

COUNTY OF SUFFOLK



STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF HEALTH SERVICES

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

October 17, 2022

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



Re: Fuji Clean CEN21 Precast Containment Vault

Dear Mr. Osman,

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 Roman Stone Construction Company, Project No. 2021.487.001, with your signature and sealed on 10/11/2022 and 10/15/2022 for the "SCDHS (CEN21) 16'-0" x 7'-0" x 8'-0" ID Precast Containment Vault Designed for HS-20 Vehicle Live Load".

Based on the information provided, the Department of Health Services approves the use of this precast concrete structure as a containment vault for the Fuji Clean model CEN21 Innovative and Alternative Onsite Wastewater Treatment System (I/A OWTS) in traffic areas, with a burial depth of one (1) to three (3) feet below finished grade and water table below the bottom of the structure.

This approval requires that at least one readily accessible suction line (minimum ¾-inch diameter) be permanently installed within the containment vault extending from a maximum of 3-inches above the vault's bottom to its access riser, a maximum of 1-foot below finished grade. This suction line is required to be present to allow for purging of trapped storm-water with the use of a portable, self-priming pump as part of routine operations and maintenance servicing of the I/A OWTS.

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.



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

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)
Scott Samuelson (Fuji Clean USA)
Kevin McGowin (Advanced Wastewater Solutions)
Bryan McGowin (Advanced Wastewater Solutions)



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



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. 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.

Project Number: 2021.487.001

10/17/2022

APPROVAL DATE

Ken Zegel, P.E.

DESIGN COMPUTATIONS FOR
SDCHS (CEN21)
16'-0" x 7'-0" x 8'-0" ID
Precast Containment Vault
Designed for HS-20 Vehicle Live Load

PREPARED FOR:

Roman Stone Construction Company
85 South 4th Street
Bay Shore, New York 11706

PREPARED BY:



State License # 111870

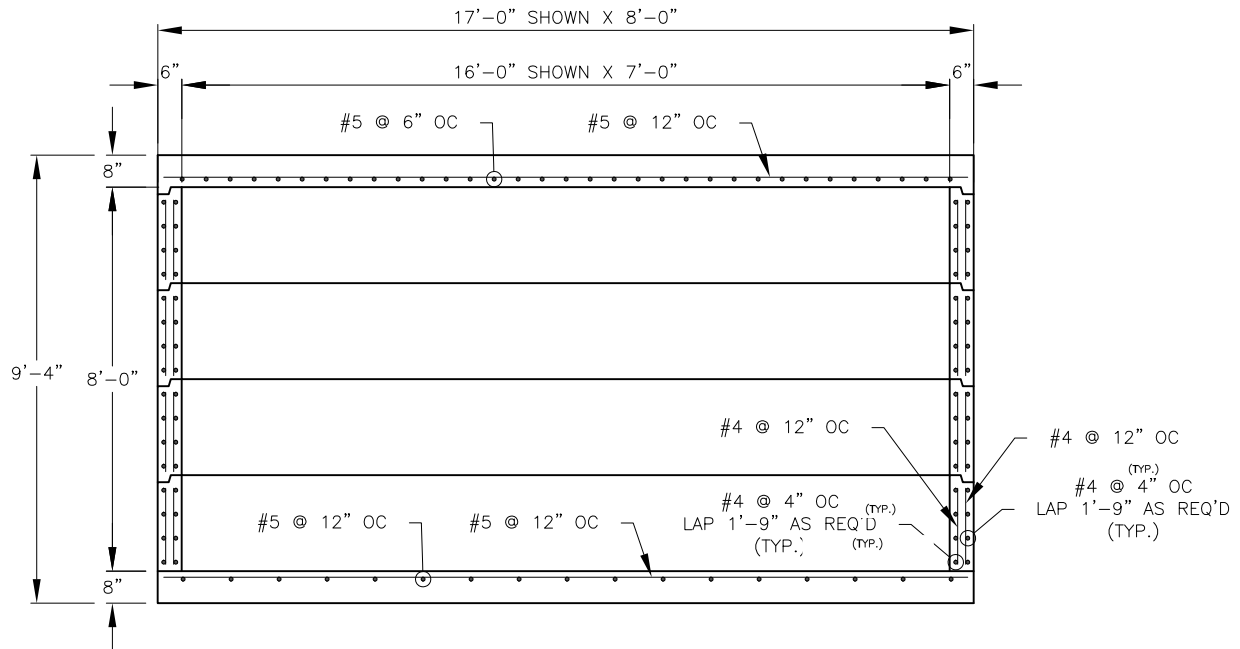


10-15-22

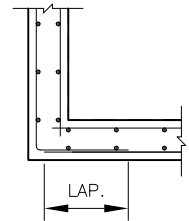
860 Hooper Road, Endwell, New York 13760
TEL: 607-231-6600 FAX: 607-231-6650
EMAIL: precast@delta-eas.com
www.delta-eas.com

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

TYPICAL LAP LENGTH	
BAR SIZE	MINIMUM LAP LENGTH
#4	1'-9"
#5	2'-2"
#6	2'-7"
#7	3'-0"
#8	3'-10"



ELEVATION



CORNER PLAN



10-15-22

DESIGN NOTES

(TO BE VERIFIED BY EOR)

- DESIGN PER ACI 318-14 WITH HS-20 LOADING.
- BAR COVER = 1" U.N.O.
- EARTH COVER = 1'-0" TO 3'-0"
- EQUIVALENT FLUID PRESSURE = 39.6 PCF
- f'c @ 28 DAYS = 5,000 PSI
- WATER TABLE = BELOW BOTTOM OF STRUCTURE.
- REINFORCEMENT = BAR PER ASTM A615, GRADE 60
- TRIM OPENINGS WITH DIAGONAL #4 BARS, EXTEND BARS MINIMUM 12" BEYOND OPENINGS, BEND BARS AS REQ'D TO MAINTAIN BAR COVER.
- PROVIDE ADD'L REINFORCING AT OPENINGS EQUAL TO STEEL INTERRUPTED, HALF EACH SIDE AND IN THE SAME PLANE.

REV. NO. DATE REVISION		PREPARED FOR: ROMAN STONE CONSTRUCTION COMPANY	
PREPARED BY: 860 HOOPER ROAD, ENDWELL, NY 13760-1564 TEL: (607) 231-6600 FAX: (607) 231-6650		DATE: 01/13/21 SCALE: N.T.S.	SHEET TITLE: REINFORCING SUMMARY
PROJECT: SDCHS 16'-0" X 7'-0" X 8'-0" I.D PRECAST VAULT		DRWN BY: CCFH CKD BY:	CONTRACTOR: DELTA PROJ. NO.: 2021.487.001
DWG. I.D. RS-01 SHT. NO. 1 OF 1		DATE: 01/13/21 SCALE: N.T.S.	

