

COUNTY OF SUFFOLK



STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF HEALTH SERVICES

GREGSON H. PIGOTT, M.D., M.P.H.
Commissioner

August 31, 2023

Mr. John M. Spritzer III, P.E.
Delta Specialty Precast Concrete Engineers
860 Hooper Road
Endwell, NY 13760
Sent via e-mail: precast@delta-eas.com



Re: NS-007 500 Gallon HS-20 Pretreatment Tank

Dear Mr. Spritzer,

The Suffolk County Department of Health Services, Division of Environmental Quality, Office of Ecology has received and reviewed your design drawings and computations prepared for Advanced Wastewater Solutions., Project No. 2023.030.002, with your signature and sealed on 8/15/2023 for the "4'-1" x 6'-6" ID 500-Gallon Pretreatment Tank Designed for HS-20 Live Load".

Based on the information provided, the Department of Health Services approves the use of this 500 gallon tank in traffic areas with a maximum burial depth of 2.5-feet. A copy of this letter and the signed and sealed design report will remain on file in the Office of Wastewater Management for future reference.

If you have any questions, please do not hesitate to contact me at (631) 852-5811.

Sincerely,

Ken Zegel, P.E.
Principal Public Health Engineer
Chief, Office of Ecology

cc: John Sohngen, P.E. (SCDHS)
Vincent Ernst (Delta)
Kevin McGowin & Bryan McGowin (Advanced Wastewater Solutions)
Peter Mercurio (Coastal Pipeline Products)



DIVISION OF ENVIRONMENTAL QUALITY
Office of Ecology
360 Yaphank Avenue, Suite 2B, Yaphank NY 11980
P:(631) 852-5750 F:(631) 852-5812

Project Number: 2023.030.002

DESIGN COMPUTATIONS FOR

4'-1" Diameter x 6'-6" ID
500-Gallon Pretreatment Tank
Designed for HS-20 Live Load



PREPARED FOR:

Advanced Wastewater Solutions
Post Office Box 1622
Southampton, NY 11969

8-15-23

PREPARED BY:



860 Hooper Road, Endwell, New York 13760
 TEL: 607-231-6600 FAX: 607-231-6650
 EMAIL: precast@delta-eas.com
 www.delta-eas.com



ACCEPTED BY THE SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES
 (DEPARTMENT) BASED ON INFORMATION PROVIDED BY ENGINEER.

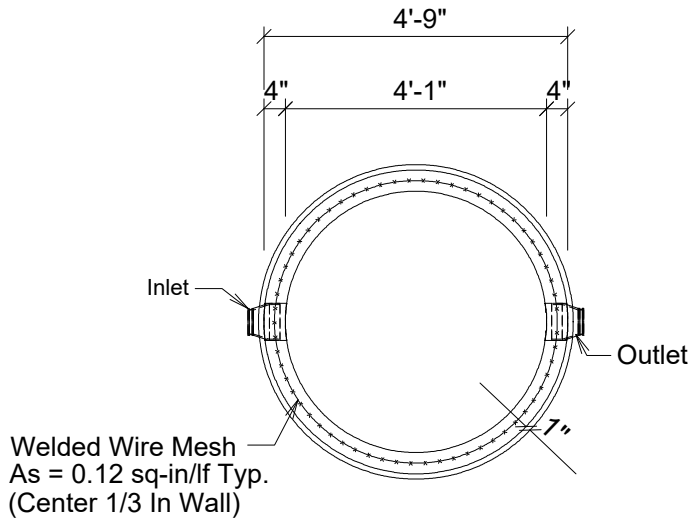
SCDHS Approval No.: NS-007

The Department has reviewed this submittal for completeness and is hereby approved for use in Suffolk County. This approval is solely for the model(s), units(s) and/or structure(s) included in the engineering design drawings and calculations provided by the licensed design professional(s). Any changes or modifications to the approved design must be submitted for review and approval by the Department prior to its use in Suffolk County. The Department is not responsible for any errors, omissions, failures, construction defects or installation errors that may occur due to design professional, manufacturer, distributor or installer oversight or negligence.

