



# **40-Series 2.66" Corrugation Commercial Stiffened (CTS Stiffened) Frost Free Style Pad Concrete Foundation Manual**

Instructions Manual

PNEG-2070

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**All information, illustrations, photos, and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.**

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## 1. General Overview

### General Information

The foundation recommendations in this manual are for use with 2.66" Corrugation 40-Series stiffened bins with CTS stiffeners.

Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

Soil bearing shall be confirmed by geotechnical investigation.

This document only provides estimation aids for frost free style pad foundations for CTS stiffened 2.66" bins. Refer to the other appropriate GSI foundation estimation documents for other style foundations and sizes.

### Anchor Bolt Detail (For CTS Stiffeners)

The following is the minimum requirement for anchoring of standard tanks. Refer to sidedraw instructions for special anchoring details.

1. 3/4" Diameter anchor bolt (A) is the minimum allowed, 1" diameter anchor bolt (A) is the minimum with sidedraw flume system.
2. Exposed anchor bolt thread height (B) is 5" (12.7 cm).
3. Overall anchor bolt length (C) for 3/4" and 1" diameter anchor bolt is 18" (45.72 cm). *(See Figure 1A.)*

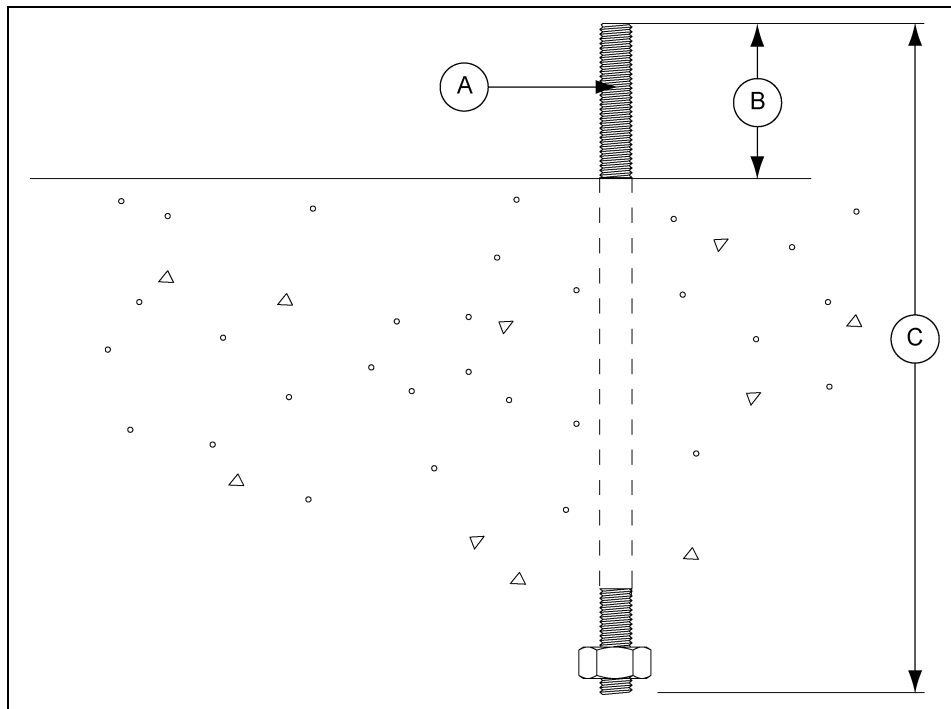


Figure 1A Anchor Bolt Example (3/4" Diameter Anchor Bolt Shown)

Ref #	Description
A	Anchor Bolt
B	Anchor Bolt Thread Height
C	Anchor Bolt Length

## Anchor Bolt Charts (CTS Stiffeners)

Prior to setting any anchor bolts, you must be sure to have the correct anchor bolt placement chart. This is very critical for stiffener alignment during erection.

The charts are divided up based on the following criteria:

- Does your bin have 2 or 3 stiffeners per sidewall sheet?
- What diameter of bin do you have?

Refer to proper chart on [Pages 6-11](#) to find the anchor chord that corresponds to the bin that is going to be built.

Start with one anchor bolt and work from it to the left to locate one quarter of the anchor bolts then to the right to locate another quarter of the bolts. Now work off of the last anchor bolts in each quarter to locate remaining anchor bolts in the last two (2) quarters. Anchor bolt radius tolerance =  $\pm 1/4"$  (7 mm).

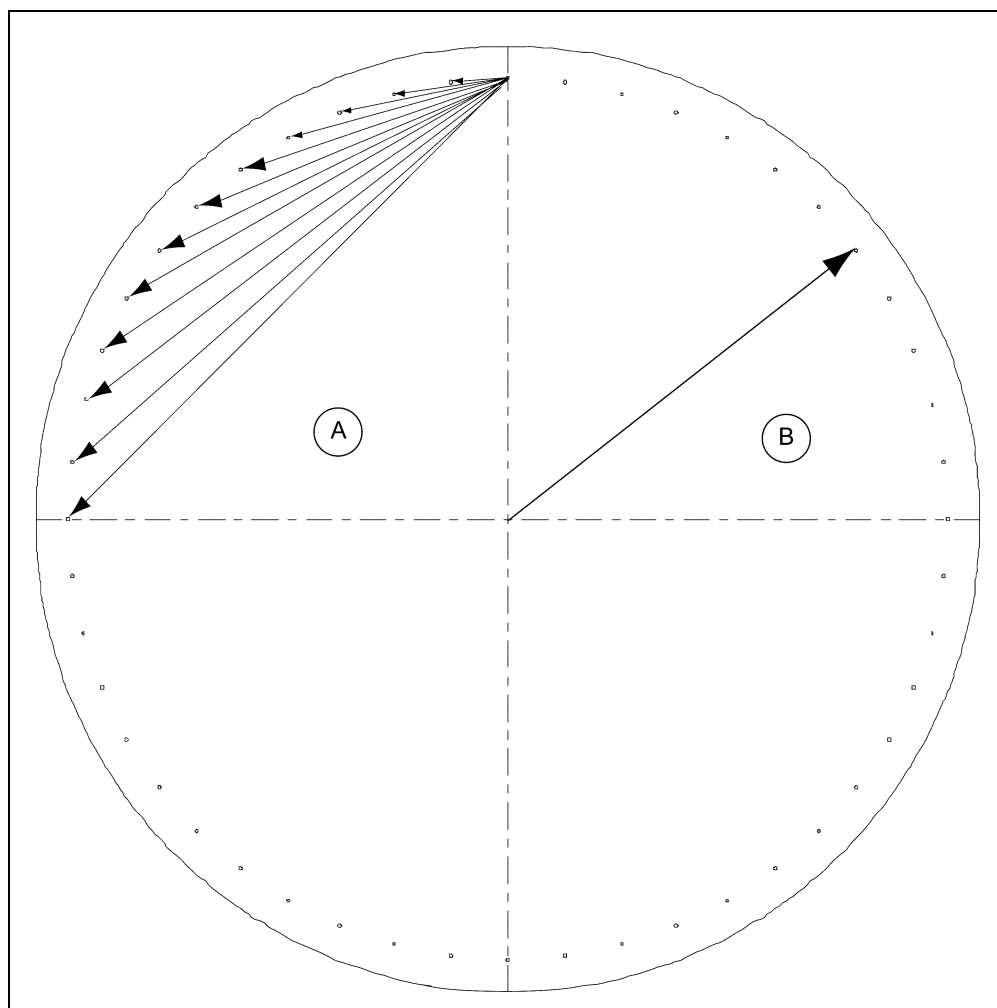


Figure 1B

Ref #	Description
A	Anchor Chord Dimensions
B	Bolt Radius

# 1. General Overview

## 2 Stiffener per Sidewall Sheet Anchor Bolt Placement Charts

Nominal	12 Anchors
Diameter	= 18' 2 Post
Bolt Radius	= 9' - 4-3/16"
Anchor Chord	4' - 10-1/8"
	9' - 4-1/4"
	13' - 2-3/4"

Nominal	14 Anchors
Diameter	= 21' 2 Post
Bolt Radius	= 10' - 10-1/8"
Anchor Chord	4' - 9-15/16"
	9' - 4-15/16"
	13' - 6-5/16"

Nominal	16 Anchors
Diameter	= 24' 2 Post
Bolt Radius	= 12'-4"
Anchor Chord	4' - 9-13/16"
	9' - 5-5/16"
	13' - 8-1/2"
	17' - 5-3/8"

Nominal	18 Anchors
Diameter	= 27' 2 Post
Bolt Radius	= 13' - 9-7/8"
Anchor Chord	4' - 9-11/16"
	9' - 5-9/16"
	13' - 9-15/16"
	17' - 9-3/8"

Nominal	20 Anchors
Diameter	= 30' 2 Post
Bolt Radius	= 15' - 3-13/16"
Anchor Chord	4' - 9-9/16"
	9' - 5-5/8"
	13' - 10-15/16"
	18' - 1/8"
	21'-8"

Nominal	22 Anchors
Diameter	= 33' 2 Post
Bolt Radius	= 16' - 9-3/4"
Anchor Chord	4' - 9-7/16"
	9' - 5-11/16"
	13' - 11-5/8"
	18' - 2-3/16"
	22'-1/4"

Nominal	24 Anchors
Diameter	= 36' 2 Post
Bolt Radius	= 18' - 3-5/8"
Anchor Chord	4' - 9-3/8"
	9' - 5-3/4"
	14'-1/8"
	18' - 3-11/16"
	22' - 3-7/16"
	25' - 10-11/16"

**NOTE:** The tables on this page are for 2 post outside stiffened tanks only.

2 Stiffener per Sidewall Sheet Anchor Bolt Placement Charts (Continued)

Nominal	28 Anchors
Diameter	= 42' 2 Post
Bolt Radius	= 21' - 3-1/2"
Anchor Chord	4' - 9-1/4"
	9' - 5-3/4"
	14'-3/4"
	18' - 5-11/16"
	22' - 7-7/8"
	26' - 6-3/4"
	30' - 1-5/16"

