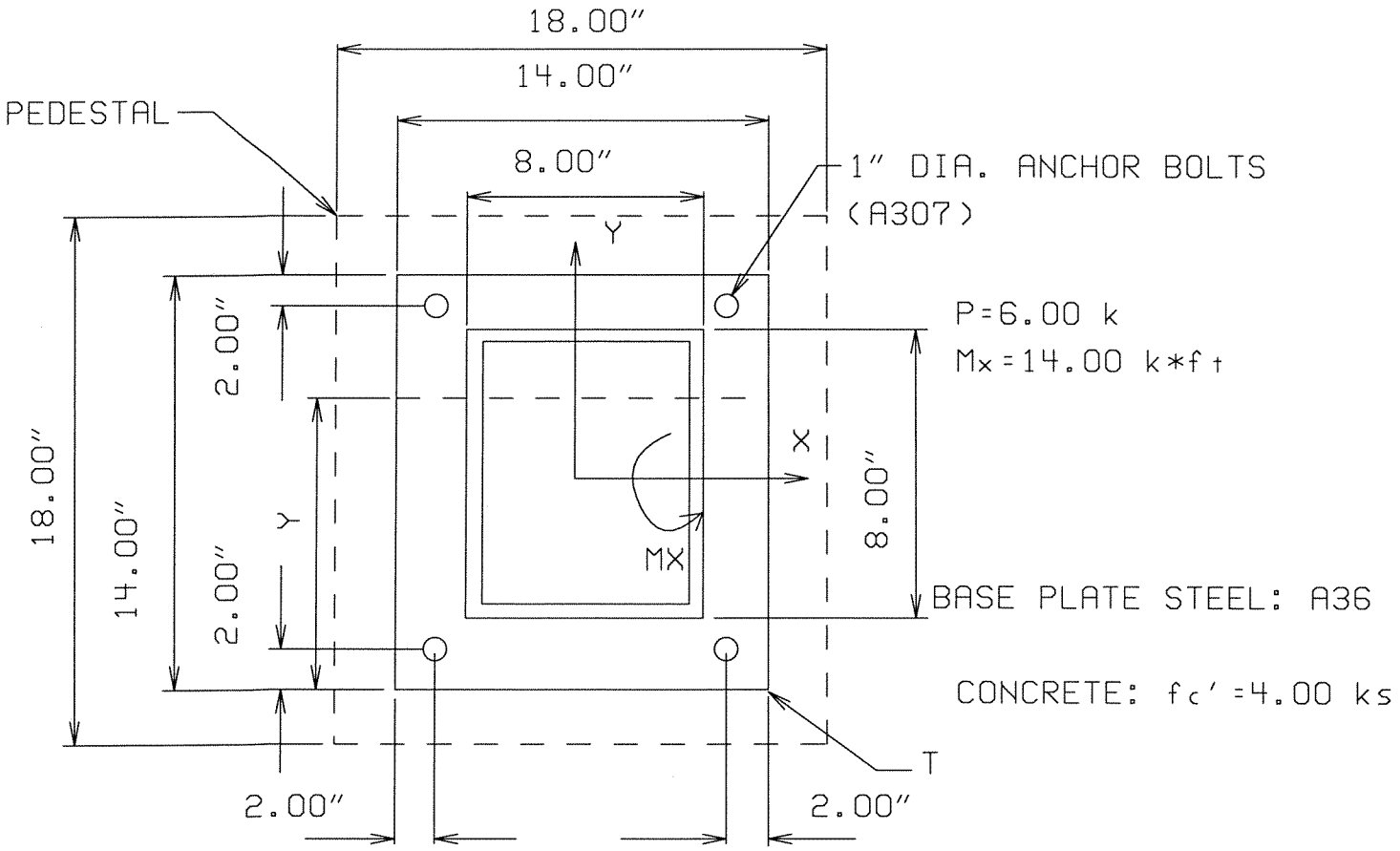
FIRM:Your Firm JOB NO. SHEET NO: 1
MADE BY:KJH DATE:05-21-2006 CHECKED BY: DATE:
TITLE:Example BASEPL calculation

