

Raven brings you plastic tanks

**YOUR ONE SOURCE SOLUTION FOR
LIQUID STORAGE.**

**Fiberglass Reinforced Plastic (FRP)
Rotationally Molding Polyethylene & Polypro
Dual Laminate FRP & PP- PVDF**



R A V E N
INDUSTRIES

Tanksystems.com
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sales@raventank.com

Centrifugally Cast Fiberglass Tanks

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- Horizontal Fiberglass Tanks
- Horizontal FRP Tank Accessories
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- Fillwells and Manways
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- Dual Laminate Construction
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- Custom Piping - Plastic & Fiberglass

- Process & Plating Tanks
- Chemical Day Tanks

- Ventilation Equipment
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Technical Information

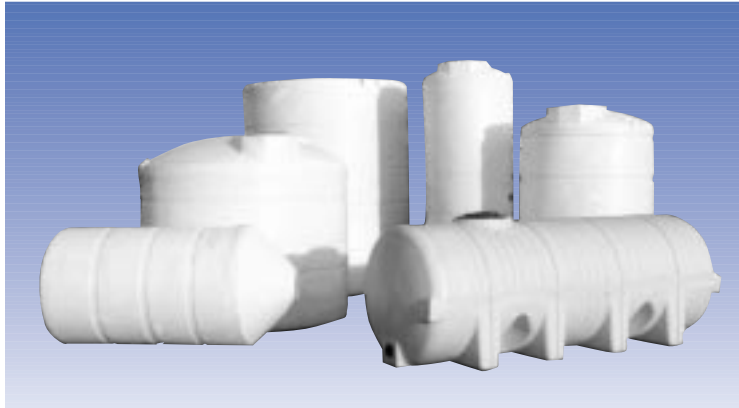
- How to Order Tanks and Accessories
- Resin Selection Guide
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- Site Handling
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INTRODUCTION

The Plastics Division of Raven Industries, Inc. was created more than four decades ago with the introduction of centrifugally cast fiberglass tanks for the agricultural and industrial markets. From its early beginnings, the Division has enjoyed substantial growth and now consists of four manufacturing locations, more than 200,000 square feet of production, capabilities in fiberglass and polyethylene, and a nationwide distribution network. By the custom nature of the markets we serve, this information is meant to be representative of our product line. It should not be considered as a limitation of our capabilities. Requests for quotations on engineered products are encouraged and should be addressed to our attention for evaluation.



Rotatorially-molded polyethylene tanks



Dual Laminate Products



Centrifugally cast fiberglass tanks



Chop-hoop filament wound fiberglass tanks



End section is inserted into position determined by desired capacity.



Fiberglass mat is placed into the mold on top of a layer of plain or pigmented mold coat.



Industrial waste water treatment facility.

Originally pioneered by Raven more than four decades ago as a method to construct high performance gondolas for atmospheric test balloons, the centrifugally cast process developed into and remains one of the most versatile and economical methods of producing high-quality fiberglass tanks. It provides all of the mechanical strength necessary for liquid storage plus the superior chemical resistance capability of a high resin-to-glass ratio wall construction.

By utilizing centrifugal force to combine resin and glass, the Raven process provides tanks with a dense uniform wall laminate capable of a 70% resin content. For all practical purposes, the entire wall becomes a resin-rich, chemical-resistant barrier that can be custom designed for specific requirements ranging from the storage of corrosive chemicals such as hydrochloric acid and sodium hydroxide to food grade applications.

The Raven spin cast tank is produced inside a smooth metal cylinder. First the end section, which is sprayed up in a separate mold, is inserted into the cylinder at a point determined by tank capacity. This flexibility allows Raven to manufacture a variety of sizes without changing tooling. For example a 32" diameter tank can be made to hold any capacity between 100 and 300 gallons by adjusting the distance that the head is placed into the mold.

After the end section has been located, sidewall construction begins by applying a 10 to 15 mil layer of resin coat or gel coat to the spinning mold. This provides the tank with its desired color and the distinctive Raven exterior finish.

The backbone of the tank, the structural wall and corrosion barrier, is constructed next by combining chemical resistant resin with chopped strand "E" glass for strength. Chopped glass, either in mat or roving form, has been selected to minimize potential wicking problems sometimes associated with other reinforcements.

The resin saturated chopped strand reinforcement is introduced to the mold in layers and then rolled to remove trapped air bubbles to insure a dense uniform laminate. This process is then repeated with each additional resin/glass layer to meet the design wall thickness.

- A** A 10-15 mil layer of pure or pigmented resin is applied to the mold surface.
- B** Glass mat or chopped "E" glass is added to meet design thickness.
- C** 7-10 mils of pure resin is applied to the inside surface.



SPECIFICATIONS:

Centrifugally cast tanks manufactured by Raven are designed to meet or exceed the strength requirements of ASTM D4097-95a.

Standard catalog tanks are built to hold liquid with a specific gravity of 1.3 at a safety factor of not less than 10:1. Tanks designed to hold heavier materials are available upon request. Contact the factory for specific requirements.

Centrifugally cast tanks can be manufactured for food grade applications depending upon resin selection.

In tanks 23" through 48" diameter, the entire wall is constructed from a single resin system throughout. Larger diameter tanks (60" through 90" diameter) feature the additional flexibility of manufacturing with a dual resin system to achieve a high quality tank at an economical price.

Upon completion of the wall, the inside surface is coated with 7 to 10 mils of pure resin to give the interior of the tank a smooth corrosion-resistant barrier. In highly corrosive applications, such as the storage of caustic materials, a layer of synthetic veil is added before the final resin coat to provide further resistance to chemical attack.

After curing in the mold, the tank is removed by air pressure, checked for quality and sent to the final assembly area for the installation of accessories. Raven centrifugally cast tanks are available in several sizes and styles. Each can be constructed from a number of resin systems to meet specific chemical and temperature requirements. Refer to resin selection guide to determine material compatibility.

PROPERTIES (MINIMUM)

Tensile strength (PSI).....14,000 ASTM D638-96
Tensile modulus (PSI)800,000 ASTM D638-96
Compressive strength (PSI)18,000 ASTM D695-96
Coefficient of thermal expansion
(in./in./°F x 10⁻⁶)12 ASTM D-696-91
Flexural modulus (PSI) 600,000 ASTM D790-96a
Flexural strength (PSI)....19,000 ASTM D790-96a



Polyester resin is sprayed onto the mat while the mold cylinder is revolving. This centrifugal action forces the resin through the mat, saturating it.



Each layer of glass and resin is rolled to remove air bubbles and to insure a dense uniform laminate.

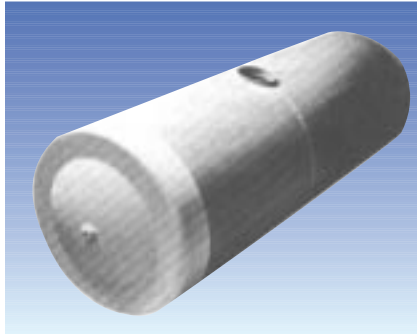


Finished product is removed from the mold.

HORIZONTAL FIBERGLASS TANKS

RAVEN

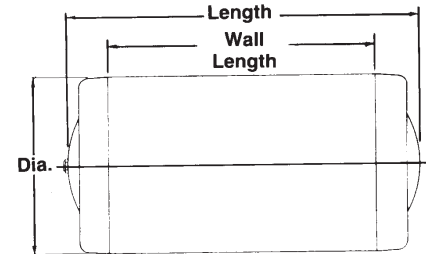
CENTRIFUGALLY CAST HORIZONTAL FIBERGLASS TANKS



Horizontal fiberglass tanks can be designed for either stationary storage or non/D.O.T. regulated mobile applications. Tanks must be properly supported during use.

- Isophthalic resin tanks, through 72" diameter, can be supplied with a variety of sidewall colors and white ends. Please specify when ordering. 90" diameter tanks and all vinylester tanks are natural in color.
- **Baffles are recommended for mobile applications whenever the tank length to diameter ratio exceeds 1.5.**

NOTES: 1) Tanks are designed for atmospheric pressure only and must be vented! Follow vent specifications. 2) 90" diameter tanks have two lifting lugs.



PART No.	NOMINAL CAPACITY (GALS.)	DIAMETER x LENGTH (IN.)	APPROX. WALL LENGTH (IN.)	APPROX. WALL THK. (IN.)	APPROX. WEIGHT (LBS.)	No. OF SADDLES REQUIRED
A1103	25	23 x 18	8	1/8	22	2
A1283	55	23 x 36	26	1/8	27	2
A1343	65	23 x 42	32	1/8	29	2
A1463	85	23 x 54	44	1/8	34	2
†A2223	55	24 x 32	20	1/8	28	2
†A2273	65	24 x 37	25	1/8	30	2
†A2383	85	24 x 47	36	1/8	34	2
†A2513	110	24 x 60	49	1/8	40	2
†A2623	130	24 x 71	59	5/32	56	3
†A3332	110	30 x 43	30	1/8	46	2
†A3472	150	30 x 57	44	1/8	51	2
†A3653	200	30 x 75	63	5/32	74	3
†A4362	150	32 x 49	32	1/8	53	2
†A4513	200	32 x 65	48	5/32	74	2
†A4663	250	32 x 79	64	5/32	86	3
†A4853	300	32 x 93	78	5/32	109	3
†A5202	150	38 x 37	17	1/8	68	2
†A5313	200	38 x 48	27	5/32	73	2
†A5423	250	38 x 58	38	5/32	82	2
†A5533	300	38 x 69	50	5/32	105	2
†A5633	350	38 x 79	60	5/32	115	2
†A5784	400	38 x 89	70	3/16	147	3
†A5834	425	38 x 94	75	3/16	156	3
A6483	350	42 x 66	46	5/32	117	2
A6563	400	42 x 75	55	5/32	127	2

PART No.	NOMINAL CAPACITY (GALS.)	DIAMETER x LENGTH (IN.)	APPROX. WALL LENGTH (IN.)	APPROX. WALL THK. (IN.)	APPROX. WEIGHT (LBS.)	No. OF SADDLES REQUIRED
A6744	500	42 x 91	70	3/16	170	3
A6834	530	42 x 97	76	3/16	181	3
†A7544	500	48 x 73	50	3/16	186	2
†A7674	600	48 x 86	63	3/16	206	2
†A7855	700	48 x 100	77	7/32	266	3
†A7955	800	48 x 112	90	7/32	291	3
†A7B25	900	48 x 126	104	7/32	317	4
†A7C56	1000	48 x 139	117	9/32	391	4
†A8654	1000	60 x 97	60	3/16	393	2
†A8765	1100	60 x 105	68	7/32	452	3
†A8865	1200	60 x 113	77	7/32	476	3
†A8955	1300	60 x 122	86	7/32	498	3
†A8A35	1400	60 x 130	94	7/32	517	3
†A8B26	1500	60 x 138	102	9/32	590	3
†A8F66	2000	60 x 180	145	9/32	718	4
AF655	1500	72 x 102	61	7/32	661	2
AF985	2000	72 x 131	90	7/32	756	3
AFC87	2500	72 x 160	120	5/16	990	3
AFG18	3000	72 x 189	149	3/8	1211	4
A9215	1000	90 x 54	16	7/32	603	2
A9585	2000	90 x 91	53	7/32	735	2
A9956	3000	90 x 128	90	1/4	945	2
A9D28	4000	90 x 165	127	11/32	1418	2
A9G9A	5000	90 x 202	164	13/32	1995	2
A9K6C	6000	90 x 239	200	1/2	2649	2

HORIZONTAL FRP TANK ACCESSORIES

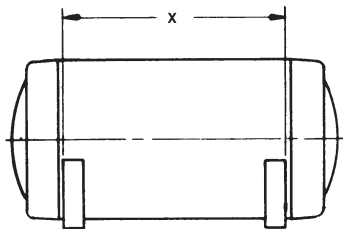
RAVEN

SADDLE ASSEMBLY REQUIREMENTS

TANK PART NO.	SADDLE SPACING "X" IN INCHES		TANK PART NO.	SADDLE SPACING "X" IN INCHES		TANK PART NO.	SADDLE SPACING "X" IN INCHES	
	MIN.	MAX.		MIN.	MAX.		MIN.	MAX.
A1102	7	9	A5202	16	18	A8654	58	61
A1282	24	27	A5313	26	28	A8765	65	69
A1342	30	33	A5423	37	39	A8865	72	78
A1462	41	45	A5533	48	51	A8955	81	87
A2222	18	21	A5633	57	61	A8A35	89	95
A2272	23	26	A5784	67	71	A8B26	96	103
A2382	34	37	A5834	71	76	A8F66	139	146
A2512	46	50	A6483	41	45	AF655	58	62
A2623	56	60	A6563	50	54	AF985	87	91
A3332	29	31	A6744	67	71	AFC87	116	121
A3472	42	45	A6834	71	76	AFG18	144	150
A3653	60	64	A7544	47	51	A9215	16	17
A4362	31	33	A7674	60	64	A9585	51	54
A4513	46	49	A7855	73	78	A9956	85	91
A4663	61	65	A7955	86	91	A9D28	122	128
A4853	74	79	A7B25	99	105	A9G9A	158	165
			A7C56	111	118	A9K6C	195	202

All horizontal tanks must be properly supported either by Raven saddles or customer supplied saddles that have been approved by Raven engineering. To insure adequate support, follow guidelines for saddle spacing that are provided on this page.

NOTE: Failure to comply with support requirements may void warranty.



X = measurement from outside edges of saddles. Additional saddles must be equally spaced between outside pair.

BAFFLES AND BULKHEADS FOR HORIZONTAL FIBERGLASS TANKS

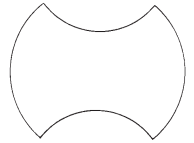
TANK DIAM.	BAFFLE PART NO.	BULKHEAD PART NO.
23	N/A	5015I
24	5088I	5016I
30	5089I	5017I
32	5090I	5018I
38	5091I	5019I
42	5092I	5020I
48	5093I	5021I
60	5103I	5107I
72	5305I	5306I
90	N/A	N/A

N/A - Not Available

Baffles and bulkheads are constructed of chemical-resistant FRP resin and bonded permanently to the interior of the tank wall.

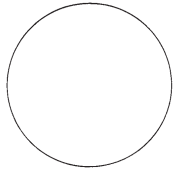
BAFFLES

Partial flow-through baffles eliminate excessive shifting of liquid in mobile applications.



BULKHEADS

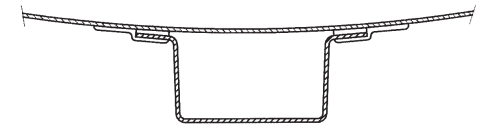
Bulkheads divide horizontal tanks into compartments allowing the storage of more than one chemical.



FRP SUMPS FOR COMPLETE DRAINAGE OF HORIZONTAL TANKS

PART. NO.	SUMP SIZE(IN.)
5145I**	10 x 10 x 6
5146I	4 x 4 x 2

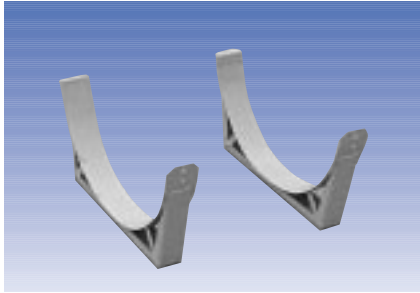
**For tanks 42" diameter & larger



Sumps will accept either bulkhead fittings or fiberglass couplings.

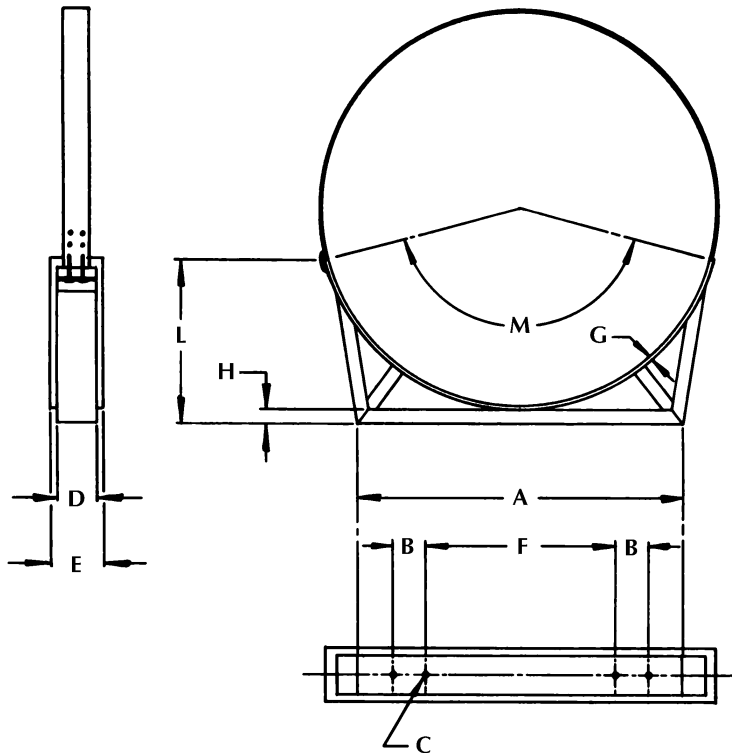
FRP sumps can be factory installed on any horizontal fiberglass tank to provide nearly complete drainage.

STANDARD SADDLE ASSEMBLIES



Raven standard steel saddles provide complete support for horizontal fiberglass tanks when guidelines are followed.

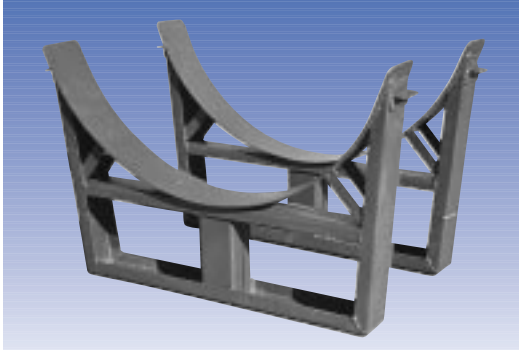
- Standard saddles feature minimum clearance between the tank bottom and floor.
- Saddles are supplied painted red.
- Lead-free Vinyl Alkyd Vogel #IC-5623
- Polyester straps hold tank to saddle.
- Standard saddles are intended for mobile applications.



SADDLE PART NO.	TANK DIA. (IN.)	APPROX. WT. (LBS.)	DIM. (INCHES)					
			A	B	C	D	E	F
A5000	23	9	19	2 1/2	1 7/32	2 1/2	3	9 1/2
A5001	24	9	19	2 1/2	1 7/32	2 1/2	3	9 1/2
A5002	30	13	25	2 1/2	1 7/32	3	4	14 1/2
A5003	32	13	26 3/4	2 1/2	1 7/32	3	4	14 1/2
A5004	38	15	31	2 1/2	1 7/32	3	4	17
A5005	42	20	33	2 1/2	1 7/32	3 3/8	5	19 1/2
A5006	48	30	39	2 1/2	1 7/32	4 3/8	5	24 1/2
A5014	60	64	43 1/2	N/A	5/8	6 3/8	8	36

SADDLE PART NO.	TANK DIA. (IN.)	APPROX. WT. (LBS.)	G DIM. (GA.)	DIM. (INCHES)		M DIM. ANGLE (°)	M BAND LENGTH (IN.)
				H	L		
A5000	23	9	14	1	10	165	34
A5001	24	9	14	1	11	160	34
A5002	30	13	13	1	13 3/4	165	43
A5003	32	13	10	1 3/16	14 3/8	161	45
A5004	38	15	12	1	13 1/2	140	47
A5005	42	20	12	1 3/16	15 5/8	145	54
A5006	48	30	11	1 3/16	16	135	58
A5014	60	64	10	2 3/16	17 1/8	120	64

INDUSTRIAL SADDLE ASSEMBLIES

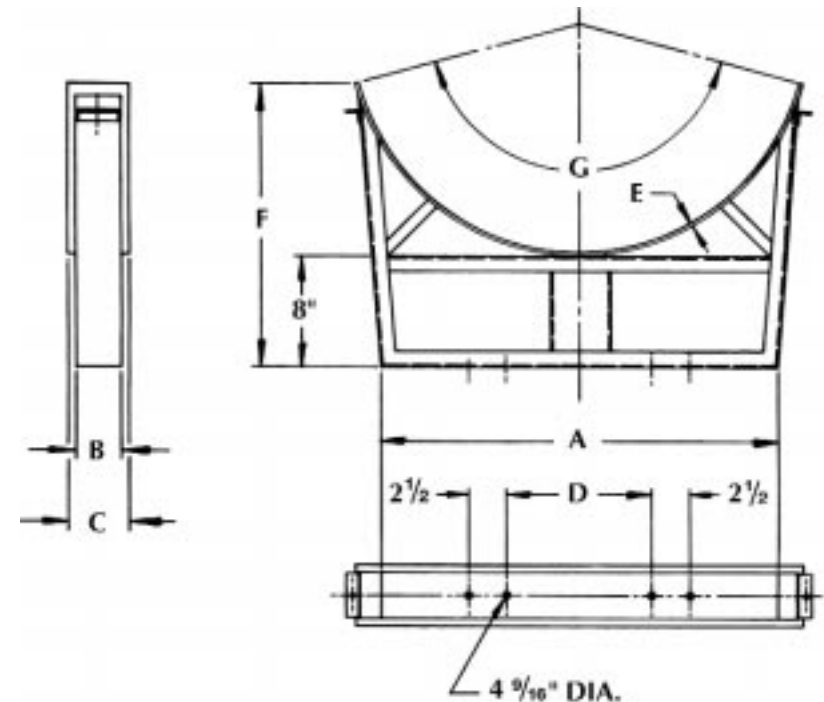


Industrial saddle assemblies feature an 8" clearance between the bottom of the tank and the floor and are recommended for support of horizontal tanks when plumbing access to a bottom drain fitting is required. When ordering, please specify either standard or industrial saddles. If no part number is called out, standard saddles will be shipped.

- Industrial saddles are shop primed with Vogel No. 5521 Rust Red Primer.
- Stainless steel straps and bolts are provided. Primed straps on 72".
- Heavy duty foam rubber pad is included with the saddle.
- Industrial saddles are not intended for mobile applications.

SADDLE PART NO.	TANK DIA. (IN.)	APPROX. WT. (LBS.)	DIM. (INCHES)			
			A	B	C	D
A5025	23	21	19 1/4	3	4	9 1/2
A5026	24	22	19 1/4	3	4	9 1/2
A5027	30	27	26	3	4	14 1/2
A5028	32	28	26 3/4	3	4	14 1/2
A5029	38	40	31	4	5	17
A5030	42	44	35 3/4	4	5	19
A5031	48	48	40 1/2	4	5	24 1/2
A5032	60	114	46 1/4	6 1/2	8	27
A5041	72	190	58 1/2	8	10	31

SADDLE PART NO.	TANK DIA.(IN.)	APPROX. WT.(LBS.)	E DIM.	F DIM.	G DIM.	G BAND
			(GA.)	(IN.)	ANGLE(°)	LENGTH(IN.)
A5025	23	21	10	16 1/2	150	30 1/4
A5026	24	22	10	17 1/16	150	32 1/4
A5027	30	27	10	19 1/8	150	39 3/8
A5028	32	28	10	20	150	42 3/4
A5029	38	40	10	21 11/16	146	49 1/4
A5030	42	44	10	23 11/16	150	55 3/4
A5031	48	48	10	24 5/16	142	60 1/4
A5032	60	114	7	30 7/16	150	79 3/8
A5041	72	190	7	34 5/8	150	95 1/16

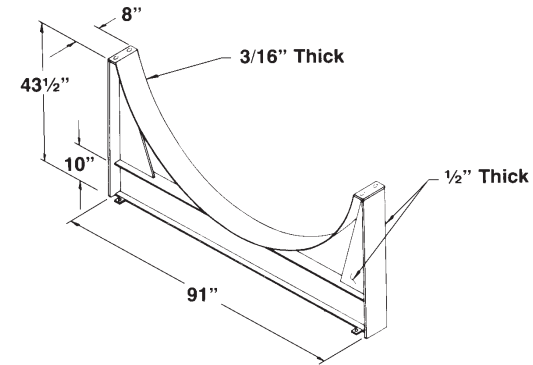
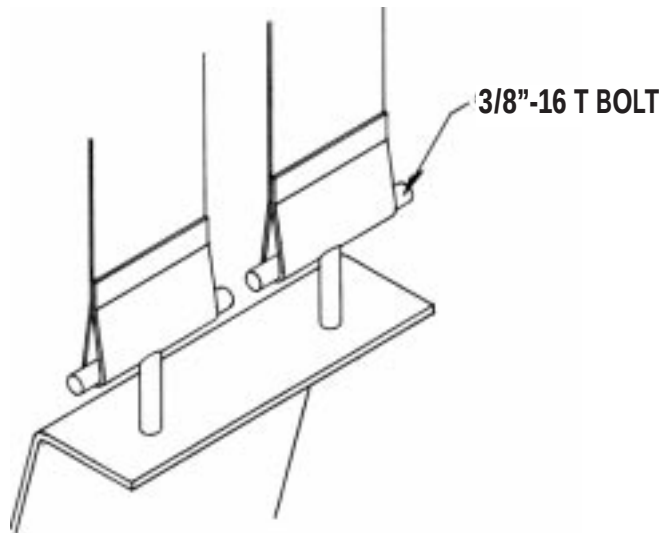


SADDLES – 90" DIAMETER TANKS

PART NO.	NUMBER OF SADDLES REQUIRED	WT. (LBS.) EACH
A5010	2	315

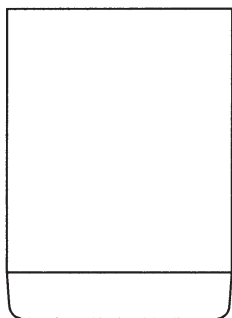
Primed heavy duty steel saddles for 90" diameter horizontal tanks feature 10" of clearance from bottom of tank to ground.

- 90" diameter horizontal tanks are designed to be supported by no more than 2 saddles.
- Saddle assembly provides contact with 120 degrees of tank side-wall to insure proper support.
- Customer must provide adequate concrete pad footings for saddle.
- Engineering recommendations are available for specific applications.



CENTRIFUGALLY CAST FLAT BOTTOM, OPEN TOP FIBERGLASS TANKS

Available in capacities to 6000 gallons, Raven flat bottom open top tanks provide economical storage for a wide range of chemicals depending upon resin selection.



- Isophthalic resin tanks, through 72" diameter, are supplied with aqua sidewall and white end. 90" diameter tanks and all vinylester resin tanks are natural in color.
- Covers are not included. See chart on next page for options.

PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
B1333	58	23 x 36	1/8	28
B1393	68	23 x 42	1/8	31
B1453	78	23 x 48	1/8	34
†B2333	68	24 x 36	1/8	30
†B2393	79	24 x 42	1/8	33
†B2453	91	24 x 48	1/8	36
†B2513	103	24 x 54	1/8	40
†B2583	114	24 x 60	1/8	44
†B2643	126	24 x 66	5/32	47
†B2813	152	24 x 79	5/32	54
†B3333	100	30 x 36	5/32	45
†B3393	116	30 x 42	5/32	51
†B3463	133	30 x 48	5/32	56
†B3523	150	30 x 54	5/32	62
†B3583	167	30 x 60	5/32	68
†B3643	184	30 x 66	5/32	72
†B3673	192	30 x 69	5/32	75
†B4333	119	32 x 36	5/32	53
†B4393	139	32 x 42	5/32	59

PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†B4463	160	32 x 48	5/32	64
†B4523	180	32 x 54	5/32	70
†B4583	200	32 x 60	5/32	76
†B4703	241	32 x 72	5/32	88
†B4813	267	32 x 79	5/32	95
†B5323	167	38 x 36	5/32	74
†B5383	196	38 x 42	5/32	78
†B5443	225	38 x 48	5/32	85
†B5503	254	38 x 54	5/32	93
†B5623	312	38 x 66	5/32	111
†B5683	341	38 x 72	5/32	120
†B5803	381	38 x 79	5/32	130
B6363	203	42 x 36	5/32	86
B6483	274	42 x 48	5/32	100
B6553	310	42 x 54	5/32	109
B6613	345	42 x 60	5/32	118
B6673	380	42 x 66	5/32	127
B6733	416	42 x 72	5/32	136
B6843	457	42 x 79	5/32	146

† Available from Tacoma, WA and Sioux Falls, SD

CENTRIFUGALLY CAST FLAT BOTTOM, OPEN TOP FIBERGLASS TANKS - CONTINUED

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†B7323	265	48 x 36	5/32	112
†B7383	311	48 x 42	5/32	122
†B7443	357	48 x 48	5/32	132
†B7503	403	48 x 54	5/32	143
†B7593	449	48 x 60	5/32	154
†B7663	495	48 x 66	5/32	165
†B7693	541	48 x 72	5/32	176
†B7863	628	48 x 84	5/32	195
†B7983	720	48 x 96	5/32	216
†B7B03	812	48 x 108	5/32	236
†B7C23	904	48 x 120	5/32	255
†B7C83	950	48 x 126	5/32	268
†B8524	530	60 x 48	7/32	219
†B8644	670	60 x 60	7/32	245
†B8804	810	60 x 72	7/32	272
†B8924	955	60 x 84	7/32	298
†B8A44	1090	60 x 96	7/32	324
†B8B64	1240	60 x 108	7/32	350
†B8C84	1380	60 x 120	7/32	377

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†B8D84	1500	60 x 130	7/32	399
BF564	1000	72 x 61	7/32	300
BF894	1500	72 x 90	7/32	378
BFB84	2000	72 x 119	7/32	447
BFF54	2500	72 x 148	7/32	536
BFJ44	3000	72 x 177	7/32	628
B9354	1000	*90 x 41	3/16	438
B9534	1500	*90 x 59	3/16	470
B9844	2000	*90 x 78	3/16-1/4	582
B9895	2500	*90 x 96	3/16-1/4	638
B9C15	3000	*90 x 115	3/16-5/16	775
B9C56	3500	*90 x 133	3/16-5/16	854
B9F86	4000	*90 x 152	3/16-3/8	1011
B9E18	4500	*90 x 170	3/16-3/8	1118
B9G58	5000	*90 x 189	3/16-3/8	1270
B9I78	5500	*90 x 207	3/16-3/8	1368
B9L18	6000	*90 x 226	3/16-3/8	1525

OPTIONAL COVERS

DUST COVER - removable non-load bearing cover designed to keep out unwanted debris.

FLOATING COVER - designed to float on top of liquid to reduce evaporation losses.

TANK DIAM.	DUST COVER PART No.	FLOATING COVER PART No.
23	B500C	B500F
24	B501C	B501F
30	B502C	B502F
32	B503C	B503F
38	B504C	B504F
42	B505C	B505F
48	B506C	B506F
60	B507C	B507F
72	B508C	B508F
90*	5164I*	N/A

**90" covers bolt down to an external flanged lip. Cover is not designed for loads and must be vented!*

† Available from Tacoma, WA and Sioux Falls, SD

***90" diameter tanks include an external flanged lip measuring 2 3/4" wide and 1/2" thick. Actual outside diameter of open top 90" tanks is 95 1/2".**

***90" diameter tanks 2000 gallon and below, have two lifting lugs. All other 90" tanks have three lugs included.**

DISHED BOTTOM OPEN TOP

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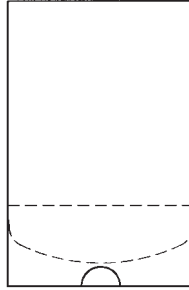
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CENTRIFUGALLY CAST DISHED BOTTOM, OPEN TOP FIBERGLASS TANKS

PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER x HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†C2353	50	24 x 35	1/8	25
†C2613	100	24 x 61	1/8	35
†C2793	125	24 x 75	5/32	60
†C3283	50	30 x 28	5/32	39
†C3443	100	30 x 44	5/32	51
†C3623	145	30 x 62	5/32	64
†C4263	50	32 x 26	5/32	39
†C4403	100	32 x 40	5/32	52
†C4553	150	32 x 55	5/32	65
†C4693	200	32 x 69	5/32	78
†C4793	220	32 x 75	5/32	85
†C5223	50	38 x 22	5/32	40
†C5323	100	38 x 32	5/32	54
†C5423	150	38 x 42	5/32	68
†C5533	200	38 x 53	5/32	80
†C5633	250	38 x 63	5/32	92
†C5774	300	38 x 73	7/32	135
C6194	50	42 x 19	7/32	59
C6284	100	42 x 28	7/32	71
C6364	150	42 x 36	7/32	83
C6454	200	42 x 45	7/32	95
C6534	250	42 x 53	7/32	107
C6624	300	42 x 62	7/32	119

PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER x HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
C6704	350	42 x 70	7/32	131
C6794	380	42 x 75	7/32	137
†C7374	200	48 x 37	7/32	95
†C7444	250	48 x 44	7/32	108
†C7504	300	48 x 50	7/32	121
†C7574	350	48 x 57	7/32	134
†C7644	400	48 x 64	7/32	147
†C7814	500	48 x 77	7/32	173
†C7944	600	48 x 90	7/32	199
†C7A74	700	48 x 103	7/32	225
†C7B84	785	48 x 114	7/32	247
†C8486	425	60 x 48	5/16	290
†C8606	570	60 x 60	5/16	328
†C8736	710	60 x 72	5/16	365
†C8A34	855	60 x 84	7/32	357
†C8B54	1000	60 x 96	7/32	384
†C8C74	1140	60 x 108	7/32	410
†C8D94	1285	60 x 120	7/32	436
†C8E54	1350	60 x 126	7/32	450
CF944	1000	72 x 80	7/32	412
CFC34	1500	72 x 109	7/32	481
CFF24	2000	72 x 138	7/32	550
CFI54	2500	72 x 167	7/32	628

Supported by an extension of the sidewall, Raven dished bottom tanks allow for complete drainage and easy cleaning.



This style features a 6" minimum clearance from bottom of the dish to floor to provide convenient access to plumbing through 5" radius scallop in the sidewall. (Standard clearance on 72" diameter tanks is 12".)

- Isophthalic resin tanks, through 72" diameter, are supplied with aqua sidewall. 90" diameter tanks and all vinylester resin tanks are natural in color.

† Available from Tacoma, WA and Sioux Falls, SD

90" DIAMETER DISHED BOTTOM, OPEN TOP WITH LEG RING

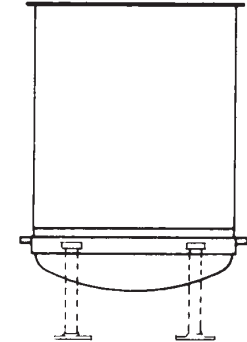
PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
CC314	1000	90 x 47	3/16	895
CC494	1500	90 x 65	3/16	955
CC754	2000	90 x 84	3/16-1/4	1040
CC815	2500	90 x 102	3/16-1/4	1120
CCA95	3000	90 x 121	3/16-5/16	1280
CCB56	3500	90 x 139	3/16-5/16	1385
CCE56	4000	90 x 158	3/16-3/8	1515
CCF07	4500	90 x 176	3/16-3/8	1640
CCH77	5000	90 x 195	3/16-3/8	1850
CCK37	5500	90 x 213	3/16-3/8	1980
CCN07	6000	90 x 232	3/16-3/8	2090

NOTE: 90" diameter tanks 2000 gallon and below, have two lifting lugs. All other 90" tanks have three lugs included.

"90 diameter open top tanks include an external flanged lip and are supported by (4) 4" steel pipe legs threaded into a fiberglass encapsulated leg ring. Legs are not included with the tank and must be ordered separately.

1/2" thick external lip extends 2 3/4" outside tank wall.

Leg length required for 0" clearance is 18 5/8".



- **Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.**

FLAT BOTTOM ANNULAR DOMED TOP

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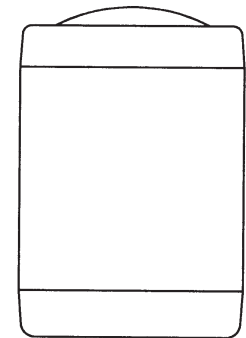
CENTRIFUGALLY CAST FLAT BOTTOM, ANNULAR DOMED TOP FIBERGLASS TANKS

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†D2243	60	24 x 34	1/8	32
†D2503	110	24 x 60	1/8	47
†D2813	160	24 x 87	1/8	61
†D3163	70	30 x 28	1/8	40
†D3333	120	30 x 45	5/32	55
†D3533	170	30 x 63	5/32	72
†D3643	200	30 x 75	5/32	85
†D4133	75	32 x 26	5/32	41
†D4283	125	32 x 41	5/32	59
†D4423	175	32 x 55	5/32	72
†D4583	225	32 x 70	5/32	81
†D4733	275	32 x 84	5/32	102
†D4813	290	32 x 89	5/32	106
†D5183	145	38 x 34	5/32	71
†D5293	195	38 x 44	5/32	85
†D5393	245	38 x 55	5/32	98
*D5493	295	38 x 65	5/32	111
*D5603	345	38 x 76	5/32	127
*D5703	395	38 x 86	5/32	143
*D5803	425	38 x 92	5/32	149
D6243	205	42 x 39	5/32	98
D6333	255	42 x 48	5/32	110
D6413	305	42 x 56	5/32	121
D6503	355	42 x 65	5/32	132
D6593	405	42 x 73	5/32	143
D6683	455	42 x 82	5/32	155
D6803	505	42 x 90	5/32	168
†D7213	275	48 x 41	5/32	134
†D7273	325	48 x 48	5/32	146
†D7343	375	48 x 54	5/32	158

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†D7413	425	48 x 61	5/32	172
†D7473	475	48 x 67	5/32	188
†D7613	575	48 x 80	5/32	207
†D7784	675	48 x 93	7/32	238
†D7914	775	48 x 106	7/32	250
†D7A44	875	48 x 120	7/32	272
†D7C44	1025	48 x 139	7/32	306
†D8434	690	60 x 65	7/32	331
†D8554	830	60 x 77	7/32	356
†D8674	990	60 x 91	7/32	380
†D8834	1115	60 x 101	7/32	405
†D8954	1250	60 x 112	7/32	429
†D8B94	1540	60 x 139	7/32	478
†D8C94	1660	60 x 147	7/32	499
DF354	1000	72 x 66	7/32	488
DF654	1500	72 x 96	7/32	560
DF994	2000	72 x 124	7/32	641
DFD24	2500	72 x 153	7/32	720
DFG84	3000	72 x 182	7/32	806
D9224	1000	90 x 47	3/16	557
D9414	1500	90 x 66	3/16	613
D9594	2000	90 x 84	3/16	693
D9725	2500	90 x 103	3/16-1/4	763
D9925	3000	90 x 121	3/16-1/4	853
D9A56	3500	90 x 140	3/16-5/16	947
D9C96	4000	90 x 158	3/16-5/16	1071
D9C18	4500	90 x 177	3/16-3/8	1183
D9E58	5000	90 x 196	3/16-3/8	1339
D9G88	5500	90 x 214	3/16-3/8	1489
D9J18	6000	90 x 233	3/16-3/8	1596

Flat Bottom Annular Dome Top Tanks are totally enclosed and are designed for chemical and water storage applications requiring a dust-free environment.

- Annular head configuration allows for easy fitting installation.
- Isophthalic resin tanks, through 72" diameter are supplied with aqua sidewall and white ends. 90" diameter tanks and all vinylester resin tanks are natural in color.

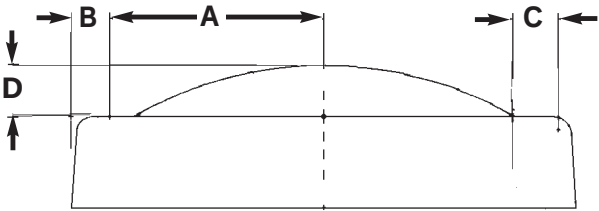


NOTES: 1. Enclosed tanks are designed for atmospheric pressure only and must be vented!
2. 90" diameter tanks 2000 gallon and below, have two lifting lugs. All other 90" tanks have three lugs included.

† Available from Tacoma, WA and Sioux Falls, SD

ANNULAR HEAD DIMENSIONS

TANK DIA.	DIM. (INCHES)			
	A	B	C	D
24	7 1/8	4 7/8	5	1
30	10 1/8	4 7/8	5	1 1/2
32	11	5	5	2
38	14	5	5	3
42	16	5	5	3
48	19	5	5	4
60	24 3/4	5 1/4	4 1/2	6
72	30	6	6	7 1/4
90	40	5	5	8 3/4



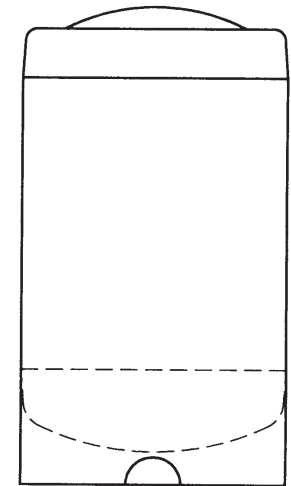
CENTRIFUGALLY CAST DISHED BOTTOM, ANNULAR DOMED TOP FIBERGLASS TANKS

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†E2353	60	24 x 44	1/8	32
†E2613	110	24 x 70	1/8	44
†E2793	135	24 x 84	5/32	67
†E3283	70	30 x 37	5/32	49
†E3443	120	30 x 53	5/32	61
†E3623	170	30 x 71	5/32	74
†E4263	75	32 x 36	5/32	50
†E4403	125	32 x 50	5/32	63
†E4553	175	32 x 65	5/32	76
†E4693	225	32 x 79	5/32	89
†E4793	245	32 x 85	5/32	96
†E5323	145	38 x 44	5/32	73
†E5423	195	38 x 54	5/32	87
†E5533	245	38 x 65	5/32	99
†E5633	295	38 x 75	5/32	111
†E5774	345	38 x 85	7/32	154
E6364	205	42 x 48	7/32	107
E6454	255	42 x 57	7/32	119
E6534	305	42 x 65	7/32	131
E6624	355	42 x 74	7/32	143
E6704	405	42 x 82	7/32	155
E6794	435	42 x 87	7/32	161
†E7374	285	48 x 51	7/32	133
†E7444	335	48 x 58	7/32	146
†E7504	385	48 x 64	7/32	154
†E7574	435	48 x 71	7/32	172

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†E7644	485	48 x 78	7/32	185
†E7814	585	48 x 91	7/32	211
†E7944	685	48 x 104	7/32	237
†E7A74	785	48 x 117	7/32	263
†E7B84	870	48 x 128	7/32	285
†E8534	590	60 x 65	7/32	395
†E8654	735	60 x 77	7/32	421
†E8814	875	60 x 89	7/32	448
†E8934	1020	60 x 101	7/32	474
†E8A54	1165	60 x 113	7/32	501
†E8B74	1305	60 x 125	7/32	527
†E8C94	1450	60 x 137	7/32	554
†E8D54	1515	60 x 143	7/32	567
†E8D64	1590	60 x 149	7/32	580
†E8E74	1735	60 x 161	7/32	606
†E8F14	1775	60 x 165	7/32	615
EF564	750	72 x 71	7/32	560
EF704	1000	72 x 85	7/32	594
EF894	1250	72 x 100	7/32	639
EFA34	1500	72 x 114	7/32	672
EFB84	1750	72 x 129	7/32	708
EFD24	2000	72 x 143	7/32	741
EFE74	2250	72 x 158	7/32	777
EFG54	2500	72 x 172	7/32	820
EFI04	2750	72 x 187	7/32	855

Totally enclosed tank features a dished bottom for easy cleanout and complete drainage. The 6" clearance (12" on 72" diameter tanks) provides easy access to plumbing through a 5" radius scallop cut in sidewall.

