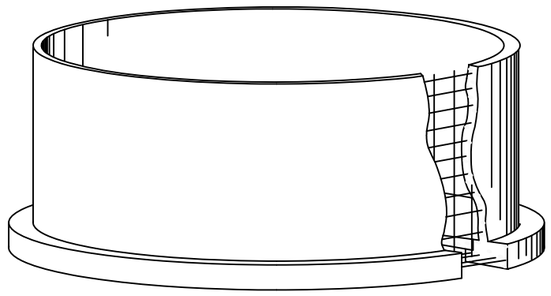
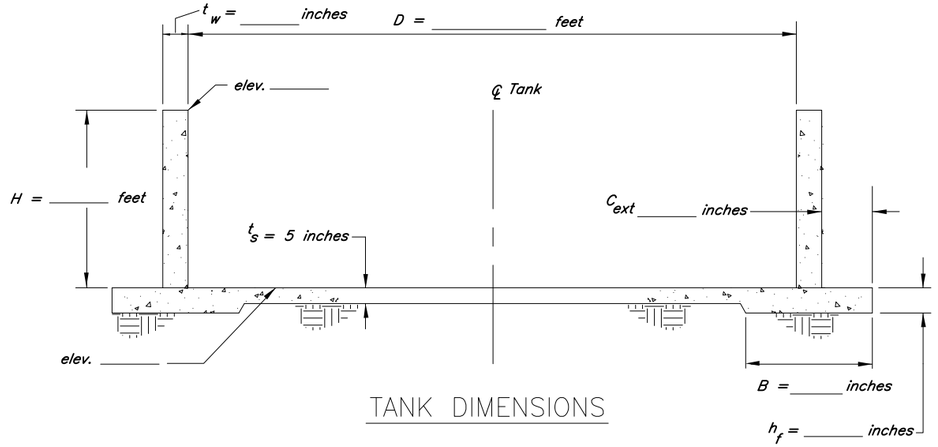
This drawing is based on a design prepared by the MidWest Plan Service (MWPS) at Iowa State University and modified by NRCS. For more specific details concerning the design, refer to MidWest Plan Service Publication TR–9, Circular Concrete Manure Tanks (March 1998). This drawing may be used for tanks which are above or below ground. The design is in accordance with ultimate strength design requirements detailed in ACI 318–95.



CIRCULAR CONCRETE MANURE TANK



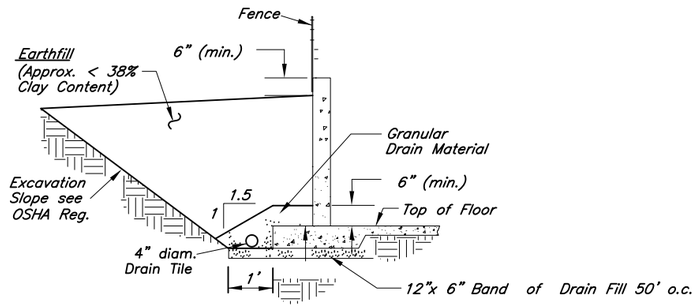
TANK DIMENSIONS

Design Loading:

1. *Manure load: 65 psf/ft. of depth.*
2. *Soil backfill loads: 65 psf/ft. of depth with no surcharge or 60 psf/ft. of depth with 120 psf lateral surcharge. This requires the structure backfill to be adequately drained. To meet this requirement see backfill details on this sheet.*

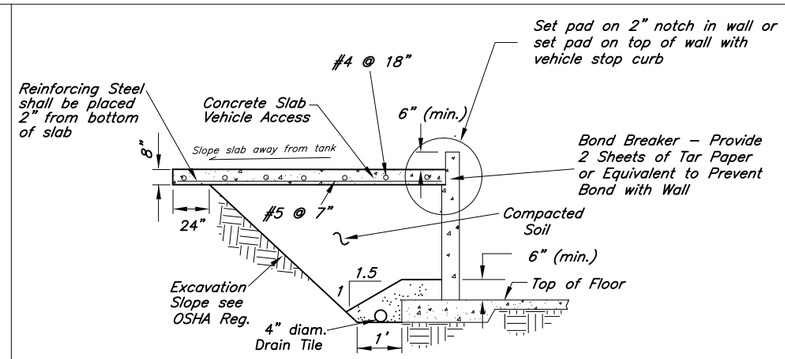
Construction Notes:

