Justin Billodeau, P.E.
New Mexico P.E. 20388

EXHIBIT F
STRUCTURAL CALCULTIONS
TANK MODLE 3003-WT-CHR
FOR LAS PALOMAS VFD

STRUCTURAL CALCULATIONS
TANK MODEL 3003-WT-CHR

RECEIVED
JUN 04 2015
BY:

JUSTIN BILLODEAU
NEW MEXICO
20388
PROFESSIONAL ENGINEER

Justin Billodeau
6/3/15

Sierra County – Caballo Volunteer Fire Department
Sierra County, New Mexico
Job No. 15108

EXHIBIT F
STRUCTURAL CALCULATIONS
CREATED FOR CVFD
SHALL BE USED IN EXACT FOR
THE LAS PALOMAS VFD

5-5-2015
Approved

These structural design calculations have been prepared by Justin Billodeau, P.E. for review by other design professionals as required for local building permit. Placement of Justin Billodeau' New Mexico P.E. stamp on these calculations indicates responsibility for the preparation of this document only.

510 South Congress Suite B-100 Austin, TX 78704
512 328 5353 Phone 512 328 5359 Fax

TABLE OF CONTENTS

A. SUMMARY OF TANK ANALYSIS

Roof Panel and Roof Clip Design Summary		
Roof Panel Thickness =	22 ga	
Roof Clip Thickness =	18 Gauge	
Top Stave Thickness =	20 gauge	
No. of High Roof Clips =	36	2 Bolts per Clip
No. of Center Roof Clips =	36	1 Bolt per Clip
Bolts =	5/16" Diameter SAE 8.2 Bolts	
REFERENCE APPENDIX FOR STANDARD ROOF CLIP DETAILS		

Project Design Criteria	
Tank Model :	3003-WT-CHR
Location :	Sierra County, NM
Zip Code :	87901
Design to NFPA-22 :	Y
Building Code :	2012 International Building Code
Risk Category :	II
Ultimate Wind Speed V (mph) =	115
Exposure Category =	C
Ground Snow Load (psf) =	25
Seismic Design Category =	C
Soil Site Class =	D
S_s =	0.281
S_1 =	0.089
I_p =	1.0
Seismic Use Group =	I
T_L =	6

Wallsheet and Bolt Schedule for Tank Body		
Steel Wall Sheet Schedule (Top to Bottom)	Sheet Gauge	SAE 8.2 Grade Bolt Diameter
1	20	0.3125
2	17	0.3125
3	15	0.3125

Base Anchor Clip Design Summary	
Base Clip Type =	Standard Clip
Base Clip Thickness =	12 Gauge
Bottom Stave Thickness =	15 Gauge
Number of Base Clips =	20
4 Bolts Per Clip at Stave =	3/8" Diameter SAE 8.2 Bolts
(1) Anchor Bolt Per Clip at Foundation =	3/4" Diameter Bolts
REFERENCE APPENDIX FOR STANDARD BASE CLIP ANCHOR DETAIL	

Anchor Bolt Design Summary	
Simpson Titen HD Screw Anchor Bolt Diameter (in)=	0.75
Minimum Embedment Depth (in)=	5.75
Minimum Concrete Strength (psi)=	3000
Critical Edge Distance (in) =	6.00
Allowable Tension Load T_{all} (lbs) =	4055
Allowable Shear Load V_{all} (lbs) =	5560
Anchor bolt design shall be verified for conformance with the design criteria of ACI 318 Appendix D per site specific foundation design.	

Alternate Anchor Bolt Design Summary	
Simpson Strong-Bolt 2 Wedge Anchor Diameter (in)=	0.75
Minimum Embedment Depth (in)=	5.75
Minimum Concrete Strength (psi)=	3000
Critical Edge Distance (in) =	8.00
Pull-out Strength Cracked Concrete, Np,cr, (lbs) =	8500
Shear Strength for Seismic Loads, Vsa,eq (lbs) =	11775
Anchor bolt design shall be verified for conformance with the design criteria of ACI 318 Appendix D per site specific foundation design.	

Calculations Summary and Notes

1. Calculations are based on the drawings prepared by Water Storage Tanks, Inc dated February 18, 2015 (page 2A of the calculations package).

2. Design based on the minimum code requirements of the ASCE 7-10, ANSI/ AWWA D103-09, AISI Manual for Cold-Formed Steel Design 2008 Edition, and the 2012 International Building Code., and the NFPA-22-08

3. Calculations are based on the following materials, unless noted otherwise:

   a) Angles, channels, and all other miscellaneous steel - ASTM A-36 (Fy= 36 ksi)

   b) All galvanized steel manufactured to ASTM A653

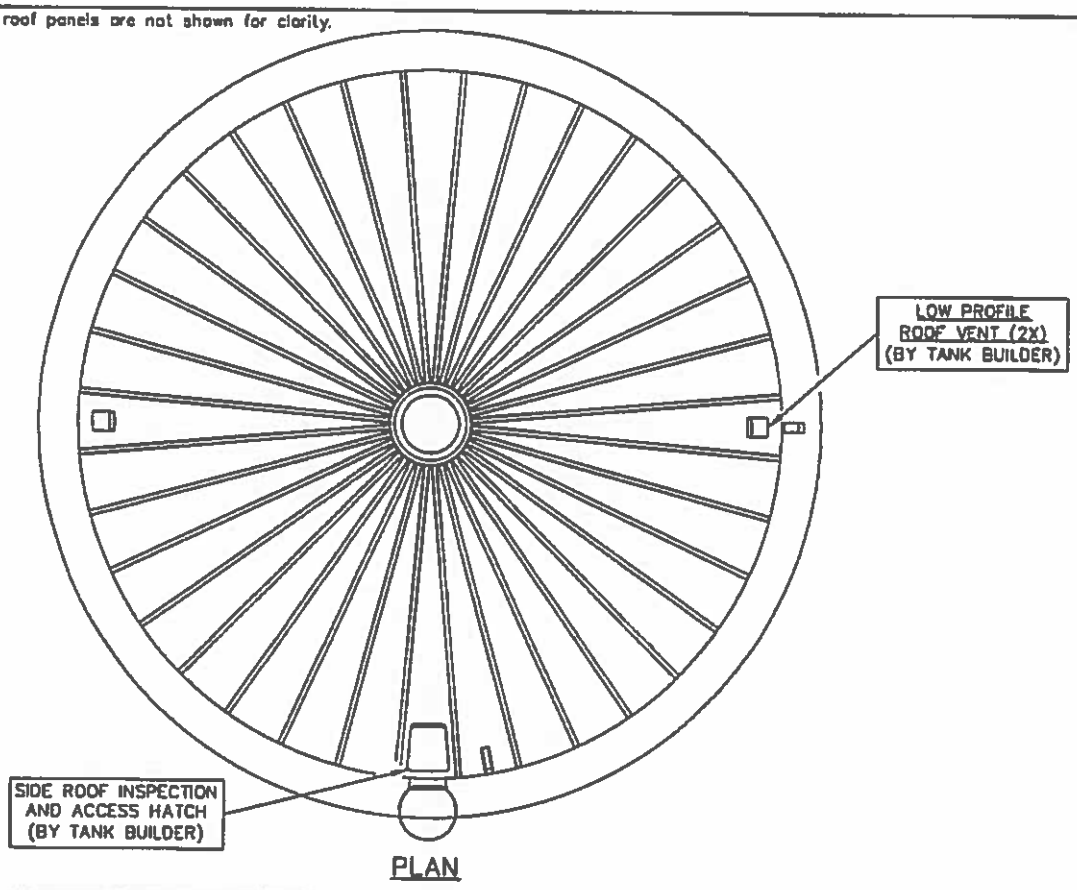
   c) All bolts shall be grade SAE 8.2 Fu= 120ksi.

   d) All wall sheets and roof panels Fy= 50ksi for thicknesses less than 16ga and Fy= 57ksi for 16ga and thicker

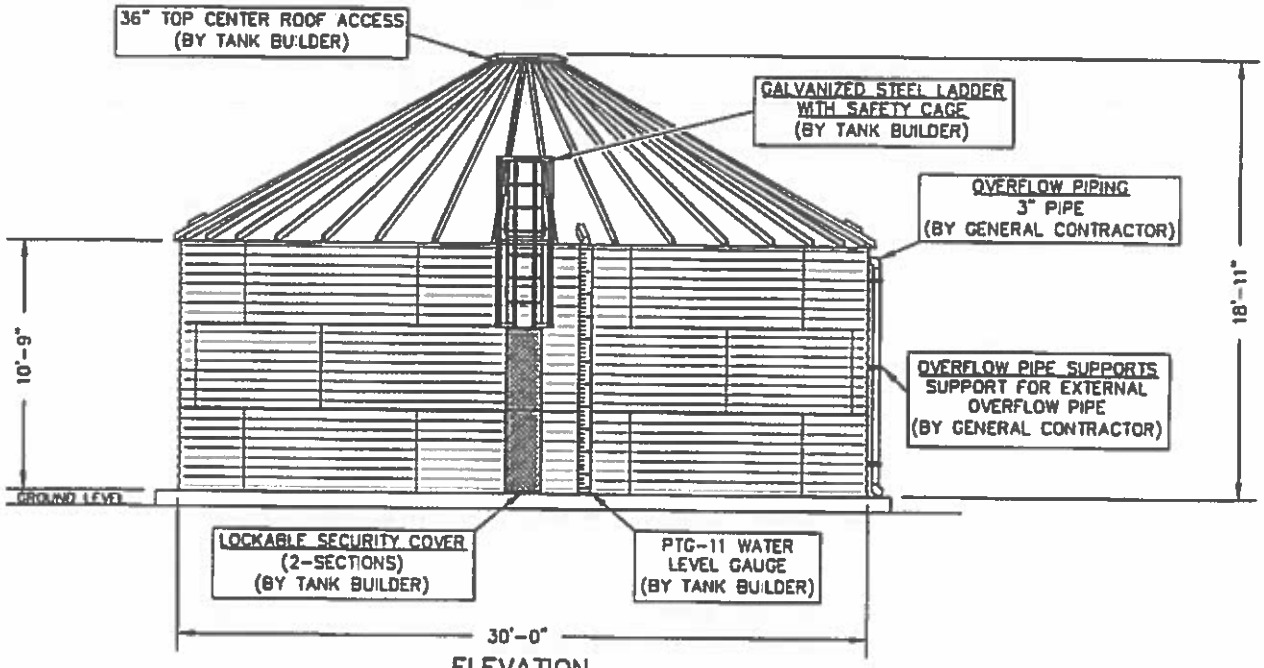
4. Summary of Items to be verified:

   a) Engineer of Record to review calculations for conformance of project specifications and local building code requirements as required for local building permit.

Corrugations on roof panels are not shown for clarity.



PLAN



ELEVATION

DESIGN STRUCTURE TO NFPA-22-13 STANDARDS

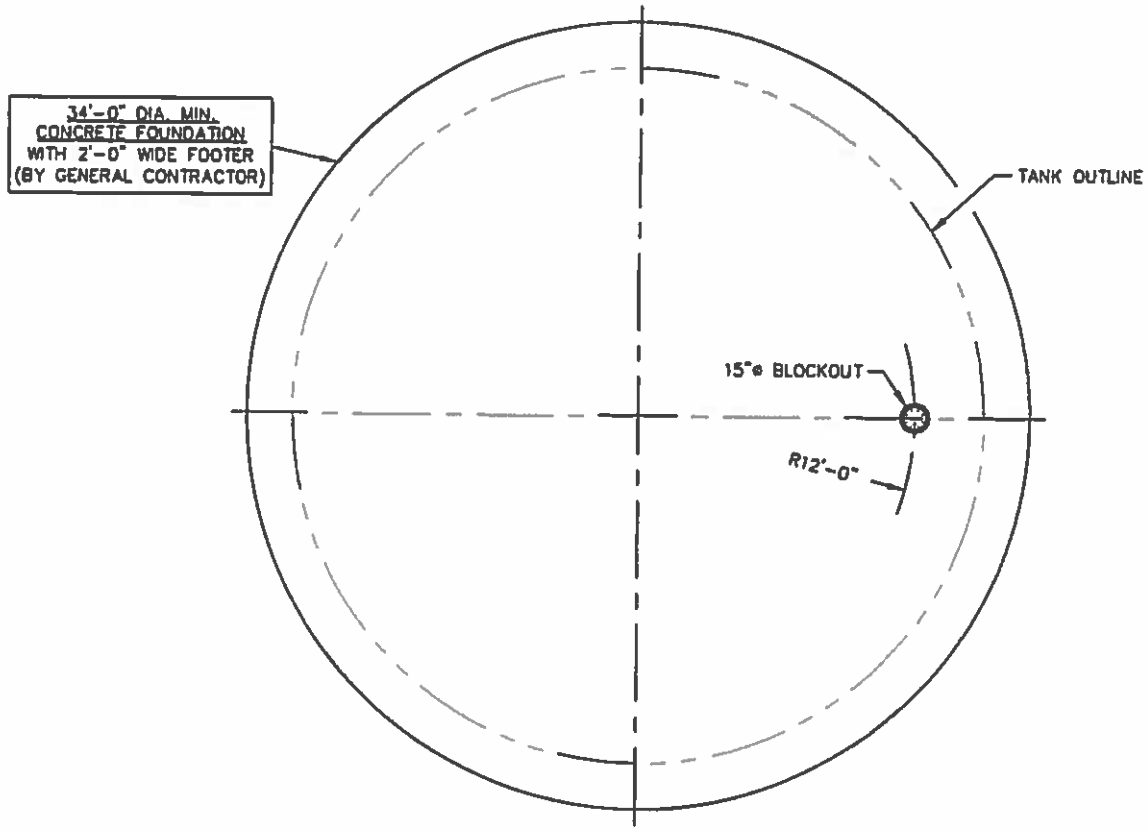
		BY	DATE
	DWN	IU	2/18/15
	CKD	JH	2/18/15
	ENG	JH	2/18/15

WATER STORAGE TANKS, INC.
1-800-463-1898
www.waterstoragetanksinc.com

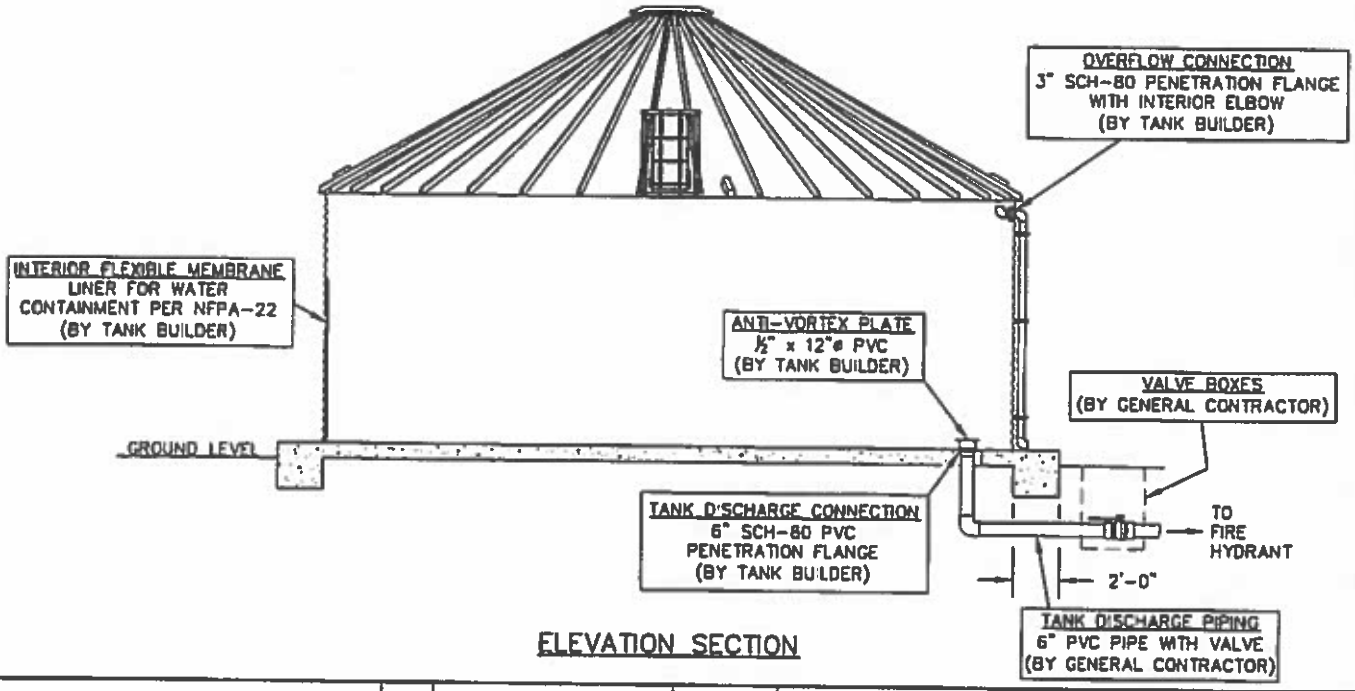
TITLE: MODEL 3003-WT-CHR
CORGAL STEEL WATER STORAGE TANK
NOMINAL CAPACITY – 53,000 GALLONS (U.S.)

DWG. NO.: WST-Sierra County Fire Tank-1
REV. NO.: A

SIZE: A | SCALE: 1/8"=1'-0" | SHEET: 1 OF 2



PLAN



ELEVATION SECTION

WATER STORAGE TANKS, INC.
1-800-463-1898
www.waterstoragetanksinc.com

	BY	DATE
DWN	IU	2/18/15
CKD	JH	2/18/15
ENG	JH	2/18/15

TITLE: MODEL 3003-WT-CHR
CORGAL STEEL WATER STORAGE TANK
NOMINAL CAPACITY - 53,000 GALLONS (U.S.)

DWG. NO.: WST-Sierra County Fire Tank-2
REV. NO.: A

SIZE: A | SCALE: 1/8"=1'-0" | SHEET: 2 OF 2

B. PROJECT DESIGN CRITERIA

1. Building Codes: Based on ASCE 7-10, ANSI/AWWA D103-09, 2012 IBC, NFPA 22-08

Risk Category	II
Seismic Use Group	I

2. Gravity Loads:

Roof	Maximum (psf)	Minimum (psf)
High Rib Roof	1.70	1.70
Miscellaneous	0.30	0.00
Total =	2.00	1.70

Tank	Maximum (psf)	Minimum (psf)	Average Wall Thickness
Corrugated Wall Sheets	2.12	2.12	17 gauge
Tank Liner, Misc	0.50	0.00	0.052
Total =	2.62	2.12	

Roof Slope (degrees) =	30.00
Tank Diameter (ft) =	30.00
Tank Eave Height (ft) =	10.68
Tank Overall Height (ft) =	18.92
Tank Dead Weight (W) (lbs) =	40513
Total Roof Live Load (lbs) =	12016.6
Tank Circumference (ft) =	94.25
Total Vertical Dead Wall Load (plf) =	43.02
Total Vertical Dead + Live Wall Load (plf) =	170.52

Water (pcf) =	62.40
Freeboard (ft) =	0.50
Max Height of Water (ft) =	10.18
Capacity (ft^3) =	7196
Capacity (gallons) =	53829
Total weight of tank contents (lbs) =	449019

Roof Live Load

	20.0	psf
Controlling =	17.0	psf (Reduced 85% per roof slope)

Note: A minimum roof live load of 25psf must be used for roof slopes less than 30 degrees per NFPA 22 Section 4.11.2.4

Snow Loads

$P_f = 0.7C_eC_tIP_g$	0.7	
Ground Snow Load, P_g (psf)	25	
Importance Factor, I	1.0	
Snow Exposure Factor, C_e	1.0	
Thermal Factor, C_T	1.2	
Roof Slope Factor, Cs	0.80	Figure 7-2 page 36, ASCE
Roof Snow Load, P_F (psf)	21.00	
Slope Roof Snow Load, P_S (psf)	16.80	
Min. Roof Snow Load, P_M (psf)= (I)P_g	20.0	ONLY IF SLOPE < 15
(For roof slopes less than 15 degrees)		
Roof Snow Load Applied (psf)	17	

Wind Loading

Ultimate V (mph) =	115	Figure 26.5-1C

C. DESIGN CRITERIA - WIND LOADING

$F = q_z G C_f A_{f(s)}$ (29.5-1)

WIND LOAD CALCULATIONS ASCE 7-10 Chapter 29.5

Design per NFPA-22 =	Y	
Risk Category =	II	Table 1.5-1
Ultimate V (mph) =	115	Figure 26.5-1C
Exposure =	C	Section 26.7
K_{zt} =	1.0	Section 26.8 page 254
K_d =	0.95	Table 26.6-1 page 250
Tank Diameter D (ft)=	30.00	
Tank Eave Height (ft) =	10.68	
Tank Overall height h (ft)=	18.92	h= tank height + height of roof for conservative overturning design
h/D=	1.59	
$D\sqrt{q_z}$ =	156.76	
C_f =	0.70	Force Coefficient Fig 29.5-1 page 312
G_s =	0.85	Section 26.9 page 254
Centroid of Tank in Feet (y) =	9.46	
α =	9.50	Table 26.9-1 page 256
Z_g =	900	Table 26.9-1 page 256
Area of Tank =	567.60	

Velocity Pressure, q_z (psf) $q_z = 0.00256 K_z K_{zt} K_d V^2$ (psf) Section 29.3.2

height (ft)	K_z	q_z	$P = q_z G C_{f(psf)}$
0-15	0.85	27.30	16.25
20	0.90	28.95	17.22
25	0.94	30.23	17.99
30	0.98	31.52	18.75
40	1.04	33.45	19.90

q_z (psf)= 27.30 (at centroid when y<40ft)

F (lb) =	9221	Using qz at centroid of Tank
F (lb) =	10217	Using Minimum of 16 psf per Section 29.8 (Use Minimum of 18 psf per Section 4.11.3.1 of NFPA 22 if Designing for Fire Protection)
F (lb) =	11920	$P_w > 30C_f$ per Section 15.1 of AWWA D-109
F (lb) =	11920	Controlling
F (lb) =	7152	ASD Design Load Combination D + 0.6W

Anchor Bolt Design for Empty Tank

Anchor Bolt Diameter (in)=	0.75	Minimum Diameter per Section 5.9.4
Tank Circumference (C) (ft)=	94.25	
Number of Anchor Bolts (Nmin)=	9	Maximum spacing of 10ft or minimum of 5 anchor bolts per 5.9.1.2.1
Number of Anchor Bolts (N)=	20	Enter Number of bolts used
W (lbs)	4054	total weight of tank shell, roof dead-load reaction on shell
Wind Overturning Moment (M_w) (ft-lbs)	67656	=(F)(y)
Tension Force per Anchor (P_w) (lbs)	248	$= 4(M_w/ND) - (W/N)$ (Eq 5-10)
Shear Force per Anchor (V_w) (lbs)	358	= F/N
Anchor bolt spacing (S) (ft) =	4.71	= C/N
Tensile / Compressive force on Tank Shell (plf) =	52.7	$=P_w/S$

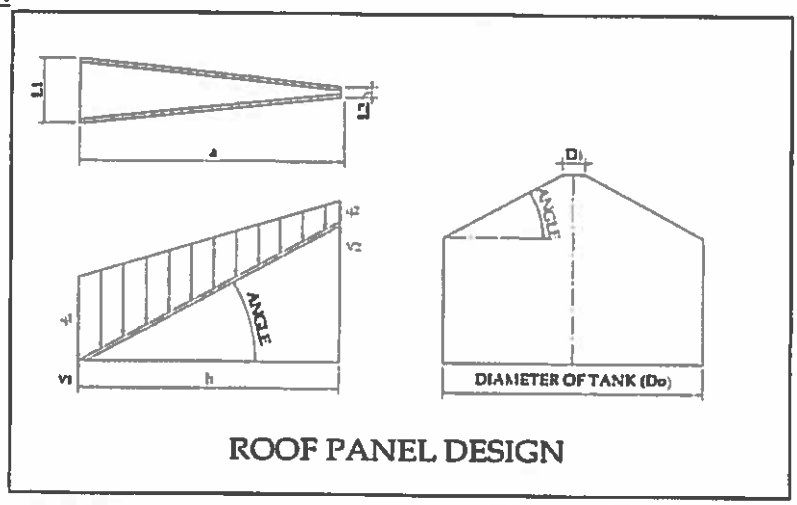
Anchor Bolt Design Summary		
Simpson Titen HD Screw Anchor Bolt Diameter (in)=	0.75	
Minimum Embedment Depth (in)=	5.75	
Minimum Concrete Strength (psi)=	3000	
Critical Edge Distance (in) =	6.00	
Allowable Tension Load T_{all} (lbs) =	4055	
Allowable Shear Load V_{all} (lbs) =	5560	
Interaction Equation Combined Loading =	0.02	$= (P_w/T_{all})^{5/3} + (V_w/V_{all})^{5/3} <= 1.0$ O.K.

