

TSR-Arch

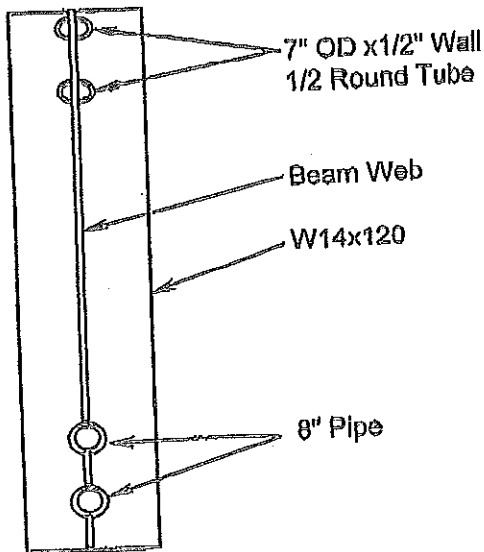
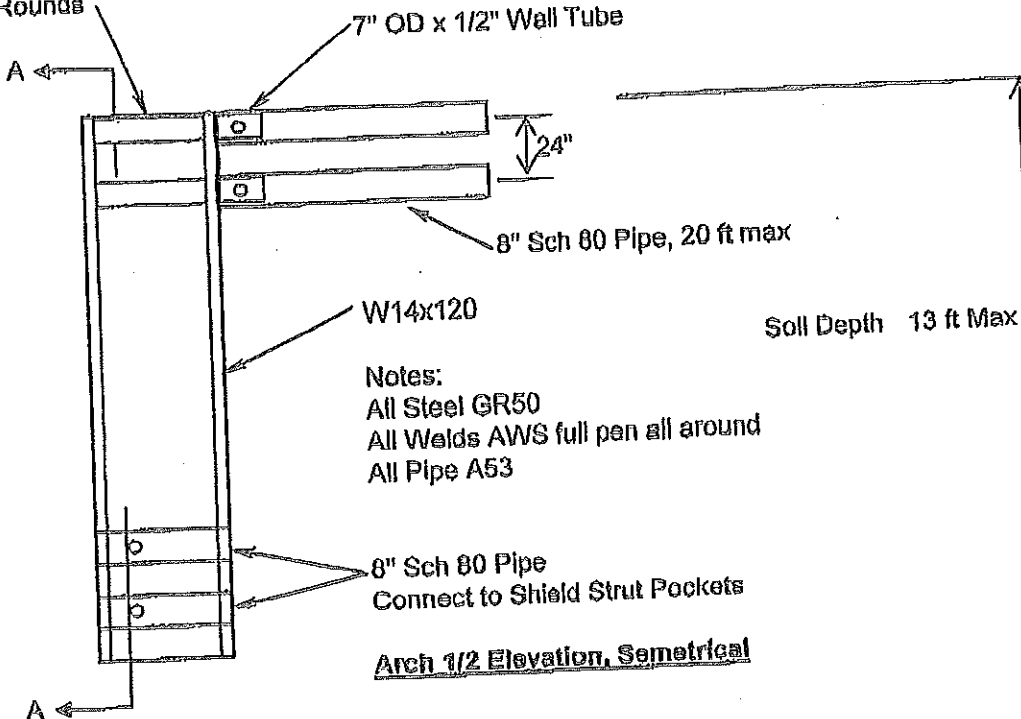
Date: Nov 6, 07
by: EGW Engineering, P.C.

SHIELD ARCH
Client: Trench Shore Rentals

514 psf

7"OD x1/2L Wall Tube
1/2 Rounds

Note: Minimum Shield Rating:



Section A-A

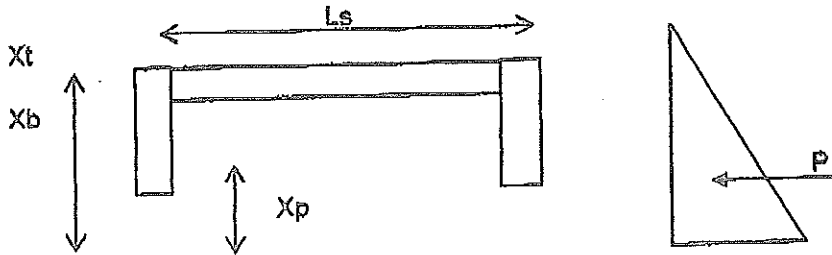


SHIELD ARCH DETAILS

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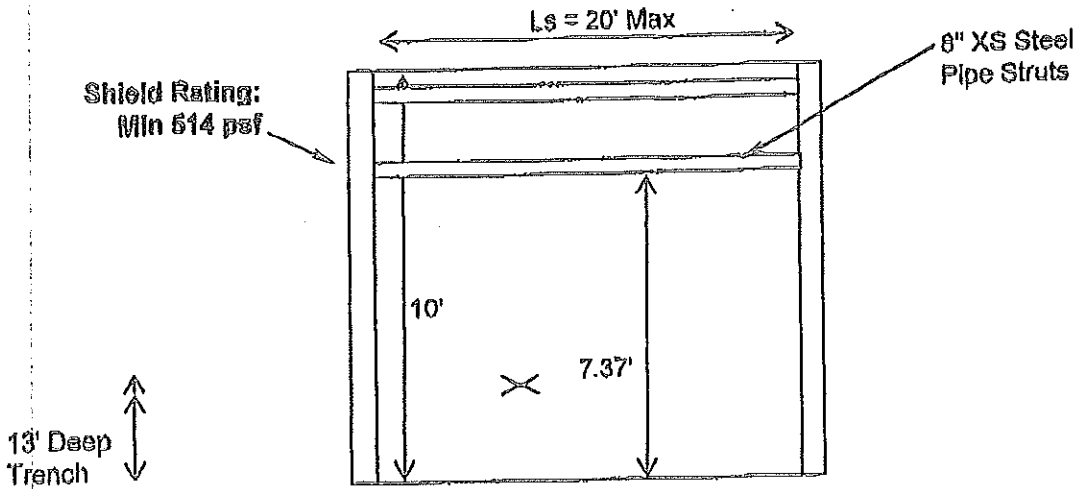
Arch Spreader Check