1. Reinforcing steel for footing and walls shall have a tension yield point of fy = 60,000 psi. Refer to Sheet 2 for floor reinforcing steel grades.
2. For splice lengths refer to the table on Sheet 2. All bends in reinforcing steel shall have a minimum inside 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. Unless shown otherwise in the construction specifications, the following requirements shall apply:
   - Cement shall be Type I or Type II
   - Slump – 3–6" inches without superpasticizing admixtures added
   - Slump – 2–4" inches prior to adding superplasticizing admixtures with a maximum slump of 7.5" after adding superplasticizing admixtures.
   - Air content from 5 to 7 percent.
   - Aggregate size – maximum of 1 inch diameter.
   - Construction joints – cleaned prior to subsequent concrete placement.
   - Cure concrete for a minimum of 7 days – acceptable methods are:
     - –membrane forming curing compound at rate of 1 gal/150 s.f. unless the manufacturer requires a higher application rate.
     - –leaving the forms in place
     - –soaking / continuous spray
4. Construction joints may be used to ease construction. The location of construction joints shall be approved by the Engineer prior to placing the concrete.
5. Refer to manufacturers recommendation for placing waterstop material.
6. Backfill shall be brought up uniformly around the tank. The maximum difference in the finished backfill elevations around the tank shall be 4 feet.
7. All construction methods shall meet OSHA regulations.
8. Installation of this structure shall conform to NRCS Practice Specification 313.
9. Additional details may be found in design notes and drawings.



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 minimum 3' of backfill over top of footing for frost protection.*



WALL BACKFILL DETAIL–VEHICLE ACCESS

*** Vehicle access slab is required if heavy tank wagons or trucks are driven within a distance equal to the wall height from the edge of the tank.*

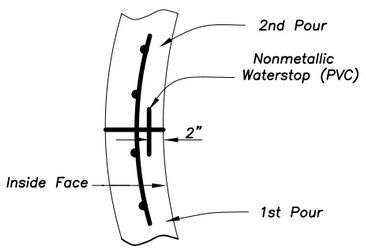
*** Alternative plans may be shown in site specific drawings.*

Safety Requirements:

1. The tank shall be surrounded by a chain link or woven wire fence.(min 4.5' height)
2. Posts shall be attached to the wall with brackets.
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

If heavy tank wagons, or trucks will be driven within a distance equal to the wall height from the edge of the tank, cast a 8 inch thick concrete slab along the traffic route by the tank. The concrete slab should be large enough to eliminate any wheel loads directly on the natural ground or backfill by the tank. The purpose of the slab is to distribute the loading along the tank wall and prevent mud and erosion.



PLAN VIEW
TYPICAL WALL JOINT DETAIL

Revision	1/21	TWP
Updated notes for consistency with other standard tank drawings.		

Date		
Approved		
Title		
Date		
Designed		
Drawn	WAC	12/99
CADD	HLS	06/07
Revised		
Title		