JOB: 2020.487.001

DESCRIPTION: 16'-0" x 7'-0" x 8'-0" ID Vault


SHEET NO.: of

CALCULATED BY: CCFH Date 01/13/2021

CHECKED BY: Date

PRECAST VAULT DESIGN DESCRIPTION

Length (I.D.) =	16.00 ft
Width (I.D.) =	7.00 ft
Height (I.D.) =	8.00 ft
Wall Thickness =	6.00 in
Base Slab Thickness =	8.00 in
Cover Slab Thickness =	8.00 in

 Denotes input field

TECHNICAL DATA

Earth Cover (Min.) =	0.00 ft
Earth Cover (Max) =	3.00 ft
Min Watertable Depth =	12.33 ft
ka =	0.33
Unit Weight of Soil =	120 pcf
Equivalent Lateral Fluid Pressure =	0.040 kcf
LL Surcharge =	0.08 ksf
Depth Below F.G. to Apply Surcharge =	8.00 ft

Concrete Strength (f'c) =	5.0 ksi
Unit Weight of Concrete =	150 pcf
$E_c = 57,000 * \sqrt{f'c}$ =	4.03E+06 psi (19.2.2.1.b)
Yield Strength (fy) =	60 ksi
$E_s =$	2.90E+07 psi (20.2.2.2)
$n = E_s / E_c =$	7.2
$\beta_1 =$	0.8 (Table 22.2.2.4.3)
$f_r = 7.5 \sqrt{f'c} =$	530 psi (19.2.3.1)
$Rho_{max} = (.75 \rho_b) =$	0.0251531

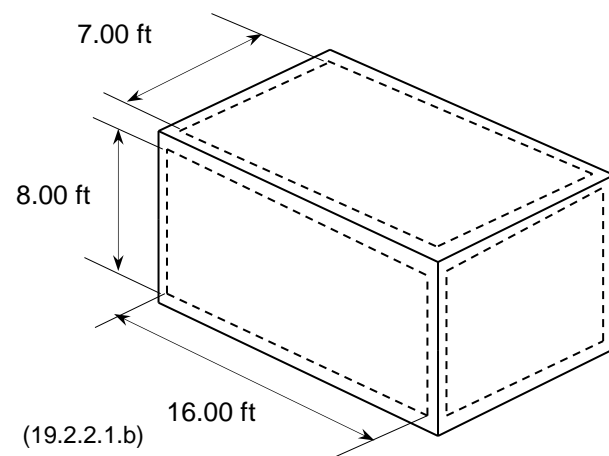
Design Wheel Load (Pw) =	16 kips	AASHTO HS20
Uniform Live Load =	0 psf	

Capacity Reduction Factors:

$$\phi - \text{Shear} = 0.75 \text{ (Table 21.2.1)}$$

Load Factors: (Table 5.3.1)

$\beta - LL =$	1.60
$\beta - DL =$	1.20
$\beta - EL =$	1.60 (5.3.8)



Vault Isometric View
 (Joints not shown for clarity)
 (All dimensions I.D.)



10-15-22

References:

- "Specifications for Highway Bridges, 17th Ed." - AASHTO
- "Building Code Requirements for Structural Concrete" - ACI 318-14.
- "Rectangular Concrete Tanks, 5th Ed." - PCA Publication.
- "Theory of Plates and Shells" - Timoshenko, S. 1959.
- "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
 delta-eas.com
 Phone (607) 231-6600
 Fax (607) 231-6650

JOB: 2020.487.001
 DESCRIPTION: 16'-0" x 7'-0" x 8'-0" ID Vault
 SHEET NO.: of
 CALCULATED BY: CCFH Date 01/13/2021
 CHECKED BY: Date

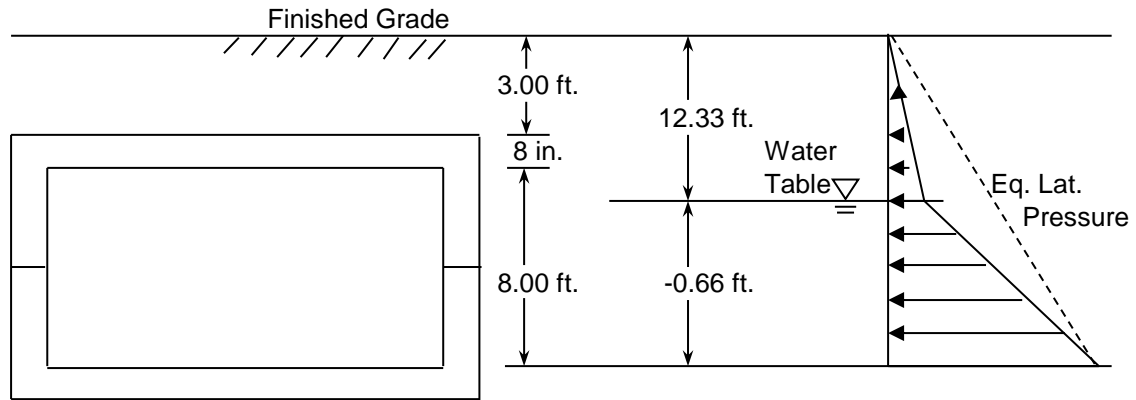
EQUIVALENT LATERAL FLUID PRESSURE:

ka =	0.33	
Unit Wt. of Soil =	120 pcf	
Max. Fill Above Structure =	3.00 ft.	(Worst Case)
Structure Inside Ht. =	8.00 ft.	
Top Slab Thickness =	8.00 in.	
Min. Watertable Depth =	12.33 ft.	

Lateral Pressure (Dry) = 39.6 pcf
 (Ka*Soil Wt.)