- Annular head configuration allows for easy fitting installation.
- Isophthalic resin tanks, through 72" diameter, are supplied with aqua sidewall. 90" diameter tanks and all vinylester tanks are natural in color.



NOTE: Enclosed tanks are designed for atmospheric pressure only and must be vented!

90" DIAMETER DISHED BOTTOM, ANNULAR DOMED TOP WITH LEG RING

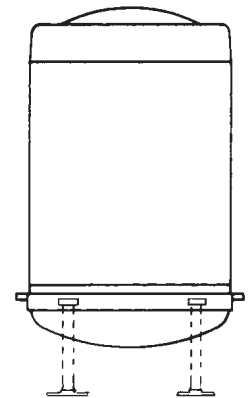
PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
EC184	1000	90 x 58	3/16	1145
EC364	1500	90 x 71	3/16	1205
EC554	2000	90 x 90	3/16-1/4	1290
EC675	2500	90 x 109	3/16-1/4	1370
EC885	3000	90 x 127	3/16-5/16	1530
EC996	3500	90 x 146	3/16-5/16	1635
ECC36	4000	90 x 164	3/16-3/8	1765
ECD37	4500	90 x 183	3/16-3/8	1890
ECG07	5000	90 x 202	3/16-3/8	2100
ECI67	5500	90 x 220	3/16-3/8	2230
ECL37	6000	90 x 239	3/16-3/8	2340

NOTE: 90" diameter tanks 2000 gallon and below, have two lifting lugs. All other 90" tanks have three lugs included.

90" diameter tanks are supported by (4) 4" steel pipe legs threaded into a fiberglass encapsulated steel leg ring. Legs are not included with the tank and must be ordered separately.

Height shown is for tank only.

Leg length required for 0" clearance is 18 5/8".



- Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.

30° CONE BOTTOM WITH SKIRT

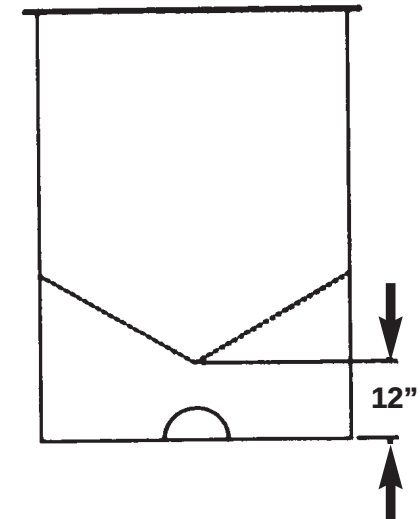
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30° CONE BOTTOM W/SKIRT, OPEN TOP

PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†C34-250	250	48 x 55	7/32	178
†C34-450	450	48 x 81	7/32	227
†C34-650	650	48 x 107	7/32	272
†C35-450	450	60 x 62	7/32	372
†C35-650	650	60 x 79	7/32	421
†C35-850	850	60 x 96	7/32	419
†C35-1050	1050	60 x 113	7/32	453
†C35-1250	1250	60 x 130	7/32	488
†C35-1450	1450	60 x 147	7/32	522
C36-650	650	72 x 64	7/32	430
C36-850	850	72 x 76	7/32	458
C36-1050	1050	72 x 88	7/32	487
C36-1250	1250	72 x 100	7/32	516
C36-1450	1450	72 x 112	7/32	545
C36-1650	1650	72 x 124	7/32-1/4	584
C36-1850	1850	72 x 136	7/32-1/4	620
C36-2050	2050	72 x 148	7/32-1/4	656
C36-2250	2250	72 x 160	7/32-1/4	693

Open top skirted tanks include a flanged lip for tank stability and one scallop for plumbing access to the bottom of the tank. Standard clearance from the bottom of the cone to the floor is 12".



† Available from Tacoma, WA and Sioux Falls, SD

CONSTRUCTION NOTES:

30° Cone bottom skirted tanks are supported by an extension of the sidewall and feature one 5" radius scallop for plumbing access. Larger scallops are available upon request.

Standard clearance from the bottom of the cone to the floor is 12". Clearances to meet specific customer requirements are available at no additional cost but must be specified at the time of the order.

Tanks are supplied in natural resin color. Specific color options are available at additional cost.

30° CONE BOTTOM WITH SKIRT

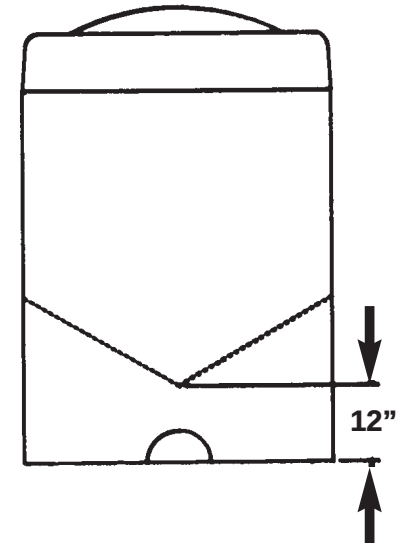
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30° CONE BOTTOM w/SKIRT, ANNULAR DOMED TOP

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER x HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†C34-25C	250	48 x 58	7/32	175
†C34-45C	450	48 x 84	7/32	240
†C34-65C	650	48 x 110	7/32	265
†C35-45C	450	60 x 66	7/32	408
†C35-65C	650	60 x 83	7/32	457
†C35-85C	850	60 x 100	7/32	466
†C35-105C	1050	60 x 117	7/32	500
†C35-125C	1250	60 x 134	7/32	534
†C35-145C	1450	60 x 151	7/32	569
C36-65C	650	72 x 70	7/32	497
C36-85C	850	72 x 82	7/32	524
C36-105C	1050	72 x 94	7/32	555
C36-125C	1250	72 x 106	7/32	584
C36-145C	1450	72 x 118	7/32	613
C36-165C	1650	72 x 130	7/32-1/4	652
C36-185C	1850	72 x 142	7/32-1/4	688
C36-205C	2050	72 x 154	7/32-1/4	724
C36-225C	2250	72 x 166	7/32-1/4	761

† Available from Tacoma, WA and Sioux Falls, SD



Annular dome top skirted tanks are totally enclosed for a dust free environment. Standard clearance from bottom of the cone to the floor is 12".

- **Enclosed tanks must be vented.**

30° CONE BOTTOM WITH LEG RING

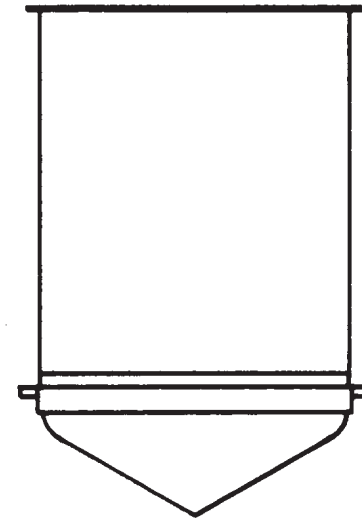
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30° CONE BOTTOM W/LEG RING, OPEN TOP

OPEN TOP PART NO.	NOMINAL CAPACITY (GALS.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICK. (IN.)	APPROX. WEIGHT (LBS.)	PIPE SIZE (IN.)	LEG LENGTH FOR 0" CLEARANCE
†C34-250L	250	48 x 44	5/32	182	2	19
†C34-450L	450	48 x 70	5/32	215	2	19
†C34-650L	650	48 x 96	7/32	281	2	19
†C35-450L	450	60 x 51	7/32	366	3	26
†C35-650L	650	60 x 68	7/32	401	3	26
†C35-850L	850	60 x 85	7/32	435	3	26
†C35-1050L	1050	60 x 102	7/32	477	3	26
†C35-1250L	1250	60 x 119	7/32	503	3	26
†C35-1450L	1450	60 x 136	7/32	538	3	26
C36-650L	650	72 x 55	7/32	450	3	28 1/2
C36-850L	850	72 x 67	7/32	479	3	28 1/2
C36-1050L	1050	72 x 79	7/32	508	3	28 1/2
C36-1250L	1250	72 x 91	7/32	537	3	28 1/2
C36-1450L	1450	72 x 103	7/32	566	3	28 1/2
C36-1650L	1650	72 x 115	7/32	595	3	28 1/2
C36-1850L	1850	72 x 127	7/32	624	3	28 1/2
C36-2050L	2050	72 x 139	7/32	653	3	28 1/2
C36-2250L	2250	72 x 151	7/32	682	3	28 1/2
C37-1500L	1500	90 x 74	3/16	865	4	32
C37-2000L	2000	90 x 92	3/16	925	4	32
C37-2500L	2500	90 x 111	3/16-1/4	1017	4	32
C37-3000L	3000	90 x 129	3/16-1/4	1079	4	32
C37-3500L	3500	90 x 148	3/16-1/4	1213	4	32
C37-4000L	4000	90 x 166	3/16-5/16	1338	4	32

Open top leg ring tanks include a flanged lip and FRP encapsulated steel leg ring. Legs are not included and must be ordered separately.



Tanks are supplied in natural resin color. Specific color options are available at additional cost.

- **Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.**

† Available from Tacoma, WA and Sioux Falls, SD

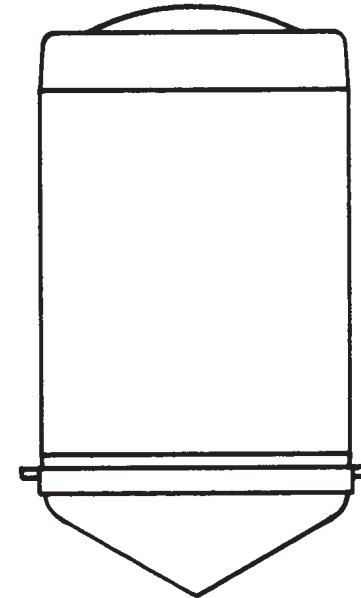
30° CONE BOTTOM WITH LEG RING

RAVEN

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30° CONE BOTTOM w/LEG RING, ANNULAR DOMED TOP

OPEN TOP PART NO.	NOMINAL CAPACITY (GALS.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICK. (IN.)	APPROX. WEIGHT (LBS.)	PIPE SIZE (IN.)	LEG LENGTH FOR 0" CLEARANCE
†C34-25CL	250	48 x 47	5/32	187	2	19
†C34-45CL	450	48 x 73	5/32	215	2	19
†C34-65CL	650	48 x 99	7/32	272	2	19
†C35-45CL	450	60 x 55	7/32	426	3	26
†C35-65CL	650	60 x 72	7/32	458	3	26
†C35-85CL	850	60 x 89	7/32	489	3	26
†C35-105CL	1050	60 x 106	7/32	521	3	26
†C35-125CL	1250	60 x 123	7/32	560	3	26
†C35-145CL	1450	60 x 140	7/32	592	3	26
C36-65CL	650	72 x 61	7/32	534	3	28 1/2
C36-85CL	850	72 x 73	7/32	558	3	28 1/2
C36-105CL	1050	72 x 85	7/32	587	3	28 1/2
C36-125CL	1250	72 x 97	7/32	614	3	28 1/2
C36-145CL	1450	72 x 109	7/32	640	3	28 1/2
C36-165CL	1650	72 x 121	7/32	667	3	28 1/2
C36-185CL	1850	72 x 133	7/32	694	3	28 1/2
C36-205CL	2050	72 x 145	7/32	721	3	28 1/2
C36-225CL	2250	72 x 157	7/32	748	3	28 1/2
C37-150CL	1500	90 x 81	3/16	1022	4	32
C37-200CL	2000	90 x 99	3/16	1072	4	32
C37-250CL	2500	90 x 118	3/16-1/4	1154	4	32
C37-300CL	3000	90 x 136	3/16-1/4	1236	4	32
C37-350CL	3500	90 x 155	3/16-1/4	1336	4	32
C37-400CL	4000	90 x 173	3/16-5/16	1432	4	32



Annular dome top leg ring tanks are totally enclosed and are supported by a FRP encapsulated steel leg ring. Legs are not included and must be ordered separately.

- **Enclosed tanks must be vented.**

† Available from Tacoma, WA and Sioux Falls, SD

NOTE: 90" diameter tanks have two or three lifting lugs included.

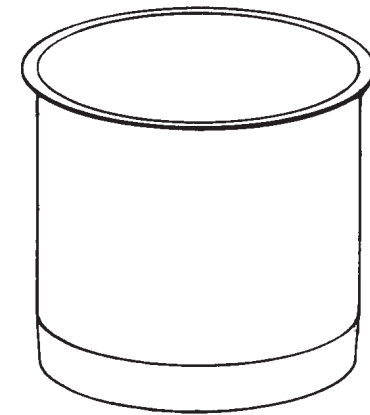
RAVEN Mix Tanks

The Raven Mix Tank line was developed to meet the more stringent performance requirements of industrial mixing applications. Offered in three styles, this series of tanks is a heavy-walled version of the standard line and features an external flanged lip which can accommodate mixers weighing up to 250 pounds.

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER x HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†J2273	50	24 x 29	5/32	45
†J2403	75	24 x 42	5/32	53
†J3364	100	30 x 38	7/32	65
†J3454	125	30 x 47	7/32	78
†J4394	125	32 x 39	7/32	73
†J4454	150	32 x 47	7/32	84
†J4524	175	32 x 54	7/32	105
†J5404	200	38 x 44	7/32	104
†J5454	225	38 x 49	7/32	110
†J5514	250	38 x 54	7/32	117
J6425	250	42 x 45	1/4	127
J6475	275	42 x 50	1/4	143
J6515	300	42 x 54	1/4	148
†J7456	350	48 x 49	9/32	183
†J7516	400	48 x 55	9/32	199
†J7586	450	48 x 62	9/32	216
†J7656	500	48 x 69	9/32	230
†J8366	500	60 x 45	9/32	257
†J8456	600	60 x 54	9/32	283
†J8536	700	60 x 62	9/32	306
†J8636	800	60 x 70	9/32	335
JF385	750	72 x 46	1/4	345
JF526	1000	72 x 60	9/32	406
JF678	1250	72 x 75	3/8	526
JF818	1500	72 x 89	3/8	589

FLAT BOTTOM

flanged lip included



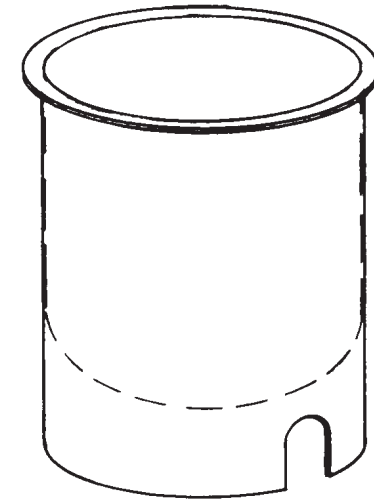
Heavy duty flat bottom mix tanks are ideal for applications where complete drainage is not critical.

- Hold down lugs are recommended for mixing applications.
- Isophthalic resin tanks are supplied with aqua sidewall and white ends. Vinylester resin tanks are natural in color.

PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
†K2433	50	24 x 43	5/32	55
†K2563	75	24 x 56	5/32	63
†K3524	100	30 x 52	7/32	85
†K3614	125	30 x 61	7/32	94
†K4534	125	32 x 53	7/32	95
†K4614	150	32 x 61	7/32	104
†K4684	175	32 x 68	7/32	112
†K5594	200	38 x 59	7/32	130
†K5644	225	38 x 64	7/32	136
†K5704	250	38 x 70	7/32	144
K6595	250	42 x 59	1/4	167
K6645	275	42 x 64	1/4	176
K6685	300	42 x 68	1/4	183
†K7646	350	48 x 64	9/32	237
†K7706	400	48 x 70	9/32	250
†K7816	450	48 x 77	9/32	276
†K7886	500	48 x 84	9/32	292
†K8636	500	60 x 63	9/32	365
†K8716	600	60 x 71	9/32	391
†K8806	700	60 x 80	9/32	414
†K8886	800	60 x 88	9/32	437
KF656	750	72 x 65	9/32	494
KF807	1000	72 x 80	5/16	590
KF949	1250	72 x 94	13/32	749
KFA9A	1500	72 x 109	15/32	882

DISH BOTTOM W/SKIRT

flanged lip included



Skirted mix tanks feature a 12" clearance to the floor and are designed to provide complete drainage.

- Hold down lugs are recommended for mixing applications.
- Isophthalic resin tanks are supplied with aqua sidewall. Vinylester resin tanks are natural in color.

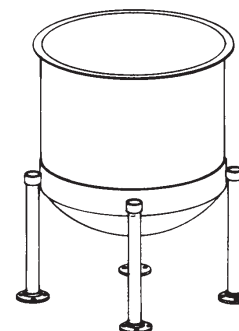
† Available from Tacoma, WA and Sioux Falls, SD

DISH BOTTOM W/LEG RING

flanged lip included

OPEN TOP PART NO.	NOMINAL CAPACITY (GALS.)	DIAMETER x HEIGHT (IN.)	APPROX. WALL THICK. (IN.)	APPROX. WEIGHT (LBS.)	PIPE SIZE (IN.)	LEG LENGTH FOR 0" CLEARANCE
†M2253	50	24 x 31	5/32	66	1 1/2	6 1/4
†M2383	75	24 x 44	5/32	74	1 1/2	6 1/4
†M3354	100	30 x 40	7/32	96	1 1/2	7 1/2
†M3444	125	30 x 49	7/32	105	1 1/2	7 1/2
†M4354	125	32 x 41	7/32	105	1 1/2	8 1/2
†M4424	150	32 x 49	7/32	112	1 1/2	8 1/2
†M4504	175	32 x 56	7/32	121	1 1/2	8 1/2
†M5384	200	38 x 47	7/32	144	2	10
†M5434	225	38 x 52	7/32	150	2	10
†M5494	250	38 x 58	7/32	158	2	10
M6395	250	42 x 47	1/4	181	2	10
M6445	275	42 x 52	1/4	189	2	10
M6485	300	42 x 56	1/4	196	2	10
†M7426	350	48 x 52	9/32	239	2	12 1/4
†M7486	400	48 x 58	9/32	252	2	12 1/4
†M7556	450	48 x 65	9/32	268	2	12 1/4
†M7626	500	48 x 72	9/32	285	2	12 1/4
†M8356	500	60 x 49	9/32	407	3	17 3/4
†M8446	600	60 x 58	9/32	433	3	17 3/4
†M8526	700	60 x 66	9/32	456	3	17 3/4
†M8606	800	60 x 74	9/32	479	3	17 3/4
MF396	750	72 x 51	9/32	552	3	18 3/4
MF547	1000	72 x 66	5/16	631	3	18 3/4
MF689	1250	72 x 80	13/32	756	3	18 3/4
MF83A	1500	72 x 95	15/32	873	3	18 3/4

† Available from Tacoma, WA and Sioux Falls, SD



Dished bottom leg ring tanks are designed to achieve complete bottom access and maximum floor clearance. Legs are not included and must be ordered separately. See below for details.

- For best results, legs should be anchored to the floor. Maximum length = 48".
- Isophthalic resin tanks are supplied with aqua sidewall and white ends. Vinylester resin tanks are natural in color.

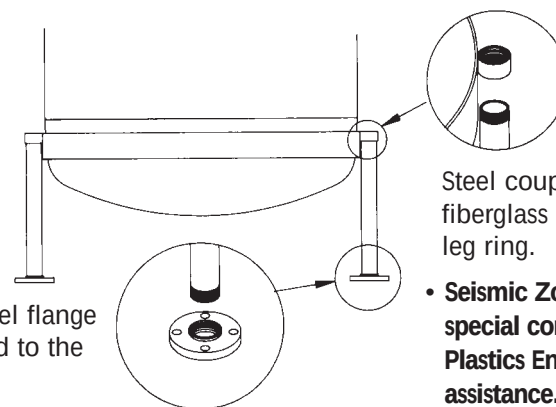
STEEL PIPE LEGS

Legs must be ordered separately on all leg ring tanks and can either be factory or customer supplied. If legs are to be customer supplied refer to specific tank to determine correct pipe size. All centrifugally cast tanks require four (4) pipe legs.

Legs available through Raven are primed steel pipe with NPT threads on both ends and are designed to fit into steel couplings welded onto a fiberglass encapsulated steel leg ring. Lower portion of leg threads into a primed steel flange pad with ASA 150# bolting geometry.

When ordering legs refer to specific tank part number and add the amount shown for 0" clearance to the amount that you require between the bottom of the tank and the floor.

For example to get 12" of clearance on a M7486 (shown above) you would add 12" to a 0" clearance of 12 1/4". Proper leg length would be 24 1/4".



Steel coupling is welded to fiberglass encapsulated steel leg ring.

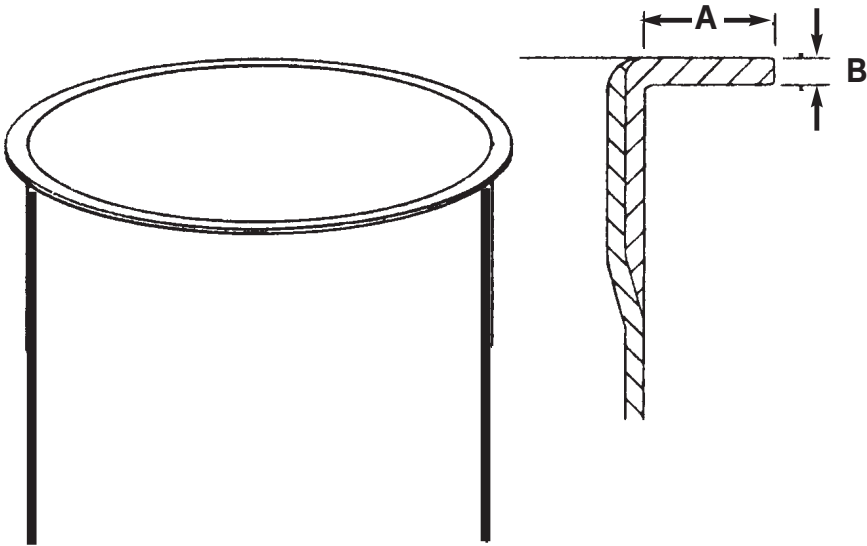
- Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.

Pipe leg threads into steel flange pad. Pads can be bolted to the floor for stability.

FRP FLANGED LIPS

Fiberglass flanged lips are included as standard equipment on all Raven Mix Tanks and are also available as an option on other open top tanks. Constructed from the same resin as the tank corrosion barrier, reinforced lips add rigidity to the top and allow for the use of bolt-down covers.

- Lips are constructed as an integral part of the tank wall.
- Lip is supplied without bolting holes unless otherwise specified.



TANK PART. No.	A Dia. (in.)	B Dim. (in.)	Dim. (in.)
5108B	23	2	3/8
5109B	24	2	3/8
5110B	30	2	3/8
5111B	32	2	3/8
5112B	38	2	3/8
5113B	42	2	3/8
5114B	48	2	3/8
5115B	60	2	3/8
5303B	72	2 1/4	1/2
5150I	90	2 3/4	1/2
7007B	96	2 1/2	1/2

BOLT DOWN COVERS



Fiberglass bolt-down covers are designed for use with mix tanks or standard open top tanks that have flanged lips. When ordered in conjunction with a tank, cover and flanged lip will be match-drilled. If ordered as a replacement item, cover will be supplied without holes in order that customer can field drill.

Solid Covers available either plain or with an 8" x 8" mixer shaft cutout.

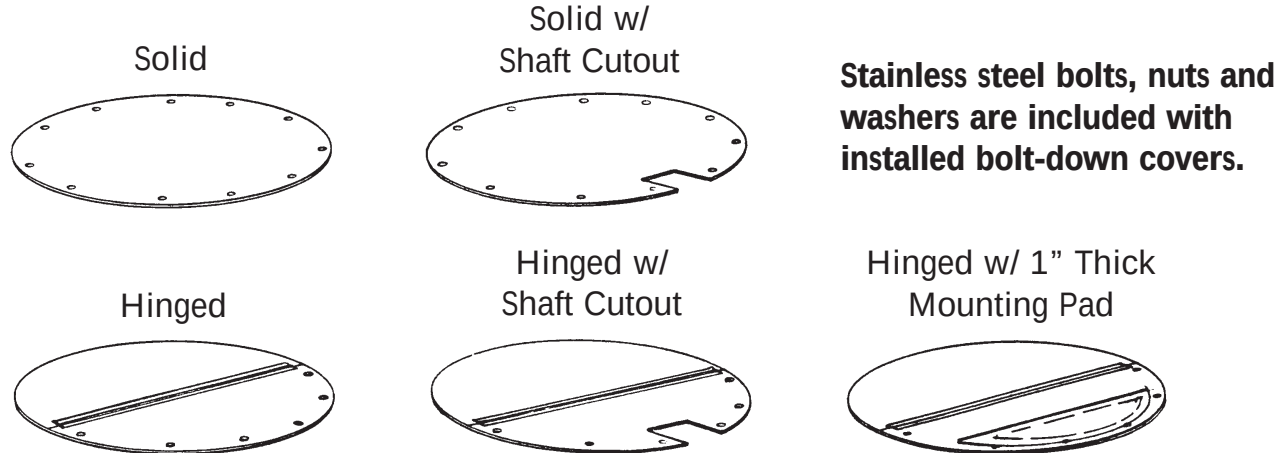
Hinged Covers split with 304 stainless steel hinge to provide easy access to the tank interior. 24" - 72" diameter tanks feature a center split with 1 1/2" wide hinge. 90" & 8' diameter tanks are split at 1/4 of tank diameter and have a 5" wide stainless hinge. 8' hinge and solid covers are reinforced to take 350 lb. load.

Hinged covers are available plain, with an 8" x 8" shaft cutout, or with a 1" thick FRP encapsulated pad for mixer mount.

TANK DIA. (IN.)	SOLID SOLID COVER	WITH CUTOUT	HINGED HINGED COVER	HINGED WITH CUTOUT	WITH MFG. PAD
23	5108I	NA	5108F	NA	NA
24	5109I	5109C	5109F	5109H	5109G
30	5110I	5110C	5110F	5110H	5110G
32	5111I	5111C	5111F	5111H	5111G
38	5112I	5112C	5112F	5112H	5112G
42	5113I	5113C	5113F	5113H	5113G
48	5114I	5114C	5114F	5114H	5114G
60	5115I	5115C	5115F	5115H	5115G
72	5303I	5303C	5303F	5303H	5303G
90	5164I*	5164C*	5239F*	5164H*	5164G*
8'	7007I	NA	7007F	NA	NA

***90" solid covers are not designed for loads.**

Hinged 90" & 8' covers are ribbed and are capable of supporting up to 350 lbs.

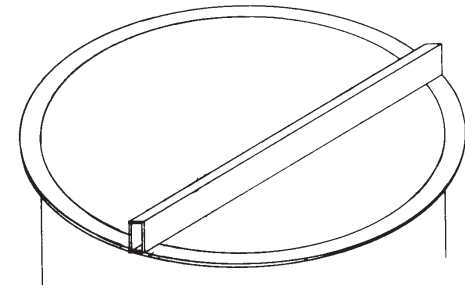


Mixer Bars

Mixer bars for open top tanks 60" diameter and smaller consist of 2" x 4" rectangular fiberglass tubing with wood cores. Bars are designed to hold mixers weighing up to 125 pounds and are secured to flanged lip with stainless bolts.

Tank Dia. (in.)	Part No.
24	5195C
30	5195D
32	5195E
38	5195F
42	5195G
48	5195H
60	5195J

24" - 60" Diameter

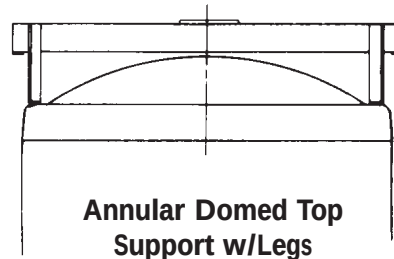


Agitator Supports

90" diameter tanks utilize a primed carbon steel agitator support constructed from two 6" x 8.2 lb./ft. channels and feature a 15" square mounting plate. Agitator supports designed to be used on an annular domed top tank require four (4) steel legs for clearance. When ordering include part numbers for support and legs.

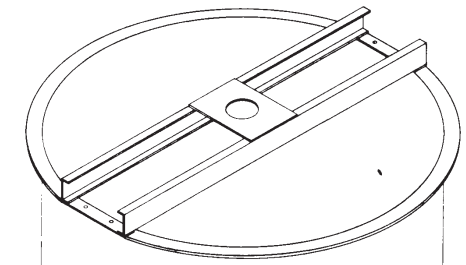
Supports for 72" diameter tanks are constructed from two 4" x 7.25 lb./ft. channels and feature a 12" square mounting plate.

Engineering assistance is available from the factory to meet custom applications and for larger tanks or special installations.



Tank Dia. (in.)	Part No.	Leg Part No.*
72	5314R	5315R
90	5278R	5279R

72" and 90" Diameter

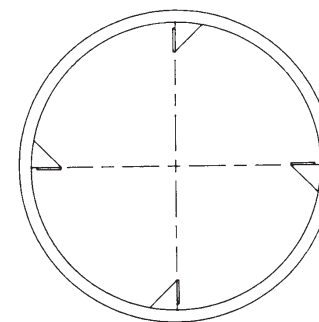
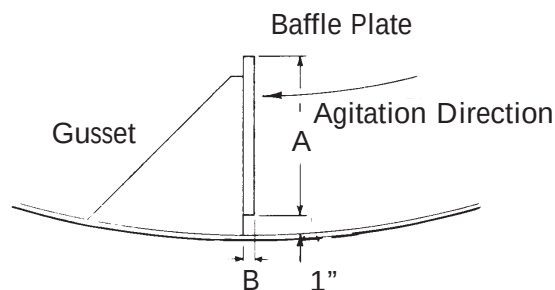


***legs required only
on domed top tanks.**

Anti-Vortex Baffles

Fiberglass anti-vortex baffles minimize problems associated with vortexing during agitation.

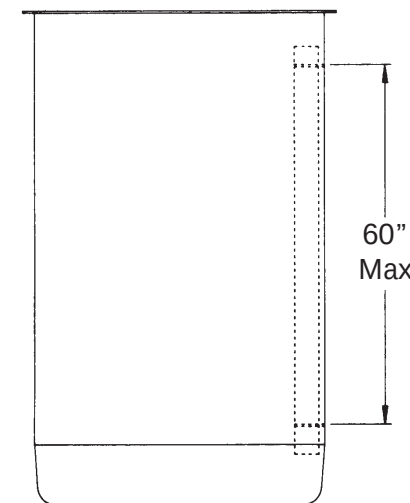
- Flat plate baffles are positioned to oppose agitation direction specified by customer.
- For best results four baffles are recommended per tank.
- Baffles are attached to tank by fiberglass gussets permanently bonded to sidewall.



Ordering Guidelines

- When ordering specify number of baffles per tank, length of each baffle, and number of gussets per baffle.
- Typical baffle length will equal sidewall length minus 3" for 32"-72", sidewall length minus 12" for 90" diameter.
- Top and bottom gussets should be located within 3"-6" of end of baffles. Distance between gussets should not exceed 60".

Tank Dia.	Baffle Part #	Baffle Width	Baffle Thick.	Gusset Part No.
		A	B	
32	5159E	3	1/4	5158E
38	5159F	3	1/4	5158F
42	5159G	4	1/4	5158G
48	5159H	4	1/4	5158H
60	5159J	6	3/8	5158J
72	5159K	6	3/8	5158K
90	5159L	8	3/8	5158L



Centrifugally Cast Sectionalized Fiberglass Tanks



Raven's unique sectionalized fiberglass tank provides an excellent option for retrofit applications such as solar energy storage and domestic fire protection systems.

Part No.	Dia. x Ht. (in.)	Nominal Capacity (gals.)	Total Sections	Approx. Weight (lbs.)	Approx. Thick. (in.)
S42-150	42 x 29	150	1	75	5/32
S42-300	42 x 55	300	2	107	5/32
S42-450	42 x 81	450	3	139	5/32
S48-200	48 x 29	200	1	101	5/32
S48-400	48 x 55	400	2	137	5/32
S48-600	48 x 81	600	3	173	5/32
S48-800	48 x 107	800	4	209	5/32

- Modular design allows for storage up to 800 gallons with a tank capable of passing through a 30" door.
- Factory pre-sanded sections can be assembled on site with no special equipment or training.
- Tanks include adhesive kit and installation instructions.
- Sectionalized tanks are not recommended for the storage of highly aggressive chemicals or for use in food grade applications.
- Available in either isophthalic polyester or vinylester resins.

INSTALLATION INSTRUCTIONS



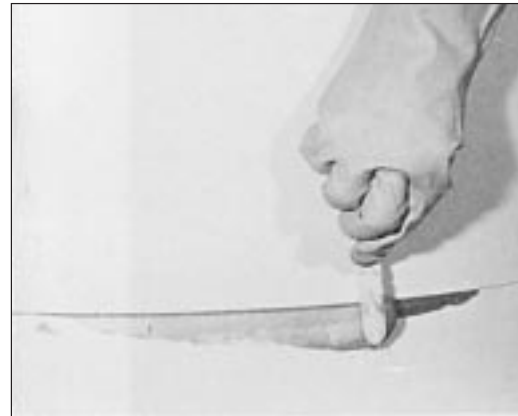
Clean both factory pre-sanded bonding surfaces with MEK or acetone to insure positive seal.



Mix vinylester adhesive per instructions enclosed with kit. Butter bonding surfaces on spigot joint (base) and bell portion (top) with material, making sure all pre-sanded surfaces are evenly covered.



Slip top half of tank smoothly over the base until seams meet.

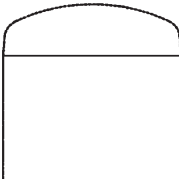
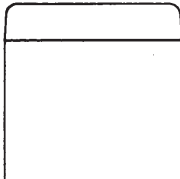


Strip off excessive adhesive on both outside and inside seams with wooden paddle and wipe off seams with a solvent soaked cloth to produce smooth appearing seams.



Slip top on assembled tank and installation is complete. Tank should be allowed to cure overnight and be water tested before being put into service.

CAUTION! The following chart is intended to be used as a guide only. Variations in mold taper and head preparation will affect actual dimensions. For applications requiring strict tolerances contact the factory for details.

					
TANK DIAMETER	GALS. / IN	DOME		FLANGE LIP	
		GALS.	Ht. (IN.)	GALS.	Ht. (IN.)
8'	31.3	425	20	240	8*
9'	39.6	630	23	300	8
10'	48.9	875	25	370	8
12'	70.5	1340	28	600	9

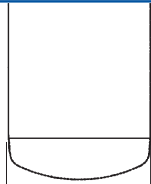
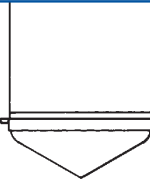
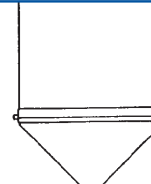
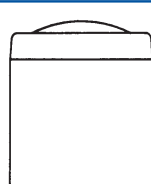
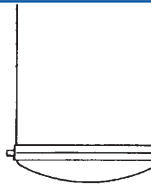
**NOTE: The 8' is also available in an external flange lip. Height of the external lip is 6". Capacity of the external 8' lip is 235 gallons.*

CAPACITY AND DIMENSION CHARTS

RAVEN

page 2 of 2

CAUTION! The following chart is intended to be used as a guide only. Variations in mold taper and head preparation will affect actual dimensions. For applications requiring strict tolerances contact the factory for details.

														
NOMINAL TANK DIA. (IN.)	ACTUAL TANK DIA. (IN.)	GAL./INCH OF SIDEWALL	BOTTOM FLAT HEAD		BOTTOM DISHED HEAD		BOTTOM 30 CONE		BOTTOM 45 CONE		TOP ANNULAR HEAD		BOTTOM DISHED HEAD	
			GALS.	Ht, (IN.)	GALS.	Ht, (IN.)	GALS.	Ht, (IN.)	GALS.	Ht, (IN.)	GALS.	Ht, (IN.)	GALS.	Ht, (IN.)
23	22.60	1.70	7	5	11	9	NA	NA	NA	NA	NA	NA	NA	NA
24	24.25	1.94	11	6	12	9	14	12	NA	NA	11	6.5	12	9
30	29.25	2.84	16	6	21	10	23	14.2	NA	NA	16	7	21	10
32	32	3.41	19	6	29	11	31	15	NA	NA	23	8	29	11
38	38	4.84	32	7	46	13	49	17.75	NA	NA	38	10.5	46	13
42	42	5.89	30	6	59	13	65	19	NA	NA	55	12	59	13
48	48	7.65	70	10	85	15	93	21.75	NA	NA	74	13	85	15
60	60	11.90	152	14.5	165	20.5	180	27.62	NA	NA	165	18.25	165	20.5
72	72	17.26	215	13.5	192	19	222	29.5	NA	NA	253	20.5	192	19
90	90	27.00	310	10	390	21.25	444	33.87	608	50	330	20.25	390	21.25
96	96	31.3	240	8	NA	NA	470	34	670	55	NA	NA	425	20
108	108	39.6	300	8	NA	NA	670	35	1000	62	NA	NA	630	23
120	120	48.9	370	8	NA	NA	910	42	1320	67	NA	NA	875	25
144	144	70.5	600	9	NA	NA	NA	NA	2180	79	NA	NA	NA	NA

Chop-hoop filament winding is a unique blend of two proven fabrication techniques: chopped glass spray-up and continuous filament winding. This combination provides the benefits of maximum corrosion resistance plus the strength required for vertical storage.

The Raven chop-hoop filament wound tank is produced over a smooth male mandrel in four automated steps:

1. The bottom head is produced in a separate spray-up process and affixed to the mandrel. A resin rich inner surface is applied to the mandrel and reinforced either with a glass veil or a synthetic veil (Nexus®) in those applications requiring maximum chemical resistance. This layer is a minimum of 10 mils thick with a glass/resin ratio of approximately 20/80.
2. The interior corrosion barrier is constructed next by combining resin with chopped “E” glass in two 45 mil passes. Total thickness is a minimum of 90 mils with an approximate glass/resin ratio of 30/70.
3. The structural wall is produced using a process of simultaneous glass chopping, resin spraying, and hoop filament winding. The

glass/resin ratio is approximately 50/50 with the glass roving (filament) providing the required hoop strength. The thickness of the structural wall is varied according to tank height, application, and specific gravity of the contents.

4. Finally, a 5 mil resin coat or a 45 mil exterior corrosion barrier is added depending upon projected service. The exterior corrosion barrier consists of a layer of resin and chopped “E” glass strand applied in an approximate resin to glass ratio of 70/30.



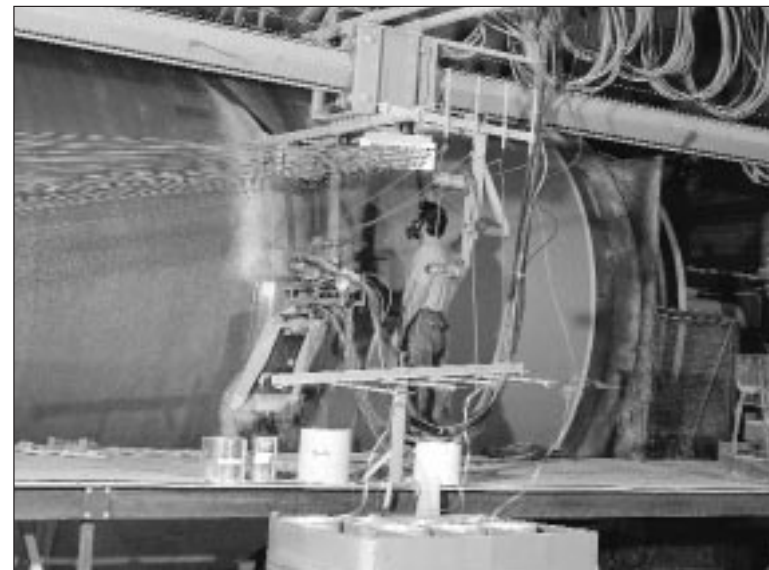
Structural wall is constructed by simultaneous glass chopping, resin spraying and hoop filament winding. (Winding glass is visible at top of photo.)

SPECIFICATIONS

Using chop-hoop filament wound fabrication, fiberglass reinforced plastic tank walls manufactured by Raven meet or exceed the design criteria of ASTM D 3299-95A.

Raven's standard storage vessels are designed for liquids with a specific gravity of up to 1.3. Tanks designed to hold heavier materials are available upon request.

Chop-hoop filament wound tanks can be manufactured for food grade applications depending on resin selection.



An interior corrosion barrier is fabricated by spraying a chopped roving glass and resin mixture.

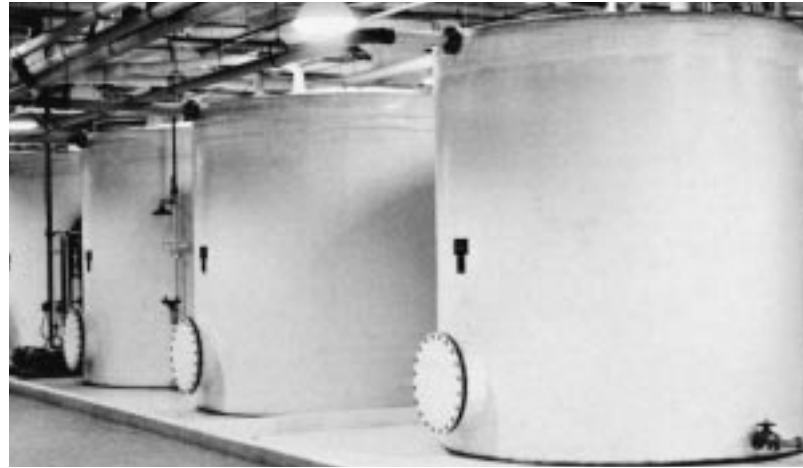
TYPICAL PROPERTIES

Hoop Direction

Tensile Strength PSI	42,000
Tensile Modulus PSI	2,400,000
Flexural Strength PSI	58,000
Flexural Modulus PSI	1,800,000

AXIAL DIRECTION

Tensile Strength PSI	13,500
Tensile Modulus PSI	1,450,000
Flexural Strength PSI	33,600
Flexural Modulus PSI	1,330,000

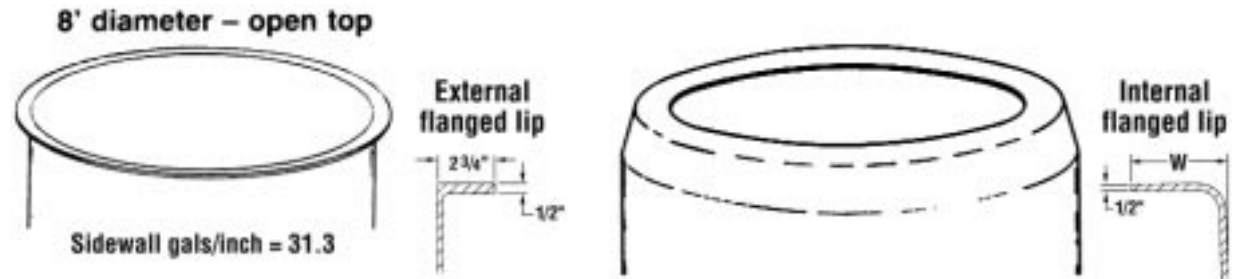


Series of 9000 gallon storage tanks for treatment of waste water at an industrial plating operation.