U.S. DEPARTMENT OF AGRICULTURE – NATURAL RESOURCES CONSERVATION SERVICE

PENNSYLVANIA ROUND TANK
Adapted from MWPS TR–9

CAD FILE NAME
PA–064r2

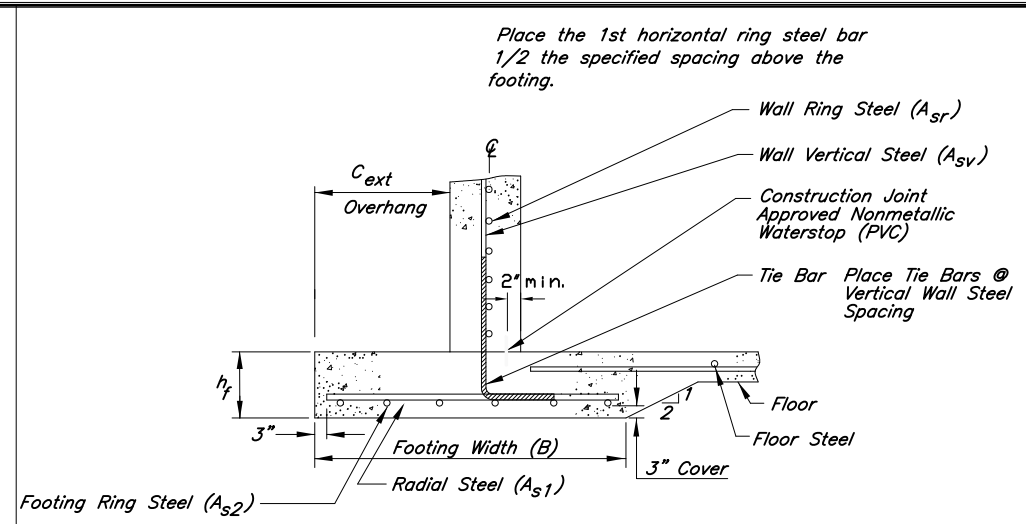
DRAWING NO.
PA–064r2

SHEET NO. 1 OF 3

RING FOUNDATION

Footing Dimensions and Steel						
Wall Height H	Tank Diameter D	Footing Width B	Footing Depth h_f	Overhang C_{ext}	Radial Steel A_{s1}	Ring Steel A_{s2}
8 ft.	all	30 in.	10 in.	12 in.	Place A_{s1} at vertical wall steel (A_{sv}) spacing. For spacing greater than 9 inches use #5 bars, otherwise use #4 bars (#5 bars could be replaced with #4 bars at 1/2 A_{sv} spacing).	#4 @ 8 in.
10 ft.	all	36 in.	12 in.	14 in.		#4 @ 6 in.
12 ft.	all	48 in.	12 in.	14 in.		#4 @ 6 in.
14 ft.	all	60 in.	12 in.	15 in.		#4 @ 6 in.

1. *For tanks 10 feet and deeper, required soil bearing pressure shall be at least 2,000 psf; tanks less than 10 feet require 1,500 psf.*
2. *Place ring steel 3 inches above the footing bottom.*
3. *Place radial steel on top of ring steel.*



MONOLITHIC FOOTING/FLOOR PLACEMENT

WALL TO RING FOUNDATION DETAIL

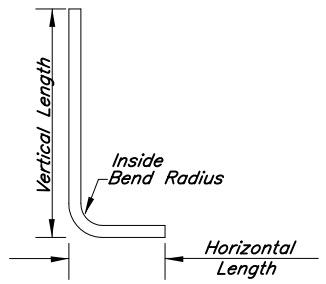
FLOOR STEEL (A_s)

DISTANCE BETWEEN JOINTS *	FOR 5" THICK FLOOR	
	A_s	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 or 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.

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

** See PA–004 and PA–063 for Joint details*



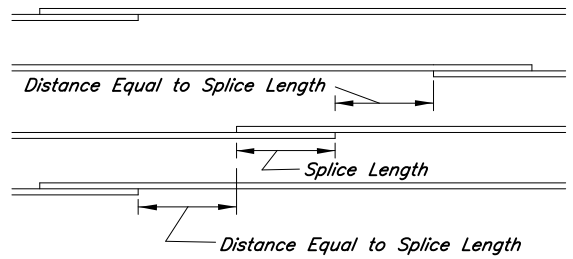
BAR DIMENSIONS

Bar Size	#4	#5
Vertical Length	26 in.	29 in.
Horizontal Length	8 in.	11 in.
Inside Bend Radius	1–1/2 in.	1–7/8 in.
Total Length	34 in.	40 in.

