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12255 West 187th Street
Mokena, Illinois 60448
(708) 479-8385

File : JonesSgn1770.mcd

Site : Village of Sussex
Town Hall / Library
N64 W238020 Main Street
Sussex, Wisconsin 53089

Sign Type : 10'-0" OAH direct bury center pole for a 8'-2" x 8'-0" combination Village of Sussex push thru copy and logo, 3'-0" x 7'-0" electronic message center, a Pauline Haass Public Library panel with 'OPEN' and 'CLOSED' signs with 2'-0" square x 7'-0" tall stone veener side columns and base on a 6" below grade caisson footing. Drawing No. 1605152 rev. A

Design wind load based on the 2012 International Building Code (ASCE 7-10) using Exposure C and 115 mph wind speed.

Design Wind Speed : (mph.) $V := 115.0$ Based on Risk Category II

Velocity Pressure Coefficient at a Height of Less Than 15', Exposure C : $Kz := 0.85$ Based on Table 29.3-1

Topographic Factor : $Kzt := 1.00$ Based on Table 26.8-1

Wind Directionality Factor : $Kd := 0.95$ Based on Table 26.6-1

Velocity Pressure : (PSF) $qz := 0.00256 \cdot Kz \cdot Kzt \cdot Kd \cdot V^2$ $qz = 27.339$ Based on 29.3-1

Force Coefficient : $Cf := 1.80$ Based on Figure 29.4-1

Gust Effect Factor : $G := 0.85$ Based on 26.9.4 for Other Structures

Load Combination Factor : $LCF := 0.60$ Based on 2.4.1, Case 7

Design Pressure : (PSF) $F := qz \cdot Cf \cdot G \cdot LCF$ $F = 25.097$ Use : $WL := 25.1$

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Reference : Manual of Steel Construction, AISC 13th Edition.

Pipe : ASTM A-252 Gr. 3 Fy = 42.0 ksi. ; Fb = 27.72 ksi. ; Fv = 16.80 ksi.

Reference : American Concrete Institute, Code 318.10

Concrete : 3,000 psi. Compressive Strength after 28 days.

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

<u>Design Loads at Top of Footing :</u> (6" Below Grade)

Upper Sign Section : $UprSgn := (3.0 \cdot 8.0 \cdot WL) \cdot \left[\left(\frac{3.0}{2}\right) + 7.5\right]$ $UprSgn = 5421.6$ ft.lbs.

Lower Sign Section :
(Including side columns and base.) $LwrSgn := (7.0 \cdot 12.0 \cdot WL) \cdot \left[\left(\frac{7.0}{2}\right) + 0.5\right]$ $LwrSgn = 8433.6$ ft.lbs.

Moment : (ft.lbs.) $MtTOF := UprSgn + LwrSgn$ $MtTOF = 13855.2$

Shear : (lbs.) $ShrTOF := (3.0 \cdot 8.0 \cdot WL) + (7.0 \cdot 12.0 \cdot WL)$ $ShrTOF = 2710.8$

<u>Design of Pole Structure at Top of Footing :</u>

Section Modulus of Pipe : (in.^{3}) 6-5/8" Dia. x 0.280" wall - (6" Sch. 40) $PipeSM := 7.99$

Bending Stress : (psi.) $f_b := \frac{MtTOF \cdot 12}{PipeSM}$ $f_b = 20808.811$

Area of Pipe : (in.^{2}) 6-5/8" Dia. x 0.280" wall - (6" Sch. 40) PipeArea := 5.22

Shear Stress : (psi.) $f_v := \frac{ShrTOF}{PipeArea}$ $f_v = 519.31$

Unity Check - Pole : $UCPole := \frac{f_b}{27720} + \frac{f_v}{16800}$ $UCPole = 0.782 < 1.00$ OK

Design of Caisson Footing :

Overturning Moment : (ft.lbs.)	Ma := MtTOF	Ma = 13855.2
Shear : (lbs.)	Va := ShrTOF	Va = 2710.8
Applied Lateral Force : (lbs.)	P := Va	P = 2710.8
Allowable Lateral Soil Pressure : (lbs./ft.^{2} per ft.)		LP := 150
Diameter of Round Footing : (ft.)		b1 := 3.0
Distance in Feet From Ground Surface to Point of Application of "P"	$h := \frac{Ma}{Va}$	h = 5.111
Depth of Footing Below Grade : (ft.)		d := 6.5
Height of Concrete Footing : (ft.)		d1 := 6.0
Depth of footing below grade : (ft.)	Dpth := d − d1	Dpth = 0.5
Allowable Lateral Soil Bearing Pressure Pursuant to the 2012 International Building Code Section 1807.3.2.1 and Table 1806.2 with 100% increase for allowable 1/2" deflection at grade.	$S1 := d1 \cdot \frac{(LP \cdot 1.33)}{3}$	S1 = 399

