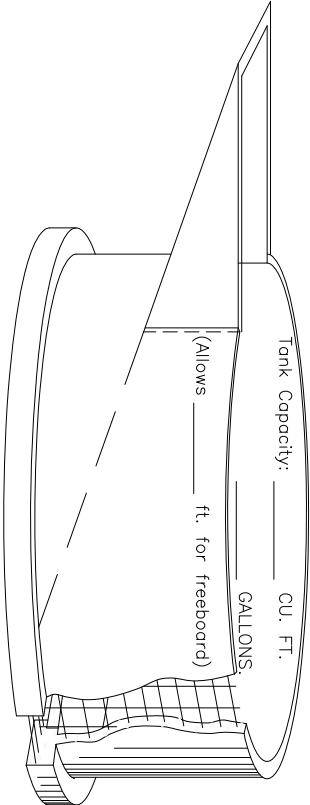


The design is in accordance with strength design requirements detailed in ACI 318–05.



CIRCULAR CONCRETE MANURE TANK

DESIGN LOADING:

1. Manure load: 65 psf/ft of depth with a Factor of Safety = 1.2.
2. Soil back fill loads: Equivalent Fluid Pressure 45 psf/ft of depth with no surcharge and a F.S. = 1.6. This requires the structure to be backfilled for adequate drainage. See wall backfill details for fill material and placement requirements necessary to meet wall loading conditions.
3. Supplemental design and calculations performed by TeamAG January 9, 2008.

CONSTRUCTION NOTES:

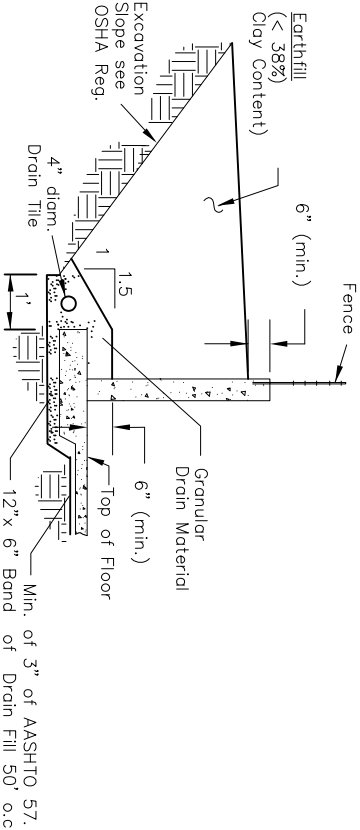
1. All reinforcing steel shall have a yield point of $f_y = \underline{60,000}$ psi
2. For splice lengths, refer to the table on Sheet 2. All bends in reinforcing steel shall have a minimum radius of 3 bar diameters.
3. All concrete shall have a minimum 28 day compressive strength of 4,000 psi. The mix design shall be submitted to NRCS prior to placement.
4. Construction joints may be used to facilitate construction. The location of construction joints shall be approved by the Engineer prior to placing the concrete. See Sheet 2.
5. Refer to manufacturer's recommendation for placing water stop material.
6. Backfill shall be brought up uniformly around the tank. The maximum difference in the finished back fill elevations around the tank shall be 4 feet.
7. All construction methods shall meet OSHA regulations.
8. Foundations (footings) shall extend to below frost depth or otherwise be protected from frost heaving or freezing as approved by the engineer. Required bearing pressure greater than 2,000 psf.
9. Installation of this structure shall conform to NRCS Construction Specifications 313S.

SAFETY REQUIREMENTS:

1. The tank shall be surrounded by a chain link or woven wire fence.(min 5' height)
2. Posts shall be attached to the wall or can be cast into the concrete wall, with a 6" rebar welded to the base of the post. The posts must be capped at time of installation See PA Standard 382 Fence or Standard Drawing PA–002A.
3. Gates and safety stops shall be installed at pushoff locations to prevent accidental entry of equipment, people and animals. See PA Standard Drawing PA–039.
4. Warning and Hazard signs shall be erected at the tank stating drowning and/or agitation hazards. See PA Standard 313 for types and locations. See NRCS–PA Fact Sheet 4 for examples.

VEHICLE ACCESS / SURCHARGE LOAD:

Depending on vehicle weight and location to facility, a concrete pad may be required near or on the tank wall. The purpose of the slab is to distribute the loading along the tank wall. See section labeled "Wall Backfill with Vehicle Surcharge" for additional details.



WALL BACKFILL DETAIL–TYPICAL

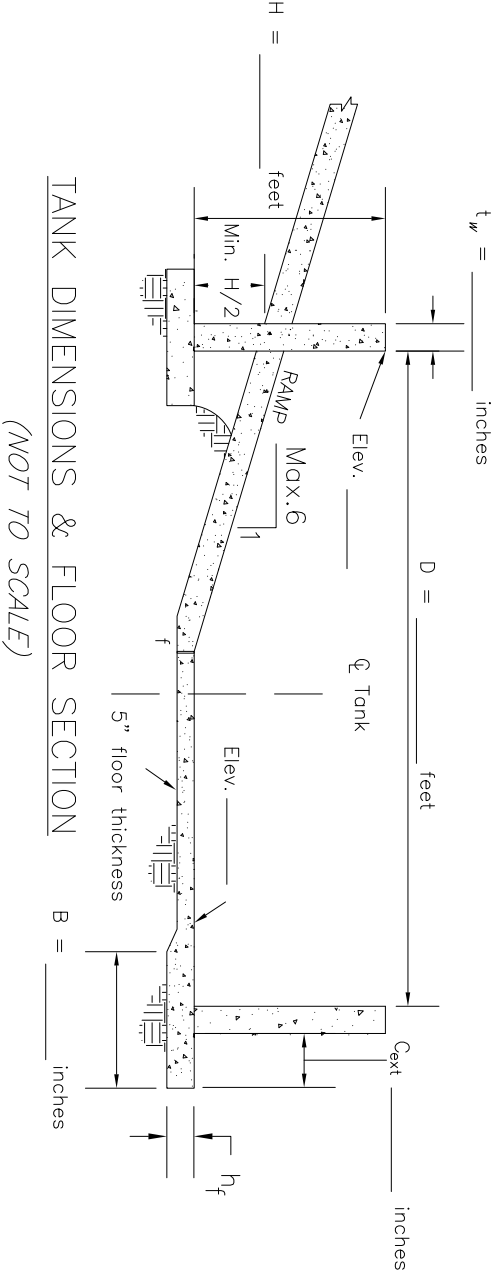
1. Provide a minimum 4 inch diameter perimeter drain tile for wall backfill drainage. Outlet the tile at a location downslope where flow from the outlet may be monitored. Provide heavy wall pipe where backfill cover is < 24". Provide an animal guard on all outlets.
2. If a high water table is present a special drain design will be required under the tank floor to prevent uplift.
3. To provide adequate drainage, the granular drain material shall be clean with maximum 5 percent fines. The maximum particle size shall be 1.5 inches.
4. Provide a 12"x6" band of granular drain material under the footing every 50' on center around the tank perimeter as a minimum.
5. Provide Min. of 3' of backfill over top of footing for frost protection.

WALL BACKFILL with VEHICLE SURCHARGE

1. Agitation and unloading equipment (<8K axle load) at wall requires a 12" thick stone pod. Backfill under pod to be placed in uniform 6 inch lifts and mechanically compacted.
2. Heavy agitation and unloading equipment (>8K axle load) at wall requires a concrete pod. Pod to set on top of wall, in notch or on support pillars meeting Standard Drawing PA–068. Backfill under pod to be placed in uniform 6 inch lifts and mechanically compacted.
- Option: A concrete pod may be deleted for equipment loads (>8k to 15k axle load) if the following wall reinforcement is added. Single mat requires (6) extra horizontal #6 bars @ 4" o.c. starting at top of wall and change vertical steel spacing to 6". Double mat requires (5) horizontal #6 bars @ 4" o.c. each face, starting at top of wall with no change in vertical steel. In all cases extend steel changes 12' beyond opening, on both sides.
3. Manure being pushed directly into tank requires a concrete pod. Pod to be set on top of wall or in notch. Pod shall meet Standard Drawing PA–068 or PA–040. Backfill under pod to be placed in uniform 6 inch lifts and mechanically compacted.
4. If heavy tank wagons or loaded trucks are driven near the tank wall (within a distance equal to the tank wall or backfill height) a concrete slab is required. Slab to be 6" thick with #4 bars at 18" both ways. Backfill under pod shall be granular (GP, GW, SP, SW, GM, GC or equal). It shall be placed in uniform 6 inch lifts and mechanically consolidated.
5. Agitation and unloading equipment access point shall be at least 12' away from access ramp wall.

*** ADDITIONAL DRAWING USAGE INFORMATION ***

1. Pg. 6 of PA–067 is the steel schedule. Select 1 of 32 options on Pages 6.01–6.32. Use next larger tank size for steel spacing, size, and wall thickness for intermediate diameters.
2. Kicker walls can NOT be used on this tank design.
3. Depth Options are 8, 10, 12 & 14 feet.
4. Diameter range up to 200 feet.
5. These drawings are "Concurred with by NRCS" for meeting Practice Standard 313, however they require additional review and approval by NRCS Engineering prior to their use for a site specific project. All other users do so at their own risk and agree to indemnify, defend and hold harmless NRCS against any claims, liability, and expense arising from such use.
6. The use of these drawings for liquid manure storage requires approval by a PA Registered Engineer.



