City of Napoleon
Engineering Department

Office Use Only	
Permit No:	
App. Date:	
Est. Cost:	
Base Fee:	
Plus Fee:	
Total Fee:	

Application for Sign Permit

Owner Name: _____

Owner Address: 1270 INDEPENDANCE

Contractor Name : Humphrey Sign Co. Inc

Contractor Address: 2939 Dorr / Toledo, OH 43607 PH: 4195361952

Location of Project: 1270 INDEPENDANCE

Additional Information: Sign Type - Post ____ Wall ____ Ground ✓ Awning ____

Dimensions: 16' W X 17' Total S.F. 272 X 2

Date: 9/8/04 Applicant Signature: _____

Application must include a site drawing or a description of the location of the sign (where applicable) and a sketch of the proposed sign(s).

The permit fee is as follows: $25.00 base which includes up to 50 square feet of sign area, plus .10 per square foot after 50 square feet, not to exceed $100.00 in any case.

10 @ 180

File : Stuckey008a.mcd

Sign Type : 78'-0" OAH D/B Single Pole for 15'-10" x 17'-3" Best Western ID with 3'-9" x 20'-0" wrap-around 10' below ID with block footing.

Site: Napoleon, Ohio

Design Windload : Based on the 2002 Ohio Building Code using Exposure C and 90 mph winds.

Reference : Manual of Steel Construction, AISC 9th Edition.

Pipe : API 5-LX 24" Dia. Fy = 60.0 ksi. ; Fb = 39.60 ksi. (Compact section)
36" Dia. Fy = 50.0 ksi. ; Fb = 30.72 ksi. (Non compact section)

Plate : ASTM A-36 Fy = 36.0 ksi. ; Fb = 31.60 ksi.

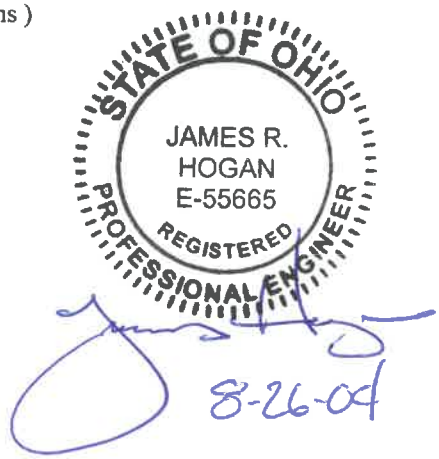
Tube : ASTM A-500 Gr. B Fy = 46.0 ksi. ; Fb = 36.71 ksi. (Non-Compact Sections)

Mounting Bolts : ASTM-A325 Fu = 133.0 ksi. ; Ft = 44.00 ksi.

Reference : American Concrete Institute, Code 318.02.

Rebar : ASTM A-615 Grade 60 Fy = 60.0 ksi.

Concrete : 3,000 psi. compressive strength at 28 days.



CHECK OF SIGN STRUCTURE :

Moment at EL. 70.25' : (Mid point of two piece sign.)

ID Sign : $IDSgn := (7.75 \cdot 17.25 \cdot 35.0) \cdot \left(\frac{7.75}{2}\right) \cdot 12$ IDSgn = 217576.406 in.lbs.

Moment : (in.lbs.) MtEL7025 := IDSgn MtEL7025 = 217576.406

Design of Sign Pole at EL. 70.25' :

Required Section Modulus : ($in.^3$) $ReqdSx := \frac{MtEL7025}{36710}$ ReqdSx = 5.927
(Non-Compact Tube Section)

Section Modulus of Tube : ($in.^3$) TS 8" x 8" x 1/4" wall - TubeSx := 18.8

Unity Check : $UCSectMod := \frac{ReqdSx}{TubeSx}$ UCSectMod = 0.315 < 1.00 OK

Design of Mounting Bolts at EL. 70.25' :

Number of Mounting Bolts in Tension per Plate : No := 2

Front to Back Distance Between Mounting Bolts : (in.) LvrArm := 12.0

Tension Load per Mounting Bolt : (lbs.) $TenMntBlt := \frac{MtEL7025}{No \cdot LvrArm}$ TenMntBlt = 9065.68