$A := 2.34 \cdot \frac{P}{(S1 \cdot 2) \cdot b1}$ A = 2.65

$d2 := \left(\frac{A}{2}\right) \cdot \left[1 + \left(\sqrt{1 + 4.36 \cdot \frac{h}{A}}\right)\right]$ $d2 = 5.389 \leq d1 = 6$ OK

Check Tensile Stress in Footing :

Overturning Moment About Heel Point : (ft.lbs.) Treat as a cantilever at bottom.	Mh := Ma + (Va·d1)	Mh = 30120
Compressive Strength of Concrete : (psi.)		fc := 3000
Yield Strength of Rebar : (psi.)		fy := 60000
Section Modulus of Footing : (in.^{3})	$Sw := \frac{\pi \cdot (b1 \cdot 12)^3}{32}$	Sw = 4580.442
Tensile Stress in Concrete : (psi.)	$ft := \left[\frac{(Mh \cdot 12)}{Sw}\right]$	ft = 78.909

Allowable Concrete Stress : (psi.) $\phi Ft := 0.65 \cdot (5 \cdot \sqrt{fc})$ $\phi Ft = 178.01$ > $ft = 78.909$

REBAR NOT REQUIRED FOR STRESS

Design of Temperature and Shrinkage Steel in Caisson :

Moment for USD Design : $Mu := 1.7 \cdot Mh$ $Mu = 51204$

$d := [(b1 \cdot 12) \cdot .80] - \left[\frac{(b1 \cdot 12) - 6.625}{2}\right]$ $d = 14.113$

To Plot for " ju " : $coeff := \frac{Mu \cdot 12}{fc \cdot b1 \cdot 12 \cdot d^2}$ $coeff = 0.029$ $ju := 0.83$

Use yield strength of direct bury pipe to check.

Yield Strength of Pipe : (psi.) $fy := 42000$

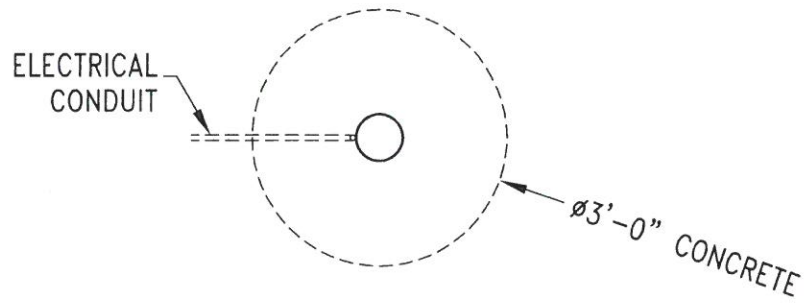
Required Area : (in.^{2}) $As := \frac{Mu \cdot 12}{ju \cdot fy \cdot d \cdot 0.90}$ $As = 1.388$

Reinforcement Requirment : $As = 1.388$ < $PipeArea = 5.22$

No rebar required with the direct bury pipe.

