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

R⊙W
Reclaim Our Water

Re: NS-009 990 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 "5'-8" x 6'-6" ID 990-Gallon Pretreatment Tank Designed for HS-20 Live Load".

Based on the information provided, the Department of Health Services approves the use of this 990 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)

Public Health
Prevent. Promote. Protect.

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

5'-8" Diameter x 6'-6" ID
990-Gallon Pretreatment Tank
Designed for HS-20 Live Load

PREPARED FOR:

Advanced Wastewater Solutions
Post Office Box 1622
Southampton, NY 11969

PREPARED BY:

DELTA
SPECIALTY PRECAST CONCRETE ENGINEERS

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-009

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.

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 1¼ UNO
6. Storage Capacity 188.66 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
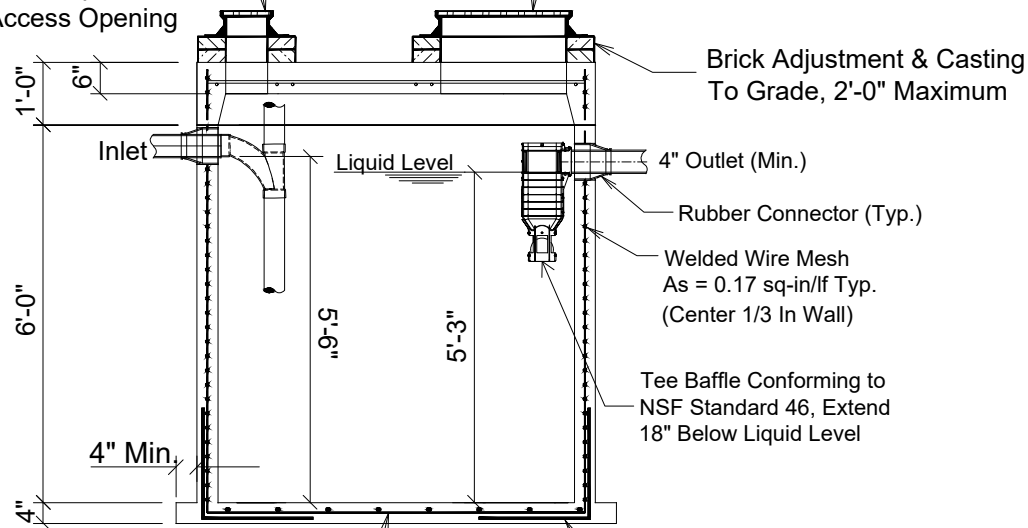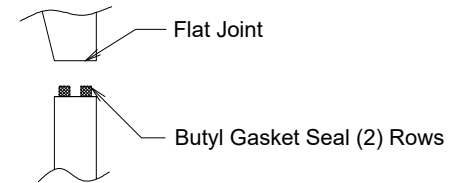9. Ground Water Table At Finished Grade.
10. Buoyancy Safety Factor = 1.50
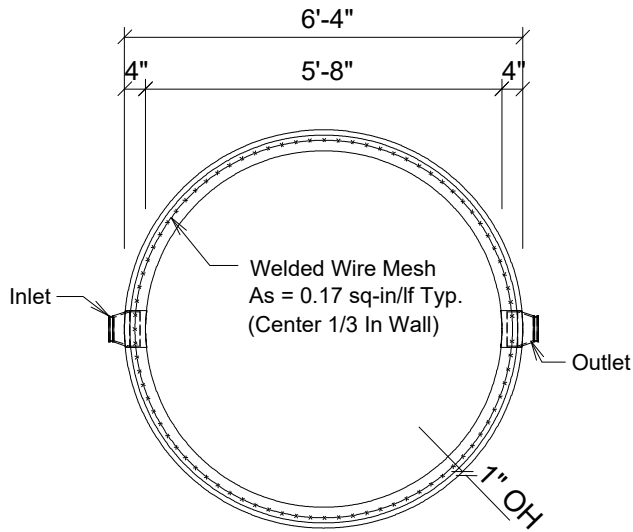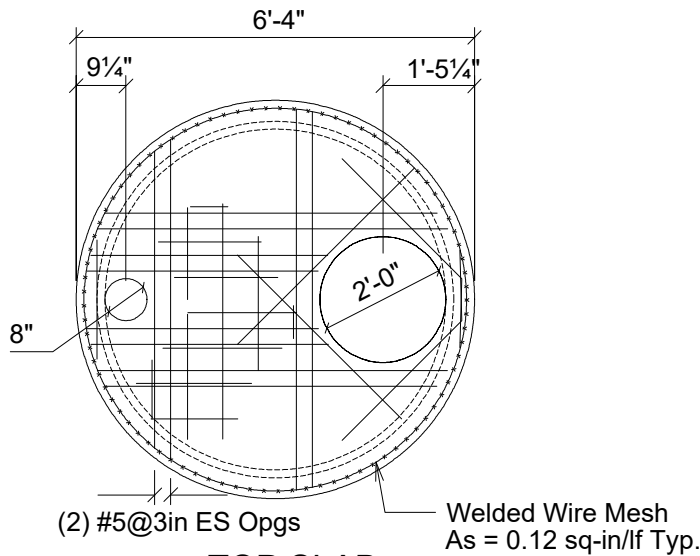
Note:
Precast Manufacturer will be Identified by an Imprinted Label on the Interior Wall of the Tank