CHOP-HOOP FILAMENT WOUND, FLAT BOTTOM, OPEN TOP FIBERGLASS TANKS



- 8' diameter open top tanks include external flanged lips. 9', 10' and 12' diameter tanks are supplied with internal flange lips. See drawing below for dimensions.
- Standard tank is designed for 1.3 specific gravity material. 1.8 and 2.1 versions are available upon request.
- All filament wound tanks include three lift lugs.



Tank diameter	"W" dimension
9'	6"
10'	7"
12'	9"

NOTE: Tank bottom must be fully supported and pad must remain level within 1/8" over a ten foot span.

- Consult a local engineer for specific site requirements.
- Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.

CHOP-HOOP FILAMENT WOUND, FLAT BOTTOM, OPEN TOP FIBERGLASS TANKS - CONTINUED

PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
F082OT	2000	8' x 5'10"	1/4	720
F092OT	2000	9' x 4'9"	1/4	778
F083OT	3000	8' x 8'6"	1/4	860
F093OT	3000	9' x 6'11"	1/4	908
F084OT	4000	8' x 11'2"	1/4	1000
F094OT	4000	9' x 9'0"	1/4	1033
F104OT	4000	10' x 7'5"	1/4-9/32	875
F085OT	5000	8' x 13'9"	1/4-9/32	1220
F095OT	5000	9' x 11'1"	1/4	1157
F105OT	5000	10' x 9'1"	1/4-9/32	1006
F086OT	6000	8' x 16'5"	1/4-9/32	1410
F096OT	6000	9' x 13'2"	1/4-5/16	1327
F106OT	6000	10' x 10'9"	1/4-11/32	1136
F126OT	6000	12' x 7'8"	1/4-5/16	1110
F087OT	7000	8' x 19'1"	1/4-9/32	1610
F097OT	7000	9' x 15'4"	1/4-5/16	1498
F107OT	7000	10' x 12'6"	1/4-11/32	1280
F127OT	7000	12' x 8'10"	1/4-5/16	1230
F088OT	8000	8' x 21'9"	1/4-11/32	1830
F098OT	8000	9' x 17'5"	1/4-3/8	1662

PART No.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
F108OT	8000	10' x 14'2"	1/4-11/32	1447
F128OT	8000	12' x 10'0"	1/4-5/16	1350
F109OT	9000	10' x 15'11"	1/4-11/32	1613
F129OT	9000	12' x 11'3"	1/4-5/16	1493
F1010OT	10000	10' x 17'7"	1/4-7/16	1788
F1210OT	10000	12' x 12'5"	1/4-3/8	1635
F1012OT	12000	10' x 21'0"	1/4-7/16	2190
F1212OT	12000	12' x 14'9"	1/4-3/8	1940
F1014OT	14000	10' x 24'5"	1/4-1/2	2620
F1214OT	14000	12' x 17'2"	1/4-7/16	2290
F1015OT	15000	10' x 26'1"	1/4-1/2	2900
F1215OT	15000	12' x 18'4"	1/4-7/16	2475
F1216OT	16000	12' x 19'6"	1/4-7/16	2660
F1218OT	18000	12' x 21'10"	1/4-1/2	3075
F1220OT	20000	12' x 24'3"	1/4-1/2	3305
F1221OT	21000	12' x 25'5"	1/4-1/2	3525
F1222OT	22000	12' x 26'7"	1/4-19/32	4210
F1225OT	25000	12' x 30'2"	1/4-5/8	5275
F1230OT	30000	12' x 36'0"	1/4-23/32	6675

*Wall thickness is stepped.

CHOP-HOOP FILAMENT WOUND FLAT BOTTOM, DOMED TOP FIBERGLASS TANKS - CONTINUED



- Domed top tanks are designed for atmospheric pressure only and must be vented.
- Standard tank designed for 1.3 specific gravity material. 1.8 and 2.1 versions are available upon request.
- All filament wound tanks include three lift lugs.
- **Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.**

NOTE: *Tank bottom must be fully supported and pad must remain level within 1/8" over a ten foot span.*

Consult a local engineer for specific site requirements.

CHOP-HOOP FILAMENT WOUND FLAT BOTTOM, DOMED TOP FIBERGLASS TANKS

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
F082DT	2000	8' x 6'4"	1/4	840
F092DT	2000	9' x 5'4"	1/4	850
F083DT	3000	8' x 9'0"	1/4	980
F093DT	3000	9' x 7'5"	1/4	974
F084DT	4000	8' x 11'8"	1/4	1140
F094DT	4000	9' x 9'6"	1/4	1098
F104DT	4000	10' x 8'0"	1/4-9/32	1075
F085DT	5000	8' x 14'3"	1/4-9/32	1280
F095DT	5000	9' x 11'7"	1/4	1223
F105DT	5000	10' x 9'9"	1/4-9/32	1206
F086DT	6000	8' x 16'11"	1/4-9/32	1520
F096DT	6000	9' x 13'9"	1/4-5/16	1384
F106DT	6000	10' x 11'5"	1/4-11/32	1336
F126DT	6000	12' x 8'5"	1/4-5/16	1375
F087DT	7000	8' x 19'7"	1/4-9/32	1710
F097DT	7000	9' x 15'10"	1/4-5/16	1549
F107DT	7000	10' x 13'1"	1/4-11/32	1480
F127DT	7000	12' x 9'7"	1/4-5/16	1500
F088DT	8000	8' x 22'3"	1/4-11/32	1900
F098DT	8000	9' x 17'11"	1/4-3/8	1715

PART NO.	NOMINAL CAPACITY (GAL.)	DIAMETER X HEIGHT (IN.)	APPROX. WALL THICKNESS (IN.)	APPROX. WEIGHT (LBS.)
F108DT	8000	10' x 14'10"	1/4-11/32	1647
F128DT	8000	12' x 10'10"	1/4-5/16	1625
F109DT	9000	10' x 16'6"	1/4-11/32	1813
F129DT	9000	12' x 12'0"	1/4-5/16	1768
F1010DT	10000	10' x 18'3"	1/4-7/16	1988
F1210DT	10000	12' x 13'2"	1/4-5/16	1910
F1012DT	12000	10' x 21'8"	1/4-7/16	2390
F1212DT	12000	12' x 15'6"	1/4-3/8	2215
F1014DT	14000	10' x 25'1"	1/4-1/2	2820
F1214DT	14000	12' x 17'11"	1/4-7/16	2565
F1015DT	15000	10' x 26'9"	1/4-1/2	3100
F1215DT	15000	12' x 19'1"	1/4-7/16	2750
F1216DT	16000	12' x 20'3"	1/4-7/16	2935
F1218DT	18000	12' x 22'7"	1/4-1/2	3350
F1220DT	20000	12' x 25'0"	1/4-1/2	3580
F1221DT	21000	12' x 26'2"	1/4-1/2	3800
F1222DT	22000	12' x 27'4"	1/4-9/32	4410
F1225DT	25000	12' x 30'10"	1/4-5/8	5550
F1230DT	30000	12' x 36'9"	1/4-23/32	6950

**Wall thickness is stepped.*

CHOP-HOOP FILAMENT WOUND 30° CONE BOTTOM FIBERGLASS TANKS

30° CONE - OPEN TOP



NOMINAL OPEN TOP PART No.	CAPACITY (GAL.)	WALL* DIA. X HEIGHT (IN.)	APPROX. THICK. (IN.)	WEIGHT (LBS.)	No. OF LEGS
C38-2MO	2000	8' x 7'1"	1/4	1280	4
C39-2MO	2000	9' x 6'3"	1/4	784	4
C38-3MO	3000	8' x 9'9"	1/4	1430	4
C39-3MO	3000	9' x 8'4"	1/4	914	4
C38-4MO	4000	8' x 12'5"	1/4	1570	4
C39-4MO	4000	9' x 10'6"	1/4	1039	4
C310-4MO	4000	10' x 9'3"	1/4	2230	6
C38-5MO	5000	8' x 15'1"	1/4-5/16	1710	4
C39-5MO	5000	9' x 12'7"	1/4	1164	6
C310-5MO	5000	10' x 11'0"	1/4	2340	6
C38-6MO	6000	8' x 17'9"	1/4-5/16	1950	4
C39-6MO	6000	9' x 14'8"	1/4-5/16	1323	6
C310-6MO	6000	10' x 12'8"	1/4-5/16	2450	6
C39-7MO	7000	9' x 16'9"	1/4-5/16	1489	6
C310-7MO	7000	10' x 14'5"	1/4-5/16	2560	6
C39-8MO	8000	9' x 18'11"	1/4-3/8	1658	8
C310-8MO	8000	10' x 16'1"	1/4-5/16	2720	8
C310-9MO	9000	10' x 17'9"	1/4-5/16	2860	8
C310-10MO	10000	10' x 19'6"	1/4-5/16	3010	8

**Wall thickness is stepped.*

CHOP-HOOP FILAMENT WOUND 30° CONE BOTTOM FIBERGLASS TANKS

- 30° cone bottom tanks are supported by a fiberglass encapsulated steel leg ring which will accept threaded steel pipe legs.
- 8' diameter open top tanks include an external flanged lip. 9' and 10' diameter tanks include an internal flanged lip.
- Closed top tanks are designed for atmospheric pressure only and must be vented.
- Standard tank designed for 1.3 specific gravity material. 1.8 and 2.1 versions are available upon request.
- **Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.**

30° CONE - CLOSED TOP

NOMINAL OPEN TOP PART NO.	CAPACITY (GAL.)	WALL* DIA. X HEIGHT (IN.)	APPROX. THICK. (IN.)	WEIGHT (LBS.)	NO. OF LEGS
C38-2MC	2000	8' x 7'8"	1/4	1340	4
C39-2MC	2000	9' x 6'9"	1/4	830	4
C38-3MC	3000	8' x 10'4"	1/4	1480	4
C39-3MC	3000	9' x 8'10"	1/4	955	4
C38-4MC	4000	8' x 13'0"	1/4	1620	4
C39-4MC	4000	9' x 11'0"	1/4	1086	4
C310-4MC	4000	10' x 9'11"	1/4	2350	6
C38-5MC	5000	8' x 15'8"	1/4-5/16	1760	4
C39-5MC	5000	9' x 13'1"	1/4	1209	6
C310-5MC	5000	10' x 11'7"	1/4	2460	6
C38-6MC	6000	8' x 18'4"	1/4-5/16	1980	4
C39-6MC	6000	9' x 15'2"	1/4-5/16	1334	6
C310-6MC	6000	10' x 13'3"	1/4	2570	6
C39-7MC	7000	9' x 17'3"	1/4-5/16	1514	6
C310-7MC	7000	10' x 15'0"	1/4	2680	6
C39-8MC	8000	9' x 19'5"	1/4-3/8	1686	8
C310-8MC	8000	10' x 16'8"	1/4-5/16	2830	8
C310-9MC	9000	10' x 18'5"	1/4-5/16	2970	8
C310-10MC	10000	10' x 20'1"	1/4-5/16	3120	8

**Wall thickness is stepped.*

CONE BOTTOM

TANK DIAMETER	SIDEWALL GAL./INCH	30° CONE CAP. (GALS.)	CLEARANCE LEG LENGTH (IN.)
8'0"	31.3	470	34"
9'0"	39.6	670	35"
10'0"	48.9	910	42"

STEEL PIPE LEGS

30° cone bottom tanks are supported by steel pipe legs threaded into a fiberglass encapsulated steel leg ring. Legs must be ordered separately.

LEG ORDERING INFORMATION

To order legs, specify number required and overall length. Overall length is determined by adding amount of leg for 0" clearance (shown above) to desired clearance between the bottom of the cone and the floor.

(NOTE: Raven recommends that clearance not exceed 24" unless specific application has been reviewed by the factory.)

EXAMPLE: Legs for an 8' diameter 6000 gallon tank (part #C38-6MC) with a 24" clearance from bottom of cone to the floor would be ordered as follows:

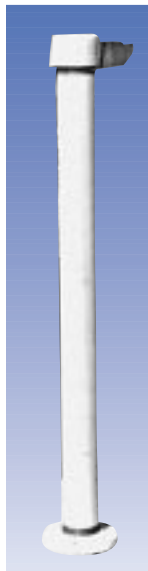
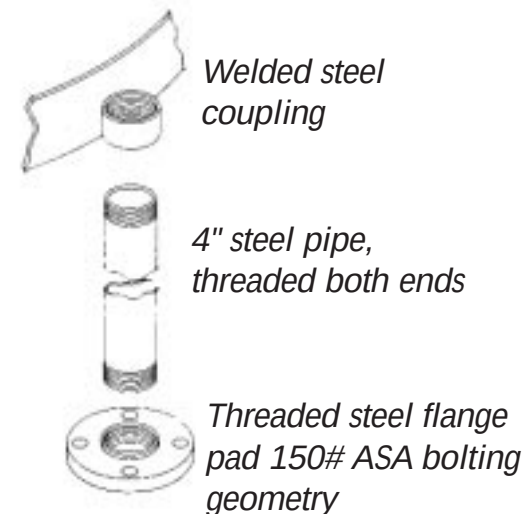
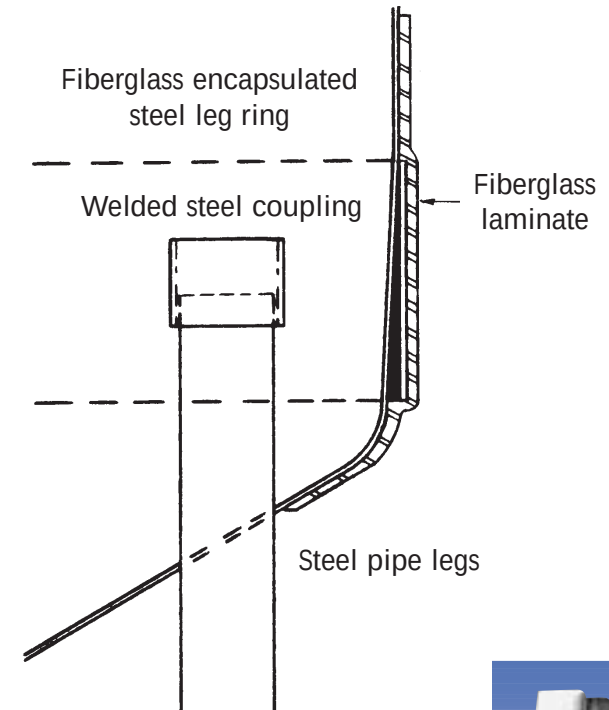
Number of legs required = 4

Leg length = 0" clearance

+ required clearance

34"+24"

Correct order would be (4) 58" tall legs.



45° CONE BOTTOM

page 1 of 3

RAVEN

CHOP-HOOP FILAMENT WOUND 45° CONE BOTTOM FIBERGLASS TANKS

45° CONE - OPEN TOP



OPEN TOP PART NO.	NOMINAL CAPACITY (GAL.)	DIMENSIONS DIA. X HEIGHT (IN.)	WALL* THICK. (IN.)	APPROX. WEIGHT (LBS.)	No. OF LEGS
C47-1.5MO	1500	+90" x 87"	3/16	1050	4
C47-2MO	2000	+90" x 106"	3/16	1130	4
C48-2MO	2000	8' x 8'4"	1/4	1190	4
C49-2MO	2000	9' x 7'10"	1/4	645	4
C47-2.5MO	2500	+90" x 124"	3/16-1/4	1230	4
C47-3MO	3000	+90" x 143"	3/16-1/4	1320	4
C48-3MO	3000	8' x 11'	1/4	1330	4
C49-3MO	3000	9' x 9'11"	1/4	770	4
C47-3.5MO	3500	+90" x 161"	3/16-5/16	1410	4
C47-4MO	4000	+90" x 180"	3/16-5/16	1580	4
C48-4MO	4000	8' x 13'8"	1/4	1478	4
C49-4MO	4000	9' x 12'0"	1/4	896	4
C410-4MO	4000	10' x 10'8"	1/4	2060	6
C48-5MO	5000	8' x 16'4"	1/4-5/16	1620	4
C49-5MO	5000	9' x 14'1"	1/4	1019	6
C410-5MO	5000	10' x 12'4"	1/4	2170	6
C48-6MO	6000	8' x 19'0"	1/4-5/16	1840	4
C49-6MO	6000	9' x 16'3"	1/4-5/16	1149	6
C410-6MO	6000	10' x 14'1"	1/4	2280	6
C412-6MO	6000	12' x 11'8"	1/4-5/16	2970	8
C49-7MO	7000	9' x 18'4"	1/4-5/16	1331	6
C410-7MO	7000	10' x 15'9"	1/4	2390	6
C412-7MO	7000	12' x 12'10"	1/4-5/16	3070	8
C49-8MO	8000	9' x 20'5"	1/4-3/8	1496	8
C410-8MO	8000	10' x 17'6"	1/4-5/16	2540	8
C412-8MO	8000	12' x 14'0"	1/4-5/16	3170	8
C410-9MO	9000	10' x 19'2"	1/4-5/16	2680	8
C412-9MO	9000	12' x 15'2"	1/4-5/16	3370	8
C410-10MO	10000	10' x 20'10"	1/4-5/16	2820	8
C412-10MO	10000	12' x 16'4"	1/4-3/8	3550	#4
C412-11MO	11000	12' x 17'7"	1/4-3/8	3680	#4
C412-12MO	12000	12' x 18'9"	1/4-3/8	3810	#4
C412-13MO	13000	12' x 19'11"	1/4-3/8	4050	#4
C412-14MO	14000	12' x 21'1"	1/4-3/8	4210	#4

+ 90" diameter tanks are constructed by centrifugally cast method.

Requires steel I-beam legs.

* Wall thickness is stepped.

CHOP-HOOP FILAMENT WOUND 45° CONE BOTTOM FIBERGLASS TANKS - CONTINUED

45° CONE - CLOSED TOP

- 45° cone bottom tanks are supported by a fiberglass encapsulated steel leg ring which will accept threaded steel pipe legs or steel I-beams depending on capacity.
- 8' diameter open top tanks include external flanged lips. 9', 10' and 12' diameter tanks include internal lips.
- Closed top tanks are designed for atmospheric pressure only and must be vented.
- Standard tank designed for 1.3 specific gravity material. 1.8 and 2.1 versions are available upon request.
- **Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.**

OPEN TOP PART No.	NOMINAL CAPACITY (GAL.)	DIMENSIONS DIA. X HEIGHT (IN.)	WALL* THICK. (IN.)	APPROX. WEIGHT (LBS.)	No. OF LEGS
C47-1.5MC	1500	+90" X 93"	3/16	1230	4
C47-2MC	2000	+90" X 112"	3/16	1300	4
C48-2MC	2000	8' X 8'9"	1/4	1250	4
C49-2MC	2000	9' X 8'4"	1/4	711	4
C47-2.5MC	2500	+90" X 130"	3/16-1/4	1400	4
C47-3MC	3000	+90" X 149"	3/16-1/4	1490	4
C48-3MC	3000	8' X 11'5"	1/4	1380	4
C49-3MC	3000	9' X 10'5"	1/4	836	4
C47-3.5MC	3500	+90" X 167"	3/16-5/16	1580	4
C47-4MC	4000	+90" X 186"	3/16-5/16	1750	4
C48-4MC	4000	8' X 14'1"	1/4	1530	4
C49-4MC	4000	9' X 12'6"	1/4	946	4
C410-4MC	4000	10' X 11'3"	1/4	2180	6
C48-5MC	5000	8' X 16'9"	1/4-5/16	1670	4
C49-5MC	5000	9' X 14'8"	1/4	1090	6
C410-5MC	5000	10' X 13'0"	1/4	2290	6
C48-6MC	6000	8' X 19'5"	1/4-5/16	1830	4
C49-6MC	6000	9' X 16'9"	1/4-5/16	1215	6
C410-6MC	6000	10' X 14'8"	1/4	2400	6
C412-6MC	6000	12' X 12'5"	1/4-5/16	3064	8
C49-7MC	7000	9' X 18'10"	1/4-5/16	1384	6
C410-7MC	7000	10' X 16'4"	1/4	2510	6
C412-7MC	7000	12' X 13'7"	1/4-5/16	3170	8
C49-8MC	8000	9' X 20'11"	1/4-3/8	1547	8
C410-8MC	8000	10' X 18'1"	1/4-5/16	2620	8
C412-8MC	8000	12' X 14'9"	1/4-5/16	3270	8
C410-9MC	9000	10' X 19'9"	1/4-5/16	2780	8
C412-9MC	9000	12' X 15'11"	1/4-5/16	3360	8
C410-10MC	10000	10' X 21'6"	1/4-5/16	2920	8
C412-10MC	10000	12' X 17'1"	1/4-3/8	3630	#4
C412-11MC	11000	12' X 18'4"	1/4-3/8	3760	#4
C412-12MC	12000	12' X 19'6"	1/4-3/8	3890	#4
C412-13MC	13000	12' X 20'8"	1/4-3/8	4020	#4
C412-14MC	14000	12' X 21'10"	1/4-3/8	4270	#4

+ 90" diameter tanks are constructed by centrifugally cast method.
Requires steel I-beam legs.

* Wall thickness is stepped.

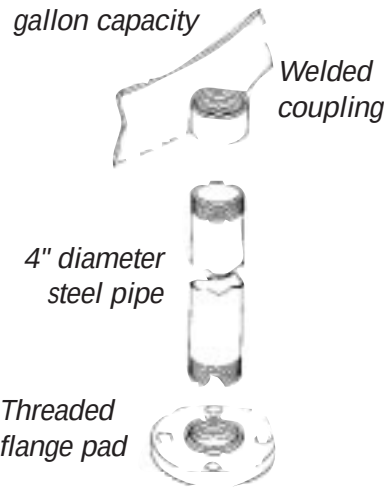
CONE BOTTOM

TANK DIAMETER	SIDEWALL GAL./INCH	45° CONE CAP. (GALS.)	0" CLEARANCE LEG LENGTH (IN.)
90"	27	608	50 3/8"
8'	31.3	670	54 1/2"
9'	39.6	1000	62"
10'	48.9	1320	68"
12'	70.5	2180	79"

STEEL LEGS

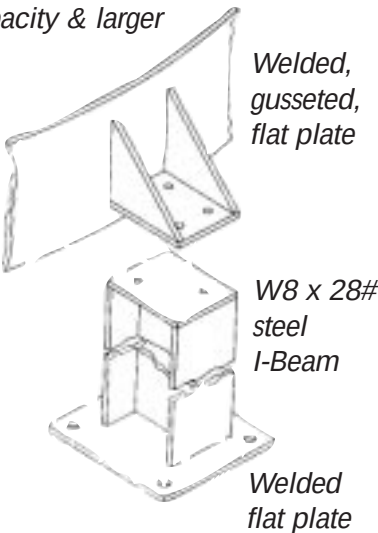
PIPE LEGS

All 8', 9', 10' and 12' tanks up to 10,000 gallon capacity



I-BEAM LEGS

Used with 12' diameter tanks, 10,000 gallon capacity & larger



LEG ORDERING INFORMATION

To order legs, specify number required and overall length. Overall length is determined by adding amount of leg for 0" clearance (shown above) to desired clearance between the bottom of the cone and the floor. (NOTE: Raven recommends that clearance not exceed 24" unless specific application has been reviewed by the factory.)

EXAMPLE: Legs for an 10' diameter 10,000 gallon tank (part #C410-10MO) with an 18" clearance from bottom of cone to the floor would be ordered as follows:

Number of legs required = 8

Leg length = 0" clearance

+ required clearance

68"+18"

Correct order would be (8) 86" tall legs.

CHOP-HOOP FILAMENT WOUND DISHED BOTTOM FIBERGLASS TANKS

DISHED BOTTOM - OPEN TOP



OPEN TOP PART NO.	NOMINAL CAPACITY (GAL.)	DIMENSIONS DIA. X HEIGHT (IN.)	WALL* THICK. (IN.)	APPROX. WEIGHT (LBS.)	NO. OF LEGS
D8-2MO	2000	8' x 6'2"	1/4	1195	4
D9-2MO	2000	9' x 5'4"	1/4	1052	4
D8-3MO	3000	8' x 8'10"	1/4	1350	4
D9-3MO	3000	9' x 7'5"	1/4	1176	4
D8-4MO	4000	8' x 11'6"	1/4	1495	4
D9-4MO	4000	9' x 9'6"	1/4	1300	4
D10-4MO	4000	10' x 8'0"	1/4	1120	6
D8-5MO	5000	8' x 14'2"	1/4-5/16	1650	4
D9-5MO	5000	9' x 11'7"	1/4	1425	6
D10-4MO	5000	10' x 9'8"	1/4	1300	6
D8-6MO	6000	8' x 16'0"	1/4-5/16	1900	4
D9-6MO	6000	9' x 13'9"	1/4-5/16	1586	6
D10-6MO	6000	10' x 11'5"	1/4	1490	6
D9-7MO	7000	9' x 15'10"	1/4-5/16	1751	6
D10-7MO	7000	10' x 13'1"	1/4	1670	6
D9-8MO	8000	9' x 17'11"	1/4-3/8	1917	8
D10-8MO	8000	10' x 14'9"	1/4-5/16	1920	8
D10-9MO	9000	10' x 16'6"	1/4-5/16	2150	8
D10-10MO	10000	10' x 18'2"	1/4-5/16	2360	8

* Wall thickness is stepped.

CHOP-HOOP FILAMENT WOUND DISHED BOTTOM FIBERGLASS TANKS - CONTINUED

- Dished bottom 8', 9' and 10' diameter tanks are available either open top or closed top in capacities to 10,000 gallons.
- 8' open top tanks include a 1/2" thick x 2 3/4" wide external flanged lip. 9' and 10' tanks have an internal flanged lip.
- Closed top tanks are designed for atmospheric pressure only and must be vented.
- Dished bottom chop-hoop filament wound tanks are supported by a fiberglass encapsulated steel leg ring and 4" diameter steel pipe legs.
- Tanks include three lift lugs to facilitate positioning of empty tank on site.
- **Seismic Zone design requires special consideration. Contact Plastics Engineering for full assistance.**

DISHED BOTTOM - CLOSED TOP

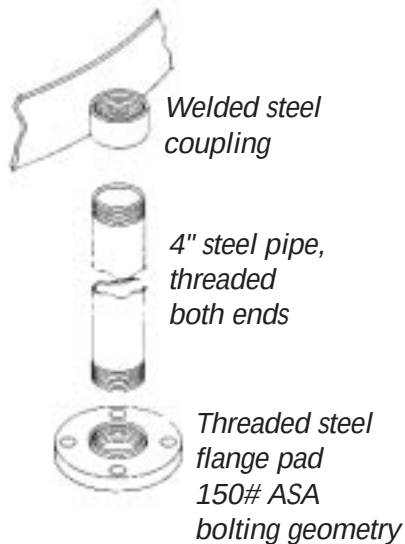
OPEN TOP PART No.	NOMINAL CAPACITY (GAL.)	DIMENSIONS DIA. X HEIGHT (IN.)	WALL* THICK. (IN.)	APPROX. WEIGHT (LBS.)	No. OF LEGS
D8-2MC	2000	8' x 6'8"	1/4	1280	4
D9-2MC	2000	9' x 5'10"	1/4	1117	4
D8-3MC	3000	8' x 9'4"	1/4	1430	4
D9-3MC	3000	9' x 7'11"	1/4	1242	4
D8-4MC	4000	8' x 12'	1/4	1580	4
D9-4MC	4000	9' x 10'10"	1/4	1368	4
D10-4MC	4000	10' x 8'7"	1/4	2002	6
D8-5MC	5000	8' x 14'8"	1/4-5/16	1730	4
D9-5MC	5000	9' x 12'1"	1/4	1419	6
D10-5MC	5000	10' x 10'3"	1/4	2182	6
D8-6MC	6000	8' x 17'4"	1/4-5/16	1980	4
D9-6MC	6000	9' x 14'3"	1/4-5/16	1621	6
D10-6MC	6000	10' x 12'0"	1/4	2372	6
D9-7MC	7000	9' x 16'4"	1/4-5/16	1803	6
D10-7MC	7000	10' x 13'8"	1/4	2562	6
D9-8MC	8000	9' x 18'5"	1/4-3/8	1968	8
D10-8MC	8000	10' x 15'5"	1/4-5/16	2826	8
D10-9MC	9000	10' x 17'1"	1/4-5/16	3046	8
D10-10MC	10000	10' x 18'10"	1/4-5/16	3276	8

* Wall thickness is stepped.

DISH BOTTOM

TANK DIAMETER	SIDEWALL GAL./INCH	DISH CAP. (GALS.)	0" CLEARANCE LEG LENGTH (IN.)
8'0"	31.3	425	20
9'0"	39.6	630	23
10'0"	48.9	875	25

STEEL PIPE LEGS



LEG ORDERING INFORMATION

To order legs, specify number required and overall length. Overall length is determined by adding amount of leg for 0" clearance (shown above) to desired clearance between the bottom of the dish and the floor.

(NOTE: Raven recommends that clearance not exceed 24" unless specific application has been reviewed by the factory.)

EXAMPLE: Legs for an 8' diameter 6000 gallon tank (part #D8-6MO) with a 24" clearance from bottom of dish to the floor would be ordered as follows:

Number of legs required = 4

Leg length = 0" clearance

+ required clearance

20"+24"

Correct order would be (4) 44" tall legs.

FLANGED CONNECTIONS

Hand lay-up vinylester flanges with stub pipe are available in sizes from 1" to 24" and are permanently bonded to the tank. Flanges can be located either above or below liquid level and can be ordered in three different styles based upon intended use.

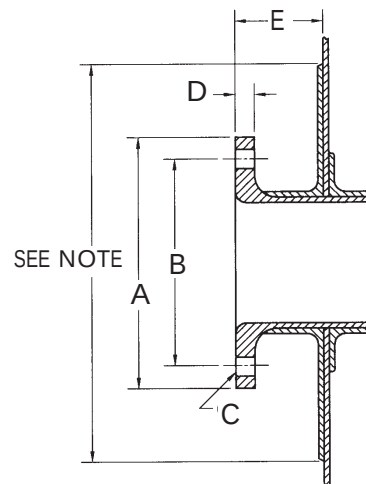
- Gaskets, bolts, washers, and nuts are not included with flanges. Raven recommends the use of a 40 to 60 durometer full faced gasket, 3/16" thick, and a maximum bolt take up torque of 30 ft.-lbs.
- Flange face is 150 lb. A.S.A. bolting geometry.
- Sidewall mounted flanges protrude inside tank a minimum of 1" as shown. Bottom flanges are flush mounted unless otherwise specified.

NOTE: Bonding area equals three times the nominal pipe size on all pipe through 8". On 10" through 24", patch diameter is 16" larger than pipe size.

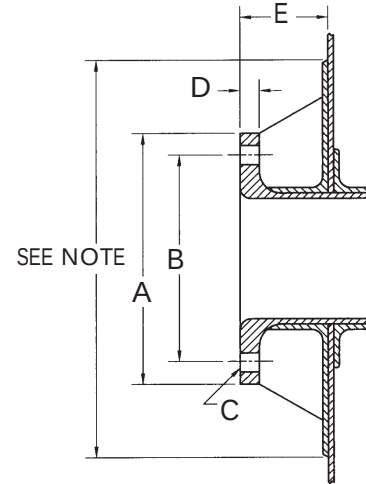
PIPE SIZE(IN.)	NON GUSSET	BLADE GUSSET	CONICAL GUSSET	A DIM. (IN.)	B DIM. (IN.)	C DIM. (IN.)	D DIM. (IN.)	E DIM. (IN.)	NO. OF HOLES
1	6058B	6174B	6269B	4 1/2	3 1/8	5/8	5/8	4	4
1 1/2	6058C	6174C	6269C	5 1/2	3 7/8	5/8	11/16	4	4
2	6058D	6174D	6269D	6 1/2	4 3/4	3/4	11/16	4	4
3	6058F	6174F	6269F	8	6	3/4	13/16	4	4
4	6058G	6174G	6269G	9 1/2	7 1/2	3/4	15/16	4	8
6	6058H	6174H	6269H	11 1/2	9 1/2	7/8	7/8	4	8
8	6058J	6174J	6269J	14	11 3/4	7/8	1	6	8
10	6058K	NA	NA	16 1/2	14 1/4	1	1 3/16	8	12
12	6058L	NA	NA	19 1/2	17	1	1 7/16	8	12
14*	6058M	NA	NA	21 1/2	18 3/4	1 1/8	1 1/2	8	12
18*	6058P	NA	NA	25 1/2	22 3/4	1 1/4	1 3/4	8	16
20*	6058R	NA	NA	28	25	1	1	8	20
24*	6123I	NA	NA	32 1/2	29 1/2	1	1 1/8	9	20

* Flange must include appropriate blind flange if used as below liquid level access.

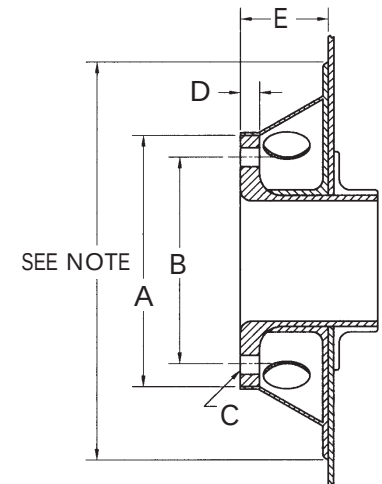
Non-Gusseted Flanges



Blade-Gusseted Flanges



Conically-Gusseted Flanges

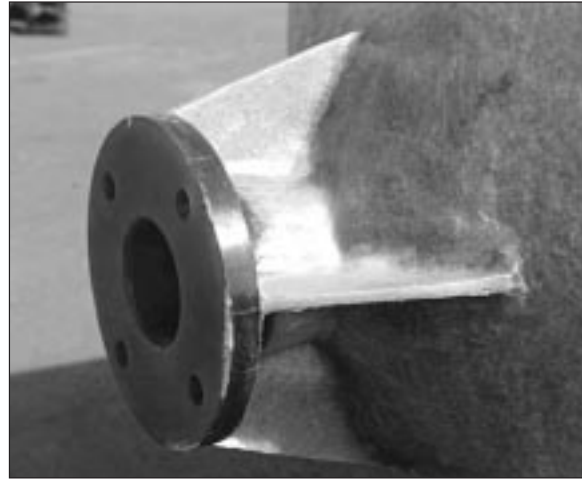


NON-GUSSETED FLANGES



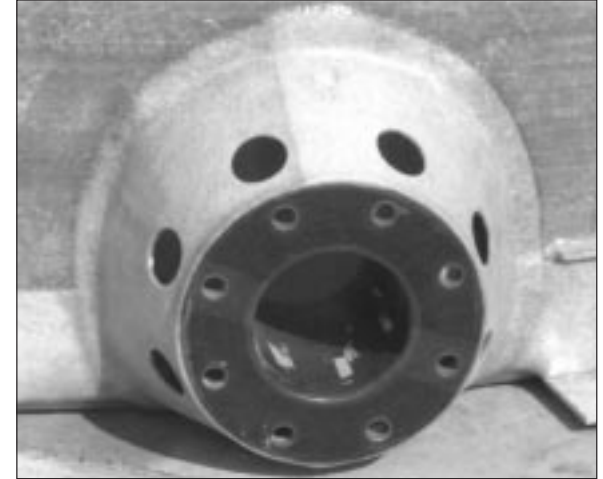
Non-gusseted flanges through 8" pipe size are designed for light duty, non-weight bearing applications on tanks 72" diameter or smaller. Raven recommends the use of gusseted flanges on all tanks 90" diameter and larger.

BLADE-GUSSETED FLANGES



Blade gusseted flanges are reinforced by flat fiberglass plates bonded the full length of the flange assembly. They are recommended for heavy-duty applications where ease of access to the back of the flange face is important.

CONICALLY-GUSSETED FLANGES

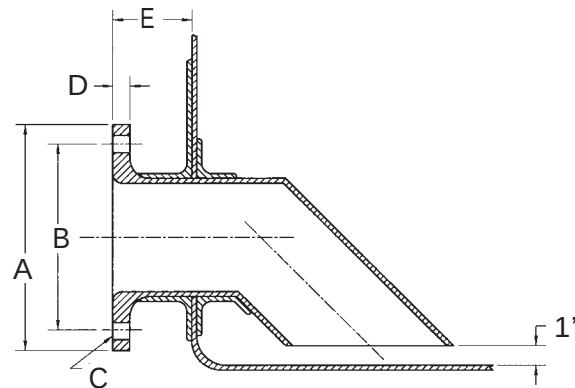


Conically gusseted flanges are reinforced by a fiberglass bonded cone and are recommended for applications where maximum strength is required.

SIPHON DRAIN FLANGES

PIPE SIZE(IN.)	NON GUSSET	BLADE GUSSET	CONICAL GUSSET	A DIM. (IN.)	B DIM. (IN.)	C DIM. (IN.)	D DIM. (IN.)	E DIM. (IN.)	No. OF HOLES
1 1/2	6122C	6175C	6270C	5 1/2	3 7/8	5/8	11/16	4	4
2	6122D	6175D	6270D	6 1/2	4 3/4	3/4	11/16	4	4
3	6122F	6175F	6270F	8	6	3/4	13/16	4	4
4	6122G	6175G	6270G	9 1/2	7 1/2	3/4	15/16	4	8
6	6122H	6175H	6270H	11 1/2	9 1/2	7/8	7/8	4	8
8	6122J	6175J	6270J	14	11 3/4	7/8	1	6	8

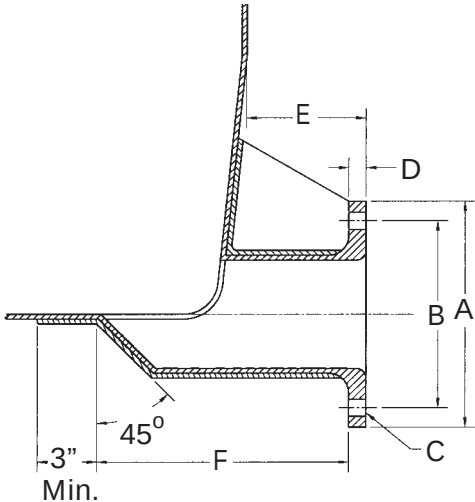
**NOTE: Bolts are not included with flanges unless a blind flange is also ordered. Column listing number of bolt holes and size refers to maximum size that flange will accommodate and does not necessarily reflect Raven's standard installation. See blind flanges below to determine standard size bolts.*



Available either non-gusseted (shown above) or gusseted, siphon drains provide drainage within 1" of tank bottom.

SIDE BOTTOM DRAIN FLANGES

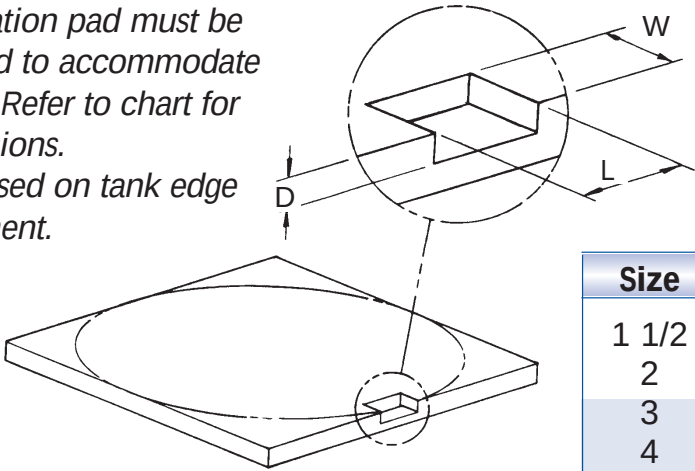
PIPE SIZE(IN.)	NON GUSSET	BLADE GUSSET	CONICAL GUSSET	A DIM. (IN.)	B DIM. (IN.)	C DIM. (IN.)	D DIM. (IN.)	E DIM. (IN.)	No. OF HOLES
1 1/2	6198C	6271C	5 1/2	3 7/8	5/8	11/16	4	8	4
2	6198D	6271D	6 1/2	4 3/4	3/4	11/16	4	8	4
3	6198F	6271F	8	6	3/4	13/16	4	8 1/2	4
4	6198G	6271G	9 1/2	7 1/2	3/4	15/16	4	8 1/2	8
6	6198H	6271H	11 1/2	9 1/2	7/8	7/8	4	11	8
8	6198J	6271J	14	11 3/4	7/8	1	6	12	8



Bonding Leg

Side bottom drains extend below the tank bottom to provide nearly complete drainage of flat bottom tanks. Must be gusseted.

Foundation pad must be notched to accommodate flange. Refer to chart for dimensions.
"W" based on tank edge placement.

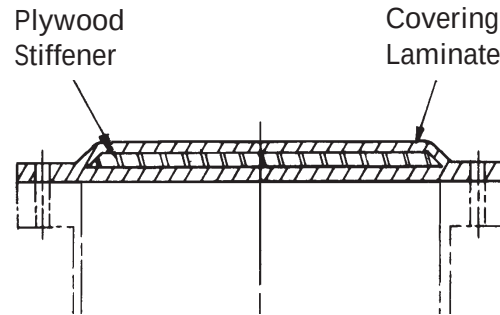


(inches)

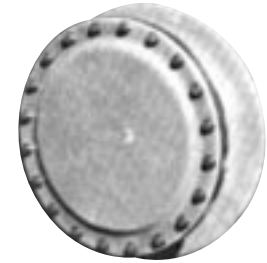
Size	L	W	D
1 1/2	12	8	4
2	13	8	4
3	14	8	5
4	15	8	6
6	20	10	7
8	24	10	8

BLIND FLANGES

PIPE SIZE (IN.)	PART No.
1	5163B
1 1/2	5163C
2	5163D
3	5163F
4	5163G
6	5163H
8	5163J
10	5163K
12	5163L
14	5163M
18	5163P
20	5163R
24	5123B



*NOTE: Diagram shows 10" – 18" blind flanges
1" – 8" are flat
20" – 24" are domed*



Blind flanges provide a sealed cap for flanges that are not currently plumbed to.

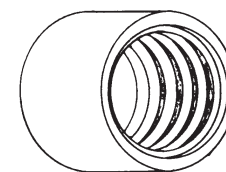
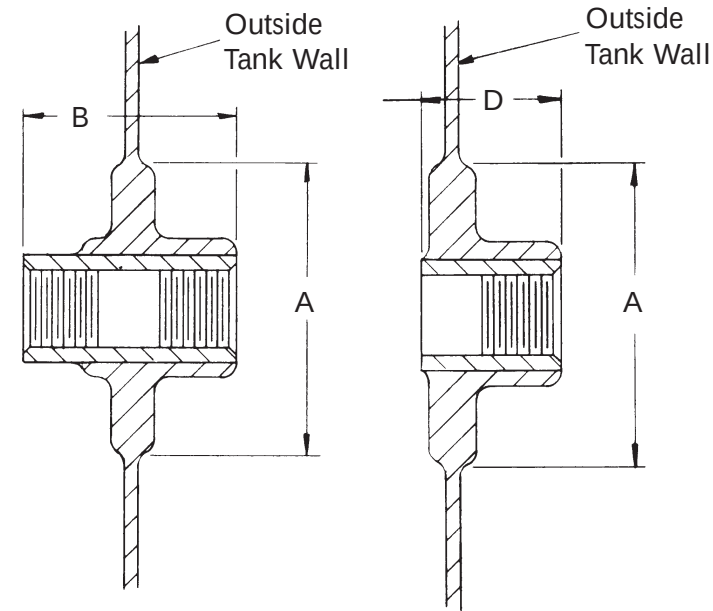
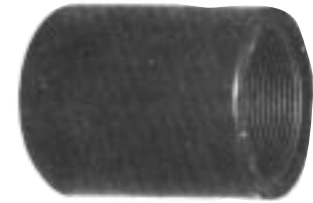
NOTE: All blind flanges are installed with teflon rope gasket, and stainless steel bolts, nuts, and washers.
1/2" bolting hardware supplied for sizes through 6",
3/4" hardware for 8" through 24" pipe size.

