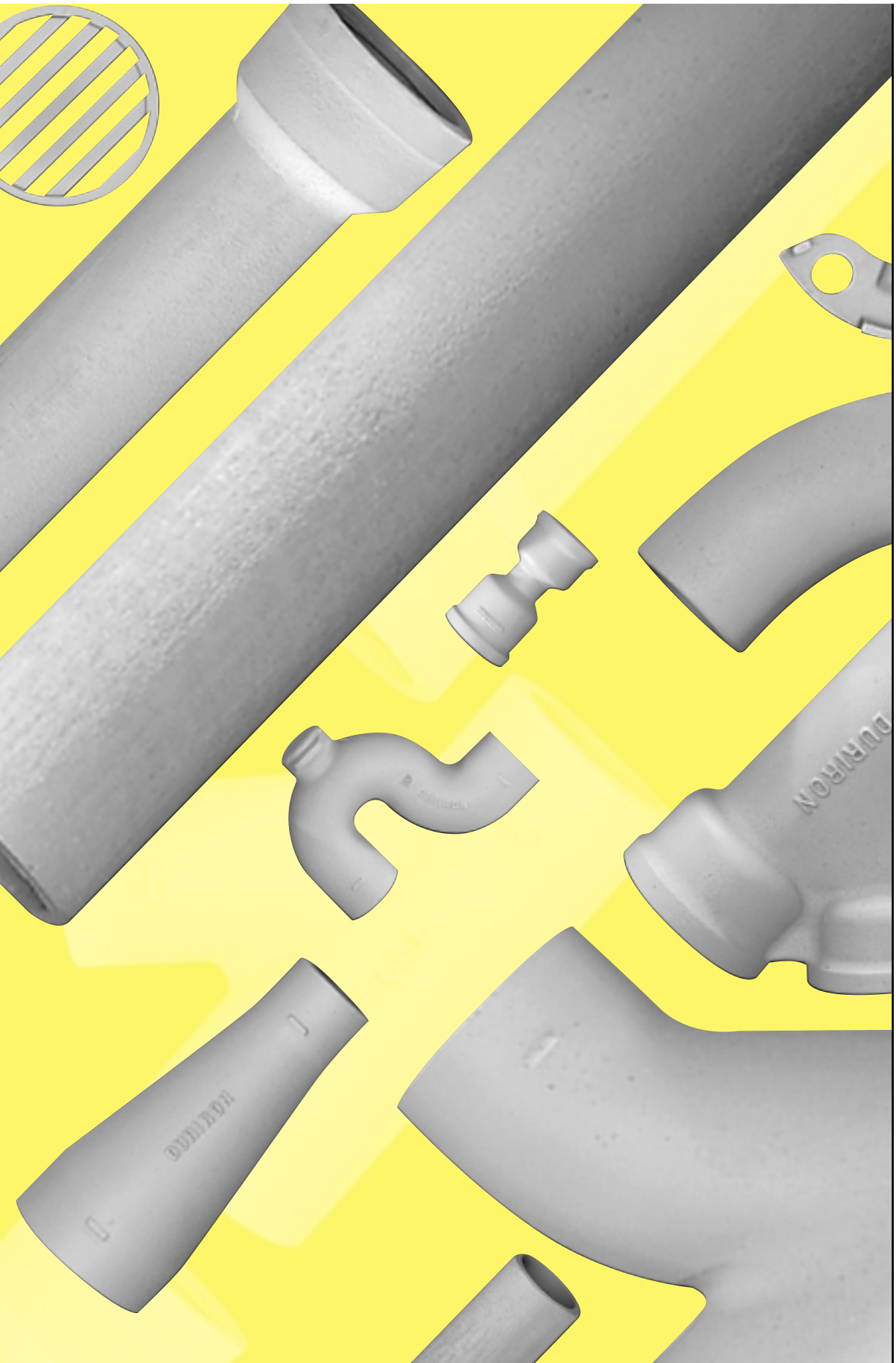
FLOWSERVE

Foundry Operations



Duriron Corrosion Resistant Piping

Chemical Compatibility Chart

FCD FDATB0016
(Bulletin PF-16b)

For nearly 90 years Duriron pipe and fittings have provided a durable and reliable means of transporting corrosive chemicals safely. Installed using traditional plumbing techniques, Duriron pipe and fittings require little maintenance and often outlast the life of the building or system in which they are used.

