Permit Application

Lea County, New Mexico

C.K. Disposal E & P Landfill and Processing Facility

Permit No. TBD

Attachment F

Geosynthetic and Pipe Document

November 2015

PSC Project # 01058015

PARKHILLSMITH&COOPER

TRI/Environmental, Inc.
A Texas Research International Company

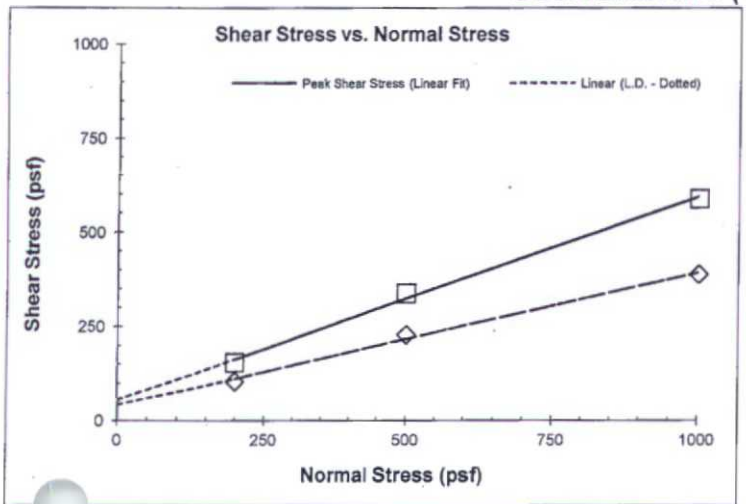
Interface Friction Test Report

Client: **PSI**
Project: **City of El Paso, Clint Landfill**
Test Date: 10/14/11-10/17/11

TRI Log#: E2357-60-01
Test Method: ASTM D 6243

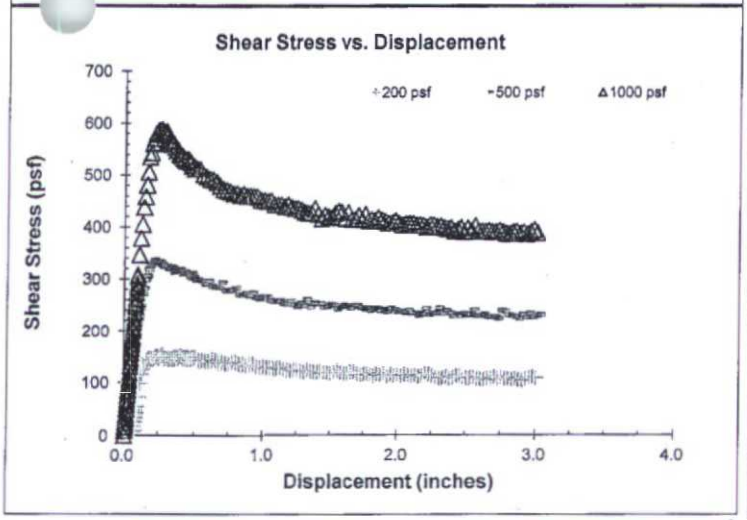
John M. Allen, P.E., 10/17/2011
Quality Review/Date

Tested Interface: BentoLiner NSL GCL (502193561) vs. GSE 60 mil HDPE Textured Geomembrane (102162724)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	28.2	19.3
Y-intercept or Adhesion (psf):	56	42

Shearing occurred at the interface.



Test Conditions

Upper Box &	BentoLiner NSL GCL (non-woven side)
Lower Box	GSE 60 mil HDPE textured geomembrane
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 72 hours prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data

Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	10	13	18
Normal Stress (psf)	200	500	1000
Corrected Peak Shear Stress (psf)	155	338	588
Corrected Large Displacement Shear Stress (psf)	105	228	388
Peak Secant Angle (degrees)	37.7	34.0	30.4
Large Displacement Secant Angle (degrees)	27.7	24.5	21.2
Asperity (mils)	23.0	21.2	21.8

TRI/ENVIRONMENTAL, INC.
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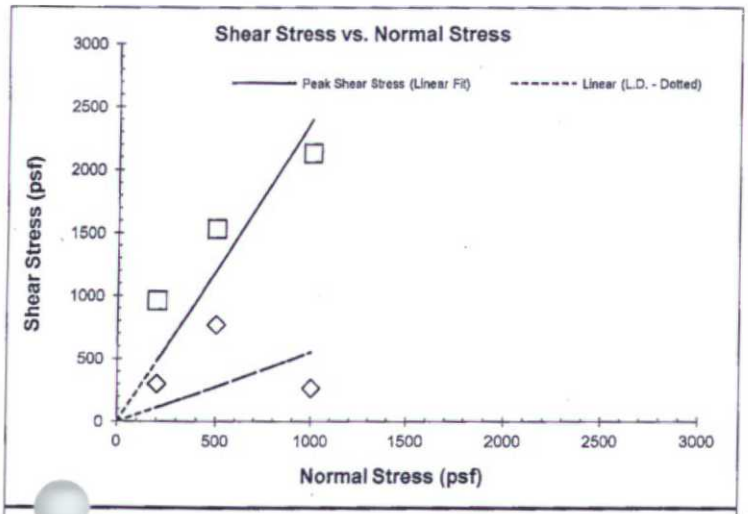
Interface Friction Test Report

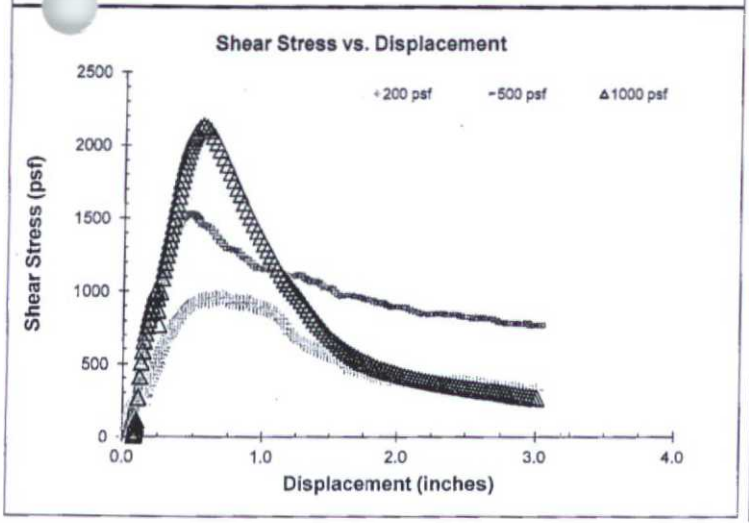
Client: **PSI**
Project: **City of El Paso, Clint Landfill**
Test Date: 10/14/11-10/17/11

TRI Log#: E2357-60-01
Test Method: ASTM D 6243

John M. Allen, P.E., 10/17/2011
Quality Review/Date

Tested Interface: Internal Shear of BentoLiner NSL GCL (502193561)





Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	55.2	29.0
Y-intercept or Adhesion (psf):	730	0

The GCL sheared internally under all loads. The large displacement friction angle regression analysis was adjusted to fit a zero y-intercept.

Test Conditions

Upper Box & Lower Box: BentoLiner NSL GCL

Box Dimensions: 12"x12"x4"

Interface Conditioning: Interface soaked and loading applied for a minimum of 72 hours prior to shear.

Test Condition: Wet

Shearing Rate: 0.04 inches/minute

Test Data

Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	10	13	18
Normal Stress (psf)	200	500	1000
Corrected Peak Shear Stress (psf)	963	1535	2134
Corrected Large Displacement Shear Stress (psf)	302	771	268
Peak Secant Angle (degrees)	78.3	72.0	64.9
Large Displacement Secant Angle (degrees)	56.5	57.0	15.0

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

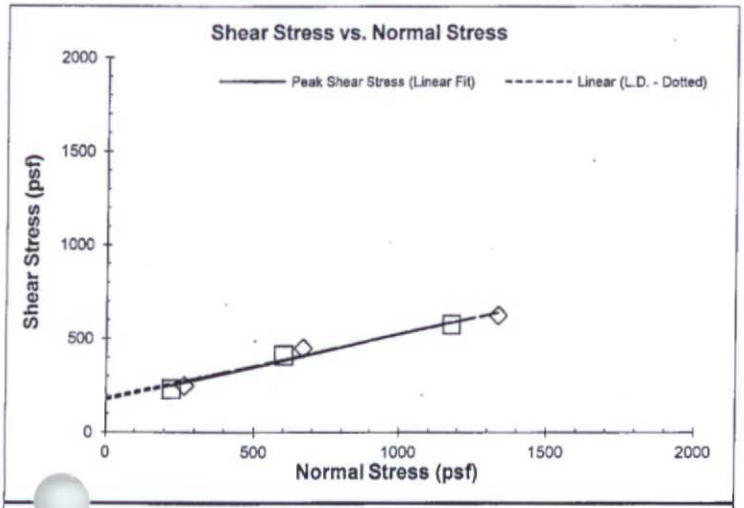
Interface Friction Test Report

Client: **PSI**
Project: **City of El Paso, Clint Landfill**
Test Date: 11/03/11-11/07/11

TRI Log#: E2357-60-01
Test Method: ASTM D 6243

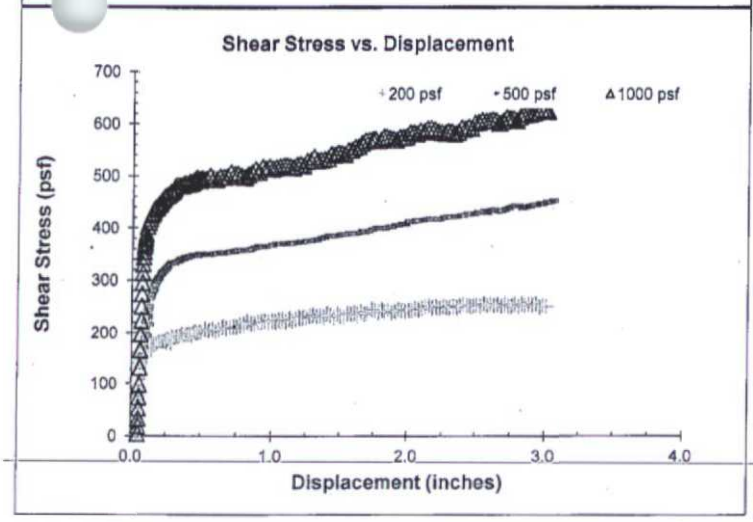
John M. Allen, P.E., 11/07/2011
Quality Review/Date

Tested Interface: Soil mixed with Ash vs. BentoLiner NSL GCL (502193561)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	19.4	18.8
Y-intercept or Adhesion (psf):	174	184

Note: Regression angles include an area correction. Shearing occurred at the Soil/GCL interface under all loads.



Test Conditions

Upper Box & Lower Box: BentoLiner NSL GCL (scrim side down)

Soil Ash Blend (5% ash) remolded to 112.0 pcf at 14.5% moisture content

Box Dimensions: 12"x12"x4"

Interface Conditioning: Interface soaked and loading applied for a minimum of 72 hours prior to shear.

Test Condition: Wet

Shearing Rate: 0.04 inches/minute

Test Data

Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	10	13	18
Area Corrected Normal Stress (psf)	224	602	1178
Area Corrected Peak Shear Stress (psf)	235	415	576
Area Corrected Large Displacement Normal Stress (psf)	267	667	1335
Area Corrected Large Displacement Shear Stress (psf)	251	450	624
Peak Secant Angle (degrees)	46.3	34.6	26.1
Large Displacement Secant Angle (degrees)	43.2	34.0	25.1

PRODUCT DATA SHEET

GSE BentoLiner EC Geosynthetic Clay Liner

GSE BentoLiner "EC" is a lightly needle-punched reinforced composite geosynthetic clay liner (GCL) comprised of a uniform layer of granular sodium bentonite encapsulated between a woven and a nonwoven geotextile. The product is intended for use on relatively flat slope surfaces and low load applications where minimal internal shear strength is required.

[*]

AT THE CORE:

This composite clay liner is intended for use on relatively flat slope surfaces and low load applications where minimal internal shear strength is required.

Product Specifications

Tested Property	Test Method	Frequency	Value
Geotextile Property			
Cap Nonwoven, Mass/Unit Area	ASTM D 5261	1/200,000 ft²	3.0 oz/yd² MARV[1]
Carrier Woven, Mass/Unit Area	ASTM D 5261	1/200,000 ft²	3.1 oz/yd² MARV
Bentonite Property			
Swell Index	ASTM D 5890	1/100,000 lb	24 ml/2 g min
Moisture Content	ASTM D 4643	1/100,000 lb	12% max
Fluid Loss	ASTM D 5891	1/100,000 lb	18 ml max
Finished GCL Property			
Bentonite, Mass/Unit Area[2]	ASTM D 5993	1/40,000 ft²	0.75 lb/ft² MARV
Tensile Strength[3]	ASTM D 6768	1/40,000 ft²	30 lb/in MARV
Peel Strength	ASTM D 6496 ASTM D 4632[4]	1/40,000 ft²	1 lb/in MARV 6 lb MARV
Hydraulic Conductivity[5]	ASTM D 5887	1/Week	5 x 10⁻⁹ cm/sec max
Index Flux[5]	ASTM D 5887	1/Week	1 x 10⁻⁸ m³/m²/sec max
Internal Shear Strength[6]	ASTM D 6243	Periodically	150 psf Typical
TYPICAL ROLL DIMENSIONS			
Width x Length[7]	Typical	Every Roll	15.5 ft x 150 ft
Area per Roll	Typical	Every Roll	2,325 ft²
Packaged Weight	Typical	Every Roll	2,600 lb

NOTES:

- [1]Minimum Average Roll Value
- [2]At 0% moisture content
- [3]Tested in machine direction
- [4]Modified ASTM D 4632 to use a 4 in wide grip. The maximum peak of five specimens averaged in machine direction.
- [5]Deaired, deionized water @ 5 psi maximum effective confining stress and 2 psi head pressure
- [6]Typical peak value for specimen hydrated for 24 hours and sheared under a 200 psf normal stress
- [7]Roll widths and lengths have a tolerance of ±1%

GSE is a leading manufacturer and marketer of geosynthetic lining products and services. We've built a reputation of reliability through our dedication to providing consistency of product, price and protection to our global customers.

Our commitment to innovation, our focus on quality and our industry expertise allow us the flexibility to collaborate with our clients to develop a custom, purpose-fit solution.

GSE ENVIRONMENTAL™

[DURABILITY RUNS DEEP] For more information on this product and others, please visit us at GSEworld.com, call 800.435.2008 or contact your local sales office.

PRODUCT DATA SHEET

GSE FabriNet 200 mil Geocomposite

GSE FabriNet geocomposite consists of a 200 mil thick GSE HyperNet geonet heat-laminated on one or both sides with a GSE nonwoven needle-punched geotextile. The geotextile is available in mass per unit area range of 6 oz/yd² to 16 oz/yd². The geocomposite is designed and formulated to perform drainage function under a range of anticipated site loads, gradients and boundary conditions.

AT THE CORE:
A 200 mil thick HyperNet geonet heat-laminated on one or both sides with a nonwoven needlepunched geotextile.

