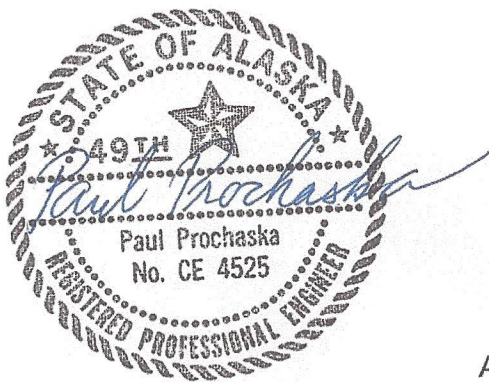


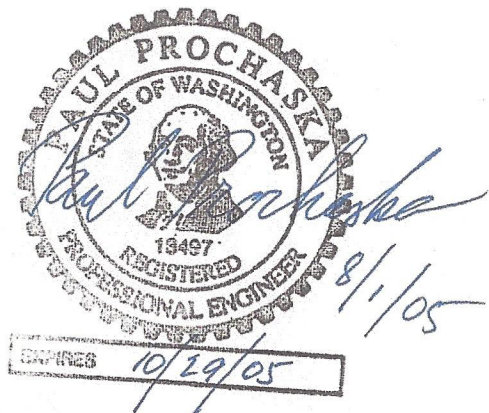
**GARMIRE IRON WORKS, INC
5620 48TH DRIVE N.E.
MARYSVILLE, WA 98270-5720**

30, 35, AND 40 FEET HINGED BEACON POLE DESIGN

CTS JOB NO. WA04.002.S08



August, 2005



Prepared by

CTS ENGINEERS, INC.