1. *Use the same bar size as A_{sv}*

TIE BAR CONFIGURATION

SPLICING DETAIL FOR WALL AND FOOTING RING STEEL



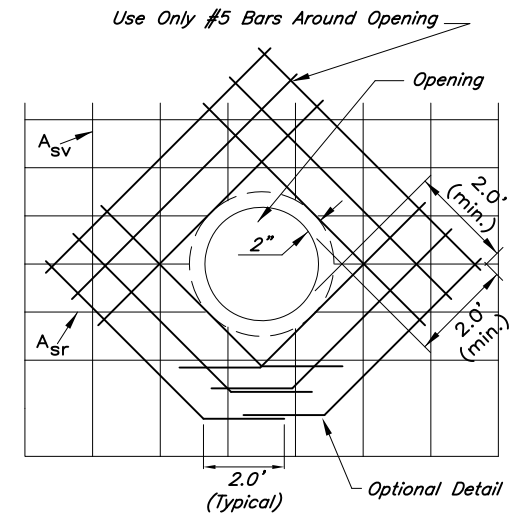
SPLICE LENGTHS FOR ALL BARS

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

WALL STEEL REINFORCEMENT
VERTICAL STEEL A_{sv}

Wall Height	8 ft (8" thickness)	10 ft (8" thickness)	12 ft (10" thickness)	14 ft (10" thickness)
Tank Diam.	Bar Size Spacing	Bar Size Spacing	Bar Size Spacing	Bar Size Spacing
30 ft	#4 @ 12"	#4 @ 12"	#4 @ 11"	#4 @ 11"
45 ft	#4 @ 12"	#4 @ 12"	#4 @ 11"	#4 @ 11"
60 ft	#4 @ 12"	#4 @ 11"	#4 @ 10"	#5 @ 12"
75 ft	#4 @ 12"	#4 @ 10"	#4 @ 8"	#5 @ 10"
90 ft	#4 @ 12"	#4 @ 9"	#4 @ 8"	#5 @ 9"
105 ft	#4 @ 12"	#4 @ 8"	#5 @ 9"	#5 @ 8"
120 ft	#4 @ 12"	#4 @ 8"	#5 @ 9"	#5 @ 7"

1. *See separate steel schedules for A_{sr} ring steel for corresponding tank size.*
2. *For tank sizes not listed, use the steel spacing & wall thickness from the next larger tank size. (Maximum height is 14 feet. Maximum diameter is 120 feet.)*
3. *Ring steel shall be located along the wall centerline.*
4. *Place vertical steel on the outside of the ring steel.*
5. *See MidWest Plan Service, Publication TR–9, Circular Concrete Manure Tanks (March 1998) for alternative ring steel placement (Tables 4, 5, 6, and 8).*



1. *Cut all vertical and ring steel 2 inches from opening.*
2. *For each ring steel bar interrupted by the opening, install one #5 bar around each side of the opening. A minimum 2 – #5 bars are to be used along each side.*
3. *Bars spacing shall not be closer than 3 inches C – C and not farther apart than A_{sr} spacing.*
4. *Tie diagonal bars to dowels when pipe is near the floor.*

DETAIL OF PIPE PROTRUDING THROUGH A WALL

Revision Log

Revision1 3/19 TWP Floor steel table updated to meet 313 standard. A_s reduction note removed. Formula added to calculate A_s.	Revision2 10/20 TWP Ring steel increased to at least 0.5% for bottom 1/3 of tank wall. Tank specific A_{sr} steel schedules developed as sheet #3. Splice lengths changed to match PA–67 and PA–83.

