

# AST Tank Slab Foundation Requirements

## Seismic Zone 1

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Rectangular p.3

## Seismic Zone 3

Cylindrical p.8  
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## Seismic Zone 2a

Cylindrical p.4  
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Cylindrical p.10  
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Foundation Notes for Cylindrical Tanks

Foundation Notes for Rectangular Tanks

Seismic Zone Map

Disclaimer

## Cylindrical Aboveground Storage Tank Foundation Requirements

Steel Tank Institute  
 Designed By: Jimmy Dale Schroeder, P.E., Minnesota  
 Date: 12/6/01  
 Revised: 1/8/00

DESIGN PER UBC 1997	Design Conditions
Seismic Zone 1	Allowable Soil Bearing = 2000 PSF
110 MPH Wind, Exposure B	f 'c = 2000 PSI
Occupancy Category: 4 Standard	Rebar Fy = 40000 PSI

Tank Requirements			Concrete Slab Foundation Minimum Requirements										
Secondary Tank Dimensions			Foundation Dimensions			Reinforcing Steel			Anchor Bolt Requirements				
Volume (gallons)	Dia. (in)	Length (in)	F <sub>w</sub> (in)	F <sub>l</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	No.	Dia. (B <sub>d</sub> ) (in)	Embed Len. (B <sub>l</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)	Spacing (in)
186	48	x 54	12	x 45	x 9	#4 @	24 O.C.	5.00	( 2 )	0.375	x 3.000	4.720	0.000
250	48	x 68	12	x 45	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.720	0.000
300	50	x 72	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	5.350	0.000
500	51	x 70	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.920	0.000
560	54	x 78	12	x 54	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	6.620	0.000
1,000	70	x 78	12	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.500	x 3.000	7.280	0.000
1,500	70	x 114	15	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000
2,000	70	x 150	18	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000
2,500	70	x 186	21	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000
3,000	70	x 222	21	x 72	x 9	#6 @	18 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000
4,000	90	x 174	24	x 84	x 9	#6 @	18 O.C.	5.00	( 2 )	0.750	x 4.000	6.030	0.000
5,000	102	x 168	24	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	0.750	x 5.000	6.880	0.000
6,000	102	x 198	30	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	0.750	x 5.000	6.880	0.000
8,000	102	x 258	36	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	0.875	x 5.000	6.880	0.000
10,000	102	x 330	42	x 108	x 12	#6 @	18 O.C.	8.00	( 2 )	0.750	x 6.000	9.880	0.000
12,000	102	x 390	51	x 108	x 12	#6 @	16 O.C.	8.00	( 2 )	0.875	x 6.000	9.880	0.000
15,000	126	x 312	45	x 144	x 12	#6 @	18 O.C.	8.00	( 2 )	0.875	x 6.000	12.540	0.000
20,000	126	x 414	60	x 144	x 12	#6 @	12 O.C.	8.00	( 2 )	1.000	x 6.000	12.540	0.000
25,000	126	x 516	75	x 144	x 16	#8 @	18 O.C.	12.00	( 2 )	1.125	x 6.000	12.540	0.000
30,000	126	x 618	84	x 156	x 18	#8 @	18 O.C.	14.00	( 4 )	0.875	x 8.000	18.540	10.000

See "Foundation Notes"

[Go to Seismic Zone Map](#)

# Rectangular Aboveground Storage Tank Slab Foundation Requirements

Design Conditions	
DESIGN PER 1997 UBC	Allowable Soil Bearing = 1000 PSF
Seismic Zone 1	f 'c = 2000 PSI
110 MPH Wind, Exposure B	Rebar Fy = 40000 PSI
Occupancy Category: 4 Standard	

Date: 12/15/99

Tank Requirements				Concrete Slab Foundation Minimum Requirements											
Secondary Tank Dimensions				Foundation Dimensions				Reinforcing Steel				Anchor Bolt Requirements			
Volume (gallons)	T <sub>l</sub> (in)	T <sub>w</sub> (in)	T <sub>h</sub> (in)	F <sub>l</sub> (in)	F <sub>w</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	Dia. (B <sub>d</sub> ) No.	Embed Len. (B <sub>l</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)			
186	44	x 44	x 55	44	x 60	x 6	# 4 @	18 O.C.	3.00	( 2 )	0.250 x	3.000	5.000		
250	117	x 36	x 36	117	x 52	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.250 x	3.000	4.980		
250	78	x 50	x 36	78	x 66	x 6	# 4 @	18 O.C.	3.00	( 2 )	0.250 x	3.000	5.000		
500	140	x 51	x 36	140	x 69	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.250 x	3.000	6.000		
750	140	x 72	x 35	140	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.250 x	3.000	6.000		
1,000	127	x 72	x 36	127	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.250 x	3.000	6.000		
1,000	88	x 72	x 50	88	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.250 x	3.000	6.000		
1,500	124	x 88	x 43	124	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.250 x	3.000	5.980		
2,000	140	x 86	x 50	140	x 104	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375 x	3.000	5.960		
2,000	140	x 72	x 60	146	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375 x	3.000	6.000		
2,500	140	x 88	x 60	146	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375 x	3.000	5.980		
3,000	250	x 72	x 50	256	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375 x	3.000	6.000		
3,000	117	x 102	x 72	129	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500 x	3.000	6.000		
4,000	331	x 72	x 50	337	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375 x	3.000	6.000		
4,000	154	x 102	x 72	166	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375 x	3.000	6.000		
5,000	336	x 72	x 60	348	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375 x	3.000	6.000		
5,000	191	x 102	x 72	203	x 120	x 6	# 6 @	18 O.C.	3.00	( 2 )	0.500 x	3.000	6.000		
6,000	402	x 72	x 60	414	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375 x	3.000	6.000		
6,000	228	x 102	x 72	240	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500 x	3.000	6.000		
8,000	370	x 102	x 60	382	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500 x	3.000	6.000		
8,000	302	x 102	x 72	314	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500 x	3.000	6.000		
10,000	460	x 102	x 60	472	x 120	x 6	# 6 @	18 O.C.	3.00	( 2 )	0.500 x	3.000	6.000		
10,000	376	x 102	x 72	394	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500 x	3.000	6.000		
12,000	451	x 102	x 72	469	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500 x	3.000	6.000		
15,000	386	x 102	x 102	413	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 )	0.500 x	5.000	6.000		
18,000	462	x 102	x 102	495	x 120	x 8	# 6 @	18 O.C.	3.96	( 2 )	0.750 x	4.000	6.000		
24,700	465	x 137	x 102	501	x 156	x 8	# 6 @	18 O.C.	3.96	( 2 )	0.750 x	4.000	6.500		