FULL AND HALF FRP COUPLINGS

PIPE PART No.	PIPE SIZE (IN.)	FULL OR HALF OD (IN.)	FULL OR HALF DIM. A(IN.)	FULL DIM. B(IN.)	HALF DIM. D(IN.)
6059B	1/2	1 1/4	4	4 3/8	2 3/16
6059C	3/4	1 5/8	5	4 3/8	2 3/16
6059D	1	1 7/8	6	4 3/8	2 3/16
6059E	1 1/2	2 1/2	8	4 3/8	2 3/16
6059F	2	3	9	4 1/2	2 3/16
6059G	2 1/2	3 3/8	10	4 1/2	2 3/16
6059H	3	4 3/8	13	4 3/8	2 3/16
6059J	4	5	15	4 3/8	2 3/16
6059K	6	7 1/4	20	4 1/4	2 3/16

Fiberglass female pipe threaded couplings are bonded permanently into the tank to eliminate potential leak problems. Full and half couplings are available in sizes from 1/2" to 6" and can be located anywhere on the tank except the saddle assembly contact area on horizontal fiberglass tanks.

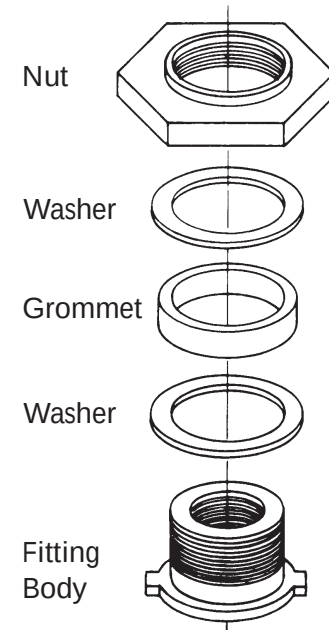
- Manufactured from corrosion-resistant vinylester resin.
- Outside bonding area at the coupling is equal to or greater than tank wall thickness.
- Inside surface is sealed with 2 layers of 1 1/2 oz. glass mat and the same resin as the tank wall on all tanks 60" diameter and larger. On smaller diameters inside sealing may not be possible unless tank is equipped with a manway.
- All side wall penetrations protrude as shown unless otherwise specified.
- Bottom fittings are flush mounted for complete drainage.
- Full couplings provide for internal piping. Please specify either full or half when ordering.
- 1 1/2" minimum edge to edge of couplings.
- 2" minimum edge to bottom of tank.



FIBERGLASS TANK BULKHEAD FITTINGS

DESCRIPTION	INSTALLED FITTING ASSEMBLIES		REPLACEMENT FITTING ASSEMBLIES	
	WITH NITRILE GROMMET	WITH FLOUREL GROMMET	WITH NITRILE GROMMET	WITH FLOUREL GROMMET
1/2"	5029IN	5029IF	5029AN	5029AF
1/2" double thread	5030IN	5030IF	5030AN	5030AF
3/4"	5031IN	5031IF	5031AN	5031AF
3/4" double thread	5032IN	5032IF	5032AN	5032AF
1"	5033IN	5033IF	5033AN	5033AF
1" double thread	5034IN	5034IF	5034AN	5034AF
1 1/4"	5035IN	5035IF	5035AN	5035AF
1 1/4" double thread	5036IN	5036IF	5036AN	5036AF
1 1/4" anti-vortex	5037IN	5037IF	5037AN	5037AF
1 1/2"	5038IN	5038IF	5038AN	5038AF
1 1/2" double thread	5039IN	5039IF	5039AN	5039AF
1 1/2" anti-vortex	5040IN	5040IF	5040AN	5040AF
2"	5041IN	5041IF	5041AN	5041AF
2" double thread	5042IN	5042IF	5042AN	5042AF
2" anti-vortex	5450IN	5450IF	5450AN	5450AF

Raven's patented bulkhead fittings for fiberglass tanks feature an expanding grommet (Nitrile or Flourel) which allows for location on most curved surfaces. Available in either PVC or glass filled polypropylene, bulkhead connections provide an economical option for tank penetrations on fiberglass tanks 48" diameter or less. Bonded in couplings are recommended for larger sizes. Before ordering, please consult corrosion guide to determine selection of fitting and grommet material.



INSTALLATION INSTRUCTIONS - FIBERGLASS TANKS

Use a standard hole saw that fits any 1/4" electric drill motor to cut the proper size hole in the fiberglass tank. A 2 1/8" hole is required for 1/2", 3/4" and 1" threaded fittings. A 3 1/4" hole saw is required for 1 1/4", 1 1/2", and 2" bulkhead fittings.

STEP 1 Place your finger through the fitting and install the body in the hole by placing one lug through the hole first. A slight tap with a hammer will slip the second lug through the hole.

STEP 2 Flex the back-up washer through the hole and over the fitting body.

STEP 3 Slip the grommet over the fitting body but do not slide it all the way down the body at this point.

STEP 4 While holding the fitting body with your finger, work the grommet down the fitting body until it is in the hole in the tank wall. (The grommet will protrude slightly on both the inside and outside of the tank.)

STEP 5 Place the washer on the fitting, then install the nut. Tighten until snug.
(Note that nut is left hand thread!)

Sealing is accomplished by the grommet expanding against the circumference of the hole you cut in the tank.

REPLACEMENT PARTS

DESCRIPTION	FITTING BODY	WASHER	GROMMET	NITRILE GROMMET	FLOUREL NUT
1/2"	5029R	5046R	5044N	5044F	5048R
1/2" double thread	5030R	5046R	5044N	5044F	5048R
3/4"	5031R	5046R	5044N	5044F	5048R
3/4" double thread	5032R	5046R	5044N	5044F	5048R
1"	5033R	5046R	5044N	5044F	5048R
1" double thread	5034R	5046R	5044N	5044F	5048R
1 1/4"	5035R	5047R	5045N	5045F	5049R
1 1/4" double thread	5036R	5047R	5045N	5045F	5049R
1 1/4" anti-vortex	5037R	5047R	5045N	5045F	5049R
1 1/2"	5038R	5047R	5045N	5045F	5049R
1 1/2" double thread	5039R	5047R	5045N	5045F	5049R
1 1/2" anti-vortex	5040R	5047R	5045N	5045F	5049R
2"	5041R	5047R	5045N	5045F	5049R
2" double thread	5042R	5047R	5045N	5045F	5049R
2" anti-vortex	5450R	5047R	5045N	5045F	5049R

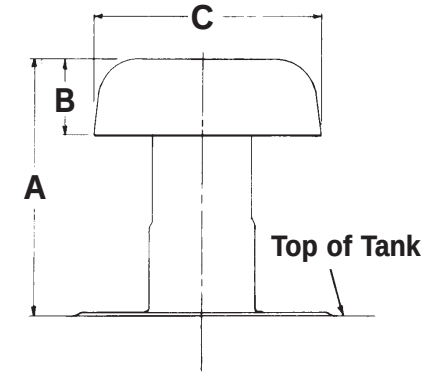
- Bulkhead fittings can be factory installed or shipped loose to be installed in the field.
- Fittings are available either with standard single thread or with double thread for applications requiring internal plumbing.
- Anti-vortex fittings feature an elevated interior plate designed to reduce vortexing problems.

NOTE: As in any gasketed fitting installation, grommets should be checked regularly and replaced if leaks are detected.

FRP MUSHROOM VENTS

PIPE SIZE (IN.)	PART NO.	A(IN.)	B(IN.)	C(IN.)
2	6293D	7 7/8	1 5/8	5
4	6293G	9 1/8	2 3/4	8 1/2
8	6293J	11 1/8	4 3/4	14

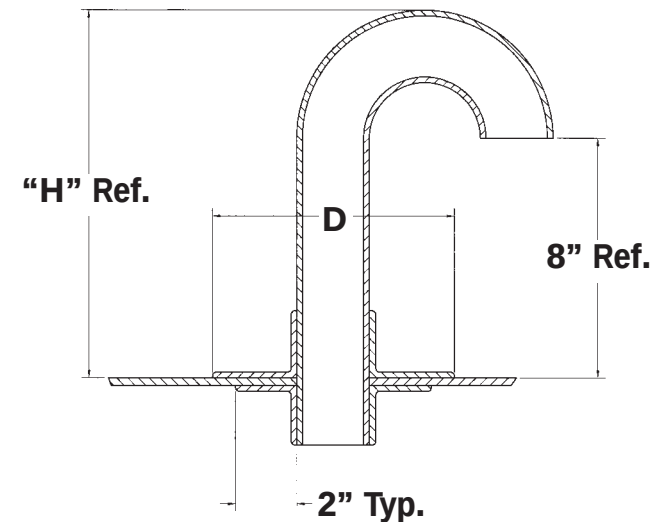
- Mushroom vents are constructed from corrosion-resistant vinylester resin and are permanently bonded directly to the top of the tank.
- Vent screen to keep out birds and bugs is available upon request. Use of a screen reduces vent capacity. Please contact the factory for recommendations and pricing.



FRP U-VENTS 2", 3", 4"

PIPE SIZE (IN.)	PART NO.	D (IN.)	H (IN.)
2	6155B	9	12
3	6155C	13	14
4	6155D	15	16

- 2", 3", and 4" U-vents are permanently bonded to the top of the tank.



FRP U-VENTS 6", 8"

PIPE SIZE (IN.)	PART NO.	A (IN.)	B (IN.)	C (IN.)
6	6155E	21"	24"	12"
8	6155F	25"	32"	16"

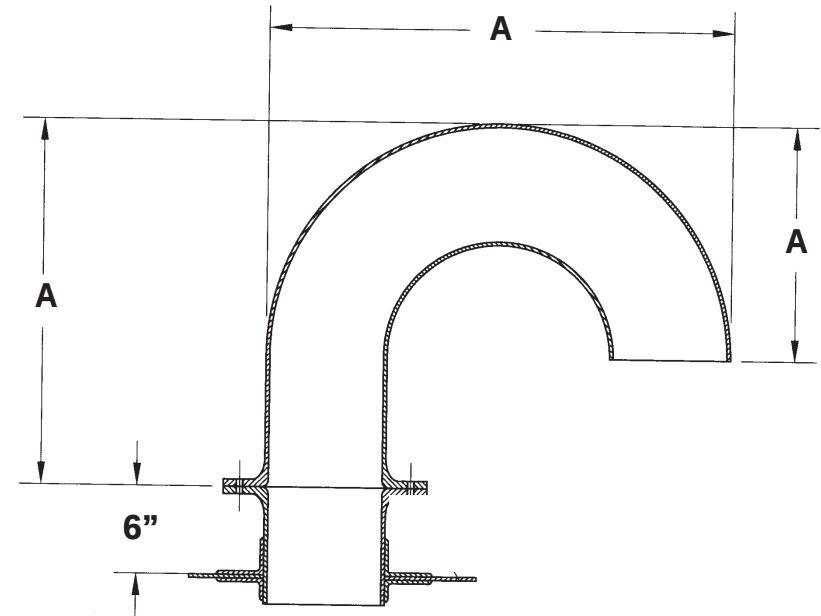
- 6" and 8" U-vents are bolted to the corresponding size non-gusseted duct style flange that is bonded into the top of the tank.

VENTING INFORMATION

All closed top tanks must have a vent of equal or greater size than the largest inlet or outlet. In addition to a standard vent, tanks being loaded by air pressure must have a minimum 18" quick access manway open and hold down lugs in use in order to prevent over pressurization and potential failure. Precautions must also be taken to avoid vacuum. If there is any question concerning the adequacy of the venting system contact the factory for recommendations.

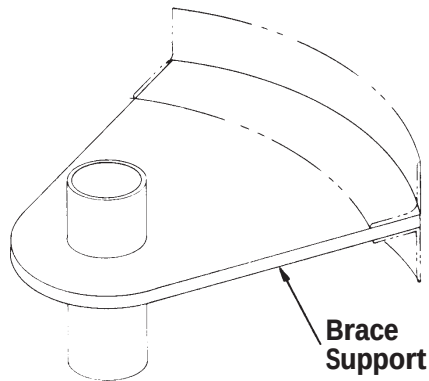
CAUTION!

All Raven tanks are designed for atmospheric pressure only and must be properly vented. Raven Industries, Inc. assumes no liability for any tank vented improperly.

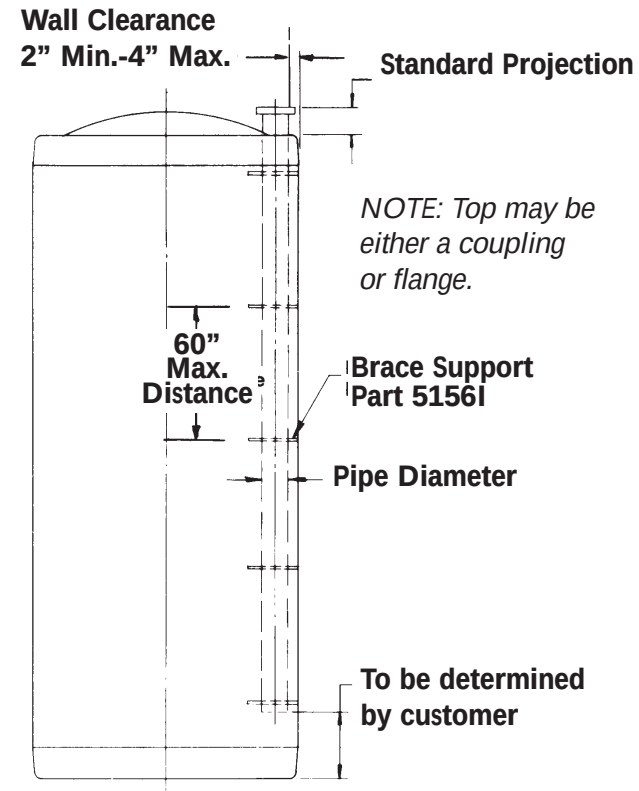


FIBERGLASS DOWNPIPES

PIPE SIZE	PART NUMBER
1"	5157B
1 1/2"	5157C
2"	5157D
3"	5157G
4"	5157H
6"	5157J
8"	5157K



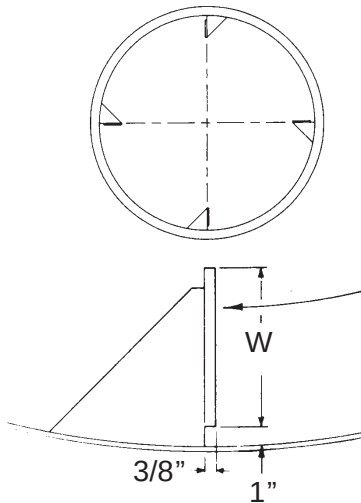
- Fiberglass downpipes are designed for either exterior or interior installation and are used for foam reduction, control of flow, and as a siphon drain.
- Standard installation features pipe permanently bonded to tank wall utilizing fiberglass brace supports. Maximum distance between supports is 60".
- External pipe support is provided using mounting lugs.



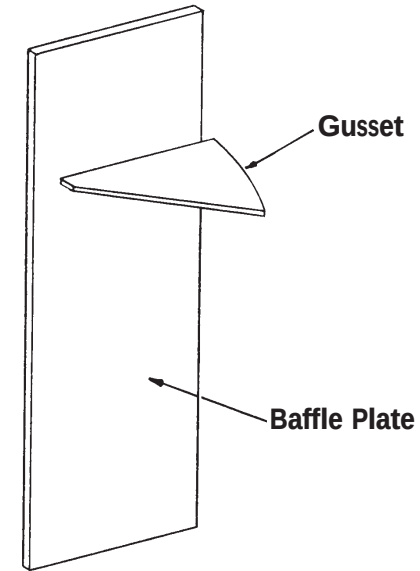
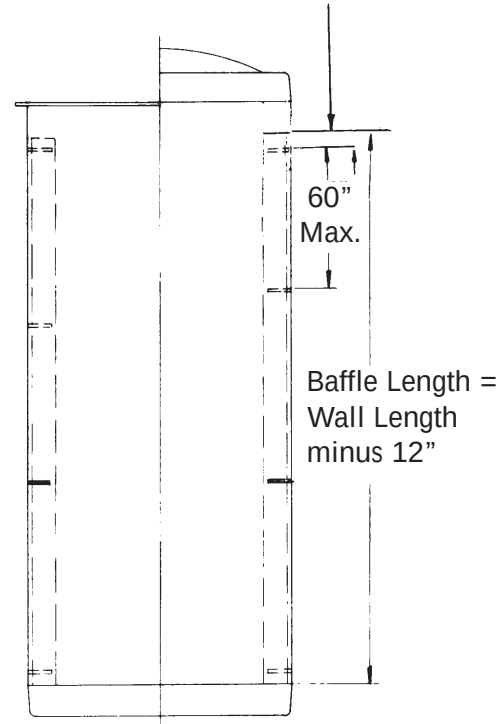
AGITATION BAFFLES

TANK DIA.	GUSSET PART NO.	BAFFLE PART NO.	BAFFLE WIDTH "W"
8'	5158M	5159M	8"
9'	5158K	5159K	8"
10'	5158N	5159N	10"
12'	5158P	5159P	10"

Typical Orientation



Locate top gusset 3-6" from end of baffle.



- Fiberglass baffles are designed to reduce vortexing in mixing applications.
- Flat plate baffles are bonded to tank wall utilizing fiberglass gussets. See drawing at left for baffle dimensions.
- Top and bottom gussets should be located within 3-6" of end of baffles. Distance between gussets should not exceed 60".

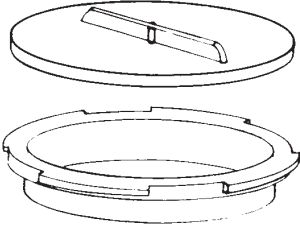
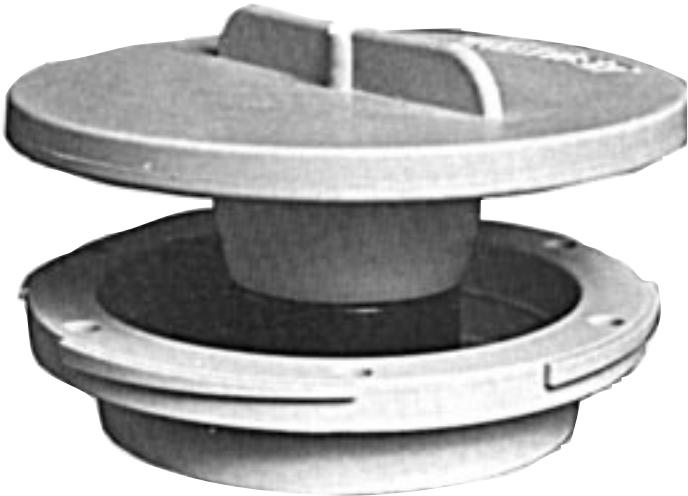
FILLWELLS & COVERS

Fillwells provide an economical means for quick top access for filling or for inspection of contents. 5" and 10" quarter turn fillwell covers are available plain or with a splash guard for mobile applications. 10" threaded fillwell cover is designed with a center vent.

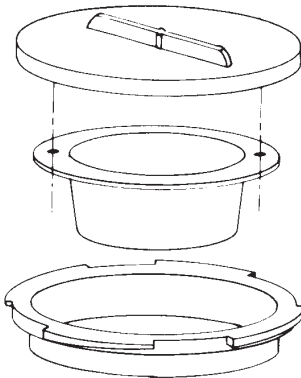
INSTALLED* DESCRIPTION	FILLWELL FILLWELL	PART COVERS	NUMBER
5" quarter-turn	5050I	plain	5051R
		w/splash guard	5052R
10" quarter-turn	5079I	plain	5080R
		w/splash guard	5082R
10" threaded	5479I	threaded	5478R

**NOTE: Part number represents installed fillwell only and does not include a cover. Cover must be ordered separately from Fillwell Cover column.*

5" QUARTER TURN W/SPLASH GUARD



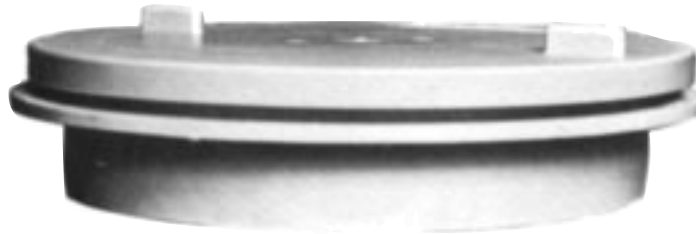
5" Quarter Turn
Plain
PVC or Filled
Nylon



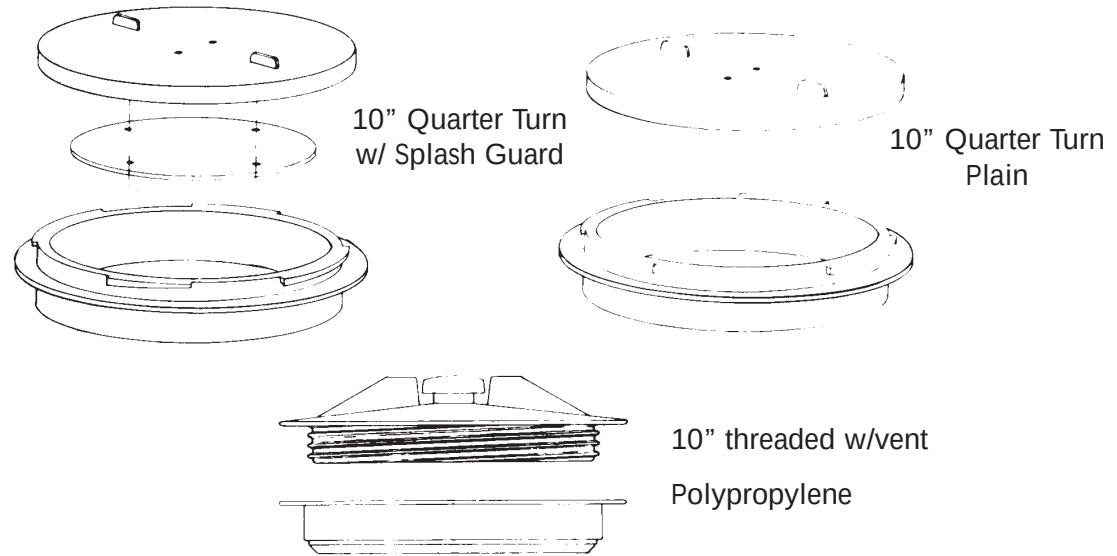
5" Quarter Turn
w/ Splash Gaurd
PVC or Filled
Nylon

Can be used on either flat or curved surfaces above liquid level.

10" QUARTER TURN PLAIN



- Can be used on flat or curved surfaces on tanks 30" diameter or larger.



- Flat Wells - PVC or Filled Polypropylene
- Curved Wells - PVC or Filled Nylon

10" THREADED (VENTED)



- Can be used only on flat surfaces.

REPLACEMENT PARTS

DESCRIPTION	REPLACEMENT FILLWELL	COVER GASKET	FILLWELL SEALANT	POP RIVETS	HOLE SIZE
5" quarter-turn	5050R	5076R	5105R	(6)5075R	5 3/4"
10" quarter-turn	5079R	5078R	5105R	(8)5075R	10 1/2"
10" threaded	5479R	5078R	5105R	(8)5075R	10 7/8"

- Specify fiberglass tank diameter when ordering replacement fillwells.
- Gaskets are 1/16" neoprene closed cell sponge rubber.
- Fillwell sealant is RTV silicone supplied in a 12 oz. tube which will seal (8) 10" fillwells.
- Pop rivets are 3/16" stainless steel.

16" & 22" FILLWELLS AND COVERS (ABOVE LIQUID LEVEL)

DESCRIPTION	16" PART NUMBER	22" PART NUMBER
Installed Fillwell	5464I	5490I
Cover Assembly	5470R	5491R
Replacement Fillwell	5464R	5490R
Replacement Center Cap	5469R	5469R
Pop Rivets (8)	5075R	-
Self Tapping Screws (8)		110053864

NOTE: Must be installed in flat surface.

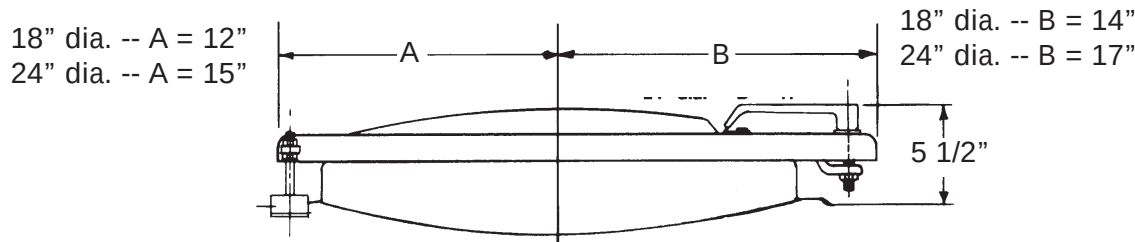
Polypropylene threaded fillwells feature large precision threads and are ideal for oval and vertical polyethylene tanks where inside access is required.



HINGED QUICK ACCESS MANWAYS (ABOVE LIQUID LEVEL) - 18" AND 24"

DESCRIPTION	18" PART NUMBER	24" PART NUMBER
Installed manway	6137I	6247I
Replacement manway	6137R	6247R
Replacement cover only	6138R	6248R
Latch assembly only (plated zinc)	6140R*	6140R*
Hinge assembly only (stainless steel)	6141R	6141R
Gasket (neoprene)	6144R	6246R

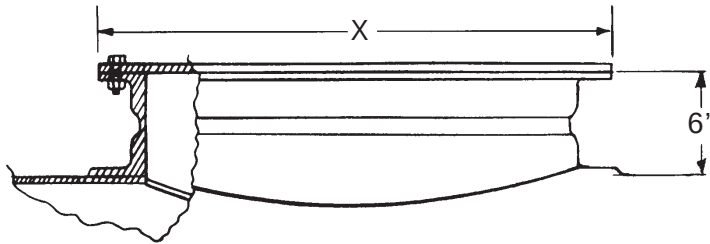
Available in either 18" or 24" diameter, hinged quick access manways provide quick and easy access to fiberglass tanks for above liquid level service.



**CAUTION: When HCL acid is present a fiberglass latch is required! Contact factory for details.*

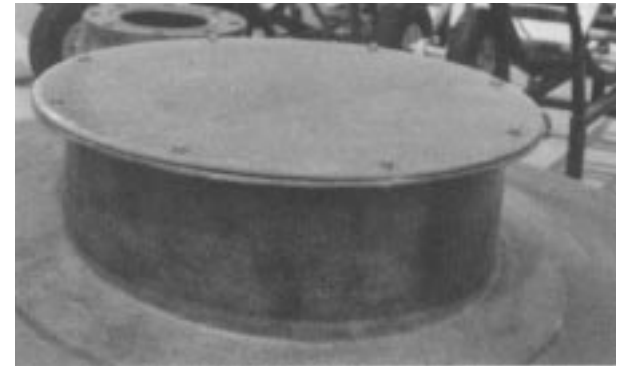
BOLT DOWN MANWAYS (ABOVE LIQUID LEVEL) - 24" AND 32"

DIAMETER (IN.)	PART NO.	NO. BOLTS	X (IN.)
24	6118I	8	28 5/16
32	6119I	8	36 1/4



Caution: Tank must be vented to atmosphere when manway is installed.

Available in either 24" or 32" size, the bolt down manway features a 3/8" thick FRP over fastened to a 3/8" flanged lip and can be located anywhere above liquid level that does not interfere with a head seam.

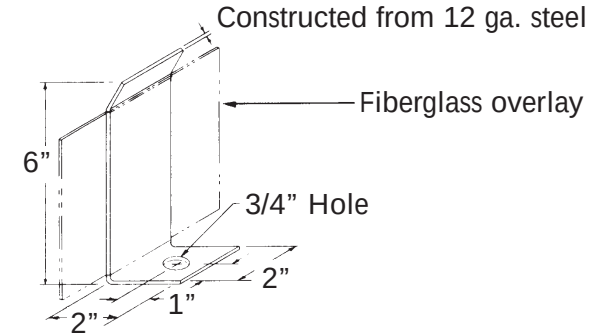


STEEL HOLD DOWN LUGS LIGHT DUTY

DESCRIPTION	GALVANIZED STEEL	304 STAINLESS	316 STAINLESS
Light Duty	5081I	5081J	5081K

Light duty hold down lugs are designed to provide stability for fiberglass tanks 48" diameter and smaller.

- Available in galvanized steel or in 304 and 316 stainless steel for more corrosive environments.
- Lugs are bonded permanently to tank wall and are intended to be bolted into a concrete mounting pad. Anchor bolts should be located after tank has been placed on pad (bolts not included).

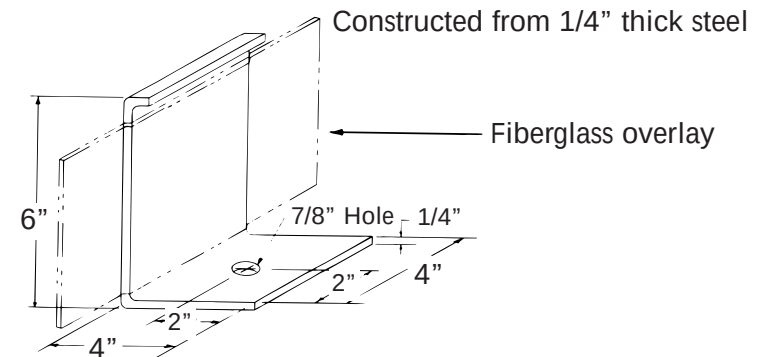


STEEL HOLD DOWN LUGS HEAVY DUTY

DESCRIPTION	GALVANIZED STEEL	304 STAINLESS	316 STAINLESS
Heavy Duty with holes	5362I	5362J	5362K
Heavy Duty w/out holes	5363I	5363J	5363K
Clamp	5161R	5161J	5161K

Heavy duty steel hold down lugs are designed for use with tanks 60" diameter or larger where there are seismic, mixing, or wind loading concerns. For specific seismic zone information contact the factory.

- Available in galvanized steel, or in 304 and 316 stainless steel.
- Lug can be ordered with or without holes. Lugs without holes are secured by steel clamps as shown in fiberglass lug drawing at right.

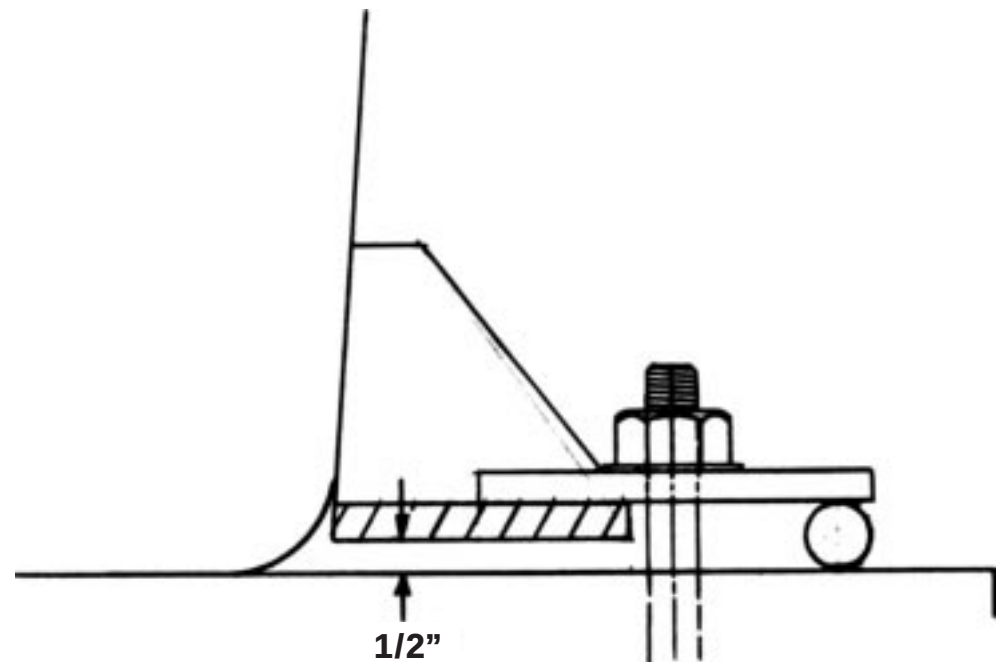
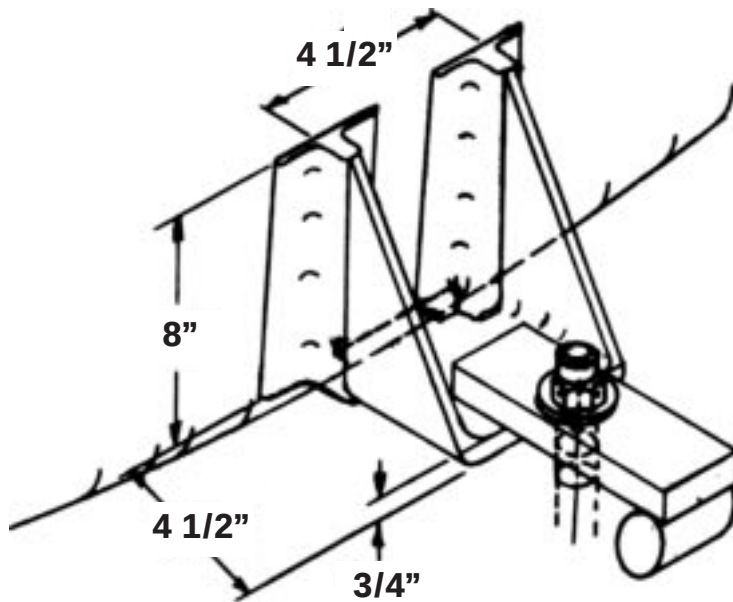


FIBERGLASS HOLD DOWN LUGS HEAVY DUTY

DESCRIPTION	PART NUMBER
Fiberglass - heavy duty	5162I
304 stainless clamp	5161J
316 stainless clamp	5161K
Galvanized carbon steel	5161R

Heavy duty fiberglass hold down lugs are designed for use in highly-corrosive environments where there are mixing or wind loading concerns.

- Fiberglass hold down lugs are secured to pad by clamps. Clamp anchoring bolts should be located after tank is mounted on pad (bolts not included).
- Lug is bonded permanently to tank sidewall with laminate equal to or greater than tank wall thickness.



LIFT LUGS

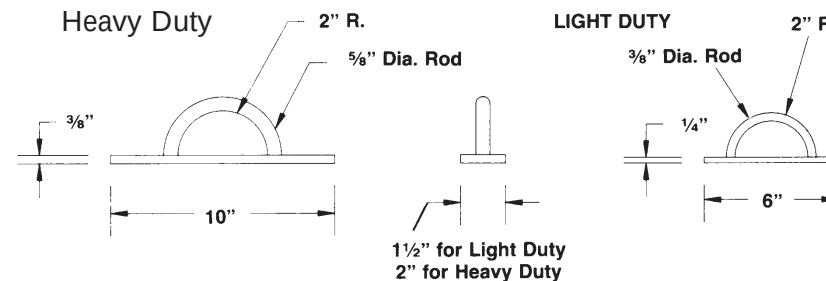
DESCRIPTION	GALVANIZED STEEL	304 STAINLESS	316 STAINLESS	RECOMMENDED USE
Light duty	5197I	5197J	5197K	23"-72" diameter tanks
Heavy duty	5153I	5153J	5153K	90" diameter and larger
Foamed tank-sidewall	5238I	5238J	5238K	insulated tanks
Foamed tank-knuckle	5240I	5240J	5240K	insulated tanks-top knuckle

Lift lugs provide a safe, economical means to lift **empty** fiberglass tanks for on site handling.

- Lift lugs are required on all tanks 90" diameter and larger.
- Lugs are attached to tank wall with hand-layed laminate equal to or greater than the tank wall thickness.
- Lugs are available in galvanized steel and 304 or 316 stainless steel.

HEAVY DUTY LIFT LUGS

Heavy duty lugs are required on all tanks 90" diameter and larger and are included with the tank. Refer to specific tank size on separate price sheet to determine number of lugs that are included as a standard. Additional lugs are available as an option.



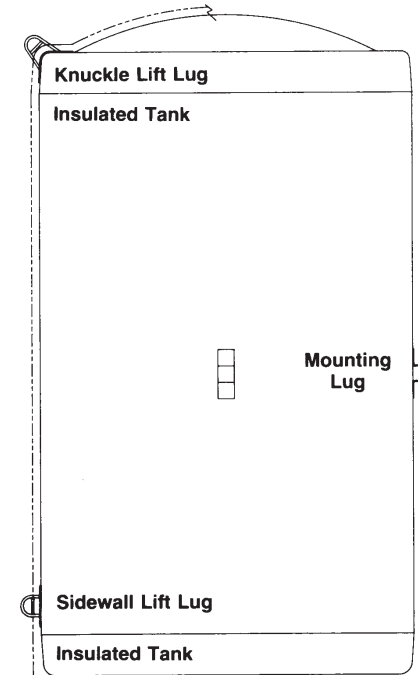
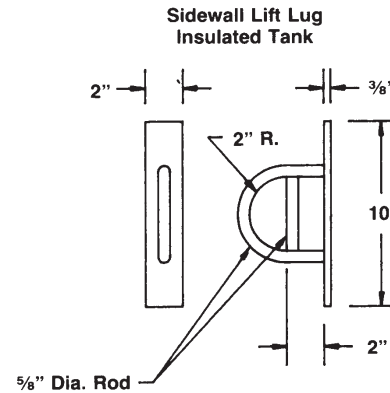
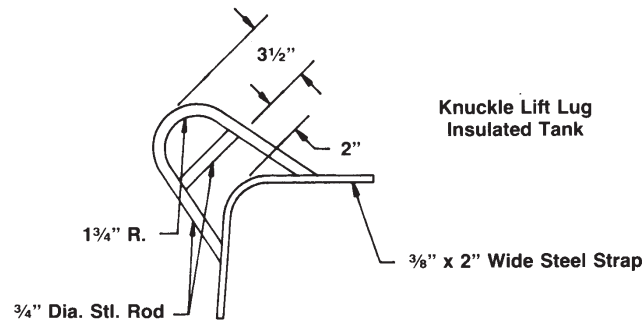
LIGHT DUTY LIFT LUGS

Light duty lugs are designed to be used on fiberglass tanks 72" diameter and less.

FOAMED TANK LIFT LUGS

Lift lugs for polyurethane insulated tanks feature additional height to compensate for 2" foam thickness. Typical installation would consist of:

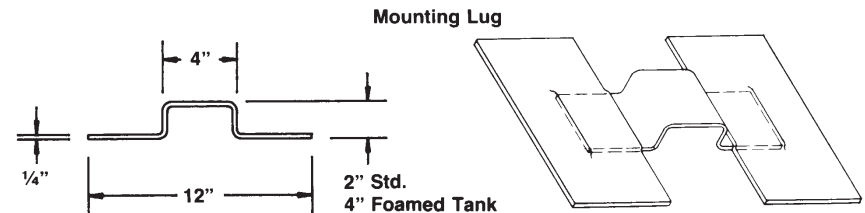
- (1) SIDEWALL LIFT LUG near the bottom.
- (2) KNUCKLE LIFT LUGS at the top. Refer to drawings on this page for detail.



MOUNTING LUGS

Mounting lugs are available in galvanized steel or fiberglass and are designed to bolt accessories (gauges, level indicators, etc.) to the tank wall.

- Attached to wall with hand-layed laminate equal to or greater than wall thickness.
- May be located on any style tank per customer specifications.



MOUNTING LUGS	PART No.
Galvanized Steel	5160I
Fiberglass	5214I

LADDERS & CAGES

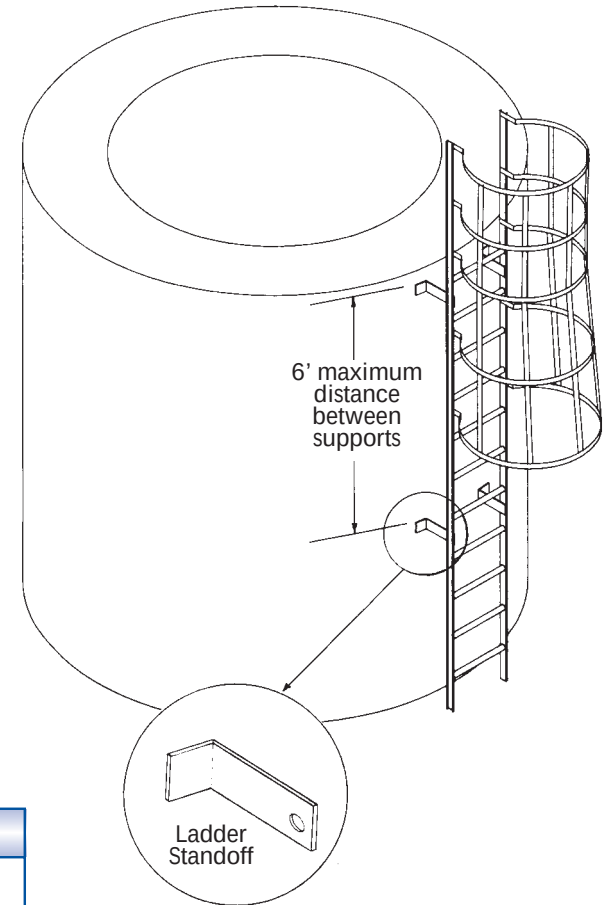


Ladders and cages meeting OSHA standards are available on any style fiberglass tank in carbon steel, fiberglass, or aluminum. Standard ladders include 3'6" walk thru.

Ladders are secured to tank wall by bolting to an "L" shaped mounting lug bonded permanently to the tank. See drawing for detail.

To order follow the guidelines listed below:

- Total ladder length = tank height + 3'6".
- Total cage length = ladder length - 7'.
- Maximum center to center distance on mounting lugs is 6'.
- See example on right for assistance.