Tank Diameter (ft)	Typ. Quantity
6	4
8	6
9	6
12	8
15	10
18	12
21	14
24	16
27	18
30	20
33	22
36	24
39	26
42	28

C&C Roof Uplift Design Wind Pressures, P (psf) $P = q_h[(GC_p) - (GC_{pi})]$ 30.6.2 ASCE 7-10

Mean Roof Height (h) =	14.80	Feet
q_h (psf)=	27.30	
GC_{pi} (+/-) =	0.18	Table 26.11-1 page 258
$+GC_p$ =	0.3	Applicable Figure 30.4-2 through Figure 30.4-7
$-GC_p$ =	-0.8	Applicable Figure 30.4-2 through Figure 30.4-7
+P (psf) =	13.11	Toward Surface
-P (psf) =	-26.76	Uplift
Minimum design wind load normal to surface =	8.0	psf per Section 27.4.7 of ASCE 7-10

D. ROOF PANEL DESIGN



ROOF PANEL DESIGN

Design Input

Roof Panel Properties	
Panel Thickness =	22 ga
thickness, t (in) =	0.0283
Area (in²) =	0.49984
Weight (psf) =	1.7
I, (in⁴) =	0.5990
r, (in) =	1.0947
Sxb (in³) =	0.41307
Sxt (in³) =	0.3477
F_y (ksi) =	50.0
F_b (ksi) =	33.0
E (ksi) =	29500
Ref. Appendix for Section Property Calculations	

Load and Span Information	
Tank Diameter (D_o) (ft) =	30.00
Tank Diameter (D_i) (ft) =	3.00
Roof Angle =	30.00
No. Roof Panels (R_p) =	36.00
Dead Load Max (psf) =	2.00
Dead Load Min (psf) =	1.70
Roof Live Load (psf) =	17.00
Snow Load (psf) =	17.00
+ Wind Load (psf) =	13.11
- Wind Load (psf) =	-26.76
L_1 (ft) = $D_o \pi / R_p$ =	2.618
L_2 (ft) = $D_i \pi / R_p$ =	0.262
a (ft) =	15.59
h = length on horiz plane (ft) =	13.50
ratio =	0.87
Roof Live Load along slope (psf) =	14.72
Snow Load along slope (psf) =	14.72
Max. Moment Occurs at x=0.423a (ft) =	6.59

(Alternate per Section 27.4.7 of ASCE 7-10)

Load Combination 1	
D (psf) =	2.00
Lr (psf) =	14.72
S (psf) =	0.00

Load Combination 2	
D (psf) =	2.00
0.75Lr (psf) =	11.04
0.75S (psf) =	0.00
+0.75(0.6W) (psf) =	5.90

Load Combination 3	
0.6D (psf) =	1.02
0.6W (psf) =	-16.05

Load Combination 4	
0.6D (psf) =	1.02
0.7E (psf) =	12.39

Design Output

Load Combination 1 Check		
q_1(plf)=	(l_1)(D+(L, or S))=	43.78
q_2(plf)=	(l_2)(D+(L, or S))=	4.38
V_1 (lb) =	(a/6)(2q_1+q_2)=	238.86
V_2 (lb) =	(a/6)(q_1+2q_2)=	136.49
M_{max}(ft-lb)=	$(a^2x/6a)[2q_1 + q_1 - 3q_1(x/a) + (q_1-q_2)(x/a)^2]$	744.03
M_{max}(in-lb)=	$(a^2x/6a)[2q_1 + q_1 - 3q_1(x/a) + (q_1-q_2)(x/a)^2]$	8928
F_b (ksi) =	0.6F_y	30.0
S, Req'd (in³) =	M_{max} / F_b =	0.29761
Sxb > SxReqd. O K		
Factor of Safety =	1.39	

Load Combination 2 Check		
q1(plf)=	(l_1)(D+0.75W + 0.75(L, or S))=	49.58
q2(plf)=	(l_2)(D+0.75W + 0.75(L, or S))=	4.96
V1 (lb) =	(a/6)(2q1+q2)=	270.52
V2 (lb) =	(a/6)(q1+2q2)=	154.58
M_{max}(ft-lb)=	$(a^2x/6a)[2q_1 + q_1 - 3q_1(x/a) + (q_1-q_2)(x/a)^2]$	842.66
M_{max}(in-lb)=	$(a^2x/6a)[2q_1 + q_1 - 3q_1(x/a) + (q_1-q_2)(x/a)^2]$	10112
F_b (ksi) =	0.6F_y	30.0
S, Req'd (in³) =	M_{max} / F_b =	0.33707
Sxb > SxReqd. O K		
Factor of Safety =	1.23	

Load Combination 3 Check		
q_1(plf)=	(l_1)(0.6D+1W)=	-39.36
q_2(plf)=	(l_2)(0.6D+1W)=	-3.94
V_1 (lb) =	(a/6)(2q_1+q_2)=	-214.74
V_2 (lb) =	(a/6)(q_1+2q_2)=	-122.71
M_{max}(ft-lb)=	$(a^2x/6a)[2q_1 + q_1 - 3q_1(x/a) + (q_1-q_2)(x/a)^2]$	-668.91
M_{max}(in-lb)=	$(a^2x/6a)[2q_1 + q_1 - 3q_1(x/a) + (q_1-q_2)(x/a)^2]$	-8027
F_b (ksi) =	0.6F_y	30.0
S, Req'd (in³) =	M_{max} / F_b =	0.26736
Sxt > SxReqd. O K		
Factor of Safety =	1.30	

Load Combination 4 Check		
q_1(plf)=	(l_1)(0.6D+0.7E)=	35.10
q_2(plf)=	(l_2)(0.6D+0.7E)=	3.51
V_1 (lb) =	(a/6)(2q_1+q_2)=	191.50
V_2 (lb) =	(a/6)(q_1+2q_2)=	109.43
M_{max}(ft-lb)=	$(a^2x/6a)[2q_1 + q_1 - 3q_1(x/a) + (q_1-q_2)(x/a)^2]$	596.52
M_{max}(in-lb)=	$(a^2x/6a)[2q_1 + q_1 - 3q_1(x/a) + (q_1-q_2)(x/a)^2]$	7158
F_b (ksi) =	0.6F_y	30.0
S, Req'd (in³) =	M_{max} / F_b =	0.23861
Sxt > SxReqd. O K		
Factor of Safety =	1.46	

E. TANK BODY DESIGN - GRAVITY LOADS

Enter (Y) for NFPA-22 Design else (N):	Y

Steel Stave Information and Capacities

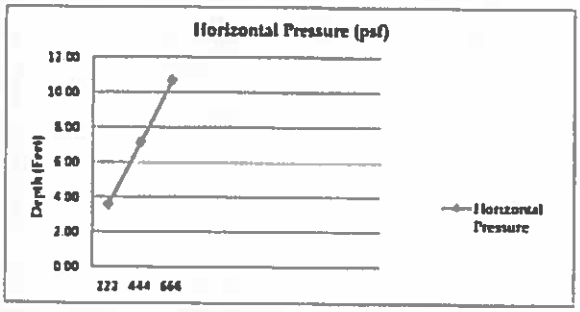
Sheet Gauge	Design Thickness (t = in)	Yield Stress (Fy = ksi)	Ultimate Stress (Fu = ksi)	Net Area per Foot, divided by Thickness (A_n = in/ft)	Allowable Hoop Force of Sheet AWWA D103-09 (plf)	Allowable Hoop Force of Sheet NFPA-22 (plf)	Allowable Compressive Stress (psi)
20	0.034	50.0	55.0	9.24	6914	5756	375
19	0.041	50.0	55.0	9.24	8338	6941	452
18	0.046	50.0	55.0	9.24	9355	7788	507
17	0.052	50.0	55.0	9.24	10575	8804	572
16	0.058	57.0	65.0	9.24	13940	11605	638
15	0.064	57.0	65.0	9.24	15382	12805	703
14	0.072	57.0	65.0	9.24	17304	14406	789
13	0.088	57.0	65.0	9.24	21150	17607	962
12	0.101	57.0	65.0	9.24	24514	20408	1112
11	0.116	57.0	65.0	9.24	27879	23209	1261
10	0.130	57.0	65.0	9.24	31244	26011	1410
8	0.148	57.0	65.0	9.24	35570	29612	1599

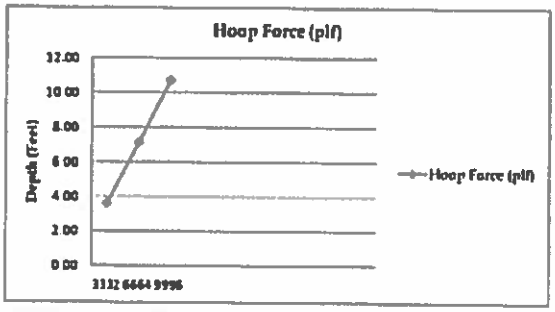
Tank Information

Tank Diameter (Φ)=	30.00	feet
Tank Depth (d) =	10.68	feet
No. of Wall Sheets =	3	3.56 ft tall per sheet
Fluid Density (γ) =	62.4	pcf
Bolts per foot (B_n) =	9	spaced at 1 1/3 inches o.c.
Hole Size (H_d) =	0.406	13/32" holes — 15 Gauge sheets and thinner
Hole Size (H_d) =	0.406	13/32" holes — 14 Gauge sheets and thicker
Shell Radius R =	180	inches

Tank Pressures

Wall Sheet (Top to Bottom)	Depth dn (ft)	Horizontal Pressure Pn (psf)	Hoop Force H_{pn} (plf)
1	3.56	222	3332
2	7.12	444	6664
3	10.68	666	9996





Equations

P_n =	$d_n\gamma$	Horizontal Pressure
H_{pn} =	$d_n\gamma(\Phi/2)$	Hoop Force
A_n =	12(1.073) - B_n * H_d	Net Area per ft (1.073 increase due to corrugation)
F_t (Lss) =	0.6Fy or 0.40Fu (Lesser of)	Allowable Tensile Stress (Eq 5-4 and Eq 5-5)
F_t (Lss) =	0.5Fy or 1/3Fu (Lesser of)	Allowable Tensile Stress (Section 6-4.1.3.1 NFPA 22)
Allowable Hoop Force =	$A_n(F_t)(t)$	plf
Allowable Compressive Stress f_c =	15,000(2/3)(100(t/R))+[2-(2/3)(100(t/R))]	(Eq 5-2)

E. TANK BODY DESIGN CONTINUED

Bolt Properties and Capacities		
Diameter, d (in) =	0.3125	5/16" Diameter
Grade =	SAE 8.2	
Area, A_c (in^2) =	0.0767	
F_v (psi) =	29455	=Fu(0.6)(0.9)/2.2 (Eq 5-6)
F_u (psi) =	120000	
$T_{all} = (F_u/2.2)A_c$=	4.18	Kips (Eq 5-7)
$V_{all} = F_vA_c$=	2.26	Kips
Bolts per foot =	9	spaced at 1 1/3 inches o.c.
V_{all} per foot =	20.33	Kips / ft

Bolt Properties and Capacities		
Diameter, d (in) =	0.4375	7/16" Diameter
Grade =	SAE 8.2	
Area, A_c (in^2) =	0.1503	
F_v (psi) =	29455	=Fu(0.6)(0.9)/2.2 (Eq 5-6)
F_u (psi) =	120000	
$T_{all} = (F_u/2.2)A_c$=	8.20	Kips (Eq 5-7)
$V_{all} = F_vA_c$=	4.43	Kips
Bolts per foot =	9	spaced at 1 1/3 inches o.c.
V_{all} per foot =	39.85	Kips / ft

Bolt Properties and Capacities		
Diameter, d (in) =	0.3750	3/8" Diameter
Grade =	SAE 8.2	
Area, A_c (in^2) =	0.1104	
F_v (psi) =	29455	=Fu(0.6)(0.9)/2.2 (Eq 5-6)
F_u (psi) =	120000	
$T_{all} = (F_u/2.2)A_c$=	6.02	Kips (Eq 5-7)
$V_{all} = F_vA_c$=	3.25	Kips
Bolts per foot =	9	spaced at 1 1/3 inches o.c.
V_{all} per foot =	29.28	Kips / ft

Capacity of Body Staves Based on Bolt Bearing		
$P_n = Cm_dtF_u$ / 1) =		kips per bolt
C =	3	AISI 2001 Table E3.3.1-1
m_d =		AISI 2001 Table E3.3.1-2
1) =	2.50	AISI 2001 E3.3.1
F_u (psi) =	Tensile strength of wall sheet	

Body Stave Capacities Based on Bolt Design						
Sheet Gauge	Design Thickness (t)	Bolt Diameter (d)	m_d	Ultimate Stress (Fu = ksi)	Allowable Bearing per Bolt P_n (Kips)	Allowable Bolt Bearing per foot (plf)
20	0.034	0.3125	1.00	55.0	0.70	6311
19	0.041	0.3125	1.00	55.0	0.85	7611
18	0.046	0.3125	1.00	55.0	0.95	8539
17	0.052	0.3125	1.00	55.0	1.07	9633
16	0.058	0.3125	1.00	65.0	1.41	12724
15	0.064	0.3125	1.00	65.0	1.56	14040
14	0.072	0.3750	0.75	65.0	1.58	14216
13	0.088	0.3750	0.75	65.0	1.93	17375
12	0.102	0.3750	0.75	65.0	2.24	20139
11	0.116	0.3750	0.75	65.0	2.54	22903
10	0.130	0.3750	0.75	65.0	2.85	25667
8	0.148	0.3750	0.75	65.0	3.25	29221

E. TANK BODY DESIGN CONTINUED

Design Summary of Tank Shell Capacities Based on Sheet Gauge, Bolt Diameter and Spacing

Sheet Gauge	Design Thickness (t)	Bolt Diameter (d)	Allowable Hoop Force of Sheet (plf)	Allowable Capacity Based on Bolt Shear (plf)	Allowable Bolt Bearing per foot (plf)	Controlling Allowable Stave Capacity in Tension (plf)
20	0.034	0.3125	5756	20332	6311	5756
19	0.041	0.3125	6941	20332	7611	6941
18	0.046	0.3125	7788	20332	8539	7788
17	0.052	0.3125	8804	20332	9653	8804
16	0.058	0.3125	11605	20332	12724	11605
15	0.064	0.3125	12805	20332	14040	12805
14	0.072	0.3750	14406	29278	14216	14216
13	0.088	0.3750	17607	29278	17375	17375
12	0.102	0.3750	20408	29278	20139	20139
11	0.116	0.3750	23209	29278	22903	22903
10	0.130	0.3750	26011	29278	25667	25667
8	0.148	0.3750	29612	29278	29221	29221

Wallsheet and Bolt Schedule for Tank Body

Depth (ft)	Sheet Gauge	Bolt Diameter (d)	Allowable Tension Capacity (plf)	Hoop Force H_{oo} (plf)	Factor of Safety (AWW 1.30)	Controlling Failure Mode
3.56	20	0.3125	5756	3332	1.7	Hoop Force in Sheet
7.12	17	0.3125	8804	6664	1.3	Hoop Force in Sheet
10.68	15	0.3125	12805	9996	1.3	Hoop Force in Sheet

Check Top Ring Tank Shell in Compression

Total Vertical Dead (plf) =	0.00	Page 1B
Compressive force from wind (plf) =	52.70	Page 1C
Sheet Thickness (in) =	0.034	20 Gauge Sheet
Stress per inch on bott. wall stave (psi) =	129.16	
Allowable Stress f_c (psi) =	375	20 Gauge Sheet
1/3 Allowable Stress Increase per Section 3.3.1 (psi) =	499	
1.33f$_c$ > Actual Stress	O.K.	

Check Bottom Ring Tank Shell in Compression

Total Vertical Dead (plf) =	43.02	Page 1B
Compressive force from wind (plf) =	52.70	Page 1C
Sheet Thickness (in) =	0.052	17 Gauge Sheet
Stress per inch on bott. wall stave (psi) =	153.39	
Allowable Stress f_c (psi) =	572	17 Gauge Sheet
1/3 Allowable Stress Increase per Section 3.3.1 (psi) =	761	
1.33f$_c$ > Actual Stress	O.K.	

F. DESIGN CRITERIA - SEISMIC LOADING

Seismic Design Information Input ASCE 7-10 Section 15.7 and AWWA D103-09 Section 14

Location:	Sierra County, NM	
Zip Code:	87901	
Risk Category:	II	
Seismic Use Group :	I	Section 14.2 Table 2 Page 41 AWWA D103-09
Site Class:	D	Section 11.4.2 Page 65
I_E =	1.00	
S_S =	0.281	For 5% Damped at 0.2 Sec Period
S_1 =	0.089	For 5% Damped at 1.0 Sec Period
F_a =	1.575	Table 11.4-1 Page 66
F_v =	2.400	Table 11.4-2 Page 66
S_{MS} =	0.443	= $F_a S_S$
S_{M1} =	0.214	= $F_v S_1$
S_{DS} =	0.295	=(2/3)S_{M1} (Eq 11.4-1)
S_{D1} =	0.142	=(2/3)S_{M1} (Eq 11.4-2)
Seismic Design Category =	C	Section 11.6 Page 67
Flat Bottom Ground Supported Tank:		Table 15.4-2 Page 142

	Mechanically Anchored	
R_i =	3.0	Invective component, AWWA D103-09, pg 64
Rc =	1.5	Convective component, AWWA D103-09, pg 64
Ωo =	2.0	Table 15.4-2 Page 142
C_d=	2.5	Table 15.4-2 Page 142
T_i =	0.0	(14.3.1 ANSI/AWWA D103-09, pg 76)
T_L =	6	(Figure 17 ANSI/AWWA D103-09, pg 67)
T_s =	0.48	=S_{D1}/S_{DS} (Section 11.4.5, page 66)

Tank Design Information Input

Tank Diameter (Di)=	30.00	feet
Tank Shell Height (Ht) =	10.68	feet
Freeboard (FB) =	0.50	feet
Max. Liquid Height (H_L) =	10.18	= H - FB
Weight of Roof (psf) =	2.00	
Total Weight of Roof =	1588	lbs
Average Wall Thickness (in) =	0.052	17 gauge
Wall Density (pcf) =	490	
Total weight of walls =	2137	lbs
Fluid Density (γ) =	62.4	pcf
Total Weight of Tank Contents (W_T) =	449.0	Kips
Weight of liner and Misc. =	0.50	psf
Total weight of Liner and Misc. =	503	lbs
Total Weight of Assembly =	453.2	Kips
Total Weight of Tank Shell (Ws) =	2641	lbs

Flexibility of Piping Attachments 15.7.4 ASCE 7-10

Mechanically Anchored Tanks at Grade:

(1)	Upward Vert. Displacement =	$1C_d$ =	2.5	inches
(2)	Downward Vert. Displacement =	$0.5C_d$ =	1.25	inches
(3)	Horizontal Displacement =	$0.5C_d$ =	1.25	inches

F. DESIGN CRITERIA - SEISMIC LOADING CONTINUED

Seismic Base Shear and Overturning Design Section 14 ANSI/AWWA D103-09

V_i (Shear at top of Fdn.) =	15074	lbs	14.3.3.1 (Eq 14-27)
M_s (Overturning Moment at Shell) =	53217	lb-Ft	14.3.2.1 (Eq 14-19)
($Sai = S_{DS}$ for $Ti = 0$)			(Eq 14-9)
$Sai\ I_E / 1.4Ri$ =	0.0703		
>= $0.36\ S_1\ I_E / Ri$ =	0.0107		
Impulsive Design Acceleration A_i =	0.0703		(Eq 14-16)
Convective Design Acceleration $A_c = Sac\ I_E / 1.4Rc$ =	0.0296		(Eq 14-17)
D/H_L =	2.95		
tanh(0.866 (D/H_L)) =	0.99		
W_i (Impulsive Weight) =	180.71	Kips	(Eq 14-20 and Eq 14-21)
tanh(3.68 H_L/D)	0.85		
g =	32.174	ft/sec^2	
T_C =	3.43	sec	(Eq 14-18)
Sac	0.062	Controlling	
For $T_C < T_L$:			
S_{DS} =	0.30		
$1.5\ S_{D1} / T_C$ =	0.062		
Sac =	0.062		(Eq 14-12)
For $T_C > T_L$:			
Sac =	0.109		(Eq 14-13)
W_c (Portion of Liq. Wt. Sloshing) =	258.06	Kips	(Eq 14-22)
Xi =	3.82	Controlling	
For D/H >= 1.333:			
Xi =	3.82	ft	(Eq 14-24)
For D/H < 1.333:			
Xi =	2.27	ft	(Eq 14-25)
3.67 H / D =	1.25		
cosh(3.67 H/D) -1 =	1		
sinh(3.67 H/D) =	2		
Xc =	5.66	ft	(Eq 14-26)
Center of gravity of shell Xs =	5.34	ft	

Summary of Weights from Above:

Impulsive Weight (W_i) =	180706	lbs	(Eq 14-20 and Eq 14-21)
Portion of Liq. Wt. Sloshing (W_c) =	258064	lbs	(Eq 14-22)
Total Weight of Tank Shell (Ws) =	2641	lbs	
Total Weight of Roof (Wr) =	1588	lbs	
Total Weight of Tank Bottom (Wf) =	0	lbs	
$V_i = [(A_i(Ws + Wr + Wf + Wi))^2 + (AcWc)^2]^{1/2}$ =	15074	lbs	(Eq 14-27)
$M_s = [(Ai(WsXs + WrHt + WiXi))^2 + (AcWcXc)^2]^{1/2}$ =	53217	ft - lbs	(Eq 14-19)

F. DESIGN CRITERIA - SEISMIC LOADING CONTINUED

Foundation Design - Overturning Moment at Top of Foundation Section 14 ANSI/AWWA D103-09

M_{mf} (Overturning Moment at top of fdn.) =	193909	ft - lbs	14.3.3.2.2 (Eq 14-28)
X_{mf} =	11.87	Controlling	
For D/H >= 1.333:			
0.866 D/H =	2.55		
tanh(0.866(D/H_L)=	0.99		
X_{mf} =	11.87	ft	(Eq 14-29)
For D/H < 1.333:			
X_{mf} =	6.89	ft	(Eq 14-30)
3.67 H / D =	1.25		
cosh(3.67 H/D) -1 =	1		
sinh(3.67 H/D) =	2		
X_{mf} =	15.60	ft	(Eq 14-31)
$M_{mf} = [(Ai(WsXs + WrHt + WiXimf))^2 + (AcWcXcmf)^2]^{1/2}$ =	193909	ft - lbs	(Eq 14-28)

F. DESIGN CRITERIA - SEISMIC LOADING CONTINUED

Hydrodynamic Seismic Hoop Tensile Stresses Section 14 ANSI/AWWA D103-09

Tank Diameter (Di) =	30.00	ft	
Max. Liquid Height (H_L) =	10.18	= H - FB	
Distance from MOL to the point under consideration (Y) =	10.68	ft	
Thickness of shell ring under consideration (t_s) =	0.064	in	15 gauge ring
Impulsive Design Acceleration (A_i) =	0.0703		(Eq 14-16)
Convective Design Acceleration (A_c) = Sac I_E / 1.4Rc =	0.0296		(Eq 14-17)
Vertical Design Acceleration (A_v) =	0.0413		14.3.4.3
Ni =	47.58	Controlling	
For D/H >= 1.333:			
D/H_L =	2.95		
Y/H_L =	1.05		
0.866 D/H =	2.55		
$\tanh(0.866(D/H_L))$ =	0.99		
Ni =	47.58	lb/in	(Eq 14-39)
For D/H <1.333 and Y<0.75D:			
0.75D =	22.50	ft	
Y / 0.75D =	0.47		
Ni =	63.41	lb/in	(Eq 14-40)
For D/H <1.333 and Y>=0.75D:			
Ni =	87.89	lb/in	(Eq 14-41)
3.68 H / D =	1.249		
cosh(3.68H/D) =	1.89		
cosh(3.68(H - Y)/ D) =	1.00		
Nc =	13.87	lb/in	(Eq 14-42)
Hydrostatic Hoop Tensile Force (Nh) = 2.6GYD =	833.04	lb/in	(page 83 AWWA)
Hydrostatic Hoop Tensile Force (Nh) = 2.6GYD =	9996	plf	
$\sigma s = [(Ni^2 + Nc^2 + (N_h A_v)^2)]^{1/2}/t_s$ =	942.79	psi	(Eq 14-38)
Hydrodynamic Hoop Tensile Force (Ns) = $\sigma s\ t_s$ =	724.1	plf	
Ntot = Ns + Nh	10721	plf	
Allowable Tensile Force, Static Loading (Nall) =	12805	plf	15 gauge ring
Allowable Tensile Force, Seismic (Ne) = 1.333 Nall =	17069	plf	Section 5.3.1
Nh + Ns < Ne =	O.K.		
Factor of Safety =	1.59		

Summary

Sheet Thickness	Y (ft)	t_s (in)	Ne (plf)	(Nh + Ns)	Factor of Safety
20 gauge	3.56	0.034	7673	3755	2.04
17 gauge	7.12	0.052	11736	7284	1.61
15 gauge	10.68	0.064	17069	10731	1.59

F. DESIGN CRITERIA - SEISMIC LOADING CONTINUED

Sloshing / Freeboard Design 15.7.6.1.2 ASCE 7-10

Height of Sloshing Wave $\delta s = 0.42 D_i I_s A_c =$	0.78	feet	
Freeboard (FB) =	0.50	feet	
Equivalent Hydrostatic Head =	17.70	psf	(Use in Design of Roof and Conn.)

Sloshing / Freeboard Design 14.3.4.4 AWWA D103-09

Height of Sloshing Wave $\delta s = d = 0.5 D A_f =$	0.933	feet	
Minimum Freeboard Required (FB) =	0.00	feet	Table 7 on page 85
Seismic Use Group =	I		
K =	1.5		
T_L =	6		(Figure 17 ANSI/AWWA D103-09, pg 67)
T_C =	3.43	sec	(Eq 14-18)
A_f =	0.062	Controlling	
For Seismic Use Goups I and II :			
Tc <= 4:	0.0622		(Eq 14-49)
Tc > 4:	0.0724		(Eq 14-50)
For Seismic Use Goup III :			
Tc <= T_L:	0.0622		(Eq 14-51)
Tc > T_L:	0.1086		(Eq 14-52)

Local Shear Transfer 15.7.6.1.6 ASCE 7-10

$v_{max} = 2V/\pi D$			(Eq 15 7-15)
V_i (Shear at top of Fdn.)=	15074	lbs	14.3.3.1 (Eq 14-27)
Base $v_{max} = 2V/\pi D$ =	319.88	plf	
V_{Roof} =	7537	lbs	= 1/2 V_{Base}
Roof $v_{max} = 2V/\pi D$ =	159.94	plf	

Anchor Bolt Design Based on Seismic Loads

Anchor Bolt Diameter (in)=	0.75	Minimum Diameter per Section 5.9.4	
Tank Circumference (C) (ft)=	94.25	= πDi	
Number of Anchor Bolts (Nmin)=	9	Maximum spacing of 10ft or minimum of 5 anchor bolts per 5.9.1.2.1	
Number of Anchor Bolts (N)=	20	Enter Number of bolts used	
$W = W_s + W_R$ = (lbs)	4229	total weight of tank shell, roof dead-load reaction on shell	
Seismic Overturning Moment (M_s) (ft-lbs)	53217	ft - lbs (Eq 14-19)	
Tension Force per Anchor (P_s) (lbs)	143.33	= 4(M_s/ND) - (W/N) (Eq 5-11)	[Set to 0 if no Tension in Bolts]
$V_i = [(A_i(W_s + W_r + W_f + W_i))^2 + (AcWc)^2]^{1/2}$ =	15074	lbs (Eq 14-27)	
Shear Force per Anchor (V_s) (lbs)	754	= V_F/N	
Anchor bolt spacing (S) (ft) =	4.71	= C/N	

Simpson Titen HD Screw Anchor Bolt Diameter (in)=	0.75		
Minimum Embedment Depth (in)=	5.75		
Minimum Concrete Strength (psi)=	3000		
Critical Edge Distance (in) =	6.00		
Allowable Tension Load T_{all} (lbs) =	4055		
Allowable Shear Load V_{all} (lbs) =	5560		
Interaction Equation Combined Loading =	0.04	= $(P_s/T_{all})^{5/3} + (V_s/V_{all})^{5/3}$ <= 1.0	O.K.