See "Foundation Notes"

\* - See Note 13 of the Foundation Notes.

[Go to Seismic Zone Map](#)

## Cylindrical Aboveground Storage Tank Foundation Requirements

Steel Tank Institute  
 Designed By: Jimmy Dale Schroeder, P.E., Minnesota  
 Date: 12/6/01  
 Revised: 1/8/00

DESIGN PER UBC 1997	Design Conditions
Seismic Zone 2a	Allowable Soil Bearing = 2000 PSF
110 MPH Wind, Exposure B	f 'c = 2000 PSI
Occupancy Category: 4 Standard	Rebar Fy = 40000 PSI

Tank Requirements			Concrete Slab Foundation Minimum Requirements										
Volume (gallons)	Secondary Tank Dimensions		Foundation Dimensions			Reinforcing Steel			Anchor Bolt Requirements				
	Dia. (in)	Length (in)	F <sub>w</sub> (in)	F <sub>l</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	No.	Dia. (B <sub>d</sub> ) (in)	Embed Len. (B <sub>l</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)	Spacing (in)
186	48	x 54	12	x 45	x 9	#4 @	24 O.C.	5.00	( 2 )	0.375	x 3.000	4.720	0.000
250	48	x 68	12	x 45	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.720	0.000
300	50	x 72	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	5.350	0.000
500	51	x 70	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.920	0.000
560	54	x 78	12	x 54	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	6.620	0.000
1,000	70	x 78	12	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.500	x 3.000	7.280	0.000
1,500	70	x 114	15	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000
2,000	70	x 150	18	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000
2,500	70	x 186	21	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000
3,000	70	x 222	21	x 72	x 9	#6 @	18 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000
4,000	90	x 174	24	x 84	x 9	#6 @	18 O.C.	5.00	( 2 )	0.750	x 4.000	6.030	0.000
5,000	102	x 168	24	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	0.875	x 5.000	6.880	0.000
6,000	102	x 198	30	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	0.875	x 5.000	6.880	0.000
8,000	102	x 258	36	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	0.875	x 5.000	6.880	0.000
10,000	102	x 330	42	x 108	x 12	#6 @	18 O.C.	8.00	( 2 )	1.000	x 6.000	9.880	0.000
12,000	102	x 390	51	x 108	x 12	#6 @	14 O.C.	8.00	( 2 )	1.125	x 6.000	9.880	0.000
15,000	126	x 312	45	x 144	x 12	#6 @	18 O.C.	8.00	( 4 )	1.000	x 6.000	12.540	8.000
20,000	126	x 414	60	x 144	x 12	#8 @	18 O.C.	8.00	( 4 )	1.000	x 6.000	12.540	8.000
25,000	126	x 516	75	x 144	x 16	#8 @	18 O.C.	12.00	( 4 )	1.125	x 6.000	12.540	8.000
30,000	126	x 618	84	x 156	x 18	#8 @	18 O.C.	14.00	( 4 )	1.125	x 8.000	18.540	10.000

See "Foundation Notes"

Go to Seismic Zone Map

# Rectangular Aboveground Storage Tank Slab Foundation Requirements

Design Conditions	
DESIGN PER 1997 UBC	Allowable Soil Bearing = 1000 PSF
Seismic Zone 2A	f 'c = 2000 PSI
110 MPH Wind, Exposure B	Rebar Fy = 40000 PSI
Occupancy Category: 4 Standard	