Nominal	36 Anchors
Diameter	= 54' 2 Post
Bolt Radius	= 27'-3"
Anchor Chord	4' - 9-1/16"
	9' - 5-5/8"
	14' - 1-5/16"
	18' - 7-3/4"
	23'-1/2"
	27' - 3-1/8"
	31' - 3-1/4"
	35'-1/2"
38' - 6-9/16"	

Nominal	32 Anchors
Diameter	= 48' 2 Post
Bolt Radius	= 24' - 3-1/4"
Anchor Chord	4' - 9-1/8"
	9' - 5-11/16"
	14' - 1-1/8"
	18' - 6-15/16"
	22' - 10-5/8"
	26' - 11-11/16"
	30' - 9-9/16"
	34' - 3-15/16"

Nominal	40 Anchors
Diameter	= 60' 2 Post
Bolt Radius	= 30' - 2-7/8"
Anchor Chord	4'-9"
	9' - 5-1/2"
	14' - 1-7/16"
	18' - 8-5/16"
	23' - 1-3/4"
	27' - 5-1/2"
	31' - 7-1/4"
	35' - 6-5/8"
	39' - 3-3/8"
	42' - 9-1/4"

**NOTE:** The tables on this page are for 2 post outside stiffened tanks only.

# 1. General Overview

## 3 Stiffener per Sidewall Sheet Anchor Bolt Placement Charts

Nominal	21 Anchors
Diameter	= 21' 3 Post
Bolt Radius	= 10' - 10-1/8"
Anchor Chord	3' - 2-13/16"
	6' - 4-3/4"
	9' - 4-15/16"
	12' - 2-5/8"
	14' - 9-1/8"

Nominal	30 Anchors
Diameter	= 30' 3 Post
Bolt Radius	= 15' - 3-13/16"
Anchor Chord	3' - 2-7/16"
	6' - 4-1/2"
	9' - 5-5/8"
	12' - 5-9/16"
	15' - 3-7/8"
	18'-1/8"
20' - 6-1/16"	

Nominal	24 Anchors
Diameter	= 24' 3 Post
Bolt Radius	= 12'-4"
Anchor Chord	3' - 2-11/16"
	6' - 4-11/16"
	9' - 5-5/16"
	12' - 4-1/8"
	15'-1/4"
	17' - 5-3/8"

Nominal	33 Anchors
Diameter	= 33' 3 Post
Bolt Radius	= 16' - 9-3/4"
Anchor Chord	3' - 2-3/8"
	6' - 4-3/8"
	9' - 5-11/16"
	12'-6"
	15' - 4-15/16"
	18' - 2-3/16"
	20' - 9-7/16"
	23' - 2-1/2"

Nominal	27 Anchors
Diameter	= 27' 3 Post
Bolt Radius	= 13' - 9-7/8"
Anchor Chord	3' - 2-9/16"
	6' - 4-9/16"
	9' - 5-9/16"
	12'-5"
	15' - 2-3/8"
	17' - 9-3/8"

Nominal	36 Anchors
Diameter	= 36' 3 Post
Bolt Radius	= 18' - 3-5/8"
Anchor Chord	3' - 2-5/16"
	6' - 4-5/16"
	9' - 5-3/4"
	12' - 6-1/4"
	15' - 5-11/16"
	18' - 3-11/16"
	21'-0"
	23' - 6-7/16"
	25' - 10-11/16"

**NOTE:** The tables on this page are for 3 post outside stiffened tanks only.



3 Stiffener per Sidewall Sheet Anchor Bolt Placement Charts (Continued)

Nominal	42 Anchors
Diameter	= 42' 3 Post
Bolt Radius	= 21' - 3-1/2"
Anchor Chord	3' - 2-3/16"
	6' - 4-3/16"
	9' - 5-3/4"
	12' - 6-5/8"
	15' - 6-11/16"
	18' - 5-11/16"
	21' - 3-1/2"
	23' - 11-13/16"
	26' - 6-9/16"
28' - 11-9/16"	

Nominal	54 Anchors
Diameter	= 54' 3 Post
Bolt Radius	= 27'-3"
Anchor Chord	3' - 2-1/16"
	6'-4"
	9' - 5-5/8"
	12' - 6-7/8"
	15' - 7-5/8"
	18' - 7-3/4"
	21' - 7-1/8"
	24' - 5-5/8"
	27' - 3-1/8"
	29' - 11-1/2"
	32' - 6-11/16"
	35'-1/2"
37' - 4-15/16"	

Nominal	48 Anchors
Diameter	= 48' 3 Post
Bolt Radius	= 24' - 3-1/4"
Anchor Chord	3' - 2-1/8"
	6' - 4-1/16"
	9' - 5-11/16"
	12' - 6-13/16"
	15' - 7-5/16"
	18' - 6-15/16"
	21' - 5-11/16"
	24' - 3-5/16"
	26' - 11-11/16"
	29' - 6-11/16"
	32'-1/8"
	34' - 3-15/16"

Nominal	60 Anchors
Diameter	= 60' 3 Post
Bolt Radius	= 30' - 2-7/8"
Anchor Chord	3'-2"
	6' - 3-7/8"
	9' - 5-9/16"
	12' - 6-15/16"
	15' - 7-7/8"
	18' - 8-5/16"
	21' - 8-1/8"
	24' - 7-1/4"
	27' - 5-1/2"
	30' - 2-15/16"
	32' - 11-5/16"
	35' - 6-5/8"
	38'-3/4"
	40' - 5-11/16"
42' - 9-1/4"	

**NOTE:** The tables on this page are for 3 post outside stiffened tanks only.

# 1. General Overview

## 3 Stiffener per Sidewall Sheet Anchor Bolt Placement Charts (Continued)

Nominal	72 Anchors
Diameter	= 72' 3 Post
Bolt Radius	= 36' - 2-1/2"
Anchor Chord	3' - 1-15/16"
	6' - 3-3/4"
	9' - 5-7/16"
	12' - 6-15/16"
	15' - 8-1/8"
	18' - 8-15/16"
	21' - 9-3/8"
	24' - 9-1/4"
	27' - 8-9/16"
	30' - 7-5/16"
	33' - 5-5/16"
	36' - 2-9/16"
	38' - 10-15/16"
	41' - 6-1/2"
	44' - 1-1/16"
46' - 6-5/8"	
48' - 11-1/8"	
51' - 2-1/2"	

Nominal	78 Anchors
Diameter	= 78' 3 Post
Bolt Radius	= 39' - 2-5/16"
Anchor Chord	3' - 1-15/16"
	6' - 3-3/4"
	9' - 5-7/16"
	12' - 6-15/16"
	15' - 8-3/16"
	18' - 9-1/8"
	21' - 9-3/4"
	24' - 9-7/8"
	27' - 9-9/16"
	30' - 8-3/4"
	33' - 7-1/4"
	36' - 5-3/16"
	39' - 2-3/8"
	41' - 10-3/4"
	44' - 6-3/8"
47' - 1-1/8"	
49' - 6-15/16"	
51' - 11-13/16"	
54' - 3-5/8"	

Nominal	75 Anchors
Diameter	= 75' 3 Post
Bolt Radius	= 37' - 8-7/16"
Anchor Chord	3' - 1-15/16"
	6' - 3-3/4"
	9' - 5-7/16"
	12' - 6-15/16"
	15' - 8-1/8"
	18' - 9-1/16"
	21' - 9-9/16"
	24' - 9-5/8"
	27' - 9-1/8"
	30' - 8-1/16"
	33' - 6-3/8"
	36' - 3-15/16"
	39'-3/4"
	41' - 8-3/4"
	44' - 3-7/8"
46' - 10-1/16"	
49' - 3-1/4"	
51' - 7-7/16"	

Nominal	90 Anchors
Diameter	= 90' 3 Post
Bolt Radius	= 45' - 1-15/16"
Anchor Chord	3' - 1-7/8"
	6' - 3-5/8"
	9' - 5-5/16"
	12' - 6-7/8"
	15' - 8-1/4"
	18' - 9-3/8"
	21' - 10-1/4"
	24' - 10-13/16"
	27' - 10-15/16"
	30' - 10-3/4"
	33' - 10-1/16"
	36' - 8-7/8"
	39' - 7-3/16"
	42' - 4-7/8"
	45'-2"
47' - 10-3/8"	
50' - 6-1/8"	
53' - 1-1/8"	
55' - 7-5/16"	
58' - 0-3/4"	
60' - 5-5/16"	
62' - 8-15/16"	

**NOTE:** The tables on this page are for 3 post outside stiffened tanks only.

3 Stiffener per Sidewall Sheet Anchor Bolt Placement Charts (Continued)

Nominal	105 Anchors
Diameter	= 105' 3 Post
Bolt Radius	= 52' - 7-1/2"
Anchor Chord	3' - 1-13/16"
	6' - 3-9/16"
	9' - 5-1/4"
	12' - 6-13/16"
	15' - 8-1/4"
	18' - 9-9/16"
	21' - 10-5/8"
	24' - 11-7/16"
	28'-0"
	31' - 0-5/16"
	34' - 0-1/4"
	36' - 11-13/16"
	39' - 10-15/16"
	42' - 9-11/16"
	45'-8"
	48' - 5-13/16"
	51' - 3-1/16"
	53' - 11-13/16"
	56' - 7-15/16"
	59' - 3-7/16"
61' - 10-3/8"	
64' - 4-9/16"	
66' - 10-1/8"	
69' - 2-15/16"	
71' - 7-1/16"	
73' - 10-3/8"	

Nominal	135 Anchors
Diameter	= 135' 3 Post
Bolt Radius	= 67' - 6-1/2"
Anchor Chord	3' - 1-3/4"
	6' - 3-7/16"
	9' - 5-1/8"
	12' - 6-11/16"
	15' - 8-1/4"
	18' - 9-5/8"
	21' - 10-15/16"
	25' - 0-1/16"
	28' - 1-1/16"
	31' - 1-7/8"
	34' - 2-7/16"
	37' - 2-7/8"
	40'-3"
	43' - 2-7/8"
	46' - 2-7/16"
	49' - 1-3/4"
	52' - 0-3/4"
	54' - 11-3/8"
	57' - 9-5/8"
	60' - 7-9/16"
63' - 5-1/16"	
66' - 2-1/8"	
68' - 10-13/16"	
71' - 7-1/16"	
74' - 2-13/16"	
76' - 10-1/16"	
79' - 4-7/8"	
81' - 11-1/16"	
84' - 4-13/16"	
86'-10"	
89' - 2-5/8"	
91' - 6-5/8"	
93' - 10-1/16"	

**NOTE:** The tables on this page are for 3 post outside stiffened tanks only.

## 1. General Overview

### Vane Axial Fan Pad

#### Placement of the Fan Pad: Transitions/Fans/Heaters Only.

If a fan or fan and heater will be installed, refer to [Figure 1C](#) to determine the concrete pad size.