Duriron pipe and fittings provide numerous advantages other corrosion resistant piping brands do not. Among these are:

- Nearly universal corrosion resistance
- Safe above and below ground
- Longevity – Life of the building installation
- Can be mechanically cleaned
- Suitable to 500°F (260°C)
- Safe to use in return air plenums
- Fire and smoke proof
- No intumescent firestops
- Outstanding abrasion resistance
- Solids will not cling to the walls

Product Comparison

Following is a general comparison of the advantages of Duriron to other materials:

	Duriron	Cast iron	Stainless Steel	Glass	PP	PVDF
Resistance to acids and bases	E	P	G	E	G	E
Resistance to solvents	E	G	G	E	P	P
Resistance to pitting corrosion (acid Cl-)	E	P	P	E	E	E
Abrasion resistance	E	G	P	G	P	P
Can be mechanically cleaned	Y	Y	N	N	N	N
Safe above 200°F	Y	Y	Y	Y	N	Y (275°F)
Noncombustible	Y	Y	Y	Y	N	Y
Smoke proof	Y	Y	Y	Y	N	Y
Safe in return air plenums	Y	Y	Y	Y	N	Y

E – Excellent G – Good P – Poor Y – Yes N – No

Applications

Anywhere there are acids, bases, solvents, bleaches, detergents, or other aggressive fluids, Duriron pipe and fittings can be used. Duriron pipe is the best-engineered solution for handling traditional acid waste services such as those found in hospitals, research laboratories, and schools and universities. Its unique characteristics also make it ideally suited for many applications normally not deemed “acid waste.” An example of the use of Duriron in a nontraditional application is in commercial and institutional kitchens and concessions, where highly acidic food waste, sodas, and cleaning chemicals are present. Following is a partial list of applications for which Duriron pipe and fittings is ideally suited:

- **Laboratories**
  - Schools
  - Forensic
  - Commercial/industrial
- **Medical Facilities**
  - Hospitals
  - Dialysis centers
- **Food & Beverage**
  - Institutional kitchens
  - Fast-food restaurants
  - Soda fountains
  - Beverage plants
  - Dairies
  - Confectioners
- **Pharmaceutical Plants**
  - Process waste
- **Correctional Facilities**
- **Commercial Operations**
  - Battery stations
  - Planting processes
  - Paint/lacquer plants

How to read this chart

The ratings listed in this bulletin represent the concentration and temperature at which each metal experiences 20 mpy corrosion or less in an uncontaminated environment and at which the plastics experience no detrimental changes in physical and mechanical properties. However many other factors must be considered when selecting a material for corrosive service. These include any secondary corrosives or by-products, pH, solids in suspension, maximum temperature, and any other peculiarities of the solution.

The corrosion chart in the bulletin is intended to be a guide to the selection of the proper corrosion resistant piping material for a given application. The ratings are not a blanket recommendation or warranty, expressed or implied, for any of the materials for any of the media. These ratings are the compilation of extensive laboratory tests, operating experience, and best judgement.