TANK DIMENSIONS & FLOOR SECTION

(NOT TO SCALE)

REVISION LOG

Revised 10/13 PJV –Correct issues on steel schedules –Move radial steel –Reword unloading pod options and Safety statement and drawing use 1/14 Font changes	Revision 3 6/20 TMP Horizontal rebar A _{sr} increased to at least 0.5% for bottom 1/4 of tank wall. Change reflected on tank specific horizontal A _{sr} steel schedules (sheet 6).
---	--

_____ COUNTY, PENNSYLVANIA
PA ROUND TANK W/RAMP DETAIL

Revisions	<u>Latshaw</u>	Date	<u>1/31/02</u>
Revisions	<u>Pereverzeff & PJV</u>	<u>1/08 10/13</u>	
Redrawn	<u>Hartz</u>	<u>2/1/08</u>	

Designed	<u>PA NRCS</u>	Date	<u>12/01</u>
Drawn	<u>WHL/HLS/PJV</u>	<u>1/31/02, 10/13,01/1-</u>	
Checked	_____		
Approved by	_____		



File No.	<u>PA–067–r3.dwg</u>
Drawing No.	<u>PA–067–r3</u>
Sheet	<u>1</u> of <u>6</u>

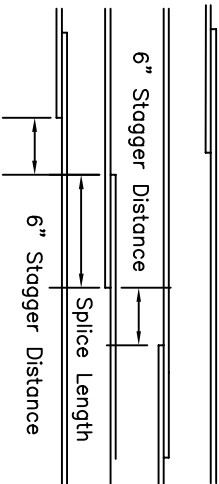
FOOTING DIMENSION & STEEL (A_{s1} & A_{s2})

Wall Height H (ft)	Wall Thickness T_w (in)	Footing Width B (in)	Footing Depth h_f (in)	Overhang C_{ext} (in)	Rebar To Wall Parallel Ring Steel A_{s1}	Rebar To Wall Perpendicular Radial Steel A_{s2}
8,10,12	8	20	12	6	3-#4 Rebar	Use #4 Rebar placed at Vertical Wall Steel (A_{sv}) spacing. For spacing greater than 9 inches use #5 bars, or #4 bars placed at $\frac{1}{2} (A_{sv})$ spacing.
8,10,12	10	24	12	7	3-#4 Rebar	
10	12	24	12	6	3-#4 Rebar	
12,14	12	30	12	8	3-#4 Rebar	

1. Required soil bearing pressure shall be at least 2,000 psi
2. Place ring steel 3 inches above the footing bottom.
3. Place radial steel on top of ring steel.

SPLICE LENGTH FOR ALL BARS

Bar Size	Min. Splice Lengths
#3	18 inches
#4	25 inches
#5	32 inches
#6	38 inches



SPlicing DETAIL FOR WALL AND FOOTING RING STEEL

FLOOR STEEL (A_s)

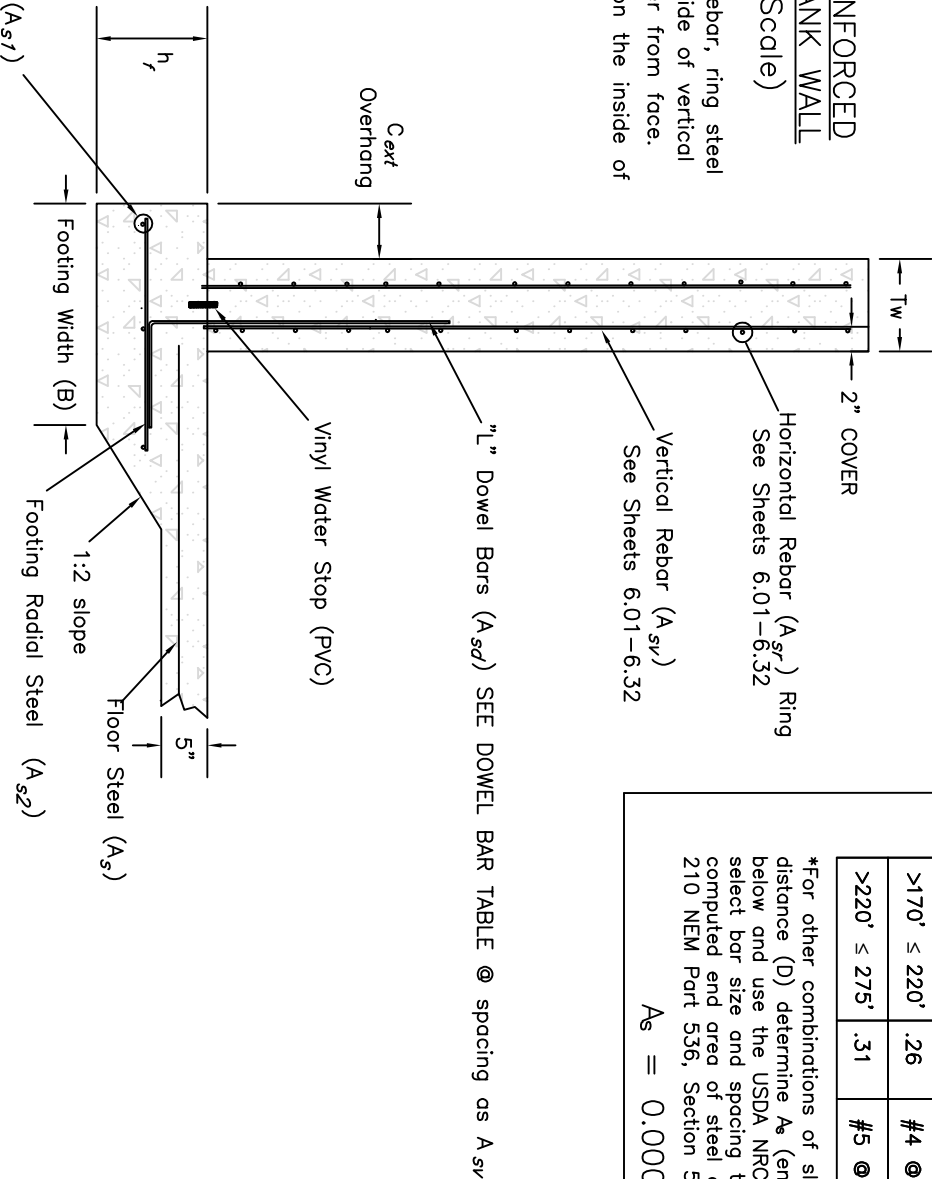
DISTANCE BETWEEN JOINTS	A _s	FOR 5" THICK FLOOR
		EXAMPLE
≤ 50'	.058	6x6-W2.9xW2.9 (6 ga.)
>50' ≤ 75'	.09	#3 @ 15" both ways
>75' ≤ 110'	.13	#4 @ 18" both ways
>110' ≤ 170'	.20	#4 @ 12" or #5 @ 18" both ways
>170' ≤ 220'	.26	#4 @ 9" or #5 @ 15" both ways
>220' ≤ 275'	.31	#5 @ 12" both ways

*For other combinations of slab thickness (t) and diameter of distance (D) determine A_s (end area of steel, in^2) as shown below and use the USDA NRCS Standard Drawing ES-46 to select bar size and spacing that meets or exceeds the computed end area of steel or refer to ACI 330R as per Title 210 NEM Part 536, Section 536.22 A.

$$A_s = 0.0002265(D)(t)$$

DOUBLE REINFORCED
CIRCULAR TANK WALL
(Not to Scale)

1. For double mat of rebar, ring steel shall be located outside of vertical and have 2" of cover from face.
2. Place vertical steel on the inside of the ring steel.
- 
- The diagram shows a cross-section of a concrete slab with two layers of reinforcement. The top layer consists of horizontal bars (ring steel) and vertical bars (vertical rebar). The bottom layer consists of horizontal bars (ring steel). The vertical rebar is shown extending from the top layer down to the bottom layer. A label 'Vertical Rebar (A_{sv})' with an arrow points to the vertical rebar. Another label 'See Sheets 6.01-6.32' with an arrow points to the bottom layer of reinforcement.