Date: 12/15/99

Tank Requirements				Concrete Slab Foundation Minimum Requirements									
Secondary Tank Dimensions				Foundation Dimensions			Reinforcing Steel				Anchor Bolt Requirements		
Volume (gallons)	T <sub>l</sub> (in)	T <sub>w</sub> (in)	T <sub>h</sub> (in)	F <sub>l</sub> (in)	F <sub>w</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	No.	Dia. (B <sub>d</sub> ) (in)	Embed Len. (B <sub>l</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)
186	44	x 44	x 55	44	x 60	x 6	# 4 @	18 O.C.	3.00	( 2 )	0.250	x 3.000	5.000
250	117	x 36	x 36	117	x 52	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.250	x 3.000	4.980
250	78	x 50	x 36	78	x 66	x 6	# 4 @	18 O.C.	3.00	( 2 )	0.250	x 3.000	5.000
500	140	x 51	x 36	140	x 69	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.250	x 3.000	6.000
750	140	x 72	x 35	140	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.375	x 3.000	6.000
1,000	127	x 72	x 36	127	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.375	x 3.000	6.000
1,000	88	x 72	x 50	88	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375	x 3.000	6.000
1,500	124	x 88	x 43	124	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375	x 3.000	5.980
2,000	140	x 86	x 50	140	x 104	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375	x 3.000	5.960
2,000	140	x 72	x 60	146	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375	x 3.000	6.000
2,500	140	x 88	x 60	146	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	5.980
3,000	250	x 72	x 50	256	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	6.000
3,000	117	x 102	x 72	129	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.750	x 3.000	6.000
4,000	331	x 72	x 50	337	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	6.000
4,000	154	x 102	x 72	166	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.500	x 4.000	6.000
5,000	336	x 72	x 60	348	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	6.000
5,000	191	x 102	x 72	203	x 120	x 6	# 6 @	18 O.C.	3.00	( 2 )	0.750	x 3.000	6.000
6,000	402	x 72	x 60	414	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	6.000
6,000	228	x 102	x 72	240	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.750	x 3.000	6.000
8,000	370	x 102	x 60	382	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.750	x 3.000	6.000
8,000	302	x 102	x 72	314	x 120	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.750	x 3.000	6.000
10,000	460	x 102	x 60	472	x 120	x 6	# 6 @	18 O.C.	3.00	( 2 )	0.750	x 3.000	6.000
10,000	376	x 102	x 72	394	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000
12,000	451	x 102	x 72	469	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000
15,000	386	x 102	x 102	413	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 )	0.750	x 5.000	6.000
18,000	462	x 102	x 102	498	x 120	x 9	# 6 @	18 O.C.	5.00	( 2 )	0.750	x 6.000	6.000
24,700	465	x 137	x 102	501	x 156	x 9	# 6 @	18 O.C.	5.00	( 2 )	1.000	x 5.000	6.500

See "Foundation Notes"

\* - See Note 13 of the Foundation Notes.

[Go to Seismic Zone Map](#)

## Cylindrical Aboveground Storage Tank Foundation Requirements

Steel Tank Institute  
 Designed By: Jimmy Dale Schroeder, P.E., Minnesota  
 Date: 12/6/01  
 Revised: 1/8/00

DESIGN PER UBC 1997	Design Conditions
Seismic Zone 2b	Allowable Soil Bearing = 2000 PSF
110 MPH Wind, Exposure B	f 'c = 2000 PSI
Occupancy Category: 4 Standard	Rebar Fy = 40000 PSI

Tank Requirements			Concrete Slab Foundation Minimum Requirements										
Volume (gallons)	Secondary Tank Dimensions		Foundation Dimensions			Reinforcing Steel			Anchor Bolt Requirements				
	Dia. (in)	Length (in)	F <sub>w</sub> (in)	F <sub>l</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	No.	Dia. (B <sub>d</sub> ) (in)	Embed Len. (B <sub>l</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)	Spacing (in)
186	48	x 54	12	x 45	x 9	#4 @	24 O.C.	5.00	( 2 )	0.375	x 3.000	4.720	0.000
250	48	x 68	12	x 45	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.720	0.000
300	50	x 72	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	5.350	0.000
500	51	x 70	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.920	0.000
560	54	x 78	12	x 54	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	6.620	0.000
1,000	70	x 78	12	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.500	x 3.000	7.280	0.000
1,500	70	x 114	15	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000
2,000	70	x 150	18	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000
2,500	70	x 186	21	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000
3,000	70	x 222	21	x 72	x 9	#6 @	18 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000
4,000	90	x 174	24	x 84	x 9	#6 @	18 O.C.	5.00	( 2 )	0.750	x 4.000	6.030	0.000
5,000	102	x 168	24	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	0.875	x 5.000	6.880	0.000
6,000	102	x 198	30	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	0.875	x 5.000	6.880	0.000
8,000	102	x 258	36	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	1.000	x 5.000	6.880	0.000
10,000	102	x 330	42	x 108	x 12	#6 @	18 O.C.	8.00	( 2 )	1.125	x 6.000	9.880	0.000
12,000	102	x 390	51	x 108	x 12	#6 @	14 O.C.	8.00	( 4 )	0.875	x 6.000	9.880	8.000
15,000	126	x 312	45	x 144	x 12	#6 @	18 O.C.	8.00	( 4 )	1.000	x 6.000	12.540	8.000
20,000	126	x 414	60	x 144	x 12	#8 @	18 O.C.	8.00	( 4 )	1.125	x 6.000	12.540	8.000
25,000	126	x 516	75	x 144	x 16	#8 @	18 O.C.	12.00	( 6 )	1.000	x 6.000	12.540	8.000
30,000	126	x 618	84	x 156	x 18	#8 @	16 O.C.	14.00	( 6 )	1.125	x 8.000	18.540	10.000