Corrosion Resistance

	Metals				Glass	Plastics		
	Duriron	Cast Iron	304	316	Borosilicate Glass	PVC	PP	PVDF
Acetaldehyde CH_3CHO	All[E]	NR	All[D]	All[D]	All[D]	NR	NR	NR
Acetic Acid CH_3COOH	All[E]	NR	All[A]	All[C]	All[D]	0-8[A]	0-9[B]	0-6[C]
Acetic Acid Anhydride $(CH_3CO)_2O$	All[E]	NR	10[*]	All[E]	All[D]	NR	10[A]	NR
Acetone CH_3COCH_3	All[E]	All[A]	All[D]	All[E]	All[D]	NR	All[B]	NR
Aluminum Chloride $AlCl_3$	0-7[D]	NR	NR	NR	0-7[D]	All[B]	All[C]	0-4[E]
Aluminum Nitrate $Al(NO_3)_3$	All[E]	NR	1[D]10[D]	All[D]	All[D]	All[B]	All[C]	All[E]
Aluminum Sulfate $Al_2(SO_4)_3$	All[E]	NR	0-5[C]	0-5[D]	All[D]	All[B]	All[C]	All[E]
Ammonia – Anhydrous NH_3	10[A]	10[E]	10[E]	10[E]	–	10[A]	10[C]	NR
Ammonium Bifluoride NH_4HF_2	NR	NR	1[A]	1[B]	NR	All[B]	10[C]	All[B]
Ammonium Carbonate $(NH_4)HCO_3$ • $(NH_4)CO_2NH_2$	All[D]	1[A]	All[D]	All[D]	All[D]	All[B]	All[C]	All[E]
Ammonium Chloride NH_4Cl	0-4[D]	NR	NR	NR	0-4[D]	All[B]	All[C]	All[E]
Ammonium Fluoride NH_4F	NR	NR	NR	1[A] 10[A]	NR	10[B]	All[C]	–
Ammonium Hydroxide NH_4OH	0-3[D]	0-4[D]	All[D]	All[D]	NR	All[B]	All[C]	All[D]
Ammonium Nitrate NH_4NO_3	All[D]	1[A]	All[D]	All[D]	All[D]	All[B]	All[C]	All[E]
Ammonium Phosphate $(NH_4)_2 HPO_4$ or $NH_4H_2PO_4$	All[D]	1[A]	0-4[D]	0-4[D]	All[D]	All[B]	10[C]	All[E]
Ammonium Sulfate $(NH_4)_2SO_4$	All[D]	0-3[A]	NR	0-5[D]	All[D]	All[B]	All[C]	All[E]
Ammonium Sulfide $(NH_4)_2S$	–	NR	1[D]10[D]	1[D]10[D]	–	All[A]	All[B]	All[B]
Ammonium Sulfite $(NH_4)_2SO_3$	0-5[D]	NR	–	0-5[E]	–	All[B]	–	–
Amyl Acetate $CH_3COOC_5H_{11}$	All[E]	10[E]	1[E]6-10[B]	All[E]	All[D]	NR	NR	All[B]
Amyl Alcohol $C_5H_{11}OH$	All[E]	10[D]	1[D]8-10[D]	All[B]	All[B]	All[B]	All[C]	All[E]
Amyl Chloride $CH_3(CH_2)_3CH_2Cl$	1[D]10[D]	NR	NR	NR	1[D]10[D]	NR	NR	All[E]
Aniline Hydrochloride $C_5H_5NH_2$ • HCl	All[E]	NR	NR	NR	All[D]	NR	NR	–
Barium Chloride $BaCl_2$	0-6[D]	NR	NR	–	All[D]	All[B]	All[C]	All[E]

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2 = 20% weight percent
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7 = 70% weight percent
8 = 80% weight percent
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10 = 100% weight percent
All = All Concentrations
NR = Not Recommended
A = 68°F max. (20°C)
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* = To boiling
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Examples:

0- 4[B]	From 0 to 40% (weight percent) the material listed is acceptable to 122°F (50°C).
8[C]	At 80% the material listed is acceptable to 167°F (75°C).
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Corrosion Resistance