Lateral Pressure (Sat.) = 81.4 pcf
 (Ka*(Soil Wt.-62.4pcf)+62.4pcf)

Equivalent Lateral Pressure = **39.6 pcf**



10-15-22



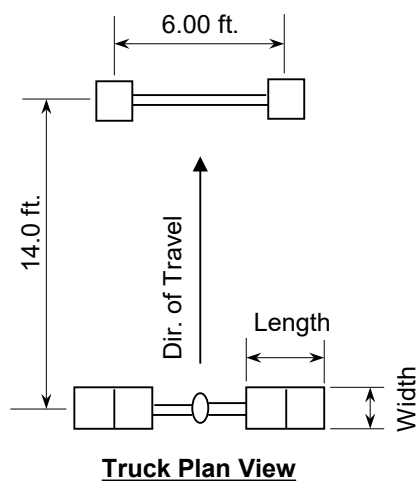
JOB:	2020.487.001
DESCRIPTION:	16'-0" x 7'-0" x 8'-0" ID Vault
SHEET NO.:	of
CALCULATED BY:	CCFH Date 01/13/2021
CHECKED BY:	Date

Determine Uniform Load From Wheel Live Load for Various Fill Depths

Distance Between CL of Wheel and CL of Truck: **3** ft
 Wheel Load: 16 kips

Distribution Length = 1.75 x Depth of Fill + Length of Dual Wheel Dimensions
 Distribution Width = 1.75 x Depth of Fill + Width of Dual Wheel Dimensions

Dual Wheel Dimensions: Length 1.67 ft. Width 0.83 ft. AASHTO 3.30



Depth of Fill (ft)	Distrib. Length	Distrib. Width	Lengths Overlap?	DLA ft^2	Uniform Load psf
3.0	6.92	6.08	YES	78.6	407.4
3.5	7.80	6.96	YES	95.9	333.5
4.0	8.67	7.83	YES	114.9	278.6
4.5	9.55	8.71	YES	135.3	236.5
5.0	10.42	9.58	YES	157.3	203.4
5.5	11.30	10.46	YES	180.8	177.0
6.0	12.17	11.33	YES	205.9	155.4
6.5	13.05	12.21	YES	232.4	137.7
7.0	13.92	13.08	YES	260.6	122.8
7.5	14.80	13.96	YES	290.2	110.3
3.0	6.92	6.08	YES	78.6	407.4
3.0	6.92	6.08	YES	78.6	407.4

Design Min Fill = 3.00 ft	78.6	407.4
Design Max Fill = 3.00 ft	78.6	407.4

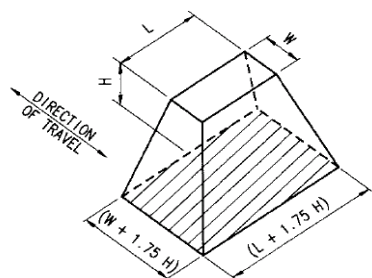


FIG. 4 Distributed Load Area
 (REF "ASTM C 890-91")

Note: If design fill < 3', design using concentrated load case



10-15-22



JOB:	2020.487.001
DESCRIPTION:	16'-0" x 7'-0" x 8'-0" ID Vault
SHEET NO.:	of
CALCULATED BY:	CCFH Date 01/13/2021
CHECKED BY:	Date

**COVER SLAB DESIGN
AASHTO 3.24.6**

Length (I.D.) = 16.00 ft
 Width (I.D.) = 7.00 ft
 Wall Thickness = 6.00 in
 Slab Thickness = 8.00 in

Earth Cover = 1.00 ft
 Bar cover = 1.00 in
 Impact = 1.30

	<u>Short Span</u>	<u>Long Span</u>
Span (s) =	7.50 ft	16.50 ft
Dead Loads: Soil =	0.12 ksf	0.12 ksf
Concrete =	0.10 ksf	0.10 ksf
Additional Uniform Dead Load =	0.00 ksf	0.00 ksf
Total (wdl) =	0.22 ksf	0.22 ksf
2-Way slab fac. (Distributed) =	1.000 (AASHTO 3.24.6.1)	0.000
2-Way slab fac. (Concentrated) =	1.000	0.000
Mdl=wdl l ² / 8 * (2-way slab factor) =	1.55 kip-ft	0.00 kip-ft
e = 4+.06S =	4.45 ft (AASHTO 3.24.3.2)	4.99 ft
p = (Pw * Impact) / e =	4.67 kips/ft	4.17 kips/ft
MII = ps/4*(2-way slab factor) =	8.76 kip-ft	0.00 kip-ft
Mu = γ[β _(L+I) *MII + β _D *Mdl] =	15.88 kip-ft	0.00 kip-ft
d =	6.69 in	6.06 in

Bottom Mat Req. Bar Size and Spacing

Short Span: As =	0.61 in. sq/ft.	Use	# 5	@	6.0 in
Long Span: As =	0.31 in. sq/ft.	Use	# 5	@	12.0 in

Min. Distribution Steel=As/Span²= 0.22 in. sq/ft. **OK, Min. Dist. Reinforcing Met**

$$\rho = \left[1 - \left(\sqrt{1 - \frac{2 \cdot M_u}{\phi b d^2 \cdot 0.85 f'_c}} \right) \right] \cdot \frac{0.85 f'_c}{f_y} = 0.00691224 \quad 0.000000$$

$$\rho * n = 0.04973441 \quad 0$$

Flexure Check:

Moment, φM (ACI 318 Table 21.2.2)=	0.90	0.90
a = AsFy / 0.85f'cb =	0.722 in	0.361 in
c=a/β1=	0.90	0.45

Reinforcing Strain ε_t = (d-c)/c*0.003 = 0.0192 tension controlled 0.0373 tension controlled

$$\epsilon_{ty} = f_y/E_s = 0.002 \quad 0.002$$

$$\phi Mn = \phi * As * Fy * (d - (a/2)) = 17.47 \text{ kip-ft OK} \quad 8.12 \text{ kip-ft OK}$$

Cracking Reinforcing Spacing: ACI 318 - Table 24.3.2

$$k = \sqrt{2\rho n + (\rho n)^2} - \rho n = 0.270 \quad 0.000$$

$$j = 1 - (k/3) = 0.910 \quad 1.000$$

$$M = Mdl + MII = 10.31 \text{ kip-ft} \quad 0.00 \text{ kip-ft}$$

$$fs = M / As j d = 33.13 \text{ ksi OK} \quad 0.00 \text{ ksi OK}$$

$$s = \min(15(40000/fs) - 2.5c_c, 12 * 40000/fs) = 14 \text{ in OK} \quad 99 \text{ in OK}$$

Note: Shear considered satisfactory per AASHTO 3.24.4



10-15-22

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

JOB: 2020.487.001
 DESCRIPTION: 16'-0" x 7'-0" x 8'-0" ID Vault
 SHEET NO.: of
 CALCULATED BY: CCFH Date 01/13/2021
 CHECKED BY: Date

COVER SLAB DESIGN
AASHTO 3.24.6
(Continued)

MINIMUM REINFORCING - ACI 318 - Table 7.6.1.1

Short Span

As, min = Max of

$$((0.0018 * 60,000) / f_y) * A_g = 0.17 \text{ in}^2/\text{ft} \leq \text{Controls}$$

$$\text{OR } 0.0014 * A_g = 0.13 \text{ in}^2/\text{ft}$$

OK, As Provided > As Min.

