



# **Ace Roto-Mold**

A DIVISION OF DEN HARTOG INDUSTRIES, INC.

## ***APPLICATION GUIDELINES***

# Table of Contents

**TANK SELECTION AND APPLICATION GUIDELINES.....3**

**CHEMICAL RESISTANCE DATA CHART.....4**

**MATERIALS INFORMATION.....13**

**HANDLING, INSTALLATION AND USE GUIDELINES.....15**

**FITTING INSTALLATION GUIDELINES.....19**

**PRICING AND TERMS.....20**

**PRODUCT PERFORMANCE.....20**

**SHIPPING AND TRANSPORTATION.....20**

**RETURNED GOODS POLICIES & WARRANTIES.....22**

**LIMITED WARRANTY POLYETHYLENE TANKS.....23**

**LIMITED WARRANTY METAL TANK SUPPORT PRODUCTS.....25**

**CONVERSION CHARTS AND FORMULAS.....27**

**SPECIFIC GRAVITY CONVERSION CHART.....29**

*Ace Roto-Mold Tanks – a tradition of quality*

*Ace Roto-Mold tanks have been available to the market since 1990. The company’s vision was to provide unparalleled quality and service. Today, this reputation remains the cornerstone of our wide range of products as we strive to meet the requirements of the agricultural and industrial users. This commitment to quality and service is met with continual investment in the latest manufacturing technologies and in trained, capable employees.*

# TANK SELECTION AND APPLICATION GUIDELINES

## How to select the proper tank for your application

**STEP 1** Identify the chemical(s) to be stored in the tanks. Be certain to obtain a Certificate of Composition, MSDS (Material Safety Data Sheet) or other data from the chemical supplier so that the actual chemical compounds can be identified to properly evaluate the effect of the chemical on polyethylene storage containers. See page 5 for additional material information.

**STEP 2** Review the Chemical Resistance Data Chart. Some chemicals may have adverse interactions with both the tank material (polyethylene) and accessories such as fitting and hardware (polypropylene, stainless, EPDM, and Nitrile). These interactions may be further impacted by elevated temperatures. If this resistance data does not list the chemical you intend to store in the tank, contact the chemical manufacturer for recommendations regarding storage in polyethylene tanks.

**STEP 3** Select the necessary tank size and accessories according to your capacity needs, available space, use/application and whether the tank is to be transported. (The Ace Roto-Mold Catalog details the available styles.) Be certain that you check the dimensional tolerances specified for the tank you select, and that the installation allows for these tolerances. For close tolerance installations, it is recommended that you measure the actual tank to be used or that you verify dimensional values with the factory before constructions.

NOTE: Fittings are installed to a standard size and location as indicated in the product Catalog. If factory fittings are not required, this should be indicated on your order (e.g., "Send fittings loose.") If you request fittings to be installed that are not the standard size, that should be indicated on your order (e.g., "Install 3-inch fittings.") If standard locations are not acceptable or to ensure proper placement of fittings, locate the tank diagram for the tank style to be ordered on pages 6-10. Specify each fitting location on the diagram according to the instructions provided. It is important to include these diagrams with your order to ensure that the fittings are installed to your specifications.

**STEP 4** Review the Handling, Installation and Use Guidelines.

**STEP 5** Contact Sales Support at Den Hartog Industries, Inc. 800-342-3408; or fax at 712-752-8222; or email: [sales@denhartogindustries.com](mailto:sales@denhartogindustries.com)

# CHEMICAL RESISTANCE DATA CHART

## Chemical Resistance Key:

R - Resistant N - Not Resistant V - Variable Resistance (Contact DHI) U – Unknown

## Caution Key:

(P) - Plasticizer (A) - Known Stress Crack Agent

(O) - Oxidizer (B) - Suspected Stress Crack Agent

CHEMICAL	CONCENTRATION	PLASTICS MAX TEMP (°F)		SEAL MATERIALS MAX TEMP (°F)			METALS
		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Acetaldehyde (A)	100%	70	R	V	R	R	N
Acetic Acid (A)	10%	R	R	R	N	R	A
Acetic Acid (A)	60%	100	R	R	N	R	A
Acetic Anhydride (B)		N	73	N	N	R	V
Aluminum Chloride		R	R	R	V	R	N
Aluminum Fluoride		R	R	V	V	R	N
Aluminum Sulfate		R	R	V	V	R	
Alums - all types		R	R	V	V	R	R
Ammonia - dry gas	100%	R	R	R	V	R	R
Ammonium Carbonate		R	R	R	V	R	V
Ammonium Chloride	Sat'd	R	R	R	V	R	V
Ammonium Fluoride	Sat'd	R	R	R	V	R	N
Ammonium Hydroxide	10%	R	R	V	R	R	R
Ammonium Hydroxide	28%	R		V	N	R	R
Ammonium Nitrate	Sat'd	R	R	V	R	R	R
Ammonium Persulfate	Sat'd	R	R	V	N	R	R
Ammonium Sulfate	Sat'd	R	R	R	R	R	V
Ammonium Metaphosphate	Sat'd	R	R	V	R	R	R
Amyl Acetate (BP)	100%	N	N	R	N	R	R
Amyl Alcohol (AP)	100%	R	R	V	V	N	R
Amyl Chloride (P)	100%	N	N	N	N	N	R
Aniline (AP)	100%	N	N	V	N	N	R
Aqua Regia (O)		N	N	N	N	N	V
Arsenic Acid		R	R	V	V	R	R
Aromatic Hydrocarbons (BP)		N	N			R	
Ascorbic acid	10%	R	R			N	

CHEMICAL	CONCENTRATION	PLASTICS MAX TEMP (°F)		SEAL MATERIALS MAX TEMP (°F)			METALS
		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Barium Carbonate	Sat'd	R	R	V	R	R	R
Barium Chloride	Sat'd	R	R	V	V	R	R
Barium Hydroxide		R	R	V	V	R	R
Barium Sulfate	Sat'd	R	R	V	V	R	R
Barium Sulfide	Sat'd	R	R	V	V	R	R
Beer		R	R	R	V	R	R
Benzene (BP)		N	N	N	N	N	R
Benzoic acid		R	R	N	N	R	R
Bismuth Carbonate	Sat'd	R	R	70	70	R	
Bleach Lye	10%	R	R			R	
Borax	Sat'd	R	R	R	V	R	R
Boric acid		R	R	V	V	R	R
Boron Trifluoride		R	R			N	
Brine		R	R	V	V	R	R
Bromine - liquid (O)		N	N	N	N	R	N
Butanediol (A)	10%	R	R			N	
Butanediol(A)	60%	R	R			N	
Butanediol (A)	100%	R	R			N	
Butter (B)		R	R			R	
Butyl Acetate (BP)	100%	N	N	N	N	N	R
Butyl Alcohol (A)	100%	R	R	V	V	R	R
Butyric Acid - conc. (P)	Conc.	N	R	N	N	N	R
Cadmium Salts		R	R			R	
Calcium Bisulfide		R	R	R	V	N	R
Calcium Carbonate	Sat'd	R	R	V	V	R	R
Calcium Chlorate	Sat'd	R	R	V	V	R	R
Calcium Chloride	Sat'd	R	R	V	V	R	R
Calcium Hydroxide	Conc.	R	R	R	V	R	R
Calcium Hypochlorite - bleach soln.		R	R	V	N	R	V
Calcium Nitrate	50%	R	R	V	V	R	R
Calcium Oxide	Sat'd	R	R	V	V	R	R
Calcium Salts		R	R			R	
Calcium Sulfate		R	R	V	V	R	R
Camphor Oil (BP)		N	73	N	R	R	R
Carbon Dioxide - all conc.		R	R	V	R	R	R