6'-4"
5'-8"
4"
4"

Welded Wire Mesh
As = 0.17 sq-in/lf Typ.
(Center 1/3 In Wall)

Inlet

Outlet

1" OH

PLAN

6'-4"
9¼"
1'-5¼"

8"

2'-0"

(2) #5@3in ES Opgs

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

TOP SLAB

#5@7in Max Sp

Flat Joint

Butyl Gasket Seal (2) Rows

JOINT DETAIL

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

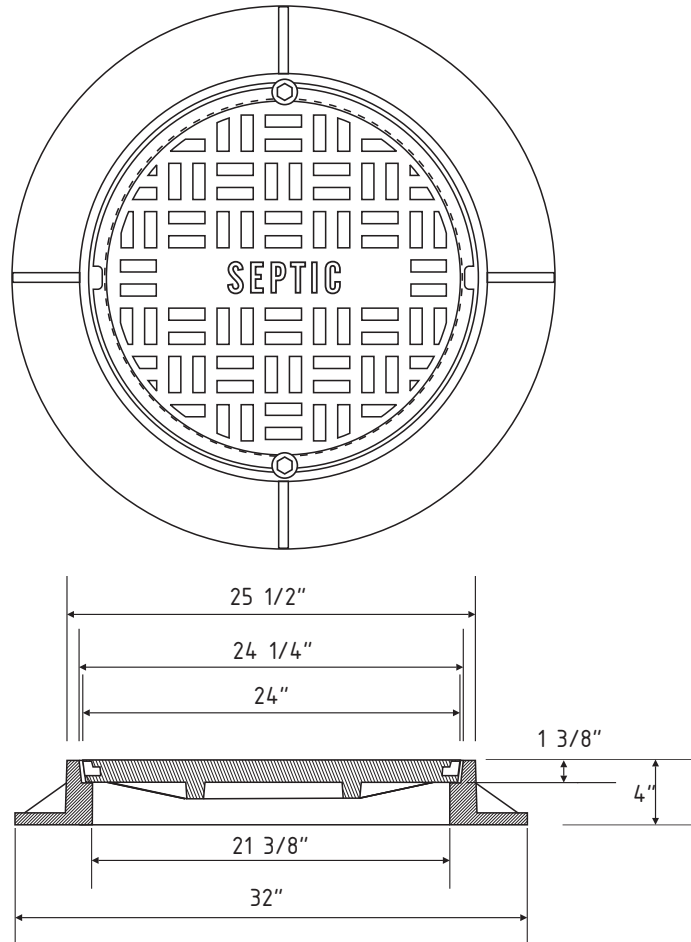24" Diameter Campbell Pattern 1007 "SANITARY" Or Approved Equal

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

1'-0"
6"

Inlet

Liquid Level

4" Outlet (Min.)