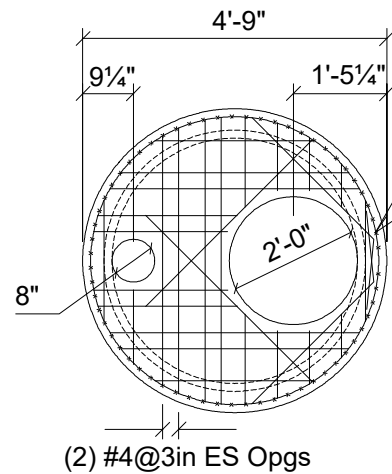
08/31/2023

APPROVAL DATE

Ken Zegel, P.E.



PLAN



TOP SLAB

#4@7in Max Sp

Welded Wire Mesh
As = 0.12 sq-in/lf Typ.

SPECIFICATIONS

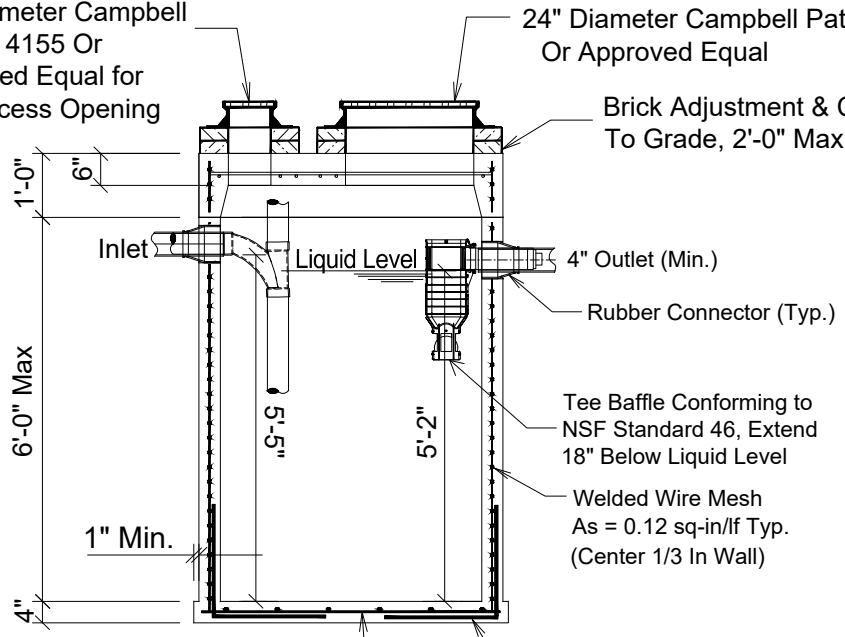
1. Design in Accordance With ASTM C478 For AASHTO HS-20 Loading.
2. Earth Load = 0 - 2.5ft
3. Concrete 4000psi @ 28 Days
4. Rebar - ASTM A-615 Grade 60 Welded Wire Mesh ASTM A-1064
5. Concrete Cover 1 1/4 UNO
6. Storage Capacity 97.96 Gallons per ft
7. Additional Reinforcing Around Openings Equal to the Bars Interrupted, Half Each Side
8. Openings Trimmed with Diagonal #4 Bars Extended Min 12" Beyond Openings, Bent To Maintain Bar Cover
9. Ground Water Table At Finished Grade.
10. Buoyancy Safety Factor = 1.50

Note:
Precast Manufacturer will be Identified by an Imprinted Label on the Interior Wall of the Tank

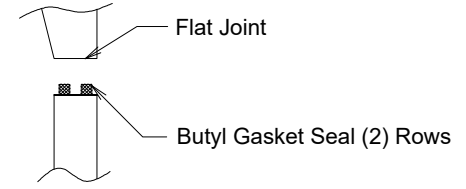
10" Diameter Campbell Pattern 4155 Or Approved Equal for 8"Ø Access Opening