CHEMICAL	CONCENTRATION	PLASTICS MAX TEMP (°F)		SEAL MATERIALS MAX TEMP (°F)			METALS
		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Carbon Disulphide		N	N	N	N	N	R
Carbon Monoxide		R	R	V	R	R	R
Carbon Tetrachloride (P)		N	N	N	N	N	R
Carbonic Acid		R	R	V	70	R	R
Castor Oil - conc. (A)		R	R		R	R	R
Chlorine - dry gas (O)	100%	N	N	N	N	N	R
Chlorine Liquid (O)		N	N	N	N	N	N
Chlorobenzene (BP)		R	73	N	N	N	R
Chloroform (BP)		N	N	N	N	N	R
Chlorosulfonic Acid	100%	N	N	N	N	N	N
Chromic Acid	10%	R	R	70	N	R	70
Chromic Acid	50%	R	73	N	N	R	V
Cider (A)		R	R			R	
Citric Acid - (A)	Sat'd	R	R			R	R
Coconut Oil Alcohols (A)		R	73	N	R	R	R
Coffee		R	R	V	R	R	R
Cola Concentrates (A)		R	R			R	
Copper Chloride	Sat'd	R	R	V	R	R	R
Copper Cyanide	Sat'd	R	R	V		R	R
Copper Fluoride	2%	R	73	V	80	R	
Copper Nitrate	Sat'd	R	R	V	V	R	R
Copper Sulfate	Sat'd	R	R	V	V	R	R
Corn Oil (A)		R	73	N	R	N	R
Cottonseed Oil (A)		R	R	V	R	R	R
Cresol	100%	N	73		N	R	R
Cuprous Chloride	Sat'd	R	R			R	
Detergents, synthetic (A)		V	V			R	R
Developers. photographic		R	R	V	V	R	R
Dextrin	Sat'd	R	R	R	V	R	R
Dextrose	Sat'd	R	R	R	R	R	R
Diazo Salts		R	R			N	
Dibutyl Phthalate (B)		R	73	V	N	R	R
Dichlorobenzene (BP)		R	N	N	N	N	R
Diethyl Ketone (BP)		N	73	N	N	R	
Diethylene Glycol (A)		R	R			R	

CHEMICAL	CONCENTRATION	PLASTICS MAX TEMP (°F)		SEAL MATERIALS MAX TEMP (°F)			METALS
		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Diglycolic Acid (A)		R	R	V	V	R	
Dimethylamine		N	73	V	N	R	R
Disodium Phosphate		R	R	V	70	R	R
Emulsions, photographic (A)		R	R	V	V	R	R
Epsom Salts - Magnesium Sulfate		R	R	R	V	R	R
Ethyl Acetate (BP)	100%	R	N	N	N	N	R
Ethyl Alcohol (A)	100%	R	R	R	V	N	R
Ethyl Alcohol (A)	35%	R	R	R	V	N	R
Ethyl Benzene (BP)		N	N	N	N	N	R
Ethyl Chloride (P)		N	N	R	R	N	R
Ethyl Ether (P)		N	N	V	N	N	R
Ethylene Chloride (BP)		N	N	N	N	N	R
Ethylene Glycol (A)		R	R	R	R	R	R
Fatty Acids (A)		R	R	N	V	R	R
Ferric Chloride	Sat'd	R	R	V	V	R	N
Ferric Nitrate	Sat'd	R	R	V	V	R	R
Ferrous Chloride	Sat'd	R	R	R	V	R	N
Ferrous Sulfate		R	R	V	V	R	R
Fish Solubles (A)		R	R	N	R	R	R
Fluoboric Acid		R	R	70	N	R	R
Fluorosilicic Acid - conc.		R	73		N	R	R
Fluosilicic Acid	32%	R	R		N	R	R
Formic Acid - all conc.		R	R	R	N	R	R
Fructose	Sat'd	R	R			R	R
Fruit Pulp (B)		R	R			R	
Furfural (P)	100%	N	N	V	N	R	R
Furfuryl Alcohol (BP)		N	N			R	
Gallic Acid (A)	Sat'd	R	R	N	N	R	R
Gasoline (PB)		N	N	N	R	N	R
Glucose		R	R	V	R	R	R
Glycerine (A)		R	R	V	R	R	R
Glycol (A)		R	R			R	R
Glycolic Acid (A)	30%	R	73	R	V	N	R
Grape Sugar- ag	Sat'd	R	R			R	
Heptane (PB)		N	N	N	R	R	R

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		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Hexachlorobenzenes		R	R				
Hexanol, Tertiary (A)		R	R	N	R	R	R
Hydrobromic Acid	50%	R	R	R	N	R	N
Hydrochloric Acid - all conc.		R	R	V	V	R	V
Hydrocyanic Acid	Sat'd	R	73	V	V	R	R
Hydrofluoric Acid (A)	30%	R	R	V	N	N	N
Hydrofluoric Acid (A)	50%	R	73	V	N	N	N
Hydrogen	100%	R	R	R	V	R	R
Hydrogen Chloride - dry gas		R	R			R	
Hydrogen Peroxide	30%	R	73	V	N	R	R
Hydrogen Sulfide		R	R	R	N	R	R
Hypochlorous Acid - conc		R	73	104	N	R	
Inks (A)		R	R	V	V	R	R
Iodine in Potassium Sol'n (O)		73	73	V	80	R	N
Lead Acetate	Sat'd	R	R	R	V	R	R
Lead Nitrate		R	R	V	V	N	
Lime		R	73	V	V	R	V
Magnesium Carbonate	Sat'd	R	R	V	R	R	R
Magnesium Chloride	Sat'd	R	R	R	R	R	N
Magnesium Hydroxide	Sat'd	R	R			R	
Magnesium Nitrate	Sat'd	R	R			R	
Magnesium Sulfate	Sat'd	R	R	R	V	R	R
Mercuric Chloride	Sat'd	R	R	V	V	R	N
Mercuric Cyanide	Sat'd	R	R	V	V	R	A
Methyl Alcohol (A)	100%	R	R	V	V	R	R
Methylene Chloride (PB)	100%	N	N	N	N	N	R
Milk		R	R	R	R	R	R
Mineral Oils (P)		70	N	N	R	N	R
Molasses		R	R	V	R	R	R
Naphtha (PA)		N	73	N	V	N	R
Naphthalene (PB)		N	73	N	N	N	R
Nickel Chloride - conc.		R	R	R	R	R	R
Nickel Nitrate	Sat'd	R	R	R	V	R	A
Nickel Sulfate - conc.		R	R	R	R	R	
Nicotine - dilute (A)		R	R		N	N	R



CHEMICAL	CONCENTRATION	PLASTICS MAX TEMP (°F)		SEAL MATERIALS MAX TEMP (°F)			METALS
		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Nitric Acid (O)	30%	R	R		N	R	R
Nitric Acid (O)	50%	70	N	N	N	R	R
Nitric Acid (O)	70%	70	N	N	N	R	R
Nitric Acid (O)	98%	N	N	N	N	R	R
Nitrobenzene (PB)	100%	N	N	N	N	N	R
Nonyl phenol ethoxylate (B)		N	N			R	
Octane		R	R			N	
Oxalic Acid (A)	Sat'd	R	R			R	
Perchloroethylene (P)		N	N	N	N	N	R
Phosphorous Pentoxide		73	73			R	R
Photographic Solutions		R	R	V	V	R	R
Plating Solutions							
Brass (A)		R	R	70	V	R	
Cadmium (A)		R	R	R	V	R	
Gold (A)		R	R	V	V	R	
Nickel (A)		R	R	V	V	R	R
Silver (A)		R	R	V	V	R	
Tin (A)		R	R	R	V	R	
Zinc (A)		R	R	V	V	R	
Potassium Acetate		R	R			R	
Potassium Bicarbonate	Sat'd	R	R	R	R	R	R
Potassium Bromate	10%	R	R	R	V	R	R
Potassium Bromide	Sat'd	R	R	R	R	R	R
Potassium Carbonate		R	R	V	R	R	R
Potassium Chlorate	Sat'd	R	R	V	70	R	R
Potassium Chloride	Sat'd	R	R	V	R	R	V
Potassium Chromate	40%	R	R	R	V	R	R
Potassium Cyanide	Sat'd	R	R	V	R	R	R
Potassium Dichromate	40%	R	R	R	R	R	R
Potassium Ferri/Ferro Cyanide	Sat'd	R	R	70	N	N	R
Potassium Fluoride		R	R	R	V	R	R
Potassium Hydroxide	20%	R	R	R	V	R	R
Potassium Hydroxide - conc.		R	R			R	
Potassium Nitrate	Sat'd	R	R	V	V	R	R
Potassium Perchlorate	10%	R	R	R	N	R	