EXAMPLE

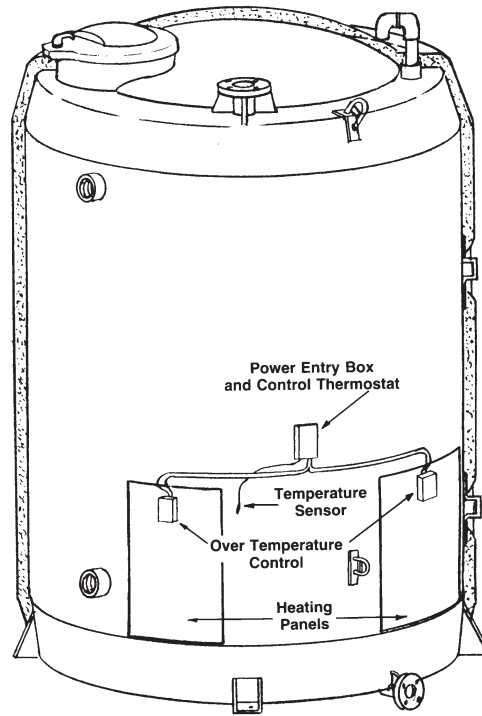
Calculate ladder length, cage length, and required number of supports for a tank that is 20' tall.

$$\begin{aligned} \text{Ladder length} &= \text{Tank height} + 3'6" \\ 20' + 3'6" &= 23'6" \end{aligned}$$

$$\begin{aligned} \text{Cage length} &= \text{Ladder length} - 7'0" \\ 23'6" - 7'0" &= 16'6" \end{aligned}$$

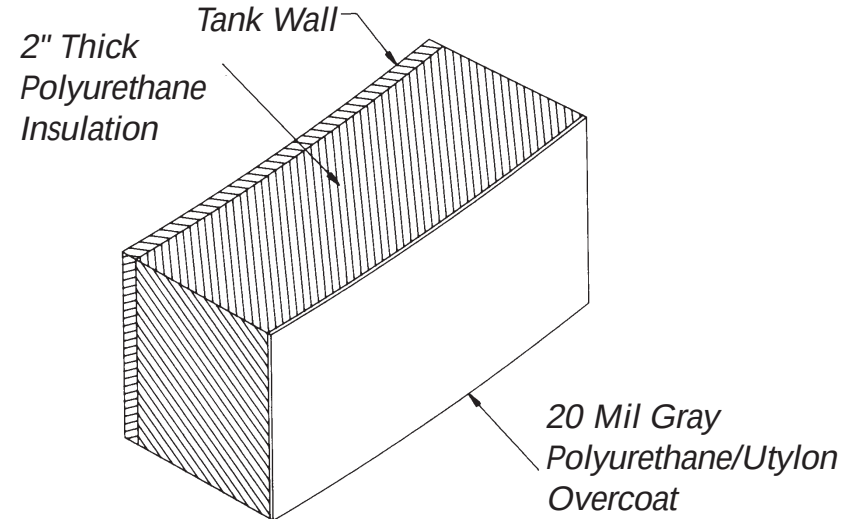
$$\begin{aligned} \text{Lugs Required} &= \text{Tank height}/6' \text{ (rounded up to next whole no.)} \\ 20'/6' &= 3.33 \text{ (round to 4) ladder requires 4 pair of lugs.} \end{aligned}$$

HEATING SYSTEMS



- Heating systems for fiberglass tanks are designed for temperature maintenance only. Sketch above reflects one style of heating system.
- Operate from 120 VAC power source with a low watt/in² output.
- Enclosed, weatherproof NEMA 4 thermostat operates up to four panels in a parallel circuit.
- To adequately design a system we require tank dimensions, anticipated minimum ambient temperature, wind velocity, and the desired minimum temperature of the contents.
- Alternate heating systems can be designed. In all cases, consult with factory for pricing.

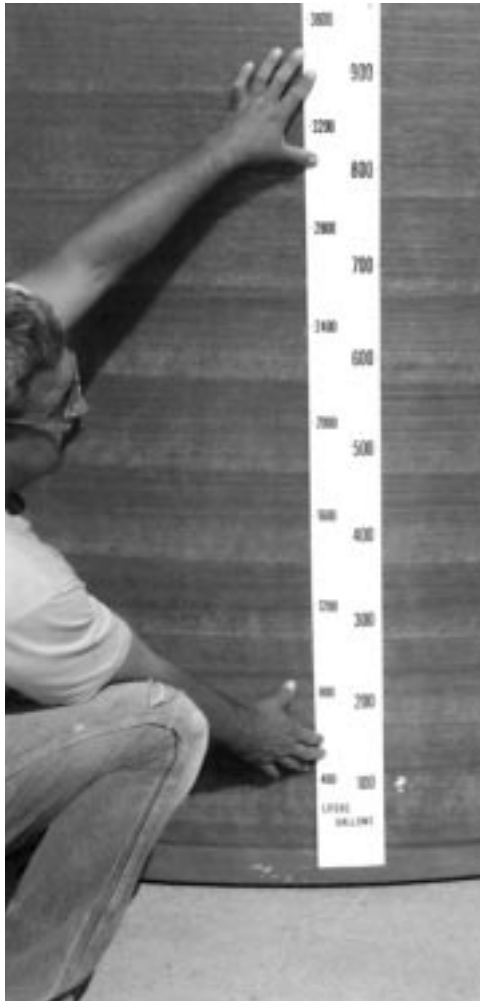
URETHANE INSULATION WITH UTYLON OVERCOAT



- Spray-on two part polyurethane foam, 2 to 2.5 pounds per cubic foot density. R value is 7.8 per inch of thickness.
- Overcoat consists of a two-part polyurethane base and a top coat of Utylon material. Total thickness is approximately 20 mils.
- Standard top coat color is gray.
- Materials exhibit excellent weathering characteristics and good corrosion resistance.
- Any damage resulting from handling or shipping should be immediately repaired to avoid moisture entry.
- Deep insulation gouges may be repaired with aerosol polyurethane foam.
- Overcoat abrasion may be recoated with the Utylon elastomer overcoat.
- If temperature is below 50°F, an industrial grade RTV silicone caulking may be used.

NOTE: Other lower cost options may be available. Please consult with the factory.

GALLONAGE TAPES—FRP



Tapes are marked in gallons and liters.

Gallonage tapes are available for cataloged vertical and horizontal fiberglass tanks 23" thru 72" diameter and are supplied with black lettering on white adhesive backed tape.

Tapes for 90" diameter tanks are 3 1/2" wide and are supplied with black lettering on white adhesive backed tape.

Tapes for 8', 9', 10', and 12' diameter tanks are marked in 500 gallon and 2000 liter increments and are supplied on Pellon veil bonded to the tank wall.

NOTE:

Due to limited translucency of tank wall, liquid level may be difficult to see in low light environments. Raven recommends the use of a sight tube assembly for those applications where viewing liquid level is critical.

TANK DIA.	GAL. RANGE	PART No.	GALLONAGE INCREMENT
23-38	To capacity	5056I	10
42-48	To capacity	5056I	20
60	To capacity	5056I	50
72	To capacity	5056I	100
90	0-2000	5264I	200
90	0-4000	5265I	200
90	0-6000	5266I	200
8'	0-2000	5337I	500
8'	0-4000	5338I	500
8'	0-6000	5339I	500
8'	0-8000	5340I	500
9'	0-2500	5341I	500
9'	0-5000	5342I	500
9'	0-7500	5343I	500
9'	0-10000	5344I	500
10'	0-3500	5350I	500
10'	0-7500	5351I	500
10'	0-12000	5352I	500
10'	0-15000	5354I	500
12'	0-5000	5355I	500
12'	0-10000	5356I	500
12'	0-15500	5357I	500
12'	0-21000	5358I	500
12'	0-26000	5360I	500
12'	0-30000	5361I	500

PVC SIGHT TUBE ASSEMBLIES

Rigid PVC sight tube assemblies provide a relatively simple and economical method to positively view liquid level in Raven fiberglass tanks. Direct measurement mechanical systems are also available by factory quotation.

Raven's standard assembly is available in either 3/4" or 1" size and features one bottom angle valve for emergency shut off. If contents are potentially hazardous, Raven recommends that a top shut off valve be added as a precaution.

An intermediate support is required when overall sight tube length reaches 10' and one additional support is required for each 6' length thereafter.

PARTS LIST

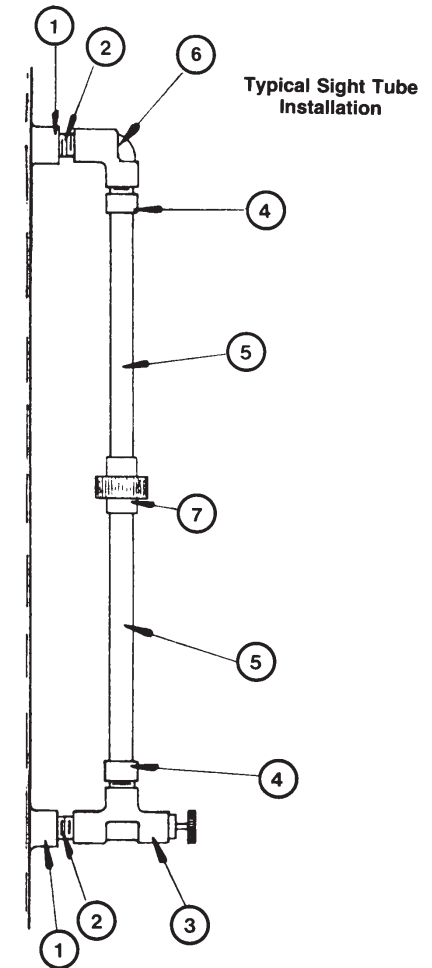
ITEM NO.	DESCRIPTION
1	Fiberglass Coupling*
2	PVC Close Nipple
3	PVC Angle Valve
4	PVC Male Adapter
5	PVC Pipe
6	PVC 90° Elbow
7	PVC Union, Socket, Socket

**Coupling bonded into tank*
Specify either 3/4" or 1" - 1 valve or 2 valve

EXAMPLES:

SIGHT TUBE LENGTH	NUMBER OF SUPPORTS
<10'	0
10'-17'11"	1
18'-23'11"	2

NOTE: When storing hazardous materials or located (tank) in a high traffic area, an ultrasonic level transmitter is strongly recommended. See information on TRANSMITTERS and CONTROLLERS for more details.



INTERNAL SLOPED BOTTOM CHOP-HOOP FILAMENT WOUND TANKS

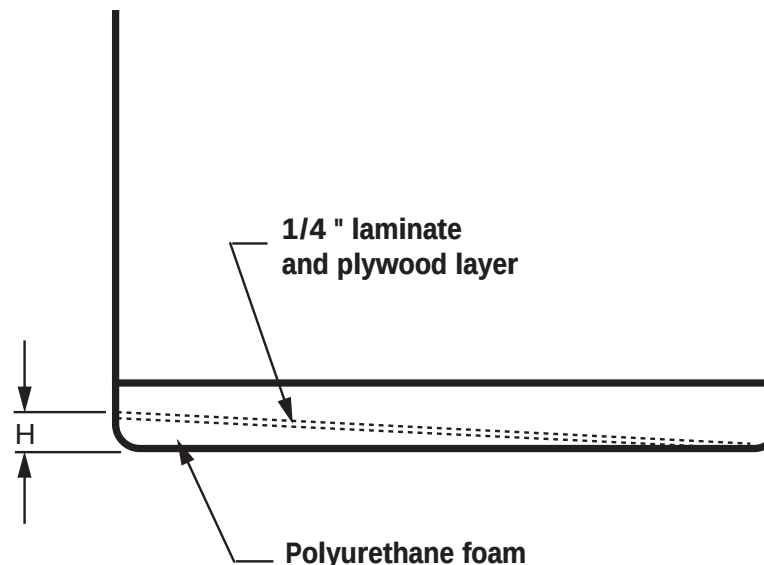
TANK DIAMETER	H DIMENSION	PART NUMBER
*90"	3 3/4"	5152I
8'0"	2 1/2"	5152J
9'0"	2 13/16"	5152K
10'0"	3 1/4"	5152L
12'0"	3 3/4"	5152N

**90" diameter tanks are produced by the centrifugally cast method and feature a 1/2" per foot slope.*

NOTE: Sloped bottoms are also available in centrifugally cast tanks. Contact factory for details.

Internal sloped bottoms are designed to provide full drainage when used in conjunction with a side bottom drain.

- Tank bottom slopes 5/16" per foot from high side to low side of drainage point. Contact the factory for custom slope applications.
- Slope is formed by covering a polyurethane foamed bottom with plywood and a layer of fiberglass laminate at least 1/4" thick.
- Tank must be mounted on a level pad.



ECHOTOUCH™ ULTRASONIC LEVEL TRANSMITTER



Model No.	Description
LU20-5001	Echotouch™ Two Wire Transmitter, Loop Powered (4-20mA), 0.5' - 18'
LU20-5001 - IS	Echotouch™ Intrinsically Safe Two Wire, Transmitter Ultrasonic Level Transmitter, 0.5' - 18'
LU30-5003	Echotouch™ Three-Wire Ultrasonic Level Transmitter (4-20mA), sourcing, 0.5' - 24.5'
LU30-5004	Echotouch™ Three-Wire Ultrasonic Level Transmitter (4-20mA), sinking, 0.5' - 24.5' (use with LC52-1001).

TECHNOLOGY

A high frequency ultrasonic sound wave is pulsed two times per second from the base of the transducer. The sound wave reflects against the process medium below and returns to the transducer. The micro-processor based electronics measure the time of flight between the sound generation and receipt, and translates this figure into the distance between the transmitter and process medium below.

FEATURES

- 8° beam allows application in restricted environments
- Rugged NEMA 4X enclosure with PVDF transducer
- Adjustable blocking distance filter for broad application (LU20 only).
- Automatic temperature compensation over entire range
- Easy-Cal™ push button calibration for all user set points
- LCD digital display indicates level in inches or centimeters
- Echo-Map™ filtration eliminates false echo signal returns
- Fail-safe intelligence provides maximum process safety

NOTES:

LU20-IS

(1) Intrinsic Safety Barrier: The LB10-10001 Stahl intrinsic safety barrier may be purchased separately.

LU30

(1) Sourcing vs Sinking: The sourcing output provides internal excitation for use with sinking devices. The sinking output requires external excitation for use with sourcing devices.

(2) Power Supply: The LC95-1001 120 VAC power supply (rated 24 VDC @ 0.6A) may be purchased separately.

CONTINUOUS RELAY CONTROLLER

PART. No.	DESCRIPTION
LC52 -1001	Continuous Relay Controller

APPLICATION

For single tank relay control and indication, package the continuous relay controller with any of our level transmitters. The general purpose DIN controller is commonly used for the automatic filling or emptying of a tank between two set points with an additional high or low level alarm set point.

A single latched relay performs the automatic pump or valve control, while a second relay provides an independent alarm. With a built-in power supply and analog repeater, the continuous relay controller offers a complete solution for single tank automation.

FEATURES

- Remote relay controller with three process set points, two relay outputs and an isolated 4-20 mA repeater
- LED digital display indicates level measurement in gallons, inches or percentage of span
- Easy-Cal™ push button calibration for offset, span and relay set points
- Fail-safe design for direct actuation of pumps, valves or alarms
- Bar graph indicates current reading as a percentage of span
- Adjustable 0-60 second time delay dampens out relay chatter
- LED indicators for power and relay output status
- PP enclosure mounts on 35 mm DIN rail or panel installation
- Invert switch provides simple NO or NC relay operation
- Security lock out protects user defined set points



LEVELINK™ MULTI-CHANNEL RELAY CONTROLLER

PART. NO.	DESCRIPTION
LC55-1001	Multi-Channel Relay Controller
LC57-1001	Modem and remote access software

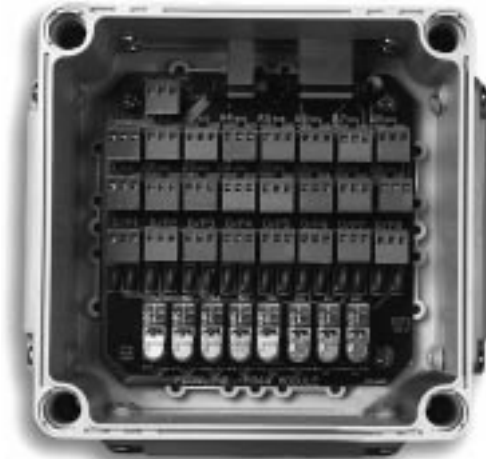
APPLICATION

For multi-tank relay control, indication, data logging and telemetry, package the LevelLink multi-channel controller with any of our level transmitters or level switches. The general purpose controller is a complete level management system with up to sixteen sensor inputs, eight relay outputs and a RS485 data connection.

For remote data acquisition and calibration of your process, install the optional modem and connect to LevelLink through the available data web-site or software packages. With a NEMA 4X, wall mount enclosure, LCD display and advanced data logging functions, the LevelLink multi-channel controller is the ultimate solution for tank automation and inventory control.

FEATURES

- Multi-tank relay controller with up to sixteen sensor inputs, eight relay outputs and an RS485 data connection
- Automates up to eight tanks with advanced linearization and inventory control functions
- Optional modem and software for worldwide calibration and data acquisition
- Rugged polycarbonate enclosure rated NEMA 4X with integral junction box
- LCD digital display indicates level in volume, distance or weight
- Data logger provides up to 64 days of real time and historical data
- Self test routine constantly scans each input and output channel
- Password protected system with up to three levels of user access
- Fail-safe relays for direct actuation of pumps, valves or alarms
- Adjustable time delay dampens out relay chatter



COMMUNICATION

For remote data acquisition and control of your process, simply install a phone line, our modem and select from one of the following remote communication packages.

[RAS™ Remote Access Software](#)

RAS is a simple Windows™ based program which displays a graphical depiction of the LevelLink faceplate including the display and keypad. Once connected, authorized users can remotely view level process data and change calibration set points.

[WEBLINK™ Data Website](#)

By subscribing to the WEBLINK data website, authorized users can remotely view and download up to three years of process data over the Worldwide Web. WEBLINK data report pages are customized for the subscriber in chart or graphic formats. The optional alarm management package alerts users to key process events by Email, fax or pager.

[InfAct™ Control Center Software](#)

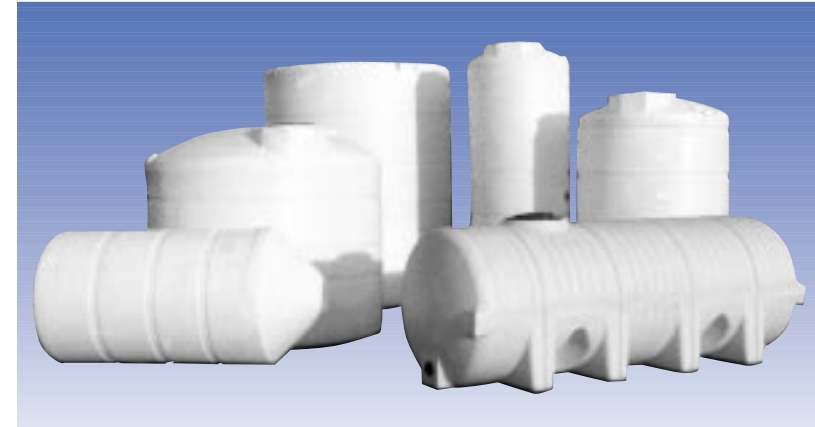
For the technical user who wants maximum control over their LevelLink process data, InfAct control center software is the right solution. InfAct is a Windows™ based program which combines advanced LevelLink commissioning functions with an SQL database.

TYPICAL PROCESSING EQUIPMENT

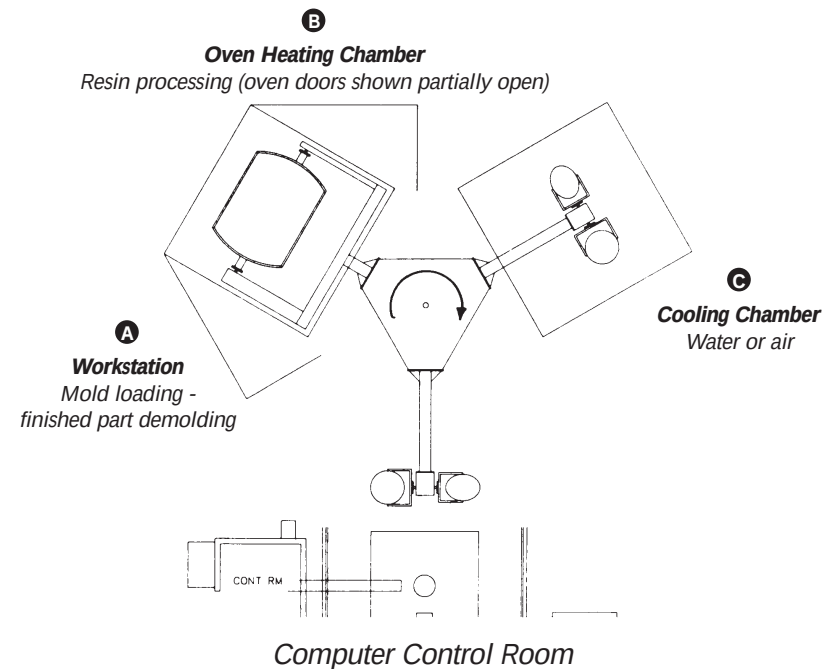
Rotational Molding traces its beginnings to the early 1930's and is now widely used as an economical method to produce partially or totally enclosed seamless parts.

Raven's entry into rotationally molded polyethylene products began in 1969 with the introduction of a line of tanks for the agricultural and water treatment markets. Since that time, Raven has undergone a continuous process of improvement and expansion of engineering, design, and production capabilities, and has emerged as an industry leader in the markets we serve. Products are now available in capacities to 10,500 gallons.

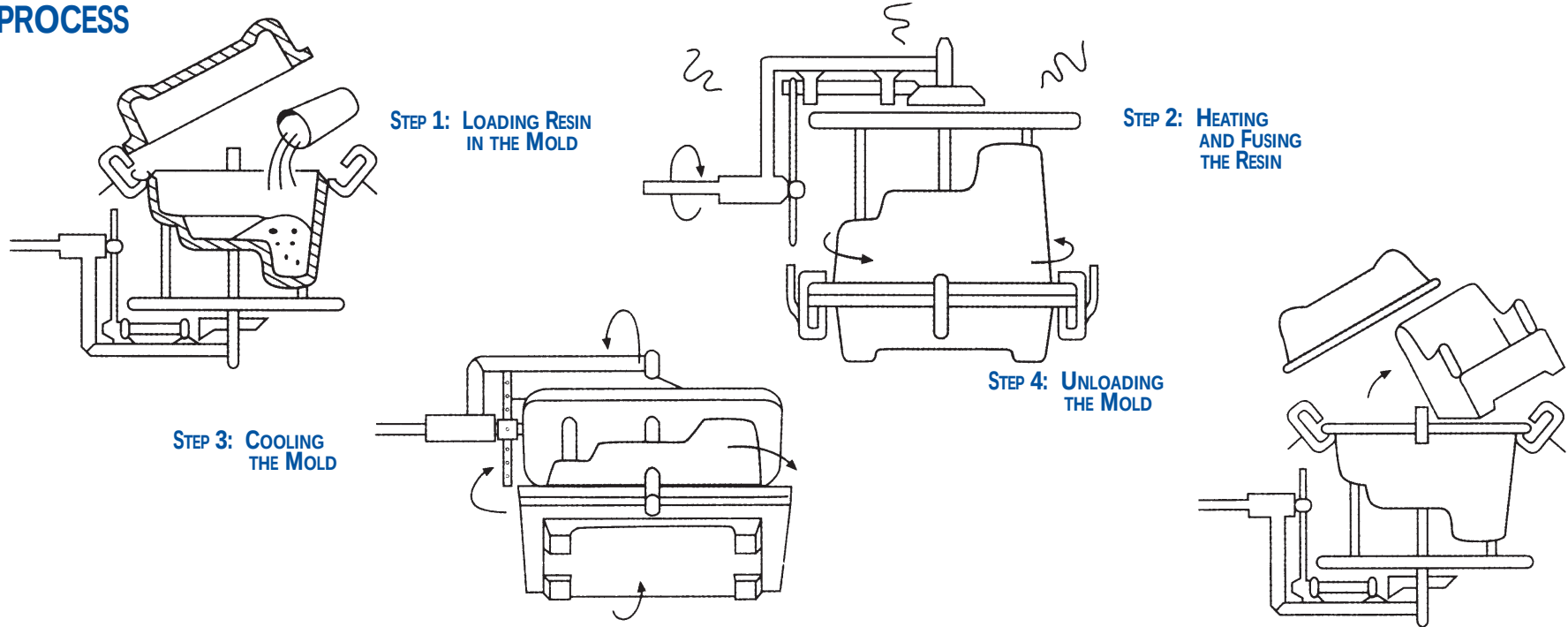
The manufacturing process itself is relatively simple and features a few basic steps as is illustrated at right and on the following page.



Raven produces polyethylene tanks in a wide variety of shapes with capacities up to 10,500 gallons.



PROCESS



The process of rotational molding includes four steps.

- loading the resin in the mold
- heating and fusing the resin
- cooling the mold
- unloading the mold

STEP 1: LOADING RESIN IN THE MOLD

A closeable mold is charged with a plastic resin material in liquid or powder form. A variety of resin materials are available. The most widely used are

polyethylenes and plastisols. Other resin materials include nylon, fluoropolymers, polypropylene, polycarbonate, cellulose acetate butyrate, elastomers, ionomer, polyurethane, EVA and specially formulated compounds.

A charged mold is moved into an oven.

STEP 2: HEATING AND FUSING THE RESIN

The mold is continuously rotated on two axes at low speed. As heat penetrates the rotating mold, the resin adheres to the mold's inner surface until it is completely fused.

STEP 3: COOLING THE MOLD

The mold is then moved to the cooling chamber and cooled by air or water spray or a combination of both while still rotating. The temperature is lowered in a gradual manner to allow the newly molded part to solidify, retaining the shape of the mold.

STEP 4: UNLOADING THE MOLD

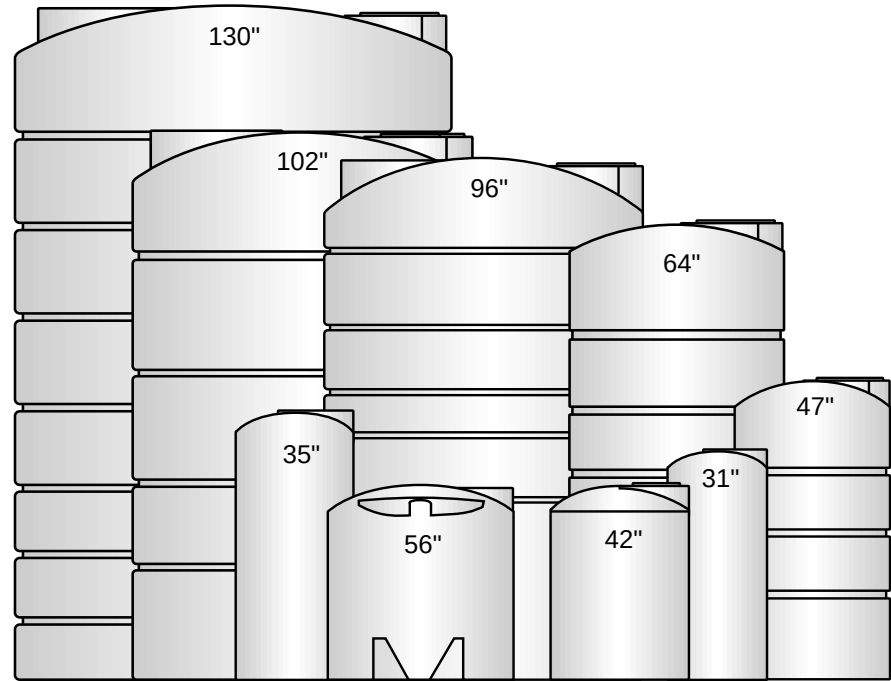
The mold is opened, the finished part is removed, and the mold is charged for the next cycle.

FLAT BOTTOM DOME TOP TANKS

RAVEN

page 1 of 2

ROTATIONALLY MOLDED VERTICAL POLYETHYLENE TANKS



Vertical polyethylene tanks provide economical storage of chemicals and water.

- Consult resin selection guide for chemical compatibility.
- Tank configurations vary by size. Contact the factory for detailed specification sheets on individual part numbers.
- Standard colors are natural and black. Other colors available on special request.
- Lifting/hold down ears (top of tank) will be available for tank diameters 64\" and above. Consult with factory for more details.

ROTATIONALLY MOLDED VERTICAL POLYETHYLENE TANKS - CONTINUED

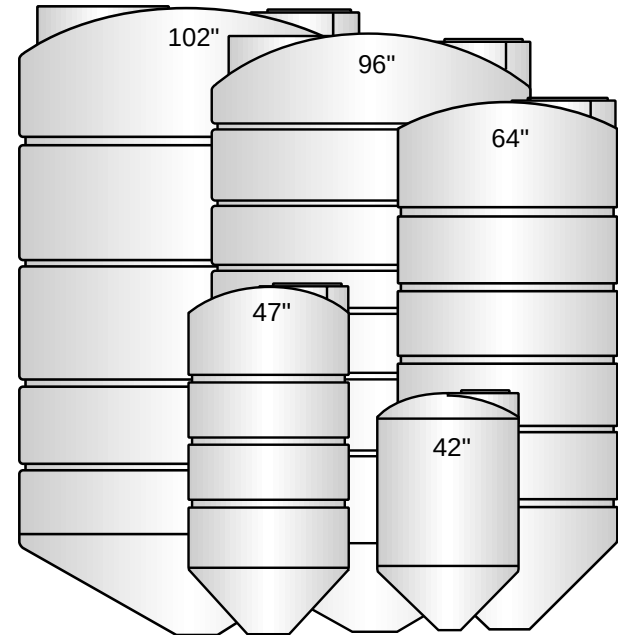
IND. PART #	IND. CAPACITY (GALS.)	DIAMETER X HEIGHT (IN.)	INCLUDED ACCESSORIES
10991	150	42 x 33	10" threaded fillwell, cover
10966	200	31 x 69	10" threaded fillwell, cover, 2" siphon
10992	300	42 x 59	10" threaded fillwell, cover, 2" siphon
30487	300	35 x 80	10" threaded fillwell, cover, 2" siphon
10918	550	56 x 59	10" threaded fillwell, cover, 2" siphon
30230	550	47 x 77	10" threaded fillwell, cover, 2" siphon
27035	625	47 x 91	16" threaded fillwell, cover, 2" siphon
28985	850	47 x 121	16" threaded fillwell, cover, 2" siphon
30231	1000	64 x 80	16" threaded fillwell, cover, 2" siphon
27040	1225	64 x 96	16" threaded fillwell, cover, 2" siphon
28986	1525	64 x 121	16" threaded fillwell, cover, 2" siphon
27049	1725	64 x 134	16" threaded fillwell, cover 2" siphon
28987	2025	64 x 159	16" threaded fillwell, cover, heavy duty 3" fitting/siphon
27051	1100	96 x 46	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
27052	1500	96 x 60	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
27053	2300	96 x 86	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
27054	2700	96 x 98	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
27680	3300	96 x 118	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
27055	4500	96 x 156	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
27056	5800	96 x 199	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
29996	4300	102 x 131	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
29998	5500	102 x 166	22" threaded fillwell, cover, heavy duty 3" fitting/siphon
30000	6500	102 x 196	22" Threaded fillwell, cover, heavy duty 3" fitting/siphon
30002	6800	102 x 210	22" Threaded fillwell, cover, heavy duty 3" fitting/siphon
27057	4500	130 x 92	22" Threaded fillwell, cover, heavy duty 3" fitting/siphon
27058	6500	130 x 124	22" Threaded fillwell, cover, heavy duty 3" fitting/siphon
27059	9000	130 x 168	22" Threaded fillwell, cover, heavy duty 3" fitting/siphon
27060	10500	130 x 202	22" Threaded fillwell, cover, heavy duty 3" fitting/siphon

ROTATIONALLY-MOLDED CONE BOTTOM POLYETHYLENE TANKS



Available in capacities to 6500 gallons, cone bottom tanks provide complete drainage of viscous materials.

- Consult resin selection guide for chemical compatibility.
- Tank configurations vary by size. Contact the factory for detailed specification sheets on individual part numbers.
- Cone bottom tanks require complete support. Poly tank stand, 42", provides 12" clearance while all others are steel and provide 18" clearance.
- Standard colors are natural and black. Other colors available on special request.
- Lifting/hold down ears (top of tank) will be available of tank diameters 64" and above. Consult with factory for more details.



ROTATIONALLY-MOLDED CONE BOTTOM POLYETHYLENE TANKS - CONTINUED

IND. PART No.	IND. CAPACITY (GALS.)	DIAMETER X HEIGHT (IN.)	STAND PART No.	INCLUDED ACCESSORIES
10985	150	42 x 44	A10993	10" threaded fillwell, cover
10986	300	42 x 69	A10993	10" threaded fillwell, cover
30241	550	47 x 87	A5089	10" threaded fillwell, cover
27036	625	47 x 101	A5089	16" threaded fillwell, cover
28988	850	47 x 131	A5089	16" threaded fillwell, cover
30242	1000	64 x 95	A5090	16" threaded fillwell, cover
27041	1225	64 x 112	A5090	16" threaded fillwell, cover
28989	1525	64 x 137	A5090	16" threaded fillwell, cover
27050	1725	64 x 154	A5090	16" threaded fillwell, cover
28990	2025	64 x 175	A5090	16" threaded fillwell, cover
27577	1100	96 x 61	A5091	22" threaded fillwell, cover
27578	1500	96 x 78	A5091	22" threaded fillwell, cover
27579	2300	96 x 101	A5091	22" threaded fillwell, cover
27580	2700	96 x 111	A5091	22" threaded fillwell, cover
27681	3300	96 x 133	A5091	22" threaded fillwell, cover
27581	4500	96 x 173	A5091	22" threaded fillwell, cover
29997	4300	102 x 146	A5092	22" threaded fillwell, cover
29999	5500	102 x 181	A5092	22" threaded fillwell, cover
30001	6500	102 x 211	A5092	22" threaded fillwell, cover

FLAT BOTTOM OPEN TOP TANKS

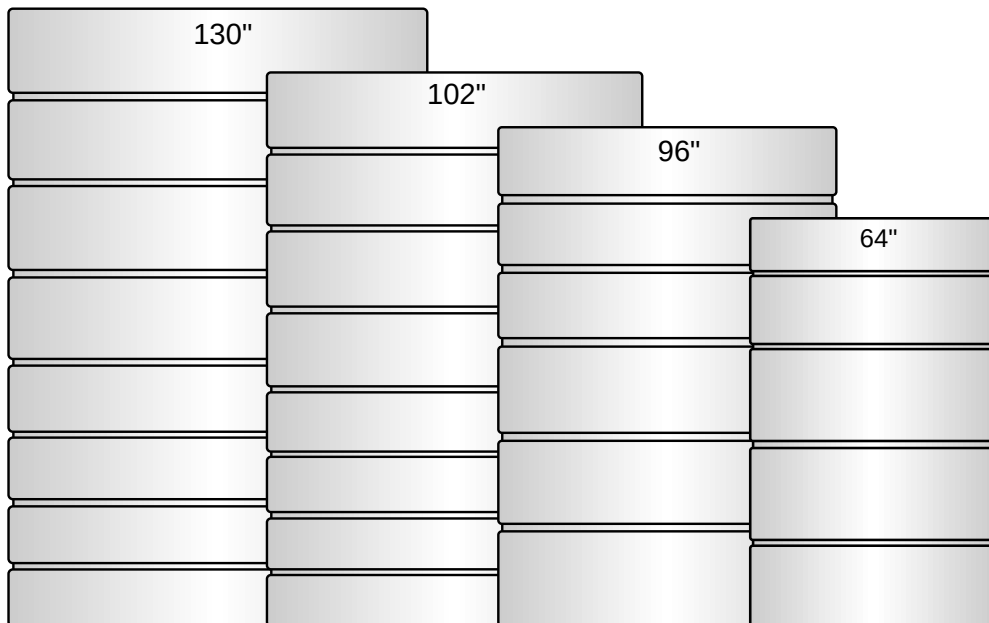
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ROTATIONALLY MOLDED VERTICAL POLYETHYLENE TANKS



Open top polyethylene tanks provide economical storage of chemicals and water.

- Consult resin selection guide for chemical compatibility.
- Tank configurations vary by size. Contact the factory for detailed specification sheets on individual part numbers.
- Standard colors are natural and black. Other colors available on special request.



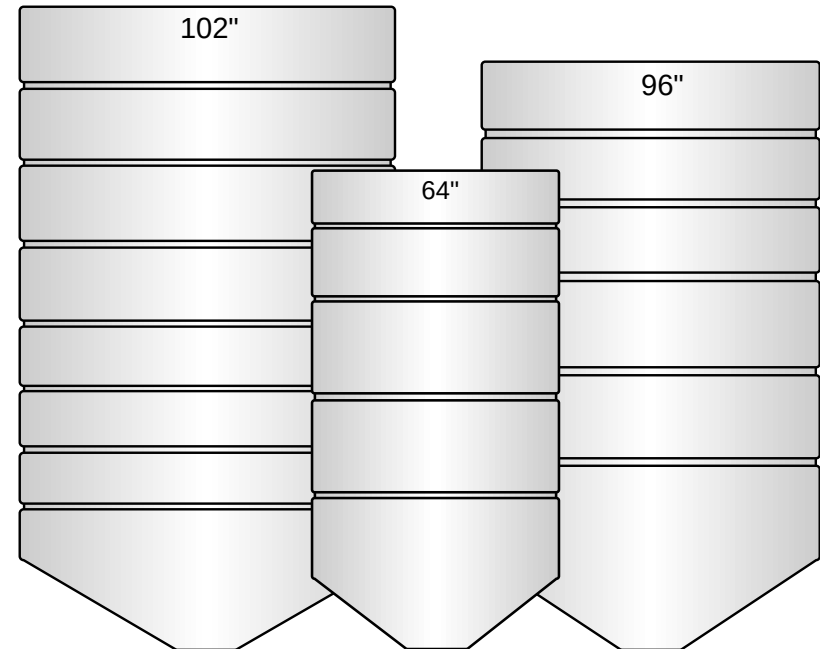
IND. PART No.	IND. CAPACITY (GALS.)	DIAMETER x HEIGHT (IN.)
30232	1000	64 x 80
30233	1225	64 x 96
30234	1525	64 x 121
30235	1725	64 x 134
30236	2025	64 x 159
29706	1000	96 x 46
29707	1500	96 x 60
29708	2300	96 x 86
29709	2700	96 x 98
29710	3300	96 x 118
29711	4500	96 x 156
29712	5800	96 x 199
30237	4300	102 x 131
30238	5500	102 x 166
30239	6500	102 x 196
30240	6800	102 x 210
29713	4250	130 x 92
29714	6500	130 x 124
29715	9000	130 x 168
29716	10500	130 x 202

CONE BOTTOM OPEN TOP TANKS

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ROTATIONALLY-MOLDED CONE BOTTOM POLYETHYLENE TANKS

IND. PART No.	IND. CAPACITY (GALS.)	DIAMETER x HEIGHT (IN.)	STAND PART No.
30243	1000	64 x 95	A5090
30244	1225	64 x 112	A5090
30245	1525	64 x 137	A5090
30246	1725	64 x 149	A5090
30247	2025	64 x 174	A5090
29717	1000	96 x 61	A5091
29718	1400	96 x 74	A5091
29719	2100	96 x 100	A5091
29720	2500	96 x 113	A5091
29721	3100	96 x 133	A5091
29722	4500	96 x 172	A5091
30248	4300	102 x 146	A5092
30249	5500	102 x 181	A5092
30250	6500	102 x 211	A5092



Available in capacities to 6500 gallons, cone bottom tanks provide complete drainage of viscous materials.

- Consult resin selection guide for chemical compatibility.
- Tank configurations vary by size. Contact the factory for detailed specification sheets on individual part numbers.
- Cone bottom tanks require complete support. All stands provide an 18" clearance.
- Standard colors are natural and black. Other colors available on special request.

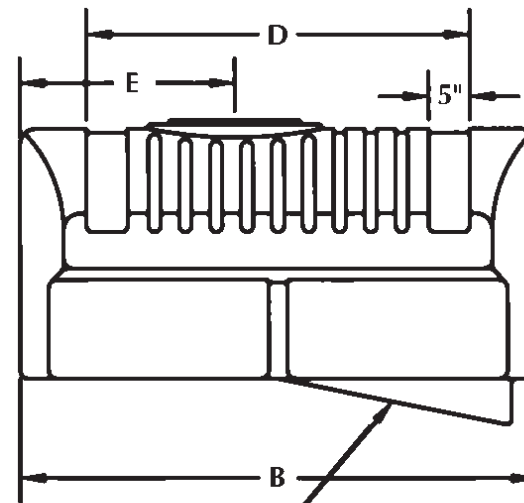
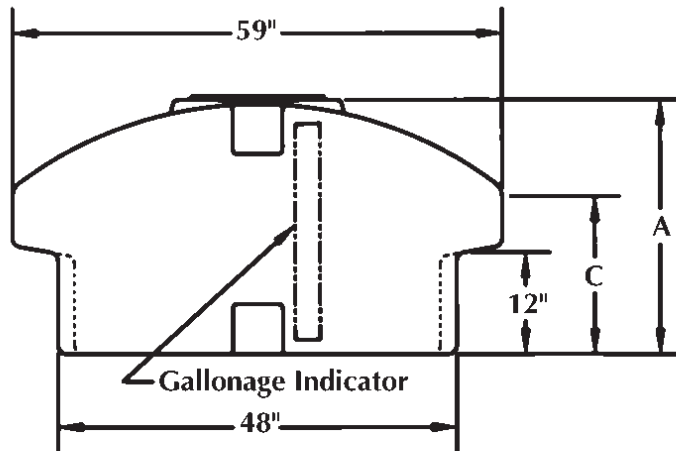
ROTATIONALLY-MOLDED PICK-UP POLYETHYLENE TANKS

TANK PART NO.	NOMINAL CAPACITY (GALS.)	APPROX. WT.(LBS.)	APPROX. THICK.(IN.)	A DIM. (IN.)	B DIM. (IN.)	C DIM. (IN.)	D DIM. (IN.)	E DIM. (IN.)
10953	325	119	9/32	30	62 1/2	19	47	26
10954	450	160	5/16	34	75	23	57	26



Available in two sizes, rotationally molded polyethylene pick-up tanks provided economical service for mobile applications.

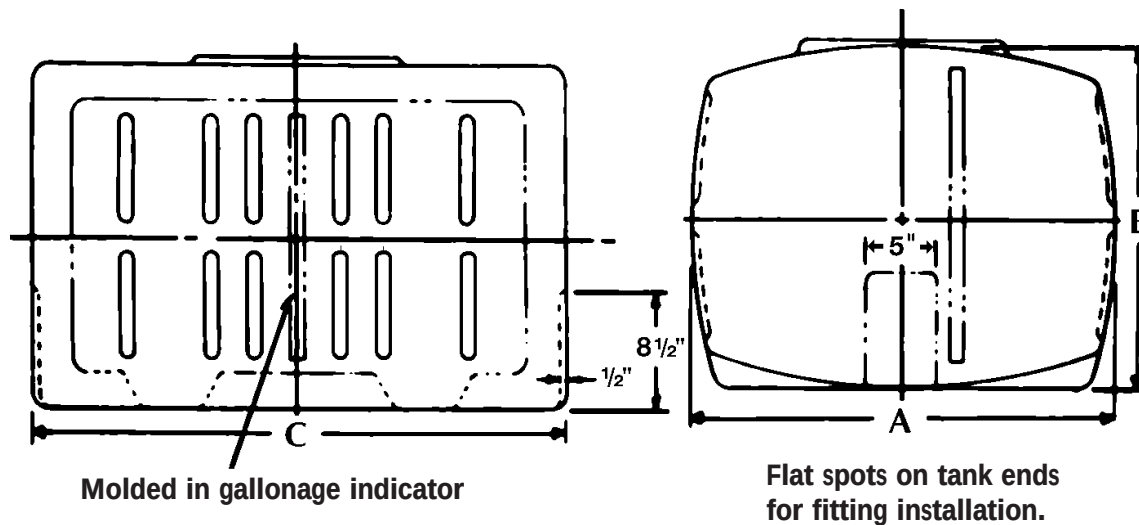
- Designed for full size pick-ups only.
- UV inhibitor added to provide protection from sunlight.
- Offset 10" fillwell with covers provides for ease of fill. 16" fillwell is also available.
- Molded in gallonage indicator.
- Flat spots on each end are provided for fitting installation.