Long Span

As, min = Max of

$$((0.0018 * 60,000) / f_y) * A_g = 0.17 \text{ in}^2/\text{ft} \leq \text{Controls}$$

$$\text{OR } 0.0014 * A_g = 0.13 \text{ in}^2/\text{ft}$$

OK, As Provided > As Min.



10-15-22

COVER SLAB DESIGN
UNIFORM LIVE LOAD
MAX FILL
ASTM C890

Length (I.D.) = 16.00 ft.
 Width (I.D.) = 7.00 ft.
 Wall Thickness = 6.00 in
 Slab Thickness = 8.00 in
 Earth Cover = 3.00 ft.
 Bar cover = 1.00 in



	<u>Short Span</u>	<u>Long Span</u>
Span =	7.50 ft.	16.50 ft.
Dead Loads: Soil =	0.36 ksf	0.36 ksf
Concrete =	0.10 ksf	0.10 ksf
Additional Uniform Dead Load =	0.00 ksf	0.00 ksf
Total (wdl) =	0.46 ksf	0.46 ksf
2-Way slab fac. (Distributed) =	1.000 (AASHTO 3.24.6.1)	0.000
Mdl=wdl l ² / 8 * (2-way slab factor) =	3.23 kip-ft	0.00 kip-ft
DLA =	78.55 sf	78.55 sf
WII =	0.407 ksf	0.407 ksf
MII=wII l ² / 8 * (2-way slab factor) =	2.86 kip-ft	0.00 kip-ft
Mu = γ[β _(L+I) *MII + β _D *Mdl] =	8.46 kip-ft	0.00 kip-ft
d =	6.69 in	6.06 in

Req. Bar Size and Spacing

Short Span: As = 0.61 in. sq/ft.	Use	# 5	@	6.0 in
Long Span: As = 0.31 in. sq/ft.	Use	# 5	@	12.0 in

$$\rho = \left[1 - \left(\sqrt{1 - \frac{2 \cdot M_u}{\phi b d^2 \cdot 0.85 f'_c}} \right) \right] \cdot \frac{0.85 f'_c}{f_y} = 0.00359605$$

$$\rho * n = 0.02587405$$

Flexure Check:

Moment, ΦM (ACI 318 Table 21.2.2)=	0.90	0.90
a = AsFy / 0.85f'cb =	0.722 in	0.361 in
c=a/β1=	0.90	0.45
Reinforcing Strain ε _t = (d-c)/c*0.003 =	0.0192 tension controlled	0.0373 tension controlled
ε _{ty} = fy/E _s =	0.002	0.002
φMn = φ*As*Fy*(d-(a/2)) =	17.47 kip-ft OK	8.12 kip-ft OK
Cracking Reinforcing Spacing: ACI 318 - Table 24.3.2		
k = √(2ρn + (ρn) ²) - ρn =	0.203	0.000
j = 1 - (k/3) =	0.932	1.000
M = Mdl + MII =	6.10 kip-ft	0.00 kip-ft
fs = M / As j d =	19.13 ksi OK	0.00 ksi OK
s = min(15(40000/fs)-2.5c _c , 12*40000/f _s) =	25 in OK	99 in OK

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

JOB: 2020.487.001
 DESCRIPTION: 16'-0" x 7'-0" x 8'-0" ID Vault
 SHEET NO.: of
 CALCULATED BY: CCFH Date 01/13/2021
 CHECKED BY: Date

COVER SLAB DESIGN
UNIFORM LIVE LOAD
MAX FILL
ASTM C890
(Continued)

Shear Check:

$$V_u @ d = \gamma[\beta_{LL} * W_{ll} + \beta_{DL} * W_{dl}] *$$

$$[(\text{span}/2) - d] = 3.84 \text{ kips/ft}$$

$$\phi V_c = 8.51 \text{ kips/ft} \quad \mathbf{OK}$$

MINIMUM REINFORCING - ACI 318 - Table 7.6.1.1

Short Span

As, min = Max of

$$((0.0018 * 60,000) / f_y) * A_g = 0.17 \text{ in}^2/\text{ft} \quad \leq \text{Controls}$$

$$\mathbf{OR} \quad 0.0014 * A_g = 0.13 \text{ in}^2/\text{ft}$$

OK, As Provided > As Min.

Long Span

As, min = Max of

$$((0.0018 * 60,000) / f_y) * A_g = 0.17 \text{ in}^2/\text{ft} \quad \leq \text{Controls}$$

$$\mathbf{OR} \quad 0.0014 * A_g = 0.13 \text{ in}^2/\text{ft}$$

OK, As Provided > As Min.



10-15-22

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

JOB: 2020.487.001
 DESCRIPTION: 16'-0" x 7'-0" x 8'-0" ID Vault
 SHEET NO.: of
 CALCULATED BY: CCFH Date 01/13/2021
 CHECKED BY: Date

WALL DESIGN
UNIFORM LOAD
MOMENT DISTRIBUTION
RISER

Height = 2.00 ft (Max.)
 Length b = 16.00 ft
 Width c = 7.00 ft
 Wall Thickness = 6.00 in

Use Interior Support (Y or N) **N**

Distribution Factor (l) = 0.304
 Distribution Factor (s) = 0.696
 Fixed end moment (l) = 9.01 kip-ft
 Fixed end moment (s) = 1.72 kip-ft
 Simple span moment (long) = 13.52 kip-ft
 Simple span moment (short) = 2.59 kip-ft
 Balanced moment at corner (-) = 6.79 kip-ft
 Pos. moment @ midspan (+) = 6.72 kip-ft

OUTSIDE FACE

Bar cover = 1.00 in

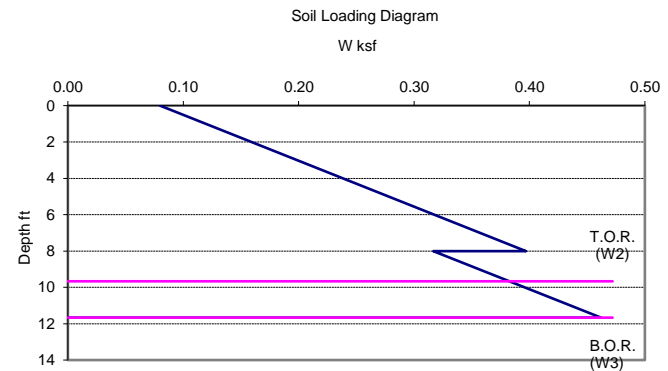
	Mu	ϕM_n	Bar Sz	Sp	d	As	a
Horizontal (-)	10.87 kip-ft	11.67 kip-ft	# 4	4.0 in	4.75 in	0.59 in. sq/ft.	0.69 in