1. The top of this pad should be level with the top of the bin's foundation.
2. Recommended pad thickness is 4" minimum.
3. Front of pad should be perpendicular to bin wall.
4. Pad for heater not required, but if it is to added, pour the pad to cover both locations.

For fans and transitions used in aeration duct system applications, refer the transition and aeration installation instructions.

**IMPORTANT:** Fan pad and fan must be level and smooth for proper operation. Vibration problems can result from improper fan leveling.

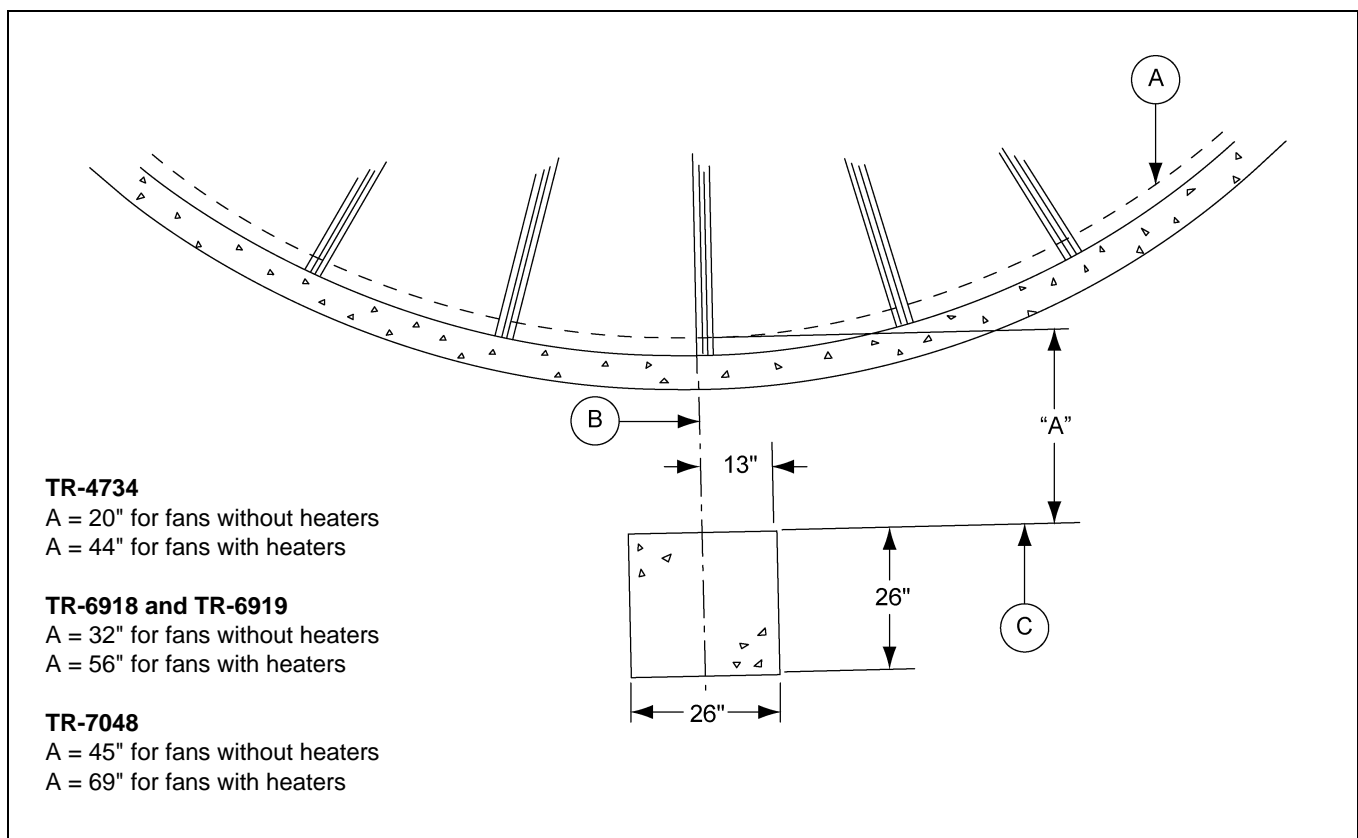


Figure 1C

Ref #	Description
A	Bin Wall
B	Centerline of Bin
C	From Sidewall

# Centrifugal Fan Pad

1. Fan pad should be poured 2" below the top of the bin foundation for all centrifugal fans.
2. A pad for heaters is not required, but is recommended.
3. Recommended pad thickness is 4".
4. If a downwind heater pad is to be installed, the pad width ("C") should be 48" and extended toward the bin by 33".
5. Fan discharge should be centered on centerline of bin.
6. The fan pad should be perpendicular to bin wall.



**Fan pad and fan must be level and smooth for proper operation. Vibration problems can result from improper fan leveling.**

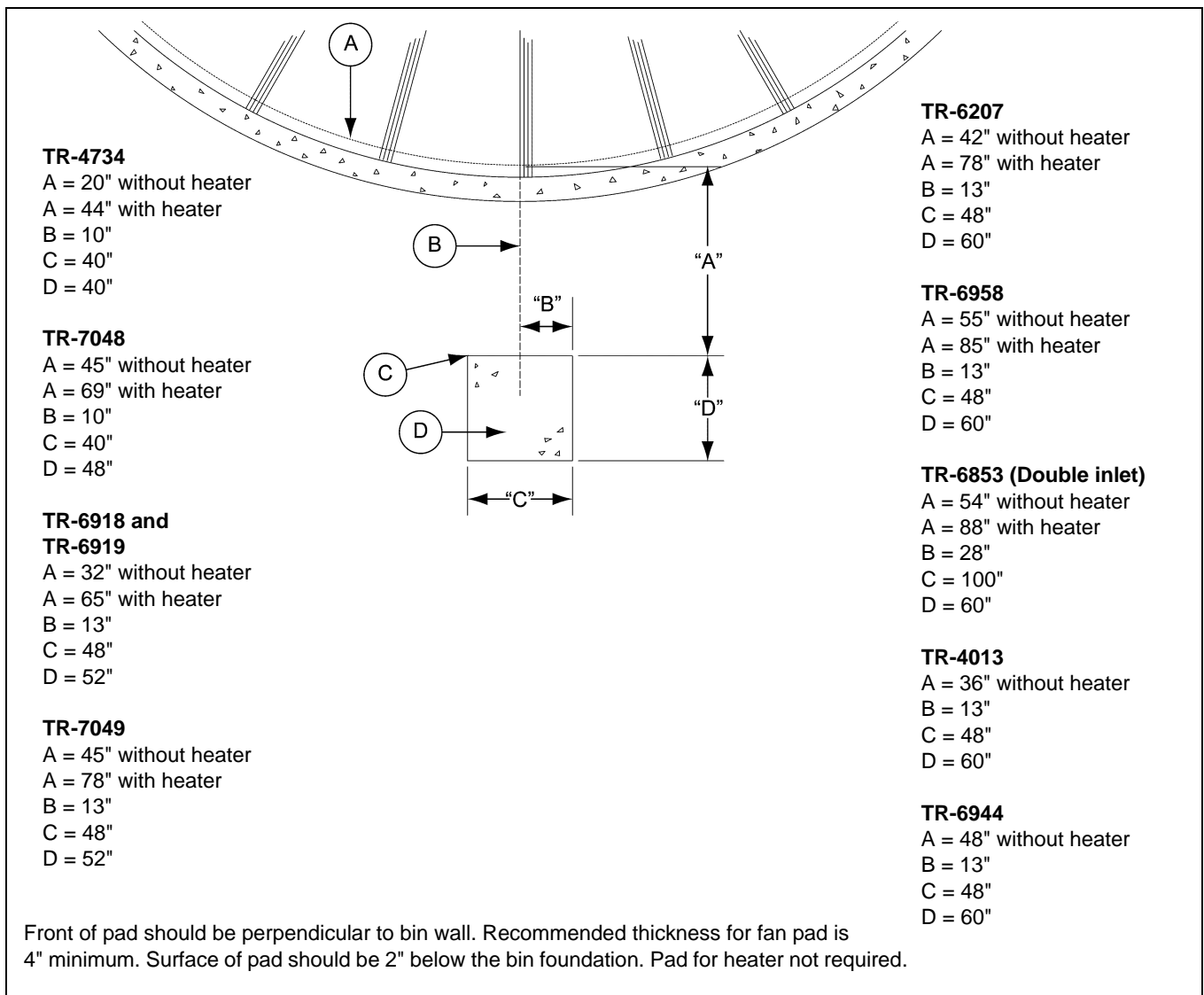


Figure 1D Centrifugal Fan Pad

Ref #	Description	Ref #	Description
A	Bin Wall	C	Dimension From Sidewall
B	Centerline of Bin	D	Fan Pad

## 2. Frost Free Pad Foundation

### 21'-60' Diameter, 14-16 Ring (2.66" Corrugation), Frost Free Pad, 3000 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 3000 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard farm bin design conditions. Seismic conditions are not considered.

All foundation specifications shall be construed as recommendations only. Because of the many variable conditions in actual installation, GSI assumes no liability for results arising from the use of such recommendations.