5 1/2" Deep X 6" Wide Optional Sump
End Drain Shown - Reverse for Center Drain

ROTATIONALLY-MOLDED RECTANGULAR POLYETHYLENE TANKS

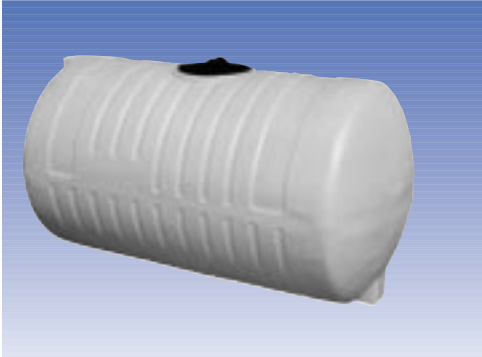
TANK PART NO.	NOMINAL CAPACITY (GALS.)	APPROX. WT.(LBS.)	APPROX. THICK.(IN.)	A DIM. (IN.)	B DIM. (IN.)	C DIM (IN.)
10936	30	16	3/16	19	20	25
10928	50	22.5	3/16	19	20	38
10929	100	41.5	7/32	30	26	38
10940	150	63	9/32	36	26	48
10945	200	76	9/32	36	35	48
10951	300	109	5/16	36	35	69



Attractive compact design requires no complex saddling or support structures and is well suited for mobile car wash, carpet cleaners, as well as other stationary applications.

- 30, 50 and 100 gallon tanks include 5" molded fillwell with vacuum break cover. 150 and 200 gallon tanks include a 10" threaded fillwell and cover. 300 gallon tank includes 16" fillwell with cover and a stainless baffle.

ROTATIONALLY-MOLDED HORIZONTAL POLYETHYLENE TANKS



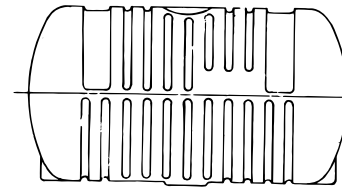
PART NO.	NOMINAL CAPACITY (GALS.)	DIAMETER X LENGTH (IN.)	APPROX. WEIGHT (LBS.)	APPROX. THICK. (IN.)	SADDLE REQUIREMENTS
10785	150	30x56	44	1/4	(1) A5069
10775	200	32x65	66	1/4	(1) A5059
10779	300	38x69	83	1/4	(1) A5060
10809	400	42x76	100	1/4	(1) A5061
10835	500	42x93	147	5/16	(1) A5062
10794	500	48x74	120	1/4	(1) A5063

Horizontal polyethylene tanks are ideal for trailer and skid mounted applications or for storage where height restrictions apply.

- Ultra-violet inhibitor added to protect against sunlight.
- Standard color is natural. Others are available upon request.
- 23" diameter tanks include a 5" molded in fillwell and vacuum break cover. 30" thru 48" tanks include a 10" fillwell and cover.
- Tanks must be properly supported during use. See saddle detail on next page.

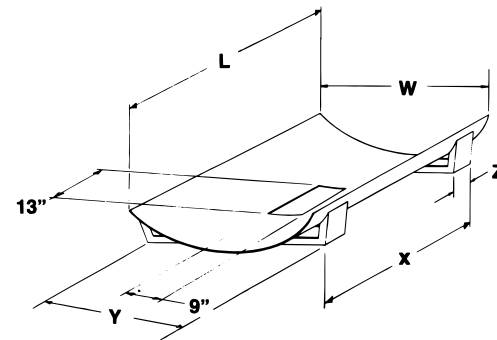
SADDLE ASSEMBLIES

- Steel saddles and assemblies are designed to provide necessary support for horizontal polyethylene tanks during use.
- Saddle assemblies are supplied either as a single unit or as multiple pieces. Refer to saddle requirements column of poly tank listing to determine correct part number and quantity to order for a specific tank.
- Saddles include polyester straps and bolts to secure tank.

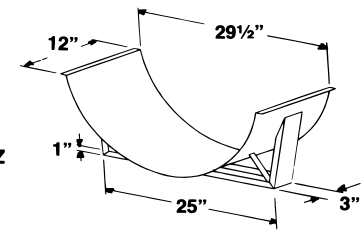


**Saddle Assemblies
A5059-A5063**

NOTE: 25 thru 110 gallon tanks have one end flat spot.
150 thru 500 gallon tanks have two end flat spots.



**Saddle Assembly
30" diameter A5069**

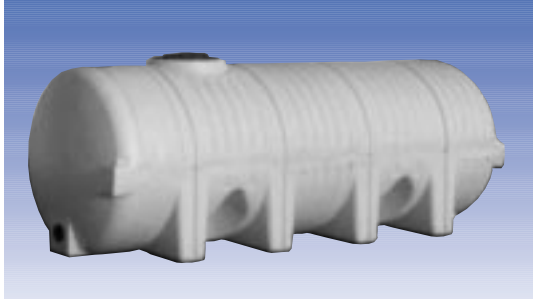


(2) pieces required

SKID No.	TANK SIZE DIA. X GAL.	APPROX. WEIGHT	L DLM. (IN.)	W DIM. (IN.)	X DIM. (IN.)	Y DIM. (IN.)	Z DIM. (IN.)
A5059	32x200	80	54	31	48	26	3
A5060	38x300	90	58	36	48	31 1/4	3
A5061	42x400	128	60	40	45 3/4	33	3 1/2
A5062	42x500	162	80	40	71 1/2	33	3 1/2
A5063	48x500	152	58	45	46 3/4	39	4 1/2

SKID No.	TANK SIZE DIA. X GAL.	APPROX. WEIGHT	
A5069	30x150	45	Part number is for assembly consisting of (2) saddles.

ROTATIONALLY MOLDED HORIZONTAL STORAGE POLYETHYLENE TANKS



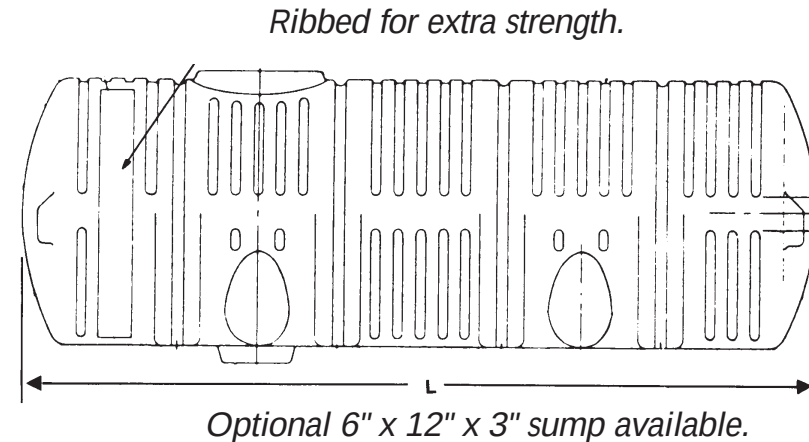
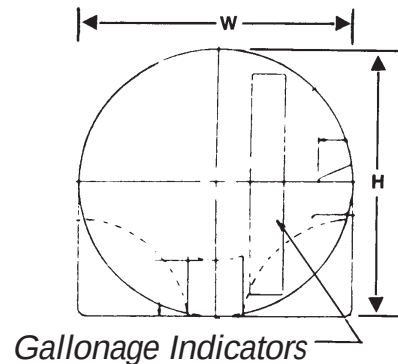
Horizontal polyethylene leg tanks are supported with a steel hoop assembly and feature molded in baffles for mobile applications.

- Includes inch gallonage marks.
- Tanks include:
 - 30 - 60 gallon - 5" molded in fillwell and cover
 - 115 - 310 gallon - 10" threaded fillwell and cover
 - 500 - 1650 gallon - 16" threaded fillwell and cover

Note: Tanks 500 gallons and above requires hoops for support.

TANK PART NO.	NOMINAL CAPACITY	APPROX. WT.(LBS.)	APPROX. THICK.(IN.)	W (IN.)	H (IN.)	L (IN.)	HOOP ASSEMBLY
30087	30	15	3/16	23	23	19	NR
30088	60	25	3/16	23	23	37	NR
30716	115	40	3/16	30	30	44	NR
30717	210	75	1/4	32	32	65	NR
30718	310	95	1/4	38	38	69	NR
10968	500	172	5/16	48	48	75	A5081
10956	750	246	5/16	48	48	107	A5079
10948	1000	302	5/16	48	48	139	A5076
10975	1650	400	5/16	62	62	139	A5084

NR - Not Required



DOUBLE WALL TANKS

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ROTATIONALLY MOLDED VERTICAL CONTAINMENT TANKS

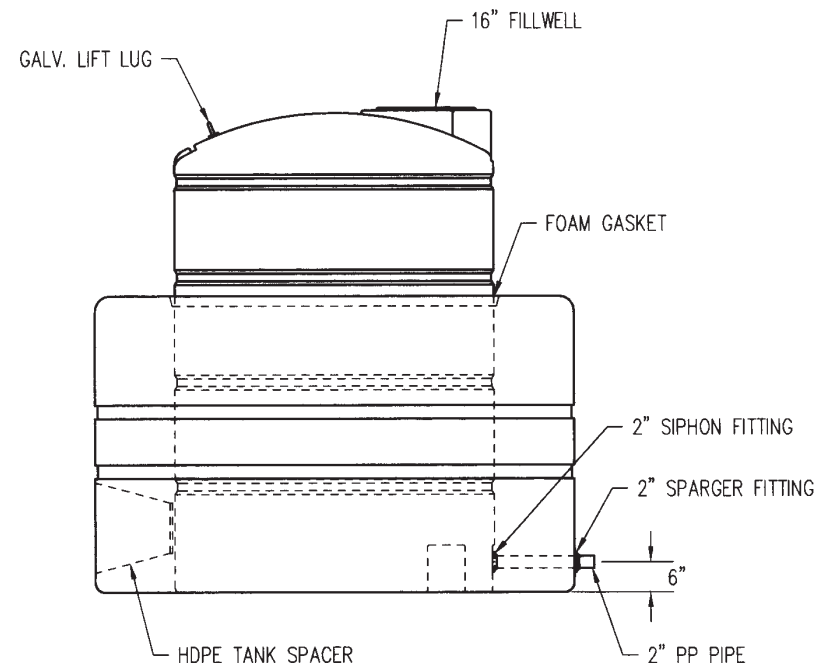
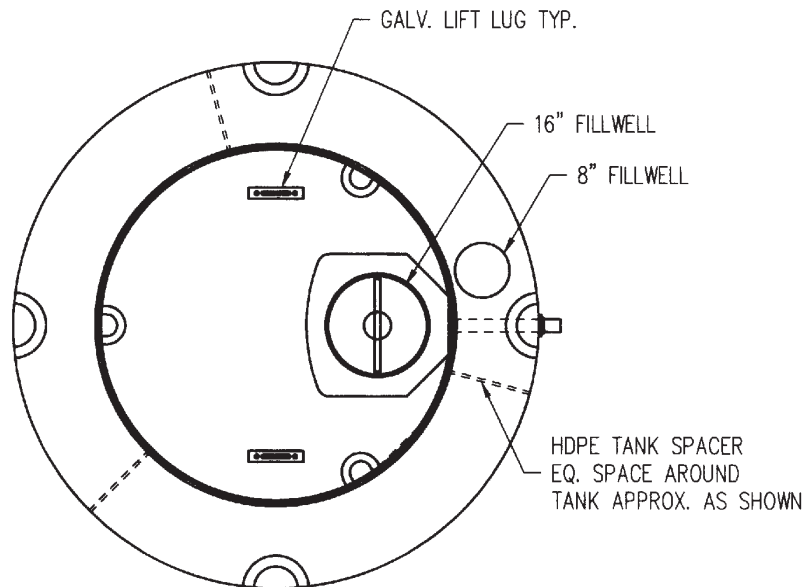
PRIMARY TANK			CONTAINMENT TANK			TOTAL HEIGHT(IN.)
PART #	CAP(GALS.)	SIZE	PART#	CAP(GALS.)	SIZE	
27040	1200	64 x 96	29707	1400	96 x 60	97
27049	1700	64 x 134	29708	2100	96 x 86	138
27680	3100	96 x 118	29713	4250	130 x 92	118
27055	4400	96 x 156	29714	6500	130 x 124	158
30000	6000	102 x 196	29715	9000	130 x 168	196

Containment tanks are designed to provide the EPA required storage margin of safety. By using a flat bottom dome top tank inside a flat bottom open top tank, the open top tank acts as the containment system for the primary storage vessel.

Drainage from the inner tank may be through the top or at the side wall with siphon capability.

Other fittings and accessories available.

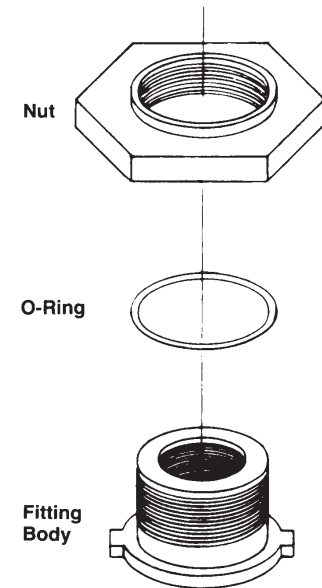
16" fillwell included in primary tank.



POLYETHYLENE TANK BULKHEAD FITTINGS

Raven's patented bulkhead fittings for polyethylene tanks require a flat surface for installation and feature an O-ring (EPDM or Viton) for the seal. Available in either PVC or glass filled polypropylene, bulkhead fittings provide economical penetrations for polyethylene tanks. All Raven bulkhead fittings are manufactured with left hand threads which prevent accidental loosening while plumbing to the fittings. Consult corrosion guide to select fitting and O-ring material.

DESCRIPTION	INSTALLED FITTING ASSEMBLIES		REPLACEMENT FITTING ASSEMBLIES	
	WITH EPDM O-RING	WITH VITON O-RING	WITH EPDM O-RING	WITH VITON O-RING
1/2"	5029IE	5029IV	5029PE	5029PV
1/2" double thread	5030IE	5030IV	5030PE	5030PV
3/4"	5031IE	5031IV	5031PE	5031PV
3/4" double thread	5032IE	5032IV	5032PE	5032PV
1"	5033IE	5033IV	5033PE	5033PV
1" double thread	5034IE	5034IV	5034PE	5034PV
1 1/4"	5035IE	5035IV	5035PE	5035PV
1 1/4" double thread	5036IE	5036IV	5036PE	5036PV
1 1/4" anti-vortex	5037IE	5037IV	5037PE	5037PV
1 1/2"	5038IE	5038IV	5038PE	5038PV
1 1/2" double thread	5039IE	5039IV	5039PE	5039PV
1 1/2" anti-vortex	5040IE	5040IV	5040PE	5040PV
2"	5041IE	5041IV	5041PE	5041PV
2" double thread	5042IE	5042IV	5042PE	5042PV
2" anti-vortex	5450IE	5450IV	5450PE	5450PV
3"	5451IE	5451IV	5451PE	5451PV
3" double thread	5454IE	5454IV	5454PE	5454PV



- Bulkhead fittings can be factory installed or shipped loose to be installed in the field.
- Double thread fittings are threaded both sides to accommodate internal piping.
- Anti-vortex fittings feature an elevated interior plate designed to reduce vortexing problems.

NOTES:

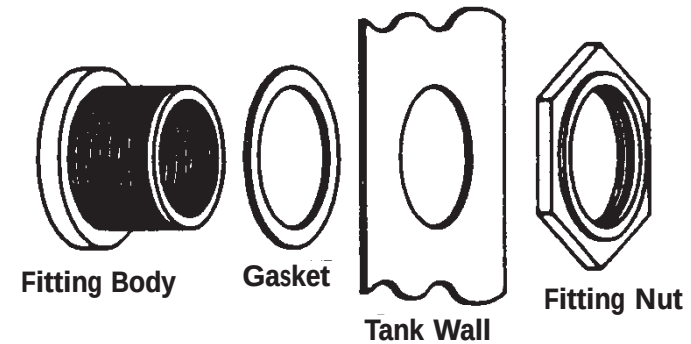
1. As in any gasketed fitting installation, O-Rings should be checked regularly and replaced if leaks are detected.
2. Our Raven bulkhead (compression) fittings are to be utilized on thinner wall tanks, 2100 gallons and below.

See [ACCESSORIES / Bulkhead Fittings / Installation Instructions](#).

HEAVY DUTY BULKHEAD FITTINGS w/GASKET

DESCRIPTION	INSTALLED FITTING ASSEMBLIES		REPLACEMENT FITTING ASSEMBLIES	
	EPDM GASKET	VITON GASKET	EPDM GASKET	VITON GASKET
1/2" Double Thread	7001IE	7001IV	7001PE	7001PV
3/4" Double Thread	7002IE	7002IV	7002PE	7002PV
1" Double Thread	7003IE	7003IV	7003PE	7003PV
1 1/4" Double Thread	7004IE	7004IV	7004PE	7004PV
1 1/2" Double Thread	7005IE	7005IV	7005PE	7005PV
2" Double Thread	7006IE	7006IV	7006PE	7006PV
3" Double Thread	7007IE	7007IV	7007PE	7007PV
4" Double Thread	7008IE	7008IV	7008PE	7008PV

- Compression fittings are available in PVC or Polypropylene and must be specified on order.



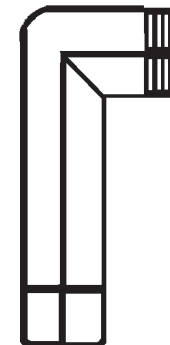
See [ACCESSORIES / Bulkhead Fittings / Installation Instructions](#).

SIPHON FITTINGS

DESCRIPTION	PART NUMBER
3/4 inch siphon	5227A
1 inch siphon	5227B
1 1/4 inch siphon	5227C
1 1/2 inch siphon	5227D
2 inch siphon	5227E
3 inch siphon	5227F
4 inch siphon	5227G



PVC or
Polypropylene
Siphon Assembly



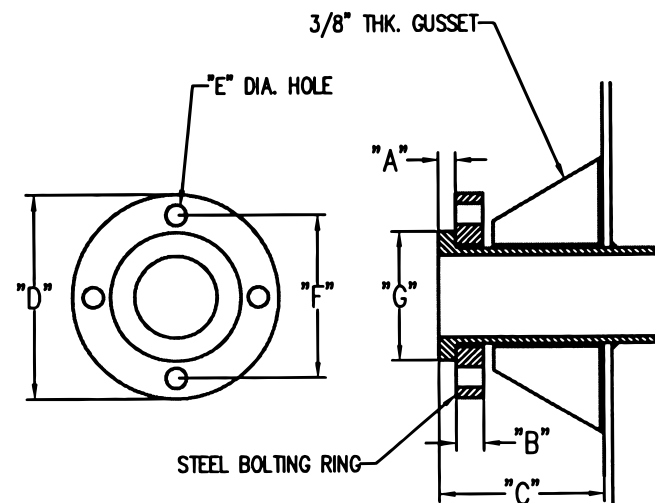
Polypropylene
One Piece Siphon
Available in 2" & 3" only

FLANGED CONNECTIONS

- Flange must include appropriate blind flange if used as below liquid level access.
- Gaskets, bolts, washers, and nuts are not included with flanges. Raven recommends the use of a 40 to 60 durometer full faced gasket, 3/16" thick, and a maximum bolt take up torque of 30 ft.-lbs. See [FLANGED CONNECTIONS - FRP / Blind Flanges](#) (rope gasket does not apply).
- Flange face is 150 lb. A.S.A. bolting geometry.
- Sidewall mounted flanges protrude inside tank a minimum of 1" as shown. Bottom flanges are flush mounted unless otherwise specified.
- When utilizing welded flanges, tanks must be constructed with a 1.5 or 1.9 s.q. wall thickness.

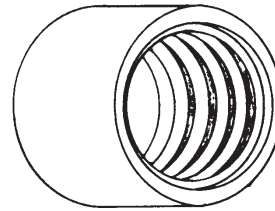
PART NUM.	NOM PIPE SIZE	DIM. "A"	DIM. "B"	DIM. "C"	DIM. "D"	NUM. OF HOLES	DIM. "E"	DIM. "F"	DIM. "G"
7174C	1 1/2	.45"	1/2"	5"	5 1/2"	4	5/8"	3 7/8"	3 1/8"
7174D	2	.45"	1/2"	5"	6 1/2"	4	3/4"	4 3/4"	3 7/8"
7174F	3	.54"	1/2"	5"	8"	4	3/4"	6"	4 7/8"
7174G	4	.57"	9/16"	6"	9 1/2"	8	3/4"	7 1/2"	6 3/16"
7174H	6	1.02"	5/8"	6"	11 1/2"	8	7/8"	9 1/2"	8 7/16"
7174J	8	1.04"	5/8"	6"	14"	8	7/8"	11 2/4"	10 9/16"
7174K	10	1.26"	5/8"	6"	16 1/2"	12	1"	14 1/4"	13"
7174L	12	1.51"	5/8"	6"	19 1/2"	12	1"	17"	15 1/2"
7174M	14	1.53"	3/4"	8"	21 1/2"	12	1 1/8"	18 2/4"	17 1/4"
7174N	16	1.73"	3/4"	8"	14 1/2"	16	1 1/8"	21 1/4"	19 3/4"
7174P	18	1.93"	7/8"	8"	25 1/2"	16	1 1/4"	22 2/4"	20 1/2"
7174Q	20	2.13"	7/8"	8"	28"	20	1"	25"	23 3/8"
7174T	24	2.33"	1"	8"	32 1/2"	20	1"	29 1/2"	27 3/4"

NOTE: All flanges 10" and above are not recommended for sidewall installation on tanks 2100 gallon and above.



COUPLING CONNECTIONS

DESCRIPTION	PART NUMBER
3/4 inch NPT Coupling	7220A
1 inch NPT Coupling	7220B
1-1/2 inch NPT Coupling	7220C
2 inch NPT Coupling	7220D
3 inch NPT Coupling	7220F
4 inch NPT Coupling	7220G
6 inch NPT Coupling	7220H

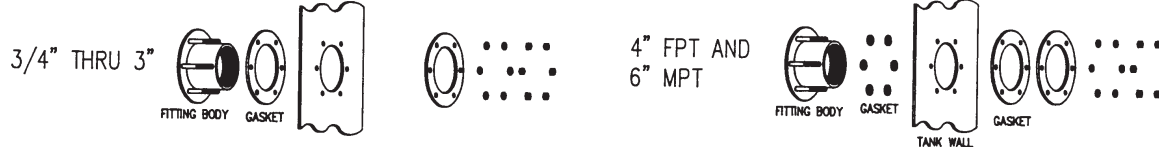


- All polyethylene (welded) construction eliminates chemical compatibility questions with gaskets or bolting hardware.
- All couplings provide both internal and external threads.
- When utilizing welded NPT coupling, tanks must be constructed with a 1.5 or 1.9 S.G. wall thickness.

316 STAINLESS STEEL BOLT-THRU FITTINGS w/GASKET

DESCRIPTION	INSTALLED FITTING ASSEMBLIES		REPLACEMENT FITTING ASSEMBLIES	
	EPDM GASKET	VITON GASKET	EPDM GASKET	VITON GASKET
3/4" Double Thread	7201IE	7201IV	7201PE	7201PV
1" Double Thread	7202IE	7202IV	7202PE	7202PV
1 1/2" Double Thread	7203IE	7203IV	7203PE	7203PV
2" Double Thread	7204IE	7204IV	7204PE	7204PV
3" Double Thread	7205IE	7205IV	7205PE	7205PV
4" Double Thread	7206IE	7206IV	7206PE	7206PV
6" Double Thread	7207IE	7207IV	7207PE	7207PV

See [ACCESSORIES / Bulkhead Fittings / Installation Instructions](#).



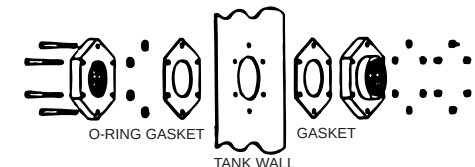
- Contents must be compatible with fitting and bolting hardware. Special bolt options are available for highly corrosive chemicals. Contact Customer Service for recommendations and pricing.
- Bolt pattern is interchangeable with the PP Bolt-Thru fitting assemblies.
- Double gaskets (inside & outside) are standard. Inside gasket is a thin full gasket or bolt washer gasket.
- Flange assembly may be installed for bolted attachment to piping versus FNPT threaded connection if specified.

POLYPROPYLENE BOLT-THRU FITTING w/316 SS BOLTS

DESCRIPTION	INSTALLED FITTING ASSEMBLIES		REPLACEMENT FITTING ASSEMBLIES	
	EPDM GASKET	VITON GASKET	EPDM GASKET	VITON GASKET
3/4" Double Thread	7101IE	7101IV	7101PE	7101PV
1" Double Thread	7102IE	7102IV	7102PE	7102PV
1 1/2" Double Thread	7103IE	7103IV	7103PE	7103PV
2" Double Thread	7104IE	7104IV	7104PE	7104PV
3" Double Thread	7105IE	7105IV	7105PE	7105PV

See [ACCESSORIES / Bulkhead Fittings / Installation Instructions](#).

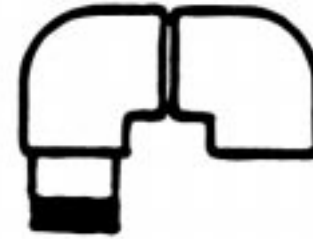
- Contents must be compatible with fitting and bolting hardware. Special bolt options are available for highly corrosive chemicals. Contact Customer Service for recommendations and pricing.
- Bolt pattern is interchangeable with the 316 SS fitting assemblies.



VENTING INFORMATION

All closed top tanks must have a vent of equal or greater size than the largest inlet or outlet. In addition to a standard vent, tanks being loaded by air pressure must have a minimum 16" fillwell open and tie-down cables in use in order to prevent over pressurization and potential failure. Precautions must also be taken to avoid vacuum. If there is any question concerning the adequacy of the venting system contact the factory for recommendations.

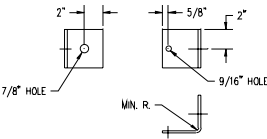
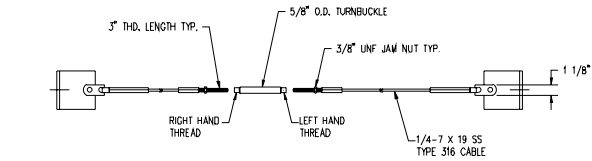
Vent screen to keep out birds and insects and is available upon request.



**PVC OR POLYPROPYLENE
U-VENT ASSEMBLY**

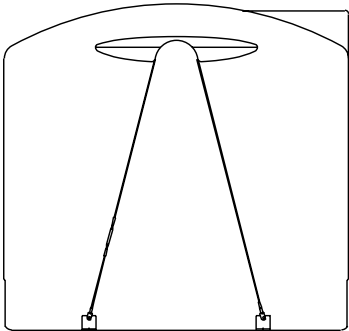
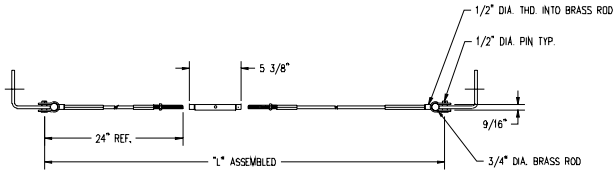
DESCRIPTION	CATALOG NUMBER
3/4 inch U-Vent	5228A
1 inch U-Vent	5228B
1 1/4 inch U-Vent	5228C
1 1/2 inch U-Vent	5228D
2 inch U-Vent	5228E
3 inch U-Vent	5228F
4 inch U-Vent	5228G

PART NUMBER	CABLE LENGTH
110051908	8 FT.
110051909	9 FT.
110051910	10 FT.
110051911	11 FT.
110051914	14 FT.
110051915	15 FT.
110051916	16 FT.
110051917	17 FT.
110051918	18 FT.
110051919	19 FT.
110051920	20 FT.
110051921	21 FT.
110051922	22 FT.
110051923	23 FT.
110051924	24 FT.
110051925	25 FT.
110051926	26 FT.
110051927	27 FT.
110051928	28 FT.
110051929	29 FT.
110051932	32 FT.
110051933	33 FT.
110051934	34 FT.
110051935	35 FT.
110051939	39 FT.
110051940	40 FT.



4" X 4" X 1/4" X 4" WIDE 316SS FLOOR ANCHOR BRACKET
PART NUMBER 110062000

NOTE: Consult with factory when seismic zone requirements apply.



These part numbers reflect one cable assembly.

See next page for tank reference.

OPEN TOP TANKS

TANK SIZE	BOTTOM STYLE	QTY. OF TIE-DOWN EARS	CABLE LENGTH
64" x 1000 GAL	FLAT	3	15 FT.
64" x 1225 GAL	FLAT	3	18 FT.
64" x 1525 GAL	FLAT	3	22 FT.
64" x 1725 GAL	FLAT	3	24 FT.
64" x 2025 GAL	FLAT	3	28 FT.
96" x 1000 GAL	FLAT	4	9 FT.
96" x 1400 GAL	FLAT	4	11 FT.
96" x 2100 GAL	FLAT	4	16 FT.
96" x 2500 GAL	FLAT	4	18 FT.
96" x 3100 GAL	FLAT	4	22 FT.
96" x 4400 GAL	FLAT	4	28 FT.
96" x 5800 GAL	FLAT	4	34 FT.
102" x 4200 GAL	FLAT	4	24 FT.
102" x 5400 GAL	FLAT	4	29 FT.
102" x 6400 GAL	FLAT	4	34 FT.
102" x 7400 GAL	FLAT	4	39 FT.
130" x 4250 GAL	FLAT	4	17 FT.
130" x 6500 GAL	FLAT	4	22 FT.
130" x 9000 GAL	FLAT	4	29 FT.
130" x 10500 GAL	FLAT	4	35 FT.
64" x 1000 GAL	45° CONE	3	20 FT.
64" x 1225 GAL	45° CONE	3	23 FT.
64" x 1525 GAL	45° CONE	3	27 FT.
64" x 1725 GAL	45° CONE	3	29 FT.
64" x 2025 GAL	45° CONE	3	34 FT.
96" x 1000 GAL	30° CONE	4	15 FT.
96" x 1400 GAL	30° CONE	4	17 FT.
96" x 2100 GAL	30° CONE	4	21 FT.
96" x 2500 GAL	30° CONE	4	24 FT.
96" x 3100 GAL	30° CONE	4	27 FT.
96" x 4400 GAL	30° CONE	4	33 FT.
102" x 4200 GAL	30° CONE	4	29 FT.
102" x 5400 GAL	30° CONE	4	35 FT.
102" x 6400 GAL	30° CONE	4	40 FT.

DOMES TOP TANKS

TANK SIZE	BOTTOM STYLE	QTY. OF TIE-DOWN EARS	CABLE LENGTH
48" x 550 GAL	FLAT	2	14 FT.
48" x 600 GAL	FLAT	2	17 FT.
48" x 850 GAL	FLAT	2	22 FT.
64" x 1000 GAL	FLAT	3	15 FT.
64" x 1200 GAL	FLAT	3	18 FT.
64" x 1500 GAL	FLAT	3	22 FT.
64" x 1700 GAL	FLAT	3	24 FT.
64" x 2000 GAL	FLAT	3	28 FT.
96" x 1000 GAL	FLAT	2	9 FT.
96" x 1400 GAL	FLAT	2	11 FT.
96" x 2100 GAL	FLAT	2	16 FT.
96" x 2500 GAL	FLAT	2	18 FT.
96" x 3100 GAL	FLAT	2	22 FT.
96" x 4400 GAL	FLAT	2	28 FT.
96" x 5600 GAL	FLAT	2	34 FT.
102" x 4000 GAL	FLAT	4	24 FT.
102" x 5000 GAL	FLAT	4	29 FT.
102" x 6000 GAL	FLAT	4	34 FT.
102" x 7000 GAL	FLAT	4	39 FT.
130" x 4200 GAL	FLAT	4	17 FT.
130" x 6500 GAL	FLAT	4	22 FT.
130" x 9000 GAL	FLAT	4	29 FT.
130" x 10500 GAL	FLAT	4	35 FT.
48" x 550 GAL	45° CONE	2	20 FT.
48" x 600 GAL	45° CONE	2	20 FT.
48" x 850 GAL	45° CONE	2	25 FT.
64" x 1000 GAL	45° CONE	3	22 FT.
64" x 1200 GAL	45° CONE	3	22 FT.
64" x 1500 GAL	45° CONE	3	26 FT.
64" x 1700 GAL	45° CONE	3	28 FT.
64" x 2000 GAL	45° CONE	3	33 FT.
96" x 1000 GAL	30° CONE	4	14 FT.
96" x 1400 GAL	30° CONE	4	16 FT.
96" x 2100 GAL	30° CONE	4	20 FT.
96" x 2500 GAL	30° CONE	4	22 FT.
96" x 3100 GAL	30° CONE	4	26 FT.
96" x 4400 GAL	30° CONE	4	32 FT.
102" x 4000 GAL	30° CONE	4	29 FT.
102" x 5000 GAL	30° CONE	4	35 FT.
102" x 6000 GAL	30° CONE	4	40 FT.

Note: Number of Tie-Down Ears indicates number of cable assemblies needed.

FEATURES AND BENEFITS



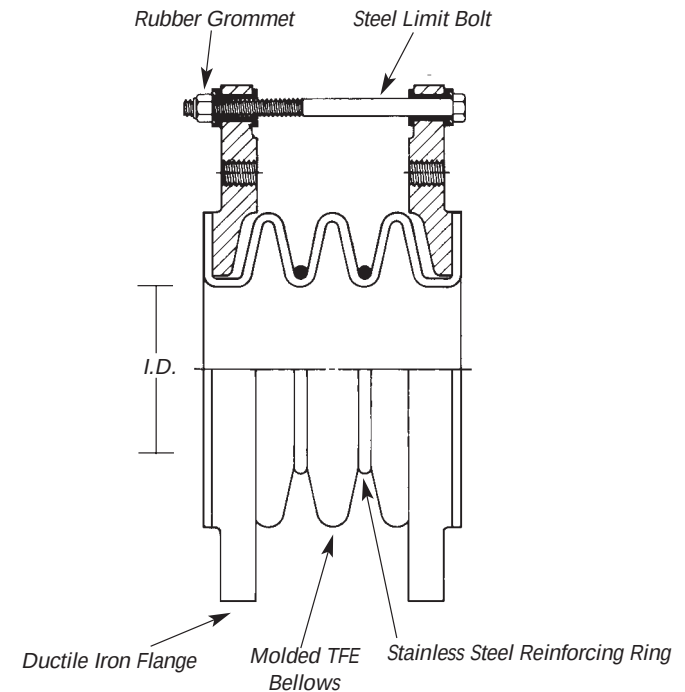
CATALOG No.	I.D. (IN)	LENGTH (IN)	PRESSURE (PSI)			MAX TEMP (FULL Vac)	MAX AXIAL + / -	MAX PARALLEL OFFSET	MAX ANGULAR DEFLECTION	WT. (LBS)
			70°F	200°F	400°F					
5427R	2.0	2 3/4	190	125	60	175°	5/8	3/8	20°	8
5427R	3.0	3 5/8	190	125	60	175°	3/4	5/8	25°	12
5427R	4.0	3 5/8	190	125	60	175°	7/8	5/8	25°	19
5427R	6.0	4	190	125	60	175°	1	1/2	20°	32
5427R	8.0	6	135	100	30	125°	1 1/8	1/2	20°	53

Raven's Flex-Coupler is molded with an extremely short face-to-face dimension making them ideal for use in limited spaces. TFE material allows higher pressures and temperatures than most rubber elastomers, provides superior flexibility, and exhibits an exceptional flexure life while featuring almost universal chemical inertness.

Flex-Coupler's connectors are designed to compensate for pipe expansion, contraction and misalignment. They also dampen vibration and reduce the transmission of noise. All flanges are tapped to mate with 125/150# companion flanges and require no gaskets due to the teflon flared face.

Common applications for Flex-Coupler's connectors include diaphragm pumps, chemical process piping, load cell applications, and pump connectors in the HVAC market.

NOTE: A FLEX-COUPLER shield is available with all sizes. The shield wraps around and fits snugly over the joint, providing the needed protection in the event of a hazardous chemical leak. An early leak can be detected by the indicating patch on the FLEX-COUPLER shield. This patch changes color immediately on exposure to an acid or base. The materials used are non-flammable and non-combustible, including the tie-cords. The shield is installed with ease and no tools are required.

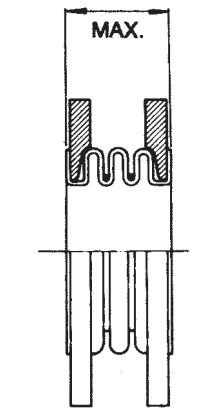


FLEX-COUPLER MOVEMENTS

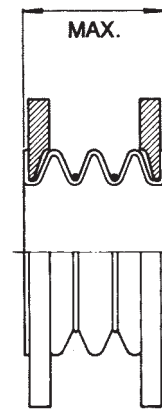
Flex-Coupler's molded bellows is capable of handling the following movements:

- *Maximum movement values are non-concurrent.*
- *Combined movement capabilities are proportionately lower for each type of movement according to the percentage of the "maximum" that is required for the other.*

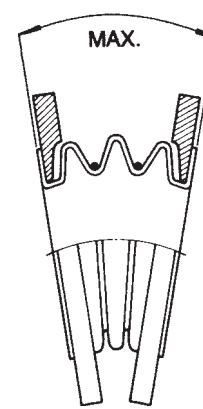
® DuPont registered trademark for fluorocarbon resins



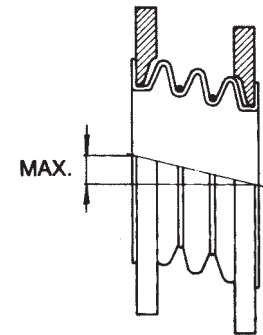
AXIAL
COMPRESSION



AXIAL
EXTENSION



PARALLEL
OFFSET



ANGULAR
DEFLECTION

10", 16" AND 22" FILLWELLS AND COVERS

DESCRIPTION	VENT SYSTEM	COVER PART NUMBER	FILLWELL PART NUMBER
10 Inch Quarter Turn Cover	Vent	5082R	5079I
10 Inch Threaded Cover	Vent	5478R	5479I
16 Inch Threaded Cover	No Vent	5470R	5464I
16 Inch Threaded Cover	Vent	5471R	5464I
22 Inch Threaded Cover	No Vent	5494R	5490I
22 Inch Threaded Cover	Vent	5491R	5490I
16 Inch Hinged Quick Access	Vent	NA	5486I

• Can be used only on flat surfaces.



16" and 22" Threaded



16" Hinged Quick Access



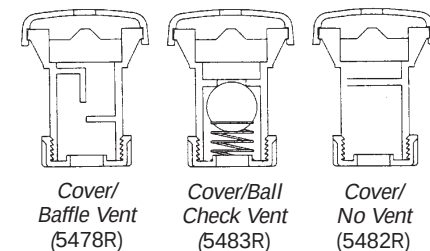
10" Threaded



10" Quarter Turn Plain

10" THREADED COVER VENT OPTIONS

DESCRIPTION	PART NUMBER
10 Inch Threaded Cover/Baffle Vent	5478R
Baffle Vent Assembly Only	5478V
10 Inch Threaded Cover/Ball Check Vent	5483R
Ball Vent Only	5483V
10 Inch Threaded Cover/No Vent	5482R
No Vent Assembly Only	5482V



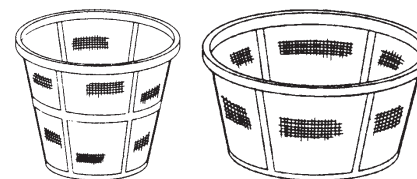
Cover/
Baffle Vent
(5478R)

Cover/Ball
Check Vent
(5483R)

Cover/
No Vent
(5482R)

STRAINER BASKETS

DESCRIPTION	PART NUMBER
10 Inch Strainer Basket	5083R
16 Inch Strainer Basket	5474R



10" Strainer Basket

16" Strainer Basket

FEATURES:

- *Nylon and polypropylene construction for maximum service life*
- *14 mesh heavy-duty nylon screen integrally molded into a durable nylon frame*
- *Chemical and corrosion resistant*
- *Fits firmly inside the fillwell throat; does NOT have to be removed to put on the fillwell cover*
- *Removable for easy cleaning*

BENEFITS:

- *Keeps unwanted debris out of tank when filling*
- *Promotes better wetting, distribution and suspension of dry powders*
- *Prevents clogging of pumps and spray nozzles caused by undissolved powder lumps*

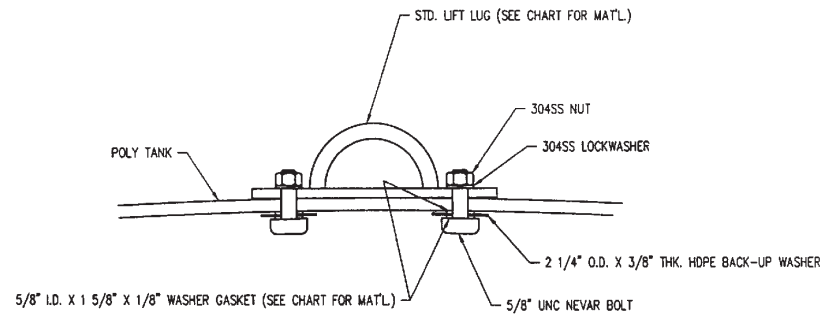
Strainer Baskets fit all 10" and 16" diameter fillwells in Raven fiberglass and polyethylene tanks

HEAVY DUTY LIFT LUGS

PART NUMBER	LIFT LUG MAT'L.	WASHER GASKET MAT'L.
5153I	Galv. C-Stl.	EPDM
5153I	Epoxy C-Stl.	EPDM
5153J	304 SS	EPDM
5153K	316 SS	EPDM
5153I	Galv. C-Stl.	Viton
5153I	Epoxy C-Stl.	Viton
5153J	304 SS	Viton
5153K	316 SS	Viton

Lift lugs provide a safe, economical means to lift **empty** poly tanks for on site handling.