CHEMICAL	CONCENTRATION	PLASTICS MAX TEMP (°F)		SEAL MATERIALS MAX TEMP (°F)			METALS
		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Potassium Permanganate	20%	R	73	R	N	R	R
Potassium Persulfate	Sat'd	R	R	R	N	N	
Potassium Sulfate - conc		R	R	R	V	N	R
Potassium Sulfide - conc.		R	R	70		N	V
Potassium Sulfite - conc.		R	R	R	V	N	R
Propargyl Alcohol (A)		R	R	R	70	R	
Propyl Alcohol (A)		R	R	V	R	R	R
Propylene Dichloride (PB)	100%	N	N			N	
Propylene Glycol (A)		R	R	R	R	R	R
Pyridine (B)		N	N	N	N	R	V
Rayon Coagulating Bath (B)		R	R				
Resorcinol	Sat'd	R	R				
Salicylic Acid	Sat'd	R	R	R	N	R	R
Selenic acid		R	R	70	N		
Shortening (A)		R	R				
Silver Nitrate Solution		R	R	R	N	R	R
Soap Solution - any conc. (A)		V	R			R	R
Sodium Acetate	Sat'd	R	R	R	N	R	R
Sodium Benzoate	35%	R	R	R	V	R	
Sodium Bicarbonate	Sat'd	R	R	R	V	R	R
Sodium Bisulfate	Sat'd	R	R	V	V	R	R
Sodium Bisulfite	Sat'd	R	R	R	R	R	R
Sodium Bromide	Dilute	R	R	R	N	R	R
Sodium Carbonate - conc		R	R	R	V	R	R
Sodium Chlorate	Sat'd	R	R	V	V	R	R
Sodium Chloride	Sat'd	R	R	V	R	R	V
Sodium Chlorite	30%	R	73	70	N	R	
Sodium Cyanide		R	R	R	V	R	R
Sodium Dichromate	Sat'd	R	R	R	R	R	R
Sodium Ferri/Ferro Cyanide	Sat'd	R	R	R	70	R	R
Sodium Fluoride	Sat'd	R	R	R	100	R	R
Sodium Hydroxide - conc.		R	R	V	V	R	R
Sodium Hydroxide	35%	R	R	V	R	R	R
Sodium Hydroxide	50%	R	R	V	R	R	R
Sodium Hypochlorite	12%	R	73	N	N	R	N

CHEMICAL	CONCENTRATION	PLASTICS MAX TEMP (°F)		SEAL MATERIALS MAX TEMP (°F)			METALS
		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Sodium Hypochlorite	16.5%	R	73	N	N	R	N
Sodium Hypochlorite	>16.5%	R	73	N	N	R	N
Sodium Nitrate		N	R	R	V	R	R
Sodium Sulfate		R	R	V	R	R	R
Sodium Sulfide	Sat'd	R	R	R	V	R	R
Sodium Sulfite	Sat'd	R	R	R	V	R	R
Sodium thiosulphate pentahydrate		R	R	R		N	R
Stannic Chloride	Sat'd	R	R	R	R	R	N
Stannous Chloride	Sat'd	R	R	V	V	R	R
Starch Solution (A)	Sat'd	R	R	R	V	R	R
Stearic Acid (A)	100%	R	73	N	V	R	R
Sulfuric Acid	50%	R	R	R	N	R	R
Sulfuric Acid (O)	70%	R	73	R	N	R	V
Sulfuric Acid (O)	80%	R	73	70	N	R	N
Sulfuric Acid (O)	96%	70	N	70	N	R	N
Sulfuric Acid (O)	98%	N	N	70	N	R	N
Sulfuric Acid - fuming (O)		N	N	N	N	R	N
Sulfurous Acid		R	R	N	N	N	R
Tallow (P)		R	R	N	R	R	R
Tannic Acid (A)	Sat'd	R	73	R	R	R	R
Tartaric Acid	10%	R	R	N	R	R	R
Tetrahydrofuran		N	N	N	N	R	
Titanium Tetrachloride (B)	Sat'd	N	R	N	N	N	V
Toluene (PB)		N	N	N	N	N	R
Transformer Oil		R	73	N	V	N	R
Trichloroethylene (PB)		N	N			N	
Triethylene Glycol (B)		R	R			N	
Trisodium Phosphate	Sat'd	R	R			R	R
Turpentine (P)		N	N			N	
Urea	30%	R	R			R	
Urine		R	R			R	
Vanilla Extract (A)		R	R			R	
Varnish		R	R			N	
Vinegar		R	R			R	
Water (Potable)		R	R	R	R	R	R

CHEMICAL	CONCENTRATION	PLASTICS MAX TEMP (°F)		SEAL MATERIALS MAX TEMP (°F)			METALS
		POLYETHYLENE	POLYPROPYLENE	EPDM	NITRILE (BUNA-N)	Santoprene (TPE)	316 SS
Water (Salt)		R	R	V	V	R	R
Water (Sea)		R	R	V	V	R	V
Water (Swimming Pool)		V	100	73	73	R	
Wetting Agents (A)		V	V			R	
Whiskey (A)		R	R	R	R	R	R
Wines (B)		R	R	R	R	R	R
Xylene (P)		N	N	N	N	N	R
Yeast		R	R			R	
Zinc Bromide	Sat'd	R	R			R	
Zinc Carbonate	Sat'd	R	R	70	70	R	V
Zinc Chloride	Sat'd	R	R	R	V	R	V
Zinc Oxide	Sat'd	R	R			R	
Zinc Stearate		R	R			R	
Zinc Sulfate	Sat'd	R	R	V	V	R	R

The information contained within this chart is based upon data supplied by resin manufacturers and is intended to be a general guide. Note that this data does not encompass all applications or service temperatures. For this reason, Den Hartog Industries, Inc. makes no claim as to the accuracy of this data and recommends that in all cases the final determination of suitability between the chemical(s) to be contained and the polyethylene tank material be verified with the chemical manufacturer(s).

## MATERIALS INFORMATION

### *Chemical Service Temperatures*

Continued or prolonged service with certain chemicals at elevated temperatures may reduce the life of a polyethylene tank. The effects of the temperature on the polyethylene will depend on the chemical chemistry, chemical specific gravity, size and model of tank the chemical is to be stored in, and the tank wall thickness. Depending upon the chemicals to be stored, Ace Roto-Mold tanks will handle sustained temperatures of up to 120° F (49° C) and intermittent temperatures of up to 140° F (60° C). Consult the chemical manufacturer for recommendations regarding storage in polyethylene tanks and service temperature limits. Please note that higher service temperatures will lower the specific gravity rating of the tank.

### *Ultraviolet light exposure*

Ace Roto-Mold tanks are molded from polyethylene compounded with the latest technology in ultraviolet (UV) light stabilizers. These UV stabilizers will reduce the harmful effects of ultraviolet light exposure and are intended to extend the life of a tank over similar materials that are not compounded with stabilizers. Our UV rating is “15” on most product materials which generally means that after 15000 hours of exposure to the sun, there will be 50% of UV protection remaining. Consult the factory for the specific UV rating of the product you are using.