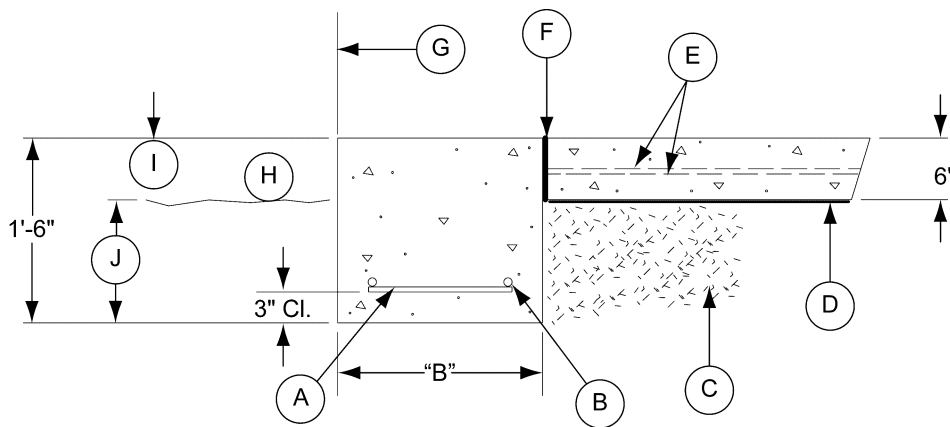


Figure 2A 21'-60' Bins

Ref #	Description
A	# 6 Bars @ 12" c/c Required
B	"N" #6 Bars evenly Spaced
C	Well Compacted Fill
D	Vapor Barrier
E	#4 Bars @ 18" C/C Grid or Two (2) Layers 6 x 6 - Wire Mesh ** W 2.9 x W 2.9 Wire Mesh

Ref #	Description
F	1/2 Expansion Joint
G	Outside Radius
H	Grade
I	6" Maximum*
J	1'-0" Minimum

\* Contact GSI technical support for heights greater than 6".

\*\* The optional #4 rebar grid can be substituted for the wire mesh in most cases. Place the #4 bars in the pad at 18" c/c each way.

## 2. Frost Free Pad Foundation

Diameter of Bin: 21'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	2'-0"	2	6	11'-8"	400	650	300	13
16	1'-6"	2'-6"	3	6	11'-8"	400	650	400	15

Diameter of Bin: 24'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	2'-6"	3	6	13'-2"	550	850	400	18
16	1'-6"	2'-9"	3	6	13'-4"	500	800	400	18

Diameter of Bin: 27'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	2'-10"	3	6	14'-10"	700	1100	500	22
16	1'-6"	3'-6"	4	6	15'-2"	700	1100	600	25

Diameter of Bin: 30'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	2'-11"	3	6	16'-5"	800	1200	550	26
16	1'-6"	3'-8"	4	6	16'-8"	800	1200	700	29

Diameter of Bin: 33'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	3'-0"	3	6	17'-11"	1000	1500	600	31
16	1'-6"	3'-10"	4	6	18'-4"	900	1500	800	35

## 2. Frost Free Pad Foundation

Diameter of Bin: 36'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	3'-6"	4	6	19'-6"	1100	1800	800	37
16	1'-6"	3'-11"	4	6	19'-10"	1100	1700	900	40

Diameter of Bin: 42'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	4'-2"	5	6	22'-10"	1600	2400	1200	51
16	1'-6"	4'-10"	5	6	23'-3"	1600	2400	1300	55

Diameter of Bin: 48'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	4'-5"	5	6	25'-11"	2000	3000	1400	64
16	1'-6"	5'-1"	5	6	26'-3"	2000	3000	1500	69

Diameter of Bin: 54'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	3'-6"	4	6	28'-2"	2700	4100	1150	68
16	1'-6"	4'-6"	4	6	29'-1"	2600	4000	1550	78

Diameter of Bin: 60'

Soil Bearing Capacity: 3000 PSF

Ring #	A (Depth)	B (Width)	N Bar Qty	N Bar Size	Outside Radius (ft.)	Length #4 18" x 18" Grid	Optional Sq. Ft. Mesh 6x6-W2.9xW2.9	Length #6 Bar (ft.)	Total Cu. Yds. Concrete
14	1'-6"	3'-8"	4	6	31'-7"	3400	5100	1400	84
16	1'-6"	4'-7"	5	6	32'-0"	3300	4900	1700	92



## 21'-54' Diameter (2.66" Corrugation), Frost Free Pad, 3000 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 3000 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

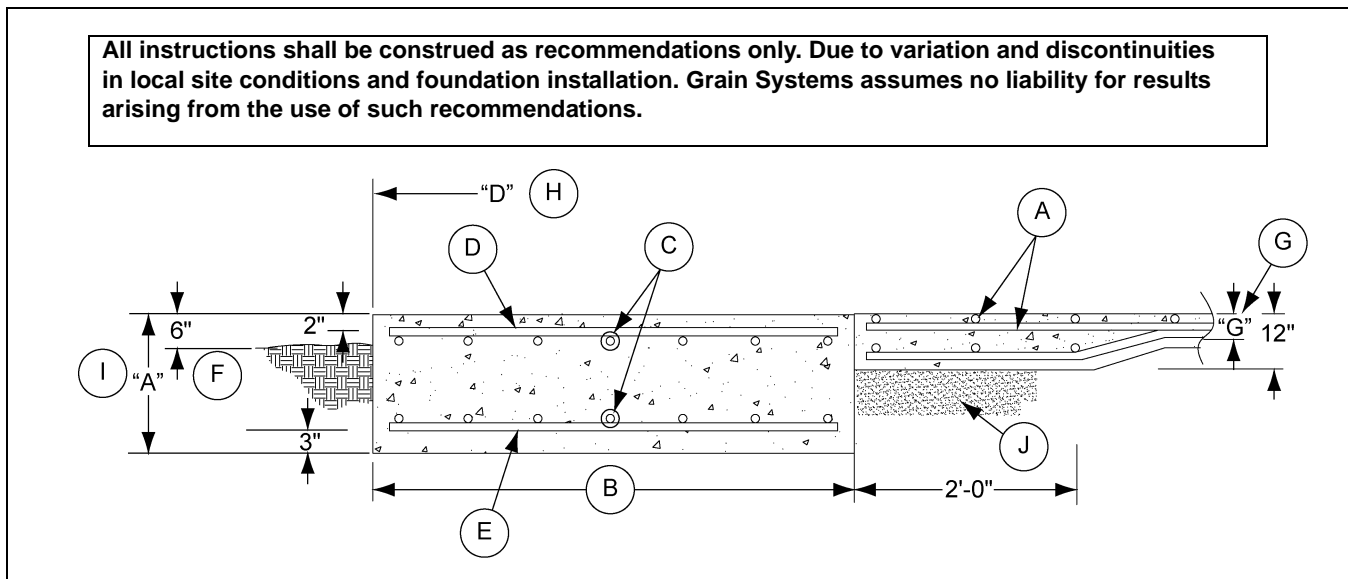


Figure 2B 21'-54' Bins

Ref #	Description
A	# 4 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill

## 2. Frost Free Pad Foundation

Diameter of Bin: 21'  
Soil Bearing Capacity: 3000 PSF

	Ring #	18
	A	2'-0"
	B	6'-0"
	D	13'-4"
	G	0'-6"
	N	8 #5's
	P	#6 @ 10" c/c
	Q	#5 @ 12" c/c
Rerod	#4 (ft.)	400
	#5 (ft.)	2500
	#6 (ft.)	500
Weight (Lbs.)		3700
Total Cu. Yds. of Concrete	Total	34

Diameter of Bin: 24'  
Soil Bearing Capacity: 3000 PSF

	Ring #	18	20
	A	1'-8"	1'-8"
	B	6'-0"	7'-6"
	D	14'-9"	15'-6"
	G	0'-6"	0'-6"
	N	7 #5's	8 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	500	400
	#5 (ft.)	2500	2900
	#6 (ft.)	500	600
Weight (Lbs.)		3700	4200
Total Cu. Yds. of Concrete	Total	34	40

Diameter of Bin: 27'  
Soil Bearing Capacity: 3000 PSF

	Ring #	18	20	22
	A	1'-6"	1'-6"	1'-10"
	B	6'-0"	7'-3"	8'-0"
	D	16'-3"	16'-8"	17'-1"
	G	0'-6"	0'-6"	0'-6"
	N	7 #5's	8 #5's	9 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 10" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	600	600	500
	#5 (ft.)	2800	3200	3600
	#6 (ft.)	500	600	800
Weight (Lbs.)		4100	4700	5300
Total Cu. Yds. of Concrete	Total	37	41	52

## 2. Frost Free Pad Foundation

Diameter of Bin: 30'  
Soil Bearing Capacity: 3000 PSF

	Ring #	18	22	24	27
	A	1'-6"	1'-6"	1'-6"	2'-0"
	B	5'-0"	6'-6"	8'-6"	8'-6"
	D	17'-5"	18'-0"	18'-9"	18'-10"
	G	0'-6"	0'-6"	0'-6"	0'-6"
	N	6 #4's	7 #4's	10 #4's	10 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 10" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	3600	4300	5000	700
	#5 (ft.)	0	0	0	4500
	#6 (ft.)	500	600	800	900
Weight (Lbs.)		3175	3775	4550	6525
Total Cu. Yds. of Concrete	Total	38	44	52	67

Diameter of Bin: 33'  
Soil Bearing Capacity: 3000 PSF

	Ring #	18	22	24	27
	A	1'-6"	1'-6"	1'-6"	2'-0"
	B	4'-6"	6'-0"	7'-6"	8'-0"
	D	18'-7"	19'-3"	19'-11"	20'-2"
	G	0'-6"	0'-6"	0'-6"	0'-6"
	N	6 #4's	7 #4's	8 #4's	10 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 10" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	4000	4400	4900	900
	#5 (ft.)	0	0	0	4900
	#6 (ft.)	500	600	800	1000
Weight (Lbs.)		3925	3850	4500	7225
Total Cu. Yds. of Concrete	Total	41	48	55	72