Rubber Connector (Typ.)

Welded Wire Mesh
As = 0.17 sq-in/lf Typ.
(Center 1/3 In Wall)

6'-0"
5'-6"
5'-3"

Tee Baffle Conforming to NSF Standard 46, Extend 18" Below Liquid Level

4" Min.

4"

#5@7in EW

SECTION

#4 Dowels x 42" Lg @ 18" o.c. Radially

1' 9"

1' 9"

Advanced Waster water Solutions

Product: 990 Gallon Pre-Treatment Tank

Proj	date	dwn. by	dwg. no.
23-0721	8/15/23	VCE	PT-990

Heavy Duty Manhole Frame and Bolted Cover

1007B

SEPTIC

25 1/2"

24 1/4"

24"

1 3/8"

4"

21 3/8"

32"
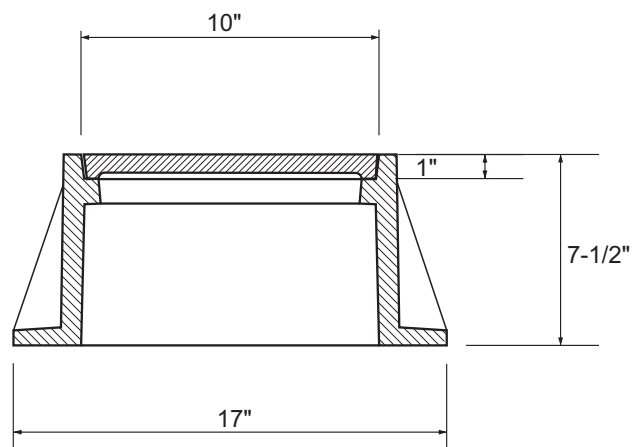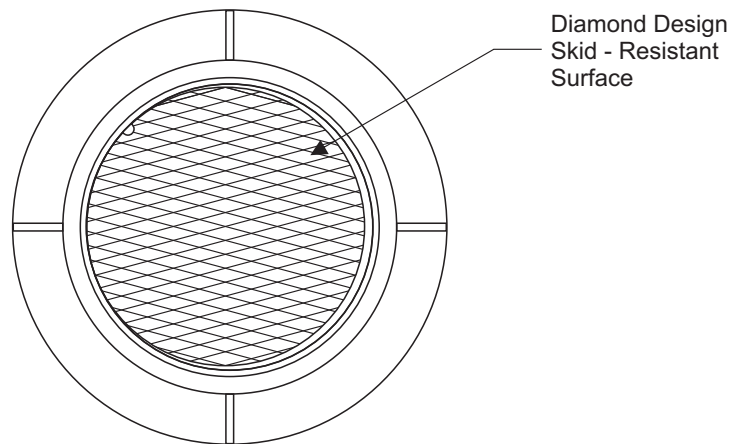
Notes:

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

Heavy Duty Manhole Frame and Cover

4155

Diamond Design Skid - Resistant Surface

10"

1"

7-1/2"

17"

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

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;
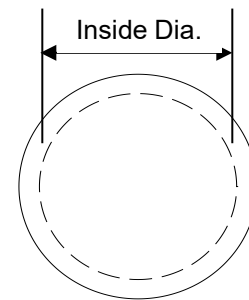4. Castings supplied without surface coating.

JOB:	2023.030.002
DESCRIPTION:	990 Gallon Pretreatment Tank
SHEET NO.:	of
CALCULATED BY: ARN	Date 5/9/23
CHECKED BY:	Date

PRECAST ROUND MANHOLE DESIGN
DESCRIPTION

Inside Diameter (I.D.) =	5.67 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

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

$n = E_s / E_c = 8.0$

$\beta1 = (.85-.05(fc-4)) = 0.85$

$fr = 7.5 \sqrt{f'c} = 474$ psi

Rho max $= (.75 \rho b) = 0.0213801$

$Zmax = 130$ 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

Inside Dia.