	Metals				Glass	Plastics		
	Duriron	Cast Iron	304	316	Borosilicate Glass	PVC	PP	PVDF
Barium Nitrate $Ba(NO_3)_2$	All[E]	10[A]	0-3[C]	0-3[C]	All[D]	All[B]	All[C]	All[E]
Barium Sulfate $BaSO_4$	All[E]	10[A]	1[D]10[D]	1[D]10[D]	All[D]	All[B]	10[A]	All[E]
Benzaldehyde C_6H_5CHO	All[E]	10[D]	10[E]	10[E]	All[D]	1[B]All[A]	10[A]	All[A]
Benzene C_6H_6	All[E]	10[A]	All[D]	All[D]	All[D]	NR	NR	All[C]
Benzoic Acid C_6H_6COOH	All[E]	NR	All[D]	All[D]	All[D]	1[A]	NR	All[D]
Black Liquor	–	NR	–	All[C]	–	–	NR	–
Boric Acid H_3BO_3	All[E]	NR	0-4[D]	0-4[D]	All[D]	All[B]	10[C]	All[E]
Brine, Neutral	All[E]	All[A]	All[A]	All[D]	All[D]	–	–	All[E]
Bromine, dry Br	NR	NR	NR	NR	–	2.5[B]	NR	All[B]
Bromine, wet Br	NR	NR	NR	NR	–	NR	NR	All[B]
Butane $CH_3CH_2CH_2CH_3$	All[E]	10[D]	All[C]	All[D]	All[D]	All[B]	NR	All[D]
Butyric Acid $CH_3CH_2CH_2COOH$	All[E]	NR	All[C]	All[D]	All[D]	All[A]	All[A]	All[D]
Calcium Carbonate $CaCO_3$	All[E]	0-2[B]	10[D]	All[D]	All[D]	All[B]	10[C]	All[E]
Calcium Chlorate $Ca(ClO_3)_2$	NR	NR	0-3[D]	0-3[D]	10[D]	All[B]	–	All[D]
Calcium Chloride $CaCl_2$	All[E]	NR	NR	NR	All[D]	All[B]	All[C]	All[E]
Calcium Hydroxide $Ca(OH)_2$	All[B]	1[D]	0-2[D]	All[D]	NR	All[B]	All[B]	All[E]
Calcium Hydrochlorite $Ca(OCl)_2$	0-7[D]	NR	NR	NR	–	All[B]	All[B]	All[E]
Calcium Nitrate $Ca(NO_3)_2$	1[D]	0-4[A]	0-4[D]	0-4[D]	–	All[B]	10[C]	All[E]
Calcium Phosphate $Ca_3(PO_4)_2$ or $CaH_4(PO_4)_2$	All[E]	NR	1[D]	1[D]	–	–	–	–
Calcium Sulfite $CaSO_3$	1[D]	1[C]	1[D]	1[D]	All[D]	–	10[D]	–
Carbon Disulfide CS_2	9[A] 10[D]	10[D]	9[A] 10[D]	9[A] 10[D]	10[D]	NR	NR	All[B]
Carbon Tetrachloride, dry (<50ppm H_2O) CCl_4	10[D]	NR	10[B]	10[B]	10[D]	NR	NR	10[E]
Carbon Tetrachloride, wet (>50ppm H_2O) CCl_4	All[B]	NR	NR	NR	–	NR	NR	All[E]
Chlorine, dry (<50ppm H_2O) Cl_2	10[B]	NR	10[A]	10[A]	10[D]	10[B]	NR	10[D]
Chlorine, wet (>50ppm H_2O) Cl_2	AII[B]	NR	NR	NR	AII[D]	AII[A]	NR	AII[D]

Corrosion Resistance

	Metals				Glass	Plastics		
	Duriron	Cast Iron	304	316	Borosilicate Glass	PVC	PP	PVDF
Chlorine Dioxide ClO_2	All[A]	NR	NR	NR	1[A]	–	NR	1[D]
Chloroacetic Acid $CH_2ClCOOH$	All[E]	NR	NR	NR	All[D]	All[A]	10[B]	0-5[D]
Chlorobenzene C_6H_5Cl	9-10[C]	10[C]	10[C]	10[D]	10[D]	NR	NR	All[B]
Chloroform $CHCl_3$	10[E]	10[D]	10[D]	10[D]	10[D]	NR	NR	All[B]
Chlorosulfonic Acid $ClSO_2OH$	10[C]	NR	10[A]	10[A]	10[D]	NR	NR	NR
Chromic Acid CrO_3	All[E]	NR	NR	NR	All[D]	0-4[A]	NR	0-5[C]
Copper Nitrate $Cu(NO_3)_2$	All[E]	NR	All[D]	All[D]	All[D]	All[B]	10[C]	All[E]
Copper Sulfate $CuSO_4$	All[E]	NR	All[B]	All[B]	All[D]	All[B]	All[C]	All[E]
Cupric Chloride $CuCl_2$	NR	NR	NR	NR	All[C]	All[B]	All[C]	All[C]
Cuprous Chloride Cu_2Cl_2	All[E]	NR	NR	NR	–	–	–	–
Cyclohexane C_6H_{12}	All[E]	10[C]	All[D]	All[D]	All[D]	All[A]	NR	All[E]
Diethanolamine $(HOCH_2CH_2)_2NH$	10[E]	10[D]	10[E]	10[E]	–	–	–	–
Diethyl Ether $(C_2H_5)_2O$	10[E]	10[C]	10[D]	9-10[D]	10[B]	NR	NR	All[B]
Dimethyl Amine $(CH_3)_2NH$	All[E]	All[D]	All[D]	All[D]	–	NR	All[B]	All[B]
Ethyl Acetate $CH_3COOC_2H_5$	All[E]	10[E]	All[C]	All[E]	All[D]	NR	–	All[A]
Ethyl Alcohol C_2H_5OH	All[E]	All[D]	All[D]	All[D]	All[D]	All[B]	10[C]	All[D]
Ethyl Benzene $C_6H_5C_2H_5$	All[E]	10[D]	10[D]	All[D]	10[D]	NR	NR	–
Ethyl Chloride C_2H_5Cl	10[E]	10[E]	10[E]	10[E]	10[D]	NR	NR	All[E]
Ethylene $H_2C:CH_2$	All[E]	10[D]	10[D]	All[D]	–	–	–	–
Ethylene Dichloride $ClCH_2CH_2Cl$	9-10[D]	10[C]	10[D]	10[D]	9-10[D]	NR	NR	All[E]
Ethylene Glycol CH_2OHCH_2OH	All[E]	All[D]	All[D]	All[D]	All[D]	All[B]	All[C]	All[E]
Ferric Chloride $FeCl_3$	NR	NR	NR	NR	All[D]	All[B]	All[C]	All[E]
Ferric Nitrate $Fe(NO_3)_3$	All[E]	NR	0-5[D]	0-5[D]	0-5[C]	All[B]	10[C]	All[E]