See "Foundation Notes"

[Go to Seismic Zone Map](#)

# Rectangular Aboveground Storage Tank Slab Foundation Requirements

Design Conditions	
DESIGN PER 1997 UBC	Allowable Soil Bearing = 1000 PSF
Seismic Zone 2B	f 'c = 2000 PSI
110 MPH Wind, Exposure B	Rebar Fy = 40000 PSI
Occupancy Category: 4 Standard	

Date: 12/15/99

Tank Requirements				Concrete Slab Foundation Minimum Requirements											
Secondary Tank Dimensions				Foundation Dimensions			Reinforcing Steel					Anchor Bolt Requirements			
Volume (gallons)	T <sub>l</sub> (in)	T <sub>w</sub> (in)	T <sub>h</sub> (in)	F <sub>l</sub> (in)	F <sub>w</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	No.	Dia. (B <sub>d</sub> ) (in)	Embed Len. (B <sub>i</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)		
186	44	x 44	x 55	44	x 60	x 6	# 4 @	18 O.C.	3.00	( 2 )	0.250	x 3.000	5.000		
250	117	x 36	x 36	117	x 52	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.250	x 3.000	4.980		
250	78	x 50	x 36	78	x 66	x 6	# 4 @	18 O.C.	3.00	( 2 )	0.250	x 3.000	5.000		
500	140	x 51	x 36	140	x 69	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.375	x 3.000	6.000		
750	140	x 72	x 35	140	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.375	x 3.000	6.000		
1,000	127	x 72	x 36	127	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.375	x 3.000	6.000		
1,000	88	x 72	x 50	88	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375	x 3.000	6.000		
1,500	124	x 88	x 43	124	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375	x 3.000	5.980		
2,000	140	x 86	x 50	140	x 104	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	5.960		
2,000	140	x 72	x 60	146	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	6.000		
2,500	140	x 88	x 60	146	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	5.980		
3,000	250	x 72	x 50	256	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	6.000		
3,000	117	x 102	x 72	129	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000		
4,000	331	x 72	x 50	337	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	6.000		
4,000	154	x 102	x 72	166	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000		
5,000	336	x 72	x 60	348	x 90	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.500	x 4.000	6.000		
5,000	191	x 102	x 72	206	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000		
6,000	402	x 72	x 60	414	x 90	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.500	x 4.000	6.000		
6,000	228	x 102	x 72	240	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000		
8,000	370	x 102	x 60	382	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000		
8,000	302	x 102	x 72	314	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000		
10,000	460	x 102	x 60	475	x 120	x 8	# 6 @	18 O.C.	3.96	( 2 )	0.750	x 4.000	6.000		
10,000	376	x 102	x 72	394	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 )	0.750	x 5.000	6.000		
12,000	451	x 102	x 72	469	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000		
15,000	386	x 102	x 102	416	x 123	x 12	# 6 @	24 O.C.	8.00	( 2 )	0.750	x 7.000	7.500		
18,000	462	x 102	x 102	501	x 120	x 9	# 6 @	16 O.C.	5.00	( 2 )	0.875	x 6.000	6.000		
24,700	465	x 137	x 102	504	x 159	x 12	# 6 @	18 O.C.	8.00	( 2 )	1.000	x 7.000	8.000		

See "Foundation Notes"

\* - See Note 13 of the Foundation Notes.

[Go to Seismic Zone Map](#)

## Cylindrical Aboveground Storage Tank Foundation Requirements

Steel Tank Institute  
 Designed By: Jimmy Dale Schroeder, P.E., Minnesota  
 Date: 12/6/01  
 Revised: 1/8/00

DESIGN PER UBC 1997	Design Conditions
Seismic Zone 3	Allowable Soil Bearing = 2000 PSF
110 MPH Wind, Exposure B	f 'c = 2000 PSI
Occupancy Category: 4 Standard	Rebar Fy = 40000 PSI

Tank Requirements			Concrete Slab Foundation Minimum Requirements										
Volume (gallons)	Secondary Tank Dimensions		Foundation Dimensions			Reinforcing Steel			Anchor Bolt Requirements				
	Dia. (in)	Length (in)	F <sub>w</sub> (in)	F <sub>l</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	No.	Dia. (B <sub>d</sub> ) (in)	Embed Len. (B <sub>l</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)	Spacing (in)
186	48	x 54	12	x 45	x 9	#4 @	24 O.C.	5.00	( 2 )	0.375	x 3.000	4.720	0.000
250	48	x 68	12	x 45	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.720	0.000
300	50	x 72	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	5.350	0.000
500	51	x 70	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.920	0.000
560	54	x 78	12	x 54	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	6.620	0.000
1,000	70	x 78	12	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.500	x 3.000	7.280	0.000
1,500	70	x 114	15	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000
2,000	70	x 150	18	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000
2,500	70	x 186	21	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000
3,000	70	x 222	24	x 72	x 9	#6 @	18 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000
4,000	90	x 174	27	x 84	x 9	#6 @	18 O.C.	5.00	( 2 )	0.875	x 4.000	6.030	0.000
5,000	102	x 168	27	x 108	x 12	#6 @	24 O.C.	8.00	( 2 )	1.000	x 6.000	9.880	0.000
6,000	102	x 198	30	x 102	x 12	#6 @	24 O.C.	8.00	( 2 )	1.000	x 5.000	6.880	0.000
8,000	102	x 258	39	x 105	x 12	#6 @	24 O.C.	8.00	( 2 )	1.125	x 6.000	8.380	0.000
10,000	102	x 330	45	x 108	x 12	#6 @	18 O.C.	8.00	( 4 )	0.875	x 6.000	9.880	8.000
12,000	102	x 390	54	x 108	x 12	#6 @	12 O.C.	8.00	( 4 )	1.000	x 6.000	9.880	8.000
15,000	126	x 312	45	x 144	x 12	#6 @	16 O.C.	8.00	( 4 )	1.125	x 6.000	12.540	8.000
20,000	126	x 414	60	x 144	x 12	#8 @	18 O.C.	8.00	( 6 )	1.000	x 6.000	12.540	8.000
25,000	126	x 516	78	x 144	x 16	#8 @	16 O.C.	12.00	( 6 )	1.125	x 7.000	12.540	9.000
30,000	126	x 618	84	x 156	x 18	#8 @	16 O.C.	14.00	( 8 )	1.125	x 8.000	18.540	10.000