F. DESIGN CRITERIA - SEISMIC LOADING CONTINUED

Longitudinal Shell Compression Stress Section 14 ANSI/AWWA D103-09

$\sigma a = f_c =$	375	psi	20 Gauge
Thickness of shell ring under consideration $t_c =$	0.034	in	
Vertical Design Acceleration $A_v =$	0.0413		14.3.4.3
Tank Diameter (Di)=	30.00	ft	
$M_s = [(Al(WsXs + WrHt + WiXi))^2 + (AcWcXc)^2]^{1/2} =$	53217	ft - lbs	(Eq 14-19)
Tank Circumference (C) (ft)=	94.25	$= \pi Di$	
Total Weight of Tank Shell (Ws) =	2641	lbs	
Total Weight of Roof (Wr) =	1588	lbs	
Wrs =	16.85	plf	
$w_t = W_s / \pi D + w_{rs} =$	44.87	plf	
$\sigma c\ [w_t(1 + 0.4A_v) + (1.273M_s / D^2)(1/12t_c) =$	296.29	psi	14.3.4.2.1 (Eq 14-35)
$\sigma e = 1.333\sigma a$	500	psi	
$\sigma c < \sigma e =$	O.K.		
Factor of Safety =	1.69		

G. ROOF AND BASE CLIP DESIGN

Tank Information		
Tank Diameter (Φ) =	30.00	feet
Tank Depth =	10.68	feet
No. Roof Panels (R_p) =	36	
No. of High Roof Clips =	36	2 Bolts per Clip
No. of Center Roof Clips =	36	1 Bolt per Clip
Tank Circumference =	94.25	feet
Roof Panel Thickness (in) =	0.0283	22 ga
Top Stave Thickness (in) =	0.0340	20 gauge
Roof Rib Clip Thickness =	0.0450	inches (18 gauge)
F_y Roof Panel =	55000	psi
F_y Top Stave =	55000	psi
F_y Roof Clip =	55000	psi

Bolt Properties and Capacities at Roof Clip		
Diameter, d (in) =	0.3125	5/16" Diameter
Grade =	SAE 8.2	
Area, A_G (in^2) =	0.0767	
F_V (psi) =	29455	=Fu(0.6)(0.9)/2.2 (Eq 5-6)
F_U (psi) =	120000	
$T_{ALL} = (F_U/2.2)A_G$ =	4.18	Kips (Eq 5-7)
$V_{ALL} = F_V A_G$ =	2.26	Kips

Shear Capacity of Roof Clip / Roof Panel (E4.5.1 AISI Standard)		
$Pns_{AB} = 2.7t_1dF_{U1} / \Omega$ =	0.559	kips per bolt
Diameter, d (in) =	0.3125	in
Thickness of member in contact t_1 =	0.028	inches
Ω =	2.35	
F_{U1} (psi) =	55000	Tensile strength of member
Total Number of Bolts =	108	
Shear Capacity, Pns_{AB} =	640.39	plf

Tension Capacity of Roof Clip / Roof Panel in Pull-over (E4.5.1 AISI Standard)		
$Pnov_{AB} = 1.5d_w't_1F_{U1} / \Omega$ =	0.497	kips per bolt
d_w' =	0.5	in
Thickness of member in contact t_1 =	0.0283	inches
Ω =	2.35	
F_{U1} (psi) =	55000	Tensile strength of member
Total Number of Bolts =	108	
Shear Capacity, $Pnov_{AB}$ =	569.24	plf

Combined Seismic Loads at Roof Clip / Roof Panel Connection (E4.5.1 AISI)		
$V_{Strength}$ (psf) =	24.77	15.7.6.1.2 [Seismic 0.7E x Ω (2.0)]
Ts = $V_{Strength}$ (plf) =	185.81	plf
Qs = Roof v_{max} = 2V/πD (plf) =	223.92	15.7.6.1.6 [Seismic 0.7E x Ω (2.0)]
$Qs/Pns_{AB} + 0.71 (Ts/Pnov_{AB})$ =	0.58	Eq E4.5.1-1
$Qs/Pns_{AB} + 0.71 (Ts/Pnov_{AB})$ < 1.10	Connection Adequate	

Combined Wind Loads at Roof Clip / Roof Panel Connection (E4.5.1 AISI)		
V_{Uplift} (psf) =	26.76	ASCE 7-10
Tw = V_{Uplift} (plf) =	200.68	plf
F =	7152	lbs
Qw = Roof v_{max} = .5F/πD (plf) =	37.94	plf
$Qw/Pns_{AB} + 0.71 (Tw/Pnov_{AB})$ =	0.31	Eq E4.5.1-1
$Qw/Pns_{AB} + 0.71 (Tw/Pnov_{AB})$ < 1.10	Connection Adequate	

Base Clip Anchor Information		
Number of Base Clips =	20	
Bottom Stave Thickness (in) =	0.0640	15 Gauge
Base Clip Thickness (in) =	0.1020	12 Gauge
Diameter of Anchor Bolt =	0.7500	inches
Controlling Min Thickness =	0.0640	inches
F_u Bottom Stave =	65000	psi
F_u Base Clip =	65000	psi

Bolt Properties and Capacities at Base Clip		
Diameter, d (in) =	0.3750	3/8" Diameter
Grade =	SAE 8.2	
Area, A_G (in^2) =	0.1104	
F_V (psi) =	29455	=Fu(0.6)(0.9)/2.2 (Eq 5-6)
F_U (psi) =	120000	
$T_{ALL} = (F_U/2.2)A_G$ =	6.02	Kips (Eq 5-7)
$V_{ALL} = F_V A_G$ =	3.25	Kips

Capacity of Base Clip in Bearing at Bottom Stave		
$Pn_{AB} = Cm_t dtF_U / \Omega$ =	1.404	kips per bolt
Controlling Thickness, t =	0.0640	inches
C =	3	AISI 2001 Table E3.3.1-1
m_t =	0.75	AISI 2001 Table E3.3.1-1
Ω =	2.50	AISI 2001 E3.3.1
F_U (psi) =	65000	
Number of Bolts per Clip =	4	
Total Number of Bolts =	80	
Shear Capacity, Pn_{AB} =	1191.75	plf

Capacity of Base Clip in Bearing at Foundation		
$Pn_{AB} = Cm_t dtF_U / \Omega$ =	4.475	kips per bolt
C =	3	AISI 2001 Table E3.3.1-1
m_t =	0.75	AISI 2001 Table E3.3.1-1
Ω =	2.50	AISI 2001 E3.3.1
F_U (psi) =	65000	
Number of Bolts per Clip =	1	
Total Number of Bolts =	20	
Shear Capacity, Pn_{AB} =	949.68	plf

Controlling Capacity of Base Clip Connection		
Controlling Shear Capacity, Pn_{AB} =	949.68	plf

Seismic Loads at Tank / Base Connection		
V_t (Shear at top of Fdn.) =	15074	lbs 14.3.3.1 (Eq 14-27)
Q_s = Base v_{max} = $2V_t/\pi D$ (plf) =	319.88	15.7.6.1.6
Qs (plf) =	447.84	Seismic Load 0.7E x Ω (2.0)
$Pn_{AB} > Qs$	Connection Adequate	

G. ROOF AND BASE CLIP DESIGN CONTINUED

Capacity of Roof Clip in Bearing at Stave		
$Pn_{AB} = CmdtF_U / \Omega$ =	0.526	kips per bolt
Top Stave Thickness =	0.0340	inches
Roof Rib Clip Thickness =	0.0450	inches
Controlling Thickness, t =	0.0340	inches
Diameter, d (in) =	0.3125	in
C =	3	AISI 2001 Table E3.3.1-1
m_t =	0.75	AISI 2001 Table E3.3.1-1
Ω =	2.50	AISI 2001 E3.3.1
F_U (psi) =	55000	
Total Number of Bolts =	108	
Shear Capacity, Pn_{AB} =	602.68	plf
$Pn_{AB} > Qs$	O.K.	
$Pn_{AB} > Qw$	O.K.	

Capacity of Roof Clip at Stave by End Distance (E4.3.2 AISI Standard)		
$Pns_{AB} = teF_U / \Omega$ =	0.292	kips per bolt
Top Stave Thickness =	0.0340	inches
Roof Rib Clip Thickness =	0.0450	inches
Controlling Thickness, t =	0.0340	inches
Diameter, d (in) =	0.3125	in
End Distance e = 1.5d =	0.469	in
Ω =	3.00	
F_U (psi) =	55000	
Total Number of Bolts =	108	
Shear Capacity, Pns_{AB} =	334.82	plf
$Pns_{AB} > Ts$	O.K.	
$Pns_{AB} > Tw$	O.K.	

Roof Panel and Roof Clip Design Summary		
Roof Panel Thickness =	22 ga	
Roof Clip Thickness =	18 Gauge	
Top Stave Thickness =	20 gauge	
No. of High Roof Clips =	36	2 Bolts per Clip
No. of Center Roof Clips =	36	1 Bolt per Clip
Bolts =	5/16" Diameter SAE 8.2 Bolts	
REFERENCE APPENDIX FOR STANDARD ROOF CLIP DETAILS		

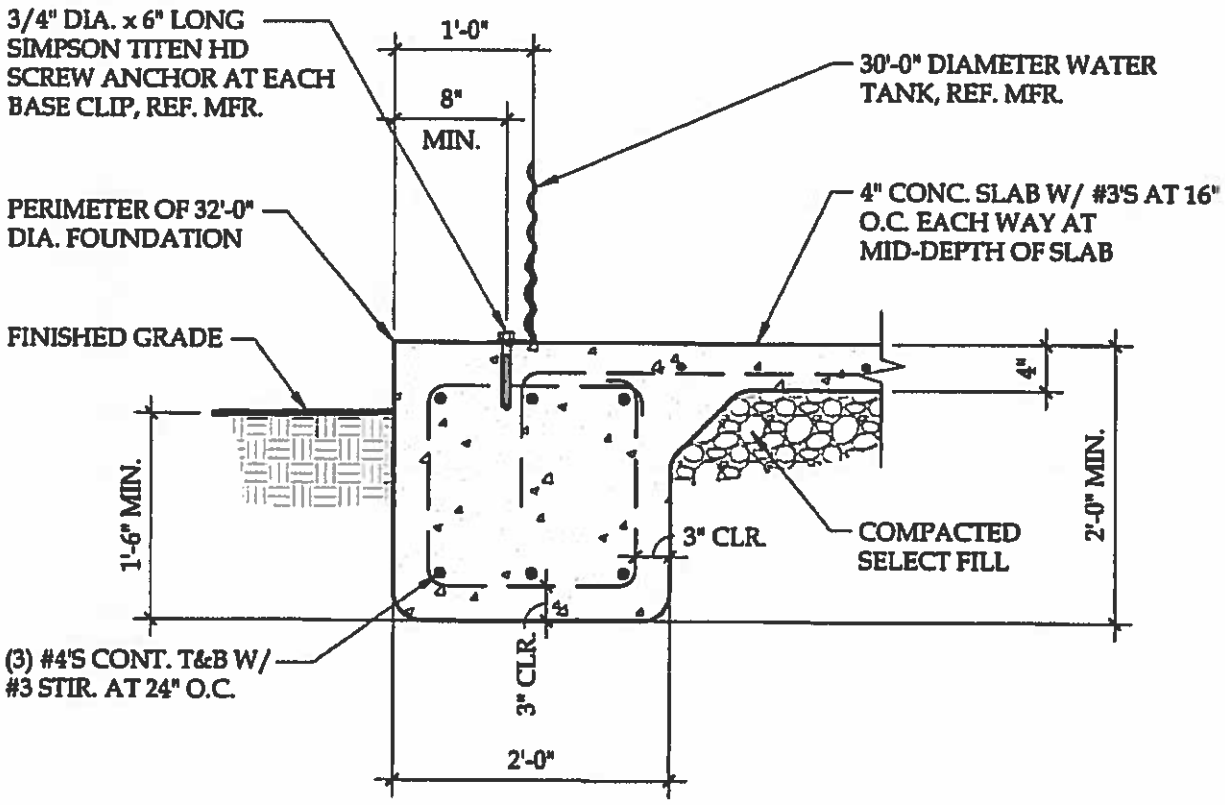
Wind Loads at Tank / Base Connection		
F =	7152	lbs
Qw = Base v_{max} = F/πD (plf) =	75.88	plf
$Pn_{AB} > Qw$	Connection Adequate	

Tension Capacity of Base Clip / Anchor Bolt in Pull-over (E4.4.2 AISI Standard)		
$Pnov_{AB} = 1.5d_w't_1F_{U1} / \Omega$ =	1475	lbs per bolt
Bolt Head diameter d_h =	1.125	in
Steel washer diameter d_w =	0.00	in
Steel washer thickness t_w =	0.00	in
$d_w' = d_h + 2t_w + t_1 < dw$ =	0.00	
Controlling d_w' =	1.125	
Thickness of member in contact t_1 =	0.1020	inches
Ω =	2.50	
F_{U1} (psi) =	65000	Tensile strength of member
Ps (lbs) =	201	(Page 5F) Seismic Load 0.7E x Ω (2.0)
Pw (lbs) =	248	Page 1C
$Pnov_{AB} > Ps$	O.K.	
$Pnov_{AB} > Pw$	O.K.	

Base Anchor Clip Design Summary	
Base Clip Type =	Standard Clip
Base Clip Thickness =	12 Gauge
Bottom Stave Thickness =	15 Gauge
Number of Base Clips =	20
4 Bolts Per Clip at Stave =	3/8" Diameter SAE 8.2 Bolts
(1) Anchor Bolt Per Clip at Foundation =	3/4" Diameter Bolts
REFERENCE APPENDIX FOR STANDARD BASE CLIP ANCHOR DETAIL	

NOTES:

1. USE MINIMUM 3000 PSI CONCRETE FOR FOUNDATION.
2. ALL REINFORCING BARS SHALL BE NEW BILLET STEEL CONFORMING TO ASTM A-615, GRADE 60.
3. PAD SITE TO BE ELEVATED ABOVE THE SURROUNDING SITE GRADE. IT IS RECOMMENDED THAT EITHER A MINIMUM OF 12 INCHES OF SELECT FILL BE PLACED BELOW THE TANK FOUNDATION OR THE SITE BE GRADED TO PRODUCE ADEQUATE SITE DRAINAGE TO PREVENT WATER FROM PONDING ADJACENT TO THE FOUNDATION.
4. REFERENCE SOILS REPORT NO. SEI-33070 DATED MAY 13, 2013 BY SOUTHWEST ENGINEERING, INC. FOR SUBGRADE PREPARATION AND SELECT FILL REQUIREMENTS.



1. PERIMETER BEAM DETAIL

3/4" = 1'-0"

Project:	SIERRA COUNTY NEW MEXICO	Job Number:	15108
	Tank Model 3003-WT-CHR for Caballo VFD	Sheet Number:	S1
Client:	WATER STORAGE TANKS, INC.	Date:	06/03/15

JUSTIN BILLODEAU, P.E.
NEW MEXICO PE 20388

510 SOUTH CONGRESS SUITE B-100 AUSTIN, TX 78704
512 328 5353 PHONE 512 328 5359 FAX

JUSTIN BILLODEAU NEW MEXICO 20388 PROFESSIONAL ENGINEER

Justin Billodeau

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JUSTIN BILLODEAU (NM P.E. #20388) ON JUNE 03, 2015.

Conterminous 48 States

2003 NEHRP Seismic Design Provisions

Zip Code = 87901

Spectral Response Accelerations Ss and S1

Ss and S1 = Mapped Spectral Acceleration Values

Data are based on a 0.05 deg grid spacing

Period (sec)	Centroid Sa (g)	
0.2	0.281	(Ss)
1.0	0.089	(S1)

Period (sec)	Maximum Sa (g)	
0.2	0.322	(Ss)
1.0	0.102	(S1)

Period (sec)	Minimum Sa (g)	
0.2	0.270	(Ss)
1.0	0.085	(S1)

Conterminous 48 States

2003 NEHRP Seismic Design Provisions

Zip Code = 87901

Spectral Response Accelerations SMs and SM1

SMs = Fa x Ss and SM1 = Fv x S1

Site Class D

Period (sec)	Centroid Sa (g)	
0.2	0.442	(SMs, Fa = 1.575)
1.0	0.214	(SM1, Fv = 2.400)

Period (sec)	Maximum Sa (g)	
0.2	0.496	(SMs, Fa = 1.543)
1.0	0.245	(SM1, Fv = 2.391)

Period (sec)	Minimum Sa (g)	
0.2	0.428	(SMs, Fa = 1.584)
1.0	0.203	(SM1, Fv = 2.400)

Conterminous 48 States

2003 NEHRP Seismic Design Provisions

Zip Code = 87901

Spectral Response Accelerations SDs and SD1

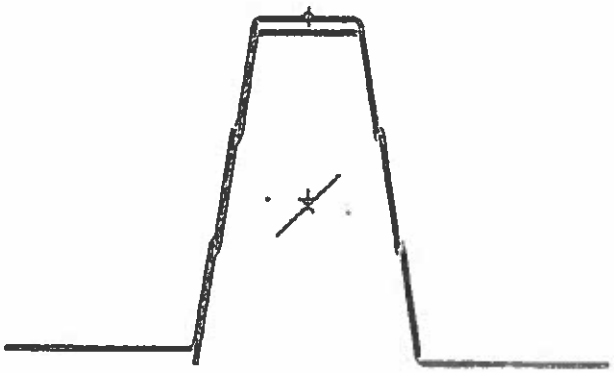
SDs = 2/3 x SMs and SD1 = 2/3 x SM1

Site Class D

Period (sec)	Centroid Sa (g)	
0.2	0.295	(SDs)
1.0	0.143	(SD1)

Period (sec)	Maximum Sa (g)	
0.2	0.331	(SDs)
1.0	0.163	(SD1)

Period (sec)	Minimum Sa (g)	
0.2	0.285	(SDs)
1.0	0.136	(SD1)



Section Inputs

Material: A653 SS Grade 40
No strength increase from cold work of forming
Modulus of Elasticity, E 29500 ksi
Yield Strength, Fy 45 ksi
Tensile Strength, Fu 55 ksi
Warping Constant Override, Cw 0 in^6
Torsion Constant Override, J 0 in^4
Connector Spacing 0 in

Part 1, Thickness 0.0283 in (22 Gage)
Placement of Part from Origin:
X to center of gravity -0.375 in
Y to center of gravity 0 in
Outside dimensions, Open shape

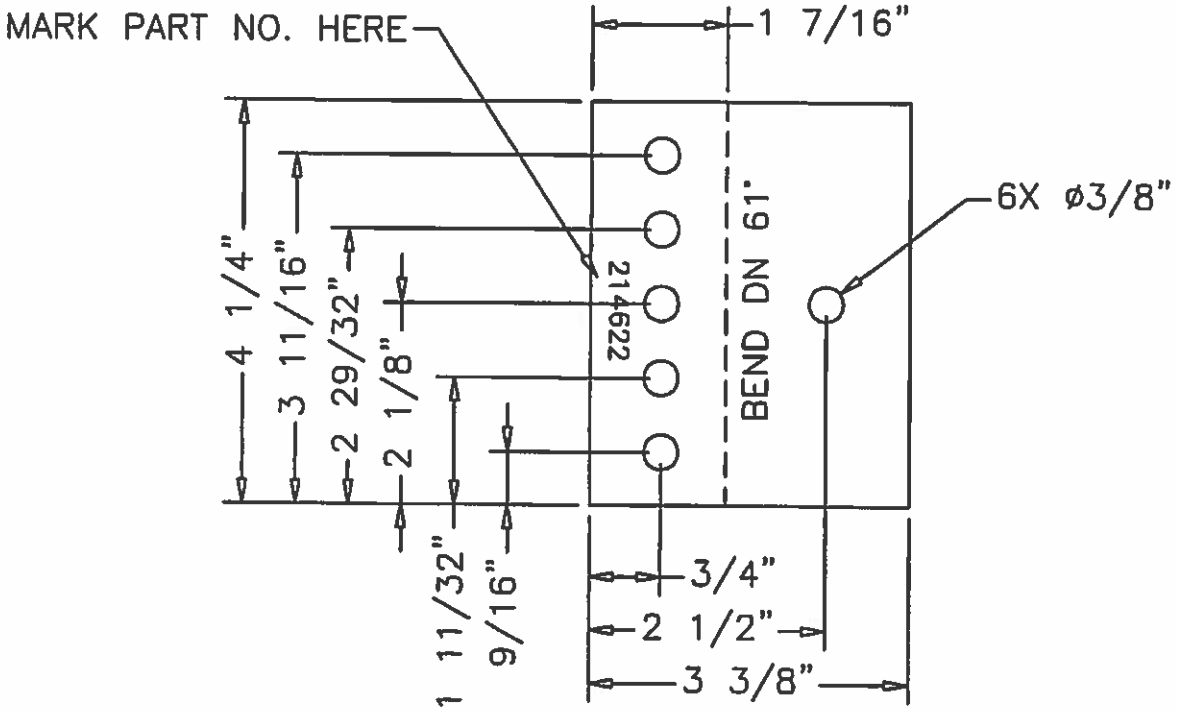
	Length (in)	Angle (deg)	Radius (in)	Web	k Coef	Hole Size (in)	Distance (in)
1	1.7500	0.000	0.062500	None	0.000	0.0000	0.8750
2	1.0000	81.250	0.062500	None	0.000	0.0000	0.5000
3	0.0775	45.000	0.062500	None	0.000	0.0000	0.0388
4	1.0000	81.250	0.062500	None	0.000	0.0000	0.5000
5	0.0775	45.000	0.062500	None	0.000	0.0000	0.0388
6	1.0000	81.250	0.062500	None	0.000	0.0000	0.5000
7	1.0000	0.000	0.062500	None	0.000	0.0000	0.5000
8	1.0000	278.750	0.062500	None	0.000	0.0000	0.5000
9	0.0775	315.000	0.062500	None	0.000	0.0000	0.0388
10	1.0000	278.750	0.062500	None	0.000	0.0000	0.5000
11	0.0775	315.000	0.062500	None	0.000	0.0000	0.0388
12	1.0000	278.750	0.062500	None	0.000	0.0000	0.5000

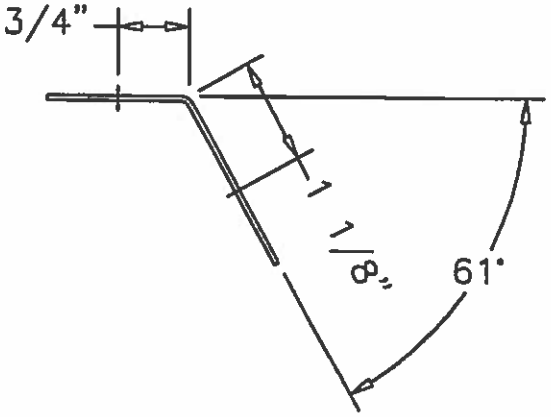
Part 2, Thickness 0.0283 in (22 Gage)
Placement of Part from Origin:
X to center of gravity 0.375 in
Y to center of gravity -0.125 in
Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.7500	180.000	0.062500	None	0.000	0.0000	0.8750
2	1.0000	98.750	0.062500	None	0.000	0.0000	0.5000
3	0.0775	135.000	0.062500	None	0.000	0.0000	0.0388
4	1.0000	98.750	0.062500	None	0.000	0.0000	0.5000
5	0.0775	135.000	0.062500	None	0.000	0.0000	0.0388
6	1.0000	98.750	0.062500	None	0.000	0.0000	0.5000
7	1.0000	180.000	0.062500	None	0.000	0.0000	0.5000
8	1.0000	261.250	0.062500	None	0.000	0.0000	0.5000
9	0.0775	225.000	0.062500	None	0.000	0.0000	0.0388
10	1.0000	261.250	0.062500	None	0.000	0.0000	0.5000
11	0.0775	225.000	0.062500	None	0.000	0.0000	0.0388
12	1.0000	261.250	0.062500	None	0.000	0.0000	0.5000

Full Section Properties

Area	0.49984	in^2	Wt	0.0016995	k/ft	Width	17.662 in
Ix	0.5990	in^4	rx	1.0947	in	Ixy	-0.0117 in^4
Sx(t)	0.34770	in^3	y(t)	1.7226	in	α	43.582 deg
Sx(b)	0.41307	in^3	y(b)	1.4500	in		
			Height	3.1726	in		
Iy	0.5978	in^4	ry	1.0936	in	Xo	0.0000 in
Sy(l)	0.21529	in^3	x(l)	2.7766	in	Yo	1.7262 in
Sy(r)	0.21529	in^3	x(r)	2.7766	in	jx	0.0266 in
			Width	5.5533	in	jy	-2.1234 in
I1	0.6101	in^4	r1	1.1048	in		
I2	0.5866	in^4	r2	1.0834	in		
Ic	1.1967	in^4	rc	1.5473	in	Cw	0.51992 in^6
Io	2.6861	in^4	ro	2.3182	in	J	0.00013344 in^4





RSN: 280150

NEXT ASSY: VARIES

MAT'L: 17 GA GALV (0.050")

SHEAR SIZE: 3 3/8" X 4 1/4" | WT: 0.20#

REV.	BY	DATE	DESCRIPTION OF CHANGE
F	JSD	8/7/03	3 3/8", 61° WAS 4 3/8", 63°; UPDATE DIMS, WT
E	JSD	2/4/00	4 1/4" WAS 4 3/8"; UPDATE DIMS
D	JSD	2/2/00	WAS 4X ø3/8"; UPDATE DIMS
C	JSD	7/24/98	17 GA WAS 15 GA; WT WAS 0.34#
B	CB	11/7/97	15 GA WAS 17 GA; 0.34# WAS 0.3#
A	DEG	2/1/83	17 GA WAS 15 GA

SCAFCO Grain Systems Company
6200 E. Main Avenue
PO Box 11215
Spokane, WA 99211-1215, USA
Tel: 509-535-1571 • Fax: 509-535-9130 • mail@scafco.com • www.scafco.com

CENTER CLIP

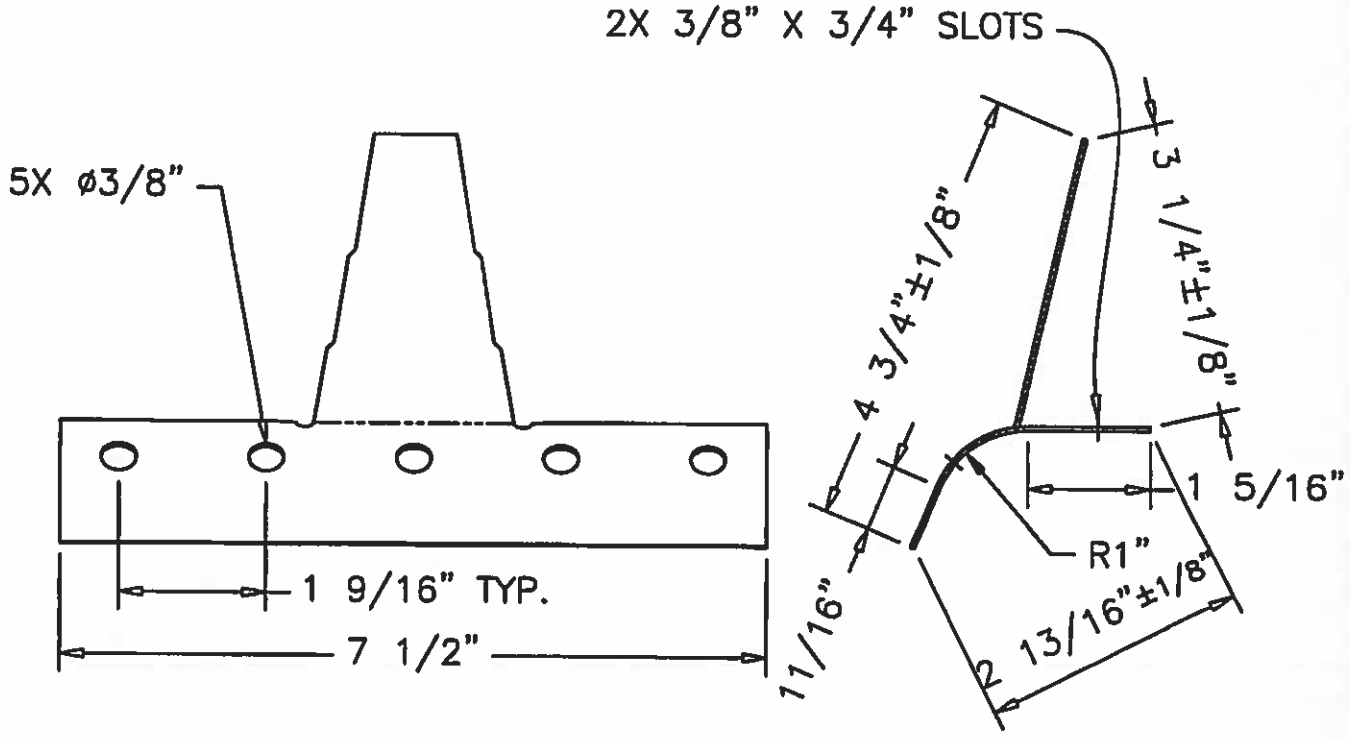
	BY	DATE
DRAWN	DEG	10JAN83
CHECKED	DW	02FEB00
APPROVED	JT	24JUL98

DRAWING NO.: 214622

REV.: F

SCALE: NTS

SHEET: 1 OF 1



SEE 214520PR FOR FLAT LAYOUT

RSN: 280014

NEXT ASSY:

MAT'L: 18 GA GALV (0.045")

SHEAR SIZE:

WT: 0.5#

REV.	BY	DATE	DESCRIPTION OF CHANGE
C	JSD	6/3/99	DEL SQ HOLES; 3/8" HOLE WAS (1); UPDATE DIMS
B	AJD	3/29/93	MATERIAL WAS 20 GA; WEIGHT WAS 0.4#
A	JMT	8/1/86	ADDED SQ HOLES & CHANGED SLOTTED HOLE TO ROUND

Scafco CORPORATION
6200 EAST MAIN AVENUE
SPOKANE, WA USA 99212
PHONE: (509) 535-1571
FAX: (509) 535-9130
E-MAIL: mail@SCAFCO.com

ROOF RIB CLIP

	BY	DATE
DRAWN	TACKES	12MAR86
CHECKED		
APPROVED	DW	12MAR86

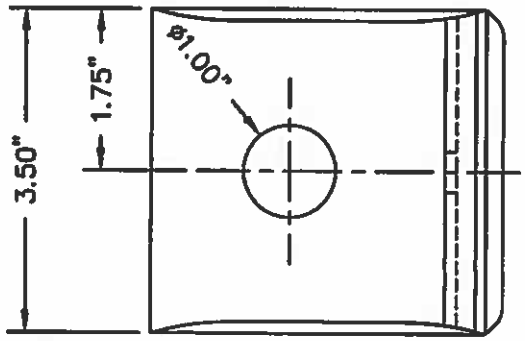
DRAWING NO.: 214520

REV.: C

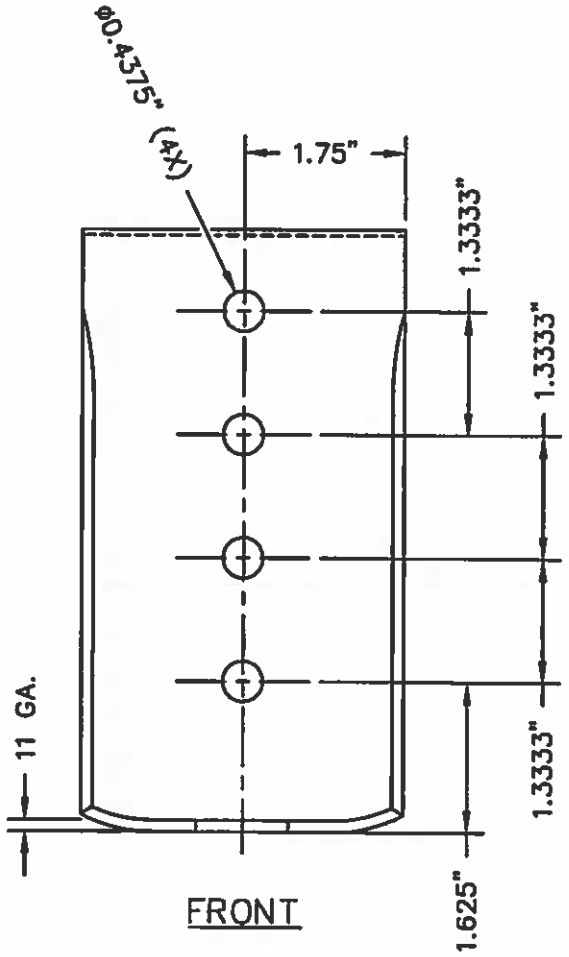
SCALE: 1:2

SHEET: 1 OF 1

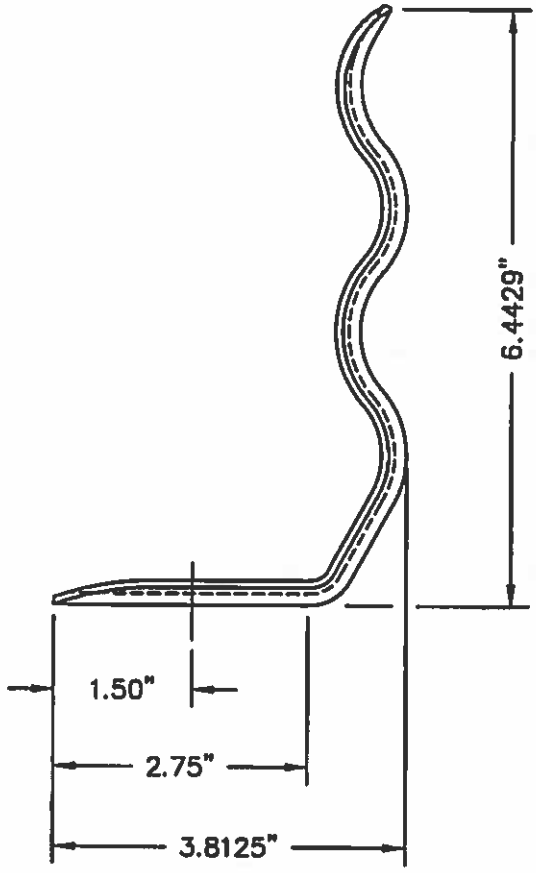
SHEAR SIZE 3.5" x 9.625"



TOP



FRONT



SIDE

MATERIAL: 12 GA. STEEL HOT DIP GALVANIZE (HDG)

WT: 1#

		BY	DATE
WATER STORAGE TANKS, INC. 1-800-463-1898 www.waterstoragetanksinc.com	DWN	IU	9/8/14
	CKD	JH	9/8/14
	ENG	JH	9/8/14

TITLE	BASE ANCHOR STANDARD CORRUGATED FORMED
DWG. NO.	WST–Base Anchor Standard Formed
REV. NO.	C
SIZE	A
SCALE	1/2"=1"
SHEET	1 OF 1

Titen HD® *Heavy Duty Screw Anchor for Cracked and Uncracked Concrete*

SIMPSON Strong-Tie

Tension Loads in Normal-Weight Concrete

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Tension Load						
					$f'_c \geq 2000$ psi (13.8 MPa) Concrete			$f'_c \geq 3000$ psi (20.7 MPa) Concrete	$f'_c \geq 4000$ psi (27.6 MPa) Concrete		
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)
⅜ (9.5)	⅜	2¾ (70)	3 (76)	6 (152)	4,297 (19.1)	—	1,075 (4.8)	1,315 (5.8)	6,204 (27.6)	—	1,550 (6.9)
		3¾ (95)			7,087 (31.5)	347 (1.5)	1,770 (7.9)	2,115 (9.4)	9,820 (43.7)	1,434 (6.4)	2,455 (10.9)
½ (12.7)	½	2¾ (70)	4 (102)	8 (203)	4,610 (20.5)	—	1,155 (5.1)	1,400 (6.2)	6,580 (29.3)	—	1,645 (7.3)
		3½ (92)			7,413 (33.0)	412 (1.8)	1,855 (8.3)	2,270 (10.1)	10,742 (47.8)	600 (2.7)	2,685 (11.9)
		5¼ (146)			10,278 (45.7)	297 (1.3)	2,570 (11.4)	3,240 (14.4)	15,640 (69.6)	2,341 (10.4)	3,910 (17.4)
⅝ (15.9)	⅝	2¾ (70)	5 (127)	10 (254)	4,610 (20.5)	—	1,155 (5.1)	1,400 (6.2)	6,580 (29.3)	—	1,645 (7.3)
		4½ (105)			8,742 (38.9)	615 (2.7)	2,185 (9.7)	2,630 (11.7)	12,286 (54.7)	1,604 (7.1)	3,070 (13.7)
		5¼ (146)			12,953 (57.6)	1,764 (7.8)	3,240 (14.4)	3,955 (17.6)	18,680 (83.1)	—	4,670 (20.8)
¾ (19.1)	¾	2¾ (70)	6 (152)	12 (305)	4,674 (20.8)	—	1,170 (5.2)	1,405 (6.3)	6,580 (29.3)	—	1,645 (7.3)
		4½ (117)			10,340 (46.0)	1,096 (4.9)	2,585 (11.5)	3,470 (15.4)	17,426 (77.5)	1,591 (7.1)	4,355 (19.4)
		5¼ (146)			13,765 (61.2)	1,016 (4.5)	3,440 (15.3)	4,055 (18.0)	18,680 (83.1)	1,743 (7.8)	4,670 (20.8)

See Notes Below

*See page 13 for an explanation of the load table icons

Shear Loads in Normal-Weight Concrete

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Shear Load						
					$f'_c \geq 2000$ psi (13.8 MPa) Concrete			$f'_c \geq 3000$ psi (20.7 MPa) Concrete	$f'_c \geq 4000$ psi (27.6 MPa) Concrete		
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs.[2] (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)
⅜ (9.5)	⅜	2¾ (70)	4½ (114)	6 (152)	6,353 (28.3)	—	1,585 (7.1)	1,665 (7.4)	—	—	1,740 (7.7)
		3¾ (95)			6,377 (28.4)	1,006 (4.5)	1,595 (7.1)	1,670 (7.4)	—	—	1,740 (7.7)
½ (12.7)	½	2¾ (70)	6 (152)	8 (203)	6,435 (28.6)	—	1,605 (7.1)	2,060 (9.1)	9,987 (44.4)	—	2,495 (7.8)
		3½ (92)			9,324 (41.5)	1,285 (5.7)	2,330 (10.4)	2,795 (12.4)	13,027 (57.9)	597 (2.7)	3,255 (14.5)
		5¼ (146)			11,319 (50.3)	1,245 (5.5)	2,830 (12.6)	3,045 (13.5)	—	—	3,255 (14.5)
⅝ (15.9)	⅝	2¾ (70)	7½ (191)	10 (254)	7,745 (34.5)	—	1,940 (8.6)	2,220 (9.9)	9,987 (44.4)	—	2,495 (11.1)
		4½ (105)			8,706 (38.7)	1,830 (8.1)	2,175 (9.7)	3,415 (15.2)	18,607 (82.8)	1,650 (7.3)	4,650 (20.7)
		5¼ (146)			12,498 (55.6)	2,227 (9.9)	3,125 (13.9)	3,890 (17.3)	—	—	4,650 (20.7)
¾ (19.1)	¾	2¾ (70)	9 (229)	12 (305)	7,832 (34.8)	—	1,960 (8.7)	2,415 (10.7)	11,460 (51.0)	—	2,865 (12.7)
		4½ (117)			11,222 (49.9)	2,900 (12.9)	2,805 (12.5)	4,490 (20.0)	24,680 (109.8)	2,368 (10.5)	6,170 (27.4)
		5¼ (146)			19,793 (88.0)	3,547 (15.8)	4,950 (22.0)	5,560 (24.7)	24,680 (109.8)	795 (3.5)	6,170 (27.4)

1. The allowable loads listed are based on a safety factor of 4.0.
2. Refer to allowable load-adjustment factors for spacing and edge distance on pages 119–120.
3. The minimum concrete thickness is 1½ times the embedment depth.
4. Tension and Shear loads for the Titen HD anchor may be combined using the elliptical interaction equation ($n=\frac{5}{3}$). Allowable load may be interpolated for concrete compressive strengths between 2000 psi and 4000 psi.

Strong-Bolt® 2 *Wedge Anchor Performance Data*

SIMPSON Strong-Tie

Carbon Steel Strong-Bolt®2 Wedge Anchor Tension Strength Design Data[1]

See page 13 for an explanation of the load table icons

Characteristic	Symbol	Units	Nominal Anchor Diameter — Carbon Steel							
			⅜ inch		½ inch		⅝ inch		¾ inch	
Anchor Category	1,2 or 3	—	1							
Nominal Embedment Depth	h_{nom}	in.	1⅞	2½	2½	3⅜	3⅜	5⅛	4½	5½
Steel Strength in Tension (ACI 318 Section D.5.1)										
Steel Strength in Tension	N_{sa}	lb	5,500		12,100		19,070		29,700	
Strength Reduction Factor - Steel Failure[2]	ϕ_{sa}	—	0.75							
Concrete Breakout Strength in Tension (ACI 318 Section D.5.2)[8]										
Effective Embedment Depth	h_{ef}	in.	1½	2½	2½	3⅜	2¾	4½	3⅜	5
Critical Edge Distance	c_{ac}	in.	6½	6	6½	7½	7½	9	9	8
Effectiveness Factor - Uncracked Concrete	k_{uncr}	—	24		24		24		24	
Effectiveness Factor - Cracked Concrete	k_{cr}	—	17		17		17		17	
Modification Factor	$\Psi_{c,N}$	—	1.00		1.00		1.00		1.00	
Strength Reduction Factor - Concrete Breakout Failure[3]	ϕ_{cb}	—	0.65							
Pull-Out Strength in Tension (ACI 318 Section D.5.3)[8]										
Pull-Out Strength Cracked Concrete (f'_c = 2500 psi)	$N_{p,cr}$	lb	1,300[4]	2,775[5]	N/A[4]	3,735[5]	N/A[4]	6,895[5]	N/A[4]	8,500[5]
Pull-Out Strength Uncracked Concrete (f'_c = 2500 psi)	$N_{p,uncr}$	lb	N/A[4]	3,340[5]	3,615[5]	5,255[5]	N/A[4]	9,025[5]	7,115[5]	8,870[5]
Strength Reduction Factor - Pullout Failure[6]	ϕ_p	—	0.65							
Tensile Strength for Seismic Applications (ACI Section D.3.3.3)[8]										
Tension Strength of Single Anchor for Seismic Loads (f'_c = 2500 psi)	$N_{p,eq}$	lb	1,300[4]	2,775[5]	N/A[4]	3,735[5]	N/A[4]	6,895[5]	N/A[4]	8,500[5]
Strength Reduction Factor - Pullout Failure[6]	ϕ_{eq}	—	0.65							

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318 Appendix D, except as modified below.
2. The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC, or ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318 D.4.5. Strong-Bolt® 2 anchors are ductile steel elements as defined in ACI 318 D.1.
3. The tabulated value of ϕ_{cb} applies when both the load combinations of Section 1605.2.1 of the IBC, or ACI 318 Section 9.2 are used and the requirements of ACI 318 Section D.4.4(c) for Condition B are met. Condition B applies where supplementary reinforcement is not provided. For installations where complying supplementary reinforcement can be verified, the ϕ_{cb} factors described in ACI 318 D.4.4 for Condition A are allowed. If the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318 Section D.4.4 for Condition A are met, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318 D 4.4(c). If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318 D.4 5(c).
4. N/A (Not Applicable) denotes that pullout resistance does not need to be considered.
5. The characteristic pull-out strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c / 2{,}500\ psi)^{0.5}$.
6. The tabulated value of ϕ_p or ϕ_{eq} applies when the load combinations of Section 1605.2.1 of the IBC, or ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, appropriate value of ϕ must be determined in accordance with ACI 318 Section D.4.5(c).
7. For the 2003 IBC, Ψ_3 replaces $\Psi_{c,N}$.
8. For sand-lightweight concrete, in lieu of ACI 318 Section D.3.4, modify the value of concrete breakout strength, $N_{p,cr}$, $N_{p,uncr}$ and N_{eq} by 0.6. All-lightweight concrete is beyond the scope of this table.

Strong-Bolt® 2 Wedge Anchor Performance Data

SIMPSON Strong-Tie

Carbon Steel Strong-Bolt® 2 Wedge Anchor Shear Strength Design Data[1]

See page 13 for an explanation of the load table icons

Characteristic	Symbol	Units	Nominal Anchor Diameter							
			Carbon Steel							
			⅜ inch		½ inch		⅝ inch		¾ inch	
Anchor Category	1,2 or 3	—	1							
Nominal Embedment Depth	h_{nom}	in.	1⅜	2⅜	2¾	3¾	3⅜	5⅛	4⅛	5¾
Steel Strength in Shear (ACI 318 Section D.6.1)[1]										
Steel Strength in Shear	V_{sa}	lb	1,800		7,235		11,035		14,480	
Strength Reduction Factor - Steel Failure[2]	ϕ_{sa}	—	0.65							
Concrete Breakout Strength in Shear (ACI 318 Section D.6.2)[1]										
Outside Diameter	d_a[5]	in.	0.375		0.500		0.625		0.750	
Load Bearing Length of Anchor in Shear	ℓ_e	in.	1.500	2.500	2.250	3.375	2.750	4.500	3.375	5.000
Strength Reduction Factor – Concrete Breakout Failure[3]	ϕ_{cb}	—	0.70							
Concrete Pryout Strength in Shear (ACI 318 Section D.6.3)										
Coefficient for Pryout Strength	k_{cp}	—	1.0	2.0	1.0	2.0	2.0		2.0	
Effective Embedment Depth	h_{ef}	in.	1 ½	2½	2¼	3⅜	2¾	4½	3⅜	5
Strength Reduction Factor – Concrete Pryout Failure[4]	ϕ_{cp}	—	0.70							
Steel Strength in Shear for Seismic Applications (ACI 318 Section D.3.3.3)										
Shear Strength of Single Anchor for Seismic Loads (f'_c = 2500 psi)	$V_{sa,eq}$	lb	1,800		6,510		9,930		11,775	
Strength Reduction Factor - Steel Failure[2]	ϕ_{sa}	—	0.65							

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318 Appendix D, except as modified below.
2. The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC, or ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318 D.4.5. Strong-Bolt® 2 anchors are ductile steel elements as defined in ACI 318 D.1.
3. The tabulated value of ϕ_{cb} applies when both the load combinations of Section 1605.2.1 of the IBC, or ACI 318 Section 9.2 are used and the requirements of ACI 318 Section D.4.4(c) for Condition B are met. Condition B applies where supplementary reinforcement is not provided. For installations where complying supplementary reinforcement can be verified, the ϕ_{cb} factors described in ACI 318 Section D.4.4 for Condition A are allowed. If the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318 Section D.4.4 for Condition A are met, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318 Section D.4.4(c). If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318 Section D.4.5(c).
4. The tabulated value of ϕ_{cp} applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{cp} must be determined in accordance with ACI 318 D.4.5(c).
5. For the 2006 IBC, d_o replaces d_a.
6. For sand-lightweight concrete, in lieu of ACI 318 Section D.3.4, modify the value of concrete breakout strength by 0.6. All-lightweight concrete is beyond the scope of this table.

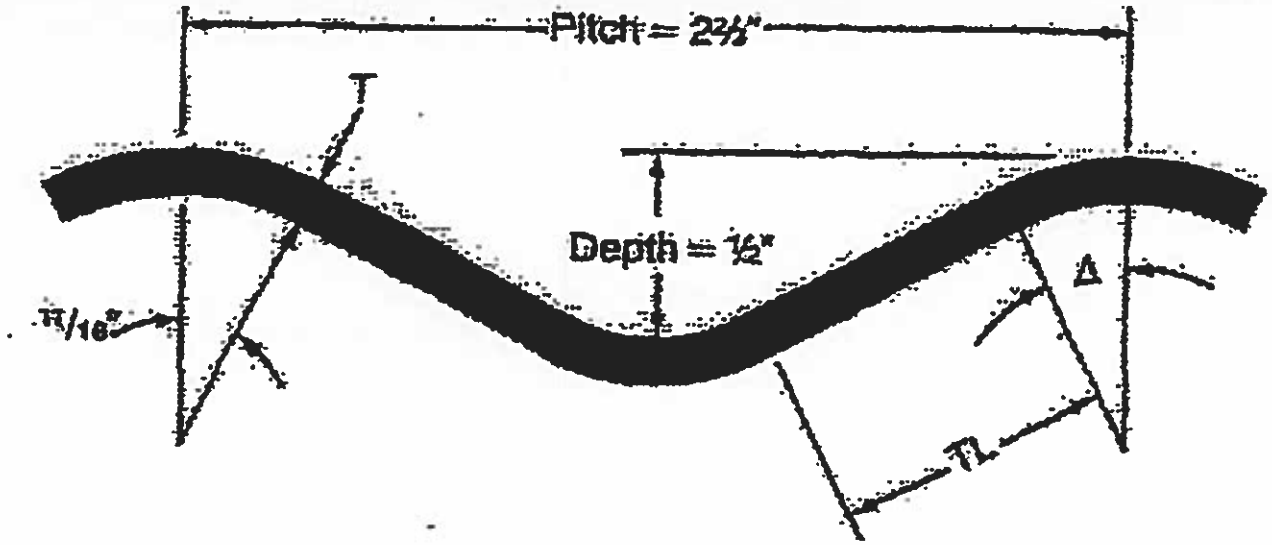


Table 1-7 Sectional Properties of Corrugated Steel Sheets[3,4]

Per ft of section width for corrugation: 2⅔ × ½ in. (Annular or Helical)
Radius of Curvature: 11/16 in.

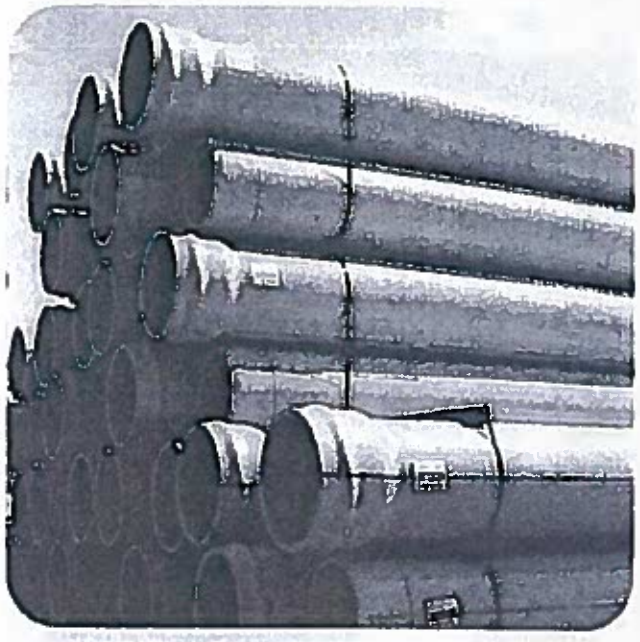
Specified Thickness in.	Uncoated Thickness *T* in.	Area of Section *A* in.²/ft	Tangent Length *TL* in.	Tangent Angle Δ Degrees	Moment of Inertia(a) *I* in.⁴/ft	Section Modulus(a) *S* in.³/ft	Radius of Gyration *r* in.	Developed Width Factor (b)
0.040	0.0359	0.465	0.785	26.56	0.0135	0.0503	0.1702	1.080
0.052	0.0478	0.619	0.778	26.65	0.0180	0.0659	0.1707	1.080
0.064	0.0598	0.775	0.770	26.74	0.0227	0.0812	0.1712	1.080
0.079	0.0747	0.968	0.760	26.86	0.0287	0.0998	0.1721	1.080
0.109	0.1046	1.356	0.740	27.11	0.0431	0.1360	0.1741	1.080
0.138	0.1345	1.744	0.720	27.37	0.0544	0.1714	0.1766	1.081
0.168	0.1644	2.133	0.699	27.65	0.0687	0.2069	0.1795	1.081

(a) Per foot of projection about the neutral axis.
To obtain *A*, *I*, or *S* per inch of width, divide the above values by 12.
(b) Developed width factor measures the increase in profile length due to corrugating.

North American Pipe Corporation™

AWWA C900-07: Municipal Water *Pipe*

North American Pipe's AWWA C900-07 PVC product line is manufactured to meet the needs of modern municipal water distribution systems. With top quality raw materials and modern processing technology North American Pipe's C900-07 pipe meets all industry standards in addition to our own rigorous quality control standards. North American Pipe's C900-07 pipe utilizes Reiber style gaskets throughout the entire product offering. North American Pipe produces a full range of CIOD pipe in DR-14, DR-18, and DR-25 classifications. Whether specifying or installing our pipe you can be assured that North American Pipe will provide the pipe "Right, On Time, All the Time".



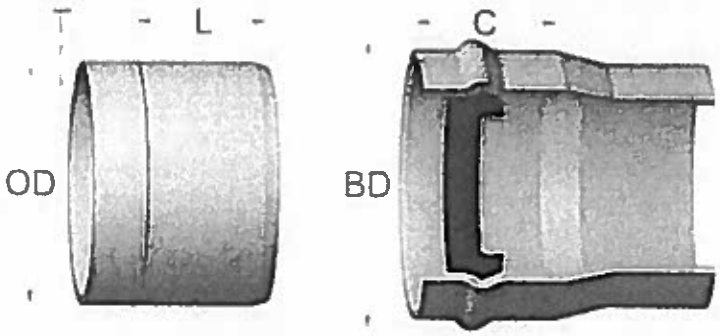
Caballo Water Tank

Short Form Specification
AWWA C900-07 Municipal Water Pipe

Pipe Standard:	AWWA C900-07
Pipe Compound:	ASTM D1784 Cell Class 12454
Gasket:	ASTM F477
Integral Bell Joint:	ASTM D3139
Certifications:	ANSI/NSF Standard 61 UL Standard 1285 DR18 & DR14: FM 1612
Applications:	Water
Color:	Blue
Lay Length:	20'
Installation:	North American Pipe's Installation Guide for PVC Pressure Pipe

North American Pipe Corporation™

AWWA C900-07: Municipal Water *Pipe*



NOMINAL PIPE SIZE	OUTSIDE DIA. – NOM. (OD)	*APPROX. BELL DIA. (BD)	**APPROX. BELL DEPTH (C)	INSERT MARK (L)
4"	4.80	6.50	5.00	3.88
6"	6.90	9.25	5.75	5.13
8"	9.05	11.75	7.00	6.13
10"	11.10	14.25	7.25	6.63
12"	13.20	16.75	8.00	7.38

NOMINAL PIPE SIZE	PC 165 DR 25 (T)	PC 235 DR 18 (T)	PC 305 DR 14 (T)
4"	.192	.267	.343
6"	.276	.383	.493
8"	.362	.503	.646
10"	.444	.617	.793
12"	.528	.733	.943

Note: These dimensions are for estimating purposes only * Dimension given for Approx. Bell Diameter (BD) is for highest pressure class
** Nominal depth, depth will vary by pressure class

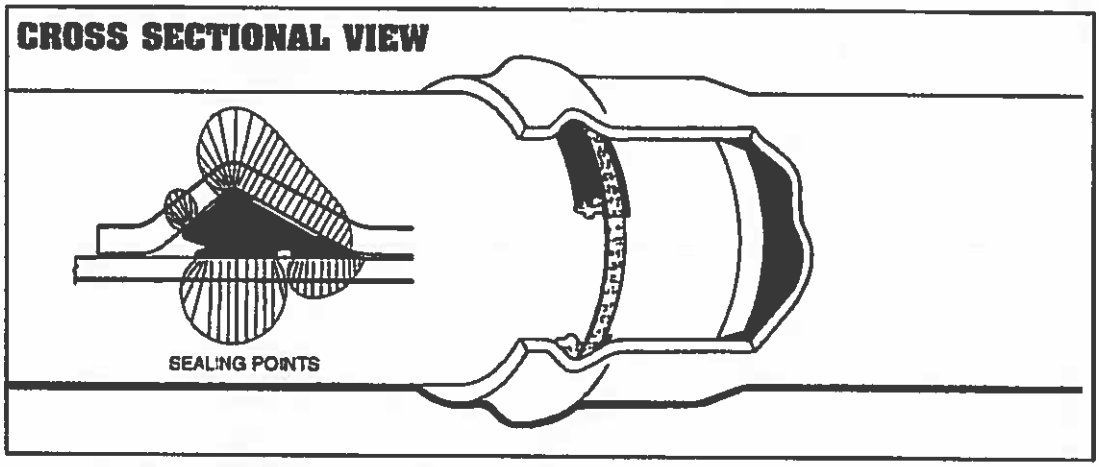
VINYLTECH VT PVC • PIPE

VINYLTECH AWWA C900-07
TECHNICAL DATA SUBMITTAL

C900 DR 18 PRESSURE CLASS 235						
NOMINAL SIZE (IN)	(mm)	OUTER DIAMETER (IN)	MINIMUM WALL (IN)	LIFTS PER TRUCK	FEET PER LIFT	APPROXIMATE WEIGHT (LB/100')
4	(100)	4.800	0.267	16	1020	251.6
6	(150)	6.900	0.383	16	440	521.2
8	(200)	9.050	0.503	20	200	903.0
10	(250)	11.100	0.617	12	240	1364.4
12	(300)	13.200	0.733	28	60-80	1935.8
C900 DR 14 PRESSURE CLASS 305						
NOMINAL SIZE (IN)	(mm)	OUTER DIAMETER (IN)	MINIMUM WALL (IN)	LIFTS PER TRUCK	FEET PER LIFT	APPROXIMATE WEIGHT (LB/100')
4	(100)	4.800	0.343	16	1020	317.5
6	(150)	6.900	0.493	16	440	658.7
8	(200)	9.050	0.646	20	200	1139.7
10	(250)	11.100	0.793	12	240	1722.3
12	(300)	13.200	0.943	28	60-80	2445.5

AWWA C900-07

CROSS SECTIONAL VIEW



THE RIEBER SEALING SYSTEM

The Rieber system provides a proven pipe joint with an excellent track record in the field. It is the fastest growing system in the world because of its many advantages.