Moment, ϕM (ACI 318 Table 21.2.2) = 0.9 (varies from 0.9 for tension controlled to 0.65 for compression controlled)
 $c = a/\beta_1 = 0.87$
 Reinforcing Strain $\epsilon_t = (d-c)/c \cdot 0.003 = 0.0135$ tension controlled
 $\epsilon_{ty} = f_y/E_s = 0.002$

$V_u @ d = \gamma[\beta E L \cdot W_{avg}] \cdot [(span/2) - d] = 5.14$ kips $\phi V_c = 6.05$ kips
 $\phi V_c > V_u$: **OK**
 Inflection pt. (from corner) 2.36 ft $l_{db} = 12$ in
 Extend bar from corner 3.36 ft Lap ($1.7 \cdot l_{db}$) = 21 in

Cracking Reinforcing Spacing: ACI 318 - Table 24.3.2

$\rho = A_s / b \cdot d = 0.01033$
 $\rho \cdot n = 0.07436$
 $k = \sqrt{2\rho n + (\rho n)^2} - \rho n = 0.318$
 $j = 1 - (k/3) = 0.894$
 $M = M_{dl} + M_{ll} = 6.79$ kip-ft
 $f_s = M / A_s j d = 32.60$ ksi **OK**
 $s = 15(40000/f_s) - 2.5c_c = 14.73$ in [and $\leq 12(40000/f_s)$] **OK**



Horizontal lines indicate top & bottom of riser wall

Lateral Earth Pressure

Eq. Lat. Press. = 0.040 kcf
 $W_2 = 0.38$ ksf
 $W_3 = 0.46$ ksf
 $W_{avg} = 0.42$ ksf
No Surcharge



10-15-22

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

JOB: 2020.487.001

DESCRIPTION: 16'-0" x 7'-0" x 8'-0" ID Vault

SHEET NO.: of

CALCULATED BY: CCFH Date 01/13/2021

CHECKED BY: Date

Moment Distribution Riser (cont.)**MINIMUM REINFORCING** - ACI 318 - Table 8.6.1.1**Horizontal**

As, min = Max of

$$((0.0018 * 60,000) / f_y) * A_g = 0.13 \text{ in}^2/\text{ft} \leq \text{Controls}$$

$$\text{OR } 0.0014 * A_g = 0.10 \text{ in}^2/\text{ft}$$

OK, As Provided > As Min.**Vertical****Minimum reinforcing requirement does not apply per ACI R11.6.1****INSIDE FACE**

Bar Cover = 1.00 in in

	Mu	ϕM_n	Bar Sz	Sp	d	As	a
Horizontal (+)	10.76 kip-ft	11.67 kip-ft	# 4	4.0 in	4.750 in	0.59 in. sq/ft.	0.69 in

Moment, ϕM (ACI 318 Table 21.2.2) = 0.9 (varies from 0.9 for tension controlled to 0.65 for compression controlled)
 $c = a / \beta_1 = 0.87$

Reinforcing Strain $\epsilon_t = (d-c) / c * 0.003 = 0.0135$ tension controlled

$$\epsilon_{ty} = f_y / E_s = 0.002$$

Cracking Check:

$$\rho = A_s / b * d = 0.01033$$

$$\rho * n = 0.07436$$

$$k = \sqrt{2\rho n + (\rho n)^2} - \rho n = 0.318$$

$$j = 1 - (k/3) = 0.894$$

$$M = M_{dl} + M_{ll} = 6.72 \text{ kip-ft}$$

$$f_s = M / A_s j d = 32.26 \text{ ksi} \quad \text{OK}$$

$$s = 15(40000 / f_s) - 2.5c_c = 14.88 \text{ in} \quad [\text{and } \leq 12(40000 / f_s)] \quad \text{OK}$$

MINIMUM REINFORCING - ACI 318 - Table 8.6.1.1**Horizontal**

As, min = Max of

$$((0.0018 * 60,000) / f_y) * A_g = 0.13 \text{ in}^2/\text{ft} \leq \text{Controls}$$

$$\text{OR } 0.0014 * A_g = 0.10 \text{ in}^2/\text{ft}$$

OK, As Provided > As Min.**Vertical****Minimum reinforcing requirement does not apply per ACI R11.6.1**

10-15-22



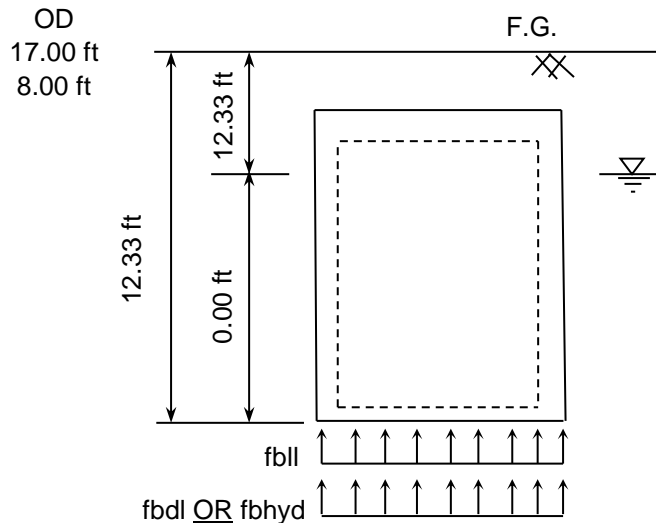
JOB: 2020.487.001
 DESCRIPTION: 16'-0" x 7'-0" x 8'-0" ID Vault
 SHEET NO.: of
 CALCULATED BY: CCFH Date 01/13/2021
 CHECKED BY: Date

BASE SLAB DESIGN
HINGED 4 SIDES
PCA Rectangular Concrete Tanks
Case #10

	ID
Length =	16.00 ft
Width =	7.00 ft
Wall Thickness =	6.00 in
Slab Thickness =	8.00 in
b/a =	2.3
Number of Wheels =	3

Vertical Loads:

Soil =	48.96 kips
Cover slab =	13.60 kips
Walls =	28.80 kips
Other =	
Total Dead Load =	91.36 kips
Live Load =	48.00 kips



Loading Diagram
 Ref: ASTM C857 Sec 4.3

Net upward bearing pressure:

Dead Load, fbdl =	0.67 ksf	← Controls
Hydrostatic, fbhyd =	0.00 ksf	(0.00 ft * 0.0624 kcf)
Live Load, fbll =	+ 0.35 ksf	
w =	1.02 ksf	
Wu =	1.37 ksf	