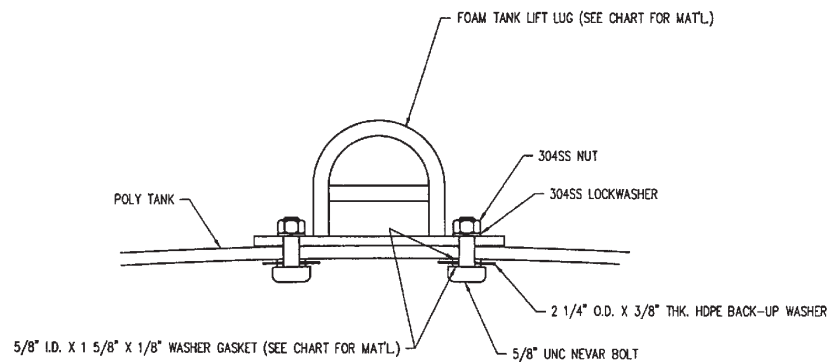
- Lugs are attached to tank wall with stainless steel Nevar bolts.
- Lugs are available in galvanized steel and 304 or 316 stainless steel.



FOAMED TANK LIFT LUGS

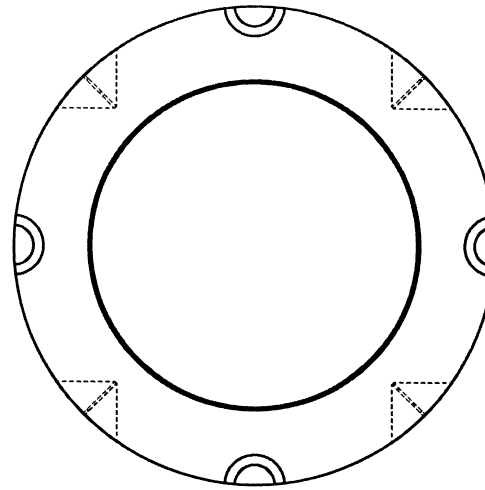
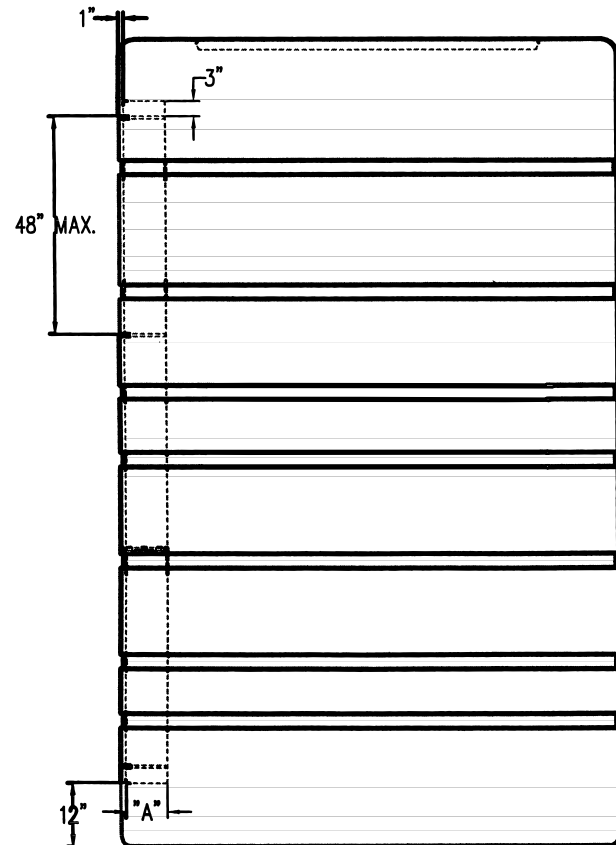
Lift lugs for polyurethane insulated tanks feature additional height to compensate for 2" foam thickness. Typical installation would consist of LIFT LUGS properly located on the top.

PART NUMBER	LIFT LUG MAT'L.	WASHER GASKET MAT'L.
5153I	Galv. C-Stl.	EPDM
5153I	Epoxy C-Stl.	EPDM
5153J	304 SS	EPDM
5153K	316 SS	EPDM
5153I	Primed C-Stl.	Viton
5153I	Epoxy C-Stl.	Viton
5153J	304 SS	Viton
5153K	316 SS	Viton



AGITATION BAFFLES

TANK DIAMETER	BAFFLE PART NUMBER	GUSSET PART NUMBER	DIM. "A"
64"	7159L	7158L	6"
96"	7159M	7158M	8"
102"	7159N	7158N	10"
130"	7159P	7158P	10"



NOTE: *Agitators must be independently supported.*

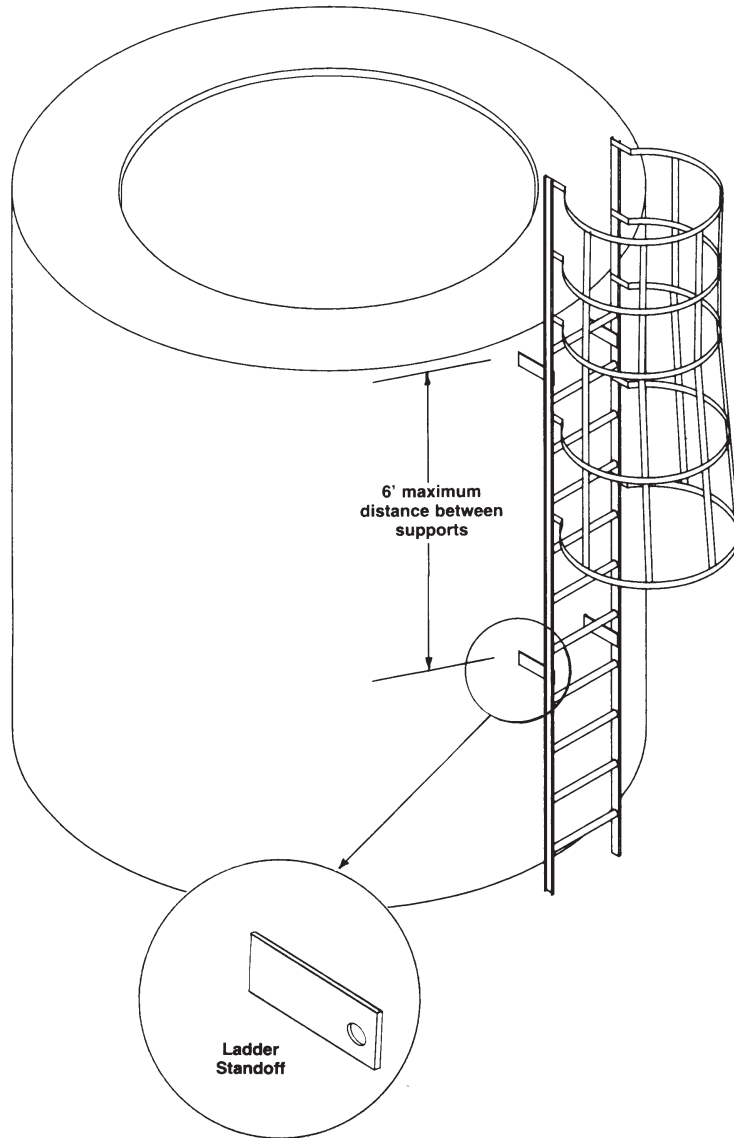
Anti-Vortex baffles minimize problems associated with vortexing during agitation.

- Flat plate baffles are positioned to oppose agitation direction specified by customer.
- For best results four baffles are recommended per tank.
- Flat plate baffles are welded to tank wall utilizing poly gussets. See drawing at left for baffle dimensions.
- Top and bottom gussets should be located within 3-6" of end of baffles. Distance between gussets should not exceed 48".

ORDERING GUIDELINES

- When ordering, specify number of baffles per tank, length of each baffle and number of gussets per baffle.
- Typical baffle length will equal sidewall length minus 3" for 64", sidewall length minus 12" for 96" diameter.
- Top and bottom gussets should be located within 3"-6" of end of baffles. Distance between gussets should not exceed 48".

LADDERS & CAGES



Ladders and cages meeting OSHA standards are available on any style polyethylene tank in carbon steel, fiberglass, or aluminum. Standard ladders include 3'6" walk thru.

Ladders are secured to tank wall by welding a lug to the tank.

To order follow the guidelines listed below:

- Total ladder length = tank height + 3'6".
- Total cage length = ladder length - 7'.
- Maximum tank to center distance on mounting lugs is 6".
- See example on left for assistance.

EXAMPLE

Calculate ladder length, cage length, and required number of supports for a tank that is 20' tall.

$$\begin{aligned}\text{Ladder length} &= \text{Tank height} + 3'6'' \\ 20' + 3'6'' &= 23'6''\end{aligned}$$

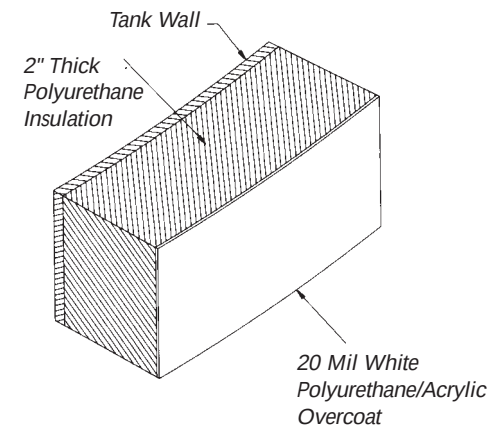
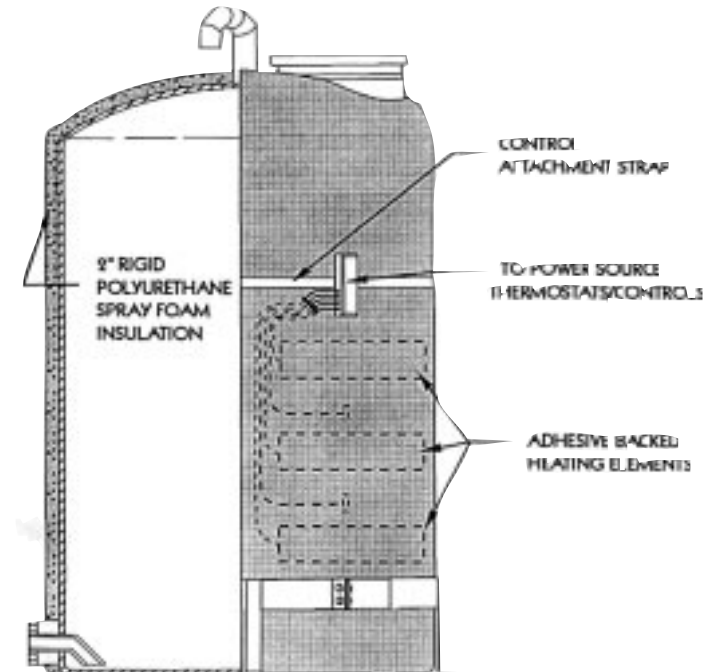
$$\begin{aligned}\text{Cage length} &= \text{Ladder length} - 7'0'' \\ 23'6'' - 7'0'' &= 16'6''\end{aligned}$$

$$\begin{aligned}\text{Lugs Required} &= \text{Tank height}/6' \text{ (rounded up to next whole no.)} \\ 20'/6' &= 3.33 \text{ (round to 4) ladder requires 4 pair of lugs.}\end{aligned}$$

HEATING SYSTEMS

- Heating systems for polyethylene tanks are designed for temperature maintenance only.
- Operate from 120 VAC power source with a low watt/in² output to eliminate any possibility of tank degradation due to excess heat.
- Heater is encapsulated flat foil resistance panels evenly spaced on the lower portion of the tank. Heating elements are in parallel to provide maximum reliability.
- Enclosed, weatherproof NEMA 4 thermostat operates up to four panels in a parallel circuit.
- To adequately design a system we require tank dimensions, anticipated minimum ambient temperature, wind velocity, and the desired minimum temperature of the contents.

HEAT TRACE/ INSULATION

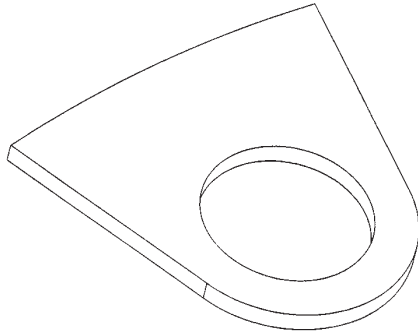


URETHANE INSULATION WITH UTYLON OVERCOAT

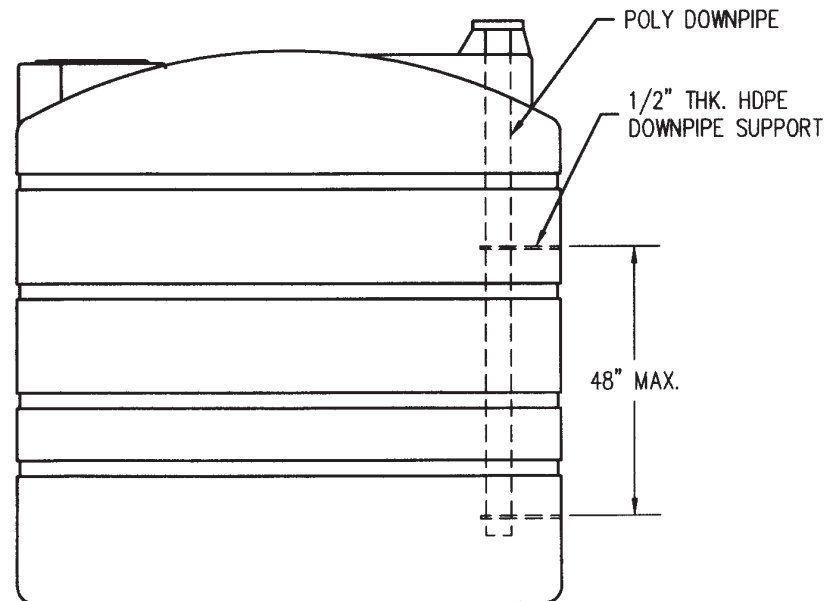
- Spray-on two part polyurethane foam, 2 to 2.5 pounds per cubic foot density. R value is 7.8 per inch of thickness.
- Overcoat consists of a two-part polyurethane base and a top coat of either Acrylic (available at additional cost) or Utylon material. Total thickness is 20 mils. Other coating materials available on a custom basis.
- Standard top coat color is white.
- Materials exhibit excellent weathering characteristics and good corrosion resistance.
- Any damage resulting from handling or shipping should be immediately repaired to avoid moisture entry.
- Deep insulation gouges may be repaired with aerosol polyurethane foam.
- Overcoat abrasion may be recoated with the Acrylic or Utylon elastomer overcoat.
- If temperature is below 50°F, an industrial grade RTV silicone caulking may be used.

NOTE: Other lower cost options may be available. Please consult with the factory.

POLY DOWNPIPES



- Poly downpipes are designed for either exterior or interior installation and are used for foam reduction, control of flow, and as a siphon drain.
- Standard installation features pipe permanently welded to tank wall utilizing welded poly brace supports. Maximum distance between supports is 48".
- External pipe support is provided using Poly welded supports.



PVC Sight Tube Assemblies

ITEM NUMBER	DESCRIPTION
1	Threaded Fitting*
2	PVC Close Nipple
3	PVC Angle Valve
4	PVC Male Adapter
5	PVC Pipe
6	PVC 90° Elbow
7	PVC Union, Socket x Socket

**Must be ordered separately*

Specify either 3/4" or 1" -1 valve or 2 valve

Rigid PVC sight tube assemblies provide a relatively simple and economical method to positively view liquid level in Raven polyethylene tanks.

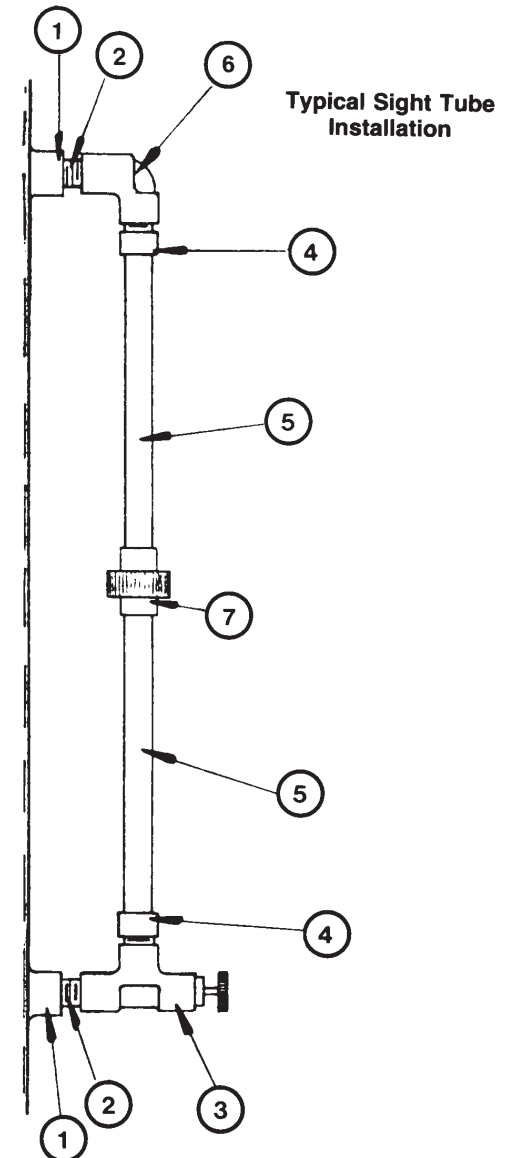
Raven's standard assembly is available in either 3/4" or 1" size and features one bottom angle valve for emergency shut off. If contents are potentially hazardous, Raven recommends that a top shut off valve be added as a precaution.

An intermediate support is required when overall sight tube length reaches 10' and one additional support is required for each 6' length thereafter.

NOTE: When storing hazardous materials or located (tank) in a high traffic area, an ultrasonic level transmitter is strongly recommended. See our fiberglass section, pages F-43/44 for more details.

EXAMPLES:

SIGHT TUBE LENGTH	NUMBER OF SUPPORTS
<10'	0
10'-17'11"	1
18'-23'11"	2



Raven Graphic Systems provide an exciting, permanent decoration and labeling system developed exclusively for use in the polyolefin molded plastic industry. This process allows a company to add lasting value to its products with a highly visible, permanent and easy-to-use graphics application for plastic parts or components. The process is a cost-effective decorating system made to enhance the appearance and saleability of conventionally hard-to-decorate polyolefin plastic products.

They are single or multi-colored custom graphics that can be produced in virtually any size, shape or design complexity

that will fit directly onto the surface of the plastic part.

Unlike other chemically applied rub-on ink transfers, or traditional pressure sensitive labels, Raven uses durable graphics that permanently thermofuse directly into the outer surface of the product. The fusion process creates an unbreakable bond by encapsulating the graphic design within the polymer matrix.

Each graphic is created to exact engineering specifications. To order, provide a camera ready copy of the graphic with colors identified.



Easy-to-use graphics are highly visible, unique and eye-catching marketing tools.



INTRODUCTION

In 1945, Norcore Plastics began offering dual laminate products and services to a variety of industries. With the acquisition of Norcore Plastics, Raven Industries has the dual laminate knowledge and design techniques no other full-service tank manufacturer has.

Today, Norcore Products by Raven continues to be a dominant leader in the fabrication of quality dual-laminate tanks, piping systems and ventilation equipment.

WHAT IS DUAL LAMINATE CONSTRUCTION?

Dual laminate construction of chemical-resistant tanks and piping has been used for more than forty years. Although thermoplastics have long been known for their excellent chemical resistance, their weak mechanical properties make design of large or higher temperature tanks and piping very difficult.

Dual laminate construction combines the superior chemical resistance of thermoplastics with the greater mechanical strength and flexibility of fiberglass. The liner is thermoformed and welded and then FRP is chemically or mechanically bonded to it. The added cost of this type of construction over conventional fiberglass construction, is often justified by greater service life, lower maintenance costs and higher process productivity.



COMMON THERMOPLASTICS USED:

Thermoplastics used in fabrication are those that are “melt processable.” Their shape can be changed through thermoforming and they can be welded. Those frequently considered for corrosion applications include:

- PP (Polypropylene)
- FEP (Fluorinated Ethylene Propylene)
- CPVC (Post Chlorinated PVC)
- PFA (Perfluoroalkoxy)
- PVC (Polyvinyl Chloride)
- ECTFE (Ethylene Chlorotrifluoroethylene)
- PVDF (Polyvinylidene Fluoride)

NORCORE PRODUCTS™

Raven Industries' Norcore Plant has been manufacturing corrosion resistant tanks and other products since 1945. Tanks are available up to 10' in diameter and a total volume of over 60,000 gallons. We ship by truck, rail or barge.

CUSTOM CHEMICAL TANKS

Raven specializes in manufacturing tanks for unique and difficult chemical environments. Chemical and mechanical engineering personnel are used to design vessels which meet specific customer requirements.

We have particular expertise in manufacturing "dual laminate" tanks where thermoplastic is used for the chemical resistant liner and fiberglass is used to provide reinforcement strength. Thermoplastics tend to be more consistent in their chemical resistance throughout their temperature capability range. Fiberglass may be resistant at one temperature and subject to attack at another.

TANK WINDING EQUIPMENT

Raven has horizontal and vertical winding equipment. The winders are set-up using computer technology. We electronically monitor the amounts of resin and glass to assure the highest quality components. The winders apply all materials needed to complete tank shells including hoop strand, woven roving, unidirectional roving, mat, resin, catalyst, urethane foam for insulation, and nexus, cveil and other liner material.





THERMOPLASTIC Fabrication Equipment

Raven's thermoplastic tooling is among the best in North America. Butt fusion welders are used for both flat sheets and pipes. Extrusion and hot air welding equipment is operated using both nitrogen gas and air for cooling. Proper welding equipment is important. Infrared vacuum forming provides fewer welds, lower stress formation and more consistent shapes.

Long-term test data has shown that butt fusion welds are nearly twice as strong as hand welds, and extrusion welds are about 50% stronger. Raven also has complete tooling capability to thermoform torispherical domes, knuckle radius bottoms, and other parts as needed.

THERMOPLASTIC LINER MATERIALS AND USES

LINER MATERIAL	TEMP. MAX-F	TYPICAL APPLICATIONS
PVC	140	Strong Acids, Alkalais
CPVC	180	Strong Acids, Alkalais Higher Temperatures
POLYPRO	210	Weak Acids, Solvents, & Alkalais
PVDF	300	Strong and Mixed Acids High Purity
FEP	400	Strong and Mixed Acids, Solvents, High Purity
PFA	500	Strong and Mixed Acids Solvents, High Purity
ECTFE	300	Strong Acids, Alkalais, High Purity

NORCOREPRODUCTS™

Raven Industries has been manufacturing high quality plastic and fiberglass pipe fittings and headers since 1945. Raven is capable of working on all the materials normally used in corrosive environments.

- ▶ FIBERGLASS
- ▶ THERMOPLASTICS — PVC, CPVC, PVDF, PP, PE, FEP and PFA Teflon® and ECTFE
- ▶ DUAL LAMINATE — Plastic and fiberglass

Raven provides a complete line of piping services:

- ▶ CUSTOM DESIGN — Chemical & Mechanical
- ▶ HIGH QUALITY FABRICATION
 - Pipe and Ducting
 - Fittings
 - Prefabricated Headers
- ▶ INSTALLATION AND FIELD REPAIR

PIPE AND FITTINGS

We provide individual pipe, valves and fittings for customer assembly and installation. Fiberglass tooling provides piping to 14 feet in diameter. Extruded PVC is stocked up to 24" in diameter, and PVDF and CPVC is available to 12" in diameter. All piping can be custom fabricated in larger sizes. Fittings and valves are available for all types of piping.

PREFABRICATED PIPING AND HEADERS

Prefabricated piping has many advantages:

- REDUCED INSTALLATION COST
- HIGH QUALITY SHOP FABRICATION
- LESS INSTALLATION TIME
- EASE OF FUTURE MODIFICATION

Raven has extensive experience and diverse capability to provide complete plant piping. Successful installations have been provided for: Chemical manufacturing, Wastewater Treatment, Metal Refining Feed and Drain Lines, Chlorine Gas Ducting, and Aquaculture. We can also provide component headers to meet specific customer dimensions and specifications.





PLASTIC AND DUAL LAMINATE PIPING

Many of our customers have begun using “dual laminate” piping. The thermoplastic liners of the piping provide the highest possible resistance to chemical attack while the fiberglass reinforcement provides strength for high pressures and temperatures, providing double protection against failure.

Raven’s plastic and dual laminate tooling is among the best in North America. Butt fusion and extrusion welding provide weld factors significantly higher than hand welding. Our chemical and mechanical engineering staff has extensive experience in designing for the creep properties of various thermoplastics and for the actual strength of chemical and mechanical bonds between the plastic and fiberglass reinforcement.

NORCOREPRODUCTS™

Raven Industries' Norcore Plant has been manufacturing high quality round and rectangular plating tanks since 1945. In-house chemical and mechanical engineering, and state of the art thermoforming, butt fusion and extrusion welding equipment provides one-of-kind versatility to meet your tank needs. Tanks are fabricated in all sizes from a variety of materials including: polypropylene, PVC, CPVC, PVDF, FEP Teflon®, Halar, ECTPE, and fiberglass. Raven will help you select the most cost-effective tank for your needs.

FREE STANDING PLASTIC TANKS

Polypropylene plating and rinse tanks are engineered to provide a long service life even when fully loaded with hot solutions. Raven's butt fusion and extrusion welding equipment make welds twice as strong as hand welds. This allows us to build tanks with up to 1" wall thickness to reduce the cost of external girthing.

We provide fast quotations and delivery for a single tank or for an entire plating line. For accurate pricing we need internal dimensions, the sizes of drains and outlets, placement of baffles and overflow wiers, and the temperature, chemical concentration and specific gravity of the contents.



LINED STEEL PLATING AND RINSE TANKS

Plasticized or flexible PVDF, ECTFE and PVC are excellent alternatives for medium and large-sized plating tanks. The superior chemical resistance of the plastic combine with the strength of the steel to meet needs up to 140 degrees (F) with PVC and up to 300 degrees (F) with PVDF. Such tanks are particularly common in metal plating and chemical milling.



DROP-IN LINERS

Raven manufactures fiberglass reinforced PVC, CPVC, PP, ECTFE, FEP (Teflon®), and PVDF liners to fit inside new or existing steel tanks. Such liners can easily be replaced if damaged and form a double containment for extra security.

DUAL LAMINATE PLASTIC & FIBERGLASS TANKS

Raven is an expert at manufacturing tanks using composites of different materials. Fiberglass is chemically or mechanically bonded to a plastic liner and urethane foam or balsa cores sandwiched between fiberglass skins to provide insulation and extra rigidity. Such tanks are chemical resistant on both the inside and outside and are much stronger than freestanding plastic. With fluoropolymer plastics, temperature capabilities of 300 to 400 degrees can be achieved. All of the following may be used as liners:

- PVDF
- FEP & PFA Teflon®
- ECTFE
- PVC & CPVC
- Polypropylene



FOR HIGH PURITY APPLICATIONS

Since 1966, Raven's Norcore plant has designed and fabricated both small and large corrosion-resistant storage tanks. They specialize in "dual laminate" where a thermoplastic liner is used for its manufactured purity and chemical resistance, and the structural reinforcement is fully bonded fiberglass.

A Chemical Day Tank (CDT) is used for small quantities of acids or other chemicals used to meet daily production requirements. The chemicals come from tank trucks or large bulk storage tanks and are then blended and delivered to a fabrication or production area.

CDT's are specifically designed to handle aggressive chemicals while meeting the high purity requirements of the semiconductor industry as well as other industries. A large variety of liner materials and tank sizes are available.

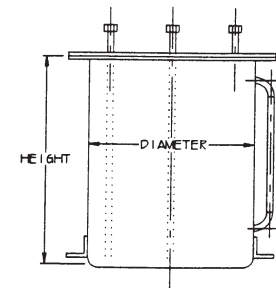
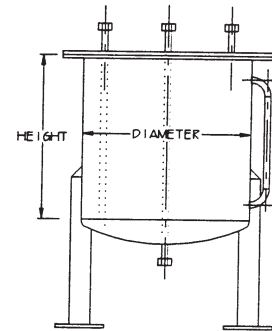
BASIC TYPES AVAILABLE

Domed Bottom (CDT-D)

These tanks have a "full drain" torospherical bottom to allow installation of bottom fittings and piping. The top is removable for inspection and cleaning. A four leg stand is provided. Gaskets are Teflon® rope. Fasteners are Teflon® coated stainless steel. All tanks are serial numbered.

Flat Bottom (CDT-F)

These tanks have a flat bottom which is fully supported by the customer's pad or grating. The flat bottom tank can hold more gallons in restricted height areas. Outlets can only be placed in the removable top or side. Tie down lugs are provided.



SIZE AND CAPACITY

Standard diameters of 24", 36", 48" and 60" allow for capacities from 200 liter (53 gallon) to 5800 liter (1532 gallon). Standard tank legs are 18" high. Tanks can also be custom sized and are available up to 60,000 gallons. The following are some common CDT sizes:

Capacity		Height (Straight Shell)			Approx. Lbs.
Liters	Gallons	Diam.	Dome	Flat	
200	53	24"	27"	30"	120
500	132	36"	28"	32"	180
800	212	36"	47"	51"	240
1200	317	36"	71"	75"	300
1800	476	48"	59"	64"	400
2400	635	48"	80"	85"	500
3600	951	60"	74"	80"	900
5500	1453	66"	94"	100"	1200
5800	1532	66"	99"	105"	1400

LINER MATERIALS

PFA Teflon® (2.3 mm) - This liner material can handle both acidic and caustic environments. It is very pure and is consistent with readily available PFA tubing, piping and fittings.

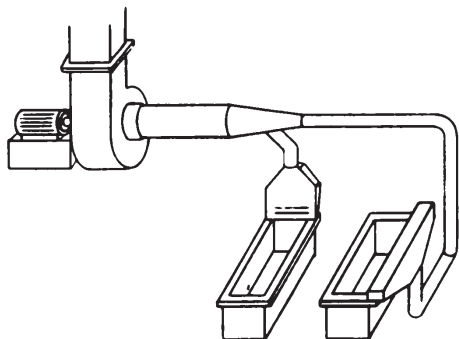
FEP Teflon® (2.3 mm) - Similar in capabilities to PFA except slightly lower in temperature capability. Flanges are used for tank outlets.

PVDF (3.0 mm) - Handles high purity acids very well but is not recommended for caustic (high pH). It is less expensive than FEP. A full line of pipe and fittings are available.

ECTFE (2.3 mm) - Handles high purity acids and is recommended for most caustic (high pH) environments. ECTFE is less expensive than PFA and FEP. Flanges are used for tank nozzles.

Polypropylene (3.0 mm) - Handles many acidic and caustic environments, and is much less costly than other liner materials where the highest levels of purity is not required.

NORCOREPRODUCTS™



Raven's Norcore plant has manufactured high quality corrosion resistant ventilation equipment since 1945. Our capabilities include full design, fabrication, and installation. Materials used include Polypropylene, CPVC, PVC, and Fiberglass. We design to SMACNA and Industrial Ventilation and Hygiene Standards and have completed systems from 200 CFM to 80,000 CFM.



Standard Updraft Polypropylene Hoods
Electronics Manufacturing —
Redmond, WA

EXHAUST HOODS

Raven designs its hoods to capture contaminated fumes from round or rectangular plating tanks. Our standard updraft polypropylene, CPVC and PVC hoods handle most common printed circuit and metal plating needs. We also fabricate a large variety of other custom hoods to meet special needs.

- DOWNDRAFT "U" SHAPED
- PUSH-PULL
- LABORATORY
- CANOPY

Call with your plating tank size, temperature and contents. We will recommend a hood type and duct size.



PVC & PP Duct
Pipe and Fittings

DUCT AND FITTINGS

Raven stocks extruded PVC duct in sizes up to 24" and manufactures PVC, CPVC and Polypropylene round duct up to 60" in diameter. Rectangular duct is also manufactured. A complete line of fittings includes Elbows, Reducers, Laterals, Transitions, Flanges, and other standard items. Custom configurations can be fabricated to your specifications.

We can assist you in designing your system to be cost effective in its ability to remove contaminated air and limit energy cost to drive fans and scrubbing equipment. We generally recommend duct velocities of 2000 FPM to 2500 FPM, slot velocities of 2000 FPM and plenum velocities of less than 1000 FPM.

NORCOREPRODUCTS™

OTHER COMPANY PRODUCTS AND MATERIALS USED

We have over 40 years of continuous experience fabricating corrosive and abrasive resistant products for industry. Products manufactured include:

- ▶ STORAGE AND PROCESS TANKS
- ▶ VENTILATION AND AIR POLLUTION CONTROL EQUIPMENT
- ▶ PIPING, FITTINGS AND CUSTOM PREFABRICATED HEADERS
- ▶ OTHER CUSTOM FABRICATED ITEMS

We are capable of working with a wide range of corrosion and abrasion resistant materials so we can select those which are most cost-effective in meeting customer needs. Materials used include:

THERMOPLASTICS

- PVC, CPVC, Polypropylene, polyethylene, PVDF, FEP and PFA Teflon® (DuPont Company) and ECTFE.

THERMOSET FIBER REINFORCED PLASTICS

- Polyester, Vinylester, Bisphenol, Isophthalic, furan, etc.

OUTLET AND OTHER OPTIONS

- Tubing Adapters
- Flanges - Full Face
- Flanges - Vanstone
- FIPT Threaded
- Site Glass Assembly
- Dip Tubes

Secondary containment flanges, instrument mounting pads, internal piping, valves and other custom items can be included with each tank. Continuous level monitoring or refill point sensors can be provided in either a liquid contact or non-contact mode.

FANS, SCRUBBERS, AND MIST ELIMINATORS

Raven has worked with all major manufacturers of high quality fans and scrubbers. We coordinate our efforts with the manufacturer to assure proper selection of materials. Raven also fabricates components or makes repairs on air handling equipment, and manufactures complete packed tower and other scrubbing equipment to specific design requirements.

PREFABRICATION AND INSTALLATION

Raven specializes in custom design, fabrication, and installation of ventilation systems. Headers and groupings of fittings are frequently prefabricated and flanged if necessary to reduce your “installed cost”. Raven crews are bonded and capable of handling a complete new installation or modification of your existing system.

HIGH PURITY CLEANING AND SHIPPING

All tanks are welded in Class 10,000 clean rooms using an inert welding gas. Tanks are cleaned with 18 megohm DI water and all flanges and tubing adaptors are capped before shipping. Wood export shipping containers are provided with all tanks.

HOW TO ORDER TANKS AND ACCESSORIES

Raven tanks both polyethylene, fiberglass, and other products are available from authorized Raven Industrial Products Distributors.

Always order by complete catalog number and size code. Be sure to include a brief product description, intended use, and drawing showing the location of installed fittings, where necessary.

For example: one each 27035 cylindrical tank and one each 7106IE PVC fitting through side. Tank to contain 15% concentration of sodium hypochlorite at 70°F at, 1.9 s.g. Drawings are required when fittings are to be factory installed and must be approved by the customer prior to fabrication.

SHRINK WRAP

Shrink wrap must be specified at the time of ordering either fiberglass or polyethylene tanks. Shrink wrap is highly recommended for polyethylene tanks to reduce scuffing, road grime, etc. For pricing information please refer to page P-26 of the Raven Price List.

FREIGHT

All shipments are F.O.B. Sioux Falls, South Dakota or other distribution points.

APPLICATIONS

Raven Industries records application details for all bulk tank orders. This information ensures correct usage of bulk tanks and supports the Raven warranty.

Please submit the following with all bulk tank orders:

- chemicals and concentration
- service temperatures
- specific gravity of contents
- installation location

NOTE: *Many Raven Industrial Distributors stock Raven tanks. Please check with the Raven Industrial Distributor in your area for potential freight savings.*

For assistance, call your nearest Raven Industrial Distributor or the Raven Industrial Customer Service Department: 1-888-366-8265.

DELIVERY

Certain standard polyethylene tanks are generally available from stock or with a short lead time for production scheduling. If your order is unusual in quantity, size or fittings required, or if it involves a major installation, please contact the Raven Industrial Customer Service Department for delivery information. Fiberglass tanks are built to order to match your exact requirements and need signed approval drawings before they are entered in the production schedule. Please contact the Raven Industrial Customer Service Department for delivery information.

RETURN GOODS PROCEDURE

No material will be accepted for return without Raven authorization. Authorized returns must carry a Raven "Authorized Return" number on the outside of the shipping container. These numbers are available from the Raven Industrial Customer Service Department.

Specially fabricated or factory-modified tanks may not be returned for credit.

The most critical step in achieving maximum service life for your Raven tank is the selection of the proper resin for the intended service environment. The resistance of any material to chemical attack is a function of several elements - the specific chemical, chemical concentration, temperature, and time of contact. The following pages represent a compilation of resin supplier testing and 30 years of Raven field experience. Since minor variations in chemical mixture or service condi-

tions can have a major impact on the chemical resistance of a plastic part, this table is supplied only as a guide for your resin selection and does not imply a guarantee of the chemical resistance of any product. Combinations of chemicals have the potential to cause unique corrosion problems and their compatability should be evaluated and approved by Raven prior to use. It is not a safe assumption that the mixture of two approved chemicals will also be approved.

How To Use This Guide

1. Locate the chemical service in the left hand column and the concentration closest to the intended contents.
2. Following the columns to the right, identify the resin or material with a listed temperature which meets or exceeds the intended maximum operating temperature.
3. Make resin selection for tank, fittings & grommet or O-ring material, If chemical is not included or if conditions deviate from those listed, please call Raven Engineering for recommendations.

EXAMPLE:

MATERIAL	% OF CONCENTRATION	FIBERGLASS LAMINATE		POLYETHYLENE		FITTINGS			GROMMETS & O-RINGS		
		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/Fluorel	EPDM
Acetic Acid	10	170	210	140	140	140	140	NR	100 ¹	100 ¹	140
Acetic Acid	25	170	210	140	140	NR	140	140	100 ¹	80	140
Ammonium Hydroxide	5	NR	150 ²	140	140	140	140	75	NR	120 ¹	140
Ammonium Hydroxide	10	NR	150 ²	140	140	140	140	75	NR	120 ¹	140
Water (deionized)	All	NR	180 ⁴	140	140	140	140	140	140	140	140
Water (demineralized)	All	180	180	140	140	140	140	140	140	140	140

1 - Minor Effect

2 - Synthetic Veil Required

3 - Derakane 470

4 - Steam Post Cure Recommended (required for food grade applications)

5 - Contact Factory with Specific Type for Recommendation

6 - Limited Service Life

7 - Preferred for this Service

NR - Not Recommended

NT - Not Tested

EXAMPLE:

MATERIAL	% OF CONCENTRATION	FIBERGLASS LAMINATE		POLYETHYLENE		FITTINGS			GROMMETS & O-RINGS		
		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/Fluorel	EPDM
Acetic Acid	10	170	210	140	140	140	140	NR	100 ¹	100 ¹	140
Acetic Acid	25	170	210	140	140	NR	140	140	100 ¹	80	140
Ammonium Hydroxide	5	NR	150 ²	140	140	140	140	75	NR	120 ¹	140
Ammonium Hydroxide	10	NR	150 ²	140	140	140	140	75	NR	120 ¹	140
Water (deionized)	All	NR	180 ⁴	140	140	140	140	140	140	140	140
Water (demineralized)	All	180	180	140	140	140	140	140	140	140	140

1 - Minor Effect

2 - Synthetic Veil Required

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5 - Contact Factory with Specific Type for Recommendation

6 - Limited Service Life

7 - Preferred for this Service

NR - Not Recommended

NT - Not Tested

A RESINS

Raven **standard fiberglass** laminate is an isophthalic polyester with a maximum temperature limit of 170 degrees F.

Raven **premium fiberglass** laminate is a vinyl ester with a maximum temperature limit of 210 degrees F.

Raven **polyethylene** is either high density linear or crosslink resin.

Other resins exhibiting specific properties such as organic solvent resistance and fire retardancy are also available by factory quotation.

Construction Note: Depending upon diameter, Raven fiberglass tanks can be manufactured either with a single resin throughout or with a premium resin in the corrosion barrier and an isophthalic resin utilized in the structural wall. Check with factory for details.

B SYNTHETIC VEIL

Synthetic veil (Nexus ®) is produced from Dacron® polyester fiber and is used as a non-glass surfacing veil in certain highly corrosive environments such as the storage of sodium hypochlorite, sodium hydroxide, and hydrofluoric acid.

C STEAM POST CURE

The application of steam to the cured fiberglass part elevates the temperature and serves to drive off residual styrene. Steam post cure is required for all food grade applications and for certain highly aggressive environments such as the storage of sodium hypochlorite.