- Factory installed, locked-in gasket
- The pipe bell forms over the gasket, making a perfect fit
- Avoids the possibility of installing the wrong gasket
- Reduces installation problems
- The locked-in gasket eliminates gasket roll-out during joining
- The gasket is molded vs. extruded and spliced
- Works equally well under pressure or vacuum
- Three sealing points achieved vs. two
- **LEAK-PROOF JOINTS**
- **"THE WORLDS BEST JOINT"**

201 S. 61st Avenue • Phoenix, AZ 85043
602 233-0071 • 602 272-4847 Fax • www.vtpipe.com

AN OTTERTAIL COMPANY

VINYLTECH AWWA C900-07

TECHNICAL DATA SUBMITTAL

VINYLTECH VT PVC • PIPE

CONFORMANCE

These specifications designate the requirements for manufacturing and installing Vinyltech AWWA C900 water pipe.

AWWA C900-07 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100mm Through 300mm), for Water Transmission and Distribution
AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
UNI-PUB-8 - Tapping Guide for AWWA C900 Pressure Pipe
UNI-B-8 - Recommended Practice for the Direct Tapping of PVC Pressure Water Pipe (Nominal Diameters 6-12 inch)

PIPE COMPOUND

The pipe shall be extruded from compounds meeting (PVC1120) the requirements of Cell Classification 12454-B, as defined in ASTM D 1784, *Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds*. The PVC shall also be listed by the National Sanitation Foundation (NSF) for use in potable water.

PIPE

Vinyltech pipe shall be manufactured in accordance with AWWA C900-07.

GASKET JOINT

The gasket shall be reinforced with a steel band and meet the requirements of ASTM F477. Vinyltech pipe shall have an integral bell end with a locked-in factory installed gasket and shall meet the joint requirements of ASTM D3139.

MARKING

The pipe shall be marked in accordance with AWWA C900 as in the following example.

a) Manufacturer's name and production codes
b) Nominal size, dimension ratio number, and O.D. base (for example, 8" DR 18 CIS)
c) Materials cell classification (PVC1120)
d) AWWA pressure class (235 psi or 305 psi) and hydrostatic test pressure (T600, or T800)
e) AWWA designation number (AWWA C900-07)
f) National Sanitaion Foundation (NSF-61)
g) Production date and time code (VJHB10A 48:34)
h) FM Approvals (FM) logo, third party certification
i) Underwriters Laboratories, Inc (UL) logo, third party certification.

QUALITY CONTROL

Each length of the pipe including the bell shall be hydrostatically tested. The pipe shall meet all additional test requirements as described in AWWA C900. Our full time quality assurance staff continually administers a rigid program of tests to maintain the production of the best pipe products available.

INSTALLATION

Recommended installation procedure of Vinyltech Corporation and the Uni-Bell PVC Pipe Association are outlined in AWWA C605, *Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water. The Uni-Bell Handbook of PVC Pipe* is also an invaluable resource guide for design and installation.

TAPPING

The consistent success of tapping PVC pressure pipe is contingent upon the use of proper procedures and equipment. Vinyltech recommends strict compliance with the requirements as specified in UNI-B-8, UNI-PUB-8, and AWWA C605.

ASSEMBLING THE PIPE

Assembly of Vinyltech PVC water pipe is easily accomplished. A depth of entry mark is on each spigot end to serve as a visual check for rapid, accurate joint inspection. **Do not over insert.**

1) Remove any mud, sand, or other foreign matter from the belled and spigot ends of the pipe. Carefully clean the gasket area.
2) With a clean applicator (a brush or hand) lubricate the entire surface of the pipe from the spigot end to the depth of entry mark and the contact surface of the gasket with **Vinyltech Brand Lubricant.**
3) Brace the bell to avoid disturbing the already installed joints. Align the pipe, insert the spigot into the bell and push until the entry mark is reached. **Do not insert past the entry mark line.**

FM APPROVED

UL Underwriters Laboratories Inc.® LISTED

NSF

AWWA C900-07

201 S 61st Avenue • Phoenix, AZ 85043
602 233-0071 • 602 272-4847 Fax • www.vipipe.com

AN OTTERTAIL COMPANY

Effective 02/09

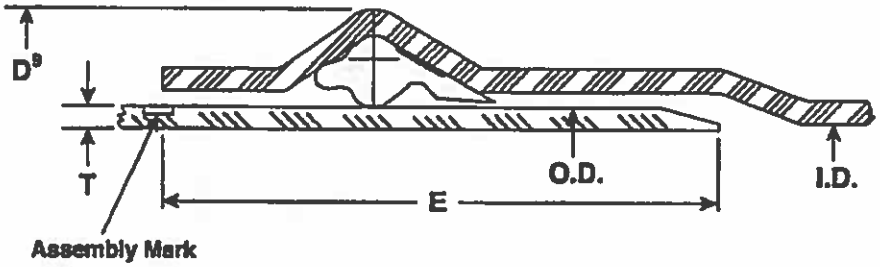
JM Eagle *Building essentials for a better tomorrow™*

BLUE BRUTE™

SUBMITTAL AND DATA SHEET

PIPE SIZE (IN)	AVERAGE O.D. (IN)	NOM. I.D. (IN)	MIN. T. (IN)	MIN. E (IN)	APPROX. D[9] (IN)	APPROX. WEIGHT (LBS/FT)
PRESSURE CLASS 165 psi (DR 25)						
4	4.80	4.39	0.192	5.25	5.57	1.9
6	6.90	6.31	0.276	6.40	8.00	3.9
8	9.05	8.28	0.362	7.05	10.50	6.7
10	11.10	10.16	0.444	8.20	12.88	10.1
12	13.20	12.08	0.528	8.80	15.31	14.4
PRESSURE CLASS 235 psi (DR 18)*						
4	4.80	4.23	0.267	5.25	5.87	2.6
6	6.90	6.09	0.383	6.40	8.43	5.3
8	9.05	7.98	0.503	7.05	11.06	9.2
10	11.10	9.79	0.617	8.20	13.57	13.9
12	13.20	11.65	0.733	8.80	16.13	19.7
PRESSURE CLASS 305 psi (DR 14)*						
4	4.80	4.07	0.343	5.25	6.17	3.2
6	6.90	5.86	0.493	6.40	8.87	6.7
8	9.05	7.68	0.646	7.05	11.63	11.6
10	11.10	9.42	0.793	8.20	14.27	17.6
12	13.20	11.20	0.943	8.80	16.97	25.1

Consult JM Eagle™ for CSA and other listing availability prior to shipment.
Note: *FM Approvals Pressure Class 150 psi for DR 18 and 200 psi for DR 14.
* Contact your JM eagleTM sales representative for location availability.

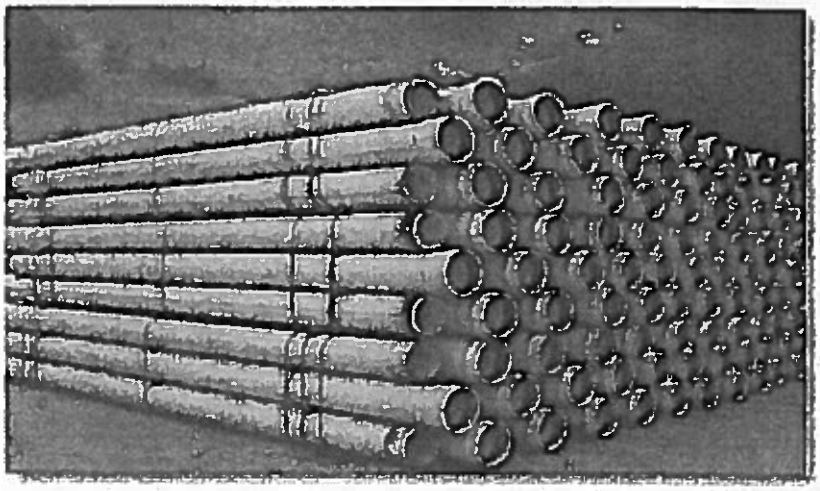


I.D. : Inside Diameter
O.D. Outside Diameter
T. . Wall Thickness
D[9] Bell Outside Diameter
E : Distance between Assembly Mark to the end of spigot

Product Standard:	ANSI/AWWA C900
Pipe Compound:	ASTM D1784 Cells Class 12454
Gasket:	ASTM F477
Integral Bell Joint:	ASTM D3139
Certifications:	ANSI/NSF Standard 61
	UL Standard 1285
	Pipe Length: 20 feet laying length
Installation:	AWWA C605
	JM Eagle™ Installation Guide

JM Eagle™ also manufactures this pipe in green for sewer force main applications and purple, specifically for reclaimed water systems. This pipe is made to the same requirements as our standard products. The only difference is that the pigment used is green or purple. These products will not be marked with UL or NSF listing marks. Additionally, the green pipe will be marked "Forced Sewer" and the purple pipe will be marked: "Reclaimed Water... Do Not Drink."

C900: PVC Pressure Pipe
SPECIFICATION DATA



Diamond (C900) PVC Pipe (4" through 12") is made of 12454 compound per ASTM D1784, in accordance with the dimensional, chemical, and physical requirements of AWWA C900.

Diamond (C900) PVC Pipe bears the mark of NSF, International (NSF), the listing of Underwriters Laboratory, Inc. (UL), and (DR14 & DR18) bears the listing of Factory Mutual(FM).

Diamond (C900) PVC Pipe utilizes a gasket, per ASTM F477, to seal the integral bell socket to the spigot of the next joint (which conforms to the requirements of ASTM D3139.) Each male end is beveled to facilitate joint assembly, and the spigot is referenced marked to ensure proper insertion depth. Diamond furnished lubricant is to be used in the joining process.

Diamond C900 is supplied in 20 foot laying lengths.

Factory Mutual Systems APPROVED

Physical Properties of PVC 12454:

Property	ASTM Test	Minimum
Specific Gravity	D792	1.40
Tensile Strength, psi	D638	7,000
Tensile Modulus, psi	D638	400,000
IZOD Impact Strength	D256	.65ft., lb./in.

NSF

UL Underwriter Laboratories Inc.©

SHORT FORM Specification for Diamond C900 PVC Water Pipe
Diamond C900 PVC Water Pipe shall be made of compounds conforming to ASTM D1784 with a cell classification of 12454. Diamond C900 shall meet all the dimensional, chemical, and physical requirements as outlined in AWWA C900 and will be supplied in 20 foot laying lengths. Joints shall meet the requirements of ASTM D3139 and shall be formed using Rieber Technology. Gaskets shall meet the requirements of ASTM F477.
Potable water pipe shall be manufactured from National Sanitation Foundation (NSF) approved compounds.

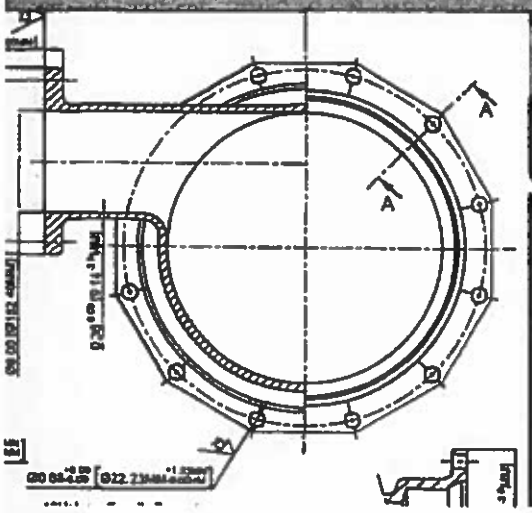
DIAMOND PLASTICS® CORPORATION

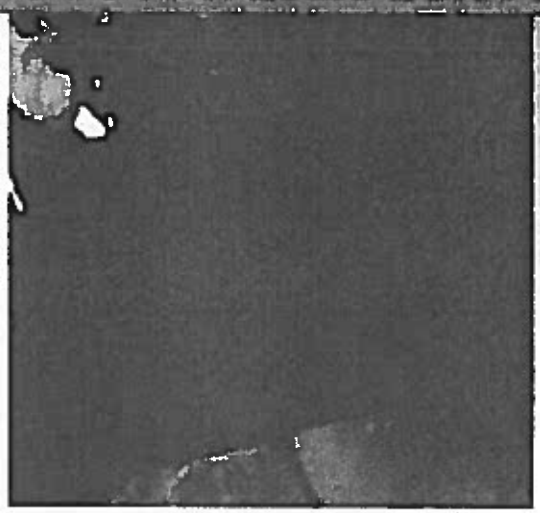
Corporate Headquarters • 1212 Johnstown Road • P.O.Box 1608 • Grand Island, NE 68802-1608

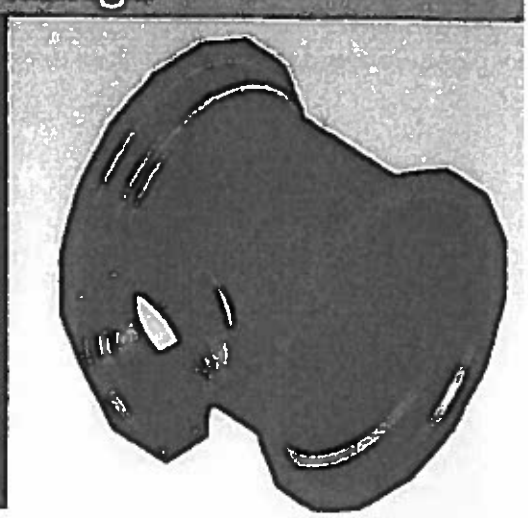
SIGMA™

Quality – Service – Commitment – Delivered.

C153 Mechanical Joint Ductile Iron Fittings







3" - 48" Ductile Iron Mechanical Joint Fittings Class

MATERIAL: Ductile Iron ASTM A536, Grade 65-45-12, 60-42-10 or 70-50-05.

PRESSURE: 350PSI WATER WORKING PRESSURE (CLASS 350) 3" - 24": & 250 PSI 30" - 48".

TESTING: In accordance with ANSI / AWWA C153 / A21.53 & UL - FM requirements.

LAYING LENGTH: Short body design - straight section of body deleted to provide a compact and lighter fitting without reducing strength or flow characterisitics, in accordance with ANSI / AWWA C153 / A21.53.

DEFLECTION: 2"- 4"=8°, 6"=7°, 8"-12"=5°, 14"-16"=3 ½°, 18"-24"=3°, 30"-48"=2°

CEMENT LINING: In accordance with ANSI / AWWA C104 / A21.4.

COATING: Interior of fitting is seal coated (asphaltic material) in accordance with ANSI / AWWA C104 / A21.4 and NSF61 approved.

COATING: Exterior of fitting is seal coated (asphaltic material) in accordance with ANSI / AWWA C153/A21.53 and NSF approved.

GASKETS: SBR in accordance with ANSI / AWWA C111 / A21.11. Also available in EDPM, NBR and CR.

T-BOLTS: Low Alloy corrosion resistant high strength steel in accordance with ANSI / AWWA C111 / A21.11.

APPROVALS: 3"-16" Underwriters Laboratories listed and Factory Mutual Approved.

STANDARDS: Certified to NSF61 Standard ANSI / AWWA C153 / A21.53 for Compact Ductile Iron Fittings 3"-48" for water and other liquids.

Note: 2" - 24" also available in Fusion Bonded Epoxy

FM APPROVED

SIGMA Corporation
700 Goldman Drive
Cream Ridge, NJ 08514
800 999 2550 p
609 758 1163 f
crm-sales@sigmaco.com
www.sigmaco.com

Compact MJ Fittings

ANSI/AWWA C153/A21.53

2" - 64" DUCTILE IRON MECHANICAL JOINT COMPACT FITTINGS

GENERAL SPECIFICATIONS

MATERIAL: Ductile Iron per ASTM A536

PRESSURE: 350 PSI rating for 3" - 24" sizes, 250 PSI rating for 30" - 48" sizes and 150 PSI rating for 54" - 60" sizes

TESTING: In accordance with ANSI/AWWA C153/A21.53 and UL requirements

LAYING LENGTH: In accordance with ANSI/AWWA C153/A21.53 (fittings not listed in ANSI/AWWA have dimensions per Star design as noted in the catalog)

WEIGHTS: Are in pounds, unless noted otherwise and do not include accessories, cement lining and coating

FLANGES: Flanged ends on fittings match ANSI/AWW C115/A21.15 and ANSI B16.1 class 125 flanges

CEMENT LINING: In accordance with ANSI/AWWA C104/A21.4 – size 2" - 3" single thickness and sizes 4" - 64" double thickness

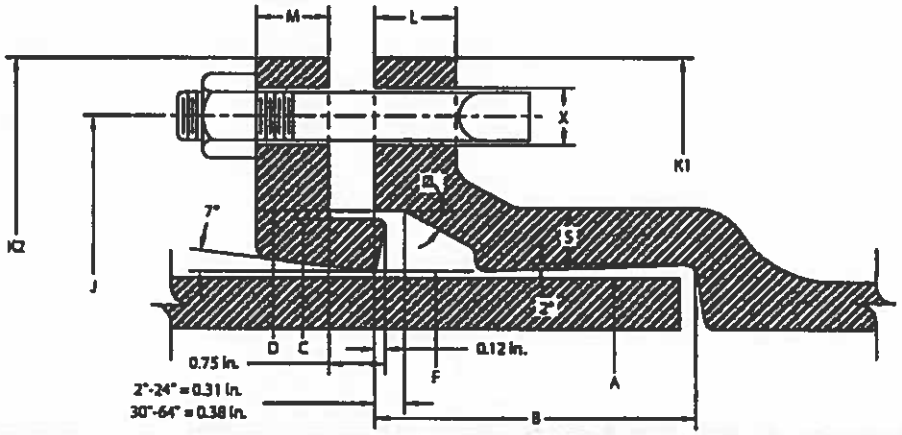
COATING: Asphaltic seal coat inside and out in accordance with ANSI/AWWA C104/A21.4

GASKETS: SBR in accordance with ANSI/AWWA C111/A21.11 (see pg. 17)

T-BOLTS/NUTS: Low alloy steel in accordance with ANSI/AWWA C111/A21.11 (see pg. 16)

APPROVALS: 4" - 12" Underwriters Laboratories Listed
3" and greater are UL/NSF-61

DIMENSIONS: All dimensions are in inches unless noted otherwise



AWWA MEMBER

CLASSIFIED WATER QUALITY

MECHANICAL JOINT DIMENSIONS

	NOM. SIZE	A DIA.	B	C DIA.	D DIA.	F DIA.	J DIA.	K1 DIA.	K2 DIA.	L	M	S	Ø	X DIA.	BOLTS SIZE	BOLTS NO.
*	2	2.50	2.50	3.39	3.50	2.61	4.75	6.19	6.25	0.58	0.62	0.36	28°	¾	⅝ x 3	2
	3	3.96	2.50	4.84	4.94	4.06	6.19	7.62	7.69	0.58	0.62	0.39	28°	¾	⅝ x 3	4
	4	4.80	2.50	5.92	6.02	4.90	7.50	9.06	9.12	0.60	0.75	0.39	28°	⅞	¾ x 3 ½	4
	6	6.90	2.50	8.02	8.12	7.00	9.50	11.06	11.12	0.63	0.88	0.43	28°	⅞	¾ x 3 ½	6
	8	9.05	2.50	10.17	10.27	9.15	11.75	13.31	13.37	0.66	1.00	0.45	28°	⅞	¾ x 3 ½	6
	10	11.10	2.50	12.22	12.34	11.20	14.00	15.62	15.62	0.70	1.00	0.47	28°	⅞	¾ x 4	8
	12	13.20	2.50	14.32	14.44	13.30	16.25	17.88	17.88	0.73	1.00	0.49	28°	⅞	¾ x 4	8
	14	15.30	3.50	16.40	16.54	15.44	18.75	20.25	20.25	0.79	1.25	0.55	28°	⅞	¾ x 4 ½	10
	16	17.40	3.50	18.50	18.64	17.54	21.00	22.50	22.50	0.85	1.31	0.58	28°	⅞	¾ x 4 ½	12
	18	19.50	3.50	20.60	20.74	19.64	23.25	24.75	24.83	1.00	1.38	0.68	28°	⅞	¾ x 4 ½	12
	20	21.60	3.50	22.70	22.84	21.74	25.50	27.00	27.08	1.02	1.44	0.69	28°	⅞	¾ x 4 ½	14
	24	25.80	3.50	26.90	27.04	25.94	30.00	31.50	31.58	1.02	1.56	0.75	28°	⅞	¾ x 5	16
	30	32.00	4.00	33.29	33.46	32.17	36.88	39.12	39.12	1.31	2.00	0.82	20°	1 ⅛	1 x 6	20
	36	38.30	4.00	39.59	39.76	38.47	43.75	46.00	46.00	1.45	2.00	1.00	20°	1 ⅛	1 x 6	24
	42	44.50	4.00	45.79	45.96	44.67	50.62	53.12	53.12	1.45	2.00	1.25	20°	1 ¾	1 ¼ x 6 ½	28
	48	50.80	4.00	52.09	52.26	50.97	57.50	60.00	60.00	1.45	2.00	1.35	20°	1 ¾	1 ¼ x 6 ½	32
*	54	*(Dimensions Available On Request)*														
*	60															
*	64															

* Not included in AWWA C153

REV.07

STAR® PIPE PRODUCTS
HOUSTON CORPORATE | TOLL FREE 1-800-999-3009 | FAX 281 558-9000
www.starpipeproducts.com

3" - 48" DUCTILE IRON MECHANICAL JOINT COMPACT FITTINGS

GENERAL SPECIFICATIONS

MATERIAL : Ductile Iron per ASTM A536.

PRESSURE : 350 psi Rating for 3"- 24" sizes and 250 psi Rating for 30"- 48".

TESTING : In accordance with ANSI/AWWA C153/A21.53 and UL Requirement.

LAYING LENGTH : In accordance with ANSI/AWWA C153/A21.53. Fittings not listed in ANSI/AWWA have dimensions per SIP design as noted in Catalog.

WEIGHTS : Do not include Accessories, Cement Lining and Coatings.

FLANGES : Flanged ends on Fittings match ANSI/AWWA C115/A21.15 and ANSI B16.1 CLASS 125 Flanges.

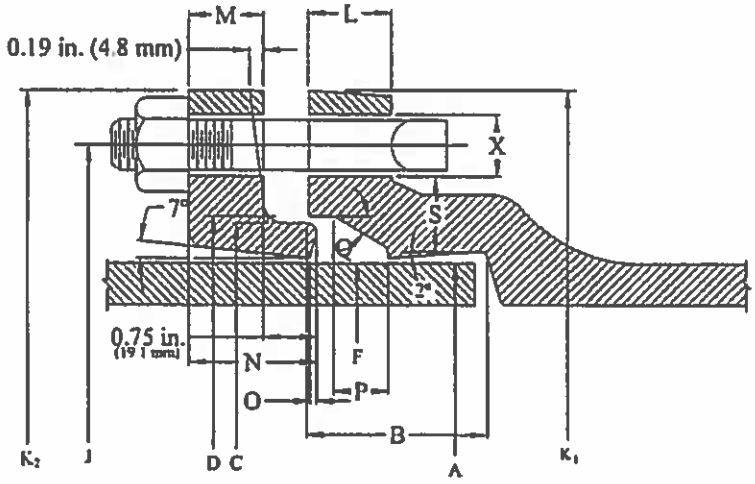
CEMENT LINING : In accordance with ANSI/AWWA C104/A21.4.

COATING : Asphaltic Seal Coat inside and out in accordance with ANSI/AWWA C104/A21.4

GASKETS : SBR in accordance with ANSI/AWWA C111/A21.11.

T-BOLTS/NUTS : Low Alloy Steel in accordance with ANSI/AWWA C111/A21.11.

APPROVALS : 3"- 24" Underwriters Laboratories Listed and UL/NSF 61.



MECHANICAL JOINT DIMENSIONS

SIZE	A	B	C	D	F	J	K_2	K_1	L	X	BOLTS		
											No	Size	Length
3	3.96	2.50	4.84	4.94	4.06	6.19	7.69	7.62	0.58	3/4	4	5/8	3
4	4.80	2.50	5.92	6.02	4.90	7.50	9.12	9.06	0.60	7/8	4	3/4	3 1/2
6	6.90	2.50	8.02	8.12	7.00	9.50	11.12	11.06	0.63	7/8	6	3/4	3 1/2
8	9.05	2.50	10.17	10.27	9.15	11.75	13.37	13.31	0.66	7/8	6	3/4	3 1/2
10	11.10	2.50	12.22	12.34	11.20	14.00	15.62	15.62	0.70	7/8	8	3/4	4
12	13.20	2.50	14.32	14.44	13.30	16.25	17.88	17.88	0.73	7/8	8	3/4	4
14	15.30	3.50	16.40	16.54	15.44	18.75	20.25	20.25	0.79	7/8	10	3/4	4 1/2
16	17.40	3.50	18.50	18.64	17.54	21.00	22.50	22.50	0.85	7/8	12	3/4	4 1/2
18	19.50	3.50	20.60	20.74	19.64	23.25	24.83	24.75	1.00	7/8	12	3/4	4 1/2
20	21.60	3.50	22.70	22.84	21.74	25.50	27.08	27.00	1.02	7/8	14	3/4	4 1/2
24	25.80	3.50	26.90	27.04	25.94	30.00	31.58	31.50	1.02	7/8	16	3/4	5
30	32.00	4.00	33.29	33.46	32.17	36.88	39.12	39.12	1.31	1 1/8	20	1	6
36	38.30	4.00	39.59	39.76	38.47	43.75	46.00	46.00	1.45	1 1/8	24	1	6
42	44.50	4.00	45.79	45.96	44.67	50.62	53.12	53.12	1.45	1 3/8	28	1 1/4	6 1/2
48	50.80	4.00	52.09	52.26	50.97	57.50	60.00	60.00	1.45	1 3/8	32	1 1/4	6 1/2

All Dimensions in Inches.
Weights shown are approximate in lbs

2000PV Mechanical Joint Restraint Sample Specifications

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, shall conform to the following:

Design

1. Restraint devices for nominal pipe sizes 3 inch through 36 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.
2. The devices shall have a working pressure rating equal to that of the most current product brochure. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.

Material

1. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
2. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.
3. Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.
4. Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

Traceability

1. An identification number consisting of year, day, plant and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body.
2. All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.
3. Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.
4. All components shall be manufactured and assembled in the United States. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense.