Mounting Bolt Diameter : (in.) MntBltDia := 0.75

Stress Area : ($in.^2$) $MntBltArea := \frac{\pi \cdot MntBltDia^2}{4}$ MntBltArea = 0.442
(Based on nominal diameter per AISC 4-3)

Allowable Tension : (lbs.) AllwTen := 44000·MntBltArea AllwTen = 19439
(Based on ASTM A-325)

Unity Check - Mounting Bolt Tension : $UCMntTen := \frac{TenMntBlt}{AllwTen}$ $UCMntTen = 0.466$ < 1.00 OK

Design of Mounting Plates at EL. 70.25' :

Plate Thickness : (in.) $PltThk := 0.75$ Plate Width : (in.) $PLW := 15.0$

Plate Specimen : (in.) $PLS := \frac{LvrArm - 8.0}{2}$ $PLS = 2$

Minimum Thickness Required : (in.) $ReqdThk := \sqrt{\left[\frac{TenMntBlt \cdot No \cdot PLS \cdot 6}{(PLW \cdot 31600)}\right]}$ $ReqdThk = 0.678$

Unity Check : Mounting Plate Thickness $UCPltThk := \frac{ReqdThk}{PltThk}$ $UCPltThk = 0.903$ < 1.00 OK

Moment at EL. 62.17' : (Base of sign.)

ID Sign : $IDSgn := (15.83 \cdot 17.25 \cdot 35.0) \cdot \left(\frac{15.83}{2}\right) \cdot 12$ $IDSgn = 907758.29$ in.lbs.

Moment : (in.lbs.) $MtEL6217 := IDSgn$ $MtEL6217 = 907758.29$

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Design of Sign Pole at EL. 62.17' :

Required Section Modulus : ($in.^3$) (Non-Compact Tube Section) $ReqdSx := \frac{MtEL6217}{36710}$ $ReqdSx = 24.728$

Section Modulus of Tube : ($in.^3$) TS 10" x 10" x 3/8" wall - $TubeSx := 42.9$

Unity Check : $UCSectMod := \frac{ReqdSx}{TubeSx}$ $UCSectMod = 0.576$ < 1.00 OK

Design of Mounting Bolts at EL. 62.17' :

Number of Mounting Bolts in Tension per Plate : $No := 4$

Front to Back Distance Between Mounting Bolts : (in.) $LvrArm := 30.0$

Tension Load per Mounting Bolt : (lbs.) $TenMntBlt := \frac{MtEL6217}{No \cdot LvrArm}$ $TenMntBlt = 7564.65$

Mounting Bolt Diameter : (in.) $MntBltDia := 1.0$

Stress Area : ($in.^2$) (Based on nominal diameter per AISC 4-3) $MntBltArea := \frac{\pi \cdot MntBltDia^2}{4}$ $MntBltArea = 0.785$

Allowable Tension : (lbs.) (Based on ASTM A-307) $AllwTen := 44000 \cdot MntBltArea$ $AllwTen = 34558$

Unity Check - Mounting Bolt Tension : $UCMntTen := \frac{TenMntBlt}{AllwTen}$ $UCMntTen = 0.219$ < 1.00 OK

Design of Mounting Plates at EL. 62.17' :

Plate Thickness : (in.) PltThk := 1.00 Plate Width : (in.) PLW := 33.0

Plate Specimen : (in.) (Taken from gussets.) $PLS := \frac{LvrArm - (10.0 + (2 \cdot 6))}{2}$ PLS = 4

Minimum Thickness Required : (in.) $ReqdThk := \sqrt{\left[\frac{TenMntBlt \cdot No \cdot PLS \cdot 6}{(PLW \cdot 31600)}\right]}$ ReqdThk = 0.835

Unity Check : Mounting Plate Thickness $UCPltThk := \frac{ReqdThk}{PltThk}$ UCPltThk = 0.835 < 1.00 OK

DESIGN OF DIRECT BURIAL POLE :

Moment at EL. 28.0' with Pole Length L1 : L1 := 34.17

Sign 1 : $Sgn1 := (15.83 \cdot 17.25 \cdot 35.0) \cdot \left[\left(\frac{15.83}{2}\right) + L1\right] \cdot 12$ Sgn1 = 4826659.21 in.lbs.