Top cage

Transverse Coeff. =	0.107
Longitudinal Coeff. =	0.037
Bar cover =	1.00 in
Transverse Moment =	5.38 kip-ft
Longitudinal Moment =	1.88 kip-ft



10-15-22

	Mu	φMn	Bar Sz	Sp	d	As	a
Transverse	7.20 kip-ft	8.98 kip-ft	# 5	12.0 in	6.69 in	0.31 in. sq/ft.	0.36 in
Longitudinal	2.51 kip-ft	8.12 kip-ft	# 5	12.0 in	6.06 in	0.31 in. sq/ft.	0.36 in
Shear Coeff. =	0.472						
Vu @ 'd' =	4.17 kips						

φVc = 8.51 kips φVc > Vu: **OK**

BASE SLAB DESIGN
HINGED 4 SIDES
PCA Rectangular Concrete Tanks
Case #10
(Continued)

	<u>Transverse</u>		<u>Longitudinal</u>	
Moment, ΦM (ACI 318 Table 21.2.2)=	0.90		0.90	(varies from 0.9 for tension
$c=a/\beta_1=$	0.45		0.45	controlled to 0.65 for
				compression controlled)
Reinforcing Strain $\epsilon_t = (d-c)/c \cdot 0.003 =$	0.0415	tension controlled	0.0373	tension controlled
$\epsilon_{ty} = f_y/E_s =$	0.002		0.002	

Cracking Reinforcing Spacing: ACI 318 - Table 24.3.2

	<u>Transverse</u>		<u>Longitudinal</u>	
$\rho = A_s / b \cdot d =$	0.003823		0.004217	
$\rho \cdot n =$	0.027507		0.030343	
$k = \sqrt{2\rho n + (\rho n)^2} - \rho n =$	0.209		0.218	
$j = 1 - (k/3) =$	0.930		0.927	
$M =$	5.38 kip-ft		1.88 kip-ft	
$f_s = M / A_s j d =$	33.83 ksi	OK	13.06 ksi	OK
$s = 15(40000/f_s) - 2.5c_c =$	14.19 in	OK	36.74 in	OK
[and $\leq 12(40000/f_s)$]				

MINIMUM REINFORCING - ACI 318 - Table 8.6.1.1

Transverse

$A_s, \text{ min} = \text{Max of}$
 $((0.0018 \cdot 60,000)/f_y) \cdot A_g = 0.17 \text{ in}^2/\text{ft} \leq \text{Controls}$
OR $0.0014 \cdot A_g = 0.13 \text{ in}^2/\text{ft}$

OK, As Provided > As Min.

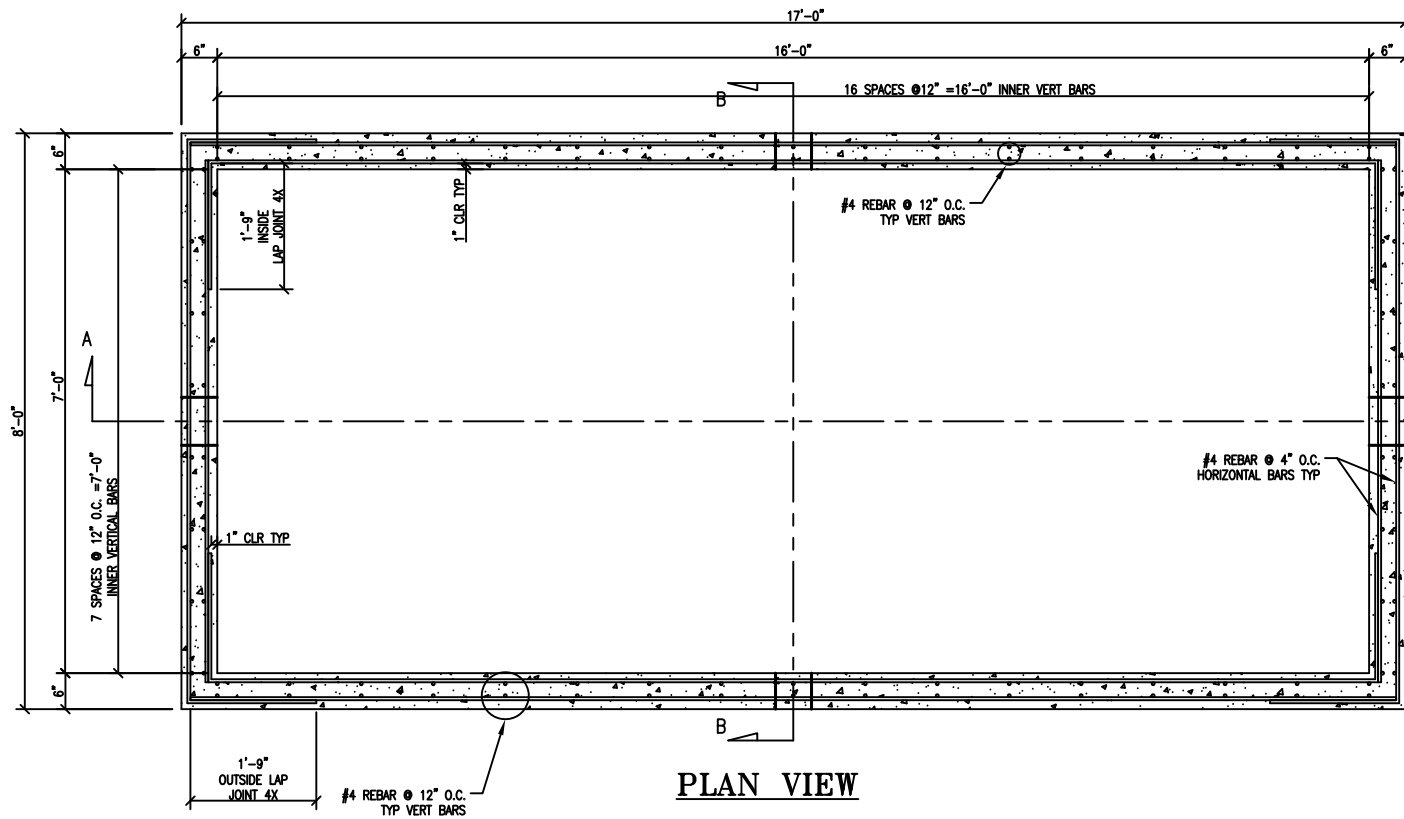
Longitudinal

$A_s, \text{ min} = \text{Max of}$
 $((0.0018 \cdot 60,000)/f_y) \cdot A_g = 0.17 \text{ in}^2/\text{ft} \leq \text{Controls}$
OR $0.0014 \cdot A_g = 0.13 \text{ in}^2/\text{ft}$