Installation

1. Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly.
2. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

Approvals

1. Mechanical Joint Restraints shall be Listed by Underwriters Laboratories in the 4 inch through 12 inch sizes.
2. Mechanical Joint Restraints shall be Factory Mutual Approved in the 4 inch through 12 inch sizes.
3. Mechanical Joint Restraints, 4 inch through 24 inch, shall meet or exceed the requirements of ASTM F1674 of the latest revision.
4. Mechanical joint restraint shall be Series 2000PV produced by EBAA Iron Inc. or approved equal.

MEGA-BOND® Restraint Coating System

Coating for restraint devices shall consist of the following:

All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid Xylan® fluoropolymer coating with heat cure to follow each coat.

All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

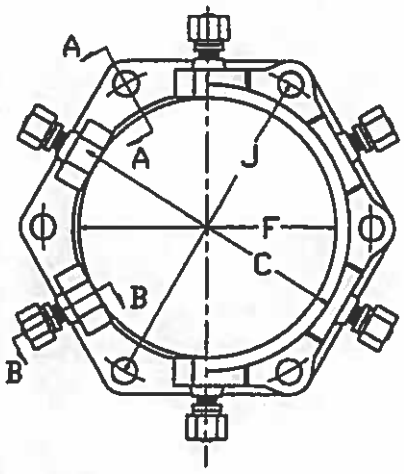
The coating system shall be MEGA-BOND by EBAA Iron, Inc. or approved equal. Requests for approved equal must submit coating material and process details for review prior to bid.

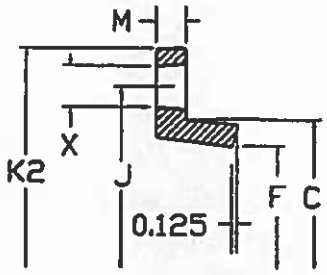
Xylan is a registered trademark of the Whitford Corporation.

For more information regarding MEGA-BOND, refer to the MEGA-BOND brochure or visit www.ebaa.com.

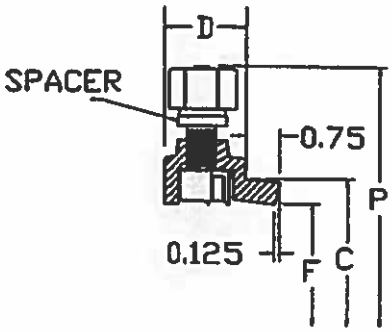
Series 2000PV Submittal Reference Drawing

EBAA IRON





SECTION A–A



SECTION B–B

MADE IN USA

Nominal Pipe Size	Series Number	C	D	F	M	P	P*	X	J	K2	Wedge Qty	Bolt Qty	Weight (lbs)
3	2003PV	4.84	1.55	3.60	0.50	9.8	8.6	¾	6.19	7.69	4	4	7.0
4	2004PV	5.92	1.68	4.90	0.50	10.5	9.5	⅞	7.50	9.13	4	4	8.8
6	2006PV	8.02	1.68	7.00	0.50	13.0	12.1	⅞	9.50	11.13	6	6	12.1
8	2008PV	10.17	1.68	9.15	0.62	14.5	13.6	⅞	11.75	13.38	6	6	16.3
10	2010PV	12.22	2.10	11.20	0.62	17.0	16.0	⅞	14.00	15.63	8	8	26.0
12	2012PV	14.32	2.10	13.30	0.75	19.0	18.1	⅞	16.25	17.88	8	8	31.4
14	2014PV	16.40	2.25	15.49	0.88	21.7	20.9	⅞	18.75	20.38	10	10	47.6
16	2016PV	18.50	2.25	17.58	0.88	23.8	23.0	⅞	21.00	22.63	12	12	52.8
18	2018PV	20.60	2.25	19.68	1.13	25.9	25.1	⅞	23.25	24.88	12	12	61.8
20	2020PV	22.70	2.25	21.79	1.25	28.0	27.2	⅞	25.50	27.13	14	14	70.9
24	2024PV	26.90	2.75	25.99	1.42	32.3	31.5	⅞	30.00	31.63	16	16	92.9
30	2030PV	33.29	2.70	32.22	1.50	38.5	37.7	1⅛	36.88	39.12	20	20	128.5
36	2036PV	39.59	2.70	38.52	1.50	44.8	44.0	1⅛	43.75	46.00	24	24	161.3
42	2242	Submittal information for pipe sizes 42 inch and greater can be found in the Series 2200 Brochure.											
48	2248	Submittal information for pipe sizes 42 inch and greater can be found in the Series 2200 Brochure.											

NOTE: Dimensions are in inches and are subject to change without notice.
For applications or pressures other than those shown, please contact EBAA for assistance.

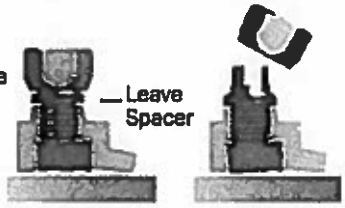
Nominal Pipe Size	Series Number	Ratings for Ordinary Water Works w/Transient surges only						Ratings for Peak Pressures used in Sewage Force Mains and other installations designed for Cyclic Surges of 1-Mill. Cycles						C905 PVC Pipe			
		DR14	DR18	DR25	SDR17	SDR21	SDR26	DR14	DR18	DR25	SDR17	SDR21	SDR26	DR18	DR25	DR32.5	DR41
3	2003PV	305	235	165	250	200	160	244	188	132	200	160	120	-	-	-	-
4	2004PV	305	235	165	250	200	160	244	188	132	200	160	120	-	-	-	-
6	2006PV	305	235	165	250	200	160	244	188	132	200	160	120	-	-	-	-
8	2008PV	305	235	165	250	200	160	244	188	132	200	160	120	-	-	-	-
10	2010PV	305	235	165	250	200	160	244	188	132	200	160	120	-	-	-	-
12	2012PV	305	235	165	250	200	160	244	188	132	200	160	120	-	-	-	-
14	2014PV	-	-	-	-	-	-	-	-	-	-	-	-	235	165	125	80
16	2016PV	-	-	-	-	-	-	-	-	-	-	-	-	235	165	125	100
18	2018PV	-	-	-	-	-	-	-	-	-	-	-	-	200	165	-	-
20	2020PV	-	-	-	-	-	-	-	-	-	-	-	-	200	165	-	-
24	2024PV	-	-	-	-	-	-	-	-	-	-	-	-	165	165	125	100
30	2030PV	-	-	-	-	-	-	-	-	-	-	-	-	-	165	125	100*
36	2038PV	-	-	-	-	-	-	-	-	-	-	-	-	-	125	125	100*

* Refer to Series 2200 to achieve rated pressure on DR41 in stated pipe size.

Spacer Instructions

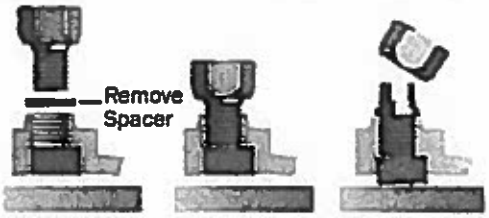
Ductile Iron or C900 PVC Pipe Sizes

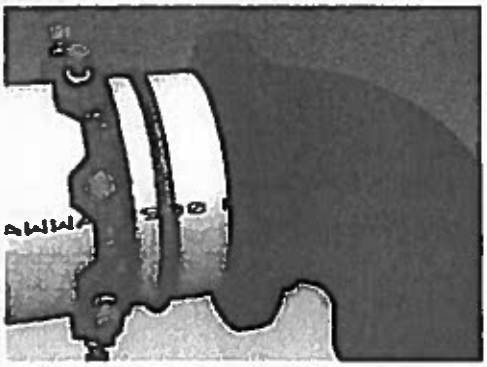
For installation on C900 PVC pipe, use as received and install per instructions.



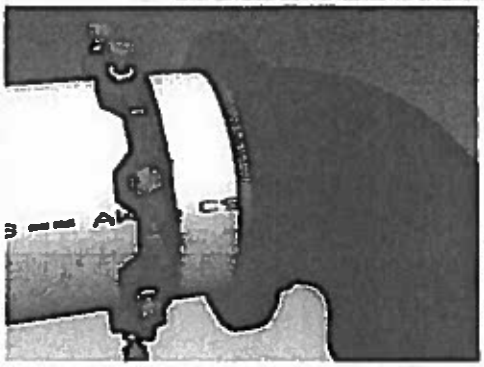
ASTM 2241 PVC Pipe Sizes (IPS O.D.)

For installation on ASTM 2241 sized pipe, remove spacers and replace screws. Install per instructions.



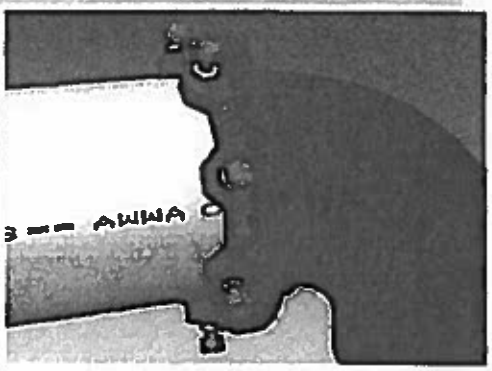


1. Identify the pipe. The 2000PV is for use with PVC and HDPE pipe. The 4 inch through 12 inch size may be used on C900, and IPS PVC pipe as well as C906 HDPE pipe. Check to see if the spacers under the screws are in place. If the pipe is C900 or is ductile iron O.D., proceed with spacers in place. If the pipe is IPS O.D., remove the spacers. Since 3 inch and 14 inch through 24 inch restraints are only used with one pipe diameter, no spacers are used.



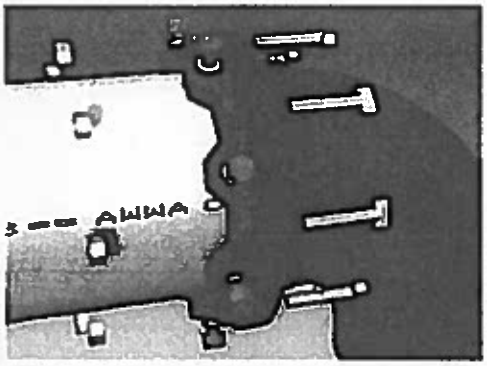
2. * Clean the socket and the plain end. Lubrication and additional cleaning should be provided by brushing both the gasket and plain end with soapy water or an approved pipe lubricate meeting the requirements of ANSI/AWWA C111/A12.11 just prior to slipping the gasket onto the plain end for joint assembly. Place the gland on the plain end with the lip extension toward the plain end; follow by the gasket with the narrow edge of the gasket toward the plain end. [The gasket provided may have been the EBAA-Seal™ Improved Mechanical Joint Gasket. This gasket is bi-directional and has no front or back. The use of a pipe wall stiffening insert is required on High Density Polyethylene pipe.]

NOTE: In cold weather it is preferable to warm the gasket to facilitate assembly of the joint.

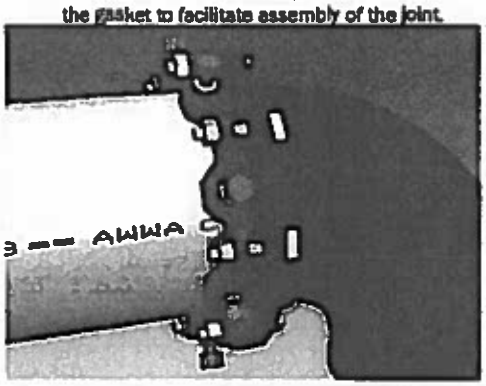


3. * Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.

4. * Push the gland toward the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand-tighten nuts. Make deflection after joint assembly but before tightening bolts.

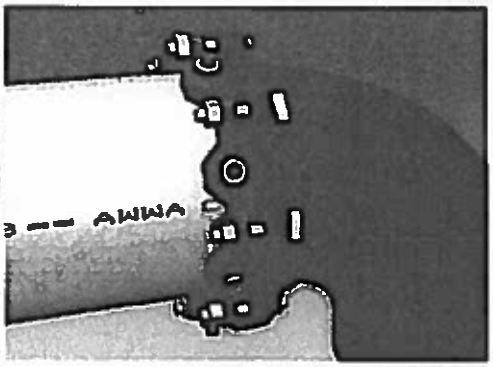


5. * Tighten the bolts to the normal range of bolt torque [45-60 ft-lbs for 3 inch, 75-90 ft-lbs for 4 inch through 24 inch, 100-120 ft-lbs for 30 inch and 36 inch, and 120-150 ft-lbs for 42 inch and 48 inch.] while at all times maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This can be accomplished by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, finally the remaining bolts. Repeat the process until all bolts are within the appropriate range of torque. In large sizes (30-48 inch), five or more repetitions may be required. The use of a torque-indicating wrench will facilitate the procedure.



6. Tighten the torque limiting twist-off nuts in a clockwise direction (direction indicated by arrow on top of nut) until all wedges are in firm contact with the pipe surface. Continue tightening in an alternating manner until all of the nuts have been twisted off.

*These steps are requirements of AWWA C600.



7. If removal is necessary, utilize the ⅝ inch hex heads provided. If reassembly is required, assemble the joint in the same manner as above, tighten the screws to 60 to 80 ft-lbs. If the Series 2000PV restraint is removed from the pipe, be sure that all of the screws, spacers (if required), and wedges are in place before the restraint is reassembled.

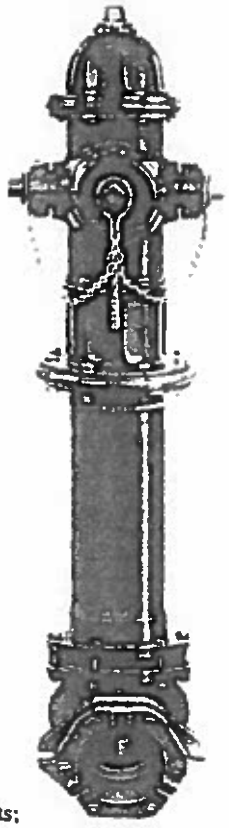
EBAA IRON Sales, Inc.
P.O. Box 857, Eastland, TX 76448
Tel: (254) 629-1731
Fax: (254) 629-8931
(800) 433-1716 within US and Canada
contact@ebaa.com
www.ebaa.com

Members of...
AMERICAN FOUNDRY SOCIETY

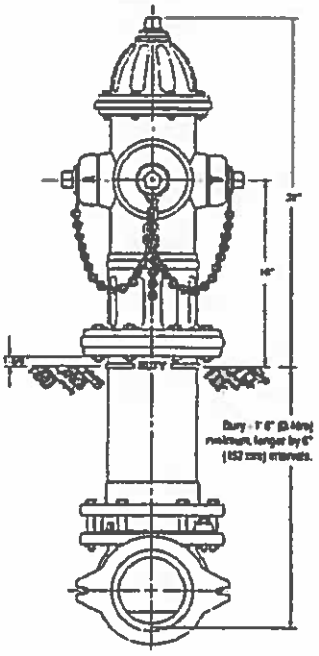
MUELLER® SUPER CENTURION® FIRE HYDRANT

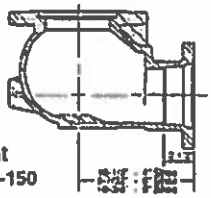
Rev. 8-04 Shaded area indicates changes

- **Super Centurion 250™ 3-way catalog numbers (approved to UL 246, FM 1510, ANSI/AWWA C502 Standards) -**
  A-421 4-1/2" main valve opening three way (two hose nozzles and one pumper nozzle)
  A-423 5-1/4" main valve opening three way (two hose nozzles and one pumper nozzle)
  Super Centurion 200™ 2-way catalog numbers (approved to ANSI/AWWA C502 Standards) -
  A-420 4-1/2" main valve opening two way (two hose nozzles)
  A-422 5-1/4" main valve opening two way (two hose nozzles)
  A-425 5-1/4" main valve opening two way (two pumper nozzles)
  Super Centurion 200™ 1-way catalog number (approved to ANSI/AWWA C502 Standards)-
  A-424 4-1/2" main valve opening one way (one pumper nozzle)
- 10 year limited warranty on material and workmanship
- Meets all applicable parts of ANSI/AWWA C502 Standard
- Post type dry barrel design
- Dry top design with O-ring sealed oil reservoir
- Traffic feature with stainless steel safety stem coupling
- Compression-type main valve closes with pressure for positive seal; it is made of rubber and is conveniently reversible providing a spare for long service life
- Operating nut available in wide variety of shapes and sizes-open left or right
- Field replaceable hose and pumper nozzles
- Hose and pumper nozzles have large radius, full flow openings for low friction loss
- Contoured shoe is designed for full flow
- Dual bronze drain valves provide effective barrel drainage
- 250 psig (1723 kPa) maximum working pressure, 500 psig (3447 kPa) static test pressure for 3-way hydrants; 200 psig (1379 kPa) maximum working pressure, 400 psig (2758 kPa) static test pressure for 2-way and 1-way hydrants

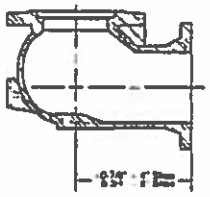


Dimensions

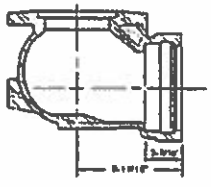




Mechanical joint standard and D-150

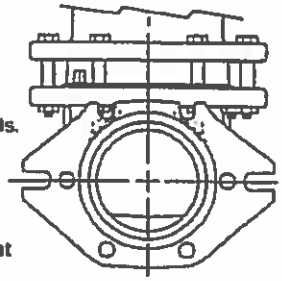


Flange ANSI 125/150 or PN 10/16 Drilling

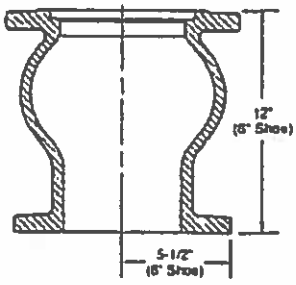


Slip-on

Non-rotating bolt design: cast-in pads eliminate need for anti-rotation bolts.



Front view detail of Mechanical joint (Standard only)



Vertical Flange*

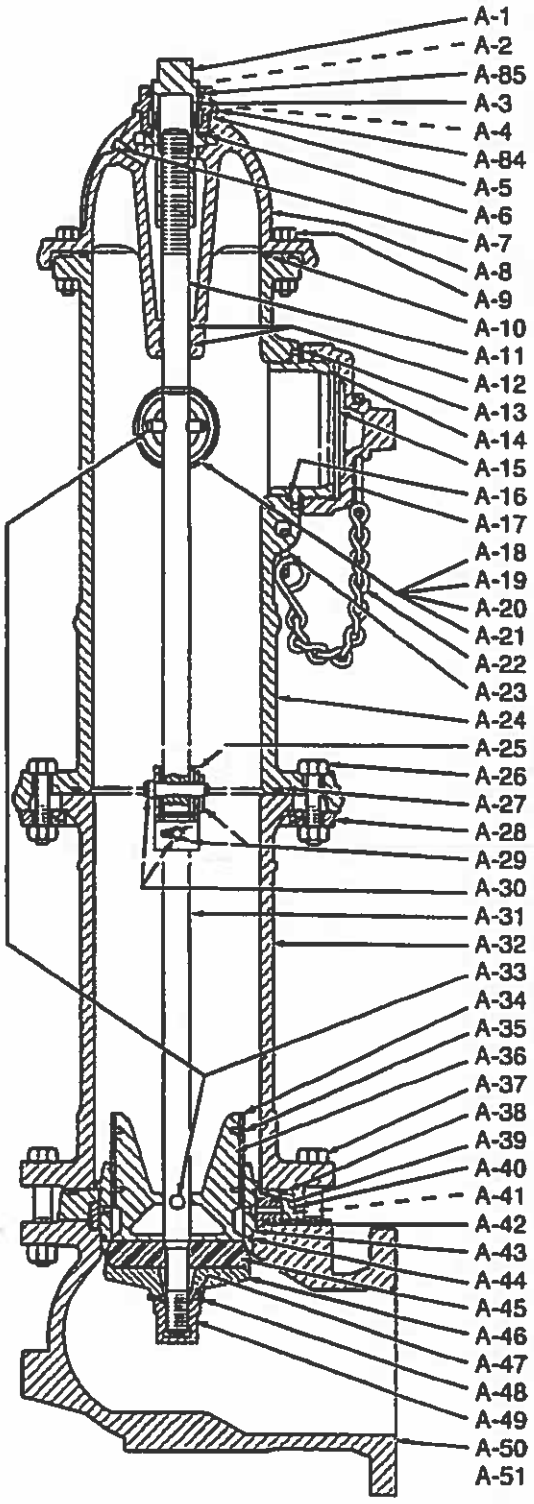
* 4" Vertical shoe available for A-420 and A-421 hydrants.

SEE PAGE 9.28 FOR ORDERING INSTRUCTIONS

MUELLER® SUPER CENTURION® FIRE HYDRANT PARTS

MUELLER Super Centurion Fire Hydrant Parts

Cat. part #	Description	Material	Material standard
A-1	Operating nut	Bronze	ASTM B584
A-2	Weather cap (not shown; used only on pre-1988 models)	Cast iron	ASTM A126 CL.B
A-3	Hold down nut O-ring	Rubber	ASTM D2000 BUNA N
A-4	Hold down nut (not shown; used only on pre-1988 models)	Bronze	ASTM B584
A-5	Bonnet O-ring	Rubber	ASTM D2000 BUNA N
A-6	Anti-friction washer	Celcon	
A-7	Oil plug	Brass	ASTM B16
A-8	Bonnet	Cast iron	ASTM A126 CL.B
A-9	Bonnet bolt and nut	Steel	ASTM A307 Plated
A-10	Bonnet O-ring (1997 and newer 3-way models; all pre-1997 models and 1-way and 2-way models have flat gasket)	Rubber	ASTM D2000 BUNA N
A-11	Upper stem	Steel	ASTM A576 GR.B
A-12	Stem O-ring	Rubber	ASTM D2000 BUNA N
A-13	Nozzle lock	Stainless steel	ASTM A276
A-14	Pumper nozzle	Bronze	ASTM B584
A-15	Pumper nozzle gasket	Rubber	ASTM D2000 Neoprene
A-16	Pumper nozzle O-ring	Rubber	ASTM D2000 BUNA N
A-17	Pumper nozzle cap	Cast iron	ASTM A126 CL.B
A-18	Hose nozzle	Bronze	ASTM B584
A-19	Hose nozzle gasket	Rubber	ASTM D2000 Neoprene
A-20	Hose nozzle O-ring	Rubber	ASTM D2000 BUNA N
A-21	Hose nozzle cap	Cast iron	ASTM A126 CL.B
A-22	Cap chain	Steel	Plated
A-23	Chain ring	Steel	Plated
A-24	Upper barrel less nozzles	Cast iron	ASTM A126 CL.B
A-25	Safety coupling	Stainless steel	ASTM A890
A-26	Safety flange bolt and nut	Steel	ASTM A307 Plated
A-27	Safety flange O-ring (1997 and newer models; pre-1997 models have flat gasket)	Rubber	ASTM D2000 BUNA N
A-28	Safety flange	Cast iron	ASTM A126 CL.B
A-29	Cotter pin	Stainless steel	ASTM A276
A-30	Clevis pin	Stainless steel	ASTM A276
A-31	Lower stem	Steel	ASTM A576 GR.B
A-32	Lower barrel	Cast iron	ASTM A126 CL.B
A-33	Stem pin	Stainless steel	ASTM A276
A-34	Drain valve facing	Plastic	
A-35	Drain valve screw	Stainless steel	ASTM A276
A-36	Upper valve plate (includes A-34 and A-35)	Bronze	ASTM B584
A-37	Shoe bolt and nut	Steel	ASTM A307 Plated
A-38	Drain ring housing O-ring (1997 and newer models; pre-1997 models have square gasket)	Rubber	ASTM D2000 BUNA N
A-39	Seat ring top O-ring	Rubber	ASTM D2000 BUNA N
A-40	Drain ring housing	Cast iron	ASTM A126 CL.B
A-41	Drain ring housing bolt and nut (not shown; used only on pre-1997 model hydrants)	Steel	ASTM A307 Plated
A-42	Drain ring	Bronze	ASTM B584
A-43	Seat ring	Bronze	ASTM B584
A-44	Seat ring bottom O-ring	Rubber	ASTM D2000 BUNA N
A-45*	Reversible main valve (1997 and newer models only; pre-1997 models use non-reversible main valve and lower valve plate - not shown)	Rubber	ASTM D2000
A-46	Lower valve plate (1997 and newer models for reversible main valve; pre-1997 models have non-reversible main valve - not shown)	Cast iron	ASTM A126 CL B
A-47	Cap nut seal	Rubber	ASTM D2000
A-48	Lock washer	Stainless steel	ASTM A276
A-49	Lower valve plate nut	Cast iron	ASTM A126 CL.B
A-50	Shoe**	Cast iron	ASTM A126 CL. B
A-84	Hold down nut	Bronze	ASTM B584
A-85	Weather seal	Rubber	ASTM D2000
A-51	10.5 oz. hydrant lubricating oil (not shown)		



* Pre-1997 models may be upgraded to use the reversible main valve by also replacing the lower valve plate with the 1997 model.

** 6" MJ shoe is Ductile Iron, ASTM A536 Grade 65-45-12.

SEE PAGE 9.28 FOR ORDERING INSTRUCTIONS

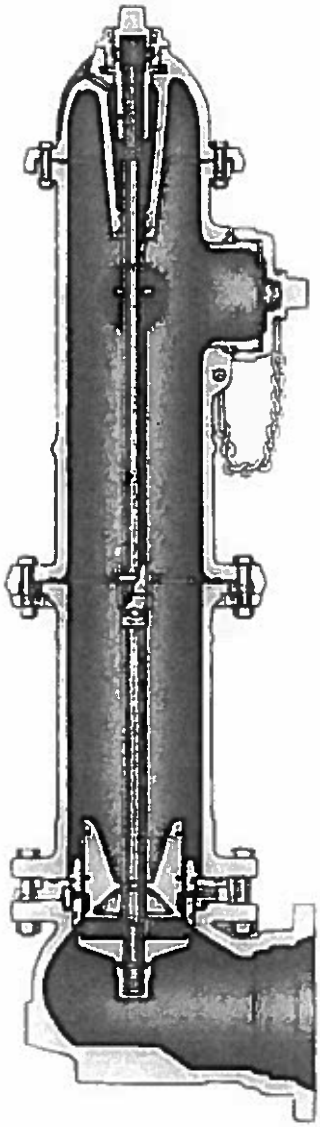
MUELLER® SUPER CENTURION® FIRE HYDRANT

Mueller Co. **9.3**

Rev. 9-09

MUELLER SUPER CENTURION 250™ 3-Way Fire Hydrant Features

- **ANTI-FRICTION WASHER** helps assure easy turning operation for the life of the hydrant.
- **OIL FILLER PLUG** permits quick check of oil level. Lets you add oil without removing bonnet.
- **OIL RESERVOIR O-RING SEALS** seal oil in, water out.
- **STAINLES STEEL SAFETY STEM COUPLING** - pulls free if hydrant is hit by a vehicle preventing damage to the stem and main valve. Coupling will not break into pieces that could drop into lower barrel and affect valve operation. Top of lower stem is below the top of the lower barrel so that a tire cannot depress the stem and open the main valve. Repair is easy and economical.
- **SAFETY FLANGE** - breaks cleanly to help prevent barrel damage, yet is strong enough to withstand normal handling. Allows economical repair, adding of extension section, rotation or changing of upper barrel without digging or water shut-off.
- **BRONZE UPPER VALVE PLATE** conical design for smooth flow.
- **DRAIN VALVE FACINGS** specially designed, long-life facings provide effective sealing.
- **DUCTILE IRON CAP NUT** retains main valve. Seats against cap nut gasket to prevent corrosion of stem threads. Locked in place by a stainless steel lock washer. Mueller HP Epoxy coated for durability.
- **250 PSIG** - 3-way hydrant: 250 psig (1723 kPa) maximum working pressure, 500 psig (3447 kPa)
- **SHOE DESIGNED FOR MAXIMUM FLOW AND EASY CONNECTION** with its smooth transitional contours, extended neck and integral anti-rotation pads, allowing use of standard tee-head bolts. The inside of the shoe is covered with MUELLER HP® Epoxy Coating. This thermosetting epoxy forms a tough corrosion-resistant barrier to chemicals, physical impact and electrical currents.
- **HOLD-DOWN NUT** - with integral weather seal. Design discourages unauthorized removal of the hold-down nut or bronze operating nut. Resilient wiper seal between hold-down nut and operating nut prevents water entry to protect operating nut from freezing. Wiper seal material is resistant to ultra-violet ray deterioration. O-ring seal provides second level of protection.