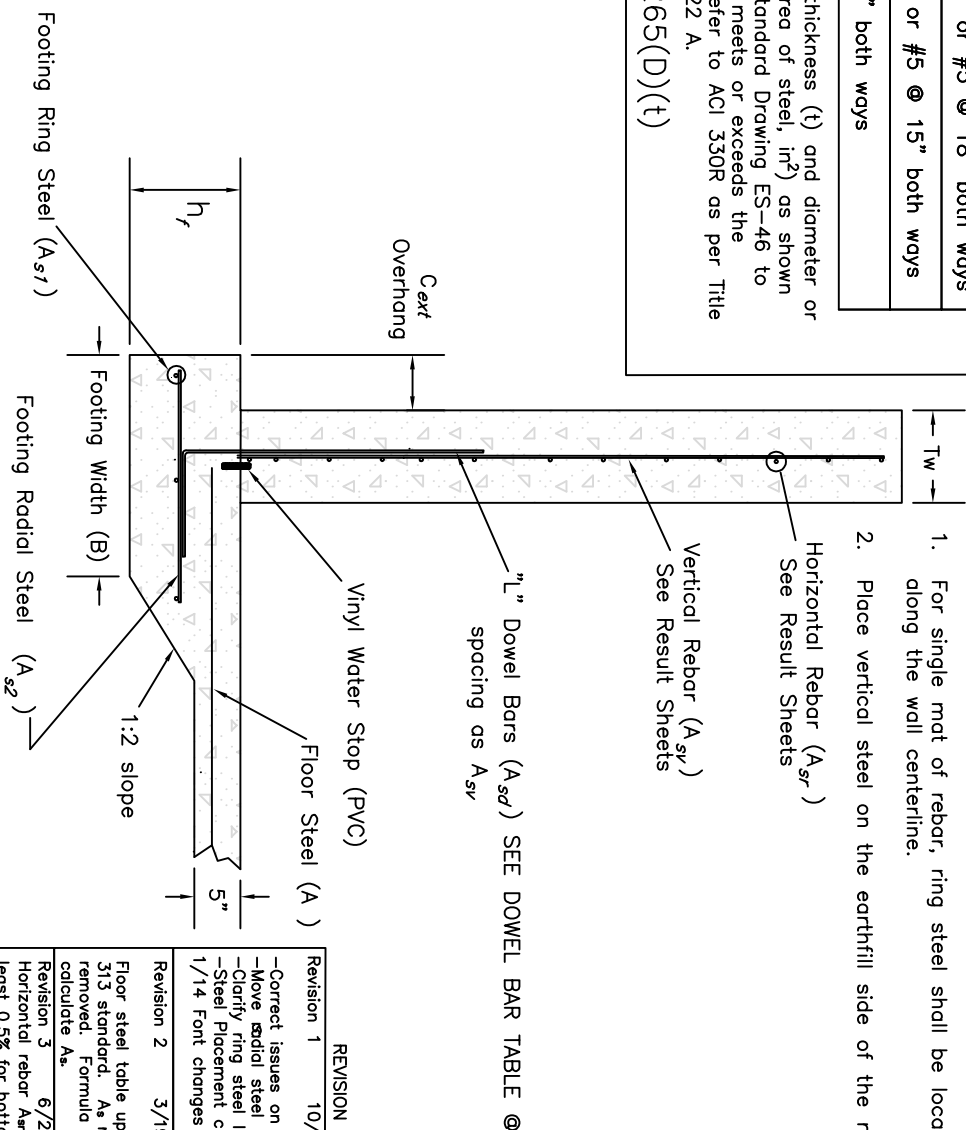


GENERAL NOTES:

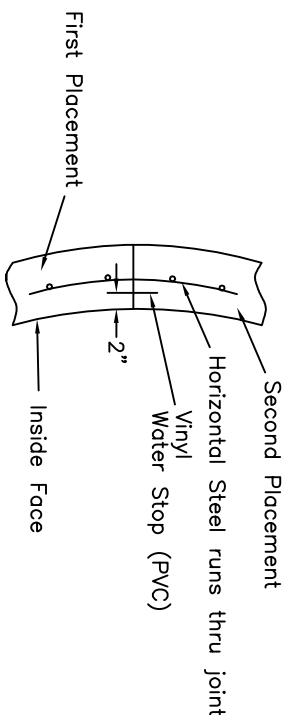
1. For tank sizes not listed use the steel spacing & wall thickness from the next larger tank size.

SINGLE REINFORCED
CIRCULAR TANK WALL
(Not to Scale)

1. For single mat of rebar, ring steel shall be located along the wall centerline.
2. Place vertical steel on the earthfill side of the ring steel



PLAN VIEW
TYPICAL WALL JOINT DETAIL



REVISION LOG	
Revision 1	10/13 PJV
-Correct issues on steel schedules -Move radial steel -Clarify ring steel location -Steel Placement clarification 1/14 Font changes	
Revision 2	3/19 TWP
Floor steel table updated to meet 313 standard. A_s reduction note removed. Formula added to calculate A_w .	
Revision 3	6/20 TWP
Horizontal rebar A_w increased to at least 0.5% for bottom $\frac{1}{3}$ of tank wall. Change reflected on tank specific horizontal A_w steel schedules (sheet 6).	

Revisions <u>Latshaw</u> <u>1/31/02</u>		Date <u>12/01</u>	
Revisions <u>Pereverzoff & PJV</u> <u>1/08 10/13</u>		Drawn <u>WHL/HLS/PJV</u> <u>1/31/02, 10/13,01/14</u>	
Redrawn <u>Hartz</u> <u>2/1/08</u>		Checked _____	
		Approved by _____	

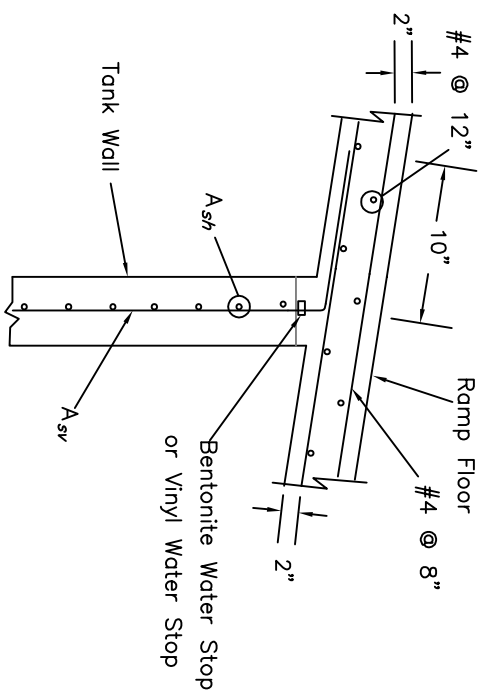


Diagram illustrating the reinforcement details for a rectangular opening in a slab. The opening is circular with a diameter of 2'. The reinforcement bars are labeled A_{sr} . The minimum distance from the edge of the opening to the center of the bar is 2' (min.). The typical splice length is 2'.

* See table for actual number and sheet 6 for spacing
EXTRA STEEL REQUIRED AROUND NOTCH

HEIGHT OF TANK (H)	VERTICAL REBAR (A_{mv}) (In tank and ramp wall)	HORIZONTAL REBAR (A_{mh})	DIAGONAL REBAR (A_{md})
8', 10'	3-#6 (12/18 total)	3-#6	4-#6
12', 14'	4-#6 (16/24 total)	4-#6	4-#6

- 1) Tank and rebar A_{sn} and A_{sv} not shown for clarity.
- 2) Height of tank affects number of extra bars.
- 3) If tank wall is double reinforced, specified extra steel must be in each mat of steel. Therefore total required varies depending on number of mats.
- 4) Spacing for extra rebar found on Page 6 showing wall steel schedule. This page should be numbered between 6.01 and 6.32.
- 5) Vertical rebar required on each side of the notch, as well as in each side of ramp wall, see "ELEVATION VIEW OF RAMP". Sheet 4

(if needed)

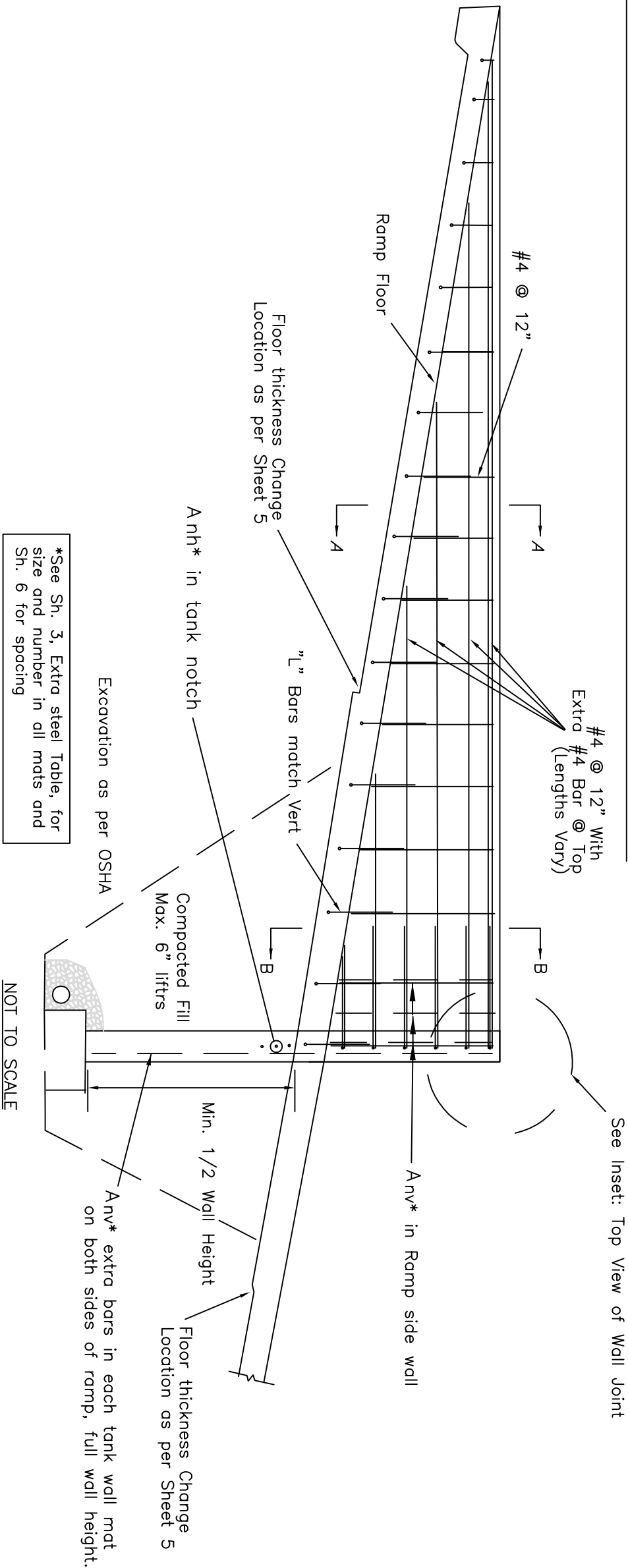
Revision 1	10/13 PJV
-Add word "Extra" for Clarification -Clarify No. of extra verticals -Pipe support and clarification of steel location 1/14 Font changes	