BASE PLATE DESIGN:



Design Data

Design Method: Allowable Stress Design, AISC 9th Edition
Allowable stresses:
  Bearing plate bending: Fb = .75 * Fy = 27.00 ksi (AISC Eq. F2-1)
  Anchor bolt tension: Ft = 20.00 ksi (AISC Table J3.2)

Base plate design:

For a tube, the critical section is taken at 0.95*D (Refer to
AISC Steel Design Guide Series 1,"Column Base Plates", p. 16)
The design can then be approached similar to an "I" shaped column,
(see AISC 9th Ed., p. 3-106, Fig. 1):
m = (N - .95 * D) / 2 = 3.20 in
n = (B - .95 * bf) / 2 = 3.20

Compute allowable bearing stress on concrete:
$Fp = .35 * fc' * (A2/A1)^{.5}$
A1 = 14.00 * 14.00 = 196.0 sq. in.
A2 = 18.00 * 18.00 = 324.0 sq. in.
$Fp = .35 * 4.00 * (324.0/ 196.0)^{.5}$
= 1.799 ksi < .7 * fc' = 2.799 ksi
Use Fp = 1.799 ksi

BASE PLATE DESIGN (CONT'D):

Eccentricity of load with respect to column centerline,
e = 12 * 14.0 k*ft/ 6.0 k = 28.0 in
e > N/6 = 14.00/6 = 2.333 in (UPLIFT OCCURS)

(Refer to AISC Steel Design Guide Series 1, "Column Base Plates")
Design using procedure for "Design for Large Eccentricties"
(see reference page 21)

The length of contact (shown as Y in the sketch)is given by,

$$A = \frac{(f' +/- (f'^2 - 4*(fp*B/6)(P*A' + M))}{fp*B/3}$$

A' = 5.00 in
N' = 12.00 in

The bearing stress is assumed equal to the maximum allowable bearing,
fp = 1.79 ksi

f' = fp * B * N'/2
= 1.79 * 14.00 * 12.00/2
= 151.19

Substitution yields the radical
Radical = $f'^2 - 4*(fp*B/6)(P*A' + M)$
= $(151.19)^2 - 4*(1.79 * 14.00/6)*(6.0* 5.00 + 168.0)$
= $19535.0 > 0$
A1 = $(f'- Radical^{.5)/(fp} * B/3)$
= $(151.19 - (19535.0)^{.5)/(} 1.79 * 14.00/3)$
= 1.36
A2 = $(f'+ Radical^{.5)/(fp} * B/3)$
= $(151.19 + (19535.0)^{.5)/(} 1.79 * 14.00/3)$
= 34.63
Therefore, the length of contact is, A = 1.36 in

Maximum anchor bolt tension force is,
T = fp * A * B/2 - P
= 1.79 * 1.36 * 14.00/2 - 6.0
= 11.1 k

BASE PLATE DESIGN (CONT'D):

Moment in the plate at the critical section is,
Mpl = 1/2 * 1.799 * (1.360) * (3.200- 1.360/3)
= 3.36 k*in/in

Determine plate moments caused by the anchor bolt tension:
(Refer to AISC Steel Design Guide Series 1,"Column Base Plates", Fig. 15, p. 22)
At the critical section, the effective width using a 45 degree distribution is,
Effective width = 4.800 in
Moment due to bolt tension,
Mplbolts = 11.1 k * 1.200 in/ 4.800 in
= 2.7 k*in/in< 3.3 k*in/in

The required plate thickness is,
$tp = (6 * Mpl/(.75 * Fy))^{.5}$
$= (6 * 3.36/(.75 * 36))^{.5}$
= .864 inch

The anchor bolt stress is,
fs = 11.1 k / 1.570 sq. in.
= 7.09 ksi < Ft = 20.00 ksi (OK)

(DESIGNER NOTE: The determination of anchor bolt embedment length required for tension and shear is outside the scope of this program.)