24" Diameter Campbell Pattern 1007 "SANITARY" Or Approved Equal

Brick Adjustment & Casting To Grade, 2'-0" Maximum



SECTION

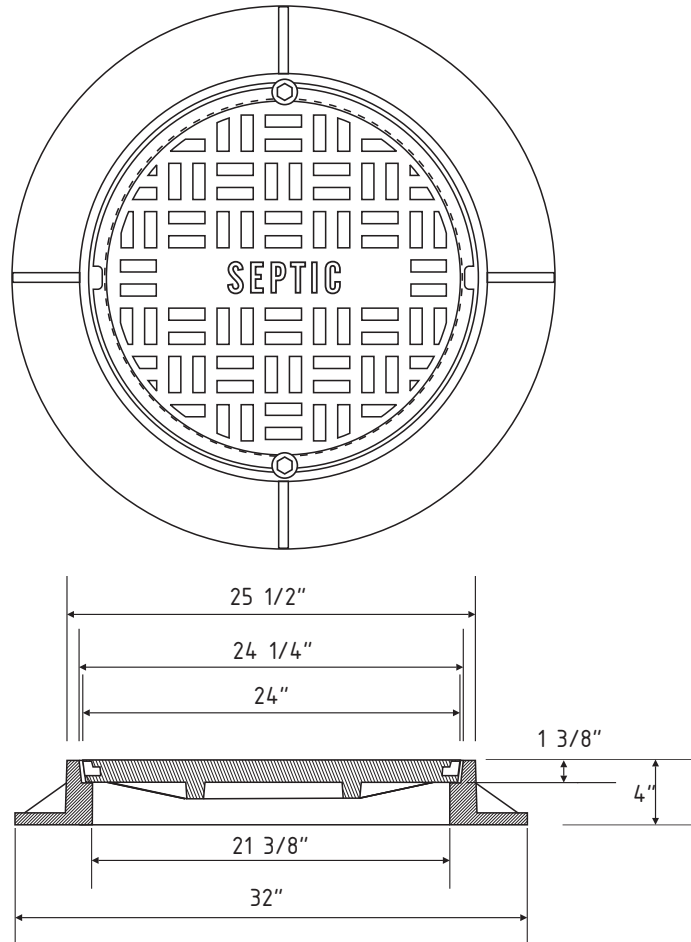


JOINT DETAIL

Advanced Waster water Solutions			
Product: 500 Gallon Pre-Treatment Tank			
Proj	date	dwn. by/dwg. no.	
23-0721	8/15/23	VCE	PT-500

1007B

Heavy Duty Manhole Frame and Bolted Cover



Notes:

1. Material: Gray Cast Iron, ASTM A48-83, Class 30B;
2. AASHTO HS20-44 Highway Loading;
3. Bearing surface at seat of cover and frame shall be machined for uniform fit;
4. Cover shall have two non-penetrating pick holes and be bolted to frame with two recessed equally spaced 1/2"-13 stainless steel hex head bolts;
5. Castings supplied without surface coating;



CAMPBELL FOUNDRY COMPANY

Harrison, N.J. 07029

Phone: 973-483-5480 FAX: 973-483-1843

SCALE:

APPROVED BY:

DRAWN BY: D.L.

DATE: 02/06/06

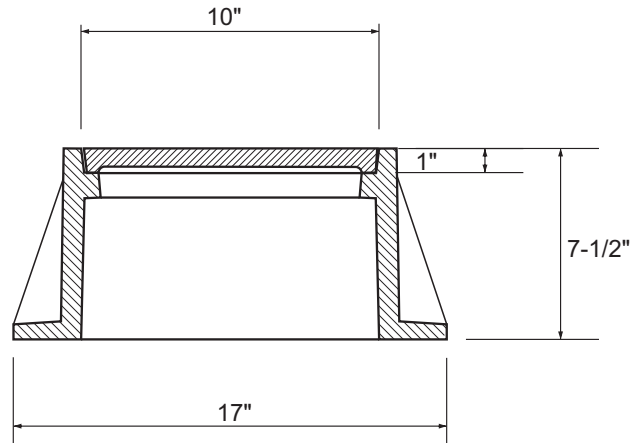
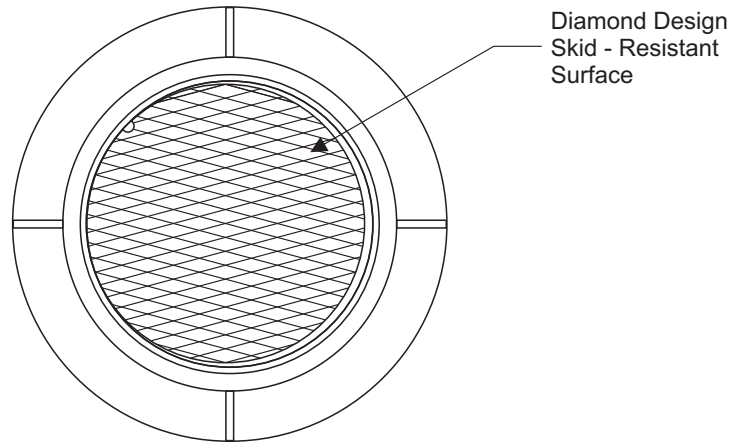
REV.:

Heavy Duty Manhole Frame and Bolted Cover

Pattern Number: 1007B


4155

Heavy Duty Manhole Frame and Cover




Notes:

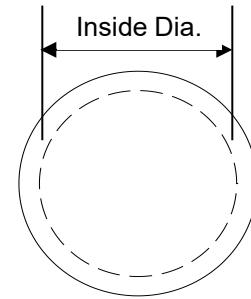
1. Material: Gray Cast Iron, ASTM A48-83, Class 30B;
2. AASHTO HS20-44 Highway Loading;
3. Bearing surface at seat of cover and frame shall be machined for uniform fit;
4. Castings supplied without surface coating.

 CAMPBELL FOUNDRY COMPANY Harrison, N.J. 07029 Phone: 973-483-5480 FAX: 973-483-1843		
SCALE: 1 1/2" = 1'-0"	APPROVED BY:	DRAWN BY:
DATE: 09/28/03		REV:
Heavy Duty Manhole Frame and Cover		
Pattern Number: 4155		

PRECAST ROUND MANHOLE DESIGN DESCRIPTION

Inside Diameter (I.D.) =	4.08 ft
Wall Height (I.D.) =	6.50 ft
Wall Thickness =	4.00 in
Base Slab Thickness =	4.00 in
Cover Slab Thickness =	6.00 in
Earth Cover (Min.) =	0.00 ft
Earth Cover (Max) =	2.50 ft
Min. Watertable Depth =	0.00 ft

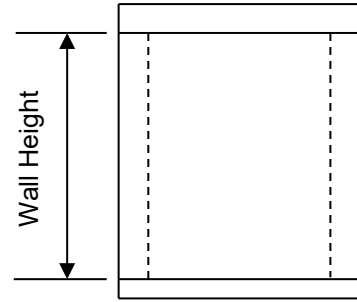
 Denotes input field



Round Manhole Plan View
 (All dimensions I.D.)

TECHNICAL DATA

Concrete Strength (f'c) =	4.0 ksi
Yield Strength (fy) =	60 ksi
Equivalent Lateral Fluid Pressure =	0.091 kcf
LL Surcharge =	0.08 ksf
Depth Below F.G. to Apply Surcharge =	8.00 ft
Unit Weight of Soil =	120 pcf
Unit Weight of Concrete =	150 pcf
$E_c = 57,000 * \sqrt{f'c}$ =	3.60E+06 psi
E_s =	2.90E+07 psi
$n = E_s / E_c$ =	8.0
$\beta_1 = (.85 - .05(fc-4))$ =	0.85
$f_r = 7.5 \sqrt{f'c}$ =	474 psi
Rho max = (.75 pb) =	0.0213801
Zmax =	130 Severe Exposure
Design Wheel Load (Pw) =	16 kips AASHTO HS20
Uniform Live Load =	0 psf
Capacity Reduction Factors:	
ϕ - Moment =	0.90
ϕ - Shear =	0.85
Load Factors:	
γ =	1.30
β - LL =	1.67
β - DL =	1.00
β - EL =	1.30



Round Manhole Elevation View
 (Joints not shown for clarity)
 (All dimensions I.D.)