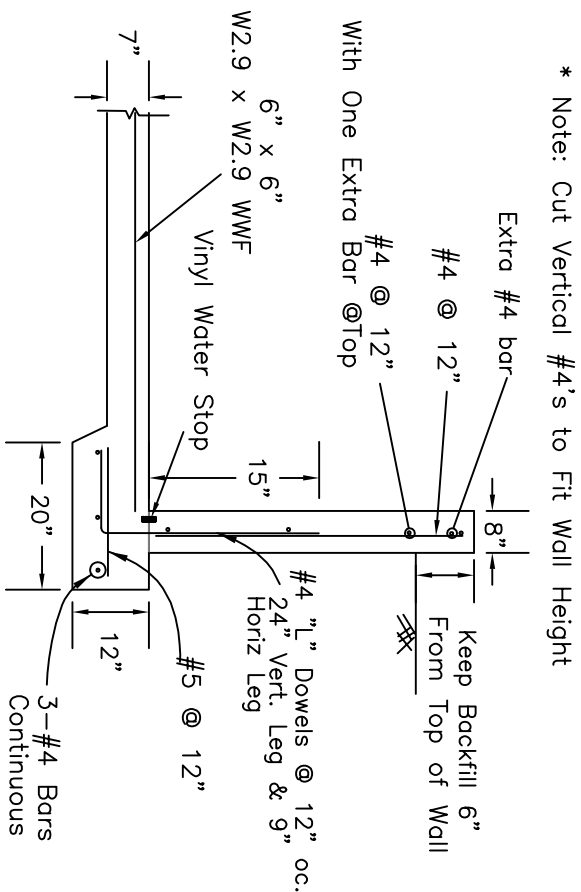
_____ COUNTY, PENNSYLVANIA
PA ROUND TANK W/RAMP DETAIL

Revisions	<u>Latshaw</u>	Date	<u>1/31/02</u>	Designed	<u>PA NRCS</u>	Date	<u>12/01</u>
Revisions	<u>Perceverzoff & PJV</u>	1/08	<u>10/13</u>	Drawn	<u>WHL/HLS/PJV</u>	1/31/02,	<u>10/13/01/14</u>
Redrawn	<u>Hartz</u>		<u>2/1/08</u>	Checked			
				Approved by			

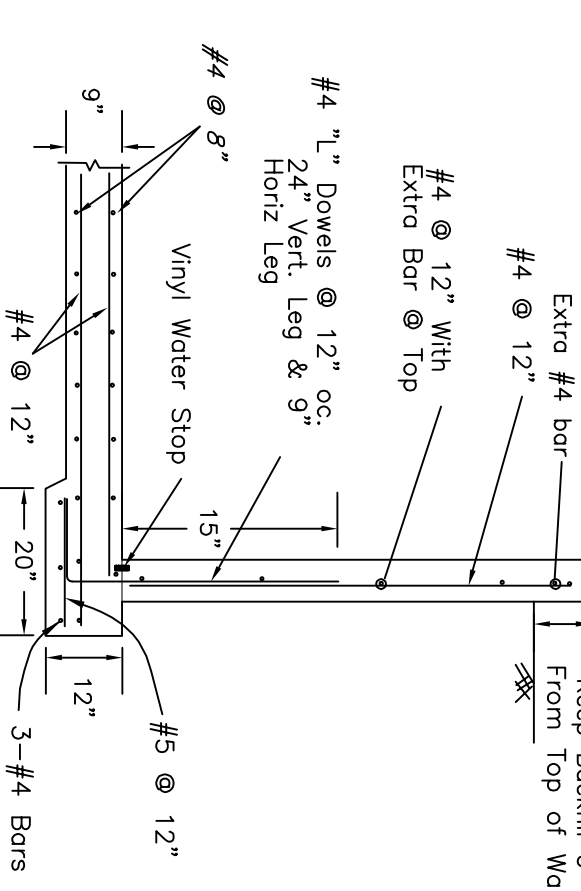
ACCESS RAMP THROUGH NOTCHED TANK – ELEVATION VIEW OF RAMP



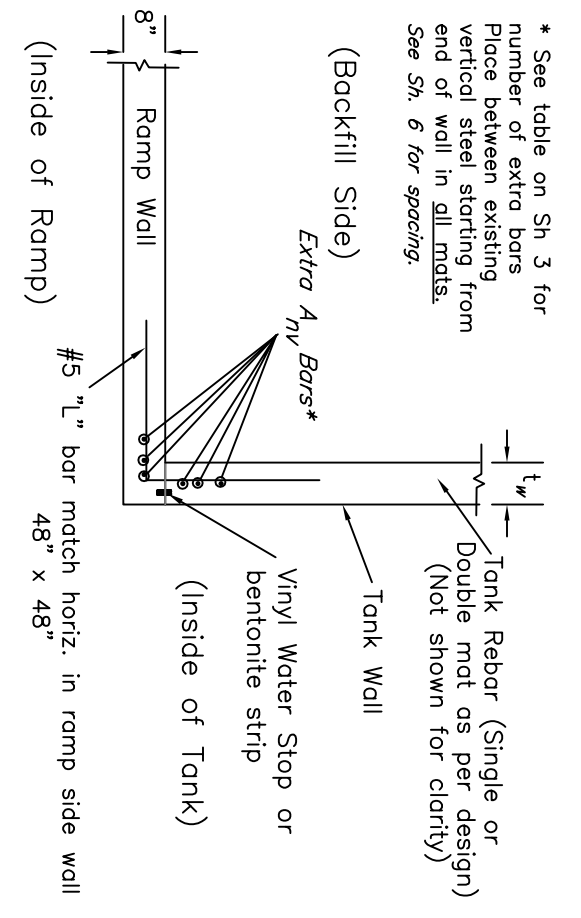
SECTION A-A (Ramp Side Wall)



SECTION B-B (Ramp Side Wall)



TOP VIEW OF WALL JOINT



REVISION LOG

Revision	1	10/13 PJV
–Correct Dowel length		
–Clarify additional steel location		
–Clarify wall details		
1/14 Font changes		

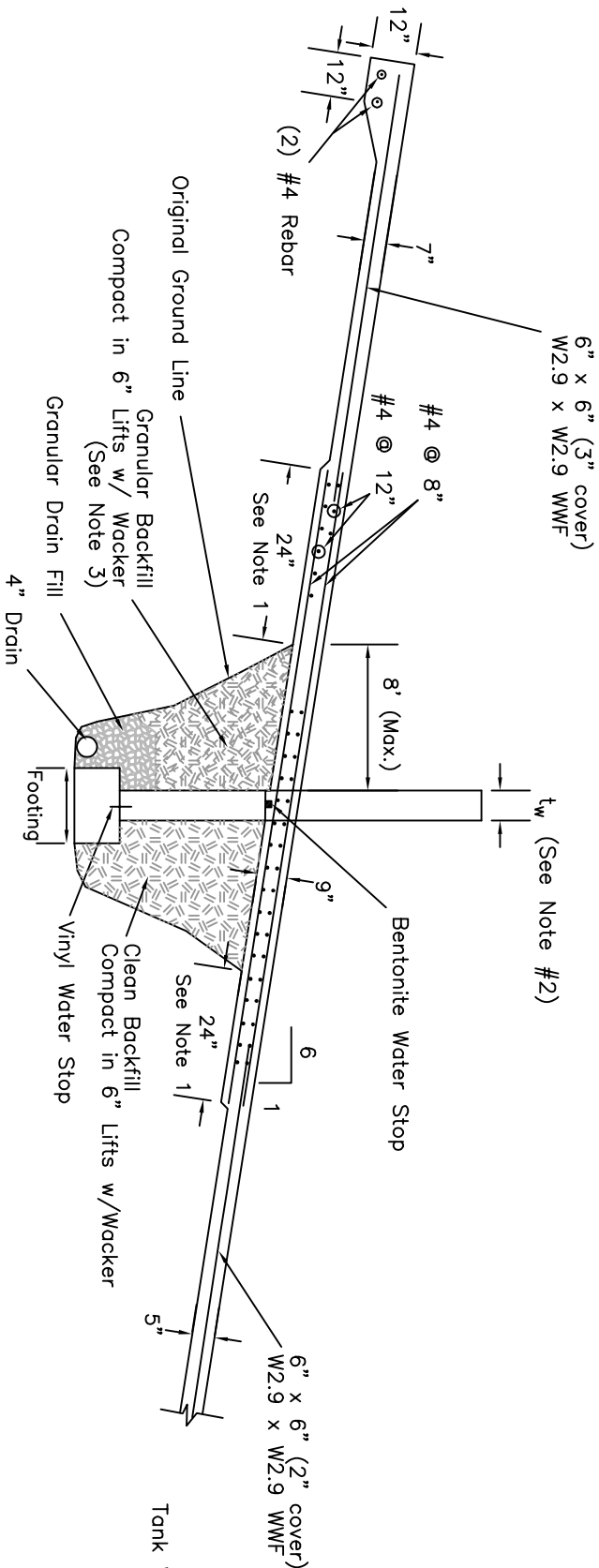


COUNTY, PENNSYLVANIA
PA ROUND TANK W/RAMP DETAIL

Revisions	Latshaw	Date	1/31/02
Revisions	Pereverzoff & PJV	1/08	10/13
Redrawn	Hartz		2/1/08
Designed	PA NRCS	Date	12/01
Drawn	WHL/HLS/PJV	1/31/02, 10/13, 01/14	
Checked			
Approved by			