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

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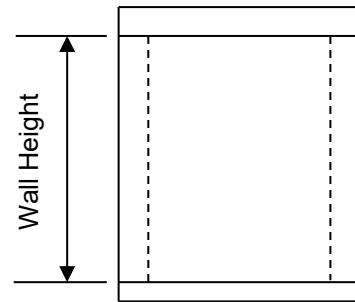
Round Manhole
Elevation View
(Joints not shown for clarity)
(All dimensions I.D.)

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

DELTA
SPECIALTY PRECAST CONCRETE ENGINEERS
860 Hooper Road, Endwell, NY 13760
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Phone (607) 231-6600
Fax (607) 231-6650

JOB:	2023.030.002
DESCRIPTION:	990 Gallon Pretreatment Tank
SHEET NO.:	of
CALCULATED BY:	ARN Date 5/9/23
CHECKED BY:	Date

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 =	1.00 ft
Bar cover =	1.50 in
Impact =	1.30

1/4 Dia.

5.29 ft

Two Way Slab
Avg. Span (s) =	5.29 ft
Dead Loads: Soil =	0.12 ksf
Concrete =	0.08 ksf
Additional Uniform Dead Load =	0.00 ksf
Total (wdl) =	0.20 ksf
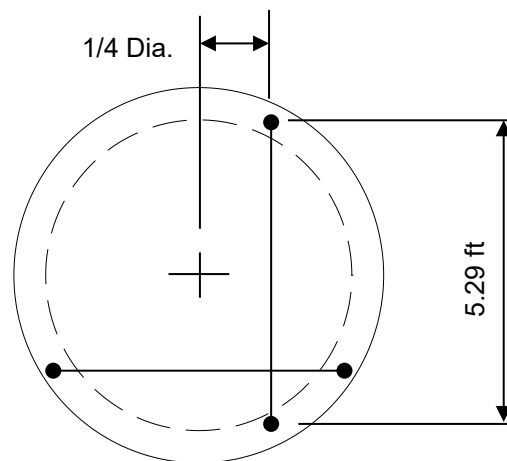
$Mdl = wdl \, l^2 / 8 * (0.5) =$ 0.34 kip-ft
$e = 4 + .06S =$ 4.32 ft   (AASHTO 3.24.3.2)
$p = (Pw * Impact) / e =$ 4.82 kips/ft
$Mll = ps / 4 * (0.5) =$ 3.19 kip-ft
$Mu = \gamma[\beta(L+I)*Mll + \beta D*Mdl] =$ 7.36 kip-ft

Avg 'd' =   3.88 in

Req. Bar Size and Spacing
Main Reinforcing: As =   0.53 in.²/ft.   Use   # 5   @   7.0 in   (Ea. Dir.)

$\rho = As / b * d =$ 0.01131046
$\rho * n =$ 0.09098574

Flexure Check:
$a = AsFy / 0.85f'cb =$ 0.773 in
$\phi Mn = \phi*As*Fy*(d-(a/2)) =$ 8.26 kip-ft   **OK**

Cracking Check:
$k = \sqrt{(2\rho n + \rho n^2)} - \rho n =$ 0.345
$j = 1 - (k/3) =$ 0.885
$M = Mdl + Mll =$ 3.53 kip-ft
$fs = M / As \, j \, d =$ 23.46 ksi   **OK**
$dc =$ 2.313 in
$A = 2 * dc * Spacing =$ 32.4 in²
$Z = fs \sqrt[3]{(dc * A)} =$ 99 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 sq. in./ft (AASHTO 8.20.1)
$\phi Mn \geq 1.2*Mcr$
$Mcr =$ 2.85 kip-ft
$1.2 \, Mcr =$ 3.42 kip-ft   **OK**

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JOB:	2023.030.002
DESCRIPTION:	990 Gallon Pretreatment Tank
SHEET NO.:	of
CALCULATED BY:	ARN Date 5/9/23
CHECKED BY:	Date

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

1/4 Dia.