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Examples:
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Corrosion Resistance

	Metals				Glass	Plastics		
	Duriron	Cast Iron	304	316	Borosilicate Glass	PVC	PP	PVDF
Ferric Sulfate $Fe_2(SO_4)_3$	All[E]	NR	All[A]	All[B]	All[D]	All[B]	10[C]	All[E]
Ferrous Chloride $FeCl_2$	0-5[D]	NR	NR	NR	All[D]	All[B]	NR	All[E]
Ferrous Sulfate $FeSO_4$	All[E]	NR	All[C]	All[D]	All[D]	All[B]	10[C]	All[E]
Formaldehyde HCHO	All[E]	NR	All[C]	All[D]	All[D]	All[A]	AII[C]	All[B]
Formic Acid HCOOH	All[E]	NR	All[B]	All[D]	All[D]	0-5[A]	AII[C]	All[B]
Furfural C_4H_3OCHO	All[E]	10[D]	All[D]	All[D]	All[D]	NR	NR	All[B]
Furfuryl Alcohol $C_4H_3OCH_2OH$	All[E]	10[D]	All[D]	All[D]	All[D]	NR	–	NR
Gasoline	All[E]	AII[D]	All[D]	All[D]	All[D]	All[B]	NR	All[E]
Glycerol $C_3H_5(OH)_3$	All[E]	AII[A]	All[D]	All[D]	All[D]	All[B]	10[C]	All[E]
Hydrobromic Acid HBr	0-4[A]	NR	NR	NR	0-4[D]	0-2[B]	0-5[C]	0-4[E]
Hydrochloric Acid (Aerated) HCL	0-4[A]	NR	NR	NR	0-4[D]	AII[B]	NR	All[E]
Hydrochloric Acid (Nonaerated) HCL	0-4[B]	NR	NR	NR	0-4[D]	AII[B]	NR	All[E]
HCl Waste Pickel Liquor	AII[B]	NR	NR	NR	0-4[D]	–	NR	–
Hydrofluoric Acid (Aerated) HF	NR	NR	NR	NR	NR	0-3[A]	0-6[C]	0-6[E]
Hydrofluoric Acid (Nonaerated) HF	NR	NR	NR	NR	NR	0-3[A]	0-6[C]	0-6[E]
Hydrogen Chloride HCl	10[A]	10[D]	10[E]	10[E]	10[D]	10[A]	10[C]	10[E]
Hydrogen Fluoride HF	NR	10[E]	10[A]	10[E]	NR	–	10[A]	–
Hydrogen Peroxide H_2O_2	10[D]	1[D]	0-5[D]	0-5[D]	All[D]	0-9[A]	NR	0-3[E]
Hydrogen Sulfide H_2S	NR	1[A]	1[A]10[A]	1[A]10[E]	All[A]	All[B]	All[C]	All[D]
Isopropyl Alcohol $(CH_3)_2CHOH$	10[E]	10[B]	9-10[B]	9-10[B]	All[D]	All[B]	10[C]	All[B]
Kerosene	10[E]	10[A]	10[D]	10[D]	10[D]	10[B]	NR	10[E]
Lead Acetate $Pb(C_2H_3O_2)_2$	AII[E]	NR	AII[D]	AII[D]	AII[D]	All[B]	All[B]	All[E]
Magnesium Chloride $MgCl_2$	5-10[D]	NR	NR	NR	0-7[D]	10[B]	10[C]	10[E]
Magnesium Sulfate $MgSO_4$	AII[E]	–	AII[D]	AII[D]	AII[D]	AII[B]	AII[C]	AII[E]
Maleic Acid $COOH(CH)_2COOH$	AII[E]	NR	5-10[D]	AII[D]	AII[D]	10[B]	1[B]	10[E]