Date — Approved — Title — Title

Date — Designed — Drawn — 12/99 — CADD — WAC — 12/99 — Revised — HLS

U.S. DEPARTMENT OF AGRICULTURE – NATURAL RESOURCES CONSERVATION SERVICE

PENNSYLVANIA ROUND TANK DETAILS

CAD FILE NAME PA–064r2

DRAWING NO. PA–064r2

SHEET NO. 2 OF 3

Results for the 8'x30' circular tank

Circular Tank:

Tank Diameter = 30 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_{sr}		
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	12	3' 9"
9	12	4' 9"
10	12	5' 9"
11	12	6' 9"
12	12	7' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

NRCS Natural Resources Conservation Services United States Department of Agriculture	_____ County, PA ROUND TANK DETAIL PA-064 Page 3.01	Designed PA NRCS 10/2020 Drawn Peters 10/2020 Revisions _____ Checked _____ Approved _____

Results for the 8'x45' circular tank

Circular Tank:

Tank Diameter = 45 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_{sr}		
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	12	3' 9"
9	12	4' 9"
10	12	5' 9"
11	12	6' 9"
12	12	7' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

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_{sr}		
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	12	3' 9"
9	12	4' 9"
10	12	5' 9"
11	12	6' 9"
12	12	7' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

Results for the 8'x75' circular tank

Circular Tank:

Tank Diameter = 75 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_{sr}		
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	12	3' 9"
9	12	4' 9"
10	12	5' 9"
11	12	6' 9"
12	12	7' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

Results for the 8'x90' circular tank

Circular Tank:

Tank Diameter = 90 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_{sr}		
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	7	3' 9"
10	8	4' 5"
11	8	5' 1"
12	8	5' 9"
13	8	6' 5"
14	8	7' 1"
15	8	7' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

Results for the 8'x105' circular tank

Circular Tank:

Tank Diameter = 105 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_{sr}		
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	7	3' 9"
10	8	4' 5"
11	8	5' 1"
12	8	5' 9"
13	8	6' 5"
14	8	7' 1"
15	8	7' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

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_{sr}		
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	6	3' 9"
10	6	4' 3"
11	6	4' 9"
12	6	5' 3"
13	6	5' 9"
14	6	6' 3"
15	6	6' 9"
16	6	7' 3"
17	6	7' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

Results for the 10'x30' circular tank

Circular Tank:

Tank Diameter = 30 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_{sr}		
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	12	5' 9"
13	12	6' 9"
14	12	7' 9"
15	12	8' 9"
16	12	9' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

Results for the 10'x45' circular tank

Circular Tank:

Tank Diameter = 45 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_{sr}		
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	10	8' 1"
16	10	8' 11"
17	10	9' 9"

Vertical Steel shall be #4 @ 12" O.C. = A_{sv}

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_{sr}		
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	5	4' 5"
12	8	5' 1"
13	8	5' 9"
14	8	6' 5"
15	8	7' 1"
16	8	7' 9"
17	8	8' 5"
18	8	9' 1"
19	8	9' 9"

Vertical Steel shall be #4 @ 11" O.C. = A_{sv}

Results for the 10'x75' circular tank

Circular Tank:

Tank Diameter = 75 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_{sr}		
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	5	4' 5"
12	8	5' 1"
13	8	5' 9"
14	8	6' 5"
15	8	7' 1"
16	8	7' 9"
17	8	8' 5"
18	8	9' 1"
19	8	9' 9"

Vertical Steel shall be #4 @ 10" O.C. = A_{sv}

Results for the 10'x90' circular tank

Circular Tank:

Tank Diameter = 90 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_{sr}		
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	6	4' 6"
12	7	5' 1"
13	7	5' 8"
14	7	6' 3"
15	7	6' 10"
16	7	7' 5"
17	7	8' 0"
18	7	8' 7"
19	7	9' 2"
20	7	9' 9"

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

Results for the 10'x105' circular tank

Circular Tank:

Tank Diameter = 105 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_{sr}		
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	6	4' 6"
12	7	5' 1"
13	7	5' 8"
14	7	6' 3"
15	7	6' 10"
16	7	7' 5"
17	7	8' 0"
18	7	8' 7"
19	7	9' 2"
20	7	9' 9"