5.29 ft

Two Way Slab

Avg. Span (s) =	5.29 ft
Dead Loads: Soil =	0.30 ksf
Concrete =	0.08 ksf
Additional Uniform Dead Load =	0.00 ksf
Total (wdl) =	0.38 ksf
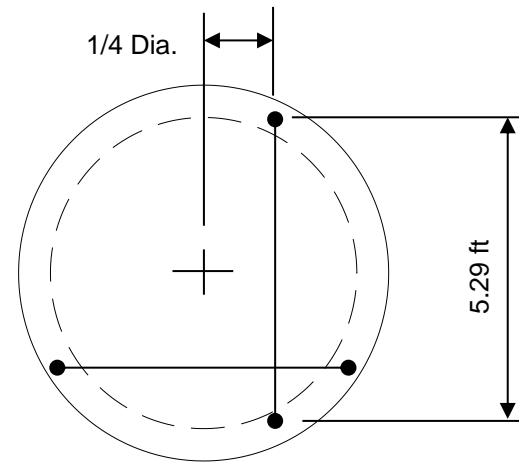
$M_{dl} = w_{dl} l^2 / 8 * (0.5) =$ 0.66 kip-ft
$e = 4 + .06S =$ 4.32 ft   (AASHTO 3.24.3.2)
$p = (P_w * Impact) / e =$ 4.45 kips/ft
$M_{ll} = ps / 4 * (0.5) =$ 2.94 kip-ft
$M_u = \gamma[\beta(L+I)*M_{ll} + \beta_D*M_{dl}] =$ 7.24 kip-ft

Avg 'd' = 3.88 in

Req. Bar Size and Spacing
Main Reinforcing: As = 0.53 in.²/ft.   Use   # 5   @   7.0 in   (Ea. Dir.)

$\rho = As / b * d =$ 0.01131046
$\rho * n =$ 0.09098574
Flexure Check:
$a = As F_y / 0.85 f'c b =$ 0.773 in
$\phi M_n = \phi * As * F_y * (d - (a/2)) =$ 8.26 kip-ft   **OK**
Cracking Check:
$k = \sqrt{(2\rho n + \rho n^2)} - \rho n =$ 0.345
$j = 1 - (k/3) =$ 0.885
$M = M_{dl} + M_{ll} =$ 3.60 kip-ft
$f_s = M / As j d =$ 23.92 ksi   **OK**
$d_c =$ 2.313 in
$A = 2 * d_c * Spacing =$ 32.4 in²
$Z = f_s \sqrt[3]{(d_c * A)} =$ 101 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 sq. in./ft (AASHTO 8.20.1)
$\phi M_n \geq 1.2 * M_{cr}$
$M_{cr} =$ 2.85 kip-ft
$1.2 M_{cr} =$ 3.42 kip-ft   **OK**

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| JOB:	2023.030.002
DESCRIPTION:	990 Gallon Pretreatment Tank
SHEET NO.:	of
CALCULATED BY:	ARN Date 5/9/23
CHECKED BY:	Date

WALL DESIGN

Height=	6.50 ft
Wall Thickness=	4.00 in
Inside Diameter=	5.67 ft
Outside Diameter=	6.33 ft
Average=	6.00 ft

Analyze compressive force at bottom of wall

Compressive force 'P'=wdl/2=	2.84 kips
Compressive stress fc=P/A=	59.15 psi
Compressive stress allowable=.45f'c=	1800.00 psi
Result=	**OK**
Minimum reinforcing required=	0.17 in.²/ft.
ref ASTM C478, Art. 14.4.1.1	

Soil Loading Diagram
W ksf

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)
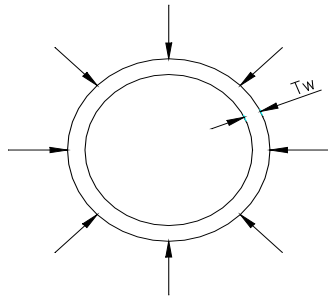
PRESSURE DIAGRAM