References:

1. "Specifications for Highway Bridges, 17th Ed." - AASHTO
2. "Building Code Requirements for Structural Concrete" - ACI 318.
3. "Standard Specification for Precast Reinforced Concrete Manhole Sections" - ASTM C478.
4. "Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures" – ASTM C890

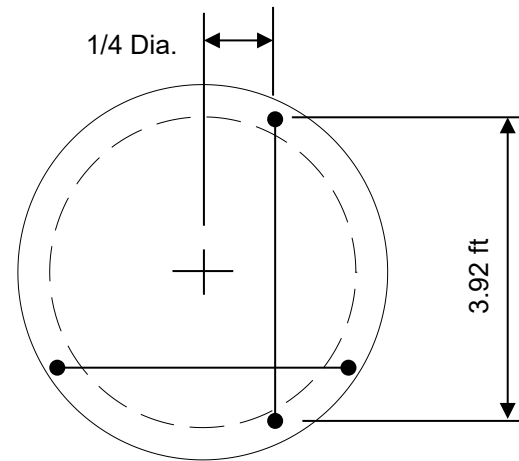
COVER SLAB DESIGN
CONCENTRATED LIVE LOAD

Note:
 1.00' of Earth cover with 1.30 Impact Controls
 over 0.00' Earth Cover with 1.30 Impact

Wall Thickness = 4.00 in
 Slab Thickness = 6.00 in
 Earth Cover = 0.00 ft
 Bar cover = 1.50 in
 Impact = 1.30

Two Way Slab

Avg. Span (s) = 3.92 ft
 Dead Loads: Soil = 0.00 ksf
 Concrete = 0.08 ksf
 Additional Uniform Dead Load = 0.00 ksf
 Total (wdl) = 0.08 ksf



$$Mdl = wdl l^2 / 8 * (0.5) = 0.07 \text{ kip-ft}$$

$$e = 4 + .06S = 4.23 \text{ ft} \quad (\text{AASHTO 3.24.3.2})$$

$$p = (Pw * \text{Impact}) / e = 4.91 \text{ kips/ft}$$

$$Mll = ps / 4 * (0.5) = 2.40 \text{ kip-ft}$$

$$Mu = \gamma[\beta(L+I)*Mll + \beta D * Mdl] = 5.31 \text{ kip-ft}$$

Avg 'd' = 4.00 in

Req. Bar Size and Spacing

Main Reinforcing: $As = 0.34 \text{ in.}^2/\text{ft.}$ Use # 4 @ 7.0 in (Ea. Dir.)

$$\rho = As / b * d = 0.00701248$$

$$\rho * n = 0.05641116$$

Flexure Check:

$$a = AsFy / 0.85fcb = 0.495 \text{ in}$$

$$\phi Mn = \phi * As * Fy * (d - (a/2)) = 5.68 \text{ kip-ft} \quad \text{OK}$$

Cracking Check:

$$k = \sqrt{2\rho n + \rho n^2} - \rho n = 0.284$$

$$j = 1 - (k/3) = 0.905$$

$$M = Mdl + Mll = 2.48 \text{ kip-ft}$$

$$fs = M / As j d = 24.38 \text{ ksi} \quad \text{OK}$$

$$dc = 2.250 \text{ in}$$

$$A = 2 * dc * \text{Spacing} = 31.5 \text{ in}^2$$

$$Z = fs \sqrt[3]{dc * A} = 101 \text{ kips/in} \quad \text{OK}$$

Note: Shear considered satisfactory per AASHTO 3.24.4

Check minimum reinforcement requirements per AASHTO 8.17.1

Note: Minimum As shall be at least 1/8 sq. in./ft (AASHTO 8.20.1)

$$\phi Mn \geq 1.2 * Mcr$$

$$Mcr = 2.85 \text{ kip-ft}$$

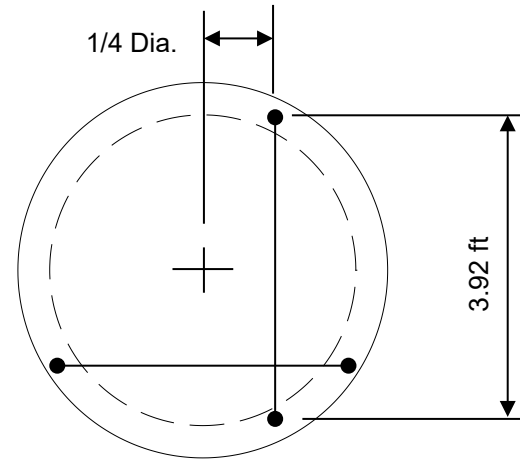
$$1.2 Mcr = 3.42 \text{ kip-ft} \quad \text{OK}$$