File No.	PA-067-r3.dwg
Drawing No.	PA-067-r8
Sheet	4 of 6

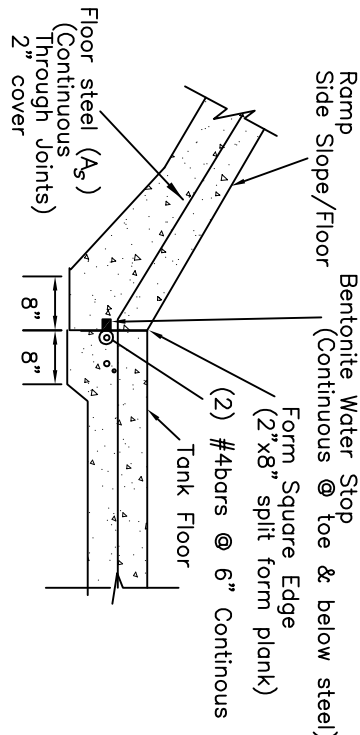
ACCESS RAMP PROFILE



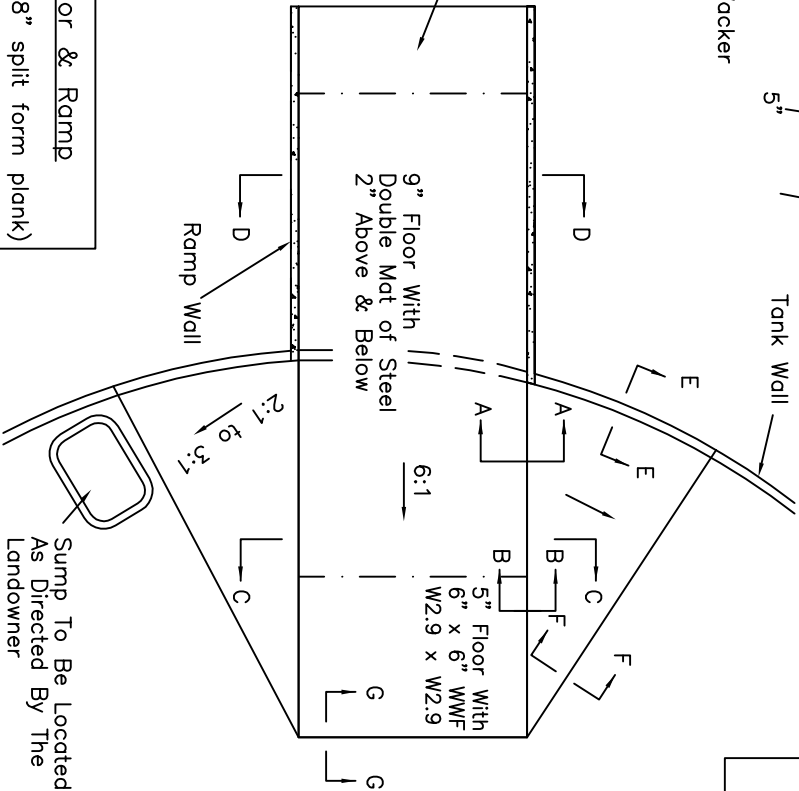
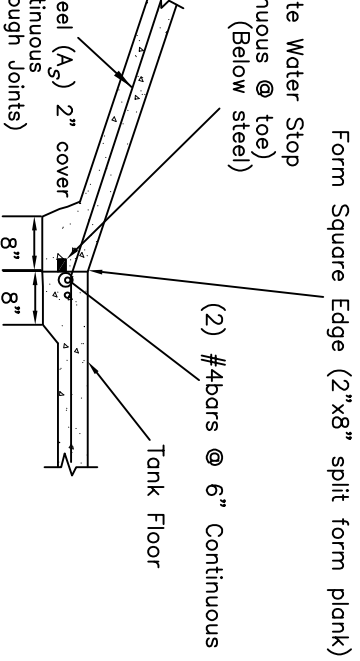
NOTES

1. Extend 9" thick ramp bridge 24" onto undisturbed original ground on both sides.
 2. Footing and wall thickness vary with wall height and diameter of tank as per sheet 2.
 3. Granular backfill shall be PennDOT 2RC.
 4. Entrance to ramp shall be protected by 12" thick stone pad.
- Extend at least 4' out unless shown differently on planview.

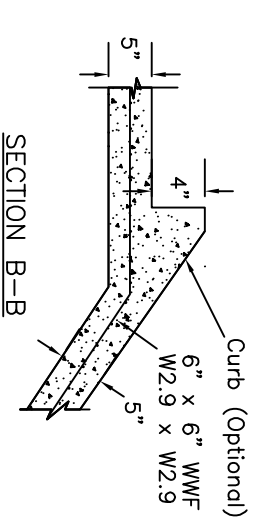
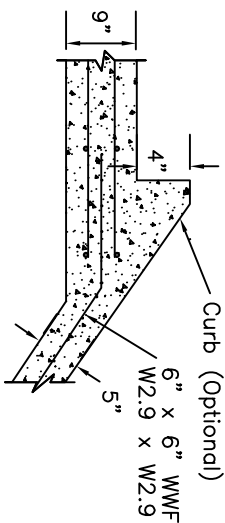
Section F-F: Inside Ramp Side Slope To Tank Floor



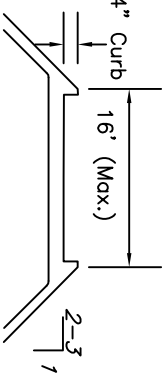
Section G-G: Elevation @ Floor & Ramp



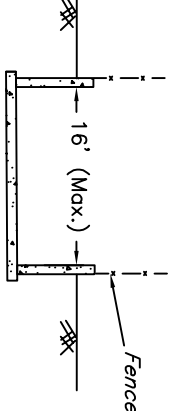
Center at least 16' from sidewall if option to add wall reinforcement is used for equipment surcharge



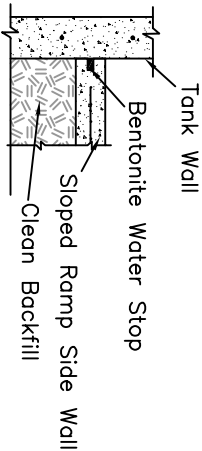
RAMP CURB DETAIL



SECTION C-C



SECTION D-D



SECTION E-E

REVISION LOG

Revision	10/13 PJV
1	PA-067-r8
2	PA-067-r8
3	PA-067-r8
4	PA-067-r8
5	PA-067-r8



COUNTY, PENNSYLVANIA
PA ROUND TANK W/RAMP DETAIL

Revisions	Date
Latshaw	1/31/02
Pereverzeff & PJV	1/08 10/13
Hartz	2/1/08

Designed	Date
PA NRCS	12/01
Drawn	WHL/HLS/PJV 1/31/02, 10/13/01/14
Checked	
Approved by	

Results for the 8'x40' circular tank

Circular Tank:

Tank Diameter = 40 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}		
Bar #	Spacing	Distance from finished floor (ft - in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	6	3' 3"
9	12	4' 3"
10	12	5' 3"
11	12	6' 3"
12	12	7' 3"
13	6	7' 9"

Vertical Steel shall be #4 @ 12" O.C.

Dowels "L" bars shall be #4 @ 12" O.C. with a horizontal leg of 6" and a vertical leg of 26"

In the tank wall, at the notch for the ramp add:

3-#6 bars x 7'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.01	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 8'x60' circular tank

Circular Tank:

Tank Diameter = 60 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}		
Bar #	Spacing	Distance from finished floor (ft - in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	6	3' 3"
9	12	4' 3"
10	12	5' 3"
11	12	6' 3"
12	12	7' 3"
13	6	7' 9"

Vertical Steel shall be #4 @ 12" O.C.

Dowels "L" bars shall be #4 @ 12" O.C. with a horizontal leg of 6" and a vertical leg of 26"

In the tank wall, at the notch for the ramp add:

3-#6 bars x 7'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.02	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 8'x80' circular tank

Circular Tank:

Tank Diameter = 80 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	6	3' 3"
9	12	4' 3"
10	12	5' 3"
11	12	6' 3"
12	12	7' 3"
13	6	7' 9"

Vertical Steel shall be #4 @ 12" O.C.

Dowels "L" bars shall be #4 @ 12" O.C. with a horizontal leg of 6" and a vertical leg of 26"

In the tank wall, at the notch for the ramp add:

3-#6 bars x 7'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6 feet long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.03	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 8'x100' circular tank

Circular Tank:

Tank Diameter = 100 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	6	3' 3"
9	12	4' 3"
10	12	5' 3"
11	10	6' 1"
12	10	6' 11"
13	10	7' 9"

Vertical Steel shall be #4 @ 12" O.C.

Dowels "L" bars shall be #4 @ 12" O.C. with a horizontal leg of 6" and a vertical leg of 26"

In the tank wall, at the notch for the ramp add:

3-#6 bars x 11'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6 feet long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.04	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 8'x120' circular tank

Circular Tank:

Tank Diameter = 120 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	6	3' 3"
9	8	3' 11"
10	10	4' 9"
11	9	5' 6"
12	9	6' 3"
13	9	7' 0"
14	9	7' 9"

Vertical Steel = #4 @ 12" O.C.

Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. 26" vertical leg, 6" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

3-#6 bars x 7'-10" long @ 6" O.C. vertically

3-#6 bars x 20' long @ 6" O.C. horizontally

4-#6 bars x 6' long @ 6" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.05	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 8'x140' circular tank

Circular Tank:

Tank Diameter = 140 ft

Tank Wall thickness = 10 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	4	0' 7"
3	4	0' 11"
4	4	1' 3"
5	4	1' 7"
6	4	1' 11"
7	4	2' 3"
8	4	2' 7"
9	6	3' 1"
10	10	3' 11"
11	8	4' 7"
12	8	5' 3"
13	6	5' 9"
14	6	6' 3"
15	6	6' 9"
16	6	7' 3"
17	6	7' 9"

Vertical Steel = #4 @ 12" O.C.

Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. 26" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

3-#6 bars x 7'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.06	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 8'x160' circular tank

Circular Tank:

Tank Diameter = 160 ft

Tank Wall thickness = 10 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	4	0' 7"
3	4	0' 11"
4	4	1' 3"
5	4	1' 7"
6	4	1' 11"
7	4	2' 3"
8	4	2' 7"
9	4	2' 11"
10	8	3' 7"
11	8	4' 3"
12	6	4' 9"
13	6	5' 3"
14	6	5' 9"
15	6	6' 3"
16	6	6' 9"
17	6	7' 3"
18	6	7' 9"

Vertical Steel = #4 @ 12" O.C.

Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. 26" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

3-#6 bars x 9'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.07	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 8'x180' circular tank

Circular Tank:

Tank Diameter = 180 ft

Tank Wall thickness = 10 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #5 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	10	4' 1"
9	10	4' 11"
10	10	5' 9"
11	8	6' 5"
12	8	7' 1"
13	8	7' 9"

Vertical Steel = #4 @ 12" O.C.

Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. 26" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

3-#6 bars x 7'-10" long @ 6" O.C. vertically.

3-#6 bars x 20' long @ 6" O.C. horizontally.

4-#6 bars x 6' long @ 6" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.08	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 8'x200' circular tank

Circular Tank:

Tank Diameter = 200 ft

Tank Wall thickness = 12 in (actual)

Tank Height = 8 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Steel shown in table must be placed in each face of the wall

Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	12	4' 3"
9	12	5' 3"
10	8	5' 11"
11	8	6' 7"
12	8	7' 3"
13	6	7' 9"

Vertical Steel = #4 @ 12" O.C. in each face.

Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. at the interior mat of steel. 26" vertical leg, 6" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

3-#6 bars x 7'-10" long @ 6" O.C. vertically in each mat of steel (6 total)

3-#6 bars x 20' long @ 6" O.C. horizontally in each mat of steel (6 total)

4-#6 bars x 6 feet long @ 6" O.C. at a 45 degree angle in each mat of steel (8 total).

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.09	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u> Checked _____ Approved _____

Results for the 10'x40' circular tank

Circular Tank:

Tank Diameter = 40 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 10 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	5	3' 2"
9	5	3' 7"
10	8	4' 3"
11	12	5' 3"
12	12	6' 3"
13	12	7' 3"
14	12	8' 3"
15	12	9' 3"
16	6	9' 9"

Vertical Steel shall be #4 @ 12" O.C.

Dowels "L" bars shall be #4 @ 12" O.C. with a horizontal leg of 6" and a vertical leg of 26"

In the tank wall, at the notch for the ramp add:

3-#6 bars x 9'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.10	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 10'x60' circular tank

Circular Tank:

Tank Diameter = 60 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 10 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	5	3' 2"
9	5	3' 7"
10	5	4' 0"
11	9	4' 9"
12	10	5' 7"
13	10	6' 5"
14	10	7' 3"
15	12	8' 3"
16	12	9' 3"
17	6	9' 9"

Vertical Steel shall be #4 @ 12" O.C.

Dowels "L" bars shall be #4 @ 12" O.C. with a horizontal leg of 6" and a vertical leg of 26"

In the tank wall, at the notch for the ramp add:

3-#6 bars x 9'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.11	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____ Approved _____

Results for the 10'x80' circular tank

Circular Tank:

Tank Diameter = 80 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 10 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	5	3' 2"
9	5	3' 7"
10	8	4' 3"
11	9	5' 0"
12	9	5' 9"
13	10	6' 7"
14	10	7' 5"
15	10	8' 3"
16	10	9' 1"
17	8	9' 9"

Vertical Steel shall be #4 @ 12" O.C.

Dowels "L" bars shall be #4 @ 12" O.C. with a horizontal leg of 6" and a vertical leg of 26"

For a length of 60 feet, centered on the ramp, substitute #5 rebar for the #4 horizontal rebar for bars #4 to bar #9 in the tank (6 bars total).

In the tank wall, at the notch for the ramp add:

3-#6 bars x 9'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.12	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 10'x100' circular tank

Circular Tank:

Tank Diameter = 100 ft

Tank Wall thickness = 10 in (actual)

Tank Height = 10 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	4	0' 7"
3	4	0' 11"
4	4	1' 3"
5	4	1' 7"
6	4	1' 11"
7	4	2' 3"
8	4	2' 7"
9	4	2' 11"
10	4	3' 3"
11	4	3' 7"
12	6	4' 1"
13	8	4' 9"
14	8	5' 5"
15	8	6' 1"
16	8	6' 9"
17	8	7' 5"
18	8	8' 1"
19	10	8' 11"
20	10	9' 9"

Vertical Steel shall be #4 @ 10" O.C.

Dowels "L" bars shall be #4 @ 10" O.C. with a horizontal leg of 8" and a vertical leg of 26"

In the tank wall, at the notch for the ramp add:

3-#6 bars x 11'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6 feet long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.13	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 10'x120' circular tank

Circular Tank:

Tank Diameter = 120 ft

Tank Wall thickness = 10 in (actual)

Tank Height = 10 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Vertical Steel = #4 @ 10" O.C.

Dowels "L" bars from tank to footing shall be #4 @ 10" O.C. 26" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

3-#6 bars x 7'-10" long @ 6" O.C. vertically

3-#6 bars x 20' long @ 6" O.C. horizontally

4-#6 bars x 6' long @ 6" O.C. at a 45 degree angle.

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	4	0' 7"
3	4	0' 11"
4	4	1' 3"
5	4	1' 7"
6	4	1' 11"
7	4	2' 3"
8	4	2' 7"
9	4	2' 11"
10	4	3' 3"
11	4	3' 7"
12	6	4' 1"
13	8	4' 9"
14	8	5' 5"
15	8	6' 1"
16	8	6' 9"
17	6	7' 3"
18	6	7' 9"
19	6	8' 3"
20	6	8' 9"
21	6	9' 3"
22	6	9' 9"

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.14	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____ Approved _____

Results for the 10'x140' circular tank

Circular Tank:

Tank Diameter = 140 ft

Tank Wall thickness = 10 in (actual)

Tank Height = 10 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #5 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	10	5' 1"
11	10	5' 11"
12	10	6' 9"
13	10	7' 7"
14	10	8' 5"
15	9	9' 2"
16	7	9' 9"

Vertical Steel = #4 @ 10" O.C.

Dowels "L" bars from tank to footing shall be #4 @ 10" O.C. 26" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

3-#6 bars x 9'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.15	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 10'x160' circular tank

Circular Tank:

Tank Diameter = 160 ft
 Tank Wall thickness = 10 in (actual)
 Tank Height = 10 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #4 @ 10" O.C.
 Dowels "L" bars from tank to footing shall be #4 @ 10" O.C. 26" vertical leg, 8" horizontal leg

For a length of 60 feet, centered on the ramp:
 Substitute #5 @ 10" O.C. vertical steel for the #4 @ 10" O.C. vertical steel.

In the tank wall, at the corner of the notch for the ramp add:
 3-#6 bars x 9'-10" long @ 6" O.C. vertically.
 3-#6 bars x 20' long @ 6" O.C. horizontally.
 4-#6 bars x 6' long @ 6" O.C. at a 45 degree angle.

Horizontal Steel = #5 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	8	4' 11"
11	10	5' 9"
12	8	6' 5"
13	8	7' 1"
14	8	7' 9"
15	8	8' 5"
16	8	9' 1"
17	8	9' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.16	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____ Approved _____

Results for the 10'x180' circular tank

Circular Tank:

Tank Diameter = 180 ft
 Tank Wall thickness = 10 in (actual)
 Tank Height = 10 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #4 @ 9" O.C.
 Dowels "L" bars from tank to footing shall be #4 @ 9" O.C. 26"
 vertical leg, 8" horizontal leg

For a length of 60 feet, centered on the ramp:
 Substitute #5 @ 9" O.C. vertical steel in each face for the #4 @ 9" O.C. vertical steel in each face.

In the tank wall, at the corner of the notch for the ramp add:
 3-#6 bars x 9'-10" long @ 6" O.C. vertically.
 3-#6 bars x 20' long @ 6" O.C. horizontally.
 4-#6 bars x 6' long @ 6" O.C. at a 45 degree angle.