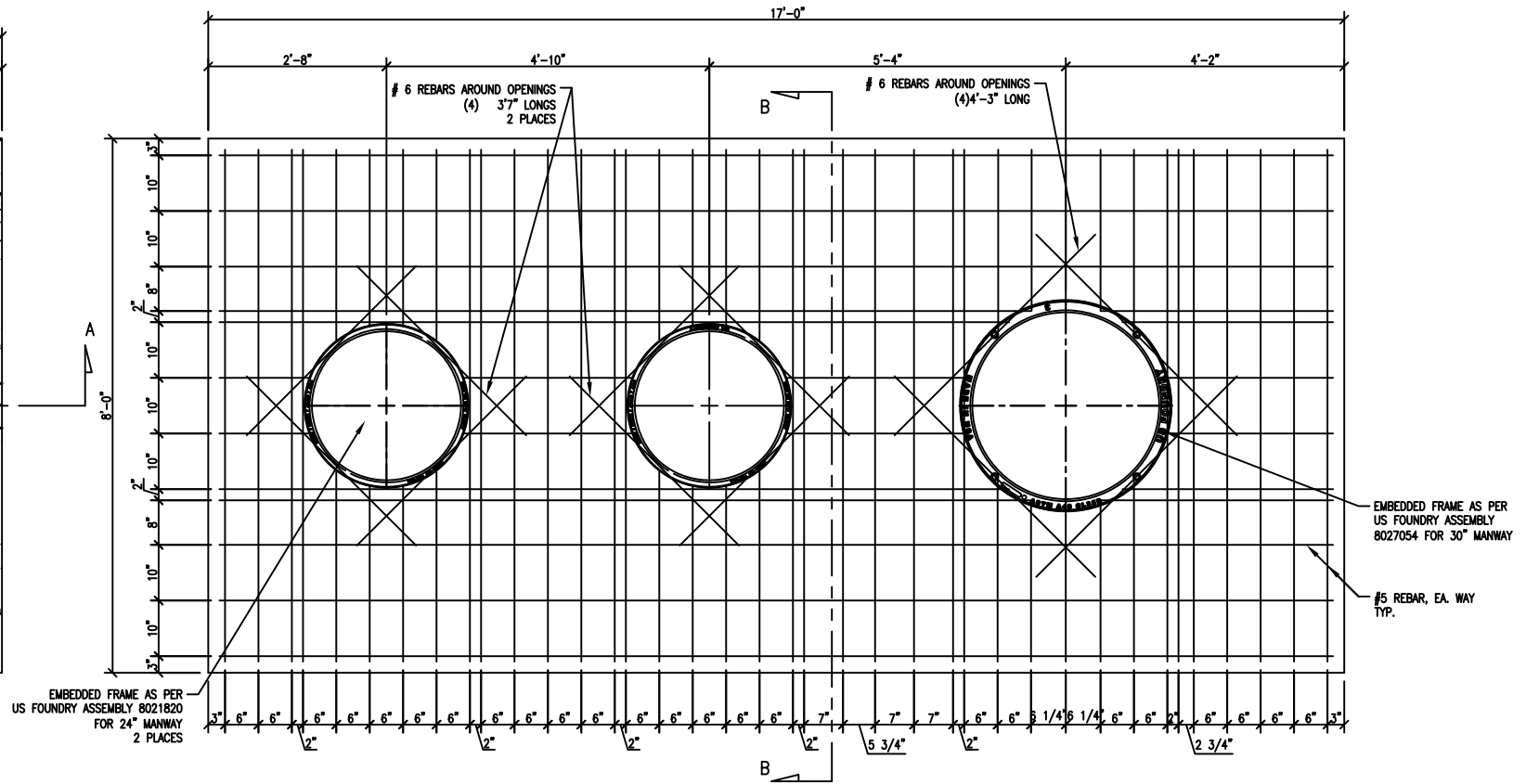
OK, As Provided > As Min.