- **MEETS OR EXCEEDS** all applicable requirements of ANSI/AWWA C502 Standard and UL 246 and FM 1510 specifications.
- **O-RING SEALS AT BONNET, GROUND, AND SHOE FLANGES** for better leak resistance, easier maintenance.
- **SEALED OIL RESERVOIR** - O-ring sealed to prevent leakage. Provides positive lubrication of stem threads and bearing surfaces each time the hydrant is operated. Filled at the factory.
- **FULL FLOW OPENINGS** large radius hose and pumper openings produce low friction loss.
- **FIELD REPLACEABLE HOSE AND PUMPER NOZZLES** - O-ring sealed. Threaded in place and retained by stainless steel locks. Nozzles are easily replaced.
- **ELECTRO-GALVANIZED BOLTS AND NUTS** - provide corrosion protection.
- **NON-KINKING CHAINS** heavy-duty chains are securely attached to the hydrant. Special chain loop permits free turning of the cap.
- **BRONZE SEAT RING** - threaded into drain ring and O-ring sealed. Seat ring is easily removed or installed from above ground. Each time main valve is opened or closed, double drain valves force-flush both drain valve openings to keep them open for effective barrel drainage. Bronze drain valves are integral parts of main valve assembly.
- **REVERSIBLE, COMPRESSION TYPE MAIN VALVE** - closes with pressure for positive seal. Rubber material has long service life, yet is reversible providing a convenient spare in place.

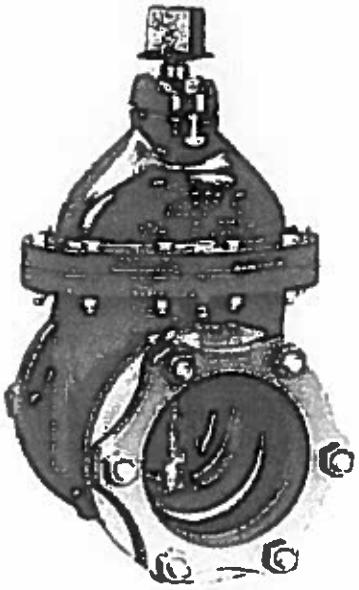
Manufactured under one or more of the following: U.S. Patent No. 4,717,178; 4,842,246.

2"-12" A-2360 RESILIENT WEDGE GATE VALVES - M.J. x M.J.

Rev. 9-09 Shaded area indicates change.

- Catalog number–
  A-2360-20 Mechanical joint ends (with accessories unassembled)
  A-2360-23 Mechanical joint ends (less accessories)
  A-2360-25 Mechanical joint ends (with transition gaskets accessories unassembled)
- Sizes – 2", 3", 4", 6", 8", 10", 12"
- Meets or exceeds all applicable requirements of ANSI/AWWA C509 Standard, UL Listed, FM Approved, and certified to ANSI/NSF 61.
- Standard mechanical joint ends comply with ANSI/AWWA C111
- Iron body with nominal 10 mils MUELLER® Pro-Gard™ Fusion Epoxy Coated interior and exterior surfaces
- Epoxy coating meets or exceeds all applicable requirements of ANSI/AWWA C550 Standard and is certified to ANSI/NSF 61
- Iron wedge, symmetrical & fully encapsulated with molded rubber; no exposed iron
- Non-rising stem (NRS)
- Triple O-ring seal stuffing box (2 upper & 1 lower O-rings), with fourth O-ring serving as dirt seal††
- 2" square wrench nut (optional handwheel available)—open left or open right
- 250 psig (1723 kPa) maximum working pressure,
  500 psig (3447 kPa) static test pressure
- 3"-12" sizes – UL Listed, FM Approved: 200 psig (1379 kPa)

††Dirt seal on 4"-12" valves



A-2360-20 M.J. accessories shipped unassembled

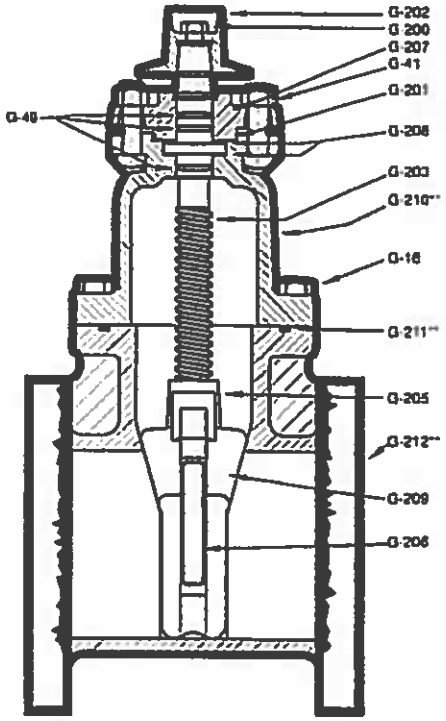
Options

See page 10.40 for more information on Resilient Wedge Gate Valve options

- Position indicators
- ASTM B98-C66100/H02 stem
- Stainless steel fasteners: Type 316
- Handwheel

Resilient wedge gate valve parts

Catalog Part No.	Description	Material	Material Standard
G-16	Bonnet Bolts & Nuts	Stainless Steel	Type 304
G-41	Stuffing Box Bolts & Nuts	Stainless Steel	Type 304
G-49	Stem O-rings (3)	Rubber	
G-200	Wrench Nut Cap Screw	Stainless Steel	Type 304
G-201	Stuffing Box Seal	Rubber	
G-202	Wrench Nut	Cast Iron	ASTM A126 CL.B
G-203	Stem	Bronze	ASTM B138
G-204	Hand Wheel	Cast Iron	ASTM A126 CL.B
G-205	Stem Nut	Bronze	ASTM B62
G-206	Guide Cap Bearings	Celcon	
G-207	Stuffing Box with dirt seal††	Cast Iron, Rubber	ASTM A126 CL.B
G-208	Anti-friction Washer (2)	Celcon	
G-209	Wedge, Rubber Encapsulation	Cast Iron* Rubber	ASTM A126 CL.B
G-210**	Bonnet	Cast Iron ♦	ASTM A126 CL.B
G-211**	Bonnet O-ring	Nitrile	
G-212**	Body	Cast Iron ♦	ASTM A126 CL.B



* Fully encapsulated in molded rubber with no iron exposed

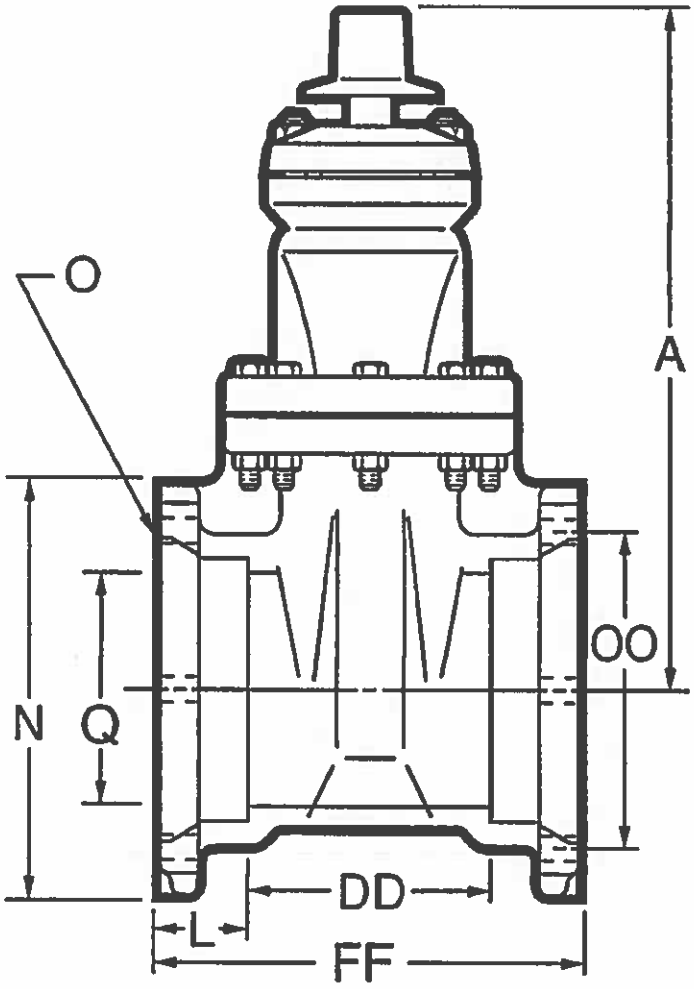
** Previous to 1999 these parts on 4"-12" valves were designed with a gasket instead of an O-ring and with additional bolts (2"-3" sizes retain neoprene gasket design affecting these parts). Confirm the type of seal when ordering a replacement gasket or O-ring.

††Dirt seal on 4"-12" valves

♦Body and bonnet of 12" valves are ductile iron standard wall thickness in compliance with C509.

SEE PAGE 10.43 FOR ORDERING INSTRUCTIONS

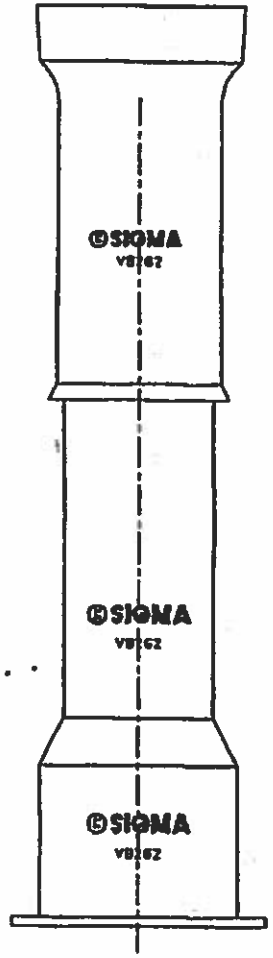
2"-12" A-2360 RESILIENT WEDGE GATE VALVE - M.J. x M.J.

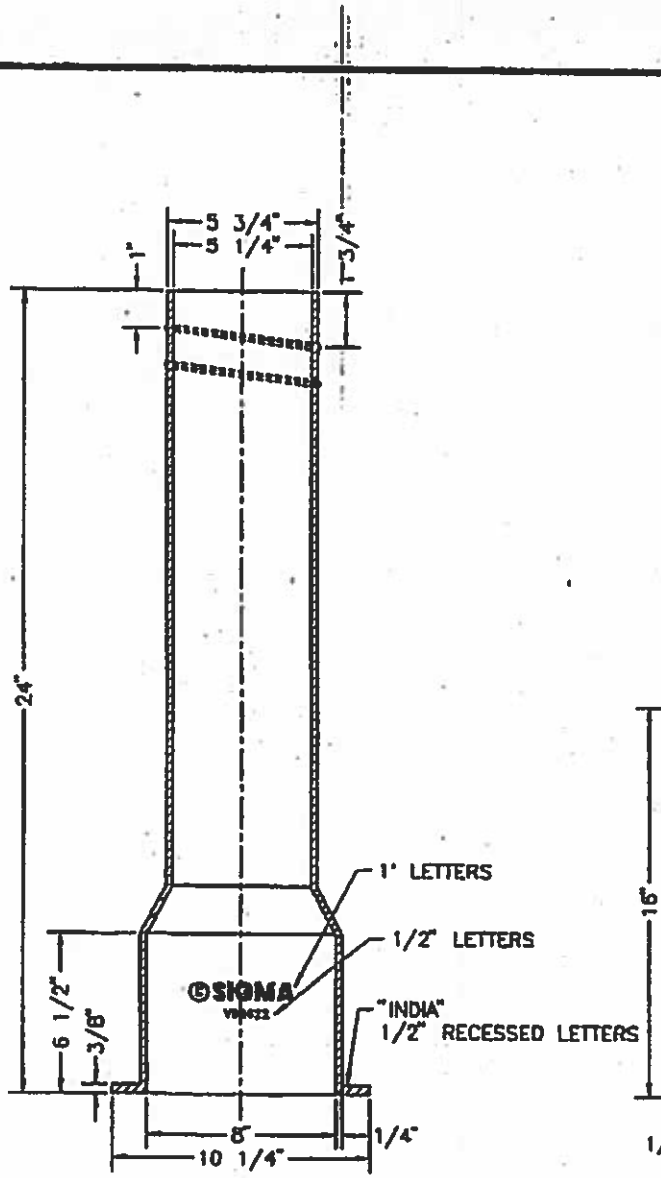


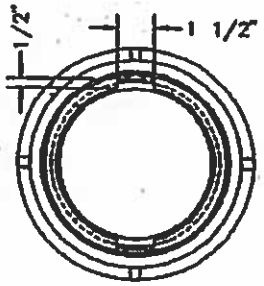
Dimensions

Dimension*	Nominal size						
	2"	3"	4"	6"	8"	10"	12"
A	9.88	12.38	14.19	18.00	21.50	25.50	28.62
FF	8.50	9.00	10.00	11.50	12.50	14.75	14.88
L	2.50	2.50	2.50	2.50	2.50	2.50	2.50
N	4.62	7.50	9.12	11.12	13.37	15.62	17.88
O (number and size of holes)	4–.88	4–.88	4–.88	6–.88	6–.88	8–.88	8–.88
DD	3.50	4.00	5.00	6.50	7.50	9.75	9.88
Q (bore)	2.30	3.30	4.30	6.30	8.30	10.30	12.30
OO (bolt circle diameter)	5.00	6.19	7.50	9.50	11.75	14.00	16.25
Turns to open	8	11	14	20.5	26.5	33	38.5
Weight*	40	83	120	186	280	405	540

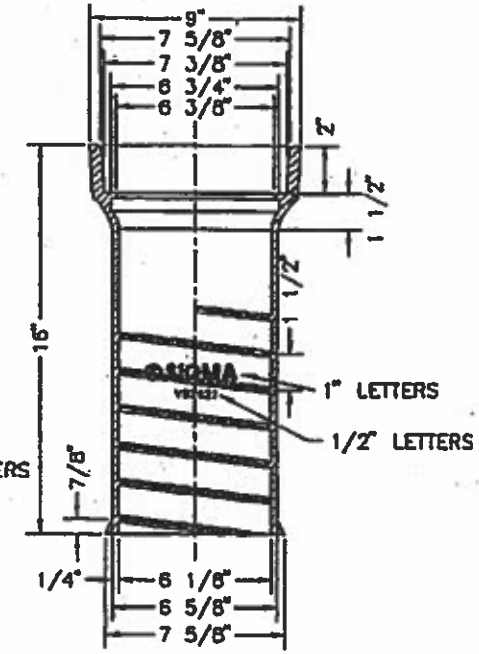
*All dimensions are in inches. All weights include accessories are in pounds and are approximate.

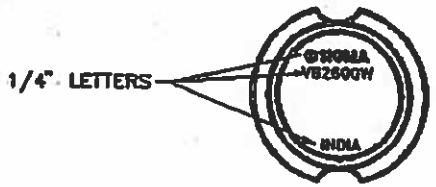




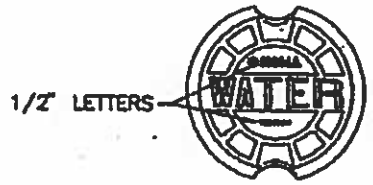


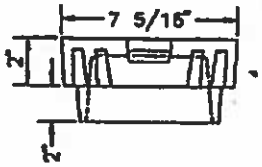
TOP SECTION
TOP VIEW





1" LETTERS

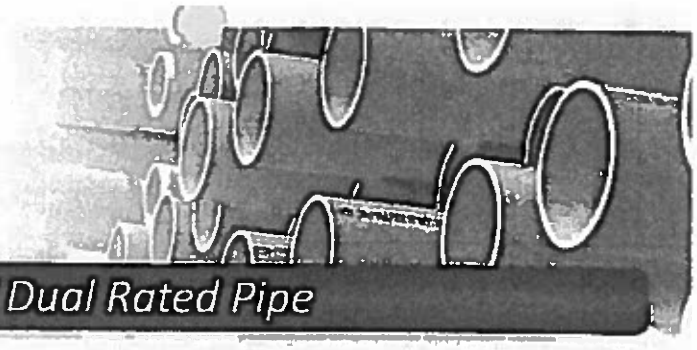




Lid Marked "WATER"

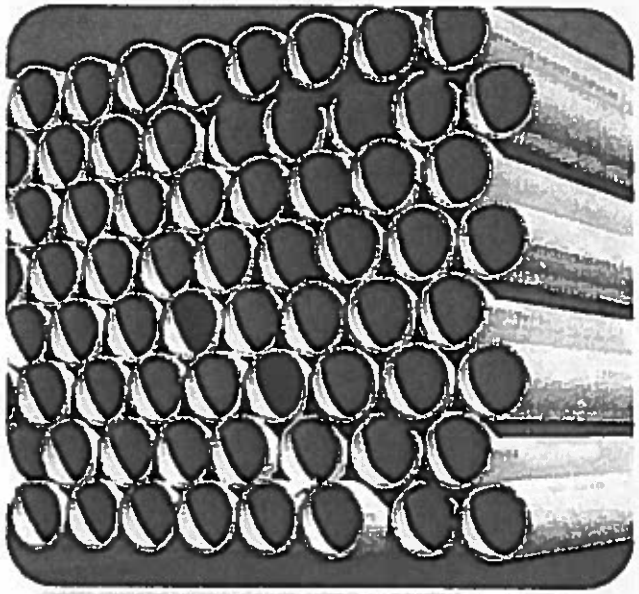
DESCRIPTION: 2 PIECE ADJUSTABLE SCREW TYPE VALVE BOX SET-A EQ. 24"-36" EXTENSION.	SIGMA CREAM RIDGE, NEW JERSEY
PART: VB262	
DATE: 5/14/97	CONSISTS OF WT.(TOTAL):79 LBS.
DRAWN BY: CHIP SANDY	VB2600W=LID 13 LBS.
APPROVED BY:	VB2821=TOP SECTION 34 LBS.
SCALE: NOT TO SCALE.	VB2822=BOTTOM 32 LBS.
MATERIAL: CAST IRON ASTM A48 CLASS 30B	
COATING: BITUMASTIC ASPHALTIC TAR	

North American Pipe Corporation™



ASTM D1785/D2665: *Schedule 40/DWV Dual Rated Pipe*

North American Pipe's ASTM D1785 Schedule 40 Dual Rated (both Pressure and DWV rating) product line is manufactured to meet the needs of a broad range of industrial, commercial and residential piping systems. With top quality raw materials and modern processing technology, North American Pipe's ASTM D1785 Schedule 40 Dual Rated pipe meets all industry standards in addition to our own rigorous quality control standards. Our ASTM D1785 Schedule 40 Dual Rated product line carries both a pressure and DWV rating to give the designer, installer and end user the flexibility of one product for two distinct applications. Whether specifying or installing our pipe you can be assured that North American Pipe will provide the pipe "Right, On Time, All the Time".

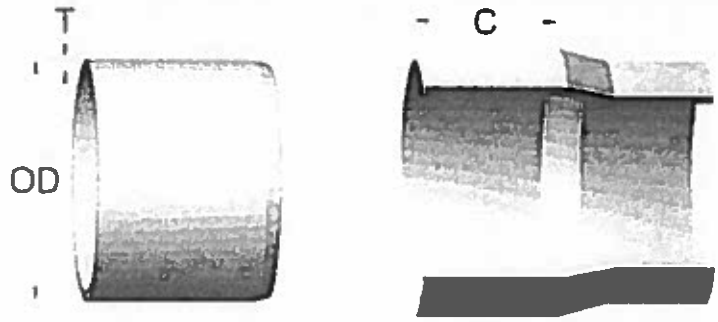


Short Form Specification
ASTM D1785/D2665 Sch 40/DWV Pipe

Pipe Standard:	ASTM D1785 ASTM D2665
Pipe Compound:	ASTM D1784 Cell Class 12454
End Type:	Plain or Belled
Certifications:	ANSI/NSF Standard 61 ANSI/NSF Standard 14
Applications:	Industrial, Commercial & Residential Water Distribution & Drain Waste & Vent
Color:	White
Lay Length:	10' or 20'
Installation:	North American Pipe's Installation Guide for Solvent Welded PVC Pipe

North American Pipe Corporation™

ASTM D1785/D2665: *Schedule 40/DWV Dual Rated Pipe*



NOMINAL PIPE SIZE	OUTSIDE DIA. – NOM. (OD)	**APPROX. BELL DEPTH (C)	(T)	PRESSURE RATING (psi)
⅜"	.84	1.75	.109	600
½"	1.05	2.50	.113	480
¾"	1.32	2.50	.133	450
1"	1.66	2.50	.140	370
1¼"	1.90	2.50	.145	330
1½"	2.38	3.25	.154	280
2"	2.88	3.50	.203	300
2½"	3.50	4.25	.216	260
3"	4.50	5.50	.237	220
4"	5.56	6.00	.258	190
5"	6.63	7.00	.280	180
6"	8.63	7.50	.322	160
8"	10.75	8.50	.365	140
10"	12.75	10.00	.406	130
12"	14.00	10.00	.437	130
14"	16.00	10.00	.500	130
16"	18.00	12.00	.562	130
18"	20.00	12.00	.593	120
20"	24.00	12.00	.687	120
24"				

Note: These dimensions are for estimating purposes only

CHARLOTTE
PIPE AND FOUNDRY COMPANY

Suggested Specification

System: PVC Schedule 40 Pressure Pipe and Fitting System

Scope: This specification covers PVC Schedule 40 pipe and fittings for pressure applications. This system is intended for pressure applications where the operating temperature will not exceed 140°F.

Specification: Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454 as identified in ASTM D 1784.

PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785. PVC Schedule 40 fittings shall conform to ASTM D 2466. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe and fittings shall be manufactured in the United States. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.

Installation shall comply with the latest installation instructions published by Charlotte Pipe and Foundry and shall conform to all local plumbing, building, and fire code requirements. Buried pipe shall be installed in accordance with ASTM F 1668. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other aggressive chemical agents not compatible with PVC compounds. Systems shall be hydrostatically tested after installation. **WARNING!** Never test with or transport/store compressed air or gas in PVC pipe or fittings.

Referenced Standards:

ASTM D 1784	Rigid Vinyl Compounds
ASTM D 1785	PVC Plastic Pipe, Schedule 40
ASTM D 2466	PVC Plastic Fittings, Schedule 40
ASTM D 2564	Solvent Cements for PVC Pipe and Fittings
ASTM F 1668	Procedures for Buried Plastic Pipe
NSF Standard 14	Plastic Piping Components and Related Materials
NSF Standard 61	Drinking Water System Components - Health Effects

Note: Latest revision of each standard applies.

(110)

PO Box 35430 Charlotte, NC 28235 USA 704/372-5030 800/438-6091 FAX 800/553-1605
www.charlottepipe.com

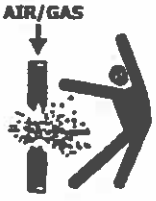
>> PVC Schedule 40 Pipe - Bell End*

PVC SCHEDULE 40 (WHITE)			BELL END		PVC 1120	ASTM D 1785	
PART NO.	NOM. SIZE	UPC # 611942-	AVG. OD (IN.)	MIN. WALL (IN.)	MAX WORK PRESSURE AT 23° C OR 73° F	BELL DEPTH (IN.)	WT. PER 100 FT. (LBS.)
PVC 4005B**	½" x 10'	04986	.840	.109	600 PSI	2.00	15.9
PVC 4005B**	½" x 20'	03923	.840	.109	600 PSI	2.00	15.9
PVC 4007B**	¾" x 10'	04987	1.050	.113	480 PSI	2.25	21.1
PVC 4007B**	¾" x 20'	03926	1.050	.113	480 PSI	2.25	21.1
PVC 4010B**	1" x 10'	04988	1.315	.133	450 PSI	2.50	31.3
PVC 4010B**	1" x 20'	03929	1.315	.133	450 PSI	2.50	31.3
PVC 4012B§	1¼" x 10'	04989	1.660	.140	370 PSI	2.75	42.4
PVC 4012B§	1¼" x 20'	03930	1.660	.140	370 PSI	2.75	42.4
PVC 4015B§	1½" x 10'	04990	1.900	.145	330 PSI	3.00	50.7
PVC 4015B§	1½" x 20'	03931	1.900	.145	330 PSI	3.00	50.7
PVC 4020B†	2" x 10'	04991	2.375	.154	280 PSI	4.00	69.2
PVC 4020B†	2" x 20'	03932	2.375	.154	280 PSI	4.00	69.2
PVC 4025B‡	2½" x 20'	04206	2.875	.203	300 PSI	4.00	110.0
PVC 7300B§	3" x 10'	04853	3.500	.216	260 PSI	4.00	145.1
PVC 4030B†	3" x 20'	03933	3.500	.216	260 PSI	4.00	144.5
PVC 7400B§	4" x 10'	04835	4.500	.237	220 PSI	4.00	207.9
PVC 9400B†	4" x 20'	03964	4.500	.237	220 PSI	5.00	206.2
PVC 7600B§	6" x 10'	04850	6.625	.280	180 PSI	6.50	371.4
PVC 9600B†	6" x 20'	03965	6.625	.280	180 PSI	6.50	365.5
PVC 7800B†	8" x 10'	09903	8.625	.322	160 PSI	7.00	532.3
PVC 9800B†	8" x 20'	03967	8.625	.322	160 PSI	7.00	552.3
PVC 7910B†	10" x 20'	03960	10.750	.365	140 PSI	9.00	785.4
PVC 7912B†	12" x 20'	03962	12.750	.406	130 PSI	10.00	1046.7
PVC 7914B†	14" x 20'	04863	14.000	.437	130 PSI	10.00	1180.1
PVC 7916B†	16" x 20'	04929	16.000	.500	130 PSI	10.00	1543.1

* Bell dimensions meet either ASTM D 2672 or ASTM F 480, depending upon pipe diameter
** ASTM D 1785
§ Dual Marked ASTM D 1785 & ASTM D 2665
† Triple Marked ASTM D 1785 & ASTM D 2665 & ASTM F 480
‡ Dual Marked ASTM D 1785 & ASTM F 480

⚠ WARNING

Testing with or use of compressed air or gas in PVC / ABS / CPVC pipe or fittings can result in explosive failures and cause severe injury or death.



- NEVER test with or transport/store compressed air or gas in PVC / ABS / CPVC pipe or fittings.
- NEVER test PVC / ABS / CPVC pipe or fittings with compressed air or gas, or air over water boosters.
- ONLY use PVC / ABS / CPVC pipe for water or approved chemicals.
- Refer to warnings in PPFA User Bulletin 4-80 and ASTM D 1785.