Vertical Steel shall be #4 @ 8" O.C. = A_{sv}

Results for the 10'x120' circular tank

Circular Tank:

Tank Diameter = 120 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_{sr}		
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	5	4' 5"
12	5	4' 10"
13	5	5' 3"
14	6	5' 9"
15	6	6' 3"
16	6	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"

Vertical Steel shall be #4 @ 8" O.C. = A_{sv}

Results for the 12'x30' circular tank

Circular Tank:

Tank Diameter = 30 ft
Tank Wall thickness = 10 in (actual)
Tank Height = 12 ft
f_y = 60,000 psi
f_c = 4,000 psi

Horizontal Steel = #4 rebar = A_{sr}		
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	9	5' 0"
15	9	5' 9"
16	9	6' 6"
17	9	7' 3"
18	9	8' 0"
19	9	8' 9"
20	9	9' 6"
21	9	10' 3"
22	9	11' 0"
23	9	11' 9"

Vertical Steel shall be #4 @ 11" O.C. = A_{sv}

Results for the 12'x45' circular tank

Circular Tank:

Tank Diameter = 45 ft
Tank Wall thickness = 10 in (actual)
Tank Height = 12 ft
f_y = 60,000 psi
f_c = 4,000 psi

Horizontal Steel = #4 rebar = A_{sr}		
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	9	5' 0"
15	9	5' 9"
16	9	6' 6"
17	9	7' 3"
18	9	8' 0"
19	9	8' 9"
20	9	9' 6"
21	9	10' 3"
22	9	11' 0"
23	9	11' 9"

Vertical Steel shall be #4 @ 11" O.C. = A_{sv}

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

Horizontal Steel = #4 rebar = A_{sr}		
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	6	4' 9"
15	6	5' 3"
16	6	5' 9"
17	6	6' 3"
18	6	6' 9"
19	6	7' 3"
20	6	7' 9"
21	6	8' 3"
22	6	8' 9"
23	6	9' 3"
24	6	9' 9"
25	6	10' 3"
26	6	10' 9"
27	6	11' 3"
28	6	11' 9"

Vertical Steel shall be #4 @ 10" O.C. = A_{sv}

Results for the 12'x75' circular tank

Circular Tank:

Tank Diameter = 75 ft

Tank Wall thickness = 10 in (actual) Tank Height = 12 ft

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

Horizontal Steel = #4 rebar = A_{sr}		
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	6	4' 9"
15	6	5' 3"
16	6	5' 9"
17	6	6' 3"
18	6	6' 9"
19	6	7' 3"
20	6	7' 9"
21	6	8' 3"
22	6	8' 9"
23	6	9' 3"
24	6	9' 9"
25	6	10' 3"
26	6	10' 9"
27	6	11' 3"
28	6	11' 9"

Vertical Steel shall be #4 @ 8" O.C. = A_{sv}

Results for the 12'x90' circular tank

Circular Tank:

Tank Diameter = 90 ft

Tank Wall thickness = 10 in (actual) Tank Height = 12 ft

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

Horizontal Steel = #4 rebar = A_{sr}		
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	6	4' 9"
15	6	5' 3"
16	6	5' 9"
17	6	6' 3"
18	6	6' 9"
19	6	7' 3"
20	6	7' 9"
21	6	8' 3"
22	6	8' 9"
23	6	9' 3"
24	6	9' 9"
25	6	10' 3"
26	6	10' 9"
27	6	11' 3"
28	6	11' 9"

Vertical Steel shall be #4 @ 8" O.C. = A_{sv}

Results for the 12'x105' circular tank

Circular Tank:

Tank Diameter = 105 ft
Tank Wall thickness = 10 in (actual)
Tank Height = 12 ft
f_y = 60,000 psi
f_c = 4,000 psi

Horizontal Steel = #5 rebar = A_{sr}		
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"

Vertical Steel shall be #5 @ 9" O.C. = A_{sv}

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

Horizontal Steel = #5 rebar = A_{sr}		
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"