Product Specifications

Tested Property	Test Method	Frequency	Minimum Average Roll Value[1]		
Geocomposite			**6 oz/yd²**	**8 oz/yd²**	**10 oz/yd²**
Transmissivity[2], gal/min/ft, (m²/sec) Double-Sided Composite Single-Sided Composite	ASTM D 4716	1/540,000 ft²	 0.5 (1x10⁻⁴) 4.8 (1x10⁻³)	 0.5 (1x10⁻⁴) 4.8 (1x10⁻³)	 0.4 (9x10⁻⁵) 4.3 (9x10⁻⁴)
Ply Adhesion, lb/in	ASTM D 7005	1/50,000 ft²	1.0	1.0	1.0
Geonet Core[1,3] – GSE HyperNet					
Geonet Core Thickness, mil	ASTM D 5199	1/50,000 ft²	200	200	200
Transmissivity[2], gal/min/ft (m²/sec)	ASTM D 4716		9.6 (2 x 10⁻³)	9.6 (2 x 10⁻³)	9.6 (2 x 10⁻³)
Density, g/cm³	ASTM D 1505	1/50,000 ft²	0.94	0.94	0.94
Tensile Strength (MD), lb/in	ASTM D 7179	1/50,000 ft²	45	45	45
Carbon Black Content, %	ASTM D 4218	1/50,000 ft²	2.0	2.0	2.0
Geotextile[1,3]					
Mass per Unit Area, oz/yd²	ASTM D 5261	1/90,000 ft²	6	8	10
Grab Tensile Strength, lb	ASTM D 4632	1/90,000 ft²	160	220	260
Grab Elongation	ASTM D 4632	1/90,000 ft²	50%	50%	50%
CBR Puncture Strength, lb	ASTM D 6241	1/540,000 ft²	435	575	725
Trapezoidal Tear Strength, lb	ASTM D 4533	1/90,000 ft²	65	90	100
AOS, US sieve[1], (mm)	ASTM D 4751	1/540,000 ft²	70 (0.212)	80 (0.180)	100 (0.150)
Permittivity, sec⁻¹	ASTM D 4491	1/540,000 ft²	1.5	1.3	1.0
Water Flow Rate, gpm/ft²	ASTM D 4491	1/540,000 ft²	110	95	75
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	per formulation	70	70	70
NOMINAL ROLL DIMENSIONS[4]					
Roll Width, ft			14.75	14.75	14.75
Roll Length, ft	Double-Sided Composite Single-Sided Composite		270 300	260 300	230 290
Roll Area, ft²	Double-Sided Composite Single-Sided Composite		3,982 4,425	3,835 4,425	3,392 4,277

NOTES:

- [1] All geotextile properties are minimum average roll values except AOS which is maximum average roll value and UV resistance is typical value. Geonet core thickness is nominal value.
- [2] Gradient of 0.1, normal load of 10,000 psf, water at 70°F between steel plates for 15 minutes. Contact GSE for performance transmissivity value for use in design.
- [3] Component properties prior to lamination.
- [4] Roll widths and lengths have a tolerance of ±1%.

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PRODUCT DATA SHEET

GSE HyperNet Geonet 175 - 225 mil

GSE HyperNet geonet is a synthetic drainage material manufactured from a premium grade high density polyethylene (HDPE) resin. The structure of the GSE HyperNet geonet is formed specifically to transmit fluids uniformly under a variety of field conditions. The geonet is formulated to be resistant to ultraviolet light for a period of time necessary to complete the installation.

[*]

AT THE CORE:
A synthetic geonet engineered specifically to transmit fluids consistently under a variety of field conditions.

Product Specifications

Tested Property	Test Method	Frequency	Minimum Average Roll Value		
			175 mil	200 mil	225 mil
Geonet Thickness, mil[1]	ASTM D 5199	1/50,000 ft²	175	200	225
Transmissivity[2], gal/min/ft (m²/sec)	ASTM D 4716	1/540,000 ft²	4.8 (1.0×10^{-3})	9.6 (2×10^{-3})	12 (2.5×10^{-3})
Density, g/cm³	ASTM D 1505	1/50,000 ft²	0.94	0.94	0.94
Tensile Strength (MD), lb/in	ASTM D 7179	1/50,000 ft²	40	45	50
Carbon Black Content, %	ASTM D 4218	1/50,000 ft²	2.0	2.0	2.0
NOMINAL ROLL DIMENSIONS[3]					
Roll Width, ft			15	15	15
Roll Length, ft			350	330	330
Roll Area, ft²			5,250	4,950	4,950

NOTES:
- [1]Geonet thickness is nominal value
- [2]Gradient of 0.1, normal load of 10,000 psf, water at 70° F, between steel plates for 15 minutes. Contact GSE for performance transmissivity value for use in design
- [3]Roll widths and lengths have a tolerance of ±1%

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PRODUCT DATA SHEET

GSE HD Smooth Geomembrane

GSE HD is a smooth high density polyethylene (HDPE) geomembrane manufactured with the highest quality resin specifically formulated for flexible geomembranes. This product is used in applications that require excellent chemical resistance and endurance properties.

[*]

AT THE CORE:
An HDPE geomembrane used in applications that require excellent chemical resistance and endurance properties.

Product Specifications

These product specifications meet GRI GM 13

Tested Property	Test Method	Frequency	Minimum Average Value				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5199	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm³	ASTM D 1505	200,000 lb	0.940	0.940	0.940	0.940	0.94
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lb	 114 63 700 12	 152 84 700 12	 228 126 700 12	 304 168 700 12	 380 210 700 12
Tear Resistance, lb	ASTM D 1004	45,000 lb	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lb	54	72	108	144	180
Carbon Black Content, % (Range)	ASTM D 1603*/4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lb	Note(1)	Note(1)	Note(1)	Note(1)	Note(1)
Notched Constant Tensile Load, hr	ASTM D 5397, Appendix	200,000 lb	500	500	500	500	500
Oxidative Induction Time, mins	ASTM D 3895, 200°C; O_2, 1 atm	200,000 lb	>100	>100	>100	>100	>100
TYPICAL ROLL DIMENSIONS							
Roll Length(2), ft			1,120	870	560	430	340
Roll Width(2), ft			22.5	22.5	22.5	22.5	22.5
Roll Area, ft²			25,200	19,575	12,600	9,675	7,650

NOTES:
- (1)Dispersion only applies to mear spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
- (2)Roll lengths and widths have a tolerance of ±1%
- GSE HD is available in rolls weighing approximately 3,900 lb
- All GSE geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77 C when tested according to ASTM D 746.
- *Modified

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PRODUCT DATA SHEET

GSE HD Textured Geomembrane

GSE HD Textured is a co-extruded textured high density polyethylene (HDPE) geomembrane available on one or both sides. It is manufactured from the highest quality resin specifically formulated for flexible geomembranes. This product is used in applications that require increased frictional resistance, excellent chemical resistance and endurance properties.

[*]

AT THE CORE:
An HDPE geomembrane used in applications that require increased frictional resistance, excellent chemical resistance and endurance properties.

Product Specifications

These product specifications meet GRI GM13

Tested Property	Test Method	Frequency	Minimum Average Value				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5994	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm³	ASTM D 1505	200,000 lb	0.940	0.940	0.940	0.940	0.940
Tensile Properties (each direction Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lb	 45 63 100 12	 60 84 100 12	 90 126 100 12	 120 168 100 12	 150 210 100 12
Tear Resistance, lb	ASTM D 1004	45,000 lb	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lb	45	60	90	120	150
Carbon Black Content, % (Range)	ASTM D 1603*/4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lb	Note(1)	Note(1)	Note(1)	Note(1)	Note(1)
Asperity Height, mil	ASTM D 7466	second roll	16	18	18	18	18
Notched Constant Tensile Load(2), hr	ASTM D 5397, Appendix	200,000 lb	500	500	500	500	500
Oxidative Induction Time, mins	ASTM D 3895, 200°C; O_2, 1 atm	200,000 lb	>100	>100	>100	>100	>100
TYPICAL ROLL DIMENSIONS							
Roll Length(3), ft	Double-Sided Textured Single-Sided Textured		830 1,010	700 780	520 540	400 410	330 330
Roll Width(3), ft			22.5	22.5	22.5	22.5	22.5
Roll Area, ft²	Double-Sided Textured Single-Sided Textured		18,675 22,725	15,750 17,550	11,700 12,150	9,000 9,225	7,425 7,425

NOTES:
- (1)Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
- (2)NCTL for GSE HD Textured is conducted on representative smooth membrane samples.
- (3)Roll lengths and widths have a tolerance of ±1%.
- GSE HD Textured is available in rolls weighing approximately 4,000 lb.
- All GSE geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77°C when tested according to ASTM D 746.
- *Modified

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GSE ENVIRONMENTAL™

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Chemical Resistance Chart

GSE is the world's leading supplier of high quality, polyethylene geomembranes and geonets. GSE polyethylene geomembranes and geonets are resistant to a great number and combinations of chemicals. Note that the effect of chemicals on any material is influenced by a number of variable factors such as temperature, concentration, exposed area and duration. Many tests have been performed that use geomembranes and geonets and certain specific chemical mixtures. Naturally, however, every mixture of chemicals cannot be tested for, and various criteria may be used to judge performance. Reported performance ratings may not apply to all applications of a given material in the same chemical. Therefore, these ratings are offered as a guide only.

Medium	Concentration	Resistance at: 20° C (68° F)	60° C (140° F)
A			
Acetic acid	100%	S	L
Acetic acid	10%	S	S
Acetic acid anhydride	100%	S	L
Acetone	100%	L	L
Adipic acid	sat. sol.	S	S
Allyl alcohol	96%	S	S
Aluminum chloride	sat. sol.	S	S
Aluminum fluoride	sat. sol.	S	S
Aluminum sulfate	sat. sol.	S	S
Alum	sol.	S	S
Ammonia, aqueous	dil. sol.	S	S
Ammonia, gaseous dry	100%	S	S
Ammonia, liquid	100%	S	S
Ammonium chloride	sat. sol.	S	S
Ammonium fluoride	sol.	S	S
Ammonium nitratesat. sol.	S	S	
Ammonium sulfate	sat. sol.	S	S
Ammonium sulfide	sol.	S	S
Amyl acetate	100%	S	L
Amyl alcohol	100%	S	L
B			
Barium carbonate	sat. sol.	S	S
Barium chloride	sat. sol.	S	S
Barium hydroxide	sat. sol.	S	S
Barium sulfate	sat. sol.	S	S
Barium sulfide	sol.	S	S
Benzaldehyde	100%	S	L
Benzene	–	L	L
Benzoic acid	sat. sol.	S	S
Beer	–	S	S
Borax (sodium tetraborate)	sat. sol.	S	S
Boric acid	sat. sol.	S	S
Bromine, gaseous dry	100%	U	U
Bromine, liquid	100%	U	U
Butane, gaseous	100%	S	S
1-Butanol	100%	S	S
Butyric acid	100%	S	L
C			
Calcium carbonate	sat. sol.	S	S
Calcium chlorate	sat. sol.	S	S
Calcium chloride	sat. sol.	S	S
Calcium nitrate	sat. sol.	S	S
Calcium sulfate	sat. sol.	S	S
Calcium sulfide	dil. sol.	L	L
Carbon dioxide, gaseous dry	100%	S	S
Carbon disulfide	100%	L	U
Carbon monoxide	100%	S	S
Chloracetic acid	sol.	S	S
Carbon tetrachloride	100%	L	U
Chlorine, aqueous solution	sat. sol.	L	U
Chlorine, gaseous dry	100%	L	U
Chloroform	100%	U	U
Chromic acid	20%	S	L
Chromic acid	50%	S	L
Citric acid	sat. sol.	S	S
Copper chloride	sat. sol.	S	S
Copper nitrate	sat. sol.	S	S
Copper sulfate	sat. sol.	S	S
Cresylic acid	sat. sol.	L	–
Cyclohexanol	100%	S	S
Cyclohexanone	100%	S	L
D			
Decahydronaphthalene	100%	S	L
Dextrine	sol.	S	S
Diethyl ether	100%	L	–
Dioctylphthalate	100%	S	L
Dioxane	100%	S	S
E			
Ethanediol	100%	S	S
Ethanol	40%	S	L
Ethyl acetate	100%	S	U
Ethylene trichloride	100%	U	U
F			
Ferric chloride	sat. sol.	S	S
Ferric nitrate	sol.	S	S
Ferric sulfate	sat. sol.	S	S
Ferrous chloride	sat. sol.	S	S
Ferrous sulfate	sat. sol.	S	S
Fluorine, gaseous	100%	U	U
Fluorosilicic acid	40%	S	S
Formaldehyde	40%	S	S
Formic acid	50%	S	S
Formic acid	98-100%	S	S
Furfuryl alcohol	100%	S	L
G			
Gasoline	–	S	L
Glacial acetic acid	96%	S	L
Glucose	sat. sol.	S	S
Glycerine	100%	S	S
Glycol	sol	S	S
H			
Heptane	100%	S	U
Hydrobromic acid	50%	S	S
Hydrobromic acid	100%	S	S
Hydrochloric acid	10%	S	S
Hydrochloric acid	35%	S	S
Hydrocyanic acid	10%	S	S
Hydrofluoric acid	4%	S	S
Hydrofluoric acid	60%	S	L
Hydrogen	100%	S	S
Hydrogen peroxide	30%	S	L
Hydrogen peroxide	90%	S	U
Hydrogen sulfide, gaseous	100%	S	S
Lactic acid	100%	S	S
Lead acetate	sat. sol.	S	–
Magnesium carbonate	sat. sol.	S	S
Magnesium chloride	sat. sol.	S	S
Magnesium hydroxide	sat. sol.	S	S
Magnesium nitrate	sat. sol.	S	S
Maleic acid	sat. sol.	S	S
Mercuric chloride	sat. sol.	S	S
Mercuric cyanide	sat. sol.	S	S
Mercuric nitrate	sol.	S	S