Corrosion Resistance

	Metals				Glass	Plastics		
	Duriron	Cast Iron	304	316	Borosilicate Glass	PVC	PP	PVDF
Manganese Chloride $MnCl_2$	0-4[D]	NR	NR	NR	–	–	10[B]	–
Mercuric Chloride $HgCl_2$	NR	NR	NR	NR	1[D]	10[B]	10[C]	10[E]
Methyl Alcohol CH_3OH	All[E]	NR	All[D]	All[D]	All[D]	All[A]	10[C]	All[E]
Methyl Ethyl Ketone $CH_3COCH_2CH_3$	All[E]	All[A]	All[C]	All[D]	All[D]	NR	10[A]	NR
Methyl Formate $HCOOCH_3$	0-3[D]	All[A]	All[D]	All[D]	–	NR	–	NR
Nickel Chloride $NiCl_2$	All[E]	NR	NR	NR	All[D]	All[B]	All[C]	All[E]
Nickel Nitrate $Ni(NO_3)_2$	All[E]	NR	All[C]	All[D]	All[D]	All[B]	All[C]	All[E]
Nickel Sulfate $NiSO_4$	All[E]	NR	All[D]	All[D]	All[D]	All[B]	All[C]	All[E]
Nitric Acid <70% HNO_3	0-7[B]	NR	0-6[*]	0-6[*]	0-7[A]	0-2[B]	NR	All[D]
Nitric Acid >70% HNO_3	10[C]	NR	7-9[A]	7-9[A]	10[A]	7[A]	NR	7-10[B]
Nitrobenzene $C_6H_5NO_2$	All[E]	All[A]	All[E]	All[E]	All[D]	NR	NR	–
Oxalic Acid $(HOOC)_2 \cdot 2H_2O$	All[E]	NR	All[A]	All[A]	All[D]	All[A]	10[B]	All[B]
Phenol C_6H_5OH	All[E]	NR	All[D]	All[D]	All[D]	NR	1[D]	All[D]
Phosphoric Acid H_3PO_4	All[A]	NR	All[C]	All[D]	All[D]	0-7[B]	0-9[C]	0-8[D]
Phthalic Acid $C_6H_4(COOH)_2$	All[E]	NR	1[E] 10[E]	1[E] 10[E]	–	–	10[A]	All[D]
Picric Acid $C_6H_2(NO_2)_3OH$	All[C]	NR	All[A]	All[A]	All[D]	1[B]	–	1[D]
Potassium Bisulfate $KHSO_4$	All[E]	NR	NR	1[D]	–	–	–	–
Potassium Chloride KCl	0-3[D]	NR	NR	NR	–	All[B]	All[C]	All[E]
Potassium Hydroxide KOH	0-3[B]	0-5[A]	0-5[D]	0-5[D]	NR	0-7[C]	All[B]	All[D]
Potassium Nitrate KNO_3	All[E]	All[D]	All[D]	All[D]	All[D]	All[B]	All[C]	All[E]
Potassium Sulfate K_2SO_4	All[E]	0-2[A]	0-2[D]	0-2[D]	All[D]	All[B]	10[C]	All[E]
Propane C_3H_8	All[E]	All[D]	All[D]	All[D]	All[D]	All[B]	NR	All[E]
Sea Water	10[C]	NR	NR	10[A]+	10[D]	10[B]	10[C]	10[E]