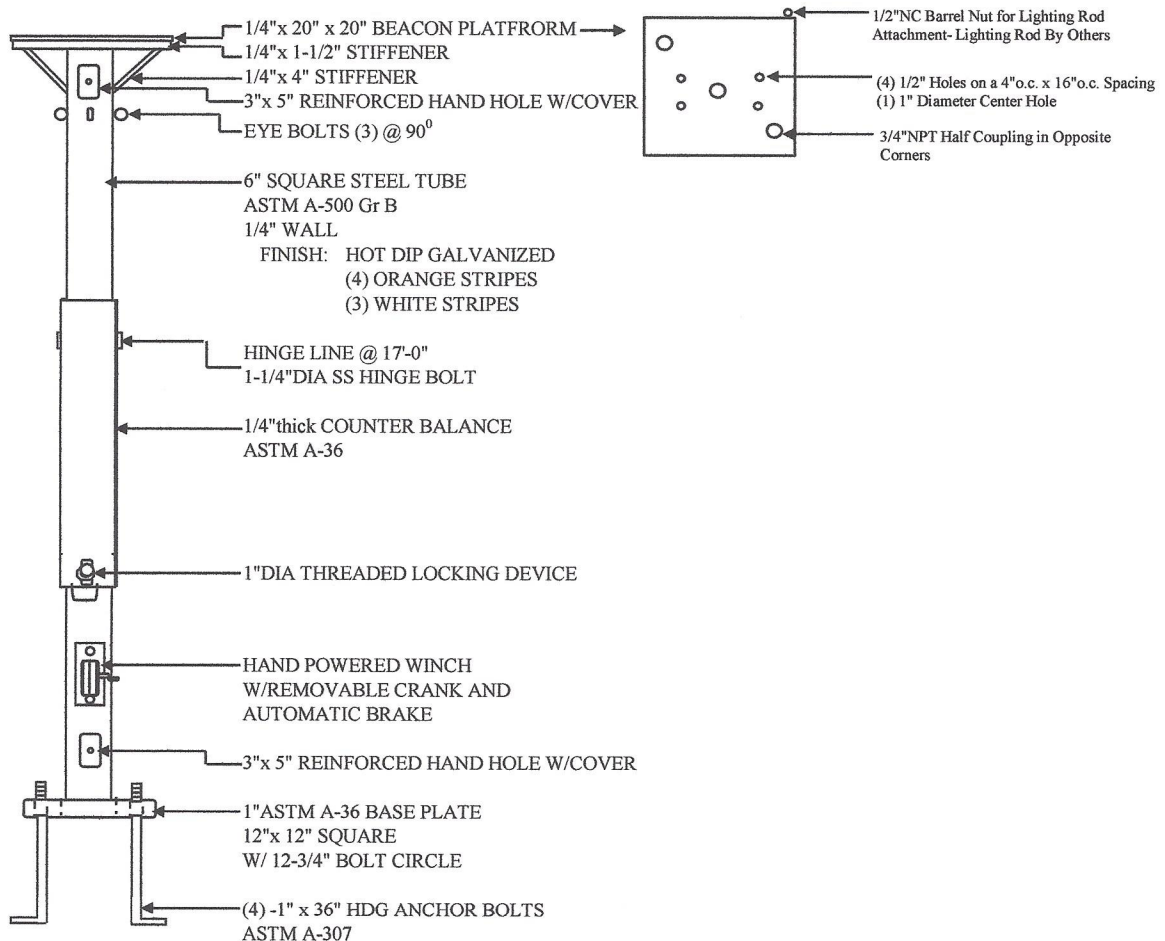
1412 112th Avenue NE
Bellevue, WA 98004



Garmire IronWorks, Inc.
 5620-48th Drive N.E. • Marysville, WA 98270
 (360) 651-1001 • Fax (360) 651-1002 • garmireironworks@frontier.com

GSO630' HINGED BEACON POLE DETAIL
 (N.T.S.)