Di = 8" Sch 80 Pipe ID	7.625 in	
Le = Shield Length	24 ft	
Hs = Trench Depth	13 ft	
Ga = Soil Active Pressure	34 psf	
We = Equipment Surcharge	72 psf	
Xt = Distance to top Strut	0 ft	
Xb = Height of Arch Strut	13 ft	
Xp = Height to Shield Pocket	9 ft	
Le = Inside Shield Width	20 ft	240 in
Shield Min Rating = $Wr = GsHs + We$		514 psf



$P = \text{Load on Shield Arch} = GaLsHs^2/4 + WeLsHs/2$	45,708 lbs	
$Mx = P(Xb-Hs/3)$	396,136 ft-lb	
$Mp = \text{At Pocket} = WrXpLe^2/4 - GaLsXp^3/12$	200,232 ft-lb	
Xs = Strut Spacing	24.00 in	
Beam: W 14x120	ASTM A36	Fy = 50,000 psi
A = Beam Area	35.30 in	
Ix = Moment of Inertia	1,380.00 in ⁴	
Zx = Plastic Modulus	212.00 in ³	
Rx = Radius of Gyration	3.74 in	
Db = Beam Depth	14.48 in	
Tf = Flange Thickness	0.94 in	
Bf = Flange Width	14.67 in	
Tw = Web Thickness	0.59 in	
KLw/Rx	64.17 in	
Fc = $12(100 \text{ plf}) Ls^2/8Zx$	283 psi	
Fb = $12Mx/Xs$	18,506 psi	
Fa =	17,000 psi	
Fe =	24,000 psi	
Fb/Fa+Fc/Fe	0.98	OK
Fd = Beam Stress = $12 Mx/Zx$	22,423 psi	OK
Pf = Pipe Compression = $12Mx/Xs$	198,068 lbs	
Tp = Pipe Wall Thickness	0.500 in	
Np = Number of Welds	2 each	
Pw = Weld Allowable Shear = $FpNpTp(Db-2Tf)$	302,400 lbs	OK
If = Flange Hole Inertia = $DiDb^3/12 - Di(Db-2Tf)^3/12$	658.07 in ⁴	
Ip = Inertia @ Pocket = $Ix - If$	721.93 in ⁴	
Zc = Pocket Scation Modulus = Zxc/Ix	110.91 in ³	
Fc = Bending Stress @ Pocket = $12Mp/Zc$	21,665 psi	OK
Fv = Allowable Beam Web Shear	20,000 psi	
Fs = Actual Web shear = $(Pf - P)/DbTw$	17,834 psi	OK

TSR-Arch



TYP MH BOX SECTION

G_a = Active Soil loading	34	pcf	
H_t = Trench Depth to Bottom of Box	13	ft	
H_b = Shield Height	10	ft	
L_b = Box Length	24	ft	
Y = Strut Height from /shield Bottom	7.37	ft	
Z = Strut Spacing	2.00	ft	
L_s = Strut Length	20.00	ft	
W_e = Surcharge Load	72	psf	
W_s = Pressure @ Bot = $G_a H_t + W_e$	514	psf	
X = Top Strut Height	9.37	ft	
F_a = Steel allowable Bending Stress	24,000	psi	
P_u = Uniform Load = $W_s H_b L_s / 2$	61,680	lbs	
P_g = Triangular Load = $G_a L_s H_b^2 / 4$	20,400	plf	
M_u = $P_u (X - H_b / 2)$	269,542	ft-lb	
M_g = $P_g (X - H_b / 3)$	123,148	ft-lb	
M_t = $M_u + M_g$	146,394	ft-lb	
Q_b = Lower Strut Load = M_t / Z	73,197	lbs	
W_s = 8" Strut w/ Panel	150.00	psf	
M_t = $W L_s^2 / 8$	7,500	ft-lb	
S_s = Section Modulus	24.50	cin	
F_b = $12 M_s / S_s$	3,673	psi	
A_s = Strut Area	12.80	sqin	
F_c = Q_b / A_s	5,719	psi	
F_a =	24,000	psi	
R_s = Strut Gyration	2.88	in	
K_r = $12 L_s / R_s$	83.33	ratio	
F_q =	17,530	psi	
$F_b / F_a + F_c / F_q$ =	0.48	OK	OK
F_v = Beam Web Shear Stress	14,400	psi	
F_s = Actual Web Shear Stress = $Q_b / D_b \bar{T} w$	8,567.84	psi	OK