### *Environmental Stress Crack Resistance (ESCR Rating)*

ESCR is a method utilized to evaluate or test processed polyethylene for stress crack resistance when exposed to a chemical for a given amount of time. Most polyethylene resins are rated according to an ESCR value that is specified in the material specifications data supplied by the resin supplier. Certain chemicals, although having no direct chemical effect on polyethylene, may accelerate cracking under mechanical stresses. Elevated temperatures may also affect polyethylene cracking. Although all processed polyethylene resins are subject to stress cracking, some are more resistant to it than others. Please reference the material data specifications for ESCR ratings for the tank model selected. To reduce the effect of ESCR proper care should be taken to reduce stress at fittings, bands, tie down lugs, etc.

### *Specific Gravity*

Specific Gravity is the ratio of the chemical weight per gallon divided by the weight of water per gallon (8.33 lb. per gallon). As an example, if a chemical weighs 10 lb. per gallon, the specific gravity of the chemical is  $10.0/8.33 = 1.2$ . (Metric: kilogram/cubic meter or gram/liter) The Ace Roto-Mold standard tank has 1.7 specific gravity (see page 27 for a specific gravity conversion chart).

### *Material Color*

The standard color for most Ace Roto-Mold tanks is natural (translucent white). Yellow is the standard color for crop care tanks, septic tanks, and liquid feeders. Spot sprayer and vertical tanks may be inventoried in both natural and yellow. Standard stock tanks are spruce green. All tanks may be ordered in non-standard colors such as yellow, black, or green as an option.

### *FDA Compliance*

Ace Roto-Mold tanks are manufactured utilizing FDA compliant resins. Natural, black, and green colored tanks are in full compliance with current FDA standards for polyethylene tanks. However, certain colors (i.e. yellow) when blended into the resin, may affect this compliance. Consult the factory regarding other colors and FDA compliance. Please specify on your tank order if FDA compliance is required and we will assist in your selection.

### *NSF Compliance*

National Sanitary Foundation (NSF) compliance considers a number of factors for approval. Among these are material and final configuration of the product including fittings and accessories that are exposed to the chemical. For this reason, please consult the factory regarding NSF approval.

### *Proposition 65 Labeling Requirements*

Some products as manufactured by Den Hartog Industries, Inc. will require the label (below) when sold in the state of California.



Replacements for damaged or missing labels can be ordered by contacting Den Hartog Industries, Inc. at 1-800-342-3408 or [www.denhartogindustries.com](http://www.denhartogindustries.com).

# HANDLING, INSTALLATION AND USE GUIDELINES

Watch for the following Warning and Caution statements used throughout this section.



WARNING...



CAUTION...

## **FAILURE TO HEED THESE STATEMENTS MAY RESULT IN PERSON INJURY, DEATH OR PROPERTY DAMAGE.**

Ace polyethylene tanks are designed to provide a safe and durable means for the containment of approved chemicals providing that the tanks are handled, installed, used and maintained according to the following guidelines. Consult Den Hartog Industries concerning any questions regarding these guidelines. Improper handling and installation can cause physical damage to tanks, fittings and accessories resulting in leakage and/or tank wall failure. Be certain to pay attention to all “Caution”, “Warning” or “Important” labeling applied to the product(s) as well as any limitations specified on the product prints. Improper use and maintenance can result in reduced product life and leakage and/or tank wall failure. Failure to comply with the following product guidelines will void all factory warranty.

### *Damaged Product Claims:*

Upon delivery, inspect the tank immediately for defects or shipping damage. Any damage or discrepancies must be noted on both the driver’s bill of lading and your packing list. Claims must be made within 30 days. See page 16 regarding the return policy for damaged or defective products.



### *WARNING - Unloading Tanks:*

When unloading the tank, avoid contact with sharp objects such as lift forks or loader buckets that can cause damage, including tank wall puncture, if the proper precautions are not observed. Never allow tanks to be rolled over on the fittings. Large bulk storage tanks should be carefully unloaded with the use of a crane or another suitable lifting device. Ensure that the unloading area is flat and free of large rocks, sharp objects or other objects that could damage the tank. Avoid unloading the tanks in high winds. Always support or brace tanks that are placed on their side to prevent rolling.



### *WARNING - Tank Installation:*

When selecting the tank site, ensure that the site is level and that adequate drainage is provided for water runoff. The bottom of all tanks must be completely supported. Reinforced concrete support pads are recommended for tanks with capacities over 1000 gallons (3785 liters). In all cases be certain that the base material is designed to support the bearing capacity requirements of the tank, including seismic and wind loads. If the tank is installed in a stand or skid, note that the bearing capacity requirements of the concrete or soil will be increased. Always anchor the tank according to seismic or wind load zone requirements for the site. Always consult with the applicable building codes governing the tank site for specific support and anchoring requirements.



#### **WARNING - Tank Burial:**

The only Ace Roto-Mold tanks designed for burial are the septic and cistern tanks. Other tanks are not designed to handle the pressure of surrounding earth and should not be buried.



#### **WARNING - Chemical Resistance:**

Be certain that the tank, fittings, and fitting gasket materials are compatible with the chemicals to be contained and the anticipated storage temperatures. Refer to the Chemical Resistance Data Chart on pages 2-4 for the most commonly stored chemicals. Used motor oil is not recommended for storage in Ace Roto-Mold tanks due to contaminants. For applications not listed, consult the chemical supplier for storage recommendations in polyethylene tanks, or consult Den Hartog Industries.



#### **WARNING - Transportable Tanks:**

Tanks that will be transported will require special consideration with regard to the dynamic loads introduced by starting, turning or stopping the tank and vehicle. Ensure that the vehicle is designed for supporting and braking for the size tank selected, including the tank weight, capacity and the specific gravity of the chemical to be transported.

Horizontal cylindrical tanks, which are not free standing, must be fully supported around the bottom of the tank diameter by not less than 1/3 of the circumference. Freestanding tanks (tanks equipped with support legs) must be fully supported under the legs and open sump areas and be installed with hoops, which are securely anchored to a metal support skid. In all cases, the tank skid or stand must be adequately fastened to the vehicle bed to prevent shifting. Vertical bulk storage tanks are designed for stationary applications.



#### **WARNING - Fitting Installation:**

Be careful not to over tighten poly fittings. If over tightened, these fittings can be damaged and leak. In such cases, always replace the fittings. If thread sealant is used, be certain that it is rated for use with the fittings and chemical to be contained. Never subject fittings to loads or weight that may cause cracking.

Avoid rigid plumbing from tank fitting. Fitting installations to and from tank must consider the effects of expansion and contraction stresses due to temperature as well as filling and emptying of the tank. (See page 19 for general fitting installation guidelines)

Caution: Be particularly careful with fittings that are friction welded, often referred to as “spin welds”. These fittings can fail if attachments are not properly supported, are exposed to excessive vibration or are over tightened. Never hang long lengths of hose or pipe without support hangers to carry the dead weight of the hose or pipe. Filters, valves and couplings will need to be supported so the loads are not transferred to the “spin weld” fitting.

- Dry Fittings – Fittings that are not exposed to chemicals and have no low temperature limit providing the plumbing loads that the fittings are subjected to are within the Application Guidelines recommendations.
- Wet Fittings – Fittings that are exposed to chemicals will have a low temperature rating equivalent to the freezing limits of the chemical the fitting is exposed to. In the case of water that would be 32° F (0° C) ambient. Chemicals or solutions such as calcium chloride are



generally rated for -20° F (-29° C) depending upon the salt concentration. Note that heaters, heat bands or chemical inhibitors that prevent chemical freeze up will allow the fittings to be exposed to ambient temperatures below the published freeze point of the chemical. Again, the low temperature rating of all fittings must be above the point at which the chemicals freeze or solidify.