WESTCOAST SALES & MARKETING

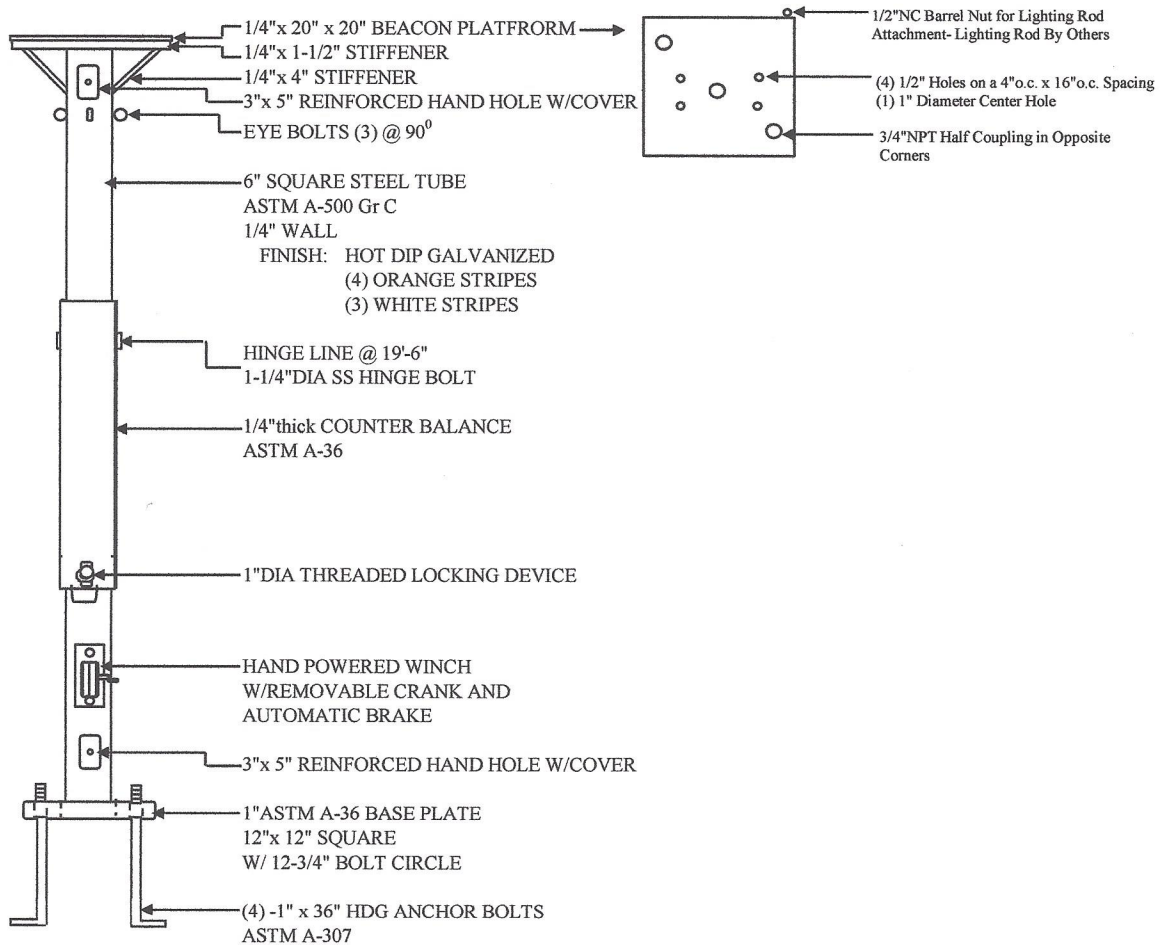




Garmire IronWorks, Inc.
 5620-48th Drive N.E. • Marysville, WA 98270
 (360) 651-1001 • Fax (360) 651-1002 • garmireironworks@frontier.com

GSQ635' HINGED BEACON POLE DETAIL
 (N.T.S.)

WESTCOAST SALES & MARKETING

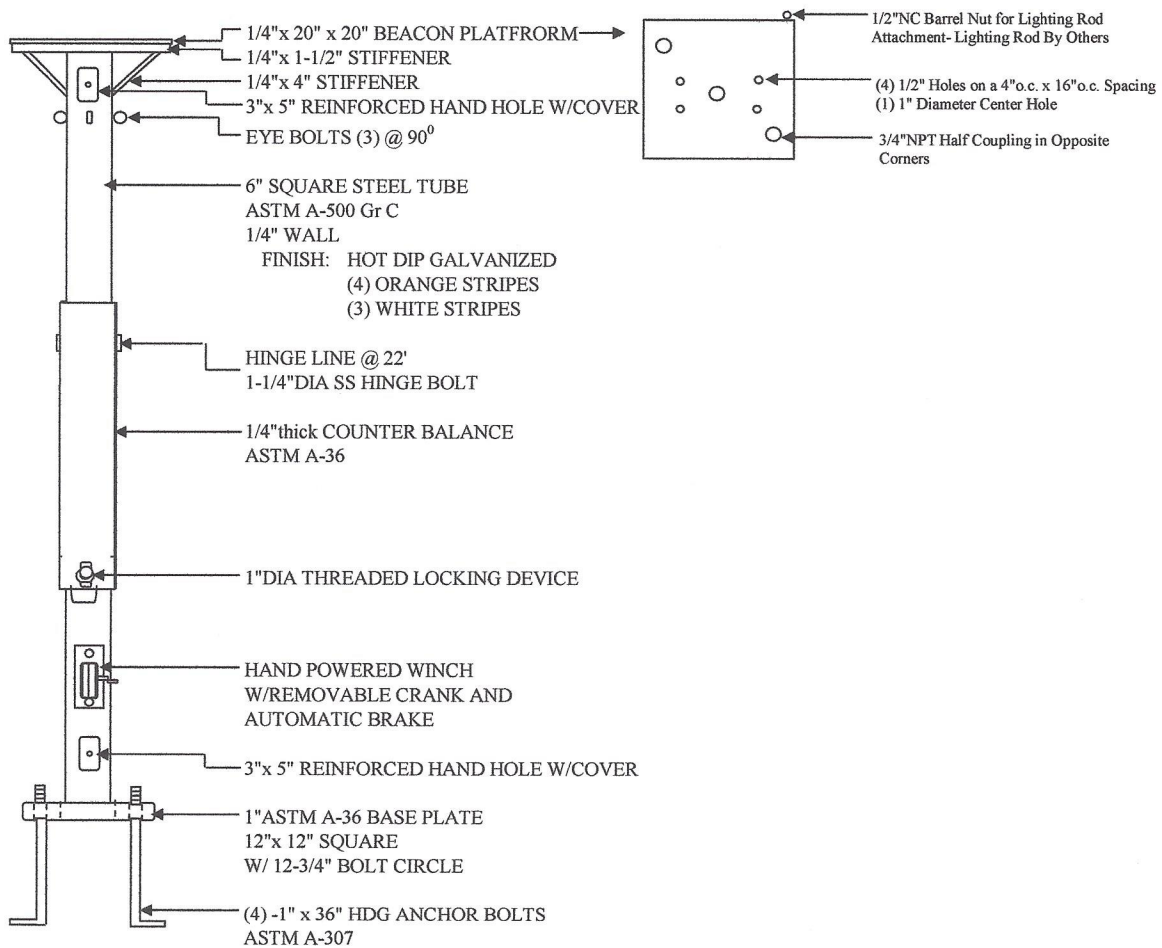




Garmire IronWorks, Inc.
 5620-48th Drive N.E. • Marysville, WA 98270
 (360) 651-1001 • Fax (360) 651-1002 • garmireironworks@frontier.com

GSQ640' HINGED BEACON POLE DETAIL
 (N.T.S.)