COMPRESSIVE FORCE

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SPECIALTY PRECAST CONCRETE ENGINEERS
860 Hooper Road, Endwell, NY 13760
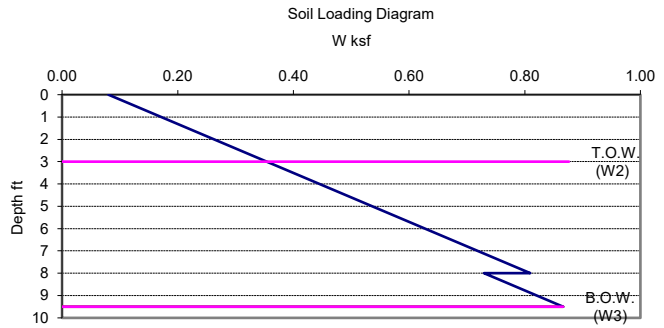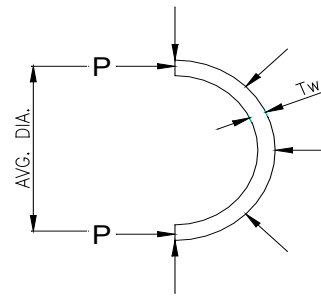delta-eas.com
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JOB:	2023.030.002
DESCRIPTION:	990 Gallon Pretreatment Tank
SHEET NO.:	of
CALCULATED BY: ARN	Date 5/9/23
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BASE SLAB DESIGN

	ID	OD
Inside Diameter =	5.67 ft	6.33 ft
Span =	5.29 ft	
Wall Thickness =	4.00 in	
Slab Thickness =	4.00 in	
Number of Wheels=	1	

Vertical Loads:

Soil =	9.45 kips
Cover slab =	2.36 kips
Walls =	6.13 kips
Other =	
Total Dead Load =	17.94 kips
Live Load =	16.00 kips

F.G.

0.00 ft

9.83 ft

9.83 ft

fbll

fbdl OR fbhyd
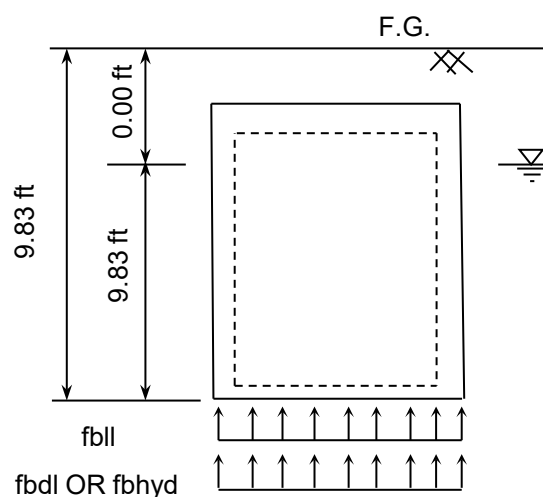
Loading Diagram
Ref: ASTM C857 Sec 4.3

Net upward bearing pressure:

Dead Load, fbdl = 0.57 ksf
Hydrostatic, fbhyd = 0.61 ksf   (9.83 ft * 0.0624 kcf)   **<== Controls**

Live Load, fbll = + 0.51 ksf
w = 1.12 ksf
W_u = 1.90 ksf

M_{ll} = fbll l^2 / 8 * (0.5) = 0.89 kip-ft
M_{dl}= fbdl l^2 / 8 * (0.5) OR
M_{hydr} = fbhyd l^2 / 8 * (0.5) = 1.07 kip-ft

M_u = wu l^2 / 8 * (0.5) = 3.32 kip-ft

Bar Cover = 1.50 in
Avg 'd' = 1.88 in

Req. Bar Size and Spacing
Main Reinforcing: As = 0.53 in.²/ft.   Use   # 5   @   7.0 in   (Ea. Dir.)