***WARNING - Testing Prior to Installation:***

Never fill a newly installed tank with chemical without first testing the tank, fittings and installation with a non-hazardous chemical such as water. This procedure will also serve to rinse out the tank and connections. Test the installation at full capacity for a minimum of 4 hours. Note that tank warranty does not cover any fluid losses. See warranty on page 22.



***WARNING - Proper Venting:***

All tanks must be vented for atmospheric pressure as well as pressure created by filling and emptying the tank. Never attempt to fill or empty a tank without adequate venting. Keep vent clear of any ice or snow that may restrict ventilation. Tanks that are 142" in diameter require additional venting beyond what is provided by a vented lid.



***CAUTION - Securing Rectangular Tanks:***

The flat sides of rectangular or square tanks greater than 18" wide or high must be securely supported according to the specific gravity of the chemical stored and application temperature. Support all tanks that are to be transported.



***CAUTION - PU0205-52 and PU0305-60 Pickup Tank Support Recommendations:***

It is recommended that in all applications the tanks have sidewall support as illustrated in Fig. 1. In applications where the chemical to be contained has a specific gravity rating above 1.0 (greater than water) it is recommended that the sides be supported as illustrated in Fig. 2. Failure to properly support the tanks as recommended will cause excessive deflection and the possibility of failure and void all warranty.

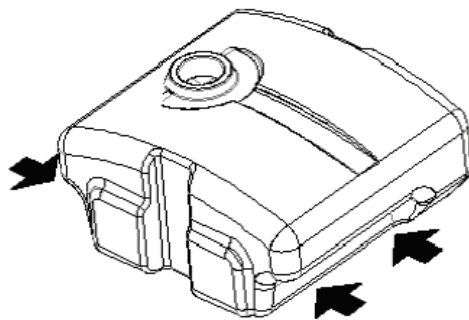


Fig. 1

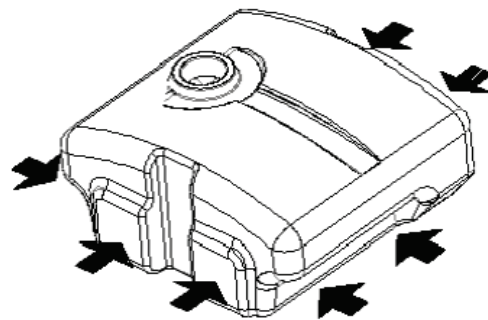


Fig. 2



***WARNING - Equipment Installation:***

Never install heavy equipment on the tank walls. Consult the equipment manufacturer for recommendations regarding installation on polyethylene tanks of the size selected.



***WARNING - Submerged Heater Installation:***

Submerged heaters must be installed with a minimum of 4" of clearance from the tank walls. Never allow the heater to contact the walls of the tank. Consult the heater manufacturer for recommendations regarding installation of the heater in polyethylene tanks.



***WARNING - Protect Tank Walls from Impact:***

Ensure that the tank walls are protected from impacts, especially at temperatures below 40° F (4° C).



***WARNING - Never walk on tank:***

Do not walk on the tank surfaces. Surfaces may be slippery. Always follow OSHA regulations when working on or around tank systems.



***WARNING - Never enter tank:***

Never enter a tank without first taking the proper safety precautions. Consult with the chemical supplier regarding recommendations as well as the appropriate safety equipment required for handling the chemicals to be stored. Always follow OSHA regulations when working on or around tank systems.



***WARNING – Do not use portable ladders:***

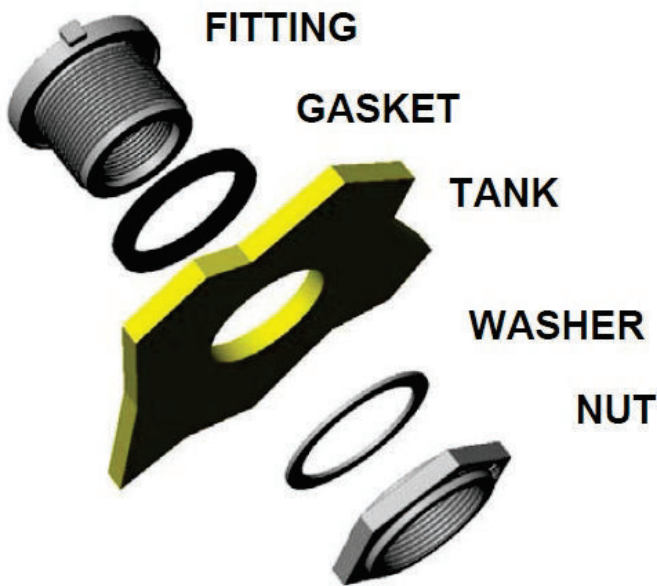
Never use portable ladders to access any area of the tank. Rolling Safety Ladders may be used providing they are OSHA compliant and rated for the height to be reached.



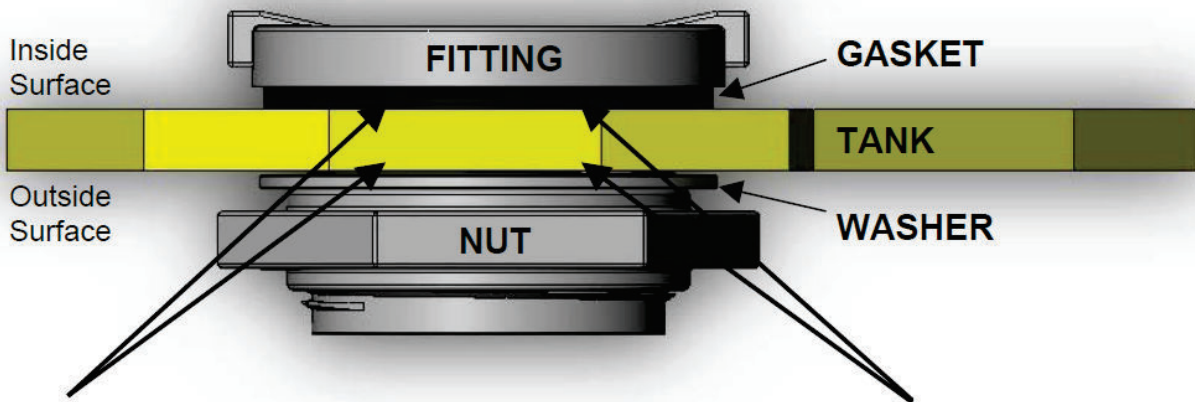
***WARNING – Secondary Containment Requirements:***

Consult the appropriate governing agency regarding secondary containment requirements for the tank selected and the chemicals to be stored.

# FITTING INSTALLATION GUIDELINES



- Drill hole as straight as possible through tank at fitting location – recommend using hole saw at smallest diameter possible. Be careful not to drill hole too close to edge of sump or tank bottom. Wall thickness variation must not exceed .050" at the sealing surface of the fitting gasket.
- Deburr edge of hole on both sides to allow smooth sealing surface
- One gasket between fitting and tank, one washer between nut and tank
- Tighten nut to hand-tight plus ½ turn



- Must remove burr and any shavings on tank surface to allow gasket to seal properly
- Do NOT deburr too much material around opening – only remove lip from saw cut, do not carve extra material out

## NOTES:

- Edge of drilled holes for fittings must be at least 1" from adjacent surface or radius to allow sufficient space for gasket and washer to seal.
- Washer is not provided with all fittings.

- Reference document WIR7.5-16

# GENERAL INFORMATION

## PRICING AND TERMS

- Terms:** Standard payment terms are 2%/10 days, net 30 days.  
Financial charges (1-1/2% per month/18% APR) are applied to late payments.
- Price:** Prices are subject to change without notice. Prices are in U.S. Dollars.
- Sales Tax:** All domestic applicable state and local taxes will be added to your invoice unless a certificate of sales tax exemption is provided in advance to Den Hartog Industries, Inc.