Vertical Steel shall be #5 @ 9" O.C. = A_{sv}

Results for the 14'x30' circular tank

Circular Tank:

Tank Diameter = 30 ft

Tank Wall thickness = 10 in (actual) Tank Height = 14 ft

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

Horizontal Steel = #4 rebar = A_{sr}		
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	4	4' 11"
16	4	5' 3"
17	6	5' 9"
18	8	6' 5"
19	8	7' 1"
20	8	7' 9"
21	8	8' 5"
22	8	9' 1"
23	8	9' 9"
24	8	10' 5"
25	8	11' 1"
26	8	11' 9"
27	8	12' 5"
28	8	13' 1"
29	8	13' 9"

Vertical Steel shall be #4 @ 11" O.C. = A_{sv}

Results for the 14'x45' circular tank

Circular Tank:

Tank Diameter = 45 ft Tank Wall thickness = 10 in (actual) Tank Height = 14 ft

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

Horizontal Steel = #4 rebar = A_{sr}		
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	4	4' 11"
16	4	5' 3"
17	4	5' 7"
18	7	6' 2"
19	7	6' 9"
20	7	7' 4"
21	7	7' 11"
22	7	8' 6"
23	7	9' 1"
24	7	9' 8"
25	7	10' 3"
26	7	10' 10"
27	7	11' 5"
28	7	12' 0"
29	7	12' 7"
30	7	13' 2"
31	7	13' 9"

Vertical Steel shall be #4 @ 11" O.C. = A_{sv}

Results for the 14'x60' circular tank

Circular Tank:

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

Horizontal Steel = #5 rebar = A_{sr}		
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"

Vertical Steel shall be #5 @ 12" O.C. = A_{sv}

Results for the 14'x75' circular tank

Circular Tank:

Tank Diameter = 75 ft
Tank Wall thickness = 10 in (actual)
Tank Height = 14 ft
f_y = 60,000 psi
f_c = 4,000 psi

Horizontal Steel = #5 rebar = A_{sr}		
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	7	7' 4"
16	7	7' 11"
17	7	8' 6"
18	7	9' 1"
19	7	9' 8"
20	7	10' 3"
21	7	10' 10"
22	7	11' 5"
23	7	12' 0"
24	7	12' 7"
25	7	13' 2"
26	7	13' 9"

Vertical Steel shall be #5 @ 10" O.C. = A_{sv}

Results for the 14'x90' circular tank

Circular Tank:

Tank Diameter = 90 ft
Tank Wall thickness = 10 in (actual)
Tank Height = 14 ft
f_y = 60,000 psi
f_c = 4,000 psi

Horizontal Steel = #5 rebar = A_{sr}		
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	7	7' 4"
16	7	7' 11"
17	7	8' 6"
18	7	9' 1"
19	7	9' 8"
20	7	10' 3"
21	7	10' 10"
22	7	11' 5"
23	7	12' 0"
24	7	12' 7"
25	7	13' 2"
26	7	13' 9"

Vertical Steel shall be #5 @ 9" O.C. = A_{sv}

Results for the 14'x105' circular tank

Circular Tank:

Tank Diameter = 105 ft Tank Wall thickness = 10 in (actual) Tank Height = 14 ft

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

Horizontal Steel = #5 rebar = A_{sr}		
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	6	9' 3"
20	6	9' 9"
21	6	10' 3"
22	6	10' 9"
23	6	11' 3"
24	6	11' 9"
25	6	12' 3"
26	6	12' 9"
27	6	13' 3"
28	6	13' 9"

Vertical Steel shall be #5 @ 8" O.C. = A_{sv}

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

Horizontal Steel = #5 rebar = A_{sr}		
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	6	9' 3"
20	6	9' 9"
21	6	10' 3"
22	6	10' 9"
23	6	11' 3"
24	6	11' 9"
25	6	12' 3"
26	6	12' 9"
27	6	13' 3"
28	6	13' 9"

Vertical Steel shall be #5 @ 7" O.C. = A_{sv}