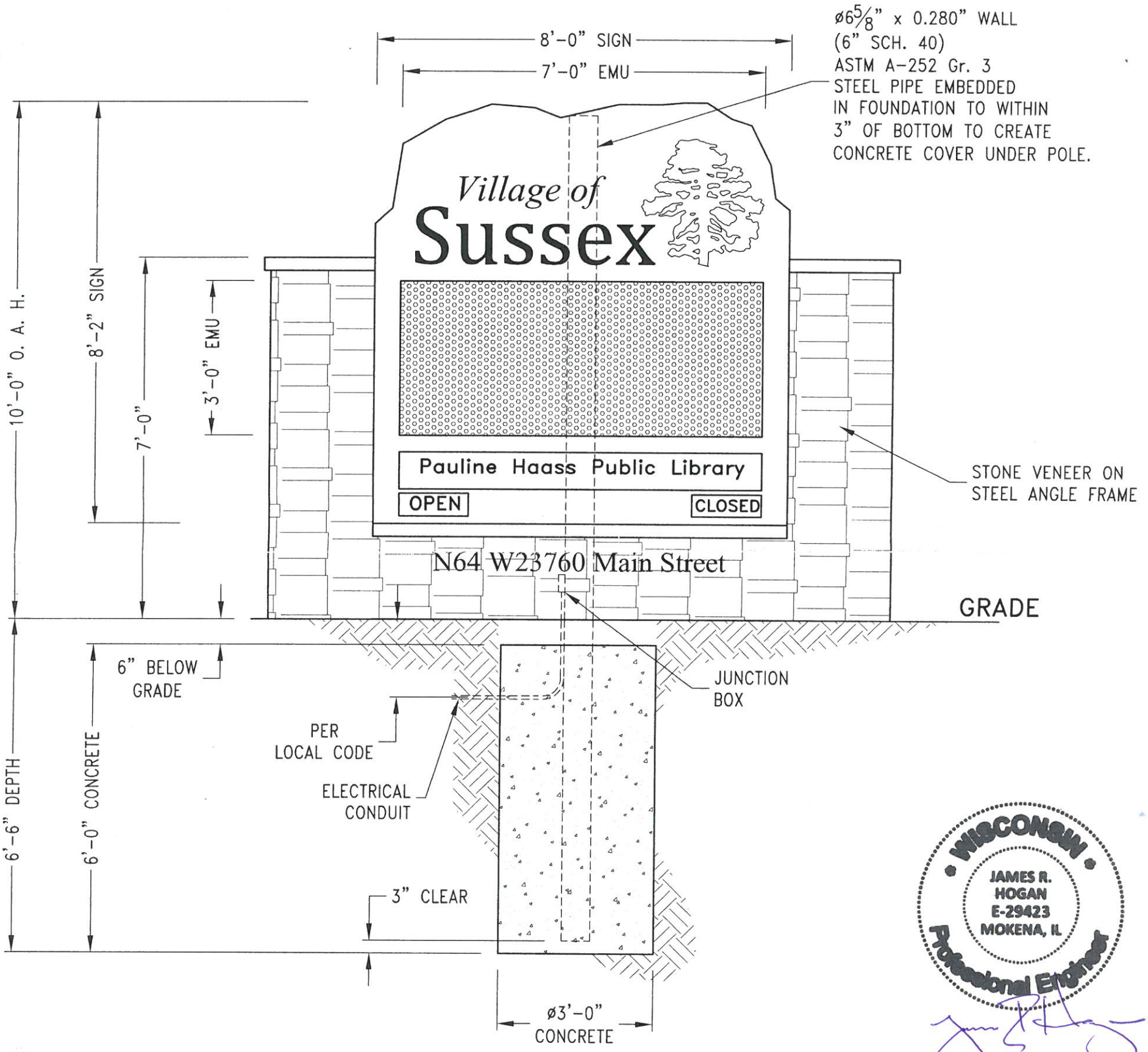
Quantity of Concrete : (yds.^{3}) $CY := \left(\frac{\pi \cdot b1^2 \cdot d1}{4 \cdot 27}\right) - \left[\frac{\pi \cdot 0.55^2 \cdot (d1 - 0.25)}{4 \cdot 27}\right]$ $CY = 1.52$

Note : Keep bottom of pipe 3" from bottom of footing to create concrete cover for water exclusion.



PLAN VIEW

QTY. CONCRETE: 1.5 CU. YDS.



ELEVATION VIEW

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FOUNDATION DESIGN NOTES:

1. Concrete shall have a minimum compressive strength of 3000 PSI at 28 days.
2. Caisson footing designed using a soil bearing force of 150 PSF per foot Lateral. If this soil condition does not exist, it is the Erector's responsibility to have a new base designed for the existing soil conditions by a Licensed Engineer.

DESIGN WIND LOAD:

Based on the 2012 International Building Code (ASCE 7-10) using Risk Category II, Exposure C and 115 mph wind speed.

SITE:
Village of Sussex
Town Hall/ Library
N64 W238020 Main Street
Sussex, Wisconsin 53089

REV	DATE	DESCRIPTION	APPROVED
A	31 May 16	RELEASED FOR PERMITTING	J. HOGAN

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12255 West 187th Street, Mokena Illinois 60448-9737
phone: 708-479-8385 fax: 708-479-8395 email: rja37@comcast.net

TITLE 10'-0" OAH DIRECT BURY SINGLE POLE FOR MULTIPLE SIGNS AND VENEER TRIM

DRAWN BY	DATE	SCALE	DRAWING NUMBER	SHEET	REV.
A. KLOTZKE	31 May 16	NONE	1605152	1 OF 1	A
CHECKED BY J. HOGAN	DATE 31 May 16				