## PRODUCT PERFORMANCE

- Chemical Compatibility:** Always verify your chemical compatibility with tanks, fittings, and gaskets. Consult your chemical manufacturer regarding applications.
- Volume/Size Disclaimer:** Volume and unit measurements are subject to variances due to thermal expansion and contraction and general molding tolerances.

## SHIPPING AND TRANSPORTATION

- Freight:** FOB factory, Hospers IA. Special freight arrangements and billing are available. Truckloads are the most economical freight arrangements. The Den Hartog Industries, Inc. truck fleet is also available for economical freight arrangements.

### Shipping charges:

#### Common and/or Contract Carriers –

**Prepaid:** We will request freight quotes and dispatch the carrier. The customer will be billed the quoted shipping rate plus a small administration markup (5-10%).

**Collect or 3<sup>rd</sup> Party Billing:** Customers request collect or 3<sup>rd</sup> party billing. We cannot request rate quotes, as the freight companies will not release rates. We will call the carrier to dispatch for load pick-up. The freight company will bill the proper party (not Den Hartog Industries, Inc.).

**UPS/Fed Ex/Speedee** – Quotes are based upon published rates and priced at time of shipment. Oversized charges may apply. Items not boxed will require additional packaging and handling charges as applied by the carrier.

**Den Hartog Trucking** – Upon availability, Den Hartog Industries, Inc.'s fleet of trucks is the most economical way to ship full truckloads. Customers are billed on a per mile basis and fuel surcharges, oversize charges, and tolls or other road use charges may also apply.

### Package & Handling charges:

Any individually shipped product that requires protective packaging (cardboard or shrink-wrap) will be assessed a minimum charge of \$2.00 per item. There will be an additional charge of \$.02/gallon for items with capacity over 100 gallons.

**Floats** – Additional loading and handling charge of \$1.00 per float.

**Pallet charges** - \$5.00 per pallet

**Other Freight Policies:**

**Insured Freight:** Insured shipments must be arranged and are billable to the customer.

**Drop Ship Charges:** Den Hartog Transportation: \$50 per drop location  
Other carriers: Quotes upon request

**Oversize Charges:** Den Hartog Transportation: additional cost per mile  
Other carriers: Quotes upon request

**Fuel Surcharges:** Carriers may attach an additional charge for fuel costs.

NOTE: Upon delivery, any quantity discrepancies or shipping damage should be noted on the packing slip prior to signing for the shipment.

**LOAD PLANNING**

Customers see a definite advantage when products can be shipped via Den Hartog's trucks. To maximize this advantage and reduce costs for both the company and the customer, we plan shipping based on full truckloads. General knowledge of load limitations can be used by the customer when ordering to save on shipping costs.

In general, 20,000 gallons of product fills a tank truck, while 16,000 gallons fills van trailers.

Here are some examples of other full truckloads:

- 2 12,500-gallon tanks fill a lowboy trailer, with room to spare for some smaller tanks
- 3 10,500-gallon tanks fill a lowboy trailer, with room to spare for some smaller tanks
- 3 7800-gallon tanks fill a lowboy, with room to spare for some smaller tanks
- 4 7000-gallon tanks fill a lowboy, with room to spare for some smaller tanks
- 3 6000-gallon tanks fill a flatbed, with room to spare for some smaller tanks
- 4 5000-gallon tanks fill a flatbed
- 4 4200-gallon tanks fill a flatbed, with room to spare for some smaller tanks
- 5 4000-gallon tanks fill a lowboy, with room to spare for some smaller tanks
- 6 3000-gallon tanks fill a flatbed
- 7 2500-gallon tanks fill a flatbed
- 8 2000-gallon tanks fill a flatbed
- 13 1300-1650 gallon tanks fill a flatbed

## RETURNED GOODS POLICIES & WARRANTIES

**Prior authorization is required for any product returns.** Please contact a Den Hartog Industries, Inc. representative within 30 days for details and instructions for making warranty claims for returned goods authorizations. An RGA number will be issued. Also, freight arrangements and other instructions will be provided. **Product shipped back to DHI freight collect without prior authorization will NOT be accepted.**

Returned goods are approved upon review if the cause is for a material or manufacturing defect, or a warranty claim. Account credits will be issued after the products are inspected and account adjustments are authorized. **Unauthorized debits on account payments will not be allowed.**

Unless an approved credit memo has been issued by Den Hartog Industries, Inc., all unauthorized debits will be considered short payment and will be subject to finance charges as unpaid balances.

Den Hartog Industries, Inc. does not authorize labor or handling charges for warranty or returned goods. Den Hartog's credit policy applies only to the product itself. Pre-existing contractual supplier agreements will be honored.

The text of Den Hartog Industries, Inc.'s limited warranty and disclaimer on Ace Roto-Mold products appears on the following pages. Note that the general warranty period is 36 months for most poly tanks. However, the warranty for poly livestock tanks is limited to 24 months. Please read the warranty and disclaimer for all details.

# LIMITED WARRANTY POLYETHYLENE TANKS

## 1. Extent and Duration of this Warranty:

Your Den Hartog polyethylene tank is warranted to be free from defects in materials and workmanship under normal use and service for the following periods after date of purchase by the original owner when properly installed, used and maintained:

- Poly Stock Tanks.....24 months
- Septic/Cistern Tanks.....60 months
- Other Poly Tanks.....60 months
- Free Standing Leg Tanks 2350 gallons or over will carry a prorated warranty.....60 Months Prorated  
(0-36 months – 100%. 37-48 Months – 75%. 49-60 Months – 50%)

Any Den Hartog polyethylene tank product found to be defective in materials or workmanship will be dealt with under the repair and replacement procedure described in this policy.

In the event replacement product is issued, the warranty available for that product shall be the time remaining from the original purchase.

THIS WARRANTY DOES NOT APPLY TO ANY COMPONENT PARTS OR ACCESSORIES USED WITH THE TANK THAT ARE NOT MANUFACTURED BY DEN HARTOG INDUSTRIES, INC.

## 2. Manufacturer and Warrantor:

Den Hartog Industries, Inc.  
4010 Hospers Drive South  
P.O. Box 425  
Hospers, IA 51238-0425  
(712) 752-8432

## 3. Repair or Replacement Procedure:

If your Den Hartog polyethylene tank product develops a defect during the warranty period, promptly notify our customer service department. Until such notice is received warrantor will not be responsible for any repair, replacement, or partial refund. Notice received more than sixty (60) days after the warranty period will not be valid and the warranty will not apply.

Upon receipt of timely notice from you, and proof of defect, warrantor will have a choice of options at its sole discretion.

- a) Warrantor may require you at your own expense to deliver or ship the product to its factory or authorized dealer. Any defective, warranted product will be repaired or replaced and returned to you or your authorized dealer free of charge. Any part returned to warrantor, and found not to be defective, will be returned to you freight collect with explanation.
- b) Warrantor may ship a new product to its dealer to be exchanged free of charge for the defective product returned by you.
- c) Warrantor may ship or deliver a replacement product to you at your address.
- d) Warrantor may refund the product's pro-rated value based on normal life span upon return of the product to it or its authorized dealer.
- e) Warrantor may choose another, reasonable procedure to compensate the purchaser.



#### **4. Limitations on Warranty Coverage:**

Coverage under this warranty will be effective only when a copy of the original invoice, showing date and location of purchase, accompanies any claim for warranty.

Warrantor has no liability whatsoever and this warranty is null and void if any Den Hartog product has been misassembled or subjected to neglect, negligence, misuse, accident or used in any way contrary to use and maintenance instructions.

This warranty does not cover any product that has been altered or modified so as to affect the product's use, performance or durability, or that has been modified to change the intended use of the product.