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Medium	Concentration	Resistance at: 20° C (68° F)	60° C (140° F)	Medium	Concentration	Resistance at: 20° C (68° F)	60° C (140° F)
Mercury	100%	S	S	Silver acetate	sat. sol.	S	S
Methanol	100%	S	S	Silver cyanide	sat. sol.	S	S
Methylene chloride	100%	L	–	Silver nitrate	sat. sol.	S	S
Milk	–	S	S	Sodium benzoate	sat. sol.	S	S
Molasses	–	S	S	Sodium bicarbonate	sat. sol.	S	S
N				Sodium biphosphate	sat. sol.	S	S
Nickel chloride	sat. sol.	S	S	Sodium bisulfite	sol.	S	S
Nickel nitrate	sat. sol.	S	S	Sodium bromide	sat. sol.	S	S
Nickel sulfate	sat. sol.	S	S	Sodium carbonate	sat. sol.	S	S
Nicotinic acid	dil. sol.	S	–	Sodium chlorate	sat. sol.	S	S
Nitric acid	25%	S	S	Sodium chloride	sat. sol.	S	S
Nitric acid	50%	S	U	Sodium cyanide	sat. sol.	S	S
Nitric acid	75%	U	U	Sodium ferricyanide	sat. sol.	S	S
Nitric acid	100%	U	U	Sodium ferrocyanide	sat. sol.	S	S
O				Sodium fluoride	sat. sol.	S	S
Oils and Grease	–	S	L	Sodium hydroxide	40%	S	S
Oleic acid	100%	S	L	Sodium hydroxide	sat. sol.	S	S
Orthophosphoric acid	50%	S	S	Sodium hypochlorite	15% active chlorine	S	S
Orthophosphoric acid	95%	S	L	Sodium nitrate	sat. sol.	S	S
Oxalic acid	sat. sol.	S	S	Sodium nitrite	sat. sol.	S	S
Oxygen	100%	S	L	Sodium orthophosphate	sat. sol.	S	S
Ozone	100%	L	U	Sodium sulfate	sat. sol.	S	S
P				Sodium sulfide	sat. sol.	S	S
Petroleum (kerosene)	–	S	L	Sulfur dioxide, dry	100%	S	S
Phenol	sol.	S	S	Sulfur trioxide	100%	U	U
Phosphorus trichloride	100%	S	L	Sulfuric acid	10%	S	S
Photographic developer	cust. conc.	S	S	Sulfuric acid	50%	S	S
Picric acid	sat. sol.	S	–	Sulfuric acid	98%	S	U
Potassium bicarbonate	sat. sol.	S	S	Sulfuric acid	fuming	U	U
Potassium bisulfide	sol.	S	S	Sulfurous acid	30%	S	S
Potassium bromate	sat. sol.	S	S	T			
Potassium bromide	sat. sol.	S	S	Tannic acid	sol.	S	S
Potassium carbonate	sat. sol.	S	S	Tartaric acid	sol.	S	S
Potassium chlorate	sat. sol.	S	S	Thionyl chloride	100%	L	U
Potassium chloride	sat. sol.	S	S	Toluene	100%	L	U
Potassium chromate	sat. sol.	S	S	Triethylamine	sol.	S	L
Potassium cyanide	sol.	S	S	U			
Potassium dichromate	sat. sol.	S	S	Urea	sol.	S	S
Potassium ferricyanide	sat. sol.	S	S	Urine	–	S	S
Potassium ferrocyanide	sat. sol.	S	S	W			
Potassium fluorid	sat. sol.	S	S	Water	–	S	S
Potassium hydroxide	10%	S	S	Wine vinegar	–	S	S
Potassium hydroxide	sol.	S	S	Wines and liquors	–	S	S
Potassium hypochlorite	sol.	S	L	X			
Potassium nitrate	sat. sol.	S	S	Xylenes	100%	L	U
Potassium orthophosphate	sat. sol.	S	S	Y			
Potassium perchlorate	sat. sol.	S	S	Yeast	sol.	S	S
Potassium permanganate	20%	S	S	Z			
Potassium persulfate	sat. sol.	S	S	Zinc chloride	sat. sol.	S	S
Potassium sulfate	sat. sol.	S	S	Zinc (II) chloride	sat. sol.	S	S
Potassium sulfite	sol.	S	S	Zinc (IV) chloride	sat. sol.	S	S
Propionic acid	50%	S	S	Zinc oxide	sat. sol.	S	S
Propionic acid	100%	S	L	Zinc sulfate	sat. sol.	S	S
Pyridine	100%	S	L				
Q				Specific immersion testing should be undertaken to ascertain the			
Quinol (Hydroquinone)	sat. sol.	S	S	suitability			
S				of chemicals not listed above with reference to special requirements.			
Salicylic acid	sat. sol.	S	S				

Notes:
(S) Satisfactory: Liner material is resistant to the given reagent at the given concentration and temperature. No mechanical or chemical degradation is observed.
(L) Limited Application Possible: Liner material may reflect some attack. Factors such as concentration, pressure and temperature directly affect liner performance against the given media. Application, however, is possible under less severe conditions, e.g. lower concentration, secondary containment, additional liner protections, etc.
(U) Unsatisfactory: Liner material is not resistant to the given reagent at the given concentration and temperature. Mechanical and/or chemical degradation is observed.
(–) Not tested
sat. sol. = Saturated aqueous solution, prepared at 20°C (68°F)
sol. = aqueous solution with concentration above 10% but below saturation level
dil. sol. = diluted aqueous solution with concentration below 10%
cust. conc. = customary service concentration

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Chemical Resistance of Thermoplastics Piping Materials

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CHEMICAL RESISTANCE OF THERMOPLASTICS PIPING MATERIALS

Foreword

This report was developed and published with the technical help and financial support of the members of the PPI (Plastics Pipe Institute, Inc.). The members have shown their interest in quality products by assisting independent standards-making and user organizations in the development of standards, and also by developing reports on an industry-wide basis to help engineers, code officials, specifying groups, and users.

The purpose of this technical report is to provide information on the transport of various chemicals using thermoplastic piping materials.

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This report has been developed as an informative guide on resistance of thermoplastic piping materials to chemical attack. It is divided into two main sections: (1) a discussion of chemical resistance and general considerations for end use applications and (2) a listing of chemical resistance data (table) for several thermoplastic piping materials applicable to *non-pressure* applications. Determination of suitability for specific applications under stress (pressurized service) is beyond the scope of this report.

SECTION I: CHEMICAL RESISTANCE IN GENERAL

Thermoplastic materials generally are resistant to attack from many chemicals which makes them suitable for use in many process applications. The suitability for use in a particular process piping application is a function of:

I. Material
   - A. The specific plastic material: ABS, CPVC, PP, PVC, PE, PB, PVDF, PEX[1], PA11, PK
   - B. The specific plastic material physical properties as identified by its cell classification according to the appropriate ASTM material specification.

II. Product and Joint System
   - A. Piping product dimensions, construction, and composition (layers, fillers, etc.).
   - B. Joining system. Heat fusion and solvent cementing do not introduce different materials into the system. Mechanical joints can introduce gaskets such as elastomers, or other thermoplastic or non-thermoplastic materials used as mechanical fitting components.
   - C. Other components and appurtenances in the piping system.

III. Use Conditions - Internal and External
   - A. Chemical or mixtures of chemicals, and their concentrations.
   - B. Operating temperature — maximum, minimum, and cyclical variations.
   - C. Operating pressure or applied stress — maximum, minimum and cyclical variations.
   - D. Life-cycle information — such as material cost, installation cost, desired service life, maintenance, repair and replacement costs, etc.

[1] Once cross-linked, PEX is no longer considered a thermoplastic material; however, it is included in this report as convenience for the reader.

Types of Chemical Attack on Plastics

In general, chemicals that affect plastics do so in one of two ways. One effect is chemical solvation or permeation; the other is direct chemical attack.

Chemical Solvation or Permeation

In the case of solvation or permeation, physical properties may be affected, but the polymer molecule structure itself is not chemically changed, degraded or destroyed. In solvation or permeation, gas, vapor or liquid molecules pass through the polymer, typically without damaging the plastic material itself. If the solvating chemical can be removed completely, the plastic is generally restored to its original condition. However, removal of the chemical is not always possible, and, in such cases, these chemical solvation effects may be permanent.

Sometimes the polymer itself may not be soluble, but it may contain a soluble compounding ingredient that may be extracted from the polymer compound. This is rare because such extractable ingredients are either not used in pipe compounds, or they are chemically bonded to the molecular polymer matrix and in such small amounts that they cannot be leached out to any significant extent.

Permeation may do little if any harm to the material, but it may have application-related effects. The permeating chemical may transfer into a fluid on the other side of the pipe. In general, thermoplastic pipes should not be used where a permeating chemical in the environment surrounding the pipe could compromise the purity of a fluid, such as potable water inside the pipe (See also PPI *Statement N* on Pipe Permeation). In gas or vapor transmission service, there may be a very slight loss of contents through the pipe wall. Lastly, a permeating chemical entrained in the material may be released when heat fusion or solvent cement joining is performed. Thus, heat fusion or solvent cement joining may be unreliable if performed on permeated pipes.

Direct Chemical Attack

Direct chemical attack occurs when exposure to a chemical causes a chemical alteration of the polymer molecules by chain scission, crosslinking, oxidation or substitution reactions. Direct chemical attack may cause profound, irreversible changes that cannot be restored by removal of the chemical. Examples of this type of attack are 50% chromic acid at 140 °F on PVC, aqua regia on PVC at 73 °F, 95% sulfuric acid at 73 °F on PE and wet chlorine gas on PVC and PE. Direct chemical attack frequently causes a severe reduction of mechanical physical properties such as tensile strength, ductility, and impact resistance, and susceptibility to cracking from applied stress (stress cracking).

Chemical resistance may vary greatly from one plastic material to another (i.e., PVC, ABS, PE, etc.), and also among different cell classifications of the same plastic type (e.g. PVC 1120 to PVC 2110, PE 3608 to PE 4710, etc.). There may also be slight variations among commercial products having the same cell classification.

The chemical resistance of plastic piping is basically a function of the chemical resistance of the thermoplastic material, in addition to additives and other ingredients in the final compound. In general, the less inert compounding ingredients used the better the chemical resistance. Thermoplastic pipes with significant filler percentages may be susceptible to chemical attack where an unfilled material may be affected to a lesser degree or not at all.

Other Considerations

Chemical Families

While the effect of each individual chemical is specific, some chemicals can be grouped into general categories based on similarities in chemical characteristics (acids, bases, alcohols, etc.). For example, water-based (aqueous) solutions of neutral inorganic salts generally have the same effect on thermoplastic piping materials as water alone; thus, sodium chloride, potassium alum, calcium chloride, copper sulfate, potassium sulfate and zinc chloride solutions have the same effect as water. However, at elevated temperatures and/or high concentrations, some oxidizing salt solutions may attack some plastic materials.

Further, with organic chemicals in a specific series such as alcohols, ketones, or acids, etc., as the molecular weight of the organic chemical series increases, the chemical resistance of a particular plastic material to members of the specific organic chemical series frequently also increases. Thus, while one type of polyvinyl chloride at 73 °F is not suitable for use with ethyl acetate, it is suitable for the higher molecular weight butyl acetate.

Accelerating factors (concentration, temperature, stress)

Generally, the resistance of a particular plastic to a specific chemical decreases with an increase in concentration. For example, at 73°F polyethylene pipe can be used to carry 70% sulfuric acid but is not satisfactory for 95% sulfuric acid.

Also, the resistance of a particular plastic to a specific chemical generally decreases as temperature increases, generally decreases with increasing applied stress, and generally decreases where temperature or applied stress are varied or cycled. These effects can be greater overall in combination.

Combinations of Chemicals

In some cases, combinations of chemicals may have a synergistic effect on a thermoplastic material where the individual chemicals do not. It cannot be

assumed that an individual chemical's lack of effect would apply for combinations that include several chemicals. When the possible combined effect of several chemicals is unknown, the material should be tested in the complete chemical mixture(s) in question.

Multi-Layered (Composite) Piping

Some piping products utilize a multi-layered (*composite*) construction, in which the pipe wall is constructed of layers of different materials. The layers may consist of both thermoplastic and non-thermoplastic – for example, PE/AL/PE and PEX/AL/PEX pipes, which contain a mid-wall aluminum layer. An all-thermoplastic composite pipe may contain PVC, ABS, and PVC layers. Layered composite material pipes may have chemical resistance that differs from the chemical resistance of the individual materials.

Rate of Chemical Attack

Chemicals that attack plastics do so at a certain rate, some slowly and some more quickly. But usually, any chemical attack is increased when temperature or stress are increased, or when temperature or stress are varied. The particular rate must be taken into consideration in the life-cycle evaluation for a particular application. It has been observed in some chemical plants that while a particular application may have a relatively short service life, the overall life-cycle cost may be economically feasible and justifiable. Each combination of material cost, installation cost and service life must be evaluated and judged on its own merits.

In some cases involving a slow rate of chemical attack, particularly when the application will be pressurized, simple immersion data, like that represented in the following resistance tables, may not adequately characterize performance throughout the intended design life. Longer-term testing to replicate service conditions is advisable to fully measure the effects of these chemicals.

SECTION 2: CHEMICAL RESISTANCE DATA FOR THERMOPLASTIC PIPING IN ***NON-PRESSURE*** APPLICATIONS AND DATA TABLE

When thermoplastic pipes come into contact with chemical agents, it is important to know how the pipe may be affected. For gravity flow or non-pressure applications, where the pipe is not subject to continuous internal pressure or thermal stress, chemical immersion test data may provide suitable information. The pipe manufacturer may have additional data from similar tests, or information on previous installations under similar field conditions.

The following table provides resistance data, with the following cautions:

I. *Data Sources.* The following chemical resistance information has been obtained from numerous sources. The data are based primarily on plastic material test specimens that have been immersed in the chemical, and to a lesser degree, on field-experience. In most cases, detailed information on the test conditions (such as exposure time), and on test results (such as change in weight, change in volume, and change in strength) was not available. Therefore, this information is best used only for comparison of different thermoplastic materials.

II. *Combinations of Chemicals.* . Chemicals that individually do not have an effect may affect the pipe if combined with certain other chemicals. The listings that follow do not address chemical combinations.

III. *Composite Piping.* Layered composite piping may have chemical resistance that differs from that of the individual materials in the layers. The listings that follow are not applicable to layered composite piping products.

IV. *Applicability to fiberglass, filled materials.* The listings that follow are not applicable to composite piping products such as reinforced epoxy resin (fiberglass) pipes, or to thermoplastic pipes containing significant percentages of filler materials.

V. *Concentrations.* Where no concentrations are given, the relatively pure material is indicated, except in the case of solids where saturated aqueous solutions are indicated.

NOTE: *Even though indicated as acceptable with certain temperature limitations, the use of PVC piping with liquid hydrocarbons such as gasoline and jet fuels should be limited to short-term exposure such as secondary containment systems. This piping is not recommended for long-term exposure to liquid hydrocarbons.*

Resistance Codes

The following code is used in the data table:

Code	Meaning	Typical Result
140	Plastic type is generally resistant to temperature (°F) indicated by code.	Swelling < 3% or weight loss < 0.5% and elongation at break not significantly changed.
R to 73	Plastic type is generally resistant to temperature (°F) indicated by code and may have limited resistance at higher temperatures.	Swelling < 3% or weight loss < 0.5% and elongation at break not significantly changed.
C to 73	Plastic type has limited resistance to temperature (°F) indicated by code and may be suitable for some conditions.	Swelling 3-8% or weight loss 0.5-5% and/or elongation at break decreased by < 50%.
N	Plastic type is not resistant.	Swelling > 8% or weight loss > 5% and/or elongation at break decreased by > 50%.
—	Data not available.	

Plastic Materials Identification

ABS	acrylonitrile-butadiene-styrene
CPVC	chlorinated polyvinyl chloride
PP	polypropylene
PVC	polyvinyl chloride
PE	polyethylene
PB	polybutylene
PVDF	poly vinylidene fluoride
PEX	crosslinked polyethylene
PA11	polyamide 11
PK	polyketone

CHEMICALS THAT DO NOT NORMALLY AFFECT THE PROPERTIES OF AN UNSTRESSED THERMOPLASTIC MAY CAUSE COMPLETELY DIFFERENT BEHAVIOR (SUCH AS STRESS CRACKING) WHEN UNDER THERMAL OR MECHANICAL STRESS (SUCH AS CONSTANT INTERNAL PRESSURE OR FREQUENT THERMAL OR MECHANICAL STRESS CYCLES). UNSTRESSED IMMERSION TEST CHEMICAL RESISTANCE INFORMATION IS APPLICABLE ONLY WHEN THE THERMOPLASTIC PIPE WILL NOT BE SUBJECT TO MECHANICAL OR THERMAL STRESS THAT IS CONSTANT OR CYCLES FREQUENTLY.