WESTCOAST SALES & MARKETING





Tel: (425) 455-7822
Pacific Park 2
1412 - 112th Ave. NE
Suite 102
Bellevue, WA 98004-3760

PROJECT NO. WA04.002.308
PROJECT NAME BEACON POLE
PAGE NO. 5 OF 5
MADE BY MT DATE 07/29/05
CHECKED BY _____ DATE _____

40 FEET HINGED BEACON POLE DESIGN

DESIGN LOADS:

$$DL \text{ BEACON} = 200^{\#}, \text{ AREA} = 4.30 \text{ SF}$$

$$DL \text{ BOTTOM SECTION} = \left(\frac{40}{35}\right)(273) = 312^{\#}$$

$$DL \text{ TOP SECTION w/ COUNTER BALANCE} = \\ = \left(\frac{40}{35}\right)(569) = 650^{\#}$$

WIND LOAD: 100 MPH BASIC WIND SPEED,

EXPOSURE B.

$$F = q_z G C_f A_f, \text{ WHERE}$$

$$q_z = 0.00256 K_z K_{zt} K_d V^2 I;$$

$$K_z = 0.64 \text{ (TABLE 6-3)}, K_{zt} = 1.0, K_d = 0.85 \text{ (TABLE 6-4)}$$

$$q_z = 0.00256 \times 0.64 \times 0.87 \times 0.85 \times 100^2 \times 1.0 = 12.12 \text{ psf}$$

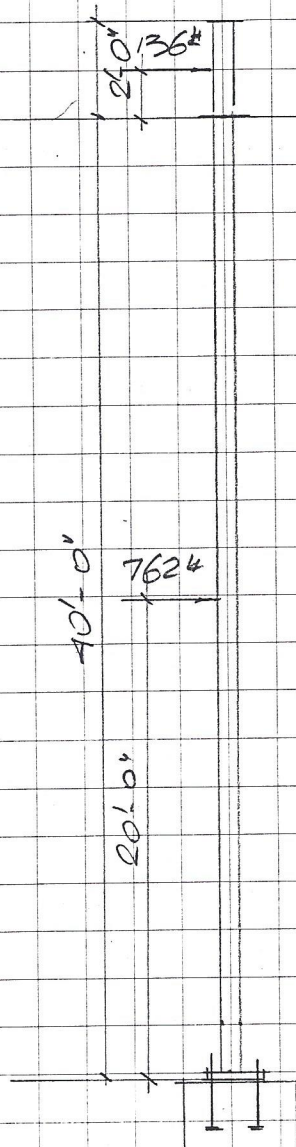
$$F = (12.12)(1.3)(2.0) = 31.51 \text{ psf (SEE p. 2).}$$



Tel: (425) 455-7822
Pacific Park 2
1412 - 112th Ave. NE
Suite 102
Bellevue, WA 98004-3760

PROJECT NO. WA05.002.208
PROJECT NAME BEACON POLE
PAGE NO. 6 OF
MADE BY MT DATE 07/29/05
CHECKED BY DATE

STEEL POLE DESIGN



WIND LOAD PER BEACON =

$$= (31.51)(4.3) = 136 \text{ \#}$$

WIND LOAD PER POLE =

$$= (31.51)(7.25/12)(40.00) = 762 \text{ \#}$$

$$\Sigma DL = 200 + 312 + 650 = 1,162 \text{ \#} = 1.16 \text{ K}$$

WIND LOAD MOMENT AT BASE PLATE =

$$= (136)(42) + (762)(20) = 5,712 + 15,240 =$$

$$= 20,952 \text{ \#-ft} = 20.95 \text{ Kft}$$

TRY HSS 6x6x3/16:

$$f_a = \frac{1.16}{4.27} = 0.27 \text{ KSI}$$

$$f_b = \frac{20.95 \times 12}{7.43} = 31.70 \text{ KSI}$$

DETERMINATION OF ALLOWABLE STRESSES

PER AASHTO "STANDARD SPECIFICATIONS

FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS", SECTION 5:

$$\text{FOR HSS } 6 \times 6 \times 3/16: b = 6 - (3 \times 1.875) \tan\left(\frac{180}{4}\right) =$$
$$= 6 - .56 = 5.44 \text{ IN}$$