COVER SLAB DESIGN
CONCENTRATED LIVE LOAD

Wall Thickness = 4.00 in
 Slab Thickness = 6.00 in
 Earth Cover = 2.50 ft
 Bar cover = 1.50 in
 Impact = 1.20

Two Way Slab

Avg. Span (s) = 3.92 ft
 Dead Loads: Soil = 0.30 ksf
 Concrete = 0.08 ksf
 Additional Uniform Dead Load = 0.00 ksf
 Total (wdl) = 0.38 ksf



$$Mdl = wdl l^2 / 8 * (0.5) = 0.36 \text{ kip-ft}$$

$$e = 4 + .06S = 4.23 \text{ ft (AASHTO 3.24.3.2)}$$

$$p = (Pw * Impact) / e = 4.53 \text{ kips/ft}$$

$$Mll = ps / 4 * (0.5) = 2.22 \text{ kip-ft}$$

$$Mu = \gamma[\beta(L+I)*Mll + \beta D * Mdl] = 5.29 \text{ kip-ft}$$

Avg 'd' = 4.00 in

Req. Bar Size and Spacing

Main Reinforcing: $As = 0.34 \text{ in.}^2/\text{ft.}$ Use # 4 @ 7.0 in (Ea. Dir.)

$$\rho = As / b * d = 0.00701248$$

$$\rho * n = 0.05641116$$

Flexure Check:

$$a = AsFy / 0.85fcb = 0.495 \text{ in}$$

$$\phi Mn = \phi * As * Fy * (d - (a/2)) = 5.68 \text{ kip-ft OK}$$

Cracking Check:

$$k = \sqrt{2\rho n + \rho n^2} - \rho n = 0.284$$

$$j = 1 - (k/3) = 0.905$$

$$M = Mdl + Mll = 2.58 \text{ kip-ft}$$

$$fs = M / As j d = 25.39 \text{ ksi OK}$$

$$dc = 2.250 \text{ in}$$

$$A = 2 * dc * Spacing = 31.5 \text{ in}^2$$

$$Z = fs \sqrt[3]{(dc * A)} = 105 \text{ kips/in OK}$$

Note: Shear considered satisfactory per AASHTO 3.24.4

Check minimum reinforcement requirements per AASHTO 8.17.1

Note: Minimum As shall be at least $1/8 \text{ sq. in./ft}$ (AASHTO 8.20.1)

$$\phi Mn \geq 1.2 * Mcr$$

$$Mcr = 2.85 \text{ kip-ft}$$

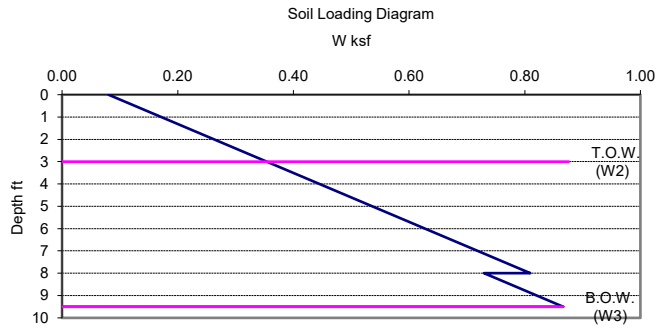
$$1.2 Mcr = 3.42 \text{ kip-ft OK}$$

WALL DESIGN

Height= 6.50 ft
 Wall Thickness= 4.00 in
 Inside Diameter= 4.08 ft
 Outside Diameter= 4.75 ft
 Average= 4.42 ft

Analyze compressive force at bottom of wall

Compressive force 'P'=wdl/2= 2.09 kips
 Compressive stress $f_c=P/A=$ 43.54 psi
 Compressive stress allowable=.45 $f'_c=$ 1800.00 psi
 Result= **OK**
 Minimum reinforcing required= 0.12 in.²/ft.
 ref ASTM C478, Art. 14.4.1.1