Silver-Line Plastics

PVC SCH 40 PRESSURE PVC 1120 TYPE I GRADE 1 BELLED END 20 FT. LENGTHS

Nominal Size	Item Number	Bar Code 717141	Outside Diameter	Min. Wall Thickness	W/100'	Ft/Pallet	Max Working Pressure at 73° F
1/2"	35.052	35052 8	0.840	0.109	16	9,600	600 PSI
3/4"	35.072	35072 6	1.050	0.113	22	8,000	480 PSI
1"	35.102	35102 0	1.315	0.133	32	5,200	450 PSI
1-1/4"	35.122	35122 8	1.660	0.140	42	5,000	370 PSI
1-1/2"	35.152	35152 5	1.900	0.145	51	4,500	330 PSI
2"	35.202	35202 7	2.375	0.154	70	2,800	280 PSI
2-1/2"	35.252	35252 2	2.875	0.203	111	1,160	330 PSI
3"	35.302	35302 4	3.500	0.216	144	1,500	280 PSI
4"	35.402	35402 1	4.500	0.237	205	1,140	220 PSI
6"	35.602	35602 5	6.625	0.280	364	520	180 PSI
8"	35.802	35802 9	8.625	0.322	546	280	160 PSI
10"	35.910	35910 1	10.750	0.365	753	220	140 PSI
12"	35.912	35912 5	12.750	0.406	1000	80	130 PSI

Note: 2" – 8" are Laying Length NSF- pw

SCH 40 conforms to ASTM D 1785 8" is dual rated SCH 40 / SDR 26

All SCH 40 also meets 2" - 12" ASTM F 480 and 1-1/2" - 12" SCH 40 conform to ASTM D 2665

Material complies with ANSI / NSF Standard 61

TOO MUCH CEMENT WILL DAMAGE THE PIPE
PVC PIPE NOT RECOMMENDED FOR AIR PRESSURE

LASCO®
Fittings, Inc.

Headquarters

414 Morgan Street
P.O. Box 116
Brownsville, TN 38012
731/772-3180
800/776-2756
Fax: 731/772-0835

Service Centers

6131 Knott Avenue
Buena Park, CA 90620
714/690-9679
800/995-2726
Fax: 714/736-1780

4780 Holly Street, Unit A
Denver, CO 80216
303/388-7204
888/388-5450
Fax: 303/388-7199

6800 Kingspointe Parkway, Suite 400
Orlando, FL 32819-8588
407/206-5705
800/437-3155
Fax: 407/515-6542

245 East Lies Road
Carol Stream, IL 60188-9421
630/597-0150
888/995-7414
Fax: 630/597-0156

325 Lasley Avenue
Wilkes Barre, PA 18706-1424
570/301-1170
800/882-5462
Fax: 570/301-1176

1600 Kelly Blvd., Suite 130
Carrollton, TX 75006
972/417-0073
800/642-8104
Fax: 972/417-9733

8212 South 228th Street
Kent, WA 98032
425/272-0990
888/285-2726
Fax: 425/272-0995

Printed in U.S.A.
L06-40P-5M 3/08

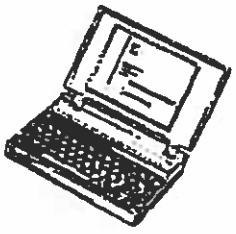
Limited Warranty

LASCO Fittings, Inc. products are warranted to be free from manufacturing defects in materials and workmanship. They are warranted against rot, rust, and electrolytic corrosion for a period of three years from date of installation. If LASCO products prove defective due to manufacturing defects in material or workmanship during that period, the manufacturer will provide new replacement units of the same type and size. No remedy will be granted under this warranty if LASCO products are not used strictly in accordance with LASCO's directions with respect to use and storage or if the products have been modified in any way. THE MANUFACTURER'S LIABILITY UNDER EXPRESSED OR IMPLIED WARRANTY OR FOR ANY REASON IS LIMITED TO FURNISHING REPLACEMENT UNITS OR GRANTING A CREDIT FOR DEFECTIVE UNITS. NO LABOR EXPENSE OR CONSEQUENTIAL DAMAGES WILL BE PAID BY LASCO. THIS WARRANTY IS IN LIEU OF ALL OTHER GUARANTEES AND WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE, EXCEPT FOR ANY WARRANTIES IMPLIED BY LAW FOR NONCOMMERCIAL CONSUMERS. ANY SUCH WARRANTIES ARE LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY.

DO NOT USE LASCO FITTINGS FOR COMPRESSED AIR OR GASES.
DO NOT TEST PVC PIPING SYSTEMS WITH COMPRESSED AIR OR GASES.
DO NOT USE FITTINGS WITH LIQUIDS NOT RECOMMENDED BY LASCO.
MODIFICATIONS OF FITTINGS VOIDS THE WARRANTY.

STANDARDS AND SPECIFICATIONS – Schedule 40

ASTM D-1784 –	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
ASTM D-2466 –	Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
ASTM F-1970 –	Standard Specification for Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems.
MATERIAL –	LASCO Schedule 40 Fittings are produced from PVC Type 1, Cell Classification 12454-B.
–	O-rings are produced from a Buna-N (Nitrile) material.
LISTINGS –	NSF/ANSI Standard 61: Drinking Water System Components NSF/ANSI Standard 14: Plastics Piping system Components and Related Materials.

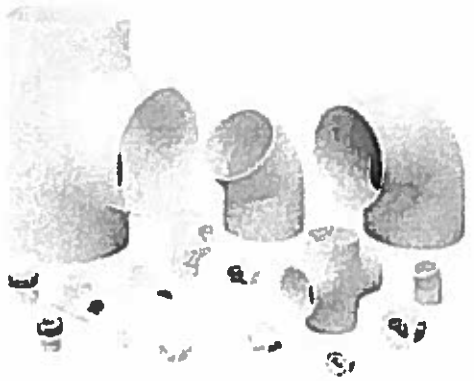


Visit our worldwide website
http://www.lascofittings.com

PVC SCHEDULE 40 FITTINGS

40-2-0604

Performance Engineered & Tested



SPEARS® Schedule 40 PVC fitting designs combine years of proven experience with computer generated stress analysis to yield the optimum physical structure and performance for each fitting. Material reinforcement is uniformly placed in stress concentration areas for substantially improved pressure handling capability. Resulting products are subjected to numerous verification tests to assure the very best PVC fittings available.

Full 1/4" Through 12" Availability

Spears® comprehensive line of PVC fittings offers a variety of injection molded configurations in Schedule 40 sizes 1/4" through 12" conforming to ASTM D 2466.

Exceptional Chemical & Corrosion Resistance

Unlike metal, PVC fittings never rust, scale, or pit, and will provide many years of maintenance-free service and extended system life.

High Temperature Ratings

PVC thermoplastic can handle fluids at service temperatures up to 140°F (60°C), allowing a wide range of process applications, including corrosive fluids.

Lower Installation Costs

Substantially lower material costs than steel alloys or lined steel, combined with lighter weight and ease of installation, can reduce installation costs by as much as 60% over conventional metal systems.

Higher Flow Capacity

Smooth interior walls result in lower pressure loss and higher volume than conventional metal fittings.

Additional Fabricated Configurations through 36"

Extra large, hard-to-find, and custom configurations are fabricated from NSF Certified pipe. Fittings are engineered and tested to provide full pressure handling capabilities according to Spears® specifications.

PVC Valves

SPEARS® PVC Valve products are available for total system compatibility and uniformity; see SPEARS® THERMOPLASTIC VALVES PRODUCT GUIDE & ENGINEERING SPECIFICATIONS (V-4).

Advanced Design Specialty Fittings

Spears® wide range of innovative, improved products include numerous metal-to-plastic transition fittings and unions with Spears® patented special reinforced (SR) plastic threads.

Sample Engineering Specifications

All PVC Schedule 40 fittings shall be produced by Spears® Manufacturing Company from PVC Type I cell classification 12454, conforming to ASTM D 1784. All injection molded PVC Schedule 40 fittings shall be Certified for potable water service by NSF International and manufactured in strict compliance to ASTM D 2466. All fabricated fittings shall be produced in accordance with Spears® General Specifications for Fabricated Fittings.

Quality Systems Certificate No. 352
Corporate Facilities, Systems, EA
Assessed to ISO 9001: 2000

PROGRESSIVE PRODUCTS FROM SPEARS® INNOVATION & TECHNOLOGY

Visit our web site: www.spearsmfg.com

PVC Thermoplastic Pipe Temperature Pressure De-Rating

To determine the maximum internal pressure rating at an elevated temperature, simply multiply the pipe pressure rating at 73°F by the percentage specified for the desired temperature.

System Operating Temperature °F (°C)	73 (23)	80 (27)	90 (32)	100 (38)	110 (43)	120 (49)	130 (54)	140 (60)
PVC	100%	90%	75%	62%	50%	40%	30%	22%

NOTE: Valves, Unions and Specialty Products have different elevated temperature ratings than pipe.

PVC Basic Physical Properties

Properties	ASTM Test Method	PVC
Mechanical Properties, 73°F		
Specific Gravity, g/cm³	D 792	1.41
Tensile Strength, psi	D 638	7,200
Modulus of Elasticity, psi	D 638	440,000
Compressive Strength, psi	D 695	9,000
Flexural Strength, psi	D 790	13,200
Izod Impact, notched, ft-lb/in	D 256	.65
Thermal Properties		
Heat Deflection Temperature, °F at 66 psi	D 648	165
Thermal Conductivity, BTU/hr/sq ft/°F/in	C 177	1.2
Coefficient of Linear Expansion, in/in/°F	D 696	3.1 X 10^5
Flammability		
Limiting Oxygen Index, %	D 2863	43
UL 94 rating	94V-0	
Other Properties		
Water Absorption, % 24 hr	D 570	.05
Industry Standard Color	White / Dark Gray	
ASTM Cell Classification	D 1784	12454
NSF Potable Water Approved	Yes	

PVC Chemical Resistance

PVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. For more information on PVC chemical resistance refer to the Chemical Resistance of Rigid Vinyls Based on Immersion Test, published by the GEON® Company.

NOT FOR USE WITH COMPRESSED AIR OR GAS

Spears® Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above and below ground locations. The use of our product in compressed air or gas systems automatically voids any warranty for such products, and its use against our recommendation is entirely the responsibility and liability of the installer.

WARNING: DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY RESULT IN EXPLOSIVE FRAGMENTATION OF SYSTEM PIPING COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY.

SPEARS® MANUFACTURING COMPANY • CORPORATE OFFICE
15853 Olden St., Sylmar, CA 91342 • PO Box 9203, Sylmar, CA 91392
(818) 364-1611 • www.spearsmfg.com

PACIFIC SOUTHWEST
15860 Olden St.
Sylmar (Los Angeles), CA 91342
(818) 364-1611 • (800) 862-1469
Fax (818) 367-3014

ROCKY MOUNTAIN
4880 Florence St.
Denver, CO 80238
(303) 371-9430 • (800) 777-4154
Fax (303) 375-9546

UTAH
5395 West 1520 South
Salt Lake City, UT 84104
(303) 371-9430 • (800) 777-4154
Fax (303) 375-9546

SOUTHEAST
4205 Newpoint Pl. Suite 100
Lawrenceville (Atlanta), GA 30043
(678) 985-1263 • (800) 662-6326
Fax (678) 985-5642

MIDWEST
1 Gateway Ct., Suite A
Bolingbrook (Chicago), IL 60440
(630) 759-7529 • (800) 562-6330
Fax (630) 759-7515

NORTHWEST
4103 C St. NE Suite 200
Auburn (Seattle), WA 98002
(253) 939-4433 • (800) 347-7327
Fax (253) 939-7557

SOUTH CENTRAL
4250 Patriot Dr. Suite 300
Grapevine (Dallas), TX 76051-2317
(972) 691-4003 • (800) 441-1437
Fax (972) 691-4404

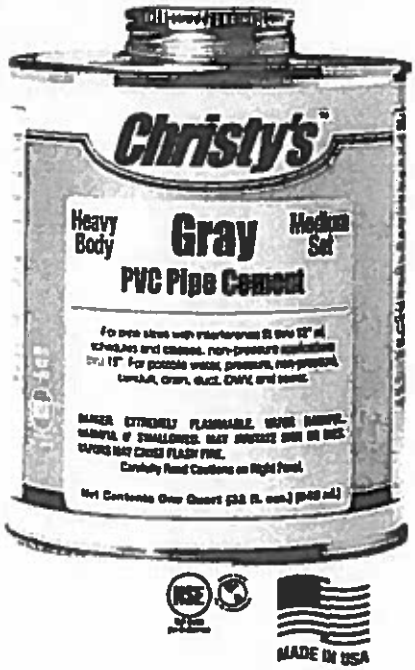
NORTHEAST
590 Industrial Dr. Suite 100
Lewisberry (Harrisburg), PA 17339-9532
(717) 938-8844 • (800) 233-0275
Fax (717) 938-6547

FLORIDA
9563 Parkisouth Court
Orlando, FL 32837
(407) 843-1960 • (800) 327-6390
Fax (407) 425-3563

INTERNATIONAL SALES
15853 Olden St.
Sylmar (Los Angeles), CA 91342
(818) 364-1611 • Fax (818) 898-3774

Christy's™

— PRODUCT INFORMATION & SPECIFICATIONS —



GRAY PVC PIPE CEMENT

DESCRIPTION

- Heavy-bodied, medium-setting industrial grade PVC solvent cement
- Excellent gap-filling capabilities, ideal product to use in larger diameter applications or where larger gaps exist between the pipe and fitting
- Designed for use on all schedules and classes of PVC through 12" diameter interference fit and non-pressure through 18"
- Requires the use of primer
- Ideal solvent when additional work time is needed in hot weather
- Approved for pressure and non-pressure, potable and non-potable, water, turf, ag, conduit, foam core, sewer, DWV and flexible PVC piping

SPECIAL CONSIDERATIONS

- Consult the SDS for health and safety specifics
- Always use in a well-ventilated environment
- Wear safety glasses and gloves at all times
- Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems
- Introduction of granules or pellets of calcium hypochlorite with PVC and CPVC solvent cements and primers (including their vapors) may result in a violent chemical reaction if water solution is not used
- Purify lines by pumping chlorinated water into the piping system – this solution will be non-volatile
- Dry granular calcium hypochlorite should not be stored or used near solvent cements or primers

This product is not for use in a system using or being tested with compressed air or gases.

PRODUCT SPECIFICATIONS

- Meets ASTM D 2564 Standard
- Meets SCAQMD rule 1168/316A
- Compliant with Leed® (Leadership in Energy and Environmental Design).
- Listed by NSF International for compliance with ASTM D 2564, NSF/ANSI Standard 14, NSF/ANSI Standard 61, CSA B 137.3 and CSA B181.2 for use on potable water, drain, waste, vent and sewer applications.
- Certified to Uniform Plumbing Code by NSF and meets CSA standards.
- Passes NSF Annex G testing which satisfies California Low Lead requirements for drinking water.

COLOR Gray

VISCOSITY (Brookfield)

Heavy body - Minimum 1,600 cP @ 73 ± 2°F

SPECIFIC GRAVITY

23°C ± 2° (73°F ± 3.6°) Typical 0.966 ± 0.011

MAX VOC EMISSIONS

510 g/l, per SCAQMD Rule 1168, Method 316A

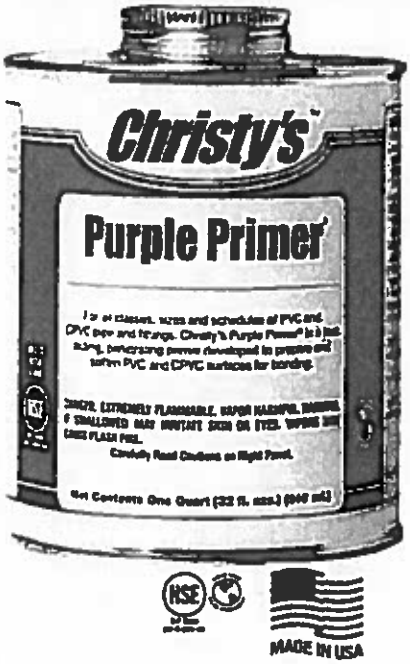
Gray PVC Pipe Cement		
Part Number	Description	Case Pack
RH.BGLV.HP	Gray / Medium Body - ½ Pint	24
RH.BGLV.PT	Gray / Medium Body - Pint	12
RH.BGLV.QT	Gray / Medium Body - Quart	12
RH.BGLV.1	Gray / Medium Body - Gallon	6

T. Christy Enterprises, Inc.
655 E Ball Rd • Anaheim, CA 92805
Tel: (714) 507-3300 • Fax: (714) 507-3310
www.tchristy.com • 800-BLU-GLUE

May 2013

Christy's™

— PRODUCT INFORMATION & SPECIFICATIONS —



PRODUCT SPECIFICATIONS

- Meets ASTM F 656 Standard
- Meets SCAQMD Rule 1168/316A.
- Compliant with Leed® (Leadership in Energy and Environmental Design).
- Listed by NSF International for compliance with ASTM F656 and NSF/ANSI standard 14 and NSF/ANSI standard 61 for use on potable water, drain, waste, vent and sewer applications.
- Product certified to Uniform Plumbing Code by NSF.
- Passes NSF Annex G testing which satisfies California Low Lead requirements for drinking water.

COLOR	Purple
VISCOSITY (Brookfield)	Water thin

SPECIFIC GRAVITY
23°C ± 2° (73°F ± 3.6°) Typically 0.842 ± 0.01

MAX VOC EMISSIONS
550 g/l, per SCAQMD Rule 1168, Method 316A

T. Christy Enterprises, Inc.
655 E Ball Rd • Anaheim, CA 92805
Tel: (714) 507-3300 • Fax: (714) 507-3310
www.tchristy.com • 800-BLU-GLUE

PURPLE PRIMER - LOW VOC

DESCRIPTION

- Purple, Low VOC, water thin, very aggressive, very fast acting industrial grade PVC/ CPVC primer
- Distinct purple color assures the entire mating surfaces have been primed
- Designed for use on all schedules and classes of PVC and CPVC
- Uniform Plumbing Code requires the use of a Purple Primer
- Approved for pressure and non-pressure, potable and non-potable water, turf, ag, conduit, foam core, sewer,and DWV PVC applications
- Apply Purple Primer prior to applying solvent cement to both mating surfaces
- Proper primer application is critical, it should be "scrubbed" into both the pipe and fitting surfaces
- For cold weather guidelines see pg. 17 in our Guide to Solvent Welding.

SPECIAL CONSIDERATIONS

- Consult the SDS for health and safety specifics
- Always use in a well-ventilated environment
- Wear safety glasses and gloves at all times
- Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems
- Introduction of granules or pellets of calcium hypochlorite with PVC and CPVC solvent cements and primers (including their vapors) may result in a violent chemical reaction if water solution is not used
- Purify lines by pumping chlorinated water into the piping system – this solution will be non-volatile
- Dry granular calcium hypochlorite should not be stored or used near solvent cements or primers

This product is not for use in a system using or being tested with compressed air or gases.

Purple Primer		
Part Number	Description	Case Pack
RH.PURP.QP	Purple Primer - ¼ Pint	24
RH.PURP.HP	Purple Primer - ½ Pint	24
RH.PURP.PT	Purple Primer - Pint	12
RH.PURP.QT	Purple Primer - Quart	12
RH.PURP.1	Purple Primer - Gallon	6

May 2013

Material Safety Data Sheet

Phoenix 27-A Pipe Joint Lubricant Date of Preparation: August 1998/Revised 4/2006

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: Phoenix 27-A Pipe Joint Lubricant
Chemical Formula: 88-6
Manufacturer: JTM Products, Inc., 31025 Carter Street, Solon, OH 44139, Phone (440) 287-2302, FAX (440) 287-3095 (CHEM-TEL 24-hour emergency: (800) 255-3924)

Section 2 - Composition / Information on Ingredients

Proprietary blend of soap [CAS#61790-44-1], glycol [CAS#57-55-6]and filler [CAS#12001-26-2].
revised February 2005 - John Cahoon

Section 3 - Hazards Identification

☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

HMIS	
H	1
F	0
R	0
PPE†	
†Sec. 8	

Potential Health Effects

Primary Entry Routes: Not Hazardous
Carcinogenicity: IARC, NTP, and OSHA do not list the ingredients in Phoenix 27-A Pipe Joint Lubricant as carcinogens.

Section 4 - First Aid Measures

Eye Contact: Flush with copious volumes of water for 15 minutes while holding eyelids open.
Skin Contact: Wash with water.
If irritation persists, call a physician.

Section 5 - Fire-Fighting Measures

Flash Point: >220 °F (>104 °C)
Flash Point Method: NA, contains water
Autoignition Temperature: NA
LEL: NA
UEL: NA
Flammability Classification: 0

NFPA

Extinguishing Media: Water, water fog, alcohol foam, carbon dioxide or dry chemical are all suitable.
Unusual Fire or Explosion Hazards: None
Hazardous Combustion Products: None
Fire-Fighting Instructions: Do not release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: This product is a biodegradable soap.
Containment: For large spills, dike far ahead of spill for later disposal.
Cleanup: Place the bulk of any spilled material into drums, then rinse any remaining material to sewage treatment facility, in accordance with any applicable regulations.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: No special precautions are required.
Storage Requirements: No special precautions are required.
Regulatory Requirements: No known regulatory requirement for handling and storage.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls:
Ventilation: Provide general or local exhaust ventilation systems.
Administrative Controls:
Respiratory Protection: If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Phoenix 27-A Pipe Joint Lubricant

Protective Clothing/Equipment: Wear chemically protective gloves to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.
Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.
Contaminated Equipment: Launder before reuse. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Paste
Appearance and Odor: amber paste, bland odor
Odor Threshold: NA
Vapor Pressure: NA
Vapor Density (Air=1): NA
Formula Weight: NA (blend)
Density: 8.3 lbs./gal.
Specific Gravity (H_2O=1, at 4 °C): 1.0
pH: 11

Water Solubility: complete solubility in water
Boiling Point: >220 °F
Freezing/Melting Point: <32 °F
Viscosity: viscous paste
Refractive Index: unknown
Surface Tension: unknown
% Volatile: 28 [Revised April 2006]
Evaporation Rate: NA

Section 10 - Stability and Reactivity

Stability: Phoenix 27-A Pipe Joint Lubricant is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization will not occur.
Chemical Incompatibilities:
Conditions to Avoid: Avoid contact with strong oxidizing agents. [Revised April 2006]
Hazardous Decomposition Products: Thermal oxidative decomposition of Phoenix 27-A Pipe Joint Lubricant can produce oxides of carbon and nitrogen.

Section 11 - Toxicological Information

Toxicity Data:
Eye Effects: Eye irritant [based on blended ingredients].
Skin Effects: Slight skin irritant if allowed to remain in contact.

Section 12 - Ecological Information

Ecotoxicity: **Environmental Fate**
Environmental Transport: Unknown. **Environmental Degradation:** Soaps are well known to be biodegradable.
Soil Absorption/Mobility: Unknown.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

Not hazardous under DOT regulations.

Section 15 - Regulatory Information

EPA Regulations: None apply.

Section 16 - Other Information

Prepared By: B. Noragon **Approved By:** B. Roll
Disclaimer: JTM PRODUCTS, INC. makes no warranty, expressed or implied, as to the accuracy, completeness, or reliability of information contained herein, except that such information is, to the best of JTM's knowledge and belief, accurate as of the date indicated. It is for the purchaser and/or user to decide whether this information is suitable for his purposes.
Reviewed/Section 2 revised February 2005 by John Cahoon; Reviewed/Section 9 & 10 revised April 2006 by John Cahoon

SOUTHWEST ENGINEERING, INC.

475 Archuleta Road
Las Cruces, New Mexico
88005

Phone 575-526-3381
Fax 575-526-1762

May 13, 2013

Mr. Sandy Jones
Sierra County
855 Van Patten Street
Truth or Consequences, New Mexico 87901

EXHIBIT G
GEOTECHNICAL REPORT SAMPLE REQUIREMENT

Re: Water Tank Site Evaluation Report
Sierra County, New Mexico
SEI-33070

Dear Mr. Jones;

Southwest Engineering, Inc. is pleased to present the enclosed Water Tank Site Evaluation Report for the above referenced project. The report outlines the suitability of three specific locations for the construction of proposed water storage tanks. If any portion of the report requires modification to meet your specific needs, please contact our office to schedule a meeting.

Should you have any questions or require any further information, please do not hesitate to contact our office.

Sincerely;

SOUTHWEST ENGINEERING, INC.

Paul J. Pompeo, P.E.
President

WATER TANK SITE EVALUATION REPORT

SIERRA COUNTY, NEW MEXICO

Prepared for

Mr. Sandy Jones
Sierra County
855 Van Patten Street
Truth or Consequences, New Mexico 87901

May 13, 2013

This document was prepared under the supervision and direction of the undersigned whose seal as a Professional Engineer, licensed to practice as such in the State of New Mexico, is affixed below.

Paul J. Pompeo, P.E.

11490
N.M.P.E. Number

05/13/2013
Date

1.0 INTRODUCTION

Sierra County is currently proposing to construction new water storage tanks at three volunteer fire department locations within the county. These locations are at the existing volunteer fire department buildings in Winston, Chloride and Poverty Creek. This report will address the following project requirements, as applicable:

- Analyze the existing site soils.
- Determine an allowable bearing capacity for each location.
- Determine site grading criteria.

2.0 WINSTON VOLUNTEER FIRE DEPARTMENT

The Winston Volunteer Fire Department is located northeast of the intersection of NM Highway 52 and Broadway Street. The new tank will be located to the north of the existing fire house and immediately east of the existing elevated tanks. One soil sample was retrieved from the center of the proposed tank location. Laboratory analysis of the sample found the following:

Sieve Analysis											
		% Passing									
Location	Depth, inches	1"	½"	#4	#10	#40	#80	#200	PI	LL	Soil Class
Center of Tank	0 to 8	100	91	71	51	28	18	10.6	S/NP	S/NP	SM

The current pad is elevated approximately 18 inches above the surrounding site grade therefore site drainage is adequate to prevent water from ponding adjacent to the foundation system. Based on the above outlined factors, an allowable bearing capacity of 1,500 psf can be used for the tank foundation design.

3.0 CHLORIDE VOLUNTEER FIRE DEPARTMENT

The Chloride Volunteer Fire Department is located on the north side of Wall Street (County Road 006) in the central portion of the town site. The new tank will be located to the north of the existing fire house. One soil sample was retrieved from the center of the proposed tank location. Laboratory analysis of the sample found the following:

Sieve Analysis											
		% Passing									
Location	Depth, inches	1"	½"	#4	#10	#40	#80	#200	PI	LL	Soil Class
Center of Tank	0 to 9	100	95	86	77	63	50	34.0	S/NP	S/NP	SM

The current pad is elevated approximately 18 inches above the surrounding site grade therefore site drainage is adequate to prevent water from ponding adjacent to the foundation system. Based on the above outlined factors, an allowable bearing capacity of 1,500 psf can be used for the tank foundation design.

4.0 POVERTY CREEK VOLUNTEER FIRE DEPARTMENT

The Poverty Creek Volunteer Fire Department is located on the north side of NM Highway 59, approximately 0.5 miles west of the intersection of Rocky Road. The new tank will be located to the northwest of the existing fire house. One soil sample was retrieved from the center of the proposed tank location. Laboratory analysis of the sample found the following:

Sieve Analysis											
		% Passing									
Location	Depth, inches	1"	½"	#4	#10	#40	#80	#200	PI	LL	Soil Class
Center of Tank	0 to 8	96	93	74	64	51	44	34.3	13	21	SC

The current pad site is not elevated above the surrounding site grade. It is recommended that either a minimum of 12 inches of engineered fill be placed at this location or the site be graded to produce adequate site drainage to prevent water from ponding adjacent to the foundation system. Based on the above outlined factors and recommendations, an allowable bearing capacity of 1,500 psf can be used for the tank foundation design.