Tel: (425) 455-7822
Pacific Park 2
1412 - 112th Ave. NE
Suite 102
Bellevue, WA 98004-3760

PROJECT NO. WA05.006.208
PROJECT NAME BEACON POLE
PAGE NO. 7 OF
MADE BY MT DATE 07/29/05
CHECKED BY _____ DATE _____

$$\frac{b}{t} = \frac{5.44}{.1875} = 29 < 1.527 \sqrt{\frac{29 \times 10^3}{46}} = 38 -$$

NON-COMPACT SECTION (TABLE 5-1).

$$F_b = 0.815 \times 46 \left(1 - \frac{.2374}{\sqrt{\frac{29 \times 10^3}{46}} \times 29} \right) = 0.815 \times 46 (1 - .27) = 27.37 \text{ ksi}$$

$$KL/r = 2 \times 40 \times 12 / 2.36 = 407 > C_c = \sqrt{\frac{2\pi^2 \times 29 \times 10^3}{46}} = 111.50$$

$$F_a = \frac{2\pi^2 \times 29 \times 10^3}{23(407)^2} = 0.90 \text{ ksi (Eq. 5-10)}$$

COMBINED STRESSES:

$$\frac{0.27}{0.90} + \frac{21.70}{27.37} = 0.30 + 1.16 = 1.46 > 1.33 \text{ N.G.}$$

TRY HSS 6x6x1/4:

$$f_a = \frac{1.16}{5.59} = 0.21 \text{ ksi} \quad f_b = \frac{2095 \times 12}{10.1} = 24.89 \text{ ksi}$$

$$D = 6 - (3 \times .25) \tan\left(\frac{180}{4}\right) = 6 - 0.75 = 5.25 \text{ in}$$

$$b/t = 5.25 / .25 = 21 < 1.116 \sqrt{\frac{29 \times 10^3}{46}} = 28 -$$

COMPACT SECTION, $F_b = 0.60 \times 46 = 27.60 \text{ ksi (Table 5-3)}$

$$KL/r = 2 \times 40 \times 12 / 2.33 = 412$$

$$F_a = \frac{2\pi^2 \times 29 \times 10^3}{23(412)^2} = 0.88 \text{ ksi}$$

$$\frac{0.21}{0.88} + \frac{24.89}{27.60} = 0.24 + 0.90 = 1.14 < 1.33 \text{ OK.}$$



Tel: (425) 455-7822
Pacific Park 2
1412 - 112th Ave. NE
Suite 102
Bellevue, WA 98004-3760

PROJECT NO. W.A.S. 006.808
PROJECT NAME BEARON POLE
PAGE NO. 8 OF 8
MADE BY MT DATE 07/29/05
CHECKED BY _____ DATE _____

USE HSS 6x6x1/4, $F_y = 46 \text{ ksi}$.

BASE PLATE CHECK PER AISC MANUAL:

FOR $f_c = 3000 \text{ psi}$: $F_b = 0.35 \times 3 = 1.05 \text{ ksi}$

ASSUME 12x12 IN PLATE W/ A.B. AT 1.5 IN FROM

PLATE EDGE: $f' = \frac{1.05 \times 12 \times 10.5}{2} = 66.15 \text{ ksi}$

$$A = \frac{66.15 - \sqrt{(66.15)^2 - 4 \left(\frac{1.05 \times 12}{6} \sqrt{1.16 \times 4.5 + 2095} \right)}}{\left[\frac{1.05 \times 12}{3} \right]} = 2.40 \text{ IN}$$

$$M_{PL} = \left(\frac{1.05 \times 2.40}{3 - \frac{2.40}{3}} \right) = 2.77 \text{ kIN/IN}$$

$$S_m = \frac{1 \times 12^2}{6} = .161 \text{ in}^3 \quad f_b = 2.77 / .16 = 16.62 \text{ ksi} <$$

$$< F_b = 1.33 \times .75 \times 36 = 35.91 \text{ ksi}$$

O.K.