In addition, the warranty does not extend to repairs made necessary by abnormal use, damage, unreasonable use including failure to provide reasonable and necessary maintenance, by use of parts, accessories or other equipment which are incompatible with Den Hartog product, including but not limited to state of the art changes, without assuming any obligation to modify any product previously manufactured.

Warrantor has a policy of continuous product improvement. We reserve the right to change or improve design of any Den Hartog product, including but not limited to state of the art changes, without assuming any obligation to modify any product previously manufactured.

#### **5. Implied Warranties Excluded:**

All implied warranties are expressly excluded.

#### **6. Limitation of Consequential Damages:**

Warrantor's responsibility under this warranty extends solely to repair or replacement of your Den Hartog product and its component parts. Warrantor does not assume responsibility for, nor shall it be liable for, any special, incidental or consequential damages. Specifically, warrantor assumes no responsibility to the owner for loss of use of the product, loss of time, inconvenience or other damage consequential or otherwise, including, but not limited to loss of revenue or earnings; expense of transporting the product; travel time; telephone, fax, overnight delivery, or postage charges; road service/towing charges; rental during the time warranty repairs are being performed; travel or lodging costs; loss or damage to personal property; or any other losses.

Some states do not allow exclusion or limitation of incidental or consequential damages, so above exclusion or limitation may not apply to you.

#### **7. Purchaser's Rights:**

This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

#### **8. Exclusive Warranty:**

This is the only warranty made by the warrantor on the product and no agent, employee, or other person is allowed to change or add to this warranty. This warranty extends solely to repair or replacement of your Den Hartog product. Warrantor does not assume any liability or responsibility not expressly covered by this limited warranty. This warranty supersedes all other warranties, written or implied.

No other express warranty has been made or will be made on behalf of warrantor with respect to this Den Hartog product or its construction, use, repair, or replacement.

- Reference document WIR7.5-57



# LIMITED WARRANTY METAL TANK SUPPORT PRODUCTS

## 1. Extent and Duration of this Warranty:

Your Den Hartog metal tank support product is warranted to be free from defects in materials and workmanship under normal use and service for 60 months after date of purchase by the original owner when properly installed, used and maintained. This warranty excludes the powder coat finish due to the variety and extremes of the environment where they are used.

Any Den Hartog metal tank support product found to be defective in materials or workmanship will be dealt with under the repair and replacement procedure described in this policy.

In the event replacement product is issued, the warranty available for that product shall be the time remaining from the original purchase.

**THIS WARRANTY DOES NOT APPLY TO ANY COMPONENT PARTS OR ACCESSORIES USED WITH THE TANK THAT ARE NOT MANUFACTURED BY DEN HARTOG INDUSTRIES, INC.**

## 2. Manufacturer and Warrantor:

Den Hartog Industries, Inc.  
4010 Hospers Drive South  
P.O. Box 425  
Hospers, IA 51238-0425  
(712) 752-8432

## 3. Repair or Replacement Procedure:

If your Den Hartog tank support product develops a defect during the warranty period, promptly notify our customer service department. Until such notice is received warrantor will not be responsible for any repair, replacement, or partial refund. Notice received more than sixty (60) days after the warranty period will not be valid and the warranty will not apply.

Upon receipt of timely notice from you, and proof of defect, warrantor will have a choice of options at its sole discretion.

- a) Warrantor may require you at your own expense to deliver or ship the product to its factory or authorized dealer. Any defective, warranted product will be repaired or replaced and returned to you or your authorized dealer free of charge. Any part returned to warrantor, and found not to be defective, will be returned to you freight collect with explanation.
- b) Warrantor may ship a new product to its dealer to be exchanged free of charge for the defective product returned by you.
- c) Warrantor may ship or deliver a replacement product to you at your address.
- d) Warrantor may refund the product's pro-rated value based on normal life span upon return of the product to it or its authorized dealer.
- e) Warrantor may choose another, reasonable procedure to compensate the purchaser.

#### **4. Limitations on Warranty Coverage:**

Coverage under this warranty will be effective only when a copy of the original invoice, showing date and location of purchase, accompanies any claim for warranty.

Warrantor has no liability whatsoever and this warranty is null and void if any Den Hartog product has been misassembled or subjected to neglect, negligence, misuse, accident or used in any way contrary to use and maintenance instructions.

This warranty does not cover any product that has been altered or modified so as to affect the product's use, performance or durability, or that has been modified to change the intended use of the product.

In addition, the warranty does not extend to repairs made necessary by abnormal use, damage, unreasonable use including failure to provide reasonable and necessary maintenance, by use of parts, accessories or other equipment which are incompatible with Den Hartog product, including but not limited to state of the art changes, without assuming any obligation to modify any product previously manufactured.

Warrantor has a policy of continuous product improvement. We reserve the right to change or improve design of any Den Hartog product, including but not limited to state of the art changes, without assuming any obligation to modify any product previously manufactured.

#### **5. Implied Warranties Excluded:**

All implied warranties are expressly excluded.

#### **6. Limitation of Consequential Damages:**

Warrantor's responsibility under this warranty extends solely to repair or replacement of your Den Hartog product and its component parts. Warrantor does not assume responsibility for, nor shall it be liable for, any special, incidental or consequential damages. Specifically, warrantor assumes no responsibility to the owner for loss of use of the product, loss of time, inconvenience or other damage consequential or otherwise, including, but not limited to loss of revenue or earnings; expense of transporting the product; travel time; telephone, fax, overnight delivery, or postage charges; road service/towing charges; rental during the time warranty repairs are being performed; travel or lodging costs; loss or damage to personal property; or any other losses.

Some states do not allow exclusion or limitation of incidental or consequential damages, so above exclusion or limitation may not apply to you.

#### **7. Purchaser's Rights:**

This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

#### **8. Exclusive Warranty:**

This is the only warranty made by the warrantor on the product and no agent, employee, or other person is allowed to change or add to this warranty. This warranty extends solely to repair or replacement of your Den Hartog product. Warrantor does not assume any liability or responsibility not expressly covered by this limited warranty. This warranty supersedes all other warranties, written or implied.

No other express warranty has been made or will be made on behalf of warrantor with respect to this Den Hartog product or its construction, use, repair, or replacement.

# CONVERSION CHARTS AND FORMULAS

## METRIC SYSTEM

**LENGTH** - Basic unit is a meter

Metric Unit	Meters	Inches	Feet	Yards	Miles
Millimeter (mm)	.001	-	-	-	-
Centimeter (cm)	.01	.3937	-	-	-
Decimeter (dm)	.1	3.937	.3281	.1094	-
Meter (m)	1	39.37	3.281	1.094	-
Decameter (dkm)	10	393.7	32.81	10.94	-
Hectometer (hm)	100	3937	328.1	109.4	-
Kilometer (km)	1000	-	3281	1094	.6214

### To convert

Inch to mm - multiply by 25.4  
 mm to inch - multiply by .03937  
 feet to meters - multiply by .3048  
 Meters to feet - multiply by 3.281  
 Yards to meters - multiply by .9144  
 Meters to yards - Multiply by 1.094  
 Miles to km - multiply by 1.609  
 km to miles - multiply by .6214

**Area** - Basic unit is centare (ca) which is one square meter

Metric Unit	Centares	Square Inches	Square Feet	Square Yards	Acres
Sq. Millimeter(sq. mm)	0.000001	-	-	-	-
Sq. Centimeter(sq. cm)	0.0001	0.1550	-	-	-
Sq. Decemeter(sq. dm)	0.01	15.50	0.1076	-	-
Centare/sq. meter (ca/sq m)	1	1550	10.76	1.196	-
Are (a)	100	-	1076	119.6	-
Hectare (ha)	10,000	-	-	-	2.471
Sq. Kilometer(sq. km)	1,000,000	-	-	-	247.1

### To convert

Sq. in. to sq. cm - multiply by 6.452  
 Sq. cm to sq. in. - multiply by .1550  
 Sq. Ft. to sq. m. - multiply by .0929  
 Sq. m. to sq. ft. - multiply by 10.76  
 Sq. yds to sq. m. - multiply by .8361  
 Sq. m. to sq. yds. - multiply by 1.196  
 Acres to Hectares - multiply by .4047  
 Hectares to Acres - multiply by 2.471  
 Acres to sq. km - multiply by .004047  
 Sq. km to Acres - multiply by 247.1  
 Sq. miles to sq. km - multiply by 2.590  
 Sq. km to sq. miles - multiply by .3861

## Specific Gravity of Liquids

Specific gravity is the ratio of chemical weight per gallon divided by the weight of water per gallon.