WHEN THE PIPE WILL BE SUBJECT TO A CONTINUOUS APPLIED MECHANICAL OR THERMAL STRESS OR TO COMBINATIONS OF CHEMICALS, TESTING THAT DUPLICATES THE EXPECTED FIELD CONDITIONS AS CLOSELY AS POSSIBLE SHOULD BE PERFORMED ON REPRESENTATIVE SAMPLES OF THE PIPE PRODUCT TO PROPERLY EVALUATE PLASTIC PIPE FOR USE IN THIS APPLICATION.

******May not be fully applicable to pressurized applications******

Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Acetaldehyde $CH_3 CHO$	--	---	N	140	N	C to 73	C to 73	---	C to 140	C to 176	R to 73
	Aq. Of 40%	---	N	---	C to 73	R to 73	---	N	R to 73	---	---
Acetamide $CH_3 CONH_2$	5%	120	---	140	---	140	---	---	140	---	---
Acetic Acid $CH_3 COOH$	vapor	120	180	180	140	140	140	---	140	---	---
	5%	---	---	---	---	---	---	---	---	---	R to 176
	10%	---	---	---	---	---	---	R to 248	140	R to 176	---
	25%	N	180	180	140	140	140	---	140	---	---
	40%	---	---	---	---	---	---	R to 140	R to 176	---	---
	50%	---	---	---	---	---	---	R to 140	R to 176	C to 68	---
	60%	N	N	180	73	73	73	R to 104	73	---	---
	80%	---	---	---	---	---	---	R to 104	---	---	---
	85%	N	N	120	73	73	73	---	73	---	---
	glacial	N	N	120	73	73	73	R to 104	R to 68	---	---
Acetic Anhydride $(CH_3 CO)_2 O$	---	N	N	73	N	73	140	N	73	C to 68	---
Acetone $CH_3 COCH_3$	5%	N	N	73	N	C to 73	140	R to 212	C to 73	C to 140	---
	10%	---	---	---	---	---	---	R to 122	---	---	---
	100%	---	---	---	---	---	---	---	---	---	R to 73 C to 122
Acetophenone $C_6 H_5 COCH_3$	---	N	---	120	--	73	---	R to 68	73	---	---
Acetyl Chloride $CH_3 COCl$	---	N	N	---	N	---	---	N	---	---	---
Acetylene $HC{\equiv}CH$	gas 100%	73	N	73	N	73	C to 73	---	73	140	---
Acetylnitrile	---	---	N	---	N	---	---	---	---	---	---
Acrylic Acid $H_2 C{=}CHCOOH$	97%	---	N	---	N	140	---	---	140	---	---

******May not be fully applicable to pressurized applications******

May not be fully applicable to pressurized applications

Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Acrylonitrile $H_2C=CHC\equiv N$	---	---	N	---	N	140	---	---	140	---	---
Adipic Acid $COOH(CH_2)_4COOH$	sat'd	---	180	140	140	140	73	R to 176	140	---	---
Allyl Alcohol $CH_2=CHCH_2OH$	96%	---	C to 73	140	R to 73	140	140	---	N	---	---
Allyl Chloride $CH_2=CHCH_2Cl$	--	---	N	---	N	C to 73	---	140	C to 73	---	---
	Liquid	---	---	---	---	---	---	R to 68	---	---	---
Aluminum Ammonium Sulfate (Alum) $AlNH_4(SO_4)_2 \cdot 12H_2O$	sat'd	---	180	140	140	140	---	---	140	---	---
Aluminum Chloride Aqueous $AlCl_2$	sat'd	160	180	180	140	140	140	R to 212	140	---	---
Aluminum Fluoride Anhydrous AlF_3	sat'd	160	180	180	73	140	140	R to 212	140	---	---
Aluminum Hydroxide $Al(OH)_3$	sat'd	160	180	180	140	140	140	R to 212	140	---	N
Aluminum Nitrate $Al(NO_3)_3 \cdot 9H_2O$	sat'd	---	180	180	140	140	140	R to 212	140	---	---
Aluminum Oxychloride	--	---	180	180	140	---	140	---	---	---	---
Aluminum Potassium Sulfate (Alum) $AlK(SO_4)_2 \cdot 12H_2O$	sat'd	160	180	140	140	140	---	R to 212	140	---	---
Aluminum Sulfate (Alum) $Al_2(SO_4)_3$	sat'd	160	180	140	140	140	C to 73	R to 212	140	194	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
Ammonia Gas NH_3	100%	N	N	140	140	140	140	---	140	140	---
Ammonia Liquid NH_3	100%	160	N	140	N	140	73	---	140	140	---
Ammonium Acetate CH_3COONH_4	sat'd	120	180	73	140	140	---	R to 212	140	---	---
Ammonium Bifluoride NH_4HF_2	sat'd	---	180	180	140	---	140	---	140	---	---
Ammonium Bisulfide $(NH_4)HS$	---	---	---	---	140	---	---	---	---	---	---
Ammonium Carbonate $(NH_4)_2CO_3$	sat'd	---	180	212	140	140	140	R to 248	140	---	---
Ammonium Chloride NH_4Cl	sat'd	120	180	212	140	140	140	R to 212	140	---	---

May not be fully applicable to pressurized applications

May not be fully applicable to pressurized applications

Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Ammonium Dichromate $(NH_4)_2Cr_2O_7$	--	---	73	---	73	---	---	---	---	---	---
Ammonium Fluoride NH_4F	10%	120	180	212	140	140	---	R to 212	140	---	---
	25%	120	180	212	C to 140	140	73	---	140	---	---
Ammonium Hydroxide NH_4OH	10%	120	N	212	140	140	140	---	140	---	N
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
	Conc.	---	---	---	---	---	---	---	194	---	---
Ammonium Metaphosphate	Sat'd	--	--	R to 212	R to 140	R to 140	R to 140	R to 248	R to 140	---	---
Ammonium Nitrate NH_4NO_3	sat'd	120	180	212	140	140	140	R to 212	140	---	---
Ammonium Persulfate $(NH_4)_2S_2O_8$	---	---	180	140	140	140	140	R to 212	140	---	---
Ammonium Phosphate (Monobasic) $NH_4H_2PO_4$	all	120	180	212	140	140	140	R to 248	140	---	---
Ammonium Sulfate $(NH_4)_2SO_4$	Sat'd.	120	180	212	140	140	140	R to 212	140	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
Ammonium Sulfide $(NH_4)_2S$	dilute	120	180	212	140	140	140	---	140	---	---
	Sat'd.	---	---	---	---	140	---	---	---	---	---
Ammonium Thiocyanate NH_4SCN	50-60%	120	180	212	140	140	140	R to 212	73	---	---
Amyl Acetate $CH_3COOC_5H_{11}$	--	N	N	N	N	73	---	R to 122	73	C to 194	---
Amyl Alcohol $C_5H_{11}OH$	--	---	N	---	N	140	140	R to 212	R to 140	---	---
	100%	---	---	---	---	---	C to 140	---	---	---	---
n-Amyl Chloride $CH_3(CH_2)_3CH_2Cl$	--	N	N	N	N	C to 73	---	---	C to 73	---	---
Anisole C_7H_8O	--	---	---	---	---	---	---	---	---	---	C to 73
Aniline $C_6H_5NH_2$	--	N	N	---	N	73	C to 140	R to 68	C to 140	---	N
Aniline Chlorohydrate	--	---	N	---	N	C to 73	N	---	C to 73	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Aniline Hydrochloride $C_6H_5NH_2 \bullet HCl$	sat'd	---	N	---	N	140	N	---	140	---	---
Anthraquinone $C_{14}H_8O_2$	--	---	180	---	140	C to 73	C to 73	---	C to 73	---	---
Anthraquinone Sulfonic Acid $C_{14}H_7O_2 \bullet SO_3 \bullet H_2O$	--	---	180	73	140	140	C to 73	---	C to 73	---	---
Antifreeze	--	---	---	---	---	---	---	---	---	---	R to 73 C to 176
Antimony Trichloride $SbCl_3$	sat'd	---	180	140	140	140	140	R to 140	140	---	---
Aqua Regia (Nitrohydrochloric Acid)	--	N	R to 73	N	C to 73	N	N	C to 194	N	---	---
Arsenic Acid H_3AsO_4	80%	---	180	140	140	140	140	R to 248	140	---	---
Aryl Sulfonic Acid $C_6H_5SO_3H$	--	---	180	---	140	73	---	---	73	---	---
Asphalt	--	---	N	73	N	73	140	---	73	---	---
Barium Carbonate $BaCO_3$	sat'd	120	180	140	140	140	140	R to 248	140	---	---
Barium Chloride [illegible] •2H2O	sat'd	120	180	140	140	140	140	R to 212	140	194	---
Barium Hydroxide $Ba(OH)_2$	sat'd	73	180	140	140	140	140	---	R to 212	---	---
	10%	---	---	---	---	---	---	---	---	---	R to 73
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
Barium Nitrate $Ba(NO_3)_2$	sat'd	73	180	140	73	140	---	---	140	---	---
Barium Sulfate $BaSO_4$	sat'd	73	180	140	140	140	140	R to 212	140	---	---
Barium Sulfide BaS	sat'd	73	180	140	140	140	140	---	R to 248	---	---
Beer	--	120	180	180	140	R to 140	140	R to 248	R to 140	68	R to 73
Beet Sugar Liquors	--	---	180	180	140	73	140	---	73	---	---
Benzaldehyde C_6H_5CHO	10%	N	R to 73	73	R to 73	73	C to 73	---	73	R to 104	---
	99%	---	---	---	---	---	---	---	---	---	C to 73
Benzene [illegible]	--	N	N	N	N	C to 120	N	C to 122	R to 68	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Benzene Sulfonic Acid $C_6 H_5 SO_3 H$	10%	---	180	180	140	R to 73	---	---	R to 73	---	---
	10%+	---	N	---	N	---	---	---	---	---	---
Benzoic Acid $C_6 H_5 COOH$	all	160	180	73	140	140	140	---	R to 248	---	---
Benzoyl Chloride C_6H_5COCl	Sat. Sol.	---	---	---	---	---	---	C to 68	---	---	---
Benzyl Alcohol $C_6 H_5 CH_2 OH$	--	---	N	120	N	140	---	R to 122	140	R to 68	---
Benzyl Chloride C_7H_7Cl	--	---	---	---	---	---	---	---	R to 140	---	---
Bismuth Carbonate $(BiO)_2 CO_3$	Sat'd.	---	180	180	140	140	140	---	140	---	---
Black Liquor	sat'd	---	180	140	140	120	140	---	120	---	---
Bleach	5% Active Cl_2	---	180	120	140	C to 140	---	---	C to 140	---	R to 73
	12% Active Cl_2	73	185	120	140	73	140	---	73	---	---
Borax $N[illegible]B_4 O_7 \cdot 10H_2O$	sat'd	160	180	212	140	140	140	---	140	---	---
Boric Acid $H_3 BO_3$	Sat'd	160	180	212	140	140	140	R to 212	140	---	---
Brake Fluid	--	---	---	140	---	140	---	---	140	---	---
Brine	sat'd	---	180	140	140	140	140	---	140	---	---
Bromic Acid $HBrO_3$	Sat'd	---	180	N	140	N	140	R to 212	N	---	---
	10%	---	---	---	---	140	---	---	---	---	---
Bromine Br_2	Liquid	73	N	N	N	N	N	R to 248	N	N	---
	vapor 25%	---	180	N	140	N	---	---	N	---	---
Bromine Water	cold sat'd	---	180	N	140	N	C to 73	R to 176	N	---	---
Bromobenzene $C_6 H_5 Br$	--	---	---	---	N	---	---	---	---	---	---
Bromotoluene (Benzyl bromide) $C_6 H_5 CH_2 Br$	--	---	---	C	N	---	---	---	---	---	---
Butadiene [illegible]$CHCH=CH_2$	50%	---	180	N	140	73	---	---	73	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	Gas	---	---	---	---	---	---	R to 212	---	---	---
Butane $C_4 H_{10}$	50%	---	180	140	140	140	N	---	140	---	---
	Gas	---	---	---	---	---	---	R to 68	---	---	---
n-Butanol $C_4 H_9OH$	Liquid	---	---	---	---	---	---	R to 140	---	---	R to 73
Butyl Acetate $CH_3COOCH_2CH_2CH_2CH_3$	100%	N	N	C to 73	N	C to 73	C to 73	C to 104	C to 73	R to 194	---
Butyl Alcohol $CH_3 (CH_2)_2 CH_2OH$	--	---	C to 73	180	140	140	140	---	140	C to 104	---
Butyl Cellosolve $HOCH_2 CH_2 O(CH_2)_3CH_3$	--	---	N	---	73	---	---	---	---	---	---
n-Butyl Chloride $C_4 H_9 Cl$	--	N	N	---	---	---	---	---	---	---	---
Butyl Glycol $HOCH_2 CH_2 O(CH_2)_3CH_3$	Liquid	---	---	---	---	---	---	R to 212	---	---	---
Butylene © $CH_3 CH=CHCH_3$	Liquid	---	---	N	140	120	---	---	120	---	---
Butyl Phenol $C_6 H_4 OH$	--	---	---	N	C to 73	73	73	---	R to 176	---	---
Butyl Phthalate $C_{16}H_{22}O_4$	--	---	N	180	---	---	---	R to 140	---	---	---
Butyl Stearate $CH_3(CH2)_{16}COO(CH_2)_3CH_3$	--	---	---	---	73	---	---	---	---	---	---
Butynediol $HOCH_2 C\equiv CCH_2OH$	--	---	---	---	73	---	---	-----	---	---	---
Butyric Acid $CH_3 CH_2 CH_2 COOH$	--	N	N	180	73	73	73	---	73	---	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
	Liquid	---	---	---	---	---	---	R to 176	73	---	---
Cadmium Cyanide $Cd(CN)_2$	--	---	180	---	140	---	---	---	---	---	---
Calcium Bisulfide $Ca(HS)_2$ o6H $_2O$	--	---	73	---	N	140	---	---	140	---	---
Calcium Bisulfite $Ca(HSO_3)_2$	--	---	180	180	140	N	140	---	N	---	---
	Sat'd	---	---	---	---	---	---	R to 248	---	---	---
Calcium Carbonate $CaCO_3$	Sat'd	---	180	180	140	140	140	R to 248	140	---	---