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Corrosion Resistance

	Metals				Glass	Plastics		
	Duriron	Cast Iron	304	316	Borosilicate Glass	PVC	PP	PVDF
Sodium Acetate $NaC_2H_3O_2$	All[E]	All[D]	All[D]	All[D]	All[D]	All[B]	All[C]	All[D]
Sodium Aluminate $Na_2Al_2O_3$ or $NaAlO_2$	NR	0-4[D]	0-4[D]	0-4[D]	–	All[A]	–	–
Sodium Bicarbonate $NaHCO_3$	All[E]	0-2[C]	All[C]	All[D]	All[D]	All[B]	10[C]	All[E]
Sodium Bichromate $Na_2Cr_2O_7$	All[D]	All[D]	All[D]	All[D]	–	All[B]	–	All[D]
Sodium Bisulfate $NaHSO_4$	All[E]	NR	0-2[A]	0-5[A]	All[B]	All[B]	10[C]	All[E]
Sodium Bisulfite $NaHSO_3$	NR	NR	NR	NR	NR	All[B]	10[C]	All[E]
Sodium Bromide NaBr	NR	NR	NR	0-5[D]	–	All[B]	10[B]	All[E]
Sodium Carbonate Na_2CO_3	0-4[C]	0-4[D]	0-4[D]	0-4[D]	–	0-3[B]	All[C]	All[E]
Sodium Chlorate $NaClO_3$	0-7[D]	NR	0-7[D]	0-7[D]	0-5[D]	All[B]	All[C]	All[E]
Sodium Chloride NaCl	0-4[D]	1[A]	0-3[D]	0-3[D]	0-3[D]	All[B]	All[C]	All[E]
Sodium Chlorite $NaClO_2$	0-5[A]	NR	NR	0-4[A]	–	NR	NR	All[D]
Sodium Citrate $C_6H_5O_7Na_3$	10[D]	NR	0-4[D]	0-4[D]	–	–	–	–
Sodium Cyanide NaCN	–	–	All[B]	All[B]	All[D]	All[B]	All[C]	All[E]
Sodium Fluoride NaF	NR	NR	1[A]	1[E]	NR	All[B]	All[C]	All[E]
Sodium Hydroxide NaOH	0-5[C]	0-5[A]	0-5[A]	0-5[D]	NR	0-7[B]	All[C]	0-5[D]
Sodium Hypochlorite NaOCl	1[B]	NR	NR	NR	1[B]	0-1[B]	1[B]	0-1[B]
Sodium Nitrate $NaNO_3$	All[E]	0-7[A]	0-7[E]	0-9[E]	All[D]	All[B]	10[C]	All[E]
Sodium Nitrite $NaNO_2$	0-6[D]	0-6[C]	0-6[D]	0-6[D]	All[D]	All[B]	All[C]	All[D]
Sodium Perchlorate $NaClO_4$	All[D]	NR	0-9[D]	0-9[E]	–	–	–	–
Sodium Peroxide Na_2O_2	1[D]	All[A]	All[D]	All[D]	1[B]	All[B]	10[C]	All[E]
Sodium Phosphate Na_2HPO_4 or NaH_2PO_4	All[D]	NR	0-6[D]	0-6[D]	NR	All[B]	10[C]	All[E]
Sodium Silicate $2Na_2O \cdot SiO_2$	All[D]	All[D]	All[D]	All[D]	1[D]	All[B]	10[C]	All[E]
Sodium Sulfate Na_2SO_4	All[D]	All[A]	All[D]	All[D]	All[D]	All[B]	All[C]	All[E]
Sodium Sulfide Na_2S	0-4[C]	NR	0-4[A]	0-4[D]	NR	All[B]	All[C]	All[E]
Sodium Sulfite Na_2SO_3	NR	NR	0-5[C]	0-5[D]	All[D]	All[B]	All[B]	All[E]