THIS TABLE IS SUPPLIED AS A GUIDE AND DOES NOT IMPLY A GUARANTEE

MAXIMUM SERVICE TEMPERATURE IN DEGREES F.											
MATERIAL	% OF CONCENTRATION	FIBERGLASS LAMINATE		POLYETHYLENE		FITTINGS			GROMMETS & O-RINGS		
		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/Fluorel	EPDM
Acetic Acid	10	170	210	140	140	140	140	NR	100 ¹	100 ¹	140
Acetic Acid	25	170	210	140	140	NR	140	140	100 ¹	80	140
Acetic Acid	50	150	180	140	140	NR	140	140	NR	80	140
Acetic Acid	75	NR	150	140	140	NR	140	140	NR	NR	140
Acetic Acid	glacial	NR	100 ³	120	120	NR	120	140	NR	NR	75
Acetone	100	NR	NR	NR	NR	NR	140	140	NR	NR	140
Aluminum Chloride	All	170	210	120 ¹	120 ¹	75	140	NR	140	140	140
Aluminum Chlorohydroxide	50	170	80	NT	NT	NT	NT	NT	NT	NT	NT
Aluminum Potassium Sulfate	All	180	210	140	140	140	140	120	140	140	140
Alumium Sulfate	All	180	210	140	140	120	140	75 ¹	140	140	140
Ammonium Bicarbonate	10	130	150	NT	NT	140	140	140	NT	NT	NT
Ammonium Bicarbonate	50	NR	150	NT	NT	140	140	140	NT	NT	NT
Ammonium Carbonate	50	NR	100	120 ¹	120 ¹	140	140	140	120	NT	140
Ammonium Chloride	All	180	210	140	140	120	120	NR	120 ¹	140	140
Ammonium Hydroxide	5	NR	150 ²	140	140	140	140	75	NR	120 ¹	140
Ammonium Hydroxide	10	NR	150 ²	140	140	140	140	75	NR	120 ¹	140
Ammonium Hydroxide	20	NR	150 ²	140	140	140	140	75	NR	120 ¹	140
Ammonium Hydroxide	29	NR	100 ²	140	140	140	140	75	NR	120 ¹	140
Ammonium Nitrate	All	160	210	140	140	120 ¹	140	140	140	140	140
Ammonium Persulfate	All	NR	180	140	140	NR	140	120	NR	140	140
Ammonium Sulfate	All	170	210	75	75	120	140	75	140	140	140
Ammonium Thiosulfate	60	NR	100	100	100	NT	NT	140	140	NT	NT
Amyl Alcohol	All	100	120	120 ¹	120 ¹	120	75 ¹	140	120 ¹	120 ¹	140
Aniline Sulfate	All	NR	210	75	75	NR	75	140	NR	75	NT
Antimony Trichloride	All	160	210	120 ¹	120 ¹	120	140	NR	NT	140	75 ¹
Barium Carbonate	All	100 ⁶	210	120 ¹	120 ¹	140	140	140	140	140	140

1 - Minor Effect

2 - Synthetic Veil Required

3 - Derakane 470

4 - Steam Post Cure Recommended (required for food grade applications)

5 - Contact Factory with Specific Type for Recommendation

6 - Limited Service Life

7 - Preferred for this Service

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MAXIMUM SERVICE TEMPERATURE IN DEGREES F.											
MATERIAL	% OF CONCENTRATION	FIBERGLASS LAMINATE		POLYETHYLENE		FITTINGS			GROMMETS & O-RINGS		
		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/Fluorel	EPDM
Barium Chloride	All	180	210	75	75	75	140	75	140	140	140
Barium Hydroxide	10	NR	150 ²	120 ¹	120 ¹	140	140	140	140	140	140
Barium Sulfide	All	NR	180	120 ¹	120 ¹	120	140	120 ¹	140	140	140
Benzaldehyde	100	NR	NR	75	75	NR	75	140	NR	NR	140
Benzene	100	NR	100 ³	NR	NR	NR	NR	140	NR	140	NR
Benzene Sulfonic Acid	0 - 75	NR	150	NR	NR	NT	NT	NT	NT	NT	75
Benzoic Acid	All	170	210	120 ¹	120 ¹	120	NR	140	NR	140	120 ¹
Benzylol	All	NR	100 ³	NT	NT	NT	140	75	NR	NR	68
Boric Acid	All	180	210	140	140	120	140	120	140	140	140
Bromine	gas/vapor	NR	100	NR	NR	NR	NR	NR	NR	140	NR
Butyl Alcohol	All	NR	120	140	140	75	75	75	140	140	120 ¹
Butyric Acid	25	120	210	NR	NR	75	NR	120	NR	75 ¹	120 ¹
Butyric Acid	50	150	210	NR	NR	NR	NR	120	NR	75 ¹	120 ¹
Calcium Chlorate	All	150	210	NT	NT	140	NT	NT	NR	140	140
Calcium Chloride	All	180	210	120 ¹	120 ¹	120	120	120 ¹	140	140	140
Calcium Hydroxide	25	160	210 ²	120 ¹	120 ¹	120	120	140 ¹	140	140	140
Calcium Hypochlorite	All	120	160 ²	120 ¹	120 ¹	75 ¹	120	140 ¹	NR	140	75 ¹
Calcium Sulfate	All	180	210	120 ¹	120 ¹	140	140	140 ¹	140	140	140
Carbon Dioxide	All	170	210	NR	NR	140	120	75	140	120 ¹	120 ¹
Carbon Disulfide	100	NR	NR	NR	NR	NR	NR	140 ¹	NR	75	NR
Carbon Monoxide	All	170	210	120 ¹	120 ¹	120	140	140	140	140	140
Carbon Tetrachloride	100	80 ⁶	150	75 ¹	75 ¹	75 ¹	75 ¹	140 ¹	NR	140	NR
Chlorine Water	All	100 ⁶	180	75 ¹	75 ¹	120	NR	NR	NR	140	NR
Chlorobenzene	100	NR	100 ³	NR	NR	NR	NR	140 ¹	NR	75	NR
Chloroform	100	NR	NR	NR	NR	NR	NR	140	NR	140	NR
Chromic Acid	5	80	150	75	75	140	140	140	NR	140	140

1 - Minor Effect

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5 - Contact Factory with Specific Type for Recommendation

6 - Limited Service Life

7 - Preferred for this Service

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MAXIMUM SERVICE TEMPERATURE IN DEGREES F.											
MATERIAL	% OF CONCENTRATION	FIBERGLASS LAMINATE		POLYETHYLENE		FITTINGS			GROMMETS & O-RINGS		
		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/Fluorel	EPDM
Chromic Acid	10	NR	150	140	140	120	120	140	NR	140	120 ¹
Chromic Acid	30	NR	NR	140	140	120 ¹	120	120 ¹	NR	140	120 ¹
Chromic Acid	50	NR	NR	NR	NR	NR	75 ¹	120 ¹	NR	140	NR
Citric Acid	All	160	210	75	75	120 ¹	140	120	140	140	140
Copper Chloride	All	180	210	75	75	140	140	NR	140	140	140
Copper Cyanide	All	90	210	120 ¹	120 ¹	120	140	140 ¹	140	140	140
Copper Sulfate	All	180	210	120 ¹	120 ¹	140	140	140	140	140	140
Crude Oil, sweet & sour	100	180	210	NR	NR	140	NR	140	140	140	NR
Dichlorobenzene	100	NR	120 ³	NR	NR	NR	NR	75	NR	75	NT
Electrosol	5	NT	150	75	75	NT	NT	140	NT	NT	NT
Ethyl Alcohol	50	ambient	100	100	100	140	140 ¹	140 ¹	75	75	75
Ethyl Alcohol	95	NR	100 ³	100	100	75	140	140	75	75	75
Ethyl Ether	100	NR	NR	NR	NR	NR	NR	75 ¹	75	NR	NT
Ethylene Chloride	100	NR	NR	NR	NR	NR	NR	75	NR	120 ¹	NR
Ethylene Dichloride	100	NR	NR	NR	NR	NR	NR	75	NR	140	NR
Ethylene Glycol	100	180	210	75	75	75	120	75	140	140	140
Ferric Chloride	All	180	210	75	75	120	75 ¹	NR	140	140	140
Ferric Nitrate	All	180	210	120 ¹	120 ¹	120 ¹	140	75	140	140	140
Ferric Sulfate	All	180	210	140	140	120	140 ¹	75	140	140	140
Ferrous Chloride	All	180	210	75	75	120	140	NR	140	140	NT
Ferrous Nitrate	All	160	210	75	75	140	140	75	NT	NT	NT
Ferrous Sulfate	All	180	210	75	75	120	140	140 ¹	140	NT	140
Fluoboric Acid	All	ambient	210 ²	120 ¹	120 ¹	120	140	NR	140	NT	140
Fluosilicic Acid (or Hydro...)	35	NR	100 ²	75	75	75	140 ¹	75 ¹	140	NT	140
Formic Acid	98	NR	100	120 ¹	120 ¹	75	75	NR	120 ¹	NR	140
Gasoline	100	100	100 ⁵	100	100 ⁷	NR	NR	140	140	140	NR

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MAXIMUM SERVICE TEMPERATURE IN DEGREES F.											
MATERIAL	% OF CONCENTRATION	FIBERGLASS LAMINATE		POLYETHYLENE		FITTINGS			GROMMETS & O-RINGS		
		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/ Fluorel	EPDM
Glycerin (Glycerol)	180	210	75	75	75	140	140	140	140	140	140
Heptane	100	200	210	75 ¹	75 ¹	75 ¹	120 ¹	140	140	140	NR
Hydrobromic Acid	25	160	180	120 ¹	120 ¹	120	120	NR	140	NR	140
Hydrobromic Acid	48	160	150	120 ¹	120 ¹	75	75	NR	140	NR	140
Hydromromic Acid	62	NR	100	75 ¹	75 ¹	75	75	NR	NR	140	140
Hydrochloric (muriatic) Acid	10	160	180	140	140	120	120	NR	140	NT	NT
Hydrochloric Acid	20	125	180	140	140	120	120	NR	140	NT	140
Hydrochloric Acid	37	NR	150	120 ¹	120 ¹	120	120 ¹	NR	140	NR	NR
Hydrocyanic Acid	10	100	210	140	140	75	140	75	120 ¹	140	140
Hydrofluoric Acid	10	NR	150 ²	140	140	120 ¹	120	NR	75 ¹	75	75
Hydrofluoric Acid	20	NR	100 ²	140	140	120 ¹	120	NR	75 ¹	75	75
Hydrogen Peroxide	30	NR	150	NR	NR	120	75	120	NT	140	140
Hypochlorous Acid	10	100	150	140	140	140	75	NR	NT	NT	NT
Hypochlorous Acid	20	80	120	140	140	140	75	NR	NT	NT	NT
Hypochlorous Acid	50	NR	ambient	140	140	140	75	NR	NT	NT	NT
Kerosene	100	180	180	NR	NR	140	75	140	140	140	NR
Lactic Acid	All	160	210	75	75	75 ¹	75	75	140	140	140
Latex	All	ambient ⁵	120	NT	NT	NT	120	120	140	140	140
Lead Acetate	All	160	210	140	140	140	75	75	120 ¹	NR	140
Lime Slurry	All	170	180	75 ¹	75 ¹	75	NT	140	140	140	NR
Linseed Oil	100	160	210	NR	NR	140	140	140	140	140	NR
Magnesium Carbonate	All	180	180	140	140	120	140	75	140	140	140
Magnesium Chloride	All	180	210	140	140	140	140	75	140	140	140
Magnesium Sulfate	All	180	210	140	140	120	140	140	140	140	140
Maleic Acid	All	160	210	120 ¹	120 ¹	120	140	140	NR	140	NR
Mercuric Chloride	All	180	210	140	140	120	140	75 ¹	140	140	140

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MATERIAL	% OF CONCENTRATION	FIBERGLASS LAMINATE		POLYETHYLENE		FITTINGS			GROMMETS & O-RINGS		
		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/Fluorel	EPDM
Mercurous Chloride	All	180	210	140	140	140	140	75	140	140	NT
Methyl Alcohol	All	NR	100 ³	75	75	120	140	140	100	100	100
Methylene Chloride	100	NR	NR	NR	NR	NR	75	140	NR	1201	NR
Methylethyl Ketone	100	NR	70 ³	NR	NR	NR	75	140	NR	NR	75
Naptha	100	180	180	NR	NR	NR	75 ¹	140	NR	140	NR
Napthalene	100	150	210	NR	NR	NR	120	140	NR	140	NR
Nickel Chloride	All	180	210	120 ¹		120	140	NR	140	140	140
Nickel Nitrate	All	180	210	140		140	140	75	140	140	NT
Nickel Sulfate	All	180	210	140		120	140	120	140	140	140
Nitric Acid	5	160	150	120 ¹		75	120	140	NR	140	120 ¹
Nitric Acid	20	NR	120	NR	NR	75	120	140	NR	140	120 ¹
Nitric Acid	40	NR	80 ³	NR	NR	75	NR	75	NR	140	NR
Nitrobenzene	100	NR	100 ³	NR	NR	NR	75	140	NR	120 ¹	NR
Oleic Acid	All	180	210	NR	NR	NR	75	140	NR	120 ¹	120 ¹
Oleum (fuming sulfuric acid)	All	NR	NR	NR	NR	NR	NR	120	NR	100	NR
Oxalic Acid	All	180	210	140	140	75	120	75	140	1201	NR
Perchloric Acid	10	NR	150	140	140	140	140	75	NR	140	NT
Perchloric Acid	30	NR	100	75	75	75	140	75	NR	75	NT
Phosphoric Acid	10	170	210	140	140	120 ¹	75	120	NR	140	120 ¹
Phosphoric Acid	50	170	210	75 ¹	75 ¹	120 ¹	120	120	NR	140	120 ¹
Phosphoric Acid	85	180	210	75 ¹	75 ¹	120 ¹	120	120	NR	140	75
Phosphoric Acid (super)	100	100	210	NR	NR	NT	NT	NT	NR	140	NR
Photographic Solutions	All	100	100	100	100	140	140	140	80	100	NT
Phthalic Acid	All	NT	210	NT	NT	NT	NR	140	120 ¹	140	NT
Pictric (alcoholic) Acid	10	80	100 ³	NR	NR	NR	75	140	120 ¹	140	120 ¹
Potassium Bicarbonate	10	160	150 ²	140	140	140	140	140	140	140	140

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		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/Fluorel	EPDM
Potassium Bicarbonate	50	140	180 ²	140	140	140	140	140	140	140	140
Potassium Carbonate	10	100	150 ²	140	140	140	140	75	140	140	140
Potassium Carbonate	50	NR	180 ²	140	140	140	140	75	140	140	140
Potassium Chloride	All	180	210	140	140	140	140	75	140	140	140
Potassium Dichromate	All	180	210	140	140	140	140	140	NR	75	140
Potassium Ferricyanide	All	180	210	75	75	100 ¹	140	140	140	140	NT
Potassium Hydroxide	10	NR	150 ²	140	140	75	140	140	75	NT	140
Potassium Hydroxide	25	NR	150 ²	140	140	75	140	140	140	140	140
Potassium Hydroxide	40	NR	180 ²	140	140	75	140	140	120 ¹	120 ¹	140
Potassium Nitrate	All	180	210	120 ¹	120 ¹	140	140	140	140	140	140
Potassium Permanganate	All	125	210	140	140	75	75	75	NR	140	140
Potassium Persulfate	All	100	210	NT	NT	140	140	75	NR	140	NT
Potassium Sulfate	All	180	210	140	140	140	140	75	140	140	140
Selenious Acid	All	NT	210	75	75	75	NT	NT	NT	NT	NT
Silver Nitrate	All	180	210	120 ¹	120 ¹	140	75	140	140	140	140
Sodium Acetate	All	150	210	120 ¹	120 ¹	75 ¹	140	140	120 ¹	NR	140
Sodium Bicarbonate	10	180	180 ²	140	140	140	140	140	120 ¹	140	140
Sodium Bicarbonate	All	140	180 ²	140	140	140	140	140	120 ¹	140	140
Sodium Bisulfate	All	180	210	140	140	140	140	75	120 ¹	140	140
Sodium Carbonate	32	100 ⁶	180 ²	120 ¹	120 ¹	140	140	140	140	140	140
Sodium Chlorate	All	NR	210	120 ¹	120 ¹	75	140	75	NR	140	140
Sodium Chloride	All	180	200	140	140	140	140	75 ¹	140	140	140
Sodium Chlorite	50	NR	100	100	100	75	NR	NT	NT	NT	NT
Sodium Cyanide	All	100	210	140	140	140	140	75	140	NT	140
Sodium Ferricyanide	All	180	210	140	140	140	140	75	NT	NT	NT
Sodium Hydroxide	5	NR	180 ²	140	140	140	140	140	120 ¹	120 ¹	140

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		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/Fluorel	EPDM
Sodium Hydroxide	10	NR	180 ²	140	140	140	140	140	120 ¹	120 ¹	140
Sodium Hydroxide	25	NR	180 ²	140	140	140	140	140	120 ¹	120 ¹	140
Sodium Hydroxide	50	NR	210 ²	140	140	140	140	75 ¹	120 ¹	120 ¹	140
Sodium Hypochlorite	5.25	NR	150 ^{2 4}	140	140	140	140	75 ¹	120 ¹	140	120 ¹
Sodium Hypochlorite	10	NR	180 ^{2 4}	140	140	140	140	NR	120 ¹	140	120 ¹
Sodium Hypochlorite	18	NR	180 ^{2 4}	120 ¹	120 ¹	140	140	NR	120 ¹	140	120 ¹
Sodium Nitrate	All	180	210	140	140	140	140	75 ¹	120 ¹	140	140
Sodium Silicate	All	NR	210	140	140	140	140	140	140	140	140
Sodium Sulfate	All	175	210	140	140	140	140	140 ¹	140	140	140
Sodium Sulfide	All	NR	210	140	140	140	140	140 ¹	140	140	140
Sodium Sulfite	All	80	210	75 ¹	75 ¹	140	120	140 ¹	140	NT	140
Stannic Chloride	All	180	210	140	140	140	140	NR	140	140	120 ¹
Stannous Chloride	All	180	210	120 ¹	120 ¹	75	140	120	140	140	140
Stearic Acid	All	180	210	75 ¹	75 ¹	120 ¹	120	140	120 ¹	140	120 ¹
Sulfonated Detergents	100	NT	160	NR	NR	NT	75	140	NT	NT	NT
Sulfuric Acid	25	180	210	75	75	75	120	NR	NR	140	120 ¹
Sulfuric Acid	50	150	210	75	75	75	75 ¹	NR	NR	140	120 ¹
Sulfuric Acid	75	NR	100	75 ¹	75 ¹	75	75 ¹	NR	NR	140	120 ¹
Sulfuric Acid	93	NR	NR	NR	NR	NR	NR	NR	NR	75	NR
Tannic Acid	All	180	210	120 ¹	120 ¹	75	140	140	140	140	140
Tartaric Acid	All	180	210	75	75	75	140	NR	140	140	120 ¹
Tetrachloroethylene	100	NR	80	100 ¹	100 ¹	NR	100 ¹	140	NR	140	NR
Toluene	100	80	80	NR	NR	NR	NR	140	NR	140	NR
Trichloroacetic Acid	50	80 ⁶	210	NT	NT	NT	NT	NT	140	NR	NT
Trisodium Phosphate	All	NR	210	140	140	140	140	120	NT	NT	NT
Urea-ammonium Nitrate Fertilizer	100	100	120	75	75	140	140	140	140	140	NT

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		Std.	Prem.	HDPE	XLPE	PVC	PP	316 S.S.	Nitrile	Viton/ Fluorel	EPDM
Water (deionized)	All	NR	180 ⁴	140	140	140	140	140	140	140	140
Water (demineralized)	All	180	180	140	140	140	140	140	140	140	140
Water (distilled)	All	1606	180 ⁴	140	140	140	140	140	140	140	140
Water (potable)	All	NR	180 ⁴	140	NR	140	140	140	140	140	140
Xylene	100	90	80	NR	NR	NR	NR	140	75	NR	NR
Zinc Chloride	All	180	210	75	75	140	140	NR	140	140	140
Zinc Sulfate	All	180	210	140	140	140	140	140	140	140	140
8-8-8 Fertilizer	100	100	100	75	75	140	140	140	100	100	100

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MATERIALS

HDPE - High-Density Polyethylene
 XLPE - Cross-Linked High-Density Polyethylene
 PP - Polypropylene
 PVDF - Polyvinylidene Fluoride
 STD - Standard Resin (Isophthalic Polyester)

PREM - Premium Resin (Vinyl Ester)
 EPDM - Ethylene Propylene Diene Monomer
 NEOPRENE - A Chloroprene Polymer, Synthetic Rubber
 VITON - A fluoroelastomer, registered trademark of E.I. du Pont de Nemours and Company, Inc.

LIMITED WARRANTY

1. Raven Industries hereby warrants that Raven industrial products are free from defects in material and workmanship and that the products, provided they are installed in accordance with Raven instructions and used with chemicals listed as satisfactory in the chemical resistance chart at the temperatures noted in the Raven Industrial Catalog, will perform satisfactorily under normal use and service in the hands of the original user.
2. The above warranty by Raven shall expire three (3) years from the date the product is shipped to the buyer from the factory for all products except those noted below:

- Rotomolded products

NOTE: *If these tanks are used to store the following: acetic acid, amyl alcohol, benzene sulfonic acid, ethylene glycol, formaldehyde, glycol, nitric acid, pickling baths with sulfuric and nitric, plating solutions, chromic acid (1% to 50% concentration), or chromic acid/sulfuric acid-50%, the warranty is only one year.*

- For FRP products, the tank must be matched to the chemical resistance chart for the resin system used.

3. All products that are customized or structurally modified at the factory by customer request have a one (1) year warranty period from the date the product is shipped to the buyer from the factory, except those products for which a longer warranty period is specifically provided in writing by Raven at time of shipment. This warranty is void if the customer or someone other than Raven modifies Raven products.
4. Hardware, fittings and steel accessories have a one (1) year manufacture warranty from the date the product is shipped to the buyer from the factory. The warranty does not extend to products installed by the customer.
5. THE WARRANTY STATED HEREIN IS THE SOLE WARRANTY APPLICABLE TO RAVEN INDUSTRIES PRODUCTS. RAVEN INDUSTRIES EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE.
6. In the event of a breach by Raven of its warranty, Raven will, at its option, either repair or replace the product (FOB factory) or refund its purchase price. Raven Industries shall provide instructions on the handling of any other warranty claim.
7. RAVEN INDUSTRIES LIABILITY WITH RESPECT TO ITS PRODUCTS IS EXPRESSLY LIMITED TO THE REMEDIES SET FORTH ABOVE. THE REMEDIES ARE THE BUYER'S EXCLUSIVE REMEDIES. RAVEN INDUSTRIES SHALL UNDER NO CIRCUMSTANCES BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

WARNING: All Raven tanks are designed for atmospheric storage of chemicals and should not be used for pressure, vacuum or direct burial applications.

UNLOADING INSTRUCTIONS

1. Review the tank drawing, inspect the tank, plan the handling procedure and have all proper handling equipment available before attempting to remove the tank.
2. Tank must be lifted off the trailer, not rolled or slid.
3. When lifting tank shipped horizontally use webbing or ropes with proper spreader bar to insure vertical, non-crushing loading.
4. Ensure the area where the tank is set when removed is free of rocks or other hard objects that could cause point loads.
5. Block the tank with padded dunnage to avoid movement until the tank is set in the final location.

FINAL PLACEMENT INSTRUCTIONS

1. Inspect surface to ensure a smooth, level area that will supply full bottom support. The knuckle radius of the tank needs continuous support. A properly constructed concrete pad that is capable of supporting the contents of the tank is the best support and is recommended above 2,000 gallons. Other materials such as very flat blacktop, or contained, packed sand or pea gravel have been used successfully. All surfaces must maintain uniform support through freeze/thaw, erosion and other disturbances.
2. Tank should be tipped upright rotating the bottom knuckle radius on padding such as a tire with a padded landing point for the opposite bottom knuckle radius.
3. Cone bottom tanks must be supported by structures that comply with Raven design requirements. Support structures must be placed on surfaces with adequate bearing properties.
4. After final placement on the pad, any restraint devices may be installed.

FITTING INSTRUCTIONS

1. Inspect and adjust all fittings prior to the initial filling; transportation, handling, and temperature variations may cause fittings to loosen.
2. All valves and piping must have external support. For permanent piping installations, expansion joints or flexible tubing must be utilized to allow for tank expansion.
3. To avoid product loss all tanks must be filled with water and the tank and fittings inspected prior to the initial filling with product.
4. After filling with water, the restraint devices may be adjusted. Restraint adjustment to be periodically checked for proper tension.

VENT REQUIREMENTS

All Raven tanks are designed for atmospheric pressure only and must be positively vented. All closed top tanks must have a vent of equal or greater size than the largest inlet or outlet. Tanks that receive chemicals which are air-unloaded require special venting systems.

SPECIAL INSTRUCTIONS

1. Tanks equipped with metal lift lugs may be lifted with a cable or chains hooked into the metal lift lugs. A 45° minimum cable angle must be maintained between two lift lugs.
2. Tank ladder mounting attachments should be in place before the tank is setup in a vertical position. Ladder attachments should not be considered as lifting points unless identified as such on the product drawing.
3. The inner tank of a double containment system will have top lift lugs. Lifting equipment must have reach height to clear both tanks plus the necessary clearance for the lifting equipment. (CAUTION: Be sure to inspect for over head electrical lines and other obstructions.)
4. Lifting with a single lift lug must be done with uniformly applied tension to avoid over-stressing the lift point.
5. When setting the inner tank be sure to confirm that the correct orientation has been maintained between both tanks.

INDUSTRIAL POLY TANK ACCESSORY GUIDELINE

SIPHON DRAIN ASSEMBLY

- Both PVC or Polypropylene fittings are available and must be specified on order.
- All listed sizes are available in two piece unit (elbow and nipple).
- 2" and 3" one piece units available in PP only and will be used as standard.
- Prices do not include tank outlet, which must be ordered separately.
- Standard fitting installation height for siphon is 10" for 96", 102" and 130" diameter.
- The one piece PP unit will be installed and appear angled to accommodate the extra length.

U VENT ASSEMBLY

- Both PVC or Polypropylene fittings are available and must be specified on order.
- ASTM minimum recommended vent size is 1 1/4".
- Raven recommends normal vent of 2" to 4", meeting or exceeding the largest inlet/outlet.
- Pneumatic unloading will require larger special vents. Contact Customer Service for assistance.

HEAVY DUTY BULKHEAD FITTINGS W/GASKET

- Compression fittings are available in PVC or Polypropylene and must be specified on order.
- For vertical storage 3,100 gallons and above: install on upper 3 feet of side wall or top of tank only. (Bolt-together fittings are to be used for outlets.)
- **2" installations:**
All Raven "original" vertical flat bottom storage tanks have outlet located on a flat spot. Withdrawal outlets will be located at 10" and utilize a siphon assembly.
- **3" & or 4" installations:**
Vertical storage tanks have outlet located on a flat spot.
Minimum elevation for bottom fittings in tanks below 2,500 gallons is 6"
Installation in tanks less than 1,000 gallons should be reviewed with Engineering.

POLYPROPYLENE BOLT-THRU FITTING w/316 SS BOLTS

- Contents must be compatible with fitting and bolting hardware. Special bolt options are available for highly corrosive chemicals. Contact Customer Service for recommendations and pricing.
- Bolt pattern is interchangeable with the 316 SS fitting assemblies.
- 3" Installation guidelines:
 - * Not recommended in < 84" diameter curvature surfaces.
 - * Not recommended on 48" or 64" diameter tank bottom flats.
 - * Bottom elevation on 96" thru 130" diameter tank is 10" minimum.
- 2" Installation guidelines:
 - * Bottom elevation on 96" thru 130" diameter tank is 10" minimum.
 - * Contact Engineering for assistance on other diameter tank elevations.
- Contact Engineering for standard elevation on all other tanks.
- Flange assembly may be installed for bolted attachment to piping versus FNPT threaded connection if specified.

316 STAINLESS STEEL BOLT-THRU FITTINGS w/GASKET

- Contents must be compatible with fitting and bolting hardware. Special bolt options are available for highly corrosive chemicals. Contact Customer Service for recommendations and pricing.
- Bolt pattern is interchangeable with the PP Bolt-Thru fitting assemblies.
- 3" Installation guidelines:
 - * Not recommended in < 84" diameter curvature surfaces.
 - * Not recommended on 48" or 64" diameter tank bottom flats.
 - * Bottom elevation on 96" thru 130" diameter tank is 10" minimum.
- 2" Installation guidelines:
 - * Bottom elevation on 96" thru 130" diameter tank is 10" minimum.
 - * Contact Engineering for assistance on other diameter tank elevations.
- Contact Engineering for standard elevation on all other tanks meeting the 9" x 9" flat spot requirement.
- Double gaskets (inside & outside) are standard. Inside gasket is a thin full gasket or bolt washer gasket.
- Flange assembly may be installed for bolted attachment to piping versus FNPT threaded connection if specified. (See Ind. Price Sheet for flange adapters w/nipple).

SELF-ALIGNING BULKHEAD FITTINGS w/GASKET

- Installation guidelines - all sizes:
Locate only above liquid level (anywhere on tank top) on all tank sizes.
Do not install 2" or 3" in <84" diameter curvature.
 - * Due to large size, dimensions from head knuckle radius and top flats are critical for vertical piping.

Consult with Customer Service for location guidance.

FLANGE ASSEMBLIES

- **CAUTION: DO NOT INSTALL ON OTHER THAN BOLT-THRU FITTINGS.**

BULKHEAD FITTINGS (RAVENS PATENTED DESIGN)

INSTALLATION INSTRUCTIONS - Fiberglass Tanks

Use a standard hole saw that fits any 1/4" electric drill motor to cut the proper size hole in the fiberglass tank. A 2 1/8" hole is required for 1/2", 3/4", and 1 " threaded fittings. A 3 1/4" hole saw is required for 1 1/4", 1 1/2", and 2" bulkhead fittings.

Step 1 Place your finger through the fitting and install the body in the hole by placing one lug through the hole first. A slight tap with a hammer will slip the the second lug through the hole.

Step 2 Flex the back-up washer through the hole and over the fitting body.

Step 3 Slip the grommet over the fitting body but do not slide it all the way down the body at this point.

Step 4 While holding the fitting body with your finger, work the grommet down the fitting body until it is in the hole in the tank wall. (The grommet will protrude slightly on both the inside and outside of the tank.)

Step 5 Place the washer on the fitting, then install the nut. Tighten until snug. (Note that nut is left hand thread!)

Sealing is accomplished by the grommet expanding against the circumference of the hole you cut in the tank.

INSTALLATION INSTRUCTIONS - Polyethylene Tanks

Use a standard hole saw that fits any 1/4" electric drill motor to cut the proper size hole in a polyethylene tank. A 1 5/8" hole is required for 1/2", 3/4" and 1" threaded fittings. A 2 3/4" hole is required for 1 1/4", 1 1/2", and 2" bulkhead fittings. A 4 1/4" hole is required for the 3" fitting. The hole saw provides the perfectly round hole that is necessary for a positive seal.

Step 1 Slip the O-Ring over the fitting body and slide until it contacts the shoulder.

Step 2 Reach through the fillwell and install fitting body through the hole.

Step 3 Install the nut and tighten until snug. (Note that nut is left hand thread!) It is not necessary to use a washer between the tank exterior and the nut because of the low friction of polyethylene.

Sealing is accomplished by the O-Ring compression between the shoulder of the fitting and the inside wall of the tank.

RAVEN FLEX-COUPLING

Installation and Maintenance Instructions for Raven Flexible Couplings and Expansion Joints

Installation

- 1) Clean all foreign matter from faces of mating metal flanges. The Teflon must mate with a smooth, clean surface.
- 2) The expansion joint should be installed close to a main anchor, and should be followed by a pipe guide which prevents displacement of the line.
- 3) Be sure all pipe lines are supported so expansion joints do not carry the pipe load.
- 4) Initial pipe misalignment must not exceed 1/8" in any direction.
- 5) Install joints with neutral face to face dimension as shown on the submittal drawing.
- 6) Piping system must be adequately anchored to limit the pipe movements the joint must absorb. If anchoring is not possible, limit bolts must be set prior to pressurization so that movements (axial, lateral, and angular) do not exceed maximum published allowable movements. Position the nut so there is a gap equal to the joint's maximum extension between the nut and gusset ear of the flange. If two jam nuts are furnished, tighten the jam nuts together to prevent loosening. Movement beyond recommended guidelines will result in premature failure.
- 7) If the expansion joint must be installed with an initial misalignment, compression, or extension, then the maximum allowable movements are reduced by the amount of the initial deflection.
- 8) Check system pressure and temperature and do not exceed recommended performance limits. Operation beyond design limits will result in premature failure.
- 9) Expansion joint polymer must be chemically compatible with the media in the piping system. If in doubt about suitability, refer to a Chemical Resistance Data Table or contact our office for guidance.
- 10) Utilize bolt lengths that do not interfere with the arch(s) during motion. Tighten the bolts by alternating around the flange until all bolts are tightened evenly.
- 11) Do not cover expansion joints with insulation as this makes it difficult to detect leaks and could restrict movement of the joint.
- 12) Welding should not be performed in the vicinity of a Teflon joint. If it is imperative to weld nearby, cover the joint with a welding cloth and pack the pipe in dry ice to prevent heat transfer. (Do not allow temperature of the Teflon to reach 400 degrees F.)
- 13) Do not mate to butterfly valves or the inlet side of a check valve.

MAINTENANCE

- 1) Check all bolt tightness one week after placing joint in service, as the Teflon will take a slight set. Continue to check periodically thereafter.
- 2) Check bolts whenever changing over from one medium to another or when there are repeated temperature swings in the line.
- 3) Periodically check the outside bellows of the joint for damage. Replace any joint with cracks or gouges.
- 4) During maintenance shutdowns, remove joints and inspect the interior for deterioration. Replace any joint which shows signs of wear.
- 5) For critical lines, it is recommended that a spare expansion joint be kept on hand to be used in the event of failure. This will minimize equipment down time while a replacement joint is ordered.

FDA REGULATION

The resins used in Raven low-density polyethylene tanks comply with U.S. Food and Drug Administration Regulation 117.1520. These tanks may be used with the following kinds of food products:

- Nonacid, aqueous products; may contain salt or sugar or both (ph above 5.0)
- Dairy products and modifications: oil-in-water emulsions, high or low fat.
- Moist bakery products with surface containing no free fat or oil.
- Dry solids with the surface containing no free fat or oil (no end-test required) and under all conditions of use as described in Table 2 of FDA Regulation 177.1520 except for condition A - high-temperature heat sterilization (e.g., over 100°C)

Note: Food Grade Applications:

The vinyl ester (premium) resin used by Raven Industries will comply with the U.S. Food and Drug and Cosmetic Act as amended under Regulation 21 CFR 177.2420 and is suitable for the storage of food. All food grade applications must include a steam post cure and tanks should be detergent washed by customer before being placed into service. Polyethylene tanks for food grade applications must be ordered in natural color (white) only.

PLASTIC PRODUCTS FOR BIOTECHNOLOGY

Knowing whether a plastic is toxic to cell cultures is critical to biotechnology production. To test cytotoxicity, Raven submitted representative molded resin samples to an independent laboratory.

Samples were evaluated utilizing an MEM Elution Procedure, utilizing a W.I. 38 cell line.

This is a standard cytotoxicity test for pharmaceutical, medical devices and ophthalmic products (though it typically utilizes an L929 cell line.)

RESINS NON-TOXIC TO CELL CULTURES

RESIN	COLOR	PRODUCT	
Cross-Linked High Density Polyethylene (XLPE)	Natural	Tanks	Contact Raven Industries Customer Service for details at 1-888-366-8265.
High-Density Polyethylene (HDPE)	Natural	Tanks	
Low-Density Polyethylene (LLDPE)	Natural	Tanks	

PHYSICAL SERVICE CAPABILITIES

Maximum service temperature listings refer to temperatures that should not be exceeded for materials utilized in the specific product line. Many factors, such as chemical resistance, specific gravity, external stresses, product geometry, environment and many others

affect the suitability of a particular product. For additional information, contact Raven Industries.

ENVIRONMENTAL STRESS-CRACKING (ESCR)

Environmental stress-cracking is the failure of a plastic material in the presence of certain types of chemicals. This failure is not a result of chemical attack. Simultaneous presence of three factors causes stress-cracking.

- Tensile stress
- A stress-cracking agent
- Inherent susceptibility of the plastic to stress-cracking

All polyethylene materials used in Raven products are rated at the maximum ESCR value.

- Fiberglass materials are generally not subject to ESCR considerations.

TENSILE STRESSES

These are set up during some molding and fabrication processes. Environmental conditions can add tensile stress, particularly if the tank is inadequately supported. Rotational molding creates parts that are virtually stress-free, so rotomolded tanks are	less subject to environmental stress-cracking than fabricated tanks.
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COMMON STRESS-CRACKING AGENTS

Detergents, surface active chemicals, lubricants, oils, ultra-pure water and plating additives such as brightener and wetting agents.	Relatively small concentrations of stress-cracking agent may be sufficient to cause cracking. (Stress cracking agents are identified in the Chemical Resistance Chart.)
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SUSCEPTIBILITY TO STRESS-CRACKING

This varies from plastic to plastic depending on several characteristics of the molecular structure. Cross-linked high-density polyethylene is inherently more resistant to stress-	cracking than either low or high-density polyethylene.
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PHYSICAL SERVICE CAPABILITIES

Prolonged use of a plastic tank at temperatures above ambient will shorten tank life. Temperature effects are directly dependent on the characteristics of the plastic resin, specific gravity of tank contents, tank size and configuration, exterior support and wall thickness of the tank.	Temperature cycling will shorten tank life. The impact resistance of most rotomolded tanks decline at low temperatures. Cross-linked high-density polyethylene retains much of its impact resistance in low temperature applications.
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WHAT IS UV PROTECTION?

RAVEN

Ultraviolet (UV) Stabilization

Plastics are attacked and deteriorate when exposed to direct sunlight. When plastic tanks absorb the sun's ultraviolet light, the UV energy excites the polymers' chains, causing them to break. The effects are discoloration, embrittlement and eventual cracking. Elevated temperatures and oxygen tend to accelerate the deterioration. Tanks listed as suitable for outdoor service are

protected from UV attack by: coloring or pigmenting and/or adding internal stabilizers which preferentially absorb or dissipate the UV energy. Shading tanks from the sun will also prevent deterioration.

Tanks must be free to expand or contract, avoid excessive tension on the tank.

For assistance in selecting the appropriate tank for a specific application, see the Tank Resin Selector Guide or contact Raven Industries Customer Service at 1-888-366-8265.

Light Stability Characteristics

All polyethylenes are susceptible to degradation upon long-term exposure to sunlight. This deterioration is brought about by chemical changes which occur in the polyethylene as a result of exposure to the ultraviolet (UV) portion of light. Degradation results in the polyethylene becoming embrittled, reducing the impact resistance and elongational properties of the part.

Degradation from UV light can be effectively inhibited by the addition of UV stabilizers, which protect the polyethylene through preferentially absorbing, transferring or reflecting UV energy.

The UV life of a part is dependent upon UV additive level and type as well as part thickness and design, pigment type, level and effectiveness of dispersion, processing conditions and the geographic location where the molded part is used (see Figure 3). It is important when comparing resin UV performance

to ensure that the testing has been done on a consistent basis. In Figure 1, accelerated weathering data is presented. Generally, 2,000 hours corresponds to 1 year in Florida and 1,400 hours to 1 year in Southern Canada. Often terms like "UV-8" are used. UV-8 means the material can withstand 8,000 hours in a Xenon Ci-65 weatherometer. UV-2 or UV-4 would mean 2,000 or 4,000 hours respectively. Hence, UV-8 corresponds to approximately 4 years of continuous outdoor exposure in Florida.

It is important to understand which weatherometer, i.e. Carbon Arc or Xenon, was used, as well as the details of how the weatherometer was run. ASTM D-2565 is the recognized standard. Testing can be performed using actual outdoor weathering exposure, such as Florida and Arizona, to confirm this data. Note Figure 1 uses the industry standard criteria of when the sample has reached less than 50% of its original break elongation to determine the end of the test. In most cases useful life of the part extends beyond this point. All samples in Figure 1 are nonpigmented as supplied by Exxon Chemical. The UV performance test data can be found on our data sheets for each specific grade.

Figure 1: Escorene Xenon Weatherometer Exposure Data

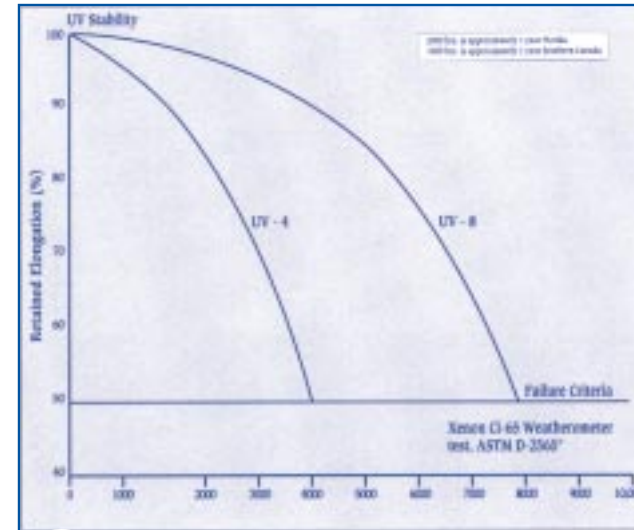


Figure 2: Comparison of Rotational Molding UV Performances

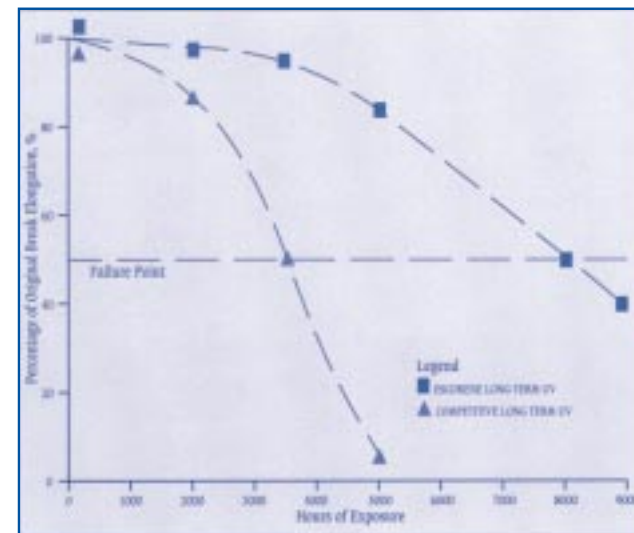
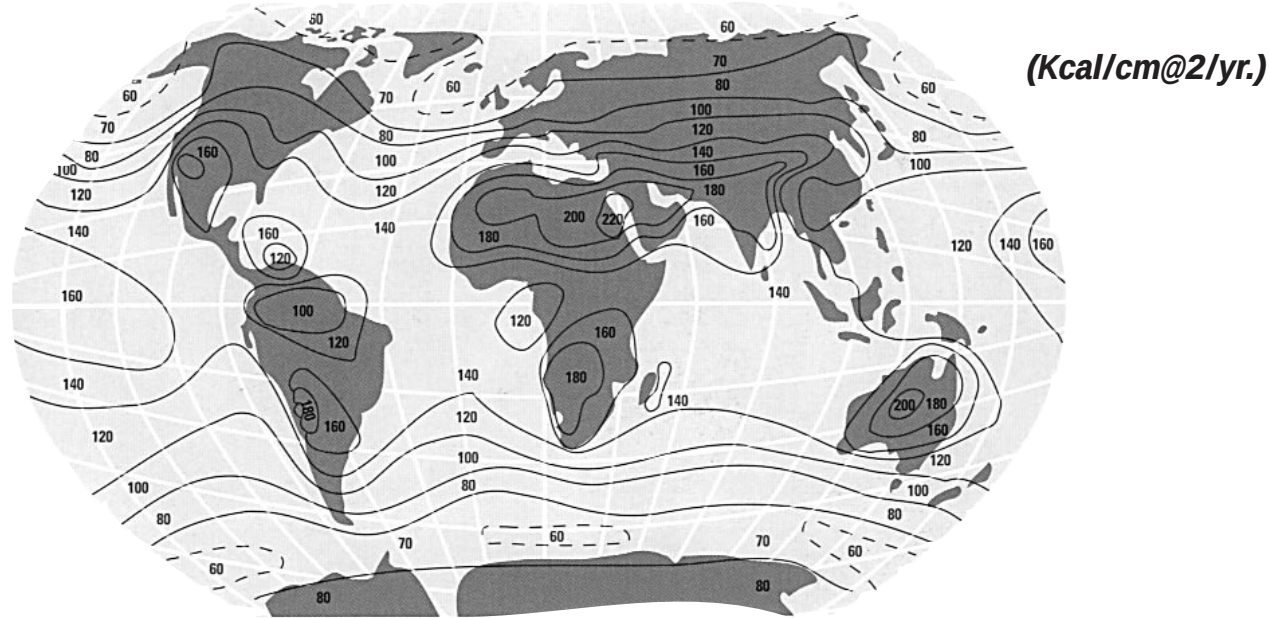


FIGURE 3



USE OF FIGURE 3

Years = $70 \times \text{UV Rating}$
 (Your Location's Isoline)
 (from Figure 3)

Example: Natural Part, Molded Properly, Using UV-8 Additive Package
 For Use in Florida

i.e. Florida = 140 Kcal/cm@2/yr. (from Figure 3)
 Thus Years "Expected" = $70/140 \times 8$
 = 4 Years (until 50% of original break elongation properties left)

UV Ratings from Supplier ie: UV-4, UV-8