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Calcium Chlorate $Ca(ClO_3)_2 \cdot 2H_2O$	--	---	180	180	140	140	140	R to 248	140	---	---
Calcium Chloride $CaCl_2$	5%	---	---	---	---	---	---	---	---	---	R to 176
	Sat'd	120	180	180	140	140	140	R to 248	R to 176	R to 194	---
Calcium Hydroxide $Ca(OH)_2$	--	160	180	180	140	140	140	---	140	---	---
	2%	---	---	---	---	---	---	---	---	---	R to 73
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
Calcium Hypochlorite $Ca(OCl)_2$	30%	160	180	140	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	C to 212	---	---	---
Calcium Nitrate $Ca(NO_3)_2$	--	---	180	180	140	140	140	---	140	---	---
	50%	---	---	---	---	140	---	R to 212	140	---	---
	Sat'd	---	---	---	---	---	---	R to 176	---	---	---
Calcium Oxide CaO	--	---	180	---	140	140	---	---	140	---	---
Calcium Sulfate $CaSO_4$	--	100	180	180	140	140	140	R to 212	140	---	---
Calcium Hydrogen Sulfide $Ca(HS)_2$	>10%	---	---	---	---	---	---	R to 248	---	---	---
Camphor $C_{10}H_{16}O$	--	N	---	73	73	73	---	---	73	---	---
Cane Sugar Liquors $C_{12}H_{22}O_{11}$	--	---	180	180	140	140	150	---	140	---	---
Carbitol $CH_3CH_2O(CH_2)_2O(CH_2)_2OH$	--	---	N	---	73	---	---	---	---	---	---
Carbon Dioxide CO_2	Dry 100%	160	180	140	140	140	---	R to 212	140	---	---
	Wet	160	180	140	140	140	140	---	140	---	---
Carbon Disulfide CS_2	--	N	N	N	N	C to 140	---	---	R to 68	R to 104	---
Carbon Monoxide CO	Gas	---	180	180	140	140	140	R to 140	140	---	---
Carbon Tetrachloride CCl_4	--	N	N	N	73	C to 73	N	C to 212	C to 68	N	R to 73

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Carbonic Acid H_2CO_3	Sat'd	185	180	140	140	140	---	---	140	---	---
Castor Oil	--	---	C to 180	140	140	73	140	---	73	---	---
Caustic Potash KOH	50%	160	180	180	140	140	73	---	140	---	---
Caustic Soda (Sodium Hydroxide) NaOH	40%	160	180	180	140	140	73	---	140	---	---
Cellosolve	--	---	N	73	73	C to 120	140	---	C to 120	---	---
Cellosolve Acetate $CH_3COOCH_2CH_2OC_2H_5$	--	---	N	73	73	---	---	---	---	---	---
Chloral Hydrate $CCl_3CH(OH)_2$	All	---	180	C to 73	140	120	140	---	120	---	---
Chloramine NH_2Cl	Dilute	---	N	73	73	73	---	---	73	---	---
Chloric acid $HClO_3 \cdot 7H_2O$	10%	---	180	73	140	73	---	---	73	---	---
	20%	---	185	73	140	73	---	---	73	---	---
Chlorine Gas	0-20 PPM moisture content	N	C to 73	N	C to 73	C to 73	---	R to 212	C to 73	---	---
	20-50 PPM moisture content	N	N	N	N	C to 73	---	---	C to 73	---	---
	50+ PPM moisture content	N	N	N	N	C to 73	---	N	C to 73	---	---
Chlorine	Liquid	N	N	N	N	N	---	---	N	---	N
Chlorinated Water											
	Sat'd	---	180	180	140	C to 120	140	R to 212	C to 120	---	---
Chloroacetic Acid $CH_2ClCOOH$	50%	N	180	C to 73	140	120	N	---	120	---	---
	>10%	---	---	---	---	---	---	R to 140	---	---	---
Chloroacetyl Chloride $ClCH_2COCl$	--	---	---	---	73	---	---	---	---	---	---
Chlorobenzene C_6H_5Cl	Dry	N	N	73	N	C to 75	N	---	C to 75	---	---
	Liquid	---	---	---	---	---	---	R to 140	R to 68	C to 176	---
Chlorobenzyl Chloride $C_6H_4CH_2Cl$	--	---	N	---	N	C to 120	---	---	C to 120	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Chloroethanol $ClCH_2CH_2OH$	Liquid	---	---	---	---	---	N	R to 122	---	---	---
Chloroform $CHCl_3$	Dry	N	N	N	N	C to 75	C to 73	---	C to 75	---	---
	Liquid	---	---	---	---	---	---	R to 212	N	---	C to 73
Chloromethane CH_3Cl	Gas	---	---	---	---	---	---	R to 212	---	---	---
Chloropicrin $CCl_3\ NO_2$	--	---	---	---	N	73	---	---	73	---	---
Chlorosulfonic Acid $ClSO_2\ OH$	--	---	73	N	73	C to 120	N	---	C to 120	---	---
	50%	---	---	---	---	---	---	R to 68	---	---	---
	100%	---	---	---	---	N	---	---	N	---	---
Chromic Acid $H_2\ CrO_4$	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
	10%	73	180	140	140	73	140	R to 212	73	N	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
	25%	---	---	---	---	---	---	R to 212	---	---	---
	30%	N	180	73	140	73	140	R to 212	73	---	---
	40%	N	180	73	140	73	73	R to 212	73	---	---
	50%	N	C to 140	73	N	73	N	R to 212	73	---	---
Chromium Potassium Sulfate $CrK(SO_4)_2 \cdot 12H_2\ O$	>10%	---	---	---	---	---	---	R to 212	---	---	---
	--	-	--	73	---	73	---	---	73	---	---
	Sat'd	---	---	---	---	---	R to 212	---	---	---	---
Citric Acid $C_6\ H_8\ O_7$	Sat'd	160	180	140	140	140	140	R to 248	140	C to 140	---
Coconut Oil	--	---	C to 180	73	140	73	140	R to 248	73	---	---
Cod Liver Oil	Work Sol.	---	---	---	---	---	---	R to 248	---	---	---
Coffee	--	---	180	140	140	140	---	---	140	---	---

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Coke Oven Gas	--	---	---	73	140	140	---	---	140	---	---
Copper Acetate $Cu(C_2 H_3 O_2)_2 \cdot H_2 O$	Sat'd	---	73	73	73	---	---	---	---	---	---
Copper Carbonate $CuCO_3$	Sat'd	---	180	---	140	140	---	---	140	---	---
Copper Chloride $CuCl_2$	Sat'd	73	180	140	140	140	140	---	140	---	---
Copper Cyanide CuCN	Sat'd	---	180	---	140	140	140	R to 212	140	---	---
Copper Fluoride $CuF_2 \cdot 2H_2 O$	2%	---	180	73	140	140	140	---	140	---	---
Copper Nitrate $Cu(NO_3)_2 \cdot 3H_2 O$	30%	---	180	140	140	140	140	---	---	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Copper Sulfate $CuSO_4 \cdot 5H_2 O$	Sat'd	120	180	120	140	140	140	R to 212	140	R to 194	---
Corn Oil	--	---	C to 180	73	140	120	---	---	120	---	---
Corn Syrup	--	---	185	140	140	140	---	---	140	---	---
Cottonseed Oil	--	120	C to 180	140	140	R to 140	140	---	R to 140	---	---
Creosote	--	---	N	73	N	140	---	---	140	---	---
Cresol $CH_3 C_6 H_4 OH$	90%	N	N	R to 73	N	73	N	R to 68	73	---	---
Cresylic Acid	50%	---	180	---	140	C to 73	N	---	C to 73	---	---
Crotonaldehyde $CH_3 CH{=}CHCHO$	--	---	N	C to 73	N	---	---	---	---	---	---
	Liquid	---	---	---	---	---	---	R to 104	--	---	---
Crude Oil	--	---	C to 180	140	140	C to 120	C to 73	R to 212	C to 120	R to 140	---
Cupric Chloride $CuCl_2 \cdot 2H_2O$	20%	---	---	---	---	---	---	---	---	---	R to 73
Cupric Fluoride CuF_2	--	---	180	---	140	140	---	---	140	---	---
Cupric Sulfate $CuSO_4 \cdot 5H_2 O$	Sat'd	100	180	73	140	140	---	---	---	---	---
Cuprous Chloride Cu_2Cl_2	Sat'd	70	180	---	140	140	---	---	140	---	---

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Cyclohexane $C_6 H_{12}$	--	73	N	N	N	N	---	R to 248	N	C to 140	---
Cyclohexanol $C_6 H_{11} OH$	--	C to 120	N	140	N	73	C to 73	R to 104	73	---	---
Cyclohexanone $C_6 H_{10} O$	Liquid	N	N	73	N	120	N	N	C to 176	C to 140	---
Detergents (Heavy Duty)	--	---	C to 180	180	140	R to 140	---	---	R to 140	---	R to 73
Dextrin (Starch Gum)	Sat'd	---	180	140	140	140	140	---	140	---	---
Dextrose $C_6H_{12}O_6$	Sat'd	---	180	140	140	140	140	---	140	---	---
Diacetone Alcohol $CH_3 COCH_2 C(CH_3)_2 OH$	--	---	N	120	N	---	---	---	---	C to 140	---
Dibutoxyethyl Phthalate $C_{20}H_{30}O_6$	--	---	N	---	N	---	---	---	---	---	---
n-Dibutyl Ether $C_4 H_9 OC_4 H_9$	--	---	---	---	---	73	---	---	73	---	---
Dibutyl Phthalate $C_6 H_4 (COOC_4 H_9)_2$	--	N	N	73	N	73	---	---	73	---	---
Dibutyl Sebacate $C_4 H_9 OCO(CH_2)_8 OCOC_4 H_9$	--	---	---	73	73	73	---	---	73	---	---
Dichloroacetic Acid $CHCl_2COOH$	50%	---	---	---	---	---	---	R to 176	---	---	---
Dichlorobenzene $C_6 H_4 Cl_2$	--	N	N	C to 73	N	C to 120	---	---	C to 120	---	R to 73
	Liquid	---	---	---	---	---	---	R to 140	---	---	---
Dichloroethylene $C_2 H_2Cl_2$	--	---	N	C to 73	N	C to 120	---	---	C to 120	---	---
	Liquid	---	---	---	---	---	---	R to 248	---	---	---
Diesel Fuels	--	---	C to 180	140	140	73	C to 73	R to 212	73	---	---
Diethanolamine $(CH_2CH_2OH)_2NH$	Solid	---	---	---	---	---	---	N	---	---	---
	20%	---	---	---	---	---	---	---	R to 194	---	---
Diethylamine $C_4 H_{10} NH$	--	N	N	---	N	C to 120	N	N	C to 120	---	---
Diethyl Ether $C_4 H_{10} O$	--	N	N	73	73	C to 140	---	---	C to 140	140	---
Diglycolic Acid $O(CH_2 COOH)_2$	Sat'd	---	180	140	140	140	140	---	140	---	---

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	10%	---	---	---	---	---	---	R to 140	---	---	---
Dimethylamine $(CH_3)_2 NH$	--	---	---	73	140	73	N	N	73	---	---
Dimethylformamide $HCON(CH_3)_2$	--	N	N	180	N	120	---	---	120	---	C to 73
	Liquid	---	---	---	---	---	---	---	N	---	---
Dimethylhydrazine $(CH_3)_2 NNH_2$	--	---	---	---	N	---	---	---	---	---	---
Dimethyl Phthalate $C_6 H_4 (COOCH_3)_2$	--	---	N	---	---	C to 73	---	---	C to 73	---	---
Dioctyl Phthalate $C_6 H_4 (COOC_8 H_{17})_2$	--	N	N	C to 73	N	73	C to 73	---	73	140	---
Dioxane $C_4H_8O_2$	--	--	N	C to 140	N	140	---	---	140	---	---
	Liquid	---	---	---	---	---	---	C to 68	---	---	---
Diphenyl Oxide $(C_6 H_5)_2 O$	Sat'd	---	---	---	---	73	---	---	73	---	---
Disodium Phosphate Na_2HPO_4	--	---	180	140	140	140	140	---	140	---	---
Dishwashing Liquid (Cascade®)	--	---	---	---	---	---	---	---	---	---	R to 73
DOWTHERM A	--	---	---	---	N	---	---	---	---	---	---
Ethanol $C_2 H_5 OH$	40%	---	---	---	---	---	---	R to 68	---	---	---
	95%	---	---	---	---	---	---	R to 122	R to 140	---	---
	Liquid	---	---	---	---	---	---	R to 122	R to 140	---	R to 176
Ether ROR	--	N	N	C to 73	N	73	N	---	73	---	---
Ethyl Acetate $CH_3 COOCH_2CH_3$	--	N	N	C to 140	N	73	C to 73	---	73	140	R to 73 C to 176
	Liquid	---	---	---	---	---	---	C to 68	---	---	---
Ethyl Acetoacetate $CH_3 COCH_2 COOC_2 H_5$	--	N	N	---	N	---	---	---	---	---	---
Ethyl Acrylate $CH_2=CHCOOC_2 H_5$	--	---	N	---	N	---	---	---	---	---	---
Ethyl Alcohol (Ethanol) $C_2 H_5 OH$	--	---	C to 140	140	140	140	140	---	140	C to 104	R to 176