Upper Pole$_1$: $UP_1 := \left[10.0 \cdot \left(\frac{24}{12}\right) \cdot 30.0\right] \cdot \left[L1 - \left(\frac{10.0}{2}\right)\right] \cdot 12$ UP_1 = 210024 in.lbs.

Sign 2 : $Sgn2 := (3.75 \cdot 20.0 \cdot 30.0) \cdot \left[(L1 - 10.0) - \left(\frac{3.75}{2}\right)\right] \cdot 12$ Sgn2 = 601965 in.lbs.

Lower Pole$_1$: $LP_1 := \left[(L1 - 13.75) \cdot \left(\frac{24}{12}\right) \cdot 30.0\right] \cdot \left[\frac{(L1 - 13.75)}{2}\right] \cdot 12$ LP_1 = 150111.504 in.lbs.

Moment : (in.lbs.) $MtEL280 := Sgn1 + UP_1 + Sgn2 + LP_1$ MtEL280 = 5788759.714

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Design of Pole Structure at EL. 28.0' :

Required Section Modulus : (in.^{3}) (Compact Pipe Section) $ReqdSxEL280 := \frac{MtEL280}{39600}$ ReqdSxEL280 = 146.181

Pipe Section Modulus : (in.^{3}) 24" Dia. x 3/8" wall - PipeSx := 161.9

Unity Check : $UCSectMod := \frac{ReqdSxEL280}{PipeSx}$ UCSectMod = 0.903 < 1.00 OK

Overall length of pipe : 34'-2" exposed plus 4'-6" inserted = 38'-8"

Stresses at Grade with Pole Length L2 : L2 := 28.0

Sign 1 : $Sgn1 := (15.83 \cdot 17.25 \cdot 35.0) \cdot \left[\left(\frac{15.83}{2}\right) + L1 + L2\right] \cdot 12$ Sgn1 = 8037933.01 in.lbs.

Upper Pole$_1$: $UP_1 := \left[10.0 \cdot \left(\frac{24}{12}\right) \cdot 30.0\right] \cdot \left[\left[L1 - \left(\frac{10.0}{2}\right)\right] + L2\right] \cdot 12$ UP_1 = 411624 in.lbs.

Sign 2 : $Sgn2 := (3.75 \cdot 20.0 \cdot 30.0) \cdot \left[\left[(L1 - 10.0) - \left(\frac{3.75}{2}\right)\right] + L2\right] \cdot 12$ Sgn2 = 1357965 in.lbs.

Lower Pole$_1$: $LP_1 := \left[(L1 - 13.75)\cdot\left(\frac{24}{12}\right)\cdot 30.0\right]\cdot\left[\left[\frac{(L1 - 13.75)}{2}\right] + L2\right]\cdot 12$ $LP_1 = 561778.704$ in.lbs.

Pole$_2$: $P_2 := \left[L2\cdot\left(\frac{36}{12}\right)\cdot 30.0\right]\cdot\left(\frac{L2}{2}\right)\cdot 12$ $P_2 = 423360$ in.lbs.

Moment : (in.lbs.) $MtGrd := Sgn1 + UP_1 + Sgn2 + LP_1 + P_2$ $MtGrd = 10792660.714$

Shear : (lbs.)

$ShrGrd := (15.83\cdot 17.25\cdot 35.0) + \left[10.0\cdot\left(\frac{24}{12}\right)\cdot 30.0\right] + (3.75\cdot 20.0\cdot 30.0) + \left[(L1 - 13.75)\cdot\left(\frac{24}{12}\right)\cdot 30.0\right] + \left[L2\cdot\left(\frac{36}{12}\right)\cdot 30.0\right]$

$ShrGrd = 16152.563$

Design of Pole Structure at Grade :

Required Section Modulus : (in.^{3}) (Compact Pipe Section) $ReqdSxGrd := \frac{MtGrd}{30720}$ $ReqdSxGrd = 351.324$