See "Foundation Notes"

[Go to Seismic Zone Map](#)



# Rectangular Aboveground Storage Tank Slab Foundation Requirements

Design Conditions	
DESIGN PER 1997 UBC	Allowable Soil Bearing = 1000 PSF
Seismic Zone 3	f 'c = 2000 PSI
110 MPH Wind, Exposure B	Rebar Fy = 40000 PSI
Occupancy Category: 4 Standard	

Date: 12/15/99

Tank Requirements				Concrete Slab Foundation Minimum Requirements										
Secondary Tank Dimensions				Foundation Dimensions			Reinforcing Steel				Anchor Bolt Requirements			
Volume (gallons)	T <sub>l</sub> (in)	T <sub>w</sub> (in)	T <sub>h</sub> (in)	F <sub>l</sub> (in)	F <sub>w</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	Dia. (B <sub>d</sub> ) No.	Embed Len. (B <sub>i</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)		
186	44	x 44	x 55	44	x 60	x 6	# 4 @	18 O.C.	3.00	( 2 )	0.250	x 3.000	5.000	
250	117	x 36	x 36	117	x 52	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.375	x 3.000	4.980	
250	78	x 50	x 36	78	x 66	x 6	# 4 @	18 O.C.	3.00	( 2 )	0.375	x 3.000	5.000	
500	140	x 51	x 36	140	x 69	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.375	x 3.000	6.000	
750	140	x 72	x 35	140	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.375	x 3.000	6.000	
1,000	127	x 72	x 36	127	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 )	0.375	x 3.000	6.000	
1,000	88	x 72	x 50	88	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	6.000	
1,500	124	x 88	x 43	124	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	5.980	
2,000	140	x 86	x 50	143	x 104	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.500	x 3.000	5.960	
2,000	140	x 72	x 60	146	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.625	x 3.000	6.000	
2,500	140	x 88	x 60	146	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.625	x 3.000	5.980	
3,000	250	x 72	x 50	256	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.625	x 3.000	6.000	
3,000	117	x 102	x 72	132	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 )	0.750	x 5.000	6.000	
4,000	331	x 72	x 50	340	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 )	0.625	x 3.000	6.000	
4,000	154	x 102	x 72	166	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000	
5,000	336	x 72	x 60	348	x 90	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.625	x 4.000	6.000	
5,000	191	x 102	x 72	209	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 )	0.750	x 5.000	6.000	
6,000	402	x 72	x 60	414	x 90	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.625	x 4.000	6.000	
6,000	228	x 102	x 72	243	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000	
8,000	370	x 102	x 60	385	x 120	x 8	# 6 @	24 O.C.	3.96	( 2 )	0.750	x 4.000	6.000	
8,000	302	x 102	x 72	317	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 )	0.750	x 5.000	6.000	
10,000	460	x 102	x 60	475	x 120	x 9	# 6 @	18 O.C.	5.00	( 2 )	0.750	x 5.000	6.000	
10,000	376	x 102	x 72	397	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 )	0.750	x 6.000	6.000	
12,000	451	x 102	x 72	472	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 )	0.750	x 6.000	6.000	
15,000 *	386	x 102	x 102	422	x 123	x 12	# 6 @	24 O.C.	8.00	( 2 )	0.875	x 7.000	7.500	
18,000 *	462	x 102	x 102	507	x 123	x 12	# 6 @	16 O.C.	8.00	( 2 )	1.000	x 7.000	7.500	
24,700 *	465	x 137	x 102	507	x 159	x 12	# 6 @	18 O.C.	8.00	( 2 )	1.125	x 8.000	8.000	

See "Foundation Notes"

\* - See Note 13 of the Foundation Notes.