## 2. Frost Free Pad Foundation

Diameter of Bin: 36'  
Soil Bearing Capacity: 3000 PSF

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	4'-9"	5'-6"	7'-0"
	D	20'-2"	20'-7"	21'-8"
	G	0'-6"	0'-6"	0'-6"
	N	5 #4's	7 #4's	8 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	4500	4900	5400
	#5 (ft.)	0	0	0
	#6 (ft.)	500	600	800
Weight (Lbs.)		3775	4175	4825
Total Cu. Yds. of Concrete	Total	48	52	59

Diameter of Bin: 42'  
Soil Bearing Capacity: 3000 PSF

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	5'-0"	6'-0"	7'-6"
	D	23'-4"	23'-9"	24'-5"
	G	0'-6"	0'-6"	0'-6"
	N	6 #4's	7 #4's	8 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	5500	6000	6600
	#5 (ft.)	0	0	0
	#6 (ft.)	600	800	1000
Weight (Lbs.)		4600	5225	6000
Total Cu. Yds. of Concrete	Total	61	67	75

## 2. Frost Free Pad Foundation

**Diameter of Bin: 48'**  
**Soil Bearing Capacity: 3000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	5'-3"	6'-6"	8'-0"
	D	26'-3"	26'-10"	27'-6"
	G	0'-6"	0'-6"	0'-6"
	N	6 #4's	8 #4's	9 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	6600	7700	8400
	#5 (ft.)	0	0	0
	#6 (ft.)	800	900	1200
Weight (Lbs.)		5625	6500	7425
Total Cu. Yds. of Concrete	Total	75	83	93

**Diameter of Bin: 54'**  
**Soil Bearing Capacity: 3000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	5'-0"	7'-0"	8'-6"
	D	29'-3"	30'-1"	30'-9"
	G	0'-6"	0'-6"	0'-6"
	N	6 #4's	8 #4's	10 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	7900	9300	10600
	#5 (ft.)	0	0	0
	#6 (ft.)	800	1100	1400
Weight (Lbs.)		6500	7900	9200
Total Cu. Yds. of Concrete	Total	90	105	116

## 2. Frost Free Pad Foundation

### 60'-72' Diameter, 18-24 Ring (2.66" Corrugation), Frost Free Pad, 3000 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 3000 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

All instructions shall be construed as recommendations only. Due to variation and discontinuities in local site conditions and foundation installation. Grain Systems assumes no liability for results arising from the use of such recommendations.

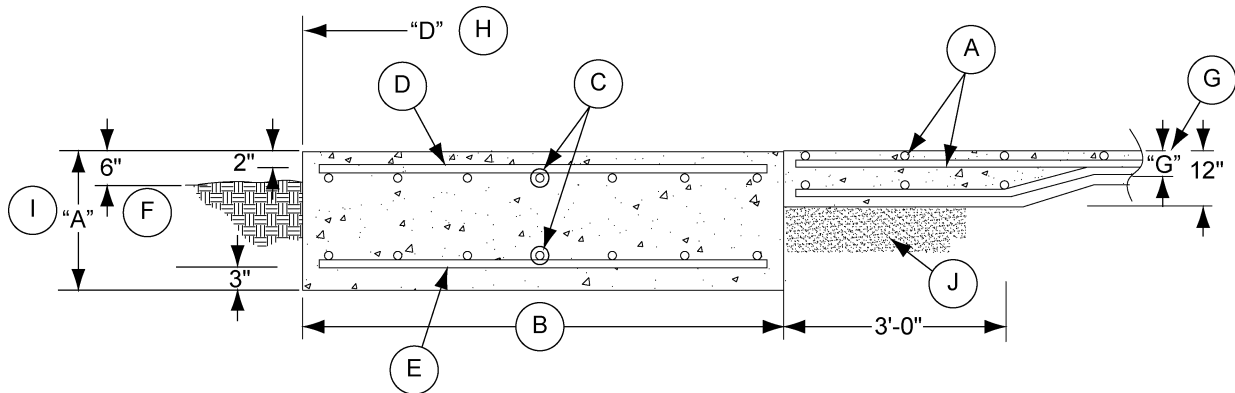


Figure 2C 60'-72' Bins

Ref #	Description
A	# 4 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill

## 2. Frost Free Pad Foundation

**Diameter of Bin: 60'**  
**Soil Bearing Capacity: 3000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	6'-0"	7'-0"	7'-3"
	D	32'-7"	33'-0"	33'-2"
	G	0'-6"	0'-6"	0'-6"
	N	7 #4's	8 #4's	9 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	9900	10600	10700
	#5 (ft.)	0	0	0
	#6 (ft.)	1100	1300	1300
	Weight (Lbs.)		8275	9050
Total Cu. Yds. of Concrete	Total	113	121	124

**Diameter of Bin: 72'**  
**Soil Bearing Capacity: 3000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	6'-3"	8'-0"	9'-9"
	D	38'-8"	39'-5"	40'-1"
	G	0'-6"	0'-6"	0'-6"
	N	7 #4's	9 #4's	10 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#7 @ 10" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	12800	14600	16200
	#5 (ft.)	0	0	0
	#6 (ft.)	1300	1700	0
	#7 (ft.)	0	0	2500
Weight (Lbs.)		10500	12300	16100
Total Cu. Yds. of Concrete	Total	151	168	197

## 2. Frost Free Pad Foundation

### 75' Diameter, 18-24 Ring and 78' Diameter, 18-22 Ring (2.66" Corrugation) Frost Free Pad, 3000 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 3000 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

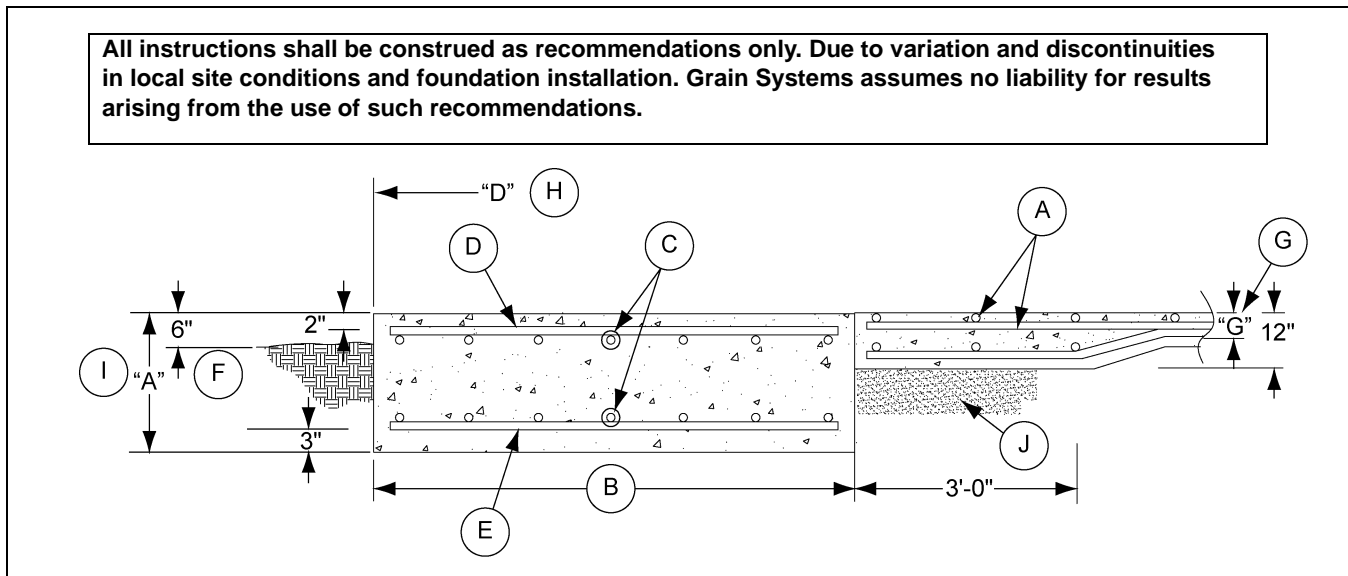


Figure 2D 75'-78' Bins

Ref #	Description
A	# 5 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill



## 2. Frost Free Pad Foundation

**Diameter of Bin: 75'**  
**Soil Bearing Capacity: 3000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	6'-0"	8'-6"	9'-6"
	D	40'-1"	41'-2"	41'-6"
	G	0'-8"	0'-8"	0'-8"
	N	7 #5's	9 #5's	10 #5's
	P	#6 @ 12" c/c	#6 @ 10" c/c	#6 @ 9" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	0	0	0
	#5 (ft.)	13500	15500	16400
	#6 (ft.)	1300	2300	2800
	#7 (ft.)	0	0	0
Weight (Lbs.)		16100	19700	21400
Total Cu. Yds. of Concrete	Total	176	200	209

**Diameter of Bin: 78'**  
**Soil Bearing Capacity: 3000 PSF**

	Ring #	18	22
	A	1'-6"	1'-6"
	B	5'-9"	8'-6"
	D	42'-2"	43'-10"
	G	0'-8"	0'-8"
	N	7 #5's	9 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	0	0
	#5 (ft.)	14700	17100
	#6 (ft.)	1300	2000
	#7 (ft.)	0	0
Weight (Lbs.)		17285	20900
Total Cu. Yds. of Concrete	Total	191	223

## 2. Frost Free Pad Foundation

### 33' Diameter, 28 Ring, 36' Diameter, 22-28 Ring and 42' Diameter 27 Ring (2.66" Corrugation) Frost Free Pad, 3500 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 3500 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