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Ethyl Benzene $C_6 H_5 C_2 H_5$	--	---	---	C to 73	N	C to 73	---	---	---	---	---
Ethyl Chloride $C_2 H_5 Cl$	Dry	---	N	C to 73	N	C to 73	---	---	C to 73	---	---
	Gas	---	---	---	---	---	---	R to 212	---	---	---
Ethyl Chloroacetate $ClCH_2COOC_2H_5$	--	---	---	---	N	---	---	---	---	---	---
Ethyl Ether $(C_2 H_5)_2 O$	Liquid	---	N	N	N	N	N	R to 122	R to 68	---	---
Ethylene Bromide $BrCH_2 CH_2 Br$	Dry	---	N	---	N	---	N	---	---	---	---
Ethylene Chloride (Vinyl Chloride) $CH_2 CH Cl$	Dry	N	N	C to 73	N	C to 140	---	---	C to 140	---	---
Ethylene Chlorohydrin $ClCH_2 CH_2 OH$	--	---	N	73	N	---	N	---	---	---	---
	Liquid	---	---	---	---	---	---	C to 68	---	---	---
Ethylene Diamine $NH_2 CH_2 CH_2 NH_2$	--	N	---	73	N	140	---	---	140	---	---
Ethylene Dichloride Cl_2	Dry	N	N	C to 140	N	C to 73	140	---	C to 73	---	---
Ethylene Glycol $OHCH_2CH_2 OH$	Liquid	73	C to 180	212	140	140	140	R to 212	R to 212	---	C to 176
Ethylene Oxide $CH_2 CH_2 O$	--	---	N	C to 73	N	73	---	---	73	C to 140	---
2-Ethylhexanol $CH_3 (CH_2)_3 CHC_2 H_5 CH_2OH$	--	---	---	---	---	73	---	---	73	---	---
Fatty Acids R-COOH	--	160	73	120	140	120	150	---	120	194	---
Ferric Chloride (Aqueous) $FeCl_3$	Sat'd	120	180	140	140	140	150	R to 212	140	---	---
Ferric Hydroxide $Fe(OH)_3$	Sat'd	160	180	140	140	140	---	---	140	---	---
Ferric Nitrate $Fe(NO_3)_3 \cdot 9H_2 O$	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
Ferric Sulfate $Fe_2 (SO_4)_3$	--	160	180	140	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Ferrous Chloride $FeCl_2$	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
Ferrous Hydroxide $Fe(OH)_2$	Sat'd	160	180	140	140	140	---	---	140	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Ferrous Nitrate $Fe(NO_3)_2$	--	160	180	140	140	140	---	---	140	---	---
Ferrous Sulfate $FeSO_4$	--	160	180	140	140	140	140	---	140	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Ferrous Chloride $FeCl_2$	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
Fish Oil	---	---	180	180	140	140	140	---	140	---	---
Fluoroboric Acid HBF_4	---	73	73	140	140	140	---	---	140	---	---
	Solid	---	---	---	---	---	---	R to 104	---	---	---
Fluorine Gas (Dry) F_2	100%	---	73	N	73	C to 73	C to 73	---	C to 73	N	---
Fluorine Gas (Wet) F_2	--	N	73	N	73	N	N	---	N	N	---
Fluorosilicic Acid H_2SiF_6	25%	---	---	---	---	---	---	R to 212	---	---	---
	30%	---	R to 140	140	140	140	---	R to 212	---	---	---
	40%	---	---	---	---	---	---	R to 140	---	---	---
	50%	---	73	73	140	140	140	R to 212	--	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Formaldehyde HCHO	Dilute	160	73	140	140	140	140	R to 176	---	C to 104	---
	35%	160	C to 73	140	140	140	140	---	140	---	---
	37%	160	C to 73	140	140	140	140	R to 212	140	---	---
	50%	---	C to 73	---	140	140	140	---	140	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Formic Acid HCOOH	--	N	C to 73	140	73	140	150	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	R to 140	N	N
	40%	---	---	---	---	---	---	R to 212	R to 140	---	---
	50%	---	---	---	---	---	---	R to 176	R to 140	---	---
	85%	---	---	---	---	---	---	R to 212	---	---	---
	100%	---	---	---	---	140	---	---	140	---	---
Freon 11 CCl_3F	100%	N	73	N	140	73	---	---	73	---	---
Freon 12 CCl_2F_2	100%	---	73	73	140	73	---	---	73	68	---
	Work. Sol.	---	---	---	---	---	---	R to 212	R to 68	---	---
Freon 21 $CHCl_2F$	100%	---	---	N	N	C to 120	---	---	C to 120	---	---
Freon 22 $CHClF_2$	100%	---	73	73	N	C to 120	---	---	C to 120	68	---
Freon 113 $C_2Cl_2F_3$	100%	---	---	N	140	73	---	---	73	---	---
Freon 114 $C_2Cl_2F_4$	100%	---	---	N	140	73	---	---	73	---	---
Fructose $C_6H_{12}O_6$	Sat'd	73	180	180	140	140	140	---	140	---	---
Fruit Juice	Work. Sol.	---	---	---	---	---	---	R to 212	---	104	---
Furfural C_4H_3OCHO	100%	N	N	N	N	C to 140	---	---	C to 140	C to 140	---
Gallic Acid $C_6H_2(OH)_3CO_2H \cdot H_2O$	--	---	73	---	140	73	---	---	73	---	---
Gasoline, Leaded*	--	N	N	N	140	73	N	---	73	---	---
Gasoline, Unleaded*	--	N	N	N	140	73	N	---	73	---	R to 176
Gasoline (Fuel)	--	---	---	---	---	---	---	R to 212	---	R to 160	---
Gasohol*	--	N	N	N	140	73	N	---	73	---	---
Gasoline, Sour*	--	N	N	N	140	C to 73	N	---	C to 73	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Gelatin	--	---	180	180	140	140	140	---	140	---	---
Glucose $C_6 H_{12} O_6 \cdot H_2 O$	--	120	180	212	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 248	---	---	---
Glue	--	---	---	140	140	140	---	---	140	---	---
Glycerine $C_3 H_5 (OH)_3$	--	140	180	212	140	140	140	---	140	---	---
	Liquid	---	---	---	---	---	---	R to 248	---	---	---
Glycol $OHCH_2 CH_2 OH$	--	---	C to 180	212	140	140	---	---	140	C to 140	---
Glycolic Acid $OHCH_2 COOH$	Sat'd	---	180	73	140	140	---	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	---	---	---
	30%	---	---	---	---	---	---	R to 140	---	---	---
	65%	---	---	---	---	---	---	R to 212	---	---	---
Glyoxal OCHCHO	--	---	---	---	---	140	---	---	140	---	---
Grape Sugar	--	---	180	---	140	---	---	---	---	---	---
Grapefruit Juice	Work. Sol.	---	---	---	---	---	---	R to 122	---	---	---
Grease	--	---	---	---	---	---	---	---	---	194	---
Green Liquor	--	160	180	---	140	---	140	---	---	---	---
Heptane (Type 1) $C_7 H_{16}$	--	73	180	N	140	73	N	---	73	---	---
	Liquid	---	---	---	---	---	---	R to 212	C to 176	---	---
n-Hexane $C_6 H_{14}$	--	C	73	73	73	---	---	---	---	---	---
	Liquid	---	---	---	---	---	---	R to 176	---	---	R to 73
Hexanol, Tertiary Type I $CH_3 (CH_2)_4 CH_2 OH$	--	---	180	---	140	140	140	---	140	---	---
Hydraulic Oil (Petroleum)	--	---	---	---	73	73	---	---	73	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Hydrazine H_2NNH_2	--	---	N	73	N	---	---	---	---	---	---
Hydrobromic Acid HBr	20%	73	73	140	140	140	140	R to 212	140	---	---
	50%	N	---	120	---	140	---	R to 140	140	---	---
	66%	---	---	---	---	---	---	R to 212	---	---	---
Hydrochloric Acid HCl	1%	---	---	---	---	---	---	---	---	---	R to 176
	10%	C to 120	180	140	140	140	140	R to 212	R to 212	C to 104	N
	20%	---	---	---	---	---	---	R to 212	R to 212	---	---
	30%	C to 73	180	140	140	140	140	R to 212	R to 140	---	---
	Conc.	---	---	---	---	---	---	---	R to 140	---	---
Hydrocyanic Acid HCN	--	160	180	73	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	R to 248	---	---	---
	10%	---	---	---	---	---	---	R to 248	---	---	---
Hydrofluoric Acid HF	Dilute	73	73	180	73	140	140	R to 212	140	---	---
	30%	N	73	140	73	140	140	---	140	---	---
	40%	---	---	---	---	---	---	R to 212	---	---	---
	50%	N	N	73	73	120	140	R to 212	120	---	---
	60%	---	---	---	---	140	---	R to 140	140	---	---
	70%	---	---	---	---	---	---	R to 212	---	---	---
	100%	N	N	C to 73	N	120	---	---	120	---	---
	Gas	---	---	---	---	---	---	R to 104	---	---	---
Hydrogen H_2	Gas	---	73	140	140	140	140	R to 248	140	194	---
Hydrogen Cyanide HCN	--	---	---	73	140	---	---	---	---	---	---

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Hydrogen Fluoride, Anhydrous HF	--	---	C	73	N	---	---	---	---	---	---
Hydrogen Peroxide H_2O_2	3%	---	---	---	---	---	---	---	---	---	R to 73
	10%	---	---	---	---	---	---	R to 212	---	---	---
	30%	---	---	---	---	---	---	R to 212	---	C to 104	---
	50%	---	180	73	140	140	N	R to 212	140	---	---
	90%	---	180	C to 73	140	73	N	---	73	---	---
Hydrogen Phosphide (Type I) PH_3	--	---	73	---	140	140	140	---	140	---	---
Hydrogen Sulfide H_2S	Dry	---	180	150	140	140	140	R to 248	140	---	---
	Wet	---	180	---	140	140	---	---	140	---	---
Hydrogen Sulfite H_2SO_3	10%	---	---	---	---	140	---	R to 248	140	---	---
Hydroquinone $C_6H_4(OH)_2$	Sat'd	---	180	---	140	140	140	---	---	140	---
Hydroxylamine Sulfate $(NH_2OH)oH_2SO_4$	--	---	180	---	140	140	---	---	140	---	---
Hypochlorous Acid HOCl	10%	73	180	73	140	140	140	---	140	---	---
	70%	---	---	---	---	---	---	R to 212	---	---	---
Inks	--	---	---	140	---	140	---	---	140	---	---
Iodine I_2	10%	N	73	73	N	C to 120	N	R to 176	C to 120	---	---
Isobutyl Alcohol $(CH_3)_2CHCH_2OH$	--	C to 73	C to 73	73	---	140	---	---	140	---	---
Isooctane $(CH_3)_3CCH_2CH(CH_3)_2$	--	---	---	C to 73	---	73	---	---	73	---	---
	Liquid	---	---	---	---	---	---	R to 212	---	---	---
Isopropyl Acetate $CH_3COOCH(CH_3)_2$	--	N	N	---	---	73	---	---	73	---	---
Isopropyl Alcohol $(CH_3)_2CHOH$	--	---	C to 180	212	140	140	140	C to 212	140	---	R to 73
Isopropyl Ether $(CH_3)_2CHOCH(CH_3)_2$	--	---	N	C to 73	N	73	---	---	73	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
JP-4 Fuel*	--	---	C to 73	C to 73	140	73	---	---	73	---	---
JP-5 Fuel*	--	---	C to 73	C to 73	140	73	---	---	73	---	---
Kerosene*	--	73	73	C to 140	140	C to 140	C to 73	---	C to 140	---	---
Ketchup	--	---	---	---	73	---	---	---	---	---	---
Ketones	--	N	N	C to 73	N	73	---	---	73	---	---
	Work Sol	---	---	---	---	---	---	---	R to 302	---	---
Kraft Liquors	--	73	180	---	140	120	140	---	120	---	---
Lactic Acid CH_3 CHOHCOOH	10%	---	---	---	---	---	---	R to 140	---	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
	25%	73	180	212	140	140	140	---	140	---	---
	80%	N	C to 180	140	73	140	---	---	140	---	---
	Liquid	---	---	---	---	---	---	R to 212	---	R to 194	---
Lard Oil	--	---	C to 180	---	140	C to 120	73	---	C to 120	---	---
Latex	--	---	---	140	---	140	---	---	140	---	---
Lauric Acid CH_3 $(CH_2)_{10}$ COOH	--	---	180	140	140	120	---	---	120	---	---
Lauryl Chloride (Type I) $CH_3(CH_2)_{10}CH_2Cl$	--	---	73	---	140	120	73	R to 248	120	---	---
Lead Acetate $Pb(C\ H_3\ COO)_2\ o3H_2\ O$	Sat'd	---	180	180	140	140	140	R to 212	140	---	---
Lead Chloride $PbCl_2$	--	---	180	140	140	120	---	---	120	---	---
Lead Nitrate $Pb(NO_3)_2$	Sat'd	---	180	140	140	120	---	---	120	---	---
Lead Sulfate $PbSO_4$	--	---	180	140	140	120	---	---	120	---	---
Lead Tetraethyl $C_8H_{20}Pb$	--	---	---	---	---	---	---	R to 212	---	---	---
Lemon Oil	--	---	N	C to 73	---	---	---	---	---	---	---

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Lemon Juice	--	---	---	---	---	C to 140	---	---	C to 140	---	---
Ligroin	--	---	---	140	---	---	---	---	---	---	---
Lime Slurry	--	---	---	---	---	140	---	---	140	---	---
Lime Sulfur	--	---	73	73	73	120	140	---	120	---	---
Linoleic Acid $CH_3(CH_2)_4(CH{=}CHCH_2)_2(CH_2)_6COOH$	--	---	180	180	140	---	73	---	---	---	---
Linoleic Oil (Type I)	--	---	---	---	140	---	73	---	---	---	---
Linseed Oil	--	73	C to 180	140	140	R to 73	73	R to 248	R to 73	194	---
Liqueurs	--	---	---	140	140	120	140	---	120	---	---
Lithium Bromide LiBr	--	---	---	140	140	140	---	---	140	---	---
Lithium Chloride LiCl	--	---	---	140	140	120	---	---	120	---	---
Lithium Hydroxide L[illegible]	--	---	---	140	---	120	---	---	120	---	---
Lubricating Oil (ASTM #1)	--	---	180	C to 140	140	73	140	R to 248	73	---	---
Lubricating Oil (ASTM #2)	--	---	180	C to 140	140	73	140	---	73	---	---
Lubricating Oil (ASTM #3)	--	---	180	C to 140	140	73	140	---	73	---	---
Magnesium Carbonate $MgCO_3$	--	120	180	212	140	140	140	R to 212	140	---	---
Magnesium Chloride $MgCl_2$	Sat'd	120	180	140	140	140	140	R to 140	140	---	---
	50%	---	---	---	---	---	---	R to 212	-----	194	---
Magnesium Citrate $MgHC_6H_5O_7 o5H_2O$	--	---	180	---	140	140	---	---	140	---	---
Magnesium Hydroxide $Mg(OH)_2$	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Magnesium Nitrate $Mg(NO_3)_2 o2H_2O$	--	160	180	212	140	140	140	R to 248	140	---	---
Magnesium Oxide MgO	--	160	---	---	---	---	---	---	---	---	---
Magnesium Sulfate M[illegible]$_4$ $o7H_2O$	--	160	180	212	140	140	140	R to 212	140	---	---

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Maleic Acid HOOCCH=CHCOOH	Sat'd	160	180	140	140	140	140	R to 140	140	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
	10%	---	---	---	---	---	---	R to 140	---	---	---
Malic Acid $COOHCH_2$ $CH(OH)COOH$	--	---	180	140	140	140	140	---	140	---	---
Manganese Sulfate $MnSO_4 \cdot 4H_2O$	--	---	180	180	140	140	---	---	140	---	---
Margarine	Work Sol.	---	---	---	---	---	---	R to 248	---	---	---
Mercuric Chloride $HgCl_2$	--	---	180	180	140	140	140	---	140	---	---
	Sat'd	--	---	---	---	---	---	R to 212	---	---	---
Mercuric Cyanide $Hg(CN)_2$	Sat'd	---	180	140	140	140	140	R to 212	140	---	---
Mercuric Sulfate $HgSO_4$	Sat'd	---	180	140	140	140	---	---	140	---	---
Mercurous Nitrate $HgNO_3 \cdot 2H_2O$	Sat'd	---	180	140	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	---	---	---
Mercury Hg	Liquid	---	180	140	140	140	140	R to 248	140	194	---
Methane CH_4	--	N	73	73	140	140	---	---	140	140	---
Methanol (Methyl Alcohol) CH_3OH	--	---	N	180	140	R to 140	140	---	R to 140	---	---
	5%	---	---	---	---	---	---	R to 140	---	---	---
	Liquid	---	---	---	---	---	---	C to 176	R to 140	---	R to 176
Methoxyethyl Oleate $CH_3OCH_2CH_2OOCC_{17}H_{33}$	--	---	---	---	73	---	---	---	---	---	---
Methyl Acetate $CH_3CO_2CH_3$	--	N	N	140	N	C to 120	---	---	C to 120	---	---
Methyl Acrylate $CH_2=CHCOOCH_3$	Tech Pure	---	---	---	---	140	---	---	140	---	---
Methyl Amine CH_3NH_2	--	---	N	N	N	---	---	---	---	---	---
Methyl Bromide CH_3Br	--	---	N	N	N	C to 73	---	---	C to 73	R to 68	---