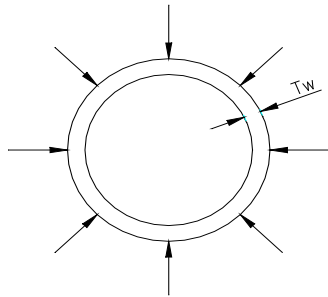


Horizontal line indicates top of wall

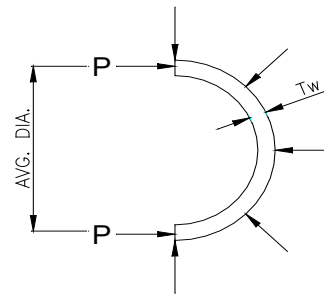
Lateral Earth Pressure

Eq. Lat. Press.= 0.091 kcf
 W2 = 0.35 ksf
 W3 = 0.95 ksf

(Surcharge Applied Over Entire Height of Unit)



PRESSURE DIAGRAM



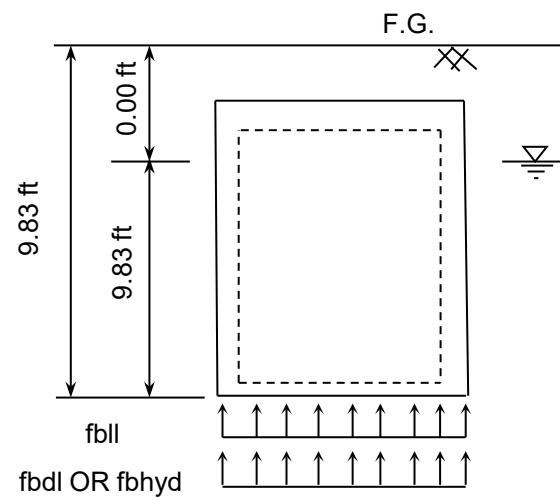
COMPRESSIVE FORCE

BASE SLAB DESIGN

	ID	OD
Inside Diameter =	4.08 ft	4.75 ft
Span =	3.92 ft	
Wall Thickness =	4.00 in	
Slab Thickness =	4.00 in	
Number of Wheels =	1	

Vertical Loads:

Soil =	5.32 kips
Cover slab =	1.33 kips
Walls =	4.51 kips
Other =	
Total Dead Load =	11.15 kips
Live Load =	16.00 kips



Loading Diagram
 Ref: ASTM C857 Sec 4.3

Net upward bearing pressure:

Dead Load, fbdl =	0.63 ksf	<== Controls
Hydrostatic, fbhyd =	0.61 ksf	(9.83 ft * 0.0624 kcf)

Live Load, fbll =	+ 0.90 ksf
w =	1.53 ksf
Wu =	2.78 ksf

Mll = fbll l² / 8 * (0.5) =	0.87 kip-ft
Mdl = fbdl l² / 8 * (0.5) OR	
Mhydr = fbhyd l² / 8 * (0.5) =	0.60 kip-ft
Mu = wu l² / 8 * (0.5) =	2.66 kip-ft

Bar Cover =	1.50 in
Avg 'd' =	2.00 in

Req. Bar Size and Spacing

Main Reinforcing: As =	0.39 in.²/ft.	Use	# 4	@	6.0 in	(Ea. Dir.)
------------------------	---------------	-----	-----	---	--------	------------

$\rho = As / b * d = 0.016362462$
 $\rho * n = 0.131626032$

Flexure Check:

$a = AsFy / 0.85f'cb = 0.577$ in
 $\phi Mn = \phi * As * Fy * (d - (a/2)) = 3.02$ kip-ft **OK**

Cracking Check:

$k = \sqrt{(2\rho n + \rho n^2)} - \rho n = 0.398$
 $j = 1 - (k/3) = 0.867$
 $M = Mdl + Mll = 1.47$ kip-ft
 $fs = M / As j d = 25.88$ ksi **OK**
 $dc = 2.250$ in
 $A = 2 * dc * Spacing = 27.0$ in²
 $Z = fs \sqrt[3]{(dc * A)} = 102$ kips/in **OK**

Shear Check:

$Vu @ d = Wu * [span/2 - d] * (0.5) = 2.49$ kips/ft
 (AASHTO 8-49) $\phi Vc = 2.58$ kips/ft **OK**