Horizontal Steel = #5 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	8	5' 11"
13	8	6' 7"
14	8	7' 3"
15	6	7' 9"
16	6	8' 3"
17	6	8' 9"
18	6	9' 3"
19	6	9' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.17	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u> Checked _____ Approved _____

Results for the 10'x200' circular tank

Circular Tank:

Tank Diameter = 200 ft
 Tank Wall thickness = 12 in (actual)
 Tank Height = 10 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #4 @ 12" O.C. in each face.
 Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. at the interior mat of steel. 26" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:
 3-#6 bars x 11'-10" long @ 6" O.C. vertically in each mat of steel (6 total)
 3-#6 bars x 20' long @ 6" O.C. horizontally in each mat of steel (6 total)
 4-#6 bars x 6 feet long @ 6" O.C. at a 45 degree angle in each mat of steel (8 total).

Horizontal Steel = #4 rebar = A_{sh} Steel shown in table must be placed in each face of the wall		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	6	5' 9"
13	10	6' 7"
14	8	7' 3"
15	8	7' 11"
16	8	8' 7"
17	8	9' 3"
18	6	9' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.18	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____ Approved _____

Results for the 12'x40' circular tank

Circular Tank:

Tank Diameter = 40 ft

Tank Wall thickness = 8 in (actual)

Tank Height = 12 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Vertical Steel shall be #4 @ 12" O.C.

Dowels "L" bars shall be #4 @ 12" O.C. with a horizontal leg of 6" and a vertical leg of 26"

For a length of 60 feet, centered on the ramp, substitute #5 rebar for the #4 horizontal rebar for bars #5 to bar #9 in the tank (5 bars total).

In the tank wall, at the notch for the ramp add:

3-#6 bars x 11'-10" long @ 4" O.C. vertically.

3-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

Horizontal Steel = #4 rebar = A_{sh}

Bar #	Spacing (in)	Distance from finished floor (ft – in)
1	3	0' 3"
2	5	0' 8"
3	5	1' 1"
4	5	1' 6"
5	5	1' 11"
6	5	2' 4"
7	5	2' 9"
8	5	3' 2"
9	5	3' 7"
10	5	4' 0"
11	9	4' 9"
12	10	5' 7"
13	10	6' 5"
14	10	7' 3"
15	12	8' 3"
16	12	9' 3"
17	12	10' 3"
18	12	11' 3"
19	6	11' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.19	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____
		Approved _____

Results for the 12'x60' circular tank

Circular Tank:

Tank Diameter = 60 ft

Tank Wall thickness = 10 in (actual)

Tank Height = 12 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Vertical Steel = #4 @ 10" O.C.

Dowels "L" bars shall be #4 @ 10" O.C. with a horizontal leg of 8" and a vertical leg of 26"

For a length of 60 feet, centered on the ramp, substitute #5 rebar for the #4 horizontal rebar for bars #3 to bar #10 in the tank.

In the tank wall, at the notch for the ramp add:

4-#6 bars x 11'-10" long @ 4" O.C. vertically. 4-#6 bars

x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

Horizontal Steel = #4 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	4	0' 7"
3	4	0' 11"
4	4	1' 3"
5	4	1' 7"
6	4	1' 11"
7	4	2' 3"
8	4	2' 7"
9	4	2' 11"
10	4	3' 3"
11	4	3' 7"
12	4	3' 11"
13	4	4' 3"
14	5	4' 8"
15	6	5' 2"
16	9	5' 11"
17	9	6' 8"
18	10	7' 6"
19	10	8' 4"
20	12	9' 4"
21	12	10' 4"
22	12	11' 4"
23	5	11' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.20	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____ Approved _____

Results for the 12'x80' circular tank

Circular Tank:

Tank Diameter = 80 ft

Tank Wall thickness = 10 in (actual)

Tank Height = 12 ft

$f_y = 60,000$ psi $f_c = 4,000$ psi

Vertical Steel shall be #4 @ 9" O.C.

Dowels "L" bars shall be #4 @ 9" O.C. with a horizontal leg of 8" and a vertical leg of 26"

For a length of 60 feet, centered on the ramp, substitute #5 rebar for the #4 horizontal rebar for bars #5 to bar #10 in the tank (6 bars total).

In the tank wall, at the notch for the ramp add:

4-#6 bars x 11'-10" long @ 4" O.C. vertically. 4-#6 bars x 20' long @ 4" O.C. horizontally.

4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

Horizontal Steel = #4 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	4	0' 7"
3	4	0' 11"
4	4	1' 3"
5	4	1' 7"
6	4	1' 11"
7	4	2' 3"
8	4	2' 7"
9	4	2' 11"
10	4	3' 3"
11	4	3' 7"
12	4	3' 11"
13	4	4' 3"
14	4	4' 7"
15	6	5' 1"
16	6	5' 7"
17	6	6' 1"
18	6	6' 7"
19	6	7' 1"
20	8	7' 9"
21	8	8' 5"
22	10	9' 3"
23	10	10' 1"
24	10	10' 11"
25	10	11' 9"

 Natural Resources Conservation Services United States Department of Agriculture	____ County, PA ROUND TANK W/RAMP DETAIL Page 6.21	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____ Approved _____

Results for the 12'x100' circular tank

Circular Tank:

Tank Diameter = 100 ft
 Tank Wall thickness = 10 in (actual)
 Tank Height = 12 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel shall be #4 @ 8" O.C.
 Dowels "L" bars shall be #4 @ 8" O.C. with a horizontal leg of 8" and a vertical leg of 26"

In the tank wall, at the notch for the ramp add:
 4-#6 bars x 11'-10" long @ 4" O.C. vertically.
 4-#6 bars x 20' long @ 4" O.C. horizontally.
 4-#6 bars x 6 feet long @ 4" O.C. at a 45 degree angle.

Horizontal Steel = #5 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	10	5' 7"
12	10	6' 5"
13	10	7' 3"
14	10	8' 1"
15	10	8' 11"
16	10	9' 9"
17	12	10' 9"
18	12	11' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.22	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/24/20</u>
		Checked _____ Approved _____

Results for the 12'x120' circular tank

Circular Tank:

Tank Diameter = 120 ft
 Tank Wall thickness = 10 in (actual)
 Tank Height = 12 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #5 @ 10" O.C.
 Dowels "L" bars from tank to footing shall be #5 @ 10" O.C.
 30" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 7'-10" long @ 4" O.C. vertically
 4-#6 bars x 20' long @ 4" O.C. horizontally
 4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

Horizontal Steel = #5 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	6	5' 9"
13	8	6' 5"
14	8	7' 1"
15	8	7' 9"
16	8	8' 5"
17	10	9' 3"
18	10	10' 1"
19	10	10' 11"
20	10	11' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.23	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/26/20</u>
		Checked _____ Approved _____

Results for the 12'x140' circular tank

Circular Tank:

Tank Diameter = 140 ft
 Tank Wall thickness = 10 in (actual)
 Tank Height = 12 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #5 @ 10" O.C.
 Dowels "L" bars from tank to footing shall be #5 @ 10" O.C.
 30" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 13'-10" long @ 4" O.C. vertically
 4-#6 bars x 20' long @ 4" O.C. horizontally
 4-#6 bars x 6 feet long @ 4" O.C. at a 45 degree angle

Horizontal Steel = #5 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	6	5' 9"
13	8	6' 5"
14	8	7' 1"
15	8	7' 9"
16	8	8' 5"
17	8	9' 1"
18	8	9' 9"
19	8	10' 5"
20	8	11' 1"
21	8	11' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.24	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/26/20</u> Checked _____ Approved _____

Results for the 12'x160' circular tank

Circular Tank:

Tank Diameter = 160 ft
 Tank Wall thickness = 12 in (actual)
 Tank Height = 12 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #4 @ 12" O.C. in each face.
 Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. at the interior mat of steel. 26" vertical leg, 10" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:
 4-#6 bars x 13'-10" long @ 6" O.C. vertically in each mat of steel (8 total)
 4-#6 bars x 20' long @ 6" O.C. horizontally in each mat of steel (8 total)
 4-#6 bars x 6 feet long @ 6" O.C. at a 45 degree angle in each mat of steel (8 total).

Horizontal Steel = #4 rebar = A_{sh}
 Steel shown in table must be placed in each face of the wall

Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	10	5' 7"
12	10	6' 5"
13	10	7' 3"
14	9	8' 0"
15	9	8' 9"
16	9	9' 6"
17	9	10' 3"
18	9	11' 0"
19	9	11' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.25	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/26/20</u>
		Checked _____ Approved _____

Results for the 12'x180' circular tank

Circular Tank:

Tank Diameter = 180 ft
 Tank Wall thickness = 12 in (actual)
 Tank Height = 12 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #4 @ 12" O.C. in each face.
 Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. at the interior mat of steel. 26" vertical leg, 10" horizontal leg

For a length of 80 feet, centered on the ramp substitute #5 @ 12" O.C. vertical steel in each face for the #4 @ 12" O.C. vertical steel in each face.

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 11'-10" long @ 6" O.C. vertically in each mat of steel (6 total)
 4-#6 bars x 20' long @ 6" O.C. horizontally in each mat of steel (6 total)
 4-#6 bars x 6 feet long @ 6" O.C. at a 45 degree angle in each mat of steel (8 total).