[Go to Seismic Zone Map](#)

## Cylindrical Aboveground Storage Tank Foundation Requirements

Steel Tank Institute  
 Designed By: Jimmy Dale Schroeder, P.E., Minnesota  
 Date: 12/6/01  
 Revised: 1/8/00

DESIGN PER UBC 1997	Design Conditions
Seismic Zone 4	Allowable Soil Bearing = 2000 PSF
110 MPH Wind, Exposure B	f 'c = 2000 PSI
Occupancy Category: 4 Standard	Rebar Fy = 40000 PSI
	Near-Source Factor Na = 1.0

Tank Requirements			Concrete Slab Foundation Minimum Requirements											
Volume (gallons)	Secondary Tank Dimensions		Foundation Dimensions			Reinforcing Steel			Anchor Bolt Requirements					
	Dia. (in)	Length (in)	F <sub>w</sub> (in)	F <sub>l</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	No.	Dia. (B <sub>d</sub> ) (in)	Embed Len. (B <sub>l</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)	Spacing (in)	
186	48	x 54	12	x 45	x 9	#4 @	24 O.C.	5.00	( 2 )	0.375	x 3.000	4.715	0.000	
250	48	x 68	12	x 45	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.715	0.000	
300	50	x 72	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	5.350	0.000	
500	51	x 70	12	x 48	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	4.920	0.000	
560	54	x 78	12	x 54	x 9	#4 @	18 O.C.	5.00	( 2 )	0.375	x 3.000	6.620	0.000	
1,000	70	x 78	12	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.500	x 4.000	6.110	0.000	
1,500	70	x 114	15	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.625	x 4.000	8.690	0.000	
2,000	70	x 150	18	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000	
2,500	70	x 186	21	x 72	x 9	#6 @	24 O.C.	5.00	( 2 )	0.750	x 4.000	8.690	0.000	
3,000	70	x 222	24	x 72	x 9	#6 @	18 O.C.	5.00	( 2 )	0.875	x 4.000	8.690	0.000	
4,000	90	x 174	30	x 84	x 9	#6 @	18 O.C.	5.00	( 2 )	1.000	x 5.000	6.030	0.000	
5,000	102	x 168	27	x 108	x 12	#6 @	24 O.C.	8.00	( 2 )	1.000	x 6.000	9.880	0.000	
6,000	102	x 198	33	x 105	x 12	#6 @	24 O.C.	8.00	( 2 )	1.125	x 6.000	8.380	0.000	
8,000	102	x 258	39	x 105	x 12	#6 @	24 O.C.	8.00	( 4 )	0.875	x 6.000	8.380	8.000	
10,000	102	x 330	48	x 108	x 12	#6 @	16 O.C.	8.00	( 4 )	1.000	x 6.000	9.880	8.000	
12,000	102	x 390	57	x 108	x 12	#8 @	18 O.C.	8.00	( 4 )	1.125	x 7.000	9.880	9.000	
15,000	126	x 312	48	x 144	x 12	#6 @	14 O.C.	8.00	( 6 )	1.000	x 6.000	12.540	8.000	
20,000	126	x 414	63	x 144	x 12	#8 @	16 O.C.	8.00	( 6 )	1.125	x 7.000	12.540	9.000	
25,000	126	x 516	81	x 144	x 16	#8 @	14 O.C.	12.00	( 8 )	1.125	x 7.000	12.540	9.000	
30,000	126	x 618	87	x 156	x 18	#8 @	14 O.C.	14.00	( 8 )	1.125	x 8.000	18.540	10.000	

See "Foundation Notes"

[Go to Seismic Zone Map](#)

# Rectangular Aboveground Storage Tank Slab Foundation Requirements

Design Conditions	
DESIGN PER 1997 UBC	Allowable Soil Bearing = 1000 PSF
Seismic Zone 4	f 'c = 2000 PSI
110 MPH Wind, Exposure B	Rebar Fy = 40000 PSI
Occupancy Category: 4 Standard	