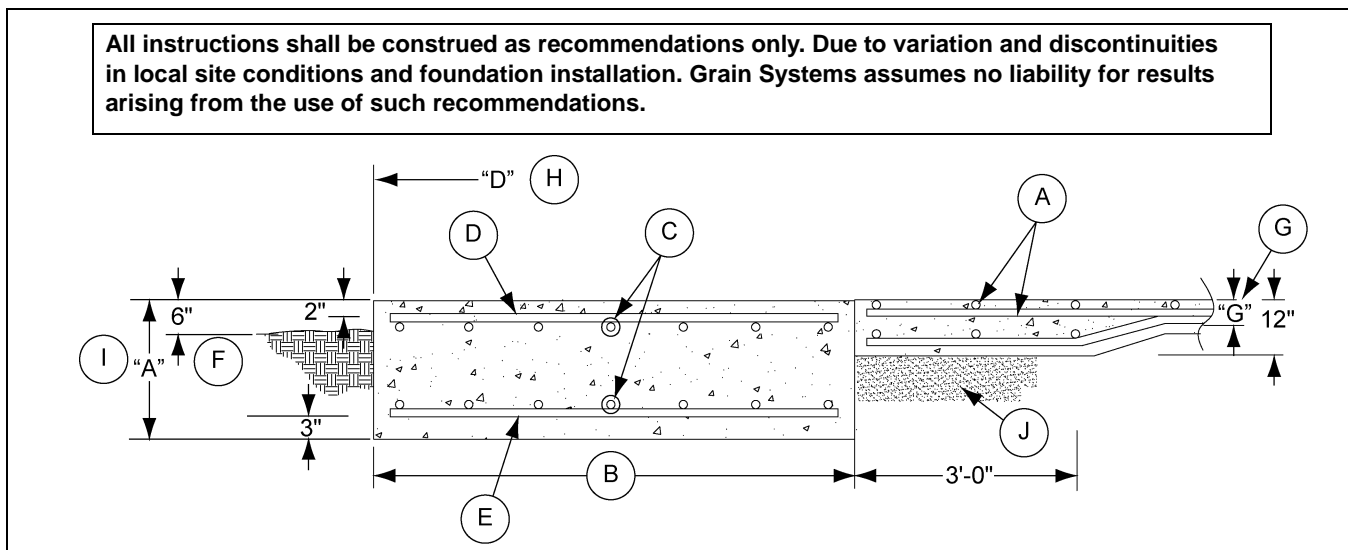


Figure 2E 33'-42' Bins

Ref #	Description
A	# 4 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill

## 2. Frost Free Pad Foundation

**Diameter of Bin: 33'**  
**Soil Bearing Capacity: 3500 PSF**

	Ring #	28
	A	2'-0"
	B	8'-0"
	D	20'-2"
	G	0'-6"
	N	10 #5's
	P	#6 @ 10" c/c
	Q	#5 @ 12" c/c
Rerod	#4 (ft.)	900
	#5 (ft.)	4500
	#6 (ft.)	1100
	#7 (ft.)	0
Weight (Lbs.)		7250
Total Cu. Yds. of Concrete	Total	72

**Diameter of Bin: 36'**  
**Soil Bearing Capacity: 3500 PSF**

	Ring #	27	28
	A	1'-8"	2'-0"
	B	8'-3"	8'-9"
	D	21'-7"	21'-11"
	G	0'-6"	0'-6"
	N	10 #4's	10 #5's
	P	#6 @ 12" c/c	#6 @ 10" c/c
	Q	#4 @ 10" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	6900	1000
	#5 (ft.)	0	5400
	#6 (ft.)	900	1100
	#7 (ft.)	0	0
Weight (Lbs.)		6000	8000
Total Cu. Yds. of Concrete	Total	70	85

**Diameter of Bin: 42'**  
**Soil Bearing Capacity: 3500 PSF**

	Ring #	27
	A	1'-6"
	B	9'-0"
	D	25'-0"
	G	0'-6"
	N	10 #4's
	P	#6 @ 12" c/c
	Q	#4 @ 12" c/c
Rerod	#4 (ft.)	7600
	#5 (ft.)	0
	#6 (ft.)	1400
	#7 (ft.)	0
Weight (Lbs.)		7200
Total Cu. Yds. of Concrete	Total	84

## 2. Frost Free Pad Foundation

### 48' Diameter, 27-28 Ring (2.66" Corrugation) Frost Free Pad, 3500 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 3500 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

All instructions shall be construed as recommendations only. Due to variation and discontinuities in local site conditions and foundation installation. Grain Systems assumes no liability for results arising from the use of such recommendations.

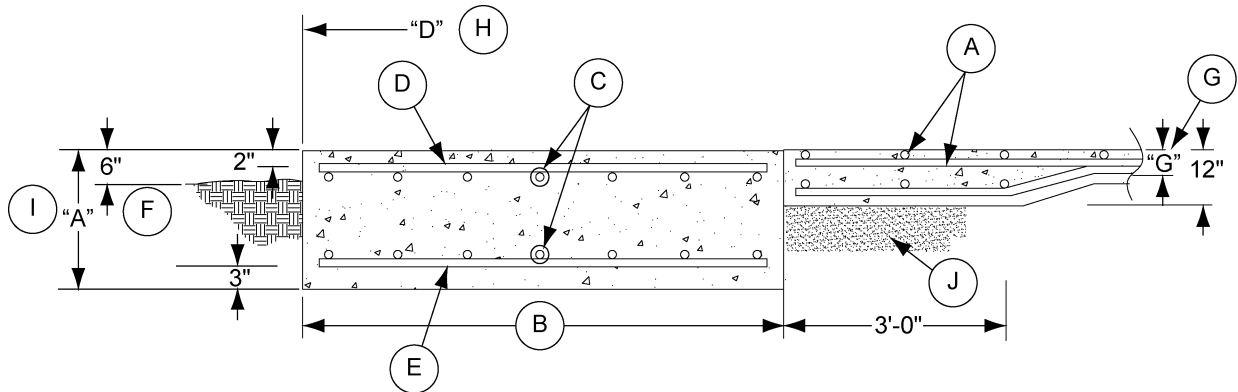


Figure 2F 48' Bin

Ref #	Description
A	# 5 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill

## 2. Frost Free Pad Foundation

Diameter of Bin: 48'  
Soil Bearing Capacity: 3500 PSF

	Ring #	27	28
	A	1'-6"	1'-6"
	B	9'-9"	10'-6"
	D	28'-3"	28'-8"
	G	0'-8"	0'-8"
	N	10 #4's	12 #4's
	P	#6 @ 12" c/c	#7 @ 10" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	9600	10300
	#5 (ft.)	0	0
	#6 (ft.)	1400	0
	#7 (ft.)	0	1800
Weight (Lbs.)		8550	10575
Total Cu. Yds. of Concrete	Total	110	115

## 2. Frost Free Pad Foundation

### 72' Diameter, 18-24 Ring (2.66" Corrugation) Frost Free Pad, 3500 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 3500 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

All instructions shall be construed as recommendations only. Due to variation and discontinuities in local site conditions and foundation installation. Grain Systems assumes no liability for results arising from the use of such recommendations.

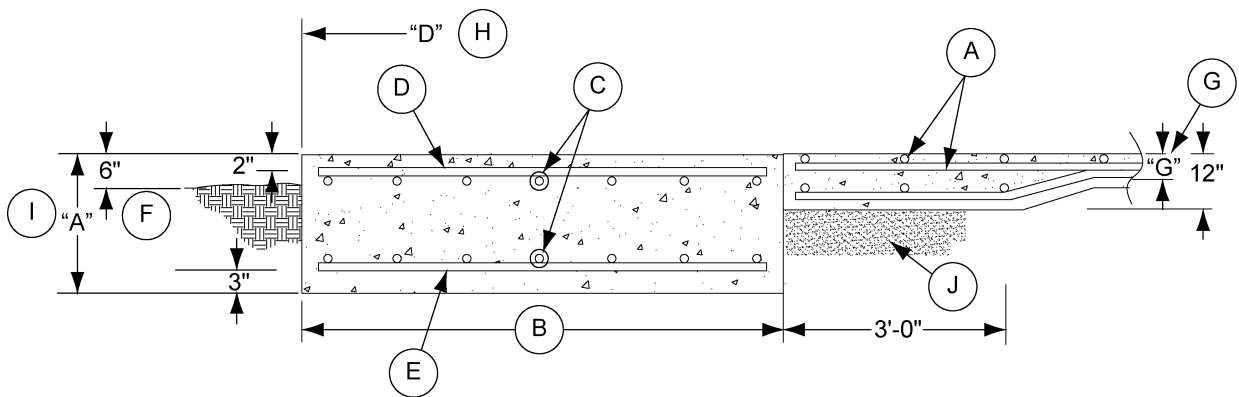


Figure 2G 72' Bin

Ref #	Description
A	# 4 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill

## 2. Frost Free Pad Foundation

Diameter of Bin: 72'  
Soil Bearing Capacity: 3500 PSF

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	5'-0"	7'-0"	8'-0"
	D	38'-2"	39'-1"	39'-6"
	G	0'-6"	0'-6"	0'-6"
	N	6 #5's	8 #5's	9 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 10" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	5500	5100	5000
	#5 (ft.)	6400	8700	9800
	#6 (ft.)	1100	1500	2100
	#7 (ft.)	0	0	0
Weight (Lbs.)		12000	14750	16750
Total Cu. Yds. of Concrete	Total	139	159	169

## 2. Frost Free Pad Foundation

### 72', 75' and 78' Diameter, 27-28 Ring (2.66" Corrugation) Frost Free Pad, 3500 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 3500 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

All instructions shall be construed as recommendations only. Due to variation and discontinuities in local site conditions and foundation installation. Grain Systems assumes no liability for results arising from the use of such recommendations.