Horizontal Steel = #4 rebar = A_{sh} Steel shown in table must be placed in each face of the wall		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	6	5' 9"
13	8	6' 5"
14	8	7' 1"
15	8	7' 9"
16	8	8' 5"
17	8	9' 1"
18	8	9' 9"
19	8	10' 5"
20	8	11' 1"
21	8	11' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.26	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/26/20</u>
		Checked _____ Approved _____

Results for the 12'x200' circular tank

Circular Tank:

Tank Diameter = 200 ft

Tank Wall thickness = 12 in (actual)

Tank Height = 12 ft

$f_y = 60,000$ psi

$f_c = 4,000$ psi

Horizontal Steel = #5 rebar = A_{sh} Steel shown in table must be placed in each face of the wall		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	10	1' 1"
3	10	1' 11"
4	10	2' 9"
5	10	3' 7"
6	10	4' 5"
7	12	5' 5"
8	12	6' 5"
9	12	7' 5"
10	12	8' 5"
11	10	9' 3"
12	10	10' 1"
13	10	10' 11"
14	10	11' 9"

Vertical Steel = #4 @ 12" O.C. in each face.

Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. at the interior mat of steel. 26" vertical leg, 10" horizontal leg

For a length of 80 feet, centered on the ramp substitute #5 @ 12" O.C. vertical steel in each face for the #4 @ 12" O.C. vertical steel in each face.

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 11'-10" long @ 6" O.C. vertically in each mat of steel (6 total)

4-#6 bars x 20' long @ 6" O.C. horizontally in each mat of steel (6 total)

4-#6 bars x 6 feet long @ 6" O.C. at a 45 degree angle in each mat of steel (8 total).

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.27	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/26/20</u>
		Checked _____
		Approved _____

Results for the 14'x120' circular tank

Circular Tank:

Tank Diameter = 120 ft
 Tank Wall thickness = 10 in (actual)
 Tank Height = 14 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #5 @ 8" O.C.
 Dowels "L" bars from tank to footing shall be #5 @ 8" O.C. 30" vertical leg, 8" horizontal leg

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 7'-10" long @ 4" O.C. vertically
 4-#6 bars x 20' long @ 4" O.C. horizontally
 4-#6 bars x 6' long @ 4" O.C. at a 45 degree angle.

Horizontal Steel = #5 rebar = A_{sh}		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	6	5' 9"
13	6	6' 3"
14	6	6' 9"
15	6	7' 3"
16	6	7' 9"
17	6	8' 3"
18	6	8' 9"
19	8	9' 5"
20	8	10' 1"
21	8	10' 9"
22	10	11' 7"
23	10	12' 5"
24	10	13' 3"
25	6	13' 9"



Natural Resources Conservation Services
 United States Department of Agriculture

_____ County, PA
ROUND TANK W/RAMP
DETAIL Page 6.28

Designed PA NRCS 12/01
 Drawn Hartz 2/1/08
 Revisions Peters 6/26/20
 Checked _____
 Approved _____

Results for the 14'x140' circular tank

Circular Tank:

Tank Diameter = 140 ft
 Tank Wall thickness = 12 in (actual)
 Tank Height = 14 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #4 @ 12" O.C. in each face.
 Dowels "L" bars from tank to footing shall be #4 @ 12" O.C. at the interior mat of steel. 26" vertical leg, 10" horizontal leg

For a length of 80 feet, centered on the ramp:

Substitute #5 rebar for the #4 horizontal rebar for bars #3 to bar #10 in the tank. (8 extra bars in each mat of steel, 16 total).
 Substitute #5 @ 12" O.C. vertical steel in each face for the #4 @ 12" O.C. vertical steel in each face.

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 13'-10" long @ 4" O.C. vertically in each mat of steel (8 total)
 4-#6 bars x 20' long @ 4" O.C. horizontally in each mat of steel (8 total)
 4-#6 bars x 6 feet long @ 4" O.C. at a 45 degree angle in each mat of steel (8 total).

Horizontal Steel = #4 rebar = A_{sh} Steel shown in table must be placed in each face of the wall		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	6	5' 9"
13	6	6' 3"
14	8	6' 11"
15	8	7' 7"
16	8	8' 3"
17	8	8' 11"
18	8	9' 7"
19	8	10' 3"
20	10	11' 1"
21	10	11' 11"
22	10	12' 9"
23	12	13' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.29	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/26/20</u>
		Checked _____ Approved _____

Results for the 14'x160' circular tank

Circular Tank:

Tank Diameter = 160 ft
 Tank Wall thickness = 12 in (actual)
 Tank Height = 14 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Vertical Steel = #4 @ 10" O.C. in each face.
 Dowels "L" bars from tank to footing shall be #4 @ 10" O.C. at the interior mat of steel. 26" vertical leg, 10" horizontal leg

For a length of 80 feet, centered on the ramp:

Substitute #5 rebar for the #4 horizontal rebar for bars #4 to bar #11 in the tank. (8 extra bars in each mat of steel, 16 total).

Substitute #5 @ 10" O.C. vertical steel in each face for the #4 @ 10" O.C. vertical steel in each face.

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 13'-10" long @ 6" O.C. vertically in each mat of steel (8 total)

4-#6 bars x 20' long @ 6" O.C. horizontally in each mat of steel (8 total)

4-#6 bars x 6 feet long @ 6" O.C. at a 45 degree angle in each mat of steel (8 total).

Horizontal Steel = #4 rebar = A_{sh} Steel shown in table must be placed in each face of the wall		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	6	5' 9"
13	8	6' 5"
14	8	7' 1"
15	8	7' 9"
16	8	8' 5"
17	8	9' 1"
18	8	9' 9"
19	8	10' 5"
20	8	11' 1"
21	8	11' 9"
22	8	12' 5"
23	8	13' 1"
24	8	13' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.30	Designed <u>PA NRCS</u> <u>12/01</u> Drawn <u>Hartz</u> <u>2/1/08</u> Revisions <u>Peters</u> <u>6/26/20</u>
		Checked _____ Approved _____

Results for the 14'x180' circular tank

Circular Tank:

Tank Diameter = 180 ft

Tank Height = 14 ft

$f_y = 60,000$ psi

Tank Wall thickness = 12 in (actual)

$f_c = 4,000$ psi

Vertical Steel = #4 @ 9" O.C. in each face.

Dowels "L" bars from tank to footing shall be #4 @ 9" O.C. at the interior mat of steel. 26" vertical leg, 10" horizontal leg

For a length of 80 feet, centered on the ramp:

Substitute #5 rebar for the #4 horizontal rebar for bars #2 to bar #12 in the tank. (11 bars in each mat of steel, 22 total).

Substitute #5 @ 9" O.C. vertical steel in each face for the #4 @ 9" O.C. vertical steel in each face.

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 13'-10" long @ 6" O.C. vertically in each mat of steel (8 total)

4-#6 bars x 20' long @ 6" O.C. horizontally in each mat of steel (8 total)

4-#6 bars x 6 feet long @ 6" O.C. at a 45 degree angle in each mat of steel (8 total).

Horizontal Steel = #4 rebar = A_{sh} Steel shown in table must be placed in each face of the wall		
Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	6	0' 9"
3	6	1' 3"
4	6	1' 9"
5	6	2' 3"
6	6	2' 9"
7	6	3' 3"
8	6	3' 9"
9	6	4' 3"
10	6	4' 9"
11	6	5' 3"
12	8	5' 11"
13	8	6' 7"
14	8	7' 3"
15	6	7' 9"
16	6	8' 3"
17	6	8' 9"
18	6	9' 3"
19	6	9' 9"
20	6	10' 3"
21	6	10' 9"
22	6	11' 3"
23	6	11' 9"
24	6	12' 3"
25	6	12' 9"
26	6	13' 3"
27	6	13' 9"

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.31	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/26/20</u>
		Checked _____
		Approved _____

Results for the 14'x200' circular tank

Circular Tank:

Tank Diameter = 200 ft
 Tank Wall thickness = 12 in (actual)
 Tank Height = 14 ft
 $f_y = 60,000$ psi
 $f_c = 4,000$ psi

Horizontal Steel = #5 rebar = A_{sh}
 Steel shown in table must be placed in each face of the wall

Bar #	Spacing (in)	Distance from finished floor (ft - in)
1	3	0' 3"
2	10	1' 1"
3	10	1' 11"
4	10	2' 9"
5	10	3' 7"
6	10	4' 5"
7	10	5' 3"
8	12	6' 3"
9	10	7' 1"
10	10	7' 11"
11	10	8' 9"
12	10	9' 7"
13	10	10' 5"
14	10	11' 3"
15	10	12' 1"
16	10	12' 11"
17	10	13' 9"

Vertical Steel shall be #4 @ 9" O.C. in each face = A_{sv}

Dowels "L" bars from tank to footing shall be #4 @ 9" O.C. at the interior mat of steel. 26" vertical leg, 10" horizontal leg.

For a length of 80 feet, centered on the ramp:

Add an extra #4 rebar between the #5 horizontal rebar for bars #1 to bar #8 in the tank (8 extra bars per steel mat – 16 bars total).

Substitute #5 @ 9" O.C. vertical steel in each face for the #4 @ 9" O.C. vertical steel in each face.

In the tank wall, at the corner of the notch for the ramp add:

4-#6 bars x 13'-10" long @ 6" O.C. vertically in each mat of steel (8 total)

4-#6 bars x 20' long @ 6" O.C. horizontally in each mat of steel (8 total)

4-#6 bars x 6 feet long @ 6" O.C. at a 45 degree angle in each mat of steel (8 total).

 Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK W/RAMP DETAIL Page 6.32	Designed <u>PA NRCS</u> <u>12/01</u>
		Drawn <u>Hartz</u> <u>2/1/08</u>
		Revisions <u>Peters</u> <u>6/26/20</u>
		Checked _____
		Approved _____