ρ = As / b * d = 0.023374945 NG
ρ * n = 0.188037189

Flexure Check:
a = AsFy / 0.85f'cb = 0.773 in
ϕM_n = ϕ*As*Fy*(d-(a/2)) = 3.52 kip-ft   **OK**

Cracking Check:
k = $\sqrt{(2\rho n + \rho n^2)}$ - ρn = 0.453
j = 1 - (k/3) = 0.849
M = Mdl + Mll = 1.96 kip-ft
f_s = M / As j d = 28.11 ksi   **OK**
d_c = 2.313 in
A = 2 * dc * Spacing = 32.4 in²
Z = fs $^3\sqrt{}$ (dc * A) = 118 kips/in   **OK**

Shear Check:

Vu@ d = Wu * [span/2 - d] *
(0.5) =   2.36 kips/ft
(AASHTO 8-49) ϕV_c = 2.42 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)
$\phi M_n \geq 1.2*M_{cr}$
M_{cr} = 1.26 kip-ft
1.2 Mcr = 1.52 kip-ft   **OK**

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JOB:	2023.030.002
DESCRIPTION:	990 Gallon Pretreatment Tank
SHEET NO.:	of
CALCULATED BY: ARN	Date 5/9/23
CHECKED BY:	Date

Check Buoyancy

Inside Diameter (D)	5.67 ft	Top Slab Thickness	6.00 in	Outside Dia. (OD)	6.33 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	$\pi OD^2 OH/4 - \pi ID^2 H/4 * Wc =$	10,064 lbs	
Weight of fill	$\pi * OD^2/4*F*Ws =$	0 lbs	
Additional Weight			lbs
Subtract for openings		- 262 lbs	
	Total	9,802 lbs	

Upward Buoyant Force

$\pi * OD^2/4*(OH+F-WT-Hg)*Ww =$	14,416 lbs	
Difference	-4,614 lbs	

Safety Factor   0.68   <   1.50   **NG**

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

JOB:	2023.030.002
DESCRIPTION:	990 Gallon Pretreatment Tank
SHEET NO.:	of
CALCULATED BY: ARN	Date 5/9/23
CHECKED BY:	Date

WALL OPENINGS:

	Length	Width	
1			
2			
3			
4			

	Dia	Qty	
1	7 in	2	0.53 sf
2			
3			
4			
5			

	Total:	0.53 sf
	Equiv. Void:	27 #

TOP SLAB OPENINGS:

	Length	Width	
1			
2			
3			
4			

	Dia	Qty	
1	24 in	1	3.14 sf
2			
3			
4			
5			

	Total:	3.14 sf
	Equiv. Void:	236 #

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JOB:	2023.030.002
DESCRIPTION:	990 Gallon Pretreatment Tank
SHEET NO.:	of
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SOLUTION - Add an extension to the outside of the base slab to engage the soil outside of the structure

Inside Diameter (ID)	5.67 ft	Top Slab Thickness	6.00 in	Outside Dia (OD)	6.33 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 Extention =	4.00 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.):	7.00 ft
Unit weight of Water (Ww)	62.4 pcf			Safety Factor Req'd	1.50

Downward Forces

Concrete Weight	$\pi OD^2 OH/4 - \pi ID^2 H/4 * Wc =$	10,064 lbs
Weight of fill	$\pi * OD^2/4*F*Ws =$	0 lbs
Buoyant Weight of Base Extension =		203.9 lbs
Buoyant Weight of soil engaged by extension =		2,815 lbs
Additional Weight 0		0 lbs
Subtract for openings		- 262 lbs
	Total	12,820 lbs

Upward Buoyant Force

$\pi * OD^2/4*(OH+F-WT-Hg)*Ww =$		14,416 lbs
	Difference	-1,595 lbs
	Safety Factor	0.89 < 1.50 **NG**

Consideration of Soil Wedge not Required

Additional Downward Force Due to Soil Wedge

Assume an interface friction angle, δ of	15 degrees (conservative)	
Raduis of soil wedge @ surface	4.13 ft @ 1/3 pt of Cone	
Perimeter of base extension	25.919 ft	
Buoy. weight of soil wedge	9,801 lbs	
Add to downward force	12,820 lbs	
	22,621 lbs	

Safety factor   1.57   >   1.50   **OK**