Date: 12/15/99

Tank Requirements				Concrete Slab Foundation Minimum Requirements										
Secondary Tank Dimensions				Foundation Dimensions			Reinforcing Steel				Anchor Bolt Requirements			
Volume (gallons)	T <sub>l</sub> (in)	T <sub>w</sub> (in)	T <sub>h</sub> (in)	F <sub>l</sub> (in)	F <sub>w</sub> (in)	F <sub>d</sub> (in)	Size	Max. Spacing Each Way (in)	d (in)	Dia. (B <sub>d</sub> ) No.	Embed Len. (B <sub>i</sub> ) (in)	Edge Dist. (E <sub>d</sub> ) (in)		
186	44	x 44	x 55	44	x 60	x 6	# 4 @	18 O.C.	3.00	( 2 ) 0.375	x 3.000	5.000		
250	117	x 36	x 36	117	x 52	x 6	# 6 @	24 O.C.	3.00	( 2 ) 0.375	x 3.000	4.980		
250	78	x 50	x 36	78	x 66	x 6	# 4 @	18 O.C.	3.00	( 2 ) 0.375	x 3.000	5.000		
500	140	x 51	x 36	140	x 69	x 6	# 4 @	16 O.C.	3.00	( 2 ) 0.375	x 3.000	6.000		
750	140	x 72	x 35	140	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 ) 0.500	x 3.000	6.000		
1,000	127	x 72	x 36	127	x 90	x 6	# 4 @	16 O.C.	3.00	( 2 ) 0.500	x 3.000	6.000		
1,000	88	x 72	x 50	91	x 90	x 6	# 6 @	24 O.C.	3.00	( 2 ) 0.500	x 3.000	6.000		
1,500	124	x 88	x 43	124	x 106	x 6	# 6 @	24 O.C.	3.00	( 2 ) 0.500	x 3.000	5.980		
2,000	140	x 86	x 50	143	x 104	x 6	# 6 @	24 O.C.	3.00	( 2 ) 0.625	x 3.000	5.960		
2,000	140	x 72	x 60	146	x 90	x 8	# 6 @	24 O.C.	3.96	( 2 ) 0.625	x 4.000	6.000		
2,500	140	x 88	x 60	146	x 106	x 8	# 6 @	24 O.C.	3.96	( 2 ) 0.625	x 4.000	5.980		
3,000	250	x 72	x 50	259	x 90	x 8	# 6 @	24 O.C.	3.96	( 2 ) 0.625	x 4.000	6.000		
3,000	117	x 102	x 72	135	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.750	x 6.000	6.000		
4,000	331	x 72	x 50	340	x 90	x 8	# 6 @	24 O.C.	3.96	( 2 ) 0.625	x 4.000	6.000		
4,000	154	x 102	x 72	166	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.750	x 5.000	6.000		
5,000	336	x 72	x 60	351	x 90	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.625	x 5.000	6.000		
5,000	191	x 102	x 72	209	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.875	x 5.000	6.000		
6,000	402	x 72	x 60	417	x 90	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.625	x 5.000	6.000		
6,000	228	x 102	x 72	243	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.750	x 5.000	6.000		
8,000	370	x 102	x 60	388	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.750	x 6.000	6.000		
8,000	302	x 102	x 72	320	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.750	x 6.000	6.000		
10,000	460	x 102	x 60	478	x 120	x 9	# 6 @	18 O.C.	5.00	( 2 ) 0.875	x 5.000	6.000		
10,000	376	x 102	x 72	400	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.875	x 6.000	6.000		
12,000	451	x 102	x 72	475	x 120	x 9	# 6 @	24 O.C.	5.00	( 2 ) 0.875	x 6.000	6.000		
15,000 *	386	x 102	x 102	425	x 123	x 12	# 6 @	24 O.C.	8.00	( 2 ) 1.000	x 7.000	7.500		
18,000 *	462	x 102	x 102	510	x 126	x 12	# 6 @	16 O.C.	8.00	( 2 ) 1.125	x 8.000	9.000		
24,700 *	465	x 137	x 102	510	x 159	x 12	# 6 @	18 O.C.	8.00	( 2 ) 1.250	x 8.000	8.000		

See "Foundation Notes"

\* - See Note 13 of the Foundation Notes.

[Go to Seismic Zone Map](#)

## **FOUNDATION NOTES FOR CYLINDRICAL TANKS**

Jimmy Dale Schroeder, P.E.

Date: 12/6/01

Revised: 1/8/00

- 1) All designs are based upon the 1997 Uniform Building Code requirements.
- 2) Tank sizes are as specified by the Steel Tank Institute.
- 3) All slab foundation dimensions are "minimum" requirements.
- 4) Only loads imposed by the tank and its contents have been considered.  
Additional loads such as, but not limited to, traffic loads or piping loads have not been considered. These foundations may not be adequate for these conditions and concrete thickness, rebar type and spacing will require additional design.
- 5) Local codes may affect the slab foundation requirements.
- 6) Design conditions assumed are as stated in the calculations. Actual conditions that are different than these assumptions must be evaluated separately. Conditions assumed in these designs include:
  - Wind Speed
  - Wind Exposure
  - Seismic Zone
  - Seismic Near-Source Factor
  - Occupancy Category
  - Concrete Strength
  - Rebar Yield Strength
  - Allowable Soil Bearing
- 7) Anchor Bolt diameters are the minimum required exclusive of corrosion allowance.  
Larger bolt diameters may be required to allow for any required corrosion allowance.
- 8) Minimum bolt grade of material is A307.
- 9) Embedded length of bolt is the minimum length of the bolt that is embedded in the concrete.  
Additional length is required for the projection above the concrete to attach the tank support.
- 10) The design is based upon a specific saddle configuration. Any changes in the saddle design or configuration requires a review of the foundation design.

[Go to Seismic Zone Map](#)