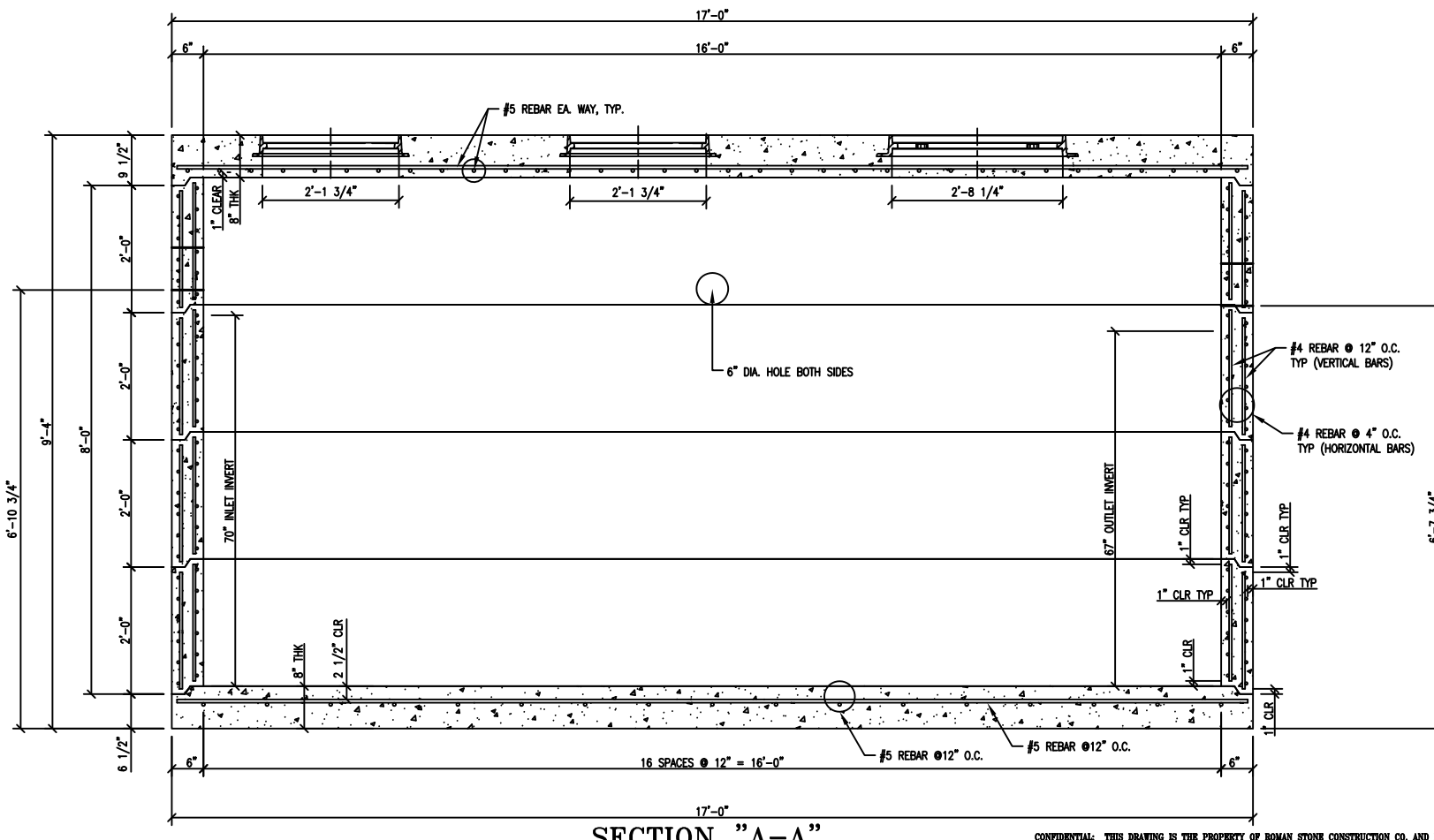
10-15-22



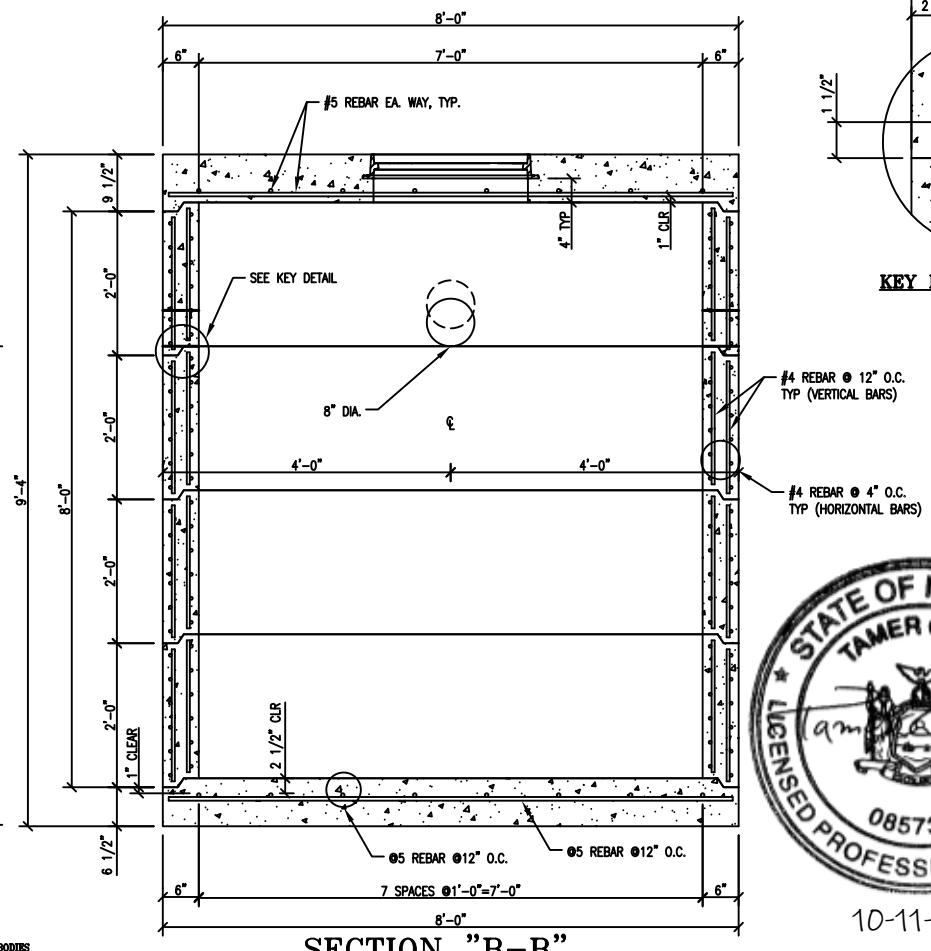
PLAN VIEW



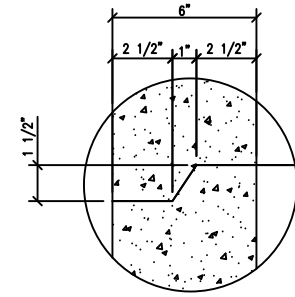
PLAN VIEW TOP SLAB



SECTION "A-A"



SECTION "B-B"



KEY DETAIL

- NOTES**
1. CONCRETE 4000 PSI @ 28 DAYS.
 2. WEIGHT OF TANK SECTION 1 = 7,000 LBS
 3. WEIGHT OF TANK SECTION 2 = 7,000 LBS
 4. WEIGHT OF TANK SECTION 3 = 7,000 LBS
 5. WEIGHT OF TANK SECTION 4 = 7,000 LBS
 6. WEIGHT OF TOP SLAB = 14,000 LBS
 7. WEIGHT OF BOTTOM SLAB = 13,200 LBS
 8. INSIDE OF CONCRETE VAULT TO BE MARKED: ROMAN STONE CONSTRUCTION CO. MONTH/DAY/YEAR MARK
 9. 1" MIN. CLEAR COVER UNLESS NOTED OTHERWISE.
 10. RATED LIFTING DEVICES WILL BE PLACED PER PRECASTER'S RECOMMENDATIONS.
 11. DIMENSIONAL TOLERANCE - ±1/2"

Approved
 Approved As Noted
 By _____ Date _____
 Drawing Verified in Customary Units Only



10-11-22

REVISIONS		
No.	Description	Date
1	Added 8" Holes	9/14/22

ROMAN STONE CONSTRUCTION CO.			
85 SOUTH FOURTH STREET			
BAYSHORE N.Y. 11706 (631) 667-0566			
DWG. NO:	21-FUJICLEANCEN21-1		
PRODUCT:	HS20 Precast Containment Vault - Cen21		
PROJECT:	CEN21		
CUSTOMER:	FujiClean USA		
SCALE	DATE	DRAWN BY	CHECK BY
SEE DWG. 04/22/22	JR	MS	1

CONFIDENTIAL: THIS DRAWING IS THE PROPERTY OF ROMAN STONE CONSTRUCTION CO. AND EMBODIES CONFIDENTIAL INFORMATION, TRADE SECRET INFORMATION, AND/OR KNOW HOW THAT IS PROPERTY OF ROMAN STONE CONSTRUCTION CO. © COPYRIGHT 2010 ROMAN STONE CONSTRUCTION CO.