Pipe Section Modulus : (in.^{3}) 36" Dia. x 3/8" wall - $PipeSx := 370.2$

Unity Check : $UCSectMod := \frac{ReqdSxGrd}{PipeSx}$ $UCSectMod = 0.949$ < 1.00 OK

Overall length of pipe : 28'-0" exposed plus 12'-0" buried = 40'-0"

Design of Block Footing :

Moment : (ft.lbs.)	$Ma := \frac{MtGrd}{12}$	$Ma = 899388.393$
Shear : (lbs.)	$Va := ShrGrd$	$Va = 16152.563$
Applied Lateral Force : (lbs.)	$P := Va$	$P = 16152.563$
Allowable Lateral Soil Pressure : (lbs./ft.^{2} per ft.)		$LP := 200$
Size of Square Footing : (ft.)		$Sq := 7.25$
Diagonal Dimension of Square Footing : (ft.)	$b1 := \sqrt{(Sq^2\cdot 2)}$	$b1 = 10.253$
Distance in Feet From Ground Surface to Point of Application of "P"	$h := \frac{Ma}{Va}$	$h = 55.681$
Depth of Embedment in Earth in Feet But Not Over 12 Feet for Purpose of Computing Lateral Pressure		$d1 := 12.0$
Allowable Lateral Soil Bearing Pressure Pursuant to the 2003 International Building Code Section 1805.7 and Table 1804.2 with 100% increase for allowable 1/2" deflection at grade.	$S1 := d1\cdot\frac{(LP\cdot 1.33)}{3}$	$S1 = 1064$

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$$A := 2.34 \cdot \frac{P}{(S1 \cdot 2.0) \cdot b1} \qquad A = 1.732$$

$$d2 := \left(\frac{A}{2}\right) \cdot \left[1 + \left(\sqrt{1 + 4.36 \cdot \frac{h}{A}}\right)\right] \qquad d2 = 11.156 \quad \leq \quad d1 = 12 \qquad \text{OK}$$

Check Tensile Stress in Footing :

Overturning Moment About Heel Point : (ft.lbs.) $Mh := Ma + (Va \cdot d1)$ $Mh = 1093219.143$
Treat as a cantilever at bottom.

Compressive Strength of Concrete : (psi.) $fc := 3000$

Yield Strength of Rebar : (psi.) $fy := 60000$

Section Modulus of Footing : (in.^{3}) $Sw := \frac{(Sq \cdot 12) \cdot (d1 \cdot 12)^2}{6}$ $Sw = 300672$

Allowable Concrete Stress : (psi.) $\phi Ft := 0.65 \cdot \left(5 \cdot \sqrt{fc}\right)$ $\phi Ft = 178.01$

Tensile Stress in Concrete : (psi.) $ft := 1.3 \cdot \left[\frac{(Mh \cdot 12)}{Sw}\right]$ $\phi Ft = 178.01 \quad > \quad ft = 56.72$

REBAR NOT REQUIRED FOR STRESS

Design of Temperature and Shrinkage Steel in Footing :

Moment for USD Design : $Mu := 1.7 \cdot Mh$ $Mu = 1858472.543$

$d := ((b1 \cdot 12) \cdot .80) - 4$ $d = 94.429$

To Plot for " ju " : $coeff := \frac{Mu \cdot 12}{fc \cdot b1 \cdot 12 \cdot d^2}$ $coeff = 0.007$ $ju := .99$

Use yield strength of direct burial pipe to check.

Yield Strength of Pipe : (psi.) $fy := 35000$

Required Area : (in.^{2}) $As := \frac{Mu \cdot 12}{ju \cdot fy \cdot d \cdot .9}$ $As = 7.573$

Pipe Size : (in.) Diameter $:= 36$ Wall Thickness : (in.) $WThx := 0.500$

Pipe Area : (in.^{2}) $Area := \frac{\pi \cdot \left[Diameter^2 - (Diameter - (2 \cdot WThx))^2\right]}{4}$ $Area = 55.76$

Reinforcement Requirment : $As = 7.573 \quad < \quad Area = 55.76$

No rebar required with the direct burial pipe.

Quantity of Concrete : (yds.^{3}) $CY := \frac{d1 \cdot Sq^2}{27}$ $CY = 23.361$

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