## **FOUNDATION NOTES FOR RECTANGULAR TANKS**

Steel Tank Institute

Date: 12/15/99

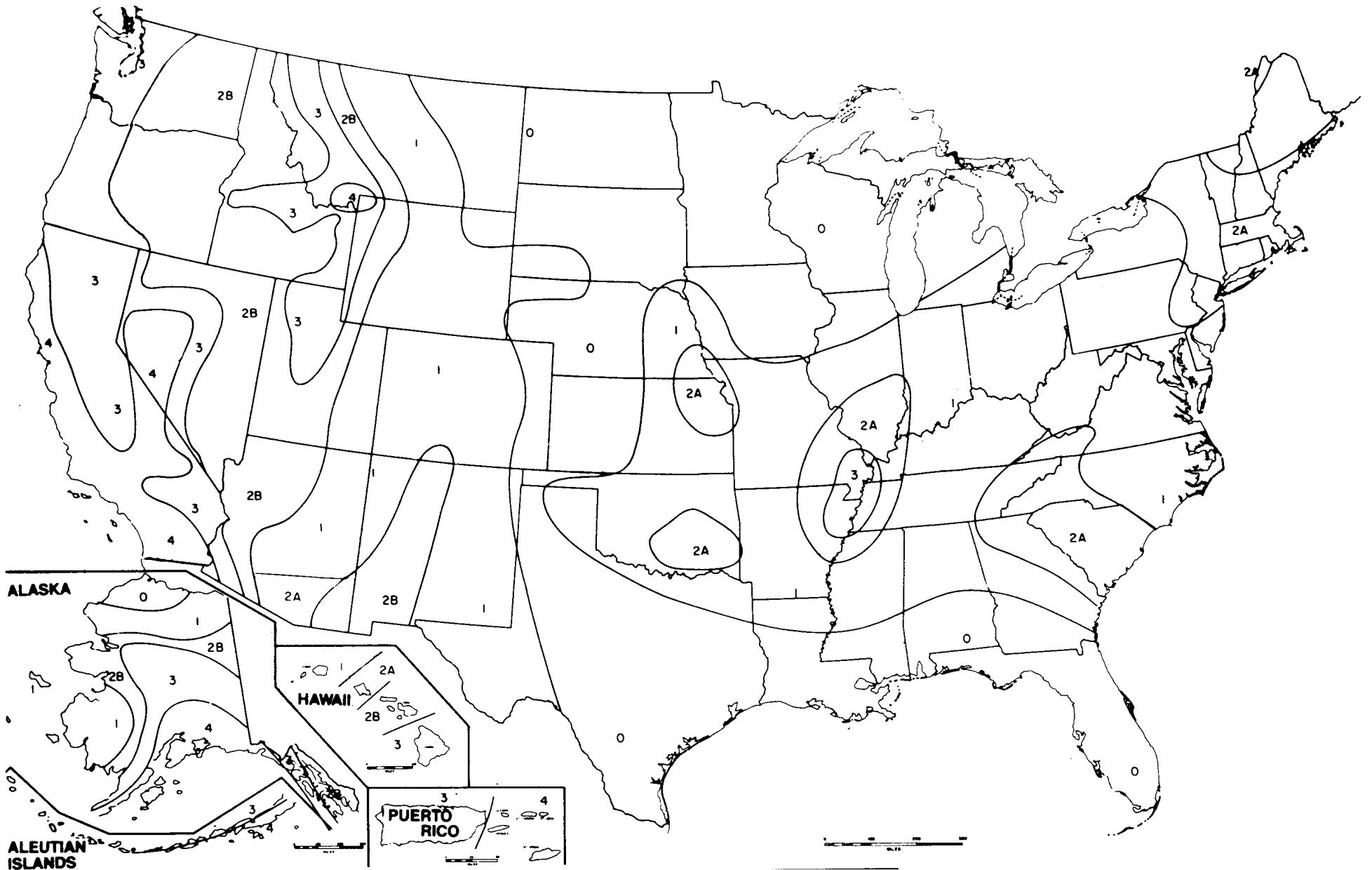
Revised: 12/15/99

- 1) All designs are based upon the 1997 Uniform Building Code requirements.
- 2) Tank sizes are as specified by the Steel Tank Institute.
- 3) All slab foundation dimensions are "minimum" requirements.
- 4) Only loads imposed by the tank and its contents have been considered.  
Additional loads such as, but not limited to, traffic loads or piping loads have not been considered. These foundations may not be adequate for these conditions and concrete thickness, rebar type and spacing will require additional design.
- 5) Local codes may affect the slab foundation requirements.
- 6) Design conditions assumed are as stated in the calculations. Actual conditions that are different than these assumptions must be evaluated separately. Conditions assumed in these designs include:
  - Wind Speed
  - Wind Exposure
  - Seismic Zone
  - Occupancy Category
  - Concrete Strength
  - Rebar Yield Strength
  - Allowable Soil Bearing
- 7) Anchor Bolt diameters are the minimum required exclusive of corrosion allowance.  
Larger bolt diameters may be required to allow for any required corrosion allowance.
- 8) Minimum bolt grade of material is A307.
- 9) Embedded length of bolt is the minimum length of the bolt that is embedded in the concrete.  
Additional length is required for the projection above the concrete to attach the tank support.
- 10) The design is based on supports being equally spaced.
- 11) The minimum support size as specified by STI is C6x8.2.
- 12) The minimum support size as specified by the Steel Tank Institute is adequate for the loads imposed on most of the tanks.
- 13) For tank sizes marked "\*\*", the supports must be modified by attaching a minimum 1/4" thick plate to the channel to create a rectangular box section rather than an open channel section. This plate must be seal welded all around to the channel section. As an alternative a larger channel section equal to at least a C8x11.5 may be used.
- 14) For seismic zone 4, the Near-Source Factor (Na) as defined by UBC Table 16-S is taken as 1.0.  
If a higher Near-Source Factor is required based upon the nearness of the tank to a seismic fault,

the tank, supports, anchorage, and foundation shall be evaluated by a qualified Registered Professional Engineer.

- 15) The Occupancy Category as defined by UBC Table 16-K is taken as a category 4. If the tank is classified as being in a category 1 or category 2, the tank, supports, anchorage, and foundation shall be evaluated by a qualified Registered Professional Engineer.

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**Seismic Zone Map of the United States**

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