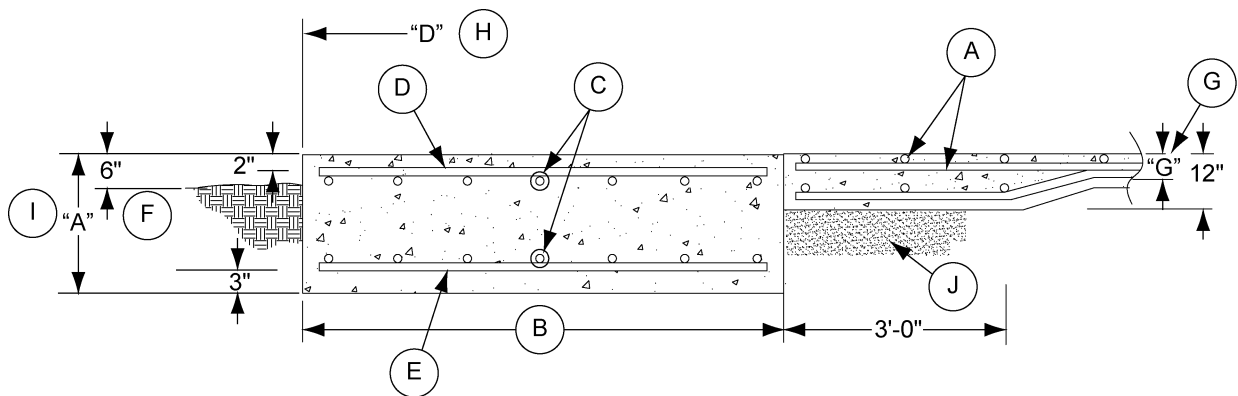


Figure 2H 72'-78' Bins

Ref #	Description
A	# 5 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill



## 2. Frost Free Pad Foundation

Diameter of Bin: 72'  
Soil Bearing Capacity: 3500 PSF

	Ring #	27	28
	A	1'-6"	1'-6"
	B	10'-0"	11'-0"
	D	40'-3"	40'-8"
	G	0'-8"	0'-8"
	N	11 #5's	12 #5's
	P	#6 @ 10" c/c	#7 @ 12" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	0	0
	#5 (ft.)	16500	17400
	#6 (ft.)	2600	0
	#7 (ft.)	0	2400
Weight (Lbs.)		21200	23100
Total Cu. Yds. of Concrete	Total	202	211

Diameter of Bin: 75'  
Soil Bearing Capacity: 3500 PSF

	Ring #	18	22	24	27	28
	A	1'-6"	1'-6"	1'-6"	1'-8"	1'-8"
	B	4'-9"	6'-9"	7'-9"	9'-9"	10'-3"
	D	39'-6"	40'-5"	40'-10"	41'-7"	41'-10"
	G	0'-8"	0'-8"	0'-8"	0'-8"	0'-8"
	N	6 #5's	8 #5's	9 #5's	11 #5's	11 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 9" c/c	#7 @ 10" c/c	#7 @ 9" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	0	0	0	0	0
	#5 (ft.)	12500	14500	15500	17300	17400
	#6 (ft.)	1000	1500	2300	0	0
	#7 (ft.)	0	0	0	2600	3100
Weight (Lbs.)		14600	17400	19700	23400	24500
Total Cu. Yds. of Concrete	Total	164	184	193	225	231

## 2. Frost Free Pad Foundation

Diameter of Bin: 78'  
Soil Bearing Capacity: 3500 PSF

	Ring #	18	22	24	27
	A	1'-6"	1'-6"	1'-6"	1'-8"
	B	5'-0"	6'-9"	8'-0"	9'-9"
	D	41'-9"	42'-9"	43'-6"	44'-6"
	G	0'-8"	0'-8"	0'-8"	0'-8"
	N	6 #5's	8 #5's	9 #5's	11 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 10" c/c	#7 @ 10" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	0	0	0	0
	#5 (ft.)	13600	15800	17000	19200
	#6 (ft.)	1200	1600	2300	0
	#7 (ft.)	0	0	0	2800
Weight (Lbs.)		16000	18900	21200	25800
Total Cu. Yds. of Concrete	Total	182	202	217	252

## 42' Diameter, 28 Ring, and 48'-72' Diameter, 18-24 Ring (2.66" Corrugation) Frost Free Pad, 4000 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 4000 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

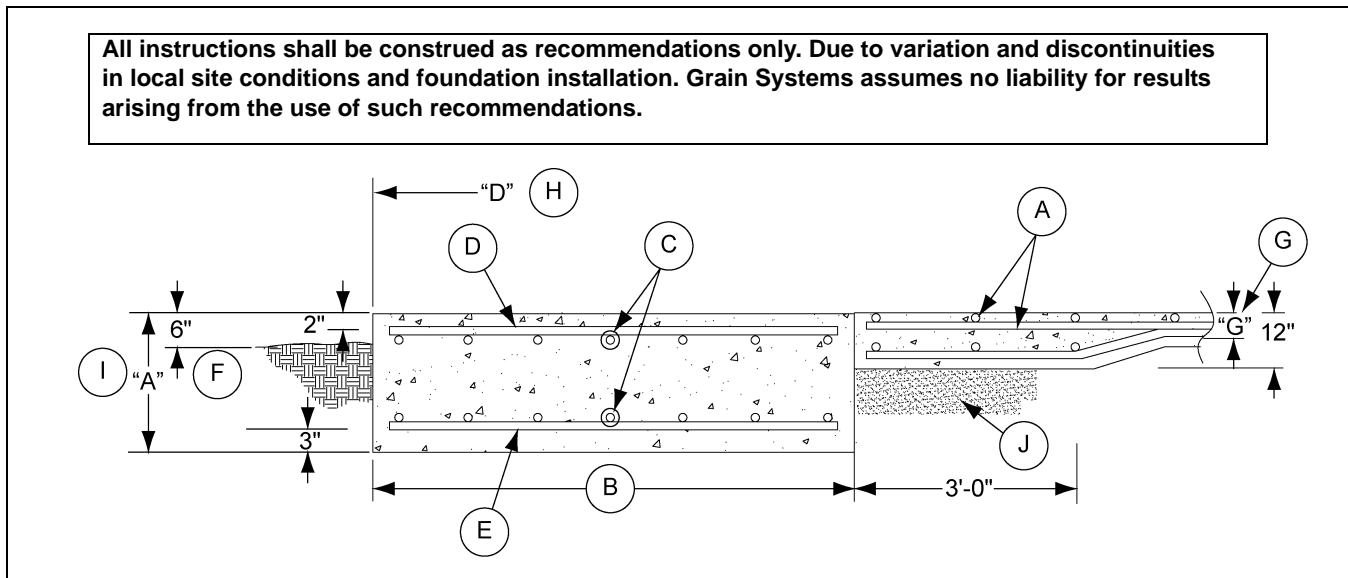


Figure 21 42'-72' Bins

Ref #	Description
A	# 4 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill

## 2. Frost Free Pad Foundation

**Diameter of Bin: 42'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	28
	A	1'-8"
	B	7'-6"
	D	24'-5"
	G	0'-6"
	N	9 #4's
	P	#6 @ 10" c/c
	Q	#4 @ 10" c/c
Rerod	#4 (ft.)	7900
	#5 (ft.)	0
	#6 (ft.)	1100
Weight (Lbs.)		7000
Total Cu. Yds. of Concrete	Total	83

**Diameter of Bin: 48'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	3'-9"	4'-6"	6'-6"
	D	25'-9"	26'-1"	26'-6"
	G	0'-6"	0'-6"	0'-6"
	N	5 #4's	6 #4's	7 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	5900	6500	7200
	#5 (ft.)	0	0	0
	#6 (ft.)	500	700	800
	#7 (ft.)	0	0	0
Weight (Lbs.)		4700	5400	6100
Total Cu. Yds. of Concrete	Total	65	70	77

**Diameter of Bin: 54'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	4'-0"	5'-0"	6'-0"
	D	28'-10"	29'-3"	29'-8"
	G	0'-6"	0'-6"	0'-6"
	N	5 #4's	6 #4's	7 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	7200	7900	8600
	#5 (ft.)	0	0	0
	#6 (ft.)	600	800	1000
	#7 (ft.)	0	0	0
Weight (Lbs.)		5725	6500	7250
Total Cu. Yds. of Concrete	Total	83	90	97

## 2. Frost Free Pad Foundation

**Diameter of Bin: 60'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	4'-0"	5'-0"	6'-3"
	D	31'-10"	32'-3"	32'-10"
	G	0'-6"	0'-6"	0'-6"
	N	5 #4's	6 #4's	7 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	8400	9100	9900
	#5 (ft.)	0	0	0
	#6 (ft.)	700	900	1100
	#7 (ft.)	0	0	0
Weight (Lbs.)		6700	7450	8275
Total Cu. Yds. of Concrete	Total	97	105	116

**Diameter of Bin: 72'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	18	22	24
	A	1'-6"	1'-6"	1'-6"
	B	4'-6"	5'-6"	6'-9"
	D	38'-0"	38'-5"	39'-0"
	G	0'-6"	0'-6"	0'-6"
	N	6 #4's	7 #4's	8 #4's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	11800	12800	13700
	#5 (ft.)	0	0	0
	#6 (ft.)	1000	1200	1400
	#7 (ft.)	0	0	0
Weight (Lbs.)		9400	10350	11250
Total Cu. Yds. of Concrete	Total	134	144	157

## 2. Frost Free Pad Foundation

### 48'-72' Diameter, 27-28 Ring, 75' Diameter, 18-28 Ring and 78' Diameter, 18-27 Ring (2.66" Corrugation) Frost Free Pad, 4000 PSF Allowable Soil Bearing Capacity

1. The foundation design is based on a minimum allowable soil bearing capacity of 4000 lbs./ft<sup>2</sup>. Bearing capacity of the soils should be determined by geotechnical investigation and be of uniform bearing capacity.
2. The foundation site must be free of vegetation and debris and well drained.
3. The foundation must be founded below the frost line or constructed on non-expansive frost free fill.
4. All material used for backfill inside the ring wall should be clean, well graded, crushed rock or a sand-gravel mixture. Backfill should be placed in 6" lifts, 95% compaction.
5. All reinforcement must meet the requirements of ASTM A615 grade 60 deformed bars.
6. Lap all circumferential bars 40 bar diameters and stagger all laps in plans 3'-0". Estimates do not include end laps.
7. Concrete must have a minimum compressive strength of 4500 PSI at 28 days.
8. The full footing thickness is to be maintained and not interrupted.
9. Foundation recommendation charts are provided as an aid in material estimation purposes for standard commercial bin design conditions. Seismic conditions are not considered.