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Methyl Butyl Ketone $CH_3CO(CH_2)_3CH_3$	Liquid	---	---	---	---	---	---	C to 122	---	---	---
Methyl Cellosolve $HOCH_2\ CH_2\ OCH_3$	--	---	N	73	N	C to 120	---	---	C to 120	---	---
Methyl Chloride $CH_3\ Cl$	Dry	N	N	N	N	C to 120	N	---	C to 120	R to 68	---
Methyl Chloroform CH_3CCl_3	--	N	N	C to 73	N	C to 120	---	---	C to 120	---	---
Methyl Ethyl Ketone (MEK) $CH_3\ COC_2\ H_5$	100%	N	N	73	N	N	73	C to 68	R to 140	C to 140	R to 73 C to 176
Methyl Isobutyl Carbinol $(CH_3\ )_2\ CHCH_2\ CH(CH_3\ )OH$	--	---	N	---	N	---	---	---	---	---	---
Methyl Isobutyl Ketone $(CH_3\ )_2\ CHCH_2\ COCH_3$	--	N	N	73	N	73	---	---	73	---	---
Methyl Isopropyl Ketone $CH_3\ COCH(CH_3\ )_2$	--	---	N	---	N	73	---	---	73	---	---
Methyl Methacrylate $CH_2=C(CH_3\ )COOCH_3$	--	---	N	---	73	140	---	R to 68	140	---	---
Methyl Sulfate $(CH_3\ )_2\ SO_4$	--	---	73	C to 73	73	140	---	---	---	68	---
Methylene Bromide CH_2Br_2	--	---	N	N	N	C to 120	---	---	C to 120	---	---
Methylene Chloride $CH_2\ Cl_2$	100%	---	N	N	N	N	73	C to 104	N	---	C to 176
Methylene Chlorobromide $CH_2\ ClBr$	--	---	N	--	N	---	---	---	---	---	---
Methylene Iodide $CH_2\ I_2$	--	---	N	N	N	C to 120	---	---	C to 120	---	---
Methylsulfuric Acid $CH_3\ HSO_4$	--	---	180	140	140	---	---	---	---	---	---
Milk	--	160	180	212	140	140	140	R to 212	140	194	---
Mineral Oil	--	73	180	C to 140	140	R to 73	C to 73	R to 212	C to 176	---	---
Molasses	--	---	180	140	140	140	140	---	140	---	---
Monochloroacetic Acid $CH_2ClCOOH$	50%	---	---	140	140	140	---	---	140	---	---
Monochlorobenzene $C_6\ H_5\ Cl$	Tech Pure	---	N	73	N	C to 120	---	---	C to 120	---	---
Monoethanolamine $HOCH_2\ CH_2\ NH_2$	--	---	---	---	N	---	---	---	---	---	---
Motor Oil	--	---	180	C to 140	140	R to 140	---	---	R to 140	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Morpholine $C_4 H_8 ONH$	--	---	---	140	---	140	---	---	140	---	---
Mustard, Aqueous	Work. Sol.	---	---	---	---	---	---	R to 248	---	---	---
N-methyl Pyrrolidone C_5H_9NO	100%	---	---	---	---	---	---	---	---	---	C to 73
Naphtha	--	---	73	73	140	73	73	R to 122	C to 176	R to 140	---
Naphthalene $C_{10} H_8$	--	---	N	73	N	73	73	---	73	R to 194	---
Natural Gas	--	73	---	73	140	140	73	---	140	---	---
Nickel Acetate $Ni(OOCCH_3)_2 \cdot 4H_2 O$	--	---	---	73	---	140	---	---	140	---	---
Nickel Chloride $NiCl_2$	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Nickel Nitrate $Ni(NO_3)_2 o6H_2 O$	Sat'd	160	180	180	140	140	140	R to 248	140	---	---
Nickel Sulfate $NiSO_4$	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Nicotine $C_{10} H_{14} N_2$	--	---	180	---	140	140	140	---	140	---	---
Nicotinic Acid $C_5H_4 NCOOH$	--	---	180	---	140	140	140	R to 212	140	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Nitric Acid HNO_3	5%	---	---	---	---	---	---	R to 176	C to 140	N	---
	10%	C to 73	180	180	140	73	C to 73	R to 212	C to 140	---	---
	20%	---	---	---	---	---	---	R to 212	C to 140	---	---
	25%	---	---	---	---	---	---	R to 212	C to 140	---	---
	30%	N	R to 130	140	140	73	N	R to 212	C to 140	---	---
	35%	---	---	---	---	---	---	---	C to 140	---	---
	40%	N	R to 120	73	140	73	N	C to 248	140	---	---
	50%	N	110	N	100	C to 73	N	---	140	---	---
	65%	---	---	---	---	---	---	C to 248	---	---	---
	70%	N	100	N	73	C to 73	N	---	C to 73	---	---
	85%	---	---	---	---	---	---	N	---	---	---
	95%	---	---	---	---	---	N	---	---	---	---
	100%	N	N	N	N	N	N	---	N	---	---
Nitrobenzene $C_6H_5NO_2$	100%	N	N	C to 140	N	N	---	R to 122	N	---	---
Nitroglycerine $CH_2NO_3CHNO_3CH_2NO_3$	--	---	---	---	N	73	---	---	73	---	---
Nitroglycol $NO_3(CH_2)_2NO_3$	--	---	---	---	N	---	---	---	---	---	---
Nitrous Acid HNO_2	10%	---	180	C to 73	140	73	---	---	73	---	---
Nitrous Oxide N_2O	--	---	73	73	73	73	---	---	73	---	---
n-Octane C_8H_{18}	--	---	C to 73	---	---	---	---	---	---	---	---
Oleic Acid $CH_3(CH_2)_7CH=CH(CH_2)_7COOH$	--	160	180	73	140	C to 140	150	R to 248	C to 140	R to 140	---
Oleum $xH_2SO_4 oySO_3$	--	N	N	N	N	N	N	N	N	---	---
Olive Oil	--	160	C to 180	73	140	140	---	R to 248	R to 68	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Oxalic Acid $HOOCCOOHo2H_2O$	50%	160	180	140	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 140	---	R to 140	---
	Sat'd	---	---	---	---	---	---	R to 122	---	---	---
Oxygen Gas O_2	--	160	180	N	140	140	---	R to 212	140	R to 140	---
Ozone O_3	--	---	180	C to 73	140	C to 120	---	---	C to 120	C to 68	---
	Sat'd	---	---	---	---	---	---	R to 68	---	---	---
Palm Oil	--	---	---	73	---	140	---	---	140	---	---
Palmitic Acid $CH_3 (CH_2)_{14} COOH$	10%	73	73	180	140	120	150	---	120	---	---
	70%	---	73	180	73	120	---	---	120	---	---
Paraffin $C_{36} H_{74}$	--	73	180	140	140	C to 140	---	R to 212	C to 140	---	---
Peanut Oil	--	---	C to 180	140	---	---	---	R to 248	---	---	---
n-Pentane $CH_3 (CH_2)_3 CH_3$	--	N	C to 180	N	C to 140	C to 120	---	---	C to 120	---	--
Peracetic Acid $CH_3 COOOH$	40%	N	---	73	73	---	---	---	---	---	---
Perchloric Acid (Type I) $HClO_4$	10%	---	---	---	---	---	---	R to 212	---	---	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
	15%	---	180	140	73	140	C to 73	---	140	---	---
	70%	73	180	C to 73	73	73	N	R to 212	73	---	---
Perchloroethylene (tetrachloroethylene) $Cl_2 C=CCl_2$	--	N	N	C to 73	C to 140	C to 120	---	C to 212	C to 120	C to 68	---
Perphosphate	--	---	73	140	73	---	---	---	---	---	---
Petroleum Ether	--	---	---	---	---	---	---	R to 212	---	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Phenol $C_6 H_5 OH$	--	N	73	73	73	140	73	---	140	N	---
	5%	---	---	---	---	---	---	---	R to 248	---	---
	50%	---	---	---	---	---	---	R to 176	---	---	---
	90%	---	---	---	---	R to 140	---	---	R to 140	---	---
	Solid	---	---	---	---	---	---	C to 122	---	---	---
Phenylhydrazine $C_6H_5 NHNH_2$	--	---	N	N	N	C to 120	---	R to 104	C to 120	---	---
Phenylhydrazine Hydrochloride $C_6H_5NHNH_2 \cdot HCl$	10%	---	---	---	---	---	---	R to 140	---	---	---
Phosphine PH_3	Gas	---	---	---	---	---	---	R to 104	---	---	---
Phosphoric Acid $H_3 PO_4$	10%	---	180	212	140	140	140	---	140	---	---
	50%	73	180	212	140	140	73	R to 212	140	C to 104	---
	75%	---	---	---	---	---	---	R to 212	---	---	---
	85%	---	180	212	140	73	---	C to 284	73	---	---
	98%	---	---	---	---	---	---	R to 212	---	---	---
Phosphoric Anhydride $P_2 O_5$	--	---	73	73	73	---	---	---	---	---	---
Phosphorous (Red)	--	---	---	---	73	140	---	---	140	---	---
Phosphorous (Yellow)	--	--	---	---	73	140	---	---	140	---	---
Phosphorus Oxychloride $POCl_3$	Liquid	---	---	---	---	---	---	R to 68	---	---	---
Phosphorus Pentoxide $P_2 O_5$	--	---	73	73	73	140	---	---	140	---	---
Phosphorus Trichloride PCl_3	--	--	N	73	N	120	C to 73	C to 122	120	---	---
Photographic Solutions	--	---	180	140	140	140	140	---	140	---	---
Phthalic Acid $C_6 H_4 (COOH)_2$	--	---	---	140	C to 140	140	---	---	140	---	---
	Susp.	---	---	---	---	---	---	R to 212	---	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Picric Acid $C_6 H_2 (NO_2)_3 OH$	10%	N	N	73	N	73	73	R to 212	73	C to 68	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd.	---	---	---	---	---	---	R to 212	---	---	---
Pine Oil	--	---	N	140	---	R to 73	---	---	R to 73	---	---
Plating Solutions (Brass)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Cadmium)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Chrome)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Copper)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Gold)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Lead)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Nickel)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Rhodium)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Silver)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Tin)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Zinc)	--	---	180	140	140	140	C to 73	---	140	---	---
Potash (Aq) KOH	Sat'd	---	180	---	140	140	---	---	140	---	---
Potassium Alum $AlK (SO_4)_2 o12H_2 O$	--	---	180	---	140	140	---	---	140	---	---
Potassium Aluminum Sulfate $AlK (SO_4)_2 o12H_2 O$	--	---	180	180	140	---	C to 73	---	---	---	---
Potassium Amyl Xanthate $CH_3(CH_2)_4OC(=S)-S.K$	--	---	---	---	73	---	---	---	---	---	---
Potassium Bicarbonate $KHCO_3$	Sat'd	---	180	140	140	140	140	R to 212	140	---	---
Potassium Bi- chromate $K_2 Cr_2 O_7$	Sat'd	---	180	140	140	---	C to 73	R to 212	---	---	---
	40%	---	---	---	---	---	---	R to 212	---	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Potassium Bisulfate $KHSO_4$	--	---	180	212	140	140	---	R to 212	140	---	---
Potassium Borate $K_2 B_4 O_7 o4H_2 O$	--	--	180	140	140	140	140	R to 212	140	---	---
Potassium Bromate $KBrO_3$	--	---	180	212	140	140	140	R to 212	140	---	---
	10%	---	---	---	---	---	---	---	R to 212	---	---
Potassium Bromide KBr	--	---	180	212	140	140	140	R to 248	140	---	---
Potassium Carbonate $K_2 CO_3$	--	73	180	180	140	140	140	N	140	---	---
Potassium Chlorate (Aqueous) $KClO_3$	--	160	180	212	140	140	140	N	140	---	---
Potassium Chloride KCl	--	160	180	212	140	140	140	R to 212	140	---	---
Potassium Chromate $K_2 CrO_4$	--	---	180	212	140	140	140	---	140	---	---
Potassium Cyanide KCN	--	---	180	180	140	140	140	R to 212	140	---	---
Potassium Dichromate $K_2 O_7$	Sat'd	--	180	180	140	140	140	---	140	---	---
Potassium Ethyl Xanthate $KS_2 COC_2 H_5$	--	---	---	---	73	---	---	---	---	---	---
Potassium Ferricyanide $K_3 Fe(CN)_6$	--	---	180	180	140	140	140	R to 248	140	---	---
Potassium Ferrocyanide $K_4 Fe(CN)_6 o3H_2 O$	--	---	180	180	140	140	---	R to 248	140	---	---
Potassium Fluoride KF	--	---	180	180	140	140	140	R to 212	140	---	---
Potassium Hydroxide KOH	4%	---	---	---	---	---	---	C to 104	---	---	---
	10%	---	---	---	---	---	---	R to 176	---	---	---
	20%	---	---	---	---	---	---	R to 176	---	---	---
	25%	160	180	212	140	R to 140	140	---	R to 140	---	---
	45%	---	---	---	---	---	---	---	---	---	R to 73
	50%	---	---	---	---	---	---	R to 176	---	C to 104	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Potassium hydrogen Sulfite $KHSO_3$	10%	---	---	---	---	---	---	R to 140	---	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Potassium Hypochlorite KClO	--	160	180	---	140	120	---	---	120	---	---
	3%	---	---	---	---	---	---	R to 212	---	---	---
Potassium Iodide KI	--	---	180	73	73	140	---	R to 212	140	---	---
Potassium Nitrate KNO_3	--	160	180	140	140	140	140	---	140	C to 104	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Potassium Orthophosphate H_2KPO_4	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Potassium Perborate KBO_3	--	---	180	140	140	140	140	---	140	---	---
Potassium Perchlorate $KClO_4$	--	---	180	140	140	140	140	---	140	---	---
Potassium Permanganate K_2O_4	10%	---	180	73	140	140	140	R to 176	140	---	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
	25%	---	180	73	73	140	---	---	140	---	---
	30%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Potassium Persulfate $K_2 S_2 O_8$	--	---	180	140	140	140	140	R to 176	140	---	---
Potassium Sulfate $K_2 SO_4$	--	160	180	180	140	140	140	R to 212	140	194	---
Potassium Sulfide $K_2 S$	--	---	180	140	---	140	140	68	140	---	---
Potassium Sulfite $K_2 SO_3$ o$2H_2 O$	--	---	180	140	---	140	---	---	140	---	---
Propane $C_3 H_8$	--	---	73	73	140	140	73	R to 248	140	140	---
Propargyl Alcohol $HC{\equiv}CCH_2 OH$	--	---	C to 180	140	140	140	140	---	140	---	---
Propionic Acid $CH_3 CH_2 CO_2 H$	--	N	N	140	---	140	---	R to 140	140	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Propyl Alcohol (Type I) $CH_3CH_2CH_2OH$	--	73	C to 73	140	140	R to 140	140	R to 122	R to 140	---	---
Propylene Carbonate $C_4H_6O_3$	100%	---	---	---	---	---	---	---	---	---	R to 73
Propylene Dichloride $CH_3\ CHClCH_2\ Cl$	100%	---	N	N	N	N	---	---	N	---	---
Propylene Oxide $CH_3\ CHCH_2\ O$	--	---	N	73	N	140	---	---	140	---	---
Pyridine $N(CH)_4\ CH$	--	---	N	C to 140	N	73	---	R to 68	73	C to 68	---
Pyrogallic Acid $C_6\ H_3\ (OH)_3$	--	---	---	---	73	--	--	---	---	---	---
Quinone $C_6\ H_4\ O_2$	--	---	---	140	---	140	---	---	140	---	---
Rayon Coagulating Bath	--	---	180	---	140	140	140	---	140	---	---
Salicylaldehyde $C_6\ H_4\ OHCHO$	--	---	---	73	N	120	---	---	120	---	---
Salicylic Acid $C_6\ H_4\ (OH)(COOH)$	--	---	---	140	140	140	---	R to 212	140	---	---
Selenic Acid Aq. [illegible]	--	---	180	---	140	140	140	---	140	---	---
Silicic Acid $SiO_2\ onH_2\ O$	--	---	180	140	140	140	140	R to 212	140	---	---
Silicone Oil	--	---	180	212	73	73	---	---	73	---	---
Silver Acetate $AgCH_3COO$	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Silver Chloride $AgCl$	--	160	180	140	140	---	---	---	---	---	---
Silver Cyanide $AgCN$	--	---	180	180	140	140	140	R to 212	140	---	---
Silver Nitrate $AgNO_3$	--	160	180	180	140	R to 140	C to 73	---	R to 140	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Silver Sulfate $Ag_2\ SO_4$	--	160	180	140	140	140	C to 73	---	140	---	---
Soaps	--	73	180	140	140	R to 140	140	---	R to 140	---	---
Sodium Acetate $CH_3\ COONa$	Sat'd	---	180	212	140	140	140	R to 212	140	---	---
Sodium Alum [illegible]	--	---	180	---	140	---	---	---	---	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Aluminate $Na_2 Al_2 O_4$	Sat'd	---	---	---	140	---	---	---	---	---	---
Sodium Benzoate $C_6 H_5 COONa$	--	---	180	140	140	140	140	---	140	---	---
	35%	---	---	---	---	---	---	R to 68	---	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Bicarbonate $NaHCO_3$	--	73	180	212	140	140	140	R to 212	140	---	---
Sodium Bisulfate $NaHSO_4$	--	73	180	140	140	140	140	---	140	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Bisulfite $NaHSO_3$	--	---	180	140	140	140	---	---	140	---	---
Sodium Borate (Borax) $Na_2 B_4 O_7 o10H_2 O$	Sat'd	160	180	180	140	140	140	---	140	---	---
Sodium Bromide NaBr	Sat'd	120	180	140	140	140	140	---	140	---	---
	50%	---	---	---	---	---	---	R to 248	---	---	---
Sodium Carbonate $Na_2 CO_3$	--	73	180	212	140	140	140	N	140	R to 140	---
Sodium Chlorate $NaClO_3$	Sat'd	---	180	140	73	140	140	N	140	---	---
Sodium Chloride NaCl	---	120	180	212	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	194	---
	10%	---	---	---	---	---	---	R to 212	---	---	R to 176
Sodium Chlorite $NaClO_2$	25%	---	180	73	N	140	---	---	140	---	---
Sodium Chromate $Na_2 CrO_4 o4H_2 O$	--	120	180	140	---	140	---	R to 176	140	---	---
Sodium Cyanide NaCN	--	---	180	180	140	140	140	R to 212	140	---	---
Sodium Dichromate $Na_2 Cr_2 O_7 o2H_2 O$	Sat'd	---	180	---	140	---	---	---	---	---	---
	20%	---	180	180	140	140	140	---	140	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Ferricyanide $Na_3\ Fe(CN)_6\ o2H_2\ O$	Sat'd	---	180	140	140	140	140	---	140	---	---
Sodium Ferrocyanide $Na_3\ Fe(CN)_6\ o10H_2\ O$	Sat'd	---	180	140	140	140	140	---	140	---	---
Sodium Fluoride NaF	--	120	180	180	140	140	140	R to 212	140	---	---
Sodium Hydrogen Sulfite $NaHSO_3$	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Hydroxide NaOH	1%	---	---	---	---	---	---	---	R to 140	---	---
	5%	---	---	---	---	---	---	C to 68	---	---	---
	15%	120	180	212	140	140	140	---	R to 140	---	---
	30%	120	180	212	140	R to 140	140	N	R to 140	---	---
	40%	---	---	---	---	---	---	---	R to 140	---	---
	50%	120	180	212	140	140	140	---	140	C to 104	---
	60%	---	---	---	---	---	---	---	R to 140	---	---
	70%	120	180	212	140	140	140	---	140	---	---
Sodium Hypochlorite $NaOClo5H_2\ O$	--	120	180	73	73	140	140	---	140	---	N
	2% Cl	---	---	---	---	---	---	R to 212	---	---	---
	12.5% Cl	---	---	---	---	---	---	R to 68	---	---	---
Sodium Iodide NaI	--	---	180	---	140	---	---	---	---	---	---
Sodium Metaphosphate $(NaPO_3\ )n$	--	---	180	120	140	---	---	---	---	---	---
Sodium Nitrate $NaNO_3$	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Sodium Nitrite $NaNO_2$	--	160	180	73	140	140	140	R to 212	140	---	---
Sodium Palmitate $CH_3\ (CH_2\ )_{14}COONa$	5%	---	180	140	140	---	---	---	---	---	---
Sodium Perborate $NaBO_3\ o4H_2\ O$	--	120	180	73	140	73	---	---	73	---	---
Sodium Perchlorate $NaClO_4$	--	---	180	212	140	140	---	---	140	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Peroxide Na_2O_2	10%	---	180	---	140	140	---	---	140	---	---
Sodium Phosphate NaH_2PO_4	Acid	120	180	212	140	140	140	R to 140	140	---	---
	Alkaline	---	120	180	212	140	140	---	140	---	---
	Neutral	---	120	180	212	140	140	---	R to 212	---	---
Sodium Silicate $2Na_2OoSiO_2$	--	---	180	140	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 140	---	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Sulfate Na_2SO_4	Sat'd	160	180	212	140	140	140	R to 212	---	---	---
	0.10%	---	---	---	---	---	---	R to 140	---	---	---
Sodium Sulfide Na_2S	Sat'd	160	180	212	140	140	140	---	140	C to 104	---
Sodium Sulfite N_2CO_3	Sat'd	160	180	212	140	140	140	R to 212	140	---	---
Sodium Thiosulfate $Na_2S_2O_3o5H_2O$	--	---	180	180	140	140	140	---	140	---	---
	50%	---	---	---	---	---	---	R to 248	---	---	---
Sour Crude Oil	--	---	---	140	140	---	---	---	---	---	---
Soybean Oil	--	---	---	73	---	140	---	---	140	---	---
Stannic Chloride $SnCl_4$	Sat'd	---	180	140	140	140	140	---	140	---	---
Stannous Chloride $SNCl_2$	15%	120	180	140	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	140	---	---	140	---	---
Starch	--	---	180	140	140	140	---	---	140	---	---
Starch Solution	Sat'd	---	---	---	---	140	---	---	140	---	---
Stearic Acid $CH_3(CH_2)_{16}COOH$	--	---	180	73	140	120	150	---	120	C to 194	---
	100%	---	---	---	---	R to 120	---	---	R to 120	---	---