Corrosion Resistance

	Metals				Glass	Plastics		
	Duriron	Cast Iron	304	316	Borosilicate Glass	PVC	PP	PVDF
Stannic Chloride $SnCl_4$	0-2[B]	NR	NR	NR	All[D]	All[B]	10[C]	All[E]
Stannous Chloride $SnCl_4$	All[D]	NR	NR	NR	All[D]	All[B]	All[B]	All[E]
Stearic Acid $CH_3(CH_2)_{16}COOH$	All[E]	NR	10[E]	10[E]	All[D]	All[B]	NR	All[E]
Styrene $C_6H_5CH:CH_2$	All[E]	All[A]	All[B]	All[B]	–	NR	–	–
Sulfur S	10[E]	–	10[E]	10[E]	10[D]	10[B]	10[A]	10[D]
Sulfur Chloride S_2Cl_2	NR	NR	NR	NR	All[B]	NR	NR	All[A]
Sulfuric Acid <70% H_2SO_4	0-7[C]	NR	NR	NR	0-7[D]	0-7[B]	0-7[C]	0-6[D]
Sulfuric Acid >70% H_2SO_4	7-10[E]	NR	10[A]	10[A]	7-10[D]	NR	7-9[B]	7-9[C]
Sulfurous Acid H_2SO_3	NR	NR	0-2[A]	0-2[A]	All[D]	All[B]	10[C]	All[D]
Tartaric Acid $COOH(CHOH)_2COOH$	All[E]	NR	0-5[A]	0-5[D]	All[D]	All[B]	10[B]	All[D]
Thionyl Chloride $SOCl_2$	10[E]	NR	–	10[A]	All[D]	NR	NR	NR
Titanium Tetrachloride $TiCl_4$	10[A]	10[A]	10[A]	10[A]	10[D]	NR	NR	All[B]
Toluene $C_6H_5CH_3$	All[E]	All[D]	All[D]	All[D]	All[B]	NR	NR	All[B]
Trichloroethylene $CHCl : CCl_2$	All[E]	10[C]	9-10[C]	9-10[D]	All[D]	NR	NR	All[B]
Triethanolamine $(HOCH_2CH_2)_3N$	All[E]	All[E]	All[E]	All[E]	All[D]	NR	10[C]	NR
Vegetable Oil	10[E]	10[A]	9-10[E]	9-10[E]	10[D]	10[B]	10[C]	10[B]
Vinyl Acetate $CH_3COOCH : CH_2$	10[E]	10[A]	10[B]	10[B]	–	NR	–	All[D]
Zinc Chloride $ZnCl_2$	0-4[C]	NR	NR	NR	All[D]	All[B]	All[C]	All[E]
Zinc Sulfate $ZnSO_4$	All[E]	NR	All[C]	All[C]	All[D]	All[B]	All[C]	All[E]

0 = 0% weight percent
1 = 10% weight percent
2 = 20% weight percent
3 = 30% weight percent
4 = 40% weight percent
5 = 50% weight percent
6 = 60% weight percent
7 = 70% weight percent
8 = 80% weight percent
9 = 90% weight percent
10 = 100% weight percent
All = All Concentrations
NR = Not Recommended
A = 68°F max. (20°C)
B = 122°F max. (50°C)
C = 167°F max. (75°C)
D = 212°F max. (100°C)
E = 257°F max. (125°C)
* = To boiling
+ = Continuous service

Examples:
0- 4[B] From 0 to 40% (weight percent) the material listed is acceptable to 122°F (50°C).
8[C] At 80% the material listed is acceptable to 167°F (75°C).
All[D] All concentrations to 212°F (100°C) are acceptable.
1[D] 10[D] Material is acceptable at 10% to 212°F (100°C) and 100% to 212°F (100°C).

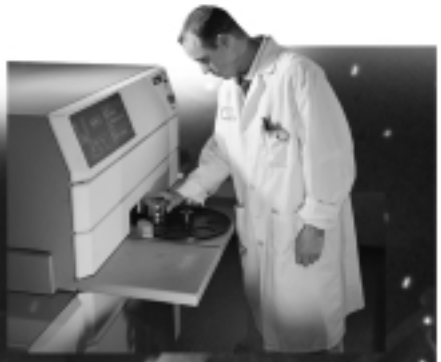
Materials Engineering

Multiple Casting Processes

Reactive Alloy Expertise

Rapid Prototyping

Technical Support



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