Liquid	Temp °F	Specific Gravity
Water (1 cu. Ft. weighs 62.41 lb)	50	1.00
Brine (Sodium Chloride 25%)	32	1.20
Pennsylvania Crude Oil	80	0.85
Fuel Oil No. 1 and 2	85	0.95
Gasoline	80	0.74
Kerosene	85	0.82
Lubricating Oil SAE 10-20-30	115	0.94

Liquid	Temp °F	Specific Gravity
30% Acetic Acid	68	1.04
50% Acetic Acid	68	1.05
20% Chromic Acid	68	1.16
20% Hydrogen Peroxide	68	1.07
25% Methyl Alcohol	68	0.96
10% Nitric Acid	68	1.05
20% Nitric Acid	68	1.11

Liquid	Temp °F	Specific Gravity
20% Phosphoric Acid	68	1.11
20% Sodium Hydroxide	68	1.21
50% Sodium Hydroxide	68	1.52
20% Sulphuric Acid	68	1.14
50% Sulphuric Acid	68	1.40
98% Sulphuric Acid	68	1.83

1 Gallon = 3.7854 liters

1 liter = 0.26417 gallons

**VOLUME** - Basic unit is stere (s) which is 1 cubic meter

Metric Unit	Steres	Cubic Inch	Cubic Foot	Cubic Yards
Cu. Millimeter (cu mm)	.000000001	-	-	-
Cu. Centimeter (cu cm)	.000001	.06102	-	-
Cu. Decimeter (cu dm)	.001	61.023	-	-
Desistere (ds)	.1	6102.3	3.531	.1308
Stere/Cu Meter (s/cu m)	1	61023	35.31	1.308
Decastere (dks)	10	-	353.1	13.08

### To convert

Cu. In. to Cu. Mm - multiply by 1639  
 Cu. Mm to Cu. In. - multiply by .000061  
 Cu. In. to Cu. cm - multiply by 16.39  
 Cu. Cm. To Cu. In.- multiply by .06102  
 Cu. Ft. to Cu. M - multiply by .0283  
 Cu. M to Cu. Ft - multiply by 35.31  
 Cu. Yards to Cu. M - multiply by .7646  
 Cu. M to Cu. yds - multiply by 1.308

**Weight** - Basic unit is gram (g)

Metric Unit	Grams	Grains	Ounces	Pounds
Milligram(mg)	0.001	0.01543	-	-
Centigram (cg)	0.01	0.1543	-	-
Decigram (dg)	0.1	1.543	-	-
Gram	1	15.43	0.03527	-
Decagram (dkg)	10	154.3	0.3527	-
Hectogram (hg)	100	1543	3.527	0.22046
Kilogram (kg)	1000	-	35.27	2.2046
Quintal (q)	100,000	-	3527	220.46
Metric Ton (MT)	1,000,000	-	-	2204.6

### To convert

g to cg - multiply by 6.48  
 cg to g - multiply by .1543  
 Ounces to g - multiply by 31.103  
 Tons(2000#) to Metric Tons - multiply by .9078  
 Metric Tons to Tons(2000#) - multiply by 1.1023  
 g to Ounces - multiply by .03527  
 Pounds to kg - multiply by .4536  
 kg to Pounds - multiply by 2.2046

To Change	To	Multiply By
Inches	Feet	0.0833
Inches	Millimeters	25.4
Feet	Inches	12
Feet	Yards	0.3333
Yards	Feet	3
Square Inches	Square Feet	0.00694
Square Feet	Square Inches	144
Square Feet	Square Yards	0.11111
Square Yards	Square feet	9
Cubic Inches	Cubic Feet	0.00058
Cubic Feet	Cubic Inches	1728
Cubic Feet	Cubic Yards	0.03703
Cubic Yards	Cubic Feet	27
Cubic Inches	Gallons	0.00433
Cubic Feet	Gallons	7.48
Gallons	Cubic Inches	231
Gallons	Cubic Feet	0.1337
Gallons	Pounds of Water	8.337
Pounds of Water	Gallons	0.12004
Ounces	Pounds	0.0625
Pounds	Ounces	16
Inches of Water	Pounds per sq. Inch	0.03609

#### Flow

1 gpm	= 0.134 cu. Ft. per min. = 500 lb. per hr. x sp. Gr.
500lb. Per hr.	= 1 gpm / sp. Gr.
1 cu. Ft. per min. (cfm)	= 448.8 gal. Per hr. (gph)

#### Pressure

1 lb. Per sq. in.	= 2.31 ft. water at 60°F = 2.04 in. hg at 60°F
1 ft. water at 60°F	= 0.4333 lb. Per sq. in. = 0.884 in. hg at 60°F
1 in. Hg at 60°F	= 0.49 lb. Per sq. in. = 1.13 ft. water at 60°F
1 lb. Per sq. in.	= lb. Per sq. in. gauge (psig)+ 14.7 Absolute (psia)

To Change	To	Multiply By
Inches of water	Inches of Mercury	0.0736
Inches of water	Ounces per sq. inch	0.578
Inches of water	Pounds per sq. foot	5.2
Inches of Mercury	Inches of Water	13.57
Inches of Mercury	Feet of Water	1.131
Inches of Mercury	Pounds per sq. inch	0.4898
Ounces per sq. inch	Inches of Mercury	0.17
Ounces per sq. inch	Inches of Water	1.73
Pounds per sq. inch	Inches of Water	27.71
Pounds per sq. inch	Feet of water	2.309
Pounds per sq. inch	Inches of Mercury	2.042
Pounds per sq. inch	Atmosphere	0.06805
Feet of water	Pounds per sq. inch	0.4331
Feet of water	Pounds per sq. foot	62
Feet of water	Inches of Mercury	0.8843
Atmosphere	Pounds per sq. inch	14.70
Atmosphere	Inches of Mercury	29.92
Atmosphere	Feet of water	34
Long Tons	Pounds	2240
Short Tons	Pounds	2000
Short Tons	Long Tons	0.89

#### Temperature

°C	= (°F - 32) x 0.556
°F	= C(1.8) + 32

#### Volume

1 gal. (US)	= 128 fl. Oz. (US) = 231 cu. In. = 0.833 gal. (Brit.)
1 cu. Ft.	= 7.48 gal. (US)

#### Mass

1 lb. (avoir)	= 16 oz. (avoir) = 7000 grain
1 ton (short)	= 2000 lb.
1 ton (long)	= 2240 lb.

# SPECIFIC GRAVITY CONVERSION CHART

Material Weight in Lbs / Gal	Specific Gravity
8	0.96
9	1.08
10	1.20
11	1.32
12	1.44
13	1.56
14	1.68
15	1.80
16	1.92
17	2.04

Specific Gravity	Material Weight in Lbs / Gal
1.5	12.50
1.6	13.33
1.7	14.16
1.8	14.99
1.9	15.83
2.0	16.66

## Examples:

Water: 8.33lbs / S.G. = 1

Brine: 6.14 lbs / S.G. = 0.74

Feric Chloride: 11.75 lbs / S.G. = 1.41

Sodium Hydroxide: 17.74 lbs / S.G. = 2.13