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Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Stoddard's Solvent	--	---	N	---	N	73	140	---	73	---	---
Styrene $C_6H_5CH=CH_2$	--	---	---	73	---	C to 73	---	---	C to 73	R to 104	---
Succinic Acid $COOH(CH_2)_2COOH$	--	---	180	140	140	140	---	---	140	---	---
Sugar $C_6H_{12}O_6$	Aq.	---	180	---	140	140	---	---	140	---	---
Sulfamic Acid HSO_3NH_2	20%	--	N	180	N	---	---	---	---	---	---
Sulfate Liquors (Oil)	6%	---	180	140	140	---	---	---	---	---	---
Sulfite Liquors	6%	73	180	---	140	140	---	---	---	---	---
Sulfur S	--	---	180	212	140	140	140	---	---	104	---
Sulfur Chloride S_2Cl_2	--	---	---	C to 73	---	---	---	---	---	---	---
Sulfur Dioxide SO_2	Gas Dry	N	73	140	140	140	---	---	140	---	---
	Gas Wet	N	N	140	73	120	73	N	120	---	---
Sulfur Trioxide SO_3	Gas Dry	---	---	---	140	N	---	N	N	C to 68	---
	Gas	---	N	---	73	N	---	N	---	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sulfuric Acid H_2SO_4	5%	---	---	---	---	---	---	---	---	---	R to 73
	30%	120	180	180	140	140	140	R to 248	R to 140	---	N
	50%	73	180	140	140	120	C to 73	R to 212	R to 140	---	---
	60%	C to 73	180	73	140	120	C to 73	R to 248	---	---	---
	70%	C to 73	180	73	140	R to 120	C to 73	---	---	---	---
	80%	C to 73	180	73	140	R to 120	N	C to 248	---	---	---
	90%	C to 73	150	73	73	120	N	R to 212	---	---	---
	93%	N	140	C to 73	73	C to 73	N	---	---	---	---
	94% - 98%	N	130	C to 73	N	C to 73	N	C to 212	N	---	---
	100%	N	N	C to 73	N	C to 73	N	---	---	C to 194	---
Sulfurous Acid H_2SO_3	--	---	180	140	140	140	140	R to 212	140	---	---
Sulfur Oil	--	---	C to 180	180	140	120	---	---	120	---	---
Tannic Acid $C_{76}H_{52}O46$	10%	N	180	73	140	140	140	R to 212	140	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Tanning Liquors	--	160	180	73	140	120	140	---	120	---	---
Tar	--	---	N	---	N	---	---	---	---	---	---
Tartaric Acid $HOOC(CHOH)_2COOH$	--	160	180	140	140	140	140	R to 248	140	---	---
	Sat'd	---	---	---	---	---	---	R to 248	R to 176	R to 194	---
Terpineol $C_{10}H_{17}OH$	--	---	---	---	C to 140	---	---	---	---	---	---
Tetrachloroethane $CHCl_2CHCl_2$	--	---	---	C to 73	C to 140	C to 120	---	---	C to 120	---	---
Tetrachloroethylene $Cl_2C=CCl_2$	--	N	N	C to 73	C to 140	C to 120	---	C to 212	C to 120	C to 68	---
Tetraethyl Lead $Pb(C_2H_5)_4$	--	---	73	73	73	---	---	---	---	68	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Tetrahydrofuran C_4H_8O	--	N	N	C to 73	N	C to 73	C to 73	C to 68	N	---	---
Tetralin $C_{10}H_{12}$	--	---	N	N	N	N	---	---	N	---	---
Tetra Sodium Pyrophosphate $Na_4P_2O_7o10H_2O$	--	---	180	---	140	---	---	---	---	---	---
Thionyl Chloride $SOCl_2$	--	---	N	N	N	N	140	N	N	---	---
Thread Cutting Oils	--	---	73	73	73	---	---	---	---	---	---
Tin (II) Chloride $SnCl_2$	--	---	---	---	---	---	---	R to 212	---	---	---
Tin (IV) Chloride $SnCl_4$	--	---	---	---	---	---	---	R to 212	---	---	---
Titanium Tetrachloride $TiCl_4$	--	---	---	140	C to 73	120	---	---	120	---	---
Toluene (Toluol) $CH_3C_6H_5$	--	N	N	C to 73	N	C to 120	N	---	C to 120	R to 140	R to 73
Tomato Juice	--	---	180	212	140	140	---	---	140	--	---
Transformer Oil	--	---	180	73	140	C to 120	---	---	C to 120	---	---
Transformer Oil DTE/30	--	---	180	---	140	R to 120	---	---	R to 120	---	---
Tributyl Citrate $C_{18}H_{32}O_7$	--	---	---	C to 73	73	C to 120	---	---	C to 120	---	---
Tributyl Phosphate $(C_4H_9)_3PO_4$	--	---	N	C to 140	N	73	---	---	73	R to 194	---
Trichloroacetic Acid CCl_3COOH	50%	---	---	140	140	140	---	R to 104	140	---	---
	10%	---	---	---	---	140	---	---	140	---	---
Trichlorobenzene $C_6H_3Cl_3$	--	---	---	---	---	---	---	R to 140	---	---	---
Trichloroethane $C_2H_3Cl_3$	--	---	---	---	---	---	---	---	---	---	R to 122
Trichloroethylene $CHCl=CCl_2$	--	N	N	N	N	C to 120	N	R to 176	C to 68	C to 68	R to 176
Triethanolamine $(HOCH_2CH_2)_3N$	--	C to 73	73	140	73	73	73	C to 104	73	---	---
Triethylamine $(C_2H_5)_3N$	--	---	---	N	140	73	---	---	73	---	---
Trimethylolpropane $(C_2H_5C(CH_2OH)_3C_3H_5$	--	---	---	140	73	C to 120	---	---	C to 120	---	---

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Trisodium Phosphate $Na_3PO_4 \bullet 12H_2O$	--	73	180	140	140	140	140	---	140	---	---
Turpentine	--	N	N	N	140	C to 120	C to 73	---	C to 120	R to 140	---
Urea $CO(NH_2)_2$	--	---	180	180	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd	---	---	---	---	---	---	R to 176	---	C to 140	---
Urine	--	160	180	180	140	140	140	---	140	---	---
Vaseline (Petroleum Jelly)	--	---	N	140	N	120	---	---	120	---	---
Vegetable Oil	--	---	C to 180	140	140	R to 140	---	R to 248	R to 140	---	---
Vinegar	--	73	150	140	140	140	140	---	140	194	---
Vinyl Acetate $CH_3COOCH=CH_2$	--	---	N	73	N	140	---	C to 68	140	---	---
Water, Acid Mine	--	160	180	140	140	140	180	---	140	---	194
Water, Deionized H_2O	--	160	180	140	140	140	180	---	140	194	176
Water, Distilled H_2O	--	160	180	212	140	140	180	R to 248	140	194	---
Water, Potable H_2O	--	160	180	212	140	140	180	R to 248	140	194	---
Water, Salt H_2O	--	160	180	212	140	140	180	---	140	194	---
Water, Sea H_2O	--	160	180	212	140	140	180	R to 248	140	194	R to 176
Water, Soft H_2O	--	160	180	212	140	140	180	---	140	194	---
Water, Waste H_2O	--	73	180	212	140	140	180	---	140	194	---
Whiskey	--	---	180	140	140	140	140	R to 212	140	---	---
White Liquor	--	73	180	---	140	---	---	---	---	---	---
Wine	--	73	180	140	140	140	140	R to 248	140	---	---
Wines and Spirits	--	---	---	---	---	---	---	R to 212	---	---	---

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Plastics at Maximum Operating Temperature (F)

Chemical (Formula)	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Xylene (Xylol) $C_6H_4(CH_3)_2$	--	N	N	N	N	N	N	C to 140	N	C to 194	---
Zinc Acetate $Zn(CH_3COO)_2o2H_2O$	--	---	180	---	---	---	---	---	---	---	---
Zinc Carbonate $ZnCO_3$	--	---	180	140	---	140	---	R to 212	140	---	---
Zinc Chloride $ZnCl_2$	--	120	180	180	140	140	---	---	140	---	---
	50%	---	---	---	---	---	---	---	---	C to 73	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Zinc Nitrate $Zn(NO_3)_2o6H_2O$	--	160	180	180	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Zinc Oxide ZnO	--	---	---	---	---	---	---	R to 212	---	---	---
Zinc Stearate $(CH_3(CH_2)_{16}COO)_2Zn$	--	---	---	---	---	---	---	R to 122	---	---	---
Zinc Sulfate $ZnSO_4o7H_2O$	--	160	180	212	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---