All instructions shall be construed as recommendations only. Due to variation and discontinuities in local site conditions and foundation installation. Grain Systems assumes no liability for results arising from the use of such recommendations.

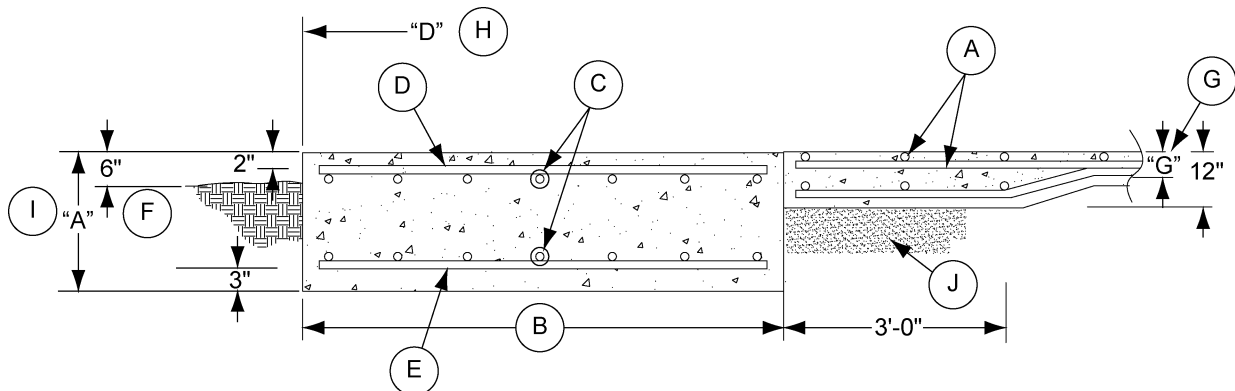


Figure 2J 48'-78' Bins

Ref #	Description
A	# 5 Bars @ 18" Each Direction
B	Footing Width
C	"N" Bars Each Face
D	"Q" Bars
E	"P" Bars

Ref #	Description
F	Grade
G	Slab Thickness "G"
H	Outside Footing Radius "D"
I	Footing Thickness "A"
J	Well Compacted Fill

## 2. Frost Free Pad Foundation

**Diameter of Bin: 48'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	27	28
	A	1'-6"	1'-6"
	B	6'-9"	7'-3"
	D	27'-1"	27'-4"
	G	0'-8"	0'-8"
	N	8 #4's	8 #4's
	P	#6 @ 12" c/c	#6 @ 10" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	5700	5800
	#5 (ft.)	2100	2100
	#6 (ft.)	1000	1300
	#7 (ft.)	0	0
Weight (Lbs.)		7500	8100
Total Cu. Yds. of Concrete	Total	92	95

**Diameter of Bin: 60'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	27	28
	A	1'-6"	1'-6"
	B	7'-6"	8'-0"
	D	33'-4"	33'-7"
	G	0'-8"	0'-8"
	N	8 #4's	9 #4's
	P	#6 @ 10" c/c	#6 @ 9" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	7300	8100
	#5 (ft.)	3500	3400
	#6 (ft.)	1600	1900
	#7 (ft.)	0	0
Weight (Lbs.)		11000	11900
Total Cu. Yds. of Concrete	Total	136	140

**Diameter of Bin: 54'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	27	28
	A	1'-6"	1'-6"
	B	7'-0"	7'-9"
	D	30'-2"	30'-6"
	G	0'-8"	0'-8"
	N	8 #4's	9 #4's
	P	#6 @ 10" c/c	#6 @ 10" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	6500	7300
	#5 (ft.)	2800	2800
	#6 (ft.)	1400	1500
	#7 (ft.)	0	0
Weight (Lbs.)		9400	10100
Total Cu. Yds. of Concrete	Total	105	118

**Diameter of Bin: 72'**  
**Soil Bearing Capacity: 4000 PSF**

	Ring #	27	28
	A	1'-6"	1'-6"
	B	8'-3"	8'-6"
	D	39'-7"	39'-8"
	G	0'-8"	0'-8"
	N	9 #4	9 #4
	P	#7 @ 12" c/c	#7 @ 10" c/c
	Q	#4 @ 12" c/c	#4 @ 12" c/c
Rerod	#4 (ft.)	9800	9800
	#5 (ft.)	4900	4900
	#6 (ft.)	0	0
	#7 (ft.)	1800	2200
Weight (Lbs.)		15400	16200
Total Cu. Yds. of Concrete	Total	186	188

## 2. Frost Free Pad Foundation

Diameter of Bin: 75'  
Soil Bearing Capacity: 4000 PSF

	Ring #	18	22	24	27	28
	A	1'-6"	1'-6"	1'-6"	1'-6"	2'-0"
	B	4'-0"	5'-9"	6'-6"	8'-3"	8'-6"
	D	39'-4"	40'-1"	40'-5"	41'-1"	41'-3"
	G	0'-8"	0'-8"	0'-8"	0'-8"	0'-8"
	N	5 #5's	7 #5's	8 #5's	9 #5's	9 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c	#7 @ 10" c/c	#6 @ 10" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	0	0	0	0	0
	#5 (ft.)	11600	13600	14600	15500	15600
	#6 (ft.)	900	1300	1500	0	2300
	#7 (ft.)	0	0	0	2200	0
Weight (Lbs.)		13500	16200	17500	20700	19800
Total Cu. Yds. of Concrete	Total	158	175	182	198	238

Diameter of Bin: 78'  
Soil Bearing Capacity: 4000 PSF

	Ring #	18	22	24	27
	A	1'-6"	1'-6"	1'-6"	1'-6"
	B	4'-0"	6'-0"	6'-9"	8'-3"
	D	41'-2"	42'-3"	42'-8"	43'-7"
	G	0'-8"	0'-8"	0'-8"	0'-8"
	N	5 #5's	7 #5's	8 #5's	9 #5's
	P	#6 @ 12" c/c	#6 @ 12" c/c	#6 @ 12" c/c	#7 @ 12" c/c
	Q	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c	#5 @ 12" c/c
Rerod	#4 (ft.)	0	0	0	0
	#5 (ft.)	12500	14700	15800	1700
	#6 (ft.)	900	1400	1600	0
	#7 (ft.)	0	0	0	2000
Weight (Lbs.)		14400	17500	18900	21900
Total Cu. Yds. of Concrete	Total	171	193	202	219



## GSI Group, LLC Limited Warranty

The GSI Group, LLC ("GSI") warrants products which it manufactures to be free of defects in materials and workmanship under normal usage and conditions for a period of 12 months after sale to the original end-user or if a foreign sale, 14 months from arrival at port of discharge, whichever is earlier. The end-user's sole remedy (and GSI's only obligation) is to repair or replace, at GSI's option and expense, products that in GSI's judgment, contain a material defect in materials or workmanship. Expenses incurred by or on behalf of the end-user without prior written authorization from the GSI Warranty Group shall be the sole responsibility of the end-user.

### Warranty Extensions:

The Limited Warranty period is extended for the following products:

	Product	Warranty Period	
<b>AP Fans and Flooring</b>	Performer Series Direct Drive Fan Motor	3 Years	* Warranty prorated from list price: 0 to 3 years - no cost to end-user 3 to 5 years - end-user pays 25% 5 to 7 years - end-user pays 50% 7 to 10 years - end-user pays 75%
	All Fiberglass Housings	Lifetime	
	All Fiberglass Propellers	Lifetime	
<b>AP and Cumberland</b>	Flex-Flo/Pan Feeding System Motors	2 Years	
<b>Cumberland Feeding/Watering Systems</b>	Feeder System Pan Assemblies	5 Years **	** Warranty prorated from list price: 0 to 3 years - no cost to end-user 3 to 5 years - end-user pays 50%
	Feed Tubes (1-3/4" and 2.00")	10 Years *	
	Centerless Augers	10 Years *	
	Watering Nipples	10 Years *	
<b>Grain Systems</b>	Grain Bin Structural Design	5 Years	
<b>Grain Systems Farm Fans Zimmerman</b>	Portable and Tower Dryers	2 Years	† Motors, burner components and moving parts not included. Portable dryer screens included. Tower dryer screens not included.
	Portable and Tower Dryer Frames and Internal Infrastructure †	5 Years	

GSI further warrants that the portable and tower dryer frame and basket, excluding all auger and auger drive components, shall be free from defects in materials for a period of time beginning on the twelfth (12<sup>th</sup>) month from the date of purchase and continuing until the sixtieth (60<sup>th</sup>) month from the date of purchase (extended warranty period). During the extended warranty period, GSI will replace the frame or basket components that prove to be defective under normal conditions of use without charge, excluding the labor, transportation and/or shipping costs incurred in the performance of this extended warranty.

### Conditions and Limitations:

THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE LIMITED WARRANTY DESCRIPTION SET FORTH ABOVE. SPECIFICALLY, GSI MAKES NO FURTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH: (I) PRODUCT MANUFACTURED OR SOLD BY GSI OR (II) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF GSI REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCTS.

GSI shall not be liable for any direct, indirect, incidental or consequential damages, including, without limitation, loss of anticipated profits or benefits. The sole and exclusive remedy is set forth in the Limited Warranty, which shall not exceed the amount paid for the product purchased. This warranty is not transferable and applies only to the original end-user. GSI shall have no obligation or responsibility for any representations or warranties made by or on behalf of any dealer, agent or distributor.

GSI assumes no responsibility for claims resulting from construction defects or unauthorized modifications to products which it manufactured. Modifications to products not specifically delineated in the manual accompanying the equipment at initial sale will void the Limited Warranty.

This Limited Warranty shall not extend to products or parts which have been damaged by negligent use, misuse, alteration, accident or which have been improperly/inadequately maintained. This Limited Warranty extends solely to products manufactured by GSI.

Prior to installation, the end-user has the responsibility to comply with federal, state and local codes which apply to the location and installation of products manufactured or sold by GSI.

This equipment shall be installed in accordance with the current installation codes and applicable regulations, which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.



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