Check minimum reinforcement requirements per AASHTO 8.17.1
 Note: Minimum As shall be at least 1/8 sq. in./ft (AASHTO 8.20.1)

$\phi Mn \geq 1.2 * Mcr$
 $Mcr = 1.26$ kip-ft
 $1.2 Mcr = 1.52$ kip-ft **OK**

Check Buoyancy

Inside Diameter (D)	4.08 ft	Top Slab Thickness	6.00 in	Outside Dia. (OD)	4.75 ft
		Wall Thickness	4.00 in		
Inside Height (H)	6.50 ft	Bottom Slab Thickness	4.00 in	Outside Height (OH)	7.33 ft
Earth Fill (F)	0.00 ft	Water table depth (WT)	0.00 ft		
Unit weight of Concrete (Wc)	150 pcf			Height of Structure above grade (Hg)	0.00 ft
Unit weight of Soil (Ws)	120 pcf				
Unit weight of Water (Ww)	62.4 pcf	Safety Factor Req'd	1.50		

Downward Forces

Concrete Weight	$\pi OD^2 OH/4 - \pi ID^2 H/4 * Wc =$	6,725 lbs
Weight of fill	$\pi * OD^2/4 * F * Ws =$	0 lbs
Additional Weight		lbs
Subtract for openings		- 262 lbs
	Total	6,462 lbs

Upward Buoyant Force

$\pi * OD^2/4 * (OH + F - WT - Hg) * Ww =$	8,109 lbs
Difference	-1,647 lbs

Safety Factor 0.80 < 1.50 **NG**

Note: The safety factor is less than required. See next sheet for solution

WALL OPENINGS:

	<u>Length</u>	<u>Width</u>	
1			
2			
3			
4			
	<u>Dia</u>	<u>Qty</u>	
1	7 in	2	0.53 sf
2			
3			
4			
5			

Total: 0.53 sf
 Equiv. Void: 27 #

TOP SLAB OPENINGS:

	<u>Length</u>	<u>Width</u>	
	<u>Dia</u>	<u>Qty</u>	
	24 in	1	3.14 sf

Total: 3.14 sf
 Equiv. Void: 236 #

SOLUTION - Add an extension to the outside of the base slab to engage the soil outside of the structure

Inside Diameter (ID)	4.08 ft	Top Slab Thickness	6.00 in	Outside Dia (OD)	4.75 ft
		Wall Thickness	4.00 in		
Inside Height (Ht)	6.50 ft	Bottom Slab Thickness	4.00 in	Outside Height (OH)	7.33 ft
Earth Fill (F)	0.00 ft	Water table depth (WT)	0.00 ft	Base Extension =	1.00 in
Unit weight of Concrete (Wc)	150 pcf			Height of Structure above grade (Hg)	0.00 ft
Unit weight of Soil (Ws)	120 pcf			Base Slab Dia.(w/Ext.):	4.92 ft
Unit weight of Water (Ww)	62.4 pcf			Safety Factor Req'd	1.50

Downward Forces

Concrete Weight	$\pi OD^2 OH/4 - \pi ID^2 H/4 * Wc =$	6,725 lbs
Weight of fill	$\pi * OD^2/4 * F * Ws =$	0 lbs
Buoyant Weight of Base Extension =		36.95 lbs
Buoyant Weight of soil engaged by extension =		510 lbs
Additional Weight	0	0 lbs
Subtract for openings		- 262 lbs
	Total	7,009 lbs

Upward Buoyant Force

$\pi * OD^2/4 * (OH + F - WT - Hg) * Ww =$	8,109 lbs
Difference	-1,100 lbs

Safety Factor 0.86 < 1.50 **NG**

Consideration of Soil Wedge not Required

Additional Downward Force Due to Soil Wedge

Assume an interface friction angle, δ of	12 degrees (conservative)
Radius of soil wedge @ surface	2.95 ft @ 1/3 pt of Cone
Perimeter of base extension	18.562 ft
Buoy. weight of soil wedge	5,568 lbs
Add to downward force	7,009 lbs
	12,577 lbs

Safety factor 1.55 > 1.50 **OK**

